OPT®
Machine Vision

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OPT Machine Vision (2024~2025 Rev1.0)

SSE: 688686

OPT®
Machine Vision



OPT Machine Vision

2025~2026 Rev1.0



OPT is a machine vision components and software supplier for factory automation. It has quickly developed to become a leader in the machine vision industry. OPT's products and solutions have reached more than 20 countries and regions, with more than 30 branches and distributors worldwide, serving more than 15000 customers. Many of these customers are Fortune 500 companies. They trust in OPT to help design and develop unique solutions to complex problems.

OPT currently has more than 2500 employees, of which more than half are technicians: over 1500 R&D and other technical personnel.

The OPT products include: vision systems, light sources, industrial cameras, industrial lenses, industrial computers, 3D laser profiler, smart code reader, measurement systems, sensors, and motion components, etc.

The vision system includes SciVision SDK, Smart3 machine vision software and vision controllers.

The machine vision light sources consist of 47 standard series including nearly 1000 standard models and customized series with over 32000 customized designs and solutions. OPT can deliver a customized light in as fast as 3 working days.

Industrial Camera Products: Coverage from 0.3MP to 150MP for area scan cameras, including both global and rolling shutter exposure options. Line scan cameras cover resolutions from 2K to 16K, compatible with GigE Vision, USB3 Vision, Camera Link, CoaXPress protocols, and GenICam standards.

Industrial Lens Products: Various types including line scan lenses, fixed-focus lenses, zoom lenses, telecentric lenses, and special lenses, meeting diverse application needs across different industries and scenarios.

Industrial Computer: Two major series - 3U desktop and 4U rack-mounted, supporting 7 expansion slots, and featuring 6th to 13th generation Intel CPUs across the entire range.

3D Laser Profiler Products: High-speed series, high-precision series, and economical series.

Smart Code Reader Products: Coverage from 0.4MP to 20MP resolutions, including manual focus and auto-focus series. Decoding algorithms employ deep learning and multi-core data processing, achieving super high read rates.

Measurement System Products: One-click measurement sensor series, Thrubeam measurement sensor smartaxis series, and scanning measurement sensor series.

Sensor Products: Sensor products: 7 series, including slot photoelectric sensors, photoelectric sensors, fiber optic sensors, safety sensors, proximity sensors, color sensors, and measurement sensors.

Motion Components: Linear motors, linear motor stators, DD motors, linear motor modules, standard screw slide tables, dust-free screw slide tables, embedded screw slide tables, standard belt slide tables, dust-free belt slide tables, and combination slide tables.

Our goal is to be a global first-class machine vision enterprise;
And to create a platform for our staffs to succeed with self-value.

OPT's Advantages

Qualifications
Leader in machine vision application technology
One of China's largest machine vision components suppliers
Possesses the most comprehensive machine vision laboratory in the country
Core supplier of machine vision for the 3C and lithium battery industries

Technology
110+ software copyrights
600+ patents
Over 1300 image acquisition technologies
More than 300 AI algorithms

Products
Six major product lines
Over 1000 standardized products
32000+ customized solutions for customers
Meeting application needs in nearly a hundred industries

Experience
18 years of technical expertise
Serving over 15,000 customers worldwide
150,000 optical imaging experiments
More than 53,000 project application cases

Team
280+ imaging engineers
300+ sales engineers
1200+ software application engineers
Comprehensive machine vision talent development system

Services
24/7 on-site technical support
Standard products in stock, customized products delivered in 3 days
Stock available based on customer requirements
Global service network to shorten delivery cycles

OPT's History

2024: Awarded "National Manufacturing Individual Champion Enterprise"(by the Ministry of Industry and Information Technology, MIIT)Second Price Winner of "Guangdong Provincial Science and Technology Innovation Award"
Approved as "Guangdong Province: Key Laboratory of Industrial Intelligent Detection Technology"

2023: Selected as a "National Intellectual Property Demonstration Enterprise"
Awarded the Second Prize of "Guangdong Provincial Science and Technology Innovation Award"Recognized as a "Guangdong Provincial Manufacturing Individual Champion Product"

2022: Granted the "Dongguan Key Laboratory of Machine Vision" and honored with the "Excellence Performance" award.
Selected as a "Guangdong Province Industry-Education Integration Enterprise" and a "Guangdong Intelligent Manufacturing Ecological Collaboration Partner."

2021: Took the lead in undertaking the Guangdong Provincial Key Area Research and Development Program, "Research and System Development of Micron-level Real-time Vision Inspection Technology."
Received the titles of "Guangdong Province Enterprise Technology Center" and the "Second Prize of Innovation Dongguan Science and Technology Progress Award."

2020: Listed on the Science and Technology Innovation Board of the Shanghai Stock Exchange.
Approved as a national "Postdoctoral Research Workstation," "Guangdong Provincial Postdoctoral Workstation," and "Guangdong OPT Machine Vision Engineering and Technological Research Center."

2019: Honored with the title of "2019 National Intellectual Property Advantage Enterprise."
Received the titles of "2019 Top 500 Manufacturing Enterprises in Guangdong Province" and "Top 100 Innovative Enterprises."; Granted the "Dongguan Machine Vision Engineering Technology Research Center" approval.

2018: Released the X3 Vision Controller; Established a research and development center in Shenzhen.
Established a subsidiary: OPT Machine Vision Tech (Suzhou) Co., Ltd.
Obtained GB/T29490-2013 certification for intellectual property management system.

2017: Selected as a pilot enterprise for the Dongguan Key Enterprise Scale and Efficiency Multiplication Plan.

2016: Completed the shareholding system reform and officially changed the name to"OPT Machine Vision Tech Co., Ltd."

2015: Launched the Q2 Vision Controller; Established a research cooperation with South China University of Technology.
Introduced high-power UV curing light sources.

2014: Received the title of "Famous Trademark of Guangdong Province."
Established the Lens Division, focusing on the research and production of machine vision lenses.

2013: Received ISO 9001:2008 quality system certification for the first time.

2012: Introduced the SciVision vision development kit and Smart vision software, both with independent intellectual property rights; Introduced a waterproof light source.

2011: The products underwent a comprehensive upgrade, and the standard light source product line expanded to include 25 major series.

2010: First-time participation in the Machine Vision Exhibition in Stuttgart, Germany.

2009: Became a provider of complete machine vision solutions.
Received the first-ever recognition as a "National High-tech Enterprise."

2008: OPT's products obtained RoHS certification and CE certification.
Introduced the first light source controller with automatic load detection technology.

2007: Received the title of "Guangdong Province Technology Enterprise."

2006: OPT was formally established.

Global Service Network


Headquarters


Suzhou Subsidiary


Ningde Subsidiary


Shenzhen R&D Center


Middle China Office


Southwest Office

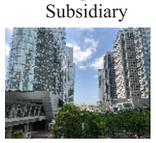

Hong Kong Subsidiary


Germany Subsidiary


USA Office


Thailand Office

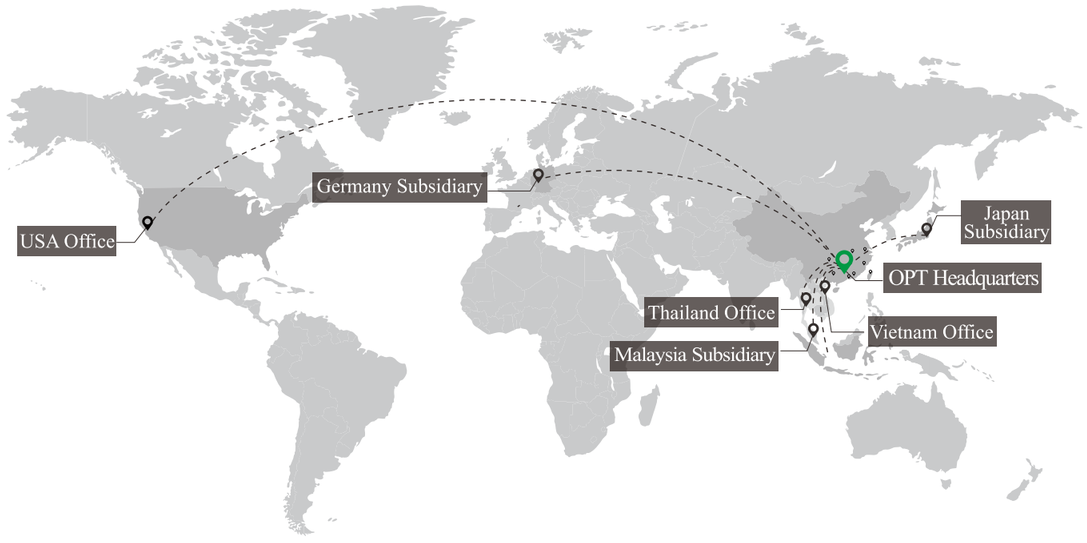

Malaysia Subsidiary


Japan Subsidiary


Taiwan Office


Vietnam Office

全球服务网络

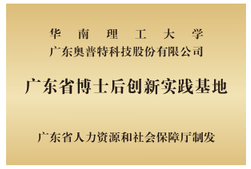


OPT's Recognitions and Awards

- Postdoctoral Research Workstation
- Famous Trademark of Guangdong Province
- National High-tech Enterprise
- National Intellectual Property Advantage Enterprise
- RoHS/CE certifications
- Intellectual property management system certification
- ISO14001
- ISO9001:2015
- China Machine Vision Association Membership
- AIA Membership
- EMVA Membership
- PI-China Membership



PhD Research Workstation



Postdoctoral Innovation Practice Base in Guangdong Province



PhD Workstation in Guangdong Province



Guangdong OPT Machine Vision Engineering Technology Research Center



National Intellectual Property Advantage Enterprise



High-tech Enterprise



Machine Vision Joint Laboratory



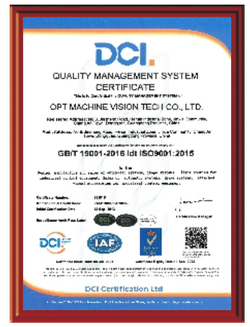
Member Unit of Machine Vision Industry Alliance



Certificate of Conformity



Certification of Product Declarations



Quality Management System Certificate



Environmental Management System Certificate



Computer Software Copyright Registration Certificate



Patent Certificate



Patent Certificate



Patent Certificate

Customer[1]

- Over 15,000 customers trust and support our products and services.
- The product quality has been verified by more than 53,000 applications.
- The above data is continuously updated.

[1] OPT's direct and indirect customers are listed as below.
Each brand belongs to its legal owner.
Listed in no particular order.

CATL · ATL · BYD · LG · CALB 中创新航 · GanfengLithium 赣锋锂业
SVOLT 蜂巢能源 · COSMX · cornex 楚能 · HTHIUM · EVE 亿纬锂能 · SUNWODA 欣旺达
LISHEN · 瑞浦能源 REPT · FOXCONN · LENS · FLEXTRONICS · Quanta Computer
领益智造 LY iTECH · BIEL · LUXSHARE ICT · JABIL · PEGATRON 和硕联合科技 · vivo
oppo · NXP · BOE · Goertek · FANUC · 广汽 HONDA
北京大学 PEKING UNIVERSITY · 清华大学 · 华南理工大学 · CETC · GREE 格力

Machine Vision Systems



SciVision SDK **P20**

Highly integrated algorithm tools; support multiple programming languages; shorten the development cycle.



Smart3 Machine Vision Software **P25**

Graphical editing; easy to operate; quickly build visual applications.



Smart Camera Hardware **P31**

Specially designed for machine vision; passed strict tests; stable performance.



Q2C Vision Controller **P32**

High performance and stability design, suitable for complicated applications.



EVC2 Vision Controller **P33**

High performance, low power consumption; multiple interfaces for devices connections.



SC Series Smart Cameras **P34**

Multifunctional integrated smart camera with minimal installation space required and support for light source control.

Smart Code Readers



B1 Series **P48**

Compact high-speed barcode reader, covering industry-standard resolutions from 1 million to 2.3 million pixels, supported by deep learning algorithms.



S2 Series **P53**

Tiny, high-speed barcode reader with 1MP resolution, powered by deep learning algorithms.



D1 Series **P57**

High-quality imaging, high-performance hardware, abundant pixel selection, cost-effective, with built-in deep learning algorithms.



E1 Series **P65**

High-performance, high-speed barcode readers covering industry-standard resolutions from 1MP to 20MP, powered by deep learning algorithms, with independently controllable multi-channel light sources.



R1 Series **P69**

Handheld, high-speed barcode reader covering industry-standard resolutions from 1MP to 2.3MP, powered by deep learning algorithms, featuring freely switchable multi-color light sources.

3D Laser Profilers



LPB Series **P83**

Sampling speeds of up to 8,000 profiles per second and 25.6 million points per second.



LPC Series **P88**

Sampling speeds of up to 67,000 profiles per second and 214.4 million points per second.



SRT3D-F2 Pro **P93**

Telecentric optical design significantly reduces the blind area in the field of view and addresses the issue of dark corner breakpoints in imaging.



SRE3D-E2 Basic **P98**

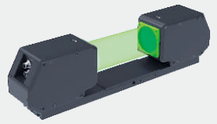
Economical and practical, with up to 3200 X-axis profile points, deliveringhigh precision and accurate contour reconstruction of products.

Measurement Systems



One-Click Measurement Sensor SmartFlash Series **P111**

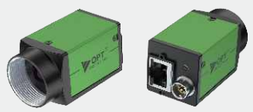
A highly efficient, precise, and stable optical image measurement system that requires no programming. The product can be placed arbitrarily, and all dimensions can be measured with a single click.



Thrubeam Measurement Sensor SmartAxis Series **P115**

Featuring high precision, efficiency, simple operation, and rich functionality, it offers a complete range of specifications to meet various product inspection needs. Focused on precision dimension measurement, it builds comprehensive measurement technology across all aspects.

OPT Industrial Cameras



CC1 Series GigE Industrial Area Scan Camera **P128**

Shutter type is Rolling, compact in size and easy to install.



CC1 Series USB3.0 Industrial Area Scan Camera **P130**

USB3.0 interface, compact size, easy to install, and cost-effective.



CH1 Series Industrial Area Scan Cameras **P132**

High resolution, high frame rate, and high image quality



CL1 Series Industrial Line Scan Cameras **P137**

Fast, Accurate, Stable



CM1 Series Multispectral Area Scan Camera **P140**

SWIR, InGaAs detector, response wavelength 0.4–1.7 µm, penetrating invisible materials.

OPT Lenses



Coloretto Series Line Scan Lens **P162**

Compatible with line scan cameras of ≥ 7um pixel size and Ø30 mm- Ø80 mm image circle.



Hawk Series Line Scan Lens **P165**

Compatible with (16k)/3.5 µm, (12k)/5 µm and (8k)/7 µm line scan cameras



Grampus Series Line Scan Lens **P167**

Compatible with (16k)/5 µm, (12k)/5 µm and (8k)/7 µm line scan cameras.



Line Scan Lenses Accessories **P169**

Various size of adaptors available for different vision project requirement.



78MP Fixed Focal Length Lens **P171**

Suitable for high-resolution full-frame face-array cameras with pixel sizes of 3.2 µm and larger.



29MP Fixed Focal Length Lens **P173**

Compatible with full frame camera and (8k)/5 µm line scan cameras.



151MP Fixed Focal Length Lens **P175**

Compatible with cameras of ≥ 3.76 µm pixel size and ≤ Ø 67 mm large image circle.



Cobra Series Fixed Focal Length Lens **P177**

Compatible with cameras of ≥ 2.2 µm pixel size and ≤ 1/1.8" | 2/3" sensor format.



Dolphin 20MP Series Fixed Focal Length Lens **P180**

Compatible with cameras of ≥ 2.4 µm pixel size and ≤ 1.1" sensor size.



10MP Fixed Focal Length Lens **P182**

Compatible with cameras of ≥ 3.45 µm pixel size and ≤ 1.1" sensor format.



5MP Fixed Focal Length Lens **P184**

Compatible with cameras of ≥ 3.45 µm pixel size and ≤ 2/3" sensor format.



2MP Fixed Focal Length Lens **P187**

Compatible with cameras of ≥ 5 µm pixel size and ≤ 2/3" sensor format.



M12 Fixed Focal Length Lens **P190**

Compatible with cameras of ≥ 3.45 µm pixel size and ≤ 1/1.7" sensor size.



Cobra Series Liquid Fixed-Focus Lenses **P192**

Liquid focus design, suitable for 2/3" and below cameras.



5MP 3X Variable Magnification Lens **P196**

0.3-1.0X magnification; compatible with cameras of ≥ 3.45 µm pixel size and ≤ 2/3" sensor size.



Variable Magnification Telecentric Lens **P197**

0.5-1.0X magnification; compatible camera sensor size: ≤ 1/1.2".



Zoom Microscopic Lens **P198**

7x zoom ratio, modular design can be freely combined according to needs, suitable for sensor size 1.1" and below.



Cheetah Series Telecentric Lens **P210**

High-resolution design, with magnification ranging from 0.3X to 2X, suitable for sensor size 2/3″ and below.



Hippo Series Telecentric Lens **P204**

Magnification is available in various specifications from 0.3X to 4X, suitable for sensor size 1.1″ and below.



Hippo Series Liquid Telecentric Lens **P207**

Telecentric liquid focus design with temperature compensation function, magnification range from 0.5X to 4.0X, suitable for camera sensor size 2/3" and below.



MH Series Telecentric Lens **P210**

Magnification is available in various specifications from 0.5X to 7.5X, suitable for sensor size 2/3″ and below.



10M Series Telecentric Lens **P213**

Magnification is available in various specifications from 0.2X to 4X, suitable for sensor size 1.1″ and below.



Non-Standard Custom Lens **P215**

To meet the needs of visual projects, OPT provides customized imaging lens services.



Lens Accessories **P218**

Lens accessories such as extension tubes, filters, polarizing filters and prisms.

OPT Standard Lights



Ring Lights OPT-RI Series **P233**

Different angles uniform illumination.



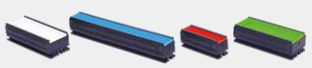
Ring Lights OPT-RIB Series **P240**

Good directivity; lower power consumption compared with OPT RI Series.



Arc-shaped Lights OPT-RIC Series **P242**

The arc light source provides illumination from various angles, enhancing the three-dimensional details of the object. The arc opening angle is customizable to meet specific requirements.



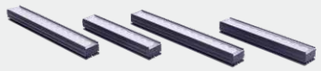
Bar Lights OPT-LI Series **P248**

Customizable colors and sizes; suitable special illumination requirements.



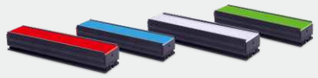
Combined Bar Lights OPT-LIM Series **P251**

Adjustable illumination angles; sectional control; suitable for special illumination requirements.



High Uniformity Bar Lights OPT-LIA Series **P254**

High directionality; can be used for long distance illuminating instead of LI series. Lower power consumption than LI series lights of the same size.



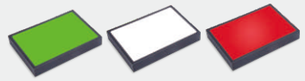
High Uniformity Bar Lights OPT-LIT Series **P256**

Variable bar light sizes for various environments.



Direct Backlight OPT-FL Series **P258**

High density LED arrays for high power and uniform illumination; maximized emitting surface.



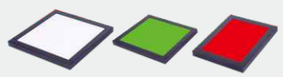
Direct Backlight OPT-FLA Series **P261**

To be preferred in OPT large-sized backlights compared with OPT-FL Series.



Edge Lit Backlight OPT-FLC Series **P264**

Ultra-light and thin design; minimum 6mm for narrow space, customisable sizing for large area illumination.



Edge Lit Backlight OPT-FLCA Series **P267**

In comparison with FLC series, equipped with bigger emitting surface, first choice for big-size back lightings.



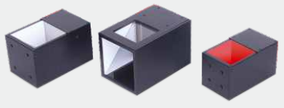
Backlight With Centre Hole OPT-FLCA-K / FLA-K Series **P270**

Good brightness and uniformity , first choice for big-size back lighting.



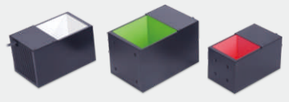
Highly-directional Backlights OPT-FLP Series **P275**

Directional illumination; higher intensity compared with FL and FLC series lights.



Coaxial Lights OPT-CO / COR Series **P248**

Good emitting directivity, suitable for high working distance also with significant image characters.



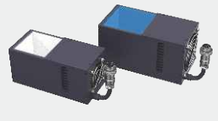
High Precision Coaxial Light Source OPT-COH Series **P283**

Ideal for high resolution imaging. Greatly decrease ghost imaging in highly reflective workpiece inspection.



High-precision Prism Coaxial Light Source OPT-COC Series **P286**

An ideal choice for high-resolution imaging. No ghosting in high-reflectivity workpiece inspection applications.



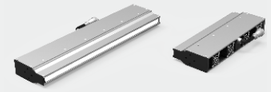
High Intensity Coaxial Lights OPT-COG Series **P288**

Intensity four times higher than OPT-CO series.



Dome Lights OPT-RID Series **P290**

Special diffuser for uniform and shadowless illumination.



Ultra High Intensity Line Scan Lights OPT-LSA Series **P292**

The light source achieves a maximum illuminance of 5 million lux; with a narrow emission angle, it is suitable for longer working distances.



Ultra High Intensity Line Scan Lights OPT-LSS Series **P295**

Illuminance up to 2000K lux; low divergence angle, suitable for long working distance applications.



Cross Line Lights OPT-LSSX Series **P298**

Special optical design, cross emitting from sides, used to detect damages of work piece in the moving direction.



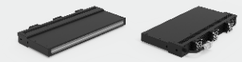
High-brightness Linear Coaxial Lights OPT-LSSC/LSNLC Series **P301**

The light source achieves a maximum illuminance of 5 million lux; with a narrow emission angle, it is suitable for longer working distances.



Passive Cooling Line Scan Lights OPT-LSNS / LSNL Series **P306**

Fan-free design, quiet and stable, suitable for special working environment with demand of noise, vibration and airflow.



Narrow Beam Linear Light Source OPT-LSE Series **P311**

The divergence angle is less than 0.5°, creating an extremely narrow beam with an exit aperture width of less than 0.5 mm. Compared to lasers, LED light sources do not produce speckle noise that can affect image processing.



High Intensity Spot Lights OPT-PIG Series **P313**

Equipped with the special light-guiding tube (Up to 1400k lux illuminance with white light at 20mm WD).



Collimated Spot Lights OPT-LDS Series **P315**

Long work distance, large effective illumination area.



Digital Fiber Spot Lights OPT-DOF Series **P317**

Lighting and control-circuit are integrated, support Ethernet and com port communication, programmable trigger and external trigger.



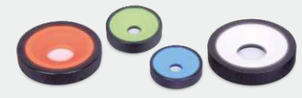
Structured Lights OPT-SL/SLS Series **P321**

Compatible with all C-Mount lenses; Uniform pattern with sharp edge, high illumination accuracy.



Diffuse Dark Field Ring Lights OPT-RIF Series **P324**

Providing uniform and shadowless illumination; suitable for multiple applications at different working distances.



Diffuse Ring Lights OPT-RIE Series **P326**

Equipped with special diffusers to reduce reflection and allow uniform illumination.



Diffuse Ring Lights OPT-RIW Series **P328**

Equipped with special diffusers to ensure uniform illumination.



Diffuse Front Ring Lights OPT-RIU Series **P329**

Special diffuser for uniform and shadowless illumination.



Diffuse Dark Field Square Lights OPT-RIH Series **P330**

Providing uniform and shadowless illumination from four directions, suitable for the inspection of irregular rectangular targets.



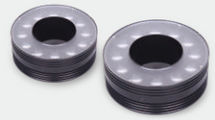
Bright Uniform Ring Lights OPT-RIP Series **P332**

Equipped with high power LEDs and high uniformity diffuser for high intensity and shadowless illumination.



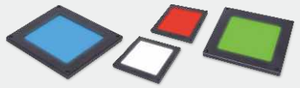
Multi-Spectrum Shadowless Ring Light OPT-RIPM Series **P334**

The lighting includes 8 wavelengths. Each waveband uniformly distributes in four regions.



High Intensity Ring Lights OPT-RIG Series **P339**

Equipped with high power LEDs for more than 3 times the intensity of RI lights.



Flat Dome Lights OPT-FC Series **P340**

Coaxial planar light source with shadowless and coaxial lighting effects.



Collimated Spot Lights OPT-PL Series **P342**

Telecentric optical design, divergence angle ≤1°; greatly increase image edge contrast gaiwei and get higher gauging accuracy.



Collimated Backlights OPT-FP Series **P346**

Compact design; suitable for high accuracy gauging.



AOI Lights OPT-RIA Series **P348**

Highlight object 3D information by multi-colored (RGB) illumination from various angles.



Vault Lights OPT-LIU Series **P349**

Adopting effective heat dissipation design for better diffusion effect, effectively eliminating interference of uneven surface.



Programmable Pattern Lights OPT-PCP Series **P351**

A programmable pattern light source that allows setting of stripe types and parameters, with customizable workflows. It supports multiple signal outputs for synchronizing with multiple cameras.



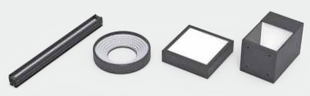
Partitioned Illumination Lights OPT-MS Series **P353**

Coaxial planar light source with shadowless and coaxial lighting effects.



High CRI Light OPT-XX-RA95W Series **P359**

Average CRI amounts over 95, excellent CRI, covering many types of lightings.



IR Lights OPT-IXX-IR Series **P361**

Provide 850nm/940nm illumination; customizable shapes and illumination angles.



UV Lights OPT-UXX-UV Series **P372**

2 standard products of 365nm and 375nm are available. Using glass to cover LED and long service life.



UV Glue Curing Lights OPT-CXXX-UV Series **P378**

Light spots with various diameter ranging from 4mm, 6mm, 8mm, 10mm until 15mm.

OPT Custom Lights



Waterproof Lights **P383**

Ip67 rating; suitable for humid and dusty environments.



Air Cooled Light Series **P385**

Applicable in dust-free and other environments that have special requirements for air pressure.



Water Cooled Light Series **P386**

High power LEDs are distributed closely for uniform illumination. Adopting water cooling for better heat dissipation effect.



Custom Lights **P389**

OPT has developed more than 30,000 custom lights;3 business days minimum lead time for the custom prototype.

OPT Controllers



DPA Digital Current Controller **P398**

OPT-DPA2024EB -X
24V output voltage; 48W/CH output power; RS232 and Ethernet interfaces; 4CH/8CH/16CH available.



Digital Current Controller **P402**

OPT-DPA2012EB-4
12V output voltage; 24W/CH output power, total output power ≤ 48W; RS232 and Ethernet interfaces; 4CH output.



Digital Current Controller for Spot Lights **P405**

OPT-DPA2005EB-X
5V output voltage; 10W/CH output power; RS232 and Ethernet interfaces; 4CH/8CH available.



High Power Digital Current Controller **P408**

OPT-DPA6024E-2
5V-48V output voltage; 144W/CH output power; RS232 and Ethernet interfaces; 2CH output.



High Power Digital Current Controller **P408**

OPT-DPA6024EC-2
24VDC input voltage; 5V-48V output voltage; 144W/CH output power; RS232 and Ethernet interfaces.



High Power Digital Current Controller **P411**

OPT-DPA6024EB-X
24V output voltage; 144W/CH output power; 2CH/4CH/8CH/16CH available; RS232 and Ethernet interfaces.



High Power Digital Current Controller **P415**

OPT-DPA10024EB-X
24V output voltage; 240W/CH output power; 1CH/2CH available; RS232 and Ethernet interfaces.



Ultra-high Power Digital Current Controller **P418**

OPT-DPA20024EB-X
24V output voltage; 240W/CH output power; 1CH/2CH available; Rs232 and Ethernet interfaces.



DPH Strobe Overdrive Digital Controller **P421**

OPT-DPH20048E-4
48V output voltage; max. transient output current: 20A; RS232 and Ethernet interfaces; 4CH output.



Light-scan Type Digital Current Controller **P423**

OPT-DPA6024ES-X
24V output voltage; 144W/CH output power; 4CH/8CH/16CH available; RS232 and Ethernet interfaces.



AP Analog Voltage Controller **P428**

OPT-AP1024F-X
24V output voltage; 24W/CH output power; 1CH/2CH/3CH/4CH available.



APA High Power Analog Current Controller **P431**

OPT-APA6024-2
24V output voltage; 144W/CH output power; two-channel output.



Analog Current Controller for Spot Lights **P433**

OPT-APA0805F-X
Output voltage of 5V, with a power output of 4W per channel. Available in models with 1, 2, 3, or 4 channels.



DPA Mini Digital Current Controller **P435**

OPT-DPA2024EC
24V input voltage DC; 24V output voltage; 48W/CH output power; support up to 36 channels; RS232 and Ethernet interfaces.



DPA Mini Digital Current Controller **P435**

OPT-DPA2012EC
24V input voltage DC; 24V output voltage; 48W/CH output power; support up to 36 channels; RS232 and Ethernet interfaces.



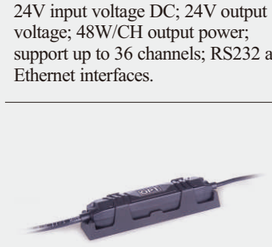
DPA Mini Digital Current Controller **P435**

OPT-DPA2005EC
24V input voltage DC; 5V output voltage; 10W/CH output power; support up to 36 channels; RS232 and Ethernet interfaces.



APM MiniAnalog Voltage Controller **P439**

OPT-APM0524B-2
24V output voltage; 12W/CH output power; two-channel output.



SPM Mini Strobe Controller **P441**

OPT-SPM2024-1
12V - 48V output voltage; 96W output power; single channel output.

OPT Other Accessories



Accessories/Lab Stand/Lab Equipment **P444**

Various testing platforms and machine vision accessories available.



Lab stand / Experimental facilities **P446**

Flexible installation and easy to use.

OPT Applications



Applications **P449**

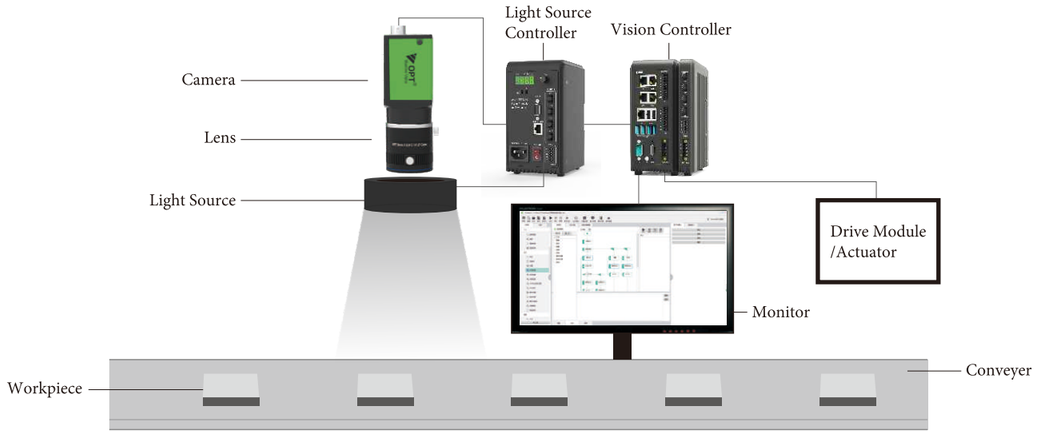
Over 10 years of experience; more than 500,000 applications proven by various industries.

Machine Vision System

- Overview of Machine Vision »P16
- Software / Hardware Platform »P19
- SciVision SDK »P20
- Smart3 Machine Vision Software »P25
- Smart Camera Hardware »P31
- Q2C Vision Controller »P32
- EVC2 Vision Controller »P33
- SC Series Smart Cameras »P34
- Applications »P37
- Lithium Battery Applications »P38
- Consumer Electronics Applications »P39
- Laser Applications »P40
- Other Applications »P41

Machine Vision Systems Overview

Machine vision systems simulate human visual functions to perform automated detection, judgment, recognition, positioning, and measurement. They enhance quality control and efficiency across various industries such as manufacturing, electronics, and logistics. A complete vision system typically consists of lighting, lens, camera, image processing software, image acquisition card, and computer/processing unit. Machine vision has expanded rapidly due to advances in technologies such as image processing, artificial intelligence, optics, and embedded systems.





Working Principle of Machine Vision Systems

A machine vision system uses image acquisition hardware to convert optical signals into image signals, which are then sent to image processing software. The software analyzes parameters such as brightness and color distribution to extract target features, make judgments, and output results to control field devices, enabling inspection and detection.

The vision processing system includes both hardware and software. Based on hardware configuration, systems are typically categorized into smart camera systems and PC-based systems. A PC-based machine vision system generally consists of four core components: light source, lens, camera, and image processing software.

The lens focuses the target image onto the camera's sensor. The camera captures the image, converts the optical signal into an electrical signal, and transmits it to the computer for further processing.

Machine vision relies on image processing and analysis algorithms, including image enhancement, segmentation, feature extraction, and recognition. These processes enable quality inspection, dimensional measurement, and result output to connected hardware for display or execution.

Comparison of Machine Vision and Human Vision

Before machine vision emerged in the 1970s, industrial production relied on human vision for measurement, identification, and analysis. This manual process was inefficient, unstable, and imprecise. Machine vision greatly improves efficiency and automation.

In hazardous or demanding environments—such as nuclear monitoring or wafer defect inspection—machine vision often replaces human vision. It also enables data integration and underpins computer-integrated manufacturing.Today, machine vision is widely used in automated production for assembly alignment, quality inspection, identification, and dimensional measurement. Key differences between machine and human vision are summarized below.

	Machine Vision	Human Vision
Efficiency	High	Low
Speed	Fast	Slow
Reliability	Stable detection results	Inconsistent results
Work hours	24/7 nonstop	Limited
Integration	Enables data integration	Cannot integrate data automatically
Cost	One time investment	High long term cost
Environment	Suitable for all	Unsuitable for hazardous environment

Machine Vision Development History

Development History of Machine Vision (Domestic and International)

Machine vision technology first emerged in the 1950s, with practical development beginning in the 1970s and entering a phase of rapid growth by the late 1990s. Two major breakthroughs fueled its advancement: the invention of CCD image sensors in the 1970s, which allowed optical signals to be digitized for computer processing, and the development of high-performance CPUs and DSP image processing technologies in the 1980s. These laid a solid foundation for widespread adoption.

Today, countries like Germany, the United States, and Japan lead the global machine vision industry in both technology and scale. The technology is widely used across sectors such as semiconductors, electronics, automotive, food, and medical devices. Although growth has slowed in the 21st century, these countries continue to maintain a strong technological edge.

In China, machine vision development began in the 1980s and accelerated significantly after 2000. As manufacturing standards rose and demand for quality control increased, machine vision became essential for replacing manual inspection. Initially, automation in China lagged behind, creating strong market demand. However, advances in optics, sensors, and image processing have enabled domestic companies to develop competitive solutions. With the rise of smart manufacturing, robotics, automation, and AI, China has become one of the most active and promising regions for machine vision development.

Machine Vision Development Trends

As machine vision expands into more complex and varied applications, it is increasingly integrated with deep learning, 3D imaging, and communication standards. Deep learning mimics the brain's layered structure, using neural networks to map low-level signals to high-level features, enhancing recognition and image processing. Advances in 3D technology have introduced methods like structured light, DFF, TOF, stereo vision, and photometric stereo, making 3D analysis a major development trend. Vision systems are also becoming more connected—with internal components, smart manufacturing equipment, and enterprise systems—supporting intelligent production. Industry groups such as EMVA, AIA, CMVA, and JIIA have developed standards like GenICam, GigE Vision, and USB3 Vision to promote interoperability and cross-industry integration.

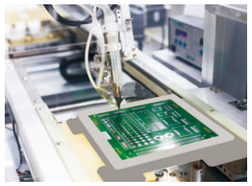
Typical Application of Machine Vision

In modern automated production, machine vision is widely applied in industries such as electronics, semiconductors, pharmaceuticals, printing, food and beverage, automotive, lithium batteries, and photovoltaics. Typical uses include assembly positioning, quality inspection, product identification, and size measurement.

Machine Vision Applications in the Electronics Industry

The fast-growing electronics industry presents major opportunities for machine vision, which is now used throughout the production process—from design and manufacturing to inspection and packaging—to boost quality and efficiency.

Typical tasks include capacitor and inductor inspection, LCD AA zone positioning, SIM card slot alignment, defect detection, and logo verification.





Machine Vision Applications in the SMT Industry

SMT (Surface Mount Technology) is a core process in electronics assembly. Machine vision is widely used for positioning and quality inspection, including stencil-to-PCB alignment, 3D solder paste inspection, component placement, and AOI after printing, placement, and reflow.

Key tasks include dispensing inspection, polarity checking, component alignment, solder joint inspection (e.g., cold, excess, or insufficient solder), OCR, and QR code reading.

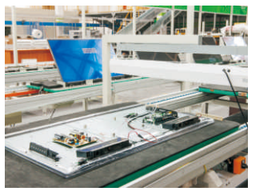


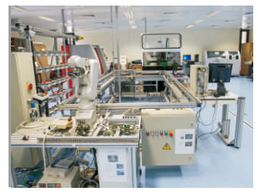


Machine Vision Applications in the Semiconductor Industry

Machine vision is widely used in the semiconductor industry for inspecting appearance defects, dimensions, quantity, flatness, spacing, positioning, solder quality, and bending.

Typical inspection tasks include: metal rod and wafer size measurement, wafer dicing and ingot cutting alignment, appearance and foreign object detection, IC pin flatness inspection, SMD package inspection, and character recognition.

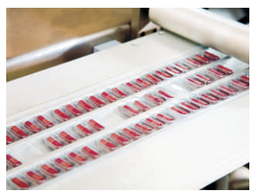


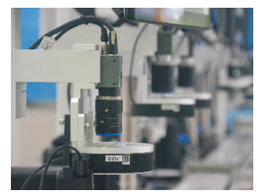


Machine Vision Applications in the Pharmaceutical and Medical Industry

The pharmaceutical and medical industry plays a vital role in public health and demands high standards for quality and efficiency. Machine vision provides critical support in inspection tasks across production.

These tasks include liquid filling alignment, capsule size measurement, bottle impurity and cap inspection, capsule contamination detection, barcode reading on packaging, outer appearance inspection, and full-box detection for cartons.





Machine Vision Applications in the Tobacco Industry

The tobacco industry is shifting from volume to quality-focused growth. Accessory suppliers are adopting smart upgrades and vision inspection solutions to support high-quality production and stay competitive.

Inspection task includes:
foreign object detection in raw tobacco leaves, filter rod size measurement, wrapping paper defect detection, character and QR code recognition on cigarette packs, pack deformation detection, and carton counting.




Machine Vision Applications in the Printing Industry

The printing industry is shifting toward digitalization and smart manufacturing, with rising demands for quality, precision, and faster delivery. Manual inspection can no longer meet these needs, driving demand for faster, high-precision vision systems to improve quality and efficiency.

Inspection tasks includes: detecting material defects (e.g., holes, foreign objects), print defects (e.g., ink splatter, blade marks, misalignment), and color defects (e.g., light printing, color shifts, missing areas).




Machine Vision Applications in the Food and Beverage Industry

Manual inspection on high-speed food and beverage lines can no longer meet quality demands. The rapid development of machine vision has greatly enhanced inspection capabilities and increased automation across production as key challenges are resolved.

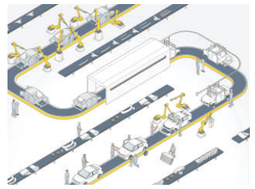
Inspection tasks include: glass bottle checks (e.g., mouth damage, foreign objects), bottle counting, filling alignment, fill level detection, post-fill contamination checks, label positioning, and code recognition.




Machine Vision Applications in the Automotive Industry

The automotive industry is a key sector in China's high-quality development strategy. With the rapid growth of the new energy vehicle market, China is building an independent and controllable supply chain. Machine vision plays a vital role in both online assembly inspection and offline component testing, creating strong growth opportunities for domestic vision technology providers.

Inspection tasks includes: measuring metal parts, detecting defects, reading part barcodes, inspecting weld spots, aligning assemblies, recognizing characters on lamp covers and clips, and checking surface and panel markings.

Machine Vision Applications in the Lithium Battery Industry

Driven by renewable energy policies, the lithium battery industry has grown rapidly. Electrode sheets commonly show defects like exposed foil, spots, and material loss. Machine vision replaces manual inspection, enabling automated defect detection and ensuring product safety.

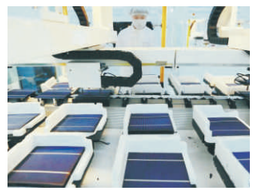
Inspection tasks includes: coating surface inspection, tab welding alignment, dimensional measurement, crease detection, weld splash detection, battery surface character recognition, and finished product appearance inspection.



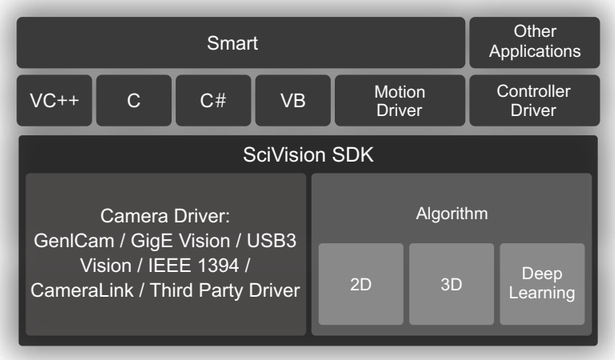

Machine Vision Applications in the Photovoltaic Industry

As renewable energy grows and manufacturing becomes smarter, the photovoltaic industry faces rising demands for efficiency and quality. In solar panel production, any process error can affect final product quality, causing issues like contamination or cell breakage. Machine vision is increasingly used to replace manual inspection for detecting and sorting silicon wafers and solar cells.

Inspection task includes: tin coating and size measurement of solar cells, welding alignment for solar panels, weld surface contamination detection, and cell defect inspection (e.g., cracks, impurities, voids, chipped corners, broken grid lines, paste stains, and color deviation).

Software Platform



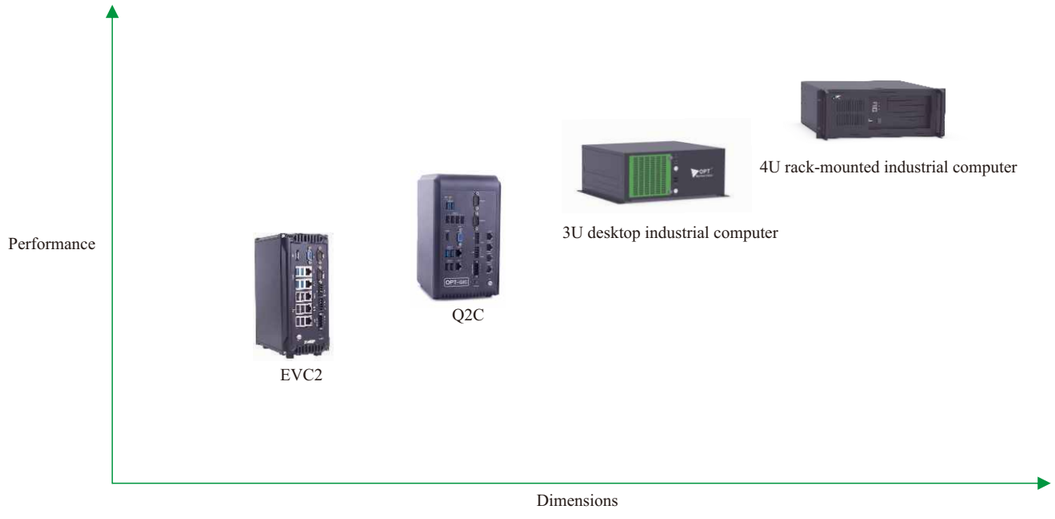
Products

Mainly covering visual software and visual controller products, among which:"

- SciVision SDK is a platform of machine vision libraries and tool sets. Use it to customize your new applications.
- Smart3 machine vision software is developed based on the SciVision SDK. Users can implement a vision project via simple graphical flow editing and configuration without any coding.

Hardware Platform

There are hardware platforms available to meet different needs. All hardware platforms support Smart3 visual software and SciVision visual development kits. In addition, more third-party software can also be run on the hardware platform, such as existing motion control software that customers may have.



SciVision SDK

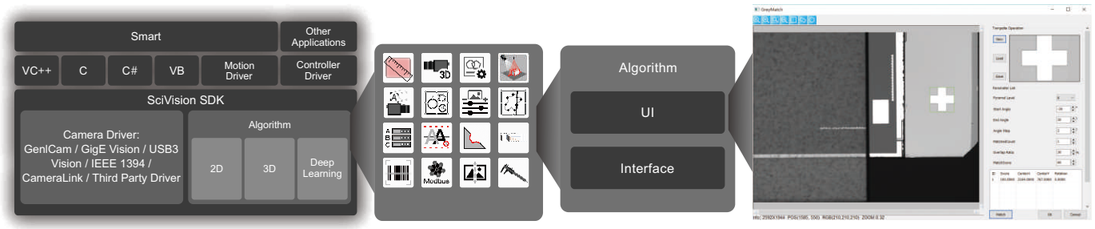


Features

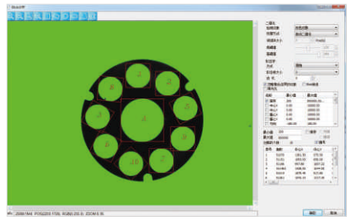
- Reliability: The stability of SDK is verified in tens of thousands of multiple industrial devices.
- Easy-to-operate: SciVision has functions of interface layer and algorithm layer, and interface layer can quickly realize interaction.
- Industrial application: Complete industrial application controls, such as 3D image control,robot coordinate calibration, structured light 3D measurement, classifier, SPC (Statistical Process Control including CPK, GR&R) etc.
- Support multiple programming languages: C++, C#, VB
- Optimized performance:Utilizing TBB acceleration, AVX, SSE instruction set acceleration, and GPU acceleration to enhance performance.
- Professional technical support: More than 1160 engineers around the world provide technical support during project cycle.

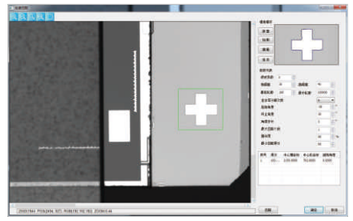
Structure

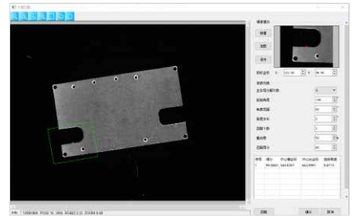
SciVision is an SDK that contains algorithm libraries, toolsets, drivers, etc. Users can use the UI layer provided by the SDK to implement project applications quickly, or develop their own UI (by calling the function layer) to maintain flexibility.



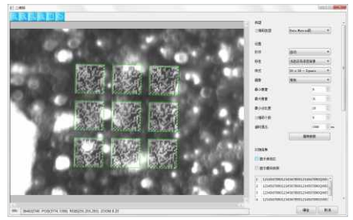
Functional Interfaces

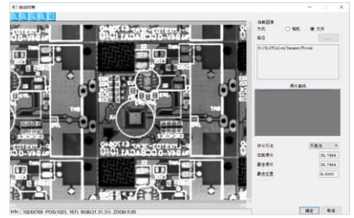

Blob analysis

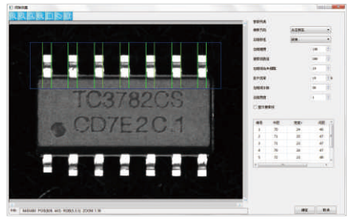

Contour match


Gray value match

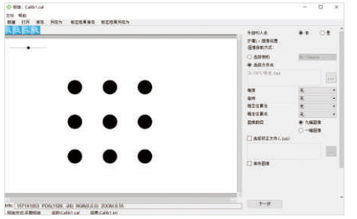

Deep learning code reading

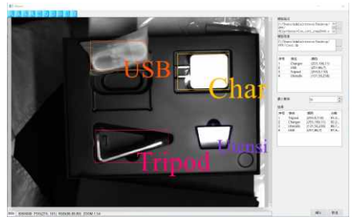

2D Code recognition and quality assessment


Auto focus

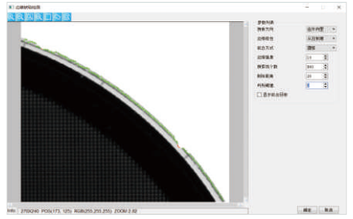


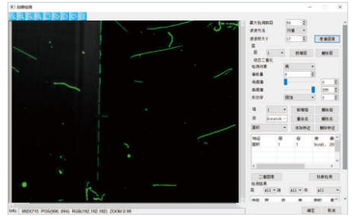
Gap measurement


Auto calibration



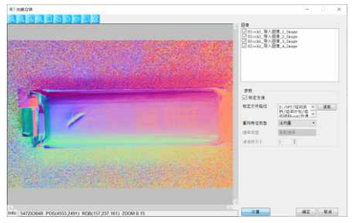
Deep learning object detection

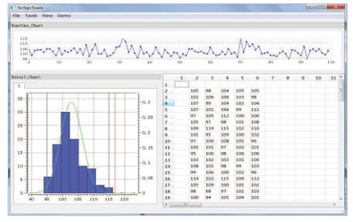

Edge defect detection


Scratch detection



Deep learning OCR


Photometric stereo

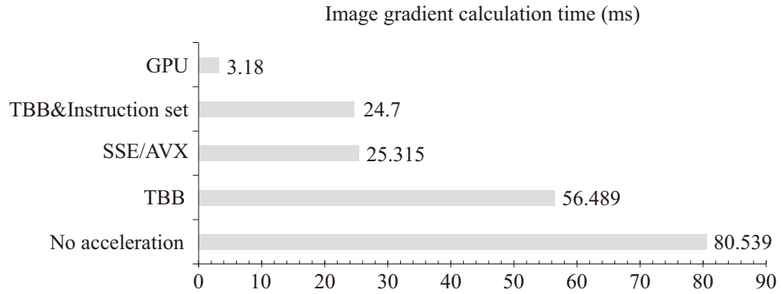

CPK



Customized interface

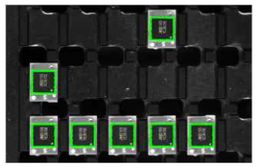
Performance

- TBB/AVX/SSE/GPU acceleration

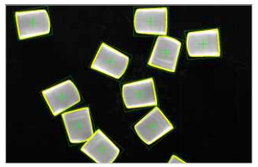


Test conditions: System: Windows7 64Bit, Memory: 8G, CPU: Intel® Core™ i5-7400 CPU@3.00GHZ 3.00GHZ, GPU: NVDIA GTX1070

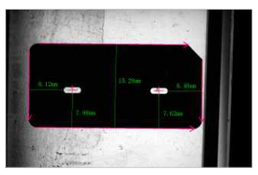
- Performance improvements of common algorithms



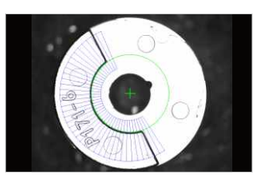
BLOB analysis
Manual binarization, automatic binarization, local adaptive binarization, and other image segmentation operators; over 70 feature extraction methods such as area, orientation, and shape: SciVision can complete Blob analysis in just a few milliseconds.



Matching
It can quickly and effectively detect targets in the search image that are similar to the template, even in cases where the target undergoes rotation, local deformation, changes in lighting, or partial occlusion. Through custom image data structures, it can handle different data types and provide sub-pixel accuracy detection of the tar get.



Geometric measurement
Geometric measurement employs highly accurate mathematical models and methods to ensure the precision and stability of geometric measurement results. It provides rich geometric measurement functionalities and supports various operating systems and architectures to meet the needs of different application fields. It performs exceptionally well when handling large-scale data or complex geometric structures. Furthermore, it is continuously updated and maintained, allowing users to benefit from the latest features and performance improvements. Users can select desired output results by inputting different data.



Detecting circles and lines
Circle and line detection operators are used to search for edge information in an image. They generate search lines to find edge points that meet certain conditions for fitting. Sub-pixel edge localization is achieved through interpolation algorithms.



OCR
The OCR module integrates traditional algorithms and deep learning models, enabling efficient and accurate recognition of character information across different scenarios. Its automatic character localization and segmentation capabilities effortlessly handle variations in lighting conditions, increasing background complexity, as well as changes in character orientation and polarity. The custom character set feature empowers users to create character sets tailored to specific tasks, thereby expanding the product's applicability. Equipped with pre-trained deep learning models, the module eliminates the need for users to undergo cumbersome training processes, allowing them to achieve outstanding text recognition results in most scenarios. The OCR module offers users an integrated and reliable text recognition solution, catering to diverse application needs.

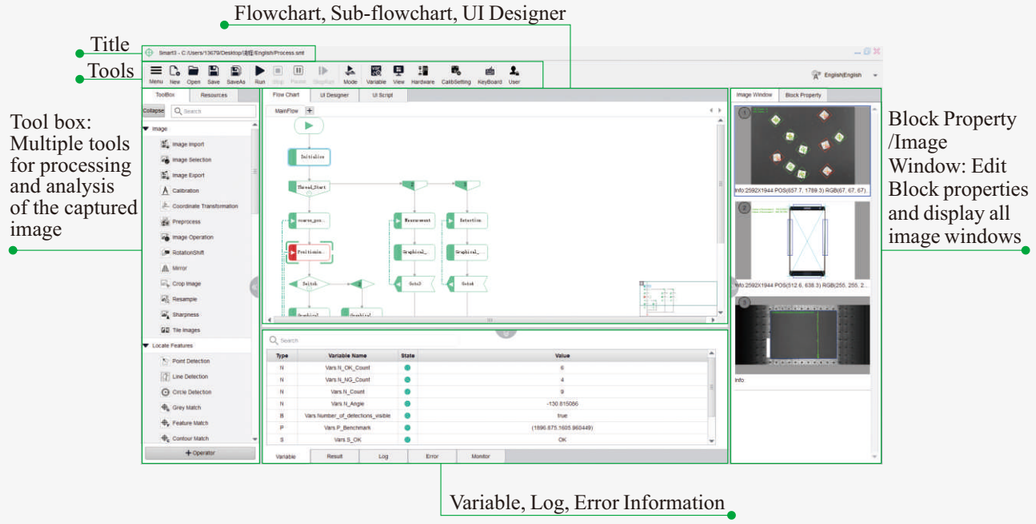
Function Table

Tool Category	Function	Description
Image	Acquisition	Compatible with various cameras, such as GenICam, GigE Vision, USB3 Vision
	Calibration	Hand-eye, Point Distance, Rotation, Center, Calibration Board, Distortion, Fixed Length, Automatic Focus
Image Enhancement	Binarization	Manual, Automatic binarization (local adaptive method, Otsu's method, bimodal mean method, valley minimum method, fuzzy set theory method), and color image binarization.
	Image Filter	Gaussian, Median, Mean, Differential Laplace, Sobel, Roberts, Canny, Prewitt and Custom
	Morphology	Dilate, Erode, Closing, Opening, Hit or Miss, Gradient, Top Hat, Black Hat, Extract Boundary
	Image Operation	Arithmetic Operations, Logical Operations, Stitch, Rotate, Mirror, Zoom, Crop Image
	Image Stitching	Supports 2D image feature stitching and calibration stitching
	Equalize Histogram	Adjusting the histogram to enlarge the difference between foreground and background
	Brightness Adjustment	Adjust image brightness, contrast, gamma
	Photometric Stereo	Estimating surface normals via shading using different light source
	Shading Correction	Supports the removal of background shadows from 2D images to emphasize the contours and feature information of the target
	Color Mapping and Operations	Supports 2D image lookup tables and color space operations to achieve high contrast and dynamic range color mapping
Location and Alignment	Find Point	Locating the required first, last, best, and all points
	Find Line	Iterative Least Squares Method, Huber Weighted Least Squares Method, Local Fitting, Hough Line Detection
	Find Circle	Iterative Least Squares Method, Hough Circle Detection
	Grayscale match	Sum of Squared Differences (SSD) Matching, Normalized Sum of Squared Differences (NSSD) Matching, Cross-Correlation Matching, Normalized Cross-Correlation Matching
	Geometry match	Grey Match, Contour Match, Feature Match
	Color match	Normalized Cross-Correlation Matching
	Coordinate System Setting	2D Horizontal Translation, Vertical Translation, Horizontal + Vertical Translation, Horizontal + Vertical + Rotation
Measurement	Caliper Measurement	Measure the distance between two parallel lines
	Pitch Measurement	Multiple edge pitch measurements within the specified area to achieve the required pitch, width, and interval
	Geometric Measurement	Horizontal rotation angle of the line, Vertical rotation angle of the line, Angle determined by three points, Angle determined by four points, Angle bisector, Median line, Centroid of a polygon
		Point-to-point distance, Point-to-line distance, Line-to-line distance, Midpoint of a line segment, Intersection point of two lines, Projected point from a point to a line
		Polygon area, Circle determined by three points, Ellipse determined by five points, Radius measurement, Area measurement, Circle fitting, Line fitting, Ellipse fitting
	2D Sectional Contour Measurement	Contour inflection points, Peaks, Valleys, Mean value, Edges, Section area, Contour straightening (line straightening, projection correction, pose correction)
		Contour binarization (cleaning points outside the filtering interval), Contour cleaning (removing sharp protrusions), Contour smoothing, Contour interpolation, Intersection of contour lines with the XY plane
		Contour normals, Contour curvature, Contour symmetry, Obtaining the projection line of a line ROI on a reference plane
	Brightness and color Measurement	Minimum, Maximum, Average, Standard Deviation, Color measurement
Surface Inspection	Blob Analysis	Blob centroid, Blob size, Blob orientation, Blob hole count, Blob hole filling, Blob filtering.
	Scratch Detection	Scratch inspection (detecting inconsistencies on the surface of an object compared to the surrounding areas, such as spots, foreign objects, scratches, bubbles, streaks, etc.)
	Edge Detection	Closed edge, non-closed edge
	Contour Processing	Segment, Union, Select, Sort and Compare Contours
	Contour Extration	Gaussian line extraction, skeleton extraction
	Variation Model	Checks by comparing the actual model with the ideal one
	Profile Tolerance	The tested contour change with respect to the theoretical contour
	One-Key Contour Extraction	One-key to extract the contour of closed edge
	Edge Defect Detection	Accurately detects burrs, mutations and other anomalies on edges

Tool Category	Function	Description
Classification and Recognition	OCR	Support Chinese, English, number and etc
	OCV	Optical character verification
	Classifier	Classifies objects of different shapes, colors, or textures
	Barcode	Code 39, Code 128, EAN 8, EAN 13, UPC-A, UPC-E, Code 93, ITF
	2D Barcode	QR Code, PDF 417, Data Matrix Code, Vericode
	Quality Assessment	Support ISO/IEC 15416 standard to evaluate BarCode's parameter rating; support ISO/IEC 15415 to evaluate QR Code and Data Matrix parameter rating
Deep learning*	Semantic Image Classification	Using deep convolutional networks to locate and classify pixel-level objects
	Object Detection	Using deep learning to track, locate and recognize object
	Image classification	Use deep learning to extract image features and classify them to reduce the requirement of manual analysis features
	Character Recognition	Use inherent attributes of characters and combined with the deep learning principle to locate and recognize characters
	Code Reading with Deep Learning	Support Code39、Code128、EAN8、EAN13、UPC-A、UPC-E、Code93、ITF、QR Code、Data Matrix、PDF417
Graphical Interface	Image and Common Tools	Display of Images, Current Mouse Coordinates and Grey Values; Image Zooming
	ROI Toolbar	Point, Rectangle, Circle, Torus and other common ROI
3D Image Aquisition	Camera Aquisition	Support 3D cameras from OPT, SSZN, Keyence and etc.
	3D Calibration	Biplanar calibration, lift table calibration, structured light calibration, 3D calibration, radiation calibration, autofocus
3D Image Enhancement	3D Binarization	3D Image Manual, Automatic binarization (local adaptive method)
	3D Filter	Gaussian, Median, Mean, Differential, Laplace, Canny, Sobel, Roberts, Prewitt, High-Pass, Low-Pass, Customized Filter
	3D Morphology	3D Image Dilate, Erode, Closing, Opening, Hit or Miss, Gradient, Top Hat, Black Hat, Extract Boundary
	3D Image Operation	3D Image Arithmetic Operations, Logical Operations, Stitch, Rotate, Mirror, Zoom, Crop Image
	3D Resampling	3D Image Nearest-neighbor resampling, linear resampling, spline curve interpolation sampling, point cloud resampling
	3D Image Stitching	Multiple 3D images point cloud stitching
	3D Shading Correction	Supports the removal of background shadows to emphasize the contours and feature information of the target.
	3D Cleaning	Using 3D feature information and connectivity methods for cleaning, achieving noise removal, interference removal, and similar effects.
	Color Mapping and Operations	Supports 3D image lookup tables and color space operations to achieve high contrast and dynamic range color mapping.
	3D Surface Fitting and Correction	3D plane/curve polynomial fitting, orthogonal polynomial fitting, spline surface fitting, 3D plane/curve correction, curve fitting surface correction, baseline fitting surface correction, and pose correction.
3D Image Location	Geometry match	3D surface feature matching, point cloud matching (PCA, SVD, ICP)
	Coordinate System Setting	3D rotation transformation, translation transformation, affine transformation, perspective transformation, axis transformation, Euler angles and quaternion operations, coordinate system conversion.
3D Measurement	3D Geometric Measurement	Plane formed by points and lines in 3D space, plane formed by two lines, projection point from a point to a line, projection point from a point to a plane, projection point from a point to a cube.
		The angle between two lines in 3D space, the angle between two planes, the distance from a point to a line, the distance from a point to a plane, the distance from a point to a cube, and the distance from a line to a plane.
	3D Surface Measurement	Height mean, height extreme measurement, surface area, base area, volume measurement of concave and convex bodies, planeness measurement (Gaussian least squares, Chebyshev minimum area).
	GD&T Measurement	Geometric measurements and tolerances, straightness, planeness, roundness, parallelism, runout, etc. (Gaussian least squares, Chebyshev minimum area).
3D Surface Detection	3D Blob Analysis	3D image blob valid pixel count, surface area, volume, height, rectangularity, cross-sectional area, contour perimeter, bounding rectangle.
	3D Contour Extraction	3D Contour Extraction, Gaussian line extraction, Skeleton extraction
	3D Concentration Defect Detection	Detecting defects by comparing the height difference between pre-filtered and post-filtered regions with a height threshold.
3D Image Interface	3D Image Display Widget	Display 3D effects of images and ROI data
Others	Files R/W	Supports file compression and reading/saving of various image, point cloud, and CAD file formats (BMP, JPG, PNG, TIF, CSV, ECD, MRI, JXR, IGES, DXF).
	Statistics Interface	Statistics Interface and Template: SPC, GR&R, CPK, etc.

*Requires separate purchase

Smart3 Machine Vision Software NEW



Product Features

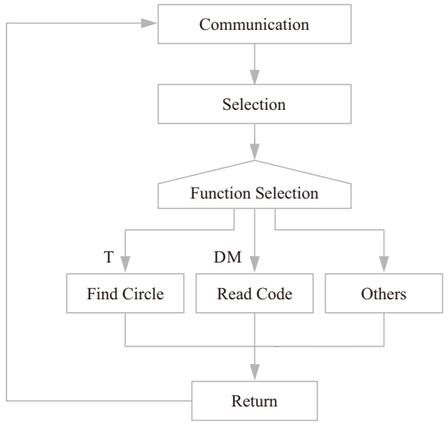
- Rich and comprehensive visual application functions. Covering different visual needs such as 2D, 3D, and deep learning.
- Support for commonly used industrial communication modes and protocols.
- Support for multiple brands of industrial cameras and the GenICam standard protocol.
- Comprehensive coverage of product measurement, positioning, assembly, quality inspection, code reading, and traceability applications throughout the production process. Capable of meeting a wide range of project requirements.

Toolbox

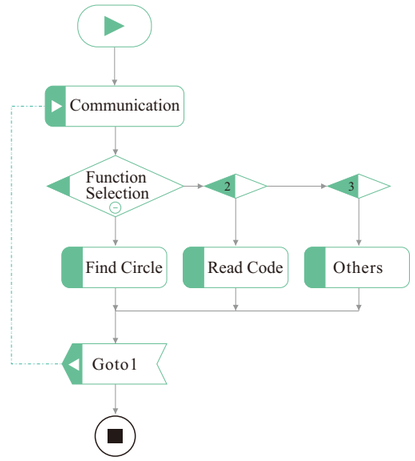
Image I/O	Image Import, Image Selection, Image Export, Calibration, Coordinate Transformation, Preprocess, Image Operation, Rotation Shift, Crop Image, Resample, Sharpness, Image stitching
Locate features	Find point, find line, find circle, gray match, feature match, contour match, multiple templates contour match, ROI alignment setting, ROI creation, Hough circles, corner detection, Hough lines, contour
Measure feature	Caliper, pitch measurement, geometry relationship, conlor pick, intensity mesurement, color measurement
Inspection	Blob analysis , scratch detection, variation model, profile tolerance, edge defect inspection, contour operation
Recognition	OCR, Bar Code Reading, 2D Code Reading, Classifier
Communication	TCP/IP, Serial Port, DIO, Modbus, USB-HID, PLC
Additional tool	Scriptor, logical operation, calculatore, image display, time, export to CSV, data base operation, variable r/w, variable assignment, queue, dialogue box, customized log
Deep Learning	OCR, object positioning, semantic segmentation, image classification
3D Tool	Import 3D image, 2D image conversion, 3D image conversion, 3D preprocess, height measurement, volumn measurement, plane correction, planeness, datum plane fitting, 3D image cropping, 3D image operation,3D geometry relationship
Custom Operators	Extension of Operator Tools

Graphical Programming

Smart3 software adopts visual graphical and programming, eliminating the need for coding. It's easy to use, user-friendly, and quickly respons to demands, thus shortening project development cycles.



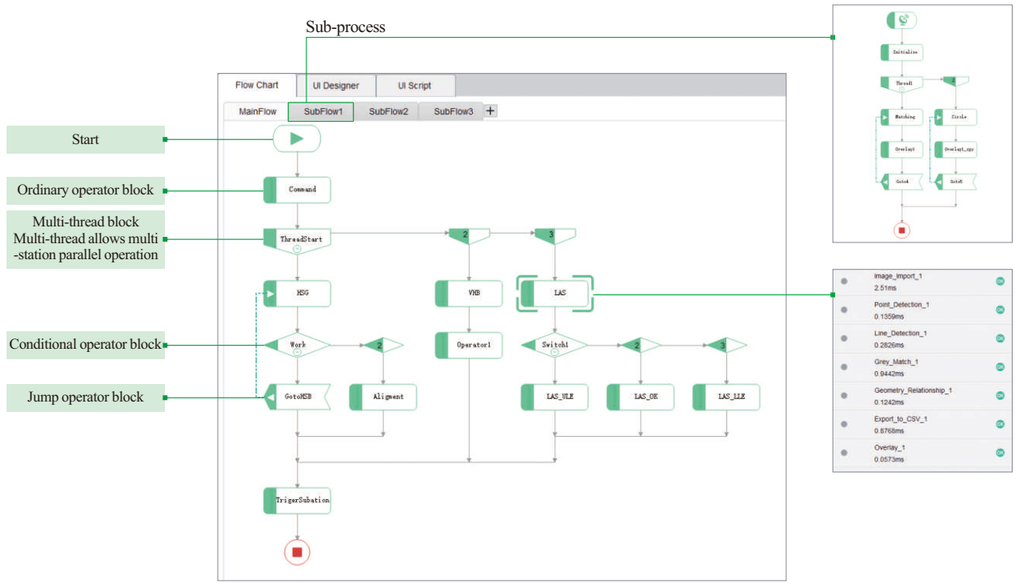
Logical Diagram for Project Requirements



Flowchart for Project by Smart

Concise Flowchart

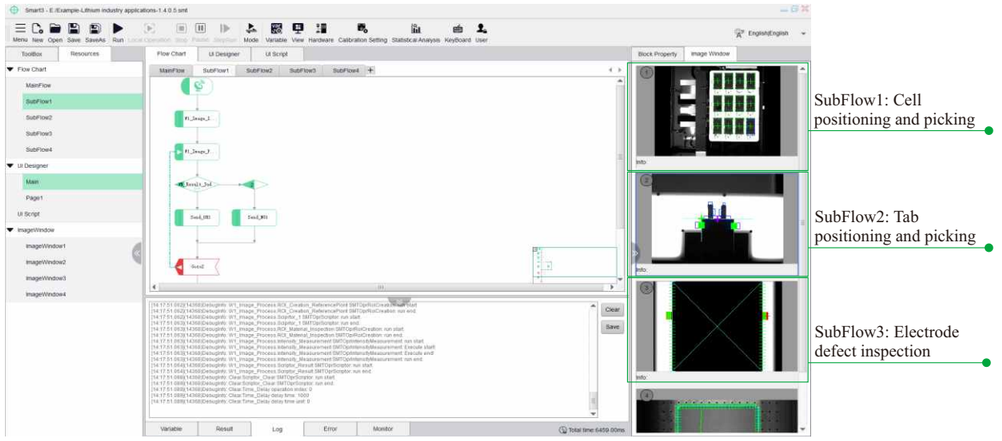
There are two types of basic elements in the flowchart, one is the operator block, and the other is the control operator block. After the process is established, it can jump to the sub-flow chart through conditional control combined with event triggering to complete the entire detection process.



Multi-thread Blocks for Multi-station Operation

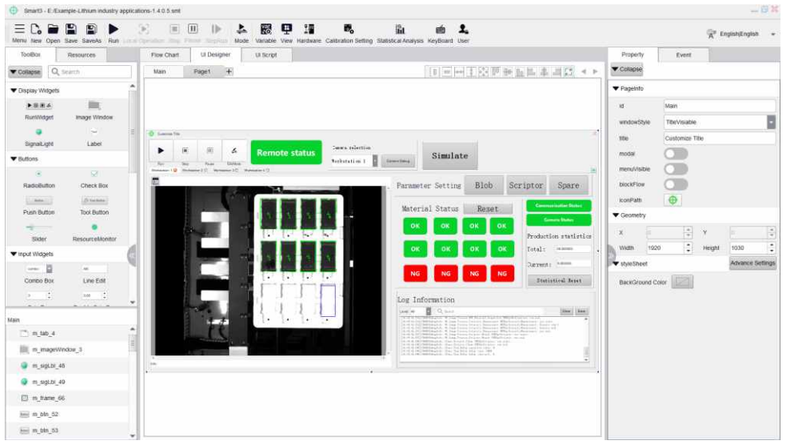
Subroutine Flow

For complex project applications, Smart3 can add sub-processes, providing a concise, highly readable process diagram for multi-station operation. Sub-processes support event-triggered or resident running modes, making them easy to reuse and understand



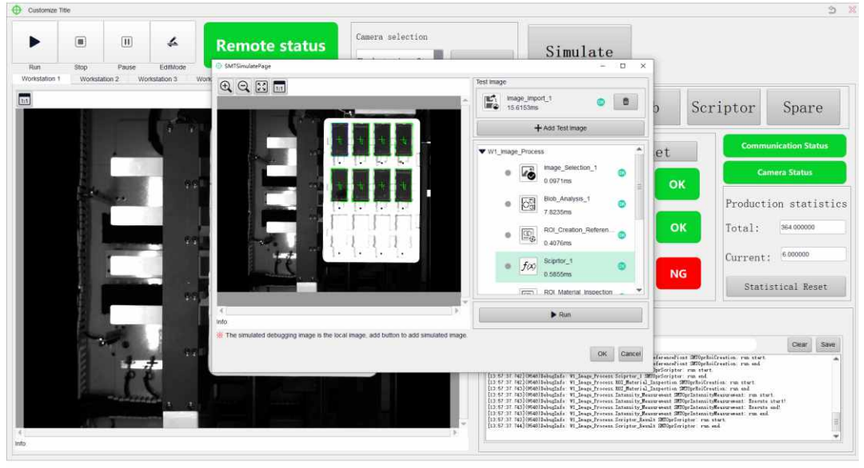
User Defined UI

Smart3 offers a rich set of interface controls for quickly implementing interface layout and control. Its user-centric interaction design improves upon the issues of low user-friendliness in traditional software interfaces.



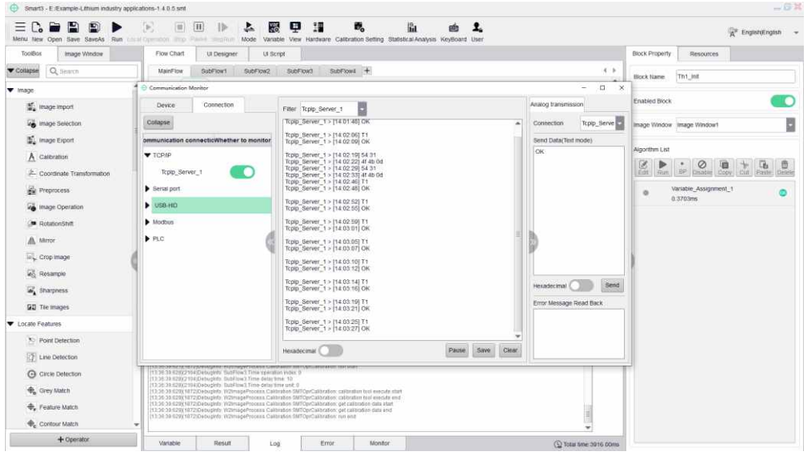
Simulative Debugging

Real-time adjustment of algorithm parameters is possible without the need to stop the machine, enabling better adaptation to complex and demanding working environments.



Communication Monitoring

Real-time monitoring of data in the communication and interaction process, efficiently locating abnormal commands.



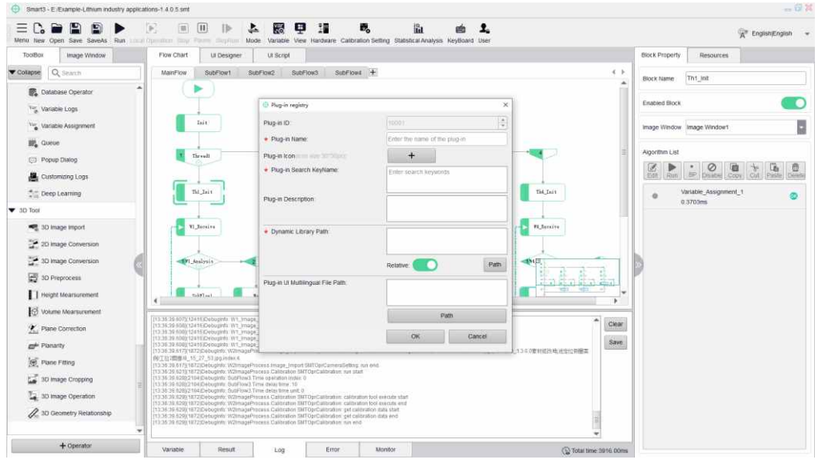
Steable & Easy to Operate

In the tool settings interface, you only need to use default parameters or perform simple parameter configuration to achieve the desired image processing results.



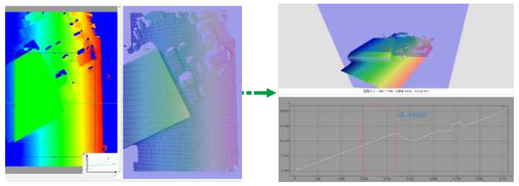
Powerful Feature

Smart3 has a rich set of interface controls, enabling rapid interface layout for customer projects through drag-and-drop functionality. It meets customers' design requirements and usage habits for the interface, making it user-friendly and reducing the learning curve.



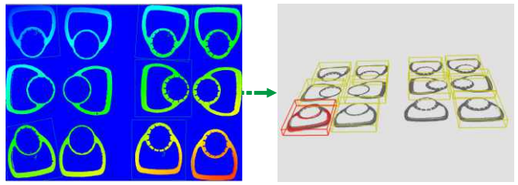
Software Features

3D Contour Detection



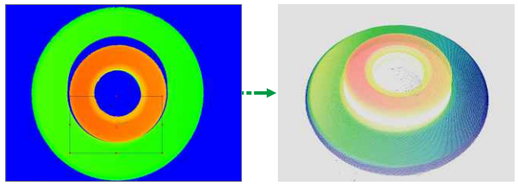
Raw Image | Processed Image

3D Feature Matching



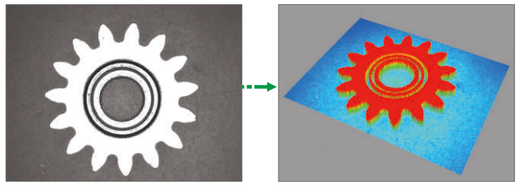
Raw Image | Processed Image

3D Feature Matching



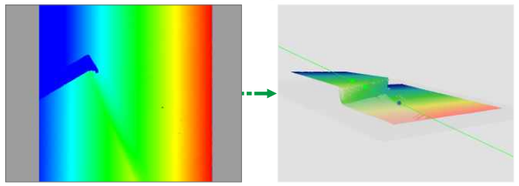
Raw Image | Processed Image

3D Image Display



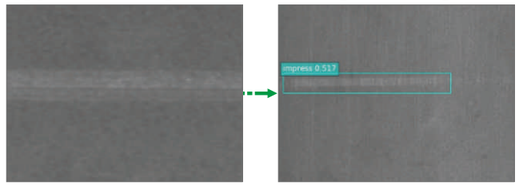
Raw Image | 3D Image

3D Geometry Relationship



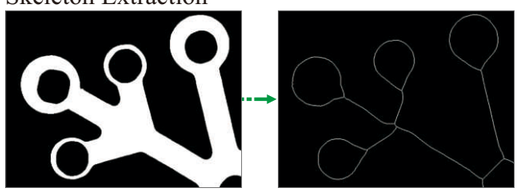
Raw Image | Processed Image

Appearance Inspection with Deep Learning



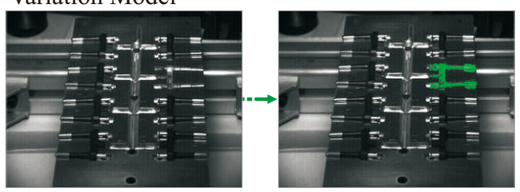
Raw Image | Processed Image

Skeleton Extraction



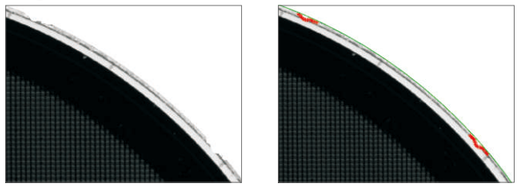
Raw Image | Processed Image

Variation Model



Raw Image | Processed Image

Edge Defect Detection



Raw Image | Processed Image

2D Code Recognition



Raw Image | Processed Image

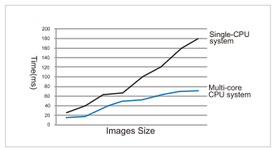
Smart Camera Hardware



Hardware Features

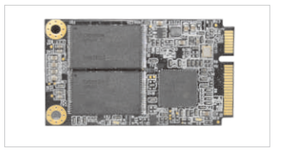
- High-performance CPU
- SSD
- Multithreading Technology
- Thermal Optimization
- PoE Support
- Backup and Restore
- Wide Voltage Power Supply
- Rigorous Testing

High-performance CPU



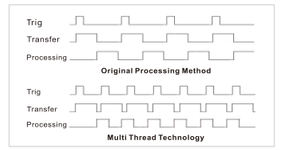
Multi-core CPU for image processing

SSD (Solid State Drive)



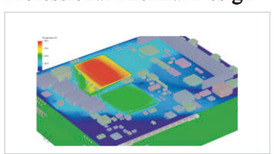
Better reliability with faster read and write speed

Multi-thread Technology



Reduce cycle time and meet the needs of multi-station

Professional Thermal Design



Efficient Cooling

PoE Support



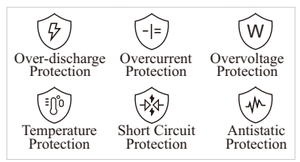
Integrated Gigabit Ethernet, USB port, DI/DO interface, light source controller interface

Backup and Restore



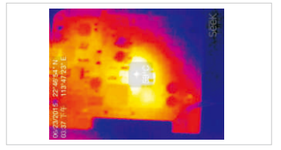
Implementing a physical button system for one-key restoration greatly addresses issues such as the difficulty of reinstalling the system and the high cost of waiting for after-sales service.

Wide Voltage Power Supply



The industrial control computer features a wide voltage power supply (supporting 100-240V) and high reliability with overvoltage and overcurrent protection.

Strict Testing

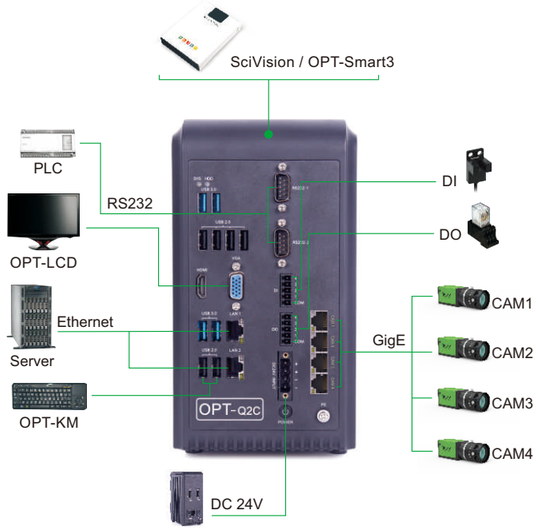


Passed 200+ test specifications, including high/low temperature and humidity, drop, aging, full function tests, etc.

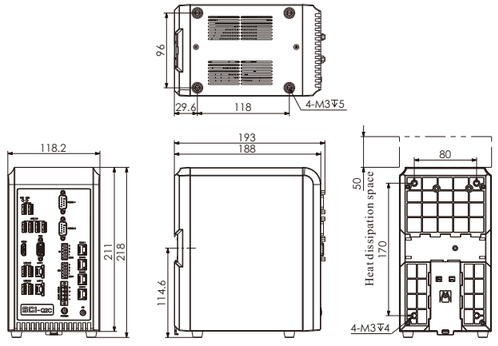
Q2C Vision Controller



Connector Description



Dimensions (mm)



Features

- Integrated functions and small footprint
- High performance multi-core CPU
- SSD+HDD combining performance with capacity configuration
- Supports several PoE GigE cameras to acquire images simultaneously
- Reasonable design and excellent heat dissipation performance

Specifications

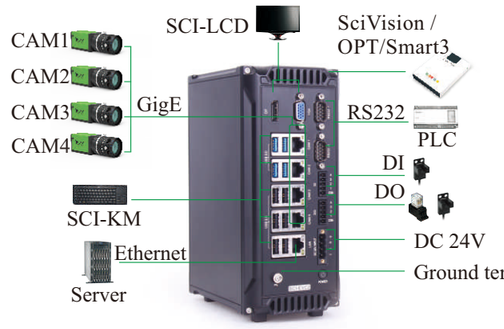
Model	OPT-Q2C-73215	OPT-Q2C-53215	OPT-Q2C-33215
CPU	i7	i5	i3
Number of Camera Support	5 (Note:6 Network ports)[1]		
Memory	8GB (It supports up to 32GB)		
SSD	64GB SSD (Upgradable)		
HDD	1TB (Upgradable)		
Power	24VDC/7A		
Cooling	By smart fan		
Video Interface	1×HDMI, 1×VGA		
Serial Port	2×RS232		
USB	4×USB3.0, 6×USB2.0		
DI	4		
DO	4		
Operating Temperature	0°C - 50°C (32°F - 122°F)		
Operating RH	10% - 85%, non-condensing		
Storage Temperature and RH	-20°C - 75°C (-4°F - 167°F); 0 - 80%		

[1] One of the ports is used for other data transmission

EVC2 Vision Controller



Connector Description



Specifications

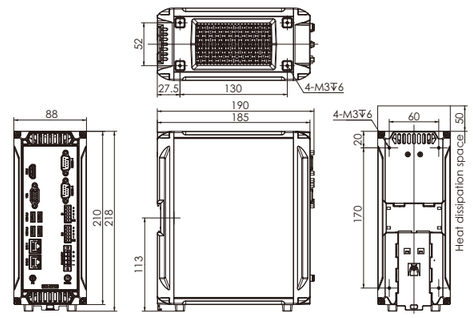
Model	OPT-EVC2-72204	OPT-EVC2-52204	OPT-EVC2-32204	OPT-EVC2-J2201
Processor	i7	i5	i3	J1900
Number of Camera Support	4 (Note:5 Network ports, one of the ports is used for other data transmission)			1(Note:2 Network ports)
Memory	4GB (It supports up to 16GB)			4GB (It supports up to 8GB)
SSD	64GB(Capacity customizable)			
HDD	Capacity customizable			
Power	24VDC/3A			24VDC/2A
Cooling method	Fan cooling			Fanless
Video Interface	1×VGA, 1×DP			1×VGA, 1×HDMI
Serial Port	2×RS232			
USB Port	6×USB2.0, 4×USB3.0			3×USB2.0 1×USB3.0
DI/O	4			
Operating Temperature	0°C - 50°C (32°F - 122°F)			
Operating RH	10% - 85%, non-condensing			
Storage Temperature/RH	-40°C - 80°C (-40°F - 176°F); 0 - 80%			

Features

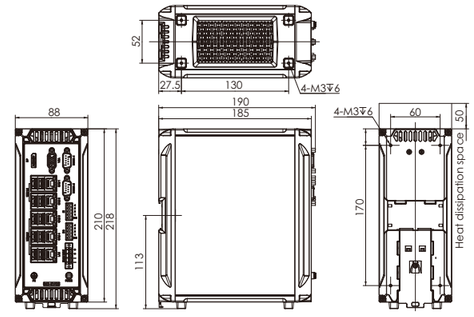
- High performance multi-core CPU
- High throughput SSD (Solid State Drive)
- Supports simultaneous capture of multiple GigE cameras
- Rich peripheral interfaces
- Full aluminum alloy casing design

Dimensions (mm)

1. OPT-EVC2-J2202



2. OPT-EVC2-32205



SC Series Smart Cameras





Product Features

- Utilize high-performance image sensors to enhance image quality.
- Multi-functional integrated smart camera, saving installation space.
- Graphical process editing for simple usability.
- Integrated vision algorithms enabling efficient positioning, measurement, defect detection, and various other applications.
- Built-in deep learning for a series of tasks including Optical Character Recognition (OCR).
- Equipped with HDMI and USB interfaces for direct connection to a monitor for debugging.
- Rich IO interfaces allowing for the connection of multiple input and output signals.

Panel Instructions

SC Series Smart Cameras

Mounting Holes
The device is equipped with four mounting holes at the back for securing the device to a bracket.

OK/NG Indicator Light
The OK/NG indicator light is used to indicate the recognition status of the smart camera.

IO Interface
17-pin M12 Interface, providing power, DI (Digital Input), DO (Digital Output), and serial communication capabilities. The interface comes with threads ensure to tighten the interface when in use.

Ethernet Port
Ethernet Port for data transmission. Ensure to tighten the interface when in use as it comes with threads.

HDMI Interface
17-Pin M12 Interface, providing HDMI and USB ports for connecting external displays.

Test Button
Short press enables single hardware triggering.



ERR Indicator Light
The abnormal indicator light remains constantly lit when there is a device malfunction and remains off under normal conditions.

OK/NG Indicator Light
The OK/NG indicator light is used to indicate the recognition status of the smart camera.

TRIG Indicator Light
The trigger indicator light flashes in sync with the trigger signal.

Sight Adjuster
Utilizes a high-brightness green LED for positioning.

Lens Hood
Removable and replaceable, polarized lens hoods can be purchased according to actual needs.

Light Source
The device's lens hood contains 8 LED beads for supplementary lighting, with the option to adjust the light source intensity based on actual on-site application requirements.

AUTO Button
Automatic Tuning

LINK Indicator Light
Network Connection Indicator Light, flashing when the network is normal.

PWR Indicator Light
The power indicator light remains constantly lit when power is normal and remains off in case of abnormalities.

SC Series Smart Cameras (C Interface)

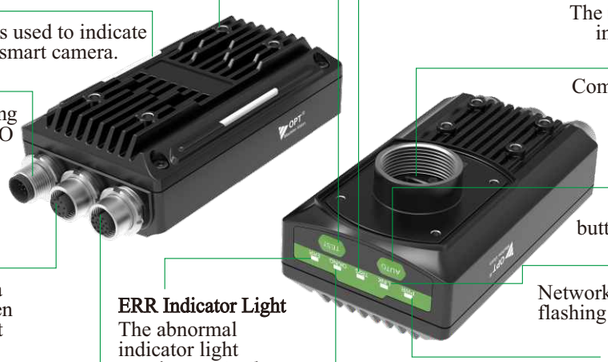
Mounting Holes
The device is equipped with four mounting holes at the back for securing the device to a bracket.

OK/NG Indicator Light
The OK/NG indicator light is used to indicate the recognition status of the smart camera.

IO Interface
17-pin M12 Interface, providing power, DI (Digital Input), DO (Digital Output), and serial communication capabilities. The interface comes with threads ensure to tighten the interface when in use.

Ethernet Port
Gigabit Ethernet Port for data transmission. Ensure to tighten the interface when in use as it comes with threads.

HDMI Interface
17-Pin M12 Interface, providing HDMI and USB ports for connecting external displays.



ERR Indicator Light
The abnormal indicator light remains constantly lit when there is a device malfunction and remains off under normal conditions.

OK/NG Indicator Light
The OK/NG indicator light is used to indicate the recognition status of the smart camera.

Test Button
Short press enables single hardware triggering.

TRIG Indicator Light
The trigger indicator light flashes in sync with the trigger signal.

C-Mount Lens Interface
Compatible with interchangeable C-mount lenses.

AUTO Button
Long-pressing the AUTO button enables automatic tuning.

LINK Indicator Light
Network Connection Indicator Light, flashing when the network is normal.

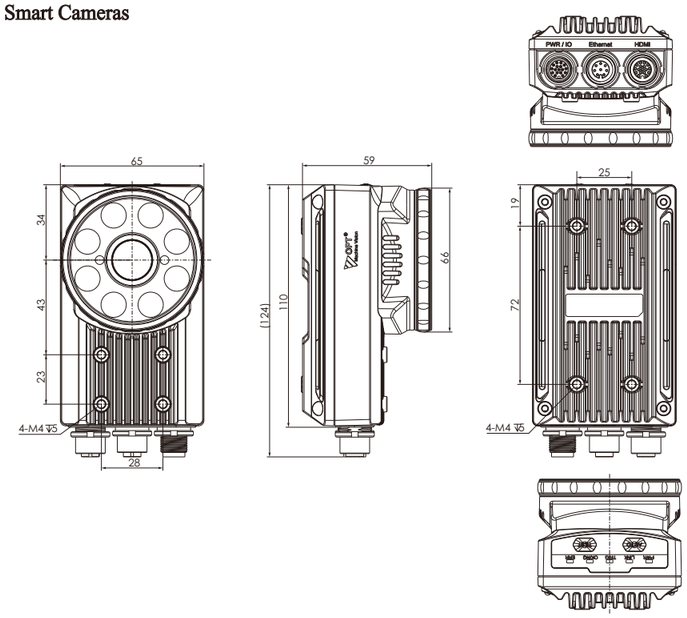
PWR Indicator Light
The power indicator light remains constantly lit when power is normal and remains off in case of abnormalities.

Specifications

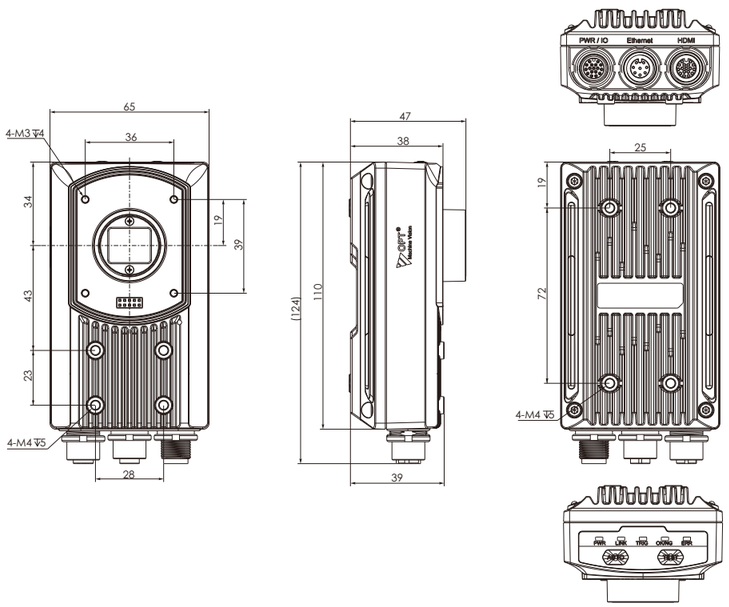
Model	OPT-SCA1-23	OPT-SCA1-50	OPT-SCA2-50	OPT-SCA2-60	OPT-SCA2-80	OPT-SCA2-120	OPT-SCA2-200
Sensor Type	CMOS, Global Shutter	CMOS, Global Shutter	CMOS, Rolling Shutter	CMOS, Rolling Shutter	CMOS, Rolling Shutter	CMOS, Rolling Shutter	CMOS, Rolling Shutter
Resolution	1920×1200	2448×2048	2592×1944	3072×2048	3840×2144	4000×3000	5440×3648
Pixel Size	3.0 μm×3.0 μm	2.74 μm×2.74 μm	2.2 μm×2.2 μm	2.74 μm×2.74 μm	2.0 μm×2.0 μm	1.85 μm×1.85 μm	2.4 μm×2.4 μm
Sensor Size	1/2.6"	1/1.8"	1/2.5"	1/1.8"	1/2"	1/1.7"	1"
Exposure Time	6 μs ~1 sec	11 μs ~1 sec	8 μs ~1 sec	11 μs ~1 sec	13 μs ~1 sec	10 μs ~1 sec	13 μs ~1 sec
Gain	1 dB ~16 dB	1 dB ~24 dB	1 dB ~16 dB	1 dB ~15 dB	1 dB ~16 dB	1 dB ~27 dB	1 dB ~27 dB
Maximum Acquisition Frame Rate	60 fps	30 fps	50 fps	30 fps	30 fps	25 fps	20 fps
Image Type	Black/White or Color						
Focus Mode	Electric Focus Adjustment						-
Lens Focal Length	8mm/12mm/16mm/25mm (M12-Mount)						-
Lens Interface	M12-Mount/C-Mount						C-Mount
Memory	Optional 2GB/4GB/8GB/16GB/32GB						
Storage	Optional 16GB/32GB/64GB/128GB/256GB						
Light Source	Optional Red, White, Blue Light (C-Mount does not have built-in light source)						-
Sight Adjuster	High-brightness Green LED						-
Interface Type	The 17-Pin M12 interface provides power, DI (Digital Input), DO (Digital Output), and serial communication. The 8-Pin M12 interface provides Ethernet functionality. The 17-Pin M12 interface offers HDMI and USB connections.						
I/O Interface	3 channels of opto-isolated inputs, 3 channels of opto-isolated outputs						
Communication Interface	1 RS232, 1 USB 2.0, 1 Gigabit Ethernet (100Mbit/s)						
Display Interface	1 HDMI						
Power Supply	24VDC±20%						
Power Consumption	M12-Mount: 48W, C-Mount: 24W						
Lens Hood	Transparent lens hood, optional polarized lens hood available						-
Protection Level	IP62						
Temperature	Operating temperature: 0~50°C, Storage temperature: -20~70°C						
Environmental Humidity	<85% relative humidity (non-condensing)						
Dimensions	124mm×59.3mm×65mm						124 mm×65 mm×48 mm
Weight	466g						366g

Dimensions (mm)

SC Series Smart Cameras



SC Series Smart Cameras (C Interface)



Applications

Solutions have been successfully applied to various industries.

Lithium Battery
Electrode surface inspection
Coating and subsection surface inspection
Electrode tab solder joint inspection
Electrode tab position check & rotating angle measurement
Key size measurement of various batteries
Anode & cathode detection

Consumer Electronics
Logo pitch and contour measurement
Mobile phone parts assembly positioning
Screw assembly positioning
Mobile phone battery surface inspection
OS system vision development

Semiconductor and Electronics
LED wafer cutting positioning
PCB board, wafer and DIE inspection
LED inspection
OMM

Solar Panel
Wafer and battery inspection
Coating inspection
Panel assembly positioning
Primary/secondary printing inspection and alignment

Food and Beverage
OCR
Label inspection
Absence detection for caps, labels and sealing materials
Packaging defect inspection
Sealing inspection

Pharmaceutical
OCR
Sealing inspection
Color recognition and classification
1D and 2D codes reading
Infusion needle and bottle inspection
Liquid level gauging

Laser
IC/Glass/Panel positioning radium carving,
cutting and detection after cutting

Robot Guidance
Obtaining position and pose information
Parts assembly positioning

Automotive Industry
Size measurement and tracking of key components
Gluing tracking and inspection
Solder joint inspection
OCR

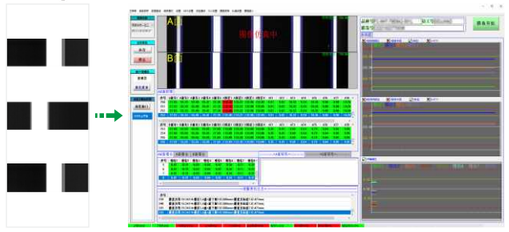
Printing Industry
Material inspection
Printing inspection
Color inspection

Machinery Industry
Parts dimension measurement
Position detection after assembly
Surface defect detection

Intelligent Traffic
Auto recognition of traffic signage
Traffic flow monitoring
Distance measurement between vehicles
License plate OCR

Lithium Battery Applications

Coating Machine



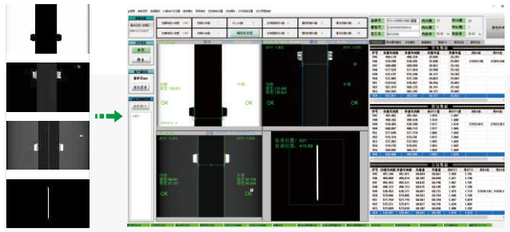
The coating process includes double-sided dimension measurement, defect detection, foil pinhole detection, and correction loop; dimensional measurement accuracy ≤0.1mm detection speed ≤120m/min, pinhole detection ≤20um.

Roll Press Slitting Machine



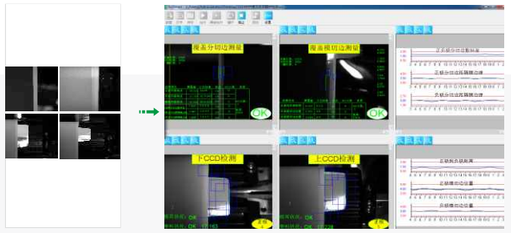
Roller pressing process includes double-sided dimension measurement, defect detection, and correction loop; dimension and defect detection results are fed back to the executing mechanism for labeling or inkjet printing; Dimension measurement accuracy is ≤0.1mm, defect detection area is ≤0.2mm², detection speed is ≤100m/min, and labeling accuracy is ≤±10mm.

Laser Die Cutting and Slitting Machine



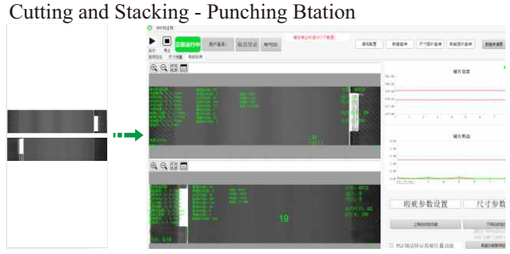
Detection of defects on A/B sides and ceramic edges, feedback of detection results to the executing mechanism for labeling, accuracy ≤0.1mm, speed ≤120m/min, width 500mm; Equipped with die cutting and slitting CCD closed-loop correction function.

Winding machine



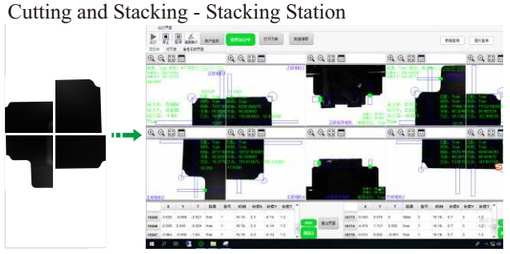
Real-time measurement of winding alignment, determination of whether there is folding of the extreme ears, and feedback of results to the main equipment for processing, detection speed <3m/s.

Cutting and Stacking - Punching Btation



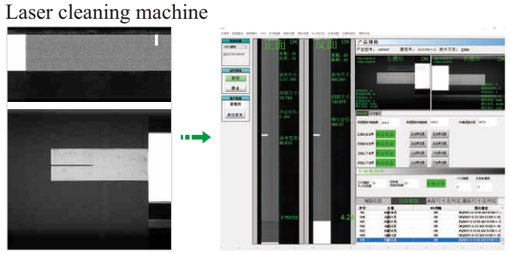
Detecting defects such as scoring, pinholes, spots, exposed foil, voids, joints, and incompleteness on the pole pieces, with capabilities for multi-variety switching, real-time curve monitoring, communication interaction anomaly recording, and rich data anomaly prevention. The defect detection accuracy is ≤0.15mm².

Cutting and Stacking - Stacking Station



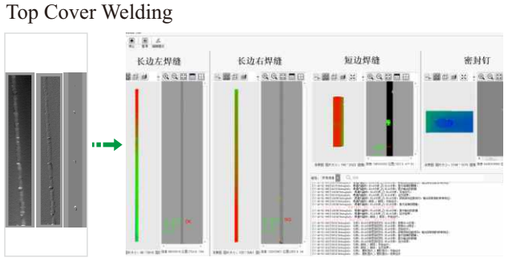
Detection of pole piece position and missing corners, equipped with ear folding detection, secondary alignment positioning function, accuracy ±0.1mm.

Laser cleaning machine



Measure the relevant dimensions of the pole piece cleaning area, the misalignment between the front and back sides, and detect the cleaning effect. The detection speed is ≤1500mm/s, and the detection accuracy is ≤±0.05mm. Suitable for pole piece widths ranging from 50mm to 1500mm.

Top Cover Welding

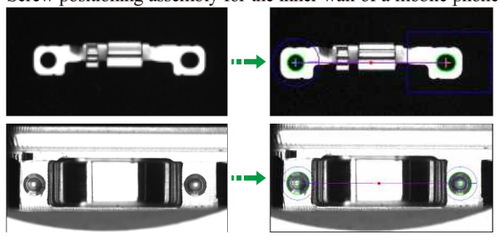


Detecting pits, lack of weld, leak weld, and blow holes in the top cover welding, detecting defective dimensions, feeding back the detection results to the control system, with a detection accuracy of <7um, and a running speed of up to 220mm/s.

The pictures are for reference only.

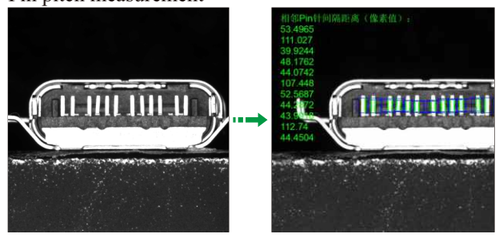
Consumer Electronics Applications

Screw positioning assembly for the inner wall of a mobile phone



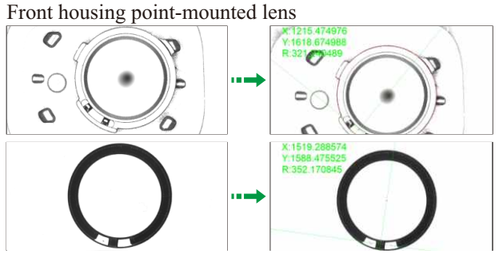
Using the upper camera for positioning and capturing snaps, and the lower camera for locating the positions of screw holes on the inner wall of the mobile phone, then proceeding with the assembly. The visual accuracy is at 0.047mm, with a concentricity of circular holes at 0.15mm.

Pin pitch measurement



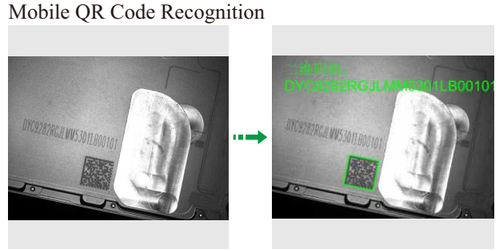
Measurement of the distance between adjacent pin needles, with the measured value not exceeding the set limit considered as a good product.

Front housing point-mounted lens



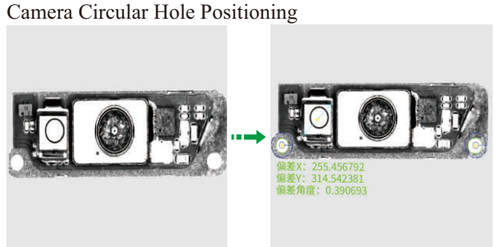
By adjusting plastic pieces, the coordinates and angles of the lens are corrected, and then the lens is grabbed for fitting.
The fitting accuracy is 0.05-0.1mm, with a single pixel accuracy of 0.0078mm, and a visual positioning accuracy of 0.023mm.

Mobile QR Code Recognition



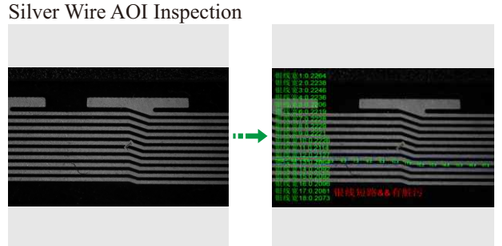
Use a QR code recognition operator to identify the product's QR code within the designated area on the phone case, and transmit the recognized information to the terminal server for record-keeping.

Camera Circular Hole Positioning



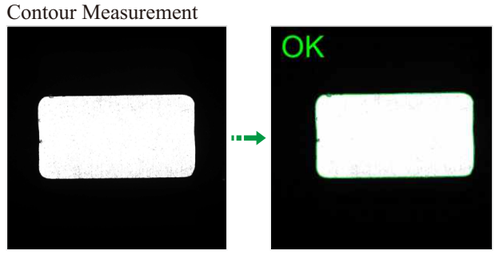
Capture the four sides of the square outside the circular hole, fit two diagonal intersection points, and determine the center and angle. Capture the centers of two circles on the base, fit a straight line, and determine the Mark points and angle.

Silver Wire AOI Inspection



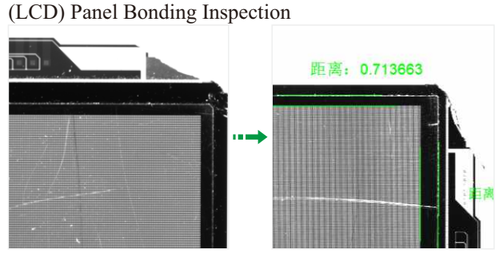
Mainly inspecting product dimensions of 355.6mm × 406.4mm. Automatically inspect for defects such as silver wire breaks, micro breaks, short circuits, scratches, and foreign objects. Visual inspection accuracy: 0.01mm.

Contour Measurement



Visual extraction of workpiece contours, reading standard CAD files for contour comparison.

(LCD) Panel Bonding Inspection

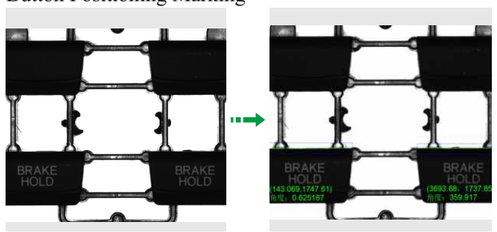


Capture the edges of the AA region and POL, calculate the distance between the two edges, with a detection accuracy of ±0.03mm/pixel. Utilize high-speed photography, with a maximum line speed of 600m/s.

The pictures are for reference only.

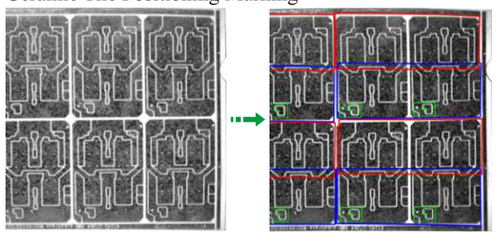
Laser Applications

Button Positioning Marking



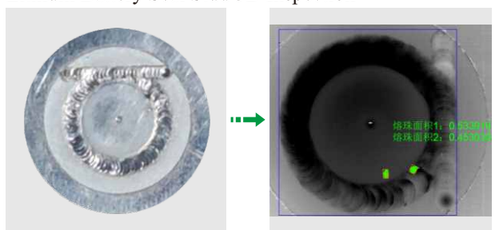
CCD captures the corner points of each button, guiding the positioning point to the center for laser marking. After marking, another photo is taken for re-inspection to verify if marking is OK.

Ceramic Tile Positioning Marking



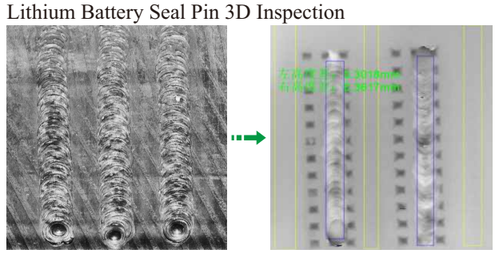
CCD is used to determine the incoming direction of materials. By using matching operators, the overall incoming state of the material is determined based on the position of the characteristic object, providing a basis for positioning and marking. Based on the intersection points and angles of the characteristic object's edges, the positioning point is determined to guide laser marking.

Lithium Battery Seal Stud 3D Inspection



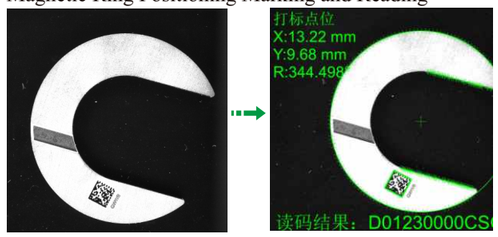
Perform flat correction and preprocessing on the image, use blob analysis to calculate the area sizes of pits formed by solder balls, welding slag splashes, and solder splatters, etc.

Lithium Battery Seal Pin 3D Inspection



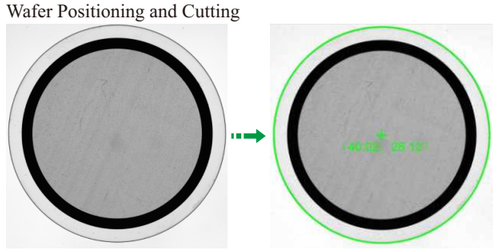
When the weld mark is OK, its height variation is minimal. However, when defects such as solder splatters, pits, or solder joint breakage occur, there will be a noticeable height variation. The height measurement algorithm is used to detect the height variation of the weld mark.

Magnetic Ring Positioning Marking and Reading



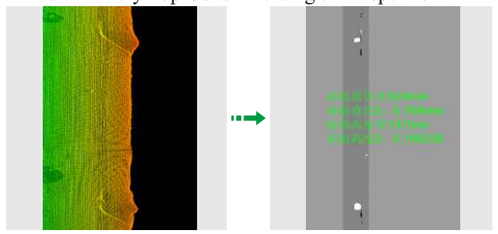
For products with both circular and U-shaped forms, center the magnetic ring, fit a straight line, offset by a fixed distance, conduct coding, and then read the code.

Wafer Positioning and Cutting



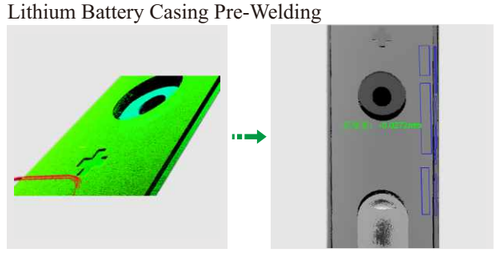
CCD positioning captures the center of the outer circle of the glass sheet, guiding the laser for cutting.

Lithium Battery Top Cover Welding 3D Inspection



Locate and analyze defects such as pits, protrusions, solder splatters, and solder joint breakage in the welding of the top cover by detecting the white and black areas in the image.

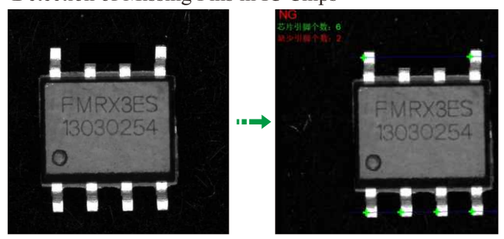
Lithium Battery Casing Pre-Welding



Using height measurement operators, take three regions along the edge of the cover, calculate their averages, and then subtract the averages to determine the height difference between the cover and the edge. On either side of the gap, locate a straight line, and utilize geometric relationship operators to calculate the distance between the lines, representing the width of the gap.

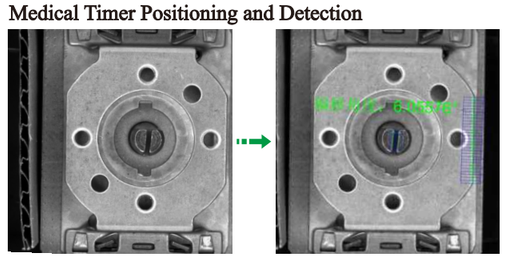
Other Applications

Detection of Missing Pins in IC Chips



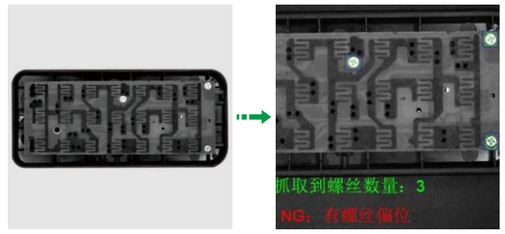
Utilizing point detection to count the number of pins on IC chips, comparing the detected quantity with the standard quantity to determine if any pins are missing from the IC chip.

Medical Timer Positioning and Detection



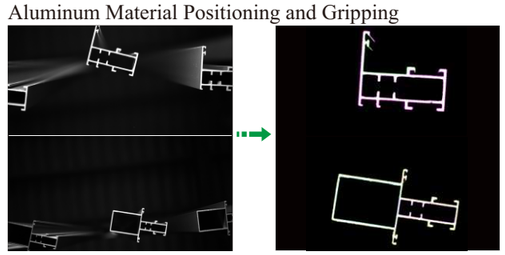
Using straight line detection and geometric angle measurement to determine if the medical timer is calibrated properly.

Screw Quantity and Offset Detection



Capture the number of screws on the material in the image and perform offset detection on the screws. The camera field of view is 140mm * 110mm, with a single pixel accuracy of 0.057 mm/pix.

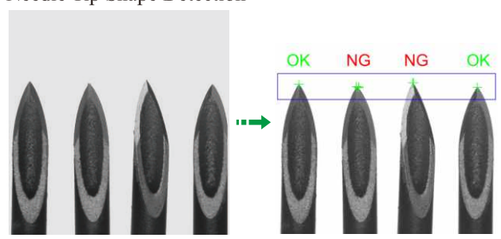
Aluminum Material Positioning and Gripping



Capture the contour of the aluminum material and assist the robotic arm in positioning the aluminum material before clamping. Given the various shapes of aluminum materials, which can number in the thousands, the vision system extracts the contours within its field of view and provides this information to the mechanism. The mechanism autonomously determines the location for positioning and gripping.

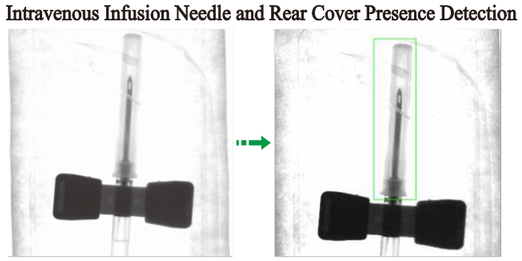
The pictures are for reference only.

Needle Tip Shape Detection



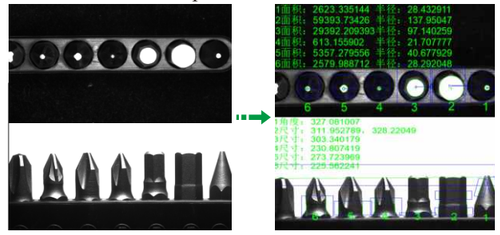
Using grayscale matching to locate the needle tip position, calculating the number of needle tip points and their angle relationships to determine if the needle tip is deformed.

Intravenous Infusion Needle and Rear Cover Presence Detection



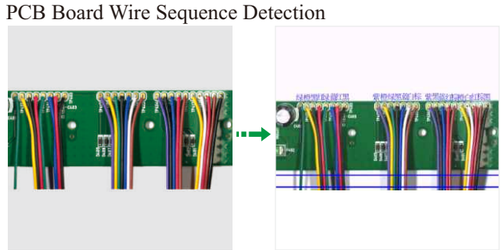
Analyzing and matching the features of the intravenous infusion needle and rear cover using feature matching to determine their presence.

Metal Batch Head Inspection



By ensuring the correct orientation of the batch head, two shots are taken with top and side cameras. Pre-defined features of each batch head are used to measure whether the template at that position matches the preset features. Based on this, the correctness, presence, and orientation (front or back) of the batch head are determined.

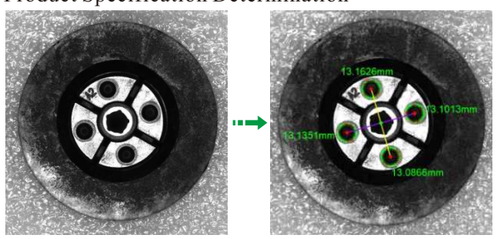
PCB Board Wire Sequence Detection



Using a color measurement tool to analyze and determine the colors of cables, ensuring the accurate insertion of cables.

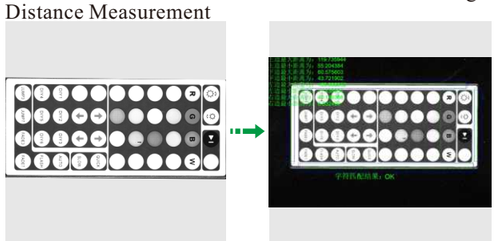
Other Applications

Product Specification Determination



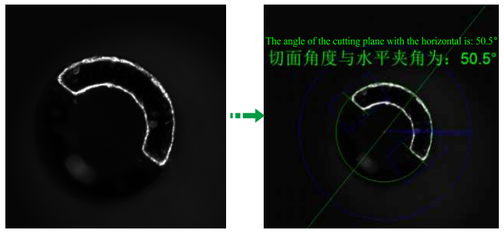
Measure part dimensions through geometric relationships, and use the measurement results to determine whether the product exceeds specifications.

Remote Control Button Character Detection and Edge Distance Measurement



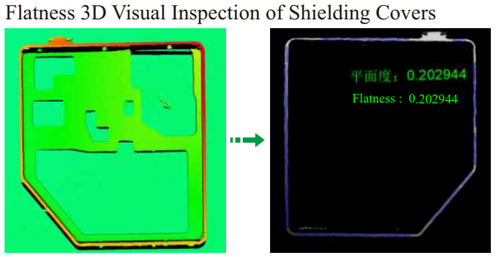
Capture and detect characters in a specific area to determine if they match the set template values; mismatched characters are judged as NG (No Good). Measure the deviation between the remote control button stickers and the base plate. The camera's field of view is 130mm by 98mm, with a single pixel precision of 0.05 mm/pixel.

Needle Tip Notch Positioning



Assist in positioning the needle tip angle, ensuring that the material is within ±15° of the standard placement position. Locate the center of the circle of the needle's cross-section where the notch is, as well as the edges at both ends of the notch. Draw the angle bisector from the center to the edges, and output the angle between the bisector and the horizontal axis.

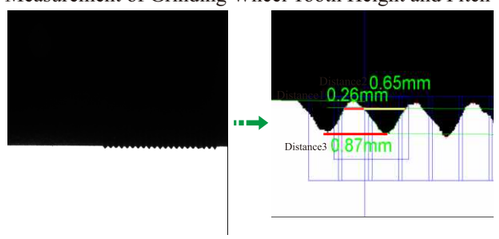
Flatness 3D Visual Inspection of Shielding Covers



Scan the product and use contour matching features to process the image with opening operation and 3D binarization for rough processing. Utilize line finding and geometric relationships for positioning, with ROI referencing the geometric center. Finally, conduct flatness detection.

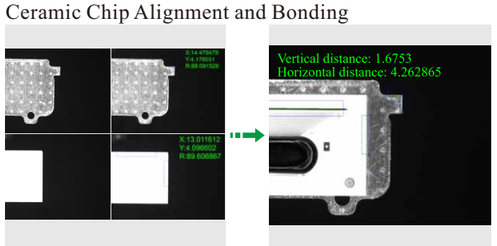
The pictures are for reference only.

Measurement of Grinding Wheel Tooth Height and Pitch



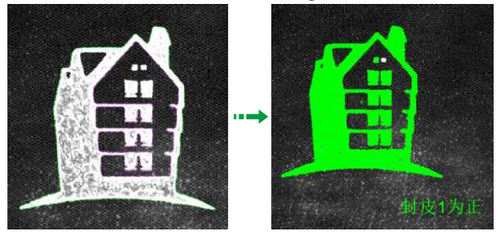
Fit a straight line to the lowest points of the sawtooth tips, then translate the line upwards by 0.35mm. Measure the distances from the translated line to the gear edges as Distance 1 and Distance 2. Also, measure the distance between the two gear bottoms as Distance 3. The repeatability precision requirement is within ±0.05mm.

Ceramic Chip Alignment and Bonding



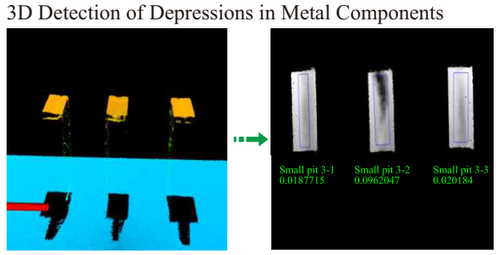
The upper camera locates and photographs the carrier to obtain its position coordinates. The lower camera photographs the product to be bonded. After assembly, recheck the vertical distance tolerance between the carrier and the product, which should be ±0.03mm, and the horizontal distance tolerance, which should be ±0.1mm.

Book Cover Front and Back Recognition



Confirm the orientation of the entire book cover by detecting the orientation of certain icons on the cover. Only when the icon detection matches is it recognized as correct; otherwise, it is deemed NG.

3D Detection of Depressions in Metal Components



Utilize height measurement algorithms to select the position of the depression for measurement and obtain the height of the depression.

Smart Code Reader

- Product Features »P44
- Smart code reader selection guide and steps »P45
- Smart code reader model description »P47
- Smart Code Reader B1 Series »P48
- Smart Code Reader S2 Series »P53
- Smart Code Reader D1 Series »P57
- Smart Code Reader E1 Series »P65
- Smart Code Reader R1 Series »P69
- Industrial Application Examples »P73

Built-in Deep Learning Algorithm

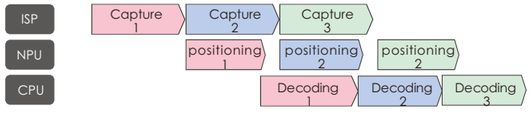
Utilizing a three-stage pipelined architecture, the ISP, NPU, and CPU collaborate in parallel, enabling realtime decoding without delays. This boosts computational efficiency, reducing processing time by threefold.

Leveraging the parallel processing of the ISP and NPU, combined with the heterogeneous computing of the CPU, multi-hardware acceleration enhances decoding efficiency. The system runs smoothly and stably, handling complex scenarios and meeting demands of industrial applications.

Common Scanner



OPT Scanner



CPU, NPU, and SP process in parallel, with no waiting time for decoding.

One-Button Auto Tuning

The code reader's hardware and software support one-click tuning, enabling fast and intelligent adjustment of focus, exposure, gain, gamma, and other parameters to suit real-world conditions. Its compatibility allows seamless adaptation to a wide range of scenarios, fulfilling the demands of diverse environments.



Manual tuning of barcode scanners is often inconsistent and inconvenient due to varying standards.



Automatic tuning can be completed with just one click and saved to the configuration.

Liquid Lens

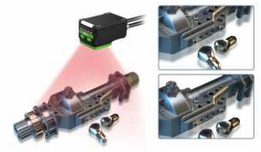
The OPT intelligent code reader requires no mechanical focusing or movement. Its high-speed liquid static lens can achieve millisecond-level focusing, adapting to different working distances and heights, improving efficiency.

Superior Imaging System

Equipped with high-quality LED light sources-featuring independently controllable channels. Available light types include red, white, blue, infrared, and UV. Supports various illumination modes such as direct lighting, polarized, and diffused lighting. Unaffected by ambient light interference or variations in workpiece materials.



Liquid Lens Focus Module



Automatically focuses at different working distances and heights.

Built-in deep learning algorithms

The deep learning algorithm is optimized for barcode defects. Combined with a high-performance processor, it can reliably read all types of barcodes even if they are damaged, blurry, low contrast, or poor quality.

Deep learning decoding algorithm with a neural network model, offering high stability.



Cylindrical distortion | Blur | Missing edge for positioning | Film covering | Tearing

Smart Code Reader Selection Guide



IDB1

Compact design with high cost-performance ratio, for complex and confined environments.

- Resolution: Up to 2.3 megapixels.
- Frame Rate: Up to 50 fps.
- Illumination: Optional red/blue/white light.
- Focusing Method: Manual focus.
- Communication Protocols: UDP/TCP /Serial/Modbus/FTP, etc.



IDS2

Compact body and easy deployment, can be embedded into existing automated machinery.

- Resolution: Up to 2.3 megapixels.
- Frame Rate: Up to 50 fps.
- Illumination: Optional red/blue/white light.
- Focus method: fixed focus
- Communication Protocols: UDP/TCP /Serial/Modbus/FTP, etc.



IDD1

High-quality imaging, high-performance hardware, versatile pixel options, cost-effective, built-in deep learning algorithm.

- Resolution: Up to 8.0 megapixels.
- Frame Rate: Up to 50 fps.
- Illumination: Optional red/blue/white light.
- Focusing Method: Auto focus.
- Communication Protocols: UDP/TCP /Serial/Modbus/FTP, etc.



IDE1

Octa-core 6T high-performance processor with a high-sensitivity image sensor, supporting ultra-wide field-of-view batch reading.

- Resolution: Up to 20 megapixels.
- Frame Rate: Up to 20 fps.
- Illumination: Optional red/blue/white light (No illumination for C interface).
- Focusing Method: Auto focus (C interface depends on lens configuration).
- Communication Protocols: UDP/TCP /Serial/Modbus/FTP, etc.



IDR1

Compact and lightweight design for a more comfortable user experience.

- Resolution: Up to 2.3 megapixels.
- Frame Rate: Up to 50 fps.
- Illumination: Red/Blue light.
- Rubbing method: fixed focus
- Communication Protocols: UDP/TCP /Serial/Modbus/FTP, etc.

The basic steps for selecting barcode reader

Step 1: Confirm smallest unit width of barcode.

As shown, the one-dimensional code is the narrowest width (mm), and the two-dimensional code is the width (mm).



QR code

Step 2: Confirm working distance and vision of the code reader.

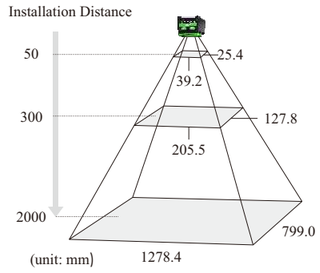
The working distance depends on the smallest unit width of step-1.

When the working distance is limited, you must also consider the reading field of the code reader and size of the barcode.

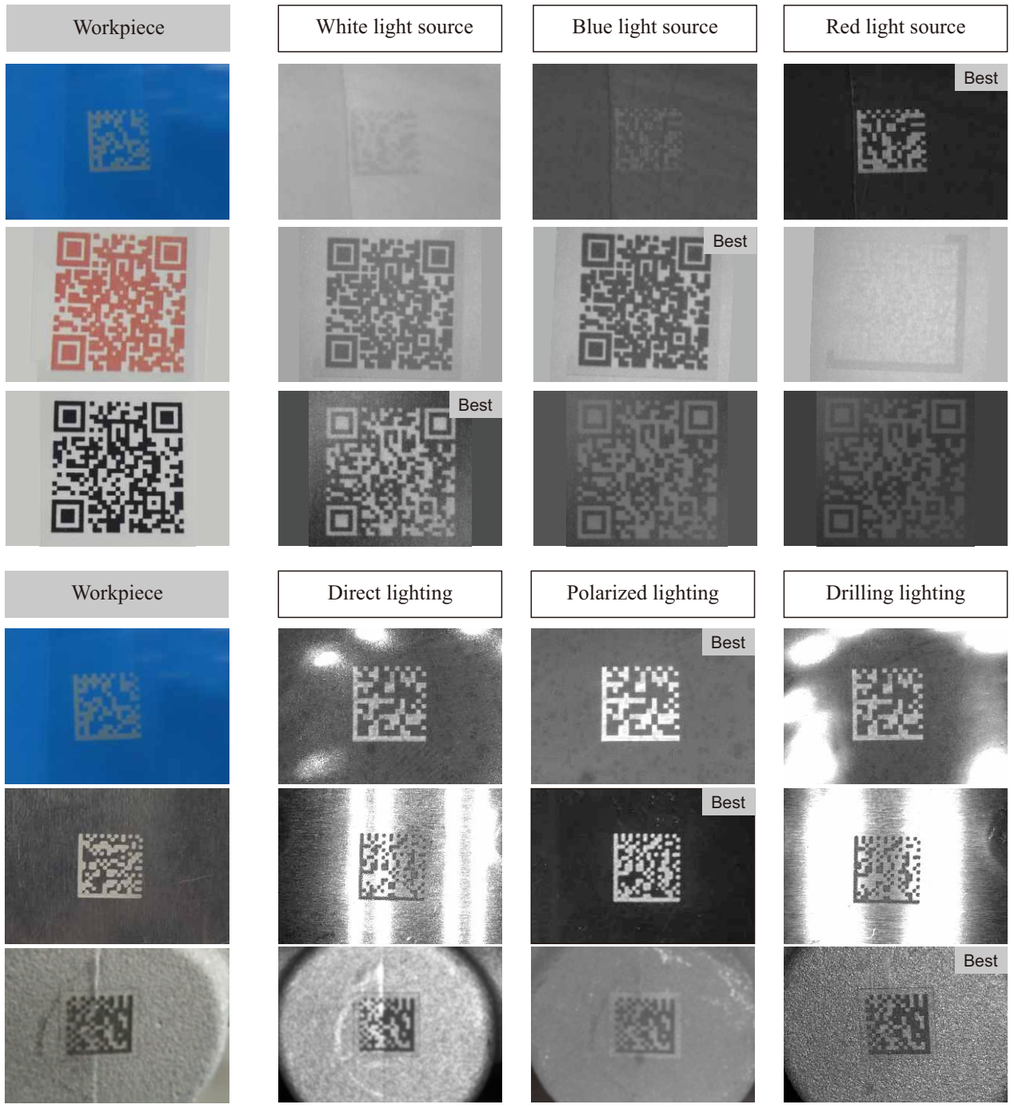
Generally speaking, the greater the working distance, the greater the vision.

Smart Code Reader Selection Guide and Steps

OPT-IDD1-M010G-L06					
Lens Focal Length	Working Distanc (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
6mm	50	39.2	25.4	0.123	0.061
	100	72.8	45.0	0.228	0.114
	300	205.5	127.8	0.642	0.321
	600	403.5	252.2	1.261	0.630
	1000	638.4	399.0	1.995	0.998
	2000	1278.4	799.0	3.995	1.998



Step 3: Select the best light source and accessories.



Smart Code Reader Model Description

Selection Guide

Fixed Code Reader

OPT - ID D1 - M 010 G - L06 - 311- ESD

- Communication Interfaces:
  E: Ethernet / U: USB / S: Serial / W: WiFi / ESD: Ethernet + Serial + DIO
- Product Information:
  No. 1: Light source color 2nd place: Lens cover and light source type
  See the attached table for specific
- Lenses:
  L06: Built-in 6mm mechanical lens L08: Built-in 8mm mechanical lens
  L12: Built-in 12mm mechanical lens L16: Built-in 16mm mechanical lens
  L25: Built-in 25mm mechanical lens LC: No built-in lens, C-mount interface
  LQ12: Built-in 12mm liquid lensL Q16: Built-in 16mm liquid lens
  LQ25: Built-in 25mm liquid lens
- Chip Types:
  G: Global Shutter / R: Rolling Shutter
- Resolution:
  10: 1 million 23: 2.3 million 50: 5 million 180: 8 million
  120: 12 million 200: 20 million
- Color: M: Monochrome (Black and White)
- Sub-series: B1 / S2 / D1 / E1 / F1 / R1
- Code Reader
- Company Name

Appendix of Additional Product Information

OPT-IDD1-M010G-L06-311-ESD
(1 2 3)

1: Light Source Color

NO	Meaning
0	C-mount, no built-in light source
1	White light
2	Blue light
3	Red light
4	Infrared light
5	Red-blue combined light (handheld only)

2: Lens Cover Type

NO	Meaning
0	C-mount, no lens cover
1	Standard lens cover
2	Semi-polarized lens cover
3	Fully polarized lens cover

3: Light Source Type

NO	Meaning
0	C-mount, no lens cover
1	Standard lens cover
2	High-brightness light source
3	Extended light source
4	Logistics light source
5	Semiconductor light source

B1 Series



Product Features

- Opt for high-performance image sensors.
- Compact design adapts to a wider range of applications.
- Equipped with a rich set of I/O interfaces, supporting multiple input and output signal connections.
- Supports mainstream communication protocols including TCP, UDP, Serial, Ethernet/IP, Modbus, Profinet, FTP, HTTP, MC, and Fins.
- Deep learning decoding algorithm enables efficient reading of barcodes and QR codes, unaffected by contamination or damage. recognizes curved, dirty, low-contrast, and high-density DPM codes.
- An external focus adjustment knob offers precise, efficient, and user-friendly operation, meeting diverse application needs.

Exterior Design and Structure

IDB1-17PIN



INK Indicator
Network connection indicator, blinking for normal network status.

TRIG Indicator
Trigger indicator, blinking in response to trigger signals.

Decoding Indicator
Decoding OK/NG indicator, green light on for successful decoding; red light on for decoding failure.

ERR Indicator
Error indicator, the device abnormality indicator remains steady; it turns off in normal conditions.

PWR Indicator
Power indicator, stays lit when power supply is normal; turns off in case of abnormalities.

Mounting Holes
There are a total of 6 mounting screw holes on the back and sides of the device for securing it to a bracket.

Aiming Device
Used for positioning.

Lens Cover
Removable and replaceable, optional polarized lens cover can be purchased based on actual needs.

Illumination
There are 4 LED light beads inside the device lens cover for supplementary lighting, which can be selected in different colors and adjusted in brightness based on the actual on-site application.

Focusing Knob
Adjust focus manually by rotating the focusing knob.

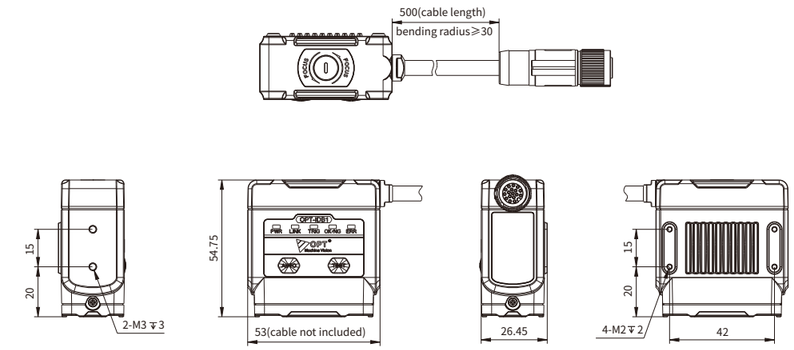
17-PIN Interface
Provides power, DI, DO, serial port, and Ethernet port.The interface is threaded, so tighten it when in use.

TEST Button
Short press for one-time trigger and decoding.

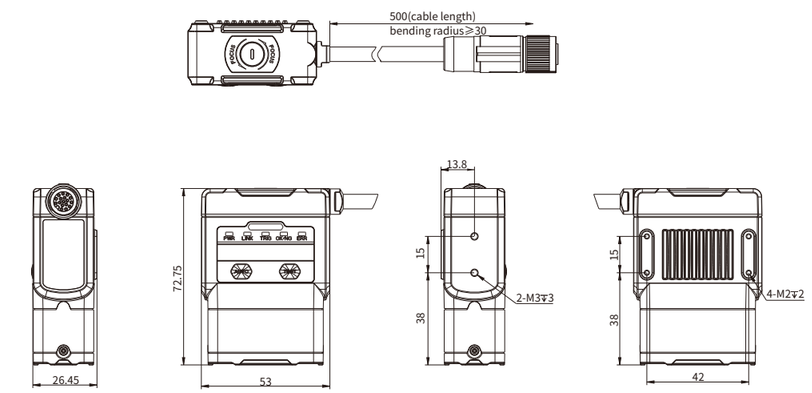
AUTO Button
Long press for automatic parameter adjustment function.

Dimensions (mm)

OPT-IDB1（6mm）



OPT-IDB1（25mm）



Technical Parameters

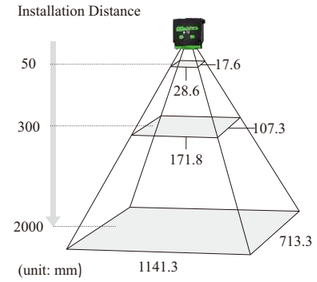
Model		OPT-IDB1-M010G		OPT-IDB1-M023G	
Sensor Type		CMOS, Global Shutter			
Resolution		1280×800		1920×1200	
Pixel Size		3.0 μm×3.0 μm			
Sensor Size		1/4"		1/2.6"	
Exposure Time		20 μs~1 sec		6 μs~1 sec	
Gain		1 dB ~ 16 dB			
Maximum Processing Frame Rate		50 fps		40 fps	
Maximum Decoding Speed		60 reads/second		50 reads/second	
Focusing Method		Manual Focus			
Lens Focal Length		6.7 mm	25 mm	6.7 mm	25 mm
Optical Interface		M8-Mount			
Reading Distance		50 mm~2000 mm	80 mm~500 mm	50 mm~2000 mm	80 mm~500 mm
Barcode Types	1D Barcodes	Code39, Code128, EAN8, EAN13, UPC_A, UPC_E, Code93, GS1-128, GS1-DataBar Expand, ITF, PHARMACODE, CODABAR etc.			
	2D Barcodes	QR Code, Micro QR Code, Data Matrix, PDF417, etc.			
Communication Protocols		TCP, UDP, Serial, Ethernet/IP, FTP, HTTP, Modbus, Profinet, MC, FINS communication etc.			
Interface Type		17-PIN M12 interface provides power, DI, DO, serial port, and Ethernet			
I/O Interface		2 opto-isolated inputs, 2 opto-isolated outputs			
Communication Interface		1 × RS232, 1 × Fast Ethernet (100 Mbit/s)			
Power Supply Method		24 VDC ±20%			
Power Consumption		<20 W @ 24 VDC			
Light Source		Optional red, white, or blue light *			
Aimer		Green high-brightness LED			
Lens Cover		Transparent lens cover; optional polarized lens cover			
Dimensions		6.7mm: 54.75 mm×53 mm×26.45 mm 25 mm: 72.75 mm×53 mm×26.45 mm			
Weight		234 g			
Operating Temperature		Operating temperature: 0°C ~ 50°C; Storage temperature: -20°C ~ 70°C			
Ambient Humidity		<85% RH (non-condensing)			
Protection Rating		IP62			
Product Certifications		CE, ROHS			

Note: * Please refer to page 10 of light sources and lens hoods.

Technical Parameters

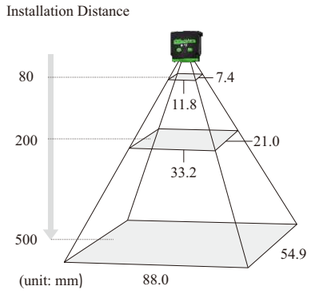
OPT-IDB1-M010G-L06

Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
6mm	50	28.6	17.6	0.089	0.045
	100	56.8	35.4	0.178	0.089
	300	171.8	107.3	0.537	0.268
	600	344.9	214.1	1.078	0.539
	1000	569.9	356.2	1.78	0.89
	2000	1141.3	713.3	3.57	1.78



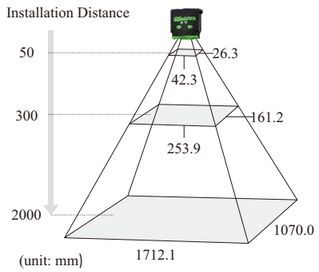
OPT-IDB1-M010G-L25

Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
25 mm	80	11.8	7.4	0.037	0.018
	100	15.6	9.8	0.049	0.024
	200	33.2	21.0	0.104	0.052
	300	51.0	31.9	0.159	0.080
	400	70.2	43.9	0.219	0.110
	500	88.0	54.9	0.275	0.138



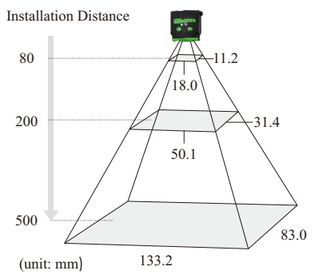
OPT-IDB1-M023G-L06

Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
6 mm	50	42.3	26.3	0.088	0.044
	100	85.6	53.2	0.178	0.089
	300	253.9	161.2	0.529	0.264
	600	516.5	312.0	1.076	0.538
	1000	584.8	534.3	1.22	0.61
	2000	1712.1	1070.0	3.57	1.78



OPT-IDB1-M023G-L25

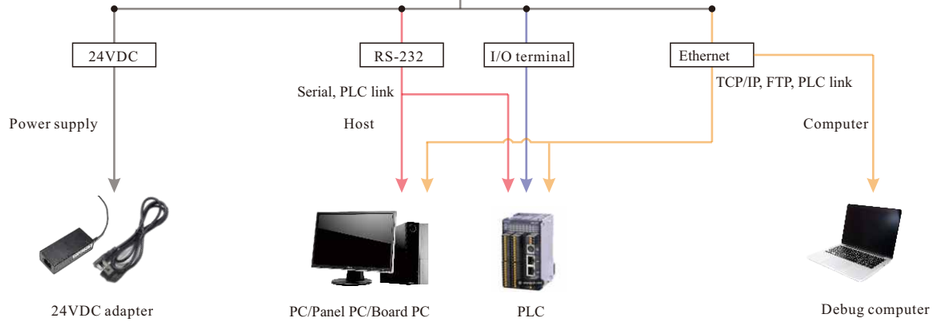
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
25 mm	80	18.0	11.2	0.038	0.019
	100	22.8	14.0	0.048	0.024
	200	50.1	31.4	0.104	0.052
	300	78.0	48.3	0.163	0.081
	400	105.1	65.8	0.219	0.109
	500	133.2	83.0	0.278	0.139



Matching Cables

Accessory Cable

Cable Length	B1 Ethernet Series	
	Static straight-head IO Cable	Dynamic/Drag chain straight-head IO Cable
3M	CB-M12-A17M008-S3M	CB-M12-A17M008-T3M
5M	CB-M12-A17M008-S5M	CB-M12-A17M008-T5M
10M	CB-M12-A17M008-S10M	CB-M12-A17M008-T10M
Interface		



S2 Series NEW



Product Features

- Utilizes high-performance image sensor.
- Compact and streamlined design, adaptable to industrial applications.
- Offers a rich set of I/O interfaces, supporting multiple input and output signal connections.
- Deep learning decoding algorithm enables efficient reading of barcodes and QR codes, unaffected by contamination or damage. Easily identifies curved surfaces, smudged codes, low-contrast markings, and high-density DPM codes.
- Supports mainstream communication protocols such as TCP, UDP, Serial, Ethernet/IP, Modbus, Profinet, FTP, HTTP, MC, and FINS.

Exterior Design and Structure

IDS2-17PIN

Mounting Holes
There are a total of 6 mounting screw holes on the back and sides of the device for securing to a bracket.

PWR Indicator
Power indicator, stays lit when power supply is normal; turns off in case of abnormalities.

Decoding Indicator
Decoding OK/NG indicator, green light for successful decoding; red light for decoding failure.

Aiming Device
Used for positioning.

Multi-function Button
Short press for one-time trigger and decoding, long press for automatic parameter adjustment function.



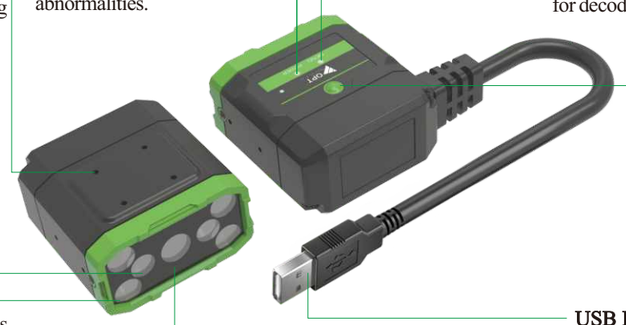
Illumination
There are 4 LED light beads inside the device lens cover for supplementary lighting, which can be selected in different colors and adjusted in brightness based on the actual on-site application.

Lens Cover
Removable and replaceable, polarized lens cover can be purchased based on actual needs.

17-PIN Interface
Provides power, DI, DO, serial port, and Ethernet port.The interface is threaded, so tighten it when in use.

Exterior Design and Structure

IDS2-USB



Mounting Holes
There are a total of 6 mounting screw holes on the back and sides of the device for securing it to a bracket.

PWR Indicator
Stays lit when power supply is normal; turns off in case of abnormalities.

Decoding Indicator
Decoding OK/NG indicator, green light for successful decoding; red light on for decoding failure.

Aiming Device
Used for positioning.

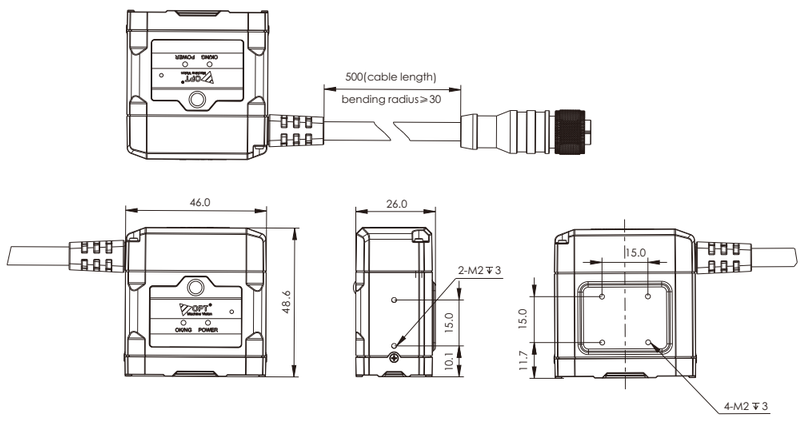
Multi-function Button
Short press for one-time trigger and decoding, long press for automatic parameter adjustment function.

Illumination
There are 4 LED light beads inside the lens cover for supplementary lighting, which can be selected in different colors and adjusted in brightness based on the on-site application.

Lens Cover
Removable and replaceable, polarized lens cover can be purchased.

USB Interface
Provides both power supply and data transmission.

Dimensions (mm)



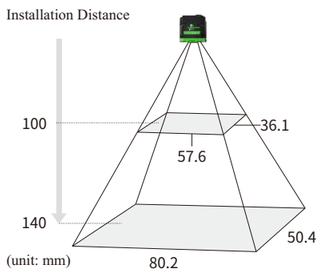
Technical Parameters

Model		OPT-IDS2-M010G	OPT-IDS2-M023G
Sensor Type		CMOS,Global Shutter	
Resolution		1920×1200	1920×1200
Pixel Size		3.0 μm×3.0 μm	
Sensor Size		1/4 "	1/2.6 "
Exposure Time		20 μs ~ 1 sec	6 μs ~ 1 sec
Gain		1 dB ~ 16 dB	
Maximum Processing Frame Rate		50 fps	40 fps
Maximum Decoding Speed		60 reads/second	50 reads/second
Focusing Method		Fixed focus	
Lens Focal Length		6.7 mm	
Optical Interface		M8-Mount	
Reading Distance		30mm-200mm	
Barcode Types	1D Barcodes	Code39, Code128, EAN8, EAN13, UPC_A, UPC_E, Code93, GS1-128, GS1-DataBar Expand, ITF, PHARMACODE, CODABAR etc.	
	2D Barcodes	QR Code, Micro QR Code,Data Matrix, PDF417 etc.	
Communication Mode		Network Port:TCP, UDP, Serial, Ethernet/IP, FTP, HTTP, Modbus, Profinet, MC, Fins, etc. USB Port:Simulated network port (supports TCP, UDP, HTTP, FTP communication, etc.), simulated serial port, simulated keyboard	
Interface Type		Ethernet Port: 17-PIN M12 interface provides power, DI, DO, serial port, and Ethernet USB Port: USB 2.0	
I/O Interface		Ethernet Port: 2 opto-isolated inputs, 2 opto-isolated outputs USB Port: /	
Communication Interface		Ethernet Port: 1 RS232, 1 Fast Ethernet (100 Mbit/s) USB Port: USB 2.0	
Power Supply Method		Ethernet Port: 24 VDC ±20% USB Port: USB 5V	
Power Consumption		Ethernet Port: <20 W @ 24 VDC USB Port: <10 W @ 5 VDC	
Light Source		Optional red, white, or blue light *	
Aimer		Green high-brightness LED	
Lens Cover		Transparent lens cover; optional polarized lens cover	
Dimensions		48.6 mm × 46 mm × 26 mm	
Weight		161 g	
Operating Temperature		Operating temperature: 0°C ~ 50°C; Storage temperature: -20°C ~ 70°C	
Ambient Humidity		<85% RH (non-condensing)	
Protection Rating		IP62	
Product Certifications		CE, ROHS	

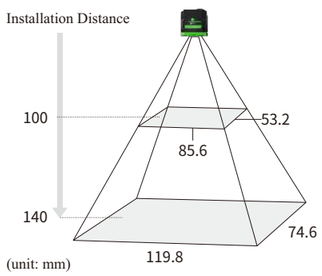
Note: * Please refer to page 10 of light sources and lens hoods.

Technical Parameters

OPT-IDS2-M010G-L06					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
6mm	100	57.6	36.1	0.180	0.090
	140	80.2	50.4	0.251	0.125



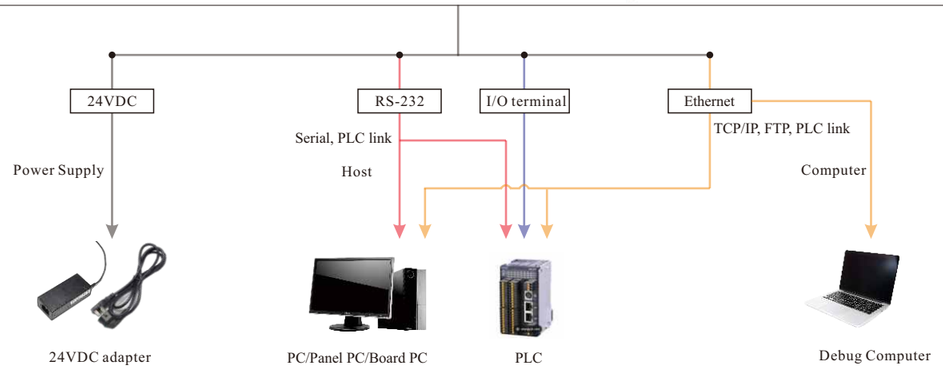
OPT-IDS2-M023G-L06					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
6mm	100	85.6	53.2	0.178	0.090
	140	119.8	74.6	0.250	0.125



S2 Matching Cables

Accessory Cable

Cable Length	S2 Series Universal Cable	
	Static Straight-head IO Cable	Dynamic/Drag Chain Straight-head IO Cable
3M	CB-M12-A17M008-S3M	CB-M12-A17M008-T3M
5M	CB-M12-A17M008-S5M	CB-M12-A17M008-T5M
10M	CB-M12-A17M008-S10M	CB-M12-A17M008-T10M
Interface		



D1 Series



Product Features

- High-sensitivity image sensor with fast response ensure clear recognition even in low-light environments.
- High-speed autofocus enables rapid response and sharp imaging across various working distances and scenarios.
- Versatile interface design supports Ethernet, serial, and I/O connections, enabling efficient communication between devices.
- The light source is divided into controlled zones, adaptable to different lighting conditions. It can be paired with polarizers, diffusers, and different color lights to achieve optimal imaging results.
- Deep learning decoding algorithm enables efficient reading of barcodes and QR codes, unaffected by contamination or damage. Recognizes curved, dirty, low-contrast, and high-density DPM codes.
- Supports mainstream communication protocols including TCP, UDP, Serial, Ethernet/IP, Modbus, Profinet, FTP, HTTP, MC, and FINS.

Exterior Design and Structure

Light Source
The device's lens cover contains 8 LED beads for illumination. Different light colors and brightness levels can be selected and adjusted.

Sight
Green high-bright LED is used for positioning.

Lens Cover
Removable and replaceable, optional polarized lens cover can be purchased.

17-PIN Interface
Provides power, DI, DO, serial port, and Ethernet port.The interface is threaded, so tighten it when in use.

PWR Indicator
Power indicator, stays lit when power supply is normal; turns off in case of abnormalities.

Mounting Holes
There are a total of 4 mounting screw holes on the back and sides of the device for securing it to a bracket.



8-pin Interface
Gigabit network port is used to transmit data. The interface needs to be tightened when using threading.

INK Indicator
Network connection indicator, blinking for normal network status.

TRIG Indicator
Trigger indicator, blinking in response to trigger signals.

Decoding Indicator
Decoding OK/NG indicator, green light or successful decoding; red light for decoding failure.

ERR Indicator
Error indicator, the device abnormality indicator remains steady; it turns off in normal conditions.

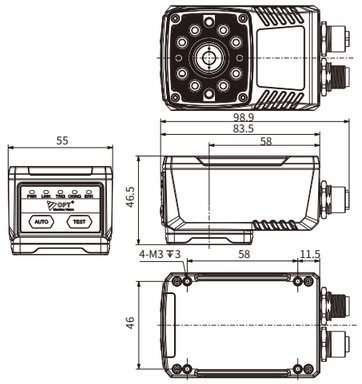
Decoding Indicator
Decoding OK/NG indicator, green light on for successful decoding; red light on for decoding failure.

TEST Button
Short press for one-time trigger and decoding.

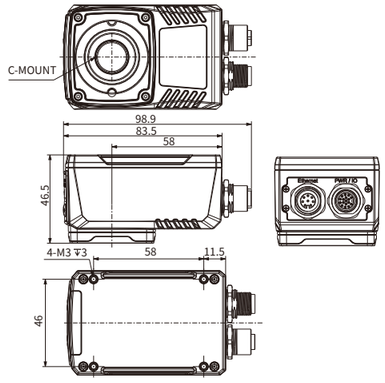
AUTO Button
Long-pressing can achieve automatic adjustment function.

Dimensions (mm)

OPT-IDD1-MXXXG/R-LXX



OPT-IDD1-MXXXG/R-LC

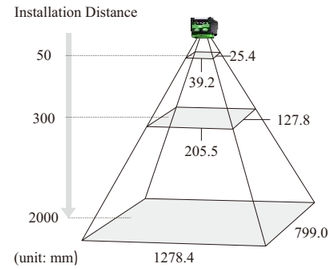


Technical Parameters

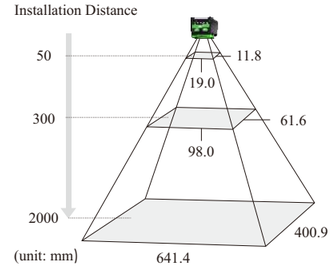
Model		OPT-IDD1-M010G	OPT-IDD1-M023G	OPT-IDD1-M050G		OPT-IDD1-M050R	OPT-IDD1-M080R	
Sensor Type		CMOS, Global Shutter	CMOS, Global Shutter	CMOS, Global Shutter		CMOS，Rolling shutter	CMOS，Rolling shutter	
Resolution		1280 × 800	1920 × 1200	2448 × 2048		2592 × 1944	3840 × 2144	
Pixel Size		3.0 μm × 3.0 μm	3.0 μm × 3.0 μm	2.74 μm × 2.74 μm		2.2 μm × 2.2 μm	2.0 μm × 2.0 μm	
Sensor Size		1/4 "	1/2.6 "	1/1.8 "		1/2.5 "	1/2 "	
Exposure Time		20 μs~1 sec	6 μs ~1 sec	11 μs ~1 sec		8 μs ~1 sec	13 μs ~1 sec	
Gain		1 dB ~ 16 dB	1 dB ~ 16 dB	1 dB ~ 24 dB		1 dB ~ 16 dB	1 dB ~ 16 dB	
Maximum Processing Frame Rate		50 fps	40 fps	30 fps		30 fps	15 fps	
Maximum Decoding Speed		65 reads/second	80 reads/second	80 reads/second		80 reads/second	90 reads/second	
Focusing Method		Mechanical Focus	Mechanical Focus	Mechanical Focus	-	Mechanical Focus	Mechanical Focus	-
Lens Focal Length		6 mm/12 mm/ 16 mm/25 mm	8 mm/12 mm/ 16 mm/25 mm	8 mm/12 mm/ 16 mm/25 mm	-	8 mm/12 mm/ 16 mm/25 mm	8 mm/12 mm/ 16 mm/25 mm	-
Optical Interface		M12-Mount		M12-Mount	C-Mount	M12-Mount	M12-Mount	C-Mount
Reading Distance		50 mm ~ 2000 mm(For 16 mm lens: 100 mm ~ 2000 mm; For 25 mm lens: 200 mm ~ 2000 mm)			-	50 mm ~ 2000 mm(For 16 mm lens: 100 mm ~ 2000 mm;For 25 mm lens: 200 mm ~ 2000 mm)		-
Barcode Types	1D Barcodes	Code39, Code128, EAN8, EAN13, UPC_A, UPC_E, Code93, GS1-128, GS1-DataBar Expand, ITF, PHARMACODE, CODABAR etc.						
	2D Barcodes	QR Code, Micro QR Code, Data Matrix, PDF417,etc						
Communication Modes		TCP, UDP, Serial, Ethernet/IP, FTP, Http, Modbus, Profinet, MC, Fins communication,etc						
Interface Type		17-PIN M12 connector provides power, DI, DO, and serial communication; 8-PIN M12 connector provides Ethernet functionality.						
I/O Interface		3 opto-isolated inputs, 3 opto-isolated outputs						
Communication Interface		1 RS232, 1 Gigabit Ethernet (1000 Mbit/s)						
Power Supply Method		24 VDC ±20%						
Power Consumption		< 30W@24 VDC			< 10W@ 24 VDC	< 30W@24 VDC		< 10W@ 24 VDC
Light Source		Available red, white and blue light *			No built-in light source	Available red, white and blue light *		No built-in light source
Aimer		High-brightness green LED			-	High-brightness green LED		-
Lens Cover		Transparent lens cover, optional fully polarized or semi-polarized lens cover			-	Transparent lens cover, optional fully polarized or semi-polarized lens cover		-
Dimensions		83.5 mm ×55 mm × 46.5 mm						
Weight		264 g						
Operating Temperature		Operating temperature: 0°C ~ 50°C; Storage temperature: -20°C ~ 70°C						
Ambient Humidity		<85% RH (non-condensing)						
Protection Rating		IP62/IP65						
Product Certifications		CE, ROHS						

Technical Parameters

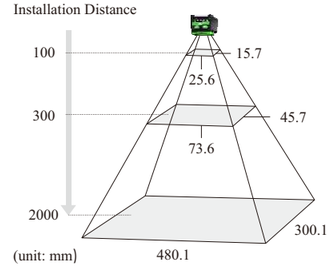
OPT-IDD1-M010G-L06					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
6mm	50	39.2	25.4	0.123	0.061
	100	72.8	45.0	0.228	0.114
	300	205.5	127.8	0.642	0.321
	600	403.5	252.2	1.261	0.630
	1000	638.4	399.0	1.995	0.998
	2000	1278.4	799.0	3.995	1.998



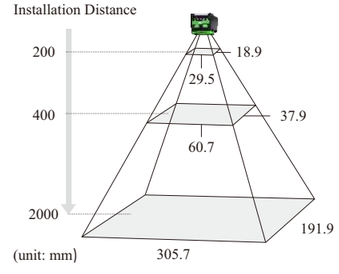
OPT-IDD1-M010G-L12					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
12mm	50	19.0	11.8	0.059	0.030
	100	34.7	21.6	0.108	0.054
	300	98.0	61.6	0.306	0.153
	600	194.0	122.0	0.606	0.303
	1000	321.4	200.9	1.004	0.502
	2000	641.4	400.9	2.004	1.002



OPT-IDD1-M010G-L16					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
16mm	100	25.6	15.7	0.080	0.040
	200	49.6	30.7	0.155	0.078
	300	73.6	45.7	0.230	0.115
	600	145.0	90.0	0.453	0.227
	1000	240.1	150.1	0.750	0.375
	2000	480.1	300.1	1.500	0.750

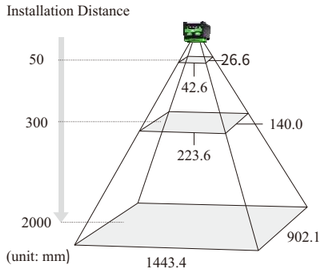


OPT-IDD1-M010G-L25					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
25mm	200	29.5	18.9	0.092	0.046
	300	45.1	28.3	0.141	0.070
	400	60.7	37.9	0.190	0.095
	600	91.2	57.0	0.285	0.143
	1000	152.1	95.1	0.475	0.238
	2000	305.7	191.1	0.955	0.478

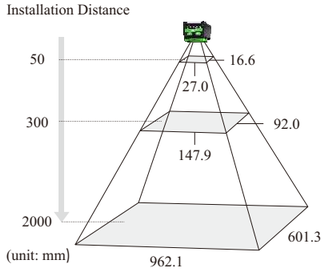


Technical Parameters

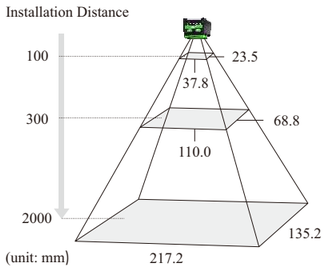
OPT-IDD1-M023G-L08					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
8mm	50	42.6	26.6	0.089	0.044
	100	78.2	48.6	0.163	0.081
	300	223.6	140.0	0.466	0.233
	600	440.9	274.0	0.919	0.459
	1000	723.4	452.1	1.507	0.754
	2000	1443.4	902.1	3.007	1.504



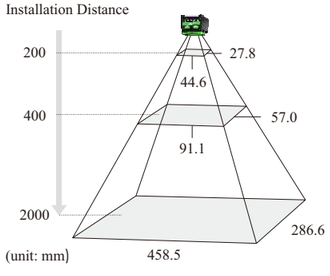
OPT-IDD1-M023G-L12					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
12mm	50	27.0	16.6	0.056	0.028
	100	51.6	32.2	0.108	0.054
	300	147.9	92.0	0.308	0.154
	600	292.3	181.8	0.609	0.304
	1000	482.1	301.3	1.004	0.502
	2000	962.1	601.3	2.004	1.002



OPT-IDD1-M023G-L16					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
16mm	100	37.8	23.5	0.079	0.039
	200	73.9	45.9	0.154	0.077
	300	110.0	68.8	0.229	0.115
	600	217.2	135.2	0.453	0.226
	1000	360.1	225.1	0.750	0.375
	2000	720.1	450.1	1.500	0.750

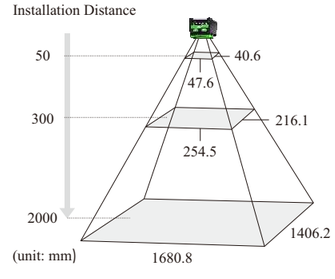


OPT-IDD1-M023G-L25					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
25mm	200	44.6	27.8	0.093	0.046
	300	68.0	42.6	0.142	0.071
	400	91.1	57.0	0.190	0.095
	600	137.4	85.9	0.286	0.143
	1000	228.1	142.6	0.475	0.238
	2000	458.5	286.6	0.955	0.478

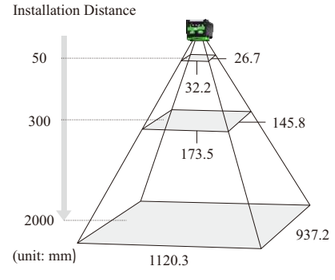


Technical Parameters

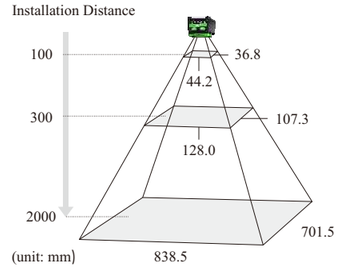
OPT-IDD1-M050G-L08					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
8mm	50	47.6	40.6	0.078	0.039
	100	91.2	76.3	0.149	0.075
	300	254.5	216.1	0.416	0.208
	600	518.9	424.1	0.848	0.424
	1000	842.4	704.8	1.376	0.688
	2000	1680.8	1406.2	2.746	1.373



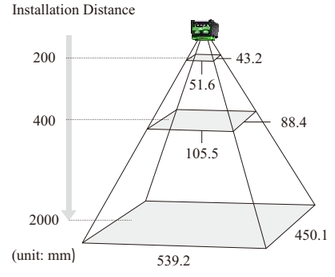
OPT-IDD1-M050G-L12					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
12mm	50	32.2	26.7	0.053	0.026
	100	60.8	50.7	0.099	0.050
	300	173.5	145.8	0.283	0.142
	600	340.0	284.2	0.556	0.278
	1000	561.4	469.7	0.917	0.459
	2000	1120.3	937.2	1.831	0.915



OPT-IDD1-M050G-L16					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
16mm	100	44.2	36.8	0.072	0.036
	200	86.2	72.5	0.141	0.070
	300	128.0	107.3	0.209	0.105
	600	250.0	211.0	0.408	0.204
	1000	419.3	350.8	0.685	0.343
	2000	838.5	701.5	1.370	0.685

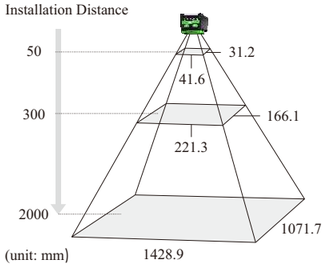


OPT-IDD1-M050G-L25					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
25mm	200	51.6	43.2	0.084	0.042
	300	78.6	66.1	0.128	0.064
	400	105.5	88.4	0.172	0.086
	600	159.2	133.1	0.260	0.130
	1000	268.2	223.9	0.438	0.219
	2000	539.2	450.1	0.881	0.441

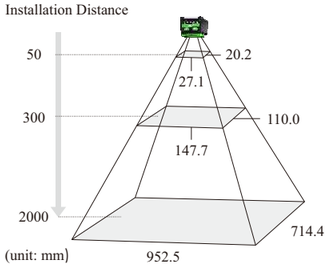


Technical Parameters

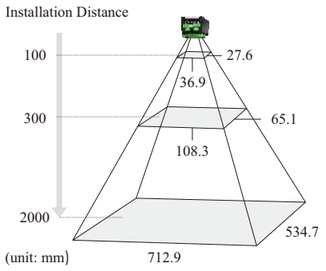
OPT-IDD1-M050R-L08					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
8mm	50	41.6	31.2	0.064	0.032
	100	77.2	57.2	0.119	0.060
	300	221.3	166.1	0.342	0.171
	600	439.2	326.8	0.678	0.339
	1000	716.5	537.4	1.106	0.553
	2000	1428.9	1071.7	2.205	1.103



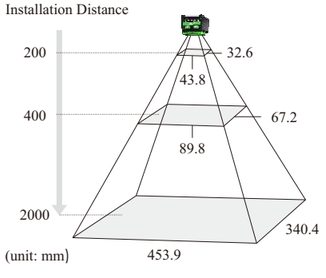
OPT-IDD1-M050R-L12					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
12mm	50	27.1	20.2	0.042	0.021
	100	52.0	38.8	0.080	0.040
	300	147.7	110.0	0.228	0.114
	600	291.0	217.0	0.449	0.225
	1000	477.3	358.0	0.737	0.368
	2000	952.5	714.4	1.470	0.735



OPT-IDD1-M050R-L16					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
16mm	100	36.9	27.6	0.057	0.028
	200	72.4	54.3	0.112	0.056
	300	108.3	65.1	0.167	0.084
	600	214.6	160.6	0.331	0.166
	1000	356.5	267.4	0.550	0.275
	2000	712.9	534.7	1.100	0.550

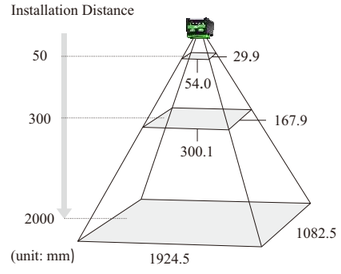


OPT-IDD1-M050R-L25					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
25mm	200	43.8	32.6	0.068	0.034
	300	66.7	50.0	0.103	0.051
	400	89.8	67.2	0.139	0.069
	600	135.5	102.0	0.209	0.105
	1000	225.8	169.4	0.348	0.174
	2000	453.9	340.4	0.700	0.350

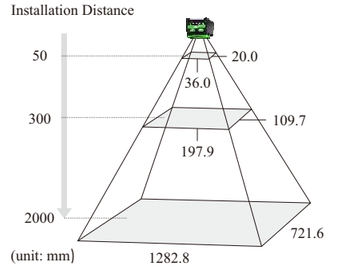


Technical Parameters

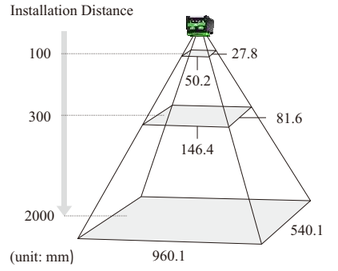
OPT-IDD1-M080R-L08					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
8mm	50	54.0	29.9	0.056	0.028
	100	102.5	56.9	0.107	0.053
	300	300.1	167.9	0.313	0.156
	600	587.9	326.0	0.612	0.306
	1000	964.5	542.5	1.005	0.502
	2000	1924.5	1082.5	2.005	1.002



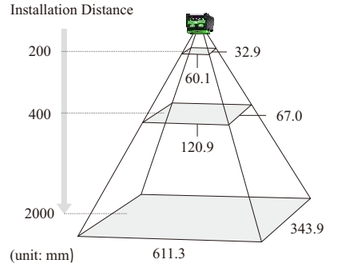
OPT-IDD1-M080R-L12					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
12mm	50	36.0	20.0	0.038	0.019
	100	68.4	37.6	0.071	0.036
	300	197.9	109.7	0.206	0.103
	600	389.8	216.0	0.406	0.203
	1000	642.8	361.6	0.670	0.335
	2000	1282.8	721.6	1.336	0.668



OPT-IDD1-M080R-L16					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
16mm	100	50.2	27.8	0.052	0.026
	200	98.1	54.1	0.102	0.051
	300	146.4	81.6	0.153	0.076
	600	290.3	152.3	0.302	0.151
	1000	480.1	270.1	0.500	0.250
	2000	960.1	540.1	1.000	0.500



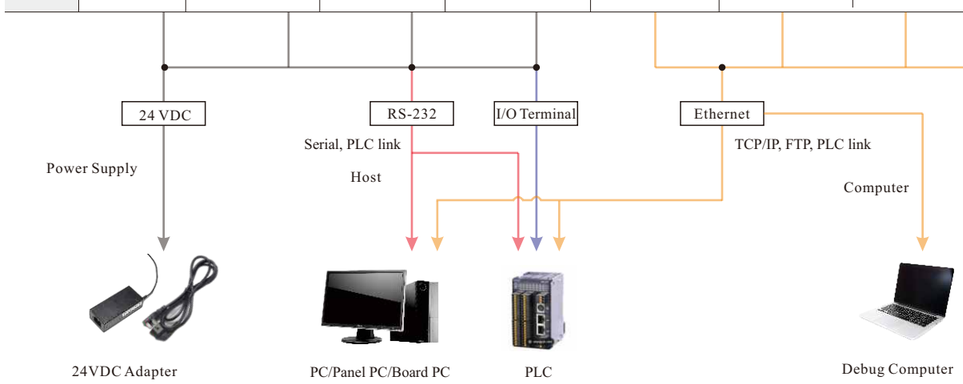
OPT-IDD1-M080R-L25					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
25mm	200	60.1	32.9	0.063	0.031
	300	89.9	49.5	0.094	0.047
	400	120.9	67.0	0.126	0.063
	600	183.0	101.9	0.191	0.095
	1000	304.1	171.1	0.317	0.158
	2000	611.3	343.9	0.637	0.318



Matching Cables

Accessory Cable

Cable Length	D1 Series Universal Cable							
	Control Cable				Gigabit Ethernet Cable			
	Straight-head Static IO Cable	Dynamic/Drag Chain Straight-head IO Cable	Static Elbow IO Cable	Dynamic/Drag Chain Elbow IO Cable	Static Straight-head Gigabit Ethernet Cable	Dynamic/Drag Chain Straight-head Giga Bit Ethernet Cable	Static Elbow Gigabit Ethernet Cable	Dynamic/Drag Chain Elbow Gigabit Ethernet Cable
3M	CB-M12-A17F 009-S3M	CB-M12-A17F 009-T3M	CB-M12-A17FLA 009-S3M	CB-M12-A17FLA 009-T3M	CB-GE-M12A8 MRJ45-S3M	CB-GE-M12A8 MRJ45-T3M	CB-GE-M12A8 MUARJ45-S3M	CB-GE-M12A8 MUARJ45-T3M
5M	CB-M12-A17F 009-S5M	CB-M12-A17F 009-T5M	CB-M12-A17FLA 009-S5M	CB-M12-A17FLA 009-T5M	CB-GE-M12A8 MRJ45-S5M	CB-GE-M12A8 MRJ45-T5M	CB-GE-M12A8 MUARJ45-S5M	CB-GE-M12A8 MUARJ45-T5M
10M	CB-M12-A17F 009-S10M	CB-M12-A17F 009-T10M	CB-M12-A17FLA 009-S10M	CB-M12-A17FLA 009-T10M	CB-GE-M12A8 MRJ45-S10M	CB-GE-M12A8 MRJ45-T10M	CB-GE-M12A8 MUARJ45-S10M	CB-GE-M12A8 MUARJ45-T10M
Interface								



E1 Series NEW



Product Features

- Equipped with a high-performance image sensor to enhance image quality.
- Supports mainstream communication protocols including TCP, UDP, Serial, Ethernet/IP, Modbus, Profinet, FTP, HTTP, MC, and FINS.
- Features multiple decoding indicators such as buzzer, vibration, and LED lights.
- Deep learning decoding algorithm enables efficient reading of barcodes, unaffected by dirt or damage.
- Compact and lightweight design ensures a more comfortable user experience.
- WiFi wireless communication offers wide coverage and fast, stable data transmission.
- Variety of communication interfaces, supporting Ethernet, Serial, and USB output options.
- Cable-separated design allows for easy replacement and flexible use.

Exterior Design and Structure

Lens Hood
Detachable and replaceable, can be selected and purchased based on actual needs for polarized lens hood.

Aim Point
Utilizes green high-brightness LED for positioning.

Light Source
The device's lens hood contains 8 LED beads for illumination, different colors of light sources can be selected according to actual on-site applications, as well as adjusting the brightness of the light source.

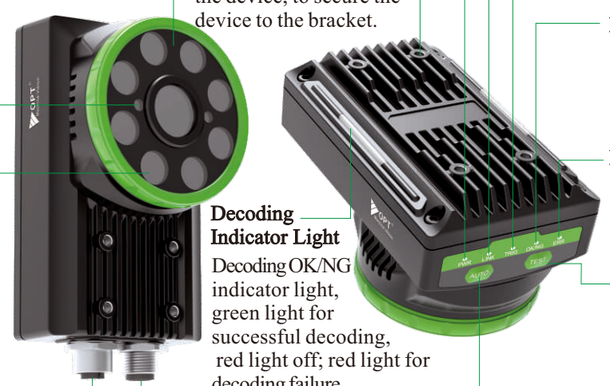
8-PIN Interface
Gigabit Ethernet port, used for data transmission. Interface has threads and needs to be tightened when in use.

PWR Indicator Light
Power indicator light, on when power supply is normal, and off in case of anomalies.

Mounting Holes
There are four mounting screw holes at the back of the device, to secure the device to the bracket.

Decoding Indicator Light
Decoding OK/NG indicator light, green light for successful decoding, red light off; red light for decoding failure.

17-PIN Interface
Provides power, DI, DO, and serial port functionalities.The interface needs to be tightened when in use.



LINK Indicator Light
Network connection indicator light, blinks when the network is normal.

TRIG Indicator Light
Trigger indicator light, blinks along with trigger signal.

Decoding Indicator Light
Decoding OK/NG indicator light, green light for successful decoding; red light for decoding failure.

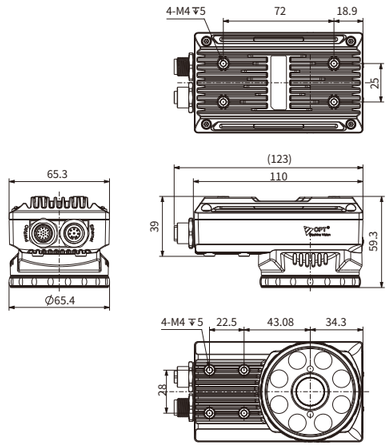
ERR Indicator Light
Error indicator light, stays on when the device is abnormal, goes off if everything is normal.

TEST Button
Press shortly to trigger decoding once.

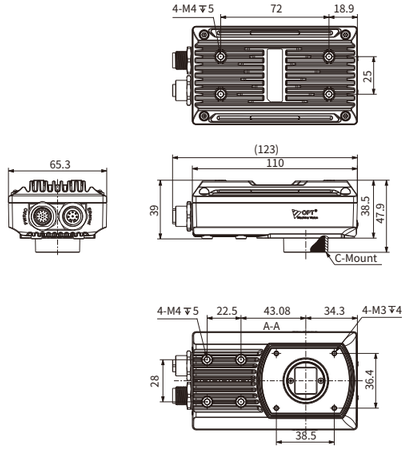
AUTO Button
Press and hold to initiate automatic focusing.

Dimensions (mm)

OPT-IDE1-MXXXR-LXX



OPT-IDE1-MXXXR-LC



Technical Parameters

Model		OPT-IDE1-M120R		OPT-IDE1-M200R
Sensor Type		CMOS, Rolling shutter		
Resolution		4000 × 3000		5440 × 3648
Pixel Size		1.85 μm × 1.85 μm		2. 4 μm × 2. 4 μm
Sensor Size		1/1.7"		1"
Exposure Time		10 μs~1 sec		13 μs~1 sec
Gain		1 dB ~ 27 dB		1 dB ~ 27 dB
Maximum Processing Frame Rate		20 fps		10 fps
Maximum Decoding Speed		110 reads/second		120 reads/second
Focusing Method		Mechanical Focus	C-mount supports manual focus	C-mount supports manual focus
Lens Focal Length		8 mm/12 mm/16 mm/25 mm	-	-
Optical Interface		M12-mount	C-mount	C-mount
Reading Distance		50 mm ~ 2000 mm(For 16 mm lens: 100 mm ~ 2000 mm; For 25 mm lens: 200 mm ~ 2000 mm)	-	-
Barcode Types	1D Barcodes	Code39, Code128, EAN8, EAN13, UPC_A, UPC_E, Code93, GS2-128, GS2-DataBar Extended, ITF, PHARMACODE, CODABAR, etc.		
	2D Barcodes	QR Code, Micro QR Code, Data Matrix, PDF417, etc.		
Communication Modes		TCP, UDP, Serial, Ethernet/IP, FTP, HTTP, Modbus, Profinet, MC, Fins, etc.		
Interface Type		17-PIN M12 connector provides power, DI, DO, and serial communication; 8-PIN M12 connector provides Ethernet functionality.		
I/O Interface		3 opto-isolated inputs, 3 opto-isolated outputs		
Communication Interface		1 RS232, 1 Gigabit Ethernet (1000 Mbit/s)		
Power Supply Method		24 VDC ±20%		

Technical Parameters

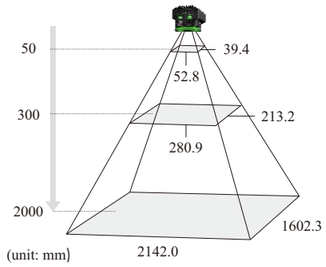
Model	OPT-IDE1-M120R		OPT-IDE1-M200R
Power Consumption	< 48W@24 VDC	< 17W@24 VDC	< 30W@24 VDC
Light Source	Available red, white and blue light *	No built-in light source	No built-in light source
Aimer	High-brightness green LED	-	-
Lens Cover	Transparent lens cover, optional fully polarized or semi-polarized lens cover	-	-
Dimensions	110 mm ×65.3 mm × 59.3 mm	110 mm ×65.3 mm × 47.9 mm	110 mm ×65.3 mm × 47.9 mm
Weight	441 g	351 g	351 g
Operating Temperature	Operating temperature: 0°C ~ 50°C; Storage temperature: -20°C ~ 70°C		
Ambient Humidity	<85% RH (non-condensing)		
Protection Rating	IP62/IP65		
Product Certifications	CE, ROHS		

Note: * Please refer to page 10 of light sources and lens hoods.

Technical Parameters

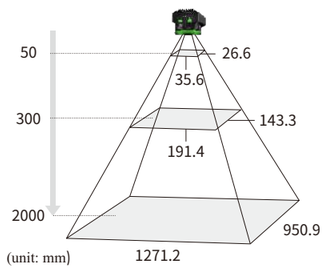
OPT-IDE1-M120R-L08					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
8mm	50	52.8	39.4	0.052	0.026
	100	99.9	75.7	0.099	0.050
	300	280.9	213.2	0.279	0.140
	600	569.0	410.0	0.566	0.283
	1000	1098.4	821.7	1.092	0.546
	2000	2142.0	1602.3	2.129	1.065

Installation Distance



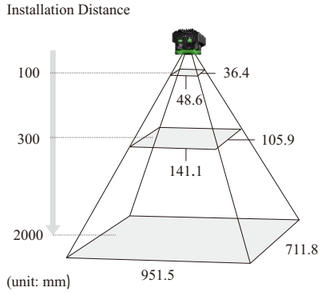
OPT-IDE1-M120R-L12					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
12mm	50	35.6	26.6	0.035	0.018
	100	67.1	50.0	0.067	0.033
	300	191.4	143.3	0.190	0.095
	600	379.5	283.5	0.377	0.189
	1000	643.4	481.3	0.640	0.320
	2000	1271.2	950.9	1.264	0.632

Installation Distance



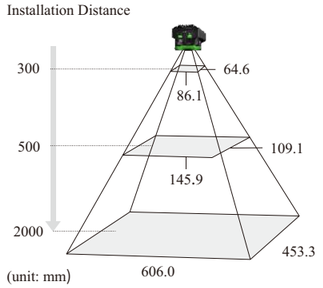
OPT-IDE1-M120R-L16					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
16mm	100	48.6	36.4	0.048	0.024
	200	95.1	71.3	0.095	0.047
	300	141.1	105.9	0.140	0.070
	600	277.9	208.1	0.276	0.138
	1000	480.7	359.6	0.478	0.239
	2000	951.5	711.8	0.946	0.473

Installation Distance



Technical Parameters

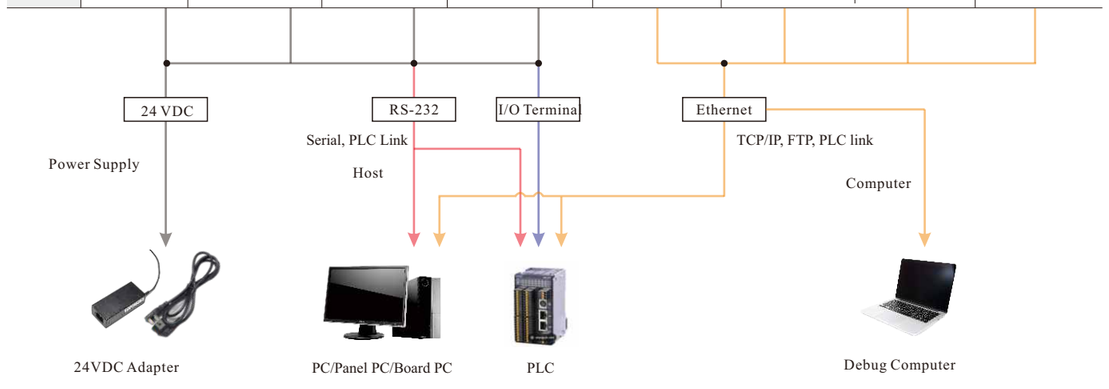
OPT-IDE1-M120R-L25					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
25mm	300	86.1	64.6	0.086	0.043
	400	116.1	87.2	0.115	0.058
	500	145.9	109.1	0.145	0.073
	600	175.0	131.5	0.174	0.087
	1000	304.6	227.9	0.303	0.151
	2000	606.0	453.3	0.602	0.301



Matching Cables

Accessory Cable

Cable Length	E1 Series Universal Cable							
	Control Cable				Gigabit Ethernet Cable			
	Straight-head Static IO Cable	Dynamic/Drag Chain Straight-head IO Cable	Static Elbow IO Cable	Dynamic/Drag Chain Elbow IO Cable	Static Straight-head Gigabit Ethernet Cable	Dynamic/Drag Chain Straight-head Giga Bit Ethernet Cable	Static Elbow Gigabit Ethernet Cable	Dynamic/Drag Chain Elbow Gigabit Ethernet Cable
3M	CB-M12-A17F 009-S3M	CB-M12-A17F 009-T3M	CB-M12-A17FLA 009-S3M	CB-M12-A17FLA 009-T3M	CB-GE-M12A8 MRJ45-S3M	CB-GE-M12A8 MRJ45-T3M	CB-GE-M12A8 MUARJ45-S3M	CB-GE-M12A8 MUARJ45-T3M
5M	CB-M12-A17F 009-S5M	CB-M12-A17F 009-T5M	CB-M12-A17FLA 009-S5M	CB-M12-A17FLA 009-T5M	CB-GE-M12A8 MRJ45-S5M	CB-GE-M12A8 MRJ45-T5M	CB-GE-M12A8 MUARJ45-S5M	CB-GE-M12A8 MUARJ45-T5M
10M	CB-M12-A17F 009-S20M	CB-M12-A17F 009-T10M	CB-M12-A17FLA 009-S20M	CB-M12-A17FLA 009-T10M	CB-GE-M12A8 MRJ45-S10M	CB-GE-M12A8 MRJ45-T10M	CB-GE-M12A8 MUARJ45-S20M	CB-GE-M12A8 MUARJ45-T10M
Interface								



R1 Series NEW



Product Features

- High -performance image sensors to improve image quality.
- Electric lens supporting autofocus, significantly improves debugging efficiency.
- Support TCP/IP, Serial, FTP, HTTP and other transmission protocols.
- Deep learning code reading algorithm, read various types of barcodes and QR codes.
- With a display scanning gun status and the results of the code reading.
- Wireless charging.
- WiFi wireless communication, increasing transmission distance speed and distance.
- With a variety of decoders such as bee tweezers, vibration and indicator lights.
- The base has communication interfaces that support a variety of communication output methods.
- Uses a wiring separation design for easy replacement.

Exterior Design and Structure

R1 Wireless Series

Decoding Indicator Light

Decoding OK/NG indicator light, green light for successful decoding; red light for decoding failure.

Function Button

Functional page switching and setting for code scanning guns.

Call Button

The search button is used to find the position of the code reader, and press the post -code reader to send a prompt sound.

PWR Indicator Light

Normal indicator of the power supply is often on, and bnormalities are often extinguished.

CHG Indicator Light

The base charging indicator is extinguished when the indicator light is not charged. Indicator lights flicker during the charging process.

Display

The menu display is used to display the code reading result and device status information, as well as the debugging configuration of the device.





Light Source

Lens cover contains red LEDs and blue LEDs for replenishment.

Aim Point

The cross laser sight is used for positioning.

Decoding Buttons

Press the button to trigger the collection decoding.

Pairing Code

For pairing connection between the code scanning gun and the communication base.

Communication Base

It is used for wireless communication with the code scanning gun, and charging code scanning guns with mesh, serial port, USB, DI, and Do.

External Structure

R1 Wired Series

Display

The menu display is used to display the results and device status information of the reader, as well as the debugging configuration of the device.

Decoding Indicator Light

Decoding OK/NG indicator light, green light for successful decoding; red light for decoding failure.

Function Button

Used to switch settings for the function page of the code scanning gun.

Power Cable

Power with code scanning guns, optional wires with different communication methods.



Light Source

Lens cover contains red LEDs and blue LEDs for replenishment.

Sight

The cross laser sight is used for positioning.

Decoding Buttons

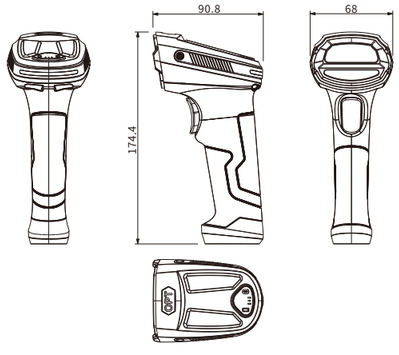
Press the button to trigger the collection decoding.



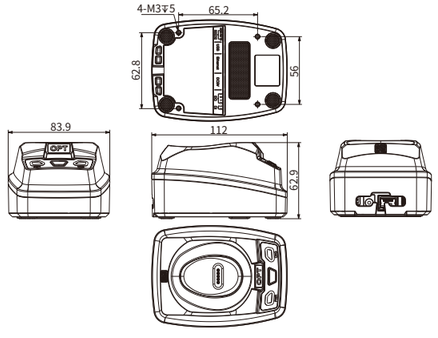
Dimensions (mm)

F1 Wireless Series

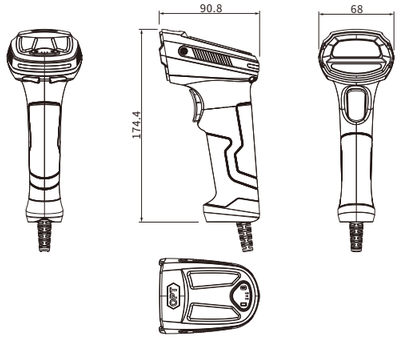
Scanning gun



F1 Wired Series



Communication Base



Technical Parameters

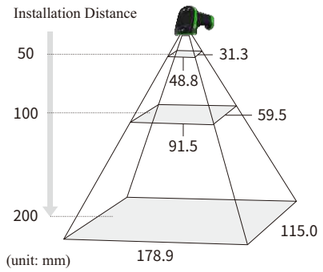
Model		OPT-IDR1-M010G-L04-511-W	OPT-IDR1-M023G-L04-511-E/U/S
Interface		Wireless	Wired
Sensor Type		CMOS, global shutter	
Resolution		1280 × 800	
Pixel Size		3.0 μm × 3.0 μm	
Sensor Size		1/4"	
Exposure Time		20 μs ~ 1 sec	
Gain		1 dB ~ 16 dB	
Maximum Processing Frame Rate		50 fps	
Focusing Method		Fixed Focus	
Lens Focal Length		4.22 mm	
Optical Interface		M8-Mount	
Reading Distance		50 mm-200 mm	
Barcode Types	1D Barcodes	Code39, Code128, EAN8, EAN13, UPC_A, UPC_E, Code93, GS1-128, GS1-DataBar Expand, ITF, PHARMACODE, CODABAR etc.	
	2D Barcodes	QR Code, Micro QR Code, Data Matrix, PDF417,etc	
Communication Protocols		Wireless	Ethernet Port: TCP, UDP, Serial, Ethernet/IP, FTP, HTTP, Modbus TCP,Profinet, MC, FINS communication protocolsUSB Port: Simulated Ethernet (supports TCP, UDP, HTTP, FTP, etc.), simulated serial port, virtual keyboardSerial Port: Serial, Modbus RTU
Barcode Types	Wireless Standard	WiFi 4 (2.4 Ghz)	-
	Wireless Communication Range	85 meters (open area)	-
Communication Method		-	Ethernet Port: Fast Ethernet (100 Mbit/s) USB Port: USB 2.0 Serial Port: RS-232
Power Supply Method		Battery powered	5-24VDC
Charging Method		Contact charging	-
Battery Capacity		3000mAh rechargeable lithium battery	-
Charging Time		2.5 h (adapter charging); 6 h (USB charging)	-
Scans per Full Charge		22,000+	-
Maximum Power Consumption		Operating Mode: 4W @ 4VDC; Standby Mode: 1.4W @ 4VDC;Sleep Mode: 0.13W @ 4VDC	2.6W
Light Source		Red LED, Blue LED	
Aimer		Red cross laser1	
Dimensions		74.4 mm × 68 mm × 90.8 mm	
Weight		188 g	139 g
Drop Height		1.5 m	
Ambient Temperature		Operating temperature: 0 ℃ ~ 50 ℃; Storage temperature : -20 ℃ ~ 70 ℃	
Ambient Humidity		< 85%RH (non-condensing)	
Protection Rating		IP62	
Product Certifications		CE, RoHs	

Communication Base Parameters:

Model	OPT-IDR1-W27
	WirelessHandheldCodeReaderCommunicationDock
Communication Mode	TCP, UDP, Serial, Ethernet/IP, FTP, HTTP, Modbus, Profinet, MC, FINS communication, virtual keyboard
Communication Output Interface	1 × USB 2.0, 1 × RS232, 1 × Fast Ethernet (100 Mbit/s)
Control Output Interface	1 opto-isolated control input, 3 opto-isolated control outputs
Power Supply Method	9 VDC
Dimensions	112 mm × 83.9 mm × 62.3 mm
Weight	193 g
Protection Rating	IP62
Product Certifications	CE, RoHS

Technical Parameters

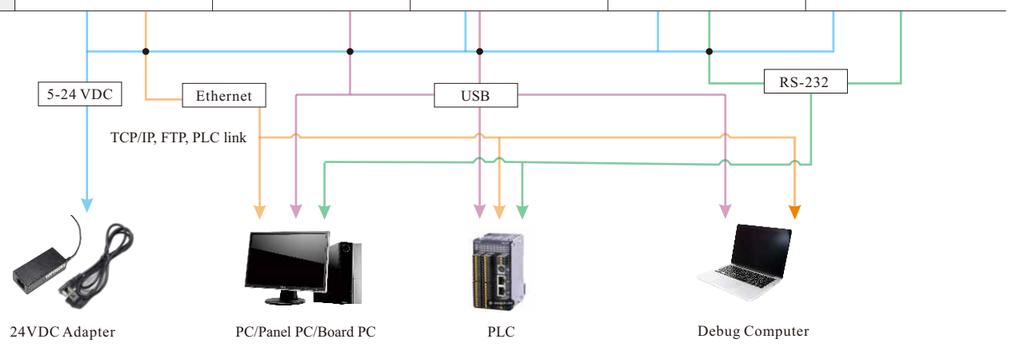
OPT-IDR1-M010G-L04					
Lens Focal Length	Working Distance (mm)	View(mm)		Minimum Recognition Accuracy(mm)	
		Horizontal	Vertical	QR code	One-dimensional Code
4 mm	50	48.8	31.3	0.153	0.076
	100	91.5	59.5	0.286	0.143
	150	178.9	115.0	0.559	0.280



Matching Cables

Accessory Cable

Cable Length	F1 Series Universal Cable				
	Static Straight-head IO Cable				
1.8M	CB-RJ48-M004-S1.8M	CB-RJ48-M001-S1.8M	CB-RJ48-M003-S1.8M	CB-RJ48-M005-S1.8M	CB-RJ48-M006-S1.8M
3M	CB-RJ48-M004-S3M	CB-RJ48-M001-S3M	CB-RJ48-M003-S3M	CB-RJ48-M005-S3M	CB-RJ48-M006-S3M
Interface					



Application Industry

Applied in 30+ Industries with 10,000+ Project Cases

Widely used in lithium batteries, 3C electronics, photovoltaics, PCB, automotive manufacturing, pharmaceuticals, chemical industry, printing, logistics (including automated warehousing), food, and more.

Lithium Battery

Battery module barcode reading
Cover barcode reading
Lithium battery blue film barcode reading
Electrode cover barcode reading

3C Electronics

Component tracking
QR code reading on casings
Connector inspection

PCB

Circuit board barcode reading
Laser-engraved barcode reading
Production process traceability

Photovoltaics

Silicon wafer QR code recognition
Component label reading
Finished product warehousing management

Automotive Manufacturing

Parts tracking and assembly
Vehicle body code verification
Vehicle factory-out management

Pharmaceuticals

Drug batch traceability
Medical equipment management
Test kit identification

Chemical Industry

Chemical packaging tracking
Batch recording in production
Hazardous chemicals warehousing management

Printing Industry

Packaging barcode printing quality inspection
Dynamic content proofreading
Finished product sorting and tracking

Logistics

Circuit board barcode reading
Laser-engraved barcode reading
Production process traceability

Food

Raw material traceability
Finished product packaging inspection
Warehousing and logistics tracking

Education

Textbook and supply barcode management
ID QR code scanning
Exam paper barcode scanning

Other Industries

Tobacco product anti-counterfeiting verification
Barcode marking for fabric and finished clothing
Energy equipment component tracking
……

Application Industry

Lithium Battery Application Cases

Battery Module Barcode , Lithium Battery Cover Barcode , Cover Barcode Reading, and Electrode Lithium Battery Blue Film Barcode Reading



Battery Module



After assembly, the side plates of the battery module have DPM codes or label QR codes, which the reader can reliably scan.



Electrode Cover



The DPM code on the electrode cover is slightly tilted, but the reader ensures stable recognition.



Lithium Battery Blue Film



After the bare battery cell is wound and formed, the blue film is engraved with a DPM code, which the reader can accurately scan.



Lithium Battery Cover



Some DPM codes on the battery cover may be faintly engraved, but the reader can still recognize them reliably.

Application Industry

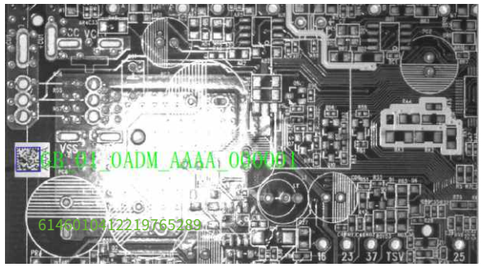
3C industry application case

Component traceability, QR code reading on housings, and connector inspection.



The label QR code on the middle frame is read steadily in its production traceability process.

Mobile phone middle frame and cure



The PCB board is engraved with a DPM code. In each process process, the code reader reads stably.

Mobile PCB board



Glass invisible code: Code reader is able to process this sample with a size of 0.3x0.3mm, which is not visible to the naked eye.

Glass invisible code



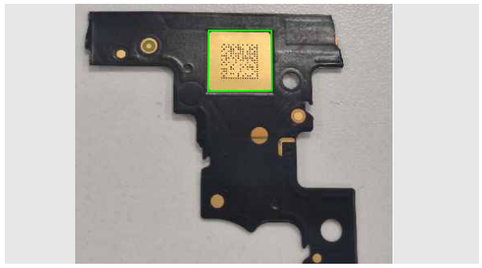
The watch frame comes in different materials and colors, and the QR code surface may have burrs and debris. Despite barcode damage and contamination, the scanner maintains stable recognition.

Watch Frame Laser-Engraved QR Code

Application Industry

PCB Industry Application Cases

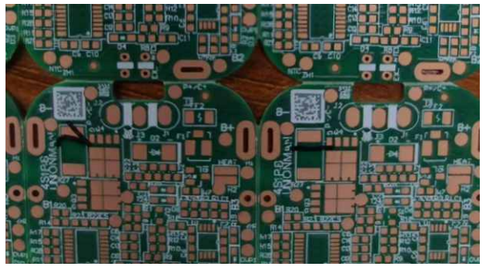
PCB barcode reading, laser-engraved barcode reading, production process traceability.



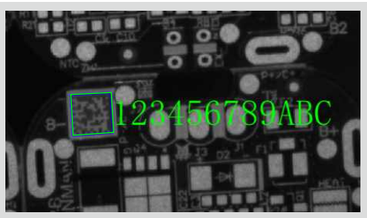
Through-Hole Code



The holes are prone to clogging, and backlighting cannot be used, yet the scanner ensures stable reading.



Graphic Code



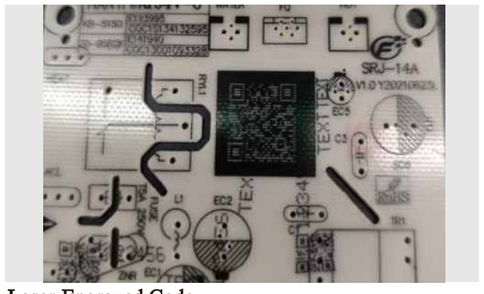
QR codes may become dirty, damaged, low-contrast, or affected by other light sources, but the scanner provides reliable recognition.



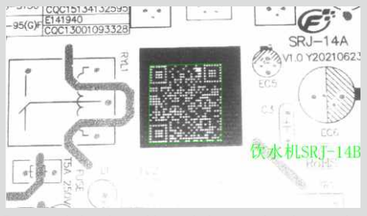
Label Graphic Code



The variety of board materials, marking techniques, and barcode contamination or damage do not affect stable scanning.



Laser-Engraved Code

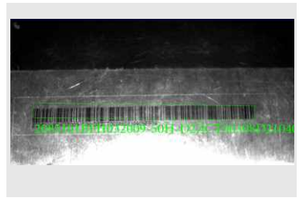


Due to variations in marking techniques, code points may be misaligned or deformed. The scanner, combined with deep learning decoding algorithms, ensures accurate recognition.

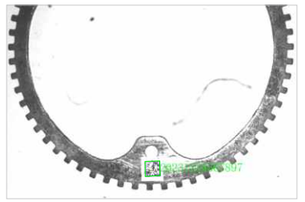
Application Industry

Other Application Cases

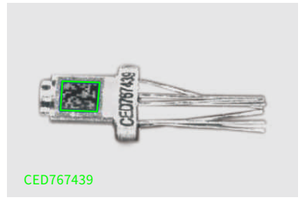
OPT barcode scanners have been tested and excelled in metal processing, automotive module components, food and daily chemicals, logistics, and more.



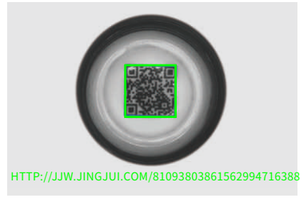
Metal Processed Parts



Automotive Parts



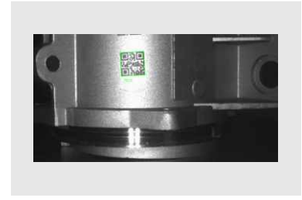
Optical Fiber Terminals



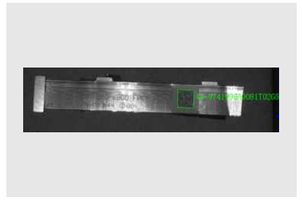
Bottle Caps



Charger QR Codes



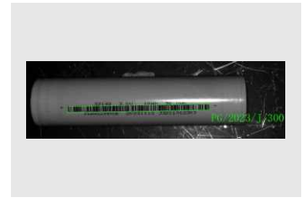
QR Codes on Automotive Metal Components



DPM Codes on Flexible PCB Boards



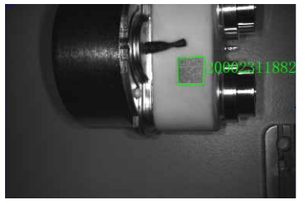
Type-C Interface Codes



128 Codes on Cylindrical Batteries



TV Internal Board Scanning



QR Codes on Electrical Casings



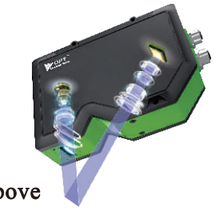
Engine Housing Laser-Engraved Code Recognition

3D Camera

- Principles and characteristics >>P79
- Overview of functions >>P80
- Selection guide >>P81
- OPT-LPB Series technical parameters >>P83
- OPT-LPC Series technical parameters >>P88
- SRT3D-F2 Series Technical Specifications >>P93
- SRE3D-E2 Series Technical Specifications >>P98
- Cables >>P103
- Application cases >>P104

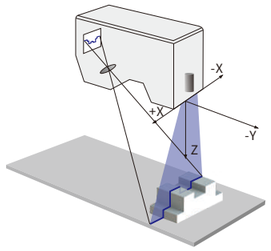
Measuring Principle

Triangular Reflection Method



As Shown Above

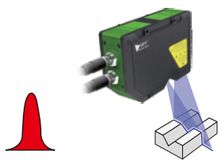
- Semiconductor laser transmitter emitting laser beam
- passes through a cylindrical lens diffusing into collimated light, forming laser lines with uniform spot size and spacing.
- Diffuses both specular and normal reflection.
- The reflected light passes through the light acceptance lens module and images on CMOS.
- Through the photoelectric reaction of different CMOS pixels, the height value and gray value of the corresponding position will be calculated.



High Accuracy

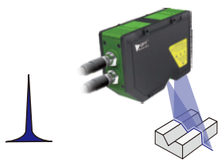
Illuminating

Dedicated blue laser with wavelength of 405nm and a high-performance optical diffusion system, featuring precise measurement position focusing, and ensures lowest diffusion within different focal lengths in order to accurately scan the changes of the object.





Effect schematic diagram of the previous red light or low-performance laser system.

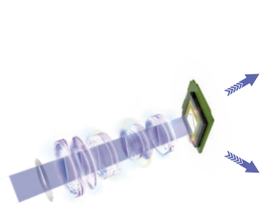




Effect schematic diagram of OPT high-performance laser optical system.

Light Acceptance

The OPT lens module features low aberration, a large aperture, and high functionality, which effectively increased the amount of light received. It adopts a unique optical design to ensure consistent imaging of targets at different heights on the CMOS sensor, improving sensor linearity accuracy and ensuring precise detection of subtle changes in product dimensions within the Z-axis range.

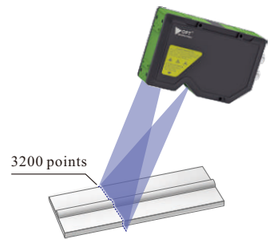


When the reflected light enters the large aberration lens, the light spot spreads and the accuracy gets lower.

When the same reflected light enters the low aberration lens, the light spot focuses and accuracy increases.

X-axis Contour Points

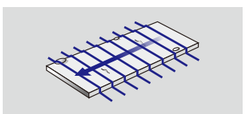
Up to 3200 X-axis countour points. In the case of same X-axis width, the distance between adjacent contour points is smaller, making it easier to measure the bulges depressions of the object.



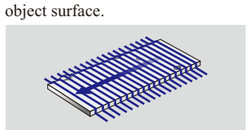
High Speed

HS-CMOS: Equipped with a3D dedicated High Speed-CMOS, it offers both high speed and large dynamic range, easy for high-speed; high-performance FPGA and IC dedicated processors can perform sub-pixel and high-precision linear processing. Through high-speed multi-threaded parallel processing of sampling, reading, processing, and output, the sampling speed reaches up to 67,000 profiles/sec. This allows for seamless high-speed, on-the-fly full inspections and reliable detection of abnormal dimensions without omissions.



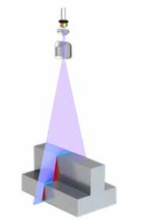


For low-speed products, its scanning frequency is low, missed-out the detection for subtle defects on the object surface.



High-speed products don't missed-out the detection on any subtle defects on the object surface by its overlay scanning .

Telecentric Laser Optics

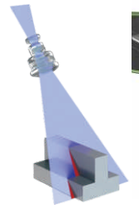


Dark corner breakpoints

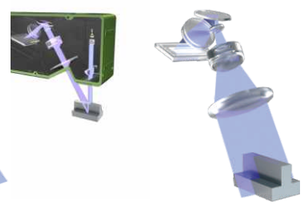


The telecentric laser optical path has no dark corner breakpoints.

Telecentric Imaging Optics



There is a blind spot in the field of view.



The telecentric imaging optics have no blind spots in the field of view.

Features and Characteristics



Large Aperture Lens Module
Utilizes a unique optical design with low aberration, large aperture, and high-performance light-receiving lens module, effectively increasing the amount of received light.

Large Dynamic Range
Both low-reflectivity black objects and high-reflectivity metal objects can be accurately measured simultaneously.

High Speed
The sampling speed can reach up to 67,000 profiles per second, equivalent to 53.6 million points per second.

High Accuracy Blue Laser
No external light source required, automatically optimizes brightness; line laser resolution can reach up to 3200 pixels.

2D and 3D Options

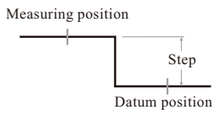
2D Mode: Utilizes standard 2D measurement tools, display measurement results as OK/NG, communicates with PLC or industrial computer for automatic detection and minimizes human involvement.
3D Mode: Scans the target object to obtain global 3D point cloud data and use SDK, synchronously outputting height and grayscale images, and displaying height differences using color rendering.

System and Software:

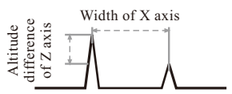
A variety of SDK interfaces are available, including VB, C#, C++, etc. Additionally, it supports Smart3 Vision software from OPT, enabling easy use without programming. The software features a visual process design, allowing non-programmers to easily complete visual applications through graphical programming, shortening project implementation cycles.

Rich Measurement Modes

Step measurement



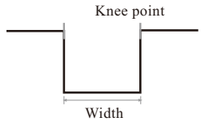
Distance measurement



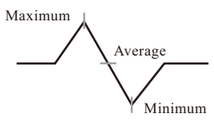
Angle measurement



Width, knee point position measurement



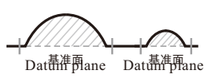
Height measurement



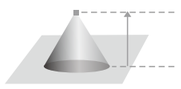
Thickness measurement



Sectional area



Fast 3D step measurement



Fast 3D flatness measurement



Selection Guide for 3D Camera



OPT-LPB

Configure the controller for seamless switching between 2.5D and 3D modes, enabling dual-machine positioning.

- Scanning speed: Up to 8000 Hz.
- X-axis width: Maximum width of 290 mm.
- Z-axis measuring range: Maximum range of 288 mm.
- Number of contour points along the X-axis: 3200 points.
- X-axis data interval: Minimum data interval is 10 μm.



OPT-LPC

Configure the controller with ultra-high scanning frequency, high-speed tuning of laser power and gain, to adapt to different materials of the test object.

- Scanning speed: Up to 67000 Hz.
- X-axis width: Maximum width of 31 mm.
- Z-axis measuring range: Maximum range of 18 mm.
- Number of contour points along the X-axis: 3200 points.
- X-axis data interval: Minimum data interval is 5 μm.



SRT3D-F2

Next-generation upgraded product series with 6 models, no external controller required, offering easy and flexible installation and setup.

Telecentric optical path design, with no dark corner breakpoints or blind spots in the angular region.

- Scan Speed: Up to 18,000 Hz
- X-Axis Width: Line scan field of view up to 380 mm
- Z-Axis Range: Maximum height measurement range of 430 mm
- X-Axis Profile Points: 3200 points across the entire series
- X-Axis Data Interval: Profile interval distributed by level, with a minimum data interval of 5 μm



SRE3D-E2

Next-generation upgraded product series with 6 models, no external controller required, offering easy and flexible installation and setup.

Telecentric optical path design, with no dark corner breakpoints or blind spots in the angular region.

- Scan Speed: Up to 18,000 Hz
- X-Axis Width: Line scan field of view up to 2600 mm
- Z-Axis Range: Maximum height measurement range of 1996 mm
- X-Axis Profile Points: 3200 points across the entire series
- X-Axis Data Interval: Profile interval distributed by level, with a minimum data interval of 19 μm

Basic Steps for Selecting a 3D Camera

Step 1: Confirm the field of view range of the object to be measured (3D X-axis width must be greater than the product field of view range).

Step 2: Confirm whether the selected 3D Camera's X-axis data interval is smaller than the minimum detection accuracy of the object. When the minimum detection accuracy is greater than the X-axis data interval, defects in the product cannot be detected. Confirm whether the Z-axis repeatability meets the project requirements.

Step 3: Match the corresponding scanning speed according to the platform's movement speed.

Scanning speed = Camera frequency * X-axis data interval

Actual Z-axis range = Z-axis range * (Full field of view speed / Scanning speed)

Example: When using OPT-LPC60 for detection, the customer requires a scanning speed of 76 mm/s. The maximum full field of view speed of OPT-LPC60 is 38 mm/s. By compressing the Z-axis range to match the platform speed, we can calculate the actual Z-axis range using the formula: Actual Z-axis range = 18 mm * 38 mm / 76 mm = 9 mm.

Step 4: Working Distance: Confirm whether there is any interference on the equipment for the product's working distance.

Note: Camera frequency: The maximum number of image rows the camera can capture within 1 second.
Linearity: An indicator to evaluate the hardware accuracy of the camera.

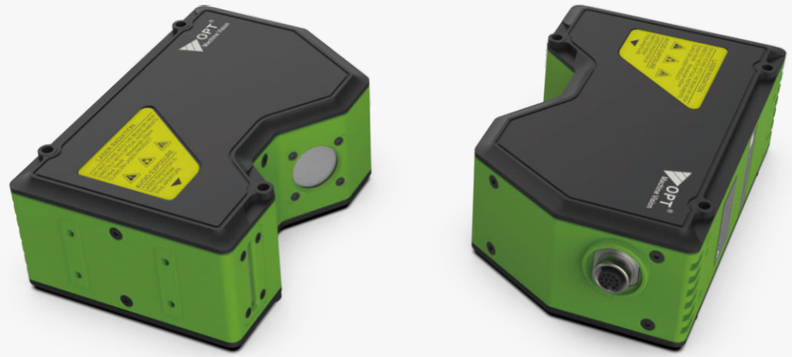
Model Descriptions

Product Selection Guide

SRT F2 -006 -01

- 01 → Product Information
  01: Blue Laser
  02: Red Laser
- 006 → Reference Working Distance
  006: Installation Height 60 mm
  050: Installation Height 500 mm
- F2 → Series Name
  F: F2 Series
- SRT → SRT (Laser Profiler – Line Laser)

LPB Series



Product Features

- Utilizes a unique optical design with low aberration, large aperture, and high-performance light-receiving lens module, whice can effectively increase the amount of received light.
- The sampling speed can reach up to 8000 profiles per second, equivalent to 25.6 million points per second.
- Can simultaneously and accurately measure low reflectivity black objects and high reflectivity metal objects.
- No external light source required, automatically optimizes brightness; high-precision line laser resolution can reach up to 3200 pixels.
- Wide distribution of accuracy field of view, compatible with various industry applications.

Exterior Design and Structure



Specialized screw holes for installation
Screw hole can be used for installing the sensor head.

Mounting hole
The mounting hole is used for installing the sensor head using the provided hexagon socket cap screw.

Laser emitter LED
Green light on: When the object is located near the center of the measurement range;
Orange light on: When the object is located within the measurement range;
Orange light blinking: When the object is located outside the specified measurement range;
Red light on: When there is a system error in the sensor head.

Mounting hole for light-shielding metal plate
Mounting hole is used for installing light -shielding metal plates, etc., onto the sensor head. Please note that it should not be used for securing the sensor head.

Sensor head cable interface connector
The connector connects the sensor head cable.

Sensor head photosensitive window
Receives the laser used for measurement and is protected by a glass cover.

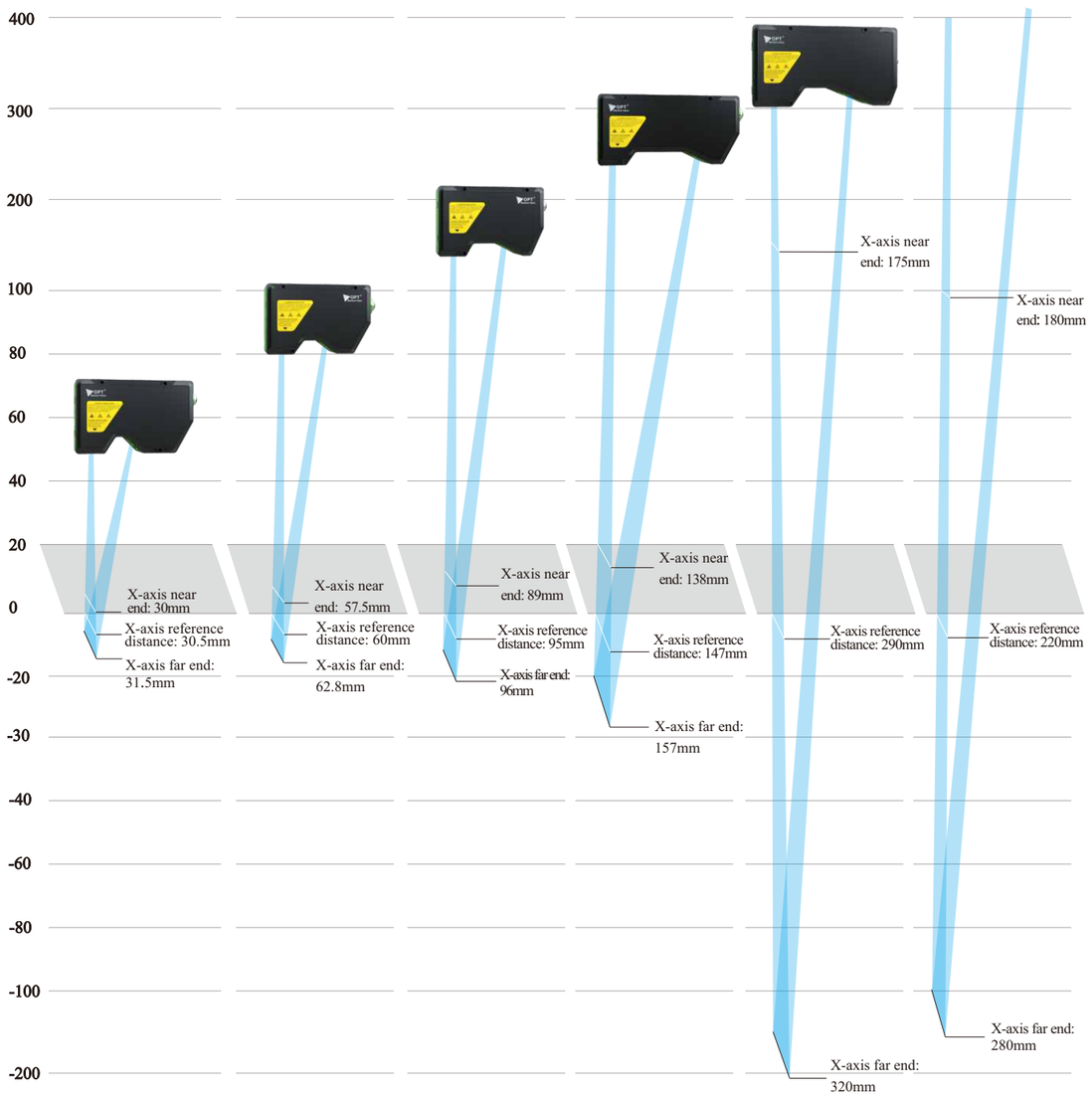
Sensor head laser emission window
Emits the laser used for measurement and is protected by a glass cover.

Field of View Range for B Series

Sensing Head

OPT-LPB50	OPT-LPB80	OPT-LPB140	OPT-LPB240	OPT-LPB300	OPT-LPB400

Z-axis measuring range(mm)

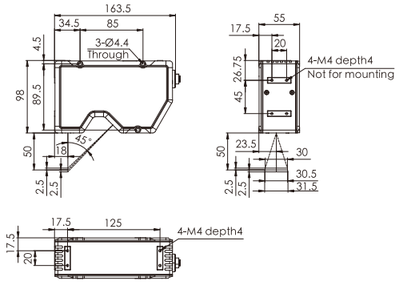


B Series Product Models and Parameters

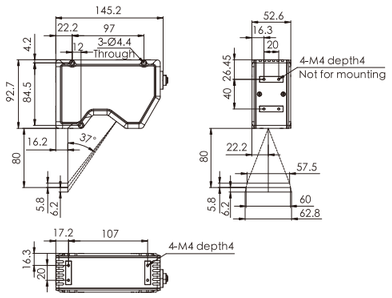
Model		OPT-LPB50	OPT-LPB80	OPT-LPB140	OPT-LPB240	OPT-LPB300	OPT-LPB400
Reference distance(CD)		50 mm	80 mm	140 mm	240 mm	300 mm	400 mm
Z axis measuring range(FS)		5 mm	12 mm	24 mm	40 mm	288 mm	200 mm
Width of X axis	Near-end	30 mm	57.5 mm	89 mm	138 mm	175 mm	180 mm
	Reference istance	30.5 mm	60 mm	95 mm	147 mm	290 mm	220 mm
	Far-end	31.5 mm	62.8 mm	96 mm	157 mm	320 mm	280 mm
Z axis repeatability		0.2 μm	0.4 μm	0.5 μm	1 μm	8 μm	5 μm
X axis repeatability		2.5 μm	0.5 μm	8 μm	13 μm	45 μm	20 μm
X axis data interval		10 μm	20 μm	30 μm	50 μm	100 μm	90 μm
Size		163.5×98×55 mm	145.2×92.7×52.6 mm	147.5×93×53.2 mm	195.2×92.7×54.7 mm	197×105.5×64.2 mm	194.5×93×55 mm
Weight		0.947 kg	0.822 kg	0.829 kg	1.018 kg	1.414 kg	1.018 kg
Light source wavelength		405 nm					
Laser safety class		2M				3R	2M
Laser output power		10 mW					
Contour points on X axis		3200 points					
Scanning speed		2500-8000Hz(1000-4000Hz for LPB300)					
I/O interface		8 programmable input interfaces;8 programmable output interfaces					
Encoder interface		Support single-ended,differential encoder					
Input/Output		100Base-Tx/1000Base-T Ethernet interface*1					
Ambient operation temperature		0~50℃					
Ambient storage temperature		-20~70℃					
Ambient operation RH		35%~85%,No condensation					
ESD protection		Contact discharge 4kV,air discharge 8kV,up to IEC61000-4-2 standard					
EFT protection		Power port: 2kV/5 or 100kHz;signal port:1kV/5 or 100kHz,up to IEC61000-4-4 standard					
Shock		15g/6ms each axis;up to IEC68-2-27Ea standard					
Vibration		10-100Hz double amplitude1.5mm; 3 hours in X,Y and Z directions;up to IEC68-2-6Fc standard					

Dimensional Drawing for B Series(mm)

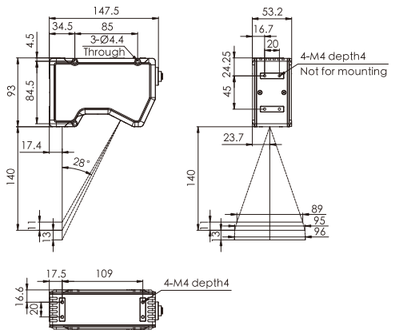
OPT-LPB50



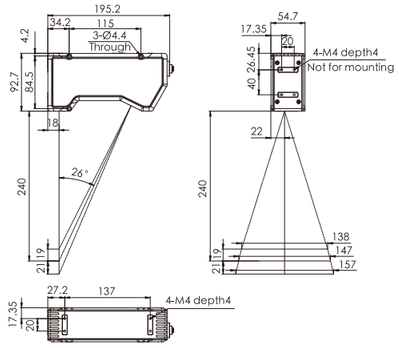
OPT-LPB80



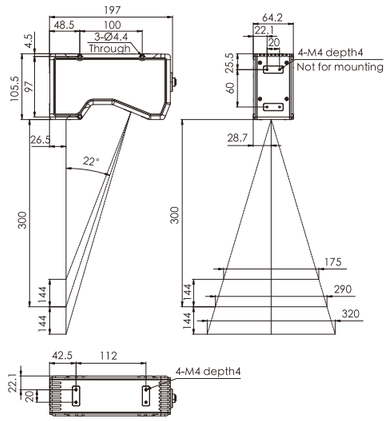
OPT-LPB140



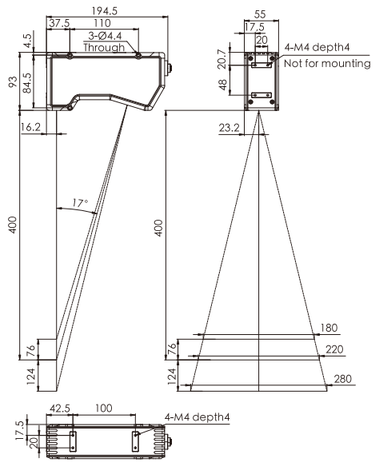
OPT-LPB240



OPT-LPB300

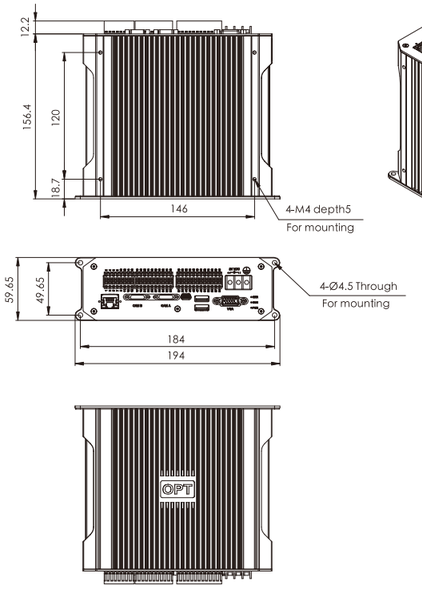


OPT-LPB400



Controller Size Drawing(mm)

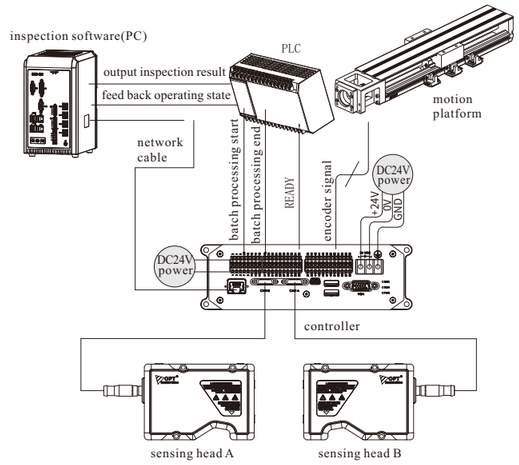
LPB Series Controller



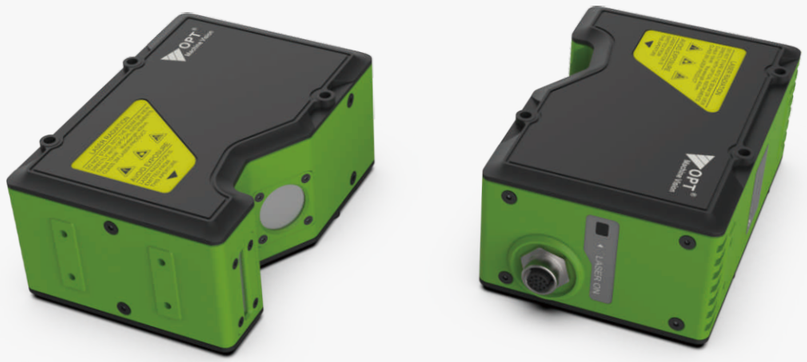
Model	Application range
OPT-LPS1	OPT-LPB Series

Multi-interface Trigger Mode

LPB Series Trigger Modes



LPC Series



Product Features

- Utilizes a unique optical design with low aberration, large aperture, and high-performance light-receiving lens module, whice can effectively increase the amount of received light.
- The sampling speed can reach up to 67,000 profiles per second, equivalent to 214.4 million points per second.
- Can simultaneously and accurately measure low reflectivity black objects and high reflectivity metal objects.
- No external light source required, automatically optimizes brightness; high-precision line laser resolution can reach up to 3200 pixels.
- High accuracy and industry-leading speed, suitable for ultra-high-speed line applications.

Exterior Design and Structure

Laser emitter LED

Green light on: When the object is located near the center of the measurement range;
Orange light on: When the object is located within the measurement range;
Orange light blinking: When the object is located outside the specified measurement range;
Red light on: When there is a system error in the sensor head.

Specialized screw holes for installation

Screw hole can be used for installing the sensor head.

Mounting hole

The mounting hole is used for installing the sensor head using the provided hexagon socket cap screw.



Sensor head cable interface connector

The connector connects the sensor head cable.

Sensor head photosensitive window

Receives the laser used for measurement and is protected by a glass cover.

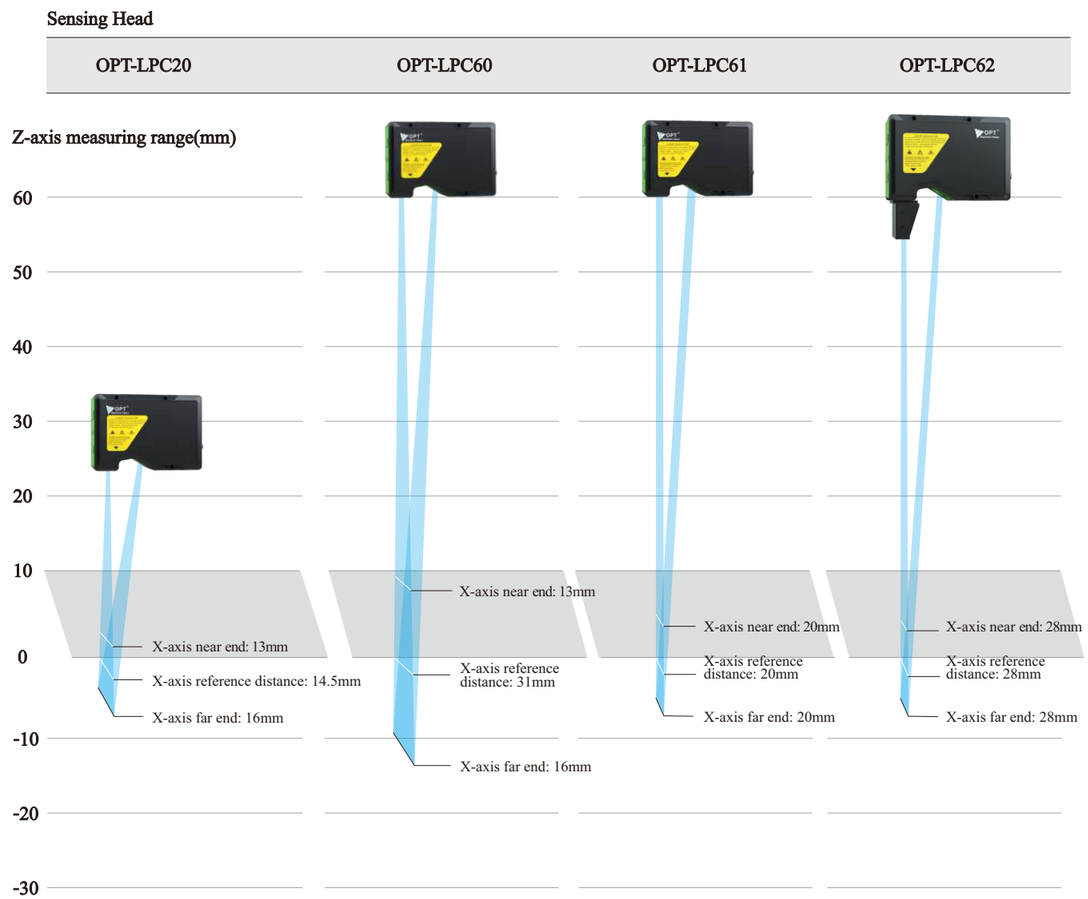
Sensor head laser emission window

Emits the laser used for measurement and is protected by a glass cover.

Mounting hole for light-shielding metal plate

Mounting hole is used for installing light -shielding metal plates, etc., onto the sensor head. Please note that it should not be used for securing the sensor head.

Field of View Range for C Series

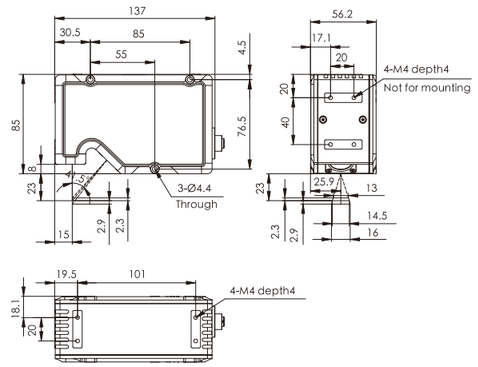


C Series Product Models and Parameters

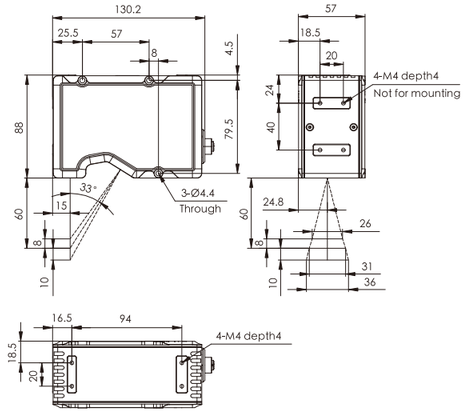
Model		OPT-LPC20	OPT-LPC60	OPT-LPC61	OPT-LPC62
Reference distance(CD)		23 mm	60 mm	60 mm	60 mm
Z axis measuring range(FS)		5.2 mm	18 mm	7.5 mm	7.5 mm
Width of X axis	Near-end	13 mm	26 mm	20 mm	28 mm
	Reference distance	14.5 mm	31 mm	20 mm	28 mm
	Far-end	16 mm	36 mm	20 mm	28 mm
Z axis repeatability		0.1 μm	0.2 μm	0.2 μm	0.2 μm
X axis repeatability		1.5 μm	5 μm	5 μm	5 μm
X axis data interval		5 μm	12 μm	12 μm	12 μm
Size		137×85×56.2 mm	130.2×88×57 mm	130.2×88×57 mm	130.2×128×57 mm
Weight		0.719 kg	0.730 kg	0.730 kg	0.80 kg
Light source wavelength		405 nm			
Laser safety class		2M			
Laser output power		10 mW			
Contour points on X axis		3200 Points			
Scanning speed		3200~67000 Hz			
I/O interface		8 programmable input interfaces;8 programmable output interfaces			
Encoder interface		Support single-ended,differential encoder			
Input/Output		100Base-Tx/1000Base-T Ethernet interface*1			
Ambient operation temperature		0~50℃			
Ambient storage temperature		-20~70℃			
Ambient operation RH		35%~85%,No condensation			
ESD protection		Contact discharge 4kV,air discharge 8kV,up to IEC61000-4-2 standard			
EFT protection		Power port: 2kV/5 or 100kHz;signal port:1kV/5 or 100kHz,up to IEC61000-4-4 standard			
Shock		15g/6ms each axis;up to IEC68-2-27Ea standard			
Vibration		10-100Hz double amplitude1.5mm; 3 hours in X,Y and Z directions;up to IEC68-2-6Fc standard			

Dimensional Drawing for C Series(mm)

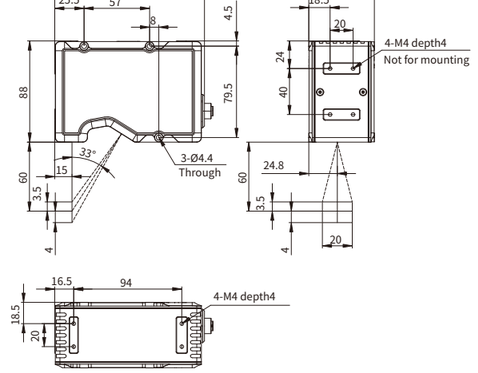
OPT-LPC20



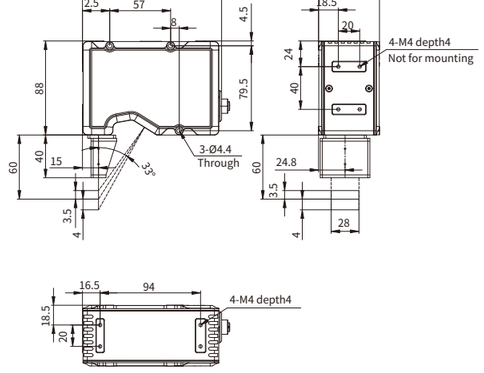
OPT-LPC60



OPT-LPC61

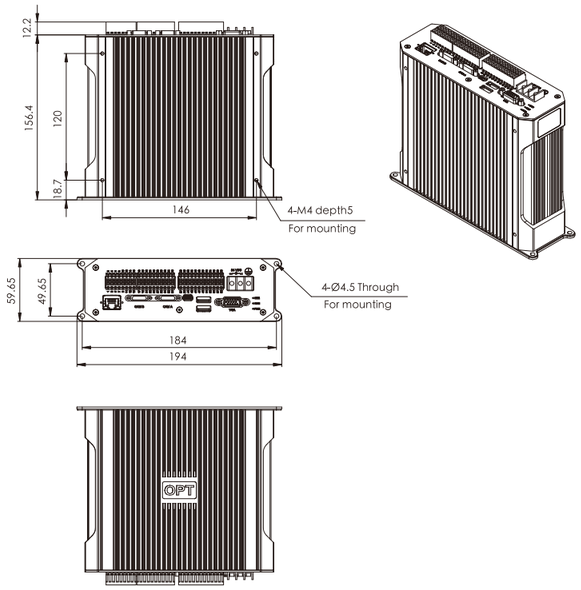


OPT-LPC62



Controller Size Drawing(mm)

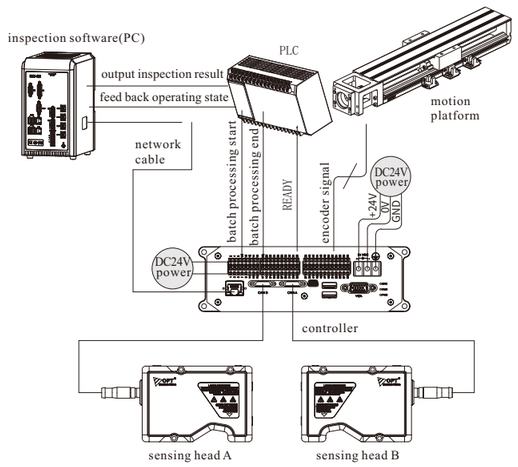
LPC Series Controller



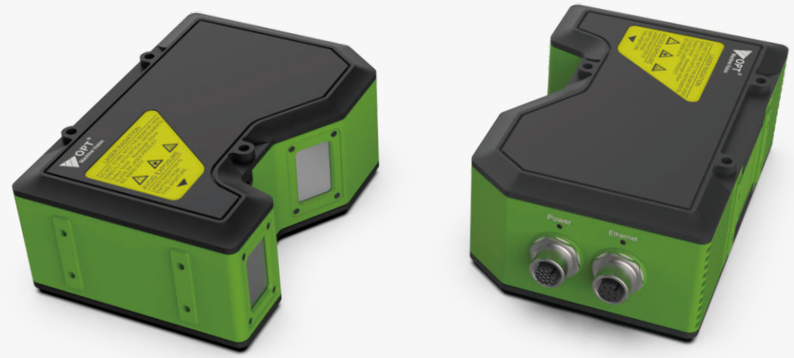
Model	Application range
OPT-LPS2	OPT-LPC Series

Multi-interface Trigger Mode

LPC Series Trigger Modes



SRT3D-F2 Pro



Product Features

- Works independently, facilitating system integration. Features a Gigabit Ethernet interface, with a maximum transmission distance of up to 100m.
- Equipped with high dynamic range high-speed CMOS, suitable for objects of different materials and colors, and can achieve ultra-high scanning speed by compressing the field of view.
- Equipped with an adaptive high-power blue laser module, 3200 effective pixel points, reproducing wheel information.
- Calibrated at the factory and paired with external installation calibration, greatly improving detection accuracy.
- Compliant with GigE Vision V2.0 protocol, GenICam standard, and EMC, ROHS certification.

Exterior Design and Structure



Ethernet indicator light

Network connection indicator light, indicating network status and image acquisition status.

Power indicator light

Displays the status of the object contour.

Mounting hole

Install the sensor head using the provided hexagon socket cap screw.

Mounting hole for light-shielding metal plate

This mounting hole is used for installing light-shielding metal plates, etc., onto the sensor head. Note: it should not be used for securing the sensor head.

Sensor laser module

Laser emission module, does not require external light source, automatically adjusts to optimal brightness.

8-pin interface

Gigabit Ethernet port, used for data transmission, with threaded interface, tighten the interface when in use.

17-pin interface

Provides power, DI, DO, and serial port. The interface has threads, tighten the interface when in use.

Sensor lens module

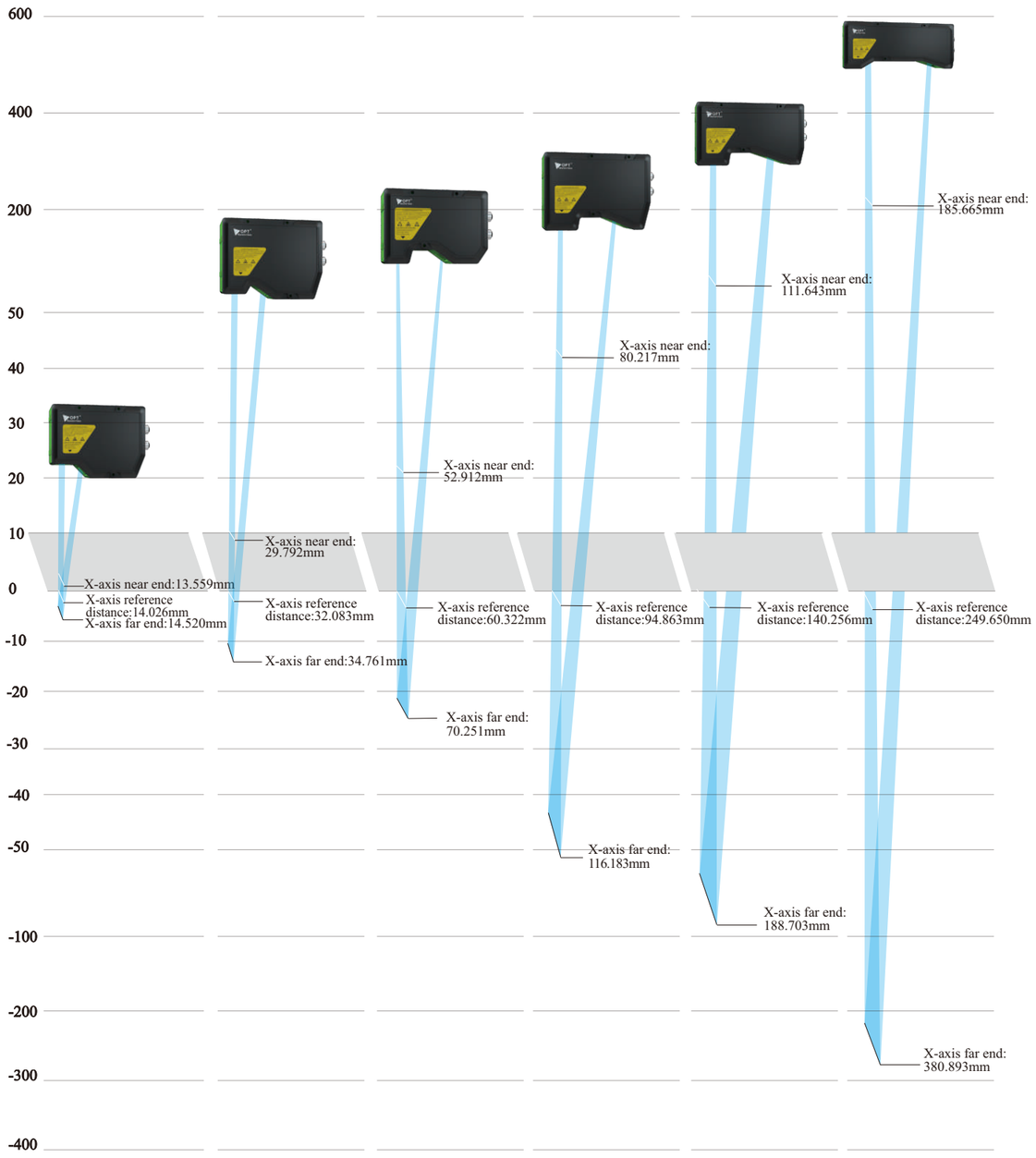
Large aperture light-receiving lens module, effectively increasing the amount of received light.

Field of View Range for F Series

Sensing Head

SRT3D-F2-002	SRT3D-F2-006	SRT3D-F2-010	SRT3D-F2-018	SRT3D-F2-030	SRT3D-F2-050

Z-axis measuring range(mm)



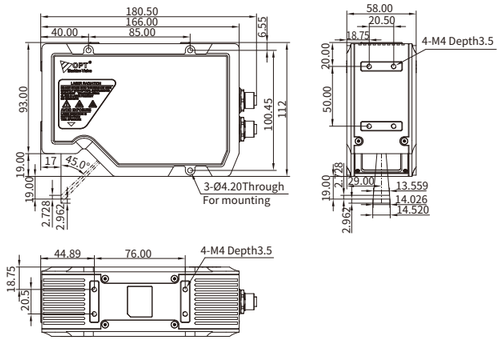
∗**Note:** The 3D Camera works independently without the need for an external controller, making installation and debugging convenient and flexible.

F2 Series Product Models and Parameters

Model		SRT3D-F2-002	SRT3D-F2-006	SRT3D-F2-010	SRT3D-F2-018	SRT3D-F2-030	SRT3D-F2-050
Reference distance(CD)		20mm	60mm	100mm	180mm	300 mm	500mm
Z axis measuring range(FS)		5.69mm	19.652mm	44.149mm	86.769mm	174.643 mm	430.008mm
Width of X axis	Near-end	13.559mm	29.792mm	52.912mm	80.217mm	111.643 mm	185.665mm
	Reference distance	14.026mm	32.083mm	60.322mm	94.863mm	140.256 mm	249.650mm
	Far-end	14.520mm	34.761mm	70.251mm	116.183mm	188.703 mm	380.893mm
Z axis repeatability		0.1μm	0.2μm	0.4μm	0.5μm	1 μm	5μm
X axis repeatability		1.5μm	5μm	8μm	10μm	15 μm	30μm
X axis data interval		4-5μm	9-11μm	17-22μm	25-36μm	35–59 μm	58-119μm
Number of X-Axis Profile Points		3200 points	3200 points	3200 points	3200 points	3200 points	3200 points
Size (mm)		180.5 × 112 × 58	171 × 114 × 58	199.35 × 101 × 58	211.35 × 98 × 58	218.5 × 103 × 58	252.35 × 96 × 58
Weight (kg)		1.398	1.313	1.276	1.288	1.345	1.419
Scan Speed (Frame Rate)		3000~18000 Hz					
Z-Axis Linearity (%)		±0.02% * FS					
Laser Wavelength		405 nm					
Laser Safety Class		Class 2					
Laser Output Power		6 mW					
System Power Consumption (W)		17.5 W (24VDC, full power operation at room temperature)					
Power Supply Requirements		24VDC Power Supply					
I/O Interface		2 Optocoupler Inputs, 3 Optocoupler Outputs					
Operating Temperature		0~50°C					
Storage Temperature		-20~70°C					
Operating Humidity		35%85% RH, Non-condensing					
ESD Protection		Contact Discharge 4kV, Air Discharge 8kV, Compliant with IEC61000-4-2					
EFT Protection		Power Port: 2kV/5 or 100kHz; Signal Port: 1kV/5 or 100kHz; Compliant with IEC61000-4-4					
Vibration (Environmental Resistance)		Frequency 12500 Hz, Max Amplitude ±25.5 mm, Max Velocity ±2 m/s, RMS Acceleration 3g, Random Vibration 2 Hours per Direction (X, Y, Z)					
Enclosure Protection Rating		IP55, Compliant with IEC60529					
Supporting Software		3D Camera Client Software OPT LP Viewer, Algorithm Platform Software Smart3					
Operating System Requirements		Windows 7/10 32/64-bit, Windows 11 64-bit (Recommended: 8GB RAM, i5 or higher equivalent processor)					
Secondary Development SDK Support		Linux/Windows					

Dimensional Drawing for F2 Series(mm)

SRT3D-F2-002



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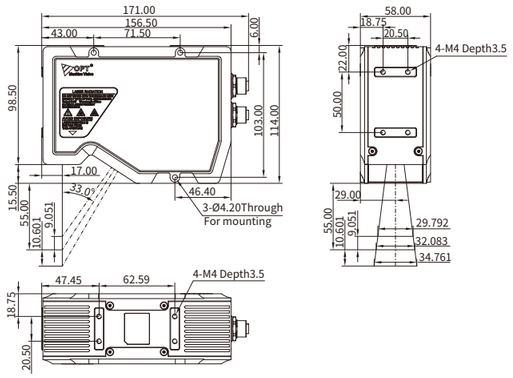

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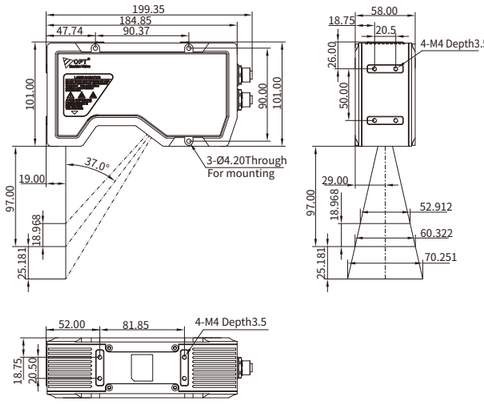

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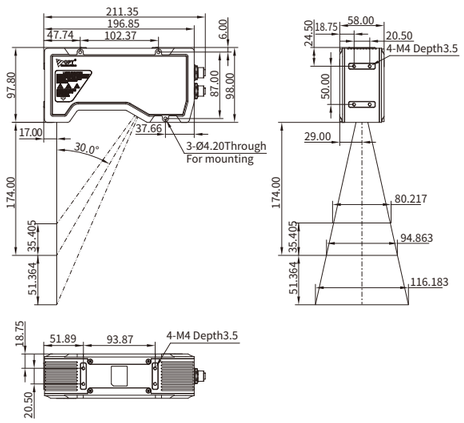

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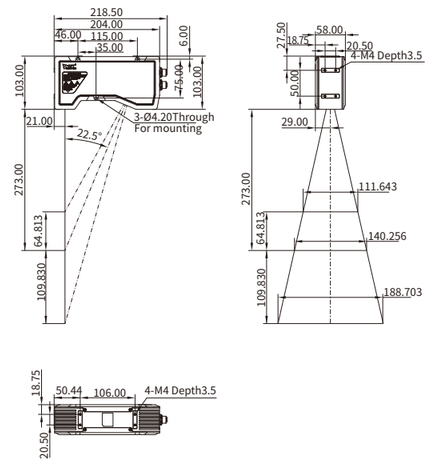

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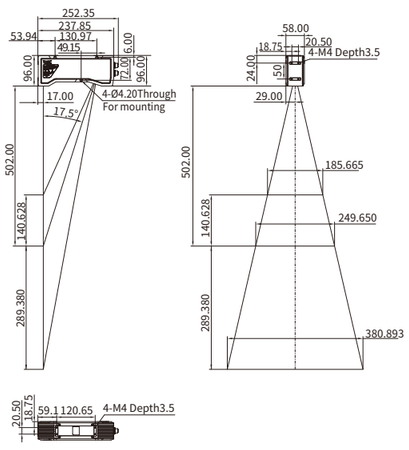
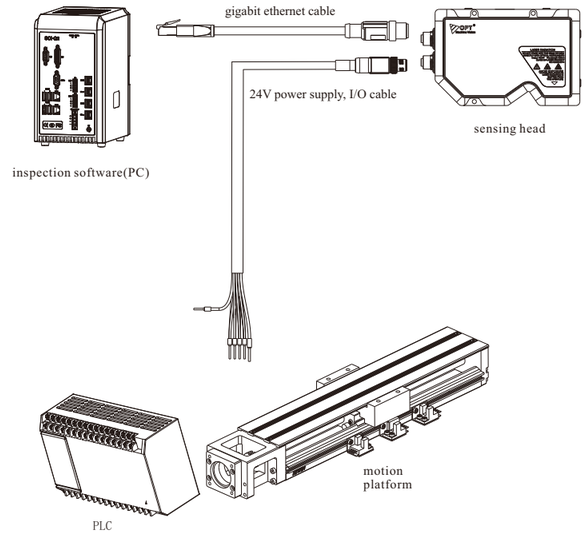
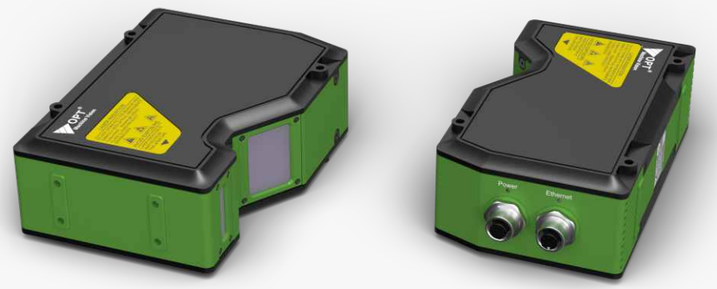


Multi-interface Trigger Mode

SRT3D-F2 Series Trigger Modes



SRE3D-E2 Basic



Product Features

- The 3D Camera can work independently without an external controller, facilitating system integration. It features a Gigabit Ethernet interface with a maximum transmission distance of up to 100m.
- Economical and practical, with up to 3200 X-axis profile points, delivering high precision and accurate contour reconstruction of products.
- Equipped with a high-performance chip and includes technology such as FPGA edge acceleration, it supports a maximum frame rate of 18 kHz for high-speed point cloud data acquisition.
- HDR functionality combined with anti-vibration correction algorithms and post-processing algorithms ensures contour fidelity and adaptability to scan products with varying background colors.
- Equipped with an adaptive high-power blue laser moduleand 3200 effective pixel points, enabling accurate reconstruction of wheel data.

Exterior Design and Structure



Ethernet indicator light

Network connection indicator light, indicating network status and image acquisition status.

Power indicator light

Displays the status of the object contour.

Mounting hole

Install the sensor head using the provided hexagon socket cap screw.

Mounting hole for light-shielding metal plate

This mounting hole is used for installing light-shielding metal plates, etc., onto the sensor head. Please note that it should not be used for securing the sensor head.

Sensor laser module

Laser emission module, no need for external light source, automatically adjusts to optimal brightness.

8-pin interface

Gigabit Ethernet port, used for data transmission, with threaded interface, tighten the interface when in use.

17-pin interface

Provides power, DI, DO, and serial port. The interface has threads, tighten the interface when in use.

Sensor lens module

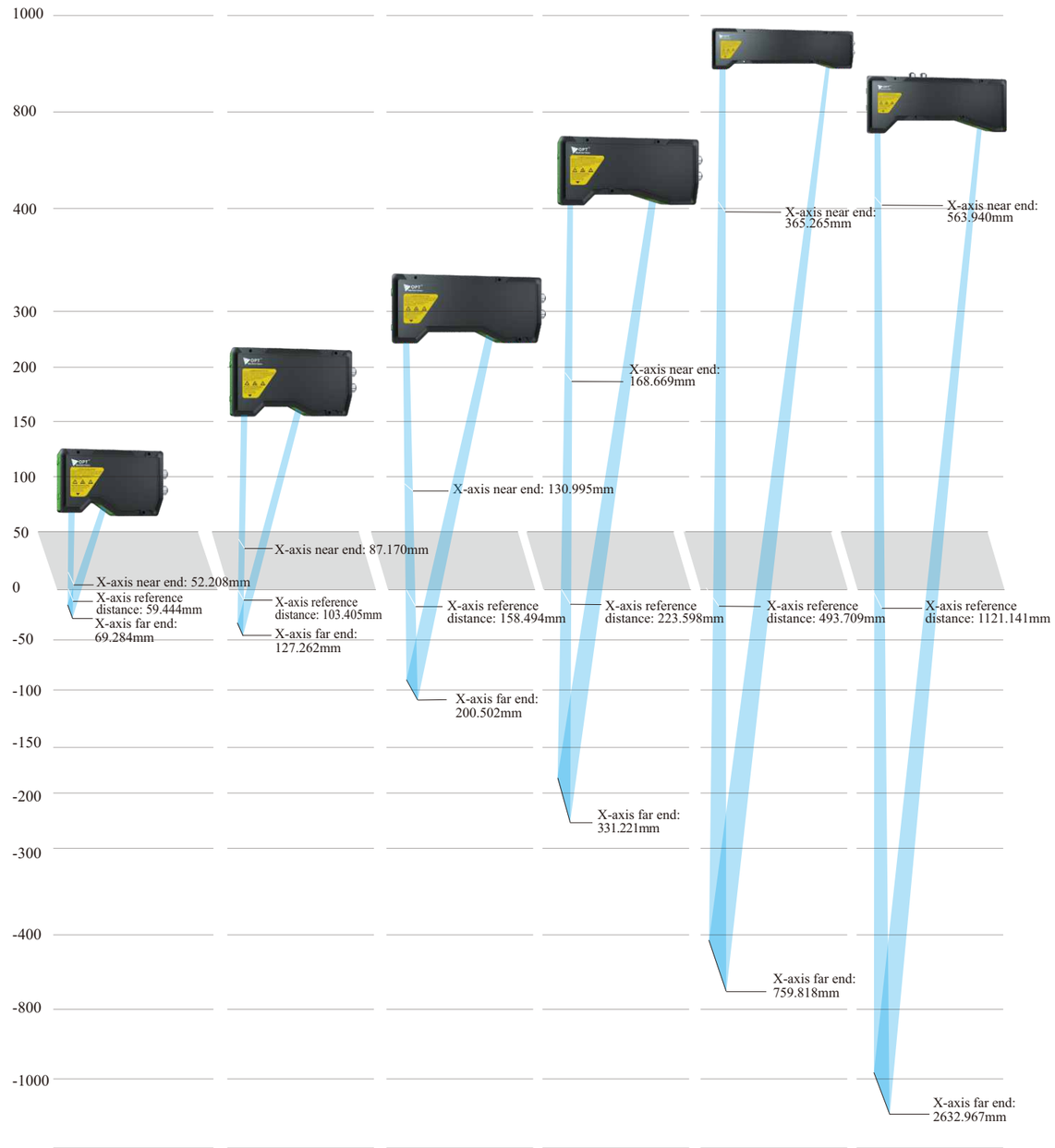
Large aperture light-receiving lens module, effectively increasing the amount of received light.

Field of View Range for F Series

Sensing Head

SRE3D-E2-007	SRE3D-E2-015	SRE3D-E2-025	SRE3D-E2-040	SRE3D-E2-090	SRE3D-E2-100

Z-axis measuring range(mm)



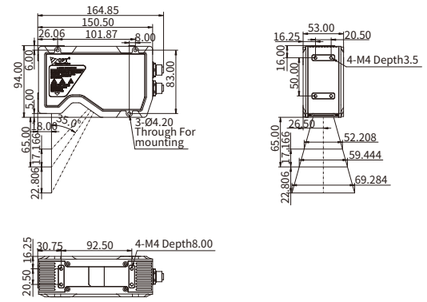
Note: The 3D Camera works independently, without the need for an external controller, making installation and debugging convenient and flexible.

E2 Series Product Models and Parameters

Model			SRE3D-E2-007	SRE3D-E2-015	SRE3D-E2-025	SRE3D-E2-040	SRE3D-E2-090	SRE3D-E2-100
Performance	Reference distance(CD)		65mm	152mm	254mm	406mm	890mm	750mm
	Z axis measuring range(FS)		39.972mm	93.011mm	157.073mm	354.465mm	811.591mm	1996.000mm
	Width of X axis	Near-end	52.208mm	87.170mm	130.995mm	168.669mm	365.265mm	563.940mm
		Reference distance	59.444mm	103.405mm	158.494mm	223.598mm	493.709mm	1121.141mm
		Far-end	69.284mm	127.262mm	200.502mm	331.221mm	759.818mm	2632.967mm
	Z-Axis Repeatability		0.4μm	0.5μm	1μm	5μm	12μm	100μm
	X-Axis Repeatability		3μm	6μm	8μm	18μm	22μm	125μm
	X-Axis Data Interval		16-22μm	27-40μm	41-63μm	53-104μm	114-238μm	176-823μm
	X-Axis Profile Points		3200 points	3200 points	3200 points	3200 points	3200 points	3200 points
	Z-Axis Linearity		±0.03%*FS	±0.03%*FS	±0.03%*FS	±0.03%*FS	±0.03%*FS	±0.05%*FS
	Scan Speed (Frame Rate)		2000~18000 Hz	2000~18000 Hz	2000~18000 Hz	2000~18000 Hz	2000~18000 Hz	2000~18000 Hz
	Laser Wavelength		405 nm	405 nm	405 nm	405 nm	405 nm	405 nm
	Laser Safety Class		Class2	Class2	Class2	Class2	Class2	Class2
Structure	Laser Output Power		6 mW	6 mW	6 mW	6 mW	6 mW	6 mW
	Dimensions (mm)		150.5 × 94 × 53	174.5 × 96 × 53	215.5 × 96 × 53	202.5 × 96 × 53	349.5 × 94 × 53	297.5 × 126.61 × 58
	Weight (kg)		1.041	1.1485	1.2485	1.236	1.730	1.649
	Operating Temperature		0~50°C					
	Storage Temperature		-20~70°C					
	Operating Humidity		35%~85% RH, non-condensing					
	ESD Protection		Contact Discharge 4kV, Air Discharge 8kV, compliant with IEC61000-4-2					
	EFT Protection		Power Port: 2kV/5 or 100kHz, Signal Port: 1kV/5 or 100kHz, compliant with IEC61000-4-4					
	Vibration (Environmental Resistance)		Frequency 12500 Hz, Max Amplitude ±25.5 mm, Max Velocity ±2 m/s, RMS Acceleration 3g, Random Vibration 2 Hours per Axis (X, Y, Z)					
	Enclosure Protection Rating		IP55, compliant with IEC60529					
Electrical Characteristics	System Power Consumption (W)		17.5W (24VDC full power operation at room temperature)					
	Power Supply Requirements		24VDC Power Supply					
	I/O Interface		2 Optocoupler Inputs, 3 Optocoupler Outputs					
Others	Supporting Software		3D Camera Client Software OPT LP Viewer, Algorithm Platform Software Smart3					
	Operating System Requirements		Windows 7/10 32/64-bit, Windows 11 64-bit (Recommended: 8GB RAM, i5 or higher equivalent processor)					
	Secondary Development SDK Support		Linux/Windows					

Dimensional (mm)

SRE3D-E2-007



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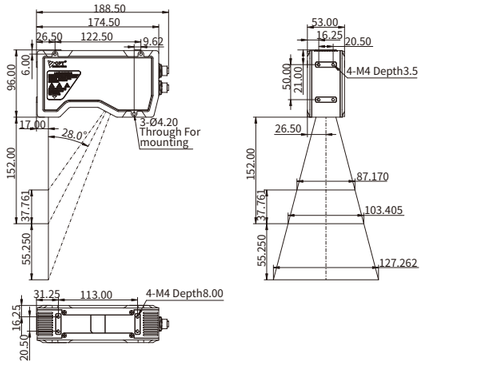

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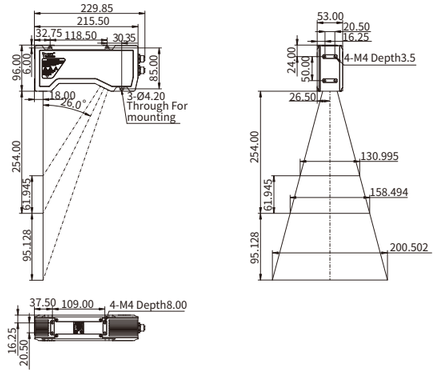

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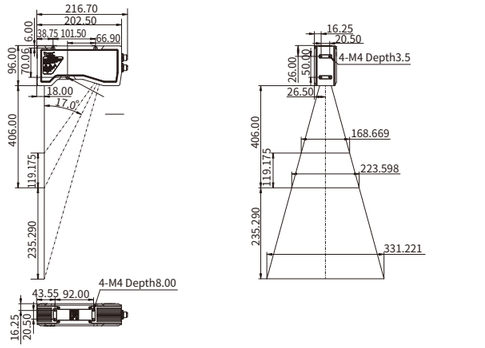
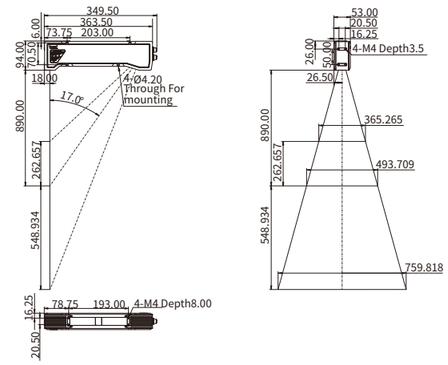
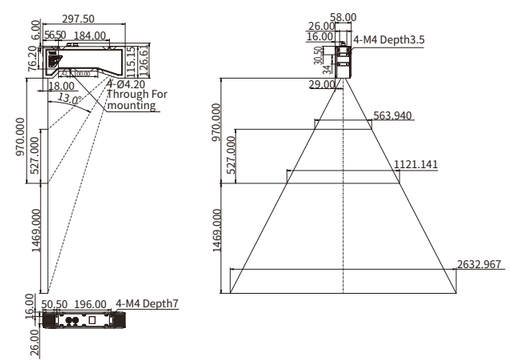


SRE3D-E2-090

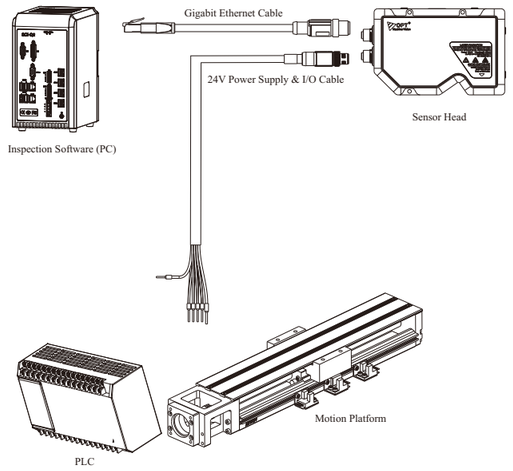


SRE3D-E2-100

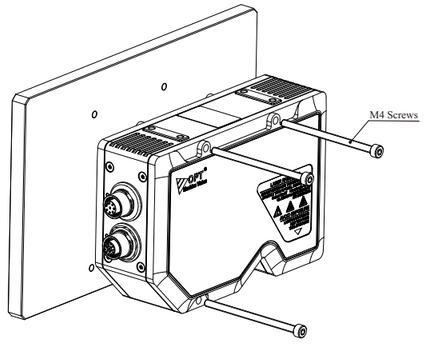


Multi-interface Trigger Mode

Wiring Method



Mounting Method



Note: The recommended length for the M4 through-hole locking nut is the camera's width plus the thread depth of the mounting metal part.(e.g., Camera width 53 mm + Thread depth 10 mm = 63 mm nut length)

Accessory Cables

F2/E2 Series Accessory Cables

Cable Length		F2/E2 Series			
		Ethernet Cable Model		Trigger cable model	
		Straight Ethernet Cable	Right Angle Ethernet Cable	Straight IO Cable	Right Angle IO Cable
3m static		CB-GE-M12A8MRJ45-S3M	CB-GE-M12A8MUARJ45-S3M	CB-M12-A17M010-S3M	CB-M12-A17MLA010-S3M
5m static		CB-GE-M12A8MRJ45-S5M	CB-GE-M12A8MUARJ45-S5M	CB-M12-A17M010-S5M	CB-M12-A17MLA010-S5M
7m static		CB-GE-M12A8MRJ45-S7M	CB-GE-M12A8MUARJ45-S7M	CB-M12-A17M010-S7M	CB-M12-A17MLA010-S7M
10m static		CB-GE-M12A8MRJ45-S10M	CB-GE-M12A8MUARJ45-S10M	CB-M12-A17M010-S10M	CB-M12-A17MLA010-S10M
15m static		CB-GE-M12A8MRJ45-S15M	/	/	/
20m static		CB-GE-M12A8MRJ45-S20M	/	/	/
3m dynamic/drag chain		CB-GE-M12A8MRJ45-T3M	CB-GE-M12A8MUARJ45-T3M	CB-M12-A17M010-T3M	CB-M12-A17MLA010-T3M
5m dynamic/drag chain		CB-GE-M12A8MRJ45-T5M	CB-GE-M12A8MUARJ45-T5M	CB-M12-A17M010-T5M	CB-M12-A17MLA010-T5M
7m dynamic/drag chain		CB-GE-M12A8MRJ45-T7M	CB-GE-M12A8MUARJ45-T7M	CB-M12-A17M010-T7M	CB-M12-A17MLA010-T7M
10m dynamic/drag chain		CB-GE-M12A8MRJ45-T10M	CB-GE-M12A8MUARJ45-T10M	CB-M12-A17M010-T10M	CB-M12-A17MLA010-T10M
15m dynamic/drag chain		CB-GE-M12A8MRJ45-T15M	CB-GE-M12A8MUARJ45-T15M	CB-M12-A17M010-T15M	CB-M12-A17MLA010-T15M
20m dynamic/drag chain		CB-GE-M12A8MRJ45-T20M	CB-GE-M12A8MUARJ45-T20M	CB-M12-A17M010-T20M	CB-M12-A17MLA010-T20M
Interface Diagram	Straight Connector				
	Right Angle Connector				
24V power supply		OPT-PS2-240			
					

Gigabit Ethernet Compatible Capture Card		
Model	OPT-G1G-J4-P-01	OPT-G1G-J4-P-02
Chipset	Intel I210-AT	Intel I210-AT
Bus Interface	4×PCIe 2.0	4×PCIe 2.0
Physical Interface	4×RJ45	4×RJ45
Transfer Speed	10/100/1000 Mbps	10/100/1000 Mbps
Operating System Support	Windows 7/Windows 10/Windows 11, Linux	Windows 7/Windows 10/Windows 11, Linux
Appearance Diagram		

Appearance Inspection

3D inspection of mobile phone casing

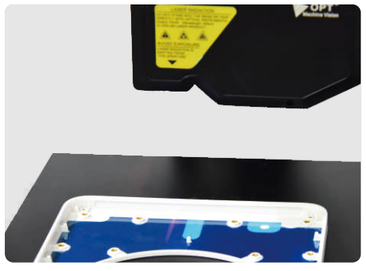
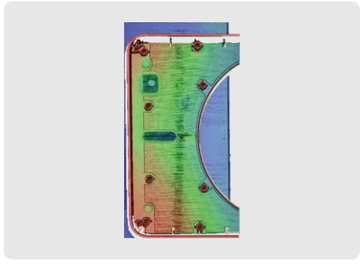
Flatness of mobile phone shell inspection; convex and concave defect detection;LOGO inspection;fingerprint module step detection.
Camera turret height difference & flatness detection; charging port, button compartment and headphone jack step detection.





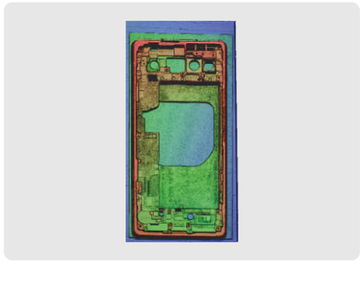
3D inspection of tablet casing

Eliminate noise caused by reflections on the tablet frame, and use visual software to detect the flatness of the tablet frame and the height of screw holes.


Differential detection of mobile phone back covers

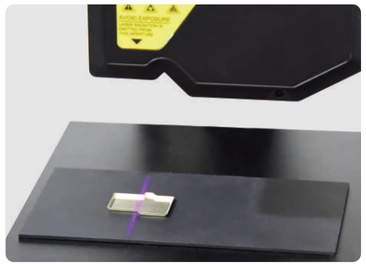
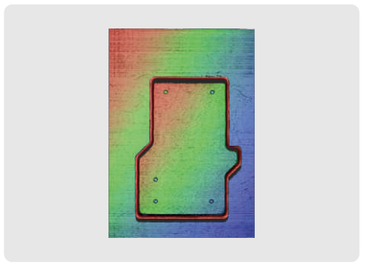
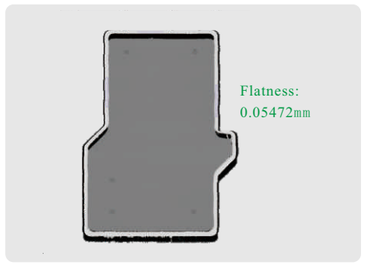
Use high dynamic range detection to remove noise caused by reflections, and detect the height and flatness of the image after image processing.


3C Precision Components Detect

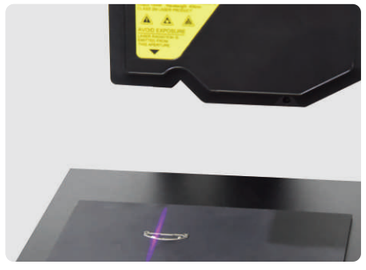
Flatness detection of hardware parts

Use OPT-LPC20 for scanning imaging of workpieces, with a camera X-axis resolution of 5μm.

Height flatness detection of 3C parts

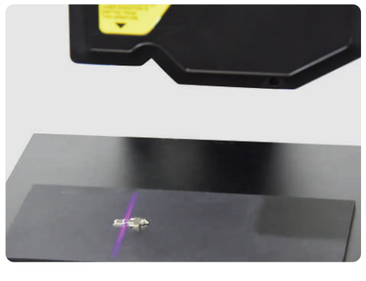
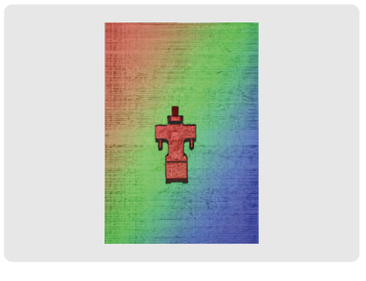
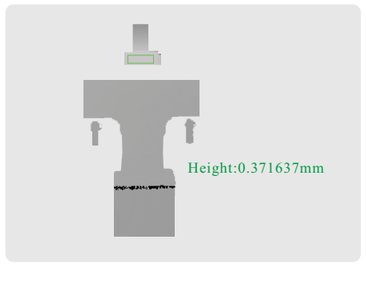
Use OPT-LPF60 for scanning 3C components and measuring component differentials and dimensions.





Metal bracket height detection

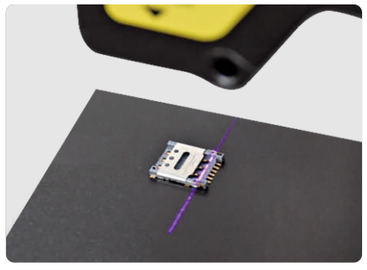
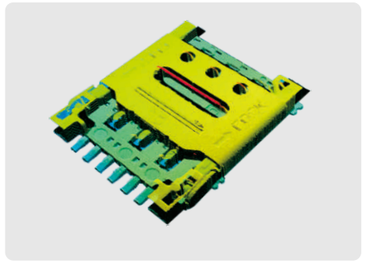
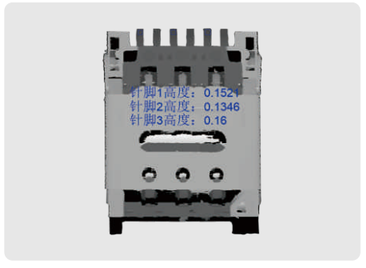
Use OPT-LPF60 laser sensor to measure the height of metal brackets, with a camera X-axis resolution of 6μm.

Inspection of Connector

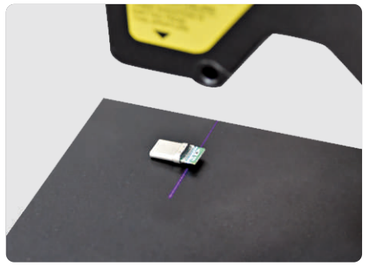
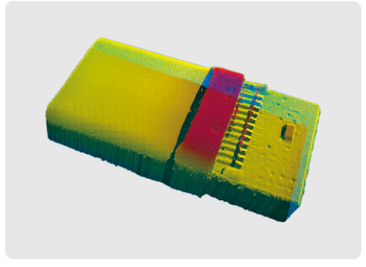
Inspection of connector height.

Find and locate the three pins through the measurement benchmark, and output the data of pins height in real time.

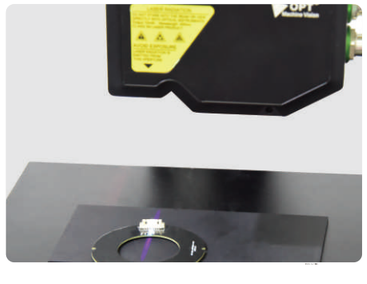
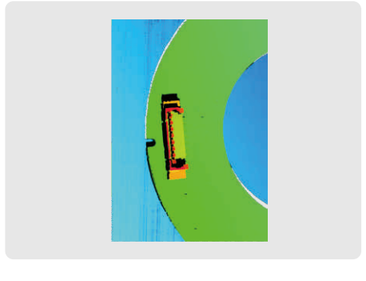
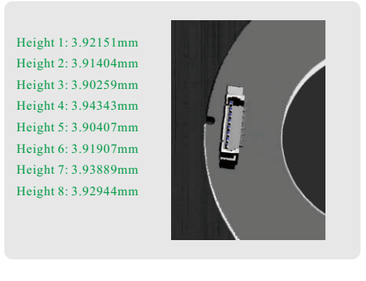
Inspection of connector pin flatness and back cover flatness.

Use OPT-LPC20 for longitudinal scanning imaging of the test object, with an X-axis resolution of up to 5μm, using height measurement data to determine the flatness of pins.


Height detection of circular pin needles

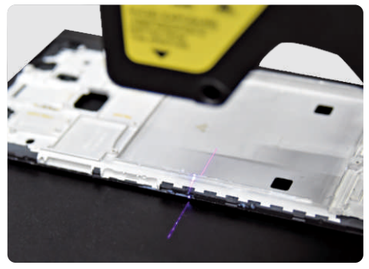
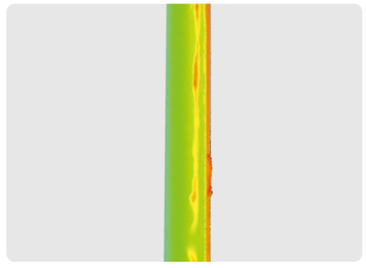
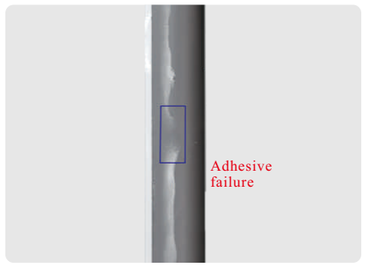
Use LPC60 for scanning imaging of workpieces, with a speed of up to 150mm/s when compressing the measurement range to 4mm.

Glue Dispensing Inspection

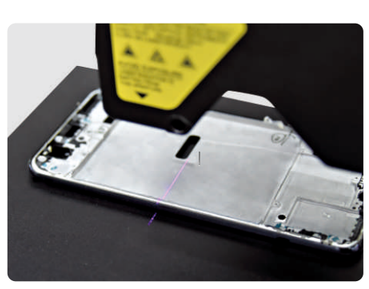
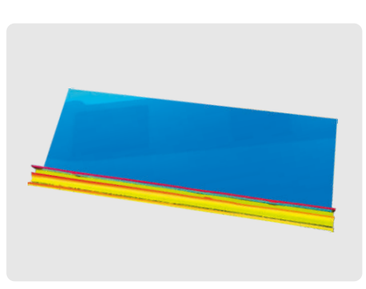
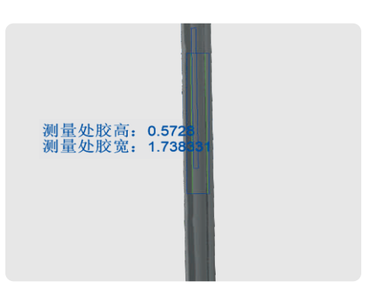
Inspection of path breakage.

The measurement accuracy of the OPT-LPB50 laser sensor can reach up to 10 μm, and the acquisition speed can achieve 150mm/s while the measuring depth is 5mm.

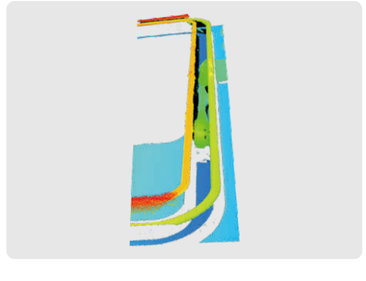
Adhesive width and height detection

Use internal calipers and height measurement tools in visual software to accurately measure adhesive width and height.

Width and height of path Inspection.

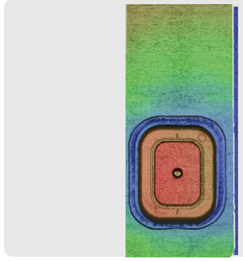
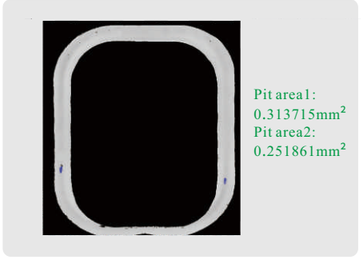
Use high dynamic range mode for scanning and imaging the adhesive path position, suppressing the influence caused by reflection on the adhesive path position, and enhancing the image effect.


Lithium Battery Detection

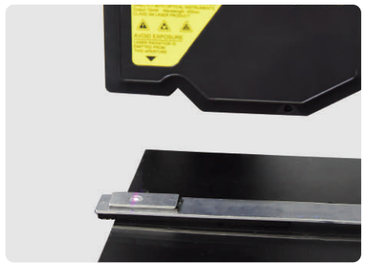
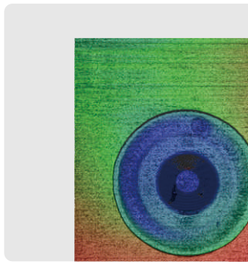
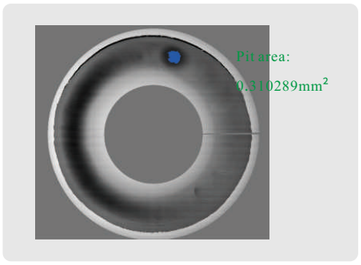
Detection of top cover weld seam defects

Perform binary processing on the image use visual software, use the seal nail algorithm to detect weld seam pit defects, and calculate the area of the pit.

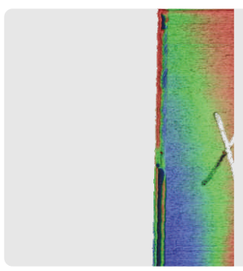
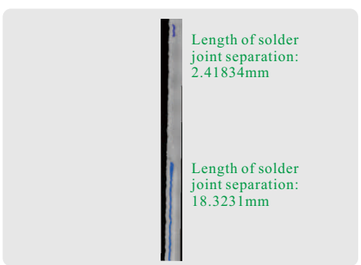
Lithium battery seal nail defect detection

Perform three-dimensional binary processing on the image with visual software, use the built-in welding defect detection algorithm to detect welding pits, protrusions, blowholes, and other defects.

Lithium battery top cover post-weld defect detection

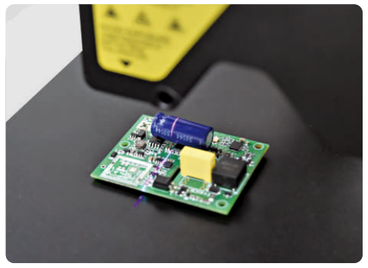
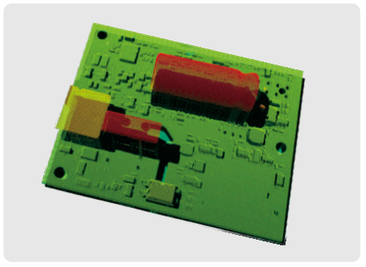
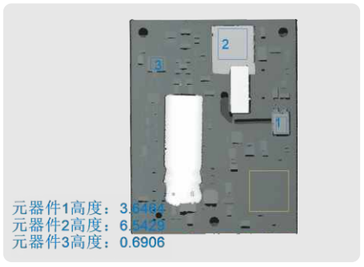
Process the image using a self-developed welding defect detection algorithm to quickly and accurately identify defects such as insufficient welding, welding offset, welding holes, and welding slag on the battery top cover.

Inspection of Circuit Board

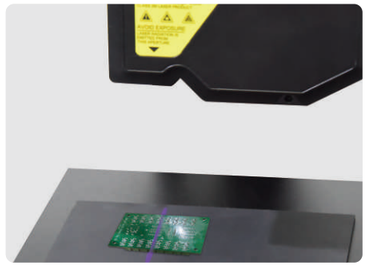
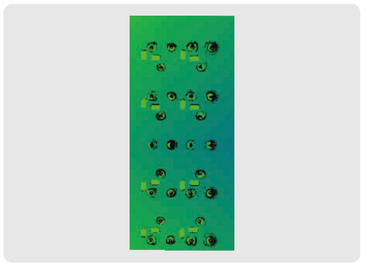
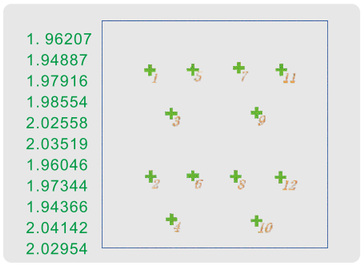
Height inspection of circuit board component.

Use the high dynamic mode imaging to greatly reduce the noise caused by the solder reflection, then use the height measurement tool to find the highest component of the entire circuit board and calculate the maximum height.

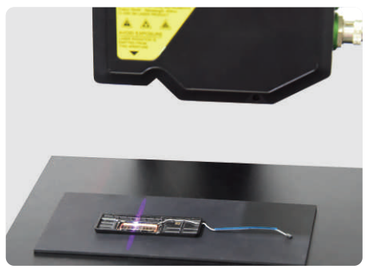
PCB solder pin height detection

Use OPT-LPF to detect PCB solder joints, measure solder defects such as blowholes, insufficient solder, and solder offset.

Height detection of ribbon cables

The OPT-LPF80 is used to take a picture of the workpiece, and the vision software locates the position of the ribbon cable based on the reference point, thereby measuring the height of the ribbon cable.





Measurement Systems

One-Click Measurement Sensor SmartFlash Series »P111

Thrubeam Measurement Sensor SmartAxis Series »P115

One-Click Measurement Sensor SmartFlash Series

High precision of up to 1μm
Highly efficient parallel computing
Programless drawing import



Function introduction

One-Click Measurement Sensor
SmartFlash Series



Optimizes measurement process, enhance test efficiency, and establish new industry measurement standards.

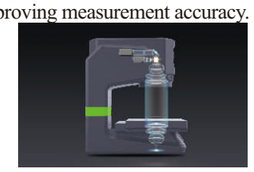
- Programless; intelligent programming can be achieved by importing CAD drawings of products to facilitate operation.
- A large field of view along with image mosaic technology allows for rapid measurement of large-sized products, with a measurement range of 315x190mm.
- The one-key measurement sensor software is compatible with a high-stability, high-precision optical image system for full-size measurement of products.
- High-efficiency, high-precision measurement and contour analysis.
- Special-purpose measurement modes for threads, gears and rubber rings.

Hardware

Combination of two telecentric lenses

▷ Automatically adjust light source to optimal position with a combination of double telecentric lenses + automatic lifting and lowering downlighting.

▷ Double telecentric lenses feature extended depth of field and almost zero distortion, avoiding object and image perspective distortion, lighting attenuation, and improving measurement accuracy.



Four-channel multi-angle + low-angle directional lighting source combination

▷ Combination of Four-channe multi-angle + low angle directional lighting source, through illumination of a more intuitive response to the surface characteristics of the product, significantly Improving product detection effect.

▷ To ensure proper functioning and optimal performance, a light source is required as it directly determines the accuracy and stability of the sensor.

Applicable to measurement of products within a certain range of height

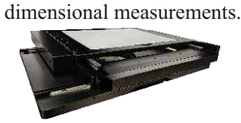
The combination of elevating and falling light illumination automatically adjusts the height, brightness and angle of the light source this provides a more accurate reflection of surface characteristics, delivering high-contrast, and consistently uniform images to ensure measurement accuracy and repeatability.



High-precision motion platform

▷ Each motion axis is equipped with a 0.1 μm high-precision linear encoder, enabling fully closed-loop control. This ensures high positioning accuracy while delivering faster operating speeds.

▷ The linear motor offers stable operation, with measurement accuracy unaffected by platform reciprocation or screw drive mechanisms. It eliminates cumulative errors and backlash, delivering high repeatability — ideal for image stitching and high-precision dimensional measurements.



Hardware



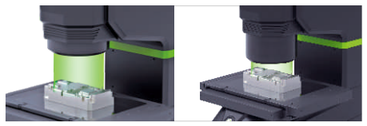
When kept far away from a workpiece, the light source provides large-scale and uniform illumination. It can be lifted for higher contrast.



Low-angle directional illumination radiates from the side. When detecting the peripheral contour, changes in surface height alter the camera's light path, resulting in prominent variations in the image.

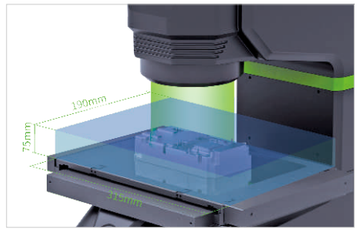
Adjustable ring light source for optimal lighting and high-precision edge measurement

The multi-angle ring light source featuring multiple adjustable lighting units allows for the capture of clear contour images



Range of measurement 315*190 mm

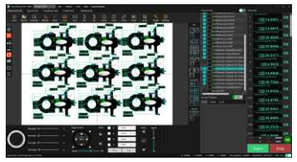
High-speed and high-precision mobile platform is used and together with software image stitching, can realize measurement of 315*190 view field rapidly.



Software

Concise and straightforward software interface, easy measurement operations

The software interface is intuitive and powerful, making it easy to learn. Anyone can easily set up and perform measurements. After measurement, results are instantly evaluated with statistical analysis charts and inspection reports automatically generated.



Measurement Software Features

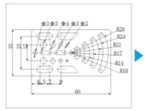
- ▷ Measurement of basic geometric features such as points, lines, circles, arcs, curves, point clouds, C angles, R angles, etc.
- ▷ Measurement of gears, springs, threads, gaps, needle rows, line finding, circle finding, auto sizing, character recognition, meter weights, and other special tools.
- ▷ Advanced functions such as autofocus, offline programming, image stitching, contour extraction, and contour comparison.
- ▷ Provide multiple feature extraction and construction methods, shape tolerance and position tolerance dimensional output.
- ▷ SPC analysis, customized output reports and other extended functions, data upload.

One-Click measurement can be utilized wherever the product is located

Quickly measure any workpieces within the field of view due to automatic template matching, without needing fixture.

CAD drawing import and automatic programming

Supports CAD drawing import and achieve automatic offline programming in a rapid manner.



Import of CAD drawing file



Program conversion



Measurement and report output

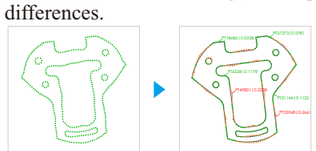
Efficient parallel measurement

Fast parallel measurement: measurement and output of 1600 parts within 7s.



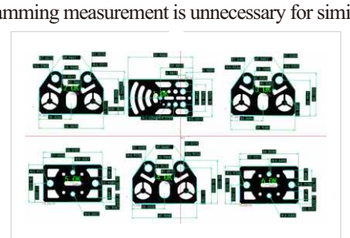
Contour comparison

Extract the product image contour and compare it with standard contour on CAD drawing, then rapidly calculate contour differences.



Simultaneous measurement of different types of products

Software positioning recognition; measures over 100 products and more than 300 parts at the same time. Individual programming measurement is unnecessary for similar products.



Software

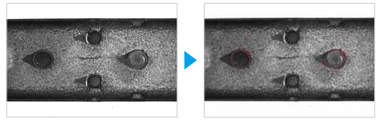
Automatic recognition of edge burrs

Recognizes burr or defect at the point of detection automatically and avoids it to assure stability and high precision of results of measurement.



Special edge processing

Automatically filter out spots, black shadows bright white edges, and other interferences, enabling effective and automatic measurement of edges with large spots or fuzzy edges.



Different segment parts within the measurement range for the depth of field, will have no influence on size

When used with a telecentric lens, camera imaging does not increase measurement errors. Even when surface segments differ at the detection point, it helps mitigate the influence of surface irregularities on measurement accuracy.



Imaging of general-purpose lens



Imaging of OPT double telecentric lens

Small imaging distortion within the field of view

The matched lens has minimal distortion, with very low edge distortion in product imaging. The influence of position on measurement results is negligible.



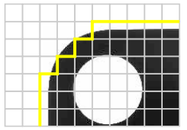
Imaging of general-purpose lens



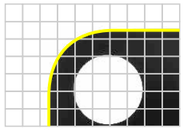
Imaging of OPT double telecentric lens

Sub-pixel computing for extraction of edge features

Sub-pixel computing is done for extraction of edge features, dividing one pixel into data less than 0.01 pixel for computing, to achieve high-precision measurement.



Sub-pixel not used for computing



Sub-pixel used for computing

Non-professional detection personnel can operate

The operation is simple and convenient, allowing even non-professional personnel to quickly learn how to use it. This minimizes variations between operators, improves equipment activation efficiency, and reduces the workload of the quality department.

Reduce time of product detection

Improve production capacity and lower manufacturing cost by reducing time of product detection.

Special measurement modules

Software has special modules measuring the threads, gears, rubber rings, etc, facilitating operation.

Software

- Measurement results are automatically saved to a designated location and support multiple report formats including PDF, XLSX, and TXT.
- Measurement results, SPC analysis reports, and more can be automatically generated with one click, and uploaded in real time via integration with the MEAS system.
- Supports mainstream industry PCL communication protocols, enabling seamless integration and efficient communication between devices with ease.

Automatic Saving of Measurement Result Reports

▷ Applicable to a wide range of industries including machinery, electronics, molds, injection molding, hardware, rubber, low-voltage electrical equipment, magnetic materials, precision hardware, precision stamping, connectors, terminals, mobile phones, home appliances, printed circuit boards (PCBs), automotive, medical devices, watches, and instrumentation.



Watches and Clocks



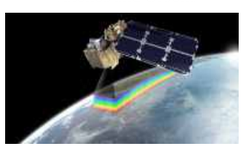
Printed Circuit Boards (PCB)



Aerospace



Precision Plastic Parts



Satellite Communication



Gears



Cutting Tools



Rubber O-Rings

List of Parameters

Model		YCSF10-10	YCSF20-20	YCSF30-20
Imaging Sensor		20-Megapixel CMOS Sensor	20-Megapixel CMOS Sensor	20-Megapixel CMOS Sensor
Receiving Lens		Dual Telecentric Lens (2× Magnification)	Dual Telecentric Lens (2× Magnification)	Dual Telecentric Lens (2× Magnification)
Lens Field of View	Wide Field of View	82x55mm	82x55mm	82x55mm
	High Precision	30x20mm	30x20mm	30x20mm
Illumination System	Transmitted Light	Telecentric Collimated Light Source (Green)	Telecentric Collimated Light Source (Green)	Telecentric Collimated Light Source (Green)
	Reflected Light	Four-Channel Multi-Angle Diffused Illumination (Optional Green)	Four-Channel Multi-Angle Diffused Illumination (Optional Green)	Four-Channel Multi-Angle Diffused Illumination (Optional Green)
	Reflected Light	Low-Angle Directional Illumination (Optional Green)	Low-Angle Directional Illumination (Optional Green)	Low-Angle Directional Illumination (Optional Green)
	Reflected Light	Coaxial Illumination (Optional)	Coaxial Illumination (Optional)	Coaxial Illumination (Optional)
XY-Axis Travel Range		-	135*135mm	235*135mm
Z1/Z2-Axis Travel Range		72mm	72mm	72mm
Measure-ment Range	Wide Field of View	-	215x190mm	315x190mm
	High Precision	-	165x165mm	265x155mm
Model		SmartFlash-1010	SmartFlash-2020	SmartFlash-3020
Repeata-bility	Without Stage Movement	Wide Field of View Mode：±1μm		
		High-Precision Mode：±0.5μm		
	With Stage Movement	-	Wide Field of View Mode：±2μm	Wide Field of View Mode：±2μm
		-	High-Precision Mode：±1.5μm	High-Precision Mode：±1.5μm
Measure-ment Accuracy ±2σ	Without Stitching*1	Wide Field of View Mode：±3μm		
		High-Precision Mode：±2μm		
	With Stitching*2	-	Wide Field of View Mode：±(5+0.02L)μm	Wide Field of View Mode：±(5+0.02L)μm
		-	High-Precision Mode：±(3+0.02L)μm	High-Precision Mode：±(3+0.02L)μm
Height Measure-ment*3 (Optional)	XY Measure-ment Range	-	-	110x155mm
	Repeatability	-	-	±2μm
	Measurement Accuracy	-	-	±(6+L/100)μm

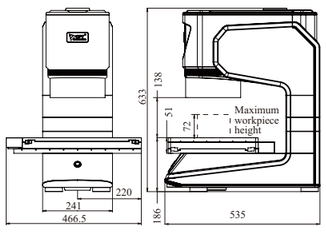
*1 At focal position, under ambient temperature of 20 ± 1 °C.

*2 At focal position, under ambient temperature of 20 ± 1 °C; when stage load is below 1 kg, L refers to the travel distance of the stage (in mm).

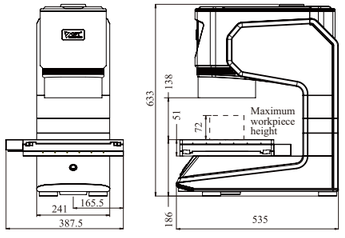
*3 Requires optional chromatic confocal sensor.

Dimensions (mm)

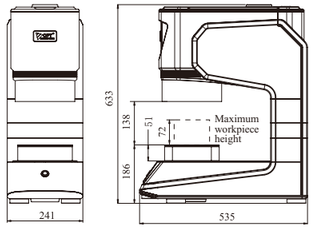
YCSF30-20



YCSF20-20



YCSF10-10



Thrubeam Measurement Sensor SmartAxis Series

Online Intelligent Measurement
Ultra-Large Depth of Field
Simple and Efficient



Function introduction

Thrubeam Measurement Sensor SmartAxis Series
OPT-SmartAxis-11
OPT-SmartAxis-36
OPT-SmartAxis-58
OPT-SmartAxis-100



Online intelligent measurement high detection efficiency new standard for industrial measurement

- SmartAxis series through-beam measurement sensor is equipped with dual telecentric high-resolution optical lenses, high-brightness LEDs, and a telecentric optical system that constitutes the light source, improving alignment and angular uniformity; the high-precision image analysis, subpixel edge extraction , and burr filtering algorithm automatically remove edge burrs, black shadows, and white bright edges, improving the measurement accuracy. Multiple lighting systems can be applied to meet user requirements for fast and accurate measurement of complex workpieces.
- With the self-developed telecentric optical system free of focus blurring, workpieces can be measured accurately even if there is position deviation. The telecentricity and uniformity of lenses are improved to enhance measurement reproducibility.
- Due to ultra-fast exposure, the workpieces conveyed at high speeds can be measured without interruption.
- Supports industry-leading PCL communication protocols, enabling users to easily achieve seamless integration and efficient communication with their equipment.

Hardware

Subminiature sensor

The ultra-small size design allows for better adaptation to various compact automation equipment and enables compact installation.

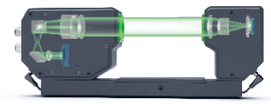


Partial schematic diagram of image detection system using ordinary telecentric lens

Significant decrease in installation dimensions of SmartAxis series through-beam sensor

Telecentric optical path with large depth of field and ultra-low distortion

Unique parallel light path, clear imaging within 30mm depth of field. A clear outline can still be captured despite product movement, greatly improving the detection accuracy and stability.



Optical Axis Alignment Function

▷ Equipped with an optical axis alignment function for engineers to quickly make optical axis adjustments.
▷ By removing the emitter and receiver probe bases, the optical axis alignment calibration can be performed, allowing for simple and accurate adjustment of the optical axis, leading to high-precision measurements.



Adjustable installation distance

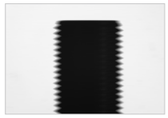
The emitter end is flexible and can adjust installation distance depending on varying on-site requirements. Due to the high telecentricity of the sensor, changes in the installation distance have minimal impact on accuracy.



Hardware

High-precision measurements can also be achieved for rapidly moving products.

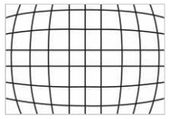
Utilizing the sensor trigger measurement function, the high-brightness LED emitter works with the optical system to synchronize data collection, enhancing the light reception of the CMOS and instantaneously exposing all pixels. With an ultra-fast exposure time of 15 μs, high-speed moving products can be accurately measured without the need for deceleration.

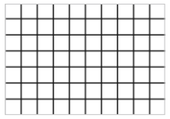

Have ghosting


No ghosting

Low distortion, no image deformation

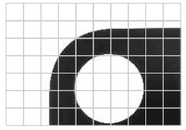
Use the low-distortion telecentric lens,to avoid resolution losses resulting from image distortion and edge blurring while reducing the workload of subsequent image processing.

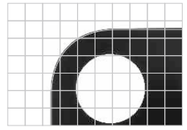

Imaging of general-purpose lens


Imaging of OPT double telecentric lens

Subpixel processing

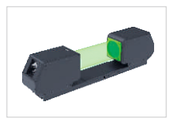
In the subpixel edge extraction algorithm, each pixel is divided into 100 subpixels for calculation. The least squares method is the used for fitting to extract edge features.


Without subpixel processing


With subpixel processing

Measurement precision

The combination of telecentric imaging and intelligent image analysis algorithm ensures the measurement accuracy within the entire field of view.





Filtering of foreign matters and burrs

Foreign matters or defects in the measurement position can be removed for stable dimensional measurement, greatly enhancing the accuracy of measurement.



IP64 protection class, high durability

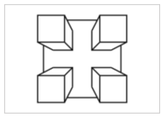
The sensor has an IP64 protection level, which prevents the ingress of splashing water and the entry of particles, enhancing the safety of the sensor.
Equipped with a highly flexible cable, for high space utilization; it can be used in scenarios where there is a moving measuring head.

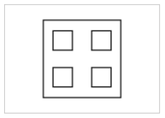

IP64 waterproof and dustproof design


High Toughness Cable

Accurate measurement even in case of deviation

The lens features high telecentricity, minimizing the effect of object height variations on measurement accuracy.


Imaging of general-purpose lens


Imaging of OPT double telecentric lens

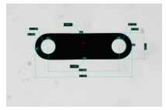
Measurement in various industries

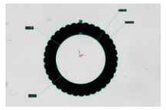
Supports multiple measurement modes such as offline and online measurement, applicable to multiple fields and industries.

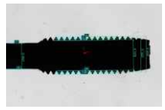

Gasket products


Copper Pillar Products


Cutting tool products








Terminal Products

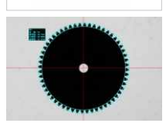

Stamping Products


Watch middle frame

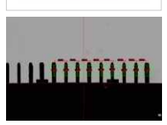







Gear wheel


3C products


PIN Needle

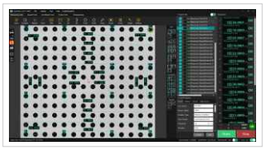
Software

Measurement software

- ▷ Simple interface, powerful function, and easy operation make it user-friendly and facilitate quick learning.
- ▷ By utilizing innovative distortion correction technology, we have achieved stable and precise measurement results. Additionally, algorithms such as sub-pixel extraction and burr filtering have significantly enhanced measurement accuracy.
- ▷ Quick creation of programming templates by importing CAD drawings no special programming required --enabling true one-click measurement.
- ▷ Multiple matching modes for accurate positioning and measurement of complex workpieces.
- ▷ Global comparison between measured workpieces and CAD drawings to quickly identify contour differences.
- ▷ Marking tools for direct measurement of points, lines, circles, arcs, distances, angles, location degrees, wall thickness, output of measurement results, and other features.
- ▷ Creation tools for fitting to generate auxiliary features such as intersections, perpendicular lines, tangent lines, tangent circles, and combined edges, simplifying complex measurements; auxiliary element can be used for direct drawing to facilitate operation and speed up programming.
- ▷ Supports multiple coordinate systems for workpieces, as well as coordinate translation and call.

The software promotes user-friendly operation, enabling high-speed and accurate online measurements.

- ▷ The software interface is designed to be concise and user-friendly, yet powerful in functionality, allowing anyone to easily set up and perform measurements.
- ▷ Adopting innovative distortion calibration technology ensures stable and accurate measurement results, while algorithms such as subpixel extraction and burr filtering significantly enhance measurement precision.



Measuring tools can be easily set up

Through various combinations and applications of measurement tools, simple dimensional measurements can be achieved and various measurement tasks such as geometric tolerance measurement, standard profile comparison of products, and distance measurement can be achieved.



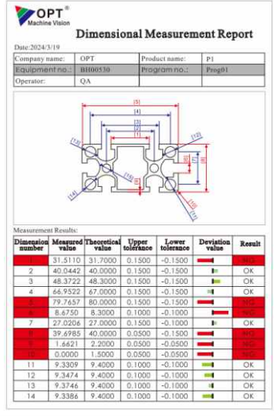
Statistical analysis

- ▷A variety of extraction and analysis tools, including statistical values, trend charts, and histograms.
- ▷Trend charts are used to monitor abnormalities of generation equipment and production process by analyzing the trend of changes in measured values.
- ▷Histograms reflect the real-time fluctuation status and distribution of product quality.

Diverse data storage formats

- ▷ Reports on measurement results can be exported in Excel, Word, TXT, and PDF formats. Support the setting of report formats.

PDF report

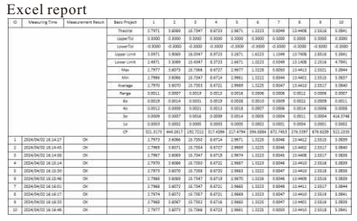

OPT Machine Vision
Dimensional Measurement Report
Date:2024/3/19

Company name:	OPT	Product name:	P1
Equipment no.:	BH00530	Program no.:	Prog01
Operator:	QA		

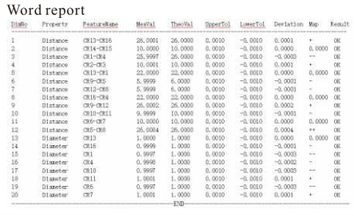
Measurement Results:

Dimension number	Measured value	Theoretical value	Upper tolerance	Lower tolerance	Deviation value	Result
1	31.5110	31.7000	0.1500	-0.1500		NG
2	40.0442	40.0000	0.1500	-0.1500		OK
3	48.3722	48.3000	0.1500	-0.1500		OK
4	66.9522	67.0000	0.1500	-0.1500		OK
5	79.7457	80.0000	0.1500	-0.1500		NG
6	8.6750	8.3000	0.1000	-0.1000		NG
7	27.0206	27.0000	0.1500	-0.1000		OK
8	39.6985	40.0000	0.0500	-0.1500		NG
9	1.6421	2.2000	0.0500	-0.0500		NG
10	0.0000	1.5000	0.0500	-0.0500		NG
11	9.3309	9.4000	0.1000	-0.1000		OK
12	9.3474	9.4000	0.1000	-0.1000		OK
13	9.3746	9.4000	0.1000	-0.1000		OK
14	9.3386	9.4000	0.1000	-0.1000		OK

Excel report



Word report



Lineup of sensor measuring heads

Four sensors can be selected according to the situation

Ultra-high precision model
YCSA11

measurement range	8.5×7 mm
repeated precision	±.2 μm
measurement precision	±1 μm



High-precision model
YCSA36

measurement range	28×23 mm
repeated precision	±0.3 μm
measurement precision	±1.5 μm



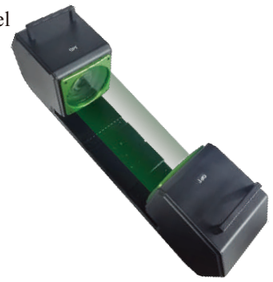
Standard model
YCSA58

measurement range	65×51 mm
repeated precision	±0.4 μm
measurement precision	±2 μm



Large field-of-view model
YCSA100

measurement range	88×64 mm
repeated precision	±0.5 μm
measurement precision	±3 μm



Applications

▷ Applicable to precision hardware, electronic components, precision injection-molded parts, home appliances, circuit boards, PCBs, automotive, medical devices, watches, and instrumentation;
Key inspection advantages include dimensional measurement of shaft parts, threads, springs, cutting tools, and more.


Springs


Pin Headers


Stud Screws


Batteries


Machined Parts


Cutting Tools


Semiconductors


Stamped Parts

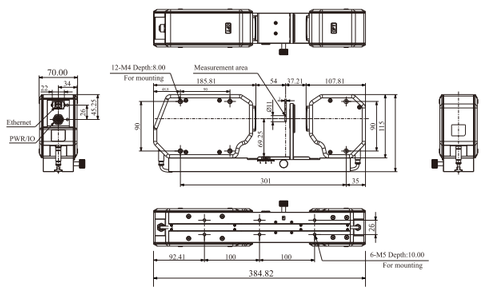
List of Parameters

Product Name		Thrubeam Measurement Sensor SmartAxis Series			
Specification and Model		YCSA11	YCSA36	YCSA58	YCSA100
Illuminating System		Telecentric parallel light source (green)			
Measurement range Field of view	Maximum measurement area	8.5×7 mm	28×23 mm	42.5×42.5 mm	80×76 mm
	High-precision measurement area	5×4 mm	18×15 mm	28×28 mm	50×48 mm
Measurement range Depth of field	Maximum measurement area	3 mm	12 mm	15 mm	30 mm
	High-precision measurement area	1.5 mm	6 mm	8 mm	15 mm
Repeated precision*1		±0.3 μm	±0.5 μm	±0.9 μm	±1.5 μm
Measurement precision*2	Maximum measurement area	±1 μm	±1.5 μm	±2 μm	±3 μm
	High-precision measurement area	±0.6 μm	±1 μm	±1.5 μm	±2 μm
Operating Environment	Temperature range	0~40℃	0~40℃	0~40℃	0~40℃
	Humidity range	20%~80%RH	20%~80%RH	20%~80%RH	20%~80%RH
Product Name		Thrubeam Measurement Sensor SmartAxis Series			
Specification and Model		SmartAxis-11	SmartAxis-36	SmartAxis-58	SmartAxis-100
Enclosure protection level *3		IP64	IP64	IP64	IP64
Transmitter Spacing Receiver Spacing		102 mm	181 mm	184 mm	240 mm
Weight	Transmitter	Approximately 960g	Approximately 1580g	Approximately 2520g	Approximately 4825g
	Receiver	Approximately 675g	Approximately 1820g	Approximately 2260g	Approximately 4480g
	Base	Approximately 515g	Approximately 1280g	Approximately 1980g	Approximately 3300g

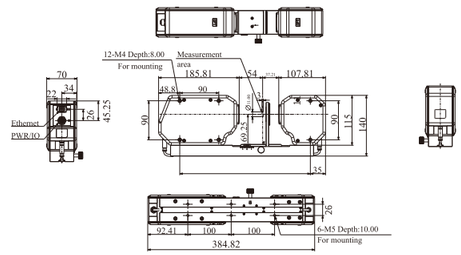
Note: 1. Value of ±2 σ after 16 repeated measurements of the distance between standard parts (dot calibration plate) at the center of the measurement area.
2. Error of the measured distance between standard parts (dot calibration plate) at the focus and ambient temperature of 20±2°C.
3. Excluding cables and peripherals.

Schematic Diagram of Product Size

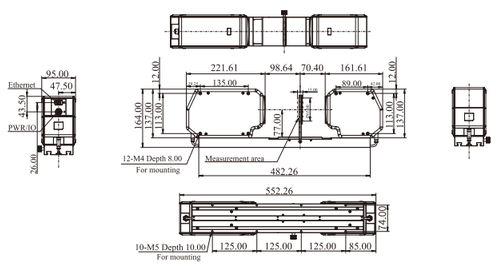
YCSA11



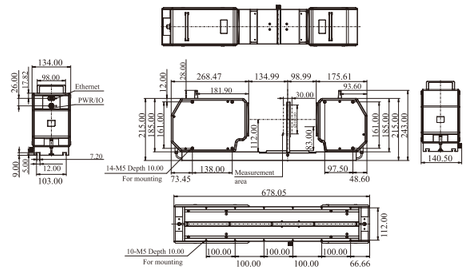
YCSA36



YCSA58



YCSA100



OPT Industrial Cameras

- Overview of Industrial Cameras »P121
- Industrial Camera Selection Guide »P127
- CC1 Series GigE Industrial Area Scan Camera »P128
- CC1 Series USB3.0 Industrial Area Scan Camera »P130
- CH1 Series Industrial Area Scan Cameras »P132
- CL1 Series Industrial Line Scan Cameras »P137
- CM1 Series Multispectral Area Scan Camera »P140
- Camera Accessories Selection »P141

Industrial Camera Overview

Industrial cameras are mainly used for image acquisition. Early models were analog and required frame grabbers to convert signals for computer processing. With the rise of digital interfaces like IEEE 1394, GigE, USB, Camera Link, and CoaXPress, digital cameras have largely replaced analog ones. These cameras follow standard protocols and convert signals directly, making them the mainstream choice in machine vision systems.

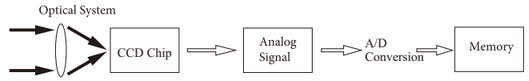
Structure and Working Principle of a CCD Camera

CCD Sensor:

A Charge-Coupled Device (CCD) is a semiconductor image sensor that detects light and converts it into electrical signals. It offers high sensitivity, compact size, and long service life. In CCDs, light-exposed pixels generate charges that are shifted through vertical and horizontal registers—like a “bucket brigade”—to a central analog-to-digital converter, driven by electric fields from on-chip electrodes.

Working Principle of a CCD Camera:

Light is focused onto the CCD chip through a lens. Photodiodes generate electrical charges in response, which are managed by the control chip and transferred through output circuits. Charges from each pixel row are shifted down, amplified, and sent out consistently. The signal processing circuit performs functions like sampling, gain control, and converts the signal into a usable video format.



Working Principle of CCD Camera

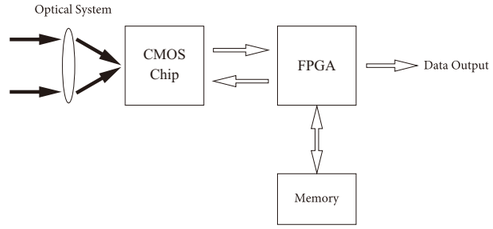
Structure and Working Principle of CMOS Camera

CMOS Sensor

CMOS (Complementary Metal-Oxide-Semiconductor) technology integrates the image sensor array, control circuits, signal processing, and A/D converters onto a single chip, improving integration and design flexibility. Each pixel has its own capacitor that charges when exposed to light, generating a voltage proportional to light intensity and exposure time. Unlike CCDs, CMOS sensors use per-pixel circuitry to convert charge directly into voltage, eliminating the need for charge shifting. This allows for faster, more efficient image capture. Its readout speed is significantly higher than that of CCD sensors, and it is far less prone to overexposure artifacts such as blooming and smearing—often avoiding them entirely.

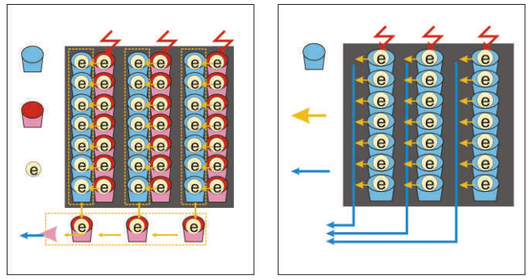
Working Principle of CMOS Camera

The photoelectric conversion process in CMOS cameras is similar to that of CCD cameras—both use photodiodes to convert light into electrical signals. The main difference lies in how image data is transmitted. In a CMOS sensor, each pixel contains its own amplifier and analog-to-digital converter, allowing it to output digital signals directly. Most CMOS cameras also integrate a DSP module to perform image preprocessing tasks such as filtering and correction.



Working Principle of CMOS Camera

CCD vs. CMOS Image Data Transmission Process:



CCD Camera　　CMOS Camera

Camera Classification

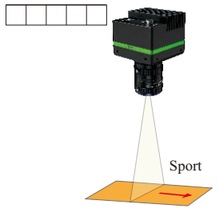
By Chip Architecture

CMOS sensors are typically available in two types: Front-Side Illuminated (FSI) and Back-Side Illuminated (BSI).

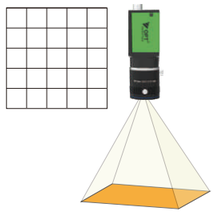
Type		Key Differences
CMOS	Front Side Illuminated	• CMOS sensors are built on metal-oxide semiconductor materials • CMOS sensors offer low manufacturing costs and power consumption • CMOS sensors use rolling or global shutters—rolling works for static scenes, while global handles motion without distortion.
	Back Side Illuminated	• Offers better light-gathering capability; • delivers ~1.7× higher resolution at the same optical size, with a reduced package size—about 91% of traditional products.
CCD		• CCDs sensors are built on single-crystal semiconductor materials • Offers high image sharpness and clarity • CCDs typically use frame or global shutter exposure, suitable for both static and moving objects.

By Sensor Type (Pixel Arrangement)

Type	Key Differences
Line Scan Camera	● Linear sensor layout ● Requires relative motion to capture images ● Offers high line rates and horizontal resolution, with typical widths of 2K, 4K, 8K, or 16K.
Area Scan Camera	● Area scan sensors feature a two-dimensional pixel array and can capture images of both stationary and moving objects. ● Provides real-time 2D image data for direct measurement ● Common resolutions include 0.3 MP, 2 MP, 5 MP, 10 MP, 12 MP, 25 MP, 31 MP, 50 MP, 65 MP, and 150 MP.



Pixel Arrangement and Imaging of Line Scan Cameras



Pixel Arrangement and Imaging of Area Scan Cameras

Based on Image Format

Type	Key Differences
Black and white Camera	Grayscale image
Color Camera	Color image

Monochrome cameras convert light intensity into grayscale values to produce grayscale images. Color cameras use a red, green, and blue mosaic filter—commonly a Bayer filter—to process signals and output digital color images. Compared to monochrome cameras, they provide more image information.

Color depth determines how many colors each pixel can represent. With N bits per red, green, and blue channel, the total color depth is 3N, defining the range of colors the device can distinguish.

Type	Key Differences
Analog Camera	● Analog cameras typically have low resolution (around 0.4 MP), slower speeds (30 fps), and low cost ● Most use interlaced scanning, which is prone to noise and image degradation ● They output analog signals, requiring external A/D conversion. ● Mainly used in surveillance, their market presence is declining
Digital Camera	● Digital cameras offer resolutions from 0.3 MP to 150 MP ● Fast acquisition speeds and high image quality ● Supports rolling and global shutter modes and output digital signals with internal A/D conversion, gradually replacing analog models

Other Classification Methods

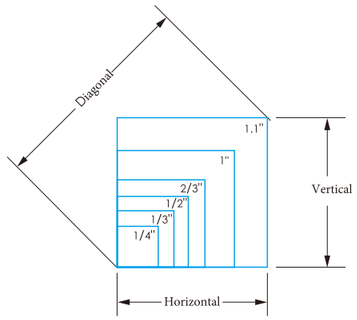
By Resolution	Divided into standard-resolution and high-resolution cameras
By Output Signal Speed	Can be divided into standard-speed and high-speed cameras
By Spectral Response	Divided into visible, infrared, and ultraviolet cameras

Main Parameters and Application Description of Area Scan Cameras

Sensor Size

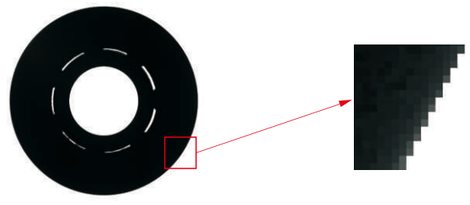
Sensor size refers to the target surface. Area scan cameras are measured by diagonal length; line scan cameras by horizontal length. Common sizes include 1" (approx. 16 mm diagonal), with slight variations.

Chip	Horizontal(mm)	Vertical(mm)	Diagonal(mm)
1.1"	14.13	10.35	17.6
1"	12.7	9.6	16.0
2/3"	8.8	6.6	11.0
1/2"	6.4	4.8	8.0
1/2.3"	6.4	4.6	7.9
1/2.5"	5.7	4.3	7.1
1/3"	4.8	3.6	6.0
1/4"	3.6	2.4	4.0



Pixel

The smallest unit of an image, each with a corresponding grayscale value when magnified.



Pixel Cell

The smallest light-sensitive unit on a camera sensor, each corresponding to one image pixel.

Pixel Size

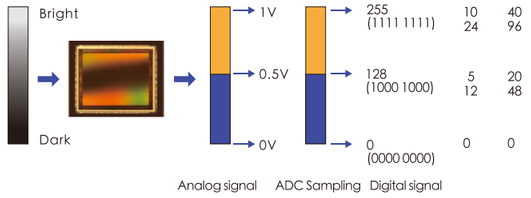
Refers to the physical size of each pixel cell on the sensor Common sizes for area sensors include 2.4 µm, 3.2 µm, 3.45 µm, 4.5 µm, 4.8 µm, 5.5 µm, and 6.9 µm; for line sensors: 3.5 µm, 5 µm, 7 µm, and 14 µm. Given the same sensor size, lighting, and camera settings, larger pixel sizes capture more light, resulting in higher sensitivity and brighter images.

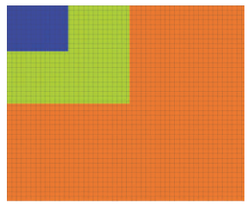
Pixel Depth

Refers to the number of bits used to store each pixel's data. For monochrome cameras, it determines the number of grayscale levels from dark to bright. Common industrial camera output formats include 8, 10, 12, and 16-bit. Higher pixel depth allows for more grayscale levels and finer detail in image brightness.

Pixel Depth	Grayscale level
8 bit	2^8 =256
10 bit	2^{10}=1024
12 bit	2^{12}=4096

The higher the pixel depth, the greater the grayscale level





Resolution is determined by the number of pixels arranged on the sensor. For area scan cameras, resolution is calculated by multiplying the number of horizontal and vertical pixels. For example, a resolution of 1280(H)×1024(V) means there are 1280 pixels per row and 1024 rows, resulting in approximately 1.3 megapixels. Higher resolution provides finer detail when imaging the same field of view. Common resolutions include: 0.3 MP, 2 MP, 5 MP, 10 MP, 12 MP, 25 MP, 31 MP, 50 MP, 65 MP, and 150 MP.

Single-Pixel Accuracy

The actual physical size represented by each pixel in an image.

Single-pixel accuracy = Field of view in one direction / Resolution in that direction.

For example: if the horizontal field of view is 32 mm and the horizontal resolution is 1600 pixels, then 32 mm ÷ 1600 pixels = 0.02 mm/pixel. The single-pixel accuracy is 0.02 mm.

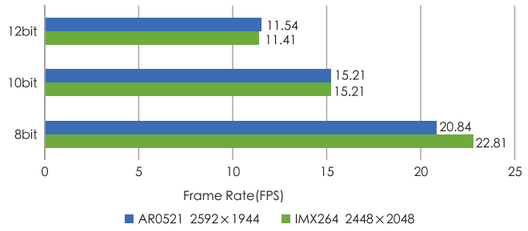
Frame Rate/Line Rate

The acquisition speed of a camera: frame rate is used for area scan cameras, and line rate for line scan cameras.

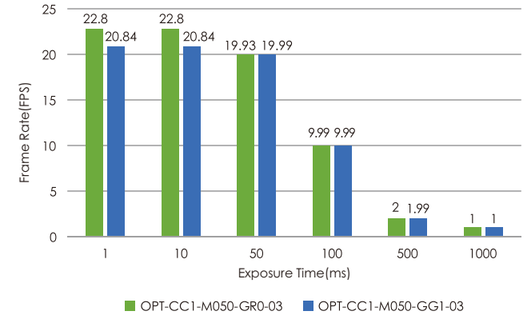
For area scan cameras, the unit is FPS (frames per second), indicating how many full images the camera captures per second. For example, 15 FPS means the camera captures up to 15 images per second. Typically, higher resolution results in lower frame rates.

For line scan cameras, the unit is Hz, representing the number of lines scanned per second. For example, 50 kHz means the camera scans 50,000 lines per second. Higher resolution generally results in lower line rates.

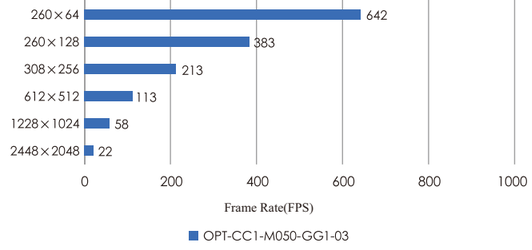
Relationship Between Pixel Depth and Frame Rate (excluding exposure time):



Relationship Between Exposure Time and Frame Rate for Common 5MP Cameras



OPT-CC1-M050-GG1-03 Relationship Between Resolution and Frame Rate



Gain

Gain refers to the amplification ratio between input and output signals, meaning each pixel's grayscale value is multiplied to enhance image brightness. However, increasing brightness also amplifies image noise, which can degrade image quality. Digital gain tends to introduce more visible noise than analog gain.

External Trigger

Industrial cameras typically support external triggering, allowing image capture to be controlled by external signals—one signal triggers one capture. This enables flexible operation by coordinating sensors with the camera's trigger function.

Signal Output

When using external triggering, the lighting must also sync with the trigger state—lights turn on during capture and off when idle. The camera's signal output feature sends trigger signals to control the lighting, ensuring synchronization with image acquisition.

Exposure Time/Exposure Method

Exposure time refers to the duration that light is projected onto the camera sensor. Generally, the longer the exposure, the brighter the image. Industrial cameras typically use two exposure modes: rolling shutter (line exposure) and global shutter (frame exposure).

Frame exposure means all pixels in the sensor array are exposed simultaneously, based on a preset shutter time. This mode is suitable for capturing moving objects without distortion or displacement.

Line exposure means pixels in the same row are exposed at the same time, but different rows start exposure at different times. Each row has the same exposure duration, with fixed delays between rows. This mode is suited for capturing static objects. Line scan cameras use line-by-line exposure with adjustable line frequency.

Motion Blur

When capturing moving objects, if the exposure time and object speed are not well matched, the object may stretch across more pixels, causing repeated imaging and motion blur.



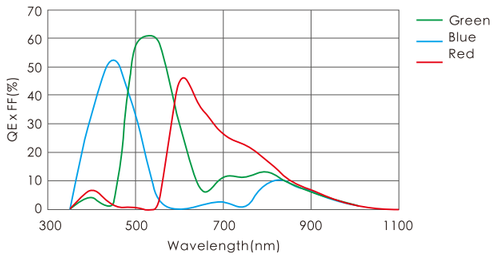
Without motion blur



With motion blur

Spectral Response

Spectral response, or quantum efficiency (QE), is the percentage of incoming photons a sensor converts to electrons. For example, 60% QE means 60 electrons from 100 photons. Cameras are classified by spectral range: UV (200–400 nm), visible (400–700 nm, peak 500–600 nm), near-infrared (780–1100 nm), and shortwave infrared (1100–2526 nm), chosen based on application.



OPT-CD1-C650-XGG3-02

Dynamic Range

Dynamic range refers to the range of light intensity a camera can detect—from the darkest to the brightest areas. It is a fixed value, unaffected by external conditions, and is expressed in ratios, dB, or bits. A higher dynamic range allows the camera to handle varying light intensities better, providing richer detail and a wider color gamut.

In the linear response region, a camera's dynamic range is defined as the ratio between the saturation exposure and the noise-equivalent exposure.

$$\text{Dynamic Range} = \frac{\text{Saturation exposure}}{\text{Noise-equivalent exposure}}$$

Noise

One category of camera noise is the statistical fluctuation noise caused by valid signals, which follows a Poisson distribution. This is also known as shot noise. This type of noise is the same for all cameras and unavoidable. It follows a known formula: noise² = signal mean. Another type is intrinsic noise, unrelated to the signal, caused by sensor readout, processing, and amplification circuits. It varies between cameras. Digital cameras also introduce quantization noise during A/D conversion—higher bit depth reduces it. Signal-to-Noise Ratio (SNR) measures signal clarity. Higher SNR means better image contrast. When SNR = 1, the signal is buried in noise, making objects hard to identify.

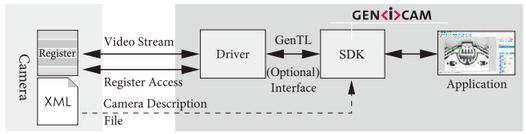
Signal-to-Noise Ratio

Signal-to-Noise Ratio (SNR) refers to the ratio of signal strength to noise. A higher SNR results in greater image contrast and clarity. When SNR equals 1, the signal is indistinguishable from the noise, making objects difficult to identify. SNR is a key factor in image quality.

Camera Software Interface Standards

GenICam

GenICam provides a universal API for different camera types, enabling compatibility across brands and standardizing industry interfaces.



The GenICam standard is composed of multiple modules

GenTL (Generic Transport Layer) standardizes the programming interface for tasks such as camera enumeration, register access, data streaming, and asynchronous event transmission. As a low-level interface, GenTL is typically accessed through software development kits rather than directly by end users.

GenApi (Generic Application Programming Interface) defines how application software interacts with camera features. It maps standard and custom features to camera registers using an XML format, which is stored in the camera's firmware and retrieved by the SDK when the camera is first connected.

SFNC (Standard Features Naming Convention) provides standardized definitions for the names, types, meanings, and usage of camera features, ensuring consistency across devices from different manufacturers.

GenCP (Generic Control Protocol) standardizes the packet structure for control commands and is used by interface standards to reuse portions of the control communication pathway.

The GenICam committee maintains a reference implementation capable of parsing files that contain a camera's self-description. The production-grade code is written in C++, freely available, and highly portable, supporting a wide range of operating systems and compilers. Most available SDKs adopt this reference implementation to ensure high interoperability.

Hardware Transmission Interfaces

Currently, common digital camera interfaces include: USB, GigE, and IEEE1394 (including 1394a and 1394b), Camera Link, Camera Link HS, and CoaXPress. Each transmission interface has distinctcharacteristics.

USB Interface

USB is a globally adopted interface with continual upgrades driven by international standards bodies. USB 3.0, now a standard in modern computers and electronics, offers a maximum transfer rate of 5 Gbps—five times that of GigE—under ideal conditions. It supports Direct Memory Access (DMA), enabling direct image transfer to system memory, making it suitable for embedded applications with limited memory bandwidth and CPU power. USB is fast, hot-swappable, compact, standardized, and supports multi-device connections.

GigE Interface

GigE Vision, based on IEEE 802.3 Ethernet standards, was first introduced in May 2006 and revised in 2010 and 2011. It supports highspeed, long-distance image transmission using standard Ethernet cables and allows interoperability across hardware and software from different vendors. Compared to Fast Ethernet, Gigabit Ethernet offers 10x the speed at lower cost, making it a cost-effective solution.

GigE Vision 2.0 introduces precise multi-camera synchronization via the Precision Time Protocol (PTP), achieving nanosecond accuracy. It is backward compatible with GigE Vision 1.2. Based on IEEE 802.3an, 10GBASE-T supports up to 100 meters of transmission over CAT-6A or better cables and uses standard RJ45 connectors. It operates at frequencies up to 500 MHz and uses PAM-16 encoding.

IEEE 1394 Interface

Also known as FireWire, IEEE 1394 was developed by Apple in 1987. 1394a offers 400 Mbps and 1394b reaches 800 Mbps. It supports true point-to-point transmission and hot swapping. While once a stable data transfer interface, IEEE 1394 has largely faded from mainstream use.

Camera Link Interface

Camera Link is a hardware interface standard developed by the AIA (Automated Imaging Association), based on Channel Link technology. It standardizes connections between cameras and frame grabbers, covering data transmission, timing, serial communication, and real-time signaling. Designed for real-time, high-bandwidth parallel communication (up to 850 MB/s), it ensures interoperability between devices from different manufacturers. The standard was first released in 2000 and updated to version 2.0 in 2012, introducing Mini Camera Link connectors, Power over Camera Link (PoCL), and PoCL-Lite. The current version, 2.1, adds support for simulating channel link chips in FPGAs, enhances serial port APIs, and improves physical specification clarity. Camera Link offers advantages such as high-speed data transfer without latency, strong cross-vendor compatibility, and power supply over a single cable via PoCL.

Camera Link HS Interface

Launched in 2012, CLHS provides high-bandwidth, low-latency, low-jitter real-time communication between cameras and frame grabbers, transmitting both image and configuration data. It supports copper and fiber cables, low-cost standardized connectors, and IP core support for easier product development. CLHS v1.2 delivers scalable bandwidth from 10G (single cable) to 25G (8 cables), robust error handling, bidirectional triggering for low jitter (ideal for line scan and short-exposure area scan), parallel image processing, and long-range transmission up to 300+ meters.

CoaXPress Interface

CoaXPress is a point-to-point interface combining coaxial cable simplicity with high-speed serial data transmission. It enables image data, control signals, and power over a single 75Ω coaxial cable. CoaXPress 1.0 was introduced in 2011, supporting up to 6.25 Gbps per channel. CoaXPress 2.0, released in 2021, doubles the rate to 12.5 Gbps per channel. With four cables, total throughput reaches 50 Gbps. It also supports 42 Mbps control signaling and Power-over-Coax for camera power, with cable lengths up to 100 meters.

Industrial Camera Overview

Standard Name	USB3 Vision			GigE Vision				IEEE1394 + IIDC	
Topology	Point-to-point, tiered-star			Point-to-point, network				Daisy chain	
Transmission Format	Packet-based			Packet-based				Packet-based	
Image Transmission Robustness	Data retransmission			Data retransmission				Error detection only	
Related Software Standards	Mandatory: GenICam GenApi, GenCP, SFNC			Mandatory: GenICam GenApi, SFNC				Mandatory: IIDC	
	Optional: GenICam GenTL, IIDC2			Optional: GenICam GenTL					
Certification Requirements	Registration form, compliance matrix, device validation software, electrical compliance tests, PlugFest			Registration form, compliance matrix, device validation software, PlugFest				Self certification	
Configuration	SuperSpeed 5 Gbits/s	SuperSpeed + Gen 2x1	SuperSpeed + Gen 2x2	1GigE	2.5GigE	5GigE	10GigE	IEEE1394a (S400) IEEE1394b (S800)	IEEE1394b (S1600)
Bandwidth(Image Data)	★★★ ⩽500 Mbytes/s	★★★★ ⩽1000 Mbytes/s	★★★★ ⩽2000 Mbytes/s	★★ ⩽125 Mbytes/s	★★★ ⩽300 Mbytes/s	★★★ ⩽600 Mbytes/s	★★★★★ ⩽1000 Mbytes/s	★ ⩽100 Mbytes/s	★★ ⩽200 Mbytes/s
Control Channel	Full-duplex, shared with image data			Full-duplex, shared with image data				Full-duplex, shared with image data	
Cable Type	SuperSpeed USB (Copper)	SuperSpeed USB (Fiber Adapter)		CAT-5e/6a/7, Fiber	CAT-6a/7, Fiber			IEEE 1394	
Cable Length(Passive Cable)	★ ⩽10 meters	★★★★ ⩽120 meters		★★★★ ⩽120 meters	★★★★★ >120 meters			★ ⩽10 meters	
Cable Power Supply	Mandatory			Optional				Mandatory	
Available Camera Power	4.5W/100W (Type-C)			13W (IEEE802.3af) 25W (IEEE802.3at)				45W max (depends on PC)	
Frame Grabber Requirement	No			No				No	
Camera Trigger Input Signal	Direct on camera			Direct on camera				Direct on camera	
Trigger Delay – Frame Grab Camera (Link Delay, Protocol Overhead Only)	N/A			N/A				N/A	

Standard Name	Camera Link			Camera Link HS			CoaXPress			
Topology	Point-to-point			Point-to-point, data splitting			Point-to-point			
Transmission Format	Parallel			Packet-based			Packet-based			
Image Transmission Robustness	None			Data retransmission/ Forward error correction			Error detection only			
Relevant Software Standards	Optional: GenICam, CLProtocol, GenCP			Mandatory: GenICam GenApi, GenCP, SFNC			Mandatory: GenICam GenApi, GenTL, SFNC			
				Optional: GenICam GenTL			Optional: GenICam GenDC, IIDC2			
Certification Standards	Registration form,Self certification,PlugFest (v2.1)			Registration form, compliance matrix			Registration form, electrical/protocol/ interoperability compliance tests, PlugFest			
Configuration	BASE	MEDIUM/ FULL	80-bit	C2	C3	F2	CXP-12	4x CXP-6	6X CXP-12	4X CXP-12 over Fiber
Bandwidth(Image Data)	★★★ ⩽500 Mbytes/s	★★★★ ⩽1000 Mbytes/s	★★★★ ⩽1000 Mbytes/s	★★★★★ ⩽5000 Mbytes/s	★★★★★★ >5000 Mbytes/s	★★★★★ ⩽5000 Mbytes/s	★★★★★ ⩽5000 Mbytes/s	★★★★★ ⩽5000 Mbytes/s	★★★★★★ >5000 Mbytes/s	★★★★★ ⩽5000 Mbytes/s
Control Channel	Dedicated serial port			Dedicated uplink, shared downlink			Dedicated uplink, shared downlink			
Cable types	Camera Link			Cx4	Cx4	Fiber	Coaxial			Fiber
Cable Length(Passive Cable)	★ ⩽10 meters			★★ ⩽20meters ★★★★ AOC⩽120 meters	★ ⩽10meters ★★★★ AOC⩽120 meters	★★★★ ⩽120meters	★★★ ⩽50 meters	★★★ ⩽50 meters	★★★ ⩽50 meters	★★★★★ >120 meters
Cable Power Supply	Optional			None			Mandatory			None
Available Camera Power	4W	8W	8W	N/A			13W	52W	78W	N/A
Frame Grabber Requirement	Yes			Yes			Yes			
Camera Trigger Input Signal	On camera or from frame grabber			On camera or from frame grabber			On camera or from frame grabber			
Trigger Delay – Frame Grab Camera (Link Delay, Protocol Overhead Only)	★★★★★ <100 ns			★★★★ ⩾100 ns			★★★★ ⩾100 ns			

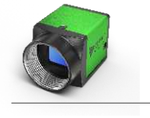
Industrial Camera Selection Guide



CC1 Series GigE Industrial Area Scan Camera

GigE interface, compact size, easy to install, and cost-effective.

- Sensor: Array
- Sensor Size: ≤1.1"
- Shutter Type: Rolling/Global
- Resolution: 0.4 MP ~ 25 MP
- Frame Rate: Up to 303.2 fps
- Color: Black and White / Color
- Data Interface: GigE
- Optical Interface: C-Mount



CC1 Series USB3.0 Industrial Area Scan Camera

USB3.0 interface, compact size, easy to install, and cost-effective.

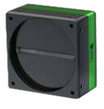
- Sensor: Array
- Sensor Size: ≤1.1"
- Shutter Type: Rolling/Global
- Resolution: 0.4 MP ~ 25 MP
- Frame Rate: Up to 526.5 fps
- Color: Black and White / Color
- Data Interface: USB3.0
- Optical Interface: C-Mount



CH1 Series Industrial Area Scan Cameras

High resolution, high frame rate, and high image quality (high sensitivity, wide dynamic range, and low noise)

- Sensor: Array
- Sensor Size: ≥2/3"
- Shutter Type: Rolling/Global
- Resolution: 5 MP~150 MP
- Frame Rate: Up to 222 fps
- Color: Black and White / Color
- Data Interface: GigE/10 GigE/Camera Link/CoaXPress
- Optical Interface: M42 Mount / M58 Mount / M72 Mount /F Mount / C Mount



CL1 Series Industrial Line Scan Cameras

Fast, Accurate, Stable

- Sensor: Line Scan
- Pixel Size: 3.5 μm ~ 14 μm
- Resolution: 2K~16K
- Line Frequency: Up to 200 kHz
- Color: Black and White / Color
- Data Interface: GigE/10 GigE/Camera Link
- Optical Interface: C-Mount / M42 Mount / M72 Mount



CM1 Series Multispectral Area Scan Camera

SWIR, InGaAs detector, response wavelength 0.4–1.7 μm, penetrating invisible materials.

- Sensor: Array
- Sensor Size: ≤1.1"
- Shutter Type: Rolling/Global
- Resolution: 0.3 MP ~ 5 MP
- Frame Rate: Up to 246 fps
- Spectral Range: 0.4 ~ 1.7 μm
- Data Interface: GigE
- Optical Interface: C-Mount

CC1 Series GigE Industrial Area Scan Camera

GigE Interface | Compact Size | Easy to Install | Cost-effective



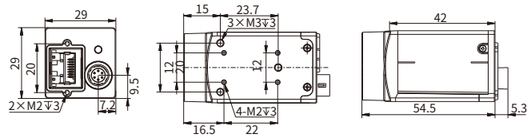
Models and Specifications

Model	Resolution	Pixel size (μm²)	Sensor type	Shutter	Frame rate (fps)	Sensor size	Sensor	Interface	Lens mount	Mono/ Color	Dimensions
OPT-CC1-M050-GR0-11	2592 × 1944	2.2 × 2.2	CMOS	Rolling	23.38	1/2.5"	AR0521	GigE PoE	C-Mount	M	A
OPT-CC1-C050-GR0-00	2592 × 1944	2.2 × 2.2	CMOS	Rolling	23.38	1/2.5"	AR0521	GigE PoE	C-Mount	C	A
OPT-CC1-M060-GR1-10	3072 × 2048	2.4 × 2.4	CMOS	Rolling	18.7	1/1.8"	IMX178	GigE PoE	C-Mount	M	A
OPT-CC1-C060-GR1-00	3072 × 2048	2.4 × 2.4	CMOS	Rolling	18.7	1/1.8"	IMX178	GigE PoE	C-Mount	C	A
OPT-CC1-C080-GR0-00	3840 × 2160	2 × 2	CMOS	Rolling	14.2	1/1.8"	AR0822	GigE PoE	C-Mount	C	A
OPT-CC1-M100-GR0-10	3840 × 2748	1.67 × 1.67	CMOS	Rolling	7.4	1/2.3"	MT9J003	GigE PoE	C-Mount	M	A
OPT-CC1-M120-GR1-10	4024 × 3036	1.85 × 1.85	CMOS	Rolling	9.6	1/1.7"	IMX226	GigE PoE	C-Mount	M	A
OPT-CC1-C120-GR1-00	4024 × 3036	1.85 × 1.85	CMOS	Rolling	9.6	1/1.7"	IMX226	GigE PoE	C-Mount	C	A
OPT-CC1-M200-GR1-10	5472 × 3648	2.4 × 2.4	CMOS	Rolling	5.9	1"	IMX183	GigE PoE	C-Mount	M	A
OPT-CC1-C200-GR1-00	5472 × 3648	2.4 × 2.4	CMOS	Rolling	5.9	1"	IMX183	GigE PoE	C-Mount	C	A
OPT-CC1-M004-GG1-10	720 × 540	6.9 × 6.9	CMOS	Global	303.21	1/2.9"	IMX287	GigE PoE	C-Mount	M	A
OPT-CC1-C004-GG1-00	720 × 540	6.9 × 6.9	CMOS	Global	303.21	1/2.9"	IMX287	GigE PoE	C-Mount	C	A
OPT-CC1-M013-GG6-11	1280 × 1024	4 × 4	CMOS	Global	89	1/2.7"	SC130GS	GigE PoE	C-Mount	M	A
OPT-CC1-C013-GG6-11	1280 × 1024	4 × 4	CMOS	Global	89	1/2.7"	SC130GS	GigE PoE	C-Mount	C	A
OPT-CC1-M013-GG0-10	1280 × 1024	4.8 × 4.8	CMOS	Global	90	1/2"	PYTHON 1300	GigE PoE	C-Mount	M	A
OPT-CC1-C013-GG0-10	1280 × 1024	4.8 × 4.8	CMOS	Global	90	1/2"	PYTHON 1300	GigE PoE	C-Mount	C	A
OPT-CC1-M016-GG1-10	1440 × 1080	3.45 × 3.45	CMOS	Global	75.75	1/2.9"	IMX273	GigE PoE	C-Mount	M	A
OPT-CC1-C016-GG1-00	1440 × 1080	3.45 × 3.45	CMOS	Global	75.75	1/2.9"	IMX273	GigE PoE	C-Mount	C	A
OPT-CC1-M016-GG3-10	1440 × 1080	4 × 4	CMOS	Global	64.8	1/2.5"	OPT	GigE PoE	C-Mount	M	A
OPT-CC1-C016-GG3-00	1440 × 1080	4 × 4	CMOS	Global	64.8	1/2.5"	OPT	GigE PoE	C-Mount	C	A
OPT-CC1-M020-GG3-10	1600 × 1200	4 × 4	CMOS	Global	58.6	1/1.7"	GMAX4002	GigE PoE	C-Mount	M	A
OPT-CC1-C020-GG3-00	1600 × 1200	4 × 4	CMOS	Global	58.6	1/1.7"	GMAX4002	GigE PoE	C-Mount	C	A
OPT-CC1-M023-GG1-10	1920 × 1200	5.86 × 5.86	CMOS	Global	41	1/1.2"	IMX249	GigE PoE	C-Mount	M	A
OPT-CC1-C023-GG1-20	1920 × 1200	5.86 × 5.86	CMOS	Global	41	1/1.2"	IMX249	GigE PoE	C-Mount	C	A
OPT-CC1-M050-GG3-14	2448 × 2048	3.4 × 3.4	CMOS	Global	23.5	2/3"	GMAX3405	GigE PoE	C-Mount	M	A
OPT-CC1-C050-GG3-00	2448 × 2048	3.4 × 3.4	CMOS	Global	23.5	2/3"	GMAX3405	GigE PoE	C-Mount	C	A
OPT-CC1-M050-GG1-11	2448 × 2048	3.45 × 3.45	CMOS	Global	23.5	2/3"	IMX264	GigE PoE	C-Mount	M	A
OPT-CC1-C050-GG1-00	2448 × 2048	3.45 × 3.45	CMOS	Global	23.5	2/3"	IMX264	GigE PoE	C-Mount	C	A
OPT-CC1-M120-GG3-10	4096 × 3072	3.4 × 3.4	CMOS	Global	9.37	1.1"	GMAX3412	GigE PoE	C-Mount	M	B
OPT-CC1-C120-GG3-00	4096 × 3072	3.4 × 3.4	CMOS	Global	9.37	1.1"	GMAX3412	GigE PoE	C-Mount	C	B

Models and Specifications

Model	Resolution	Pixel size (μm²)	Sensor type	Shutter	Frame rate (fps)	Sensor size	Sensor	Interface	Lens mount	Mono/ Color	Dimensions
OPT-CC1-M120-GG1-00	4096 × 3000	3.4 × 3.4	CMOS	Global	9.6	1.1"	IMX304	GigE PoE	C-Mount	M	B
OPT-CC1-C120-GG1-00	4096 × 3000	3.4 × 3.4	CMOS	Global	9.6	1.1"	IMX304	GigE PoE	C-Mount	C	B
OPT-CC1-M250-GG3-00	5120 × 5120	2.5 × 2.5	CMOS	Global	4.49	1.1"	GMAX0505	GigE PoE	C-Mount	M	B
OPT-CC1-C250-GG3-00	5120 × 5120	2.5 × 2.5	CMOS	Global	4.49	1.1"	GMAX0505	GigE PoE	C-Mount	C	B
OPT-CM130-GH-04	1280 × 960	3.75 × 3.75	CCD	Global	30	1/3"	RJ33J4CA0DT	GigE PoE	C-Mount	M	C
OPT-CC130-GH-04	1280 × 960	3.75 × 3.75	CCD	Global	30	1/3"	RJ33J4CA0DT	GigE PoE	C-Mount	C	C
OPT-CM200-GM-0401	1624 × 1240	4.5 × 4.5	CMOS	Global	60	1/1.7"	IMX430	GigE PoE	C-Mount	M	C
OPT-CC1-C020-GG1-03	1624 × 1240	4.5 × 4.5	CMOS	Global	60	1/1.7"	IMX430	GigE PoE	C-Mount	C	E
OPT-CM300-GM-04	2048 × 1536	3.45 × 3.45	CMOS	Global	36	1/1.8"	IMX265	GigE PoE	C-Mount	M	C
OPT-CC300-GM-04	2048 × 1536	3.45 × 3.45	CMOS	Global	36	1/1.8"	IMX265	GigE PoE	C-Mount	C	C
OPT-CM900-GM-04	4096×2160	3.45 × 3.45	CMOS	Global	13	1"	IMX267	GigE PoE	C-Mount	M	D
OPT-CC900-GM-04	4096×2160	3.45 × 3.45	CMOS	Global	13	1"	IMX267	GigE PoE	C-Mount	C	D

Dimensions (mm)



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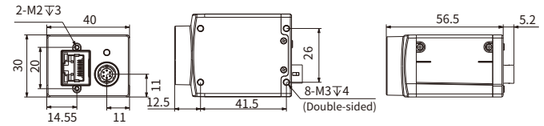

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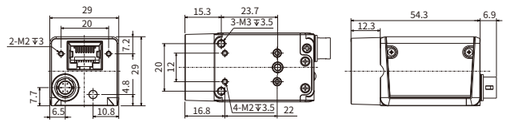

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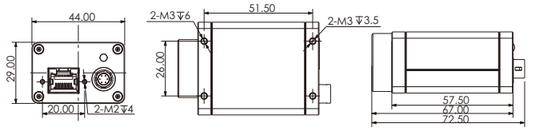

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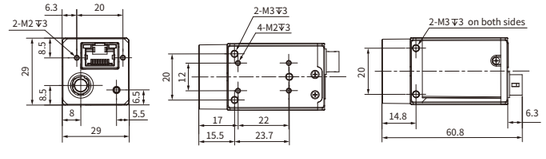


E

CC1 Series USB3.0 Industrial Area Scan Camera

USB3.0 Interface | Compact Size | Easy to Install | Cost-effective



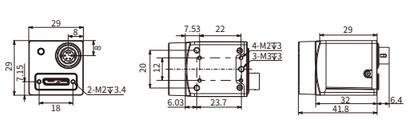
Models and Specifications

Model	Resolution	Pixel size (μm²)	Sensor type	Shutter	Frame rate (fps)	Sensor size	Sensor	Interface	Lens mount	Mono/ Color	Dimensions
OPT-CC1-M050-UR0-10	2592 × 1944	2.2 × 2.2	CMOS	Rolling	60	1/2.5"	AR0521	USB 3.0	C-Mount	M	A
OPT-CC1-C050-UR0-10	2592 × 1944	2.2 × 2.2	CMOS	Rolling	60	1/2.5"	AR0521	USB 3.0	C-Mount	C	A
OPT-CC1-M060-UR1-10	3072 × 2048	2.4 × 2.4	CMOS	Rolling	59.75	1/1.8"	IMX178	USB 3.0	C-Mount	M	A
OPT-CC1-C060-UR1-10	3072 × 2048	2.4 × 2.4	CMOS	Rolling	59.75	1/1.8"	IMX178	USB 3.0	C-Mount	C	A
OPT-CC1-M120-UR1-10	4024 × 3036	1.85 × 1.85	CMOS	Rolling	31.76	1/1.7"	IMX226	USB 3.0	C-Mount	M	A
OPT-CC1-C120-UR1-10	4024 × 3036	1.85 × 1.85	CMOS	Rolling	31.76	1/1.7"	IMX226	USB 3.0	C-Mount	C	A
OPT-CC1-M200-UR1-10	5472 × 3648	2.4 × 2.4	CMOS	Rolling	19.44	1"	IMX183	USB 3.0	C-Mount	M	A
OPT-CC1-C200-UR1-10	5472 × 3648	2.4 × 2.4	CMOS	Rolling	19.44	1"	IMX183	USB 3.0	C-Mount	C	A
OPT-CC1-M004-UG1-10	720 × 540	6.9 × 6.9	CMOS	Global	526.56	1/2.9"	IMX287	USB 3.0	C-Mount	M	A
OPT-CC1-C004-UG1-10	720 × 540	6.9 × 6.9	CMOS	Global	526.56	1/2.9"	IMX287	USB 3.0	C-Mount	C	A
OPT-CC1-M013-UG6-10	1280 × 1024	4 × 4	CMOS	Global	240	1/2.7"	SC130GS	USB 3.0	C-Mount	M	A
OPT-CC1-C013-UG6-10	1280 × 1024	4 × 4	CMOS	Global	240	1/2.7"	SC130GS	USB 3.0	C-Mount	C	A
OPT-CC1-M013-UG0-10	1280 × 1024	4.8 × 4.8	CMOS	Global	208	1/2"	PYTHON 1300	USB 3.0	C-Mount	M	A
OPT-CC1-C013-UG0-10	1280 × 1024	4.8 × 4.8	CMOS	Global	208	1/2"	PYTHON 1300	USB 3.0	C-Mount	C	A
OPT-CC1-M016-UG1-10	1440 × 1080	3.45 × 3.45	CMOS	Global	249	1/2.9"	IMX273	USB 3.0	C-Mount	M	A
OPT-CC1-C016-UG1-10	1440 × 1080	3.45 × 3.45	CMOS	Global	249	1/2.9"	IMX273	USB 3.0	C-Mount	C	A
OPT-CC1-M016-UG3-10	1440 × 1080	4 × 4	CMOS	Global	227	1/2.5"	OPT	USB 3.0	C-Mount	M	A
OPT-CC1-C016-UG3-10	1440 × 1080	4 × 4	CMOS	Global	227	1/2.5"	OPT	USB 3.0	C-Mount	C	A
OPT-CC1-M020-UG3-10	1600 × 1200	4 × 4	CMOS	Global	202	1/1.7"	GMAX4002	USB 3.0	C-Mount	M	A
OPT-CC1-C020-UG3-10	1600 × 1200	4 × 4	CMOS	Global	202	1/1.7"	GMAX4002	USB 3.0	C-Mount	C	A
OPT-CC1-M023-UG1-20	1920 × 1200	5.86 × 5.86	CMOS	Global	40	1/1.2"	IMX249	USB 3.0	C-Mount	M	A
OPT-CC1-C023-UG1-20	1920 × 1200	5.86 × 5.86	CMOS	Global	40	1/1.2"	IMX249	USB 3.0	C-Mount	C	A
OPT-CC1-M050-UG3-11	2448 × 2048	3.4 × 3.4	CMOS	Global	77.39	2/3"	GMAX3405	USB 3.0	C-Mount	M	A
OPT-CC1-C050-UG3-11	2448 × 2048	3.4 × 3.4	CMOS	Global	77.39	2/3"	GMAX3405	USB 3.0	C-Mount	C	A
OPT-CC1-M050-UG1-10	2448 × 2048	3.45 × 3.45	CMOS	Global	35.6	2/3"	IMX264	USB 3.0	C-Mount	M	A
OPT-CC1-C050-UG1-10	2448 × 2048	3.45 × 3.45	CMOS	Global	35.6	2/3"	IMX264	USB 3.0	C-Mount	C	A
OPT-CC1-M050-UG1-12	2448 × 2048	3.45 × 3.45	CMOS	Global	77.39	2/3"	IMX250	USB 3.0	C-Mount	M	A
OPT-CC1-C050-UG1-12	2448 × 2048	3.45 × 3.45	CMOS	Global	77.39	2/3"	IMX250	USB 3.0	C-Mount	C	A

Models and Specifications

Model	Resolution	Pixel size (μm²)	Sensor type	Shutter	Frame rate (fps)	Sensor size	Sensor	Interface	Lens mount	Mono/ Color	Dimensions
OPT-CC1-M120-UG3-00	4096 × 3072	3.4 × 3.4	CMOS	Global	30.83	1.1"	GMAX3412	USB 3.0	C-Mount	M	B
OPT-CC1-C120-UG3-00	4096 × 3072	3.4 × 3.4	CMOS	Global	30.83	1.1"	GMAX3412	USB 3.0	C-Mount	C	B
OPT-CC1-M120-UG1-10	4096 × 3000	3.4 × 3.4	CMOS	Global	31.57	1.1"	IMX304	USB3.0	C-Mount	M	B
OPT-CC1-C120-UG1-10	4096 × 3000	3.4 × 3.4	CMOS	Global	31.57	1.1"	IMX304	USB3.0	C-Mount	C	B
OPT-CC1-M250-UG3-00	5120 × 5120	2.5 × 2.5	CMOS	Global	14.8	1.1"	GMAX0505	USB3.0	C-Mount	M	B
OPT-CC1-C250-UG3-00	5120 × 5120	2.5 × 2.5	CMOS	Global	14.8	1.1"	GMAX0505	USB3.0	C-Mount	C	B
OPT-CM120-UH-04	1280 × 960	3.75 × 3.75	CCD	Global	33	1/3"	RJ33J4CA0DT	USB3.0	C-Mount	M	C
OPT-CC120-UH-04	1280 × 960	3.75 × 3.75	CCD	Global	33	1/3"	RJ33J4CA0DT	USB3.0	C-Mount	C	C
OPT-CC1-C020-UG1-02	1624 × 1464	4.5 × 4.5	CMOS	Global	90	1/1.7"	IMX430	USB3.0	C-Mount	C	E
OPT-CM300-UM-04	2048×1536	3.45 × 3.45	CMOS	Global	120	1/1.8"	IMX252	USB3.0	C-Mount	M	C
OPT-CC300-UM-04	2048×1536	3.45 × 3.45	CMOS	Global	120	1/1.8"	IMX252	USB3.0	C-Mount	C	C
OPT-CM400-UM-04	2048×2048	5.5 × 5.5	CMOS	Global	90	1"	CMV4000	USB3.0	C-Mount	M	C
OPT-CC400-UM-04	2048×2048	5.5 × 5.5	CMOS	Global	90	1"	CMV4000	USB3.0	C-Mount	C	C
OPT-CM900-UM-0402	4096×2160	3.45 × 3.45	CMOS	Global	40	1"	IMX255	USB3.0	C-Mount	M	D
OPT-CC900-UM-0402	4096×2160	3.45 × 3.45	CMOS	Global	40	1"	IMX255	USB3.0	C-Mount	C	D
OPT-CM900-UM-0401	4096×2160	3.45 × 3.45	CMOS	Global	32	1"	IMX267	USB3.0	C-Mount	M	D
OPT-CC900-UM-0401	4096×2160	3.45 × 3.45	CMOS	Global	32	1"	IMX267	USB3.0	C-Mount	C	D

Dimensions (mm)



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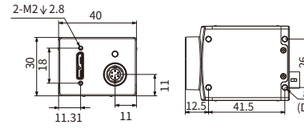

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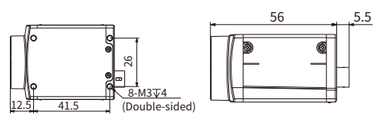

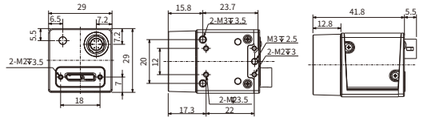

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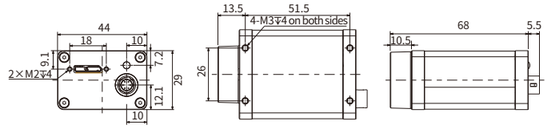

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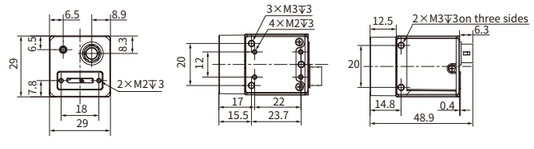

E

CH1 Series Industrial Area Scan Cameras

High Frame Rate | High Image Quality (high sensitivity, wide dynamic range, and low noise)



Models and Specifications

Model	Resolution	Pixel size (μm²)	Sensor type	Shutter	Frame rate (fps)	Sensor size	Sensor	Interface	Lens mount	Mono/ Color	Dimensions
OPT-CH1-M050-XGG3-02	2448 × 2048	3.4 × 3.4	CMOS	Global	164	2/3"	GMAX3405	10 GigE(SFP+)	C-Mount	M	A
OPT-CH1-C050-XGG3-02	2448 × 2048	3.4 × 3.4	CMOS	Global	164	2/3"	GMAX3405	10 GigE(SFP+)	C-Mount	C	A
OPT-CH1-M120-XGG3-02	4096 × 3072	3.4 × 3.4	CMOS	Global	93.7	1.1"	GMAX3412	10 GigE(SFP+)	C-Mount	M	A
OPT-CH1-C120-XGG3-02	4096 × 3072	3.4 × 3.4	CMOS	Global	93.7	1.1"	GMAX3412	10 GigE(SFP+)	C-Mount	C	A
OPT-CH1-M250-XGG3-02	5120 × 5120	2.5 × 2.5	CMOS	Global	43.4	1.1"	GMAX0505	10 GigE(SFP+)	C-Mount	M	B
OPT-CH1-C250-XGG3-02	5120 × 5120	2.5 × 2.5	CMOS	Global	43.4	1.1"	GMAX0505	10 GigE(SFP+)	C-Mount	C	B
OPT-CH1-M490-XGG3-02	7008 × 7000	3.2 × 3.2	CMOS	Global	19.7	2.3"	GMAX3249	10 GigE(SFP+)	M58×0.75	M	C
OPT-CH1-C490-XGG3-02	7008 × 7000	3.2 × 3.2	CMOS	Global	19.7	2.3"	GMAX3249	10 GigE(SFP+)	M58×0.75	C	C
OPT-CH1-M650-XGG3-04	9344 × 7000	3.2 × 3.2	CMOS	Global	18	2.3"	GMAX3265	10 GigE(SFP+)	M58×0.75	M	C
OPT-CH1-C650-XGG3-04	9344 × 7000	3.2 × 3.2	CMOS	Global	18	2.3"	GMAX3265	10 GigE(SFP+)	M58×0.75	C	C
OPT-CH1-M1000-XGG3-01	11264 × 9200	3.2 × 3.2	CMOS	Global	11.3	2.9"	GMAX32103	10 GigE(SFP+)	M72×0.75	M	D
OPT-CH1-M1500-XGG3-01	16544 × 9200	3.2 × 3.2	CMOS	Global	7.7	3.7"	GMAX32152	10 GigE(SFP+)	M72×0.75	M	E
OPT-CH1-M050-XGG3-03	2448 × 2048	3.4 × 3.4	CMOS	Global	151.99	2/3"	GMAX3405	10 GigE	C-Mount	M	F
OPT-CH1-C050-XGG3-03	2448 × 2048	3.4 × 3.4	CMOS	Global	151.99	2/3"	GMAX3405	10 GigE	C-Mount	C	F
OPT-CH1-M120-XGG3-03	4096 × 3072	3.4 × 3.4	CMOS	Global	93.43	1.1"	GMAX3412	10 GigE	C-Mount	M	F
OPT-CH1-C120-XGG3-03	4096 × 3072	3.4 × 3.4	CMOS	Global	93.43	1.1"	GMAX3412	10 GigE	C-Mount	C	F
OPT-CH1-M250-XGG3-03	5120 × 5120	2.5 × 2.5	CMOS	Global	41.8	1.1"	GMAX0505	10 GigE	C-Mount	M	G
OPT-CH1-C250-XGG3-03	5120 × 5120	2.5 × 2.5	CMOS	Global	41.8	1.1"	GMAX0505	10 GigE	C-Mount	C	G
OPT-CH1-M490-XGG3-03	7008 × 7000	3.2 × 3.2	CMOS	Global	19.76	2.3"	GMAX3249	10 GigE	M58×0.75	M	H
OPT-CH1-C490-XGG3-03	7008 × 7000	3.2 × 3.2	CMOS	Global	19.76	2.3"	GMAX3249	10 GigE	M58×0.75	C	H
OPT-CH1-M650-XGG3-03	9344 × 7000	3.2 × 3.2	CMOS	Global	18.03	2.3"	GMAX3265	10 GigE	M58×0.75	M	H
OPT-CH1-C650-XGG3-03	9344 × 7000	3.2 × 3.2	CMOS	Global	18.03	2.3"	GMAX3265	10 GigE	M58×0.75	C	H
OPT-CM3100-GM-04	6464 × 4852	3.45 × 3.45	CMOS	Global	3.6	22.3×16.6	IMX342	GigE	M58×0.75	M	I
OPT-CC3100-GM-04	6464 × 4852	3.45 × 3.45	CMOS	Global	3.6	22.3×16.6	IMX342	GigE	M58×0.75	C	I
OPT-CD1-M310-GG1-01	6464 × 4852	3.45 × 3.45	CMOS	Global	3.9	22.3×16.7	IMX342	GigE	F	M	J
OPT-CD1-C310-GG1-01	6464 × 4852	3.45 × 3.45	CMOS	Global	3.9	22.3×16.7	IMX342	GigE	F	C	J
OPT-CM6500-GM-04	9344 × 7000	3.2 × 3.2	CMOS	Global	1.7	37.4	GMAX3265	GigE	M58×0.75	M	K
OPT-CC6500-GM-04	9344 × 7000	3.2 × 3.2	CMOS	Global	1.7	37.4	GMAX3265	GigE	M58×0.75	C	K

Models and Specifications

Model	Resolution	Pixel size (μm²)	Sensor type	Shutter	Frame rate (fps)	Sensor size	Sensor	Interface	Lens mount	Mono/ Color	Dimensions
OPT-CM15000-LL-04	14160 × 10640	3.76 × 3.76	CMOS	Rolling	5.1	53.36×40.01	IMX411	Camera Link	M72×0.75	M	L
OPT-CM500-LM-04	2448 × 2048	3.45 × 3.45	CMOS	Global	150	2/3"	IMX250	Camera Link	C-Mount	M	M
OPT-CC500-LM-04	2448 × 2048	3.45 × 3.45	CMOS	Global	150	2/3"	IMX250	Camera Link	C-Mount	C	M
OPT-CM1200-LM-16	3840 × 3000	3.45 × 3.45	CMOS	Global	69.8	1.1"	IMX253	Camera Link	C-Mount	M	N
OPT-CC1200-LM-16	3840 × 3000	3.45 × 3.45	CMOS	Global	69.8	1.1"	IMX253	Camera Link	C-Mount	C	N
OPT-CM3000-LM-04	6240 × 4848	3.45 × 3.45	CMOS	Global	20	24.9×16.6	IMX342	Camera Link	M58×0.75	M	O
OPT-CC3000-LM-04	6240 × 4848	3.45 × 3.45	CMOS	Global	20	24.9×16.6	IMX342	Camera Link	M58×0.75	C	O
OPT-CM5000-LM-04	9280 × 4992	3.2 × 3.2	CMOS	Global	17.5	33.9	定制	Camera Link	M58×0.75	M	P
OPT-CC5000-LM-04	9280 × 4992	3.2 × 3.2	CMOS	Global	17.5	33.9	定制	Camera Link	M58×0.75	C	P
OPT-CM6500-LM-04	9280 × 6992	3.2 × 3.2	CMOS	Global	12.5	37.4	GMAX3265	Camera Link	M58×0.75	M	P
OPT-CC6500-LM-04	9280 × 6992	3.2 × 3.2	CMOS	Global	12.5	37.4	GMAX3265	Camera Link	M58×0.75	C	P
OPT-CM15000-XL-04	14160 × 10640	3.76 × 3.76	CMOS	Rolling	6.2	66.7	IMX411	CXP-6	M72×0.75	M	Q
OPT-CD1-M1510-XR1-02	14208 × 10640	3.76 × 3.76	CMOS	Rolling	6.2	66.7	IMX411	CXP-6	M72×0.75	M	R
OPT-CD1-C1510-XR1-01	14208 × 10640	3.76 × 3.76	CMOS	Rolling	6.2	66.7	IMX411	CXP-6	M72×0.75	C	R
OPT-CM1200-XM-04	4096 × 3072	5.5 × 5.5	CMOS	Global	188	22.5×16.9	CMV12000	CXP-6	M42×1.0	M	S
OPT-CC1200-XM-04	4096 × 3072	5.5 × 5.5	CMOS	Global	188	22.5×16.9	CMV12000	CXP-6	M42×1.0	C	S
OPT-CM1200-XM-0401	4096 × 3072	5.5 × 5.5	CMOS	Global	188	22.5×16.9	CMV12000	CXP-6	M58×0.75	M	T
OPT-CC1200-XM-0401	4096 × 3072	5.5 × 5.5	CMOS	Global	188	22.5×16.9	CMV12000	CXP-6	M58×0.75	C	T
OPT-CM1200-XM-0402	4096 × 3072	5.5 × 5.5	CMOS	Global	188	22.5×16.9	CMV12000	CXP-6	F	M	U
OPT-CC1200-XM-0402	4096 × 3072	5.5 × 5.5	CMOS	Global	188	22.5×16.9	CMV12000	CXP-6	F	C	U
OPT-CD1-M310-XG1-01	6464 × 4852	3.45 × 3.45	CMOS	Global	17.9	22.3×16.7	IMX342	CXP-6	F	M	V
OPT-CM5000-XM-0402	7920 × 6004	4.6 × 4.6	CMOS	Global	30	36.4×27.6	CMV50000	CXP-6	F	M	W
OPT-CC5000-XM-0402	7920 × 6004	4.6 × 4.6	CMOS	Global	30	36.4×27.6	CMV50000	CXP-6	F	C	W
OPT-CM6500-XM-1601	9344 × 7000	3.2 × 3.2	CMOS	Global	31.5	29.9×22.4	GMAX3265	CXP-6	F	M	X
OPT-CC6500-XM-1601	9344 × 7000	3.2 × 3.2	CMOS	Global	31.5	29.9×22.4	GMAX3265	CXP-6	F	C	X
OPT-CD1-M210-XG3-01	5120×4096	4.5 × 4.5	CMOS	Global	222	23.04×18.43	Gsprint4521	CXP-12	M58×0.75	M	Y
OPT-CM2500-XM-04	5120×5120	2.5 × 2.5	CMOS	Global	150	1.1"	GMAX0505	CXP-12	M58×0.75	M	Z
OPT-CC2500-XM-04	5120×5120	2.5 × 2.5	CMOS	Global	150	1.1"	GMAX0505	CXP-12	M58×0.75	C	Z
OPT-CD1-M650-XG3-01	9344×7000	3.2 × 3.2	CMOS	Global	71	29.9×22.4	GMAX3265	CXP-12	M58×0.75	M	Y
OPT-CD1-C650-XG3-01	9344×7000	3.2 × 3.2	CMOS	Global	71	29.9×22.4	GMAX3265	CXP-12	M58×0.75	C	Y

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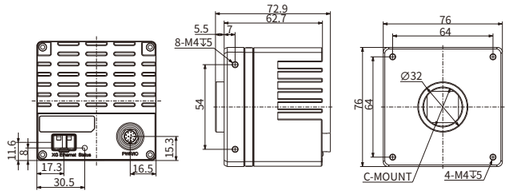

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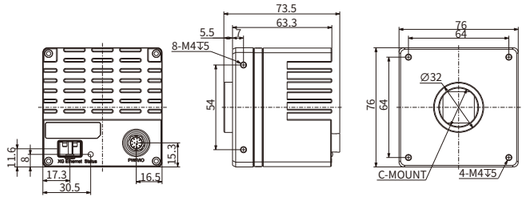

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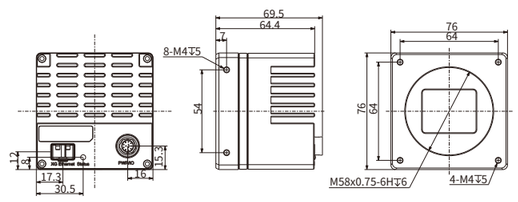

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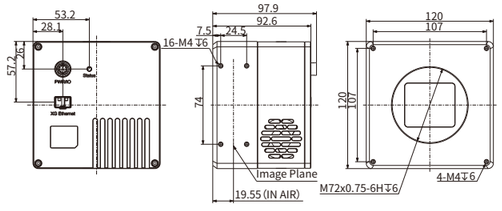

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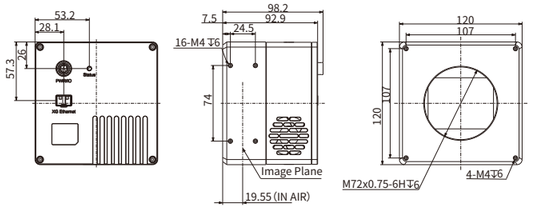

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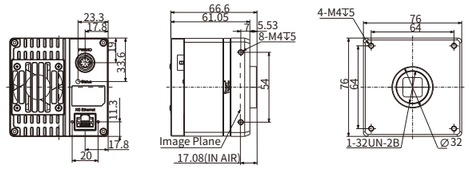

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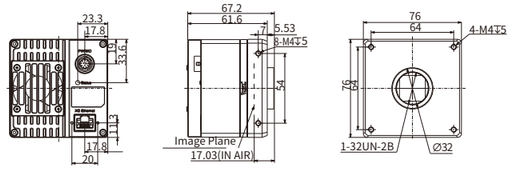

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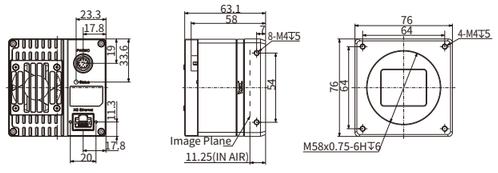

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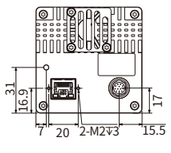

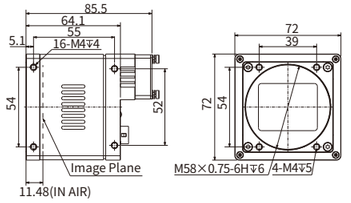

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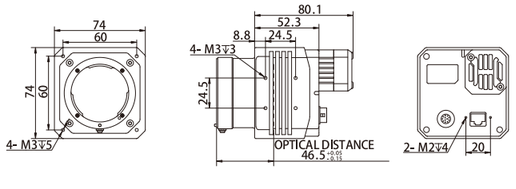

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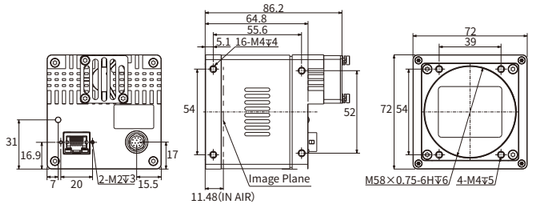

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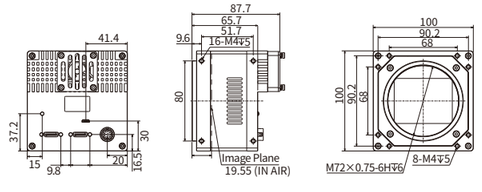

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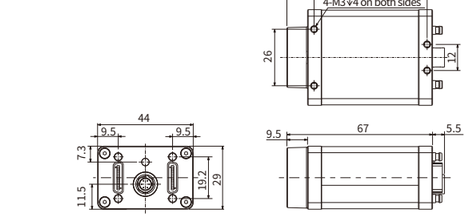

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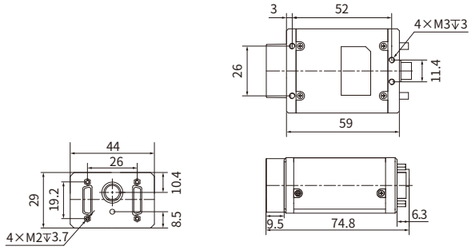

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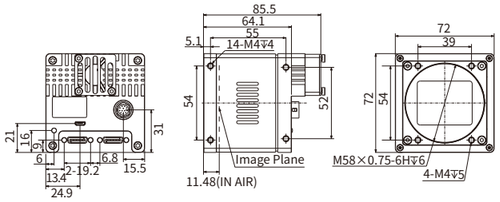

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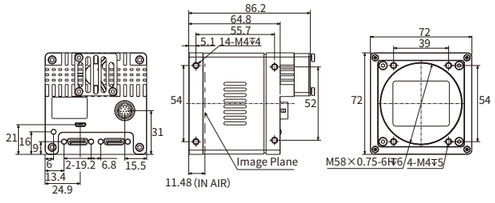

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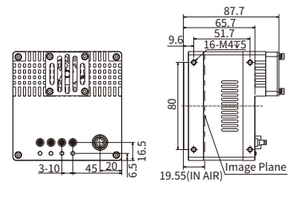

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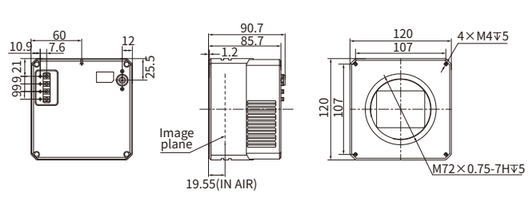

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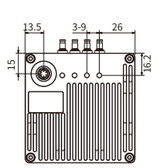

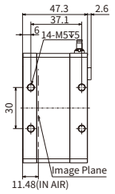

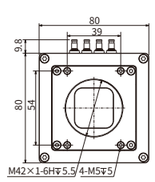

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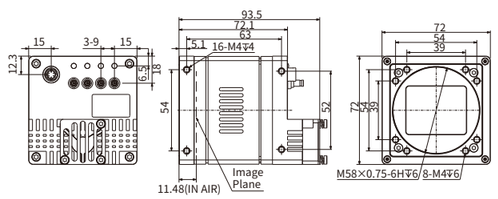

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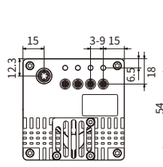

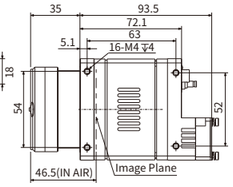

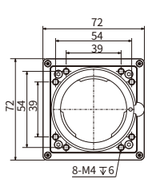

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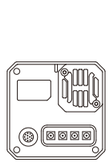

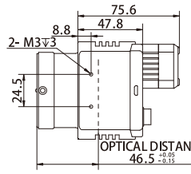

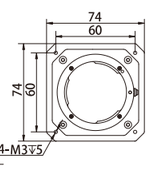

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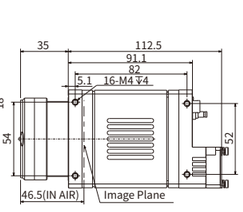

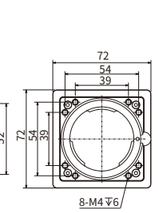

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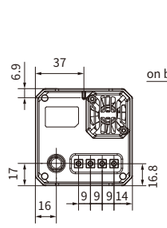

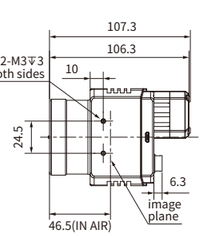

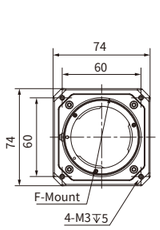

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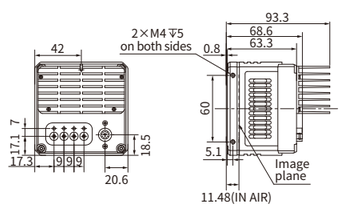

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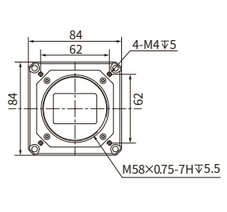
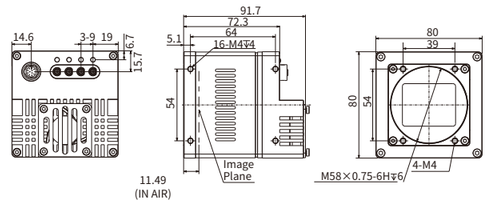
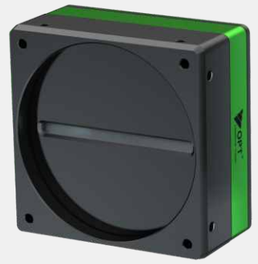




Z

CL1 Series Industrial Line Scan Cameras

Fast | Accurate | Stable





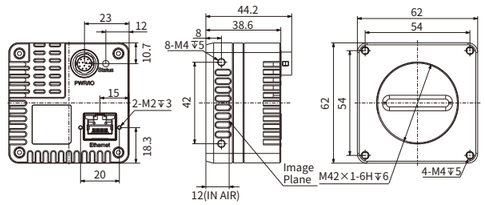
Models and Specifications

Model	Resolution	Pixel size (μm)	Sensor type	Line frequency (kHz)	Interface	Lens mount	Mono/Color	Dimensions
OPT-CL1-M2-G3-01	2048 × 1	14 × 14	CMOS	57.1	GigE PoE	M42×1.0	M	A
OPT-CL1-C2-G3-01	2048 × 3	14 × 14	CMOS	40	GigE PoE	M42×1.0	C	A
OPT-CL1-M4-G3-03	4096 × 1	7.0 × 7.0	CMOS	28.6	GigE PoE	M42×1.0	M	A
OPT-CL1-C4-G3-03	4096 × 3	7.0 × 7.0	CMOS	28.7	GigE PoE	M42×1.0	C	A
OPT-CL1-M4-XG3-01	4096 × 1	7.0 × 7.0	CMOS	200	10 GigE	M42×1.0	M	B
OPT-CL1-C4-XG3-01	4096 × 3	7.0 × 7.0	CMOS	58.8	10 GigE	M42×1.0	C	C
OPT-CL1-M8-XG3-01	8192 × 1	7.0 × 7.0	CMOS	149	10 GigE	M72×0.75	M	D
OPT-CL1-C8-XG3-01	8192 × 3	7.0 × 7.0	CMOS	41	10 GigE	M72×0.75	C	D
OPT-CL1-M16-XG3-01	16384 × 1	3.5 × 3.5	CMOS	70	10 GigE	M72×0.75	M	D
OPT-CL1-C16-XG3-01	16384 × 2	3.5 × 3.5	CMOS	23.8	10 GigE	M72×0.75	C	D
OPT-CL1-M4-XG3-02	4096 × 1	7.0 × 7.0	CMOS	200	10 GigE(SFP+)	M42×1.0	M	E
OPT-CL1-C4-XG3-02	4096 × 3	7.0 × 7.0	CMOS	58.8	10 GigE (SFP+)	M42×1.0	C	F
OPT-CL1-M8-XG3-02	8192 × 1	7.0 × 7.0	CMOS	125	10 GigE(SFP+)	M72×0.75	M	G
OPT-CL1-C8-XG3-02	8192 × 3	7.0 × 7.0	CMOS	41	10 GigE (SFP+)	M72×0.75	C	H
OPT-CL1-M16-XG3-02	16384 × 1	3.5 × 3.5	CMOS	70	10 GigE(SFP+)	M72×0.75	M	G
OPT-CL1-C16-XG3-02	16384 × 2	3.5 × 3.5	CMOS	23.8	10 GigE (SFP+)	M72×0.75	C	H
OPT-CL1-M4-L3-03	4096 × 1	7.0 × 7.0	CMOS	200	Camera Link	M42×1.0	M	I
OPT-CL1-C4-L3-01	4096 × 3	7.0 × 7.0	CMOS	65	Camera Link	M42×1.0	C	I
OPT-CL1-M8-L3-01	8192 × 1	7.0 × 7.0	CMOS	100	Camera Link	M72×0.75	M	J
OPT-CL1-C8-L3-01	8192 × 3	7.0 × 7.0	CMOS	33	Camera Link	M72×0.75	C	J
OPT-CL1-M16-L3-01	16384 × 1	3.5 × 3.5	CMOS	50	Camera Link	M72×0.75	M	J
OPT-CL1-C16-L3-01	16384 × 2	3.5 × 3.5	CMOS	25	Camera Link	M72×0.75	C	J
OPT-CLC202-G32-16	2048 × 2	7 × 7	CMOS	32	GigE PoE	M42×1.0	C	K
OPT-CLC202-G49-04	2048 × 2	14 × 14	CMOS	49	GigE	M42×1.0	C	L
OPT-CLM204-G28-0401	4096 × 2	7 × 7	CMOS	28	GigE	M42×1.0	M	M
OPT-CLC204-G28-0401	4096 × 2	7 × 7	CMOS	28	GigE	M42×1.0	C	M
OPT-CLM408-G40-16	8192 × 4	5 × 5	CMOS	14	GigE	M72×0.75	M	N
OPT-CLC608-G14-16	8192 × 6	5 × 5	CMOS	14	GigE	M72×0.75	C	N

Models and Specifications

Model	Resolution	Pixel size (μm)	Sensor type	Line frequency (kHz)	Interface	Lens mount	Mono/Color	Dimensions
OPT-CLC204-L68-17	4096 × 2	7 × 7	CMOS	68	Camera Link	M42×1.0	C	O
OPT-CLM204-L200-17	4096 × 2	7 × 7	CMOS	200	Camera Link	M42×1.0	M	O
OPT-CL1-C4-L-01	4096 × 2	7 × 7	CMOS	68	Camera Link	M42×1.0	C	P
OPT-CLM204-L100-16	4096 × 2	7 × 7	CMOS	100	Camera Link	M42×1.0	M	Q
OPT-CLC204-L100-16	4096 × 2	7 × 7	CMOS	100	Camera Link	M42×1.0	C	Q
OPT-CLM808-L100-17	8320 × 8	5 × 5	CMOS	100	Camera Link	M72×0.75	M	R
OPT-CL1-C8-L-01	8320 × 12	5 × 5	CMOS	33	Camera Link	M72×0.75	C	R
OPT-CLC1608-L30-17	8320 × 16	5 × 5	CMOS	34	Camera Link	M72×0.75	C	R

Dimensions (mm)



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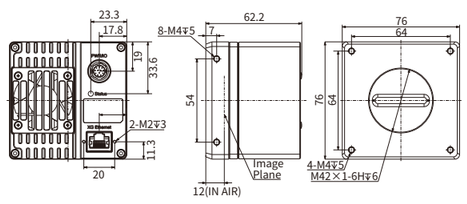

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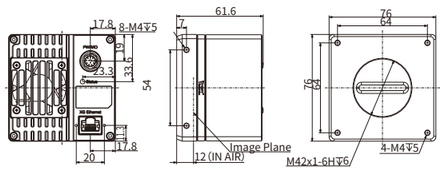

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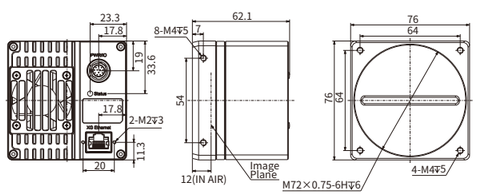

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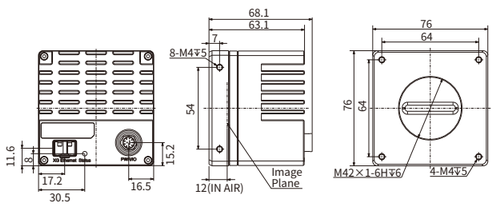

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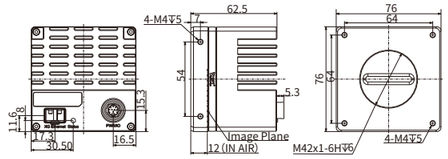

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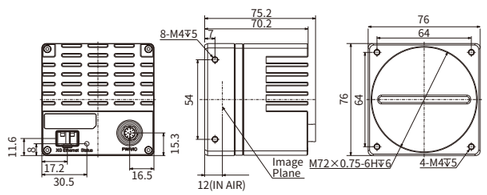

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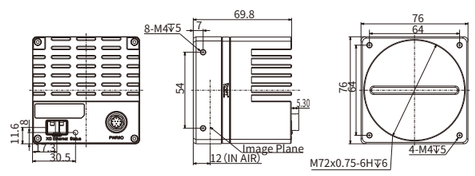

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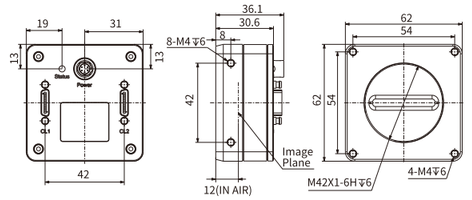
Dimensions (mm)



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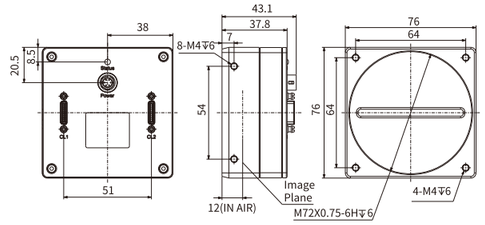

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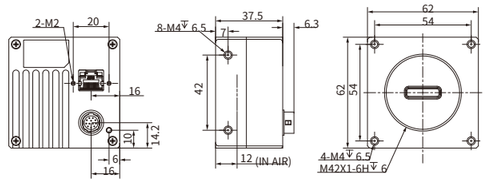

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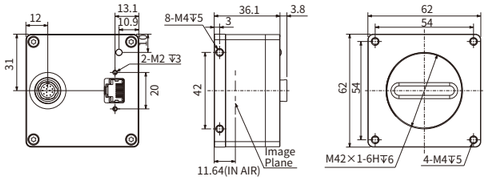

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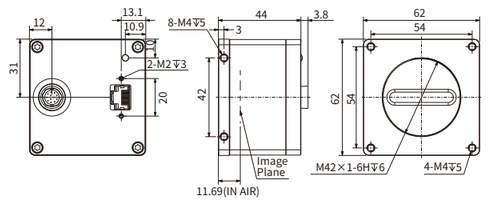

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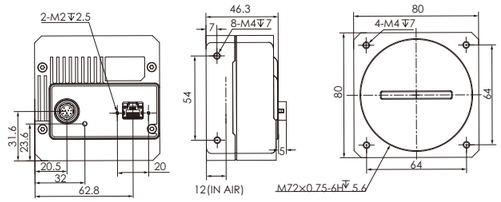

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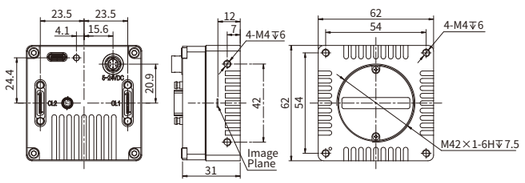

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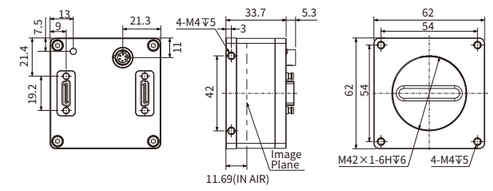

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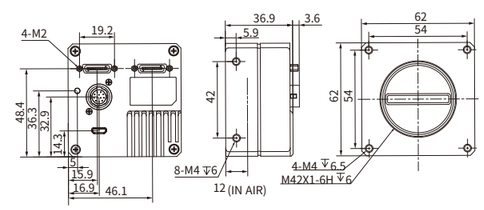

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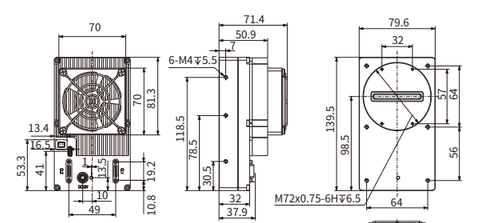


R

CM1 Series Multispectral Area Scan Camera

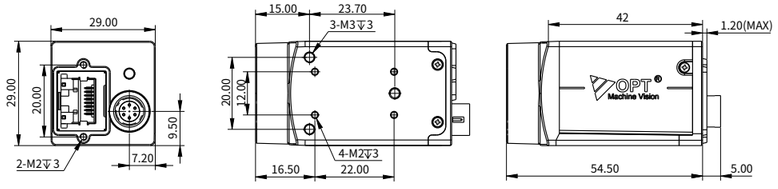
SWIR | InGaAs detector | response wavelength 0.4–1.7 μm | capable of penetrating non-visible materials



Models and Specifications

Model	Resolution	Pixel size (μm²)	Sensor type	Shutter	Frame rate (fps)	Sensor size	Sensor	Interface	Lens mount	Mono/ Color	Dimensions
OPT-CM1-I003-GG1-01	640 × 512	5 × 5	InGaAs	Global	246	1/4"	IMX991	GigE PoE	C-Mount	M	A
OPT-CM1-I013-GG1-01	1280 × 1024	5 × 5	InGaAs	Global	89.895	1/2"	IMX990	GigE PoE	C-Mount	M	A
OPT-CM1-I030-GG1-01	2048 × 1536	3.45 × 3.45	InGaAs	Global	37	1/1.8"	IMX993	GigE PoE	C-Mount	M	A
OPT-CM1-I050-GG1-01	2560 × 2048	3.45 × 3.45	InGaAs	Global	22.49	1/1.4"	IMX992	GigE PoE	C-Mount	M	A

Dimensions (mm)



A

Camera Accessories Selection

GigE Vision Camera Universal Capture Card		
Model	OPT-G1G-J4-P-01	OPT-G1G-J4-P-02
Chipset	Intel I210-AT	Intel I210-AT
Bus Interface	4×PCIe 2.0	4×PCIe 2.0
Physical Interface	4×RJ45	4×RJ45
Transmission Speed	10/100/1000 Mbps	10/100/1000 Mbps
Operating System Support	Windows 7/Windows 10/Windows 11, Linux	Windows 7/Windows 10/Windows 11, Linux
Appearance		

GigE Vision Camera Universal Cable							
Cable Type			6-pin with Power Adapter IO Cable	12-pin with Power Adapter IO Cable	6-pin IO Cable	12-pin IO Cable	Ethernet Cable
Cable Material / Length	Static	3M	CB-HR10-6F008-S3M	CB-HR10-12F009-S3M	CB-HR10-6F003-S3M	CB-HR10-12F004-S3M	CB-GE-RJ45SRJ45-S3M
		5M	CB-HR10-6F008-S5M	CB-HR10-12F009-S5M	CB-HR10-6F003-S5M	CB-HR10-12F004-S5M	CB-GE-RJ45SRJ45-S5M
		10M	CB-HR10-6F008-S10M	CB-HR10-12F009-S10M	CB-HR10-6F003-S10M	CB-HR10-12F004-S10M	CB-GE-RJ45SRJ45-S10M
	Dynamic / Robot	3M	CB-HR10-6F008-R3M	CB-HR10-12F009-R3M	CB-HR10-6F003-R3M	CB-HR10-12F004-R3M	CB-GE-RJ45SRJ45-R3M
		5M	CB-HR10-6F008-R5M	CB-HR10-12F009-R5M	CB-HR10-6F003-R3M	CB-HR10-12F004-R5M	CB-GE-RJ45SRJ45-R5M
		10M	CB-HR10-6F008-R10M	CB-HR10-12F009-R10M	CB-HR10-6F003-R10M	CB-HR10-12F004-R10M	CB-GE-RJ45SRJ45-R10M
Appearance							

Camera Accessories Selection

Universal USB Camera Capture Card	
Model	OPT-GU-J4-P-01
Chipset	ASM3042
Bus Interface	4×PCIe 2.0
Physical Interface	4×Type-A
Transmission Speed	5 Gbps
Operating System Support	Windows 7/Windows 10/Windows 11, Linux
Appearance Diagram	

Universal USB Camera Cable					
Cable Type			6-pin with Power Adapter IO Cable	6-pin IO Cable	USB 3.0 Cable
Cable Material / Length	Static	3M	CB-HR10-6F008-S3M	CB-HR10-6F003-S3M	CB-U3-MBSAM-S3M
		5M	CB-HR10-6F008-S5M	CB-HR10-6F003-S5M	CB-U3-MBSPAMP-T5M
		10M	CB-HR10-6F008-S10M	CB-HR10-6F003-S10M	/
	Dynamic / Robot	3M	CB-HR10-6F008-R3M	CB-HR10-6F003-R3M	CB-U3-MBSPAMP-T3M
		5M	CB-HR10-6F008-R5M	CB-HR10-6F003-R5M	CB-U3-MBSPAMP-T5M
		10M	CB-HR10-6F008-R10M	CB-HR10-6F003-R10M	CB-U3-MBSPAMP-T10M
Appearance Diagram					

Camera Accessories Selection

10 GigE Vision Camera Universal Capture Card		
Model	OPT-GXG-J2-P-01	OPT-GXG-J4-P-01
Chipset	SP1000A	BCM57840
Bus Interface	4×PCIe 3.0	4×PCIe 3.0
Physical Interface	2×SFP+	4×SFP+
Transmission Speed	1/10 Gbps	10 Gbps
Operating System Support	Windows 7/Windows 10/Windows 11, Linux	Windows 7/Windows 10/Windows 11, Linux
Appearance		

10 GigE Vision Camera Universal Cable						
Cable Type			12-pin with Power Adapter IO Cable	12-pin IO Cable	Ethernet Cable (for Power over Ethernet Cameras)	Ethernet Cable (for Fiber Optic Cameras)
Cable Material / Length	Static	3M	CB-HR10-12F010-S3M	CB-HR10-12F004-S3M	CB-10GE-RJ45SRJ45 -S3M	CB-10GE-LCLC-S3M
		5M	CB-HR10-12F010-S5M	CB-HR10-12F004-S5M	CB-10GE-RJ45SRJ45 -S5M	CB-10GE-LCLC-S5M
		10M	CB-HR10-12F010-S10M	CB-HR10-12F004-S10M	CB-10GE-RJ45SRJ45 -S10M	CB-10GE-LCLC-S10M
	Dynamic / Robot	3M	CB-HR10-12F010-R3M	CB-HR10-12F004-R3M	CB-10GE-RJ45SRJ45 -R3M	CB-10GE-LCLC01-T3M
		5M	CB-HR10-12F010-R5M	CB-HR10-12F004-R5M	CB-10GE-RJ45SRJ45 -R5M	CB-10GE-LCLC01-T5M
		10M	CB-HR10-12F010-R10M	CB-HR10-12F004-R10M	CB-10GE-RJ45SRJ45 -R10M	CB-10GE-LCLC01-T10M
Appearance						

Optical Module (for 10GigE cameras)		
Model	LRXP0010-Y3ATR	LRXP8510-X3ATL
Adapter for Camera	This module is a 10 GigE optical to electrical converter module, designed to be used with 10 GigE cameras	This module is a 10 GigE fiber optic module, designed to be used with 10 GigE fiber optic cameras
Appearance		

Camera Accessories Selection

Universal Camera Link Capture Card	
Model	OPT-G1L-J2-BP-04
Camera Link Mode	Base,DualBase,Medium,Full,Full+(80bit)
Bus Interface	4×PCIe 2.0
Physical Interface	2×SDR
Transmission Speed	6.8 Gbps
Operating System Support	Windows 7/Windows 10/Windows 11
Appearance	

Camera Link Camera Universal Cable					
Cable Type			6-pin with Power Adapter IO Cable	12-pin with Power Adapter IO Cable	Capture Card IO Cable
Cable Material / Length	Static	3M	CB-HR10-6F008-S3M	CB-HR10-12F009-S3M	CB-DB-15F004-S3M
		5M	CB-HR10-6F008-S5M	CB-HR10-12F009-S5M	CB-DB-15F004-S5M
		10M	CB-HR10-6F008-S10M	CB-HR10-12F009-S10M	/
	Dynamic / Robot	3M	CB-HR10-6F008-R3M	CB-HR10-12F009-R3M	/
		5M	CB-HR10-6F008-R5M	CB-HR10-12F009-R5M	/
		10M	CB-HR10-6F008-R10M	CB-HR10-12F009-R10M	/
Appearance					

Camera Link Camera Universal Cable			
Cable Type			Camera Link cable
Cable Material / Length	Dynamic / Drag Chain	5M	CB-CL-SS-T5M
		7M	CB-CL-SS-T7M
		10M	CB-CL-SS-T10M
Appearance			

OPT Lenses

- Lens Imaging Principles and Characteristics »P146
- Pixel-sensor size matching diagram »P161
- Line Scan Lenses »P162
- Line Scan Lens Accessories »P169
- Fixed Focal Length Lenses »P171
- Liquid Fixed focal-length Lenses »P192
- Variable Magnification Lenses »P196
- Zoom Microscopic Lens »P198
- Telecentric Lenses »P201
- Liquid Telecentric Lens »P207
- Non-standard Custom Lenses »P215
- Lens Accessories »P218

Machine Vision Lens Basics

The machine vision system is designed to utilise the machine to measure, judge and detect defects on the target parts, thereby reducing or eliminating the potential for human error and improving measurement accuracy and stability. The core principle is to collect optical signals from the machine vision lens to the camera, which then converts these signals into electrical signals for the image processing system. The image processing system uses the collected image information to extract the characteristics of the target, and then controls the field of the equipment action according to the results of the discrimination. The lens is a crucial component in the machine vision system, as its performance directly affects the effectiveness of the algorithm. It is therefore essential to fully understand the technical parameters of the lens to ensure the optimal selection and application.

1. Focal length f′

The focal length is the distance from the principal plane of the image to the image focus, as illustrated in Figure 1-1. Lenses can be categorised into three main groups: fixed-focus lenses, zoom lenses, and non-focus lenses, based on their focal length.

2. Field of view / FOV θ

In the field of optical engineering, the field of view is defined as the angle between the lens and the sensor, with the sensor's diagonal length, y, serving as the variable. The approximate formula for the field of view is thus 2-1:

$$2\Theta = 2 * \arctan\left(\frac{y'}{2f'}\right) \qquad 2\text{-}1$$

3. F-number Fno.

Inside the lens, there is a polygonal or circular and variable area hole-like grating device, which is called the aperture. The entrance pupil is the image formed by the aperture passing through the front set of lens groups, the diameter of which is defined as the diameter of the entrance pupil. The aperture coefficient is the ratio of the focal length of the lens to the diameter of the lens' entrance pupil, usually expressed as f/#.The formula is 2-2:

$$f/\# = f'(\text{focal length})/D\ (\text{entrance pupil diameter}) \qquad 2\text{-}2$$

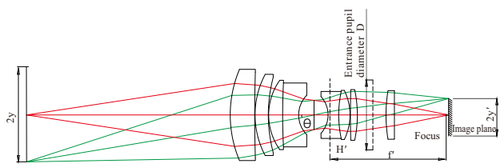


Figure 1-1

* Focal length, field of view and image plane size

According to formula 2-1 , the focal length, field of view and image plane size to meeting the triangular relationship, known two can be approximated to solve the third parameter, it can be seen in the camera to determine the model, the shorter the focal length, the larger the field of view of the lens; from the design point of view, the larger the field of view, the greater the difficulty of the lens design, the lens front of the size of the form will also increase accordingly.

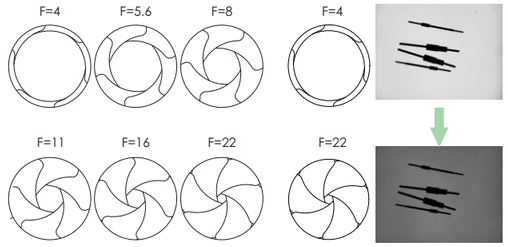


Figure 1-2

4. Working Distance(WD)

The working distance is the distance from the target to the forefront of the lens at which the lens focuses clearly. In practice, the lens cannot be any distance from the target and still achieve clear imaging. Each lens has its own applicable conditions, and the range of working distances is also limited.

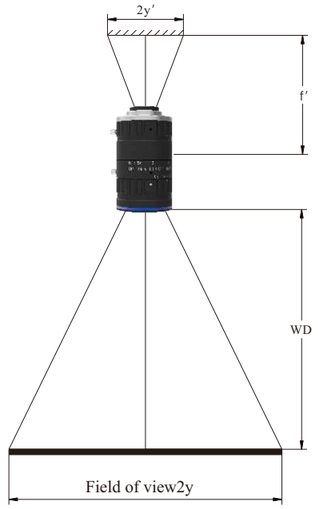


Figure 1-3

5. Magnification

The term magnification is defined as the ratio of the size of the image plane to the size of the object plane. The image plane is also the size of the camera's sensor sensor, while the object plane is the physical size of the actual range that can be observed by the lens, also called the field of view (FOV). The formula for magnification is 2-3:

$$\beta = \text{Sensor size(mm)/ Field of view(mm)} \qquad 2\text{-}3$$

* -1< β < 0, the object image of the opposite side, into an inverted reduced solid image, as shown in Figure 1-4 of the AA′, which is the principle of lens imaging.

When β = -1, the object image of the opposite side, forming an inverted, equal-sized solid image, as shown in BB′ of Figure 1-4.

β < -1, the object image of the opposite side, into an inverted magnified solid image, as shown in Figure 1-4 of the CC′, which is the principle of microscope imaging.

β >0, the object image of the same side, into an orthogonal magnified virtual image, as shown in Figure 1-4 DD ′, which is the principle of magnifying glass imaging.

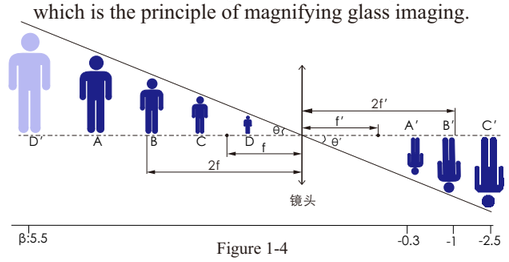


Figure 1-4

*Magnification, field of view and working distance

As illustrated in Figures 1-4, the focal length determines the FOV angle θ. Selecting the lens allows us to determine the Objects and Images relationship and approximate the size of the field of view at different working distances using the formula. The smaller the magnification, the larger the field of view that can be observed and the further away from the lens. When the working distance is sufficiently far, the working distance can be calculated using the formula 2-4:

$$WD = f'/\beta \qquad 2\text{-}4$$

The above formula was established under the condition that the value of the working distance is not in the same order of magnitude as the focal length of the lens. The initial selection of commonly used FA lenses has a certain degree of significance as a guide. When selecting code feature recognition, shape and size detection, target location positioning, defect detection and other industrial applications, it should be noted that the approximation of the formula does not apply from the outset. It can be deduced from the more accurate application of the formula that:

$$WD = \frac{f'}{\beta} + f' - S_H \qquad 2\text{-}5$$

In the above formula, S_H refers to the lens object side of the main plane, which is the lens of the foremost structural components of the distance. The parameter is determined by the optical design and mechanical design of a specific parameter.

The parameter is determined by the optical design and mechanical design of a specific parameter. Formula 2-5 is also the basis for the selection of line scanning lens to calculate the accessory programme. Further details on the back of the "Line Scan Lens Accessories"will be provided in a subsequent communication.

6. Telecentricity

Telecentricity is the angle at which the chief ray deviates from the optical axis. The smaller the angle, the better the telecentricity. An ideal telecentric lens has no trapezoidal distortion and the telecentricity is 0°. In the application of a certain range before and after the working distance, the magnification of the telecentric lens is close to a constant value, which effectively eliminates parallax and allows for the obtaining of accurate and stable images. Conventional lenses have a field of view angle, which means that the magnification decreases as the distance between the lens and the object increases. This is the behaviour of human vision and helps us perceive depth of field. Please refer to Figures 1-5 for a comparison between non-telecentric and telecentric optical paths.

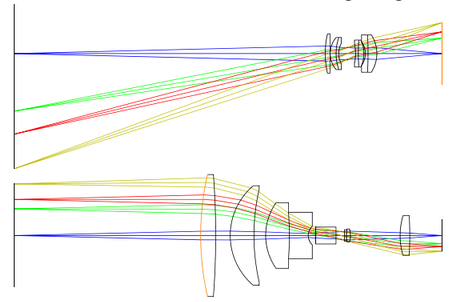


Figure 1-5

Telecentric lenses offer a number of advantages and disadvantages in metrology applications. One of the main advantages is that their magnification remains consistent regardless of depth of field. Figure 1-6 illustrates the difference between a fixed focal length (non-focal) lens and a telecentric lens when imaging two different objects at different working distances. In the image captured with the telecentric lens, it is challenging to discern which object is in front of the other. When using the fixed focal length lens, it is evident that the smaller object is situated at a greater distance from the lens.



Telecentric lens effect

Fixed-focus lens effect

Figure 1-6

* Automated inspection tasks frequently involve the detection of component objects within a moving imaging system. In such cases, the position, size, etc. of the object to be inspected within the field of view is rarely perfectly repeatable. If each object imaged by the lens is at a different working distance, the measurement results for each object will vary due to magnification changes. A machine vision system that outputs different results based on magnification calibration errors (which are unavoidable with fixed focal length lenses) is an unreliable solution. Applications requiring high accuracy and precision require the use of telecentric lenses as image acquisition components. Telecentric lenses eliminate measurement errors that would otherwise be caused by factors such as vibrating conveyors or inaccurate workpiece positioning.

7. Depth of field

The spatial depth of the object side that can obtain a clear image on the image plane. That is, the ability to maintain the desired image quality (spatial frequency at a specified contrast) in a certain range of objects before and after the subject (focus point) without focusing, and that spatial depth is the depth of field. The formula for its calculation is as follows:

$$DoF=\frac{2f^2F\Delta L(L-f)}{f^4-F^2\Delta^2(L-f)^2} \qquad 2\text{-}6$$

f: focal length

F: apertures

Δ: Diffuse spots, acceptable sharpness judgement criteria, camera pixel related

L: object distance, working distance

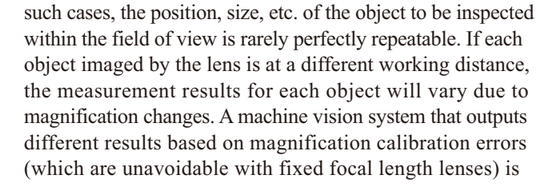


Figure 1-7

* As illustrated in Equation 2-6, the primary determinants of depth of field are the apertures, focal length, working distance and Diffuse spots (sensor pixel size). It is challenging to quantify depth of field without specifying the specific application conditions, criteria for determining image clarity and contrast requirements.

* Relationship between depth of field and working distance, apertures and focal length: as in Figure 1-8 to Figure 1-10, under the given contrast MTF30, the spatial frequency (Y-axis) changes within the working distance (X-axis), and with the same frequency, the further the working distance, the greater the depth of field; the smaller the diaphragm, the greater the depth of field; the smaller the focal length, the greater the depth of field.

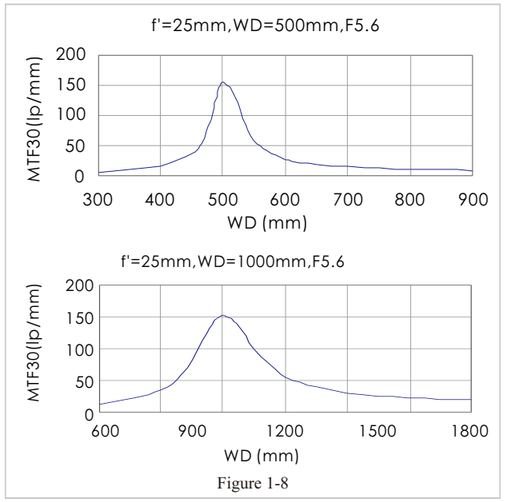


Figure 1-8

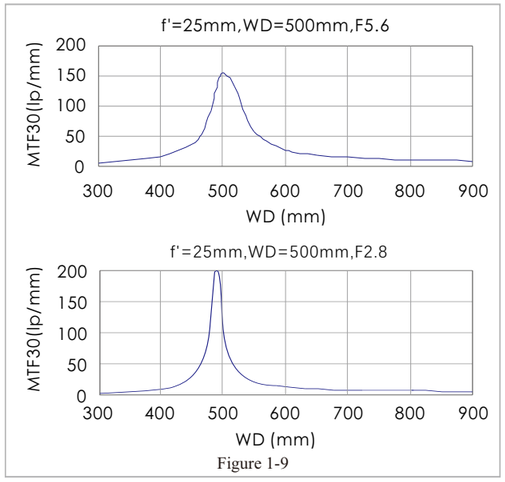


Figure 1-9

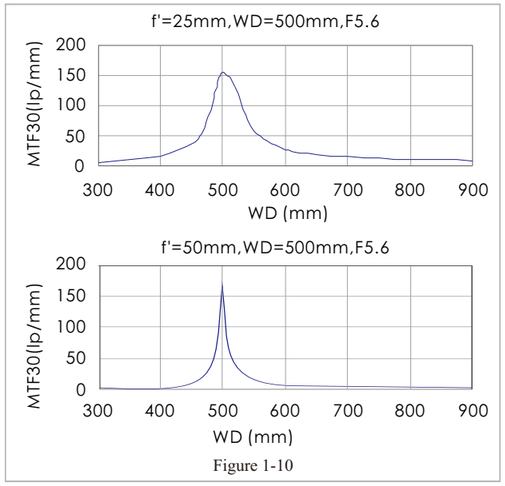


Figure 1-10

8. Optical distortion

Optical distortion (also known as distortion) is a monochromatic optical aberration that describes how the magnification in an image varies across the field of view at a given working distance. Low distortion is an extremely important consideration in precision instrumentation vision and metrology applications, and because distortion varies with wavelength, when calibrating distortion for machine vision systems, the wavelength of illumination must be considered and combined with a distortion graph to determine how to calibrate the distortion. As with other aberrations, distortion is determined by the optical design of the lens. Lenses with larger fields of view will generally have greater distortion. For simple lenses, distortion increases as the third power of image height； this means that larger fields of view (short focal lengths) are more prone to distortion than smaller fields of view (long focal lengths). When designing an optical system with a large field of view, in order to minimise distortion while maintaining high resolution, more and more complex optical glass must be incorporated into the design, further increasing the complexity of the system. The most common optical distortions are barrel distortion and cushion distortion.

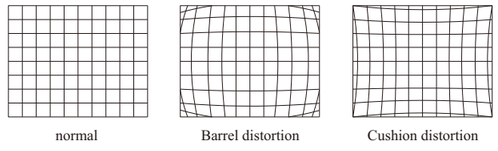


Figure 1-11

Distortion is simply a geometric misalignment of information that affects the geometry of the image, but not the clarity of the image. Therefore, distortion can actually be calculated or mapped from the image and distortion correction is applied to restore the true geometry. Note that in environments with very high distortion, where certain information and detail may be lost due to changes in resolution with magnification or because too much information is packed into a single pixel, the image cannot be easily reconstructed or even restored to its true geometric relationships.

9. TV distortion

Lens datasheets or specifications usually refer to distortion in one of two ways: optical distortion or RIAA TV distortion. RIAA TV distortion is a measure of the visual distortion of an image. It is determined by imaging a rectangular target that fills the vertical field of view, measuring the height difference between the corners of the rectangle and the central edge, and can be used in equation 2-7 to calculate TV distortion.

$$DTV=\frac{\Delta H}{H}*100\% \qquad 2\text{-}7$$

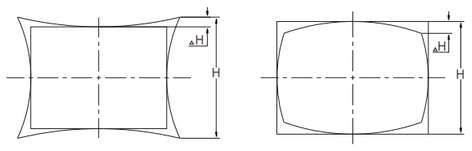


Figure 1-12

TV distortion describes the straightness of the lines displayed at the edges of the picture and is actually an optical distortion at a single field of view point in the field of view. By specifying distortion at only one point in the field of view, a non-zero distortion lens can be mistaken for having 0% distortion. In Figure 1-13 a 0% field of view can be found for each wavelength shown. However, when the full image circle is considered, it is clear that the lens has non-zero distortion. The method of measuring TV distortion is shown in Figure 1-12. In practice, the distortion curves of machine vision lenses are not all monotonically linear, and there are also inconsistencies in the positive and negative signs in different fields of view, so the optical distortion map is more informative than the TV distortion value. Often the TV distortion value of the same lens can be much lower than the maximum optical distortion value of the lens, so when selecting a lens, the distortion value corresponding to the type should be considered.

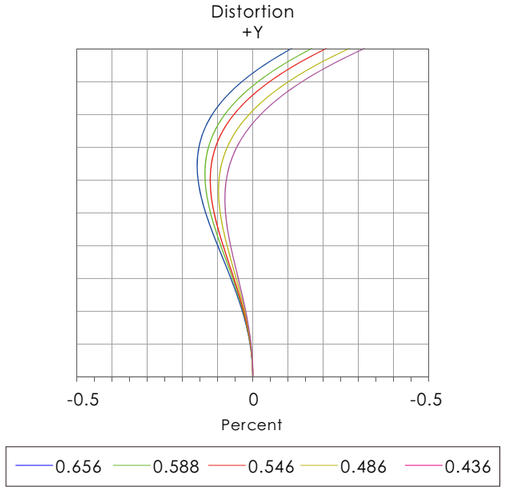


Figure 1-13

10. Trapezoidal distortion

In addition to the types of distortion inherent in the optical design, inconsistencies in the optical axis of the vision system can result in trapezoidal distortion (as shown in Figures 1-14a and 1-14b). When calibrating a vision system based on distortion, trapezoidal distortion should be considered in addition to radial optical distortion. Although distortion is often considered a modifier of aberration, it should be carefully considered against other system specifications when selecting an appropriate lens. In addition to the potential loss of image information, algorithmic distortion correction requires additional processing time, which can potentially impact system efficiency in high-speed or embedded applications.

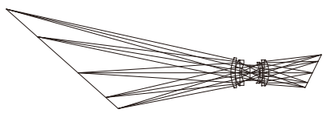


Figure 1-14a

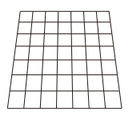


Figure 1-14b

11. Resolution

Resolution is the ability of an optical system to distinguish details of an object and is a very important performance indicator. The Rayleigh criterion means that when the centre of the diffraction pattern of a bright spot coincides with the first dark ring of the diffraction pattern of another bright spot, the two bright spots can just be resolved, as shown in Figure 1-15. At this time in the two diffraction pattern light intensity distribution of the iterative curve of the two large values and a very small value, the large value of the ratio of its very small value and 1:0.735, which is the light receiver (such as the eye or CCD and other imaging sensors)can be resolved by the brightness of the difference is equivalent. If the two bright spots are closer together, the detector can no longer distinguish them as two separate points.

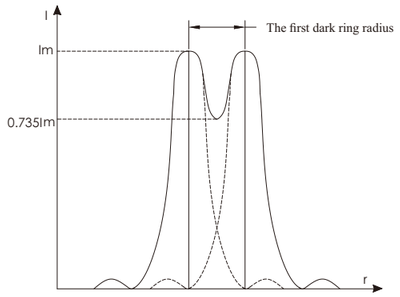


Figure 1-15Rayleigh resolution limit

According to the theory of diffraction, when an infinitely distant object passes through the diffraction pattern formed by an ideal optical system, the radius of the first dark ring is at a tensor angle to the centre of the outgoing pupil:

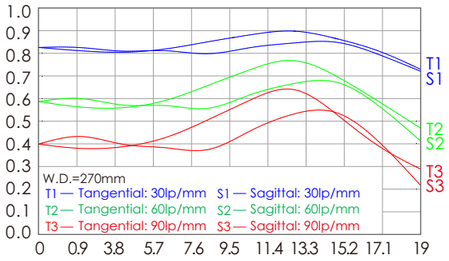
$$\theta=1.22\lambda/D \qquad 2\text{-}8$$

Equation 2-8, for the minimum resolving angle of the optical system, entrance pupil. For μm monochromatic light, the minimum resolving angle is given in units of (″) and D is given in units of mm:

$$\theta=140''/D \qquad 2\text{-}9$$

Equation 2-9 is the basic formula for calculating the theoretical resolution of an optical system, and different expressions can be derived from Equation 2-9 for different types of optical systems.

In industrial applications, resolution is usually defined as the size of the smallest resolvable feature on the measured object that can be measured by the optical system. The smaller the details of the resolved object, the higher the resolution of the lens. It is often described in terms of line pairs (lp/mm) or pixels. In practice, care should be taken to ensure that the resolution of the lens is not lower than that of the camera.



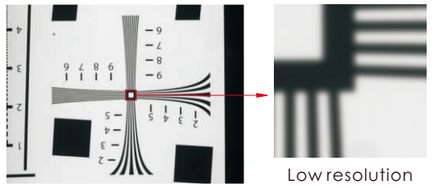
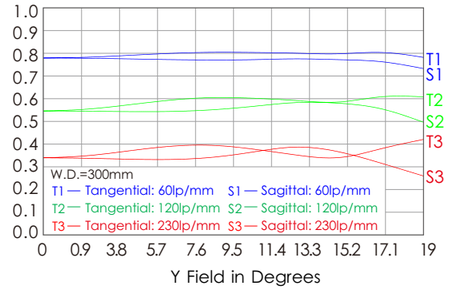


Figure 1-16a



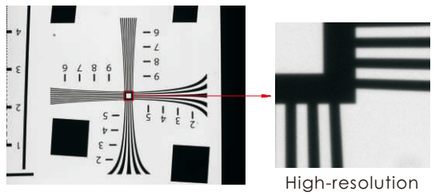


Figure 1-16b

* Resolution as a method of evaluating the imaging quality of an optical system is not well developed, mainly for the following reasons:

①The resolution plate used for resolution detection is a black and white stripe that is very different from the luminance background of the actual object, and the same optical system using the same resolution plate to detect its resolution will vary due to different lighting conditions and receivers.

②Resolution can quantitatively reflect the quality of the optical system such as high and low, but can not reflect the resolution range of the resolution of the quality of good and bad, the same resolution, the optical system of contrast also has a high and low points, high contrast imaging quality is better, can reflect more levels. This is one of the performance indicators that resolution can not reflect.

③Photographic objective lens and other large aberration optical system with resolution plate detection, sometimes there will be a "pseudo-resolution image", that is, the resolution plate of a group of stripes can not be resolved, but a denser group of stripes can be resolved, which is due to contrast inversion caused by. Therefore, the resolution to evaluate the image quality of the optical system is not a strict and reliable image quality evaluation method. However, because it is a single index and easy to measure, it has been widely used in optical system image quality testing.

12. MTF optical transfer function

Considering an object as consisting of a spectrum of different frequencies, that is, expanding the light field distribution function of an object into the form of a Fourier series (the object function is a periodic function) or a Fourier integral (the object function is a non-periodic function). If the optical system is regarded as a linear invariant spatial frequency filter, then the object is imaged by the optical system, can be regarded as the object is transmitted through the optical system, the transmission effect is the frequency is unchanged, but its contrast is reduced, the phase is shifted, and at a certain frequency cut-off, that is, the contrast is zero. This contrast reduction and phase shift is different at different frequencies, the functional relationship we call the optical transfer function. Since the optical transfer function is related to both the aberration of the optical system and the diffraction effect of the optical system, it is used to evaluate the imaging quality of the optical system, which has the advantages of objectivity and reliability, and can be applied to both small aberration optical systems and large aberration optical systems.

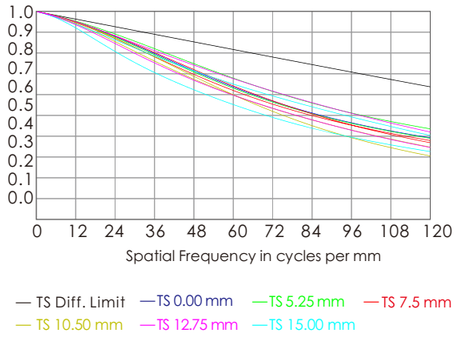


Figure 1-17

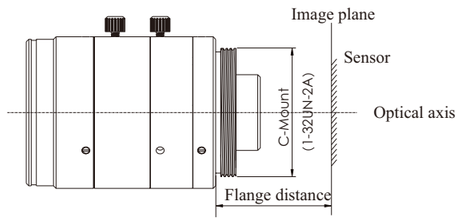
The optical transfer function is a reflection of the ability of an object to transfer different frequency components. Generallyspeaking, the high-frequency component reflects the details of the object, the mid-frequency component reflects the layers of the object, and the low-frequency component reflects the brightness and contour of the object, and the optical system is usually a low-pass filter.Neglecting phase changes and considering only the decrease in contrast of each frequency as it is transmitted through the optical system, it becomes The modulation transfer function (MTF), as shown in Figure 1-17.The following is a brief description of the use of the MTF graph.

* Utilizing MTF curves to evaluate imaging quality:The so-called MTF is an indication of how much the contrast (i.e., amplitude) of a sinusoidal intensity distribution function of various different frequencies decays after being imaged by an optical system. When the contrast of a certain frequency falls to zero, it means that there is no longer a brightness change in the light intensity distribution at that frequency, i.e., the frequency is cut off. This is the main method of using the optical transfer function to evaluate the imaging quality of the optical system.

Figure 1-17 is a graph of MTF over frequency, from the designer's point of view, it is generally believed that the frequency that can be achieved when the contrast drops to 0.3 is the highest resolution performance that the lens can theoretically achieve, which reserves 0.2 of the drop in space to the processing and manufacturing tolerance, when the lens product is completed, the lens in the design frequency, the MTF value will be at least not less than 0.1, which is the camera photoreceptor sensor's operating response threshold.

13. Optical interfaces

Optical interface refers to the lens and the camera connected to the mechanical interface, different sensor size of the camera lens interface is different, accordingly, with the matching lens optical interface also need different types of interfaces, the industry commonly used optical interface has formed a common specification, such as C-mount, CS-mount, F-mount and so on. Various interfaces corresponding to the flange distance, screw parameters, structure type is different, see Table 1, listing the parameters of commonly used optical interface.



OPT-C0620-2M

Figure 1-18

Interface name	Screw tooth parameters	Fixed structure	Flange distance
CS	1-32UN-2A	Thread	12.526 mm
C	1-32UN-2A	Thread	17.526 mm
S	M12×0.5-6g	Thread	-
TFL	M35×0.75-6g	Thread	17.526 mm
TFL-II	M48×0.75-6g	Thread	17.526 mm
T2	M42×0.75-6g	Thread	-
M42	M42×1-6g	Thread	-
M58	M58×0.75-6g	Thread	-
M72	M72×0.75-6g	Thread	-
M90	M90×1-6g	Thread	-
M95	M95×1-6g	Thread	-
A	-	Bayonet(54f	44.5 mm
K	-	Bayonet	45.5 mm
Nikon-F	-	Bayonet	46.5 mm

Table 1

Focusing and extension tube application: The structural component that adjusts the relative position of the lens group or the rear focal length of the optical system to make the image clear is called the focus ring. The figure 1-19 below shows the imaging effect of the focusing ring in various states. Extension tube can be used in the working distance is less than the minimum working distance of the lens to focus the lens, almost no change in the angle of view of the lens, usually installed between the lens and the camera interface.



The focus ring is not adjusted and the image is blurred.

Adjust the focus ring and image sharpness improves.

Continue to adjust the focus ring for the sharpest image.

Over-adjust the focus ring and the image is blurred again.

Figure 1-19

Fixed-focus lens applications and working distances are variable, taking into account the versatility, the design of the focusing ring focusing range will generally be from the nearest working distance (M.O.D.) to the infinity distance. Certain extreme (or special) applications that require the addition of extension tubes to change imaging characteristics are judged to be feasible based on the focusing method of the specific lens. For lenses designed to focus as a whole group, the addition of an extension tube only increases the focusing range of the lens, and the imaging characteristics of the lens itself at various working distances are not affected by this.

For the floating focus design of the lens, adding an extension tube will change the optical structure, breaking the original balance of various aberrations, which will affect the imaging characteristics of the lens at all working distances. Generally is not recommended to increase the extension tube on the floating focus lens, for the back focal length sensitive lens, increase the length of 0.1mm extension tube, the lens imaging will be fatal. Of course, some of the floating focus design of the lens is not sensitive to the back focal length, this time to increase a certain length of the extension tube can also be considered.

In general, the number of extension tubes installed should not exceed 1/5 of the focal length of the lens, zoom lenses and other special lenses are not recommended to install extension tubes, if you add an extension tube, it will affect the image quality.

From the perspective of geometric optics to understand the working distance, magnification, field of view and the relationship between the extension tube, from the principle formula can be derived from formula 2-10 to 2-12.

$$WD=\frac{f'^2}{\beta f'+\Delta X'}+f'-S_H \qquad 2\text{-}10$$

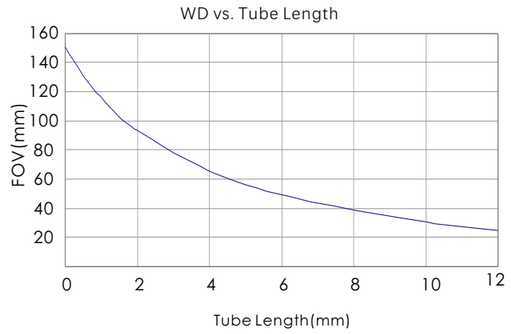


Figure 1-20a

$$\beta=\frac{\Delta X'}{f'}+\beta_0 \qquad 2\text{-}11$$

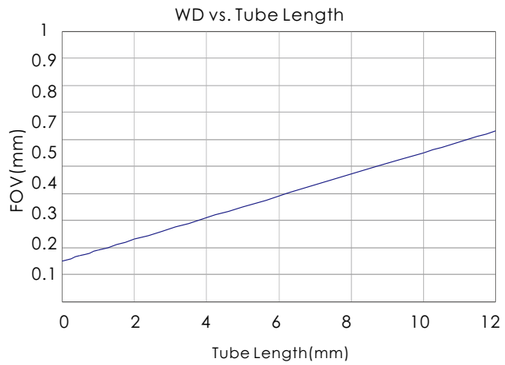


Figure 1-20b

$$FOV=\frac{f'}{\beta_0 f'+\Delta X'}+f'-S_H \qquad 2\text{-}12$$

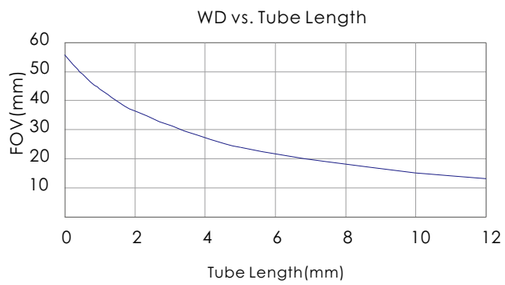


Figure 1-20c

β : Magnification

β_0: Magnification at the closest distance

FOV: Field of view

f′: Image focal length

S_H: Object principal plane

△X′ : Extension tube length

Machine Vision Lens Imaging Exploration

A thorough understanding of lens applications and limitations is required. Firstly, due to the limitations of physics, it is well known that there is no single lens that can meet all application requirements. Long working distance, large field of view, large target area, large aperture, low distortion, high resolution and other performance requirements interact with each other, so the design of the lens must be combined with the application of the targeted design to improve the corresponding optical performance as much as possible.

At the beginning of the establishment of machine vision system, should be combined with the performance of the lens as much as possible to expand the installation space, especially those who need high resolution and high magnification of the system. Usually, the "eye" of the system and its lighting components are determined first, and then the vision part of the centre to configure the electronic components and mechanical structure.

It's difficult for high resolution and large depth of field to coexist. This is because high resolution is negatively correlated with f/#, while large depth of field is positively correlated with f/#. In principle, it is impossible to achieve both very high resolution and large depth of field at the same time, unless compromises are made or more complex solutions are used, such as the use of multiple imaging systems. Secondly, imaging performance is also affected by factors such as the type of lighting used, the size of the sensor pixels or the functionality of the optics. Understanding the factors that really limit the resolution of a system is the only way to select the right lens.

1. Illumination and imaging

Machine vision system in the visual part of another indispensable part of the light source, light from the light source, irradiation to the measured object, and then carry the visual information of the measured object is collected by the lens imaging into the sensor, the controller according to the electrical signals from the sensor image processing analysis to obtain the results.

The main role of lighting in machine vision is to: ① to illuminate the target and improve brightness; ② to create a favourable effect for image processing; ③ to overcome the interference of ambient light and ensure image stability; ④ to be used as a tool or reference for measurement. Good or bad lighting is directly related to whether the vision system can correctly capture useful information.

From the perspective of the optical design of the lens, due to the existence of dispersion of optical glass, the refractive power of optical glass is different at different wavelengths, resulting in different wavelengths of light being focused at different points. This means that due to positional chromatic aberration, the best focusing surface for different wavelengths is not in the same position, as shown in Figure 2-1. The goal of most imaging lens designs is to focus all desired wavelengths on the same plane (achromatic). It is physically impossible to achieve a single plane of focus over a wide spectral range, but it is possible to focus all wavelengths very close to that plane. Although most lenses are designed to be achromatic, with curves similar to Figure 2-1 where the red and blue focus positions are already quite close, this can still be a problem for very small pixels.

Chromatic aberration is a phenomenon whereby the focal length of a lens varies with the wavelength of light. This results in different wavelengths producing different sized light spots on the image plane where the camera sensor is located. The size of the light spot is dependent on the wavelength of light, with red wavelengths producing a small spot, green wavelengths producing a large spot, and blue wavelengths producing the largest spot. This has the effect of reducing contrast in imaging. For broad-spectrum imaging, the lens system must identify the most balanced focus position for all wavelengths. However, this position is not optimal for imaging because none of the wavelengths are truly in focus. If monochromatic light is imaged, positional and magnification chromatic aberration can be eliminated to enhance contrast and achieve the full potential of the lens. As illustrated in Figure 2-2, the MTF value of the full field of view for the blue light wavelength of 486 nm, corresponding to a spatial frequency of 70 lp/mm, is 0.58, while the MTF value of the full field of view corresponding to a spatial frequency of 70 lp/mm when imaging with white light (436 nm-656 nm) is 0.40. From the MTF graph below, it can be seen that blue light MTF> green light MTF> red light MTF> white light MTF .In the absence of any other rigid requirement for the colour of the light source, the blue light source represents the optimal choice for the entire optical system.

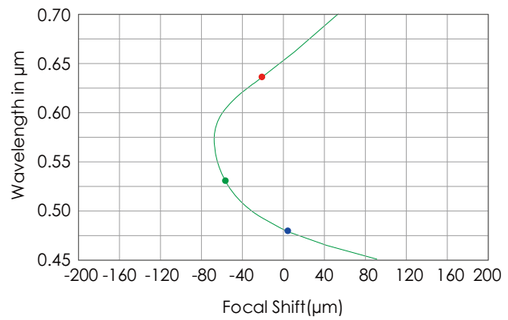


Figure 2-1

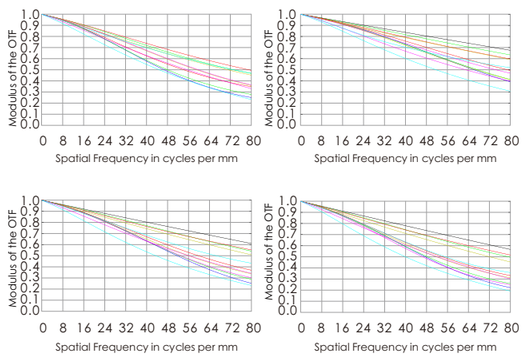


Figure 2-2

2. Sensors and imaging

Mismatched camera and lens combinations can lead to costly waste and performance limitations in machine vision imaging systems. As industrial technology advances, the variety of camera sensors is increasing, and the number of selectable options for pixel size and sensor sensor size is also increasing in different ways; accordingly, the variety of lenses is also increasing, thanks to more advanced manufacturing technologies. Understanding the interplay between camera sensors and lenses is therefore key to the design and implementation of machine vision systems.

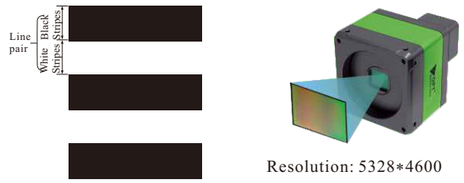


Figure 2-3

A black and white stripe is designated a line pair (illustrated in Figure 2-3). The number of line pairs that can be resolved per millimetre (lp/mm) is typically employed to quantify the resolving power of a lens. With regard to machine vision systems, the resolving limit of the sensor represents one of the principal constraints on its performance. The highest frequency that a sensor can resolve(Nyquist frequency), which is two pixels or one line pair, can be calculated by Equation 2-13(where the unit of pixel size is μm).

$$\text{Sensor resolution(lp/mm)} = \frac{1000}{2*\text{Pixel size}} \qquad 2\text{-}13$$

The formula indicates that a sensor with larger pixels will have a lower ultimate resolution. It can be demonstrated that sensors with smaller pixels have a higher ultimate resolution.

It is generally accepted that smaller pixels are more effective at resolving detail and providing higher resolution, regardless of the presence of diffraction, optical errors, noise or other parameters. Without accounting for diffraction, imaging lenses are designed with aberration, which can blur or shift an image. Imaging lenses are manufactured with manufacturing tolerances, and the corrected aberration changes to a greater or lesser degree, resulting in further blurring or shifting of the image.

The aforementioned imperfections serve to diminish the resolution of the imaging lens. Every imaging lens is subject to an absolute upper performance limit, which is determined by the laws of physics. This limit is determined by the operating f/# of the lens and the wavelength of the light penetrating the lens. It is known as the diffraction limit and is provided in the form of lp/mm. This determines the theoretical maximum resolving power of the lens. Even lenses that are free from design limitations possess a diffraction limit. This limit is the point at which two Airy spot patterns (for further details, please refer to the section entitled "Machine Vision Lens Basics: Resolution" in this publication) can no longer be distinguished from each other. The diffraction limit can be calculated using Equation 2-14.

$$\text{Diffraction Limit(lp/mm)} = \frac{1000}{f/\#*\text{wavelength}} \qquad 2\text{-}14$$

Due to the inherent noise of the sensor, the contrast threshold that it can respond to is typically set at a higher value than 0.1, in order to ensure the reliability and stability of the resulting image. To prevent the occurrence of imaging complications, it is recommended that the contrast target be set to 0.2 or above at the applied critical resolution (lp/mm). In conclusion, the analysis indicates that the limiting resolution achievable by the lens due to aberration, manufacturing process and diffraction limit constrained by the following inequality:

Lens actual limit resolution ≤ theoretical design resolution ≤ diffraction limit

The resolution of the vision system when the lens is used with the sensor is limited by the following equation:

Vision System Limit Resolution = [Min Lens Actual Resolution, Sensor Resolution]

In the formula, the actual resolution of the lens is defined as the resolution corresponding to the measured MTF value of at least 0.1. The limiting resolution of the vision system is jointly determined by the lens and the sensor. In order to obtain stable and reliable image information, the resolution of the lens is generally made higher than that of the sensor.

Figure 2-4 illustrates the relationship between the MTF curve of the optical system (curve I), the optical signal reception threshold curve of the receiver (curve II), and the camera resolution (dotted line). The area enclosed by curves I, II and the dotted line represents the resolution that can be achieved by the visual system of the lens and camera. The larger the area enclosed, the better the imaging quality of the optical system. Figure 2-4a illustrates the lens and camera combination that represents the limit of resolution that can be achieved. As illustrated in the figure, the resolution that the lens is capable of achieving is considerably greater than that of the camera. This combination does not fully leverage the potential of the lens. Figure 2-4b illustrates the resolution of the camera b, which coincides with the intersection of curves I and II. At this point, curve I, curve II, and the area enclosed by the dotted line represent the maximum value, signifying that the optical system and receiver have reached their respective limits of resolution.

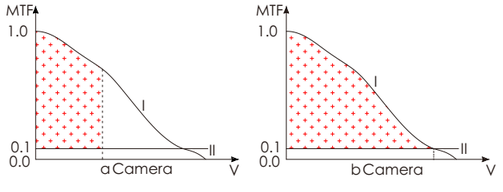


Figure 2-4

The size of the sensor pixels affects the contrast of the imaging. As illustrated in Table 2, images captured with larger pixels exhibit superior system-level contrast. As the pixel size is reduced, the contrast decreases rapidly. In a machine vision system, it is optimal to maintain a contrast ratio above 20%. Contrast below this threshold is highly susceptible to noise fluctuations caused by temperature changes or illumination crosstalk.

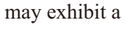
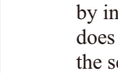
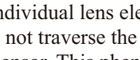
Pixel size / contrast ratio	2.2 μm	3.45 μm	3.45 μm
Resolution test board (four pixels per feature)			
contrast ratio	24.5%	60.5%	70.6%
Resolution test board (each feature occupies four pixels)			
contrast ratio	18.1%	35.2%	41.3%

Table 2

It is also important to consider that as the number of pixels per feature increases from one to two, the contrast rises significantly, particularly when the pixels are small, the frequency is halved, and the size of the smallest resolvable object is doubled. Should one be compelled to view individual pixel levels, it is recommended that the optical magnification be doubled and the field of view be halved. This would result in feature sizes capable of covering twice as many pixels and the contrast would be much higher. The disadvantage of this solution is that the overall field of view is reduced. From an image sensor perspective, the best practice is to keep the pixel size the same and double the size size of the image sensor, e.g. an imaging system using a 1/2″ sensor with a pixel size of 2.2 μm at 1X magnification has the same field of view and spatial resolution compared to another system using a 1″ sensor with a pixel size of 2.2 μm at 2X magnification, but the theoretical contrast of the 2X system is doubled.

3. Relative aperture (f/#) and imaging

1.Relative aperture (f/#) and effect on relative illumination

The reciprocal of the relative aperture is the aperture, which is an important indicator parameter for measuring the amount of light passing through the lens. A change in the relative aperture (f/#) will result in a corresponding alteration in the relative illumination and depth of field. The effect of relative aperture (f/#) on relative illumination will now be explored. The curves depicted in Figure 2-5a illustrate the relative illumination curves under varying relative apertures (f/#). As the relative aperture (f/#) increases, the relative illumination generally increases.

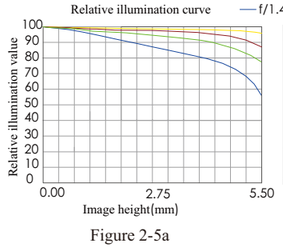


Figure 2-5a



Figure 2-5b

Attenuation when the aperture is reduced, as it is contingent upon the angle of light (as opposed to the number of rays passing through the lens). This phenomenon is particularly noticeable in short-focus (large field of view)lenses, where the image plane illumination decreases as the fourth power of the cosine of the field of view angle in the absence of vignetting. It is common for lenses to exhibit an illumination distribution that is highest in the middle of the field of view, with a subsequent plateau or decrease in illumination towards the edges. In exceptional circumstances, the relative illumination within the image circle may exhibit a slight increase.

Vignetting is the consequence of light that is obstructed by individual lens elements or mechanical spacers and does not traverse the entirety of the lens system to reach the sensor. This phenomenon of light interception may be intentional or unintentional, and in some cases unavoidable. Vignetting is most frequently observed in lenses with low relative apertures (f/#), short focal lengths, or lenses that must achieve high resolution at a reduced cost.

Figures 2-6 and 2-7 illustrate the variation in MTF curves for the same 60 mm lens with and without blocking light. It can be observed that the sacrifice of relative illumination can effectively enhance image quality. This phenomenon is one of the reasons why most lenses exhibit a darker appearance at their edges than in the centre.

Figure 2-6

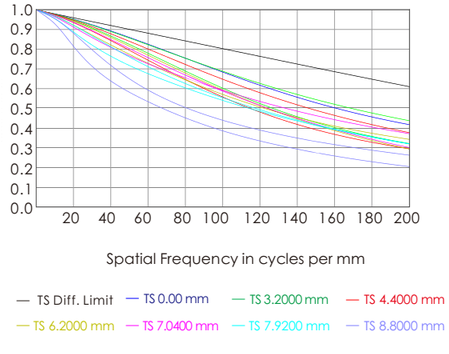


Figure 2-7

2. Effect of aperture (f/#) on MTF

The relative aperture controls the light intake of the lens. Increasing the relative aperture will reduce the light intake of the lens. For imaging, it can reduce the effect of aberration to a certain extent, thus improving the imaging performance. As can be seen from Figures 2-8, the relative aperture from F1.6 to F5.6 results in a significantly improved MTF curve. However, when the relative aperture reaches F8.0, the MTF curve begins to decline, which is attributed to the diffraction effect that constrains the limiting frequency of the optical system. 2-9 illustrates the variation in MTF performance of the lens corresponding to different relative apertures. It can be observed that increasing the relative aperture can enhance spatial frequency to a certain extent. However, beyond a certain threshold, the spatial frequency of the lens begins to decline due to diffraction effects.

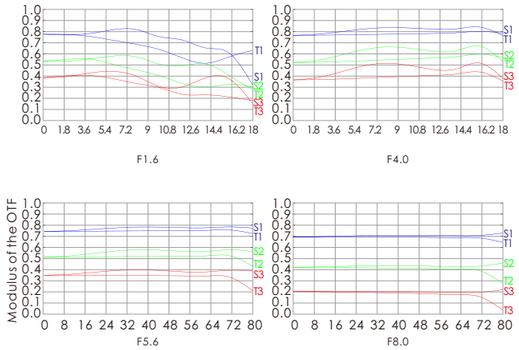


Figure 2-8

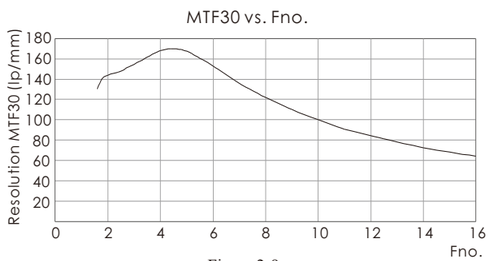


Figure 2-9

3. Effect of relative aperture (f/#) on depth of field

It can be observed that the relative aperture (f/#) of a lens has an effect on the depth of field, as illustrated in Figures 2-10a and 2-10b. The depth of field and depth of focus plots for the same lens at different relative apertures (f/#) are presented. Figure a illustrates the size of the object corresponding to the diameter of the lens' allowable diffuse spot. As the object continues to move away from the optimal focus position, the object details move into a cone with a wider angle of view. The greater the extent to which the cone is dispersed, the more blurred the boundary between the information from the lens at that distance and all other information in its surroundings. The relative aperture (f/#) of the lens determines the rate at which the cones expand, and thus the extent to which the actual information or detail is blurred into a patch at a given distance.

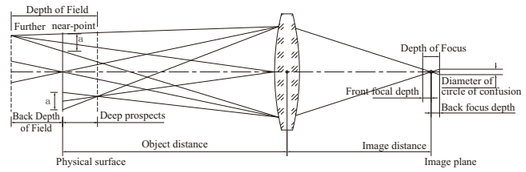


Figure 2-10a f/#=2.8

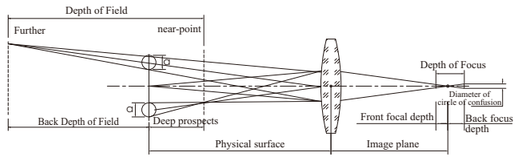


Figure 2-10b f/#=5.6

As the details become less, the beams in Figures 2-10a and 2-10b move closer together, thereby accelerating the aforementioned effect. Finally, it should be noted that an increase in the relative aperture (f/#) may result in the blurring of smaller details due to the diffraction limit of the lens. This is because the limiting resolution of the lens is inversely proportional to the relative aperture (f/#). This limitation implies that while increasing the relative aperture (f/#) will always enhance the depth of field, the dimensions of the discernible features (even at optimal focus) will also become larger. In response, the utilisation of short wavelengths is employed in a manner that recovers the loss of resolution. In general, when the lens is focused at short working distances, a large cone angle causes the cone to diverge very quickly on either side of the optimum focus point, resulting in a limited depth of field. For objects focused at longer working distances, the beam hopping rate decreases, resulting in an increase in depth of field.

4. Telecentric lens and depth of field

A common misconception is that telecentric lenses are capable of achieving a greater depth of field than conventional lenses. Although depth of field is ultimately determined by the wavelength and relative aperture (f/#) of the lens, a telecentric lens can indeed have a greater usable depth of field than a conventional lens due to the presence of symmetrical blur on either side of the optimal focal point. As the detected component is offset from the lens, it will follow the field of view (chief ray) associated with it. In a non-telecentric lens, the movement of an object in or out of focus results in the formation of symmetrical blurred areas in the component due to parallax and a change in magnification associated with its field of view. However, telecentric lenses produce symmetrical blur patterns when there is no field of view component. In practice, this implies that features such as edges retain their centre-of-mass position. Accurate measurements can be made when the object is out of optimal focus, provided that contrast is maintained at a level sufficient to support the proper functioning of the algorithms used in the machine vision system.

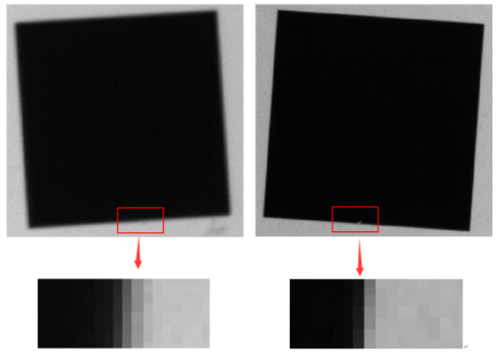


Figure 2-11a Figure 2-11b

Looking at the grayscale plot of the image of the line profile extracted from the edge of the part (as shown in Figure 2-12), the slope of the slightly defocused image is much more gradual as the edge of the pin is spread over multiple pixels. Since the telecentric lens produces a symmetrical blur, the blur pattern is still usable because the centroid has not moved and the amount of sub-pixel interpolation required is reduced. This reduces the sensitivity to grayscale fluctuations due to sensor noise and allows the pin center location to be found more reliably and repeatedly.

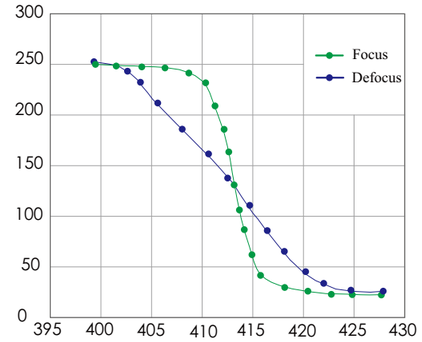


Figure 2-12

5. Lens and camera matching

1) Maximum compatible camera sensor size

The maximum compatible camera sensor size refers to the range of maximum clear imaging that the lens is capable of supporting. When selecting a camera and lens, it is important to note that the maximum compatible sensor size of the selected lens should be greater than or equal to the size of the selected camera sensor.

The following section presents compatibility notes for common lenses and camera sensors.

Lenses \ camera	1″	2/3″	1/2″	1/3″	1/4″
1″	OK	OK	OK	OK	OK
2/3″	×	OK	OK	OK	OK
1/2″	×	×	OK	OK	OK
1/3″	×	×	×	OK	OK

Table3

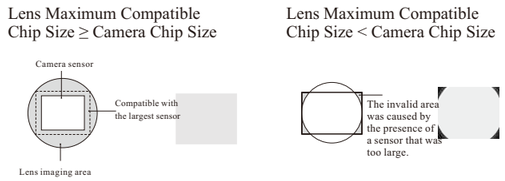


Figure 2-13

2) Backward Compatibility

The resolution of the lens and the flange distance can be made compatible with the demands of Cameras for small needs. For instance, a five-million-resolution lens can be paired with a sensor size similar to that of a two-million-resolution camera. Similarly, a twenty-million-resolution lens can be paired with a sensor size similar to that of a ten-million-resolution camera. This allows the overall vision system to achieve the resolution of the camera. However, the lens's high-resolution performance is not evident in this configuration. Nevertheless, the image's contrast is significantly enhanced, which benefits the back-end image processing.

Once the camera selection has been made, the lens interface and flange parameters have been established, the range of lens options is significantly reduced. At this juncture, the adapter ring extension tube and other accessories may be employed. The most prevalent of these is the conversion between C-Mount and CS-Mount, whereby a C-Mount interface lens can be utilised in conjunction with a CS-Mount camera. Furthermore, a 5mm extension tube can be employed with a CS-Mount camera. Additionally, there are F-Mount to M42 and M58 interfaces, as well as C-Mount to M42 interfaces, which can be consulted with our technical staff for specific applications.

Lens Selection Guide

The selection of an appropriate lens is of paramount importance for the machine vision system to fulfil its intended role. The lens selection process is a gradual process of elucidating the parameters of the lens. As an imaging device, the lens is typically situated in conjunction with the light source, with the camera forming a unified system for image acquisition. Consequently, the lens selection process must align with the requirements and constraints of the entire system. In general, the following aspects should be considered when analysing the lens. For the system to be fully functional, the lenses must be able to meet the requirements in order to do so. When selecting lenses for a control system, machine vision integrators should consider four main factors: the type and characteristics of the objects that can be detected; the depth of field or focal length; the loading and detection distance; and the operating environment.
By analysing these four factors, it is possible to determine the most appropriate lens choice for a specific application.

1. Wavelength, zoom or not

The working wavelength of the lens and whether the need for zoom is relatively easy to determine first. If you need to change the magnification, you can use a zoom lens; otherwise, use a fixed-focus lens.
Regarding the operating wavelength of the lens, it is common to see visible light bands, but there are also other bands. Are additional light filtering measures required? Monochromatic or multicoloured light? Can you effectively avoid the impact of stray light? Consider these issues clearly, and then determine the working wavelength of the lens after a comprehensive measurement.

2. Priority consideration for special requirements

In addition to the application's intrinsic characteristics, there may be specific requirements that require clarification. For instance, it is necessary to ascertain whether there is a measurement function, whether the use of telecentric lenses is required, and whether the depth of field of the image is large. While depth of field is often overlooked, it is a crucial aspect to consider when developing any imaging system.

3. Working distance, focal length

It is often the case that working distance and focal length are considered in combination. This concept can be generally applied as follows: firstly, the resolution of the system can be clarified, combined with the CCD pixel size, the magnification can be known, and then combined with the spatial structure constraints, the approximate object distance can be known, and the focal length of the lens can be further estimated. The focal length of the lens is therefore related to the working distance of the lens and the system resolution (and CCD pixel size).

4. Diaphragm and Interface

The aperture of the lens has a significant impact on the brightness of the image plane. In modern machine vision systems, the final image brightness is determined by a number of factors, including the aperture, camera gain, integration time, light source, and so on. In order to achieve the desired image brightness, a number of additional adjustments can be made.
The lens interface must be compatible with the camera interface. This means that they must match, and cannot be directly connected. In this case, an adapter must be considered.

5. Cost and technological maturity

In the event that, following an evaluation of the aforementioned factors, more than one option is deemed to satisfy the requisite criteria, the relative costs and maturity of the technology in question can be taken into account in order to facilitate a comparison and the identification of the optimal solution.
For example, the coin detection imaging system with optional lens, constraints: camera CCD2/3", pixel size 4.65μm; C-mount working distance greater than 200mm, the system resolution of 0.05 mm. light source using white LED light source.

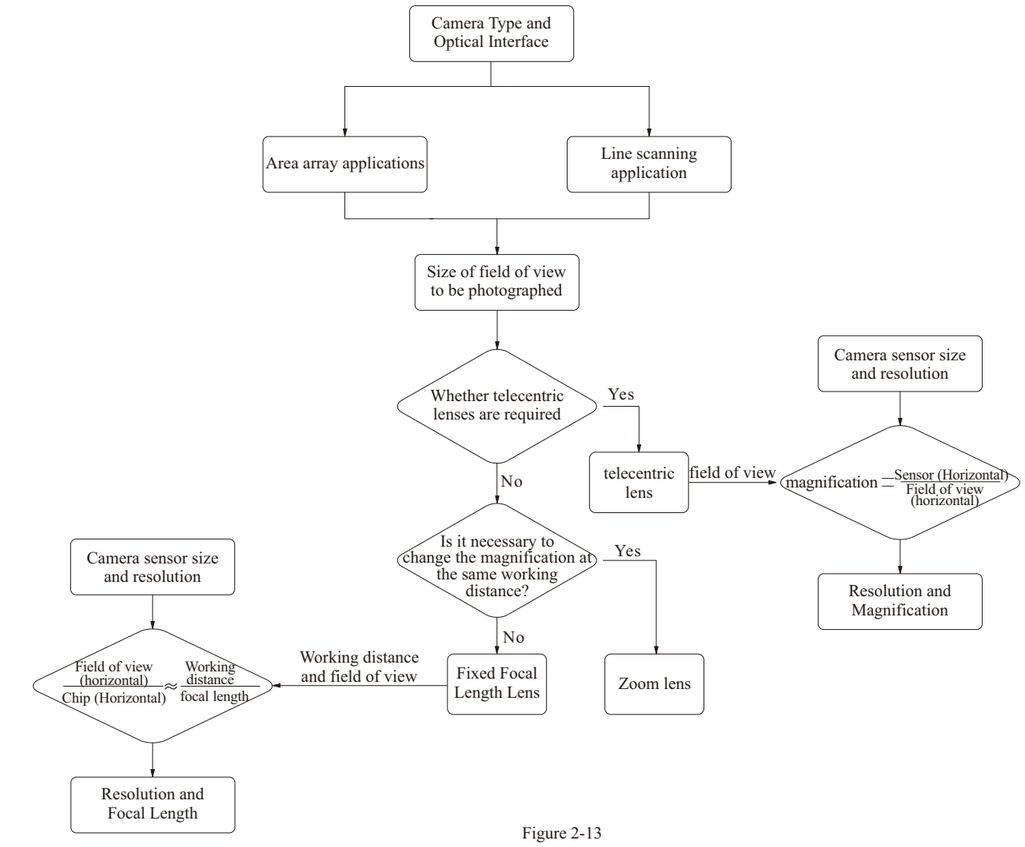


Figure 2-13

Note 1: The selection guide is for reference only; the actual selection involves many factors such as the size of the depth of field, space limitations, operating temperature, etc., which cannot be listed.

1. Based on the flowchart guidelines, the specific analysis steps are as follows:

① When using a white LED light source, the lens should be in the visible light band. There is no need to zoom, just choose a fixed focal length lens.

② Used for industrial inspections where there is a measurement function and therefore the selected lens requires less distortion.

③ Working distance and focal length

Magnification of imaging

PMAG=4.65/(0.05×1000)=0.093

Focal length f ′=L×M/(M+1)=200 x 0.093/1.093 = 17mm;

If the object distance is greater than 200mm, then the selected lens should have a focal length greater than 17 mm.

④ The image plane of the selected lens should not be smaller than the CCD size, i.e. at least 2/3″.

⑤ The lens interface must be a C-mount that can be used with the camera. No requirements for the aperture. Calculations from the above aspects of the analysis can first be derived from the lens "profile": focal length greater than 17mm, fixed focus, visible light band, C port, at least when using a 2/3″ CCD, and image distortion should be small. In accordance with these requirements, you can further select, if a variety of lenses can meet these requirements, you can choose the best.

2. Line Scan Selection Calculations

Line scan lenses, also known as line array lenses, are paired with line scan cameras to form line scan systems. The working principle of the line scanning system is similar to the copying and scanning process of a printer, and is mainly used for occasions where there is relative motion between the object to be measured and the camera.

Through the line scan camera high-speed acquisition, each time after the acquisition of a line just after the movement to the next unit of precision length, continue the next line acquisition, so after a period of time will be put together into a two-dimensional similar to the surface array camera captured images, the difference is that the height can be infinitely long. You can then use the software to cut this 'infinite length' image into a specific height of the image, for real-time processing or into the cache for later processing. Line scan cameras are characterised by a linear arrangement of sensor sensors. Common line scan cameras are generally classified in terms of resolution as 1K, 2K, 4K, 8K, 12K, 16K, with pixel sizes of 3.5 μm, 5 μm, 7 μm, 10 μm, 14 μm and sensor sizes ranging from 14 mm to 80 mm. Therefore, one of the most important features of line scan lenses is the relatively large image plane size, and common sizes on the market are 43.2 mm, 60 mm, 80 mm, and so on.

With the widespread popularity of machine vision and the improvement of speed and accuracy requirements of industrial assembly line, line scanning system is widely used in machine vision system. Selection of machine vision lens for line scanning system: first, according to the detection accuracy and speed requirements of the system, determine the resolution and line scanning speed of the line array CCD camera, and at the same time determine the corresponding acquisition card; then, according to the lens interface of the line array camera and the field of view requirements of the detected workpieces to consider the selection of lenses; finally, according to the application environment of the detected workpieces and the detection target to determine the selection of light source.

Example: A field of view of 140mm is required using a Dalsa 4K camera with a sensor size of 28mm (4K7 μm), a camera flange distance of 12mm and a working distance of approximately 300mm. The details are analysed below:

(1) Calculation of magnification

Magnification = sensor size/field of view=28/140=0.2X

(2) Working distance estimation

Select the lens according to the calculated magnification and sensor size, usually there may be different focal lengths for the same magnification, the working distance WD can be estimated from equation 2-15 and equation 2-16.

$$L=\frac{f'}{\beta}+f' \qquad 2\text{-}15$$

$$WD\approx L-S_H \qquad 2\text{-}16$$

Note: The formula L refers to the object distance, the distance from the object to the main plane of the object; refers to the distance from the foremost end of the SH lens machine to the main plane of the object (as shown in Figure 2-14).

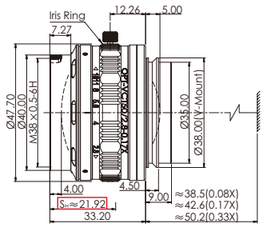


Figure 2-14

An example of the
OPT-VCT50/2.8: WD=50÷0.2+50-21.92=278 mm

An example of the
OPT-VCT60/4.0：WD=61.5÷0.2+61.5-28.03=340.97 mm

The most suitable lens is then selected according to the working distance limitations.

3. Determine the length of the extension tube EXT

Once the lens has been determined, the splice length EXT must be calculated and determined. This can be calculated using equations 2-17 and 2-18.

$$FBL\approx(\beta-\beta_0)*f'+FBL_0 \qquad 2\text{-}17$$

$$EXT=FBL-FBL_C \qquad 2\text{-}18$$

Note: β refers to the magnification, with the index 0 indicating the base magnification, referring to the magnification indicated in the lens catalogue parameter table; FBL refers to the flange distance, with the index 0 indicating the flange distance of the lens corresponding to the base magnification, referring to the flange distance indicated in the lens catalogue parameter table; the index c indicates the flange distance of the camera; EXT refers to the extension length.

Take the OPT-VCT50/2.8 as an example:
FBL≈(0.2-0.17)*50+42.6=44.1 mm—Based on 0.17X
Or FBL≈(0.2-0.08)*50+38.5=44.5 mm— Based on 0.08X
Or FBL≈(0.2-0.33)*50+50.2=43.7 mm—Based on 0.33X
Latest EXT=44-12=32 mm

4. Determine the splice ring

Lens interface V38, camera interface M42, so you need a V38 to M42 adapter ring. In order to make the lens in the use of convenience, the need for a focusing tube, focusing tube length is with a certain range of adjustment, the remaining length of the adapter EXT by the extension tube. Typical fitting combination diagram (shown in image 2-15).

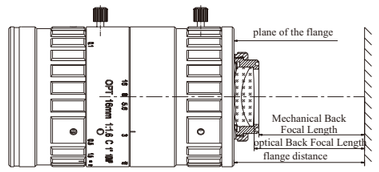


Figure 2-15

Select OPT-ADP-V38M42-E18/23 according to the splice length of 32 mm; select OPT-ETB-M42E6 (two) for the remaining splice length so that the combined splice length is 30 mm to 35 mm.

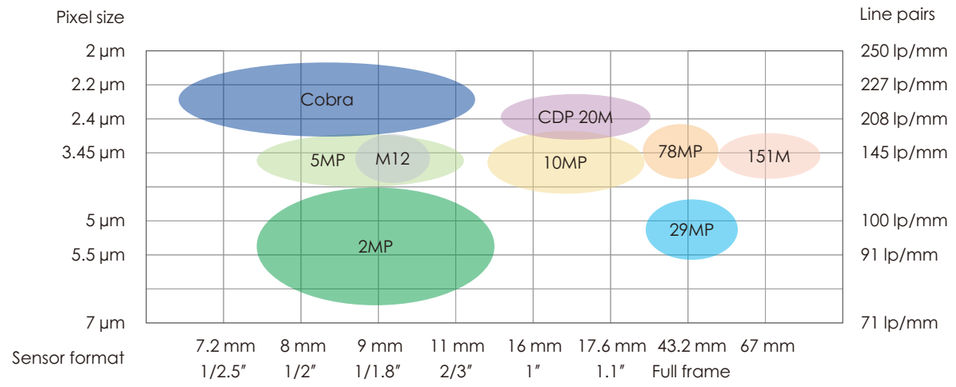
5. Output programmes

Lens:OPT-VCT50/2.8-0.17X
Working distance:278 mm
Extension Tube:OPT-ADP-V38M42— One
OPT-ETB-M42E6 — Two

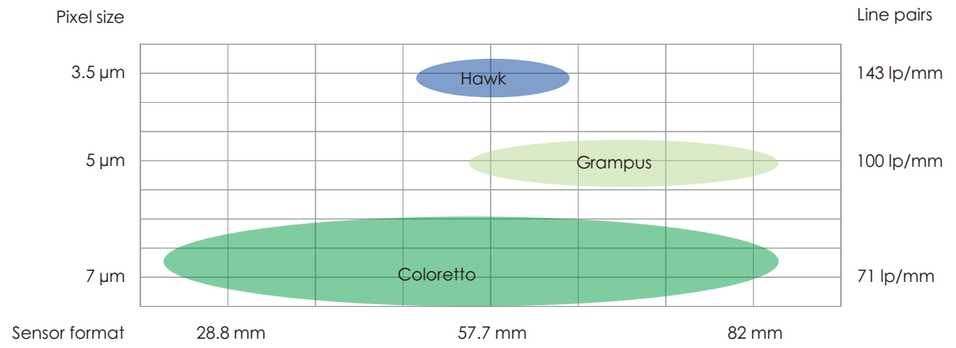
OPT line scanning lenses support 2K to 16K almost all types of industrial line array cameras, with high resolution up to 100 lp/mm, ultra-low distortion, target size covers a wide range of good chromatic aberration correction ability. Covering a wide range of magnification to meet the needs of AOI, printing inspection, non-woven inspection, electronics manufacturing, food packaging and quality assurance, screening and colour sorting and other types of line array inspection, and can provide customers with better lens product selection services, to help customers to better complete the project.

Pixel-sensor size matching diagram

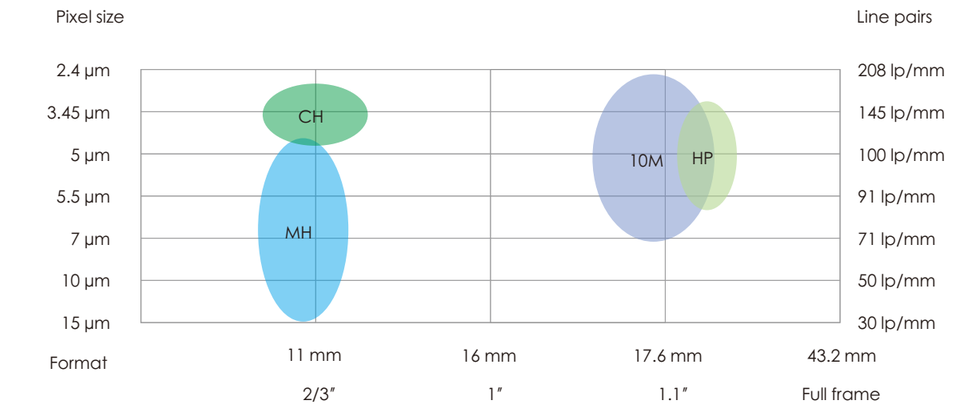
Fixed focus series



Line Scan Series



Telecentric Series



Coloretto Series Line Scan Lenses



Product Features

High standard optical design
Achromatic design with wide spectrum range from 400 to 700 nm; compatible with the line scan camera of 7 µm pixel size.

Low distortion
Total distortion < 0.60%[1].

Wide image circle range
Ø30 mm - Ø82 mm.

Magnification
Range: 0.01X - 0.33X; suitable for various industrial applications.

[1] Distortion at primary magnification.

Selection Guide

OPT-VCT60/5.6-0.17X

- 0.17X primary magnification
- Maximum Aperture:F5.6
- 60 mm±5% focal length
- Coloretto series line scan lenses
- V: V-Mount M: M-Mount
- Brand name

Resolution Comparison

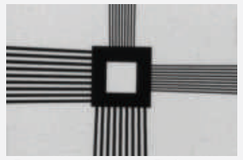


Image taken by Coloretto

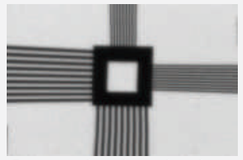
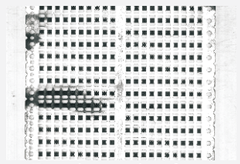


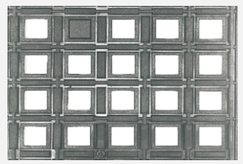
Image taken by other lens

Application Cases


Mobile phone screen scratches inspection


Plug surface inspection


Burr inspection for LED sensors


Locating objects in a tray

Model Table

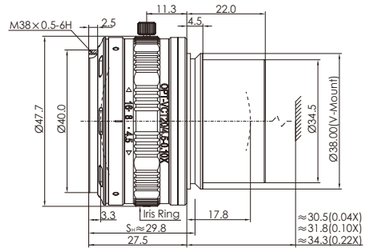
No.	Model	Focal length (mm)	Aperture range	Sensor Ø (mm)	Mount	Weight (kg)	Distortion	Mag.	WD (mm)	Flange focal distance (mm)	Object to image distance (mm)
1	OPT-VCT20/4.5-0.10X	21	F4.5-F16	30	V38	0.14	0.20%	0.04X	510.7	30.5	568.7
							0.60%	0.10X	206.2	31.8	265.5
							0.95%	0.22X	90.7	34.3	152.5
2	OPT-MCT28/4.0-0.1X	28	F4.0～F22	30	M42	0.2	0.55%	0.01X	2794.0	22.0	2865.8
							0.5%	0.10X	275.9	22.0	350.1
							0.4%	0.28X	95.9	22.0	175.2

Model Table

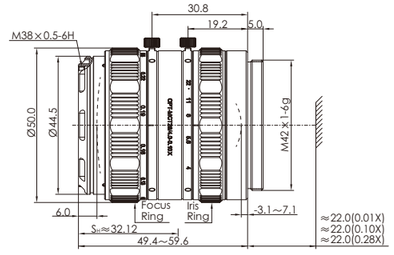
No.	Model	Focal length (mm)	Aperture range	Sensor Ø (mm)	Mount	Weight (kg)	Distortion	Mag.	WD (mm)	Flange focal distance (mm)	Object to image distance (mm)
3	OPT-MCT35/4.5-0.10X	35	F4.5-F16	30	M42	0.15	0.25%	0.04X	878.3	12	943.2
							0.20%	0.10X	355	12	420.3
							0.30%	0.16X	226.3	12	291.4
4	OPT-MCT40/4.0-0.10X	40	F4.0-F22	30	M42	0.17	0.46%	0.04X	1003.6	12	1072.7
							0.09%	0.10X	404.6	12	475.1
							0.32%	0.16X	258.4	12	329.0
5	OPT-MCT40/4.5-0.08X	40	F4.5-F22	60	M42/M58 M72	0.53	0.35%	0.01X	4146.4	46.5	4250.3
							0.22%	0.08X	522.4	46.5	629.3
							1.60%	0.26X	162.7	46.5	277
6	OPT-MCT50/4.8-0.10X	50.6	F4.8-F22	60	M58	0.50	0.18%	0.04X	1287.4	20	1388.6
							0.20%	0.10X	528.5	20	632.6
							0.22%	0.16X	338.7	20	445.8
7	OPT-VCT60/5.6-0.17X	60	F5.6-F22	63	V38	0.14	0.60%	0.05X	1232	49.8	1312.2
							0.16%	0.17X	385.5	56.9	473.9
							0.18%	0.31X	226.2	65.3	322.9
8	OPT-VCT80/5.6-0.1X	80	F5.6-F45	63	V38	0.14	0.14%	0.04X	2048.9	70.7	2149.5
							0.09%	0.10X	851.4	75.5	956.8
							0.35%	0.25X	371.4	87.4	488.7
9	OPT-VCT100/5.6-0.17X	100	F5.6-F45	82	V38	0.14	0.05%	0.08X	1269.1	100.2	1400.8
							0.05%	0.17X	672.1	108.5	812.1
							0.13%	0.33X	372.1	125.2	528.8

Dimensions (mm)

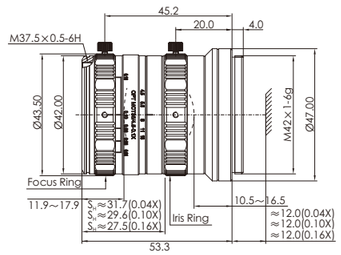
1.OPT-VCT20/4.5-0.10X



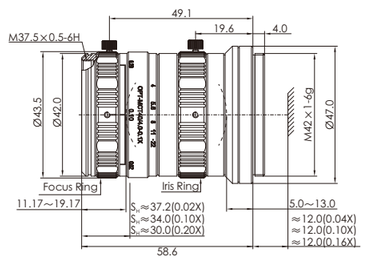
2.OPT-MCT28/4.0-0.10X



3.OPT-MCT35/4.5-0.10X

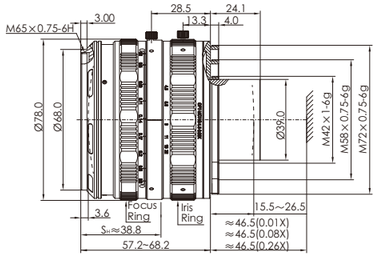


4. OPT-MCT40/4.0-0.10X

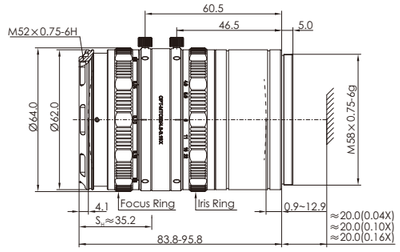


Dimensions (mm)

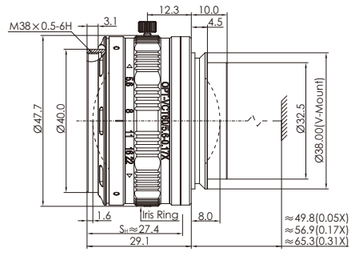
5.OPT-MCT40/4.5-0.08X



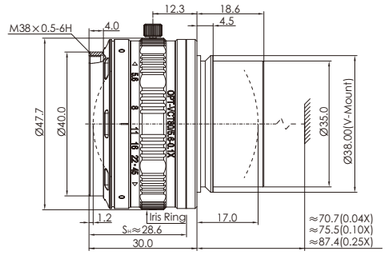
6. OPT-MCT50/4.8-0.10X



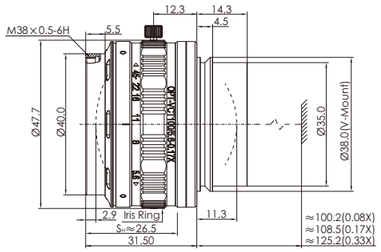
7.OPT-VCT60/5.6-0.17X



8.OPT-VCT80/5.6-0.1X



9.OPT-VCT100/5.6-0.17X



Hawk Series Line Scan Lenses



Product Features

- **High resolution**
  High resolution optical design; Ø63 mm sensor[1], compatible with (16k) 3.5 µm, (12k) 5 µm, and (8k) 7 µm line scan cameras
- **Low distortion**
  Total distortion < 0.22%[2], Min. distortion as low as 0.005%
- **High uniformity**
  High relative illumination across the entire image with low vignetting
- **Wide magnification range**
  0.02X - 2.1X

[1] Up to Ø126 mm sensor for OPT-VHK116/8.6-2.0X
Up to Ø58 mm sensor for OPT-MHK40/4.2-0.10X
[2] Distortion at primary magnification

Selection Guide

OPT-VHK120/5.8-1.0X

- 1.0X primary magnification
- Maximum Aperture:F5.8
- 120 mm±5% focal length
- Hawk series line scan lenses
- V: V-Mount M: M-Mount
- Brand name

Resolution Comparison


Image taken by Hawk


Image taken by other lens

Application Cases

FPC position cutting


Film hole inspection on mobile cover

Capacitor surface inspection

Barcode reading on PCB

Model Table

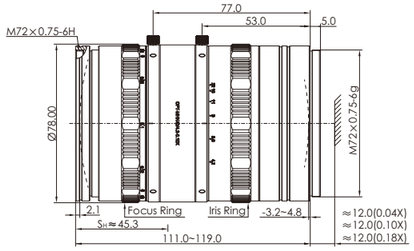
No.	Model	Focal length (mm)	Aperture range	Sensor Ø (mm)	Interface	Weight (kg)	Distortion	Mag.	WD (mm)	Flange focal distance (mm)	Object to image distance (mm)
1	OPT-MHK40/4.2-0.10X	40	F4.3-F32	58	M72	1.00	< 0.87%	0.04X	996.9	12.0	1121.6
							< 0.85%	0.10X	395.6	124.6	522.7
							< 0.82%	0.18X	217.5	128.1	347.7
2	OPT-MHK60/5.1-0.07X	60	F5.1-F22	63	M72	1.06	0.15%	0.02X	3017	12	3149.8
							0.22%	0.07X	874	12	1009.8
							0.28%	0.15X	417	18	557.6
3	OPT-VHK98/3.9-0.23X	98.7	F3.9-F32	63	V58	0.51	0.2%	0.21X	497.9	88	648.8
							0.04%	0.23X	456.9	90	609.8
							0.15%	0.26X	407.6	93	563.5
4	OPT-VHK116/4.3-0.5X	116	F4.3-F32	63	V58	0.65	0.07%	0.475X	289.5	121.8	474.2
							0.005%	0.50X	277.5	124.6	465
							0.1%	0.53X	264.5	128.1	455.5

Model Table

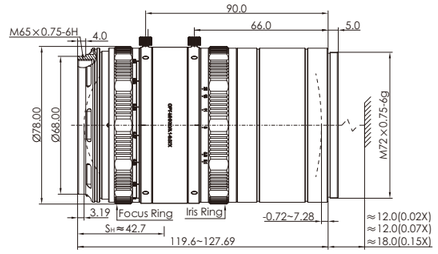
No.	Model	Focal length (mm)	Aperture range	Sensor Ø (mm)	Interface	Weight (kg)	Distortion	Mag.	WD (mm)	Flange focal distance (mm)	Object to image distance (mm)
5	OPT-VHK116/5.4-0.67X	116	F5.4-F45	63	V58	0.68	0.023%	0.64X	219.6	168	454.6
							0.018%	0.67X	212.6	171	450.6
							0.058%	0.7X	204.4	174.8	446.2
6	OPT-VHK120/5.8-1.0X	120	F5.8-F45	63	V58	0.61	0.07%	0.97X	172	172.4	407.3
							0.01%	1.0X	168.5	175.8	407.2
							0.1%	1.04X	164	180.4	407.3
7	OPT-VHK116/8.6-2.0X	116	F8.6-F64	126	V58	0.63	0.07%	1.9X	100.2	293.3	456.4
							0.008%	2.0X	97.1	305	465
							0.06%	2.1X	94.5	316.1	473.5

Dimensions (mm)

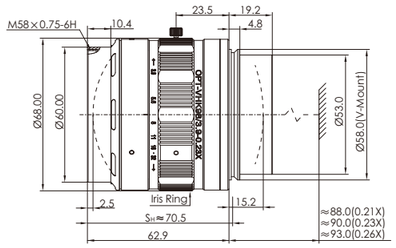
1.OPT-MHK40/4.2-0.10X



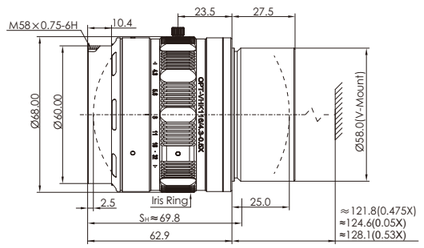
2.OPT-MHK60/5.1-0.07X



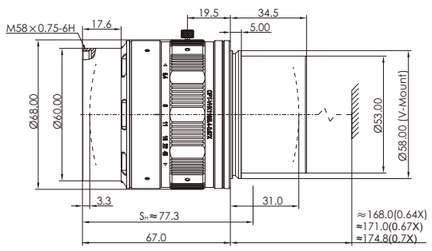
3.OPT-VHK98/3.9-0.23X



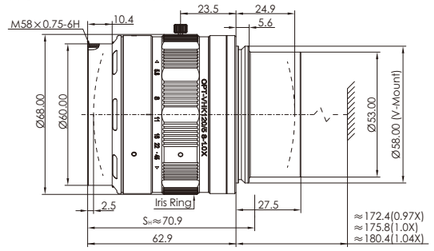
4.OPT-VHK116/4.3-0.5X



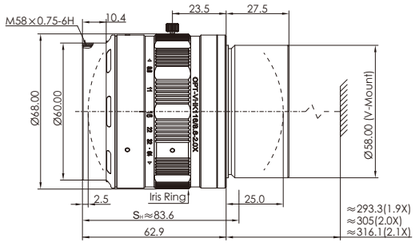
5.OPT-VHK116/5.4-0.67X



6.OPT-VHK120/5.8-1.0X



7.OPT-VHK116/8.6-2.0X



Grampus Series Line Scan Lenses NEW



Product Features

- **Large image circle**
  High resolution optical design; Ø82 mm sensor, compatible with (16k) 5 µm, (12k) 5 µm, and (8k) 7 µm line scan cameras
- **Low distortion**
  Total distortion < 0.028%[1], Min. distortion as low as 0.01%
- **Wide magnification range**
  0.22X - 1.56X

[1] Distortion at primary magnification.

Resolution Comparison

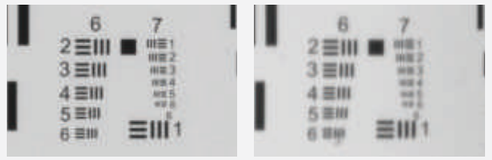


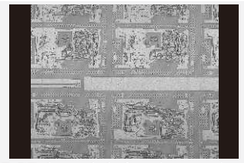
Image taken by Grampus | Image taken by other lens

Selection Guide

OPT-VGP116/3.2-1.5X

- 1.5X primary magnification
- Maximum Aperture:F3.2
- 116 mm±5% focal length
- Grampus series line scan lenses
- V-Mount
- Brand name

Application Cases



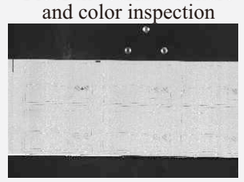
PCB board defect inspection



Floor tile surface texture and color inspection



Optical film defect inspection



Film printed circuit inspection

Model Table

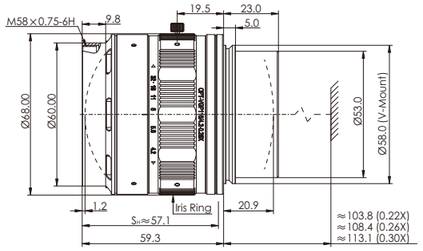
No.	Model	Focal length (mm)	Aperture range	Sensor Ø (mm)	Interface	Weight (kg)	Distortion	Mag.	WD (mm)	Flange focal distance (mm)	Object to image distance (mm)
1	OPT-VGP116/4.2-0.26X	116	F4.2-F32	82	V58	0.54	0.177%	0.22X	586.8	103.8	751.5
							0.012%	0.26X	504.8	108.4	674.5
							0.169%	0.30X	444.8	113.1	623.8
2	OPT-VGP116/4.2-0.33X	116	F4.2-F32	82	V58	0.53	0.085%	0.29X	462.5	116.4	639.5
							0.010%	0.33X	414.5	120.9	596
							0.107%	0.38X	367.5	126.8	554.8
3	OPT-VGP116/4.8-0.5X	116	F4.8-F22	82	V58	0.52	0.122%	0.425X	353.0	131.3	542.5
							0.028%	0.50X	312.1	140	510.3
							0.090%	0.60X	273.4	151.6	483.2

Model Table

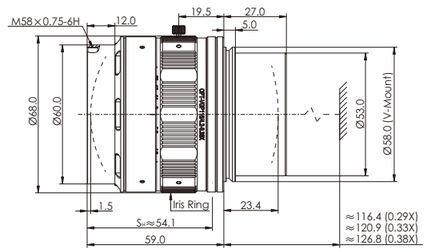
No.	Model	Focal length (mm)	Aperture range	Sensor Ø (mm)	Interface	Weight (kg)	Distortion	Mag.	WD (mm)	Flange focal distance (mm)	Object to image distance (mm)
4	OPT-VGP116/4.8-0.75X	116	F4.8-F22	82	V58	0.50	0.08%	0.65X	248.4	176.9	485.4
							0.01%	0.75X	224.6	188.5	473.2
							0.04%	0.85X	206.4	200.1	466.6
5	OPT-VGP116/4.8-1.0X	116	F4.8-F22	82	V58	0.53	0.060%	0.875X	200.4	200.1	462.4
							0.003%	1X	183.8	214.6	460.4
							0.045%	1.125X	170.9	229.1	461.9
6	OPT-VGP116/3.2-1.5X	116	F3.2-F22	82	V58	0.68	0.058%	1.43X	140.2	245.8	446.2
							0.018%	1.5X	136.4	254	450.6
							0.023%	1.56X	133.4	261	454.3

Dimensions (mm)

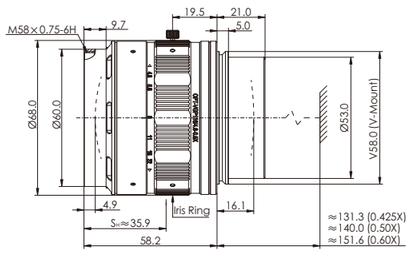
1.OPT-VGP116/4.2-0.26X



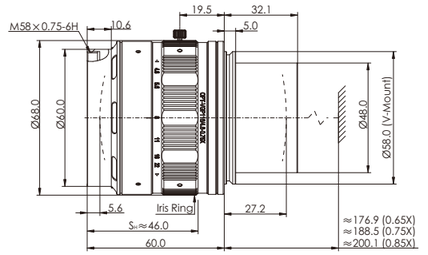
2.OPT-VGP116/4.2-0.33X



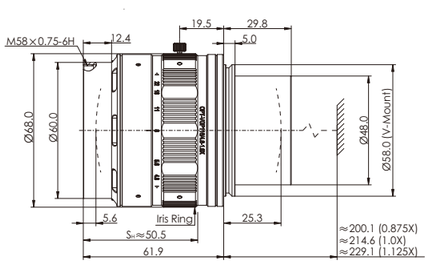
3.OPT-VGP116/4.8-0.5X



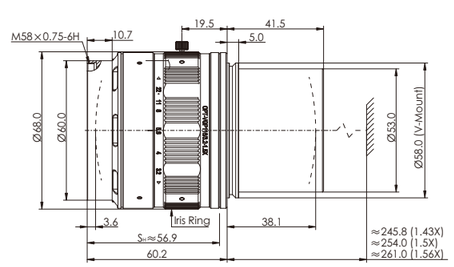
4.OPT-VGP116/4.8-0.75X



5.OPT-VGP116/4.8-1.0X



6.OPT-VGP116/3.2-1.5X



Line Scan Lenses Accessories



- Different adaptors are used to assemble with line scan cameras and line scan lenses for different magnifications, camera mounts and sensor size in order to meet certain imaging requirements.

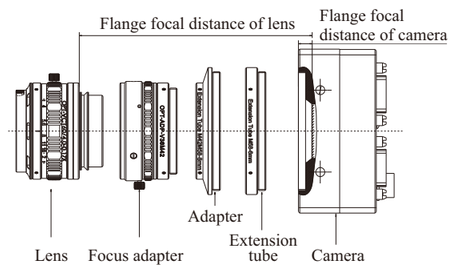
Selection Guide

OPT-ADP-V38M42-E18/23
- Length: 18-23 mm
- V38 to M42-Mount
- Focus adapter
- Brand name

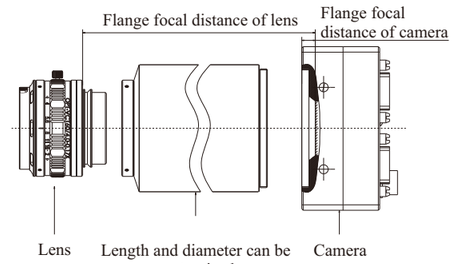
OPT-ETB-M42E10
- Length: 10 mm
- M42-Mount
- Extension tube
- Brand name

Adaptor Connecting Guide

Adaptor Connecting Diagram



Standard version



Custom version

Formula

$FBL \approx (\beta - \beta_0) \times f' + FBL_0$

$EXT = FBL - FBL_C$

$L \approx f' \div \beta + f'$

$WD = L - S_H$

Remarks:
Please refer to the diagram on the right.
1. β is target magnification, β_0 is the basic magnification given in Model Tables.
2. FBL is flange focal distance, FBL_0 is the flange focal distance given in Model Tables, FBL_c is the flange focal distance of camera.
3. EXT is the length of extension tube.
4. L is the distance between object plane and the object principal plane of lens.
5. f ' is the focal length of lens; WD is working distance.
6. S_H is the distance between the front end of the lens and the object principal plane. Please refer to drawings for details.

Model Table (1)

	Model	Lens mount T1	Lens mount T2	Diameter (D)	Length (L)
Focus adaptor	OPT-ADP-V38M42-E12/17	V38	M42×1-6g	Ø48.5	12-17
	OPT-ADP-V38M42-E18/23	V38	M42×1-6g	Ø48.5	18-23
	OPT-ADP-V58M58-E31.5/39.5	V58	M58×0.75-6g	Ø71.5	31.5-39.5
	OPT-ADP-V58M72-E31.5/39.5	V58	M72×0.75-6g	Ø76	31.5-39.5

Model Table (1)

No.	Model	Lens mount T1	Lens mount T2	Diameter (D)	Length (L)
Adapter	OPT-ADP-V38M42-E5	V38	M42×1-6g	Ø47	5
	OPT-ADP-V38M42-E5.5	V38	M42×1-6g	Ø47	5.5
	OPT-ADP-V38M42-E6.5	V38	M42×1-6g	Ø47	6.5
	OPT-ADP-V38M42-E8	V38	M42×1-6g	Ø47	8
	OPT-ADP-V38M42-E9	V38	M42×1-6g	Ø47	9
	OPT-ADP-V38M42-E9.5	V38	M42×1-6g	Ø47	9.5
	OPT-ADP-V38M58-E5	V38	M58×0.75-6g	Ø47	5
	OPT-ADP-V58M72-E5	V58	M72×0.75-6g	Ø76	5
	OPT-ADP-M42M58-E8	M42×1-6H	M58×0.75-6g	Ø62	8
	OPT-ADP-M42M72-E8	M42×1-6H	M72×0.75-6g	Ø76	8
	OPT-ADP-M58M72-E8	M58×0.75-6H	M72×0.75-6g	Ø76	8
	OPT-ADP-M58M90-E8	M58×0.75-6H	M90×1-6g	Ø94	8
	OPT-ADP-M58M95-E8	M58×0.75-6H	M95×1-6g	Ø99	8
	OPT-ADP-M72M90-E8	M72×0.75-6H	M90×1-6g	Ø94	8
	OPT-ADP-M72M95-E8	M72×0.75-6H	M95×1-6g	Ø99	8
	OPT-ADP-M58M42-E8	M58×0.75-6H	M42×1-6g	Ø62	8
	OPT-ADP-FM42-E34.5	F-Mount	M42×1-6g	Ø62	34.5
	OPT-ADP-FM58-E34.5	F-Mount	M58×0.75-6g	Ø60	34.5
	OPT-ADP-M42F-E4	M42×1-6H	F-Mount	Ø59.6	4
	OPT-ADP-M58F-E8	M58×0.75-6H	F-Mount	Ø62	8
	OPT-ADP-FC-E28.97	F-Mount	C-Mount	Ø61	28.97
	OPT-ADP-CM42-E5.526	C-Mount	M42×1-6g	Ø45	5.526
	OPT-ADP-SC	M12×0.5-6H	C-Mount	Ø28.7	0.7~5

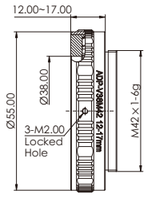
Model Table (2)

Extension tube	Model	D1	D2	L
F-Mount	OPT-ETB-FE15	F-Mount	F-Mount	15
	OPT-ETB-FE20	F-Mount	F-Mount	20
M42	OPT-ETB-M42E4.8	M42×1-6H	M42×1-6g	4.8
	OPT-ETB-M42E6	M42×1-6H	M42×1-6g	6
	OPT-ETB-M42E6.5	M42×1-6H	M42×1-6g	6.5
	OPT-ETB-M42E8	M42×1-6H	M42×1-6g	8
	OPT-ETB-M42E10	M42×1-6H	M42×1-6g	10
	OPT-ETB-M42E15	M42×1-6H	M42×1-6g	15
	OPT-ETB-M42E25	M42×1-6H	M42×1-6g	25
	OPT-ETB-M42E34.5	M42×1-6H	M42×1-6g	34.5
	OPT-ETB-M42E50	M42×1-6H	M42×1-6g	50
	OPT-ETB-M42E75	M42×1-6H	M42×1-6g	75
	OPT-ETB-M42E100	M42×1-6H	M42×1-6g	100
M58	OPT-ETB-M58E6	M58×0.75-6H	M58×0.75-6g	6
	OPT-ETB-M58E6.5	M58×0.75-6H	M58×0.75-6g	6.5
	OPT-ETB-M58E8	M58×0.75-6H	M58×0.75-6g	8
	OPT-ETB-M58E10	M58×0.75-6H	M58×0.75-6g	10
	OPT-ETB-M58E15	M58×0.75-6H	M58×0.75-6g	15
	OPT-ETB-M58E25	M58×0.75-6H	M58×0.75-6g	25
	OPT-ETB-M58E50	M58×0.75-6H	M58×0.75-6g	50
	OPT-ETB-M58E75	M58×0.75-6H	M58×0.75-6g	75
	OPT-ETB-M58E100	M58×0.75-6H	M58×0.75-6g	100
M72	OPT-ETB-M72E6	M72×0.75-6H	M72×0.75-6g	6
	OPT-ETB-M72E6.5	M72×0.75-6H	M72×0.75-6g	6.5
	OPT-ETB-M72E8	M72×0.75-6H	M72×0.75-6g	8
	OPT-ETB-M72E10	M72×0.75-6H	M72×0.75-6g	10
	OPT-ETB-M72E15	M72×0.75-6H	M72×0.75-6g	15
	OPT-ETB-M72E25	M72×0.75-6H	M72×0.75-6g	25
	OPT-ETB-M72E50	M72×0.75-6H	M72×0.75-6g	50
	OPT-ETB-M72E75	M72×0.75-6H	M72×0.75-6g	75
	OPT-ETB-M72E100	M72×0.75-6H	M72×0.75-6g	100
	OPT-ETB-M72E30/50	M72×0.75-6H	M72×0.75-6g	30~50
M90	OPT-ETB-M90E6	M90×1-6H	M90×1-6g	6
	OPT-ETB-M90E6.5	M90×1-6H	M90×1-6g	6.5
	OPT-ETB-M90E8	M90×1-6H	M90×1-6g	8
	OPT-ETB-M90E10	M90×1-6H	M90×1-6g	10
	OPT-ETB-M90E15	M90×1-6H	M90×1-6g	15

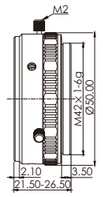
Extension tube	Model	D1	D2	L
M90	OPT-ETB-M90E25	M90×1-6H	M90×1-6g	25
	OPT-ETB-M90E50	M90×1-6H	M90×1-6g	50
	OPT-ETB-M90E75	M90×1-6H	M90×1-6g	75
	OPT-ETB-M90E100	M90×1-6H	M90×1-6g	100
M95	OPT-ETB-M95E6	M95×1-6H	M95×1-6g	6
	OPT-ETB-M95E6.5	M95×1-6H	M95×1-6g	6.5
	OPT-ETB-M95E8	M95×1-6H	M95×1-6g	8
	OPT-ETB-M95E10	M95×1-6H	M95×1-6g	10
	OPT-ETB-M95E15	M95×1-6H	M95×1-6g	15
	OPT-ETB-M95E25	M95×1-6H	M95×1-6g	25
	OPT-ETB-M95E50	M95×1-6H	M95×1-6g	50
	OPT-ETB-M95E100	M95×1-6H	M95×1-6g	100

Dimensions (mm)

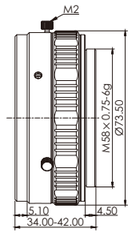
1.OPT-ADP-V38M42-E12/17



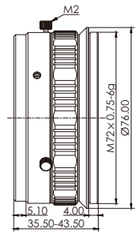
2.OPT-ADP-V38M42-E18/23



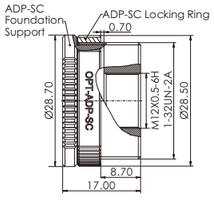
3.OPT-ADP-V58M58-E31.5/39.5



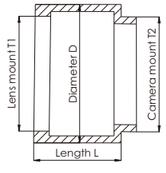
4.OPT-ADP-V58M72-E31.5/39.5



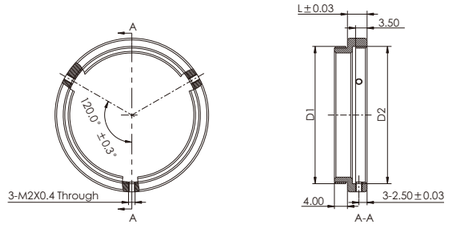
5.OPT-ADP-SC



6.Dimension diagram of adaptor



7.Dimension diagram of extension tube



78M Fixed Focal Length Lenses NEW



Product Features

High resolution
Compatible with cameras which pixel size ≥ 3.2 μm and max. full frame (Ø44 mm) sensor; resolution up to 160 lp/mm in full FOV

Broad spectrum
The coating band is 400-1000 nm, compatible with visible light and near-infrared band applications.

Floating focus structure design
The floating focus structure design is adopted to effectively ensure good optical performance under a wide working distance range[1].

[1] Equipped with flange adjustment gaskets to maximize the optical performance of the lens used with the camera.

Selection Guide

OPT-F3545-78M
- 78M
- Maximum Aperture:F4.5
- Focal length: 35 mm
- F: F-Mount, M: M-Mount
- Brand name

Resolution Comparison



Image taken by OPT 78M Lens

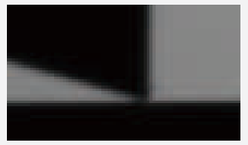


Image taken by other lens

Application Cases



Circuit board defect detection

Lithium battery pole piece defect detection

LCD screen defect detection



Printing quality inspection

Model Table

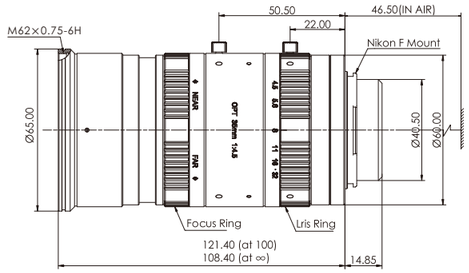
No	Model	Focal length (mm)	Aperture range	WD (mm)	Sensor Ø (mm)	Resolution (μm)	Interface	Filter thread	Flange focal distance (mm)	Back Focal Length (mm)	Weight (kg)	Optical distortion	Mag. at MOD
1	OPT-F3545-78M	35	F4.5-F32	100-∞	44	3.2	F	M62×0.75-6H	46.5	37.71	0.93	<1.25% at WD200	0.246X at WD100
												<1.00% at WD300	0.107X at WD300
												<0.80% at WD500	0.069X at WD500

Model Table

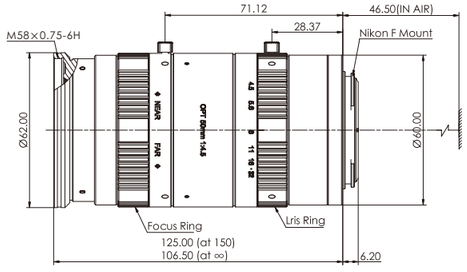
No	Model	Focal length (mm)	Aperture range	WD (mm)	Sensor Ø (mm)	Resolution (μm)	Interface	Filter thread	Flange focal distance (mm)	Back Focal Length (mm)	Weight (kg)	Optical distortion	Mag. at MOD
2	OPT-F5045-78M	50	F4.5-F32	150-∞	44	3.2	F	M58×0.75-6H	46.5	45.73	0.75	<0.42% at WD200	0.326X at WD150
												<0.16% at WD300	0.166X at WD300
												<0.28% at Wd500	0.100X at WD500
3	OPT-M3545-78M	35	F4.5-F32	100-∞	44	3.2	M58	M62×0.75-6H	46.5	37.71	0.93	<1.25% at WD200	0.246X at WD100
												<1.00% at WD300	0.107X at WD300
												<0.80% at WD500	0.069X at WD500
4	OPT-M5045-78M	50	F4.5-F32	150-∞	44	3.2	M58	M58×0.75-6H	46.5	45.73	0.75	<0.42% at WD200	0.326X at WD150
												<0.16% at WD300	0.166X at WD300
												<0.28% at WD500	0.100X at WD500

Dimensions (mm)

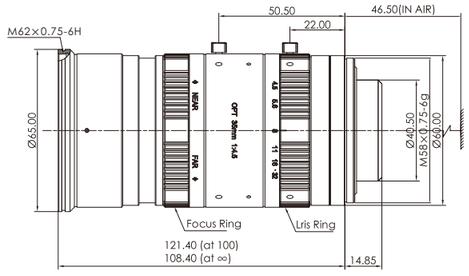
1.OPT-F3545-78M



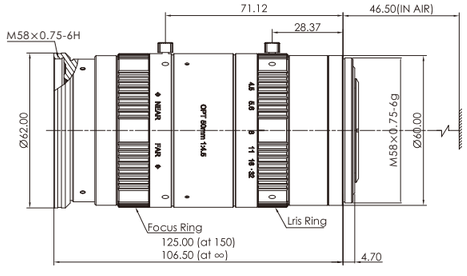
2.OPT-F5045-78M



3.OPT-M3545-78M



4.OPT-M5045-78M



29M Fixed Focal Length Lenses

Compatible with 8K line scan cameras



Product Features

- **High resolution**
  High-resolution optical design with full-field-of-view resolution of up to 100 lp/mm. Ensures image clarity.
- **Large sensor size**
  Compatible with 29M camera, and line scan camera up to 8K with 5 μm pixel size
- **Low distortion**
  Total distortion < 0.9%, and min. distortion as low as 0.03%

Selection Guide

OPT-F2528-29M

- 29M
- Maximum Aperture:F2.8
- Focal length: 25 mm
- F-Mount
- Brand name

Resolution Comparison

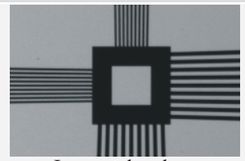


Image taken by OPT 29M Lens

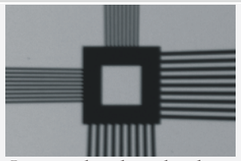
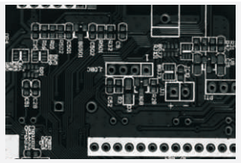


Image taken by other lens

Application Cases



Surface inspection for beverage can



OCR for PCB



OCR for plastic parts



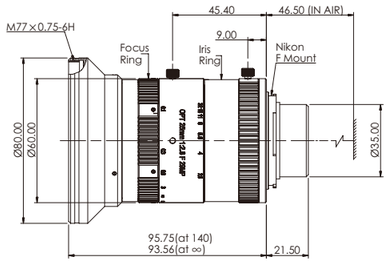
Dent detection on bearing

Model Table

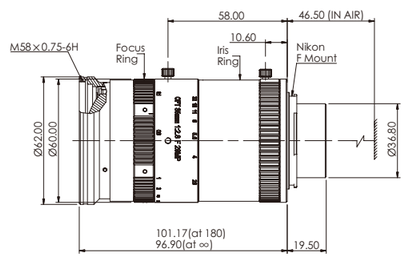
No	Model	Focal length (mm)	Aperture range	WD (mm)	Filter thread (mm)	Distortion	Back focal length (mm)	Weight (kg)	Sensor	FOV angle (H×V×D)		
1	OPT-F2528-29M	25	F2.8-F32	140~∞	M77×0.75-6H	<0.9%	26.4	0.71	1"	28.72°	21.74°	35.49°
									4/3"	39.60°	30.22°	48.46°
									44 mm	70.29°	55.67°	82.70°
2	OPT-F3528-29M	35	F2.8-F32	180~∞	M58×0.75-6H	<0.4%	27.9	0.65	1"	20.72°	15.62°	25.75°
									4/3"	28.84°	21.83°	35.64°
									44 mm	53.39°	41.33°	64.30°
3	OPT-F5028-29M	50	F2.8-F32	180~∞	M58×0.75-6H	<0.2%	36.1	0.59	1"	14.59°	10.97°	18.18°
									4/3"	20.41°	15.38°	25.36°
									44 mm	38.78°	29.58°	47.50°
4	OPT-F7528-29M	75	F2.8-F32	300~∞	M58×0.75-6H	<0.03%	35.8	0.58	1"	9.75°	7.32°	12.18°
									4/3"	13.69°	10.29°	17.06°
									44 mm	26.41°	19.96°	32.69°

Dimensions (mm)

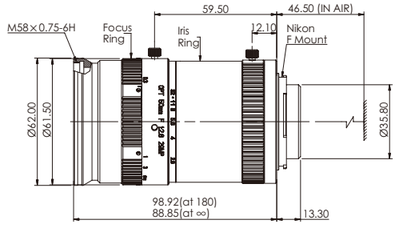
1.OPT-F2528-29M



2.OPT-F3528-29M



3.OPT-F5028-29M



4.OPT-F7528-29M

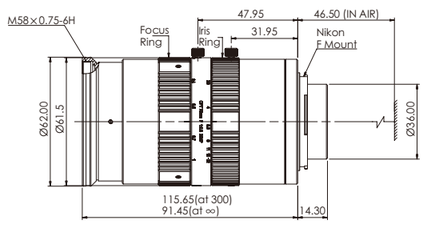
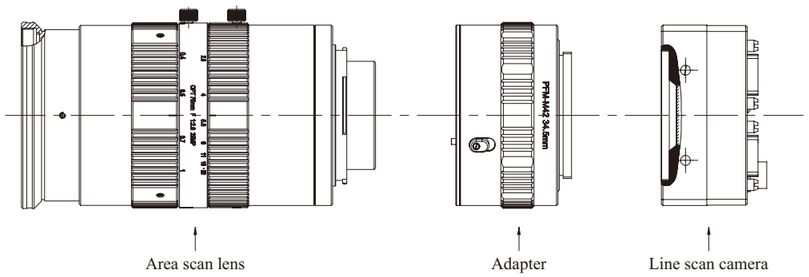


Diagram of Connecting of Area Scan Lens and Line Scan Camera



Notes: If the sensor and resolution of lenses are applicable, the area scan lenses can apply to line scan cameras. The imaging sensor of 29M series lenses is 44 mm, for which 29M series lenses can apply to 4k 7 µm or 8k 5 µm line scan cameras. The diagram above is about 29M lens connecting with line scan camera by adaptor. The Flange Back Length of F-mount lenses is 46.5 mm, of line scan cameras is FBLc. The length of adaptor is 46.5-FBLc.

151M Fixed Focal Length Lenses NEW



Product Features

High resolution

For Ø67 mm large sensor size and 3.76 µm pixel; resolution up to 151M.

Floating focus design

Enabling good optical performance among wide working distance by floating focusing design.

Low distortion

Full FOV Max. optical distortion <0.7% in working distance.

Wide spectrum coating

400-1000 nm coating band; compatible with visible light and near-infrared band.

Selection Guide

OPT-M6050-151M

- 151M
- Maximum Aperture:F5.0
- Focal length: 60 mm
- M-Mount
- Brand name

Resolution Comparison

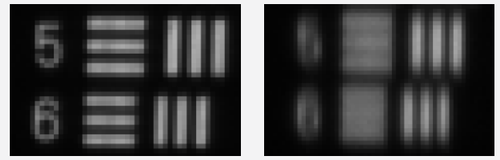
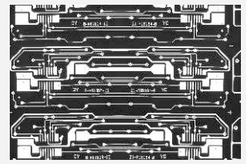


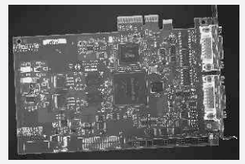
Image taken via OPT 151M Lens

Image taken via other lens

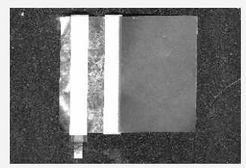
Application Cases



FPC positioning cutting



PCB defects detection



lithium battery pole piece measurement and defects detection



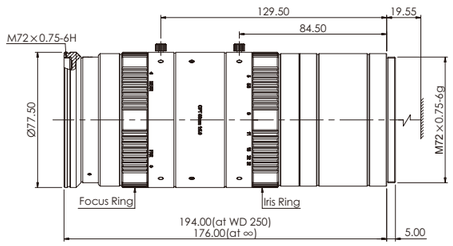
Panel defects detection

Model Table

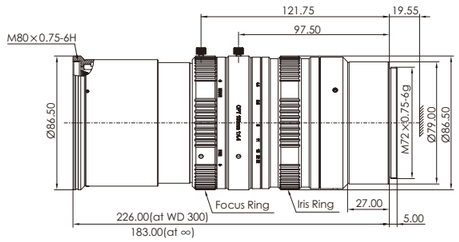
No.	Model	Focal length (mm)	Aperture range	WD (mm)	Sensor Ø (mm)	Pixel size (μm)	Mount	Flange focal distance (mm)	Back focal length (mm)	Weight (kg)	Optical Distortion	Mag. at MOD
1	OPT-M6050-151M	60	F5.0~F32	250~∞	67	3.76	M72×0.75-6H	19.55	52.53	1.66	<0.68% at WD 250	0.232X at WD 250
											<0.34% at WD 400	0.147X at WD 400
											<0.57% at WD 1000	0.060X at WD 1000
2	OPT-M10044-151M	100	F4.4~F32	300~∞	67	3.76	M80×0.75-6H	19.55	26.49	1.92	<0.41% at WD 300	0.409X at WD 300
											<0.07% at WD 500	0.230X at WD 500
											<0.15% at WD 1000	0.110X at WD 1000

Dimensions (mm)

1.OPT-M6050-151M



2.OPT-M10044-151M



Cobra Series Fixed Focal Length Lenses NEW



Product Features

Compact design
Lens diameter Ø29 mm, compatible with camera dimensions, compact and small.

High resolution
Full field of view resolution up to 230 lp/mm. Suitable for pixel size 2.2 μm and above, Sensor size ≤ 2/3″ (Ø11 mm)[1].

Wide spectrum range
400-1000 nm optical coating spectrum; compatible with VIS and NIR.

Low distortion
TV distortion < 0.2%[2]

High relative illumination
Chief ray angle <5°[3], matching with cameras enables to realize high evenness image.

[1] The OPT-COB0828, OPT-COB1228, and OPT-COB1628 can be matched to cameras with a sensor of up to 1/1.8" (Ø9 mm).

[2] The TV distortion of the OPT-COB0628B and the OPT-COB0828B is <0.56%

[3]The OPT-COB0628F and the OPT-COB0628B have a Chief ray angle <7°.

Selection Guide

OPT-COB0828

- Maximum Aperture:F2.8
- Focal length: 8 mm
- Cobra series lenses
- C-Mount
- Brand name

Resolution Comparison

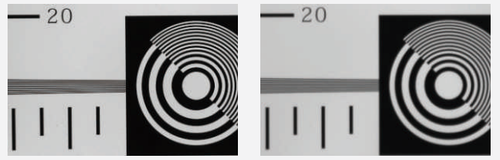
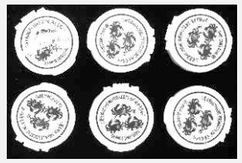


Image taken by Cobra | Image taken by other lens

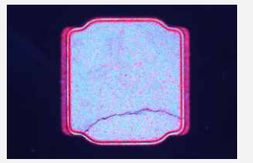
Application Cases



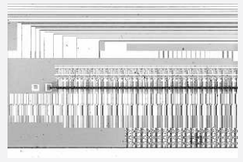
Character defect detection on plastic parts



Sand particle on lens detection



Sensor crack detection



OLED screen size measurement

Model Table

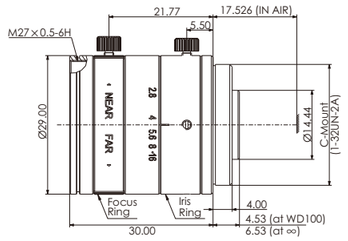
No.	Model	Focal length (mm)	Aperture	Sensor Ø (mm)	Resolution (μm)	TV Distortion	WD (mm)	Back Focal Length (mm)		Mag. at MOD	Chief Ray Angle	Filter thread (mm)	Weight (kg)
1	OPT-COB0828	8	F2.8-F16	9(1/1.8″)	2.2	<0.18% at WD300	100-∞	12.99 at WD100	12.34 at ∞	0.071X at WD100	<5°	M27×0.5-6H	0.05
2	OPT-COB1228	12	F2.8-F16	9(1/1.8″)	2.2	<0.16% at WD300	100-∞	14.00 at WD100	12.76 at ∞	0.101X at WD100	<5°	M27×0.5-6H	0.06
3	OPT-COB1628	16	F2.8-F16	9(1/1.8″)	2.2	<0.10% at WD300	100-∞	15.76 at WD100	13.57 at ∞	0.135X at WD100	<5°	M27×0.5-6H	0.06
4	OPT-COB0628F*	6	F2.8-F16	11（2/3″）	2.2	<0.15% at WD500	100-∞	12.77 at WD100	12.41 at ∞	0.049X at WD100	<7°	M58×0.75-6H	0.15

Model Table

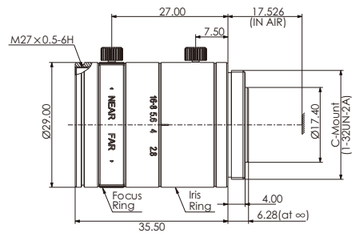
No.	Model	Focal length (mm)	Aperture	Sensor Ø (mm)	Resolution (μm)	TV Distortion	WD (mm)	Back Focal Length (mm)		Mag. at MOD	Chief Ray Angle	Filter thread (mm)	Weight (kg)
5	OPT-COB0628B	6	F2.8-F16	11(2/3")	2.2	< 0.46% at WD 250	100-∞	12.77 at WD 100	12.41 at ∞	0.048X at WD150	< 7°	M58×0.5-6H	0.15
6	OPT-COB0828B	8	F2.8~F16	11(2/3")	2.2	<0.56% at WD 300	30~∞	13.06		0.168X at WD 30	< 5°	M27×0.5-6H	0.08
7	OPT-COB1228B	12	F2.8~F16	11(2/3")	2.2	< 0.1% at WD 300	80~∞	13.03		0.112X at WD 80	< 5°	M27×0.5-6H	0.09
8	OPT-COB1628B	16	F2.8~F16	11(2/3")	2.2	< 0.02% at WD 300	100~∞	14.89		0.126X at WD 100	< 5°	M27×0.5-6H	0.07
9	OPT-COB2528B	25	F2.8~F16	11(2/3")	2.2	< 0.15% at WD 300	150~∞	16.63 at WD 150	12.65 at ∞	0.159X at WD 150	< 5°	M27×0.5-6H	0.05
10	OPT-COB3528B	35	F2.8~F16	11(2/3")	2.2	< 0.20% at WD 350	210~∞	18.39 at WD 210	12.87 at ∞	0.161X at WD 210	< 5°	M27×0.5-6H	0.06
11	OPT-COB5028B	50	F2.8~F22	11(2/3")	2.2	< 0.07% at WD 500	400~∞	20.56 at WD 400	13.67 at ∞	0.136X at WD 400	< 5°	M27×0.5-6H	0.06
12	OPT-COB5028N	50	F2.8~F22	11(2/3")	2.2	< 0.01% at WD 300	250~2000	18.11		0.222X at WD 250	< 5°	M27×0.5-6H	0.08
13	OPT-COB7528B	75	F2.8~F16	11(2/3")	2.2	< 0.07% at WD 500	250~1000	13.06		0.363X at WD 250	< 5°	M37.5×0.5-6H	0.21

Dimensions (mm)

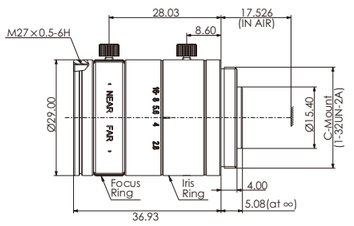
1.OPT-COB0828



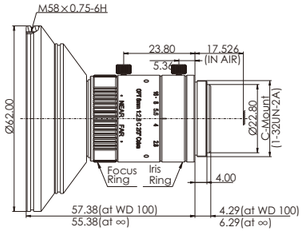
2.OPT-COB1228



3.OPT-COB1628



4.OPT-COB0628F



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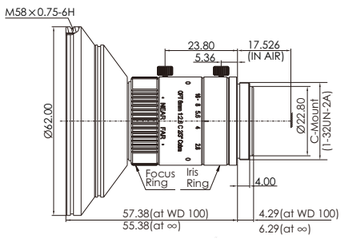
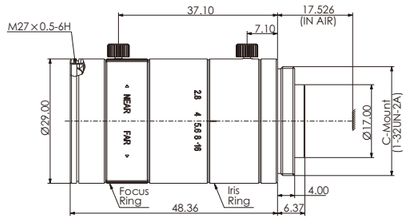
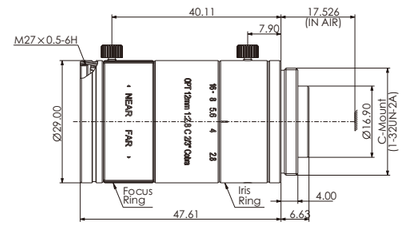


6.OPT-COB0828B



7.OPT-COB1228B



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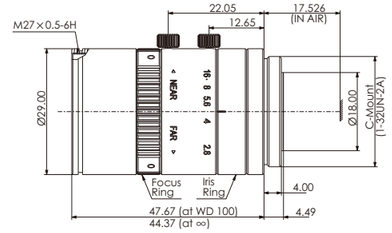
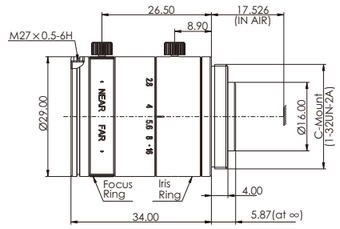


9.OPT-COB2528B



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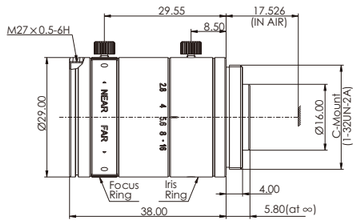
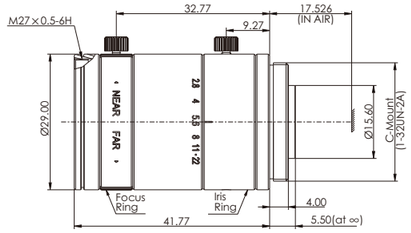


11.OPT-COB5028B



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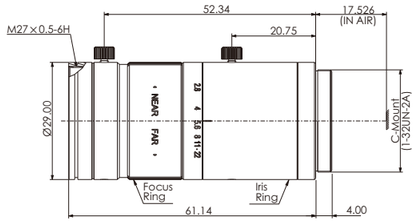
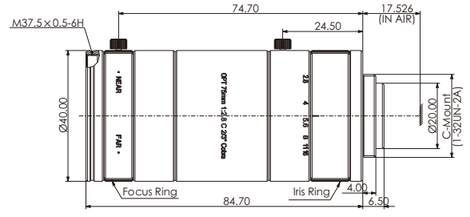


13.OPT-COB7528B



Dolphin 20M Series Fixed Focal Length Lenses NEW



Product Features

High resolution
Compatible with cameras which pixel size ≥ 2.4 μm and max. 1.1″ (Ø17.6 mm) sensor size; resolution up to 208 lp/mm in full FOV.

Wide spectrum range
Compatible with VIS and NIR (400 - 1000 nm).

Low distortion
The TV distortion of the whole series products is at a low level≤0.58%.

High relative illumination
Chief ray angle below 5°, this guarantees a high relative illumination across the entire image without vignetting.

Selection Guide

OPT-CDP5028
- Maximum Aperture:F2.8
- Focal length: 50 mm
- Dolphin series lenses
- C-Mount
- Brand name

Resolution Comparison

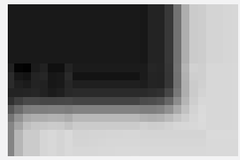
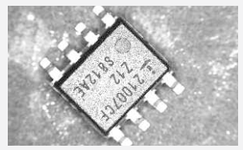


Image taken by Dolphin



Image taken by other lens

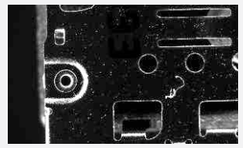
Application Cases



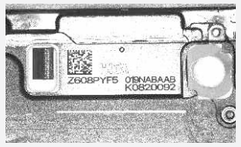
IC OCR



Connector PIN detection



Shielding cover hole positioning detection



Mobile phone shell OCR

Model Table

No.	Model	Focal length (mm)	Aperture	WD (mm)	Sensor Ø (mm)	Resolution (μm)	TV Distortion at WD300	Back Focal Length (mm)		Mag. at MOD	Chief Ray Angle	Filter thread (mm)	Weight (kg)
1	OPT-CDP0828	8.5	F2.8~F16	100~∞	17.6(1.1″)	2.4	< 0.22%[1]	11.57 at WD100	10.85 at ∞	0.067X at WD100	<7.6°	M86×0.75-6H	0.41
2	OPT-CDP0828F[2]	8.5	F2.8~F16	150~∞	17.6(1.1″)	2.4	< 0.02%	11.39 at WD 100	10.87 at ∞	0.048X at WD150	<7.6°	M86×0.75-6H	0.41
3	OPT-CDP1228	12	F2.8~F16	100~∞	17.6(1.1″)	2.4	< 0.85%	13.40 at WD 100	11.79 at ∞	0.101X at WD 100	< 3.8°	M40.5×0.5-6H	0.21
4	OPT-CDP1628	16	F2.8~F22	100~∞	17.6(1.1″)	2.4	< 0.41%	19.98 at WD 100	17.58 at ∞	0.131X at WD 100	< 5.0°	M37.5×0.5-6H	0.17

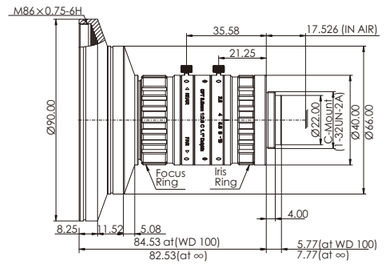
[1]The OPT-CDP0828 has a working distance of 260mm for TV distortion.
[2]For applications where the working distance is greater than 400mm, the OPT-CDP0828F is recommended.

Model Table

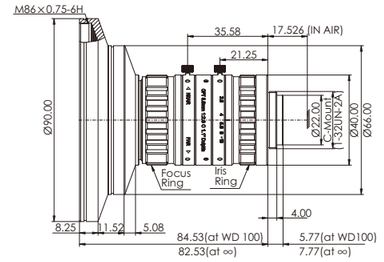
No.	Model	Focal length (mm)	Aperture	WD (mm)	Sensor Ø (mm)	Resolution (μm)	TV Distortion at WD300	Back Focal Length (mm)	Mag. at MOD	Chief Ray Angle	Filter thread (mm)	Weight (kg)
5	OPT-CDP2528	25	F2.8~F16	150~∞	17.6(1.1″)	2.4	< 0.16%	11.89	0.162X at WD 150	< 5.0°	M32.5×0.5-6H	0.14
6	OPT-CDP3528	35	F2.8~F16	200~∞	17.6(1.1″)	2.4	< 0.15%	13.44	0.176X at WD 200	< 4.85°	M32.5×0.5-6H	0.14
7	OPT-CDP5028	50	F2.8~F16	250~∞	17.6(1.1″)	2.4	< 0.13%	13.05	0.206X at WD 250	< 3.64°	M32.5×0.5-6H	0.17
8	OPT-CDP7528	75	F2.8~F22	300~1600	19.4 (1.2″)	2.4	<0.09%	13.79	0.271X at WD300	<4.4°	M32.5×0.5-6H	0.24

Dimensions (mm)

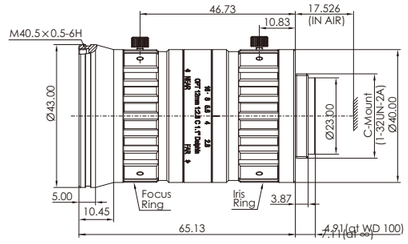
1.OPT-CDP0828



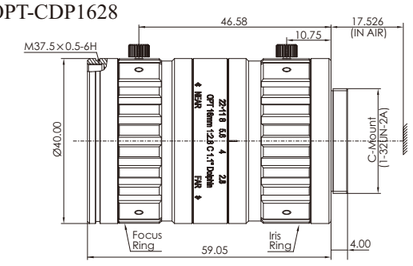
2.OPT-CDP0828F



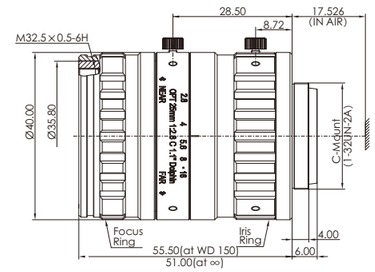
3.OPT-CDP1228



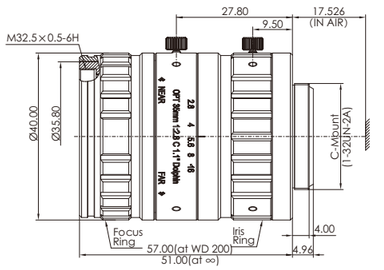
4.OPT-CDP1628



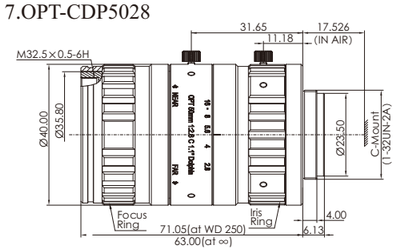
5.OPT-CDP2528



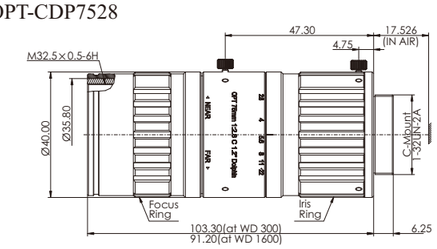
6.OPT-CDP3528



7.OPT-CDP5028



8.OPT-CDP7528



10M Fixed Focal Length Lenses



Product Features

High resolution
High resolution optical design, compatible with mainstream 10MP industrial cameras. Suitable for pixel size3.45 μm and above, compatible with 12MP cameras up to 1.1″[1] sensor size. Full-field-of-view resolution up to 140 lp/mm to ensure image clarity.

Low distortion
Total distortion < 0.8%, min. distortion as low as 0.1%

Floating focus design[2]
Totall distortion is less than 0.8%, with minimum distortion as low as 0.1%.

[1] OPT-C0824-10M, OPT-C1220-10M, and OPT-C1616-10M: Max. compatible with 1" sensor
[2] OPT-C5024-10M and OPT-C7528-10M are not included.

Selection Guide

OPT-C2514-10M
- 10M
- Maximum Aperture:F1.4
- Focal length: 25 mm
- C-Mount
- Brand name

Resolution Comparison

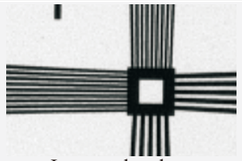


Image taken by OPT 10M Lens

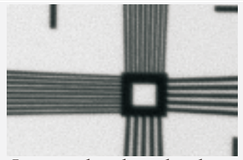
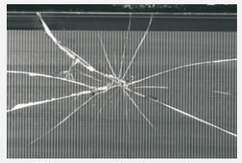
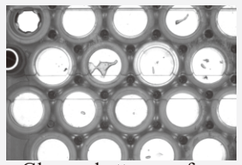


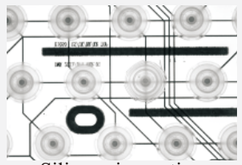
Image taken by other lens

Application Cases


Metal piece flatness inspection


Glass crack detection


Glue on battery surface inspection


Silicone inspection

Model Table

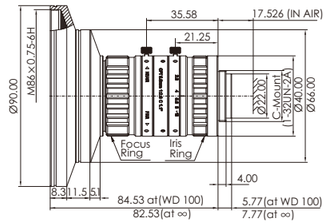
No.	Model	Focal length (mm)	Aperture range	WD (mm)	Filter thread (mm)	Distortion	Back focal length (mm)	Weight (kg)	Sensor	FOV angle (H×V×D)		
1	OPT-C0828-10M	8.5	F2.8-F16	100~∞	M86×0.75-6H	<0.22% at WD260 <0.66% at WD500	11.57 at WD100 10.85 at ∞	0.41	2/3″	54.7°	42.4°	65.8°
									1″	73.9°	58.9°	86.5°
2	OPT-C1220-10M	12	F2.0-F16	100~∞	M37.5×0.5-6H	<0.77%	10.36	0.19	2/3″	40.2°	30.6°	49.6°
									1″	56.1°	43.6°	67.4 °
3	OPT-C1616-10M	16	F1.6-F16	100~∞	M37.5×0.5-6H	<0.68%	10.7	0.19	2/3″	30.7°	23.2°	38.4°
									1″	43.6°	33.4°	53.1 °
4	OPT-C2514-10M	25	F1.4-F16	200~∞	M37.5×0.5-6H	<0.3%	10.8	0.1	2/3″	20.1°	15.4°	24.3°
									1.1″	31.2°	23.4°	38.4°
5	OPT-C3514-10M	35	F1.4-F16	160~∞	M40.5×0.5-6H	<0.39%	11.3	0.12	2/3″	14.4°	10.8°	17.6°
									1.1″	22.4°	16.8°	27.8°

Model Table

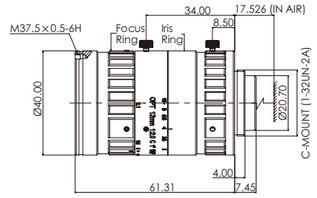
No.	Model	Focal length (mm)	Aperture range	WD (mm)	Filter thread (mm)	Distortion	Back focal length (mm)	Weight (kg)	Sensor	FOV angle (H×V×D)		
6	OPT-C5024-10M	50	F2.4-F22	550~∞	M37.5×0.5-6H	<0.1%	16.24	0.13	2/3″	10°	7.6°	12.2°
									1.1″	15.6°	11.8°	19.4°
7	OPT-C7528-10M	75	F2.8-F32	600~∞	M37.5×0.5-6H	<0.1%	36.9	0.25	2/3″	6.7°	5.0°	8.2°
									1.1″	10.4°	7.9°	13°

Dimensions (mm)

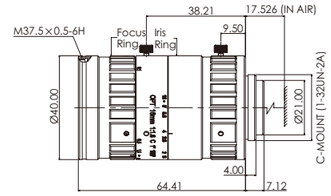
1.OPT-C0828-10M



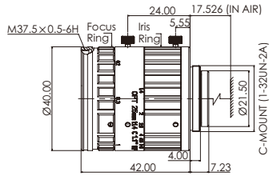
2.OPT-C1220-10M



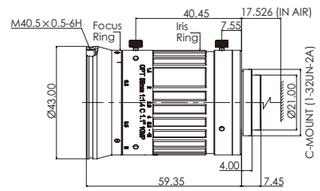
3.OPT-C1616-10M



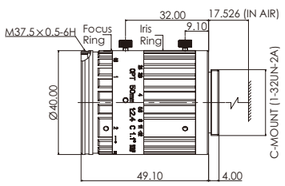
4.OPT-C2514-10M



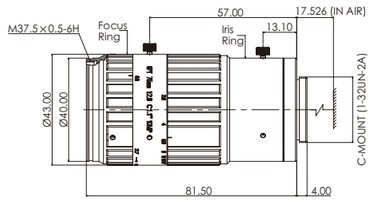
5.OPT-C3514-10M



6.OPT-C5024-10M



7.OPT-C7528-10M



5M Fixed Focal Length Lenses



Product Features

High resolution
Compatible with 5M industrial cameras[1] which pixel size ≥ 3.45 μm and max. 2/3" sensor size; resolution up to 140 lp/mm in full FOV

Low distortion
Total distortion < 0.7%, min. distortion as low as 0.02%[2]

[1] OPT-C0420-5M and OPT-C0620-5M: Compatible with 3M cameras of max. 1/2" sensor
[2] OPT-C0420-5M and OPT-C0620-5M are not included.

Selection Guide

OPT-C2514-5M

- 5M
- Maximum Aperture:F1.4
- Focal length: 25 mm
- C-Mount
- Brand name

Resolution Comparison

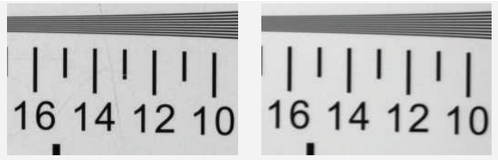


Image taken by OPT 5M Lens Image taken by other lens

Application Cases


Magnet defect detection


Circuit inspection

Lens surface inspection

Capacitor OCR

Model Table

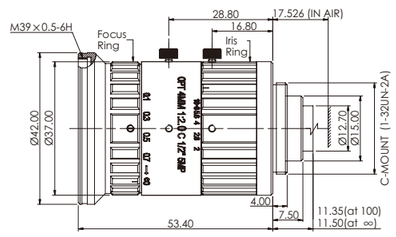
No.	Model	Focal length (mm)	Aperture range	WD (mm)	Filter thread (mm)	Distortion	Back focal length (mm)	Weight (kg)	Sensor	FOV angle (H×V×D)		
1	OPT-C0420-5M	4	F2.0~F16	100-∞	M39×0.5-6H	<1.7%	6.46	0.13	1/3″	62.5°	48.6°	74.2°
									1/2.5″	71.4°	56.0°	83.6°
									1/2″	76.0°	60.8°	90.0°
2	OPT-C0620-5M	6	F2.0~F16	80-∞	M30.5×0.5-6H	<1.05%	7.44	0.11	1/3″	43.8°	32.9°	53.0°
									1/2.5″	51.2°	39.6°	61.8°
									1/2″	56.8°	44.0°	68.2°
3	OPT-C0828-5M	8	F2.8~F16	30-∞	M30.5×0.5-6H	<0.81%	13.06	0.12	1/3″	32.5°	25.4°	40.4°
									1/2.5″	39.2°	29.8°	48.0°
									1/1.8″	48.2°	37.3°	58.5°
									2/3″	57.6°	49.3°	71.2°

Model Table

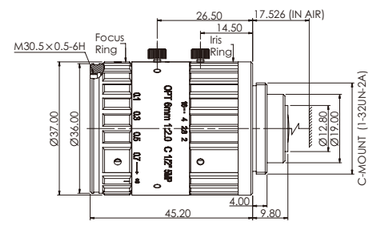
No.	Model	Focal length (mm)	Aperture range	WD (mm)	Filter thread (mm)	Distortion	Back focal length (mm)	Weight (kg)	Sensor	FOV angle (H×V×D)		
4	OPT-C1218-5M	12	F1.8~F16	100-∞	M30.5×0.5-6H	<0.25%	13.39	0.13	1/3″	23.0°	17.3°	28.6°
									1/2.5″	27.4°	20.7°	33.9°
									1/1.8″	34.1°	25.8°	41.8°
									2/3″	40.1°	33.9°	50.9°
5	OPT-C1618-5M	16	F1.8~F16	150-∞	M30.5×0.5-6H	<0.2%	13.58	0.14	1/3″	18.0°	13.5°	22.4°
									1/2.5″	21.2°	16.1°	26.4°
									1/1.8″	26.7°	20.3°	33.1°
									2/3″	31.4°	26.3°	40.2°
6	OPT-C2514-5M	25	F1.4~F16	200-∞	M30.5×0.5-6H	<0.3%	11.54	0.08	1/3″	10.9°	8.3°	13.6°
									1/2.5″	13.1°	9.9°	16.4°
									1/1.8″	16.4°	12.4°	20.4°
									2/3″	19.4°	16.2°	25.1°
7	OPT-C3514-5M	35	F1.4~F16	390-∞	M30.5×0.5-6H	<0.1%	12.75	0.13	1/3″	7.7°	5.9°	9.7°
									1/2.5″	9.3°	7.0°	11.6°
									1/1.8″	11.6°	8.9°	14.5°
									2/3″	13.7°	11.4°	17.8°
8	OPT-C5025-5M	50	F2.5~F22	600-∞	M30.5×0.5-6H	<0.05%	13.19	0.11	1/3″	5.3°	3.9°	6.6°
									1/2.5″	6.2°	4.6°	7.7°
									1/1.8″	7.9°	5.9°	9.8°
									2/3″	9.1°	7.7°	12.0°
9	OPT-C7528-5M	75	F2.8~F32	600-∞	M30.5×0.5-6H	<0.02%	31.38	0.22	1/3″	3.4°	2.6°	4.3°
									1/2.5″	4.0°	3.0°	5.0°
									1/1.8″	5.1°	3.9°	6.4°
									2/3″	6.0°	5.0°	7.8°

Dimensions (mm)

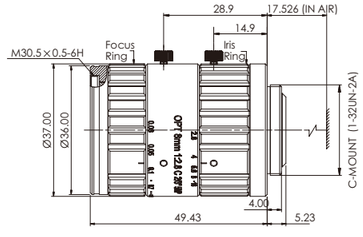
1.OPT-C0420-5M



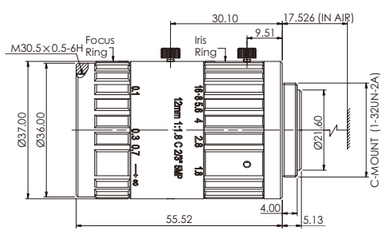
2.OPT-C0620-5M



3.OPT-C0828-5M

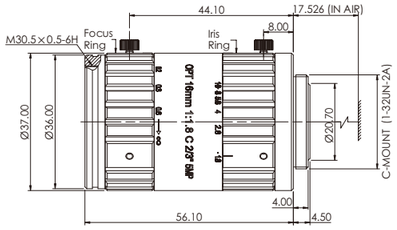


4.OPT-C1218-5M

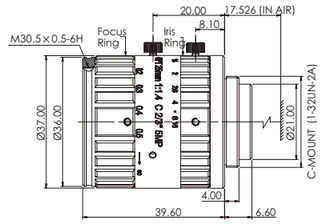


Dimensions (mm)

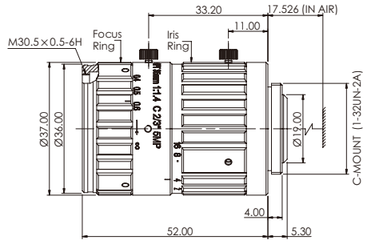
5.OPT-C1618-5M



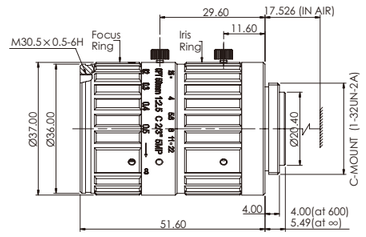
6.OPT-C2514-5M



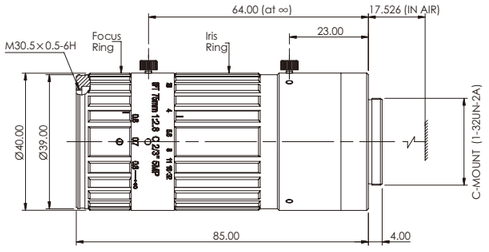
7.OPT-C3514-5M



8.OPT-C5025-5M



9.OPT-C7528-5M



2M Fixed Focal Length Lenses



Product Features

- **Compact, light weight and stable**
- **High resolution**
  High resolution optical design. Suitable for Two mega pixel camera with pixel size of 5.5 μm and above, compatible with up to 2/3″[1] sensor size. Full-field-of-view resolution of up to 100 lp/mm ensures image clarity.
- **High uniformity**
  Controls the vignetting of edges ray and has a high relative illumination.

[1] OPT-C0420-2M and OPT-C0620-2M: Max. compatible with 1/2" sensor size

Selection Guide

OPT-C2514-2M

- 2M
- Maximum Aperture:F1.4
- Focal length: 25 mm
- C-Mount
- Brand name

Resolution Comparison

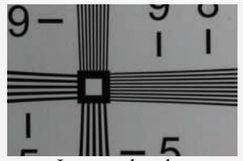


Image taken by OPT 2M Lens

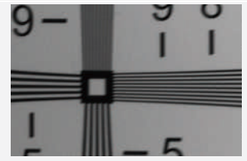
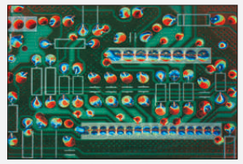


Image taken by other lens

Application Cases



PCB soldering inspection



OCR for plastic parts



Lenses on plate detection



Connector pins inspection

Model Table

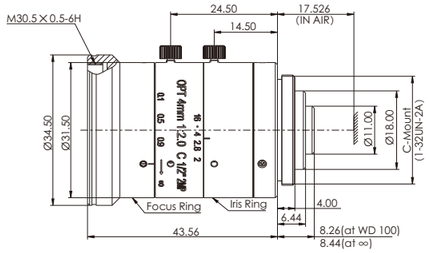
No.	Model	Focal length (mm)	Aperture range	WD (mm)	Filter thread (mm)	Distortion	Back focal length (mm)	Weight (kg)	Sensor	FOV angle (H×V×D)		
1	OPT-C0420-2M	4	F2.0~F16	100-∞	M30.5×0.5-6H	<1.6%	9.14	0.08	1/3″	62.2°	48.6°	74.0°
									1/2.5″	71.4°	56.3°	83.7°
									1/2″	76.2°	61.6°	89.0°
2	OPT-C0620-2M	6	F2.0~F16	100-∞	M27×0.5-6H	<1.2%	9.15	0.06	1/3″	42.4°	32.1°	51.5°
									1/2.5″	49.0°	37.4°	59.2°
									1/2″	52.8°	40.6°	64.0°
3	OPT-C0814-2M	8	F1.4~F16	100-∞	M27×0.5-6H	<2.4%	8.95	0.07	1/3″	33.8°	24.7°	41.0°
									1/2.5″	38.3°	29.0°	46.8°
									1/1.8″	47.5°	36.9°	57.8°
									2/3″	55.4°	47.1°	68.6°

Model Table

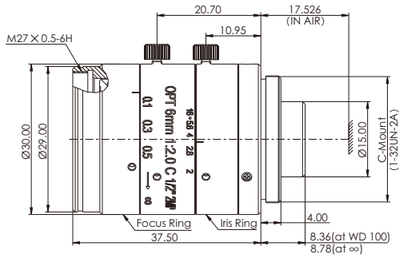
No.	Model	Focal length (mm)	Aperture range	WD (mm)	Filter thread (mm)	Distortion	Back focal length (mm)	Weight (kg)	Sensor	FOV angle (H×V×D)		
4	OPT-C1214-2M	12	F1.4~F16	100-∞	M27×0.5-6H	<2.8%	9.33	0.06	1/3″	23.0°	17.3°	28.6°
									1/2.5″	27.4°	20.4°	33.7°
									1/1.8″	34.2 °	26.2°	42.2°
									2/3″	40.1°	33.7°	50.7°
5	OPT-C1614-2M	16	F1.4~F16	100-∞	M27×0.5-6H	<2.4%	9.53	0.05	1/3″	17.6°	13.3°	21.9°
									1/2.5″	20.8°	15.7°	25.9°
									1/1.8″	26.2°	20.0°	32.5°
									2/3″	30.8°	25.8°	39.4°
6	OPT-C2514-2M	25	F1.4~F16	180-∞	M27×0.5-6H	<0.45%	11.54	0.05	1/3″	11.1°	8.3°	13.8°
									1/2.5″	13.2°	9.9°	16.5°
									1/1.8″	16.5°	12.2°	20.4°
									2/3″	20.1°	15.1°	25.0°
7	OPT-C3516-2M	35	F1.6~F16	250-∞	M27×0.5-6H	<0.25%	11	0.05	1/3″	7.3°	6.0°	9.4°
									1/2.5″	9.6°	7.2°	11.9°
									1/1.8″	12.0°	9.0°	15.0°
									2/3″	14.1°	11.8°	18.3°
8	OPT-C5024-2M	50	F2.4~F22	500-∞	M27×0.5-6H	<0.1%	15	0.06	1/3″	5.4°	3.9°	6.6°
									1/2.5″	6.3°	4.7°	7.9°
									1/1.8″	7.9°	6.0°	9.9°
									2/3″	9.6°	8.0°	12.5°
9	OPT-C7528-2M	75	F2.8~F32	700-∞	M30.5×0.5-6H	<0.02%	18	0.16	1/3″	3.2°	2.4°	3.9°
									1/2.5″	3.9°	2.9°	4.8°
									1/1.8″	4.7°	3.6°	5.9°
									2/3″	5.7°	4.9°	7.5°
10	OPT-C10028-2M	100	F2.8~F16	2700-∞	M37.5×0.5-6H	<0.05%	19.95	0.13	1/3″	2.0°	1.5°	2.5°
									1/2.5″	2.4°	1.8°	3.0°
									1/1.8″	3.0°	2.3°	3.7°
									2/3″	3.7°	2.8°	4.6°

Dimensions (mm)

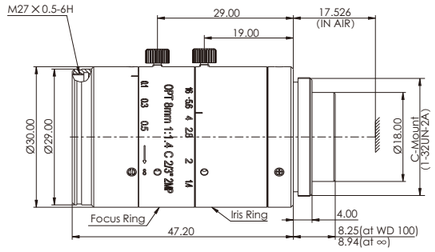
1.OPT-C0420-2M



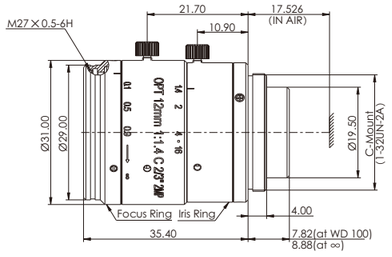
2.OPT-C0620-2M



3.OPT-C0814-2M

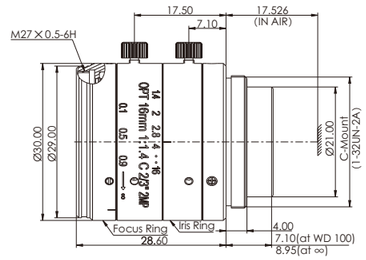


4.OPT-C1214-2M

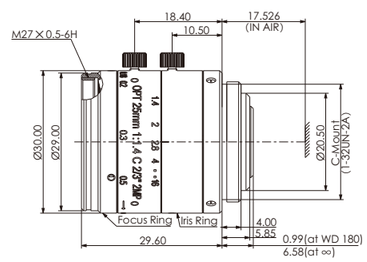


Dimensions (mm)

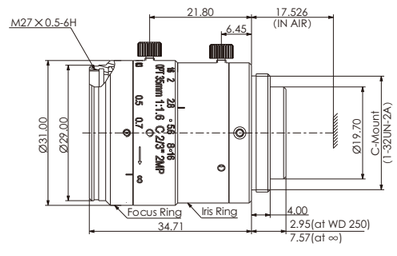
5.OPT-C1614-2M



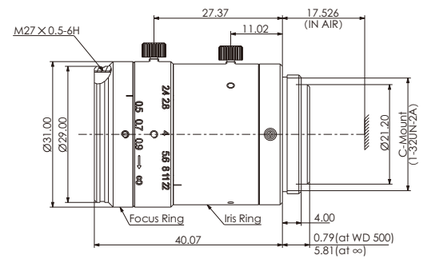
6.OPT-C2514-2M



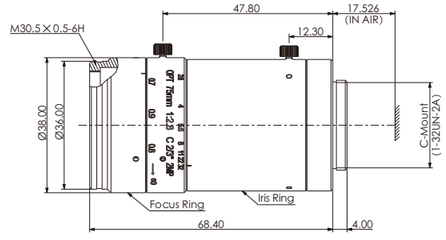
7.OPT-C3516-2M



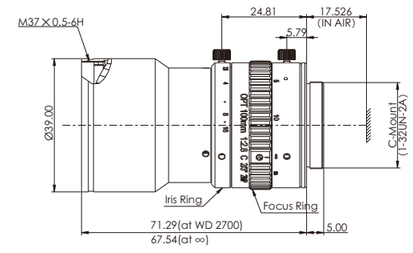
8.OPT-C5024-2M



9.OPT-C7528-2M



10.OPT-C10028-2M



M12 Fixed Focal Length Lenses NEW



Product Features

Miniaturized structure
S-Mount design, small size, compact structure, total lens length <18.5 mm.

Large depth of field and high resolution
Fixed aperture F5.6 large depth of field design, full field of view resolution close to the diffraction limit, compatible with cameras with a maximum Sensor size of 1/1.7".

Low distortion
The working distance is wide, and full FOV Max. TV distortion <0.48%.

High relative illumination
Chief ray angle below 5.5°[1], this guarantees a high relative illumination across the entire image without vignetting.

[1] OPT-S0856 has a chief ray angle <7.45"

Selection Guide

OPT-S1256

- Maximum Aperture:F5.6
- Focal length: 12 mm
- S: M12-Mount
- Brand name

Resolution Comparison

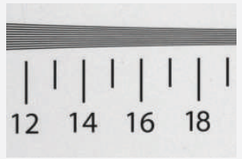


Image taken by OPT M12 Lens

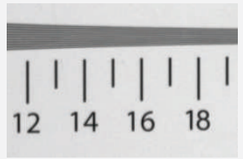
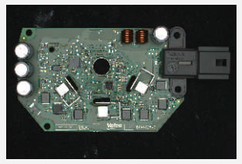
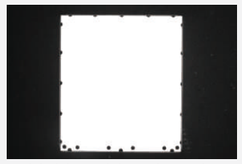


Image taken by other lens

Application Cases



Circuit board defect detection



Shield position detection



PCB code reading



Photovoltaic glass QR code scanning

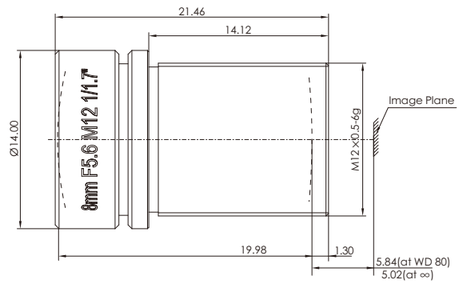
Model Table

No.	Model	Focal Length (mm)	Aperture	Sensor Ø (mm)	Resolution (μm)	TV Distortion	WD (mm)	Back Focal Length (mm)		Mag. at MOD	Chief Ray Angle	Weight (kg)
1	OPT-S0856	8	F5.6	9.3 (1/1.7")	3.45	< 0.65% at Wd300	80~∞	5.84 at WD80	5.02 at ∞	0.095X at WD80	< 7.45°	0.006
2	OPT-S1256	12	F5.6	9.3 (1/1.7")	3.45	< 0.48% at WD 400	100~∞	8.79 at WD 100	7.38 at ∞	0.115X at WD 100	< 5.4°	0.006
3	OPT-S1656	16	F5.6	9.3 (1/1.7")	3.45	< 0.19% at WD 400	100~∞	8.09 at WD 100	5.50 at ∞	0.160X at WD 100	< 5.5°	0.005
4	OPT-S2556	25	F5.6	9.3 (1/1.7")	3.45	< 0.08% at WD 400	150~∞	10.04 at WD 150	5.57 at ∞	0.179X at WD 150	< 5.5°	0.005

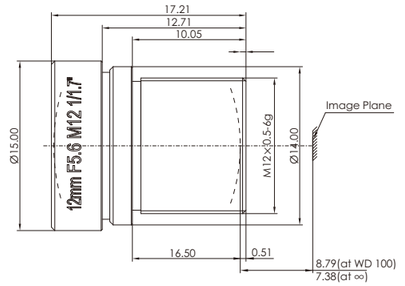
1. Multiple apertures available, including F8.0, F11.0.
2. An M12 to C connector accessory is available, model OPT-ADP-SC, see the 'Line Scan Lens Accessories' section for details.

Dimensions (mm)

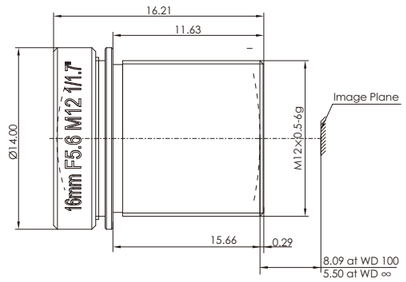
1.OPT-S0856



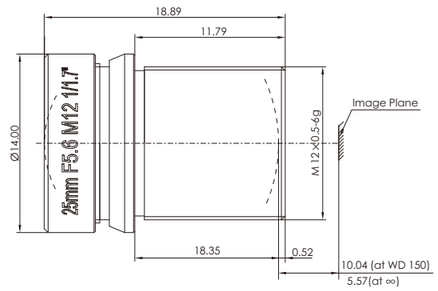
2.OPT-S1256



3.OPT-S1656



4.OPT-S2556



Cobra Series Liquid Fixed focal-length Lenses New



Product Features

Faster focus
Can achieve liquid focus, response time <4 ms, focus can be completed almost instantly.

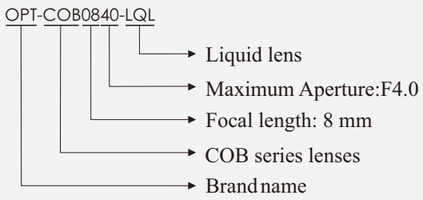
High resolution
The highest resolution is 145lp / mm, can match 3.45μm pixel size, maximum compatible with 2 / 3 ″ Sensor size camera[1], focal length of 8 mm to 50 mm optional.

Repeatability stability
The repeated adjustment of the liquid lens can be kept at + / -0.1 dpt.

Phase adjustable up to 360°
The liquid lens digital I/O interface can rotate around Optic Axis 360°,better accommodating applications with limited space.

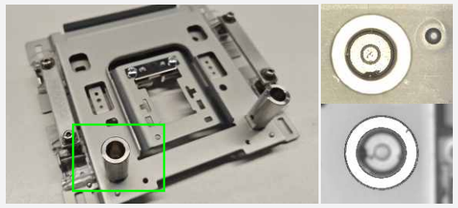
[1] The sensor size of applicable cameras to OPT-COB0840-LQL and OPT-COB1240-LQL is up to 1/1.8".

Selection Guide



Application Cases

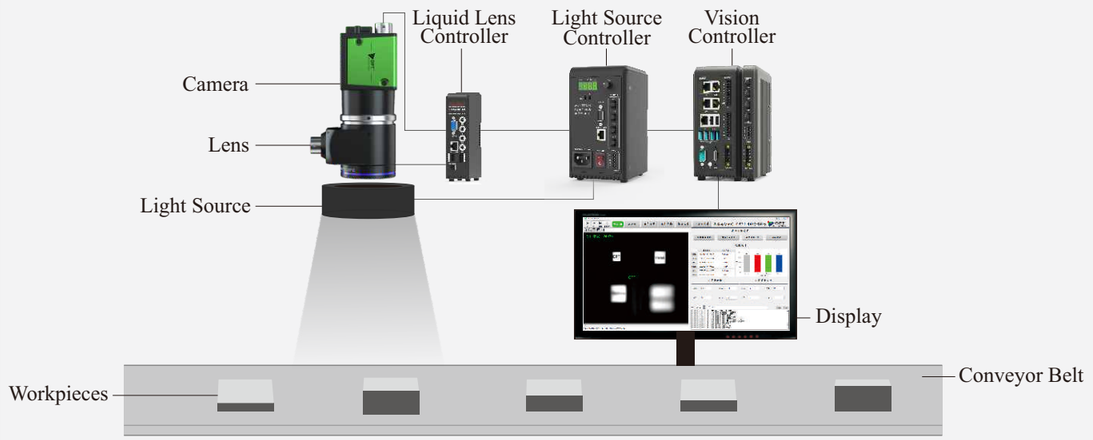

Recognition of labels on different heights of shipping boxes


Metal circular hole outline positioning and bottom defect detection


Ice cream cone exterior inspection-liquid lens testing


Bearing outer contour positioning and shaft axial runout detection

System Configuration

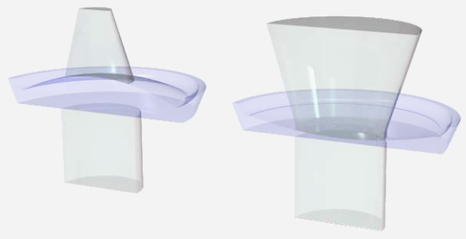


Technology Introduction

The COB series liquid fixed focal length lense employ high-precision optical design and integrated liquid lens technology, providing rapid electronic focusing, superior image performance, and a quick autofocus solution. When combined with the OPT-LLC0524E-4 liquid lens controller and Smart3 software, the liquid lens can deliver the active autofocus control required for implementing autofocus solutions. Additionally, the digital I/O interface of the liquid lens can rotate 360° to prevent interference with the imaging system's structure.

The core element of the liquid lens consists of a container that contains the optical fluid and is sealed with a thin elastic \polymer film. The driver, which is regulated by electric current, causes the curvature of the lens to change by applying pressure to the container.

The OPT liquid lens offers millisecond-level response speeds, enabling rapid autofocus, addressing challenges caused by varying working distances, and reducing the time required for lens movement and adjustments. It is compatible with cameras featuring a pixel size of 3.45 μm, allowing for quick and precise capture of high-definition images and providing a solid foundation for efficient image processing. It finds applications in fields such as 3C electronics, new energy, lithium battery, electronic components, packaging printing, food, pharmaceuticals, logistics, and automation equipmen etc..



Model Table

No.	Model	Focal length (mm)	Apeture	Sensor Ø(mm)	Pixel Size (μm)	TV Distortion	WD (mm)	Chief Ray Angle	Back Focal Length (mm)	I/O Number	Focal Power Range (20C°(dpt))	Wavefront Error[1]	FOV Angle (H×V×D)		
1	OPT-COB0840-LQL	8	F4.0	9(1/1.8")	3.45	<0.45% at WD 300	100~∞	< 5°	12.60	6-pin Hirose connector	-13~+13	<0.2λ/0.2λ	58.72°	48.46°	37.30°
2	OPT-COB1240-LQL	12	F4.0	9(1/1.8")	3.45	< 0.13% at WD 300	100~∞	< 5°	13.23	6-pin Hirose connector	-13~+13	<0.2λ/0.2λ	41.11°	33.40°	25.36°

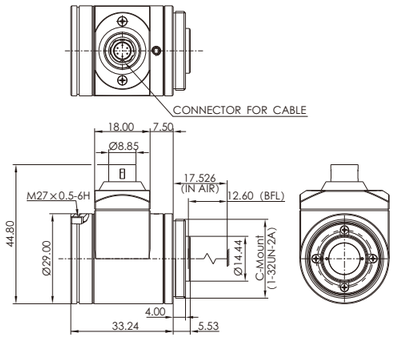
Model Table

No.	Model	Focal length (mm)	Apeture	Sensor Ø(mm)	Pixel Size (μm)	TV Distortion	WD (mm)	Chief Ray Angle	Back Focal Length (mm)	I/O Number	Focal Power Range (20C°(dpt))	Wavefront Error[1]	FOV Angle (H×V×D)		
3	OPT-COB1656-LQL	16	F5.6	11(2/3")	3.45	< 0.35% at WD 300	100~∞	< 5°	14.89	6-pin Hirose connector	-13~+13	<0.2λ/0.2λ	37.94°	30.75°	23.31°
4	OPT-COB2556-LQL	25	F5.6	11(2/3")	3.45	< 0.5% at WD 300	150~∞	< 5°	14.58	6-pin Hirose connector	-13~+13	<0.2λ/0.2λ	24.81°	19.96°	15.04°
5	OPT-COB3564-LQL	35	F6.4	11(2/3")	3.45	< 0.4% at WD 450	150~∞	< 5°	15.54	6-pin Hirose connector	-13~+13	<0.2λ/0.2λ	17.86°	14.33°	10.77°
6	OPT-COB5080-LQL	50	F8.0	11(2/3")	3.45	<0.2% at WD 400	150~∞	< 5°	18.69	6-pin Hirose connector	-13~+13	<0.2λ/0.2λ	12.55°	10.06°	7.55°

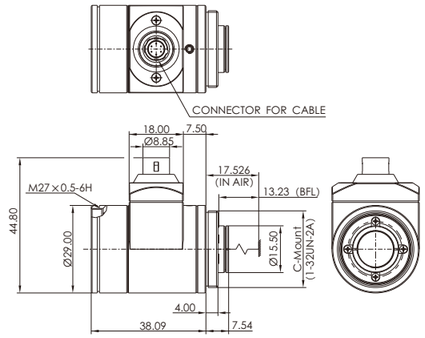
[1] The wavefront error is the mean variance in the vertical / horizontal optical axis direction at the 525 nm wavelength (RMS)λ.

Dimensions (mm)

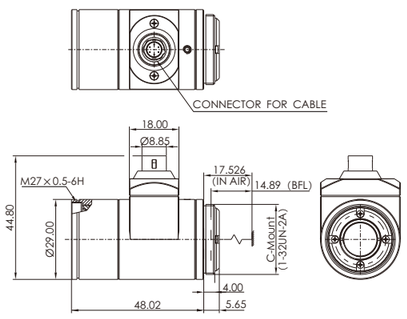
1.OPT-COB0840-LQL



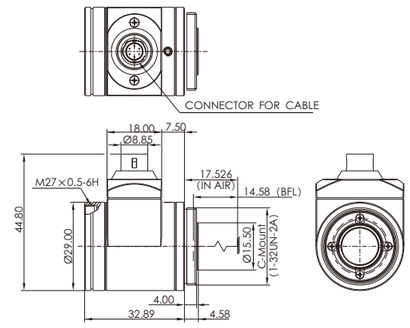
2.OPT-COB1240-LQL



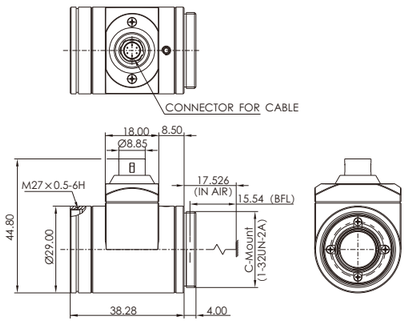
3.OPT-COB1656-LQL



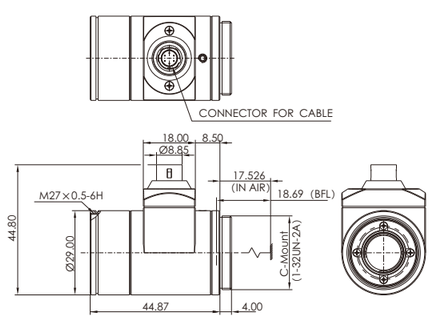
4.OPT-COB2556-LQL



5.OPT-COB3564-LQL



6.OPT-COB5080-LQL



Liquid Lens Controller

OPT-LLC0524E-4, is a liquid lens controller used in OPT liquid lenses. It has the following functions: 8190 level focusing adjustment,multi-channel independent Control, programmable debugging, 100M Ethernet communication, RS232 communication.

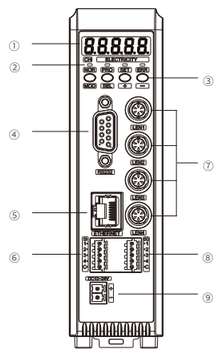


Selection Guide

OPT-LLC0524E-4
- Number of channels:4
- Ethernet
- Input voltage 24V
- Power 5W
- Controller type : Liquid Lens Controller
- Brand name

Project	Parameters	Description
Adjustable levels of current	8190 levels	Setting via keypad panel or Demo software
Liquid lens channels	4	
Communication method	RS232/Ethernet	
Lens interface	6-pin Hirose connector	
User Software Development Kit (SDK)	Applications written in C# and C++	
Supply voltage	DC24V±10%	
Power	<5W	
Operating environment temperature	-5℃~+50℃	
Humidity	20% to 85% (non-condensing)	
Dimensions(L×W×H)(mm)	95.5×40×145	Refer to dimension diagram
Weight(kg)	0.20	

Panel description

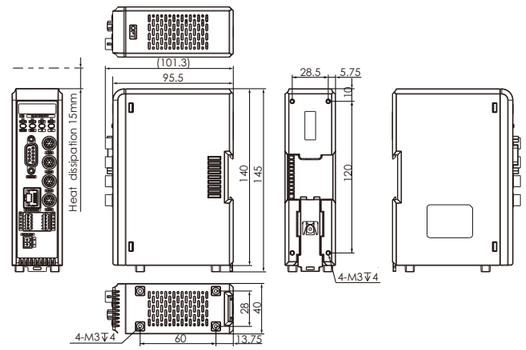


Panel description

No.	Name	Description	
1	5-Bit digital tube	From the left, the first dig it is the channel bit of the current operation, and the last four dig its are the values corresponding to the current operation.	
2	Pilot lamps	NOR Light	Normal debug
		PRO Light	Programmable debug
		SET Blink	Key setting
		ERR Light	An normal channel displayed in the current digital tube
3	Function-button	To configure the keys,the digital tube starts to blink, each press to shift, under the flashing state through the '+ ', '- ' keys to the corresponding bit.	
4	Serial port base	Communicate with the PC device by the RS232.	
5	100 Megabit network	Communication through the Ethernet and the PC devices.	
6	Control input	To be used	
7	Liquid lens interface	A total of 4 current output, each way independently controllable.	
8	Control output	To be used	
9	Power interface	Supply power to Controller.	

Dimensions (mm)

OPT-LLC0524E-4



5M 3X Variable Magnification Lenses



Product Features

- Adjustable magnification: 0.3X-1.0X
- Large sensor, max compatible with 2/3" sensor size
- Up to 120 lp/mm resolution
- High uniformity
- Full field of view< 0.5%

Resolution Comparison

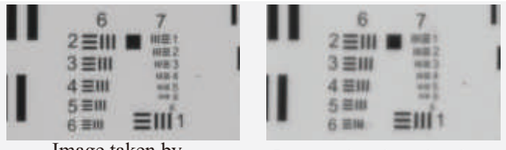


Image taken by OPT-C3X45-5M

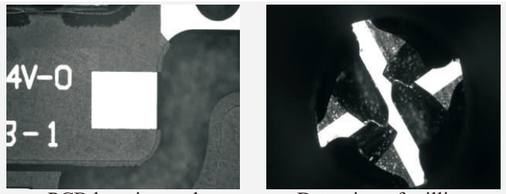
Image taken by other lens

Selection Guide

OPT-C3X45-5M

- 5M
- Maximum Aperture:F4.5
- Magnification: 0.3X-1.0X
- C-Mount
- Brand name

Application Cases



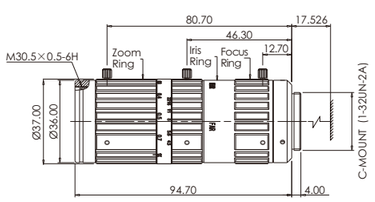
PCB locating and recognition

Detection of milling cutter edge spacing

Model Table

Model	Mag.	Aperture range	WD (mm)	Filter thread (mm)	Weight (kg)	Sensor	Distortion		FOV (mm) (H×V×D)		
OPT-C3X45-5M	0.3X-1.0X	F4.5~F22	87±3%	M30.5×0.5-6H	0.2	1/2"	0.3X	0.26%	21.33	16.00	26.67
							1.0X	0.25%	6.40	4.80	8.00
						2/3"	0.3X	0.49%	29.33	22.00	36.67
							1.0X	0.47%	8.80	6.60	11.00

Dimensions (mm)



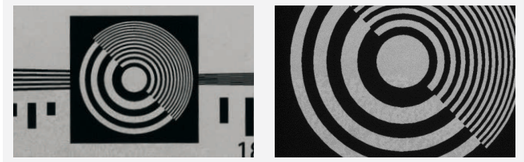
Variable Magnification Telecentric Lens



Product Features

- Adjustable magnification: 0.5X-1.0X
- Large sensor, max. compatible with 1/1.2" sensor size
- Object-space telecentric design, telecentricity: ≤ 0.05°
- Total distortion < 0.1%

Resolution Comparison



0.5X

1.0X

Selection Guide

OPT-CZT0510X

- Mag. range: 0.5X-1.0X
- Telecentric zoom lens
- C-Mount
- Brand name

Application Cases



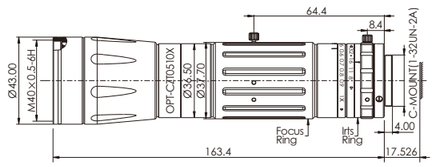
MARK locating for cutting

Gauging for metal parts

Model Table

Model	Aperture range	WD (mm)	Distortion (at 546 nm)	Mount	Weight (kg)	Magnification	Telecentricity	MTF 30 (lp/mm)	FOV Ø (mm)			
									13.4(1/1.2")	11.0(2/3")	9.0(1/1.8")	8.0(1/2")
OPT-CZT0510X	F8-F32	106±3%	<0.05%	C	0.38	0.5X	<0.05°	90	26.80	22.00	18.00	16.00
						0.6X	<0.04°	90	22.33	18.33	15.00	13.33
						0.7X	<0.05°	90	19.14	15.71	12.86	11.43
						0.8X	<0.03°	75	16.75	13.75	11.25	10.00
						0.9X	<0.02°	70	14.89	12.22	10.00	8.89
						1.0X	<0.05°	70	13.40	11.00	9.00	8.00

Dimensions (mm)



Zoom Microscopic Lens New



Product Features

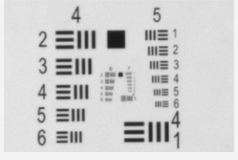
Modular design
Various magnification objective lenses are available for selection, and other functional module components such as coaxial prism group and focusing group are provided for option, which can meet the needs of different usage scenarios.

7X zoom ratio
Magnification[1]0.65X~4.55X, working distance is fixed during the magnification change.

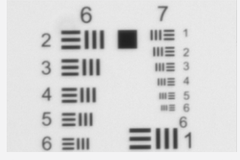
Optical system for clear imaging
High resolution with an ultimate resolution of 3.46 μm.

[1]:This magnification is for the tube lens OPT-TL160-1.0X, the zoom Lens OPT-ZL7000 and the Lens Attachment OPT-LA100-1.0X paired with the zoom microscope system; If the Lens Attachment OPT-LA200-0.5X, the magnification is from 0.325 to 2.275X.

Resolution Comparison

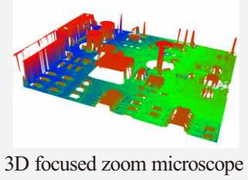


OPT-LA100-1.0X-OPT-ZL7000 -OPT-TL160-1.0X-Minimum Magnification-0.65X

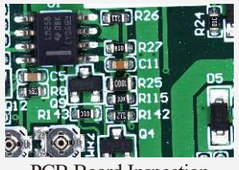


OPT-LA100-1.0X-OPT-ZL7000 -OPT-TL160-1.0X-Maximum Magnification-4.55X

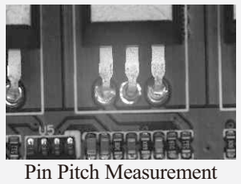
Application Cases



3D focused zoom microscope



PCB Board Inspection



Pin Pitch Measurement



Detecting Screw Scratches

Selection Guide

Lens Attachment
OPT-LA100-1.0X

- Lens Attachment magnification:1.0X
- Focal length:100mm
- Lens Attachment
- Brand name

Tube Lens
OPT-TL160-1.0X

- Tube Lens magnification:1.0X
- Focal length:160mm
- Tube Lens
- Brand name

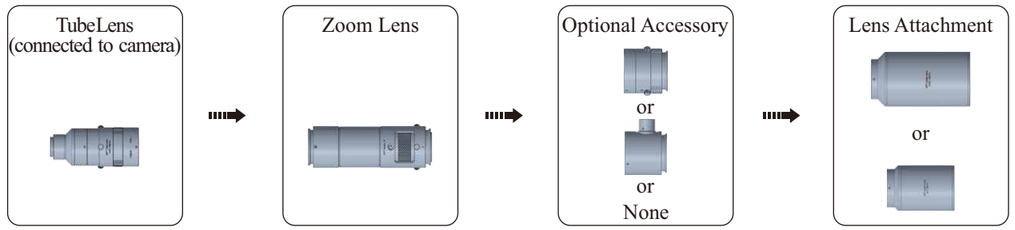
Optional Accessory
OPT-ADP-ZL7000-1

- Focus Group
- For OPT-ZL7000 zoom lens
- Optional Accessory
- Brand name

Zoom Lens
OPT-ZL7000

- 7X zoom ratio
- Zoom Lens
- Brand name

Selection instructions



Model Table

System Parameter Table

Lens Attachment	Optional Accessory	Function of Accessory	Zoom Lens	Tube Lens	Working Distance(mm)	System Magnification		Object NA		Resolving Limit*(μm)		Depth of Field*(mm)		Pixel Size*(μm)		Sensor Format	Object Coverage(mm)	
						Low Mag.	High Mag.	Low Mag.	High Mag.	Low Mag.	High Mag.	Low Mag.	High Mag.	Low Mag.	High Mag.		Low Mag.	High Mag.
OPT-LA100-1.0X	None	None	OPT-ZL7000	OPT-TL160-1.0X	90	0.65	4.55	0.036	0.097	9.32	3.46	0.93	0.05	6.06	15.74	1/4″	6.15	0.88
																1/3″	9.23	1.32
	OPT-ADP-ZL7000-1	Working distance can be fine tuned														1/2″	12.31	1.76
																2/3″	16.92	2.42
	OPT-ADP-ZL7000-2	Built-in coaxial light illumination														1″	24.62	3.52
																1.1″	27.08	3.87
OPT-LA200-0.5X	None	None			180	0.325	2.275	0.018	0.048	18.64	6.99	3.71	0.20	3.03	7.87	1/4″	12.31	1.76
																1/3″	18.46	2.64
	OPT-ADP-ZL7000-1	Working distance can be fine tuned														1/2″	24.62	3.52
																2/3″	33.85	4.84
																1″	49.23	7.03
																1.1″	54.15	7.74

Notes:
*Resolving Limit: Resolving Limit evaluation formula is: 0.61×0.55/NA
NA: Objective NA
*Depth of Field: Depth of Field evaluation formula: DOF(mm)=F/#×P×k/β²
F/#: The real F-number of a lens when used P: Sensor pixel size (5.5 μm used here)
β: Lens magnification k: The parameter based on application (measurement: k=0.015: defect detection: k=0.008: 0.008 used here)
*Pixel Size: The evaluation formula is: resolution Limit×System Magnification

Lens Attachment

Model	Focal Length(mm)	Working Distance(mm)	Object Coverage(mm)		Optical Distortion		Object NA		AR Coating(nm)	Weight (kg)
			Low Mag.	High Mag.	Low Mag.	High Mag.	Low Mag.	High Mag.		
OPT-LA100-1.0X	100±1%	90	27.08	3.87	-1.87%	-1.87%	0.036	0.018	400～1000	0.56
OPT-LA200-0.5X	200±1%	180	54.15	7.74	-0.04%	-0.04%	0.097	0.049	400～1000	0.71

Tube Lens

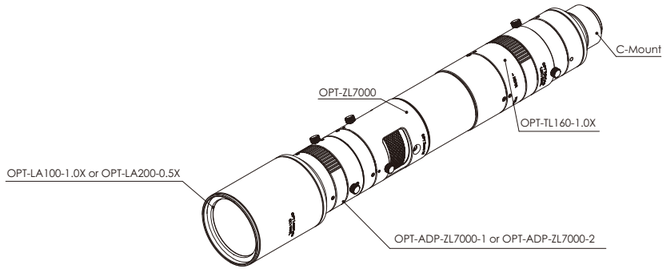
Model	Focal Length(mm)	SensorØ (mm)	Max. entrance pupil DiameterØ(mm)	Entrance Pupil Distance(mm)	Mount	Flange Focal Distance (mm)	Optical Distortion	Image NA	Design Wavelength Range(nm)	AR Coating(nm)	Weight (kg)
OPT-TL160-1.0X	160±1%	17.6(1.1")	20	0～250	C-Mount	17.526	0.23%	0.062	425～675	400～1000	0.33

Zoom Lens

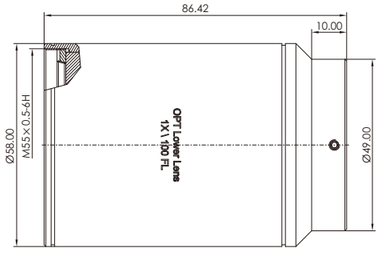
Model	Magnification Range	AR Coating(nm)	Weight (kg)
OPT-ZL7000	0.4X～2.8X	400～1000	0.57

Dimensions (mm)

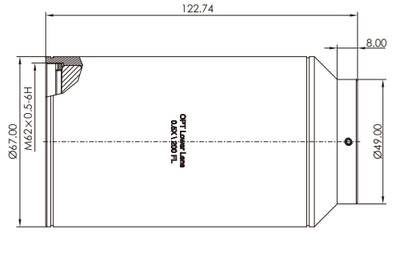
1.7X Zoom Microscope Lens



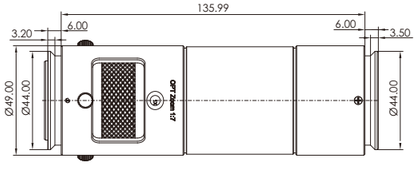
2.OPT-LA100-1.0X



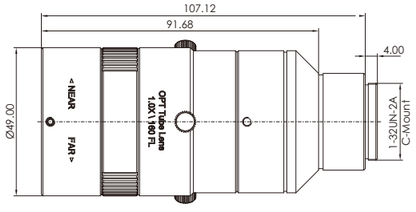
3.OPT-LA200-0.5X



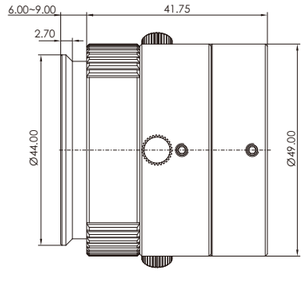
4.OPT-ZL7000



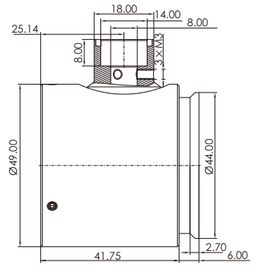
5.OPT-TL160 -1.0X



6.OPT-ADP-ZL7000-1



7.OPT-ADP-ZL7000-2



Note: AR Coating: 400-1000nm

Cheetah Series Telecentric Lenses



Product Features

- Large aperture high-resolution design, compatible with 5-megapixel cameras with 2/3" sensor size
- The full range of magnification range is wide, from 0.3X to 2.0X a variety of magnification options
- High telecentricity, high contrast, optional built-in coaxial light illumination specifications

Resolution Comparison



Image taken by Cheetah

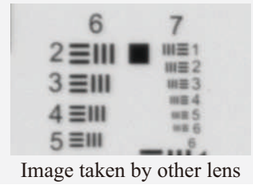


Image taken by other lens

Selection Guide

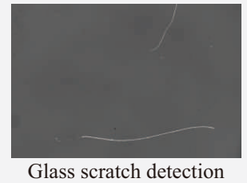
OPT-CH05-110C-F6.5

- Maximum Aperture:F6.5
- C: Coaxial point light illumination can be built-in; FC: Built-in coaxial surface illumination available.
- Object side working distance (WD): 110 mm
- Magnification: 1.0X
- Cheetah Series Telecentric Lenses
- Brand name

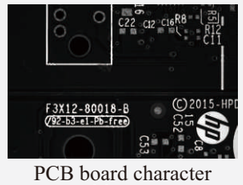
Application Cases



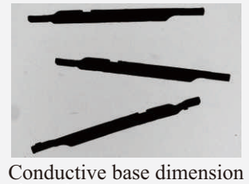
Glass screen Mark positioning



Glass scratch detection



PCB board character recognition



Conductive base dimension detection

Model Table

No.	Model	WD (mm)[1]	Mag.	Sensor Ø (mm)	Aperture (F/#)[2][4]	Distortion (Max.)	DOF (mm)[3]	MTF30 (lp/mm)	Telecentricity (Max.)	O/I (mm)	Weight (kg)	FOV. Ø (mm)
1	OPT-CH03-110-F6.5	110±2	0.3X	11.0(2/3")	F6.5	<0.1%	5.96	145	0.10°	261.6	0.26	36.67
2	OPT-CH05-110-F6.5	110±2	0.5X	11.0(2/3")	F6.5	<0.1%	2.15	145	0.10°	264.4	0.23	22.00
3	OPT-CH08-110-F6.5	110±2	0.8X	11.0(2/3")	F6.5	<0.1%	0.84	145	0.10°	235.6	0.19	13.75
4	OPT-CH10-110-F6.5	110±2	1.0X	11.0(2/3")	F6.5	<0.1%	0.54	145	0.10°	236.8	0.20	11.00
5	OPT-CH15-110-F7.5	110±2	1.5X	11.0(2/3")	F7.5	<0.1%	0.28	130	0.10°	273.6	0.29	7.33
6	OPT-CH05-65-F4.8	65±2	05X	11.0(2/3")	F4. 8	<0.1%	1.58	200	0.10°	184.59	0.20	22.00
7	OPT-CH20-65-F7	65±2	2.0X	11.0(2/3")	F7.0	<0.1%	0.14	140	0.10°	199.6	0.28	5.50

Model Table

No.	Model	WD (mm)[1]	Mag.	Sensor Ø (mm)	Aperture (F/#)[2][4]	Distortion (Max.)	DOF (mm)[3]	MTF30 (lp/mm)	Telecentricity (Max.)	O/I (mm)	Weight (kg)	FOV. Ø (mm)
8	OPT-CH03-110C-F6.5	110±2	0.3X	11.0(2/3")	F6.5	<0.1%	5.96	145	0.10°	261.6	0.31	36.67
9	OPT-CH03-110FC-F6.5	110±2	0.3X	11.0(2/3")	F6.5	<0.1%	5.96	145	0.10°	261.6	0.31	36.67
10	OPT-CH05-110C-F6.5	110±2	0.5X	11.0(2/3")	F6.5	<0.1%	2.15	145	0.10°	264.4	0.28	22.00
11	OPT-CH05-110FC-F6.5	110±2	0.5X	11.0(2/3")	F6.5	<0.1%	2.15	145	0.10°	264.4	0.28	22.00
12	OPT-CH08-110C-F6.5	110±2	0.8X	11.0(2/3")	F6.5	<0.1%	0.84	145	0.10°	235.6	0.24	13.75
13	OPT-CH08-110FC-F6.5	110±2	0.8X	11.0(2/3")	F6.5	<0.1%	0.84	145	0.10°	235.6	0.24	13.75
14	OPT-CH10-110C-F6.5	110±2	1.0X	11.0(2/3")	F6.5	<0.1%	0.54	145	0.10°	236.8	0.25	11.00
15	OPT-CH10-110FC-F6.5	110±2	1.0X	11.0(2/3")	F6.5	<0.1%	0.54	145	0.10°	236.8	0.25	11.00
16	OPT-CH15-110C-F7.5	110±2	1.5X	11.0(2/3")	F7.5	<0.1%	0.28	130	0.10°	273.6	0.31	7.33
17	OPT-CH05-65C-F4.8	65±2	0.5X	11.0(2/3")	F4.8	<0.1%	1.58	200	0.10°	184.6	0.22	22.00
18	OPT-CH20-65C-F7	65±2	2.0X	11.0(2/3")	F7.0	<0.1%	0.14	140	0.10°	199.6	0.29	5.50

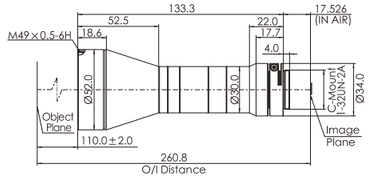
Notes:

1. Working Distance (WD): The distance between the front end of the lens and the object.
2. Aperture F/#: The actual working F-number of the telecentric lens.
3. Depth of Field (DOF): For telecentric lenses, the depth of field can be estimated by the formula: DoF(mm) = F/# * P * k / β^2 Here, F/# represents the actual working F-number of the lens; P is the sensor pixel size, calculated as 5.5um in this case; β denotes the magnification of the lens; K is a dimensionless parameter specific to the application.
   For measurement applications, K = 0.015, and for defect detection, K = 0.008. The value of 0.015 is used in the table. At the nominal depth of field edge, the image can still be used for measurement, but to obtain a clearer image, it is recommended to use half the nominal value.
4. There are various aperture specifications available: for 0.3X, there are small apertures F8 and F11 available; for 0.5X, there are F6, F8, and F11 available; for 0.8X, there are small apertures F8 and F11 available; for 1.0X~2.0X, there are small apertures F11 and F16 available; for 4.0X, there are small apertures F16 and F22 available. Custom apertures can also be made according to application requirements.
5. both types of light sources support shooting highly reflective objects. If shooting low-reflective objects, it is recommended to use a dedicated surface light source for better illumination. If a dedicated surface light source is selected, the light source PT-FL3118-CH-X must be additionally purchased, where X represents the light source color, with options of red, green, blue, and white light available.

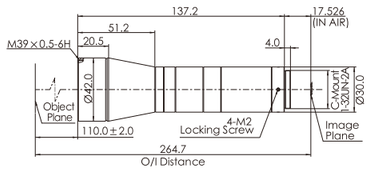
No.	Model	◦Power Dissipation ○	◦Power consumption 🔴	◦Power consumption 🟢	◦Power consumption 🔵	Size (mm)	Recommended controller
1	OPT-FL3118-CH-X	2.88W@24V				31×18×15.5	OPT-AP1024-4

Dimensions (mm)

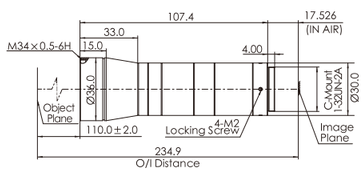
1.OPT-CH03-110-F6.5



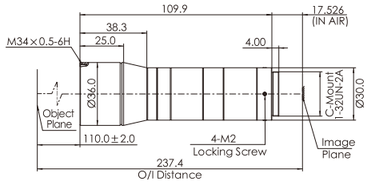
2.OPT-CH05-110-F6.5



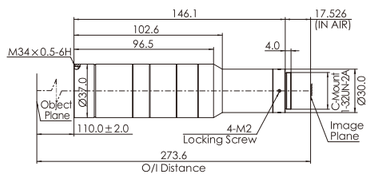
3.OPT-CH08-110-F6.5



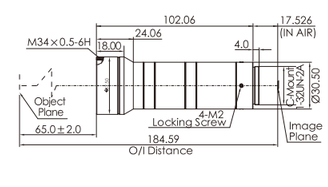
4.OPT-CH10-110-F6.5



5.OPT-CH15-110-F7.5



6.OPT-CH05-65-F4.8



Model Table

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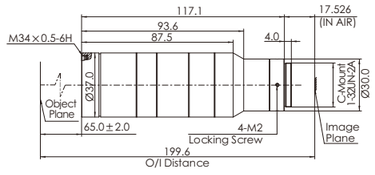

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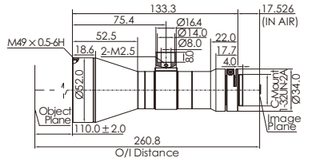

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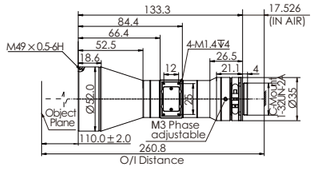

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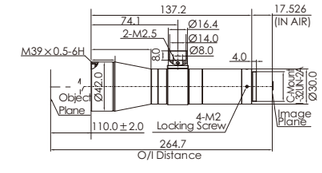

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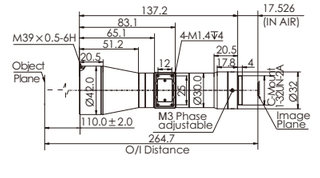

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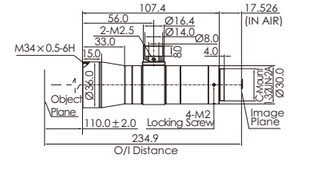

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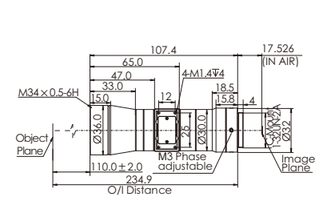

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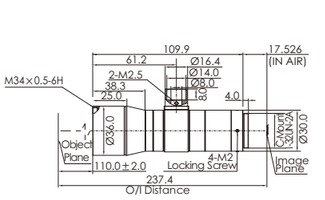

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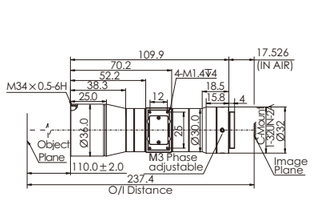

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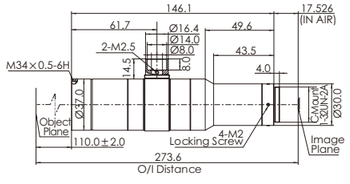

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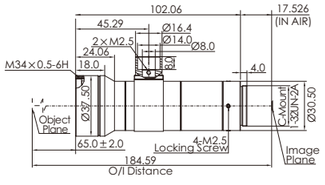

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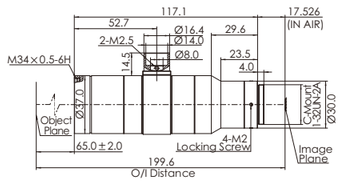
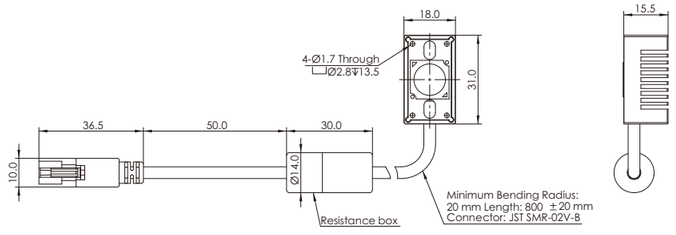


1.OPT-FL3118-CH-X



Hippo Series Telecentric Lenses



Product Features

- High resolution, low distortion, compatible with cameras up to 1.1″ sensor size
- The entire series has a wide magnification range, with multiple magnifications available from 0.3X to 4X
- Telecentric light path design, high telecentricity, optional built-in coaxial light illumination specifications

Resolution Comparison



Image taken by Cheetah



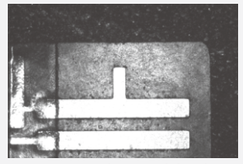
Image taken by other lens

Selection Guide

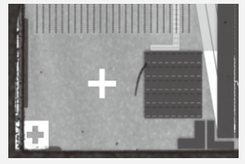
OPT-HP10-110C-F6.5

- Maximum Aperture:F6.5
- C: Coaxial point light illumination can be built-in; FC: Built-in coaxial surface illumination available.
- Object side working distance (WD): 110 mm
- Magnification: 1.0X
- Hippo Series Telecentric Lenses
- Brand name

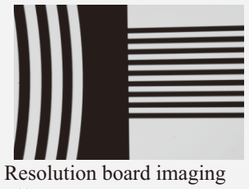
Application Cases



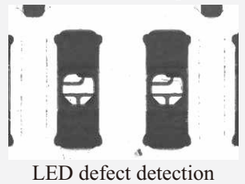
MARK point positioning



LCD screen MARK positioning



Resolution board imaging effect



LED defect detection

Model Table

No.	Model	WD (mm)[1]	Mag.	Sensor Ø (mm)	Aperture (F/#)[2][4]	Distortion (Max.)	DOF (mm)[3]	MTF30 (lp/mm)	Telecentricity (Max.)	O/I (mm)	Weight (kg)	FOV. Ø (mm)
1	OPT-HP03-110-F6.5	110±2	0.3X	18.4(1.1")	F6.5	<0.1%	5.96	145	0.10°	292.6	0. 86	61. 33
2	OPT-HP04-190-VI	190±2	0.4X	18.4(1.1")	F6.5~F44	<0.1%	3.35~22.69	145~25	0.10°	381.6	0.719	46
3	OPT-HP05-110-F6.5	110±2	0.5X	18.4(1.1")	F6.5	<0.2%	2.15	145	0.10°	284.6	0. 52	36. 80
4	OPT-HP08-110-F6.5	110±2	0.8X	18.4(1.1")	F6.5	<0.1%	0.84	145	0.10°	278.7	0. 51	23. 00
5	OPT-HP10-110-F7	110±2	1.0X	18.4(1.1")	F7.0	<0.1%	0.58	130	0.10°	273.6	0. 36	18. 40
6	OPT-HP15-110-F7	110±2	1.5X	18.4(1.1")	F7.0	<0.2%	0.26	135	0.10°	275.6	0. 46	12. 27
7	OPT-HP20-65-F7	65±2	2.0X	18.4(1.1")	F7.0	<0.1%	0.14	130	0.10°	233.6	0. 46	9. 20
8	OPT-HP40-65-F12	65±2	4.0X	18.4(1.1")	F11.8	<0.1%	0.06	80	0.10°	252.6	0. 51	4. 60

Model Table

No.	Model	WD (mm)[1]	Mag.	Sensor Ø (mm)	Aperture (F/#)[2][4]	Distortion (Max.)	DOF (mm)[3]	MTF30 (lp/mm)	Telecentricity (Max.)	O/I (mm)	Weight (kg)	FOV. Ø (mm)
9	OPT-HP03-110C-F6.5	110±2	0.3	18.4(1.1")	F6.5	<0.1%	5.96	145	0.10°	292.7	0.92	61.33
10	OPT-HP03-110FC-F6.5	110±2	0.3	18.4(1.1")	F6.5	<0.1%	5.96	145	0.10°	292.7	0.92	61.33
11	OPT-HP05-110C-F6.5	110±2	0.5	18.4(1.1")	F6.5	<0.2%	2.15	145	0.10°	284.7	0.58	36.80
12	OPT-HP05-110FC-F6.5	110±2	0.5	18.4(1.1")	F6.5	<0.2%	2.15	145	0.10°	284.7	0.58	36.80
13	OPT-HP08-110C-F6.5	110±2	0.8	18.4(1.1")	F6.5	<0.1%	0.84	145	0.10°	278.7	0.57	23.00
14	OPT-HP08-110FC-F6.5	110±2	0.8	18.4(1.1")	F6.5	<0.1%	0.84	145	0.10°	278.7	0.57	23.00
15	OPT-HP10-110C-F7	110±2	1.0	18.4(1.1")	F7.0	<0.1%	0.58	130	0.10°	273.6	0.41	18.40
16	OPT-HP10-110FC-F7	110±2	1.0	18.4(1.1")	F7.0	<0.1%	0.58	130	0.10°	273.6	0.41	18.40
17	OPT-HP15-110C-F7	110±2	1.5	18.4(1.1")	F7.0	<0.2%	0.26	135	0.10°	275.6	0.49	12.27
18	OPT-HP20-65C-F7	65±2	2.0	18.4(1.1")	F7.0	<0.1%	0.14	130	0.10°	233.6	0.49	9.20
19	OPT-HP40-65C-F12	65±2	4.0	18.4(1.1")	F11.8	<0.1%	0.06	80	0.10°	252.6	0.53	4.60

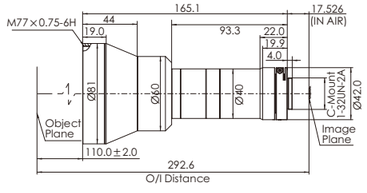
Notes:

1. Working distance (WD): the distance between the foremost part of the lens and the object.
2. Aperture F/#: the actual working F/# the telecentric lens.
3. Depth of field: for telecentric lens, depth of field is estimated by the formula: DOF (mm) = F / # * P * k / β^2, F / #: for the lens of the actual work of the number of F; P: is the sensor pixel size, here take 5.5 μm calculations; β: the lens of the magnification; k is the decision of the specific application of the dimensionless parameter, if it is the application of the measurement of k = 0.015, if it is a defect detection k = 0.008, the table is calculated by taking 0.015. At the edge of the nominal depth of field, the image can still be used for measurement, but half the nominal value is recommended to obtain a clearer image.
4. There are a variety of aperture specifications can be selected, 0.3X ~ 0.8X has a small aperture F8 and F11 optional; 1.0X ~ 2.0X has a small aperture F11 and F16 optional; 4.0X has a small aperture F16 and F22 optional.
5. Both light sources support the shooting of highly reflective objects, if you want to shoot low-reflective objects, it is recommended to use a dedicated surface light source to get better lighting effects. If optional dedicated surface light source, you need to purchase a separate light source, OPT-FL4120-HP-X for 0.3X ~ 0.8X; OPT-FL3820-HP10-X for 1.0X; where X indicates the color of the light source, there are red, green, blue, and white light available.

No.	Model	*Power Dissipation ○	*Power consumption ●	*Power consumption ●	*Power consumption ●	Size (mm)	Recommended controller
1	OPT-FL4120-HP-X	2.88W@24V				41×20×22.8	OPT-AP1024-4
2	OPT-FL3820-HP10-X					38×20×17.8	

Dimensions (mm)

1.OPT-HP03-110-F6.5



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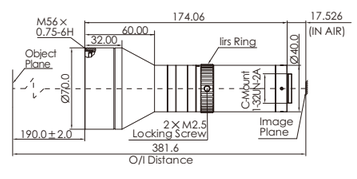

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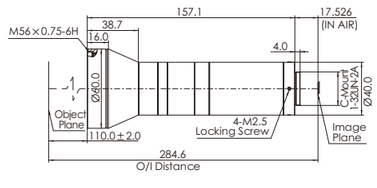

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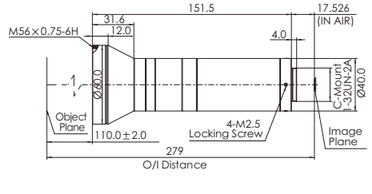

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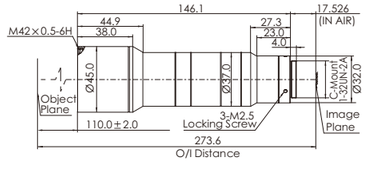
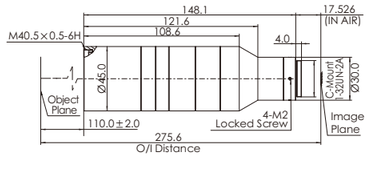
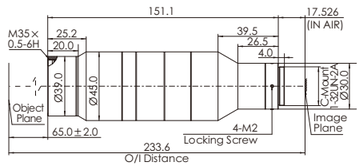


6.OPT-HP15-110-F7



Dimensions (mm)

7.OPT-HP20-65-F7



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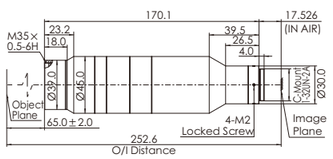

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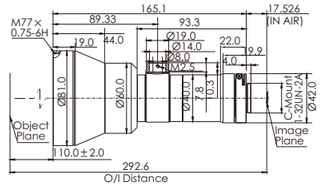

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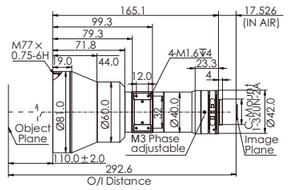

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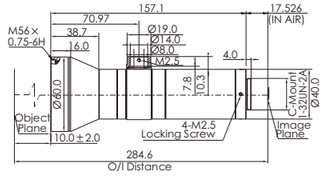

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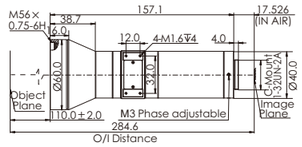

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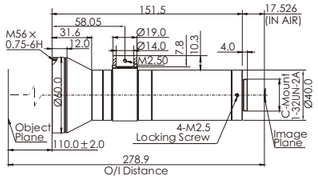

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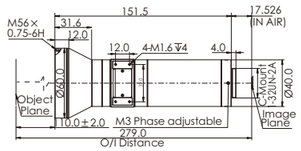

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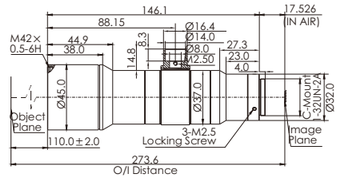

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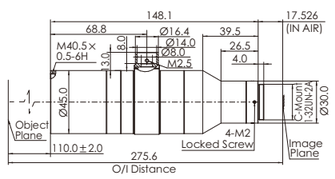

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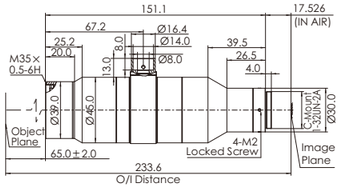

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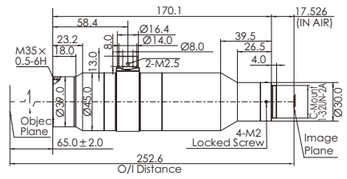

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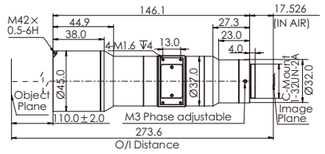
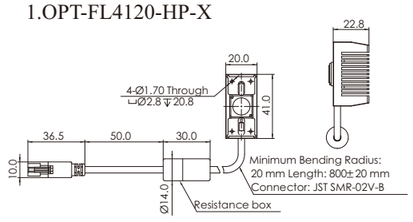
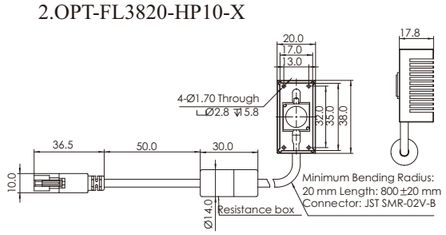


1.OPT-FL4120-HP-X



2.OPT-FL3820-HP10-X



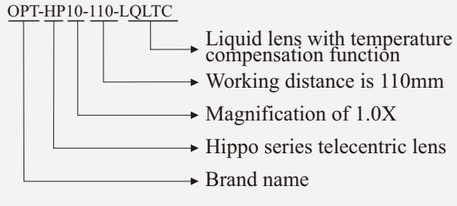
Hippo Series Liquid Telecentric Lens New



Product Features

- **High resolution**
  Maximum resolution of 145lp/mm, low distortion, compatible with cameras up to 1.1" sensor size, and magnification options.
- **Fast focusing**
  The fastest response time is 3ms, and the image is stabilized within 10ms. Almost instantaneous focusing.
- **Repeatability Stability**
  Repeatability adjustment accuracy up to 0.01dpt.
- **Temperature compensation function**
  Integrated liquid lens controller, its built-in temperature sensor can read the temperature in real time, in order to instantly compensate for temperature changes brought about by the change of optical power.
- **Eliminate parallax**
  Telecentric optical path design, high telecentricity.

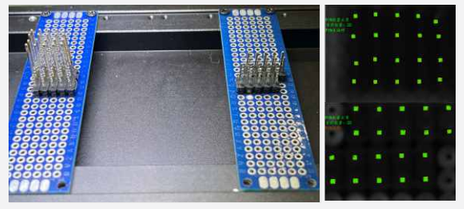
Selection Guide



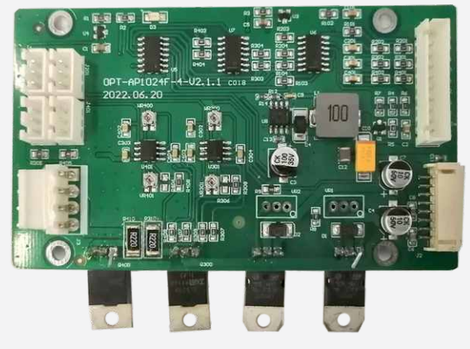
Application Cases



Information extraction and recognition of parcels of different shapes



Detect the number and defects of pins of different heights



Electronic component testing

Technology Introduction

The Hippo series liquid telecentric lenses utilize a high precision telecentric optical design. Integrated liquid lens and controller. It enables fast and accurate electronic focusing, providing superior image performance and a fast autofocus solution. The telecentric optical path design makes it more accurate when focusing on workpieces of different heights. Combined with the Smart3 it enables the active focus control required for autofocus solutions.

The principle of the liquid lens is that a layer of elastic polymer hermetically seals the optical fluid in a container, and the curvature of the liquid lens is varied by adjusting the electric current so that the driver applies different pressures to the container, thus adapting it to different working distances.

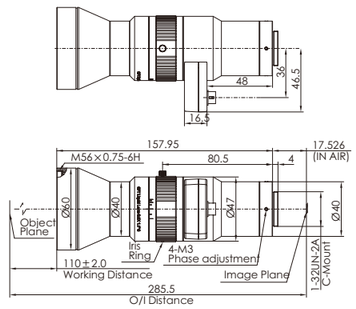
OPT liquid telecentric lens response speed of up to milliseconds, to achieve fast focusing, can solve the problem caused by different working distance, while eliminating parallax, reducing the lens movement and debugging time; through the integration of liquid lens controller, to provide temperature compensation function, reduce component heating, environmental temperature changes on the interference of the imaging effect, so as to make the imaging more stable. Provide a good foundation for efficient image processing. Application areas include: 3C electronics, new energy, lithium-ion battery, printing, food and medicine, and automation equipment.

Model Table

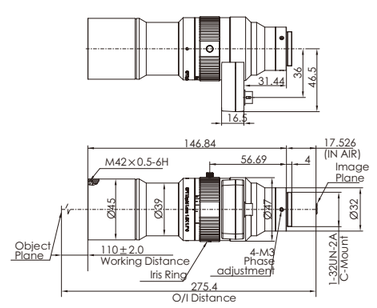
Model	OPT-HP05-110-LQLTC	OPT-HP10-110-LQLTC	OPT-HP20-65-LQLTC	OPT-HP40-65-LQLTC
Magnification	0.5X	1.0X	2.0X	4.0X
Aperture	F6.5 ~ F44	F7.0 ~ F62	F7.0 ~ F62	F12 ~ F124
Sensor ø(mm)	18.4(1.1")	18.4(1.1")	18.4(1.1")	18.4(1.1")
Pixel size(μm)	3.45	3.85	3.85	6.25
Distortion	<0.2%	<0.1%	<0.1%	<0.1%
Working distance (mm)	110±2	110±2	65±2	65±2
Telecentricity	0.10°	0.10°	0.10°	0.10°
Focal power at 0 mA (25°C, typical) (dpt)	-1 ~ +2	-1 ~ +2	-1 ~ +2	-1 ~ +2
Digital I/O	Hirose HR10G-7R-6SB(73)	Hirose HR10G-7R-6SB(73)	Hirose HR10G-7R-6SB(73)	Hirose HR10G-7R-6SB(73)
Focal power range (25°C, ±250 mA)(dpt)	-6 ~ +10	-6 ~ +10	-6 ~ +10	-6 ~ +10
Image MTF30 (at 0 dpt) (lp/mm)	145	130	130	80
Field of View ø(mm)	36.8	18.4	9.2	4.6
Temperature compensation	Yes	Yes	Yes	Yes
Depth of Field (mm)	2.15	0.58	0.14	0.06

Dimensions (mm)

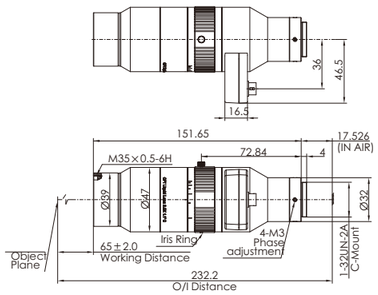
1.OPT-HP05-110-LQLTC



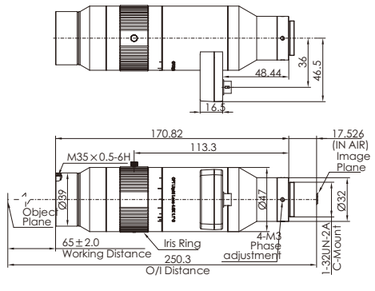
2.OPT-HP10-110-LQLTC



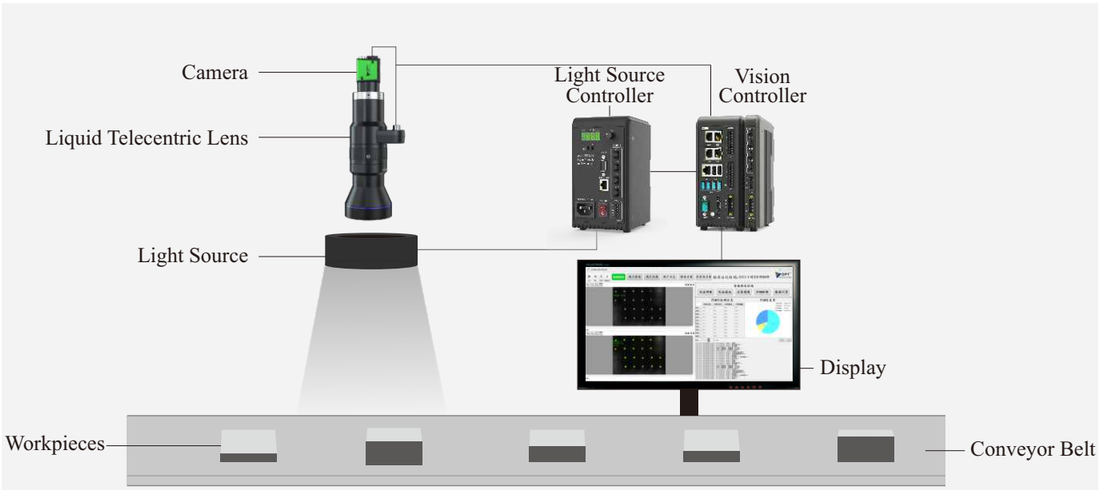
3.OPT-HP20-65-LQLTC



4.OPT-HP40-65-LQLTC



System Configuration



MH Series Telecentric Lenses



Product Features

- High-definition large-aperture telecentric lens, compatible with up to 2/3" sensor size camera.
- The magnification range of the whole series is wide, multiple magnifications are available from 0.5X to 7.5X.
- Object-oriented telecentric design, with built-in coaxial light illumination specifications optional.

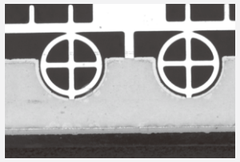
Selection Guide

OPT-MH05-65C
- C: Built-in coaxial light illumination
- Working distance (WD): 65 mm
- Magnification: 0.5X
- MH Series Telecentric Lenses
- Brand name

Application Cases



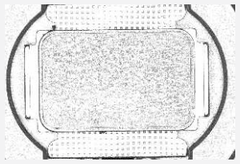
Wafer recognition



MARK Point Positioning



QR code reading



Glue uniformity inspection

Model Table

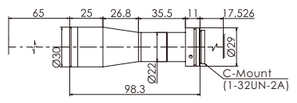
No.	Model	WD (mm)[1]	Mag.	Sensor Ø (mm)	Aperture (F/#)[2]	Distortion (Max.)	DOF (mm)[3]	MTF30 (lp/mm)	Object telecentricity (Max.)	Object image distance (mm)	Weight (kg)	Field of View Ø (mm)
1	OPT-MH08-65	65±1	0.8X	11.0(2/3″)	F10.0	<0.086%	1.29	100	0.08°	180.8	0.20	13.80
2	OPT-MH08-65C	65±1	0.8X	11.0(2/3″)	F10.0	<0.083%	1.29	100	0.07°	183.9	0.40	13.80
3	OPT-MH10-65	65±1	1X	11.0(2/3″)	F11.1	<0.038%	0.92	90	0.06°	190.1	0.20	11.00
4	OPT-MH10-65C	65±1	1X	11.0(2/3″)	F11.1	<0.039%	0.92	90	0.06°	193.0	0.20	11.00
5	OPT-MH15-65	65±1	1.5X	11.0(2/3″)	F11.9	<0.105%	0.44	85	0.15°	168.6	0.20	7.30
6	OPT-MH15-65C	65±1	1.5X	11.0(2/3″)	F11.9	<0.105%	0.44	85	0.15°	168.6	0.30	7.30
7	OPT-MH30-65	65±1	3X	11.0(2/3″)	F15.7	<0.038%	0.14	65	0.15°	182.0	0.10	3.70
8	OPT-MH30-65C	65±1	3X	11.0(2/3″)	F15.7	<0.038%	0.14	65	0.15°	182.0	0.20	3.70
9	OPT-MH60-65	65±1	6X	11.0(2/3″)	F26.6	<0.028%	0.06	35	0.15°	211.8	0.10	1.80
10	OPT-MH60-65C	65±1	6X	11.0(2/3″)	F26.6	<0.028%	0.06	35	0.15°	211.8	0.20	1.80

No.	Model	WD (mm)[1]	Mag.	Sensor Ø (mm)	Aperture (F/#)[2]	Distortion (Max.)	DOF (mm)[3]	MTF30 (lp/mm)	Object telecentricity (Max.)	Object image distance (mm)	Weight (kg)	Field of View Ø (mm)
11	OPT-MH20-110	110±2	2X	11.0(2/3″)	F13.5	<0.036%	0.28	75	0.15°	257.1	0.20	5.50
12	OPT-MH20-110C	110±2	2X	11.0(2/3″)	F13.5	<0.036%	0.28	75	0.15°	257.1	0.15	5.50
13	OPT-MH30-110	110±2	3X	11.0(2/3″)	F18.2	<0.037%	0.17	55	0.15°	259.7	0.15	3.70
14	OPT-MH30-110C	110±2	3X	11.0(2/3″)	F18.2	<0.037%	0.17	55	0.15°	259.7	0.15	3.70
15	OPT-MH40-110	110±2	4X	11.0(2/3″)	F22.1	<0.055%	0.11	45	0.04°	262.7	0.15	2.80
16	OPT-MH40-110C	110±2	4X	11.0(2/3″)	F22.1	<0.055%	0.11	45	0.04°	262.7	0.14	2.80
17	OPT-MH60-110	110±2	6X	11.0(2/3″)	F33.2	<0.03%	0.08	30	0.03°	297.0	0.15	1.80
18	OPT-MH60-110C	110±2	6X	11.0(2/3″)	F33.2	<0.03%	0.08	30	0.03°	297.0	0.30	1.80

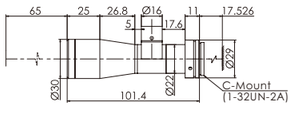
[1] WD: The distance between the front end of the lens and the object.
[2] F/#: The real F-number of a lens when used.
[3] DOF evaluation formula for telecentric lenses: DOF(mm)=F/#×P×k/β^2;
P: Sensor pixel size (5.5 μm used here)
β: Lens magnification
k: The parameter based on application (measurement, k=0.015; defect detection, k=0.008; 0.015 used here)
At the borders of DOF, the image can still be use for measurement. But only half of the nominal DOF should be used to get a sharp image.

Dimensions (mm)

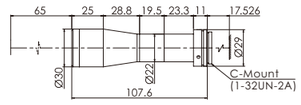
1.OPT-MH08-65



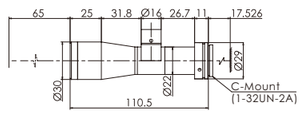
2.OPT-MH08-65C



3.OPT-MH10-65



4.OPT-MH10-65C



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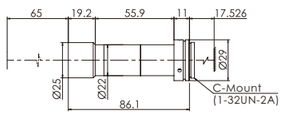
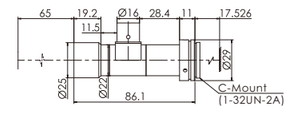
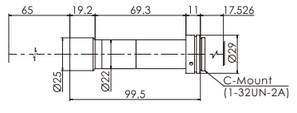


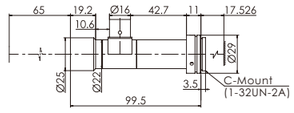
6.OPT-MH15-65C



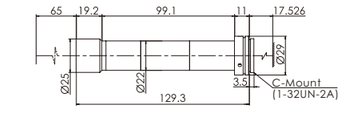
7.OPT-MH30-65



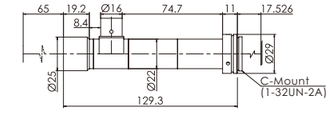
8.OPT-MH30-65C



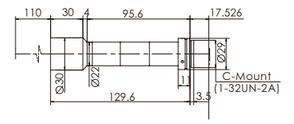
9.OPT-MH60-65



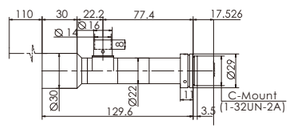
10.OPT-MH60-65C



11.OPT-MH20-110

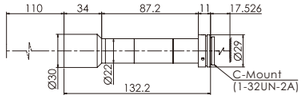


12.OPT-MH20-110C

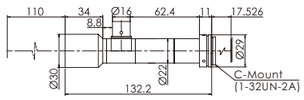


Dimensions (mm)

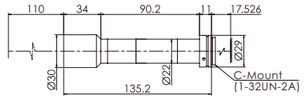
13.OPT-MH30-110



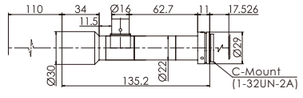
14.OPT-MH30-110C



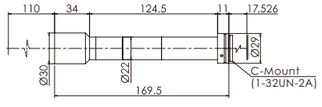
15.OPT-MH40-110



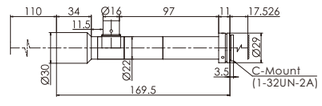
16.OPT-MH40-110C



17.OPT-MH60-110



18.OPT-MH60-110C



10M Series Telecentric Lenses



Product Features

- Large aperture and high resolution, compatible with cameras up to 1.1" sensor size.
- The magnification range of the whole series is wide, multiple magnifications are available from 0.2X to 4X.
- High-contrast, low-distortion design, and optional built-in coaxial lighting specifications.

Selection Guide

OPT-10M05-65C

- C: Built-in coaxial light illumination
- Working distance (WD): 65 mm
- Magnification: 0.5X
- 10M Series Telecentric Lenses
- Brand name

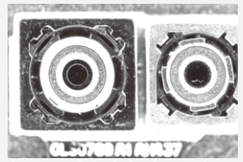
Application Cases



Cell phone back cover jack detection



Socket Character Recognition



Camera Module Scratch Detection



Dispensing and Positioning

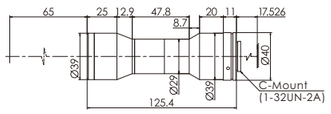
Model Table

No.	Model	WD (mm)[1]	Mag.	Sensor Ø (mm)	Aperture (F/#)[2]	Distortion (Max.)	DOF (mm)[3]	MTF30 (lp/mm)	Object telecentricity (Max.)	Object image distance (mm)	Weight (kg)	Field of view Ø (mm)
1	OPT-10M10-65	65±1	1X	17.6(1.1")	F7.0	<0.007%	0.58	145	0.21°	207.9	0.25	17.60
2	OPT-10M10-65C	65±1	1X	17.6(1.1")	F7.0	<0.008%	0.58	145	0.19°	212.2	0.26	17.60
3	OPT-10M30-65	65±1	3X	17.6(1.1")	F9.5	<0.085%	0.09	105	0.20°	240.9	0.48	5.87
4	OPT-10M30-65C	65±1	3X	17.6(1.1")	F9.5	<0.085%	0.09	105	0.20°	240.9	0.53	5.87
5	OPT-10M035-110	110±2	0.35X	16.2(1")	F8.0	<0.084%	5.39	120	0.10°	292.9	0.65	46.30
6	OPT-10M035-110C	110±2	0.35X	16.2(1")	F8.0	<0.05%	5.39	120	0.10°	296.1	0.70	46.30
7	OPT-10M04-110C	110±2	0.4X	16.2(1")	F8.0	<0.08%	4.13	120	0.10°	291.7	0.75	40.50

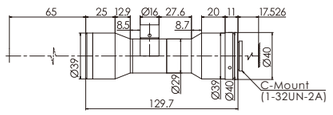
[1] WD: The distance between the front end of the mechanism and the object.
[2] F/#: The real F-number of a lens when used.
[3] DOF evaluation formula for telecentric lenses: $DOF(mm)=F/\# \times P \times k/\beta^2$;
P: Sensor pixel size (5.5 μm used here)
β: Lens magnification
k: The parameter based on application (measurement, k=0.015; defect detection, k=0.008; 0.015 used here)
At the borders of DOF, the image can still be use for measurement. But only half of the nominal DOF should be used to get a sharp image.

Dimensions (mm)

1.OPT-10M10-65



2.OPT-10M10-65C



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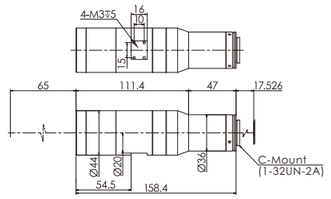

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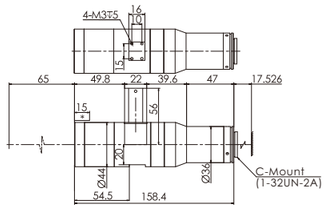

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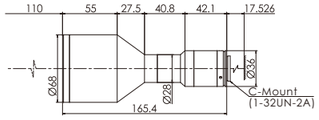
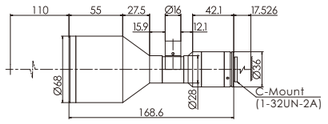


6.OPT-10M035-110C



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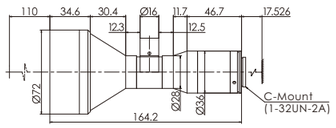


Note: * indicates that this area cannot be clamped

Non-standard custom lens

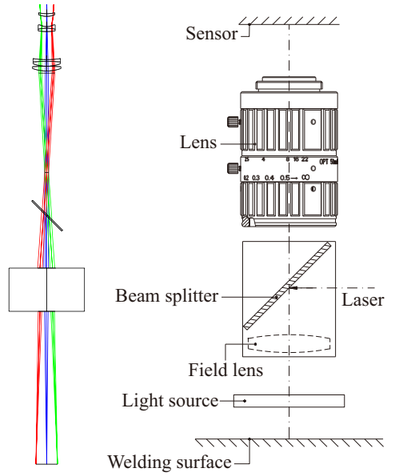
- Due to the extensive applications of machine vision systems, OPT offers custom imaging lens services to meet the needs of vision projects.

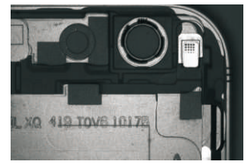
Customization Directions

Working distance	Magnification	Application wavelength	Focal length
Scheimpflug tilt	Seismic reinforcement	Coaxial structure	Specific aperture
Multi-magnification imaging module	Waterproof and dustproof	Special imaging	Customized interface
Motorized focus	External dimensions	Built-in light source	Liquid adaptive focusing

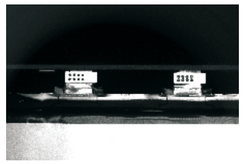
Laser Marking Vision Lens

- Keywords: Working distance, Focal length
- Customization description: In laser marking systems, laser energy is focused through a field lens to achieve marking and welding functions. Due to the presence of the field lens, the visual inspection system cannot directly detect the marking or welding results and requires coaxial imaging through the field lens for inspection.

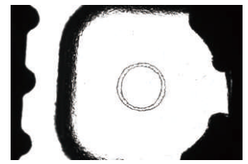




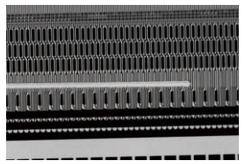
Copper foil welding inspection



Mobile phone battery solder joint inspection



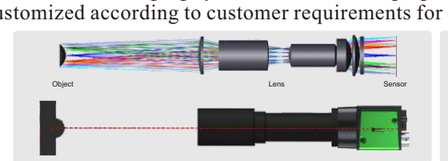
Watch dial marking positioning

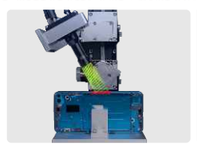


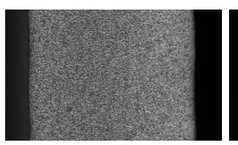
OLED screen cutting channel size measurement

Curved Imaging Lens

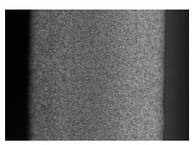
- Keywords: Special Imaging
- Customization Description: Detecting visual defects on curved edges has always been a challenge. To ensure clear focusing and accuracy on curved surfaces,the conventional approach involved using high-resolution cameras to widen the field of view to meet depth of field requirements, often wasting a significant portion of the camera's resolution. Special optical path designs achieve clear imaging of specific curved objects across the entire field of view, addressing depth of field issues in such imaging systems. Curved imaging lenses tailored for specific curved surface detection can be flexibly customized according to customer requirements for different curvatures.







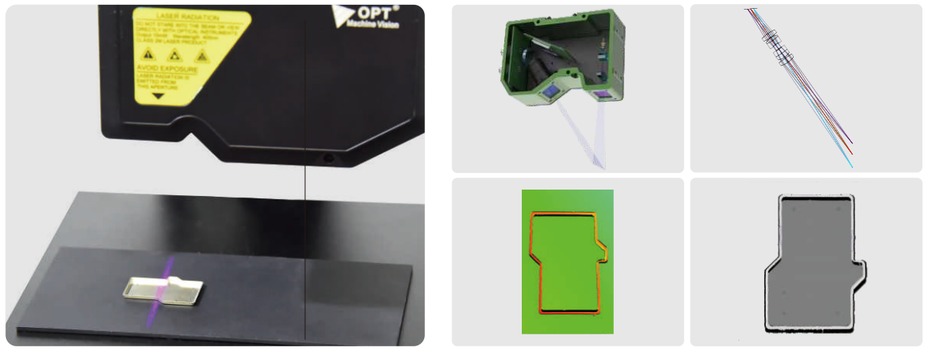
Curved Lens Focusing Effect Diagram



Conventional Lens Focusing Effect Diagram

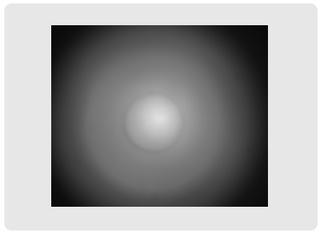
3D Sensor Lens

- Keywords: Application wavelength, Magnification ratio, Working distance, Scheimpflug tilt
- Customization Description: The imaging lens for 3D sensors is customized based on specific wavelengths, sizes, and requirements for different fields of view, measurement ranges, working distances, and tilt angles.

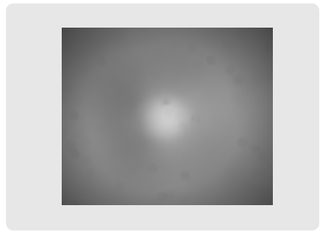


Wide-field Coaxial Telecentric Imaging System

- Keywords: Built-in light source
- Customization Description: When using a wide-field coaxial telecentric lens system with point light for inspecting low-reflectivity workpieces, nonuniform illumination brightness may occur. This can be effectively improved by incorporating a built-in light source design into the lens optical path to enhance illumination uniformity.

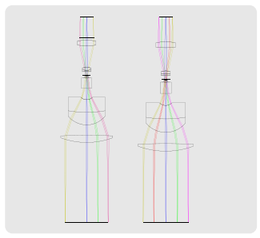
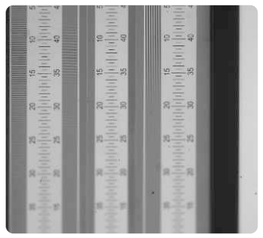
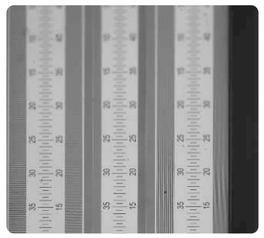
External point light coaxial illumination uniformity



Internal coaxial flat light illumination uniformity

Liquid Telecentric Lens

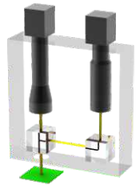
- Keywords: Liquid adaptive focusing
- Customization Description: Traditional imaging lenses require mechanical refocusing when detecting objects at different heights, which affects detection efficiency. Liquid lenses are small components containing optical liquid. When current or voltage is applied to the liquid lens element, the shape of the optical liquid changes, altering the lens's focal length and consequently the working distance of the lens. Liquid lenses can rapidly refocus to adapt to changing working distances, making them ideal tools for imaging applications. Liquid telecentric lenses, possessing both telecentric characteristics and rapid focusing capabilities, maintain their magnification ratio without changing as the focusing working distance varies, making them an ideal choice for "large depth of field" measurement applications.

Multi-magnification Imaging Lens Module

- Keywords: Multi-magnification imaging module
- Customization Description: By using turning angle prism and splitters prism to combine light paths in the imaging system, functions such as single-camera dual field of view, dual-camera dual magnification ratio, and single-camera dual focal points can be achieved.



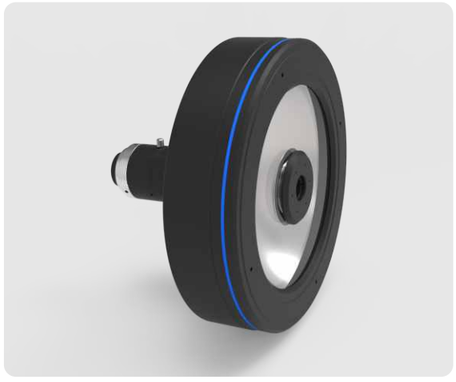
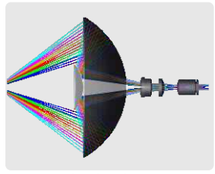


Endoscope Lens

- Keywords: Special Imaging
- Customization Description: Comprehensive inspection of the outer wall of the workpiece can be achieved with just one camera.

360° Side Wall Inspection Lens CDF01

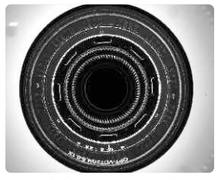
Featuring a folded optical path design, the compact folded optical path design achieves 360° imaging of the object's side walls. With just one camera, it enables 360° side-view imaging of the object. Customized services are available, allowing lens specifications to be tailored according to the dimensions of the objects to be inspected. Suitable for inspecting components such as medicine containers, plastic caps, bottle necks, screws, and threaded objects.

Optical Diagram



Thread Outer Wall Inspection



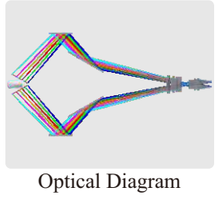
Metal Component Outer Wall Inspection



Bottle Outer Wall Inspection

Cylinder Multi-angle Inspection Lens CDF02

Integrated with just one camera, it captures multiple angle images in one go. With a wide side shooting angle of 45°, it offers high resolution for capturing detailed images. Compatible with surface imaging of perforated objects, it can simultaneously capture the outer wall and top of objects. It can also capture the inner surface of perforated objects, suitable for detecting side features (inner surface features) of objects, such as medicine containers, plastic caps, screws, nuts, etc.

Optical Diagram



Screw Inspection



Bottle Neck Inspection



Inner Surface Inspection of Cavities

Lens Accessories

To optimize the lens performance in applications, OPT has designed multiple optional accessories, including extension tubes, adaptors, filters, polarizers, prism, and more.

Extension Tubes



Product Features

- Extension tubes enable lens to focus when practical working distance is shorter than minimum working distance of lens, barely change the lens angle of view, generally installed between lens and camera mount.
- Generally, the length of extension tubes should not be more than 1/5 of lens focal length. Extension tubes are not suggested to use on zoom lens and other special lens to avoid influencing image quality.

Selection Guide

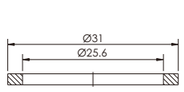
OPT-ETB-CE1

- Length: 1 mm
- C-Mount
- Extension tube
- Brand name

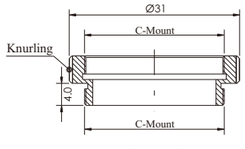
Model Table

Model	Size A (mm)	Thread	Mount
OPT-ETB-CE0.3	0.3		C-Mount (Drawing 1)
OPT-ETB-CE0.5	0.5		C-Mount (Drawing 1)
OPT-ETB-CE1	1		C-Mount (Drawing 1)
OPT-ETB-CE2	2		C-Mount (Drawing 1)
OPT-ETB-CE5	5	(1-32UN-2A)	C-Mount (Drawing 2)
OPT-ETB-CE10	10	(1-32UN-2A)	C-Mount (Drawing 2)
OPT-ETB-CE20	20	(1-32UN-2A)	C-Mount (Drawing 2)
OPT-ETB-CE30	30	(1-32UN-2A)	C-Mount (Drawing 2)

Dimensions (mm)



Drawing 1



Drawing 2

Optical Filters



Product Features

- The filter blocks or partially passes a certain wavelength light, which can highlight or suppress the color characteristics of a particular object. It is usually mounted on the front end of the lens.

Selection Guide

OPT-PLG 27-BP525

- Center wavelength: 525 nm
- Bandpass filtering
- Filter thread caliber: M27
- Optical filter
- Brand name

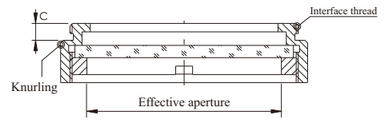
Optical Filter Model Table

Model of Optical Filter	Specifications	Transmittance
OPT-PLGXX-BP365	335-400 nm wavelength: transmitting	80%
OPT-PLGXX-BP405	375-425 nm wavelength: transmitting	85%
OPT-PLGXX-BP465	425-495 nm wavelength: transmitting	85%
OPT-PLGXX-BP525	500-555 nm wavelength: transmitting	85%
OPT-PLGXX-BP585	560-600 nm wavelength: transmitting	85%
OPT-PLGXX-BP635	615-650 nm wavelength: transmitting	85%
OPT-PLGXX-BP850	810-900 nm wavelength: transmitting	85%
OPT-PLGXX-BP940	>880 nm wavelength: transmitting; 300-850 nm: cut-off	85%
OPT-PLGXX-BPVIS	425-675 nm wavelength: transmitting; UV & near-infrared: cut-off	85%
OPT-PLGXX-BPNIR	>760 nm near-infrared: transmitting; visible light & UV light: cut-off	85%
OPT-PLGXX-BPUV	330-395 nm UV: transmitting; visible light &near-infrared: cut-off	85%

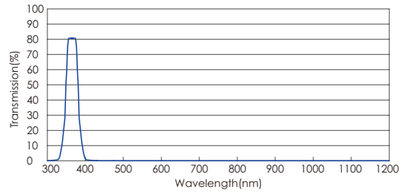
Thread Model Table

Thread Model	Thread Specifications	Effective Aperture (mm)
OPT-PLG27-BPXXX	M27×0.5-6g	>Ø23
OPT-PLG30.5-BPXXX	M30.5×0.5-6g	>Ø26.5
OPT-PLG37.5-BPXXX	M37.5×0.5-6g	>Ø33.5
OPT-PLG38-BPXXX	M38×0.5-6g	>Ø34
OPT-PLG39-BPXXX	M39×0.5-6g	>Ø35
OPT-PLG40-BPXXX	M40×0.5-6g	>Ø36
OPT-PLG40.5-BPXXX	M40.5×0.5-6g	>Ø36
OPT-PLG58-BPXXX	M58×0.75-6g	>Ø54
OPT-PLG65-BPXXX	M65×0.75-6g	>Ø60
OPT-PLG77-BPXXX	M77×0.75-6g	>Ø72

Dimensions (mm)



Spectral Transmittance



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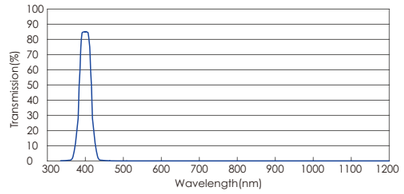
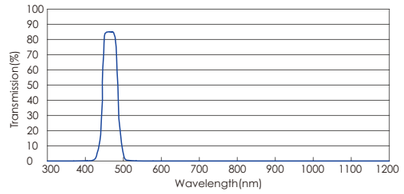


2.OPT-PLGXX-BP405



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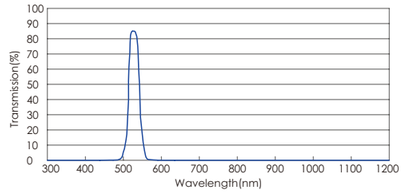
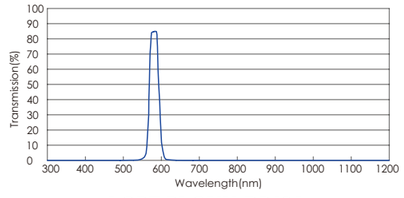


4.OPT-PLGXX-BP525



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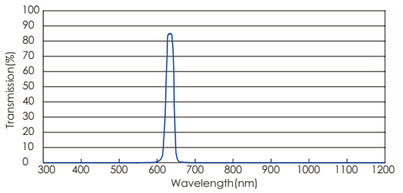
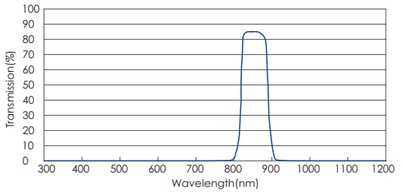
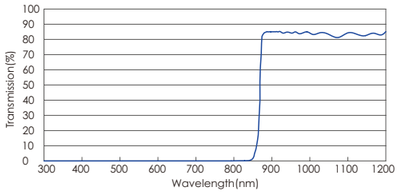


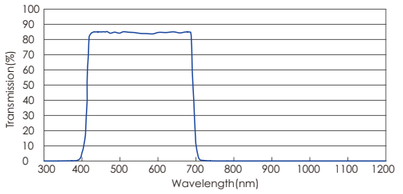
6.OPT-PLGXX-BP635



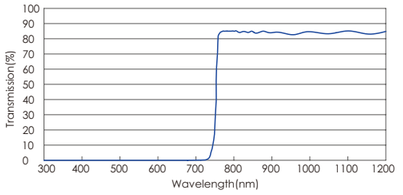
7.OPT-PLGXX-BP850



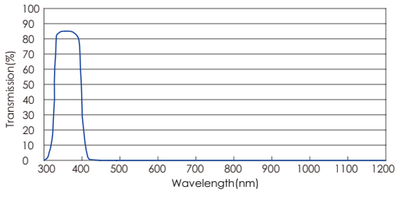
8.OPT-PLGXX-BP940



9.OPT-PLGXX-BPVIS



10.OPT-PLGXX-BPNIR



11.OPT-PLGXX-BPUV

Polarizers for Lenses



Product Features

- Polarizer is able to reduce or eliminate the unfavorable interference caused by workpiece reflection in imaging system, adding imaging contrast and enhancing image quality.

Selection Guide

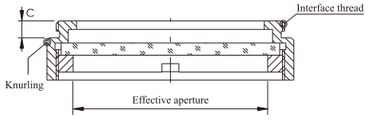
OPT-PPZ 27-CPL

- Circular polarization
- Filter thread caliber: M27
- Polarizer
- Brand name

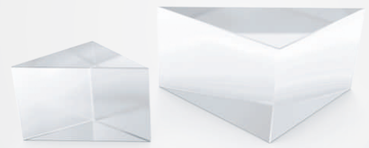
Model Table

Thread Model	Thread Specification	Effective Aperture (mm)
OPT-PPZ27-CPL	M27×0.5-6g	> Ø23
OPT-PPZ30.5-CPL	M30.5×0.5-6g	> Ø26.5
OPT-PPZ37.5-CPL	M37.5×0.5-6g	> Ø33.5
OPT-PPZ38-CPL	M38×0.5-6g	> Ø34
OPT-PPZ39-CPL	M39×0.5-6g	> Ø35
OPT-PPZ40-CPL	M40×0.5-6g	> Ø36
OPT-PPZ40.5-CPL	M40.5×0.5-6g	> Ø36
OPT-PPZ58-CPL	M58×0.75-6g	> Ø54
OPT-PPZ65-CPL	M65×0.75-6g	> Ø60
OPT-PPZ77-CPL	M77×0.75-6g	> Ø72

Dimensions (mm)



Prisms



Product Features

- Prism is applied to change viewing direction and position. Multiple prisms can be combined to change viewing distance between two points and to view more objects simultaneously or at different time.

Selection Guide

OPT-PLJ20-20-20-ZF-X

- FG: Splitting
- FS: Reflection
- ZF: Square
- SJ: Triangle
- Size C
- Size B
- Size A
- Prism
- Accessory
- Brand name

Model Table

Dimension comparison table of triangle prism

Model	A*B*C(mm) Size	Hypotenuse Coated
OPT-PLJ5-5-5-SJ-X	5*5*5	Ravg >85% @ 400 - 1200 nm
OPT-PLJ10-10-10-SJ-X	10*10*10	Ravg >85% @ 400 - 1200 nm
OPT-PLJ15-15-15-SJ-X	15*15*15	Ravg >85% @ 400 - 1200 nm
OPT-PLJ20-20-20-SJ-X	20*20*20	Ravg >85% @ 400 - 1200 nm
OPT-PLJ25-25-25-SJ-X	25*25*25	Ravg >85% @ 400 - 1200 nm
OPT-PLJ30-30-30-SJ-X	30*30*30	Ravg >85% @ 400 - 1200 nm
OPT-PLJ35-35-35-SJ-X	35*35*35	Ravg >85% @ 400 - 1200 nm
OPT-PLJ40-40-40-SJ-X	40*40*40	Ravg >85% @ 400 - 1200 nm
OPT-PLJ45-45-45-SJ-X	45*45*45	Ravg >85% @ 400 - 1200nm
OPT-PLJ50-50-50-SJ-X	50*50*50	Ravg >85% @ 400 - 1200nm

Model Table

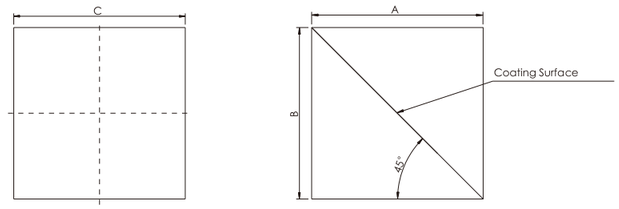
Dimension comparison table of square prism

Model	Size A*B*C(mm)	Average Reflectivity	Beam splitting ratio T:R
OPT-PLJ5-5-5-ZF-FG	5×5×5	R=45%±5%@400 nm~700 nm	50:50
OPT-PLJ10-10-10-ZF-FG	10×10×10	R=45%±5%@400 nm~700 nm	50:50
OPT-PLJ15-15-15-ZF-FG	15×15×15	R=45%±5%@400 nm~700 nm	50:50
OPT-PLJ20-20-20-ZF-FG	20×20×20	R=45%±5%@400 nm~700 nm	50:50
OPT-PLJ25-25-25-ZF-FG	25×25×25	R=45%±5%@400 nm~700 nm	50:50
OPT-PLJ30-30-30-ZF-FG	30×30×30	R=45%±5%@400 nm~700 nm	50:50
OPT-PLJ35-35-35-ZF-FG	35×35×35	R=45%±5%@400 nm~700 nm	50:50
OPT-PLJ40-40-40-ZF-FG	40×40×40	R=45%±5%@400 nm~700 nm	50:50
OPT-PLJ45-45-45-ZF-FG	45×45×45	R=45%±5%@400 nm~700 nm	50:50
OPT-PLJ50-50-50-ZF-FG	50×50×50	R=45%±5%@400 nm~700 nm	50:50

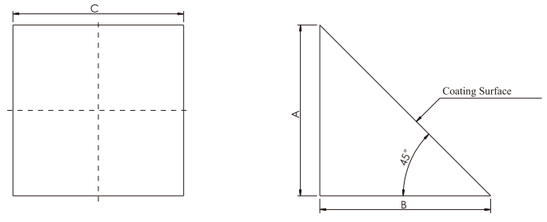
Note: The size is customizable.

Dimensions (mm)

Dimension diagram of square prism



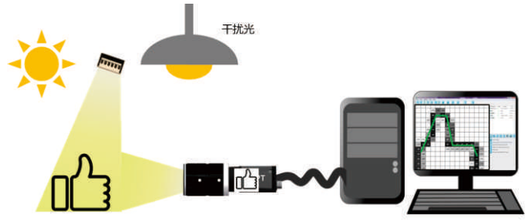
Dimension diagram of triangle prism



OPT Lights

- Machine Vision Lighting Overview >>P223
- OPT Standard Lights >>P233
- OPT Custom Lights >>P383

Machine Vision Lighting Overview



Functions of Lighting

a. Optimally separates target information from background, enhancing contrast for easier feature extraction.
b. Maintains constant illumination to ensure image stability.
c. Reduces ambient light interference, improving system anti-vibration capability.
d. Serves as a measurement tool or reference.

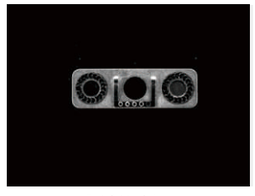
Core of Machine Vision

The core of a machine vision system is image acquisition and processing. All information originates from images, and image quality is critical to the entire system. A good image improves system stability, significantly reduces the complexity of image processing algorithms, and enhances accuracy and stability. An appropriate and effective lighting solution is therefore essential.

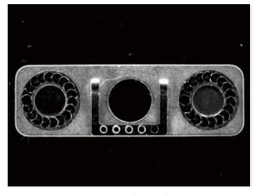
Criteria for a Good Image

1. High visual system accuracy (high precision and appropriate FOV)

1.1 Mainly determined by the field of view and camera resolution.
1.2 The field of view should be appropriate.
1.3 With the same resolution, a smaller field of view yields higher accuracy.
1.4 With the same field of view, higher resolution yields higher accuracy.
1.5 Accuracy also depends on the quality of the camera and lens hardware.



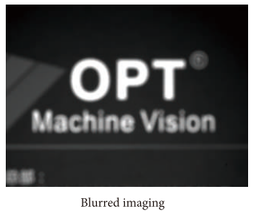
Bad field of view



Appropriate field of view

2. Sharp imaging (clear boundary transitions)

2.1 Mainly depends on lens design, usage, and matching between lens and camera pixel size;
2.2 Ensure the part to be inspected in the image is within the focus range;
2.3 Ensure the lens depth of field can detect variations in feature depth.



Blurred imaging



Clear imaging

3. High Contrast

3.1 The boundary contrast between the target feature and background information is high, with rapid transitions;
3.2 Mainly depends on camera noise, lens imaging quality, and lighting factors.



Low Contrast



High Contrast

4. Good Uniformity

4.1 Background grayscale is uniform and does not affect processing.
4.2 Avoid overexposure to prevent edge erosion (keep maximum gray below 90% of saturation; e.g., ≤230 for 255-level cameras).



Poor uniformity



Good uniformity

5. Accurate Color Reproduction

5.1 For color-related vision applications, good color reproduction is required.
5.2 This mainly depends on camera performance and lighting factors, requiring a high-CRI light source.



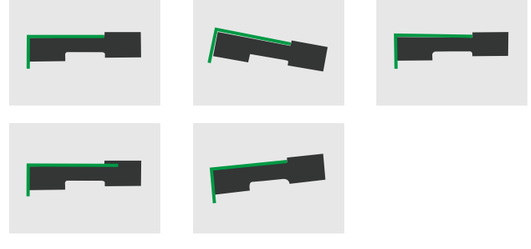
Poor color reproduction



Good color reproduction

6. Stable Image

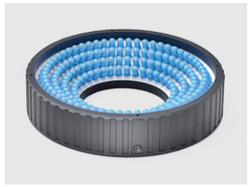
6.1 Stable image quality under varying environments and materials, with consistent feature edges.
6.2 Good repeatability and machine-to-machine consistency.



Common Types of Vision Lighting

By Emission Mechanism

Machine vision commonly uses LED lights, lasers, fiber-optic halogen lamps, xenon lamps, and high-frequency fluorescent lamps.



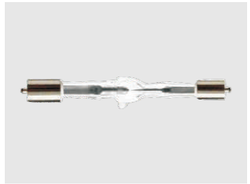


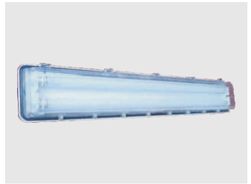
LED Light

LED lights have a service life of about 30,000–100,000 hours. Advantages include achieving high brightness with multiple LEDs, flexible shape combinations, fast response, and selectable wavelengths for different applications.

Fiber Optic Halogen Lamp

Fiber optic halogen lamps have a service life of about 1,000 hours.
Advantages: high brightness.
Disadvantages: slow response, with almost no variation in brightness or color temperature.





Xenon Lamp

lifespan around 1,000 hours;
advantages: high brightness, color temperature close to daylight;
disadvantages: slow response, high heat generation, short lifespan, high operating current, and fragile structure.

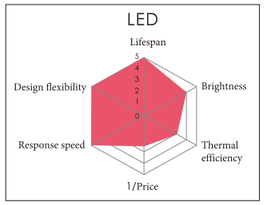
Fluorescent Lamp

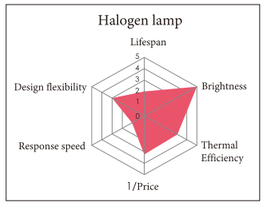
lifespan about 1,500–3,000 hours;
advantages: good diffusion, suitable for large-area uniform illumination;
disadvantages: slow response and low brightness.

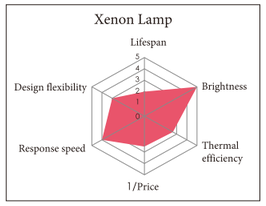
Advantages of LED Lighting

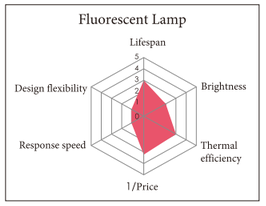
1. Nanosecond-level response time.
2. Lifespan over 50,000 hours, longer with strobe use.
3. High efficiency, energy-saving, and eco-friendly.
4. Customizable wavelength, color temperature, and CRI.

Comprehensive performance comparison of commonly used vision light sources



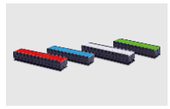






LED Light Source Types

Based on shape and illumination direction, common LED light sources include bar lights, ring lights, flat lights, combined lights, coaxial lights, dome lights, telecentric lights, and structured lights.



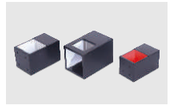
Bar light



Ring light



Flat light



Coaxial light



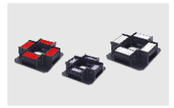
Dome light



Telecentric light



Structured light



Combined light

• • •

Basic Performance of Light Sources

Luminous Flux

Luminous flux refers to the radiant power perceived by the human eye, calculated as the product of the radiant energy per unit time within a specific wavelength range and the relative luminous efficiency for that range. Since the eye's sensitivity varies with wavelength, equal radiant power at different wavelengths results in different luminous flux.

Luminous Efficacy

Luminous efficacy is the ratio of a light source's luminous flux to its electrical power consumption, measured in lumens per watt (lm/W). For example, a 2 W light source emitting 260 lm has a luminous efficacy of 130lm/W.

Luminous Intensity

Luminous intensity, abbreviated as light intensity, is the amount of luminous flux a light source emits per unit solid angle in a specified direction, essentially the luminous flux density toward that direction. It is denoted by I and measured in candela (cd). Luminous intensity represents the source's radiation capability in different directions—in simple terms, it is the brightness of the light in that direction.

Illuminance

Illuminance is the luminous flux received per unit area of an illuminated surface, measured in lux (lx), where 1 lx = 1 lm/m². It is an important parameter for evaluating the lighting conditions of a shooting environment.

Uniformity

Uniformity describes how evenly a light source illuminates a target surface within a defined area, producing consistent brightness without variations that interfere with imaging. It depends on the light's optical design, as well as its working distance and angle. Good uniformity helps maintain consistent image quality across the field of view.

Parallelism

An ideal point light source can be shaped through a special lens module to produce parallel rays traveling in the same direction. High parallelism ensures the light spot remains consistent in shape and size regardless of distance, which is essential for applications such as reflective surface defect detection and laser engraving alignment.

Color Temperature

Color temperature measures the color composition of light and is expressed in Kelvin (K). It is defined as the temperature at which a black body emits light with the same spectral composition as the source. As a black body heats, it changes color from red to yellow, white, and finally blue. Matching the color temperature to the application is crucial for consistent imaging results.

Color Rendering

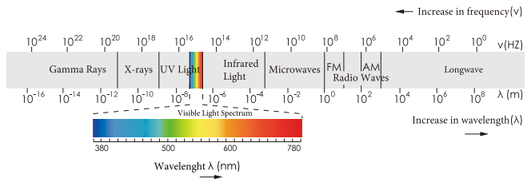
Color rendering is the ability of a light source to accurately reproduce an object's true colors compared to a reference light such as sunlight. It is quantified by the Color Rendering Index (Ra). A higher Ra value means better color fidelity: Ra 90–100 is excellent for precise color matching, while Ra 80–89 is suitable for accurate color assessment. OPT standard LEDs offer 5000–7000 K with Ra 70–90, while high-CRI LEDs provide 2700–5600 K with Ra above 95.

Lifespan

LED light sources typically last over 50,000 hours. Unlike traditional filament lamps, LEDs do not fail suddenly; instead, their luminous flux gradually decreases over time, with the lifespan defined at 50% of the initial brightness. Heat is the main factor reducing lifespan, so optimizing electrical and thermal design—along with strobe-triggered operation—can significantly extend service life.

Color

Light is a form of electromagnetic radiation, and visible light occupies only a small portion of the spectrum, from wavelengths of about 380 nm to 780 nm. Ultraviolet light falls between 10 nm and 400 nm, while infrared light ranges from 770 nm to 1 mm. The specific wavelength determines whether the light is visible and what color it appears to the human eye.

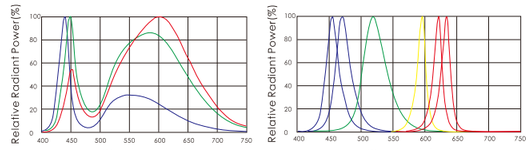


Electromagnetic Spectrum

Visible and Near-visible Light Spectrum Bands

Range	Name	Abbreviation	Vacuum Wavelength(nm)*
Ultraviolet	Vacuum UV	UV-V	100~200
	Far UV	UV-C	200~280
	Middle UV	UV-B	280~315
	Close UV	UV-A	315~380
Visible Light	Blue-violet	BP	380~430
	Blue	B	430~480
	Green-blue	GB	480~490
	Blue-gree	BG	490~510
	Green	G	510~530
	Yello-green	YG	530~570
	Yellow	Y	570~580
	Orange	O	580~600
	Red	R	600~720
	Red-viole	RP	720~780
Infrared Light	Near-infrared	IR-A	780~1400
		IR-B	1400~3000
	Middle-infrared	IR-C	3000~50000
	Close-infrared		50000~1mm

Common LED Color Spectrum

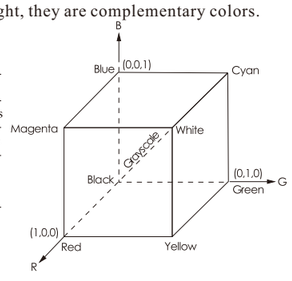


The above data represents spectral charts of some LED chips used by OPT

Color Composition and Complementary

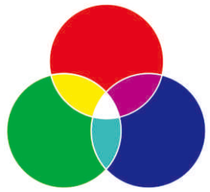
In the gradient from purple through blue, cyan, green, yellow, orange to red, none of the three primary colors—red, green, or blue—can be created by mixing the other two. However, any color, including white light, can be produced by mixing these three in certain proportions. Therefore, they are called the three primary colors of light. Based on this, the RGB color space is established, where each color corresponds to a point in this space.Besides RGB, there are other color spaces such as HSI, CIE, CMY, and CMYK (used in printing). The main color composition relationships are as follows: if two colors contain exactly the same primary components, they are considered the same color; if their components differ slightly, they are similar colors; if they share no components, they are contrasting colors; if mixed in appropriate proportions to produce white light, they are complementary colors.

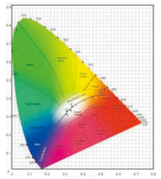
Same color	Exactly the same
Similar color	Not significant differences
Contrasting color	No common components
Complementary colors	Mixed in appropriate proportions to produce white light



Color Composition

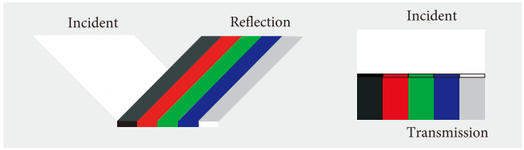
Coordinating Colors	Generated Color	Complementary Color
Red+Green	Yellow	Blue
Red+Blue	Violet	Green
Green+Blue	Cyan	Red

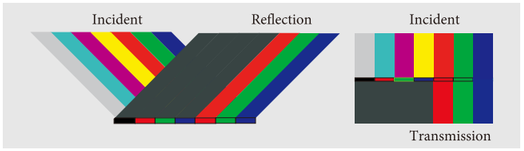




CIE Color Space

When light hits an object's surface, the reflected color matches the object's natural color. For transparent objects, the transmitted color matches the object's color. If the incident light is similar to the object's color, reflectance or transmittance is high; if complementary, it is low.



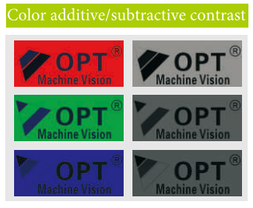


Reflection and Transmission Diagram

The visible spectrum forms a color wheel, where nearby colors are similar, opposite colors are complementary, and distant colors are contrasting. Lighting with colors close or identical to an object's natural color makes it appear brighter; contrasting colors make it darker.

The diagram shows primary color images lit by red, green, and blue light. Matching colors blend into the white background, while complementary colors turn black. Choosing the right light color helps reduce background interference and improve contrast.

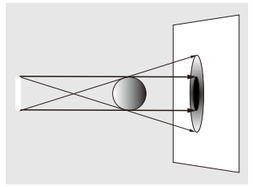


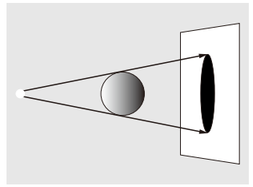


Optical Fundamental

Straight-line propagation of light

Law of light propagation: Light travels in a straight line within a uniform medium of the same type.





Related phenomena: umbra, penumbra (extended light source), pinhole imaging, etc.

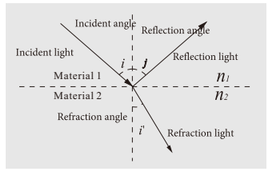
Reflection of Light

Law of reflection: The incident ray, reflected ray, and normal lie in the same plane; the reflection angle equals the incidence angle.

Refraction of Light

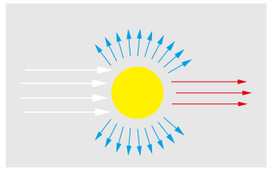
Law of Refraction：i is the incident angle, i` is the refracted angle, and n1 and n2 are the refractive indices of the two media.

$$\frac{sini}{sini'} = \frac{n_2}{n_1}$$



Scattering of Light

Scattering occurs when light strikes microscopic structures (such as particles or pits) and deviates from standard reflection and refraction laws, radiating randomly from the scattering point.

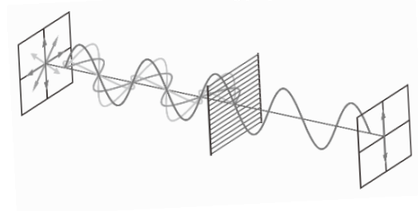


Light Polarization

Light polarization refers to the asymmetry in the transverse vibration of the light vector relative to its propagation direction, characterized by the orientation of the electric vector. Based on polarization state, light can be classified as:

1. Natural light – Vibrations have equal amplitude in all directions perpendicular to propagation; most common light sources emit natural light.
2. Linear polarization – Light vibrates in a single fixed direction in the transverse plane, also called plane-polarized or completely polarized light.
3. Partially polarized light – Composed of vibrations with random phases and unequal amplitudes in different directions, stronger in one direction and weaker in the perpendicular direction; lies between natural and linear polarization.
4. Elliptical and circular polarization – The light vector rotates at a set frequency in the transverse plane. If its endpoint traces an ellipse, it is elliptical polarization; if a circle, circular polarization.

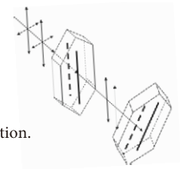
A polarizer is an optical device that only transmits light vibrating parallel to its polarization direction while blocking perpendicular vibrations.



As shown, without absorption, the transmitted intensity of linearly polarized light after the analyzer is: $I_{out} = I_{in} cos^2 \phi$

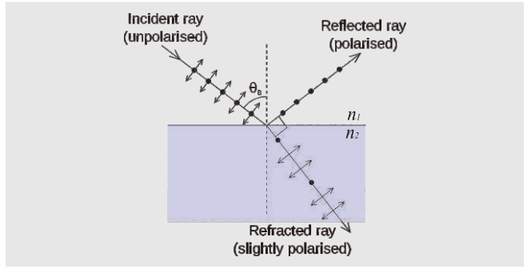
φ is the angle between the incident light's polarization and the polarizer's axis. A polarizer has two functions:

1. Converts unpolarized light to linear polarization.
2. Detects polarization state.



Malus' Law

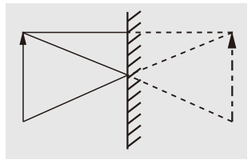
When light reflects and refracts at the boundary between two isotropic media, both reflected and refracted beams are partially polarized. The reflected beam contains more perpendicular components, while the refracted beam contains more parallel components. At the Brewster angle ($\tan\theta = n_2 / n_1$), the reflected light is fully polarized perpendicular to the plane of incidence and orthogonal to the refracted light. In practice, most surface reflections are polarized or partially polarized, and a polarizer can be used to reduce glare.



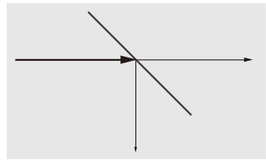
Brewster's Law



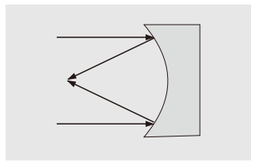
Common optical component light path diagram



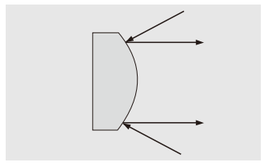
Mirror



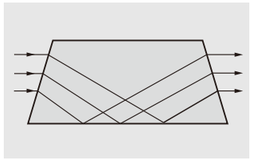
Beam Splitter



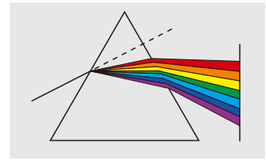
Concave Mirror



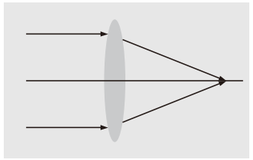
Convex Mirror



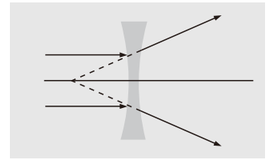
Inverting Prism



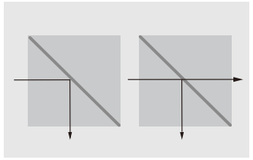
Dispersing Prism



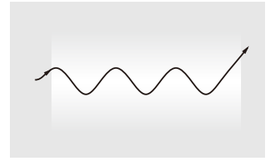
Convex Lens



Concave Lens



Right-angle prism



Optical Fiber

Selecting a machine-vision illumination scheme

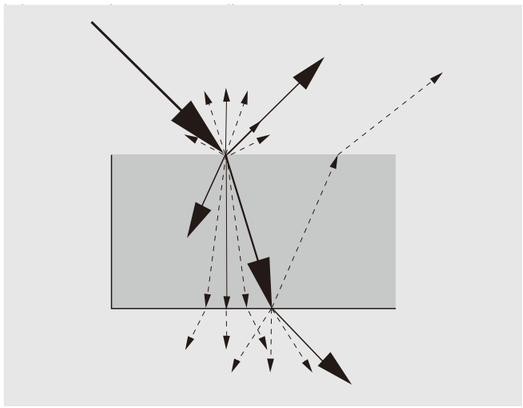
By selecting appropriate illumination, target features can be emphasized while background and noise are minimized, producing images that are easier to process and ensuring system accuracy and stability.

Basic Concept

As shown below, when light strikes a surface, it may undergo specular reflection, diffuse reflection, surface scattering, refraction, backscattering, transmission, back reflection, or dispersion, with some light absorbed. These effects depend on material properties, surface finish, shape, color, and chemical composition.

Different surfaces behave very differently: a well-coated mirror reflects almost all incident light, clear glass transmits nearly all light, while a black rough surface absorbs most light with minimal reflection or transmission.

Optical effects also depend on the light source and illumination method. Diffuse lighting can mask surface irregularities, while parallel lighting highlights them. Achieving the desired result requires both a suitable light source and an appropriate illumination method.



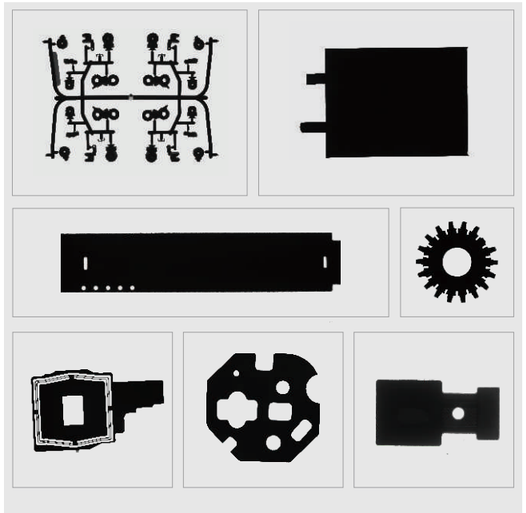
General procedure for selecting a light source

1. Understand project requirements and define the inspection or measurement target.
2. Analyze differences between the target and background, identifying the optical phenomenon that produces the greatest imaging contrast.
3. Based on the interaction between the light source and target, select an initial light source type and color.
4. Test with actual light sources to determine the optimal illumination method.
5. Finalize the product selection according to the specific application.

Applications of different illumination methods

Backlight illumination method

Diffuse Backlight Transmission
Structure: Backlight placed under the workpiece, camera positioned vertically above.
Applications: Presence detection, counting, thin-edge inspection, defect detection in transparent/semi-transparent objects, hollow marking inspection.
Advantages: Simple setup, stable measurements, clear contrast, easy brightness control.
Disadvantages: Unsuitable for many inline tasks; overlapping opaque layers cause interference; thickness, chamfers, or curved surfaces may blur edges, reducing precision.



Backlight Performance

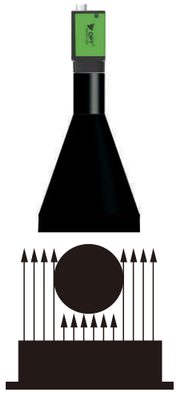
Application tips: Light source size should be sufficient but not excessive to avoid edge degradation; increasing the distance between the light source and workpiece can improve results; using an object-side telecentric lens enhances stability; avoid overexposure—keep the brightest areas below a grayscale value of 220.

Parallel Backlight Transmission

Structure: Parallel backlight placed beneath the workpiece, with the camera positioned vertically above, aligned with both the workpiece and the light source.
Applications: Suitable for high-precision edge detection, positioning, and dimensional measurement.
Advantages: Excellent beam parallelism, ideal image quality, high measurement accuracy, and stable results.
Disadvantages: Complex structure, high cost, requires compatible hardware such as telecentric lenses, and demands precise installation and alignment.Tips: Light source and lens must be coaxial; misalignment severely degrades performance. Once aligned, secure the setup to prevent displacement from vibration or external forces over time.



Diffuse backlight illumination diagram



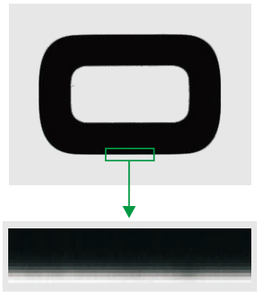
Parallel backlight illumination diagram



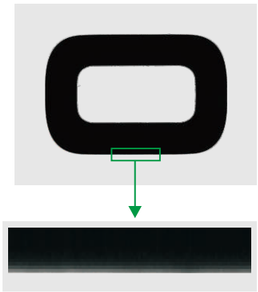
Comparison of diffuse and parallel illumination on transparent objects

Diffuse light remains scattered after passing through the bottle, giving uniform illumination with low outline contrast.

With parallel light, edge refraction directs light outside the lens aperture, creating black edges with high background contrast.



Diffuse backlight effect diagram



Parallel backlight effect diagram

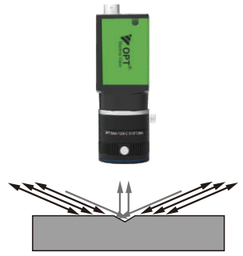
When using diffuse backlight for measurement, side light reflected into the lens causes the“blur” effect shown above, with excessive transition pixels, making it unsuitable for high-precision measurements and reducing accuracy.

Using a parallel backlight of the same size ensures uniform light direction, producing sharp edges with fewer transition pixels. When paired with a telecentric lens, imaging stability and accuracy improve, and ambient stray light interference is further reduced.

Low-Angle Direct Illumination

Structure: Light at a shallow angle makes flat areas appear dark and uneven areas bright.
Applications: Scratch and defect detection, character recognition, edge measurement, positioning, chamfer inspection, and stamped/cast mark inspection.
Advantages: Easy installation, stable results.
Disadvantages: Less effective on transparent materials or fine scratches; may require specific mounting height.

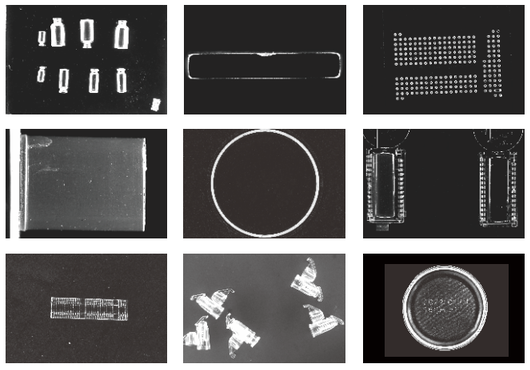
Common light sources: bar light, line light, low-angle ring light.



Low-angle direct illumination structure



With low-angle illumination, the image background appears black (dark-field lighting), revealing edge chamfers with slopes of about 45–60°, as well as surface defects, scratches, and engraved features.



Low-angle illumination effect

High-Angle Direct Illumination

Structure: Light is projected at a high angle, making reflections from flat surfaces easily enter the lens and appear bright, while uneven areas scatter light, reducing the amount reaching the lens and appearing darker.

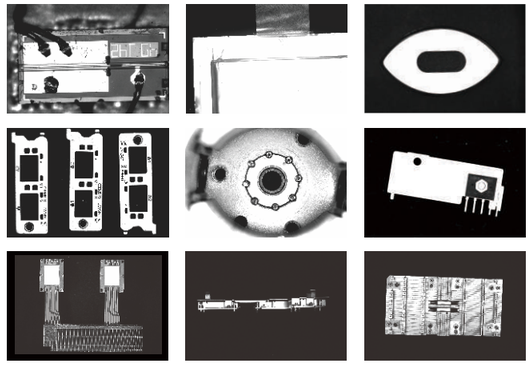
Applications: Fine scratch detection, marked character recognition, surface contaminant inspection, edge measurement, positioning, and inspection of stamped or cast characters and patterns.
Advantages: Clear effect with sharp detail.
Disadvantages: Uniformity adjustment can be challenging.
Common light sources: High-angle ring light, bar light, area light, coaxial light, point light.



High-angle direct illumination structure



With high-angle illumination, the image background appears white (bright-field lighting), revealing contours of flat surface areas as well as scratches, steps, and other irregular features. Areas with different surface roughness or reflectivity also show clear contrast.



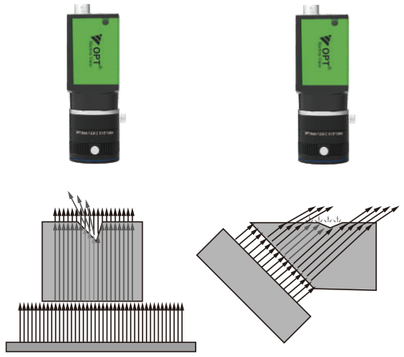
High-angle illumination effect

Refracted Light Applications

Structure: The light source is placed beneath or to the side of the object. Direct light enters the flat surface perpendicularly and exits from the opposite side in the same direction, while light passing through uneven areas is refracted and deviates from the incident direction. With the camera axis perpendicular to the surface, flat areas appear as bright background features, while uneven areas appear dark.

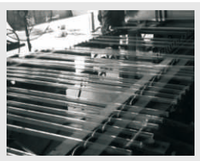
If the surface is generally flat but has varying roughness, the light can be transmitted at an inclined angle from the side. In this case, light from flat areas refracts uniformly away from the camera, producing a dark background, while rough areas, with their varied microstructure, scatter and refract light in multiple directions, allowing some to enter the lens andappear bright.

Uniformly deflected light allows some rays to enter the lens, producing bright features on a dark background. Both methods can reveal surface shape differences and detect internal impurities in transparent objects.



Optical path diagram and simulated effect

For gradient surfaces, use a patterned area light inside the object so shape or thickness changes distort the pattern. Common patterns include LED dot arrays, calibration plates, and gratings.
Applications: Detecting fine scratches, recognizing shapes or patterns, and checking flatness and thickness uniformity.
Advantages: Clear effect, sharp detail, good stability.
Disadvantages: Installation may be inconvenient in some cases.
Common light sources: Area light, dot-matrix light, area light with transparent pattern layer.



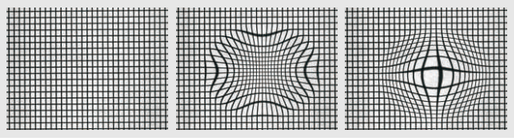
Glass tube cross-section flatness inspection, with flat areas appearing white and uneven areas appearing black.



Beer bottle anti-slip lug positioning, where light is deflected by the anti-slip points, appearing black in the image.



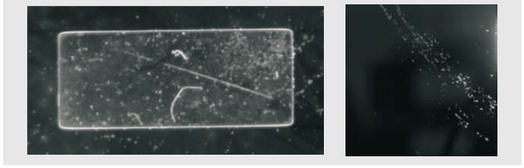
Glass bottle rim damage inspection, where irregularly shaped damage reflects or refracts light into the lens, appearing as white spots.



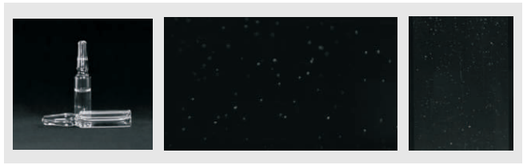
Viewing a standard image through a glass plate, surface irregularities cause local distortions in the image.

Scattered Light Applications

Direct light is projected from one side of the target. Micro-rough surfaces scatter the light and appear bright, while smooth areas remain dark with low brightness.
Application tip: For good transmission, use shorter-wavelength light sources where possible.
Applications: Detection of fine scratches on transparent materials such as glass and plastic, recognition and inspection of laser-engraved characters, and positioning or measurement of transparent film edges.
Advantages: Produces clear, detailed results.
Challenges: In some cases, requires longer detection distances and higher light source brightness.
Common light sources: Line light, bar light, point light (often requiring custom designs).



Ultraviolet light can reveal tiny defects and impurities within objects.



A blue point light source directed at the bottom of an injection ampoule can reveal tiny suspended particles in the liquid.



A diffuser plate can convert direct light into diffuse light.

Diffuse shadowless light applications

Structure: Often a secondary light source, such as a hemispherical integrating sphere or dome light, reflecting ring light for uniform area and directional distribution on uneven or curved surfaces. Others use diffuser plates to scatter light evenly.

Applications: Detecting contours, positioning, and measuring uneven objects; inspecting severe defects on curved surfaces; recognizing and checking engraved or printed patterns.

Advantages: Good overall uniformity and stable performance.
Challenge: Managing reflections from mirror-like surfaces.
Common light sources: Ring integrating light, dome light, four-sided shadowless light, ring shadowless light, extra-large area light, and lightbox-type light.



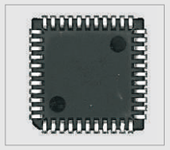
Lighting System Schematic Diagram



Surgical Needle Inspection



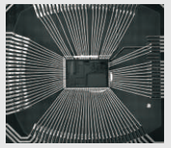
Effect of Integrating Sphere Light Source



IC Pin Positioning



Concave Can Bottom Inkjet Code Recognition



Die Bonding Wire Inspection

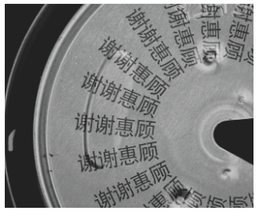


Mobile Phone Key Character Inspection

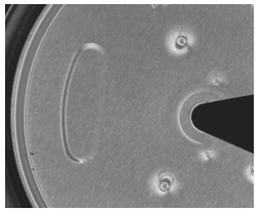
Light Wavelength Bands and Applications

Color Filtering and Enhancement

1. Color filtering (similar color suppression):
The workpiece is a can lid with red “Thank you” lettering, while the inspection target is the stamped surface after aluminum alloy processing. Under white light, the red text is clearly visible and interferes with detecting the stamping marks. Using red light completely suppresses the lettering, enabling accurate inspection without interference.



White Light Illumination

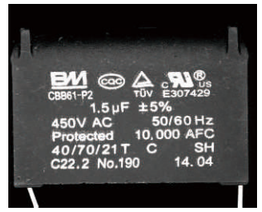


Red Light Illumination

2. Color enhancement (complementary color enhancement):
When illuminated with a complementary color, the object's reflectivity decreases, which can enhance image contrast and reduce background interference.
As shown, the workpiece is a blue capacitor with white printed characters. The inspection goal is to detect missing or blurred characters. Under white light (left image), character contrast is low. Under red light (right image), the blue surface color is intensified, producing higher contrast and clearer inspection results.

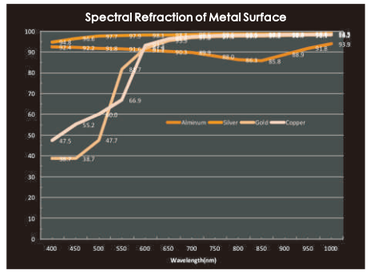


White light illumination

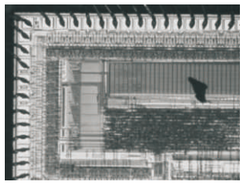


Red light illumination

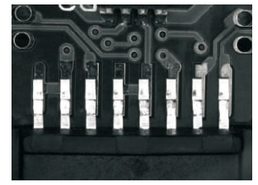
Reflectivity of different materials



Different materials have distinct reflectivity profiles because their chemical compositions cause different wavelengths of light to be absorbed or reflected to varying degrees. Gold, silver, copper, and aluminum all reflect long-wavelength light well, but for shorter wavelengths, aluminum and silver have much higher reflectivity than gold and copper. This difference can be used for inspection—illuminating with short-wavelength light can clearly distinguish between metals with large reflectivity differences.
In the first example (Die Bonding wire inspection), the workpiece is a CCD sensor substrate with silver-plated bonding pads and pure gold bonding wires. The inspection checks for broken wires or incorrect bonding positions. Using blue coaxial light exploits the high reflectivity of silver, making the pads appear bright, while the gold wires, with lower reflectivity, appear dark. This creates clear contrast and stable inspection results.
In the second example (circuit board connector inspection), the lower contact plate is copper, and the upper spring clip is silver-plated. Under natural light, both metals appear similarly bright, and the copper plate interferes with detection. Blue light illumination turns the copper plate dark while keeping the silver clip bright, producing a clear, high-contrast image that allows accurate measurement of the clip’s extension without background interference.



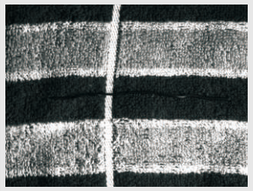
(Lower Left Image)



(Lower Right Image)

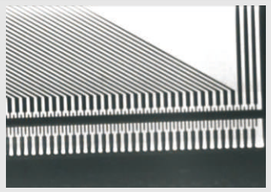
Infrared Light Applications

In vision systems, near-infrared light is commonly used, typically with center wavelengths of 850 nm or 940 nm, which are generally invisible to the human eye. Its longer wavelength gives it stronger penetration through organic materials, making it useful for imaging through thin plastic objects and for filtering out color interference caused by certain organic dyes.

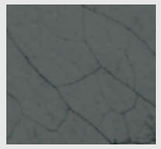



Actual object image　　Infrared light effect image

Infrared light can filter out the colors from textile dyes.



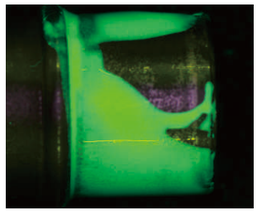

Infrared light has strong transmissivity through plastic materials, including black plastics.

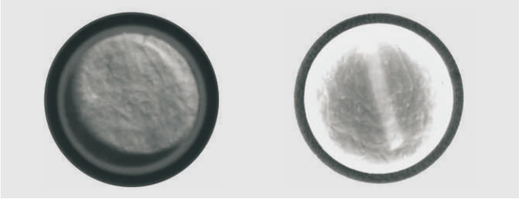

Infrared light can penetrate skin to reveal veins, and the pupil reflects infrared strongly.

Ultraviolet Light Applications

Common UV wavelengths in vision systems are 385 nm and 365nm. Shorter wavelengths can trigger photochemical reactions and cause material degradation, so some bands are restricted in food processing. UV light is often used for its strong fluorescence and good scattering effects.




Fluorescence effect of ultraviolet light



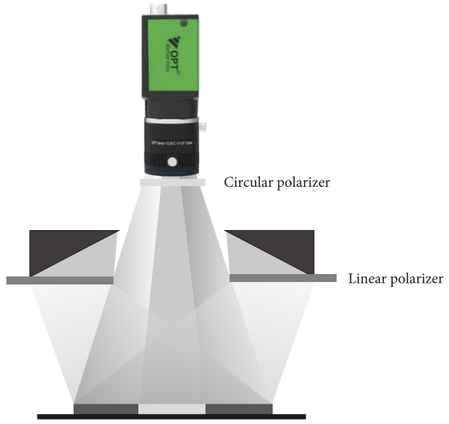
Ultraviolet light can make certain reagents visible.

Polarized Light Applications

A linear polarizer at the light source converts natural-like light into polarized light. When it strikes the target, reflected polarization differs with material type. A circular polarizer on the lens can be rotated to reverse brightness contrast between materials, as in battery electrode film positioning.

The lens polarizer also prevents unwanted optical effects from polarized light that could cause capture issues.

Tip: Focus the lens first, then adjust the light source polarizer for easier operation.



Battery electrode film positioning effect image

Ring Lights OPT-RI Series

Patented



Product Features

Main Features

- Providing extremely bright, uniform and diffuse illumination with different emitting angles.
- Profile design with expanded heat dissipation area for improving performance

Application Cases

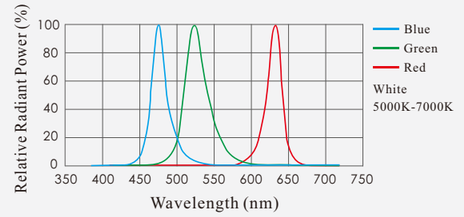
- PCB & plastic containers inspection
- Electronic components inspection; OCR for integrated circuits
- Microscope illumination; surface inspection

Selection Guide

OPT-RI12000

- Angle between the light ray and the central axis
- Outer diameter
- Ring light
- Brand name

Spectrum Chart



Note: The data is for reference only.

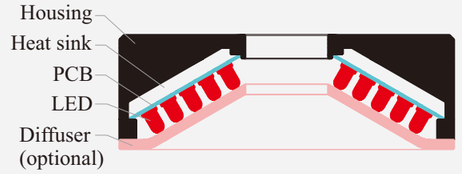
Customizable Items



Color　Emitting angle　Size

Sectional control　Mounting　Connector

Section Structure Drawing



Series Features

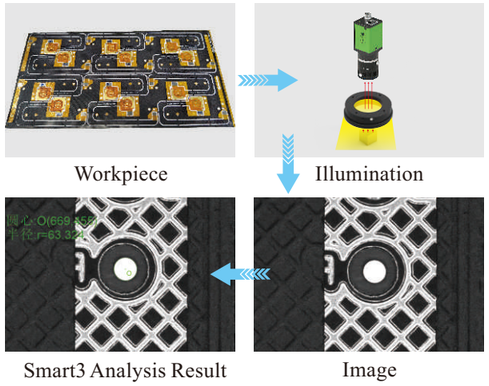
- Optional diffusers for uniform illumination



Transparent　Standard　Uniform

Application Cases

- FPC mark positioning

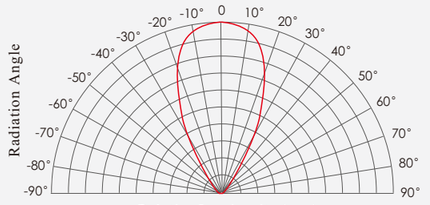


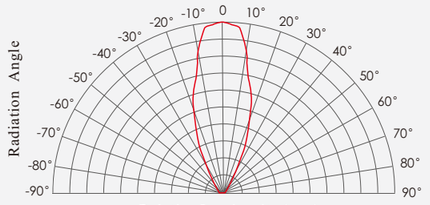
Workpiece　Illumination

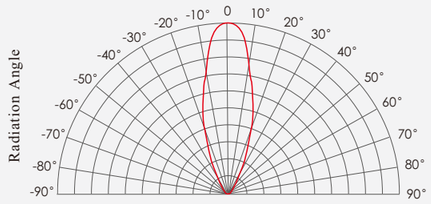
Smart3 Analysis Result　Image

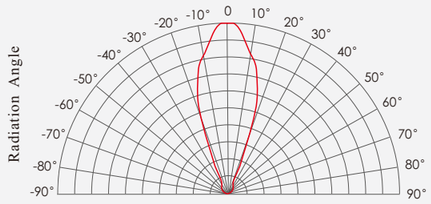
Series Features

Directivity









Note: The data is for reference only.

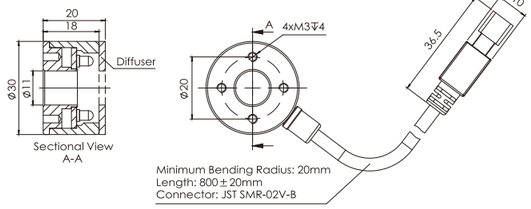
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RI3000	0.8W@24V	0.3W@24V	0.8W@24V	0.8W@24V	0°	OPT-DPA2024E
2	OPT-RI5000	2.6W@24V	1.7W@24V	2.6W@24V	2.6W@24V		
3	OPT-RI7000	4.3W@24V	4W@24V	4.4W@24V	4.3W@24V		
4	OPT-RI9000	6.8W@24V	6.7W@24V	7.6W@24V	7.2W@24V		
5	OPT-RI12000	9.1W@24V	7.5W@24V	10W@24V	9.7W@24V		
6	OPT-RI15000	15.3W@24V	15.1W@24V	14.2W@24V	17W@24V		

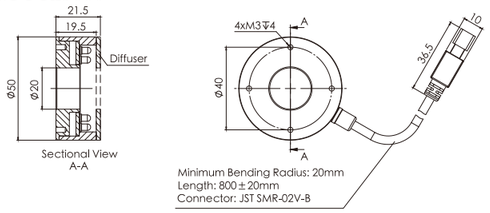
∗ Note: The data is for reference only.

Dimensions (mm)

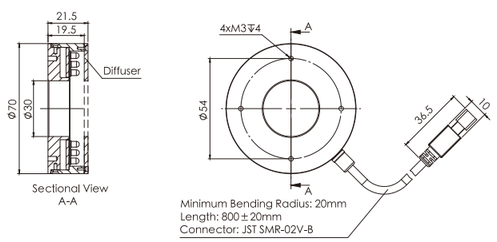
1. OPT-RI3000



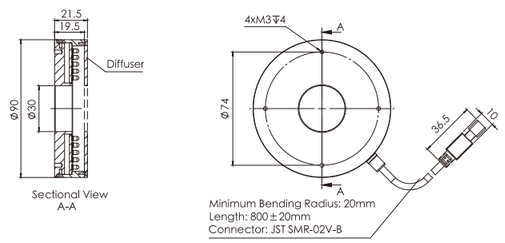
2. OPT-RI5000



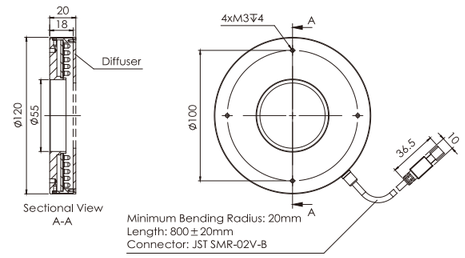
3. OPT-RI7000



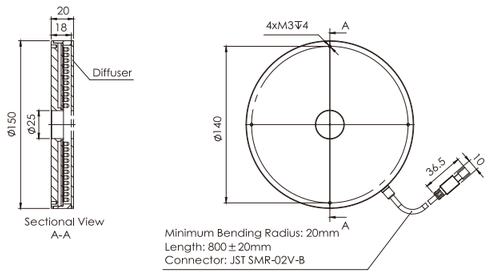
4. OPT-RI9000



5. OPT-RI12000



6. OPT-RI15000



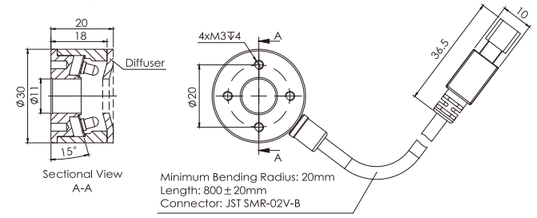
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RI3015	0.7W@24V	0.4W@24V	0.8W@24V	0.8W@24V	15°	OPT-DPA2024E
2	OPT-RI5015	2.5W@24V	1.7W@24V	2.8W@24V	2.5W@24V		
3	OPT-RI7015	4.4W@24V	3.8W@24V	4.6W@24V	4.5W@24V		
4	OPT-RI9015	6.1W@24V	5.8W@24V	6.8W@24V	6.4W@24V		
5	OPT-RI12015	10.6W@24V	8.2W@24V	10.3W@24V	10.2W@24V		
6	OPT-RI15015	14.1W@24V	11.9W@24V	15.7W@24V	15W@24V		

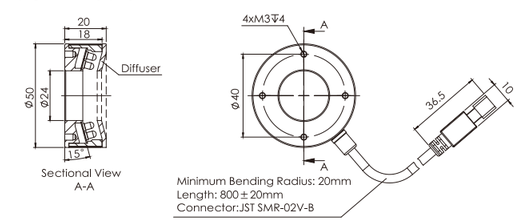
∗ Note: The data is for reference only.

Dimensions (mm)

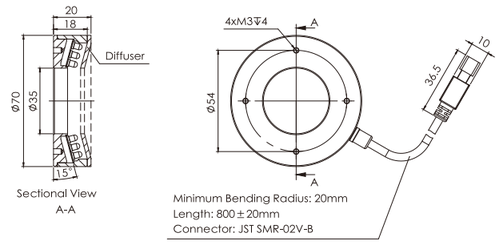
1. OPT-RI3015



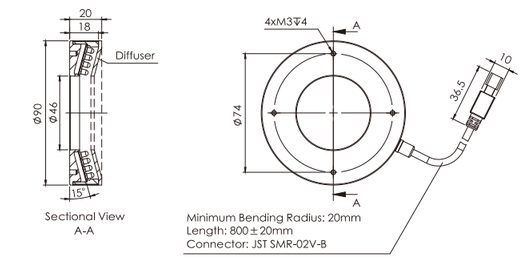
2. OPT-RI5015



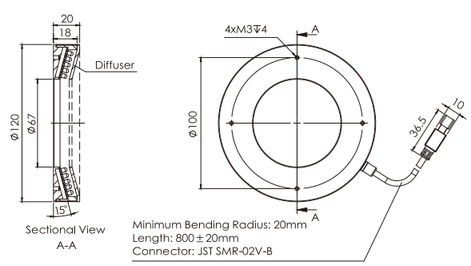
3. OPT-RI7015



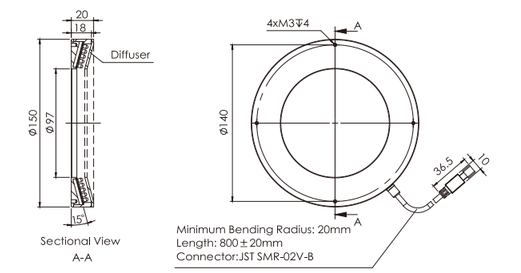
4. OPT-RI9015



5. OPT-RI12015



6. OPT-RI15015



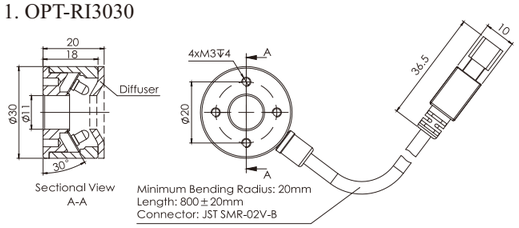
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RI3030	0.7W@24V	0.4W@24V	0.8W@24V	0.8W@24V	30°	OPT-DPA2024E
2	OPT-RI5030	2.5W@24V	1.7W@24V	2.8W@24V	2.5W@24V		
3	OPT-RI7030	4W@24V	3.7W@24V	4.2W@24V	4.1W@24V		
4	OPT-RI9030	6.6W@24V	5.7W@24V	6.3W@24V	6W@24V		
5	OPT-RI12030	11.4W@24V	9.3W@24V	10.9W@24V	10.6W@24V		
6	OPT-RI15030	13.4W@24V	10.3W@24V	15W@24V	13.7W@24V		

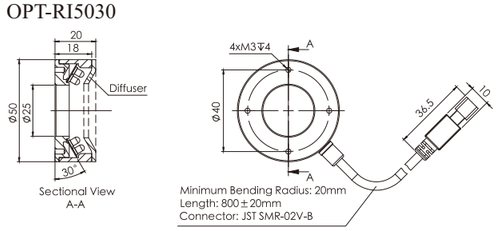
∗ Note: The data is for reference only.

Dimensions (mm)

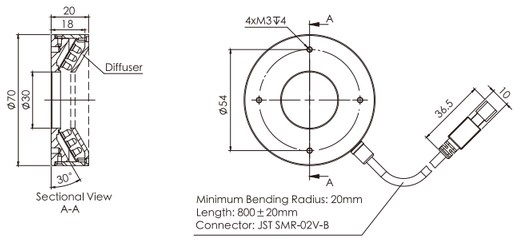
1. OPT-RI3030



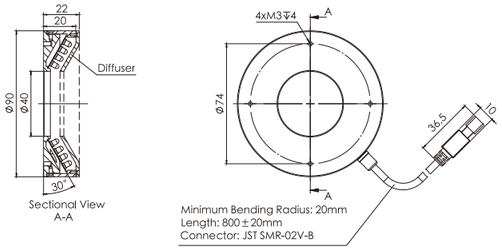
2. OPT-RI5030



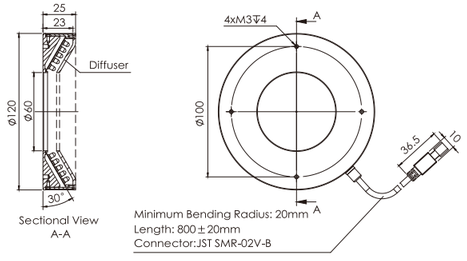
3. OPT-RI7030



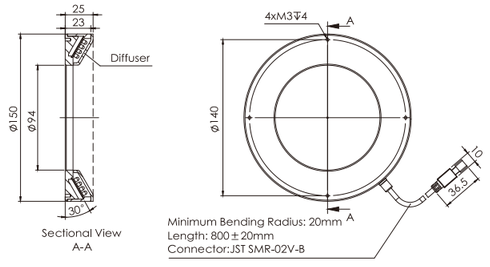
4. OPT-RI9030



5. OPT-RI12030



6. OPT-RI15030



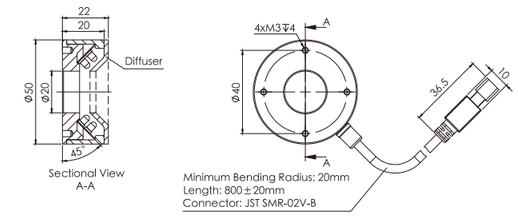
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RI5045	2.6W@24V	1.8W@24V	2.8W@24V	2.5W@24V	45°	OPT-DPA2024E
2	OPT-RI7045	4.8W@24V	3.7W@24V	4.7W@24V	4.7W@24V		
3	OPT-RI9045	6.3W@24V	5.1W@24V	6.8W@24V	6.1W@24V		
4	OPT-RI12045	9.6W@24V	8W@24V	11.6W@24V	10.6W@24V		
5	OPT-RI15045	13.7W@24V	12.2W@24V	15.6W@24V	14.9W@24V		

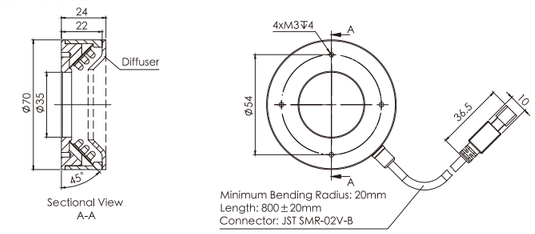
∗ Note: The data is for reference only.

Dimensions (mm)

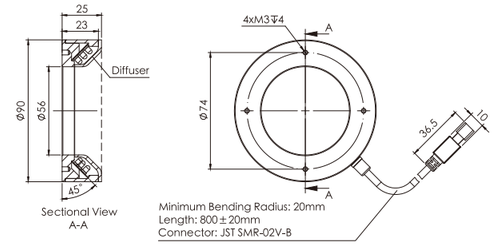
1. OPT-RI5045



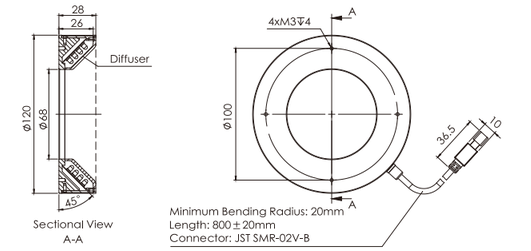
2. OPT-RI7045



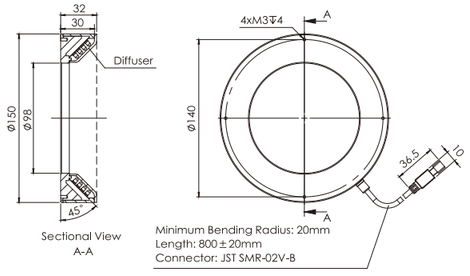
3. OPT-RI9045



4. OPT-RI12045



5. OPT-RI15045



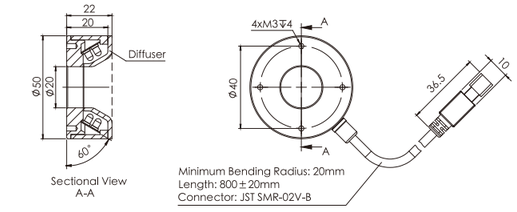
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RI5060	2.6W@24V	2W@24V	2.8W@24V	2.5W@24V	60°	OPT-DPA2024E
2	OPT-RI7060	4.7W@24V	3.5W@24V	4.8W@24V	4.7W@24V		
3	OPT-RI9060	5.6W@24V	4.7W@24V	6.7W@24V	6.2W@24V		
4	OPT-RI12060	9.9W@24V	9.6W@24V	11.6W@24V	10.5W@24V		
5	OPT-RI15060	14.2W@24V	12W@24V	15.3W@24V	15.2W@24V		

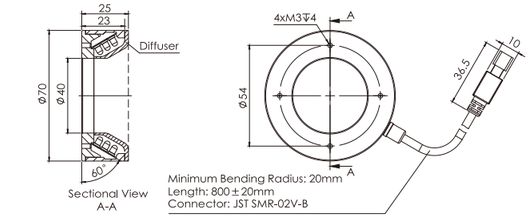
∗ Note: The data is for reference only.

Dimensions (mm)

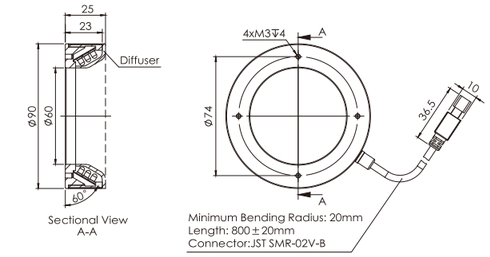
1. OPT-RI5060



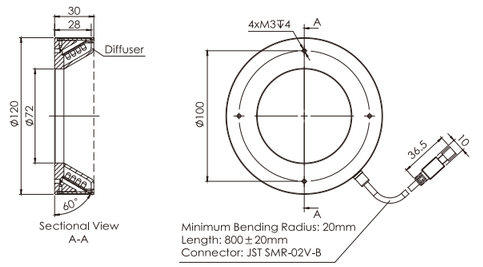
2. OPT-RI7060



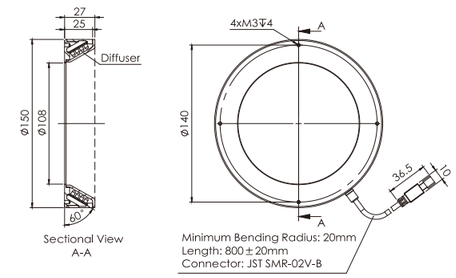
3. OPT-RI9060



4. OPT-RI12060



5. OPT-RI15060



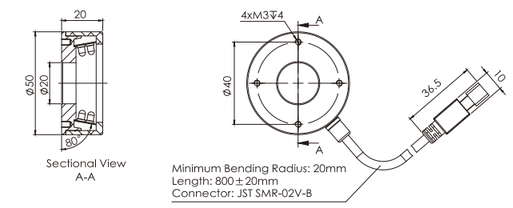
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RI5080	2.6W@24V	1.6W@24V	2.8W@24V	2.7W@24V	80°	OPT-DPA2024E
2	OPT-RI7080	4.2W@24V	3.8W@24V	4.1W@24V	4.1W@24V		
3	OPT-RI9080	7.6W@24V	5.8W@24V	7.9W@24V	7.3W@24V		
4	OPT-RI12080	10W@24V	7.5W@24V	9.5W@24V	9.9W@24V		
5	OPT-RI15080	11.4W@24V	10.2W@24V	12.6W@24V	12.4W@24V		

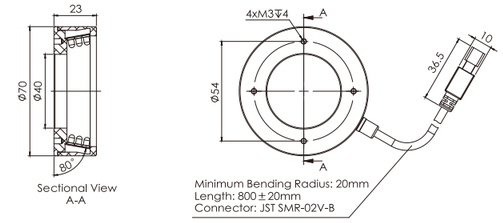
∗ Note: The data is for reference only.

Dimensions (mm)

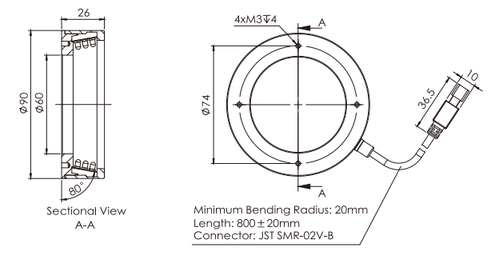
1. OPT-RI5080



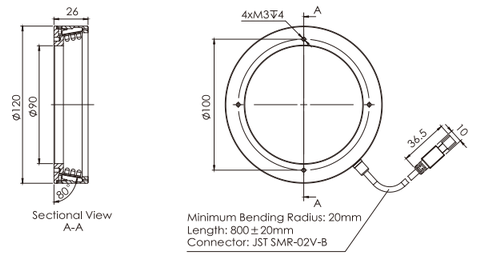
2. OPT-RI7080



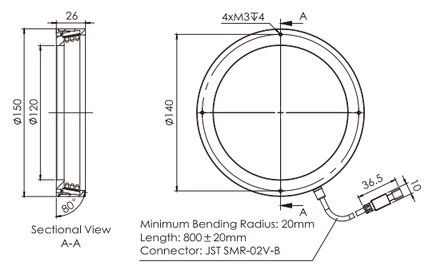
3. OPT-RI9080



4. OPT-RI12080



5. OPT-RI15080



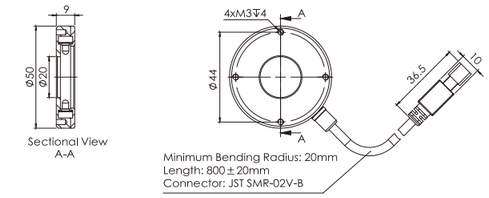
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RI5090	1.3W@24V	0.8W@24V	1.2W@24V	1.3W@24V	90°	OPT-DPA2024E
2	OPT-RI7090	1.6W@24V	1.3W@24V	1.6W@24V	1.6W@24V		
3	OPT-RI9090	2.4W@24V	1.8W@24V	2.5W@24V	2.4W@24V		
4	OPT-RI12090	3.8W@24V	2.1W@24V	4.2W@24V	4.2W@24V		
5	OPT-RI15090	6W@24V	4W@24V	5.7W@24V	5.5W@24V		

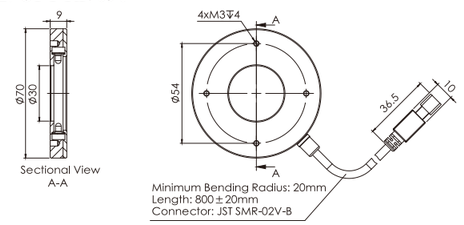
∗ Note: The data is for reference only.

Dimensions (mm)

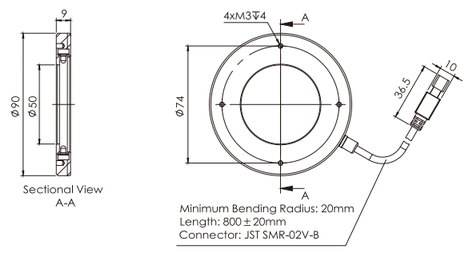
1. OPT-RI5090



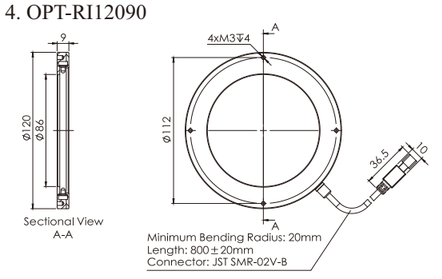
2. OPT-RI7090



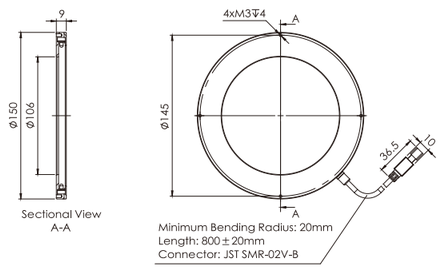
3. OPT-RI9090



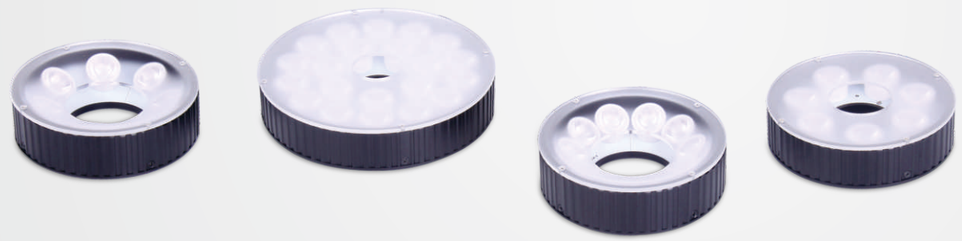
4. OPT-RI12090



5. OPT-RI15090



Ring Lights OPT-RIB Series



Product Features

Main Features

- Good directivity, lower power consumption compared to OPT RI series, ideal for illumination applications with long working distances.

Application Cases

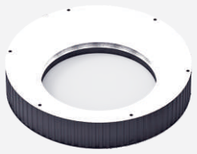
- PCB inspection
- Electronic components inspection
- IC components inspection
- Plastic containers inspection

Selection Guide

OPT-RIB12030

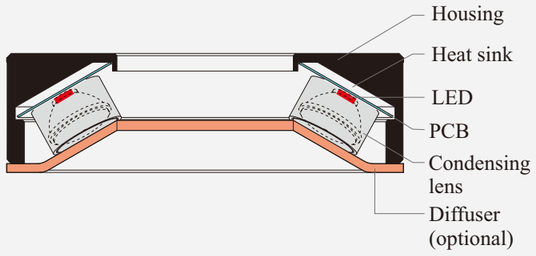
- 12030: Brand name
- 120: Outer diameter
- 30: Ring light
- Angle between the light ray and the central axis

Customizable Items

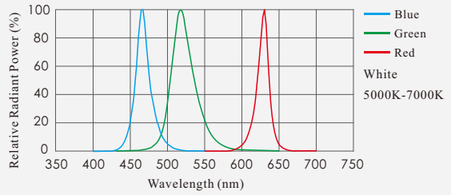


Color | Mounting | Connector | Size

Section Structure Drawing



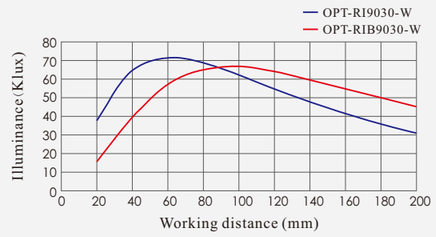
Spectrum Chart



Note: The data is for reference only.

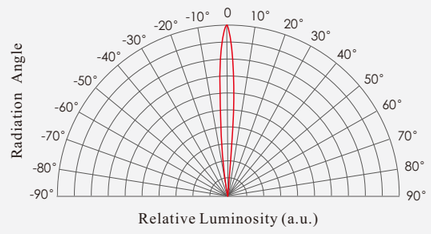
Series Features

Illuminance Change over Working Distance



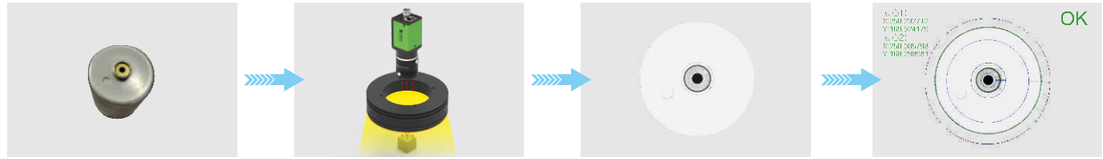
Note: The data is for reference only.

Directional Characteristics



Application Cases

- Motor accessories inspection



Workpiece | Illumination | Image | Smart3 Analysis Result

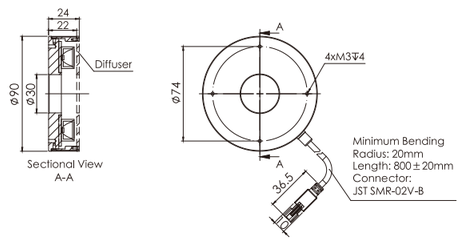
参数表

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RIB9000	2.9W@24V	2.9W@24V	2.4W@24V	2.9W@24V	0°	OPT-DPA2024E
2	OPT-RIB12000	8.6W@24V	8.6W@24V	7.2W@24V	5.8W@24V		
3	OPT-RIB15000	10.8W@24V	10.8W@24V	8.6W@24V	8.6W@24V		
4	OPT-RIB9030	2.9W@24V	2.9W@24V	2.4W@24V	2.9W@24V	30°	
5	OPT-RIB12030	5.8W@24V	5.8W@24V	4.8W@24V	2.6W@24V		
6	OPT-RIB15030	8.6W@24V	8.6W@24V	7.2W@24V	5.8W@24V		

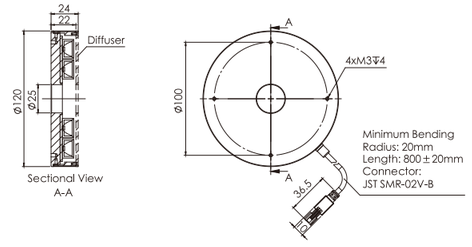
∗ Note: The data is for reference only.

Dimensions (mm)

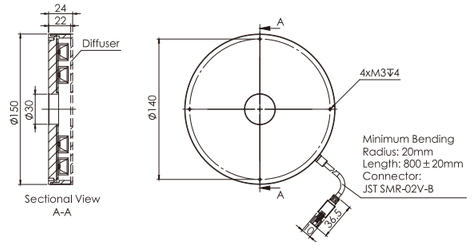
1. OPT-RIB9000



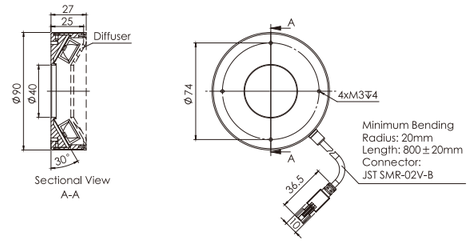
2. OPT-RIB12000



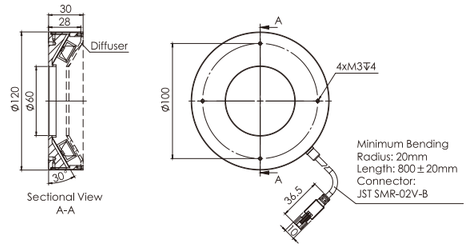
3. OPT-RIB15000



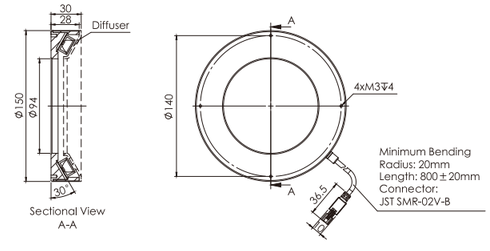
4. OPT-RIB9030



5. OPT-RIB12030



6. OPT-RIB15030



Arc Light Source OPT-RIC Series NEW



Product Features

Main Features

- An arc light source provides illumination from different angles, highlight the three-dimensional information of objects and effectively solv issues with diagonal shadowing.
- Different diffusion plates can be selected according to the requirements for various diffusion effects.
- The opening angle can be customized according to requirements.

Application Cases

- Suitable for electronic component contour positioning
- Dimensional measurement of metal parts
- Surface defect detection
- Curved character detection

Selection Guide

OPT-RIC12000

- 12000 → Angle between the light ray and the central axis
- 120 → Outer diameter
- RIC → Arc light source
- OPT → Brand name

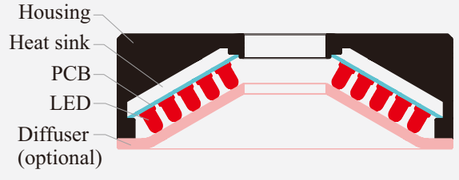
Customizable Items



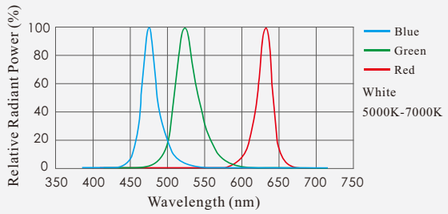
Color | Mounting | Connector

Sectional control | Emitting angle | Size

Section Structure Drawing



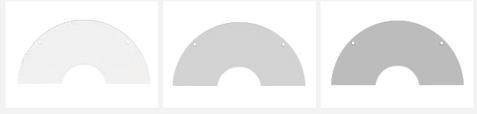
Spectrum Chart



Note: The data is for reference only.

Series Features

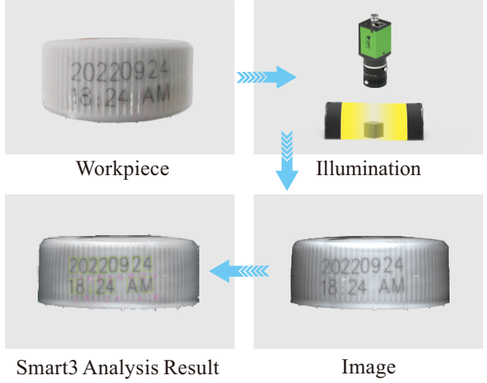
- Optional diffusers for uniform illumination



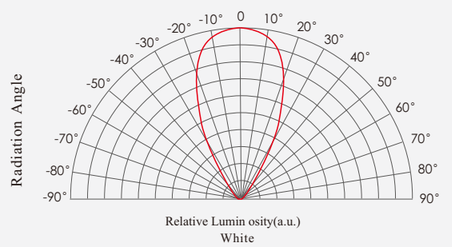
Transparent | Standard | Uniform

Application Cases

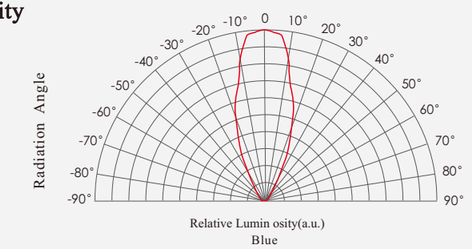
- Detection Task: Character Detection

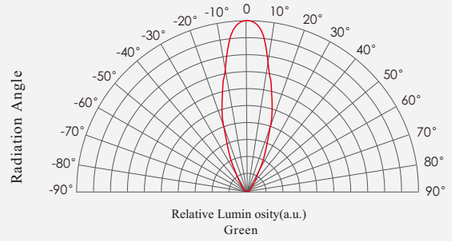


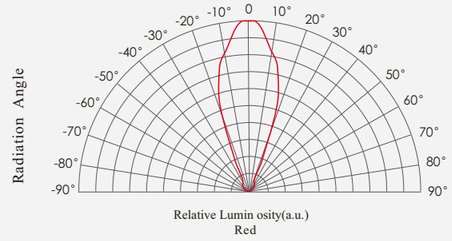
Series Features



Directivity







Note: The data is for reference only.

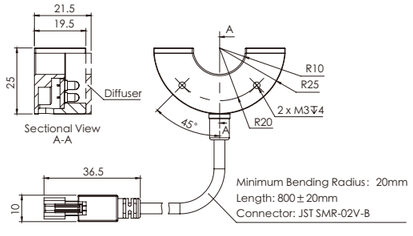
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RIC5000	1.3W@24V	0.8W@24V	1.3W@24V	1.3W@24V	0°	OPT-DPA2024E
2	OPT-RIC7000	1.9W@24V	1.8W@24V	1.9W@24V	1.9W@24V		
3	OPT-RIC9000	3.2W@24V	3W@24V	3.2W@24V	3.2W@24V		
4	OPT-RIC12000	4.6W@24V	3.9W@24V	5W@24V	4.9W@24V		
5	OPT-RIC15000	7.1W@24V	7W@24V	6.6W@24V	7.8W@24V		

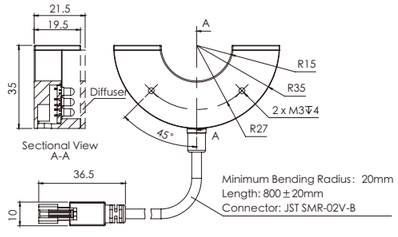
∗ Note: The data is for reference only.

Dimensions (mm)

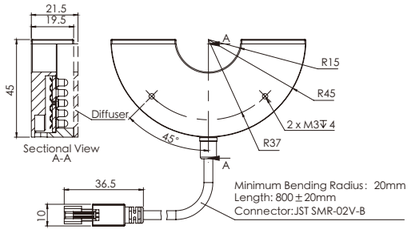
1. OPT-RIC5000



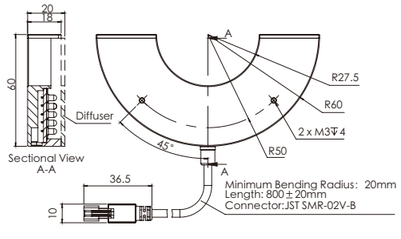
2. OPT-RIC7000



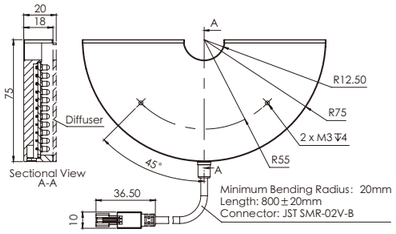
3. OPT-RIC9000



4. OPT-RIC12000



5. OPT-RIC15000



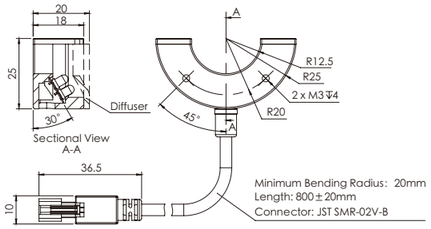
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RIC5030	1.5W@24V	0.9W@24V	1.2W@24V	1.1W@24V	30°	OPT-DPA2024E
2	OPT-RIC7030	2.1W@24V	1.6W@24V	1.8W@24V	1.8W@24V		
3	OPT-RIC9030	2.9W@24V	2.5W@24V	2.8W@24V	2.7W@24V		
4	OPT-RIC12030	5.1W@24V	4.3W@24V	5W@24V	4.9W@24V		
5	OPT-RIC15030	6.4W@24V	4.8W@24V	7.2W@24V	6.6W@24V		

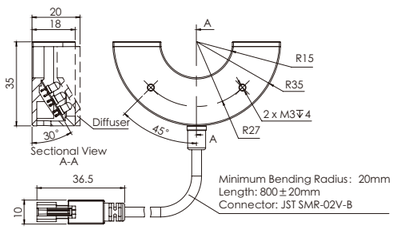
∗ Note: The data is for reference only.

Dimensions (mm)

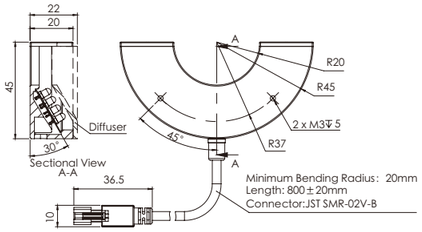
1. OPT-RIC5030



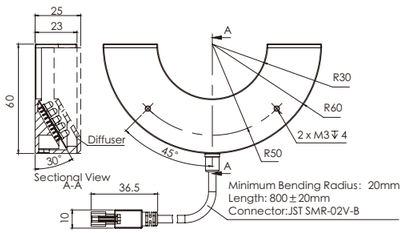
2. OPT-RIC7030



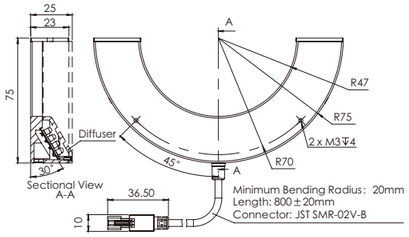
3. OPT-RIC9030



4. OPT-RIC12030



5. OPT-RIC15030



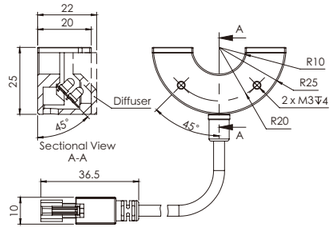
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RIC5045	1.1W@24V	0.9W@24V	1.2W@24V	1.1W@24V	45°	OPT-DPA2024E
2	OPT-RIC7045	2.1W@24V	2.2W@24V	2.1W@24V	2.1W@24V		
3	OPT-RIC9045	3W@24V	2.4W@24V	3.2W@24V	2.9W@24V		
4	OPT-RIC12045	4.5W@24V	3.7W@24V	5.5W@24V	5W@24V		
5	OPT-RIC15045	6.3W@24V	5.5W@24V	7.2W@24V	6.9W@24V		

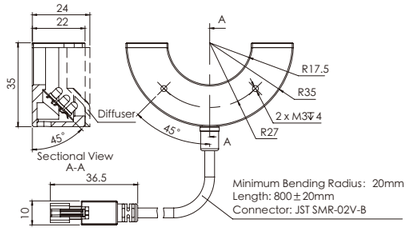
∗ Note: The data is for reference only.

Dimensions (mm)

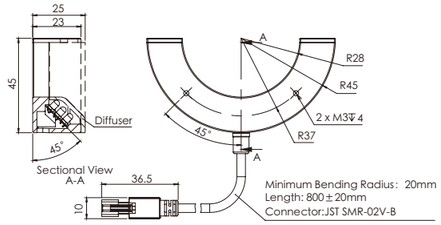
1. OPT-RIC5045



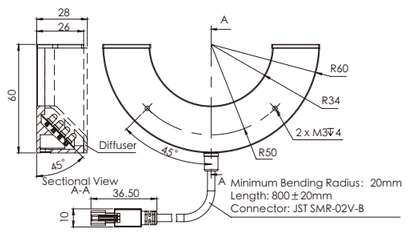
2. OPT-RIC7045



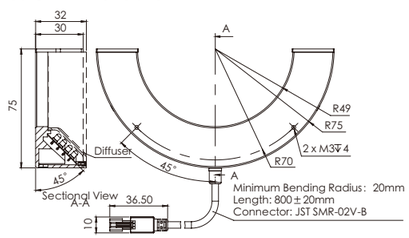
3. OPT-RIC9045



4. OPT-RIC12045



5. OPT-RIC15045



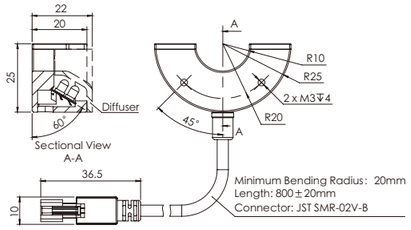
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RIC5060	1.1W@24V	1W@24V	1.2W@24V	1.1W@24V	60°	OPT-DPA2024E
2	OPT-RIC7060	2.4W@24V	1.8W@24V	2.4W@24V	2.4W@24V		
3	OPT-RIC9060	2.8W@24V	2.4W@24V	3.4W@24V	3.1W@24V		
4	OPT-RIC12060	2.8W@24V	2.4W@24V	3.4W@24V	3.1W@24V		
5	OPT-RIC15060	4.7W@24V	4.8W@24V	5W@24V	5.5W@24V		

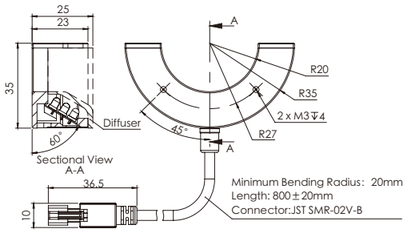
∗ Note: The data is for reference only.

Dimensions (mm)

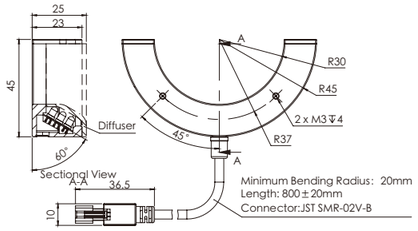
1. OPT-RIC5060



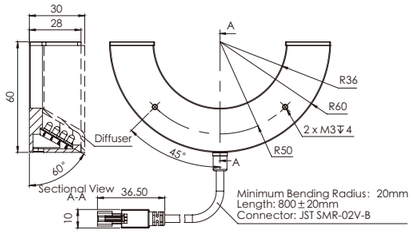
2. OPT-RIC7060



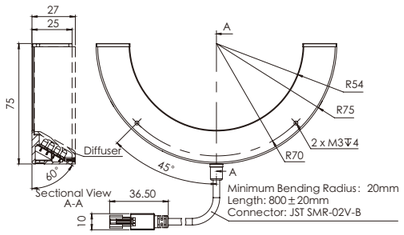
3. OPT-RIC9060



4. OPT-RIC12060



5. OPT-RIC15060



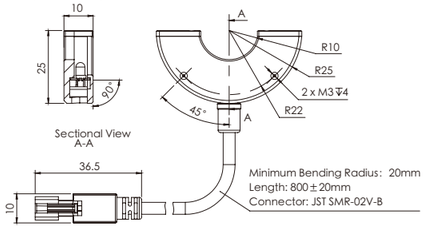
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-RIC5090	0.5W@24V	0.4W@24V	0.5W@24V	0.5W@24V	60°	OPT-DPA2024E
2	OPT-RIC7090	1.1W@24V	0.5W@24V	1.1W@24V	1.1W@24V		
3	OPT-RIC9090	1.2W@24V	0.8W@24V	1.3W@24V	1.2W@24V		
4	OPT-RIC12090	2.0W@24V	1.1W@24V	1.7W@24V	1.7W@24V		
5	OPT-RIC15090	2.6W@24V	1.8W@24V	2.4W@24V	2.4W@24V		

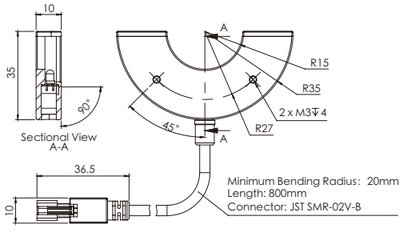
∗ Note: The data is for reference only.

Dimensions (mm)

1. OPT-RIC5090

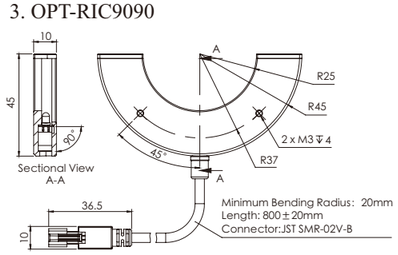


2. OPT-RIC7090

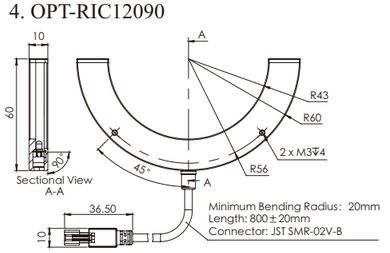


Dimensions (mm)

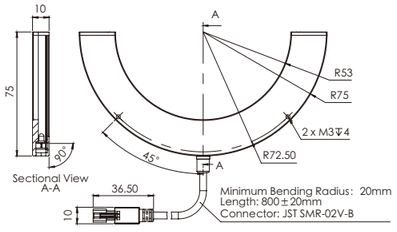
3. OPT-RIC9090



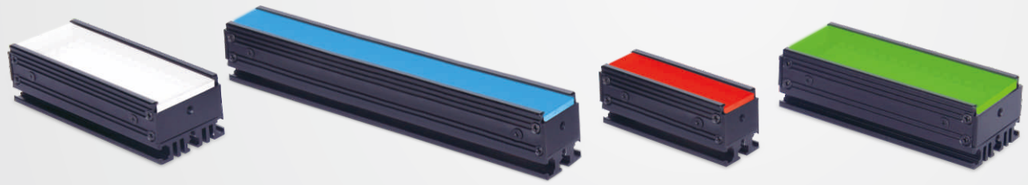
4. OPT-RIC12090



5. OPT-RIC15090



Bar Lights OPT-LI Series



Product Features

Main Features

- Suitable for special illumination requirements, can be combined flexibly
- Adjustable mounting angle
- Available for different colors and customized size

Application Cases

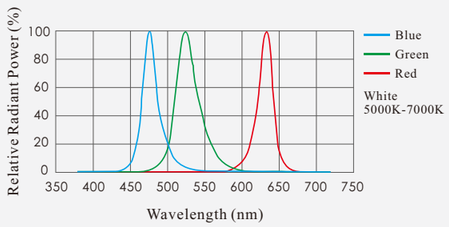
- Metal surface inspection
- Image scanning
- Surface crack detection
- LCD panel inspection

Selection Guide

OPT-LI11532

- Width
- Length
- Bar light
- Brand name

Spectrum Chart



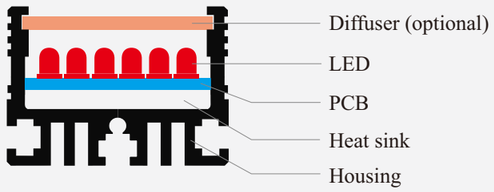
Note: The data is for reference only.

Customizable Items



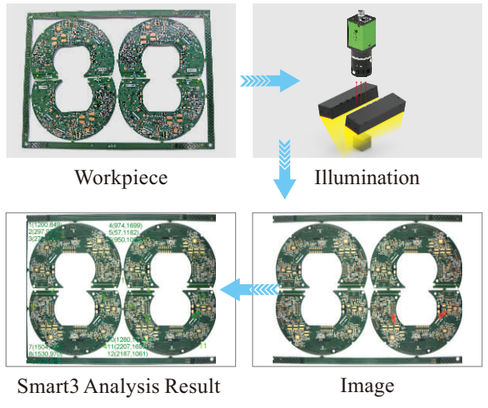
Color
Mounting
Connector
Size

Section Structure Drawing



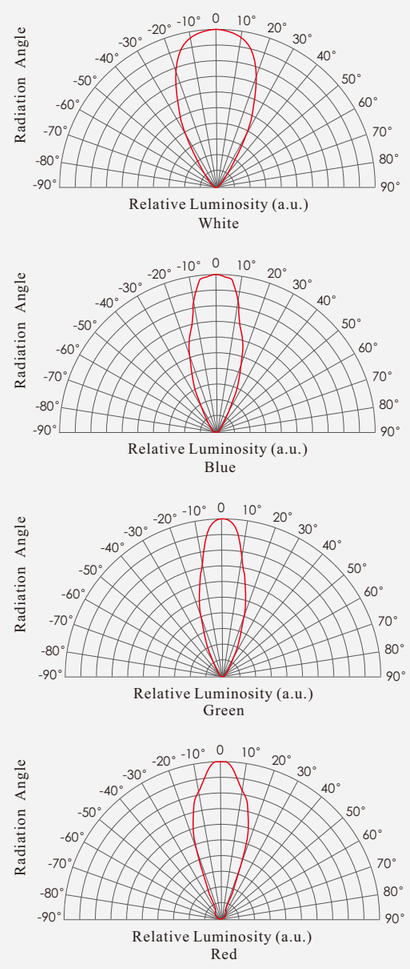
Application Cases

- PCB positioning



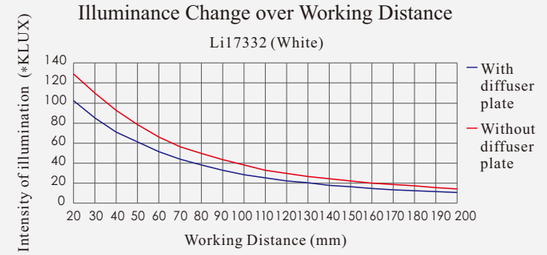
Series Features

Directional Characteristics



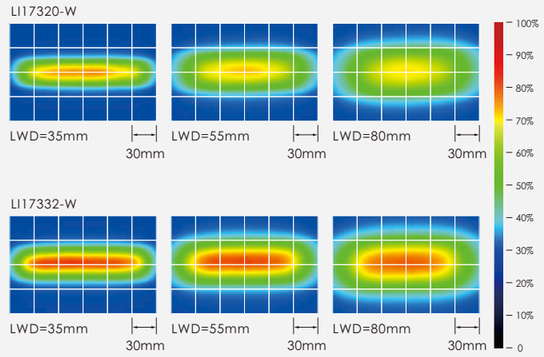
Note: The data is for reference only.

Illuminance Change over Working Distance



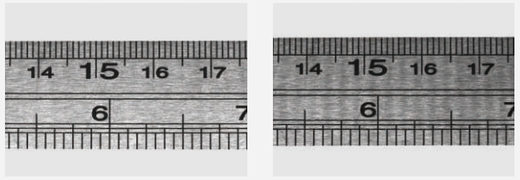
Note: The data is for reference only.

Relative Radiant Power Distribution



Note: The data is for reference only.

Matching with diffuser plate for reflective surfaces, workpiese example to improve image uniformity



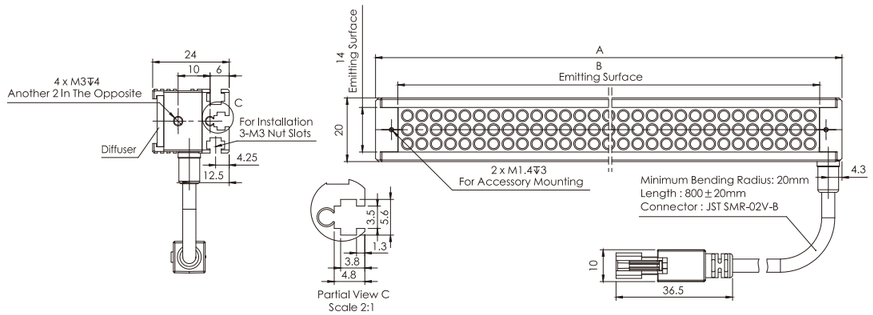
With diffuser plate
Without diffuser plate

Model Table

No.	Model	* Power ○	* Power ●	* Power ●	* Power ●	Length A (mm)	Emitting B (mm)	Light source width (mm)	Recommended controller
1	OPT-LI6120	2.8W@24V	2.9W@24V	2.7W@24V	1.7W@24V	61	47	20	OPT-DPA2024E
2	OPT-LI11520	4.2W@24V	4.9W@24V	3.7W@24V	3.2W@24V	115	101		
3	OPT-LI17320	6.7W@24V	6.7W@24V	5.8W@24V	4.8W@24V	173	159		
4	OPT-LI21820	7.2W@24V	7.8W@24V	6.2W@24V	6.9W@24V	218	204		
5	OPT-LI26820	10.5W@24V	10.9W@24V	8.3W@24V	7.9W@24V	268	254		
6	OPT-LI31320	10.7W@24V	11.7W@24V	9.3W@24V	10.4W@24V	313	299		
7	OPT-LI36220	12.3W@24V	12.9W@24V	11.5W@24V	11W@24V	362	348		
8	OPT-LI43620	15W@24V	15W@24V	12.4W@24V	12.6W@24V	436	422		
9	OPT-LI53620	17.3W@24V	17.3W@24V	15W@24V	15.8W@24V	536	522		

* Note: The data is for reference only.

Dimensions (mm)

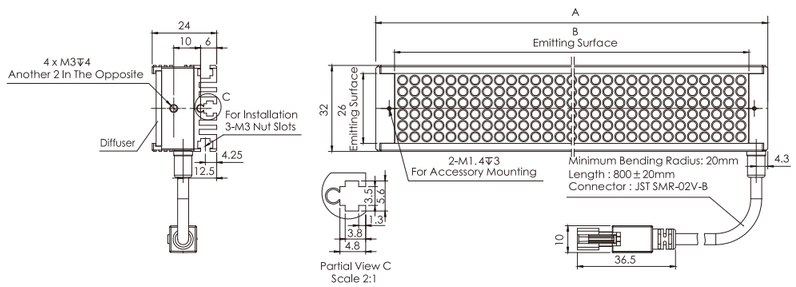


Model Table

No.	Model	∗ Power ○	∗ Power ○	∗ Power ○	∗ Power ○	Length A (mm)	Emitting B (mm)	Light source width (mm)	Recommended controller
1	OPT-LI3832	2W@24V	2W@24V	1.8W@24V	2W@24V	38	24		
2	OPT-LI6132	4W@24V	4W@24V	3.5W@24V	3.3W@24V	61	47		
3	OPT-LI8332	5.9W@24V	6.1W@24V	5W@24V	4.9W@24V	83	69		
4	OPT-LI11532	6W@24V	7W@24V	5.5W@24V	6.3W@24V	115	101		
5	OPT-LI17332	8.5W@24V	8.4W@24V	8W@24V	7.2W@24V	173	159		
6	OPT-LI21832	13W@24V	13W@24V	9W@24V	9.1W@24V	218	204	32	OPT-DPA2024E
7	OPT-LI26832	13.9W@24V	13.9W@24V	10.5W@24V	12.8W@24V	268	254		
8	OPT-LI31332	15.6W@24V	15.6W@24V	12W@24V	13W@24V	313	299		
9	OPT-LI36232	16.1W@24V	16.1W@24V	14.4W@24V	15W@24V	362	348		
10	OPT-LI43632	18.8W@24V	18.8W@24V	16W@24V	17.3W@24V	436	422		
11	OPT-LI53632	21W@24V	21W@24V	19W@24V	18.7W@24V	536	522		

∗ Note: The data is for reference only.

Dimensions (mm)



Combined Bar Lights OPT-LIM Series

Patented



Product Features

Main Features

- Adjustable illumination angle (0-90°)
- Intensity of each light bar can be controlled individually.
- Wide range of applications

Application Cases

- PCB inspection
- Electronic components inspection
- Inspection of solder joints
- Positioning of markers
- Microscope illumination
- Package barcodes reading

Selection Guide

OPT-LIM6120

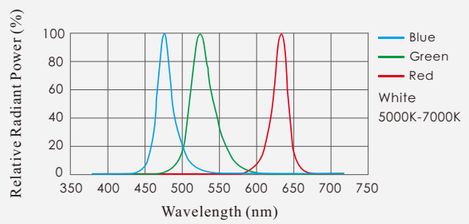
- Bar light width
- Bar light length
- Combined bar light
- Brand name

Customizable Items



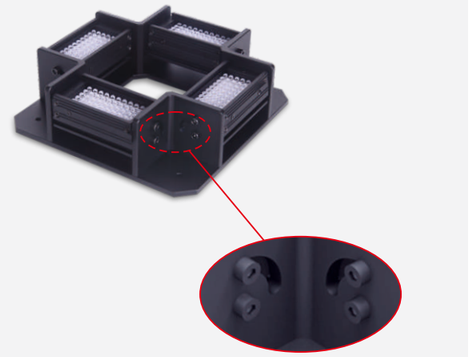
Color
Mounting
Connector
Size
Sectional control
Polygon

Spectrum Chart



Note: The data is for reference only.

Series Features



The installation angle of single side light source can adjusted with 90°C

Application Cases

- OCR for keyboards



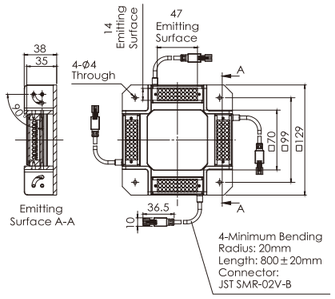
Model Table

No.	Model	∗ Power 🔴	∗ Power ⚪	∗ Power 🔵	∗ Power 🟢	LED Raw No.	Recommended controller
1	OPT-LIM6120	6.9W@24V	11.2W@24V	11.2W@24V	10.8W@24V	3	OPT-DPA2024E
2	OPT-LIM11520	12.9W@24V	16.7W@24V	19.7W@24V	14.7W@24V		
3	OPT-LIM17320	19.2W@24V	27W@24V	27W@24V	23W@24V		
4	OPT-LIM21820	27.6W@24V	28.6W@24V	31.1W@24V	24.9W@24V		
5	OPT-LIM26820	31.6W@24V	42W@24V	42W@24V	33W@24V		
6	OPT-LIM31320	41.4W@24V	42.9W@24V	46.7W@24V	37.2W@24V		
7	OPT-LIM36220	48W@24V	49.3W@24V	51.6W@24V	47.8W@24V		
8	OPT-LIM3832	8W@24V	8W@24V	8W@24V	7W@24V	6	
9	OPT-LIM6132	13.2W@24V	15.8W@24V	15.8W@24V	13.9W@24V		
10	OPT-LIM8332	19.7W@24V	23.5W@24V	24.5W@24V	20.2W@24V		
11	OPT-LIM11532	25.2W@24V	23.8W@24V	28.1W@24V	21.9W@24V		
12	OPT-LIM17332	28.8W@24V	34.2W@24V	33.6W@24V	32.2W@24V		
13	OPT-LIM21832	36.5W@24V	52W@24V	40W@24V	38W@24V		
14	OPT-LIM26832	51.2W@24V	55.6W@24V	43.6W@24V	40W@24V		
15	OPT-LIM31332	54.8W@24V	62.4W@24V	53.2W@24V	51.6W@24V		
16	OPT-LIM36232	64W@24V	64.4W@24V	64.4W@24V	62.8W@24V		

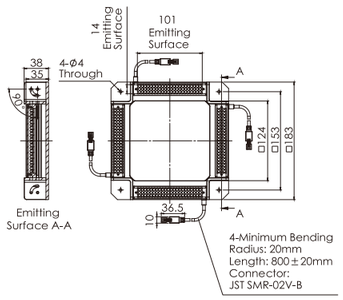
Note:∗4CH total power data is for reference only.

Dimensions (mm)

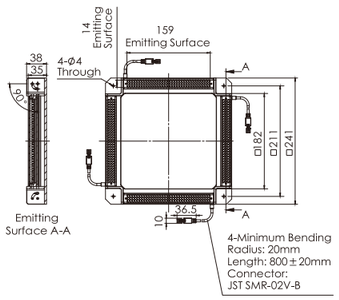
1. OPT-LIM6120



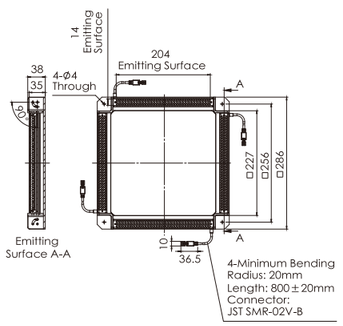
2. OPT-LIM11520



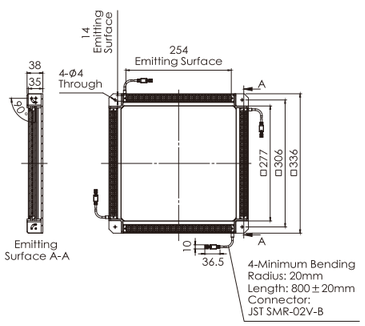
3. OPT-LIM17320



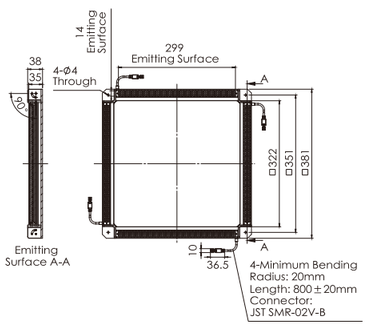
4. OPT-LIM21820



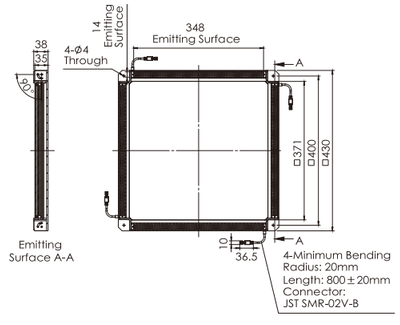
5. OPT-LIM26820



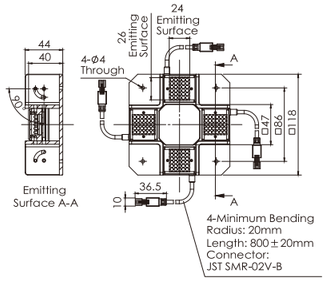
6. OPT-LIM31320



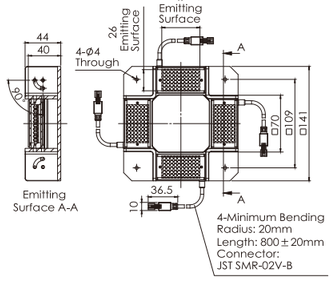
7. OPT-LIM36220



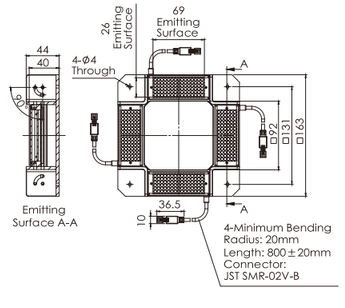
8. OPT-LIM3832



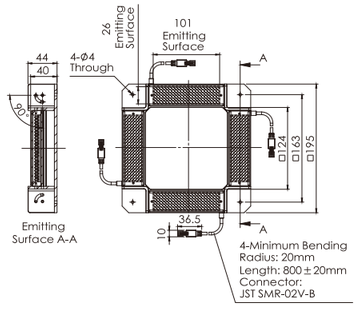
9. OPT-LIM6132



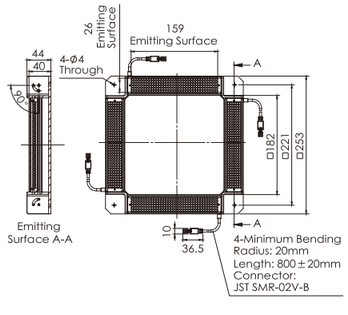
10. OPT-LIM8332



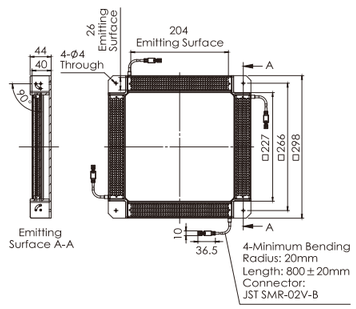
11. OPT-LIM11532



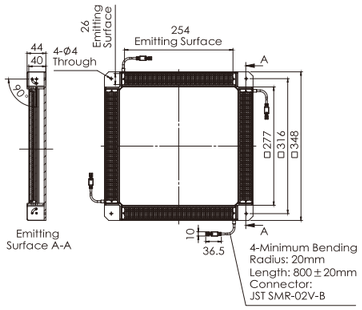
12. OPT-LIM17332



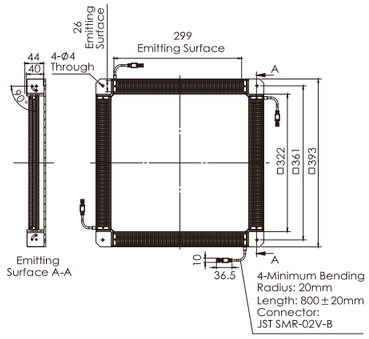
13. OPT-LIM21832



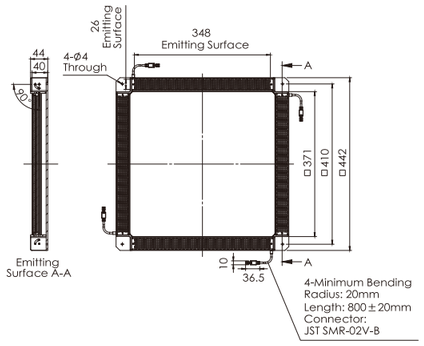
14. OPT-LIM26832



15. OPT-LIM31332



16. OPT-LIM36232



Bar Lights OPT-LIA Series



Product Features

Main Features

- High directivity, substituting OPT- LI series bar lights for illumination with long working distances
- Lower power consumption compared to the same size OPT- LI series bar lights

Application Cases

- Metal surface inspection
- Image scanning
- Surface crack detection
- LCD inspection

Selection Guide

OPT-LIA140 32

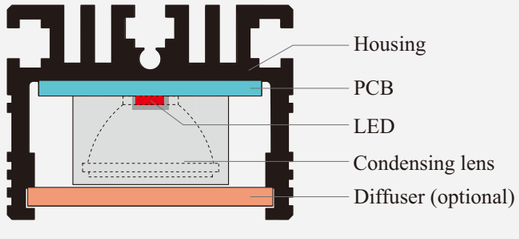
- 140 → Width
- 32 → Length
- LIA → Bar light
- OPT → Brand name

Customizable Items

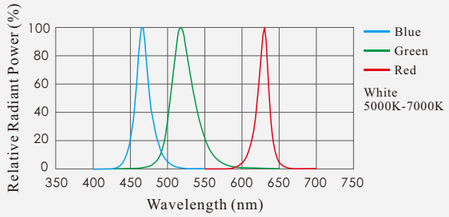


Color | Mounting | Connector | Size

Section Structure Drawing



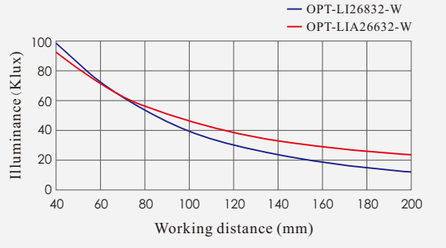
Spectrum Chart



Note: The data is for reference only.

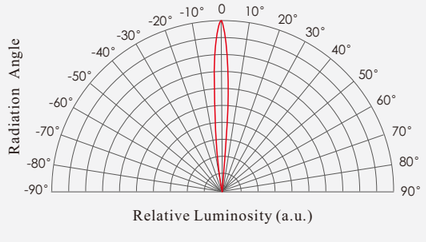
Series Features

Illuminance Change over Working Distance



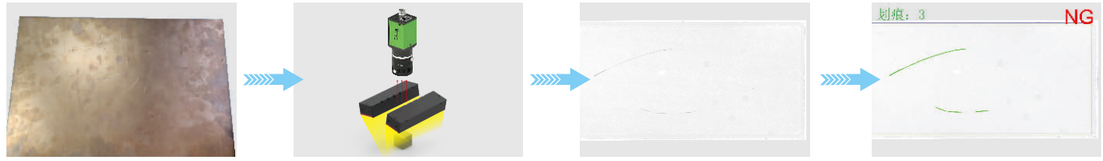
Note: recommend working distance≥60mm,the data is for reference only.

Directional Characteristics



Application Cases

Scratch inspection on metal surface



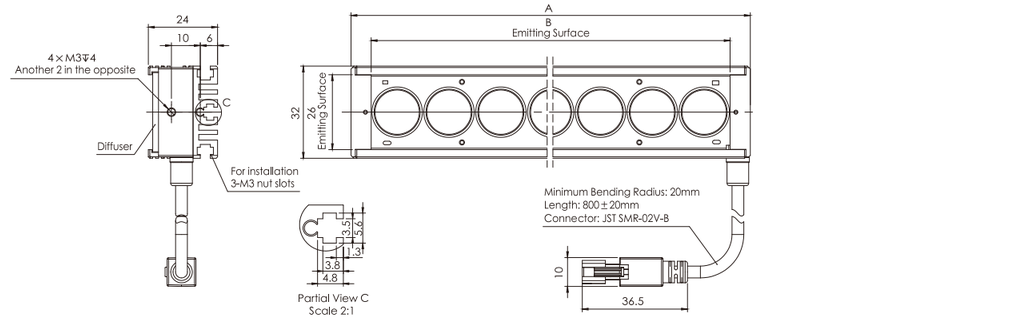
Workpiece | Illumination | Image | Smart3 Analysis Result

Model Table

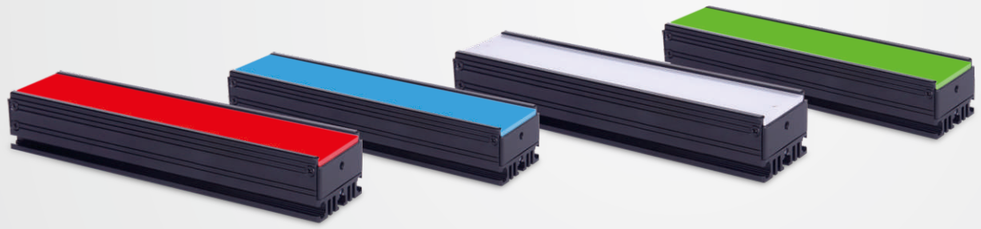
No.	Model	Color	⁎ Power	Length A (mm)	Emitting B (mm)	Recommended controller
1	OPT-LIA14032	○ ● ●	3W@24V	140	126	OPT-DPA2024E
2	OPT-LIA26632	○ ● ●	6W@24V	266	252	
3	OPT-LIA39232	○ ● ●	9W@24V	392	378	
4	OPT-LIA51832	○ ● ●	12W@24V	518	504	
5	OPT-LIA64432	○ ● ●	15W@24V	644	630	
6	OPT-LIA77032	○ ● ●	18W@24V	770	756	
7	OPT-LIA89632	○ ● ●	21W@24V	896	882	
8	OPT-LIA102232	○ ● ●	24W@24V	1022	1008	
9	OPT-LIA19432	●	3W@24V	194	180	
10	OPT-LIA37432	●	6W@24V	374	360	
11	OPT-LIA55432	●	9W@24V	554	540	
12	OPT-LIA73432	●	12W@24V	734	720	
13	OPT-LIA91432	●	15W@24V	914	900	
14	OPT-LIA109432	●	18W@24V	1094	1080	

Note:1. The data is for reference only.
2. Size customization: White, blue, and green light sources increase in increments of 126mm, while red light sources increase in increments of 180mm.

Dimensions (mm)



Bar Lights OPT-LIT Series



Product Features

Main Features

- Hidden LED particles. Can be used as back lights.
- Flexible for mounting. Can be installed with thread or insert nut into the extrusion groove.
- Customized length up to 2000 mm.

Application Cases

- Electronic components inspection
- Package inspection
- Printing inspection; light source for light boxes

Selection Guide

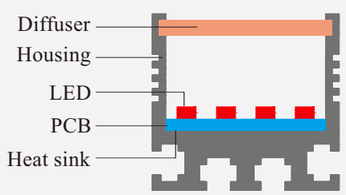
OPT-LIT 98 32
- 98 → Width
- 32 → Length
- LIT → Bar lights
- OPT → Brand name

Customizable Items

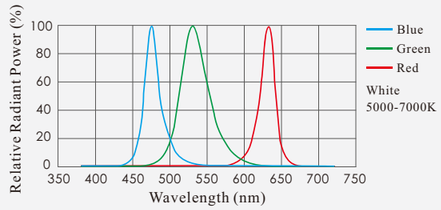


Color | Mounting | Connector | Size | Sectional control

Section Structure Drawing



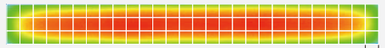
Spectrum Chart



Note: The data is for reference only.

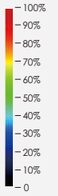
Series Features

Relative Radiation Luminance Distribution



The data comes from OPT-LIT26632-W

Note: The data is for reference only.



Application Cases

- Plastic bottle barcode reading

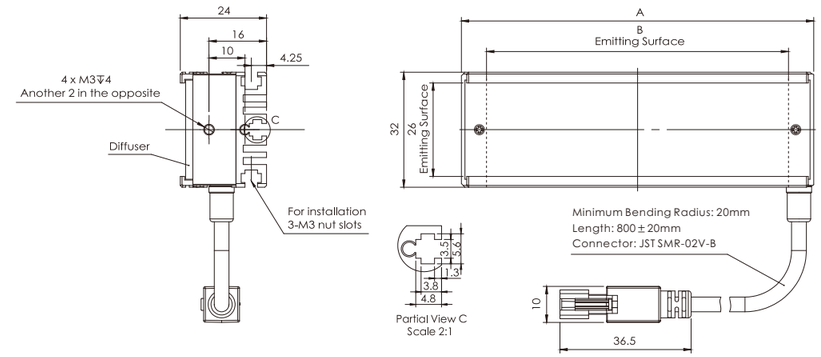


Model Table

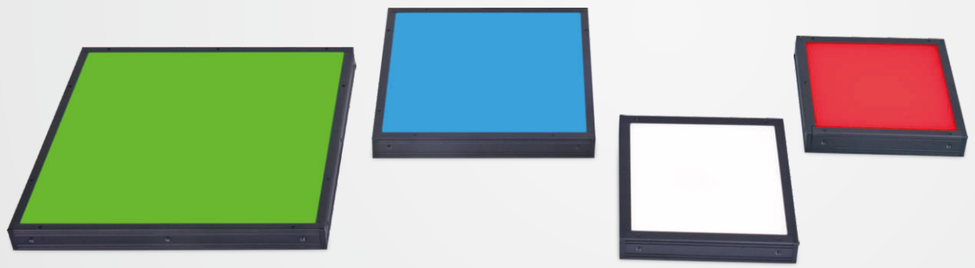
No.	Model	∗ Power 🔴	∗ Power ⚪	∗ Power 🔵	∗ Power 🟢	Length A (mm)	Emitting B (mm)	Recommended controller
1	OPT-LIT9832	5.5W@24V	6.0W@24V	5.3W@24V	4.3W@24V	98	84	
2	OPT-LIT14032	6.5W@24V	7.2W@24V	6.9W@24V	6.2W@24V	140	126	
3	OPT-LIT18232	6.4W@24V	9.8W@24V	9.1W@24V	6.8W@24V	182	168	
4	OPT-LIT22432	7.9W@24V	10.3W@24V	10.7W@24V	8.4W@24V	224	210	
5	OPT-LIT26632	9.5W@24V	12.4W@24V	12.9W@24V	10.0W@24V	266	252	
6	OPT-LIT30832	11.0W@24V	14.2W@24V	13.6W@24V	11.8W@24V	308	294	OPT-DPA2024E
7	OPT-LIT35032	10.6W@24V	16.3W@24V	15.6W@24V	13.4W@24V	350	336	
8	OPT-LIT39232	12.0W@24V	17.9W@24V	17.7W@24V	15.0W@24V	392	378	
9	OPT-LIT43432	13.1W@24V	18.1W@24V	19.4W@24V	16.5W@24V	434	420	
10	OPT-LIT47632	14.2W@24V	19.6W@24V	21.1W@24V	18.1W@24V	476	462	
11	OPT-LIT51832	15.2W@24V	21.5W@24V	22.8W@24V	19.1W@24V	518	504	

∗ Note: The data is for reference only.

Dimensions (mm)



Direct Backlight OPT-FL Series



Product Features

Main Features

- Standard models have uniformity exceeding 85%, and custom products can achieve up to 95%.
- Maximized emitting surface for applications in constrained space.
- Flexible mounting, can be installed from the front, back and side.

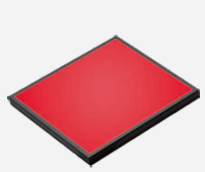
Application Cases

- Gauging for mechanical parts
- Electronic components/IC package inspection
- Film stain detection
- Scratches detection on transparent objects

Selection Guide

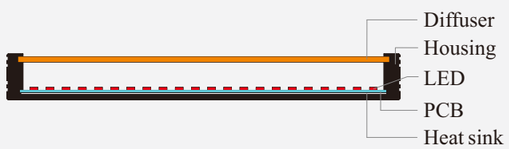
OPT-FL 90 90
- Width
- Length
- Direct Backlight
- Brand name

Customizable Items

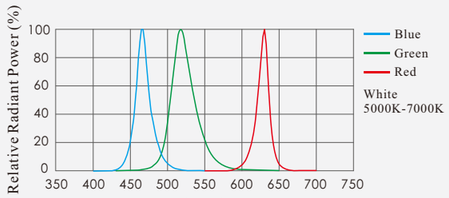


Color | Mounting | Connector | Size | Sectional control

Section Structure Drawing



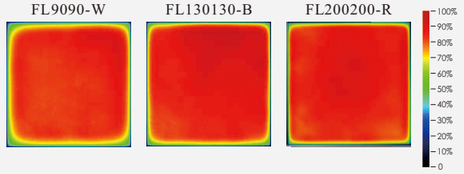
Spectrum Chart



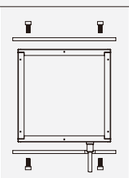
Note: The data is for reference only.

Series Features

Uniformity

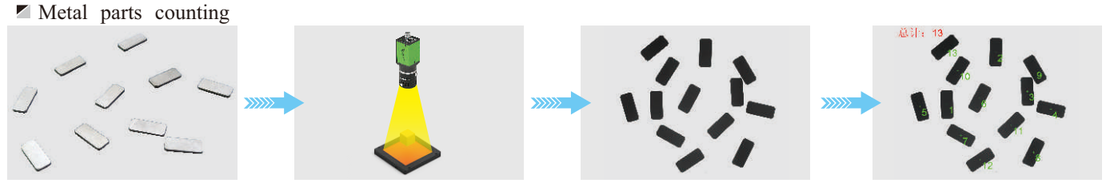


Various way of installation

		
Back screw installation	Side screw installation	Front through-hole installation (Requires the use of an adapter. For the adapter dimensions, see P224OPT-PRIN1515.)

Application Cases

Metal parts counting



Workpiece | Illumination | Image | Smart3 Analysis Result

Model Table

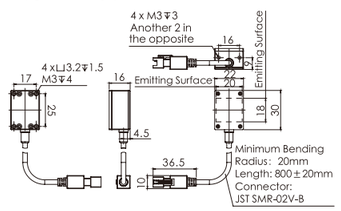
No.	Model	Color	∗ Power	Recommended controller
1	OPT-FL3022	○	1.6W@24V	OPT-DPA2024E
		Red	1.3W@24V	
		Green	1.2W@24V	
		Blue	1.4W@24V	
2	OPT-FL4336	○	2.7W@24V	
		Red	2.0W@24V	
		Green	2.3W@24V	
		Blue	2.6W@24V	
3	OPT-FL5244	○	3.4W@24V	
		Red	3W@24V	
		Green	2.9W@24V	
		Blue	3.3W@24V	
4	OPT-FL6254	○	4.9W@24V	
		Red	4.4W@24V	
		Green	4.1W@24V	
		Blue	4.3W@24V	
5	OPT-FL7070	○	6.3W@24V	
		Red	4.7W@24V	
		Green	4.6W@24V	
		Blue	5.3W@24V	
6	OPT-FL9090	○	8W@24V	
		Red	6.6W@24V	
		Green	6.4W@24V	
		Blue	8W@24V	
7	OPT-FL110110	○	11.4W@24V	
		Red	9.7W@24V	
		Green	8.8W@24V	
		Blue	12.4W@24V	

No.	Model	Color	∗ Power	Recommended controller
8	OPT-FL130130	○	16W@24V	OPT-DPA2024E
		Red	14W@24V	
		Green	11W@24V	
		Blue	14.8W@24V	
9	OPT-FL150150	○	18.6W@24V	
		Red	15.7W@24V	
		Green	13.6W@24V	
		Blue	18.9W@24V	
10	OPT-FL175175	○	24.5W@24V	
		Red	18.9W@24V	
		Green	18.4W@24V	
		Blue	21.5W@24V	
11	OPT-FL200200	○	29W@24V	
		Red	23.4W@24V	
		Green	21.3W@24V	
		Blue	26.2W@24V	
12	OPT-FL225225	○	36.7W@24V	
		Red	28.9W@24V	
		Green	21.3W@24V	
		Blue	31.1W@24V	
13	OPT-FL250250	○	41.5W@24V	
		Red	33.8W@24V	
		Green	27.3W@24V	
		Blue	39.5W@24V	

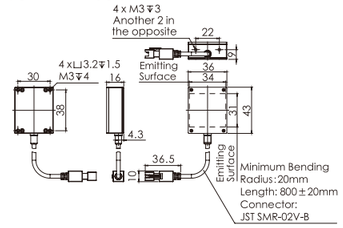
∗ Note: The data is for reference only.

Dimensions (mm)

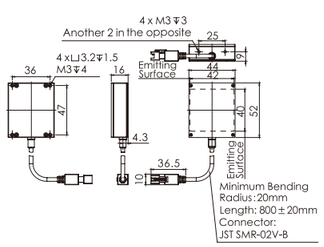
1.OPT-FL3022



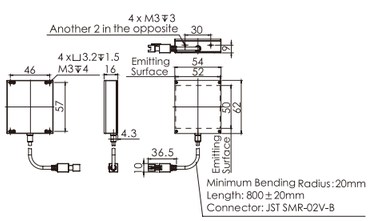
2.OPT-FL4336



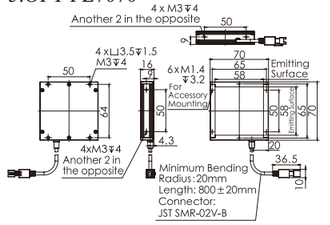
3.OPT-FL5244



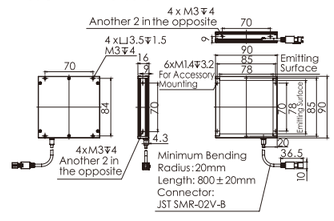
4.OPT-FL6254



5.OPT-FL7070

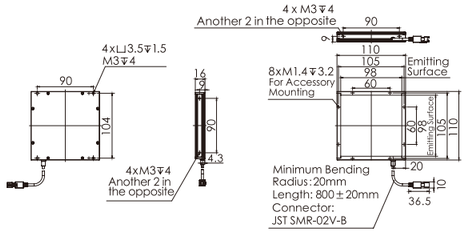


6.OPT-FL9090

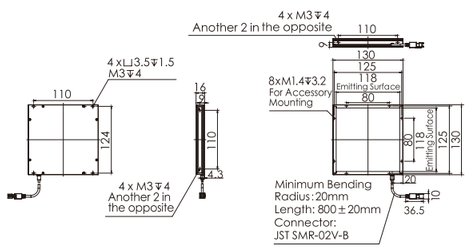


Dimensions (mm)

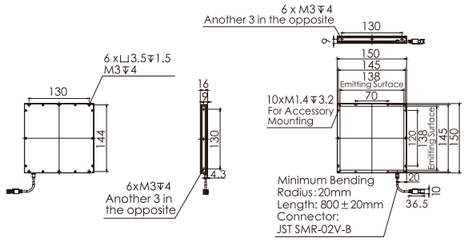
7.OPT-FL110110



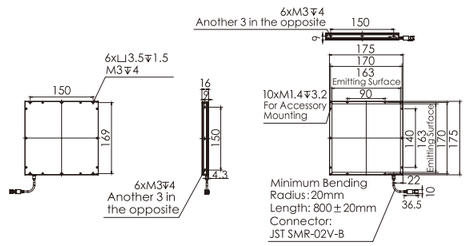
8.OPT-FL130130



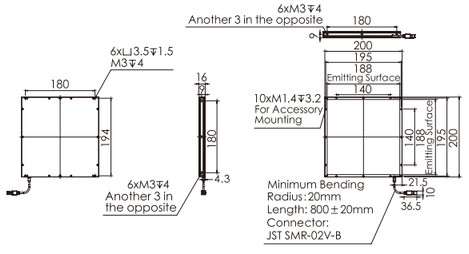
9.OPT-FL150150



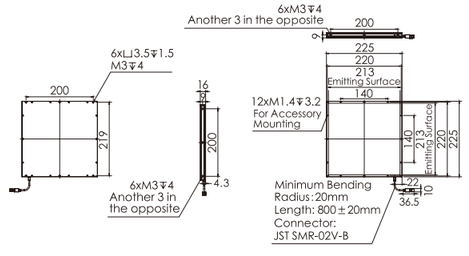
10.OPT-FL175175



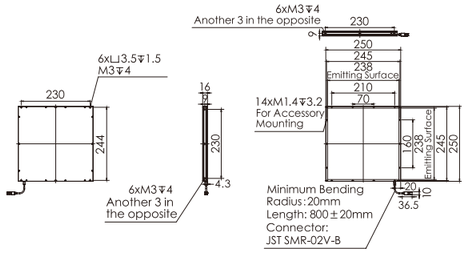
11.OPT-FL200200



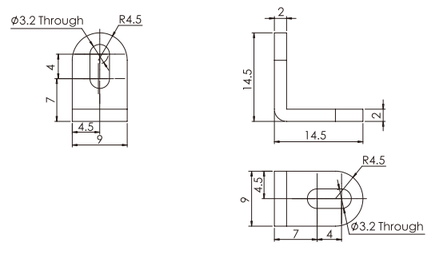
12.OPT-FL225225



13.OPT-FL250250



14.OPT-PRIN1515



Direct Backlight OPT-FLA Series



Product Features

Main Features

- Preferred for OPT backlights with large dimensions compared to OPT-FL series.
- Can be mounted using M3 nuts on the side.

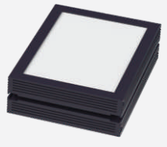
Application Cases

- Dimensional measurement of 3C components.
- Large coverage for electronic components inspection and recognition
- Contamination & foreign particles detection on transparent objects
- Multiple transparent objects positioning and inspection

Selection Guide

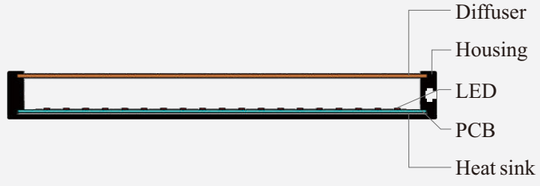
OPT-FLA 110 80
- 110 → Width
- 80 → Length
- FLA → Direct Backlight
- OPT → Brand name

Customizable Items

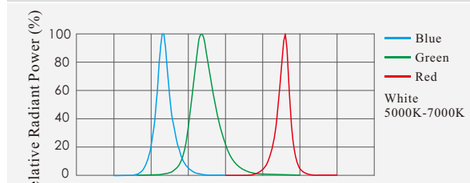


Color
Mounting
Connector
Size

Section Structure Drawing



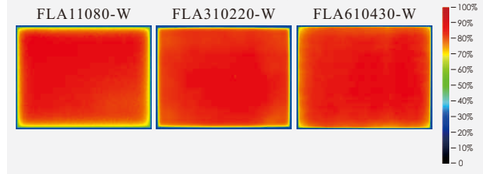
Spectrum Chart



Note: The data is for reference only.

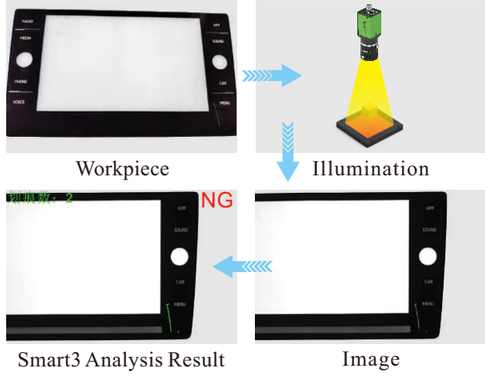
Series Features

Uniformity



Application Cases

- Detection task: Ink scratch detection.



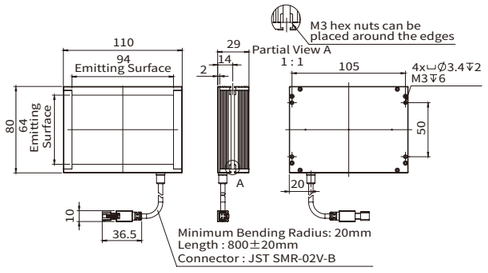
Model Table

No.	Model	∗ Power ○	∗ Power 🔴	∗ Power 🟢	∗ Power 🔵	Recommended controller
1	OPT-FLA11080	12.2W@24V	8.4W@24V	8.4W@24V	12W@24V	OPT-DPA2024E
2	OPT-FLA150110	12.2W@24V	16.2W@24V	15.4W@24V	19.2W@24V	
3	OPT-FLA210150	34.5W@24V	31W@24V	26.9W@24V	30.7W@24V	
4	OPT-FLA220210	47.5W@24V	42.4W@24V	30.3W@24V	46.1W@24V	
5	OPT-FLA310220	64.8W@2.7A	52.8W@2.2A	48W@2A	64.8W@2.7A	OPT-DPA6024E
6	OPT-FLA310290	84W@3.5A	67.2W@2.8A	57.6W@2.4A	84W@3.5A	
7	OPT-FLA410290	108W@4.5A	81.6W@3.4A	72W@3A	144W@4.5A	
8	OPT-FLA430410	144W@6A	115.2W@4.8A	96W@4A	144W@6A	
9	OPT-FLA510360	156W@6.5A	120W@5A	96W@4A	156W@6.5A	
10	OPT-FLA510500	204W@8.5A	156W@6.5A	132W@5.5A	204W@8.5A	
11	OPT-FLA610430	206.4W@8.6A	158.4W@6.6A	139.2W@5.8A	206.4W@8.6A	
12	OPT-FLA610570	259.2W@10.8A	201.6W@8.4A	172.8W@7.2A	259.2W@10.8A	

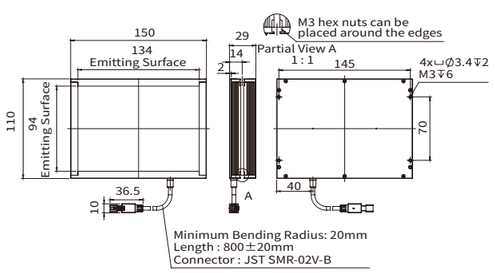
Note:The data is for reference only.

Dimensions (mm)

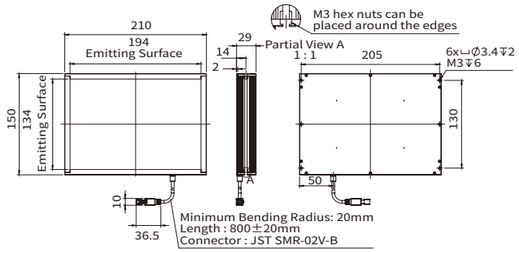
1. OPT-FLA11080



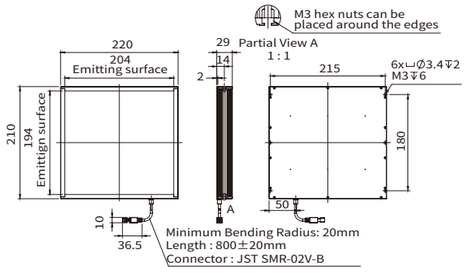
2. OPT-FLA150110



3. OPT-FLA210150

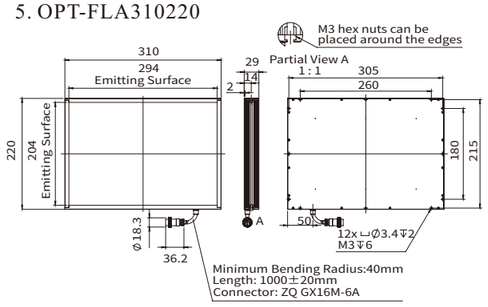


4. OPT-FLA220210

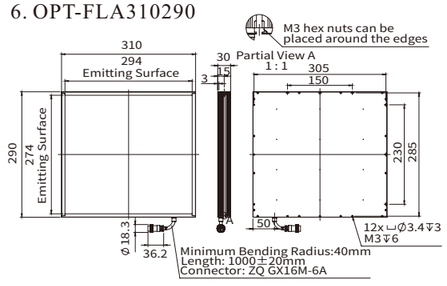


Dimensions (mm)

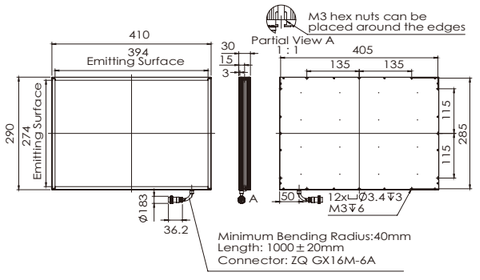
5. OPT-FLA310220



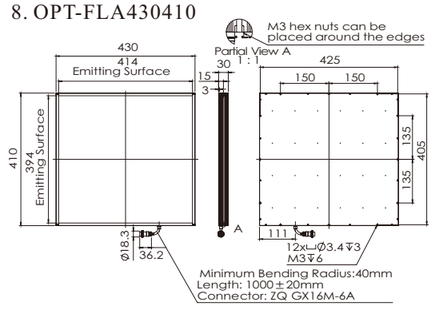
6. OPT-FLA310290



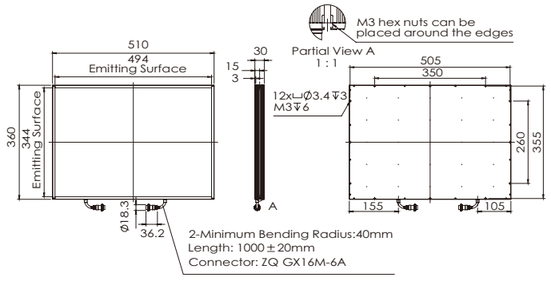
7. OPT-FLA410290



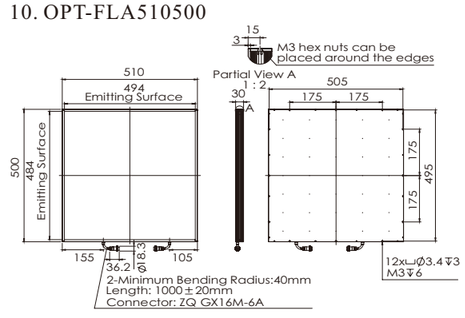
8. OPT-FLA430410



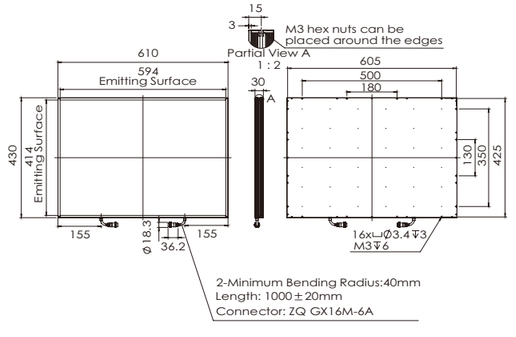
9. OPT-FLA510360



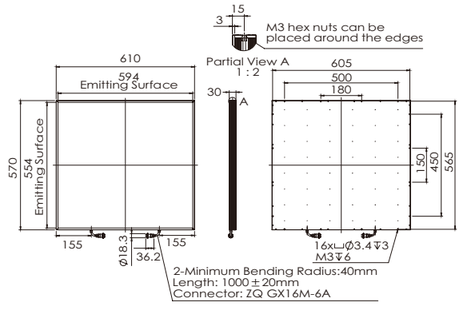
10. OPT-FLA510500



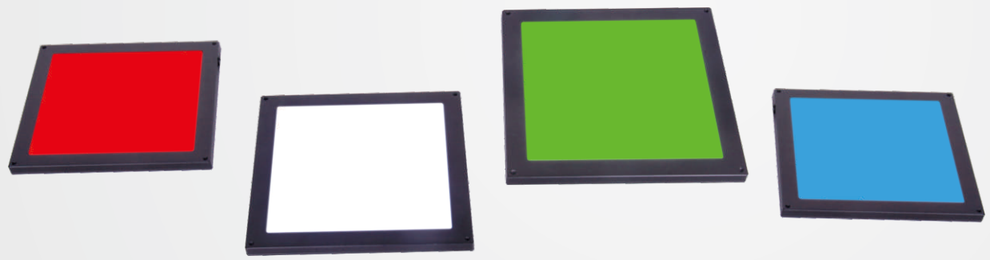
11. OPT-FLA610430



12. OPT-FLA610570



Edge Lit Backlight OPT-FLC Series



Product Features

Main Features

- High intensity and uniformity
- Ultra-light and thin design, minimum 6mm, for compact space
- Customized design available for large area uniform illumination

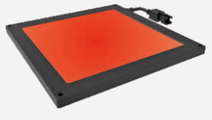
Application Cases

- Identification and inspection for PCBs
- Gauging for workpieces
- LED defects detection

Selection Guide

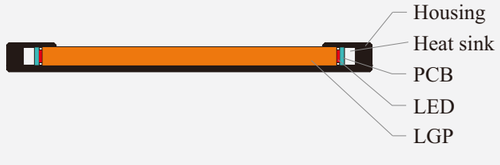
OPT-FLC9090
- Width
- Length
- Edge Lit Backlight
- Brand name

Customizable Items

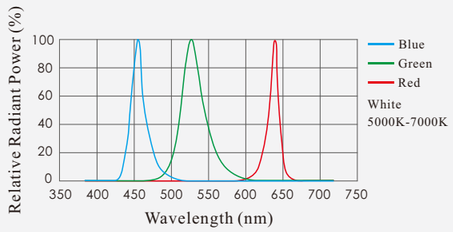


Color | Mounting | Connector | Size

Section Structure Drawing



Spectrum Chart

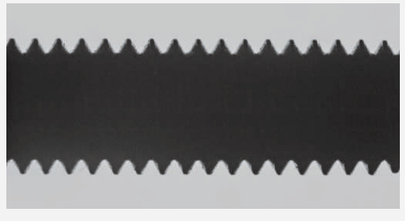


Note: The data is for reference only.

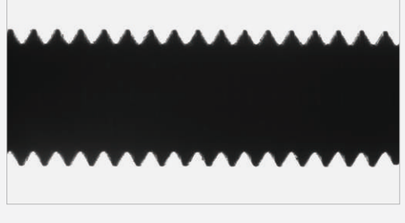
Series Features

Customization options: Bright Enhancement Film (BEF)

Standard FLC light without BEF



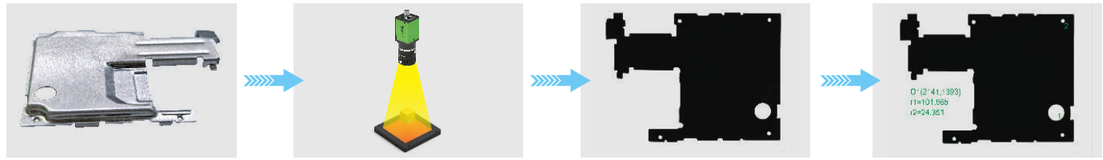
Customized FLC Light with BEF



BEF helps improvement of light collimation and intensity.

Application Cases

Contour detection for metal parts



Workpiece | Illumination | Image | Smart3 Analysis Result

Model Table

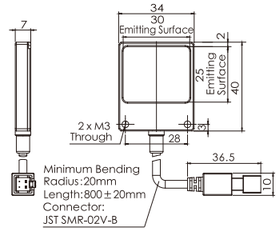
No.	Model	Color	∗ Power	Recommended controller
1	OPT-FLC4034	○	1.4W@24V	OPT-DPA2024E
		●	1.7W@24V	
		●	1.7W@24V	
		●	1.4W@24V	
2	OPT-FLC5039	○	1.8W@24V	
		●	1.7W@24V	
		●	1.7W@24V	
		●	1.7W@24V	
3	OPT-FLC7070	○	3.7W@24V	
		●	4.1W@24V	
		●	3.6W@24V	
		●	4.4W@24V	
4	OPT-FLC9090	○	6.5W@24V	
		●	5.4W@24V	
		●	4.7W@24V	
		●	6W@24V	
5	OPT-FLC110110	○	8W@24V	
		●	6.7W@24V	
		●	7W@24V	
		●	7.2W@24V	
6	OPT-FLC130130	○	10.8W@24V	
		●	9W@24V	
		●	9.1W@24V	
		●	11.3W@24V	

No.	Model	Color	∗ Power	Recommended controller
7	OPT-FLC150150	○	14.1W@24V	OPT-DPA2024E
		●	12.1W@24V	
		●	12.1W@24V	
		●	14.9W@24V	
8	OPT-FLC175175	○	14.1W@24V	
		●	14.9W@24V	
		●	14.4W@24V	
		●	14.9W@24V	
9	OPT-FLC200200	○	18.3W@24V	
		●	17W@24V	
		●	16.8W@24V	
		●	19.9W@24V	
10	OPT-FLC225225	○	22.8W@24V	
		●	20.6W@24V	
		●	22.4W@24V	
		●	24W@24V	
11	OPT-FLC250250	○	32W@24V	
		●	26.7W@24V	
		●	24.2W@24V	
		●	26.7W@24V	

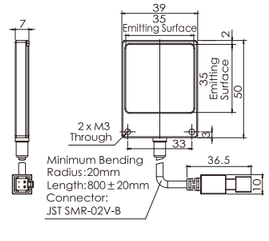
∗ Note: The data is for reference only.

Dimensions (mm)

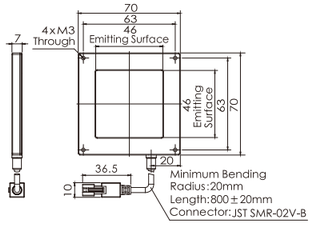
1.OPT-FLC4034



2.OPT-FLC5039

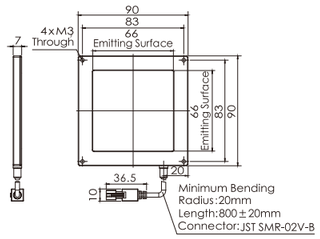


3.OPT-FLC7070

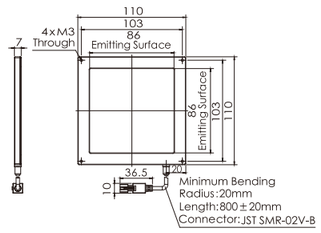


Dimensions (mm)

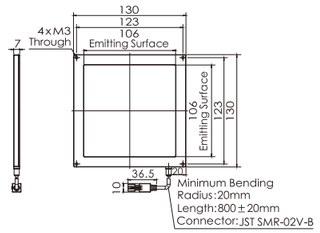
4.OPT-FLC9090



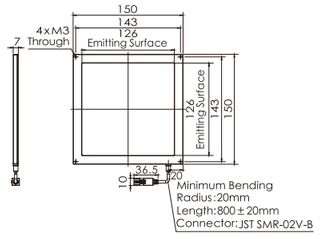
5.OPT-FLC110110



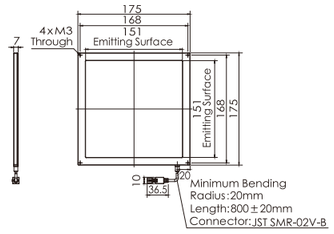
6.OPT-FLC130130



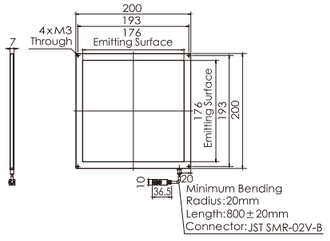
7.OPT-FLC150150



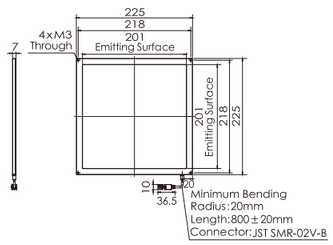
8.OPT-FLC175175



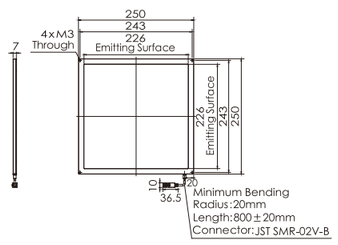
9.OPT-FLC200200



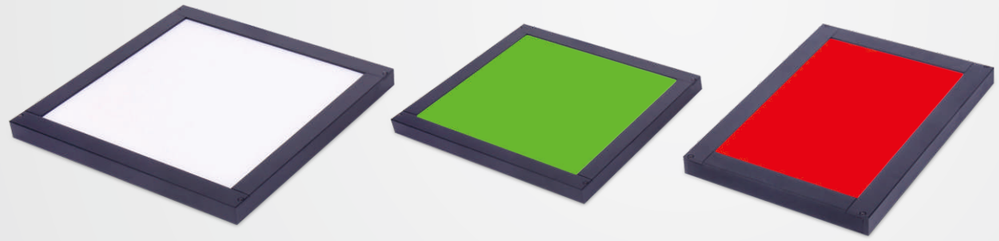
10.OPT-FLC225225



11.OPT-FLC250250



Edge Lit Backlight OPT-FLCA Series



Product Features

Main Features

- Compared to the FLC series, it has a larger luminous surface and is the first choice for large-size backlighting.

Application Cases

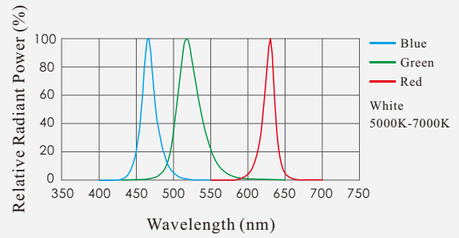
- Electronic components OMM & contour identification
- Cutting of plastic objects and positioning
- Mobile phone cover OMM
- Tray position identification
- Film transmittance inspection

Selection Guide

OPT-FLCA 210 150

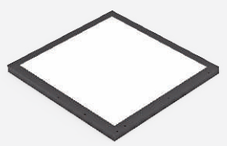
- 210 → Width
- 150 → Length
- FLCA → Edge Lit Backlight
- OPT → Brand name

Spectrum Chart



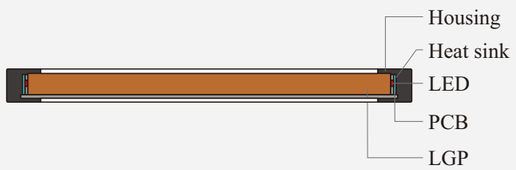
Note: The data is for reference only.

Customizable Items



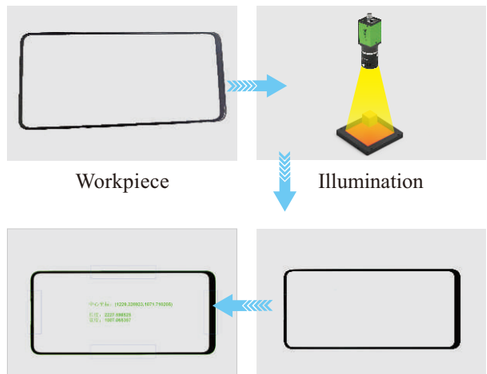
Color
Mounting
Connector
Size

Section Structure Drawing



Application Cases

- CG ink measurement.



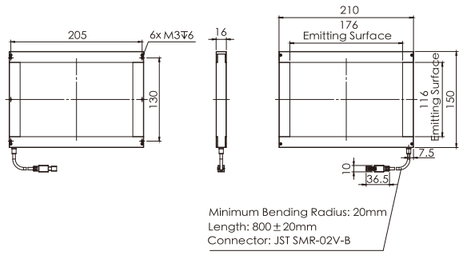
Model Table

No.	Model	∗ Power ○	∗ Power 🔴	∗ Power 🟢	∗ Power 🔵	Recommended controller
1	OPT-FLCA210150	24W@24V	20.1W@24V	24W@24V	24W@24V	OPT-DPA2024E
2	OPT-FLCA220210	28.8W@24V	23.1W@24V	28.8W@24V	31.6W@24V	
3	OPT-FLCA310220	43.2W@24V	31.2W@24V	39.6W@24V	43.2W@24V	
4	OPT-FLCA310290	47.7W@24V	37.4W@24V	44.5W@24V	47.7W@24V	
5	OPT-FLCA410290	62.4W@2.6A	50.4W@2.1A	57.6W@2.4A	62.4W@2.6A	OPT-DPA6024
6	OPT-FLCA430410	74.9W@3.1A	65.3W@2.7A	69.1W@2.9A	74.9W@3.1A	
7	OPT-FLCA510360	78W@3.2A	65.3W@2.7A	72W@3A	78W@3.2A	
8	OPT-FLCA510500	93.6W@3.9A	81.6W@3.4A	86.4W@3.6A	93.6W@3.9A	
9	OPT-FLCA610430	93.6W@3.9A	85.7W@3.5A	86.4W@3.6A	93.6W@3.9A	
10	OPT-FLCA610570	114W@4.7A	103.5W@4.3A	106.1W@4.4A	114W@4.7A	

∗ Note: The data is for reference only.

Dimensions (mm)

1. OPT-FLCA210150



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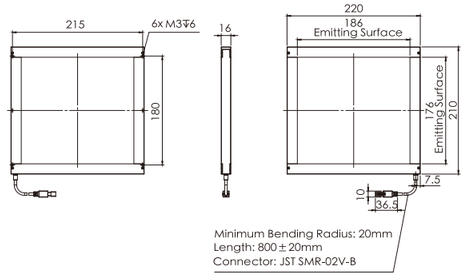
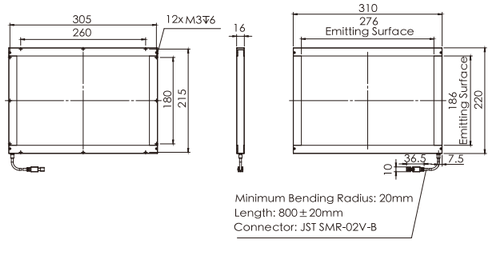
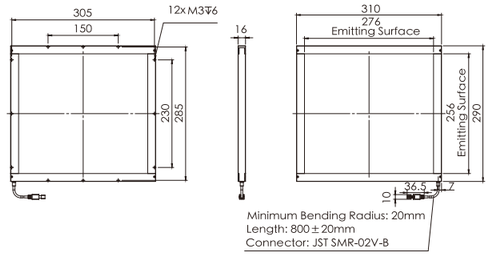


3. OPT-FLCA310220

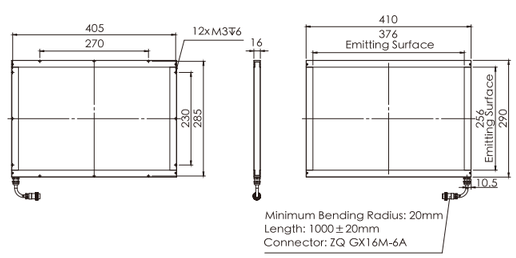


4. OPT-FLCA310290

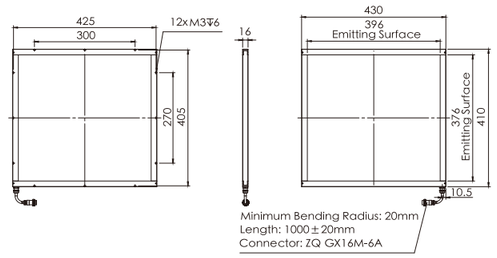


Dimensions (mm)

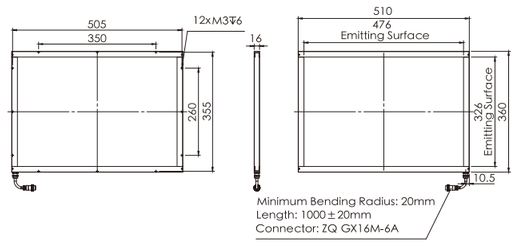
5. OPT-FLCA410290



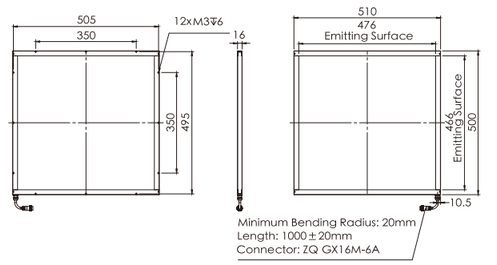
6. OPT-FLCA430410



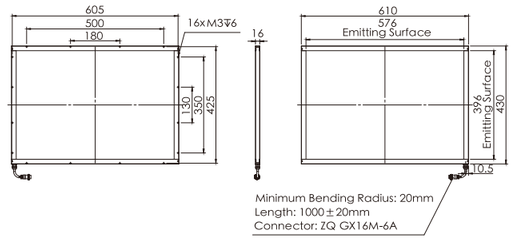
7. OPT-FLCA510360



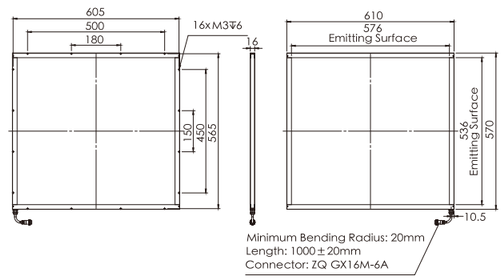
8. OPT-FLCA510500



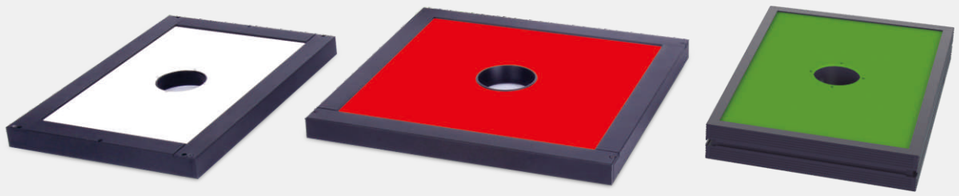
9. OPT-FLCA610430



10. OPT-FLCA610570



Backlight With Centre Hole OPT-FLCA-K/OPT-FLA-K Series



Product Features

Main Features

- Direct backlight and edge lit backlights are available
- Good luminosity and uniformity, best choice for large area backlights

Application Cases

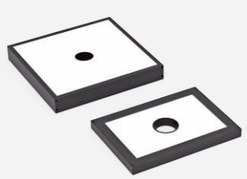
- Defect detection in printing industry
- Contour positioning of automotive parts
- Positioning for product sorting
- OCR for electronic products
- Electronic components positioning identification

Selection Guide

OPT - FLA 210 150 K

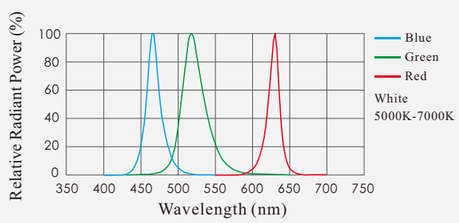
- With center hole
- Width
- Length
- FLA: direct backlight
  FLCA: edge lit backlight
- Brand name

Customizable Items



Color | Mounting | Connector | Size

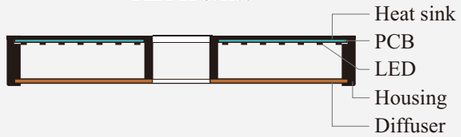
Spectrum Chart



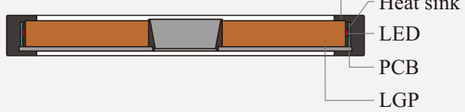
Note: The data is for reference only.

Section Structure Drawing

FLA-K Series

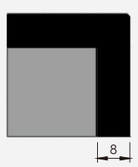
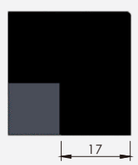


FLCA-K Series



Series Features

Size comparison

	FLA-K Series	FLCA-K Series
Thickness comparison (mm)		
Border Comparison (mm)		

Illumination contrast

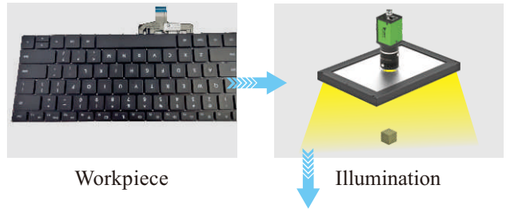
Direct backlight with centre hole	FLA210150K-W	FLA410290K-W	FLA610570K-W
Illuminance			
Illuminance value kLux	146	135	105
Edge lit backlight with centre hole	**FLCA210150K-W**	**FLCA410290K-W**	**FLCA610570K-W**
Illuminance			
Illuminance value kLux	54	50	35

Note: 1. At zero distance testing, the illuminance of the FLA-K series is higher than that of the FLCA-K series.
2. As the size of the light source increases, the illuminance of the light source decreases.

Note: The above performance varies due to the actual test workpiece and operating conditions and are for reference only.

Application Cases

Keycap positioning.



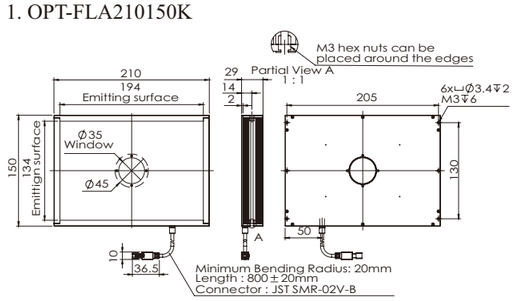
Model Table

No.	Model	∗ Power ○	∗ Power 🔴	∗ Power 🟢	∗ Power 🔵	Recommended controller
1	OPT-FLA210150K	34.5W@24V	31W@24V	26.9W@24V	30.7W@24V	OPT-DPA2024E
2	OPT-FLA220210K	47.5W@24V	42.4W@24V	30.3W@24V	46.1W@24V	
3	OPT-FLA310220K	64.2W@2.7A	52.8W@2.2A	48W@2A	64.8W@2.7A	OPT-DPA6024E
4	OPT-FLA310290K	84W@3.5A	67.2W@2.8A	57.6W@2.4A	84W@3.5A	
5	OPT-FLA410290K	108W@4.5A	81.6W@3.4A	72W@3A	108W@4.5A	
6	OPT-FLA430410K	144W@6A	115.2W@4.8A	96W@4A	144W@6A	
7	OPT-FLA510360K	156W@6.5A	120W@5A	96W@4A	156W@6.5A	
8	OPT-FLA510500K	204W@8.5A	156W@6.5A	132W@5.5A	204W@8.5A	
9	OPT-FLA610430K	206.4W@8.6A	158.4W@6.6A	139.2W@5.8A	206.4W@8.6A	
10	OPT-FLA610570K	259.2W@10.8A	201.6W@8.4A	172.8W@7.2A	259.2W@10.8A	

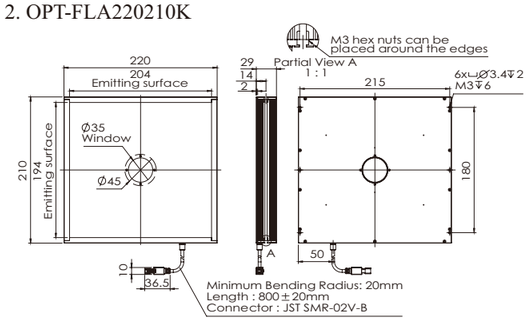
Note:1. The data is for reference only.

Dimensions (mm)

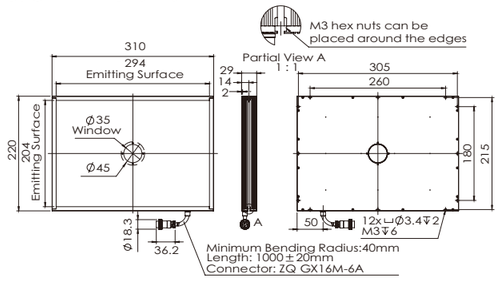
1. OPT-FLA210150K



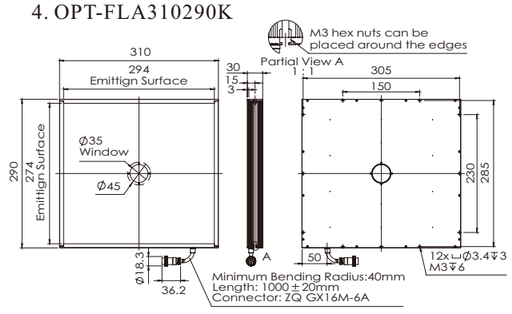
2. OPT-FLA220210K



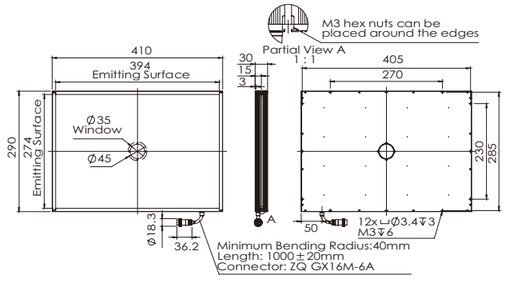
3. OPT-FLA310220K



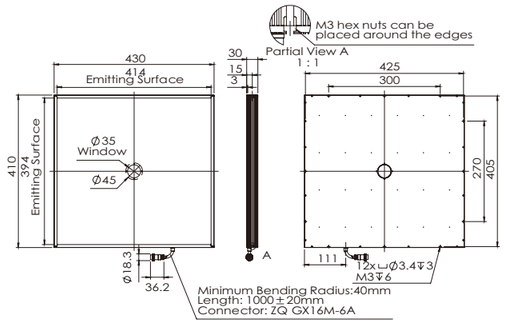
4. OPT-FLA310290K



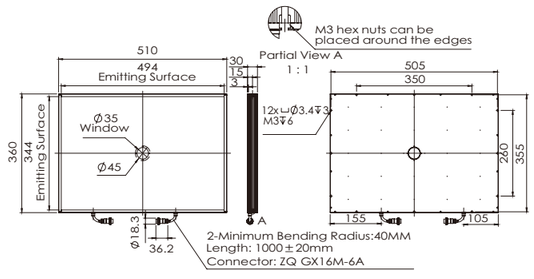
5. OPT-FLA410290K



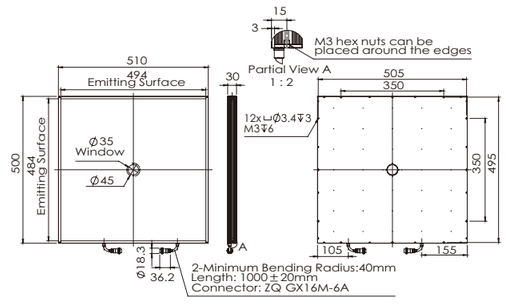
6. OPT-FLA430410K



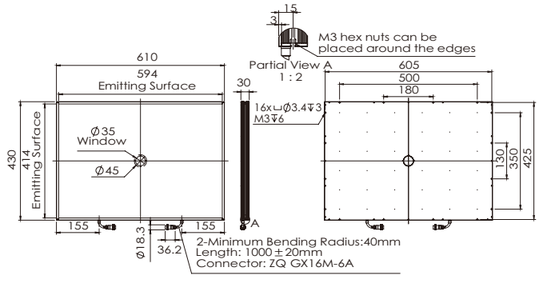
7. OPT-FLA510360K



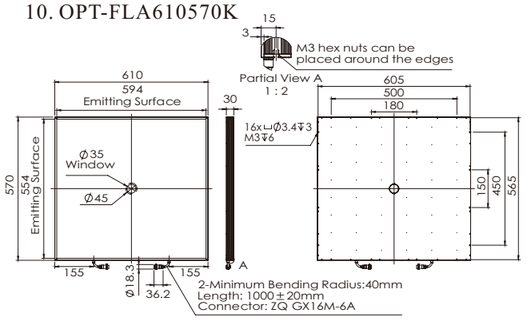
8. OPT-FLA510500K



9. OPT-FLA610430K



10. OPT-FLA610570K



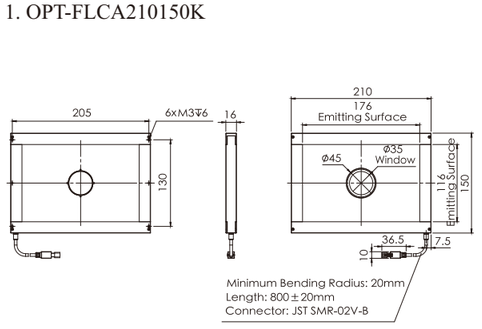
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Recommended controller
1	OPT-FLCA210150K	24W@24V	20.1W@24V	24W@24V	24W@24V	OPT-DPA2024E
2	OPT-FLCA220210K	28.8W@24V	23.1W@24V	28.8W@24V	31.6W@24V	
3	OPT-FLCA310220K	43.2W@24V	31.2W@24V	39.6W@24V	43.2W@24V	
4	OPT-FLCA310290K	47.7W@24V	37.4W@24V	44.5W@24V	47.7W@24V	
5	OPT-FLCA410290K	62.4W@2.6A	50.4W@2.1A	57.6W@2.4A	62.4W@2.6A	OPT-DPA6024E
6	OPT-FLCA430410K	74.9W@3.1A	65.3W@2.7A	69.1W@2.9A	74.9W@3.1A	
7	OPT-FLCA510360K	78W@3.2A	65.3W@2.7A	72W@3A	78W@3.2A	
8	OPT-FLCA510500K	93.6W@3.9A	81.6W@3.4A	86.4W@3.6A	93.6W@3.9A	
9	OPT-FLCA610430K	93.6W@3.9A	85.7W@3.5A	86.4W@3.6A	93.6W@3.9A	
10	OPT-FLCA610570K	114W@4.7A	103.5W@4.3A	106.1W@4.4A	114W@4.7A	

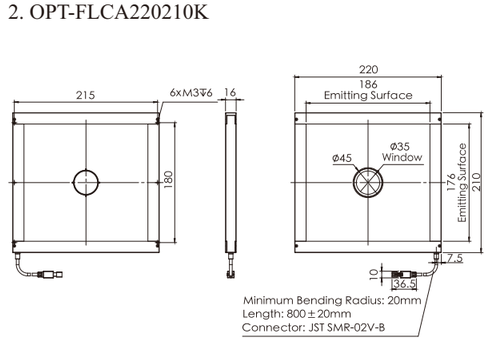
∗ Note: The data is for reference only.

Dimensions (mm)

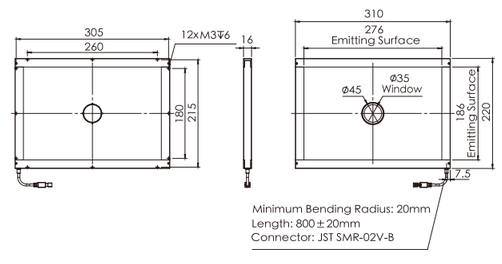
1. OPT-FLCA210150K



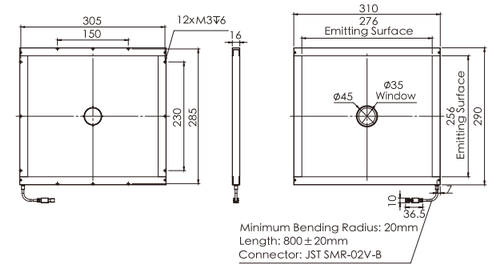
2. OPT-FLCA220210K



3. OPT-FLCA310220K

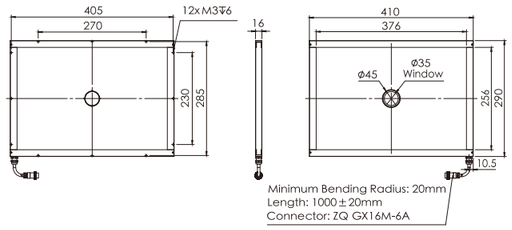


4. OPT-FLCA310290K

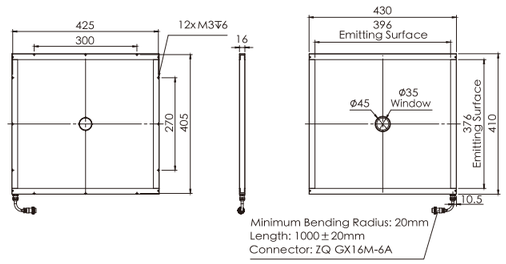


Dimensions (mm)

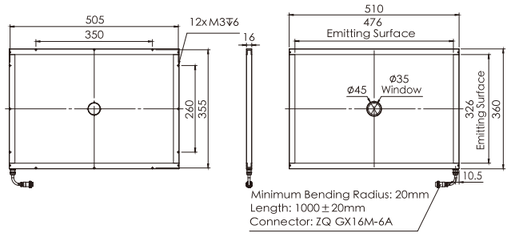
5. OPT-FLCA410290K



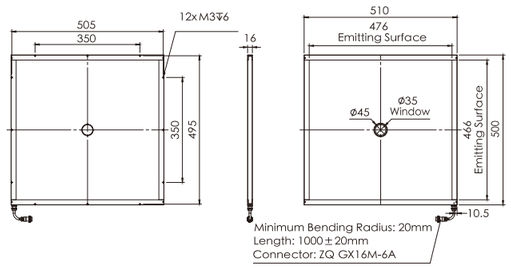
6. OPT-FLCA430410K



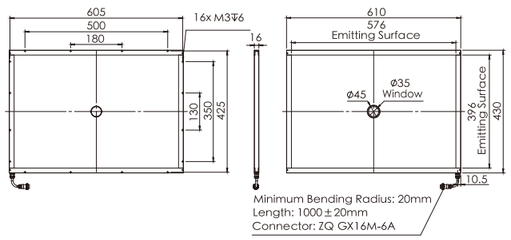
7. OPT-FLCA510360K



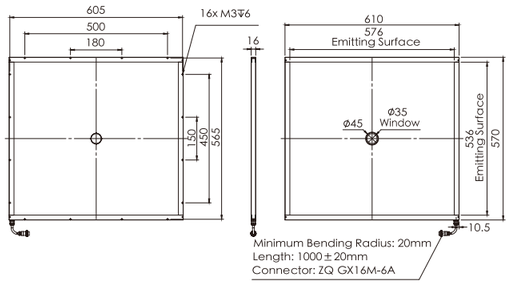
8. OPT-FLCA510500K



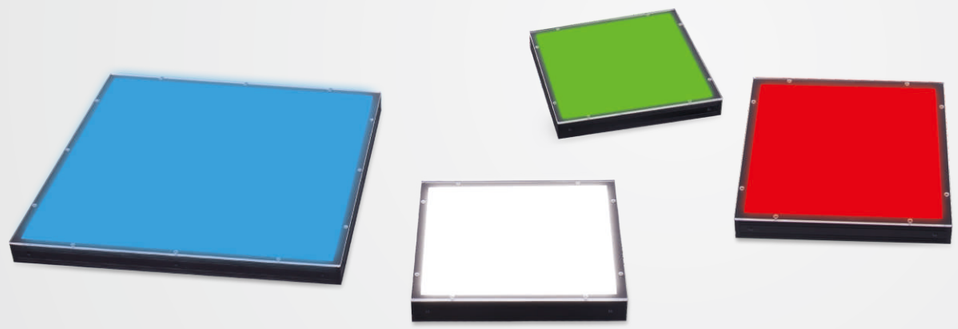
9. OPT-FLCA610430K



10. OPT-FLCA610570K



Highly-directional Backlights OPT-FLP Series



Product Features

Main Features

- Suppresses the diffused light in a specific direction so that more light falls on the camera sensor, so the relative brightness is higher than conventional backlight.
- Suppresses light diffraction, improves curve edge detection and image acquisition. Suitable for high precision and curved products

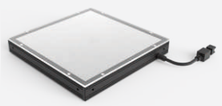
Application Cases

- PCB inspection
- Transparent objects OMM
- LCD defects detection

Selection Guide

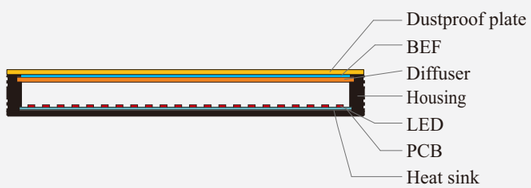
OPT - FLP9090
- Width
- Length
- Highly directional backlight
- Brand name

Customizable Items

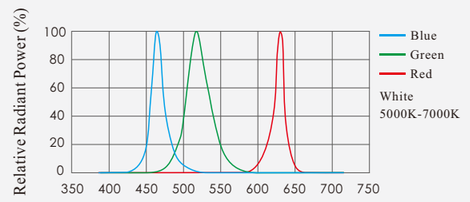


Color
Mounting
Connector
Size

Section Structure Drawing



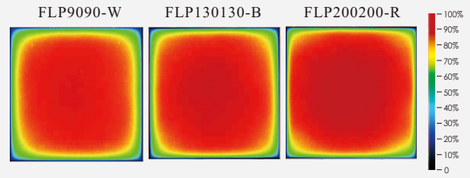
Spectrum Chart



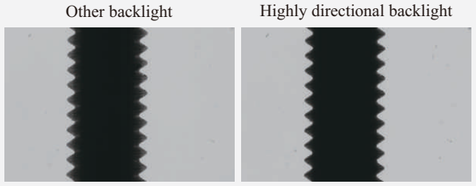
Note: The data is for reference only.

Series Features

Uniformity

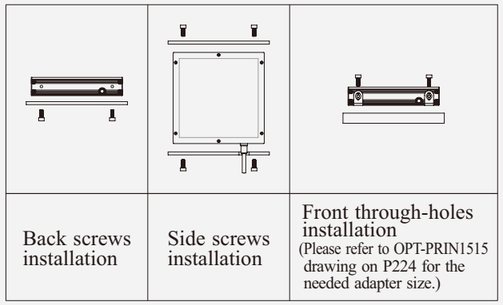


Imaging Result Comparison



The highly directional backlight can reduce light diffraction for clear contour imaging.

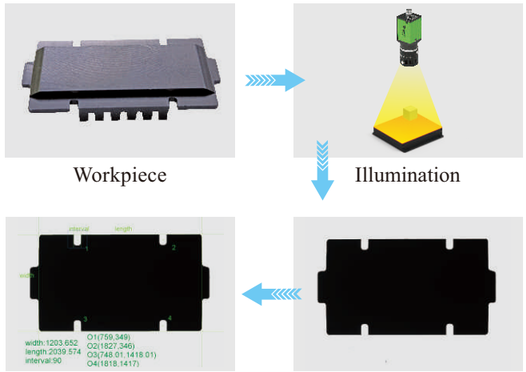
Various ways of installation



Back screws installation	Side screws installation	Front through-holes installation (Please refer to OPT-PRIN1515 drawing on P224 for the needed adapter size.)

Application Cases

Plastic part geometric measurement



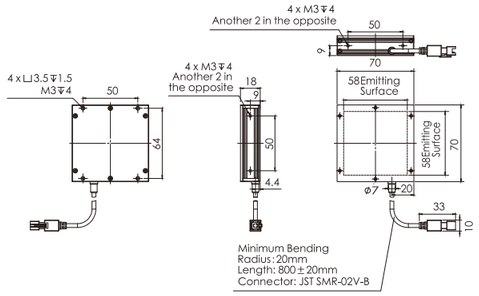
Model Table

No.	Model	Color	∗ Power	Recommended controller
1	OPT-FLP7070	○	6.3W@24V	OPT-DPA2024E
		●	4.7W@24V	
		●	4.6W@24V	
		●	5.3W@24V	
2	OPT-FLP9090	○	8W@24V	
		●	6.6W@24V	
		●	6.4W@24V	
		●	8W@24V	
3	OPT-FLP110110	○	11.4W@24V	
		●	9.7W@24V	
		●	8.8W@24V	
		●	10.5W@24V	
4	OPT-FLP130130	○	12.7W@24V	
		●	14W@24V	
		●	11W@24V	
		●	14.8W@24V	
5	OPT-FLP150150	○	18.6W@24V	
		●	15.7W@24V	
		●	13.6W@24V	
		●	18.9W@24V	
6	OPT-FLP175175	○	24.5W@24V	
		●	18.9W@24V	
		●	18.4W@24V	
		●	21.5W@24V	
7	OPT-FLP200200	○	26.2W@24V	
		●	20.6W@24V	
		●	21.8W@24V	
		●	26.2W@24V	
8	OPT-FLP225225	○	33.8W@24V	
		●	28.3W@24V	
		●	21.3W@24V	
		●	28.8W@24V	
9	OPT-FLP250250	○	35.5W@24V	
		●	30.9W@24V	
		●	27.3W@24V	
		●	31.9W@24V	

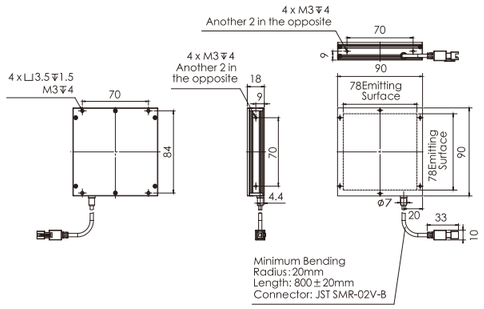
∗ Note: The data is for reference only.

Dimensions (mm)

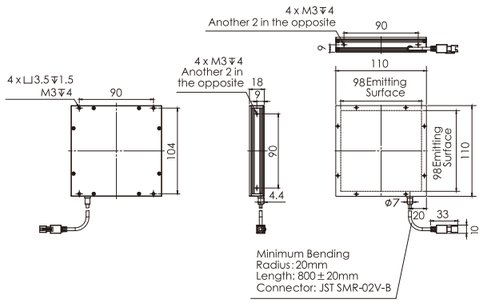
1.OPT-FLP7070



2.OPT-FLP9090

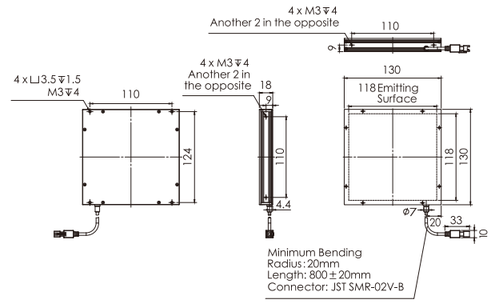


3.OPT-FLP110110

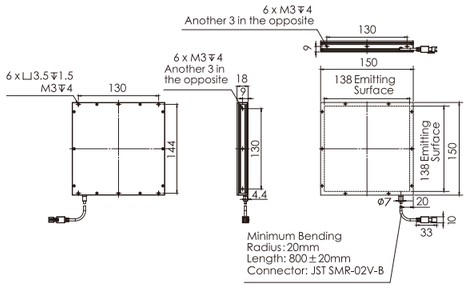


Dimensions (mm)

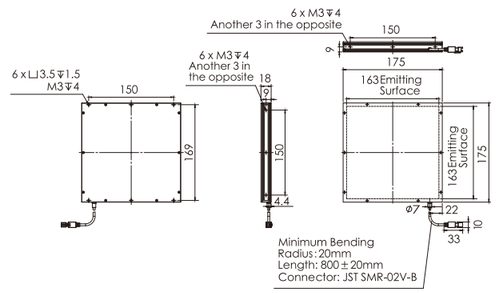
4.OPT-FLP130130



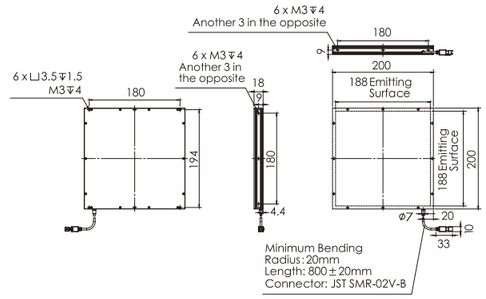
5.OPT-FLP150150



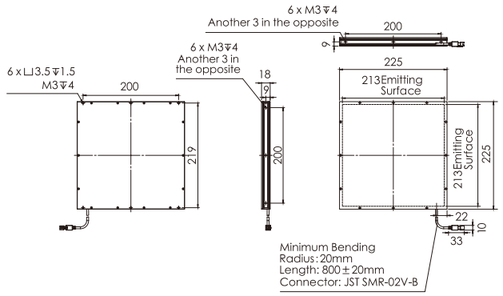
6.OPT-FLP175175



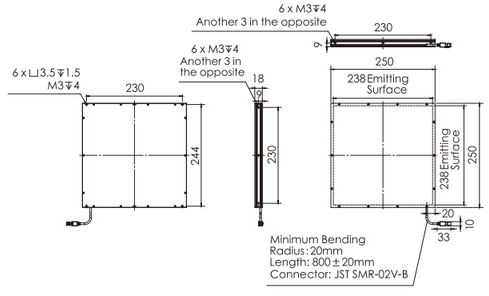
7.OPT-FLP200200



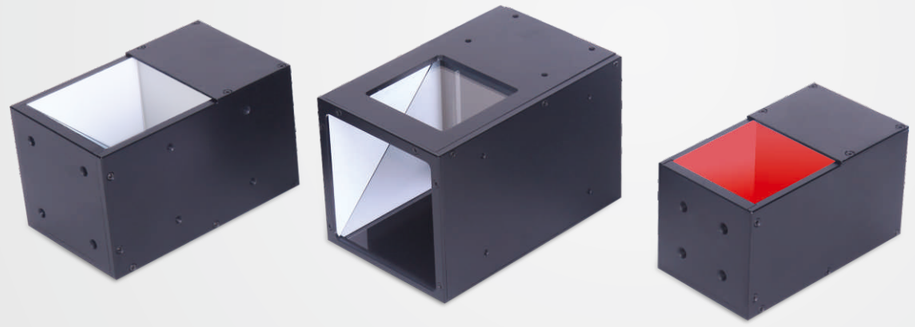
8.OPT-FLP225225



9.OPT-FLP250250



Coaxial Lights OPT-CO/OPT-COR Series



Product Features

Main Features

- Good light directionality, suitable for use at high working distances.
- The high density LED arrays and special heat dissipation design ensure the illumination intensity and long lifespan.
- For surface detection of reflective workpieces, it can highlight the surface irregularities

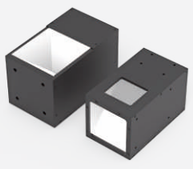
Application Cases

- Detection of scratche on highly reflective surfaces
- Defect detection on silicon wafers
- Positioning of markings
- Reading of barcodes
- Reading of laser marked OCR codes
- Edge positioning and gauging of workpiece
- LCD glue inspection
- Detection of defects such as surface irregularities and bumps on objects.

Selection Guide

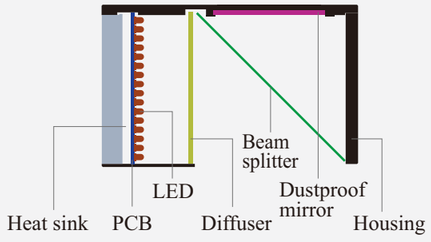
OPT-CO150
- Width
- Coaxial light
- Brand name

Customizable Items

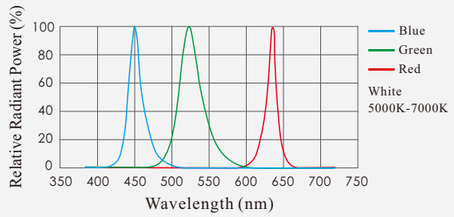


Color, Mounting, Connector, Size, Intensity, Uniformity

Section Structure Drawing



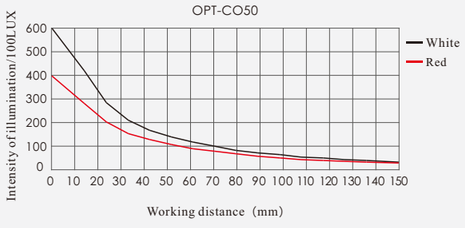
Spectrum Chart

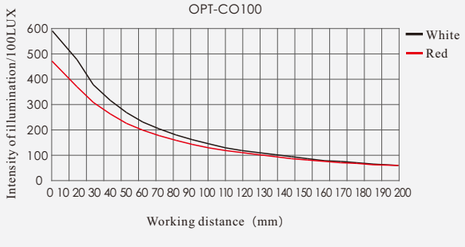


Note: The data is for reference only.

Series Features

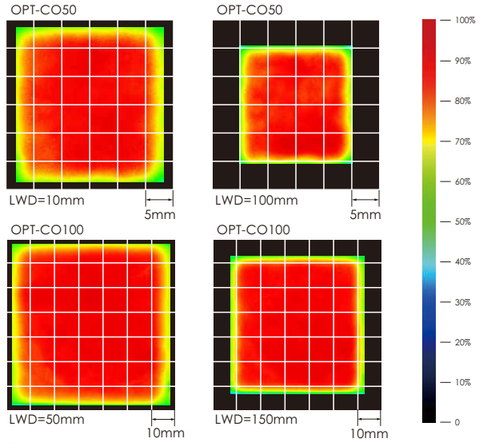
Illumination varies with distance.





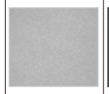
Note: The data is for reference only.

Relative Radiant Brightness Distribution

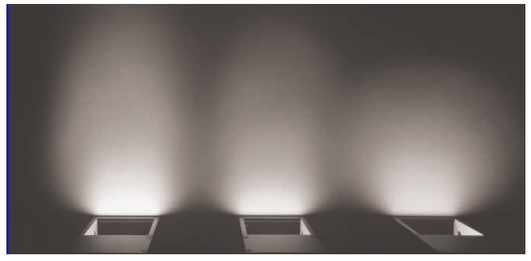


Note: The effect on mirror-finished workpieces is for reference only; actual results may vary.

Uniformity and Brightness Customization

Customization types	Brightness enhancement type	Standard type	Uniform type	Description
Uniformity				When testing highly reflective workpieces (such as glass), if the uniformity of the standard light source does not meet the requirements, a uniform type light source can be customized.
Brightness				When testing non-highly reflective workpieces (such as plastic), if the brightness of the standard light source does not meet the requirements, a brightness enhancement type light source can be customized.

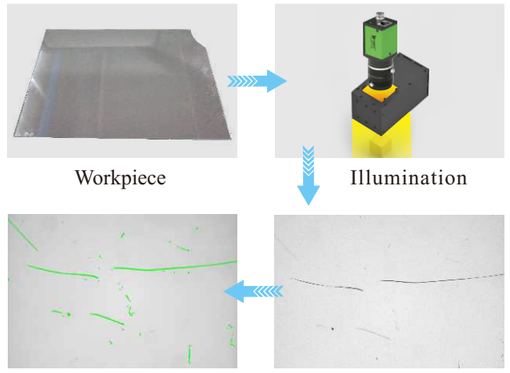
Note: The above performance may vary depending on the actual test object and operating conditions, and are provided for reference only.



Brightness Enhancement Standard Type Uniform Type

Application Cases

Detection of defects on reflective glass surface



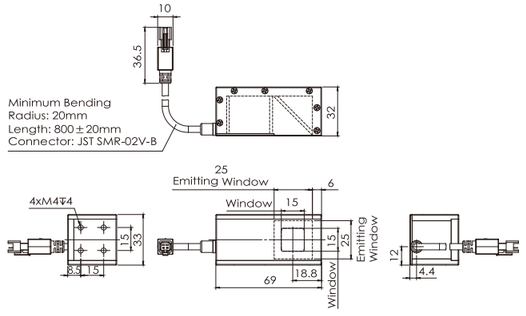
Model Table

No.	Model	∗ Power ●	∗ Power ○●●	Recommended controller
1	OPT-CO30	1.4W@24V	1.8W@24V	OPT-DPA2024E
2	OPT-CO40	2.0W@24V	3.0W@24V	
3	OPT-CO50	3.4W@24V	5.4W@24V	
4	OPT-CO60	4.7W@24V	7.6W@24V	
5	OPT-CO70	7.2W@24V	10.5W@24V	
6	OPT-CO80	8W@24V	12W@24V	
7	OPT-CO100	16.8W@24V	17.5W@24V	
8	OPT-CO150	31W@24V	36W@24V	
9	OPT-CO200	52.8W@2.2A	60W@2.5A	OPT-DPA6024E

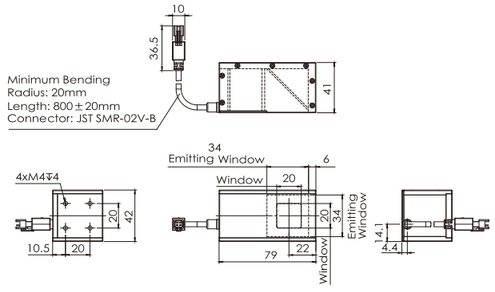
∗ Note: The data is for reference only.

Dimensions (mm)

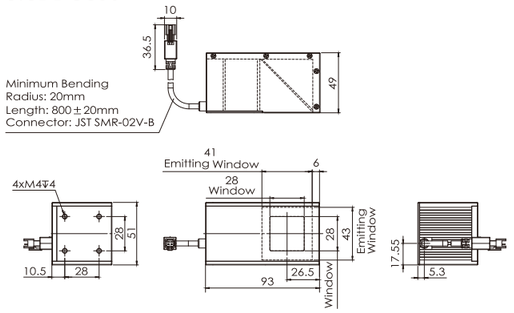
1.OPT-CO30



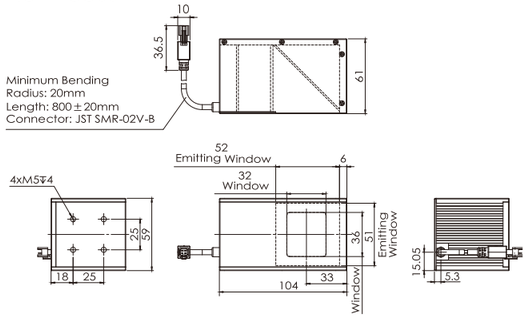
2.OPT-CO40



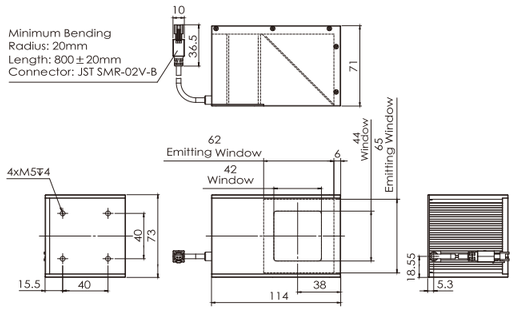
3.OPT-CO50



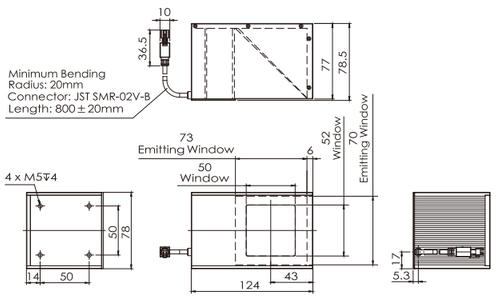
4.OPT-CO60



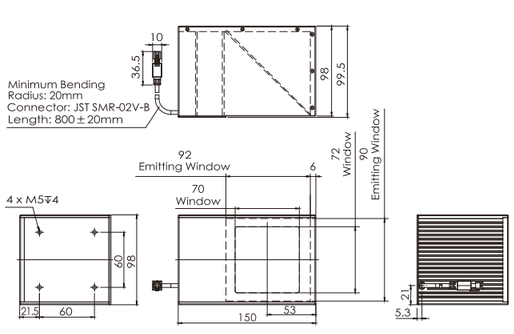
5.OPT-CO70



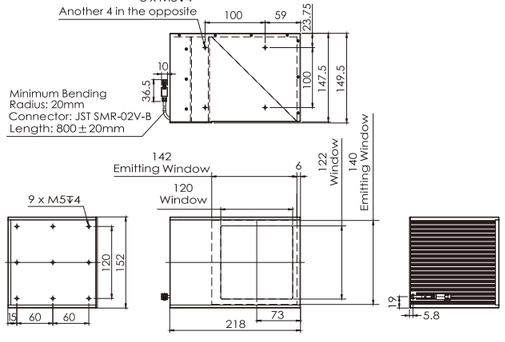
6.OPT-CO80



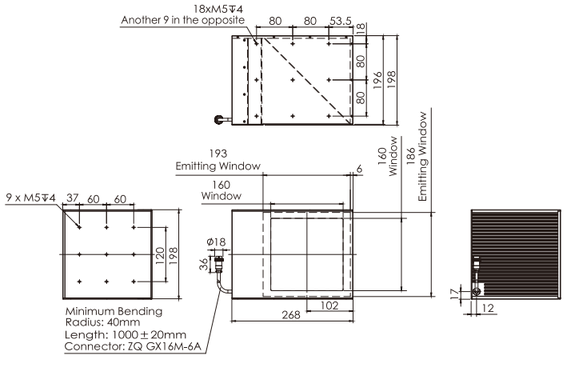
7.OPT-CO100



8.OPT-CO150



9.OPT-CO200

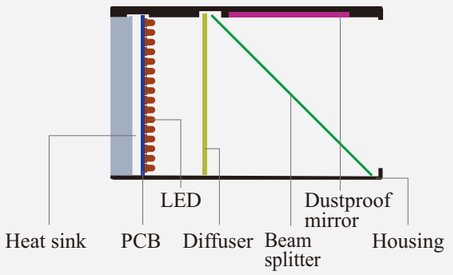


OPT-COR Right-Angle Coaxial Light Source

Selection Guide

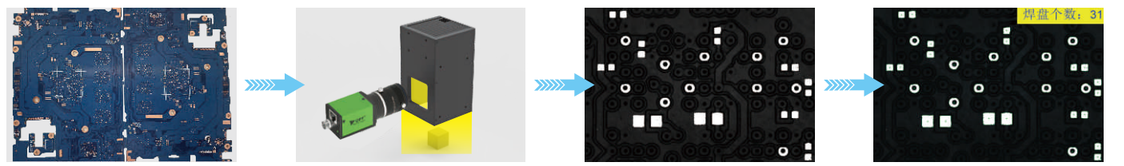
OPT-COR 40
- Width
- Right-Angle Coaxial Light Source
- Brand name

Section Structure Drawing



Application Cases

Application: positioning of PCB solder pads



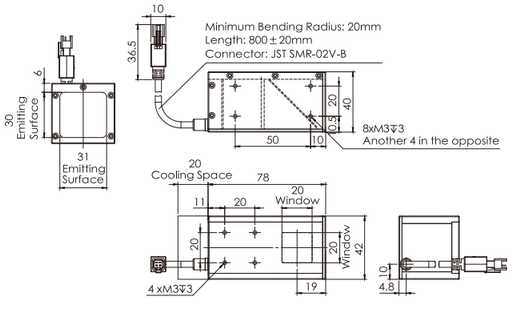
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Recommended controller
1	OPT-COR40	3.3W@24V	2.2W@24V	3.6W@24V	3.4W@24V	OPT-DPA2024E
2	OPT-COR50	5.9W@24V	4W@24V	5.1W@24V	6W@24V	
3	OPT-COR60	7.5W@24V	5.3W@24V	8.1W@24V	8.1W@24V	
4	OPT-COR70	9.9W@24V	8.9W@24V	9.5W@24V	10.1W@24V	
5	OPT-COR80	11.6W@24V	10.5W@24V	10.9W@24V	11.7W@24V	

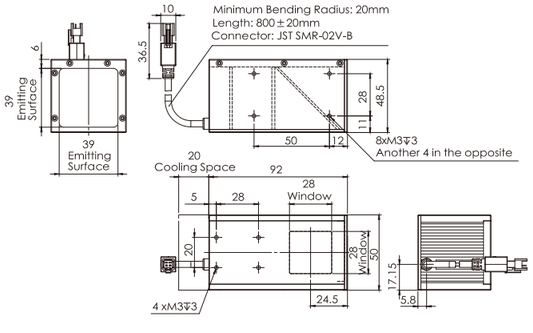
∗ Note: The data is for reference only.

Dimensions (mm)

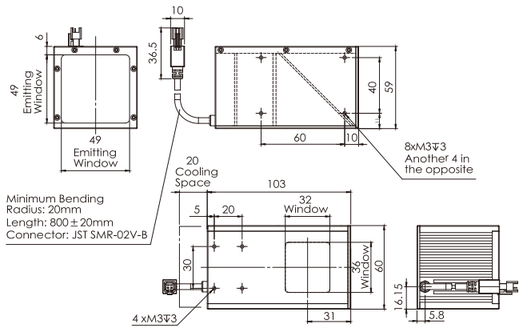
1.OPT-COR40



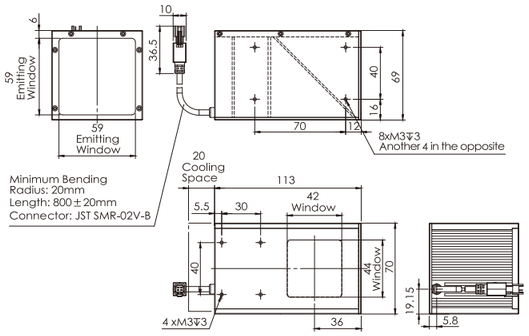
2. OPT-COR50



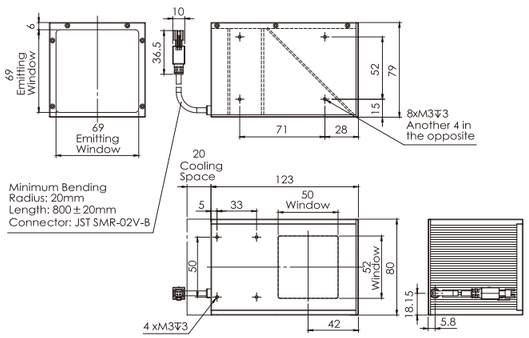
3. OPT-COR60



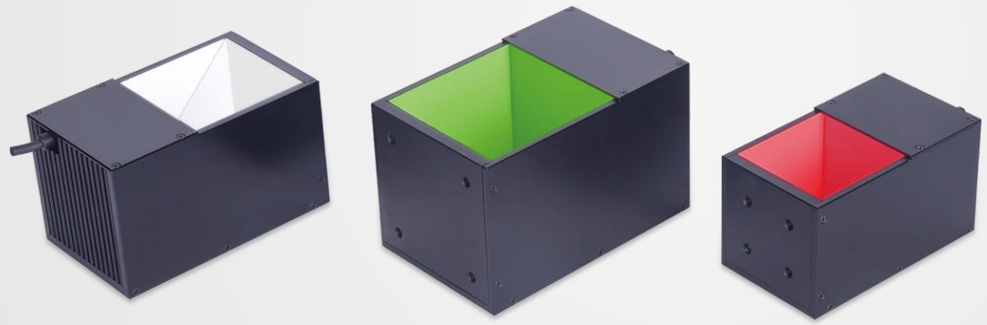
4. OPT-COR70



5. OPT-COR80



High Precision Coaxial Light Source OPT-COH Series



Product Features

Main Features

- Ideal for high-resolution Images
- Ghosting is greatly reduced when inspecting highly reflective workpieces.

Application Cases

- Defect detection on precision components
- High-precision OMM
- Wafer OMM and defect detection
- Contamination detection for precision medical equipment components
- Detection of surface defects on chips.

Selection Guide

OPT-COH 50

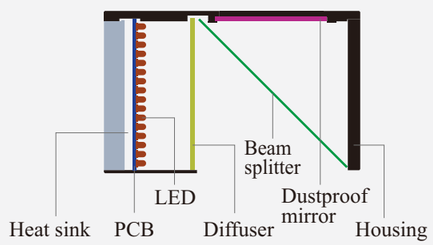
- 50 → Width
- COH → High Precision Coaxial Light Source
- OPT → Brand name

Customizable Items

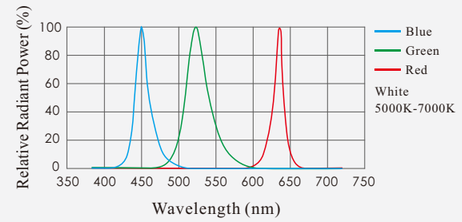


Color, Mounting, Connector, Size, Intensity, Uniformity

Section Structure Drawing



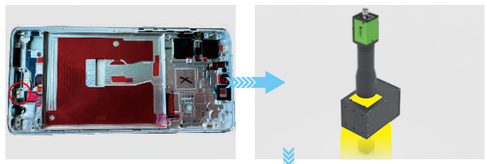
Spectrum Chart



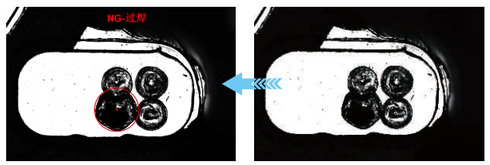
Note: The data is for reference only.

Application Cases

- Inspection of small parts for spot weld defects in cell phones.

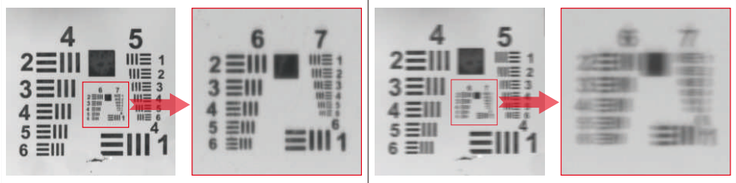
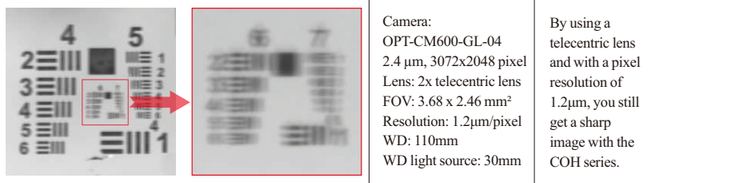
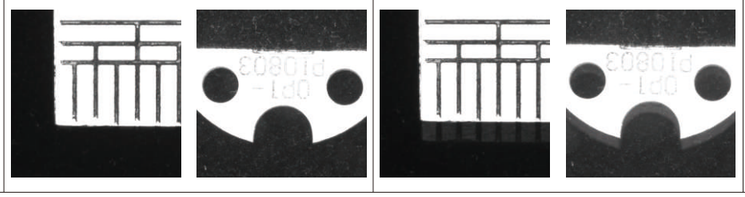


Workpiece, Illumination



Smart3 Analysis Result, Image

Series Features

	COH60-W	CO60-W	Imaging configuration	Description
Clarity			Camera: OPT-CM600-GL-04 2.4 μm, 3072x2048 pixel Lens: 2x telecentric lens FOV: 3.68 x 2.46 mm² Resolution: 1.2μm/pixel WD: 110mm WD light source: 30mm	By using a telecentric lens and with a pixel resolution of 1.2μm, you still get a sharp image with the COH series.
Ghosting			Camera: OPT-CM600-GL-04 2.4 μm, 3072x2048 pixel Lens: 75mm, 5MP Adapter: 15mm Aperture: 4 FOV: 27 x 18 mm² WD: 300mm WD light source: 30mm	When testing highly reflective workpieces, the ghost image of the COH series is greatly reduced and there is no obvious double image.

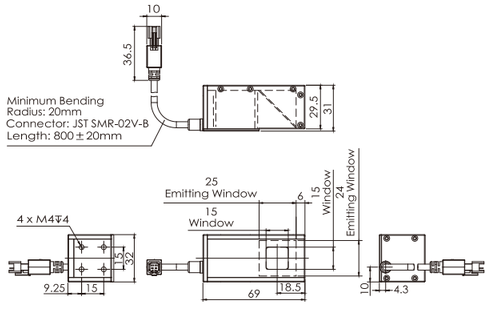
Model Table

No.	Model	* Power 🔴	* Power ⚪🔵🟢	Recommended controller
1	OPT-COH30	1.4W@24V	1.8W@24V	OPT-DPA2024E
2	OPT-COH40	2.0W@24V	3.0W@24V	
3	OPT-COH50	3.4W@24V	5.4W@24V	
4	OPT-COH60	4.7W@24V	7.6W@24V	
5	OPT-COH70	7.2W@24V	10.5W@24V	
6	OPT-COH80	8.0W@24V	12.0W@24V	

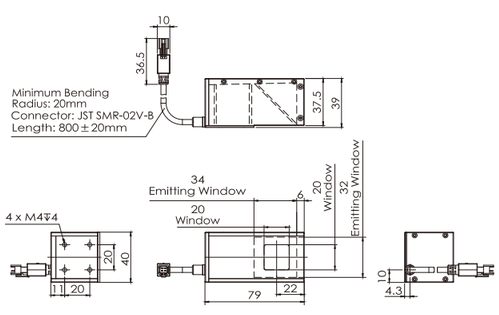
* Note: The data is for reference only.

Dimensions (mm)

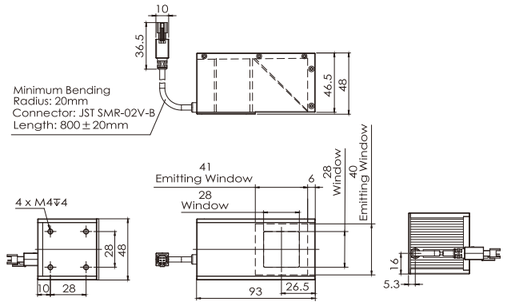
1. OPT-COH30



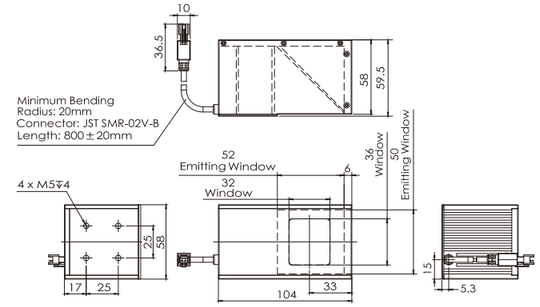
2. OPT-COH40



3. OPT-COH50



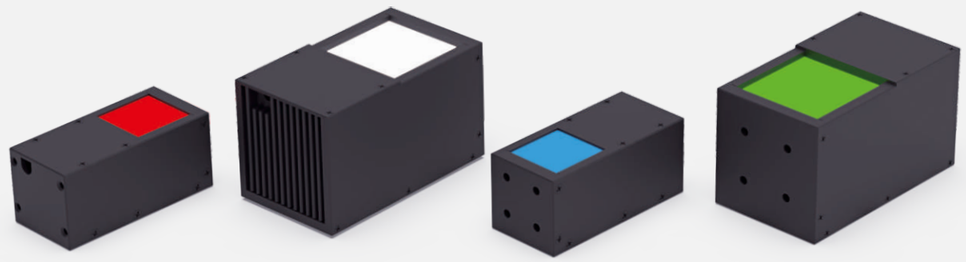
4. OPT-COH60



5. OPT-COH70

6. OPT-COH80

High-precision Prism Coaxial Light Source OPT-COC Series



Product Features

Main Features

- Ideal for high-resolution Images
- In high-reflect workpiece inspection applications, it better reflects the true surface of objects, ensuring no double imaging during testing of workpieces.

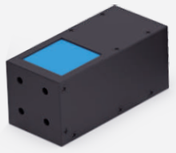
Application Cases

- Component positioning and dimension measurement
- Chip and silicon wafer damage detection
- LED screen glue inspection
- Detection of dirt and contamination on medical device components
- Recognition of characters, barcodes, and QR codes

Selection Guide

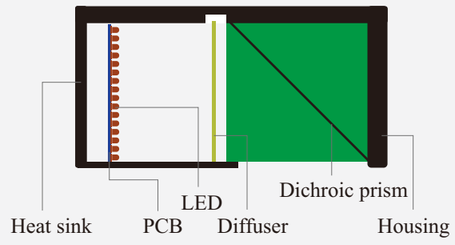
OPT - COC 50
- 50 → Dimensions
- COC → High-precision Prism Coaxial Light Source
- OPT → Brand name

Customizable Items

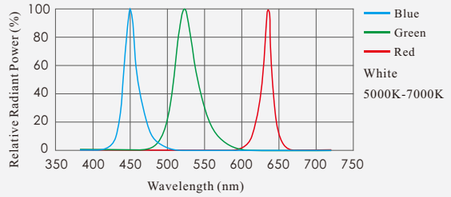


Color, Mounting, Connector, Size, Intensity, Uniformity

Section Structure Drawing



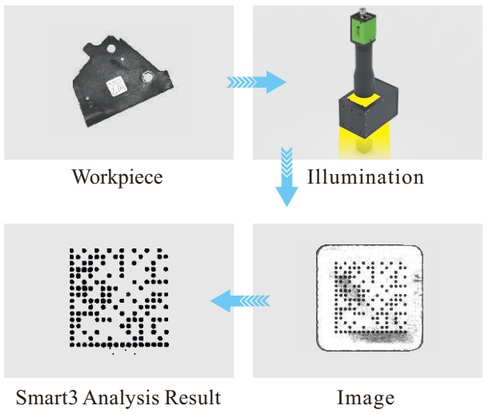
Spectrum Chart



Note: The data is for reference only.

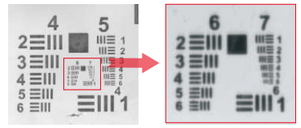
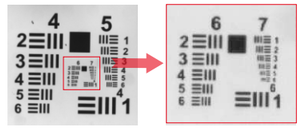
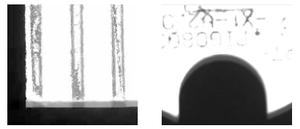
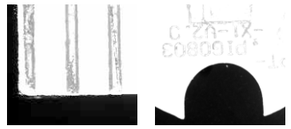
Application Cases

- Detection project: DM code detection



OPT Standard Lights | High-precision Prism Coaxial Light Source OPT-COC Series
OPT Machine Vision

Series Features

	COH60-W	COC60-W	Imaging configuration	Description
Clarity			Camera: OPT-CM600-GL-04 2.4μm 3072×2048 Lens: 2x Telecentric Lens Field of View: 3.68×2.46 mm Resolution: 1.2 μm/pixel Working Distance: 110 mm Light Source Working Distance: 30 mm	With the telecentric lens adapter,each pixel is 1.2μm, and the imaging of COC and COH is essentially the same.
Ghosting			Camera: OPT-CM600-GL-04 2.4μm 3072×2048 Lens: 75mm 5MP Extension Tube: 15mm Aperture: 4 Field of View: 27×18 mm Working Distance: 300 mm Light Source Working Distance: 30 mm	For highly reflective workpiece testing, COC has no ghosting at all.

weight				
	OPT-COH30	110g	OPT-COC30	150g
	OPT-COH40	180g	OPT-COC40	260g
	OPT-COH50	280g	OPT-COC50	440g
	OPT-COH60	390g	OPT-COC60	660g

Note:
The prism is a solid cube and significantly heavier than the dichroic mirror. Customization must take the weight of the prism into account.

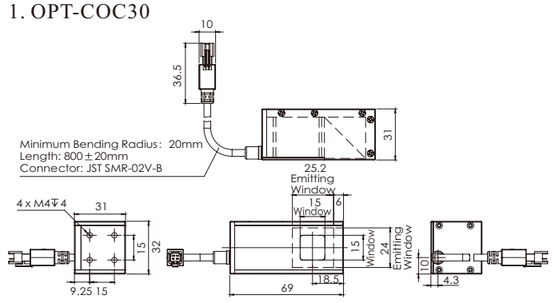
Model Table

No.	Model	∗ Power 🔴	∗ Power ⚪🔵🟢	Recommended controller
1	OPT-COC30	1.4W@24V	1.8W@24V	OPT-DPA2024E
2	OPT-COC40	2.0W@24V	3.0W@24V	
3	OPT-COC50	3.4W@24V	5.4W@24V	
4	OPT-COC60	4.7W@24V	7.6W@24V	

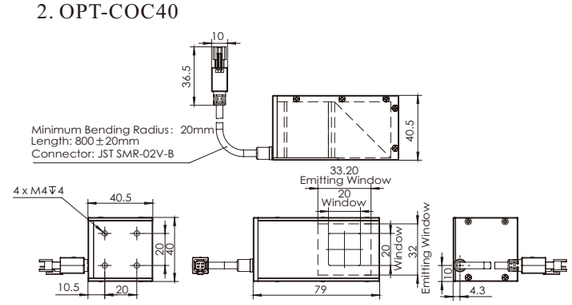
∗ Note: The data is for reference only.

Dimensions (mm)

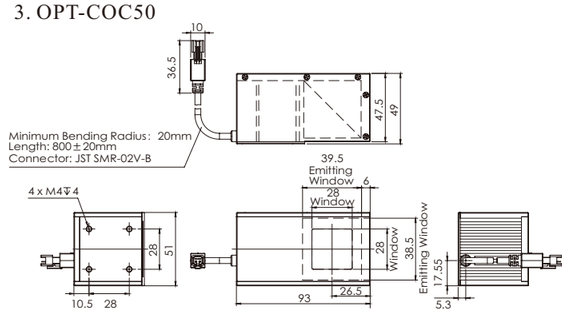
1. OPT-COC30



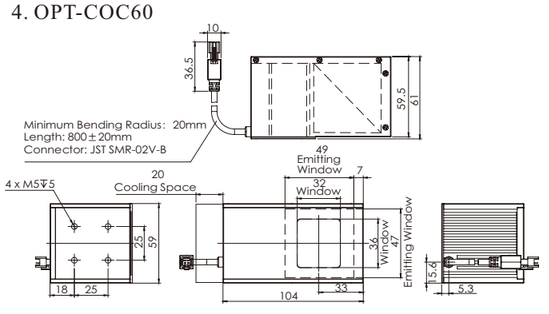
2. OPT-COC40



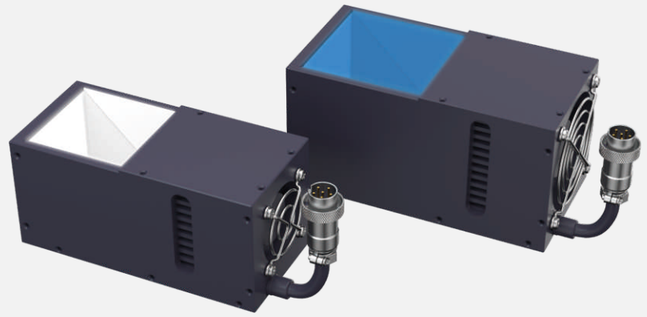
3. OPT-COC50



4. OPT-COC60



High Intensity Coaxial Lights OPT-COG Series



Product Features

Main Features

- High power brightness design with fan cooling.
- The OPT-COG50 white light illuminance can reach 550 Klux (WD=20mm), which is 10 times that of the OPT-CO50. The OPT-COG80 white light illuminance can reach 960 Klux (WD=20mm), which is 13 times that of the OPT-CO80.

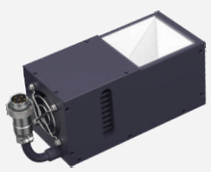
Application Cases

- Detection of defects on reflective surfaces
- PCB OCR and pattern inspection
- Positioning of markers
- QR code reading
- Glass surface and dimensions.

Selection Guide

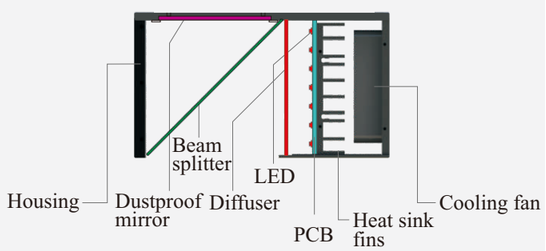
OPT-COG 50
- 50 → Width
- COG → High intensity coaxial light
- OPT → Brand name

Customizable Items



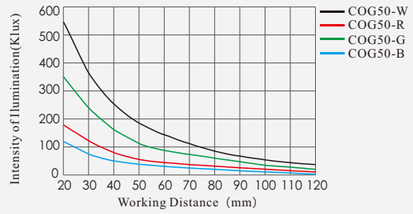
Color | Mounting | Connector | Size

Section Structure Drawing

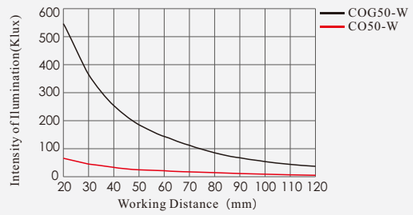


Spectrum Chart

Illuminance varies with distance.



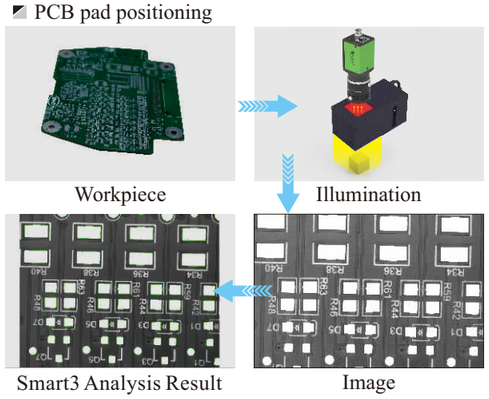
Comparison of illuminance between COG and CO



Note: The data is for reference only.

Application Cases

PCB pad positioning



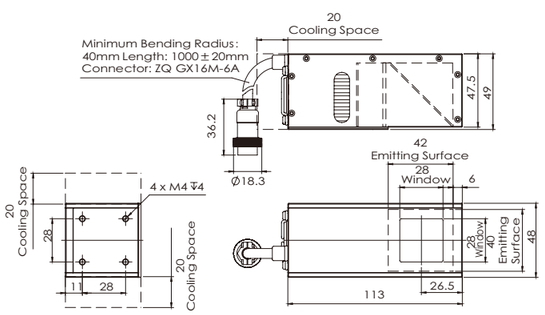
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Recommended controller
1	OPT-COG50	43.2W@1.8A	36W@1.5A	43.2W@1.8A	43.2W@1.8A	OPT-DPA6024E
2	OPT-COG60	78W@3.25A	61.2W@2.55A	78W@3.25A	78W@3.25A	
3	OPT-COG70	93.6W@3.9A	72W@3A	93.6W@3.9A	93.6W@3.9A	
4	OPT-COG80	120W@5A	108W@4.5A	120W@5A	120W@5A	

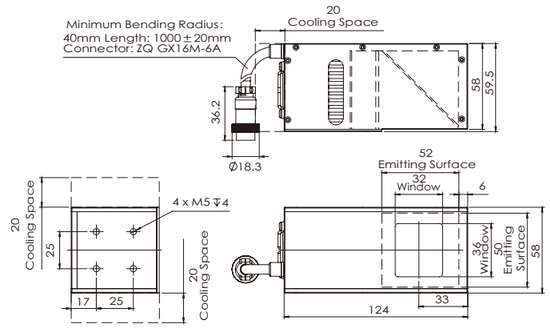
∗ Note: The data is for reference only.

Dimensions (mm)

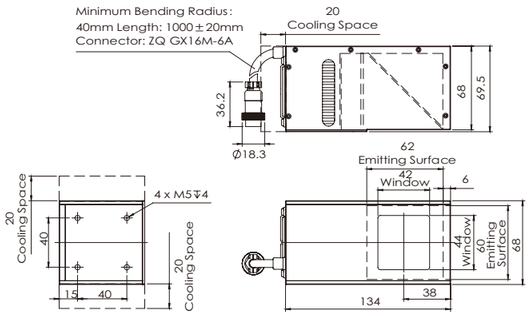
1.OPT-COG50



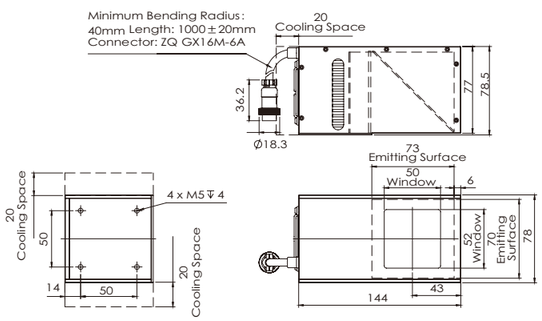
2.OPT-COG60



3.OPT-COG70



4.OPT-COG80



Dome Lights OPT-RID Series

Patented



Product Features

Main Features

- Suitable for eliminating interference caused by uneven surface
- Combined with OPT-RI Series and OPT-CO Series to achieve better detection

Application Cases

- Curved and uneven surfaces inspection
- Highly reflective metal and glass surfaces inspection

Selection Guide

OPT-RID180
- Diffuser diameter
- Dome light
- Brand name

Customizable Items





Size



View window

Combined with OPT-CO Series

Complemented by coaxial lights, the camera bore is also well illuminated, which would result in darkening in the center of highly reflective workpieces.



Without facula | With facula

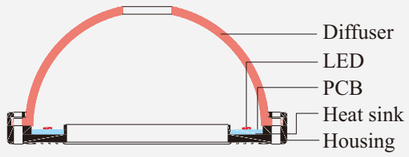
Combined with OPT-RI Series

Combined with ring lights can increase the brightness or create special lighting characteristics.

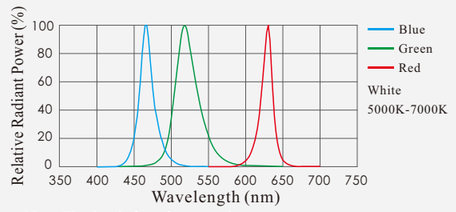


Use image RID gray value individually | Use image gray value combined with RI Series

Section Structure Drawing



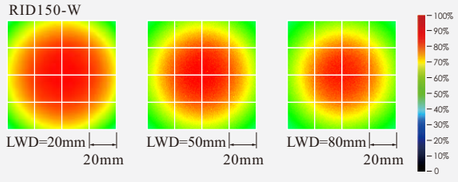
Spectrum Chart



Note: The data is for reference only.

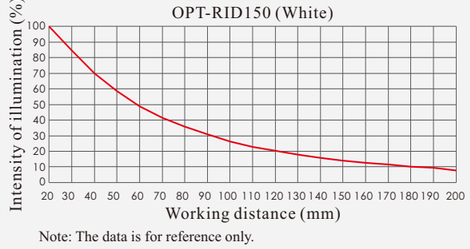
Series Features

Relative Radiation Luminance Distribution



Relative Luminance and Distance

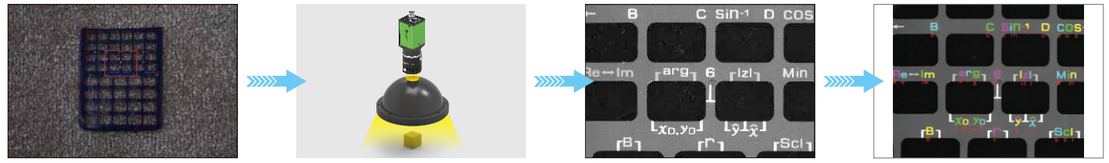
OPT-RID150 (White)



Note: The data is for reference only.

Application Cases

OCR on calculators



Workpiece | Illumination | Image | Smart3 Analysis Result

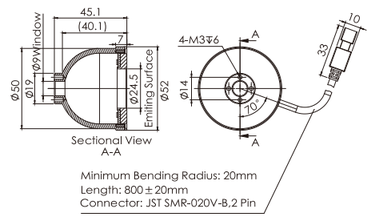
Model Table

No.	Model	∗ Power 🔴	∗ Power ○	∗ Power 🟢	∗ Power 🔵	Recommended controller
1	OPT-RID52	2.9W@24V	3.1W@24V	2.6W@24V	3.1W@24V	OPT-DPA2024E
2	OPT-RID80	5.1W@24V	5.8W@24V	4.8W@24V	5.8W@24V	
3	OPT-RID100	6.5W@24V	7.9W@24V	6.5W@24V	7.7W@24V	
4	OPT-RID150	14.2W@24V	14.2W@24V	11.8W@24V	13.2W@24V	
5	OPT-RID180	15.4W@24V	16.8W@24V	15.6W@24V	17.5W@24V	
6	OPT-RID240	22.1W@24V	25.2W@24V	17.8W@24V	26.6W@24V	
7	OPT-RID350	49.5W@2.2A	57W@2.5A	50.2W@2.2A	49.5W@2.2A	OPT-DPA6024E

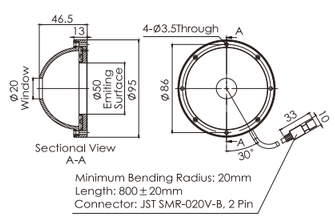
∗ Note: The data is for reference only.

Dimensions (mm)

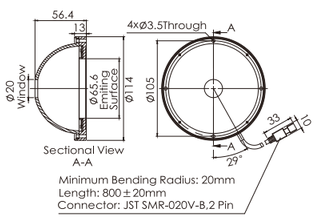
OPT-RID52



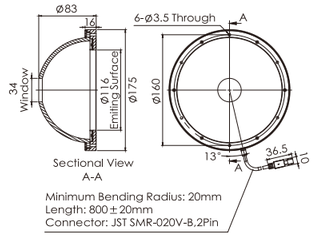
OPT-RID80



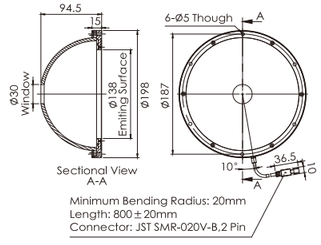
OPT-RID100



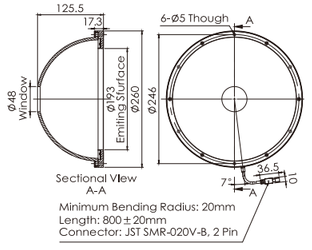
OPT-RID150



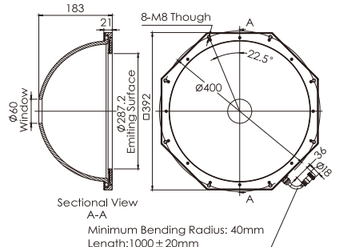
OPT-RID180



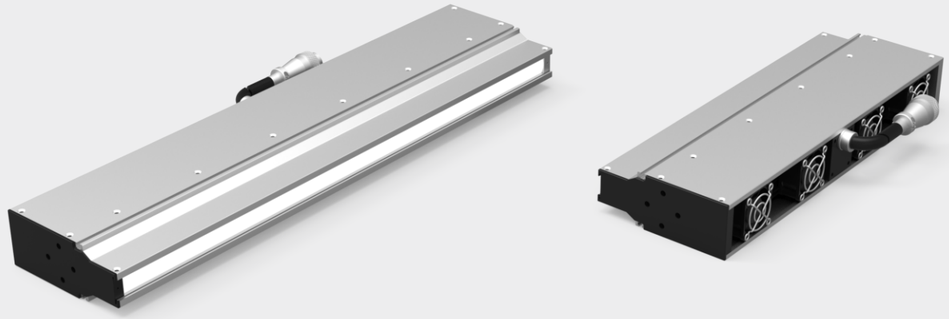
OPT-RID240



OPT-RID350



High Intensity Line Scan Lights OPT-LSA Series



Product Features

Main Features

- The highest illuminance of the white light source reaches 5,000,000 lux (WD=50mm), which is 2.5 times that of the LSS Series.
- Narrow beam angle, suitable for longer working distances.
- Can be paired with a diffusion film to achieve uniform illumination for highly reflective workpieces, or used for backlighting purposes.

Application Cases

- Dimensional measurement
- Character and QR code recognition
- Contour and defect detection
- Detection of dirt and scratches

Selection Guide

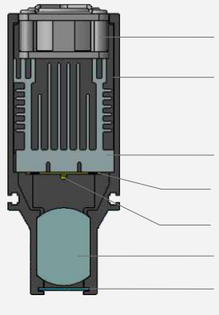
OPT-LSA 188
- 188 → Length
- LSA → Ultra high intensity line scan light
- OPT → Brand name

Customizable Items

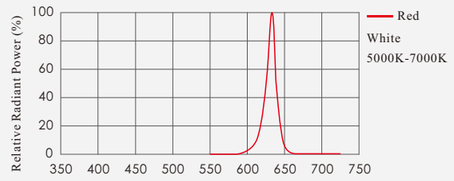


Color, Mounting, Connector, Size, Heat dissipation

Section Structure Drawing



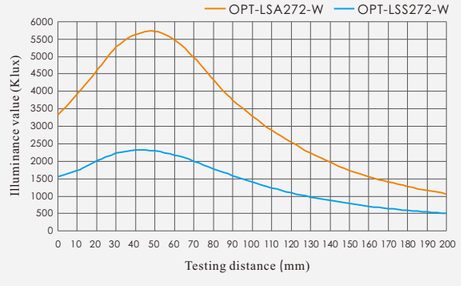
Spectrum Chart



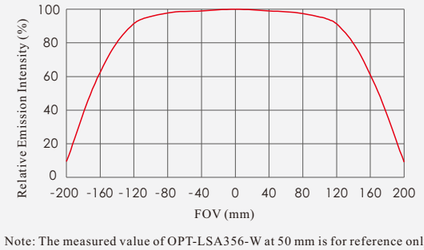
Note: The data is for reference only.

Series Features

Comparison of illuminance between LSA and LSS

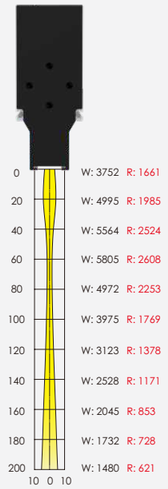


Relative brightness distribution of the light source



Note: The measured value of OPT-LSA356-W at 50 mm is for reference only.

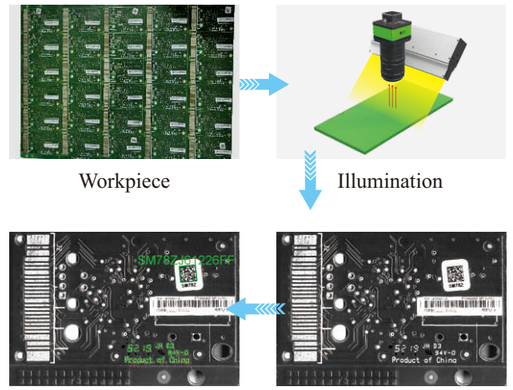
Light Spot and Illuminance at Different WDs



Note:
1. Distance and width units: mm; Illuminance unit: Klux.
2. Illuminance values were measured using the following models:
   OPT-LSA860-W
   OPT-LSA560-R
3. The above data are measured values and for reference only.

Application Cases

- Inspection item: Character and QR code recognition.



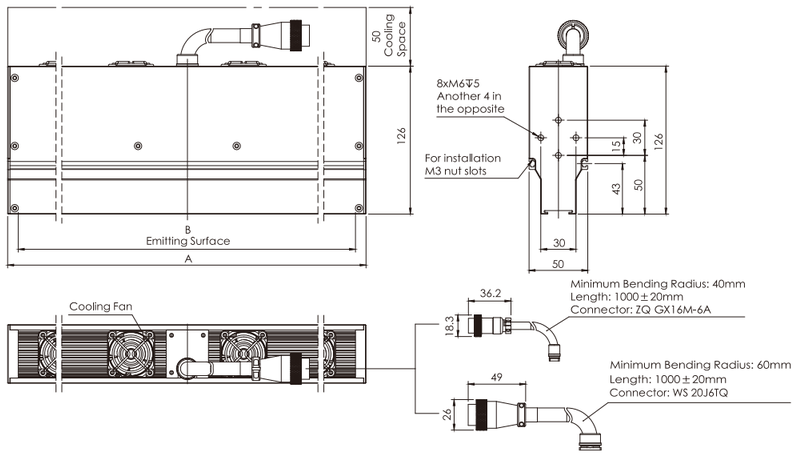
Model Table

No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
1	OPT-LSA104	○	93.6W@3.9A	104	86	OPT-DPA6024E
2	OPT-LSA188	○	187.2W@7.8A	188	170	OPT-DPA10024E
3	OPT-LSA272	○	280.8W@11.7A	272	254	OPT-DPA20024E
4	OPT-LSA356	○	374.4W@15.6A	356	338	
5	OPT-LSA440	○	468W@19.5V	440	422	
6	OPT-LSA524	○	561.6W@23.4A	524	506	
7	OPT-LSA608	○	655.2W@27.3A	608	590	
8	OPT-LSA692	○	748.8W@31.2A	692	674	
9	OPT-LSA776	○	842.4W@35.1A	776	756	
10	OPT-LSA860	○	936W@39A	860	842	
11	OPT-LSA128	●	72W@3A	128	110	OPT-DPA6024E
12	OPT-LSA236	●	144W@6A	236	218	
13	OPT-LSA344	●	216W@9A	344	326	OPT-DPA10024E
14	OPT-LSA452	●	288W@12A	452	434	OPT-DPA20024E
15	OPT-LSA560	●	360W@15A	560	542	
16	OPT-LSA668	●	432W@18A	668	650	
17	OPT-LSA776	●	504W@21A	776	758	
18	OPT-LSA884	●	576W@24A	884	866	
19	OPT-LSA992	●	648W@27A	992	974	

No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
20	OPT-LSA1100	●	720W@30A	1100	1082	OPT-DPA20024E
21	OPT-LSA1208	●	792W@33A	1208	1190	
22	OPT-LSA1316	●	864W@36A	1316	1298	

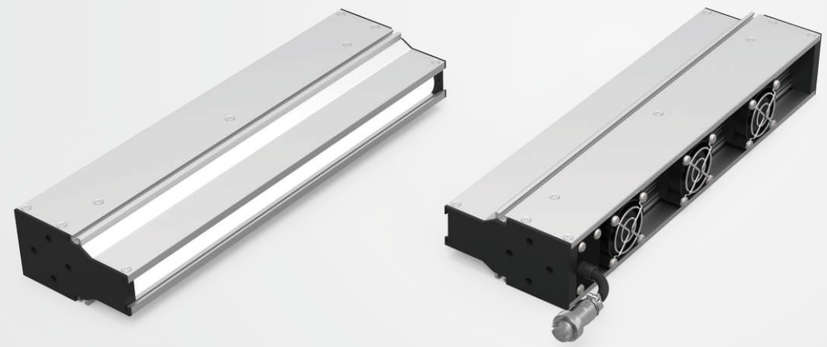
Notes: 1. The data above is for reference only.
2. Custom dimensions: The length of the white light source increases in increments of 84mm, and the length of the red light source increases in increments of 108mm.

Dimensions (mm)



Note:
1. When the rated current is less than or equal to 6A, the connector is ZQ GX16M-6A.
2. When the rated current is greater than 6A, the connector is WS20J6TQ.

High Intensity Line Scan Lights OPT-LSS Series



Product Features

Main Features

- Illuminance up to 2000 kLux (WD=50mm)
- Low divergence angle, suitable for applications with large working distance
- Diffuser film optional, suitable for highly reflected workpiece illumination, or used as backlight

Application Cases

- Ultra high speed line scan camera inspection
- Long distance line scan inspection
- High-speed print inspection

Selection Guide

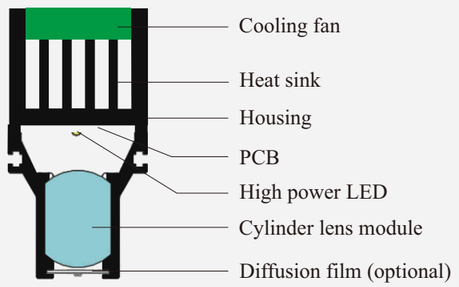
OPT-LSS104
- Length
- Ultra high intensity line scan light
- Brand name

Customizable Items

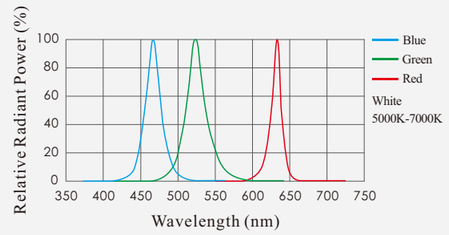


Color
Mounting
Connector
Size
Heat dissipation

Section Structure Drawing



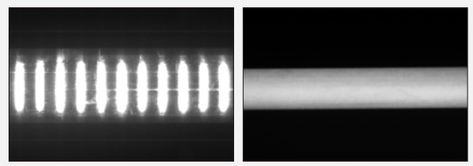
Spectrum Chart



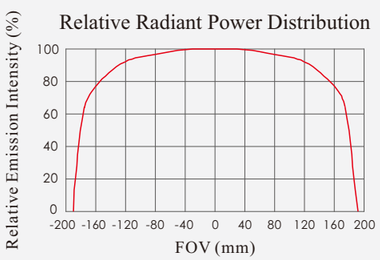
Note: The data is for reference only.

Series Features

Surface reflective workpiece can use diffusion film to help improve image homogeneity.

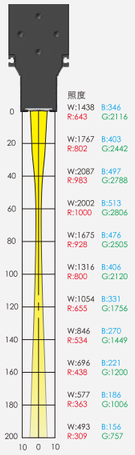


Without diffusion film | With diffusion film



Note: The data above is tested with OPT-LSS398-W at 50mm WD. It is for reference only.

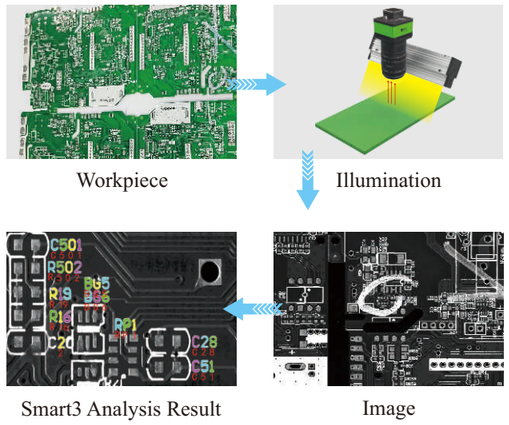
Light Spot and Illuminance at Different WDs



Notes: 1. Distance and width unit (mm)
Illuminance unit (kLux)
2. Models below are used in the test,
OPT-LSS272-W
OPT-LSS290-R
OPT-LSS272-B
OPT-LSS272-G
3. The test data is for reference only.

Application Cases

OCR for PCB



Model Table

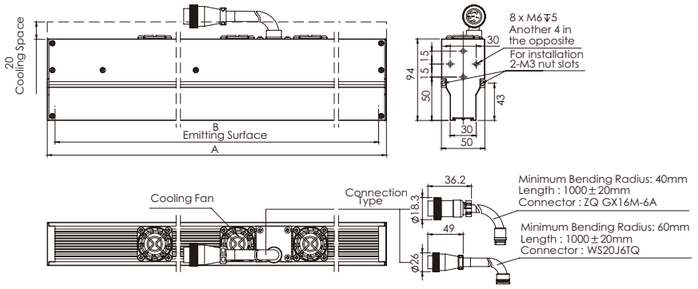
No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
1	OPT-LSS104	○ ● ●	33.6W@1.4A	104	86	OPT-DPA6024E
2	OPT-LSS146	○ ● ●	50.4W@2.1A	146	128	
3	OPT-LSS188	○ ● ●	67.2W@2.8A	188	170	
4	OPT-LSS230	○ ● ●	84W@3.5A	230	212	
5	OPT-LSS272	○ ● ●	100.8W@4.2A	272	254	
6	OPT-LSS314	○ ● ●	117.6W@4.9A	314	296	
7	OPT-LSS356	○ ● ●	134.4W@5.6A	356	338	
8	OPT-LSS398	○ ● ●	151.2W@6.3A	398	380	OPT-DPA10024E
9	OPT-LSS440	○ ● ●	168W@7A	440	422	
10	OPT-LSS482	○ ● ●	184.8W@7.7A	482	464	
11	OPT-LSS524	○ ● ●	201.6W@8.4A	524	506	
12	OPT-LSS566	○ ● ●	218.4W@9.1A	566	548	
13	OPT-LSS608	○ ● ●	235.2W@9.8A	608	590	
14	OPT-LSS650	○ ● ●	252W@10.5A	650	632	OPT-DPA20024E
15	OPT-LSS692	○ ● ●	268.8W@11.2A	692	674	
16	OPT-LSS818	○ ● ●	319.2W@13.3A	818	800	
17	OPT-LSS944	○ ● ●	369.6W@15.4A	944	926	
18	OPT-LSS1070	○ ● ●	420W@17.5A	1070	1052	
19	OPT-LSS1196	○ ● ●	470.4W@19.6A	1196	1178	
20	OPT-LSS1322	○ ● ●	520.8W@21.7A	1322	1304	
21	OPT-LSS1448	○ ● ●	571.2W@23.8A	1448	1430	
22	OPT-LSS1574	○ ● ●	621.6W@25.9A	1574	1556	
23	OPT-LSS1700	○ ● ●	672W@28A	1700	1682	
24	OPT-LSS1826	○ ● ●	722.4W@30.1A	1826	1808	
25	OPT-LSS1952	○ ● ●	772.8W@32.2A	1952	1934	
26	OPT-LSS2078	○ ● ●	823.2W@34.3A	2078	2060	
27	OPT-LSS2204	○ ● ●	873.6W@36.4A	2204	2186	

Model Table

No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
28	OPT-LSS2330	○ ● ●	924W@38.5A	2330	2312	OPT-DPA20024E
29	OPT-LSS2456	○ ● ●	960W@40A	2456	2438	
30	OPT-LSS128	●	33.6W@1.4A	128	110	OPT-DPA6024E
31	OPT-LSS182	●	50.4W@2.1A	182	164	
32	OPT-LSS236	●	67.2W@2.8A	236	218	
33	OPT-LSS290	●	84W@3.5A	290	272	
34	OPT-LSS344	●	100.8W@4.2A	344	326	
35	OPT-LSS398	●	117.6W@4.9A	398	380	
36	OPT-LSS452	●	134.4W@5.6A	452	434	
37	OPT-LSS506	●	151.2W@6.3A	506	488	OPT-DPA10024E
38	OPT-LSS560	●	168W@7A	560	542	
39	OPT-LSS614	●	184.8W@7.7A	614	596	
40	OPT-LSS668	●	201.6W@8.4A	668	650	
41	OPT-LSS722	●	218.4W@9.1A	722	704	
42	OPT-LSS830	●	252W@10.5A	830	812	OPT-DPA20024E
43	OPT-LSS938	●	285.6W@11.9A	938	920	
44	OPT-LSS1046	●	319.2W@13.3A	1046	1028	
45	OPT-LSS1154	●	352.8W@14.7A	1154	1136	
46	OPT-LSS1262	●	386.4W@16.1A	1262	1244	
47	OPT-LSS1370	●	420W@17.5A	1370	1352	
48	OPT-LSS1478	●	453.6W@18.9A	1478	1460	
49	OPT-LSS1586	●	480W@20A	1586	1568	
50	OPT-LSS1694	●	520.8W@21.7A	1684	1666	
51	OPT-LSS1802	●	554.4W@23.1A	1802	1784	
52	OPT-LSS1910	●	588W@24.5A	1910	1892	
53	OPT-LSS2018	●	621.6W@25.9A	2018	2000	
54	OPT-LSS2126	●	655.2W@27.3A	2126	2108	
55	OPT-LSS2234	●	688.8W@28.7A	2234	2216	
56	OPT-LSS2342	●	722.4W@30.1A	2342	2324	
57	OPT-LSS2450	●	756W@31.5A	2450	2432	

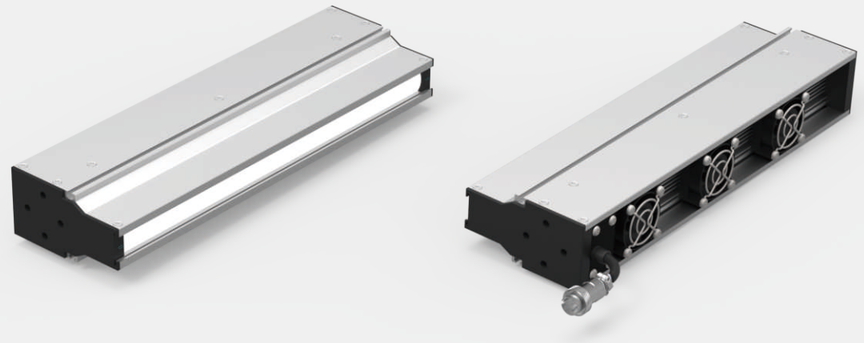
Notes: 1.The data above is for reference only.
2. Custom dimensions: The length of white, blue, and green light sources increases in increments of 42mm, while the length of the red light source increases in increments of 54mm.

Dimensions (mm)



Note: 1.When the rated current is less than or equal to 6A, the connector is ZQ GX16M-6A.
2.When the rated current is greater than 6A, the connector is WS20J6TQ.

Crossing Line Scan Lights OPT-LSSX Series



Product Features

Main Features

- Special optical design with cross illumination on two sides, which can detect the damage of a workpiece in the running direction.
- Compatible with inspection of mirror surfaces and matte surfaces.

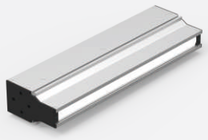
Application Cases

- Transparent glass objects defect detection
- Scratch detection on surface of metal objects
- Aluminum foil objects surface defect detection

Selection Guide

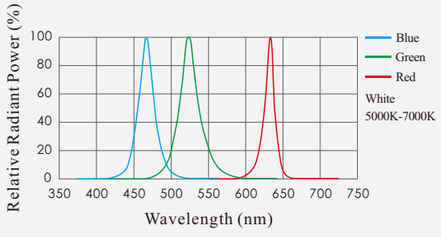
OPT-LSSX 104
- 104 → Length
- LSSX → Crossing Line Scan Lights
- OPT → Brand name

Customizable Items



Color | Mounting | Connector | Size | Heat dissipation

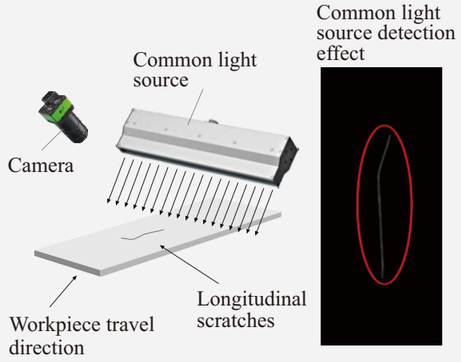
Spectrum Chart



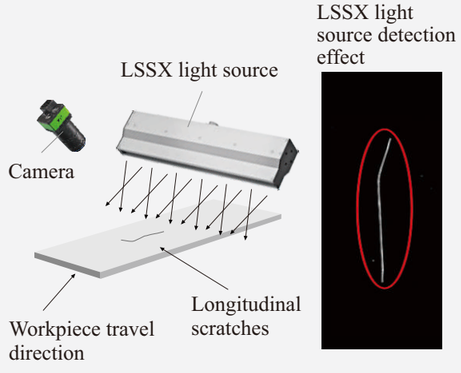
Note: The data is for reference only.

Series Features

Comparison of effects between common light source and LSSX light source



Note: Common light sources have difficulty highlighting longitudinal scratches.

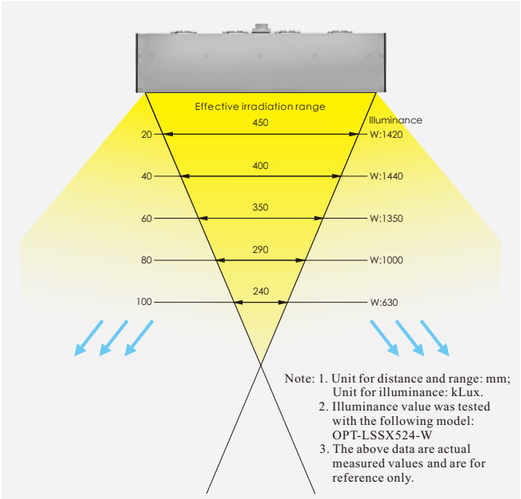


Note: Using the LSSX light source can highlight the longitudinal scratches much more clearly.

OPT Machine Vision
OPT Standard Lights | Crossing Line Scan Lights OPT-LSSX Series

No.	Model	Exposure ranges for different working distances				
		20	40	60	80	100
1	OPT-LSSX104	30				
2	OPT-LSSX146	70	20			
3	OPT-LSSX188	110	60			
4	OPT-LSSX230	160	100	40		
5	OPT-LSSX272	200	150	100	40	
6	OPT-LSSX314	240	180	130	70	
7	OPT-LSSX356	280	230	170	120	60
8	OPT-LSSX398	320	270	210	160	100
9	OPT-LSSX440	370	310	250	200	140
10	OPT-LSSX482	410	350	300	240	180
11	OPT-LSSX524	450	400	350	290	240
12	OPT-LSSX566	490	440	380	320	270
13	OPT-LSSX608	530	480	420	370	310
14	OPT-LSSX650	580	520	460	410	350
15	OPT-LSSX692	620	560	510	450	390
16	OPT-LSSX128	50				
17	OPT-LSSX182	110	50			
18	OPT-LSSX236	160	110	50		
19	OPT-LSSX290	220	160	100	50	
20	OPT-LSSX344	270	210	160	100	50
21	OPT-LSSX398	320	270	210	160	100
22	OPT-LSSX452	380	320	270	210	150
23	OPT-LSSX506	430	380	320	260	210
24	OPT-LSSX560	490	430	370	320	260
25	OPT-LSSX614	540	480	430	370	320
26	OPT-LSSX668	590	540	480	430	370
27	OPT-LSSX722	650	590	540	480	420

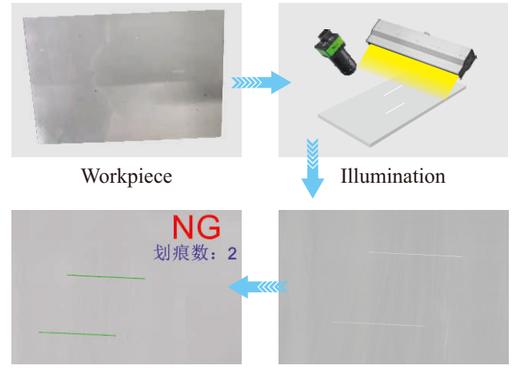
Note: The data are simulated values for reference purpose, differences from actual values may occur.



Note: 1. Unit for distance and range: mm; Unit for illuminance: kLux.
2. Illuminance value was tested with the following model: OPT-LSSX524-W
3. The above data are actual measured values and are for reference only.

Application Cases

- Detection of scratches in transparent glass



Model Table

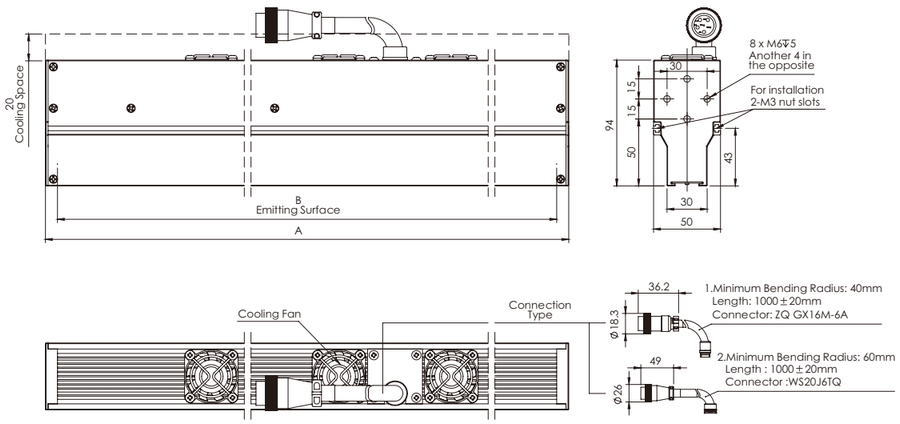
No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
1	OPT-LSSX104	○ ● ●	33.6W@1.4A	104	86	OPT-DPA6024E
2	OPT-LSSX146	○ ● ●	50.4W@2.1A	146	128	
3	OPT-LSSX188	○ ● ●	67.2W@2.8A	188	170	
4	OPT-LSSX230	○ ● ●	84W@3.5A	230	212	
5	OPT-LSSX272	○ ● ●	100.8W@4.2A	272	254	
6	OPT-LSSX314	○ ● ●	117.6W@4.9A	314	296	
7	OPT-LSSX356	○ ● ●	134.4W@5.6A	356	338	
8	OPT-LSSX398	○ ● ●	151.2W@6.3A	398	380	OPT-DPA10024E
9	OPT-LSSX440	○ ● ●	168W@7A	440	422	
10	OPT-LSSX482	○ ● ●	184.8W@7.7A	482	464	

Model Table

No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
11	OPT-LSSX524	○ ● ●	201.6W@8.4A	524	506	OPT-DPA10024E
12	OPT-LSSX566	○ ● ●	218.4W@9.1A	566	548	
13	OPT-LSSX608	○ ● ●	235.2W@9.8A	608	590	
14	OPT-LSSX650	○ ● ●	252W@10.5A	650	632	OPT-DPA20024E
15	OPT-LSSX692	○ ● ●	268.8W@11.2A	692	674	
16	OPT-LSSX818	○ ● ●	319.2W@13.3A	818	800	
17	OPT-LSSX944	○ ● ●	369.6W@15.4A	944	926	
18	OPT-LSSX128	●	33.6W@1.4A	128	110	OPT-DPA6024E
19	OPT-LSSX182	●	50.4W@2.1A	182	164	
20	OPT-LSSX236	●	67.2W@2.8A	236	218	
21	OPT-LSSX290	●	84W@3.5A	290	272	
22	OPT-LSSX344	●	100.8W@4.2A	344	326	
23	OPT-LSSX398	●	117.6W@4.9A	398	380	
24	OPT-LSSX452	●	134.4W@5.6A	452	434	
25	OPT-LSSX506	●	151.2W@6.3A	506	488	OPT-DPA10024E
26	OPT-LSSX560	●	168W@7A	560	542	
27	OPT-LSSX614	●	184.8W@7.7A	614	596	
28	OPT-LSSX668	●	201.6W@8.4A	668	650	
29	OPT-LSSX722	●	218.4W@9.1A	722	704	
30	OPT-LSSX830	●	252W@10.5A	830	812	OPT-DPA20024E
31	OPT-LSSX938	●	285.6W@11.9A	938	920	

Notes: 1. The data above is for reference only.
2.Custom dimensions: The lengths of the white, blue, and green light sources increase in increments of 42mm, while the length of the red light source increases in increments of 54mm.

Dimensions (mm)



Note:
1.When the rated current is less than or equal to 6A, the connector is ZQ GX16M-6A.
2.When the rated current is greater than 6A, the connector is WS20J6TQ.

High Intensity Coaxial Line Scan Lights

OPT-LSSC/OPT-LSNLC Series



Product Features

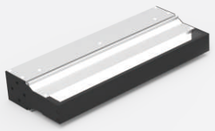
Main Features

- LSSC is designed for high brightness, to meet the requirements of high-speed line scan inspection. LSNLC, with passive heat dissipation design, offers quiet stability and is suitable for environments with special requirements for noise, vibration, and airflow.
- Compatible with the inspection of both reflective and matt surfaces
- Highly directional illumination

Application Cases

- Film and glass surface inspection; foreign objects detection
- High-speed print inspection

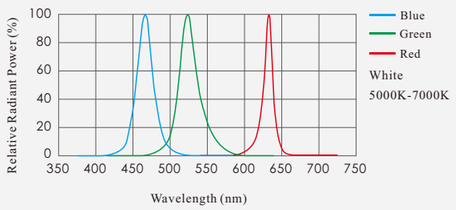
Customizable Items



Color Mounting Size

Heat dissipation

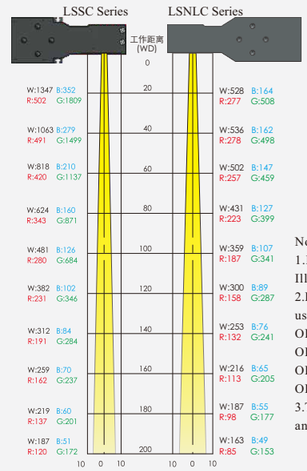
Spectrum Chart



Note: The data is for reference only.

Series Features

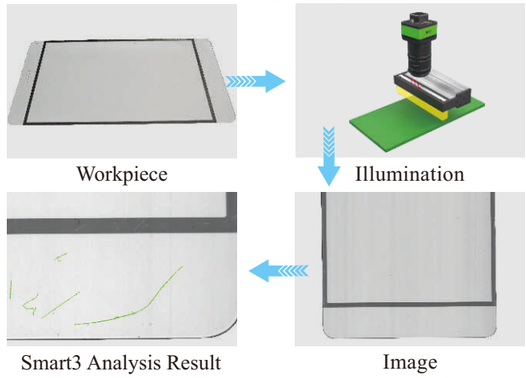
Light Spot and Illuminance at Different WDs



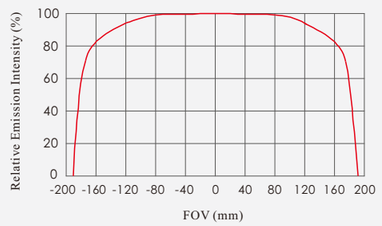
Note:
1.Distance and width units: mm
Illuminance unit: Klux
2.Illuminance values were measured using the following models:
OPT-LSSC272-W/B/G
OPT-LSNLC272-W/B/G
OPT-LSSC290-R
OPT-LSNLC290-R
3.The above data are measured values and are provided for reference only.

Application Cases

- Scratches detection on transparent glass surface

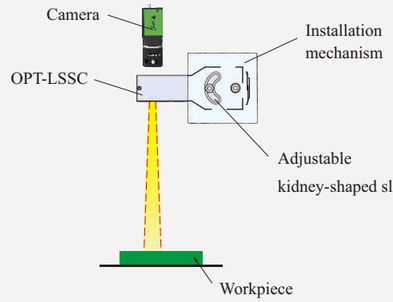


Relative Radiant Power Distribution

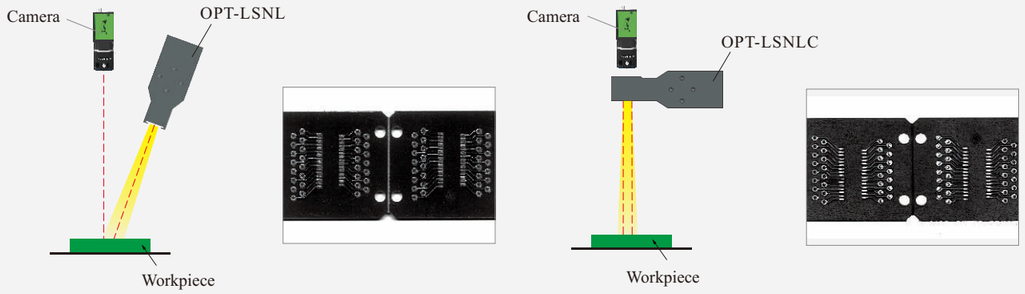


Note: The data above is tested with OPT-LSSC398-W at 30mm WD. It is for reference only.

Suggested installation way



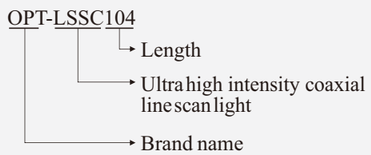
It is suggested that the installation mechanism be equipped with adjustable angle to facilitate the calibration of the spot position.



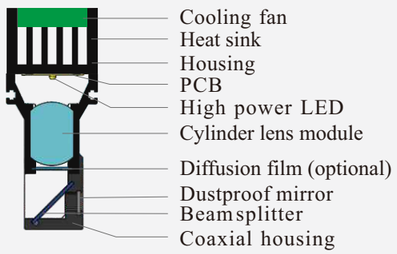
PCB bare board inspection:
When using LSNL to measure the dimensions of round holes on PCB bare boards, shadow interference may occur. However, with coaxial illumination LSNL effectively eliminates shadow interference, presenting a complete outline of the round holes.

OPT-LSSC High Intensity Coaxial Line Scan Lights

Selection Guide



Section Structure Drawing



Model Table

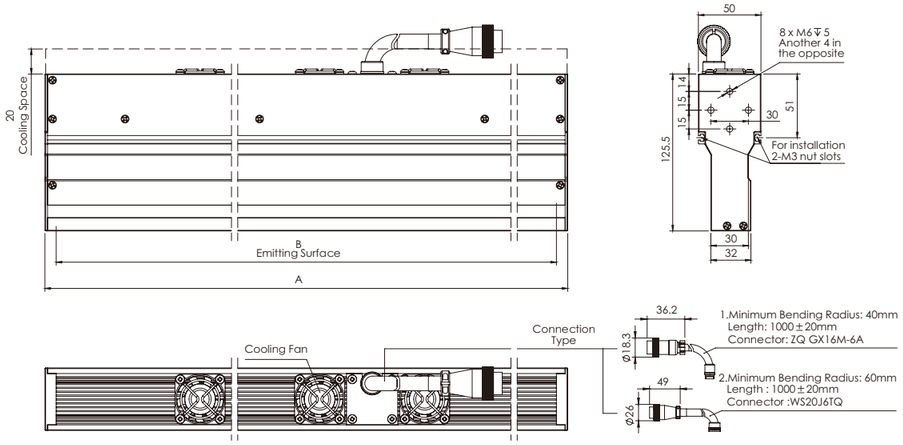
No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
1	OPT-LSSC104	○ ● ●	33.6W@1.4A	104	86	OPT-DPA6024E
2	OPT-LSSC146	○ ● ●	50.4W@2.1A	146	128	
3	OPT-LSSC188	○ ● ●	67.2W@2.8A	188	170	
4	OPT-LSSC230	○ ● ●	84W@3.5A	230	212	

Model Table

No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
5	OPT-LSSC272	○ ● ●	100.8W@4.2A	272	254	OPT-DPA6024E
6	OPT-LSSC314	○ ● ●	117.6W@4.9A	314	296	
7	OPT-LSSC356	○ ● ●	134.4W@5.6A	356	338	
8	OPT-LSSC398	○ ● ●	151.2W@6.3A	398	380	OPT-DPA10024E
9	OPT-LSSC440	○ ● ●	168W@7A	440	422	
10	OPT-LSSC482	○ ● ●	184.8W@7.7A	482	464	
11	OPT-LSSC524	○ ● ●	201.6W@8.4A	524	506	
12	OPT-LSSC566	○ ● ●	218.4W@9.1A	566	548	
13	OPT-LSSC608	○ ● ●	235.2W@9.8A	608	590	
14	OPT-LSSC650	○ ● ●	252W@10.5A	650	632	OPT-DPA20024E
15	OPT-LSSC692	○ ● ●	268.8W@11.2A	692	674	
16	OPT-LSSC818	○ ● ●	319.2W@13.3A	818	800	
17	OPT-LSSC128	●	33.6W@1.4A	128	110	OPT-DPA6024E
18	OPT-LSSC182	●	50.4W@2.1A	182	164	
19	OPT-LSSC236	●	67.2W@2.8A	236	218	
20	OPT-LSSC290	●	84W@3.5A	290	272	
21	OPT-LSSC344	●	100.8W@4.2A	344	326	
22	OPT-LSSC398	●	117.6W@4.9A	398	380	
23	OPT-LSSC452	●	134.4W@5.6A	452	434	
24	OPT-LSSC506	●	151.2W@6.3A	506	488	OPT-DPA10024E
25	OPT-LSSC560	●	168W@A	560	542	
26	OPT-LSSC614	●	184.8W@7.7A	614	596	
27	OPT-LSSC668	●	201.6W@8.4A	668	650	
28	OPT-LSSC722	●	218.4W@9.1A	722	704	
29	OPT-LSSC830	●	252W@10.5A	830	812	OPT-DPA20024E

Notes: 1. The data above is for reference only.
2. Custom dimensions: The lengths of white, blue, and green light sources increase in increments of 42mm, while the length of the red light source increases in increments of 54mm.

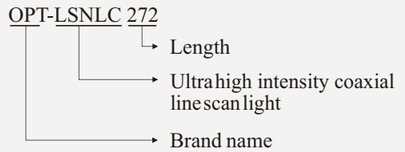
Dimensions (mm)



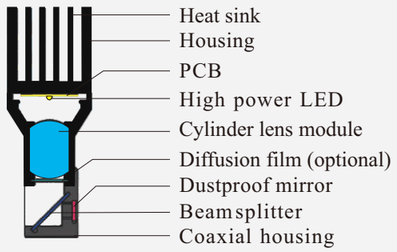
Note:1.When the rated current is less than or equal to 6A, the connector is ZQ GX16M-6A.
2.When the rated current is greater than 6A, the connector is WS20J6TQ.

OPT-LSNLC High Intensity Coaxial Line Scan Lights

Selection Guide



Section Structure Drawing



Model Table

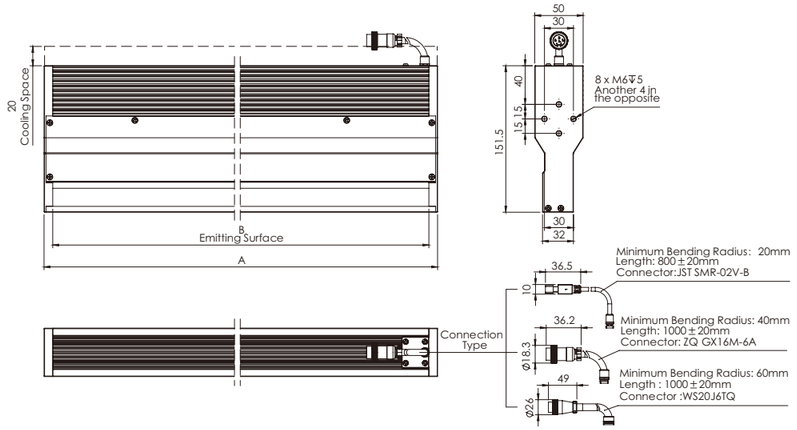
No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
1	OPT-LSNLC104	○ ● ●	14.4W@24V	104	86	OPT-DPA2024E
2	OPT-LSNLC146	○ ● ●	21.6W@24V	146	128	
3	OPT-LSNLC188	○ ● ●	28.8W@24V	188	170	
4	OPT-LSNLC230	○ ● ●	36W@24V	230	212	
5	OPT-LSNLC272	○ ● ●	43.2W@24V	272	254	
6	OPT-LSNLC314	○ ● ●	50.4W@2.1A	314	296	OPT-DPA6024E
7	OPT-LSNLC356	○ ● ●	57.6W@2.4A	356	338	
8	OPT-LSNLC398	○ ● ●	64.8W@2.7A	398	380	
9	OPT-LSNLC440	○ ● ●	72W@3.0A	440	422	
10	OPT-LSNLC482	○ ● ●	79.2W@3.3A	482	464	
11	OPT-LSNLC524	○ ● ●	86.4W@3.6A	524	506	

Model Table

No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
12	OPT-LSNLC566	○ ● ●	93.6W@3.9A	566	548	OPT-DPA6024E
13	OPT-LSNLC608	○ ● ●	100.8W@4.2A	608	590	
14	OPT-LSNLC650	○ ● ●	108W@4.5A	650	632	
15	OPT-LSNLC692	○ ● ●	115.2W@4.8A	692	674	
16	OPT-LSNLC818	○ ● ●	136.8W@5.7A	818	800	
17	OPT-LSNLC128	●	16.8W@24V	128	110	OPT-DPA2024E
18	OPT-LSNLC182	●	25.2W@24V	182	164	
19	OPT-LSNLC236	●	33.6W@24V	236	218	
20	OPT-LSNLC290	●	42W@24V	290	272	
21	OPT-LSNLC344	●	50.4W@2.1A	344	326	OPT-DPA6024E
22	OPT-LSNLC398	●	57.6W@2.4A	398	380	
23	OPT-LSNLC452	●	67.2W@2.8A	452	434	
24	OPT-LSNLC506	●	74.4W@3.1A	506	488	
25	OPT-LSNLC560	●	84W@3.5A	560	542	
26	OPT-LSNLC614	●	91.2W@3.8A	614	596	
27	OPT-LSNLC668	●	100.8W@4.2A	668	650	
28	OPT-LSNLC722	●	108W@4.5A	722	704	
29	OPT-LSNLC830	●	124.8W@5.2A	830	812	

Notes: 1. The data above is for reference only.
2. Custom dimensions: The lengths of white, blue, and green light sources increase in increments of 42mm, while the length of the red light source increases in increments of 54mm.

Dimensions (mm)



Note:1.When the rated current is less than or equal to 2A, the connector is JST SMR-02V-B.
2.When the rated current is less than or equal to 6A, the connector is ZQ GX16M-6A.
3.When the rated current is greater than 6A, the connector is WS20J6TQ.

Passive Cooling Line Scan Lights OPT-LSNS/OPT-LSNL Series



Product Features

Main Features

- Passive heat radiating design provides quiet and stable operation, making it suitable for environments with special requirements for noise, vibration, and airflow.
- LSNS series has a max illuminance value of 1 million Lux (WD=20mm), while the LSNL series has a max illuminance value of 1.1 million Lux (WD=50mm).

Application Cases

- Inspection for PCB
- Inspection for Li-ion pole piece
- Inspection for printing
- Inspection for display screen

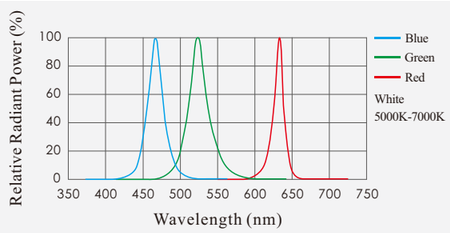
Customizable Items



Color | Mounting | Connector

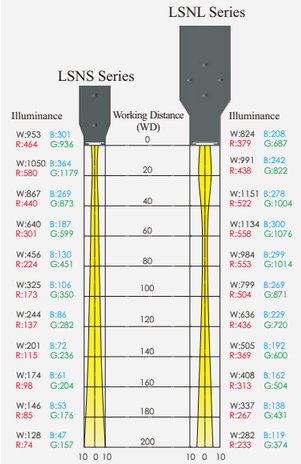
Size | Heat dissipation

Spectrum Chart



Note: The data is for reference only.

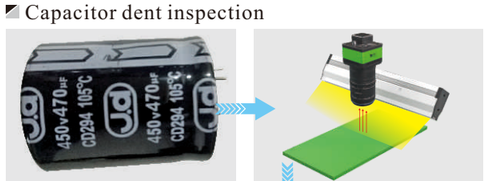
Series Features



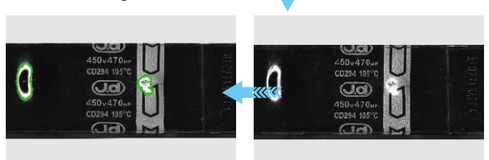
Note:
1. Unit for distance and range: mm; Unit for illuminance: kLux.
2. Illuminance value was tested with the following models:
   OPT-LSNS272-W/B/G
   OPT-LSNL272-W/B/G
   OPT-LSNS290-R
   OPT-LSNL290-R
3. The above data are actual measured values and only for reference purpose.

Application Cases

Capacitor dent inspection



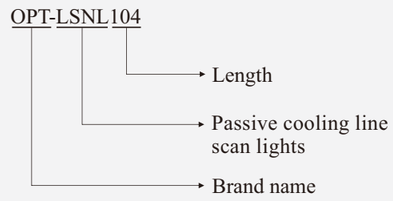
Workpiece | Illumination



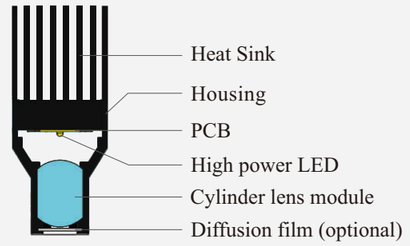
Smart3 Analysis Result | Image

OPT-LSNL Passive Cooling Line Scan Lights

Selection Guide



Section Structure Drawing



Model Table

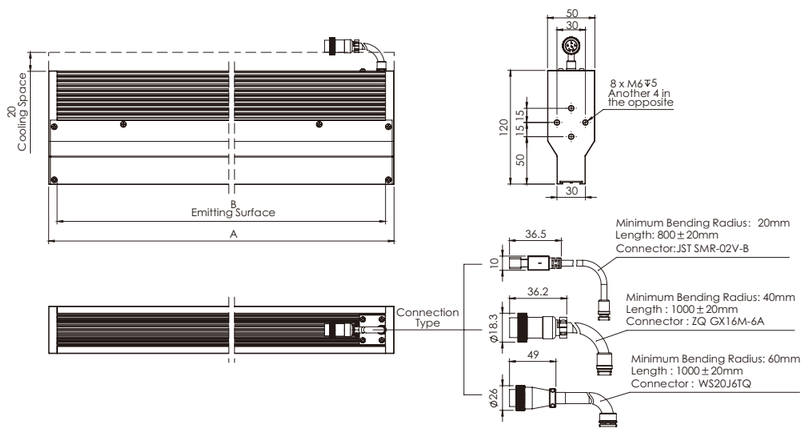
No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
1	OPT-LSNL104	○ ● ●	14.4W@24V	104	86	
2	OPT-LSNL146	○ ● ●	21.6W@24V	146	128	
3	OPT-LSNL188	○ ● ●	28.8W@24V	188	170	OPT-DPA2024E
4	OPT-LSNL230	○ ● ●	36W@24V	230	212	
5	OPT-LSNL272	○ ● ●	42W@24V	272	254	
6	OPT-LSNL314	○ ● ●	50.4W@2.1A	314	296	
7	OPT-LSNL356	○ ● ●	57.6W@2.4A	356	338	
8	OPT-LSNL398	○ ● ●	64.8W@2.7A	398	380	
9	OPT-LSNL440	○ ● ●	72W@3.0A	440	422	
10	OPT-LSNL482	○ ● ●	79.2W@3.3A	482	464	
11	OPT-LSNL524	○ ● ●	86.4W@3.6A	524	506	OPT-DPA6024E
12	OPT-LSNL566	○ ● ●	93.6W@3.9A	566	548	
13	OPT-LSNL608	○ ● ●	100.8W@4.2A	608	590	
14	OPT-LSNL650	○ ● ●	108W@4.5A	650	632	
15	OPT-LSNL692	○ ● ●	115.2W@4.8A	692	674	
16	OPT-LSNL818	○ ● ●	136.8W@5.7A	818	800	
17	OPT-LSNL944	○ ● ●	158.4W@6.6A	944	926	
18	OPT-LSNL1070	○ ● ●	180W@7.5A	1070	1052	
19	OPT-LSNL1196	○ ● ●	201.6W@8.4A	1196	1178	OPT-DPA10024E
20	OPT-LSNL1322	○ ● ●	223.2W@9.3A	1322	1304	
21	OPT-LSNL1448	○ ● ●	240W@10A	1448	1430	
22	OPT-LSNL1574	○ ● ●	266.4W@11.1A	1574	1556	
23	OPT-LSNL1700	○ ● ●	288W@12A	1700	1682	
24	OPT-LSNL1826	○ ● ●	309.6W@12.9A	1826	1808	
25	OPT-LSNL1952	○ ● ●	331.2W@13.8A	1952	1934	
26	OPT-LSNL2078	○ ● ●	352.8W@14.7A	2078	2060	
27	OPT-LSNL2204	○ ● ●	374.4W@15.6A	2204	2186	OPT-DPA20024E
28	OPT-LSNL2330	○ ● ●	396W@16.5A	2330	2312	
29	OPT-LSNL2456	○ ● ●	417.6W@17.4A	2456	2438	
30	OPT-LSNL2582	○ ● ●	439.2W@18.3A	2582	2564	
31	OPT-LSNL2708	○ ● ●	460.8W@19.2A	2708	2690	
32	OPT-LSNL2834	○ ● ●	2480W@20A	2834	2816	
33	OPT-LSNL128	●	16.8W@24V	128	110	OPT-DPA2024E
34	OPT-LSNL182	●	25.2W@24V	182	164	

Model Table

No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
35	OPT-LSNL236	●	33.6W@24V	236	218	OPT-DPA2024E
36	OPT-LSNL290	●	42W@24V	290	272	
37	OPT-LSNL344	●	50.4W@2.1A	344	326	OPT-DPA6024E
38	OPT-LSNL398	●	57.6W@2.4A	398	380	
39	OPT-LSNL452	●	67.2W@2.8A	452	434	
40	OPT-LSNL506	●	74.4W@3.1A	506	488	
41	OPT-LSNL560	●	84W@3.5A	560	542	
42	OPT-LSNL614	●	91.2W@3.8A	614	596	
43	OPT-LSNL668	●	100.8W@4.2A	668	650	
44	OPT-LSNL722	●	108W@4.5A	722	704	
45	OPT-LSNL830	●	124.8W@5.2A	830	812	
46	OPT-LSNL938	●	122.4W@5.1A	938	920	
47	OPT-LSNL1046	●	136.8W@5.7A	1046	1028	
48	OPT-LSNL1154	●	144W@6A	1154	1136	
49	OPT-LSNL1262	●	165.6W@6.9A	1262	1244	OPT-DPA10024E
50	OPT-LSNL1370	●	180W@7.5A	1370	1352	
51	OPT-LSNL1478	●	194.4W@8.1A	1478	1460	
52	OPT-LSNL1586	●	208.8W@8.7A	1586	1568	
53	OPT-LSNL1694	●	223.2W@9.3A	1694	1676	
54	OPT-LSNL1802	●	237.6W@9.9A	1802	1784	
55	OPT-LSNL1910	●	252W@10.5A	1910	1892	OPT-DPA20024E
56	OPT-LSNL2018	●	266.4W@11.1A	2018	2000	
57	OPT-LSNL2126	●	280.8W@11.7A	2126	2108	
58	OPT-LSNL2234	●	295.2W@12.3A	2234	2216	
59	OPT-LSNL2342	●	309.6W@12.9A	2342	2324	
60	OPT-LSNL2450	●	324W@13.5A	2450	2432	
61	OPT-LSNL2558	●	338.4W@14.1A	2558	2540	
62	OPT-LSNL2666	●	352.8W@14.7A	2666	2648	
63	OPT-LSNL2774	●	367.2W@15.3A	2774	2756	
64	OPT-LSNL2882	●	381.6W@15.9A	2882	2864	

Notes: 1. The data above is for reference only.
2. Custom dimensions: The lengths of white, blue, and green light sources increase in increments of 42mm, while the length of the red light source increases in increments of 54mm.

Dimensions (mm)



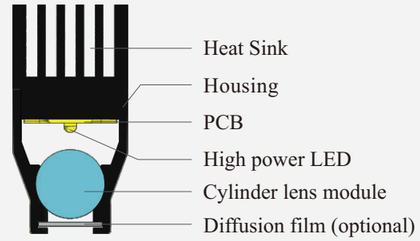
Note:1.When the rated current is less than or equal to 2A, the connector is JST SMR-02V-B.
2.When the rated current is less than or equal to 6A, the connector is ZQ GX16M-6A.
3.When the rated current is greater than 6A, the connector is WS20J6TQ.

OPT-LSNS Passive Cooling Line Scan Lights

Selection Guide

OPT-LSNS 104
- 104 → Length
- LSNS → Passive cooling line scan lights
- OPT → Brand name

Section Structure Drawing



Model Table

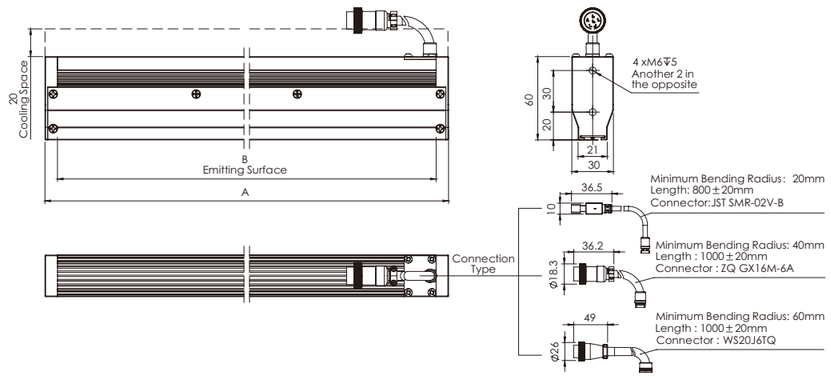
No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
1	OPT-LSNS104	○●●	9.6W@24V	104	86	OPT-DPA2024E
2	OPT-LSNS146	○●●	12W@24V	146	128	
3	OPT-LSNS188	○●●	16.8W@24V	188	170	
4	OPT-LSNS230	○●●	21.6W@24V	230	212	
5	OPT-LSNS272	○●●	26.4W@24V	272	254	
6	OPT-LSNS314	○●●	31.2W@24V	314	296	
7	OPT-LSNS356	○●●	33.6W@24V	356	338	
8	OPT-LSNS398	○●●	38.4W@24V	398	380	
9	OPT-LSNS440	○●●	43.2W@24V	440	422	
10	OPT-LSNS482	○●●	48W@24V	482	464	
11	OPT-LSNS524	○●●	52.8W@2.2A	524	506	OPT-DPA6024E
12	OPT-LSNS566	○●●	55.2W@2.3A	566	548	
13	OPT-LSNS608	○●●	60W@2.5A	608	590	
14	OPT-LSNS650	○●●	64.8W@2.7A	650	632	
15	OPT-LSNS692	○●●	69.1W@2.9A	692	674	
16	OPT-LSNS818	○●●	81.6W@3.4A	818	800	
17	OPT-LSNS944	○●●	96W@4A	944	926	
18	OPT-LSNS1070	○●●	108W@4.5A	1070	1052	
19	OPT-LSNS1196	○●●	120W@5A	1196	1178	
20	OPT-LSNS1322	○●●	134.4W@5.6A	1322	1304	
21	OPT-LSNS1448	○●●	144W@6A	1448	1430	
22	OPT-LSNS1574	○●●	160.8W@6.7A	1574	1556	OPT-DPA10024E
23	OPT-LSNS1700	○●●	172.8W@7.2A	1700	1682	
24	OPT-LSNS1826	○●●	184.8W@7.7A	1826	1808	
25	OPT-LSNS1952	○●●	199.2W@8.3A	1952	1934	
26	OPT-LSNS2078	○●●	211.2W@8.8A	2078	2060	
27	OPT-LSNS2204	○●●	225.6W@9.4A	2204	2186	
28	OPT-LSNS2330	○●●	237.6W@9.9A	2330	2312	
29	OPT-LSNS2456	○●●	249.6W@10.4A	2456	2438	OPT-DPA20024E
30	OPT-LSNS2582	○●●	264W@11A	2582	2564	
31	OPT-LSNS2708	○●●	276W@11.5A	2708	2690	
32	OPT-LSNS2834	○●●	288W@12A	2834	2816	
33	OPT-LSNS128	●	8.6W@24V	128	110	OPT-DPA2024E
34	OPT-LSNS182	●	12W@24V	182	164	

Model Table

No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Recommended controller
35	OPT-LSNS236	Red	17.3W@24V	236	218	OPT-DPA2024E
36	OPT-LSNS290	Red	21.6W@24V	290	272	
37	OPT-LSNS344	Red	26.4W@24V	344	326	
38	OPT-LSNS398	Red	31.2W@24V	398	380	
39	OPT-LSNS452	Red	33.6W@24V	452	434	
40	OPT-LSNS506	Red	38.4W@24V	506	488	
41	OPT-LSNS560	Red	43.2W@24V	560	542	
42	OPT-LSNS614	Red	48W@24V	614	596	
43	OPT-LSNS668	Red	52.8W@2.2A	668	650	OPT-DPA6024E
44	OPT-LSNS722	Red	55.2W@2.3A	722	704	
45	OPT-LSNS938	Red	112.3W@4.7A	938	920	
46	OPT-LSNS1046	Red	81.6W@3.4A	1046	1028	
47	OPT-LSNS1154	Red	91.2W@3.8A	1154	1136	
48	OPT-LSNS1262	Red	98.4W@4.1A	1262	1244	
49	OPT-LSNS1370	Red	108W@4.5A	1370	1352	
50	OPT-LSNS1478	Red	117.6W@4.9A	1478	1460	
51	OPT-LSNS1586	Red	124.8W@5.2A	1586	1568	
52	OPT-LSNS1694	Red	134.4W@5.6A	1694	1676	
53	OPT-LSNS1802	Red	141.6W@5.9A	1802	1784	
54	OPT-LSNS1910	Red	144W@6A	1910	1892	
55	OPT-LSNS2018	Red	160.8W@6.7A	2018	2000	OPT-DPA10024E
56	OPT-LSNS2126	Red	168W@7A	2126	2108	
57	OPT-LSNS2234	Red	177.6W@7.4A	2234	2216	
58	OPT-LSNS2342	Red	184.8W@7.7A	2342	2324	
59	OPT-LSNS2450	Red	194.4W@8.1A	2450	2432	
60	OPT-LSNS2558	Red	204W@8.5A	2558	2540	
61	OPT-LSNS2666	Red	211.2W@8.8A	2666	2648	
62	OPT-LSNS2774	Red	220.8W@9.2A	2774	2756	
63	OPT-LSNS2882	Red	228W@9.5A	2882	2864	

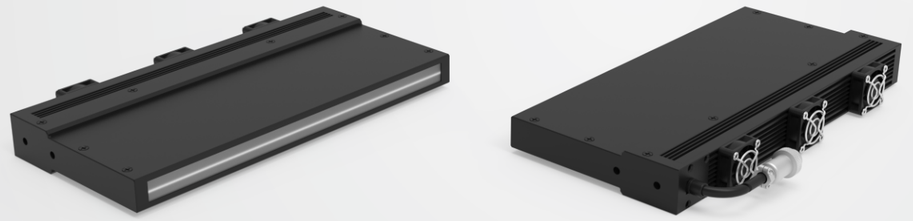
Notes: 1. The data above is for reference only.
2. Custom dimensions: The lengths of white, blue, and green light sources increase in increments of 42mm, while the length of the red light source increases in increments of 54mm.

Dimensions (mm)



Note:1.When the rated current is less than or equal to 2A, the connector is JST SMR-02V-B.
2.When the rated current is less than or equal to 6A, the connector is ZQ GX16M-6A.
3.When the rated current is greater than 6A, the connector is WS20J6TQ.

Narrow Beam Linear Light Source OPT-LSE Series NEW



Product Features

Main Features

- With a divergence angle of less than 0.5°, the light spot is extremely narrow, and the width at the light exit is less than 0.5 mm.
- Compared to laser sources, LED light sources does not contain speckle noise that affects image processing.

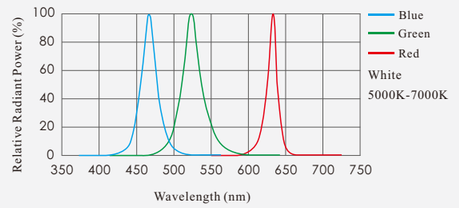
Application Cases

- 3D analysis and reconstruction
- Crack detection on biscuit surfaces

Selection Guide

OPT-LSE 104 N
- Have N: Natural cooling
  None N: Fan cooling
- Length
- Narrow beam linear light source
- Brand name

Spectrum Chart



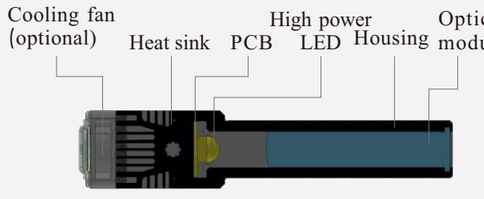
Note: The data is for reference only.

Customizable Items



Color
Mounting
Connector
Size
Heat dissipation

Section Structure Drawing

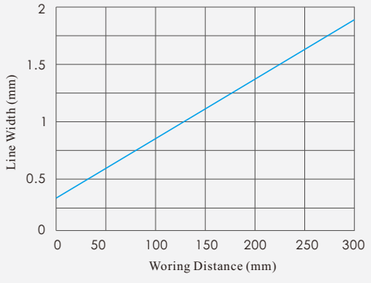


Series Features



Divergence angle less than 0.5°, extremely narrow light spot, width at the light exit less than 0.5 mm.

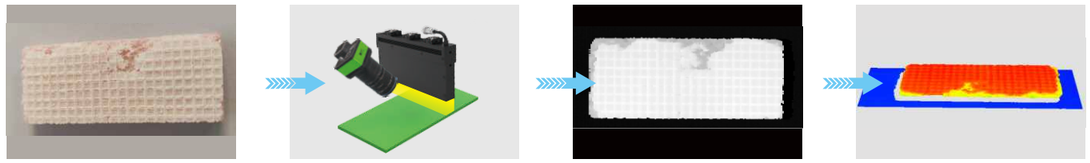
The width of the light spot at different working distances



Note: The data is for reference only.

Application Cases

Inspection item: Biscuit surface defect detection



Workpiece | Illumination | Image | Smart3 Analysis Result

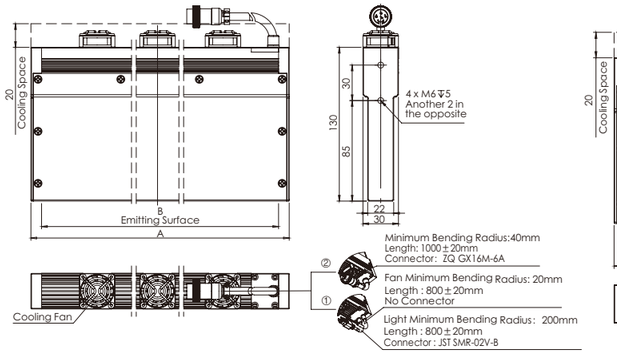
Model Table

No.	Model	Color	* Power	Total Length A (mm)	Emitting Length B (mm)	Connector port	Recommended controller
1	OPT-LSE104	○●●	21.6W@24V	104	86	①	OPT-DPA2024E
2	OPT-LSE104N	○●●	10.8W@24V	104	86	③	
3	OPT-LSE128	●	21.6W@24V	128	110	①	
4	OPT-LSE128N	●	10.8W@24V	128	110	③	
5	OPT-LSE188	○●●	43.2W@24V	188	170	①	
6	OPT-LSE188N	○●●	21.6W@24V	188	170	③	
7	OPT-LSE236	●	43.2W@24V	236	218	①	
8	OPT-LSE236N	●	21.6W@24V	236	218	③	
9	OPT-LSE272	○●●	72W@3A	272	254	②	OPT-DPA6024E
10	OPT-LSE272N	○●●	32.4W@24V	272	254	③	OPT-DPA2024E
11	OPT-LSE344	●	72W@3A	344	326	②	OPT-DPA6024E
12	OPT-LSE344N	●	32.4W@24V	344	326	③	OPT-DPA2024E
13	OPT-LSE356	○●●	96W@4A	356	338	②	OPT-DPA6024E
14	OPT-LSE356N	○●●	43.2W@24V	356	338	③	OPT-DPA2024E

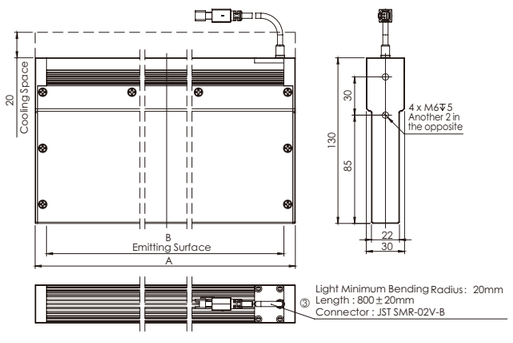
Notes: * The data above is for reference only.

Dimensions (mm)

1. Dimensions diagram with fan



2. Fanless dimension diagram



High Intensity Spot Lights OPT-PIG Series



Product Features

Main Features

- A special light guide tube is used at the light exit, achieving an illuminance of up to 2,000,000 lux for the PIG0805-W at a working distance of 20mm.
- Combined with concentrating module as front light
- Efficient heat dissipation design for effective control of the light source temperature

Application Cases

- Pitch gauging for connectors
- Screw surface inspection
- Capacitor surface inspection
- Solder joints inspection

Selection Guide

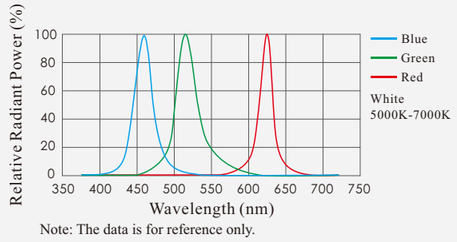
OPT-PIG0803
- Rated power
- Emitting surface diameter
- High intensity spot light
- Brand name

Customizable Items



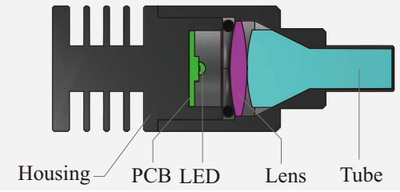
Color | Mounting | Size | Heat dissipation | Uniformity

Spectrum Chart



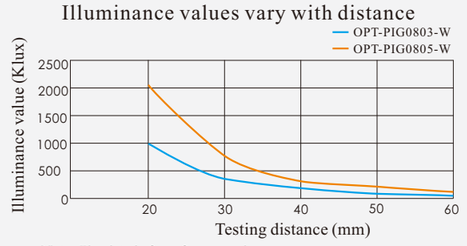
Note: The data is for reference only.

Section Structure Drawing



Series features

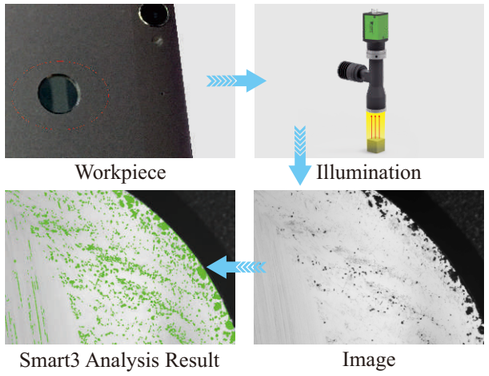
Illuminance values vary with distance



Note: The data is for reference only.

Application Cases

Surface defects detection for fingerprint scanners



Workpiece | Illumination | Smart3 Analysis Result | Image

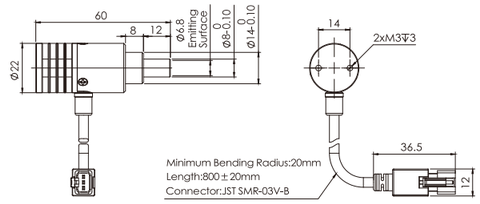
参数表

No.	Model	＊Power 🔴	＊Power ⚪	＊Power 🔵	＊Power 🟢	Recommended controller
1	OPT-PIG0803	2.1W@0.8A	2.7W@0.8A	2.5W@0.8A	2.4W@0.8A	OPT-DPA2005E
2	OPT-PIG0805	3.8W@1.3A	4.6W@1.3A	4.4W@1.3A	4.2W@1.3A	

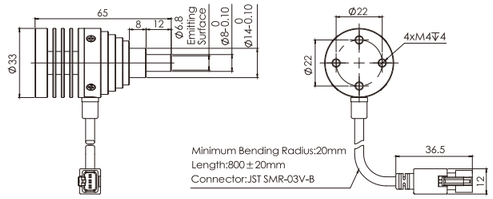
Notes: ＊The data above is for reference only.

Dimensions (mm)

1. OPT-PIG0803



2. OPT-PIG0805

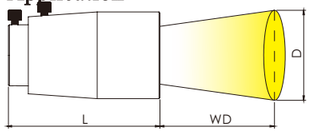


Accessory

OPT-PPIG27 Concentrating Module



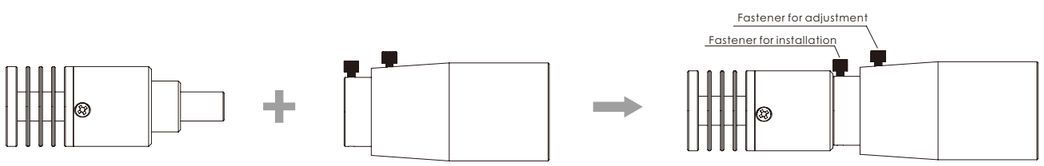
Application



Parameters (mm)										
Working distance (WD)	100	200	300	400	500	600	700	800	900	1000
Accessory length (L)	67	64	62	61	60.7	60.4	60	59.8	59.5	59
＊Spot diameter (D)	15	30	50	67	85	105	120	140	160	180

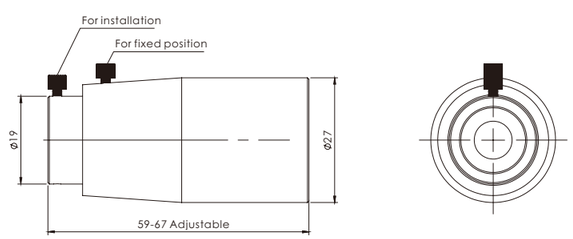
Notes: 1.The data above is tested with OPT-PIG0803,OPT-PIG0805 mounted with the module.
2. Recommended working distance: 100-000mm
＊3. The test data is for reference only.

Mounting



Dimensions (mm)

OPT-PPIG27



Collimated Spot Lights OPT-LDS Series



Product Features

Main Features

- The irradiation distance and area can be flexibly customized.
- Covering three emission angles of 15°, 30°, and 45°, the working spot area is larger.

Application Cases

- Outline gauging
- Surface scratches detection

Selection Guide

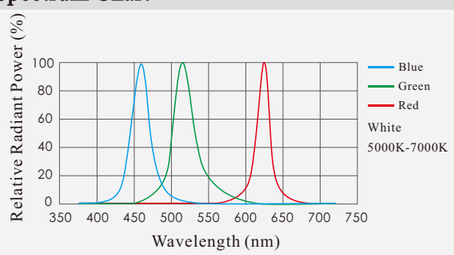
OPT-LDS 50-A15
- 50 → Emission angle
- A → Outer diameter
- 15 → Collimated spot light
- OPT-LDS → Brand name

Customizable Items



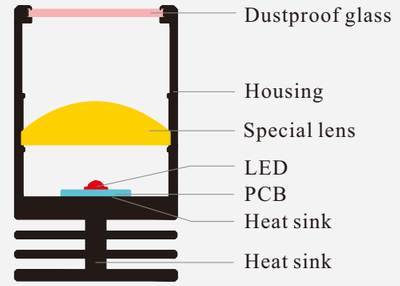
Color | Mounting | Connector | Size

Spectrum Chart



Note: The data is for reference only.

Section Structure Drawing



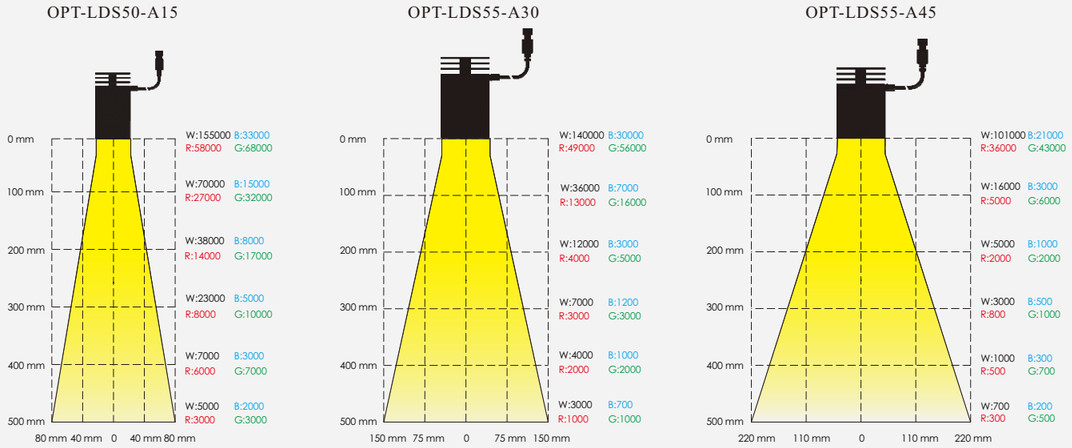
Application Cases

- Gauging for metal parts



Series Features

Spot effect and illuminance values at different working distances



Note:
1.Illuminance unit: lux.
2.The above data are measured illuminance values at different distances.
3.The light spot is circular in shape. The data provided are for reference only; actual results may vary.

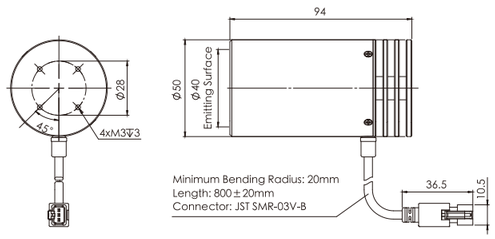
Model Table

NO.	Model	Emission angle	∗Power○	∗Power🔴	∗Power🟢	∗Power🔵	Recommended controller
1	OPT-LDS50-A15	15°	3.6W@1.2A	4.5W@1.2A	4.3W@1.2A	4.5W@1.2A	OPT-DPA2005E
2	OPT-LDS55-A30	30°					
3	OPT-LDS55-A45	45°					

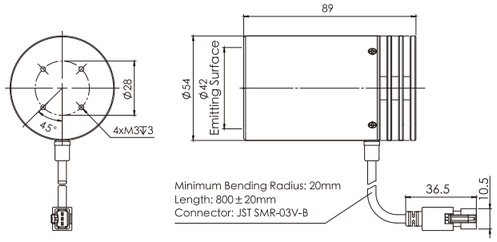
∗ Note: The data is for reference only.

Dimensions (mm)

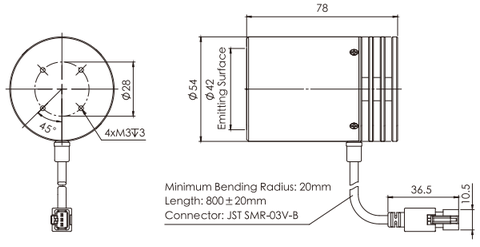
1. OPT-LDS50-A15



2. OPT-LDS55-A30



3. OPT-LDS55-A45



Digital Fiber Spot Lights OPT-DOF Series



Product Features

Main Features

- Up to 4000 kLux @ WD 20 mm
- Integrated light and control circuit design
- Ethernet and RS232 interfaces
- Application as a substitute for halogen lamps + optical fibers.

Application Cases

- Medical illumination
- Semiconductor equipment
- General industrial illumination
- Battery electrode burr detection

Selection Guide

OPT - DOF 1000 CF -W
- Color
- Color wheel
- Illuminance level
- Digital fiber spot light
- Brand name

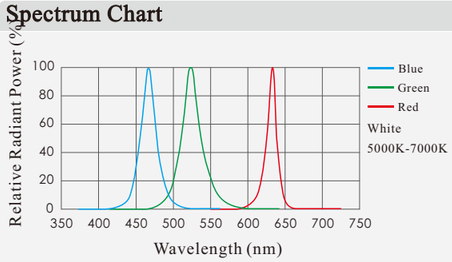
Customizable Items



Fiber length

Fiber emitting surface diameter

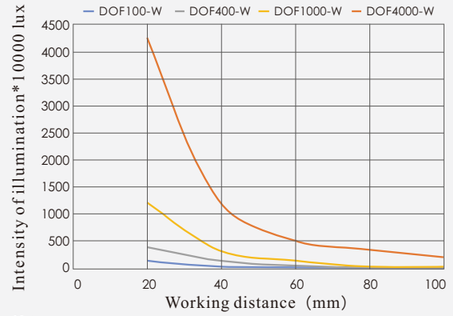
Spectrum Chart



Note: The Red, Green, Blue in the diagram refer to red, green, blue light of DOF100 and DOF1000. The data is for reference only.

Series Features

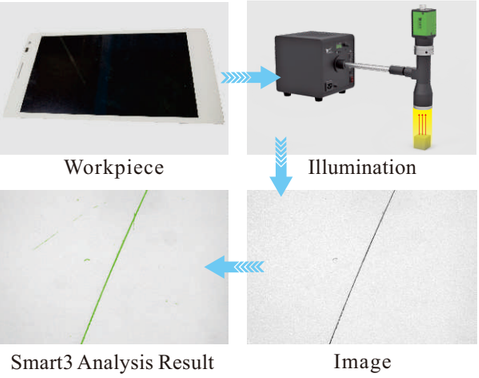
Illuminance versus working distance



Note:
At a working distance of 20mm:
DOF4000-W achieves an illuminance of over 40,000,000 lux.
DOF1000-W achieves an illuminance of over 10,000,000 lux.
DOF400-W achieves an illuminance of over 4,000,000 lux.
DOF100-W achieves an illuminance of over 1,500,000 lux.
Illuminance data measured using OPT 1-meter optical fiber, with a core diameter of 6.5mm, and brightness set to 255 for reference only.
Different light sources require matching optical fibers with different temperature resistance grades and should not be mixed. Please refer to P284 of the parameter table for specific details under "Compatible Optical Fiber Models".

Application Cases

- Mobile phone LCD screen defects detection

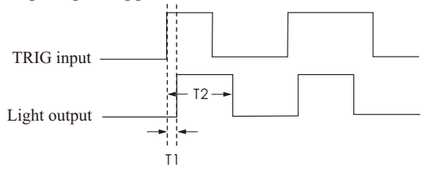


Specifications

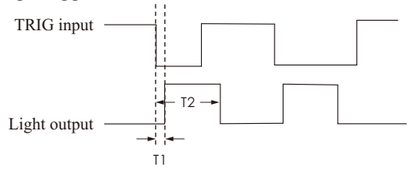
Item	Parameter				Instructions
	DOF100	DOF400	DOF1000	DOF4000	
Power consumption	10W	140W	240W	300W	
Color	White, red, green, blue	White	White, red, green, blue	White	
Input voltage	AC100-240V				50/60 Hz
Light intensity	Adjustable brightness in 256 levels				
Short circuit protection	Yes				When the controller output is short-circuited, the corresponding channel's short-circuit protection is activated. It will turn off the respective channel and display an "ER2" error message on the digital display.
Overcurrent protection	Yes				When the current output of a corresponding channel from the controller exceeds 110% of the set value, the overcurrent protection of that channel is triggered. Which this shut down the respective channel and display an "ER1" error message on the digital display.
Trigger mode	Polarity trigger				Rising edge trigger Falling edge trigger
	Level trigger				High level: 5-24V Low level: 0-2V
Trigger mode	Brightness can be set in 256 levels				The values can be set using the DEMO software and encoder. Common trigger time units can only be set via the DEMO software.
Common triggering methods	1μs-30s				
Response time	≤20 μs	≤15 μs	≤25 μs	≤25 μs	
Trigger frequency	20 KHz	50 KHz	15 KHz	15 KHz	
Normal trigger pulse width	0.01-5.00 ms				Can be set via DEMO software and encoder
Hi-Pot test	AC1500V 1 Min				Leakage current < 10 mA
Insulation	DC500V				Insulation resistance > 20 MΩ
Operating temperature	-5℃~50℃				
Programmable trigger	Yes				Brightness and pulse width are both adjustable.
Communication	RS232/Ethernet				
Dimensions (mm)	124×118×178	164×178×186	204×227×233	215×224×192	Please refer to the dimensional diagram for details.
Weight (kg)	1.5kg	3.5kg	6.5kg	5.5kg	±0.3 kg (excluding the weight of the optical fiber)
Compatible optical fiber models	OPT-POF1M-S8-T200 OPT-POF2M-S8-T200 OPT-POF3M-S8-T200		OPT-POF1M-S8-T300 OPT-POF2M-S8-T300 OPT-POF3M-S8-T300	OPT-POF1M-S8-T700 OPT-POF2M-S8-T700 OPT-POF3M-S8-T700	This light source does not include optical fibers and must be ordered separately. (Different light sources require matching optical fibers with different temperature resistance grades and should not be mixed.)

Response Time and Sequence

Rising edge trigger



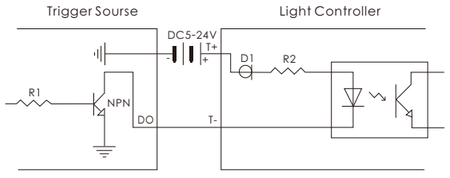
Falling edge trigger



T1 is the response time for turning on, and T2 is the trigger pulse width. Specifically, for different light sources:DOF400 light source has T1 ≤ 15us, DOF100 light source has T1 ≤ 20us,space DOF1000 light source has T1 ≤ 25us,and DOF1000CF light source has T1 ≤ 25us,DOF4000 light source has T1 ≤ 25us. T2 can be set within a range from 1us to 30s.

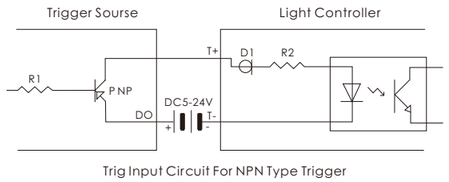
Trigger Wiring Reference

(1)NPN Wiring



Trig Input Circuit For NPN Type Trigger

(2)PNP Wiring



Trig Input Circuit For NPN Type Trigger

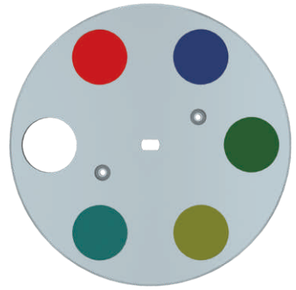
T1 is the response time for turning on, and T2 is the trigger pulse width. Specifically, for different light sources:DOF400 light source has T1 ≤ 15us, DOF100 light source has T1 ≤ 20us,DOF1000 light source has T1 ≤ 25us,DOF1000CF light source has T1 ≤ 25us,DOF4000 light source has T1 ≤ 25us. T2 can be set within a range from 1us to 30s.

Model equipped with a color wheel: OPT-DOF1000CF

By using the color wheel assembly, it is possible to achieve light switch in different colors on a single device.

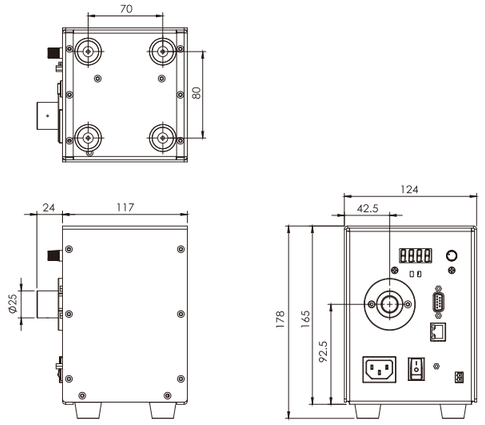
1. Standard equipped with five-color filters, colors can be customized according to specific requirements (white light pass-through hole without filters).
2. Color switching can be achieved via Ethernet/serial communication (color switch speed between adjacent colors is 1.2s).

- Red (620-660 nm)
- Blue (450-490 nm)
- Green (510-550 nm)
- Yellow (550-590 nm)
- Cyan (530-570 nm)

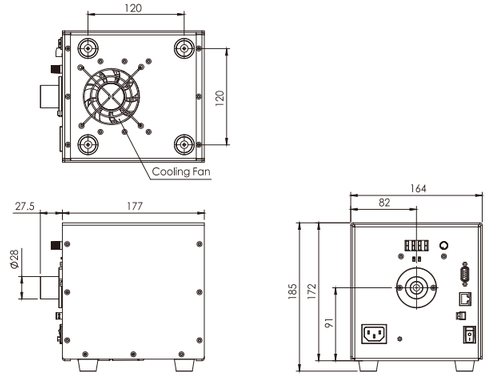


Dimensions (mm)

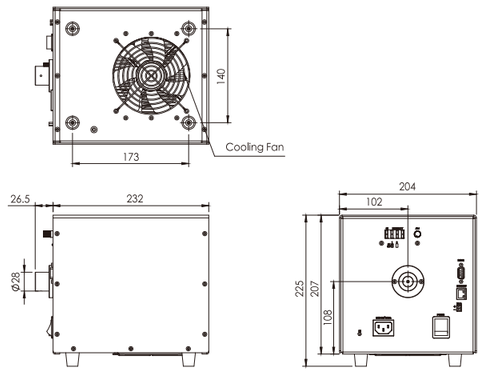
OPT-DOF100



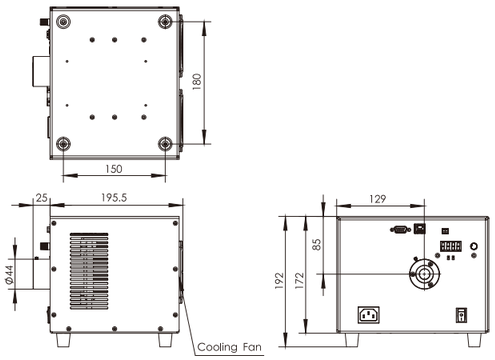
OPT-DOF400



OPT-DOF1000/OPT-DOF1000CF



OPT-DOF4000



Optical Fiber

1.Selection Guide

OPT-POF 1M-S 8-T200

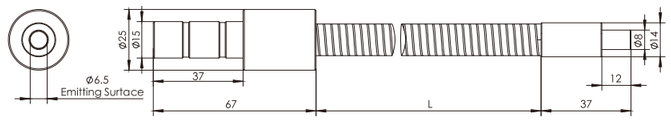
- Fiber temperature resistance
- Light exit dimensions
- Fiber shape: L-shaped, R-shaped, S-shaped
- Fiber length
- Optical fiber
- Brand name

2.Model Table

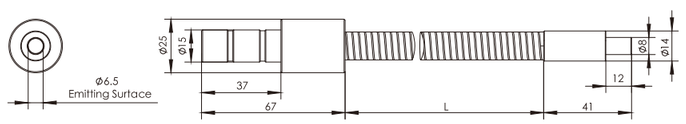
No.	Model	Length(M)	Temperature resistance(℃)
1	OPT-POF1M-S8-T200	1	200
2	OPT-POF2M-S8-T200	2	
3	OPT-POF3M-S8-T200	3	
4	OPT-POF1M-S8-T300	1	300
5	OPT-POF2M-S8-T300	2	
6	OPT-POF3M-S8-T300	3	
7	OPT-POF1M-S8-T700	1	700
8	OPT-POF2M-S8-T700	2	
9	OPT-POF3M-S8-T700	3	

3. Optical Fiber Dimensional Diagram

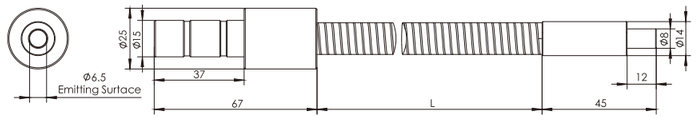
OPT-POFL-S8-T200



OPT-POFL-S8-T300



OPT-POFL-S8-T700



Structured Lights OPT-SL/OPT-SLS Series

Patented



OPT-SL Direct Structured Lights

Product Features

Main Features

- Compatible with all C-Mount lenses. Adjustable back focal length, without requiring additional adapter rings
- Uniform pattern with sharp edge, high illumination accuracy
- Perpendicular to the measured surface (For tilt illumination, please refer to OPT-SLS).

Application Cases

- 3D analysis and reconstruction
- Gauging for objects with complex structures or bevels
- Gauging for electronic components
- Checking the flatness of products
- Pick and place with robot

Selection Guide

OPT-SL03

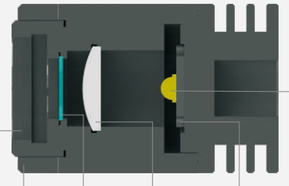
- Power
- Direct structured light
- Brand name

Customizable Items

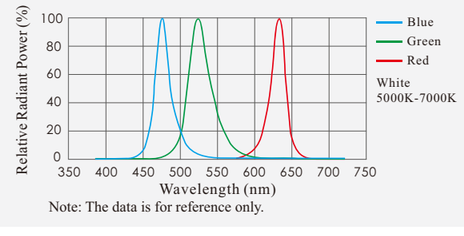


Color, Mounting, Size, Power

Section Structure Drawing



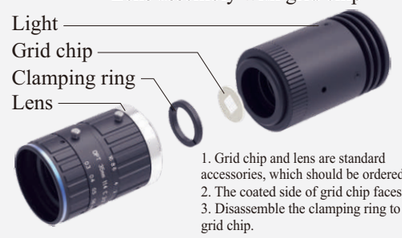
Spectrum Chart



Note: The data is for reference only.

Series Features

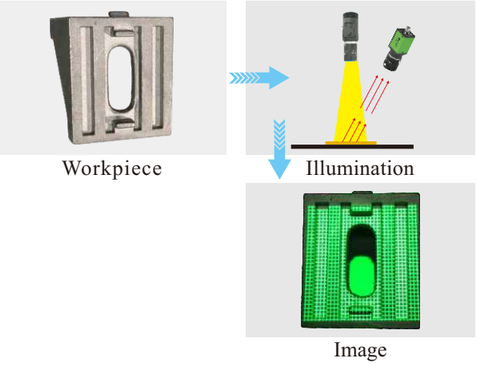
Lens assembly with grid chip



1. Grid chip and lens are standard accessories, which should be ordered separately.
2. The coated side of grid chip faces the lens.
3. Disassemble the clamping ring to replace the grid chip.

Application Cases

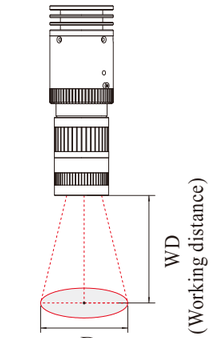
- Height gauging for metal parts



Lens and spot size

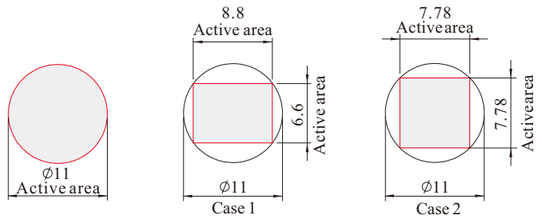
Lens Model	Working Distance (WD)						
	50mm	100mm	150mm	200mm	300mm	400mm	500mm
	Light Spot Size (mm)						
OPT-C0825-5M	90	160	220	280	420	460	–
OPT-C1216-5M	70	110	160	200	290	380	490
OPT-C1614-5M	–	90	120	150	220	300	360
OPT-C2514-5M	–	–	70	100	140	170	210
OPT-C3514-5M	–	–	–	–	100	130	160

Notes:1. The data is tested with OPT-SL03 and OPT-SL10, which is for reference only.
2. The light is also compatible with other C-Mount lenses with 2/3" image circle.



Customization for Grid Chip

Grid chip active area



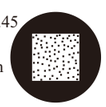

OPT-PGS-L-0.05
Spec.: Line
Line width: 0.05mm


OPT-PGS-G-0.05-0.45
Spec.: Grid
Line width: 0.05mm
Line gap: 0.45mm


OPT-PGS-G-0.05
Spec.: Cross
Line width: 0.05mm


OPT-PGS-R-0.05-0.15
Spec.: Round
Line width: 0.05mm
Line gap: 0.15mm


OPT-PGS-L-0.05-0.45
Spec.: Stripe
Line width: 0.05mm
Line gap: 0.45mm


OPT-PGS-D-0.05-0.3
Spec: point cloud grid
Shape: random square point cloud
Side length of square point: 0.05mm
Area proportion of square point: 30%

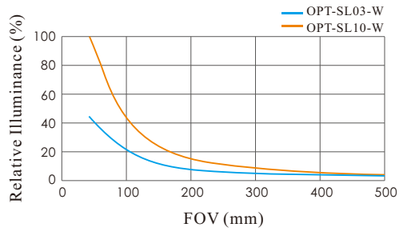
1. Grid chip accuracy can be ≤2μm.
2. Grid chip is customizable with provided precise geometric parameters.
3.The minimum line width and line spacing of grid can be as low as 0.02mm.

Illuminance

Model	Illuminance (Unit:100 Lux)	Model	Illuminance (Unit:100 Lux)
OPT-SL03-R	120	OPT-SL10-R	280
OPT-SL03-G	130	OPT-SL10-G	320
OPT-SL03-B	170	OPT-SL10-B	510
OPT-SL03-W	330	OPT-SL10-W	700

Note: The data is obtained with the 25mm focal length lens (F#=1.4, WD=100mm) and no grid chip. It is for reference only.

Relative Illuminance Comparison



Note: The data is obtained in the same testing conditions. It is for reference only.

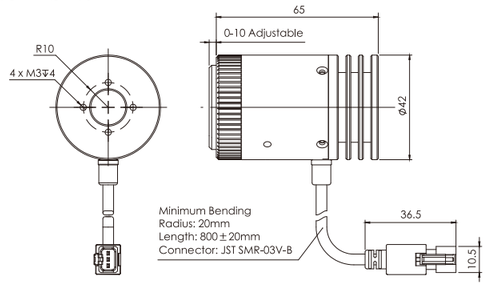
Model Table

No.	Model	＊Power●	＊Power○●●●	Recommended controller
1	OPT-SL03	2.6W@1A	3.5W@1A	OPT-DPA2005E
2	OPT-SL10	7.4W@0.7A	9.1W@0.7A	OPT-DPA2012E

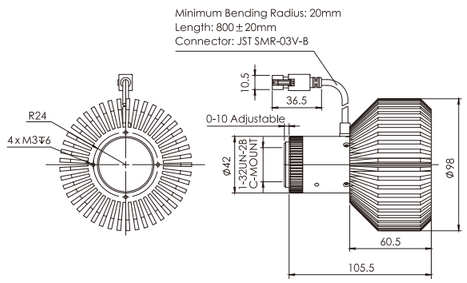
＊Note: The data is for reference only.

Dimensions (mm)

1.OPT-SL03

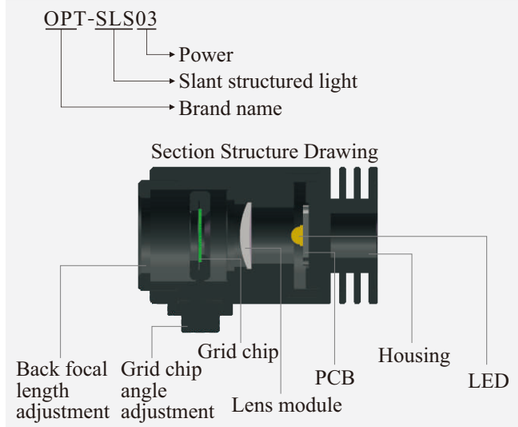


2.OPT-SL10



OPT-SLS Slant Structured Lights

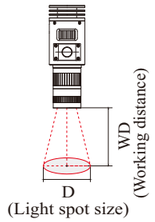
Selection Guide



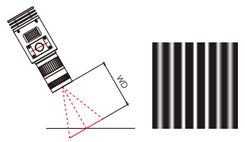
Lens and Spot Size

Lens Model	Working Distance (WD)						
	50mm	100mm	150mm	200mm	300mm	400mm	500mm
	Light Spot Size (mm)						
OPT-C0825-5M	60	115	160	210	300	390	480
OPT-C1216-5M	45	75	105	140	205	270	335
OPT-C1614-5M	40	65	90	115	160	210	260
OPT-C2514-5M	20	35	45	65	95	125	160
OPT-C3514-5M	-	25	35	50	70	90	115

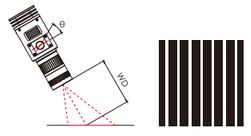
Above test data is obtained with OPT-SLS03 and OPT-SLS10 at zero grid chip angle.



Instructions



Only partial features can be focused when the grid chip is not adjusted.



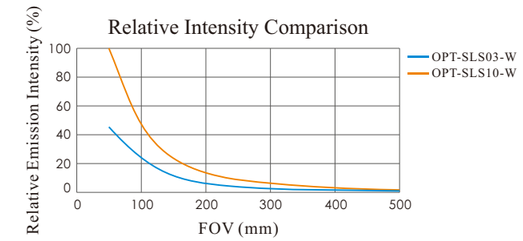
All the features can be focused after adjusting the grid chip.
(Adjustment range: ⩽ 45 degrees)

Model Table

No.	Model	＊Power●	＊Power○●●●	Recommended controller
1	OPT-SLS03	2.6W@1A	3.5W@1A	OPT-DPA2005E
2	OPT-SLS10	7.4W@0.7A	9.1W@0.7A	OPT-DPA2012E

＊Note: The data is for reference only.

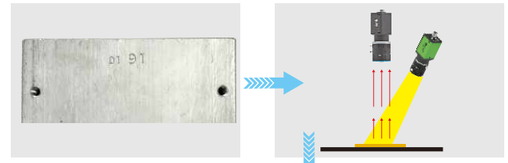
Relative Intensity Comparison



Note: The test data is obtained at zero grid chip angle. It is for reference only.

Application Cases

Character depth inspection on metal surface



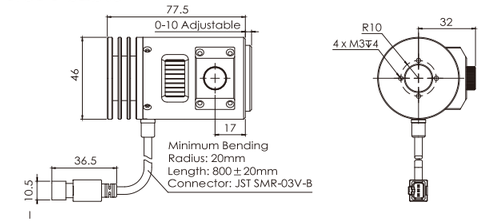
Illuminance

Model	Illuminance (Unit: 100 Lux)	Model	Illuminance (Unit: 100 Lux)
OPT-SLS03-R	100	OPT-SLS10-R	180
OPT-SLS03-G	90	OPT-SLS10-G	210
OPT-SLS03-B	130	OPT-SLS10-B	300
OPT-SLS03-W	250	OPT-SLS10-W	650

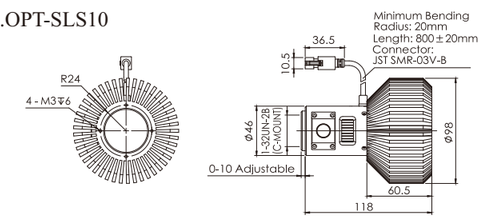
Note: The data is obtained with the 25mm focal length lens (F#=1.4, WD=100mm) and no grid chip. It is for reference only.

Dimensions (mm)

1.OPT-SLS03



2.OPT-SLS10



Diffuse Dark Field Ring Lights OPT-RIF Series



Product Features

Main Features

- Suitable for large round and small irregular objects
- Higher uniformity compared with OPT-RI series
- Providing uniform and shadowless illumination
- Suitable for multiple applications at different working distances

Application Cases

- Surface defects detection
- OCR, logos, barcodes and fingerprints recognition

Selection Guide

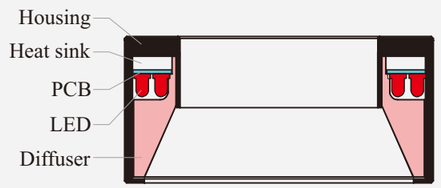
OPT-RIF88
- Outer diameter
- Diffuse dark field ring light
- Brand name

Customizable Items

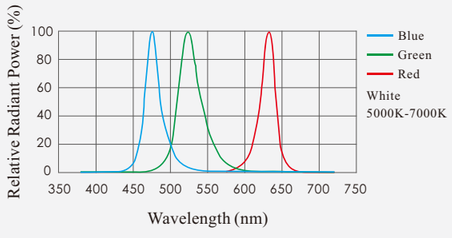


Color | Mounting | Size

Section Structure Drawing



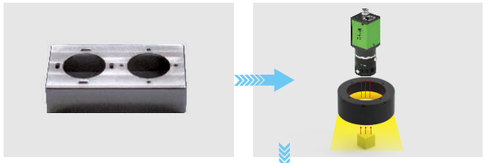
Spectrum Chart



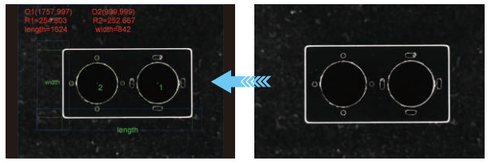
Note: The data is for reference only.

Application Cases

- Dual camera positioning



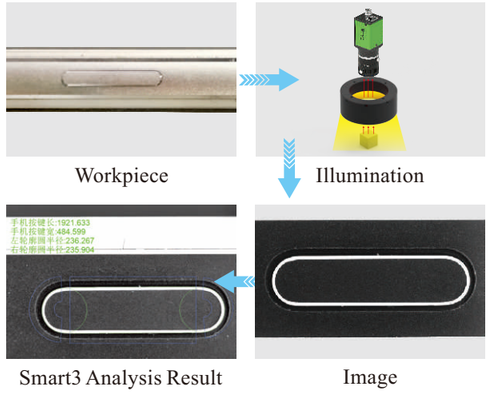
Workpiece | Illumination



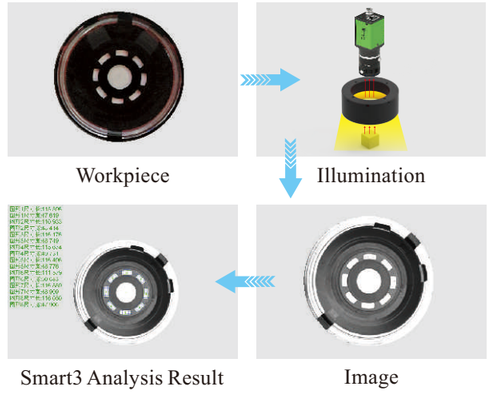
Smart3 Analysis Result | Image

Application Cases

- Gauging for mobile phone button



- Gauging for glass parts



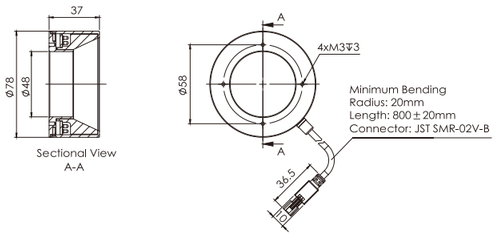
Model Table

No.	Model	＊Power ○	＊Power ●	＊Power ●	＊Power ●	Recommended controller
1	OPT-RIF78	5.8W@24V	4.6W@24V	5.7W@24V	5.8W@24V	OPT-DPA2024E
2	OPT-RIF88	6.5W@24V	5.2W@24V	6.5W@24V	6.7W@24V	
3	OPT-RIF130	9.2W@24V	7.9W@24V	9.1W@24V	9.5W@24V	
4	OPT-RIF160	12.0W@24V	10.8W@24V	11.2W@24V	12.2W@24V	

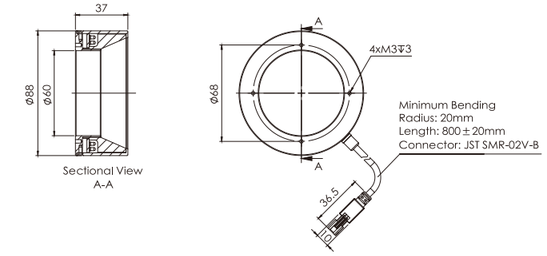
＊Note: The data is for reference only.

Dimensions (mm)

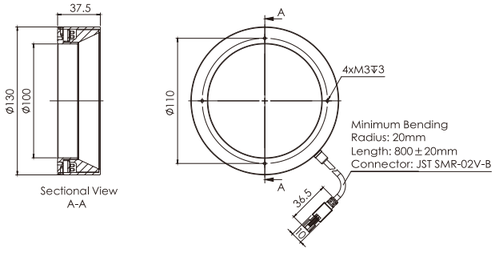
1.OPT-RIF78



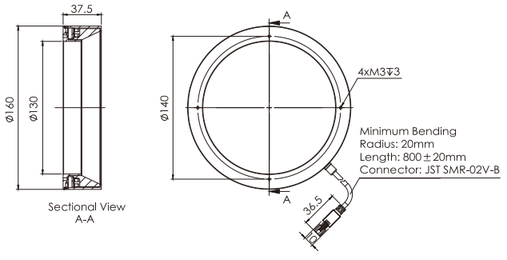
2.OPT-RIF88



3.OPT-RIF130



4.OPT-RIF160



Diffuse Ring Lights OPT-RIE Series



Product Features

Main Features

- Higher uniformity than OPT-RI series ring lights
- Providing uniform illumination for rough surfaces, eliminating stray light and highlighting 3D information
- Equipped with special diffuser that reduces reflections and allows uniform illumination

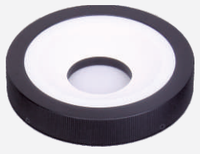
Application Cases

- Positioning and gauging for metal parts
- Detection of surface defects

Selection Guide

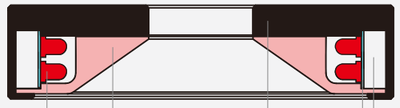
OPT-RIE74
- Outer diameter
- Flat dome ring light
- Brand name

Customizable Items

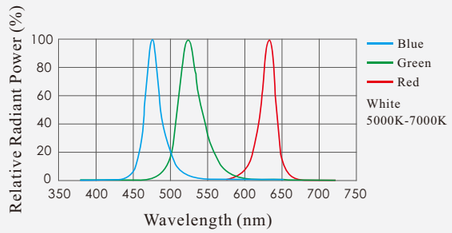


Color | Mounting | Size

Section Structure Drawing



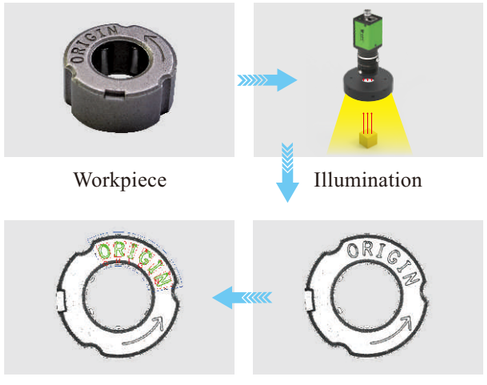
Spectrum Chart



Note: The data is for reference only.

Application Cases

OCR for metal parts

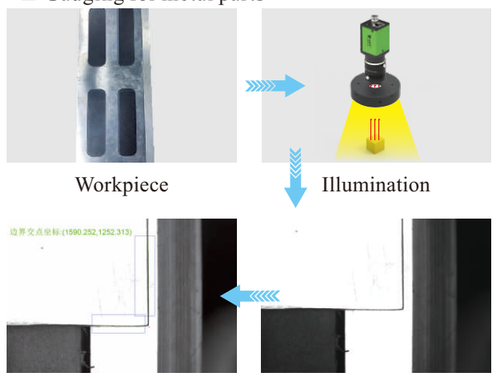


Workpiece | Illumination

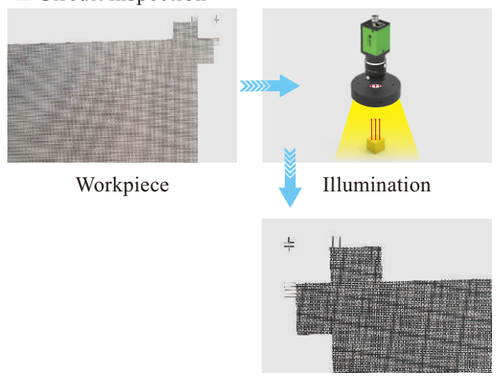
Smart3 Analysis Result | Image

Application Cases

Gauging for metal parts



Circuit inspection



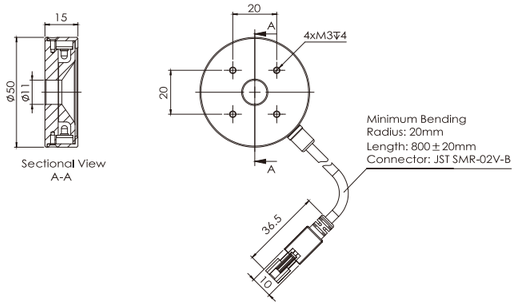
Model Table

No.	Model	∗Power ○	∗Power 🔴	∗Power 🟢	∗Power 🔵	Recommended controller
1	OPT-RIE50	2.3W@24V	1.6W@24V	2.3W@24V	2.0W@24V	OPT-DPA2024E
2	OPT-RIE74	5.0W@24V	4.2W@24V	4.9W@24V	5.0W@24V	
3	OPT-RIE100	6.5W@24V	5.6W@24V	5.3W@24V	6.1W@24V	
4	OPT-RIE150	14.4W@24V	10.8W@24V	11.3W@24V	13.5W@24V	

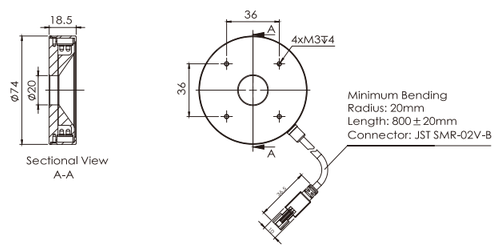
∗ Note: The data is for reference only.

Dimensions (mm)

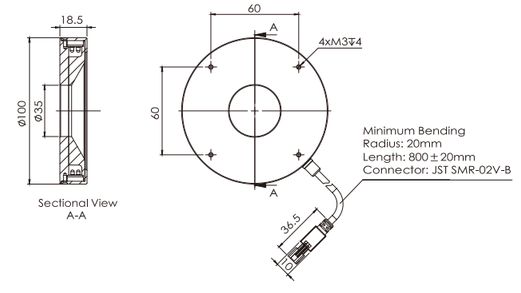
1.OPT-RIE50



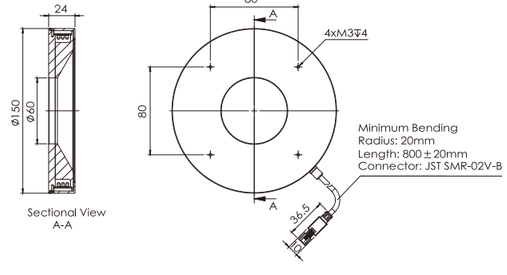
2.OPT-RIE74



3.OPT-RIE100

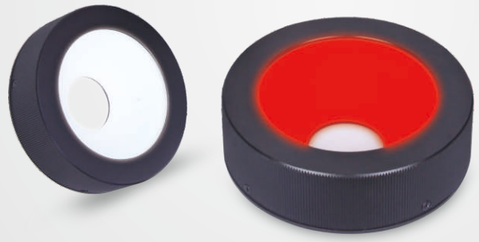


4.OPT-RIE150



Diffuse Ring Lights

OPT-RIW Series



Product Features

Main Features

- Uniform illumination of objects with multiple angles of inclination, eliminates differences caused by the different angles of reflection.
- Equipped with special diffuser to ensure diffuse and uniform illumination

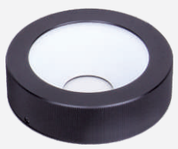
Application Cases

- Electronic parts Inspection
- Parts alignment
- OCR
- OMM

Selection Guide

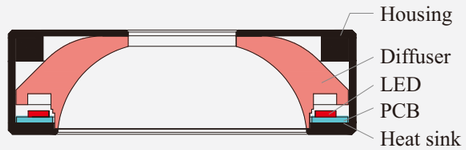
OPT-RIW90
- Outer diameter
- Diffuse ring light
- Brand name

Customizable Items

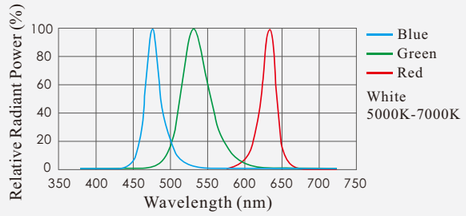


Color | Mounting | Size

Section Structure Drawing



Spectrum Chart



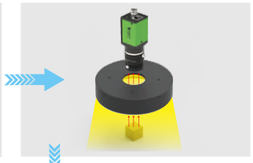
Note: The data is for reference only.

Application Cases

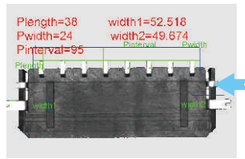
- Adaptor pin inspection



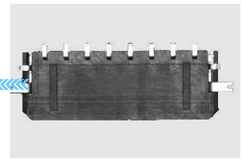
Workpiece



Illumination



Smart3 Analysis Result



Image

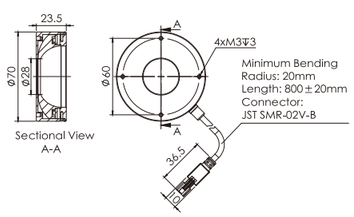
Model Table

No.	Model	∗Power ○	∗Power 🔴	∗Power 🟢	∗Power 🔵	Recommended controller
1	OPT-RIW70	6.0W@24V	4.1W@24V	4.0W@24V	8.8W@24V	OPT-DPA2024E
2	OPT-RIW90	7.9W@24V	5.3W@24V	5.0W@24V	8.8W@24V	
3	OPT-RIW120	11.5W@24V	8.4W@24V	7.9W@24V	13.4W@24V	

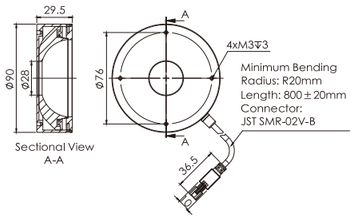
∗ Note: The data is for reference only.

Dimensions (mm)

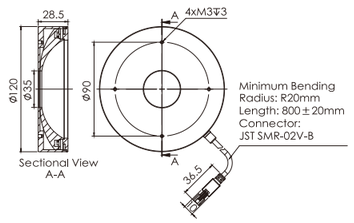
1.OPT-RIW70



2.OPT-RIW90

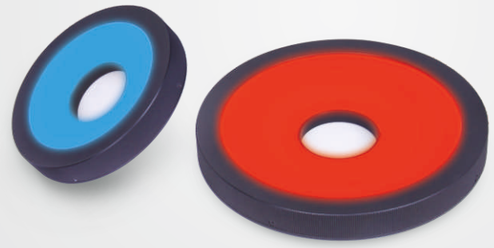


3.OPT-RIW120



Diffuse Front Ring Lights

OPT-RIU Series



Product Features

Main Features

- Effective elimination of reflections caused by complex small objects.
- Special diffuser for uniform and shadowless illumination

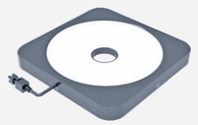
Application Cases

- OCR and patterns on reflective surfaces Inspection
- Electronic parts and glass products Inspection
- Stamping parts Inspection
- Injection Inspection molding parts

Selection Guide

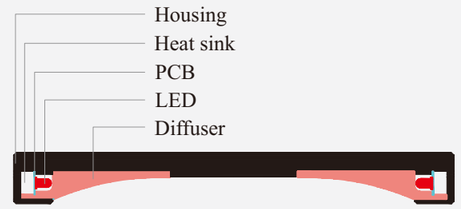
OPT-RIU114
- Outer diameter
- Diffuse front ring light
- Brand name

Customizable Items

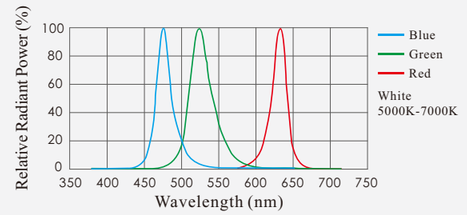


Color | Mounting | Size

Section Structure Drawing



Spectrum Chart



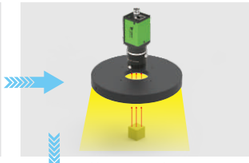
Note: The data is for reference only.

Application Cases

- Gear defects detection



Workpiece



Illumination



Smart3 Analysis Result



Image

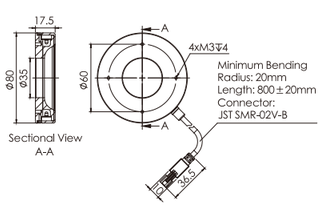
Model Table

No.	Model	∗Power ○	∗Power 🔴	∗Power 🟢	∗Power 🔵	Recommended controller
1	OPT-RIU80	3.2W@24V	2.3W@24V	3.5W@24V	3.6W@24V	OPT-DPA2024E
2	OPT-RIU114	5.2W@24V	3.5W@24V	4.7W@24V	5.6W@24V	
3	OPT-RIU150	6.5W@24V	4.6W@24V	6.0W@24V	7.4W@24V	

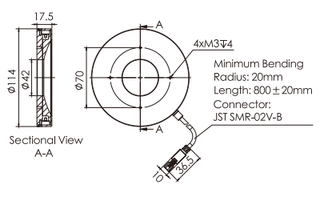
∗ Note: The data is for reference only.

Dimensions (mm)

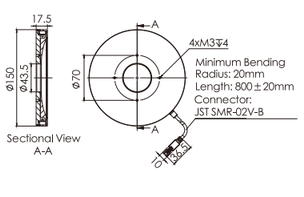
1.OPT-RIU80



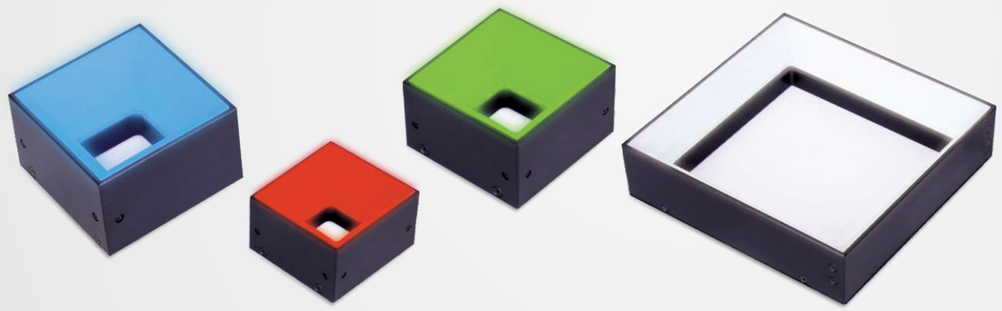
2.OPT-RIU114



3.OPT-RIU150



Diffuse Dark Field Square Lights OPT-RIH Series



Product Features

Main Features

- Uniform and shadowless illumination from four directions
- For the use on irregular rectangular targets
- Suitable for multiple applications at different working distances

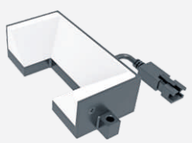
Application Cases

- Detection of surface defects
- OCR, logos, barcodes, and fingerprints recognition

Selection Guide

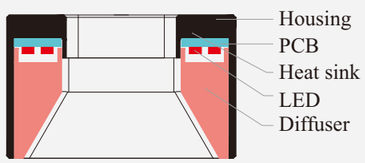
OPT-RIH48
- Length
- Diffuse dark field square light
- Brand name

Customizable Items

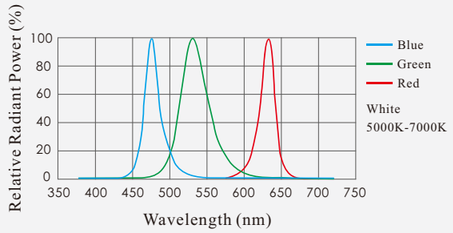


Color | Mounting | Size | Sectional control

Section Structure Drawing



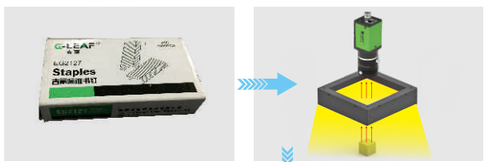
Spectrum Chart



Note: The data is for reference only.

Application Cases

- Packaging box surface inspection



Workpiece | Illumination



Smart3 Analysis Result | Image

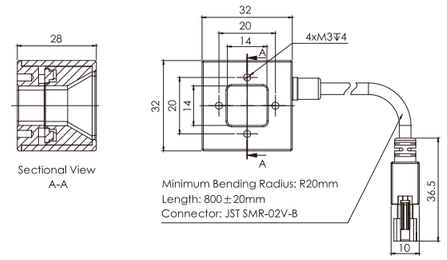
Model Table

No.	Model	∗Power ○	∗Power ●	∗Power ●	∗Power ●	Recommended controller
1	OPT-RIH32	2.4W@24V	1.7W@24V	2.1W@24V	2.5W@24V	OPT-DPA2024E
2	OPT-RIH48	4.4W@24V	3.3W@24V	4.3W@24V	4.7W@24V	
3	OPT-RIH118	11.2W@24V	9.7W@24V	10.8W@24V	12.1W@24V	
4	OPT-RIH150	12.9W@24V	9.5W@24V	15.2W@24V	13.1W@24V	
5	OPT-RIH9585	8.7W@24V	7.5W@24V	7.6W@24V	9.5W@24V	
6	OPT-RIH12570	10.3W@24V	8.7W@24V	8.2W@24V	11.4W@24V	

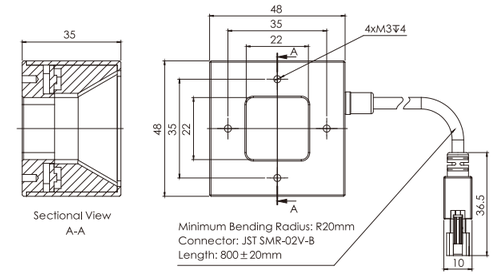
∗ Note: The data is for reference only.

Dimensions (mm)

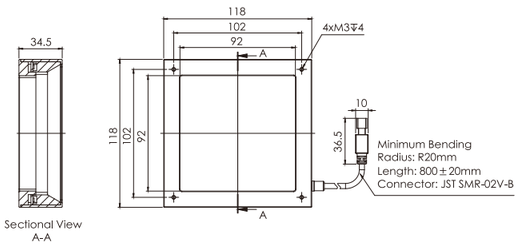
1.OPT-RIH32



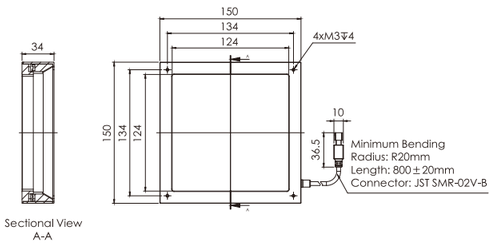
2.OPT-RIH48



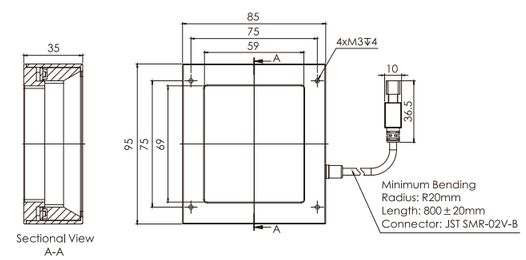
3.OPT-RIH118



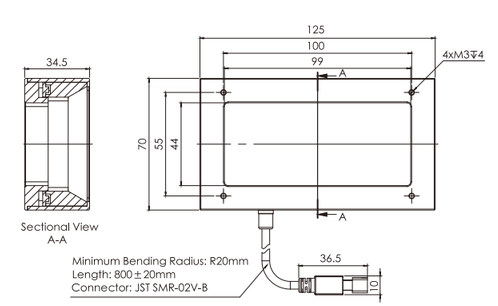
4.OPT-RIH150



5.OPT-RIH9585



6.OPT-RIH12570



Bright Uniform Ring Lights OPT-RIP Series



Product Features

Main Features

- Use of high opacity diffuser, which guarantees high light intensity and shadow-free illumination effect.

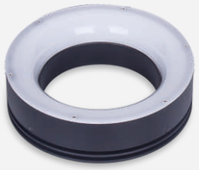
Application Cases

- Electronic components surface inspection
- Detection of contamination on cylindrical inner surfaces

Selection Guide

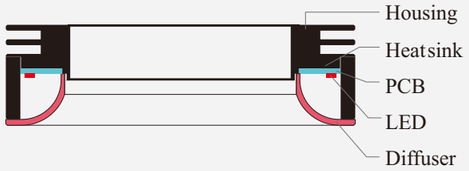
OPT-RIP120
- 120 → Outer diameter
- RIP → Bright uniform ring light
- OPT → Brand name

Customizable Items

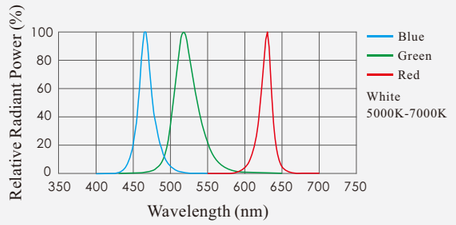


Color | Mounting | Size | Zoned control

Section Structure Drawing



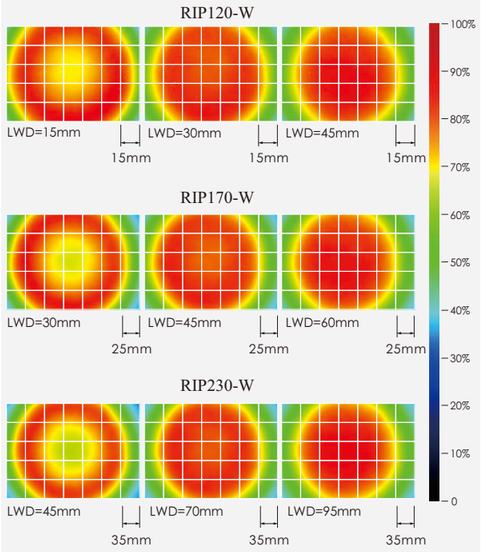
Spectrum Chart



Note: The data is for reference only.

Series Features

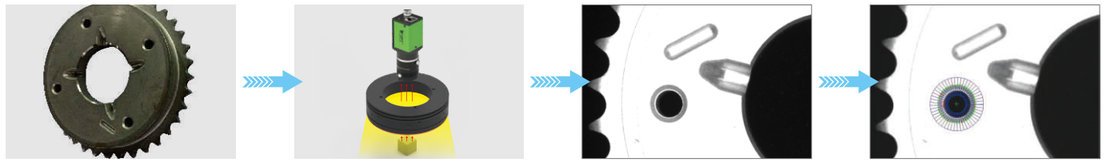
Relative Radiant Power Distribution



Note: The data is for reference only.

Application Cases

- Gear surface inspection



Workpiece | Illumination | Image | Smart3 Analysis Result

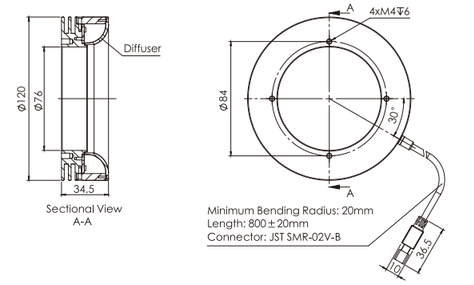
Model Table

No.	Model	* Power ○	* Power 🔵	* Power 🟢	* Power 🔴	Recommended controller
1	OPT-RIP120	13W@24V	13.4W@24V	9.6W@24V	11.6W@24V	OPT-DPA2024E
2	OPT-RIP170	19.9W@24V	20.6W@24V	17W@24V	15.1W@24V	
3	OPT-RIP230	26W@24V	27.4W@24V	22.3W@24V	20.4W@24V	

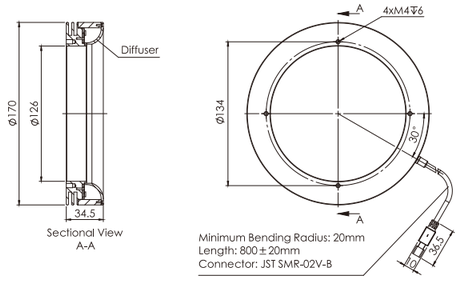
* Note: The data is for reference only.

Dimensions (mm)

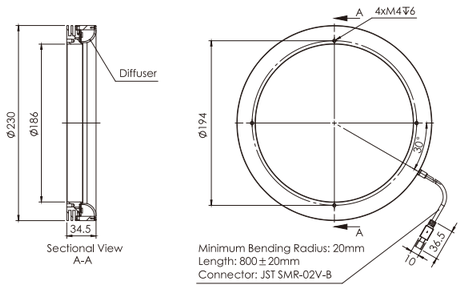
1. OPT-RIP120



2. OPT-RIP170



3. OPT-RIP230



Multi-Spectrum Shadowless Ring Light OPT-RIPM Series



Product Description

Main Features

- Including 8 wavelengths, such as 405nm(UV), 475nm(B), 530nm(G), 590nm(orange), 660nm(R), 850nm(NIR).
- Each waveband uniformly distributes in four regions; each waveband in each region can be controlled separately.
- Suitable for complex applications such as color recognition and extraction of 3D information from surfaces of an object.

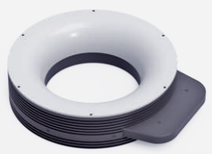
Application Cases

- Quality control of food and medicine
- Control of color differences on packages characters recognition on reflective and transparent packages
- Detection of reflective, textured, irregular objects
- 3D defect detection (Photometric Stereo)
- Detection of contours of transparent objects

Selection Guide

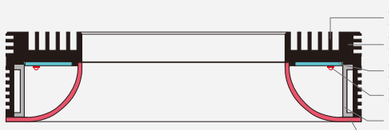
OPT-RIPM 175
- 175 → Outer diameter
- RIPM → Multi-Spectrum Shadowless Ring Light
- OPT → Brand name

Customizable Items



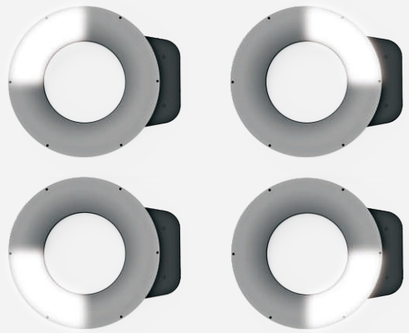
Color | Mounting | Size | Heat dissipation

Section Structure Drawing



Series Features

Local control



Four areas are evenly distributed and include 8 colors each

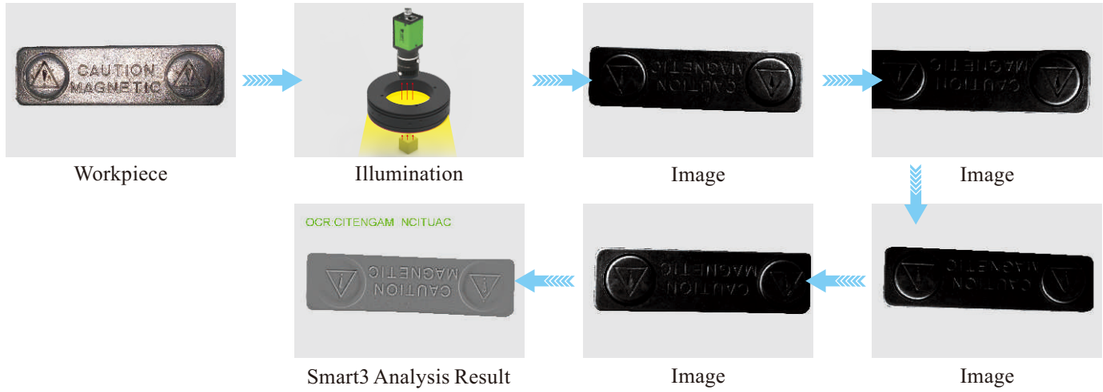
Wavelength control



Each color can be controlled separately depending on the application.

Application Cases

Gear surface inspection



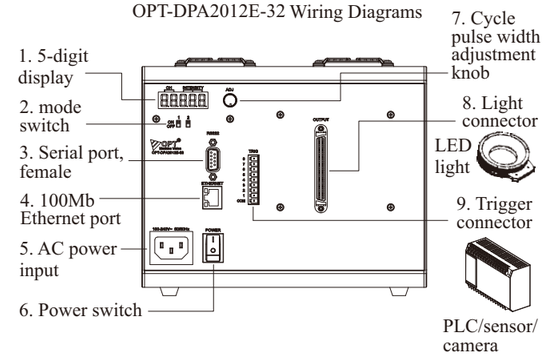
Model Table

No.	Model	central wavelength	* Power	Recommended controller
1	OPT-RIPM135-8C	405nm	8W	OPT-DPA2012E-32-135
		460nm	8W	
		530nm	8W	
		590nm	10W	
		660nm	16W	
		730nm	16W	
		850nm	16W	
		3000K	8W	
2	OPT-RIPM175-8C	405nm	16W	OPT-DPA2012E-32-175
		460nm	16W	
		530nm	16W	
		590nm	10W	
		660nm	16W	
		730nm	16W	
		850nm	16W	
		3000K	16W	
3	OPT-RIPM275-8C	405nm	24W	OPT-DPA2012E-32-275
		460nm	24W	
		530nm	24W	
		590nm	20W	
		660nm	32W	
		730nm	32W	
		850nm	32W	
		3000K	24W	

* Multicolor lights are not supported at the same time.
* Note: The data is for reference only.

Controller wiring instructions

OPT-DPA2012E-32 Wiring Diagrams



Device Overview

No.	Item	Description
1	5-digit display	Current operation channels:1st and 2nd bits from left, corresponding values: 3th, 4th and 5th bits.
2	working mode switch	Switching function
3	Serial port, female	Communication with PC via the RS232 interface
4	100Mb Ethernet port	Communication with PC via the Ethernet interface
5	AC power input	100 - 240 VAC, 50/60Hz
6	Power switch	Turns on/off the controller
7	Cycle pulse width adjustment knob	Press the knob, the flashing digit is selected; press it again, the next digit is selected; turn the knob clockwise to increase the value and counterclockwise to decrease the value.
8	Light connector	Connect with Multi-Spectrum Ring Shadowless Light
9	Trigger connector	Connects external trigger for strobe; trigger pulse width settable

Trigger

The controller has three trigger modes: common trigger, high intensity trigger and programmable trigger, and four trigger polarities: rising edge trigger, falling edge trigger, positive follow trigger and negative follow trigger, see the following details:

Trigger Mode	Normal trigger	High intensity trigger	Programmable trigger
Trigger Polarity	Rising edge trigger	Rising edge trigger	Rising edge trigger
	Falling edge trigger	Falling edge trigger	
	Positive follow trigger mode	Positive follow trigger mode	Falling edge trigger
	Negative follow trigger mode	Negative follow trigger mode	

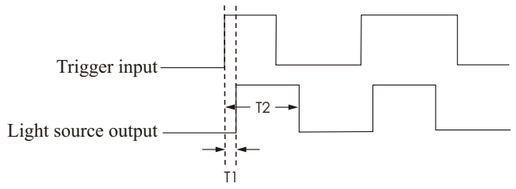
Dedicated Controller

Item	Parameter	Description
Input voltage	100 - 240 VDC,@ 3.5A, 50/60 Hz	
Lighting mode	Continuous/strobe	Set via the working mode switch or DEMO software
Manual setting for max. output current	10mA - 2A	Enabled via DEMO software
Intensity control	256 levels	Set via the adjustment key or DEMO software
Short-circuit protection	Yes	The related channel is shut down and "Er2" displays.
Overcurrent protection	Yes	Enabled when the output current is higher than 110% of the set value: the related channel is shut down and "Er1" displays.
Normal trigger	256 intensity levels settable	
High intensity trigger	2A output per channel	
Normal trigger time unit	1μs/10μs/1ms/100ms	Set via DEMO software
Normal trigger pulse width	1μs - 30s	Set via the adjustment knob or DEMO software
High intensity trigger pulse width	0.01-5.00ms	Set via the adjustment knob or DEMO software
Programmable trigger	Yes	The intensity, pulse width, and trigger source of each step can be set.
Trigger response time	⩽15μs	
Trigger response frequency	20kHz	
Output power	24W/CH	total output ≤ 260W
Communication	RS232/Ethernet	
Standby power consumption	30W	220V
Hi-Pot test	1500VAC 1min	Leakage current < 10mA
Insulation	500VDC	Insulation resistance > 20MΩ
Operating temperature	-5 - 50°C	
Dimensions (mm)(L×W×H)	206.4×132.4×172.1	Refer to the drawing for details
Weight (kg)	2.6	

Trigger Sequence

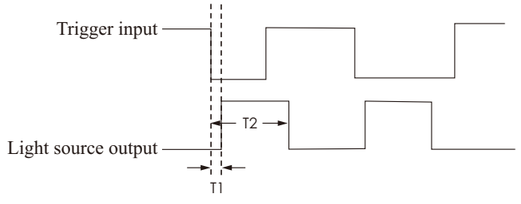
Rising edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software.



Falling edge trigger

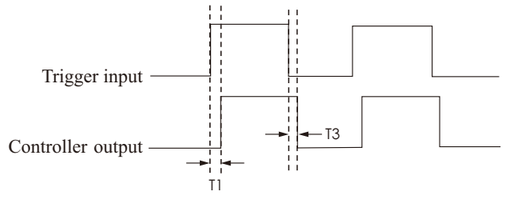
The illumination time is equal to the trigger pulse width,which is set via DEMO software.



Remarks
1. T1: Enabling response time; T2: Trigger pulse width; T3: Disabling response time
2. Normal trigger: T1 ≤ 15μs; T3 ≤ 10μs; T2 setting range: 1μs - 30s
3. High intensity trigger: T1 ≤ 15μs; T3 ≤ 10μs; T2 setting range: 0.01 - 5.00ms

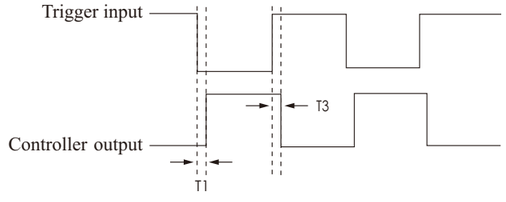
Positive follow trigger mode

When the trigger signal is at high level, the illumination time is the same as the high-level pulse width.



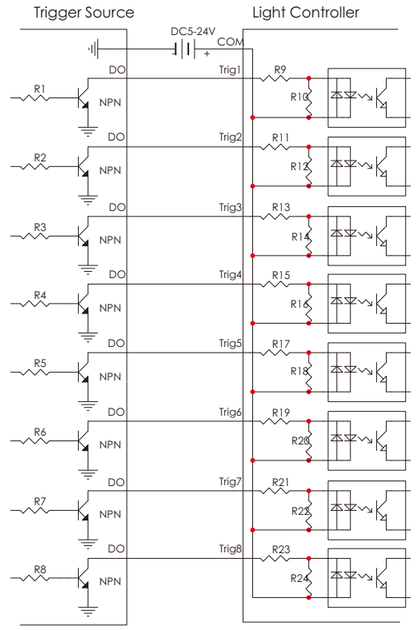
Negative follow trigger mode

When the trigger signal is at low level, the illumination time is the same as the low-level pulse width.

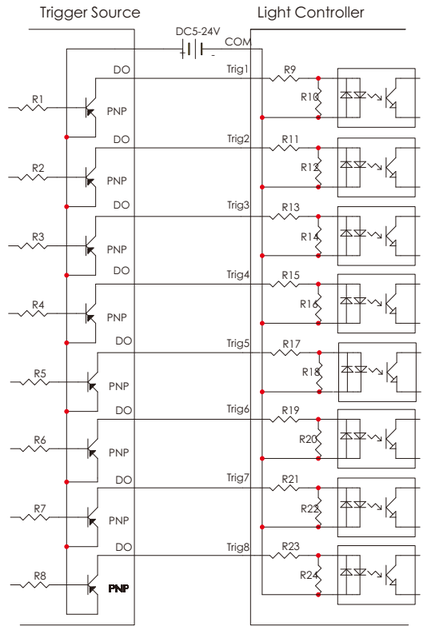


Level Trigger Wiring Diagrams

4 trigger channels, and bidirectional optocoupler inside Low level: 0 - 2V input voltage; high level: 5 - 24V input voltage. The diagrams are as shown below.



Trig Input Circuit for NPN Type Trigger

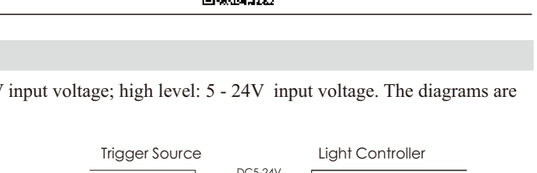


Trig Input Circuit for PNP Type Trigger

Light Source Line

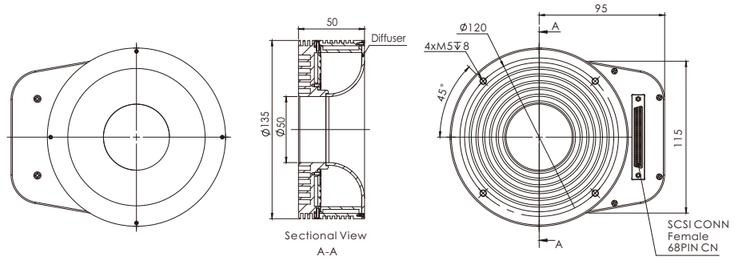
Model	Cable length (L)
OPT-DGYX1M-68P-S	1m
OPT-DGYX2M-68P-S	2m
OPT-DGYX3M-68P-S	3m

Note:Light source cable is a required accessory and must be ordered separately.



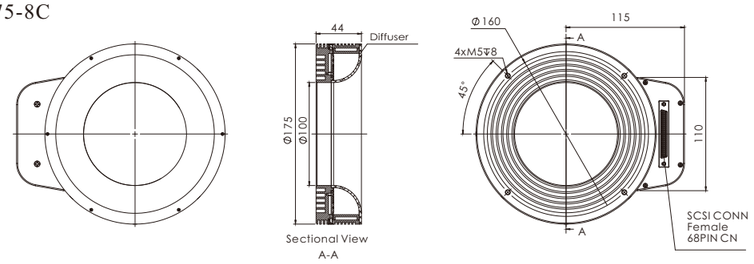
Dimensions (mm)

1.OPT-RIPM135-8C

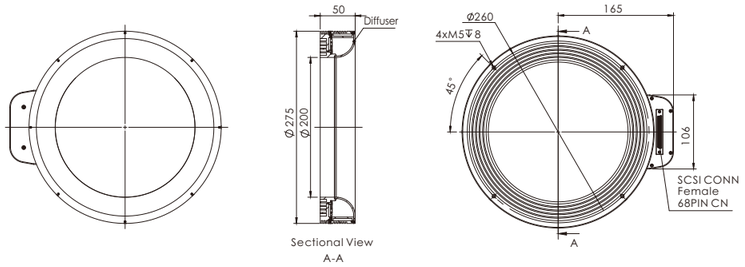


Dimensions (mm)

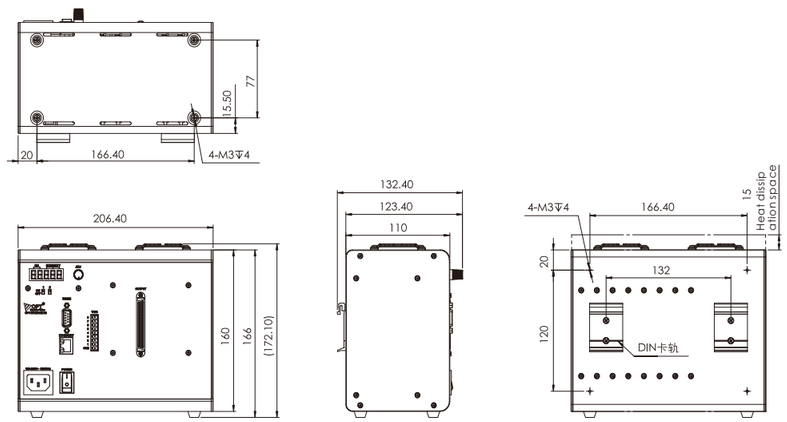
2.OPT-RIPM175-8C



3.OPT-RIPM275-8C



4.OPT-DPA2012E-32



High Intensity Ring Lights

OPT-RIG Series



Product Features

Main Features

- High density LED arrays and special lens design, brightness is more than 2 times higher than OPT-RI series ring lights.
- Suitable for special illumination requirements

Application Cases

- Longer illumination distance (compared to OPT-RI series)
- Illumination for high speed production lines

Selection Guide

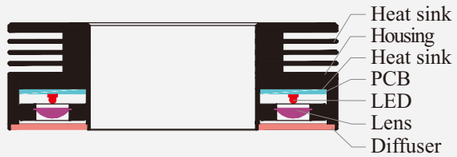
OPT-RIG9000
- Emitting angle
- Outer diameter
- High intensity ring light
- Brand name

Customizable Items

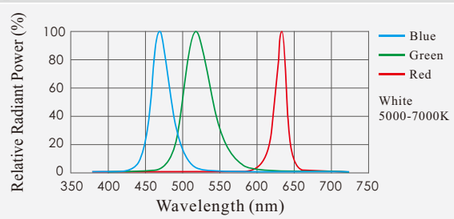


Color, Mounting, Connector, Size, Diameter, Emitting angle

Section Structure Drawing



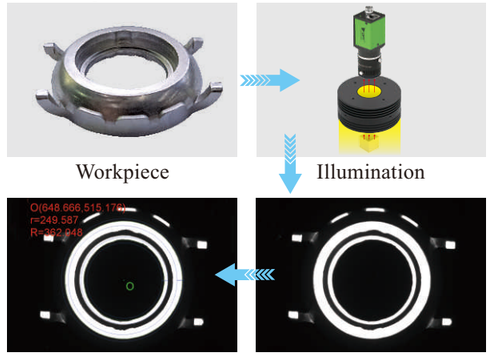
Spectrum Chart



Note: The data is for reference only.

Application Cases

- Metal parts diameter measurement



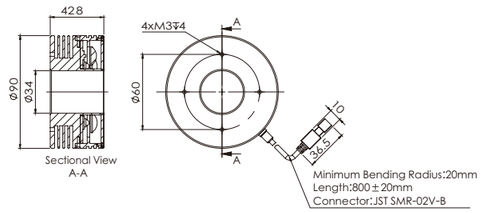
Model Table

No.	Model	∗Power ●	∗Power ○●●●	Recommended controller
1	OPT-RIG9000	7.2W@24V	7.2W@24V	OPT-DPA2024E
2	OPT-RIG12000	11.9W@24V	14.4W@24V	
3	OPT-RIG18000	20.4W@24V	21.6W@24V	

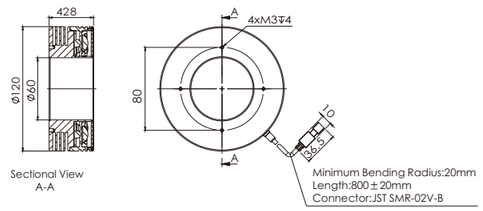
∗ Note: The data is for reference only.

Dimensions (mm)

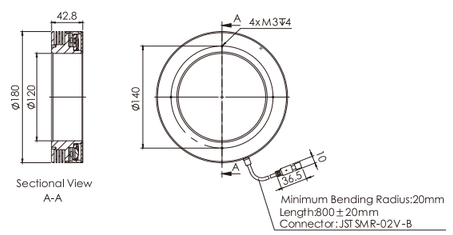
1.OPT-RIG9000



2.OPT-RIG12000

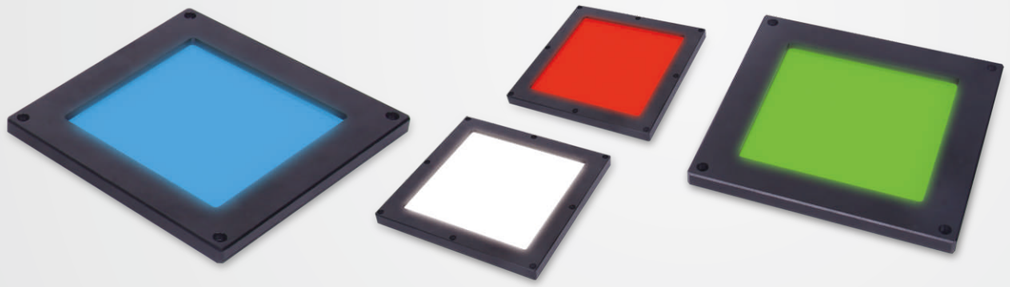


3.OPT-RIG18000



Flat Dome Lights OPT-FC Series

Patented



Product Features

Main Features

- Provides diffuse and uniform illumination
- Lightweight, compact and easy to use
- Coaxial planar light source with shadowless and coaxial lighting effects

Application Cases

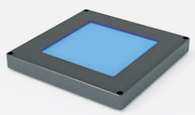
- Package inspection for food and beverage, tobacco and printing industries
- Inspection and measurement for electronic parts
- Pattern inspection and OCR on uneven and highly reflective surfaces

Selection Guide

OPT-FC100

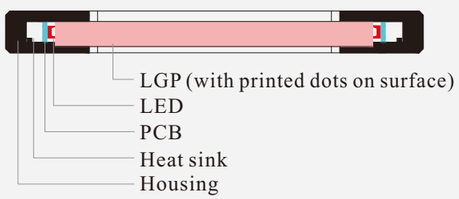
- Length
- Flat dome light
- Brand name

Customizable Items

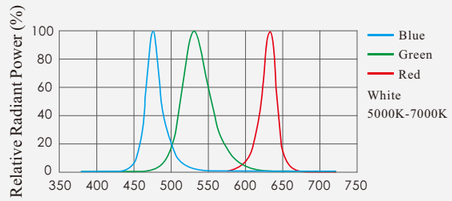


Color, Mounting, Connector, Size, Polygon

Section Structure Drawing



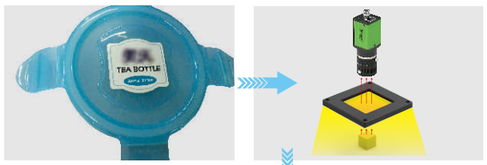
Spectrum Chart



Note: The data is for reference only.

Application Cases

- Printing inspection



Workpiece

Illumination



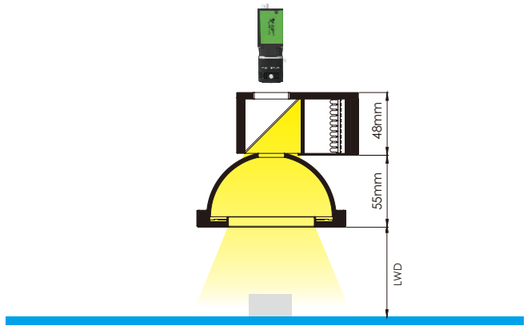
Smart3 Analysis Result



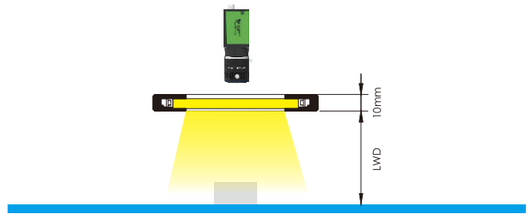
Image

Size Comparison

Coaxial light OPT-CO50 and Dome lights OPT-RID100



Flat dome light OPT-FC100



Explanation: Compared to coaxial light sources combined with integrating sphere light sources, the flat shadowless light source has a more compact structure and requires less installation space.

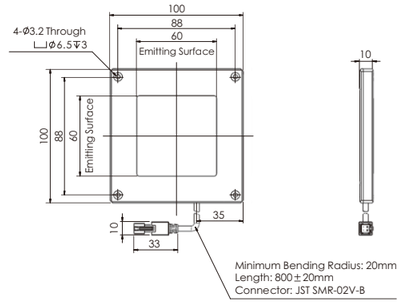
Model Table

No.	Model	* Power ○	* Power ●	* Power ●	* Power ●	Recommended controller
1	OPT-FC100	6.9W@24V	4.6W@24V	6.2W@24V	7.0W@24V	OPT-DPA2024E
2	OPT-FC143	12.8W@24V	7.5W@24V	8.9W@24V	13.1W@24V	
3	OPT-FC180	15.6W@24V	15.1W@24V	10.9W@24V	16.2W@24V	
4	OPT-FC240	21.8W@24V	18.1W@24V	15.3W@24V	18.5W@24V	

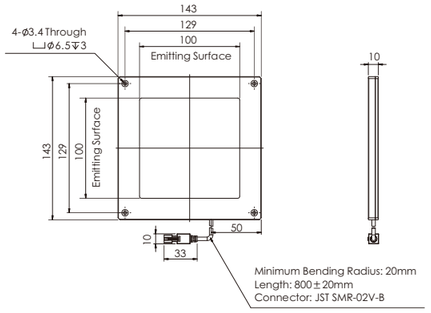
* Note: The data is for reference only.

Dimensions (mm)

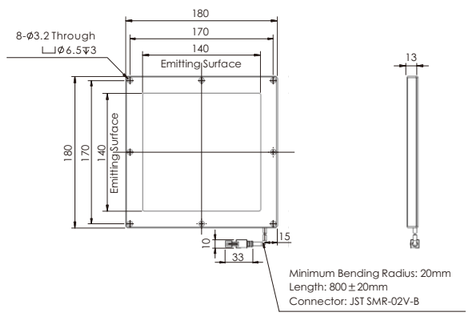
1.OPT-FC100



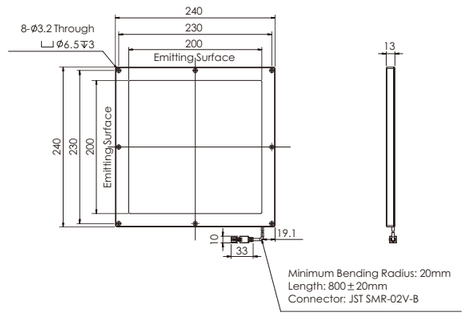
2.OPT-FC143



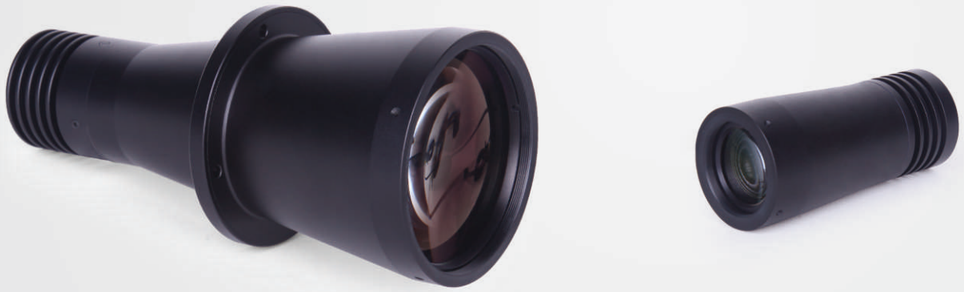
3.OPT-FC180



4.OPT-FC240



Collimated Spot Lights OPT-PL Series



Product Features

Main Features

- Telecentric optical design, divergence angle ≤1°
- Significant increase in image edge contrast for higher measurement accuracy
- Mounting of hole position is customizable
- Can be combined with telecentric lens

Application Cases

- Burr inspection
- Detection of gap obstructions
- Inspection of card surface
- Gauging for metal parts

Selection Guide

OPT-PL70
- Emitting surface diameter
- Collimated spot light
- Brand name

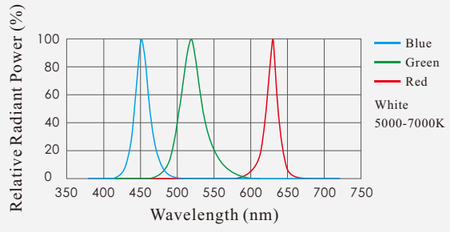
Customizable Items



Color | Mounting | Connector

Emitting surface diameter

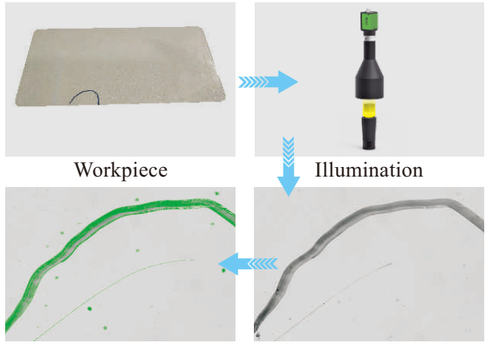
Spectrum Chart



Note: The data is for reference only.

Application Cases

- Glass surface inspection



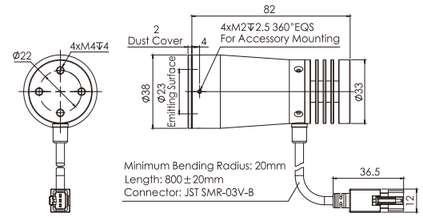
Model Table

Model	Color	*Power	Emitting surface diameter (∅/mm)	Working distance (mm)	Controller	Optional accessory
OPT-PL23	○	1A/3.2W	23	45-90	OPT-DPA2005E	OPT-PPL23
	●	1A/2.7W				
	●	1A/3.75W				
	●	1A/3.3W				
OPT-PL35	○	1A/3.2W	35	45-90	OPT-DPA2005E	OPT-PPL35
	●	1A/2.7W				
	●	1A/3.75W				
	●	1A/3.3W				
OPT-PL50	○	1A/3.2W	50	70-140	OPT-DPA2005E	OPT-PPL50
	●	1A/2.7W				
	●	1A/3.75W				
	●	1A/3.3W				
OPT-PL70	○	1A/3.2W	70	100-200	OPT-DPA2005E	OPT-PPL70
	●	1A/2.7W				
	●	1A/3.75W				
	●	1A/3.3W				
OPT-PL100	○	1A/3.2W	100	150-300	OPT-DPA2005E	OPT-PPL100
	●	1A/2.7W				
	●	1A/3.75W				
	●	1A/3.3W				

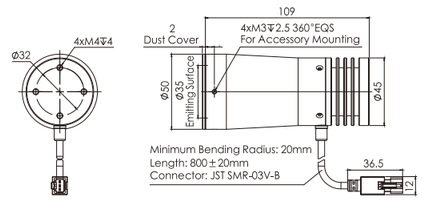
* Note: The data is for reference only.

Dimensions (mm)

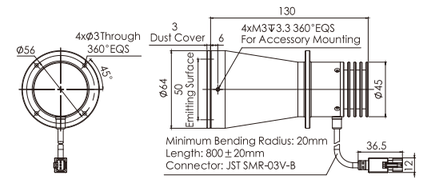
1.OPT-PL23



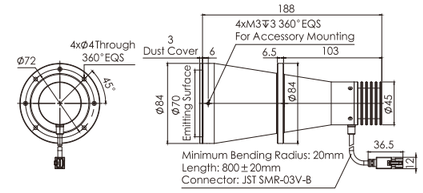
2.OPT-PL35



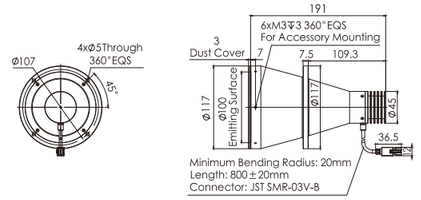
3.OPT-PL50



4.OPT-PL70



5.OPT-PL100



Coaxial Accessory



Product Features

Main Feature

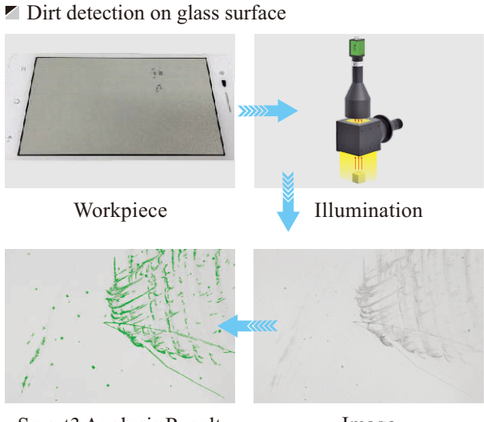
- Advanced coated beam splitter inside to minimize light loss for ideal illumination

Application Cases

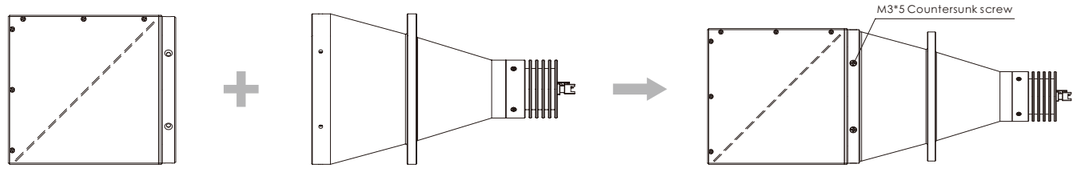
- Defects detection on metal surface
- Detection of scratches on cell phone displays
- Defects detection on glass surface

Application Cases

- Dirt detection on glass surface



Accessory Assembly

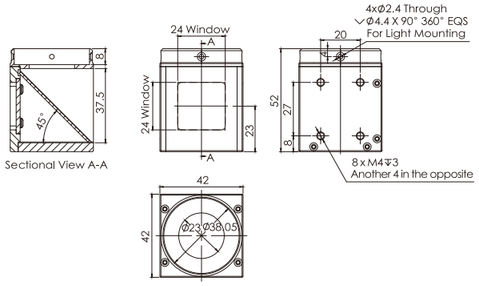


Model Table

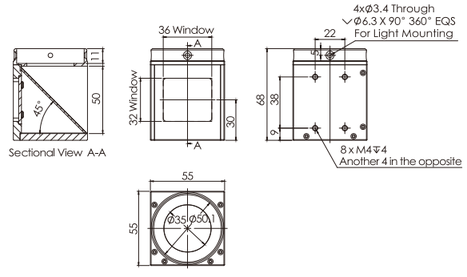
Model	Matching light	Emitting surface diameter (⌀/mm)	Working distance (mm)
OPT-PPL23	OPT-PL23	23	5-50
OPT-PPL35	OPT-PL35	35	5-50
OPT-PPL50	OPT-PL50	50	10-70
OPT-PPL70	OPT-PL70	70	10-100
OPT-PPL100	OPT-PL100	100	10-160

Dimensions (mm)

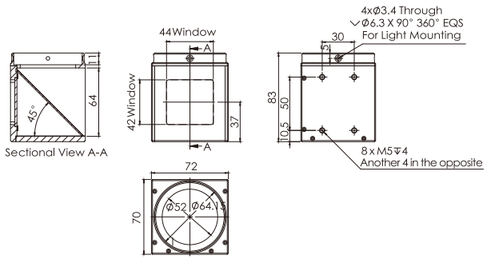
1.OPT-PPL23



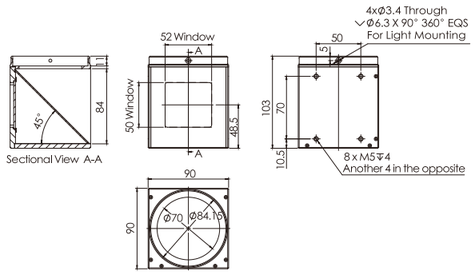
2.OPT-PPL35



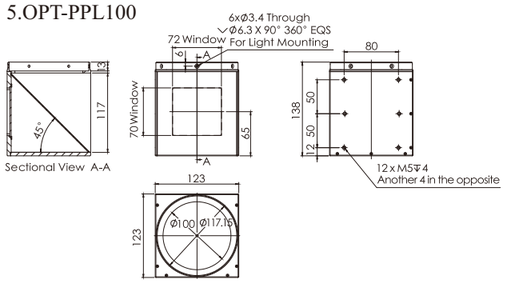
3.OPT-PPL50



4.OPT-PPL70

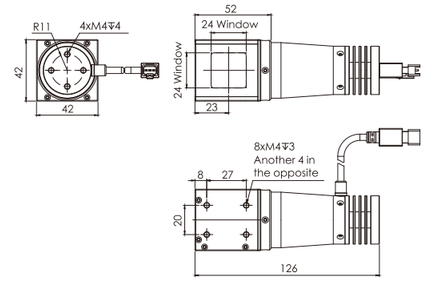


5.OPT-PPL100

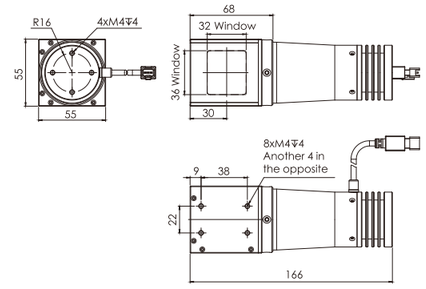


Assembled Unit Dimensions (mm)

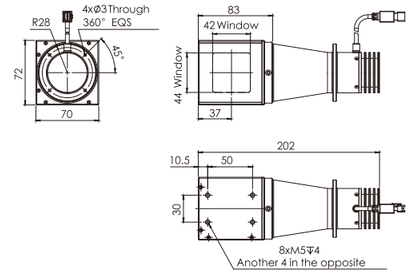
1.OPT-PL23
OPT-PPL23



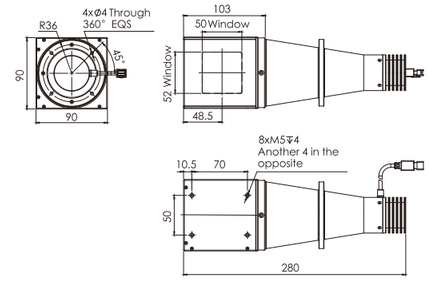
2.OPT-PL35
OPT-PPL35



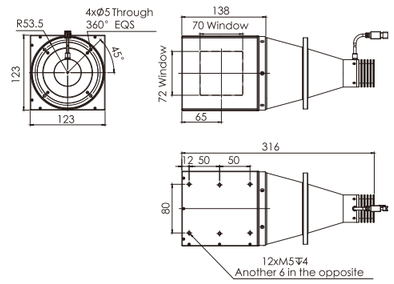
3.OPT-PL50
OPT-PPL50



4.OPT-PL70
OPT-PPL70



5.OPT-PL100
OPT-PPL100



Highly Directional Backlight Source OPT-FP Series



Product Features

Main Features

- Highly directional backlight sources are often used for contour measurements and detecting minor defects on smooth surfaces.
- Compact design; suitable for high-precision measurement operations
- Used in conjunction with the coaxial optical system to detect small defects and damages on smooth surfaces

Application Cases

- Gauging for mechanical parts
- Outline inspection for electronic parts
- Surface scratches detection

Selection Guide

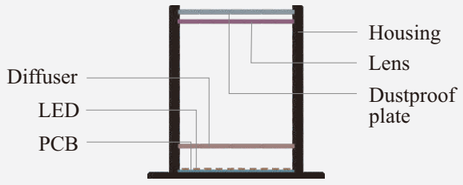
OPT-FP8272
- Width
- Length
- Highly Directional Backlight Source
- Brand name

Customizable Items

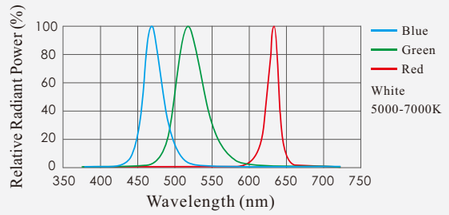


Color | Mounting | Connector | Size

Section Structure Drawing



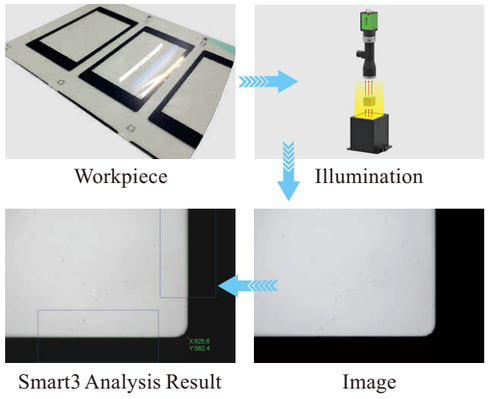
Spectrum Chart



Note: The data is for reference only.

Application Cases

- Inner frame positioning of mobile phone screen



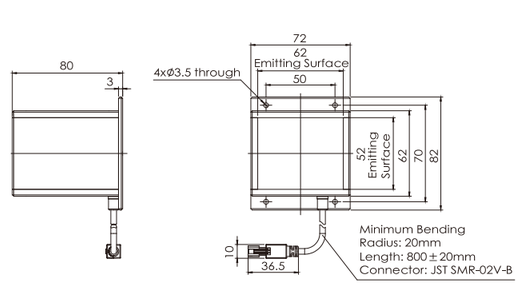
Model Table

No.	Model	∗Power🔴	∗Power⚪🟢🔵	Recommended controller
1	OPT-FP8272	5.8W@24V	7.2W@24V	OPT-DPA2024E
2	OPT-FP120100	6.9W@24V	8.6W@24V	
3	OPT-FP180160	17.3W@24V	21.6W@24V	

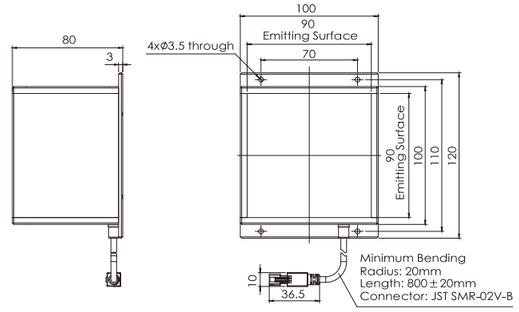
∗ Note: The data is for reference only.

Dimensions (mm)

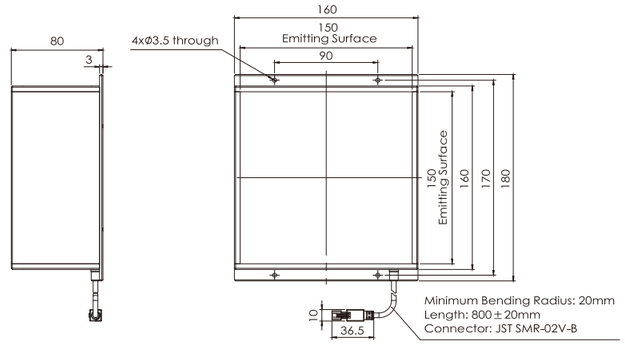
OPT-FP8272



OPT-FP120100



OPT-FP180160



AOI Lights OPT-RIA Series

Patented



Product Features

Main Features

- Special diffuser designed to improve homogeneity
- Highlighting of 3D object information through multicolor (RGB) illumination from various angles

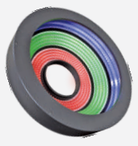
Application Cases

- Solder inspection of PCB
- Inspection of round objects
- Inspection of objects with varying heights

Selection Guide

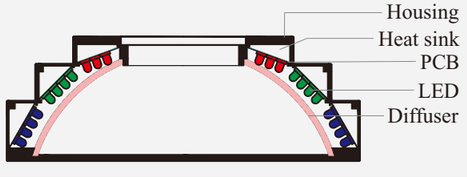
OPT-RIA200
- Outer diameter
- AOI light
- Brand name

Customizable Items

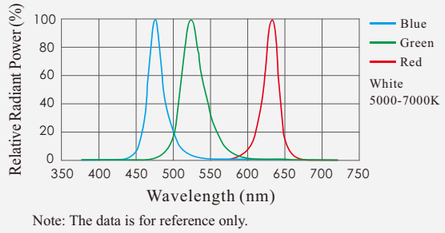


Color, Mounting, Sectional control, Emitting angle, Size

Section Structure Drawing



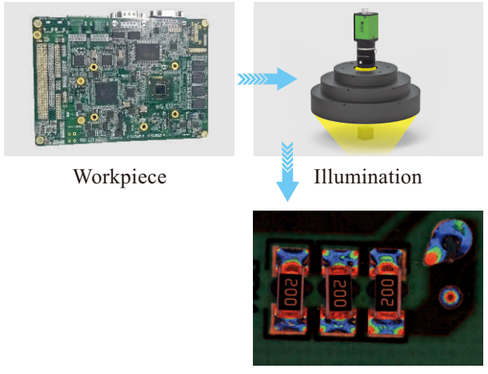
Spectrum Chart



Note: The data is for reference only.

Application Cases

- Soldering inspection



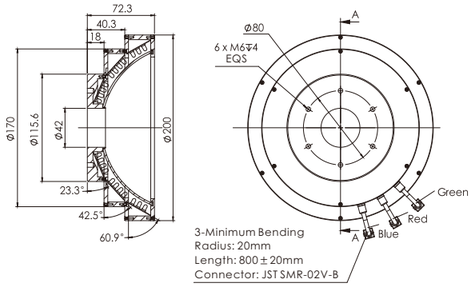
Model Table

No.	Model	∗ Power	Working distance (mm)	Channels	Recommended controller
1	OPT-RIA200-RGB	31W@24V	31.0mm	3	OPT-DPA2024E
2	OPT-RIA263-RGB	50W@24V	52.5mm	3	

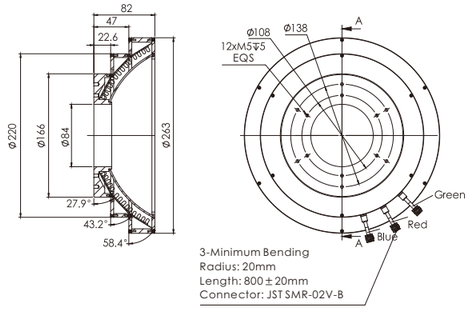
∗ Note: The data is for reference only.

Dimensions (mm)

OPT-RIA200-RGB



OPT-RIA263-RGB



Vault Lights OPT-LIU Series

Patented



Product Features

Main Features

- Efficient heat dissipation design guarantee full product brightness and life time.
- Good light diffusion can effectively eliminate interference caused by the irregular surface.

Application Cases

- Surface inspection of tobacco packaging
- Detection of package defects of electronic parts
- AOI for line scan camera applications
- Surface inspection with large field of view

Selection Guide

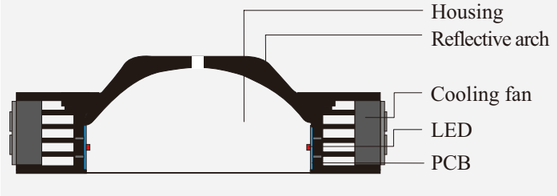
OPT-LIU275
- Length
- Vault light
- Brand name

Customizable Items

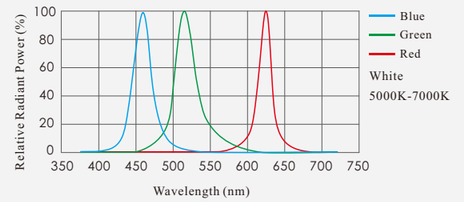


Color, Mounting, Size, Heat dissipation

Section Structure Drawing



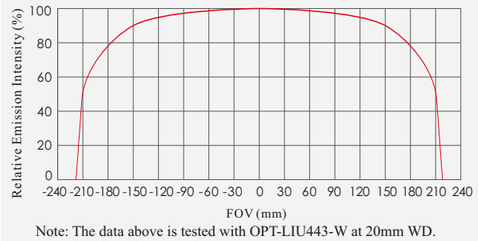
Spectrum Chart



Note: The data is for reference only.

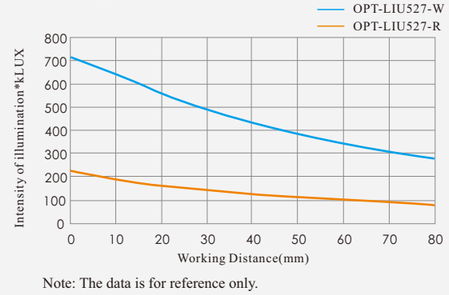
Series Features

Relative Radiant Power Distribution



Note: The data above is tested with OPT-LIU443-W at 20mm WD.
It is for reference only.

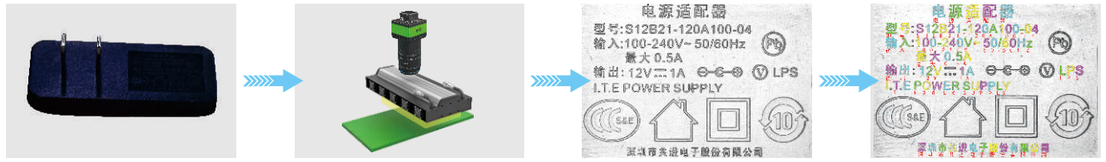
Change in illuminance versus working distance



Note: The data is for reference only.

Application Cases

- OCR for power adaptors



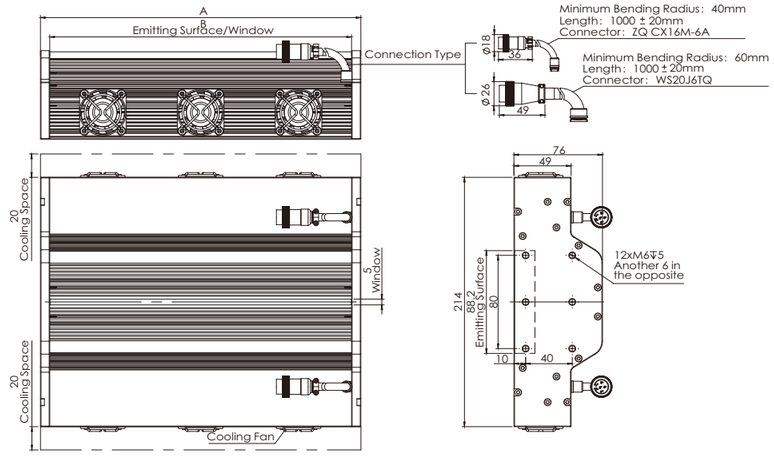
Workpiece | Illumination | Image | Smart3 Analysis Result

Model Table

No.	Model	Color	∗ Power	Length A (mm)	Emitter aperture/ observer length B (mm)	Channels	Connector port	Recommended controller
1	OPT-LIU275	○ ● ●	230.4W@9.6A	275	259	2	①	OPT-DPA6024E
2	OPT-LIU359	○ ● ●	307.2W@12.8A	359	343		②	OPT-DPA10024E
3	OPT-LIU443	○ ● ●	384W@16A	443	427			
4	OPT-LIU527	○ ● ●	460.8W@19.2A	527	511			
5	OPT-LIU611	○ ● ●	537.6W@22.4A	611	595			OPT-DPA20024E
6	OPT-LIU695	○ ● ●	614.4W@25.6A	695	679			
7	OPT-LIU779	○ ● ●	691.2W@28.8A	779	763			
8	OPT-LIU863	○ ● ●	768W@32A	863	847			
9	OPT-LIU947	○ ● ●	844.8W@35.2A	947	931			
10	OPT-LIU1031	●	921.6W@38.4A	1031	1015			
11	OPT-LIU303	●	192W@8A	303	287		①	OPT-DPA6024E
12	OPT-LIU415	●	268.8W@11.2A	415	399		②	OPT-DPA10024E
13	OPT-LIU527	●	345.6W@14.4A	527	511			
14	OPT-LIU639	●	422.4W@17.6A	639	623			
15	OPT-LIU751	●	499.2W@20.8A	751	735			OPT-DPA20024E
16	OPT-LIU863	●	576W@24A	863	847			
17	OPT-LIU975	●	652.8W@27.2A	975	959			
18	OPT-LIU1087	●	729.6W@30.4A	1087	1071			
19	OPT-LIU1199	●	806.4W@33.6A	1199	1183			
20	OPT-LIU1311	●	883.2W@36.8A	1311	1295			

Note: 1. Total power for two channels, data provided for reference only, actual values may vary.
2. Custom dimensions: The lengths of white, blue, and green light sources increase in increments of 84mm, while the length of the red light source increases in increments of 112mm.
3. Number① represents connector port ZQGX16M-6A, while number ② represents connector port WS20J6TQ.

Dimensions (mm)



Note:
When the rated current is less than or equal to 6A, the connector is ZQ GX16M-6A.
When the rated current is greater than 6A, the connector is WS20J6TQ.

Programmable Pattern Light Source OPT-PCP Series NEW



Product Features

Main Features

- Can set stripe type and parameters, and edit pattern display sequence.
- Using Ethernet communication ensures stable and reliable data transmission.
- Provides multiple signal outputs, allowing synchronous connection with multiple cameras.
- High-power constant current backlighting, providing high display brightness.

Application Cases

- Electroplated product defect detection in the furniture industry
- Appearance inspection of mobile phone shells in the 3C industry
- Defect detection in automotive body shells

Selection Guide

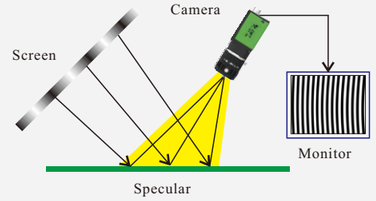
OPT - PCP 290160
- 290160 → Display area dimensions
- PCP → Programmable pattern light source
- OPT → Brand name

Customizable Items



Display area dimensions | Mounting | Connector

Series Features



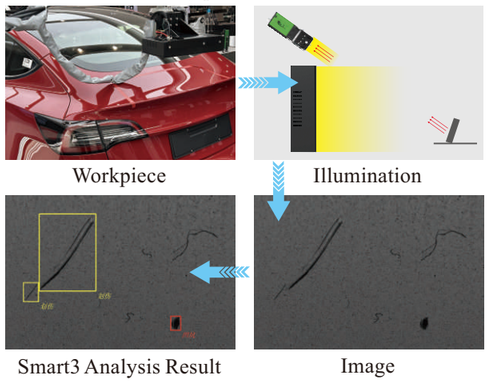
Stripe Reflection

Principle: By using stripes with a certain periodicity, the light is projected onto the measured object, causing the surface of the object to diffuse reflect and reveal the sensitivity of the mirror reflection characteristics, also known as light deflection.

-Generate binary stripes, cosine stripes, or other patterns used for optical projection phase measurement, alternating horizontally and vertically.
-Freely adjust parameters such as stripe width, image offset steps, period number, phase shift, etc., to quickly achieve image N-frame offset.
-Customize stripe colors and display sequences to achieve automated execution processes and single-step debugging.
-The stripe light source uses a pre-stored design for the process, which can effectively reduce the communication command transmission time, significantly improving control efficiency and offering superior synchronization performance.

Application Cases

- Automotive body paint defect detection.



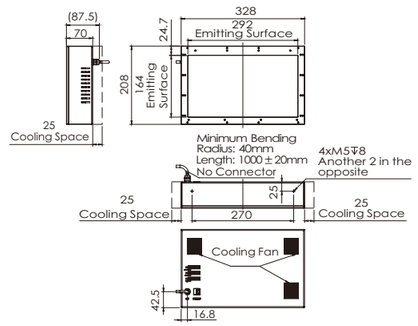
Workpiece | Illumination | Smart3 Analysis Result | Image

Model Table

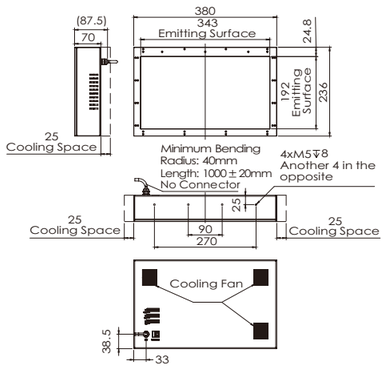
Item	Parameter			Description
Light source model	PCP290160	PCP340190	PCP530300	
Screen size	13.3 inches	15.6 inches	23.8 inches	Diagonal size
Display area dimensions(mm)	292×164	343×192	526×295	
Screen resolution	1920X1080			
Image switching rate	20Hz/S			
Pixel pitch (mm)	0.15	0.18	0.27	
Input voltage	DC24V~25.5V			
Full load power	72W	108W	252W	Under full load power, the screen temperature may be higher. It is recommended to add an external cooling device or reduce power and use triggering.
Dimensions (mm)	328×208×70	380×236×70	568×342×70	Please refer to the dimensional diagram for details.
Intensity control	256 levels			Configurable via DEMO software
Recommended power supply	SCI-PS3-300			The light source does not come with a default power supply.
Programmable trigger	Supports up to a maximum of 32 processes.			Stripe parameters and pulse width can both be adjusted.
Communication	Ethernet			
Cooling method	Fan cooling			
Illuminance range	Max≥8000Lux			Surface test values for full white screen
Binary stripes	Supports color			
Cosine stripes	Supports 255 levels of grayscale			
Hi-Pot test	DC500V 1Min			Leakage current < 5mA
Insulation	500VDC			Insulation resistance > 5MΩ
Operating temperature	0°C~50°C, Humidity: 20~85% RH (non-condensing)			
Storage ambient temperature	0°C~50°C, Humidity: 20~85% RH (non-condensing)			

Dimensions (mm)

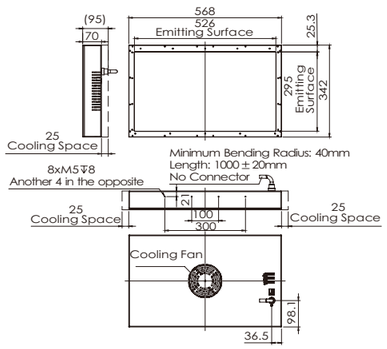
1.OPT-PCP290160



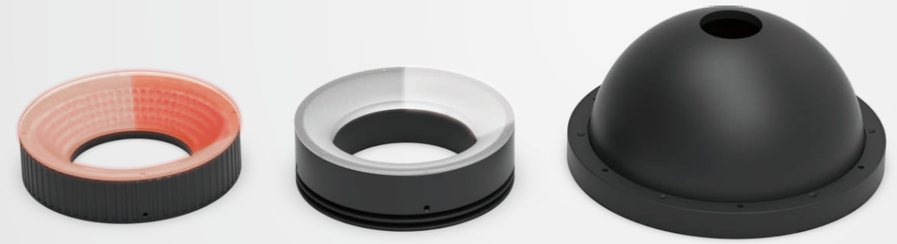
2.OPT-PCP340190



3.OPT-PCP530300



Zone Lighting Source OPT-MS Series NEW



Product Features

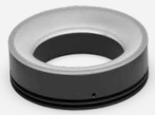
Main Features

- Light source divided into four illuminated areas, each area is controlled independently.
- Covering a variety of types of ring light sources.

Application Cases

- Directional scratch detection
- Detection of characters with PCB board irregularities
- Detection of curved surface defects in batteries

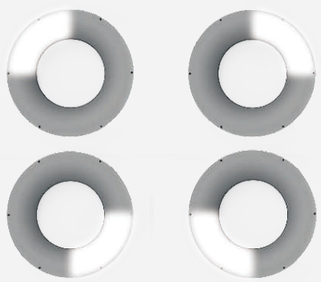
Customizable Items





Series Features

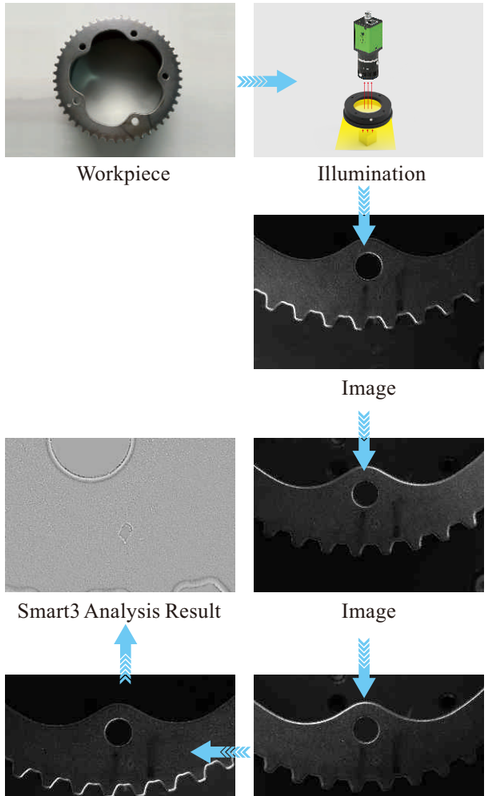
Sectional control



MSRI, MSRIP, and MSRIDD are divided into 4 equal emitting areas, each can be illuminated individually or combined.

Application Cases

- Detection of gear pits and scratches.

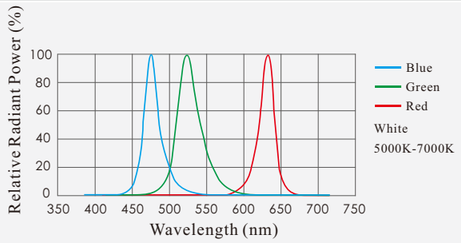


OPT-MSRI Partitioned Light Source

Selection Guide

OPT-MSRI 120 00
- Angle between PCB and mounting surface
- Outer diameter
- Ring light
- Zone lighting series
- Brand name

Spectrum Chart



Note: The data is for reference only.

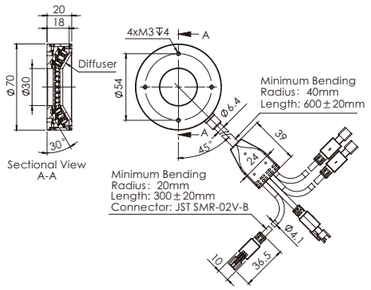
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-MSRI7030	5.7W@24V	6.7W@24V	4.8W@24V	4.6W@24V	30°	OPT-DPA2024E
2	OPT-MSRI9030	7.3W@24V	5.7W@24V	7W@24V	6.7W@24		
3	OPT-MSRI12030	13.4W@24V	9.3W@24V	12.8W@24V	12.5W@24V		
4	OPT-MSRI15030	15W@24V	10.3W@24V	16.8W@24V	15.3W@24V		

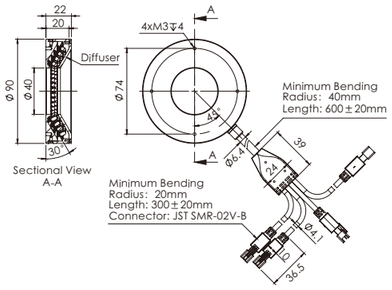
Note: Data provided for reference only, actual values may vary. Rated power refers to the total power consumption of the light source.

Dimensions (mm)

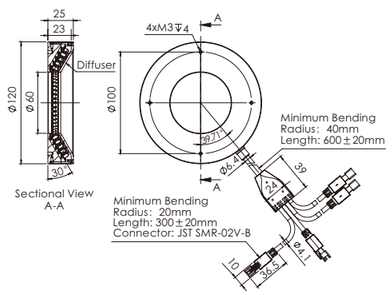
1. OPT-MSRI7030



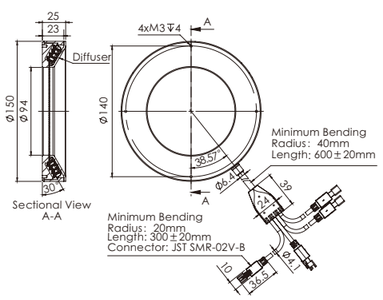
2. OPT-MSRI9030



3. OPT-MSRI12030



4. OPT-MSRI15030



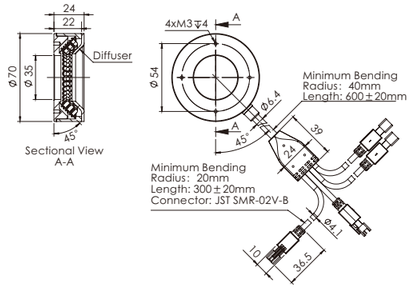
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-MSRI7045	4.8W@24V	3W@24V	4.7W@24V	4.7W@24V	45°	OPT-DPA2024E
2	OPT-MSRI9045	7.2W@24V	4.7W@24V	7.7W@24V	6.9W@24		
3	OPT-MSRI12045	11.1W@24V	8W@24V	13.4W@24V	12.2W@24V		
4	OPT-MSRI15045	15.8W@24V	11.8W@24V	18W@24V	17.1W@24		

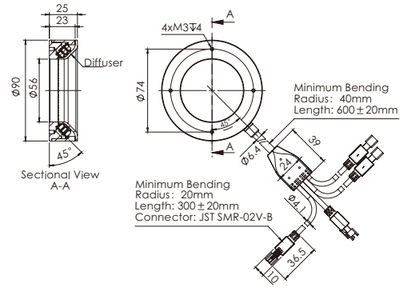
Note: Data provided for reference only, actual values may vary. Rated power refers to the total power consumption of the light source.

Dimensions (mm)

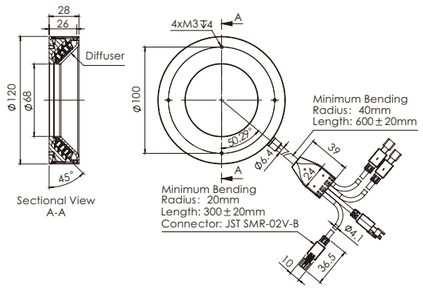
1. OPT-MSRI7045



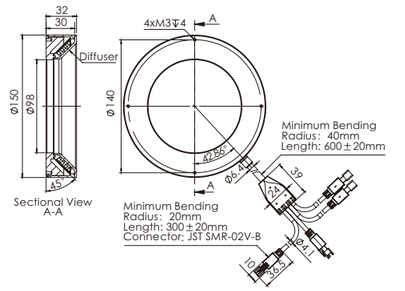
2. OPT-MSRI9045



3.OPT-MSRI12045



4.OPT-MSRI15045



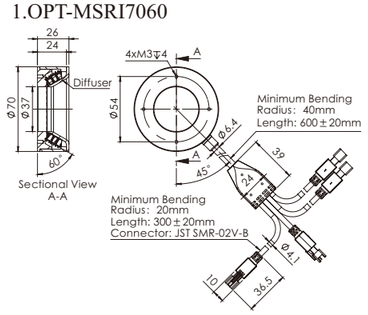
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Angle between the light ray and the central axis	Recommended controller
1	OPT-MSRI7060	4.7W@24V	2.8W@24V	4.8W@24V	4.7W@24V	60°	OPT-DPA2024E
2	OPT-MSRI9060	6.1W@24V	4W@24V	7.3W@24V	6.9W@24		
3	OPT-MSRI12060	11.4W@24V	9.6W@24V	13.4W@24V	12.2W@24V		
4	OPT-MSRI15060	16W@24V	11.3W@24V	17.3W@24V	17.1W@24V		

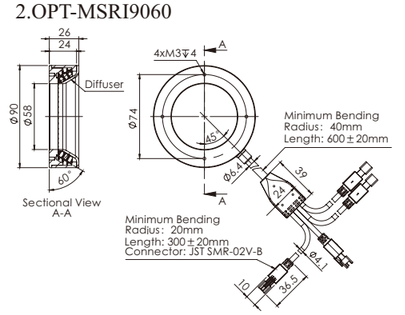
Note: Data provided for reference only, actual values may vary. Rated power refers to the total power consumption of the light source.

Dimensions (mm)

1.OPT-MSRI7060

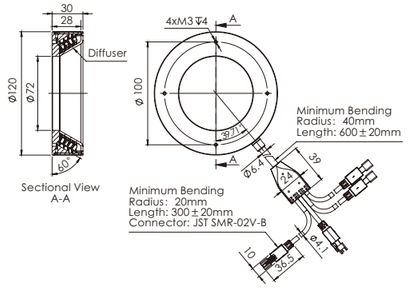


2.OPT-MSRI9060

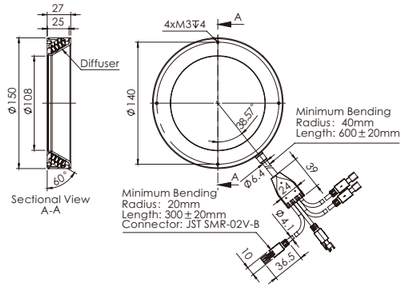


Dimensions (mm)

3.OPT-MSRI12060



4.OPT-MSRI15060



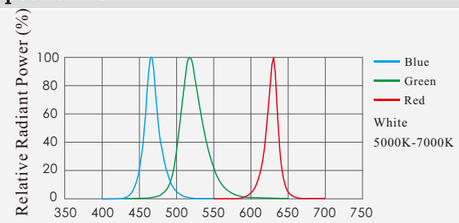
OPT-MSRIP Partitioned Light Source

Selection Guide

OPT-MSRIP 120

- Outer diameter
- Bright uniform ring light
- Zone lighting series
- Brand name

Spectrum Chart



Note: The data is for reference only.

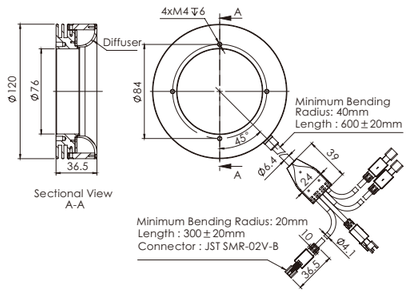
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Recommended controller
1	OPT-MSRIP120	17.2W@24V	9.3W@24V	15.3W@24V	10.9W@24V	OPT-DPA2024E
2	OPT-MSRIP170	21.7W@24V	17.2W@24V	23.5W@24V	19.4W@24	
3	OPT-MSRIP230	29.5W@24V	22.2W@24V	29.2W@24V	23.7W@24V	

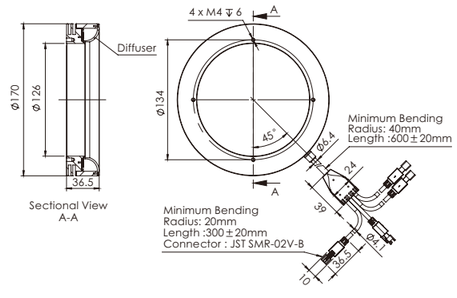
Note: Data provided for reference only, actual values may vary. Rated power refers to the total power consumption of the light source.

Dimensions (mm)

1.OPT-MSRIP120

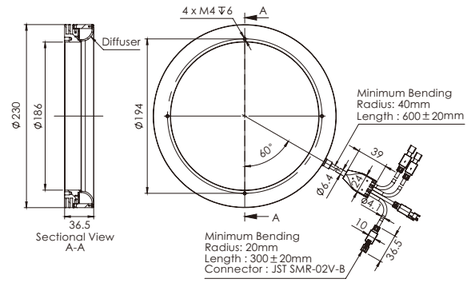


2.OPT-MSRIP0170



Dimensions (mm)

3.OPT-MSRIP230



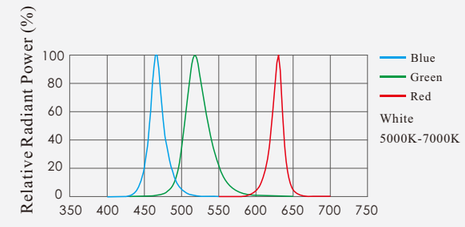
OPT-MSRID Partitioned Light Source

Selection Guide

OPT-MSRID 120

- Reflector diameter
- Dome light
- Zone lighting series
- Brand name

Spectrum Chart



Note: The data is for reference only.

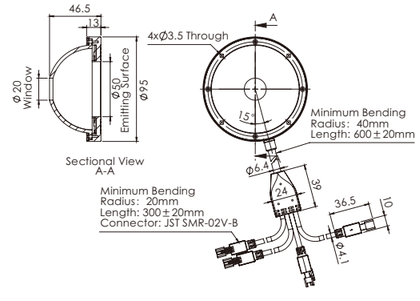
Model Table

No.	Model	∗ Power ○	∗ Power ●	∗ Power ●	∗ Power ●	Recommended controller
1	OPT-MSRID80	9.2W@24V	9.2W@24V	5.1W@24V	7.7W@24V	OPT-DPA2024E
2	OPT-MSRID100	9W@24V	8.6W@24V	8.8W@24V	7.4W@24V	
3	OPT-MSRID150	15.4W@24V	16.3W@24V	14.4W@24V	12.8W@24V	
4	OPT-MSRID180	19.8W@24V	18.4W@24V	21.5W@24V	19.2W@24V	
5	OPT-MSRID240	28W@24V	25.2W@24V	29.8W@24V	19.7W@24V	
6	OPT-MSRID350	62.4W@24V	49.5W@24V	54.9W@24V	54.9W@24V	

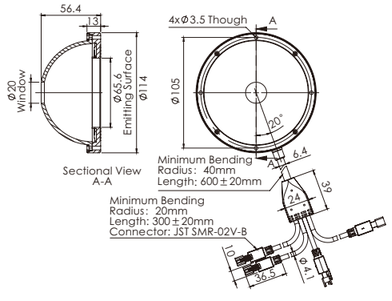
Note: Data provided for reference only, actual values may vary. Rated power refers to the total power consumption of the light source.

Dimensions (mm)

1.OPT-MSRID80

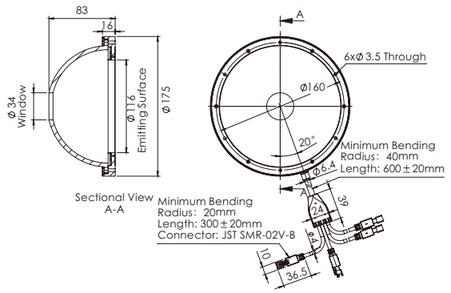


2.OPT-MSRID100

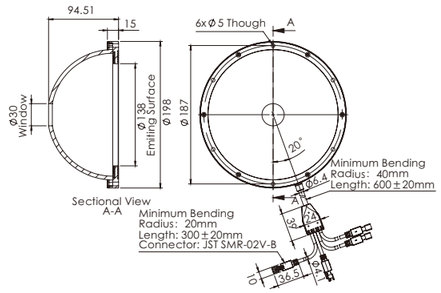


Dimensions (mm)

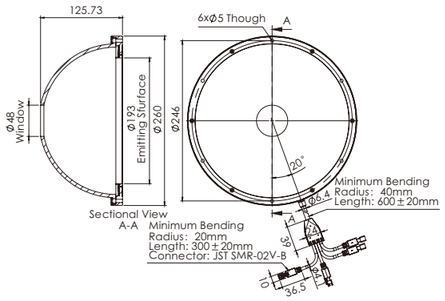
3.OPT-MSRID150



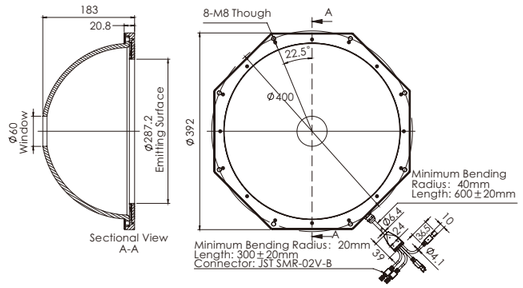
4.OPT-MSRID180



5.OPT-MSRID240

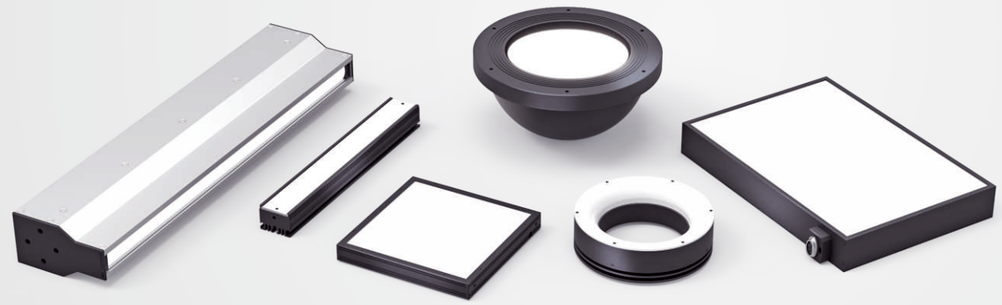


6.OPT-MSRID350



High Color Rendering Index (CRI) Light Source

OPT-XX-RA95W Series



Product Features

Main Features

- The average color rendering index (CRI) is above 95.
- The High CRI series offers various types and shapes from OPT standard lighting series.

Application Cases

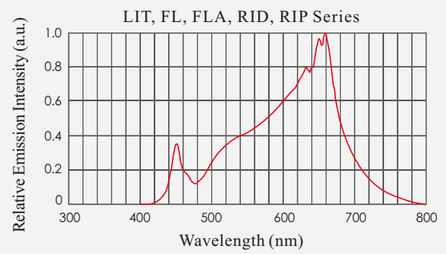
- Color separation, color measurement and inspection in printing industry
- Quality inspection and appearance sorting for food and agricultural industry.
- Applications for color sorters

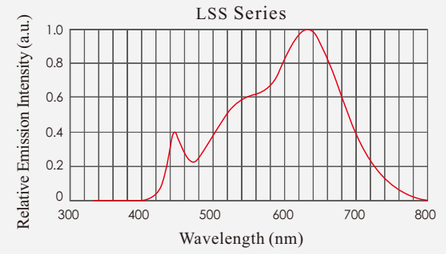
Selection Guide

OPT-XX-RA95W

- XX → Color Rendering Index (CRI)
- RA95W → Lights model series
- OPT → Brand name

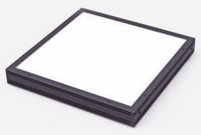
Spectrum Chart





Note: The data is for reference only.

Customizable Items



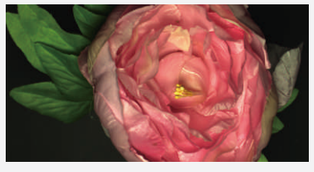
Mounting
Connector
Sectional control
Size
Color temperature customizable

Series Features

What is color renderin

The degree to which the light source reproduces the color of an object is called color rendering, which is the degree of color fidelity. Light sources with high color rendering have better color reproduction, and the colors we see are closer to natural colors. Light sources with low color rendering have poor color reproduction, and the color deviations we see are also larger.

Common CRI light source rendering effect



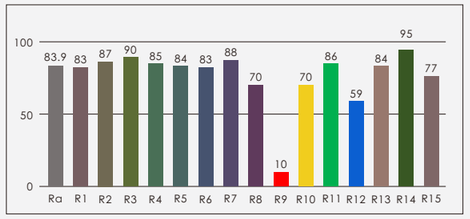
High CRI light source rendering effect



The average color rendering index is above Ra95, which is close to sunlight.

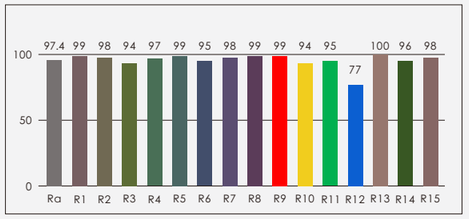
Common white LED spectrum

FLA11080-W



High CRI LED Spectrum

FLA11080-RA95W



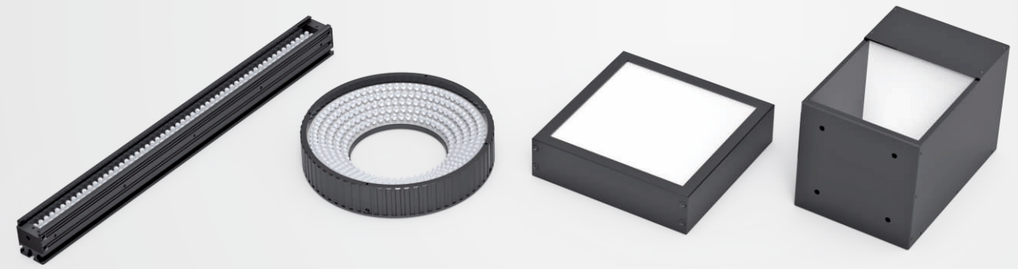
Remarks: The color rendering index refers to the index used to evaluate the color rendering properties of 15 colors (standard = 100). The average color rendering index Ra is the average value of R1-R8.

Model List

No.	Light source series	Models	Details related models and dimension drawings page reference
1	FLA Series	OPT-FLA11080	P225
		OPT-FLA150110	
		OPT-FLA210150	
2	FL Series	OPT-FL7070	P222
		OPT-FL9090	
		OPT-FL110110	
3	LIT Series	OPT-LIT9832	P220
		OPT-LIT14032	
		OPT-LIT18232	
4	RID Series	OPT-RID80	P254
		OPT-RID100	
		OPT-RID150	
5	RIP Series	OPT-RIP120	P296
		OPT-RIP170	
		OPT-RIP230	
6	LSS Series	OPT-LSS104	P259
		OPT-LSS272	
		OPT-LSS398	

Note: All models and parameters refer to the corresponding series of white light, the dimension drawings refer to the corresponding model.

IR Lights OPT-IXX-IR Series



Product Features

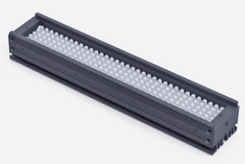
Main Features

- Standard products with 850nm and 940nm wavelengths.
- Wavelength, size and radiation intensity can be flexibly customized.

Application Cases

- Medical industry (vascular mesh detection/eye tracking)
- Packaging (transparent plastic materials)
- Clothing and textiles
- Electronics/semiconductors
- Pharmaceutical industry
- LCD/OLED

Customizable Items



Mounting

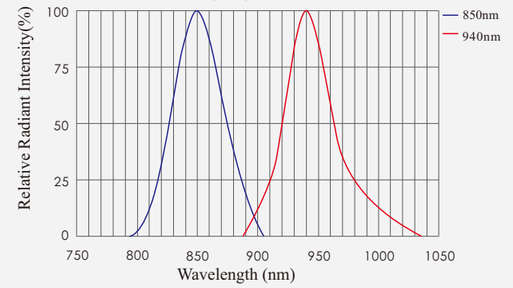
Size

Wavelength

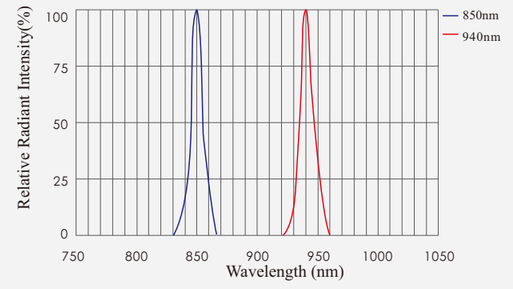
Light source type

Spectrum Chart

ILI,IRI,ICO Series



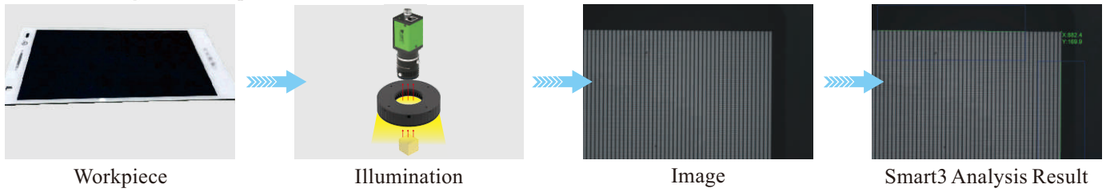
IFLA Series



Note: The data is for reference only.

Application Cases

- Positioning of screen-specific areas

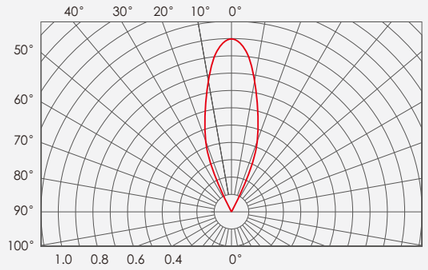


Workpiece | Illumination | Image | Smart3 Analysis Result

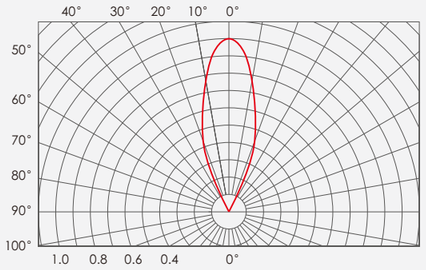
Series features

LED Directivity

ILI, IRI, ICO Series Standard Model 850nm Band



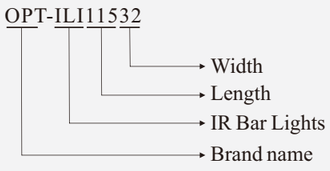
ILI, IRI, ICO Series Standard Model 940nm Band



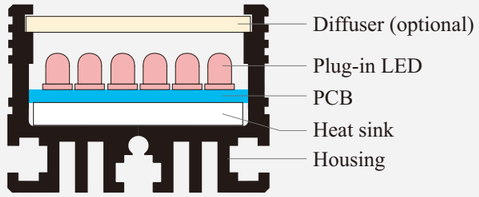
Note: The data is for reference only.

ILI IR Bar Lights

Selection Guide



Section Structure Drawing

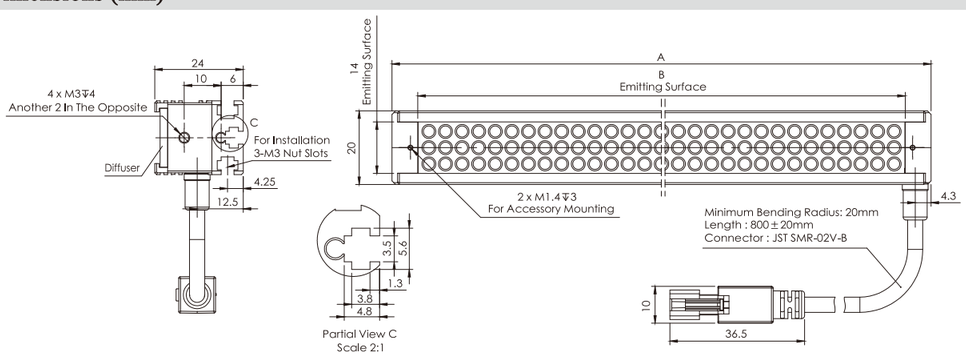


Model Table

No.	Model	∗ Power@850nm	∗ Power@940nm	Length A(mm)	Emitting B(mm)	Light source width(mm)	Recommended controller
1	OPT-ILI6120	1.9W@24V	1.7W@24V	61	47	20	OPT-DPA2024E
2	OPT-ILI11520	3.7W@24V	3.4W@24V	115	101		
3	OPT-ILI17320	6.3W@24V	5.7W@24V	173	159		
4	OPT-ILI21820	8W@24V	7.2W@24V	218	204		
5	OPT-ILI26820	9.8W@24V	8.9W@24V	268	254		
6	OPT-ILI31320	11.5W@24V	10.5W@24V	313	299		
7	OPT-ILI36220	13.4W@24V	12.1W@24V	362	348		

∗ Note: The data is for reference only.

Dimensions (mm)

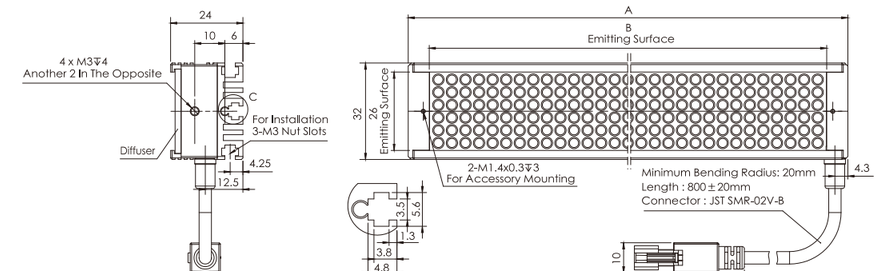


Model Table

No.	Model	∗ Power@850nm	∗ Power@940nm	Length A(mm)	Emitting B(mm)	Light source width(mm)	Recommended controller
1	OPT-ILI3832	1.8W@24V	1.7W@24V	38	24	32	OPT-DPA2024E
2	OPT-ILI6132	3.6W@24V	3.4W@24V	61	47		
3	OPT-ILI8332	5.5W@24V	5.0W@24V	83	69		
4	OPT-ILI11532	6.7W@24V	6.5W@24V	115	101		
5	OPT-ILI17332	6.5W@24V	6.6W@24V	173	159		
6	OPT-ILI21832	8.4W@24V	8.4W@24V	218	204		
7	OPT-ILI26832	10.2W@24V	10.3W@24V	268	254		
8	OPT-ILI31332	12W@24V	12.2W@24V	313	299		
9	OPT-ILI36232	13.9W@24V	14W@24V	362	348		

∗ Note: The data is for reference only.

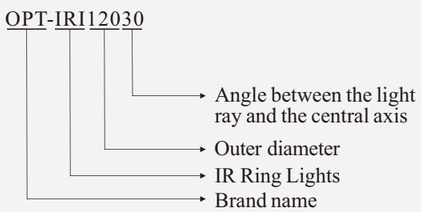
Dimensions (mm)



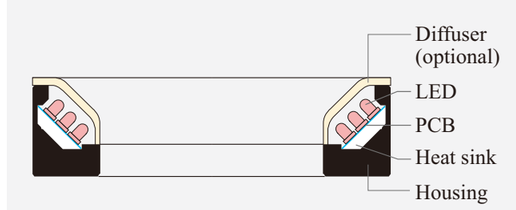
Scale 2:1

IRI IR Ring Lights

Selection Guide



Section Structure Drawing



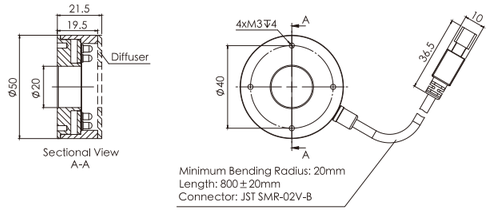
Model Table

No.	Model	∗ Power@850nm	∗ Power@940nm	Angle between the light ray and the central axis	Recommended controller
1	OPT-IRI5000	2.8W@24V	2.5W@24V	0°	OPT-DPA2024E
2	OPT-IRI7000	5W@24V	4.1W@24V		
3	OPT-IRI9000	6.3W@24V	6.3W@24V		
4	OPT-IRI12000	9.2W@24V	8.5W@24V		

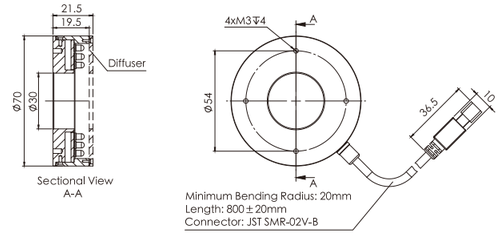
∗ Note: The data is for reference only.

Dimensions (mm)

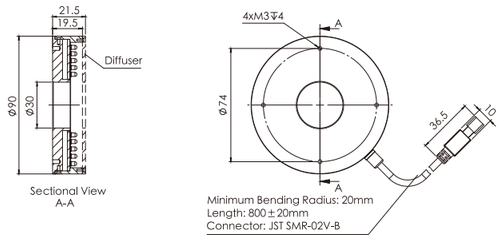
1. OPT-IRI5000



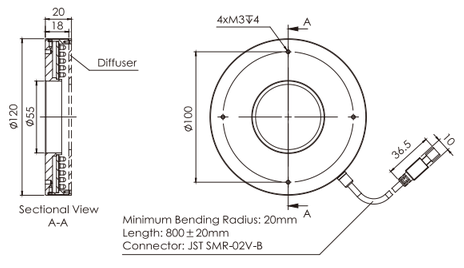
2. OPT-IRI7000



3. OPT-IRI9000



4. OPT-IRI12000



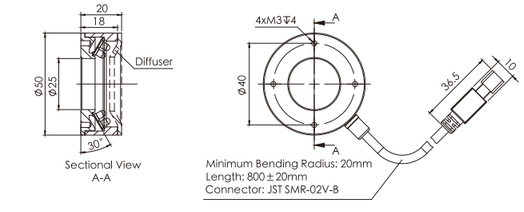
Model Table

No.	Model	∗ Power@850nm	∗ Power @940nm	Angle between the light ray and the central axis	Recommended controller
1	OPT-IRI5030	2.8W@24V	2.5W@24V	30°	OPT-DPA2024E
2	OPT-IRI7030	5.1W@24V	4.1W@24V		
3	OPT-IRI9030	5.4W@24V	5.4W@24V		
4	OPT-IRI12030	11.5W@24V	9.9W@24V		

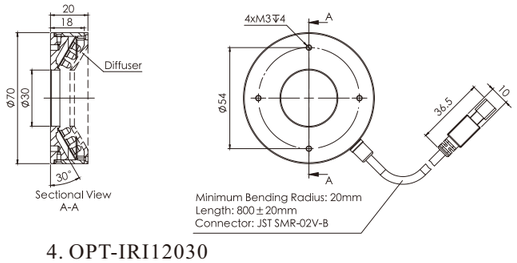
∗ Note: The data is for reference only.

Dimensions (mm)

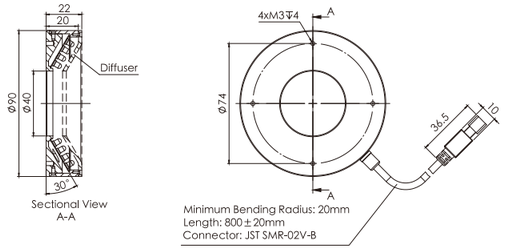
1. OPT-IRI5030



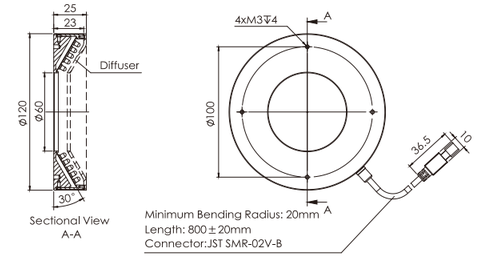
2. OPT-IRI7030



3. OPT-IRI9030



4. OPT-IRI12030



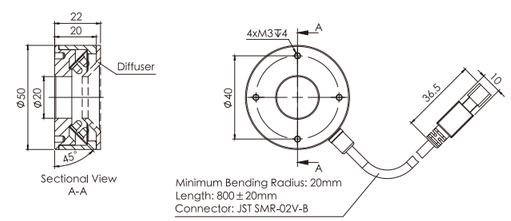
Model Table

No.	Model	∗ Power@850nm	∗ Power @940nm	Angle between the light ray and the central axis	Recommended controller
1	OPT-IRI5045	2.8W@24V	2.5W@24V	45°	OPT-DPA2024E
2	OPT-IRI7045	5.1W@24V	4.1W@24V		
3	OPT-IRI9045	5.8W@24V	5.7W@24V		
4	OPT-IRI12045	10W@24V	8.5W@24V		

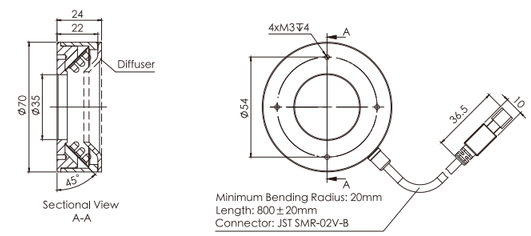
∗ Note: The data is for reference only.

Dimensions (mm)

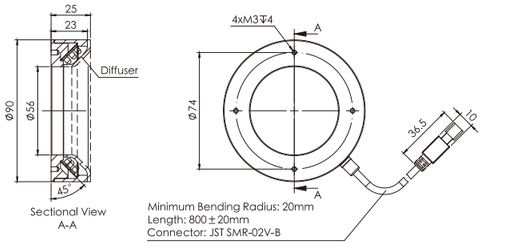
1. OPT-IRI5045



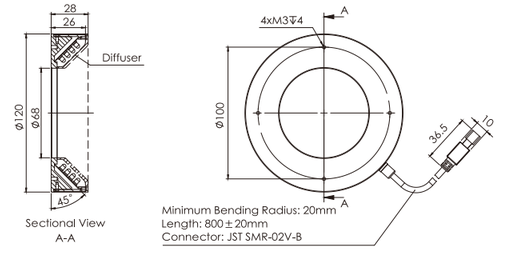
2. OPT-IRI7045



3. OPT-IRI9045



4. OPT-IRI12045



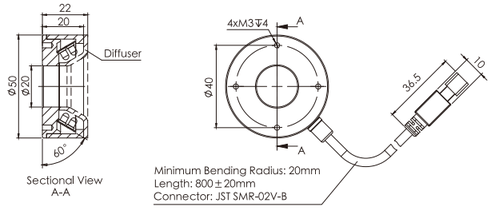
Model Table

No.	Model	∗ Power@850nm	∗ Power @940nm	Angle between the light ray and the central axis	Recommended controller
1	OPT-IRI5060	2.8W@24V	2.5W@24V	60°	OPT-DPA2024E
2	OPT-IRI7060	5.1W@24V	4.1W@24V		
3	OPT-IRI9060	6.4W@24V	6.3W@24V		
4	OPT-IRI12060	10W@24V	8.5W@24V		

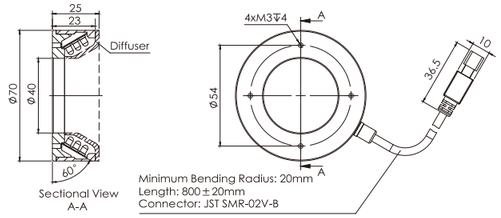
∗ Note: The data is for reference only.

Dimensions (mm)

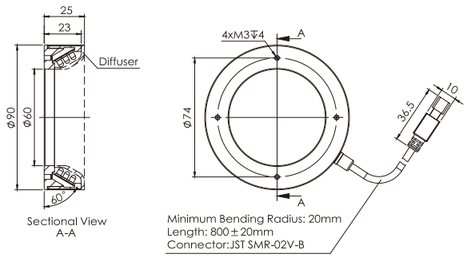
1. OPT-IRI5060



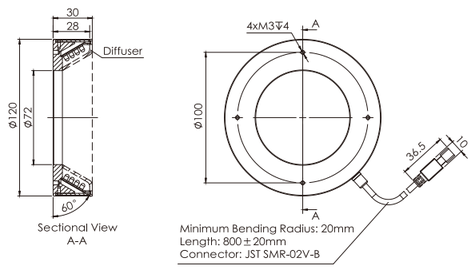
2. OPT-IRI7060



3. OPT-IRI9060



4. OPT-IRI12060



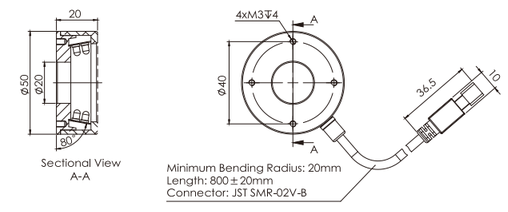
Model Table

No.	Model	∗ Power@850nm	∗ Power @940nm	Angle between the light ray and the central axis	Recommended controller
1	OPT-IRI5080	2.8W@24V	2.5W@24V	80°	OPT-DPA2024E
2	OPT-IRI7080	5.1W@24V	4.1W@24V		
3	OPT-IRI9080	6.4W@24V	6.3W@24V		
4	OPT-IRI12080	7.8W@24V	6.6W@24V		

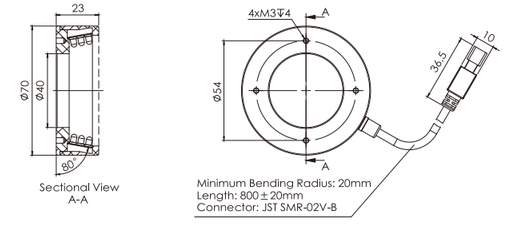
∗ Note: The data is for reference only.

Dimensions (mm)

1. OPT-IRI5080

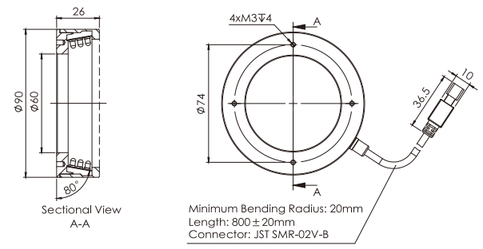


2. OPT-IRI7080

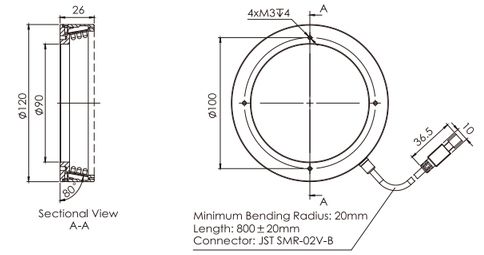


Dimensions (mm)

3. OPT-IRI9080



4. OPT-IRI12080



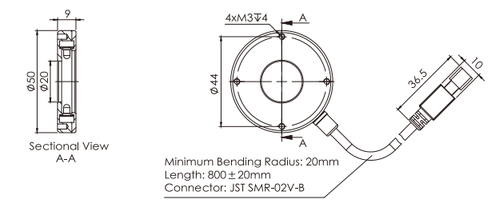
Model Table

No.	Model	∗ Power@850nm	∗ Power @940nm	Angle between the light ray and the central axis	Recommended controller
1	OPT-IRI5090	1.1W@24V	1W@24V	90°	OPT-DPA2024E
2	OPT-IRI7090	2.2W@24V	2.1W@24V		
3	OPT-IRI9090	3.3W@24V	2.6W@24V		
4	OPT-IRI12090	5.3W@24V	4.3W@24V		

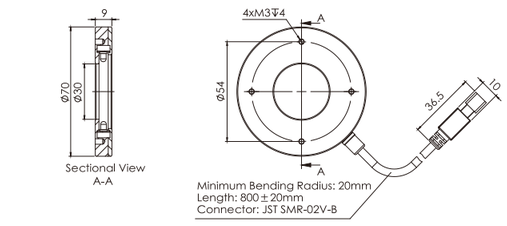
∗ Note: The data is for reference only.

Dimensions (mm)

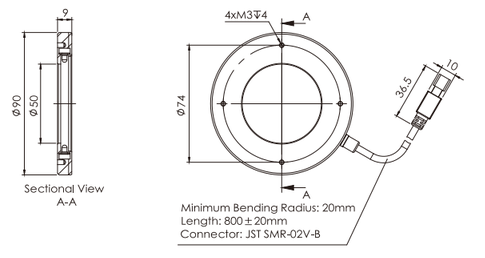
1. OPT-IRI5090



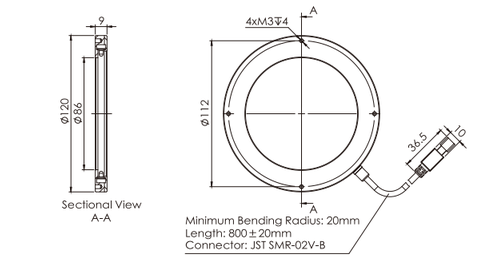
2. OPT-IRI7090



3. OPT-IRI9090

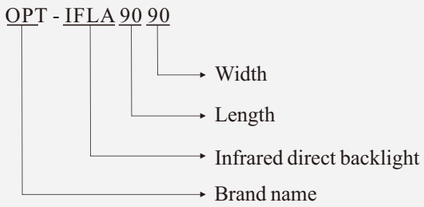


4. OPT-IRI12090

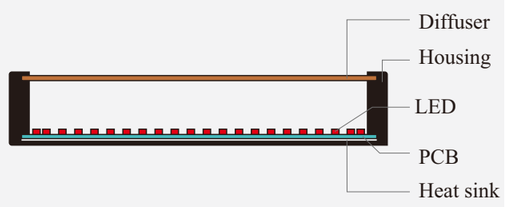


IFLA Infrared Direct Backlight

Selection Guide



Section Structure Drawing



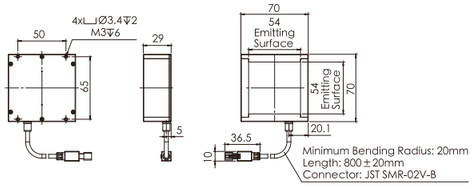
Model Table

No.	Model	∗ Power@850nm	∗ Power@940nm	Recommended controller
1	OPT-IFLA7070	7.2W@24V	7.0W@24V	OPT-DPA2024E
2	OPT-IFLA9090	9.4W@24V	8.2W@24V	
3	OPT-IFLA110110	12.5W@24V	11.3W@24V	
4	OPT-IFLA130130	16.3W@24V	14.4W@24V	
5	OPT-IFLA150150	19.7W@24V	18.5W@24V	
6	OPT-IFLA175175	26.2W@24V	24.2W@24V	
7	OPT-IFLA200200	33.4W@24V	32.6W@24V	
8	OPT-IFLA225225	40.3W@24V	40.8W@24V	
9	OPT-IFLA250250	41.3W@24V	42.7W@24V	

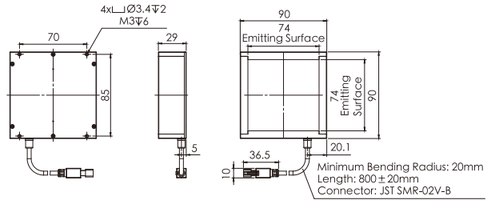
∗ Note: The data is for reference only.

Dimensions (mm)

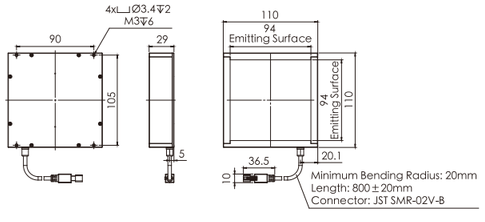
1.OPT-IFLA7070



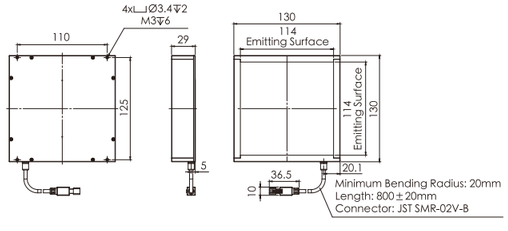
2.OPT-IFLA9090



3.OPT-IFLA110110

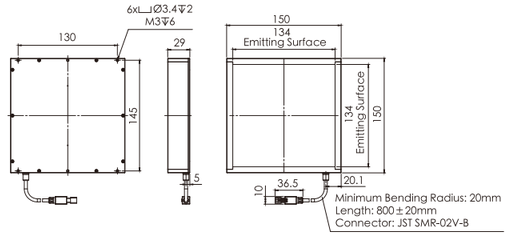


4.OPT-IFLA130130

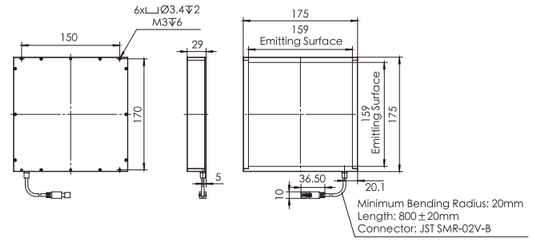


Dimensions (mm)

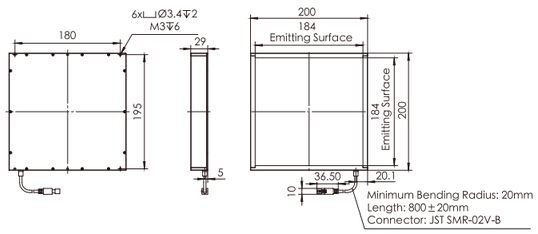
5.OPT-IFLA150150



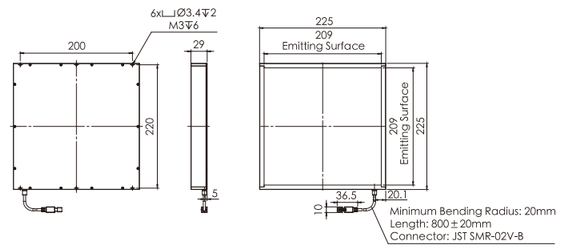
6.OPT-IFLA175175



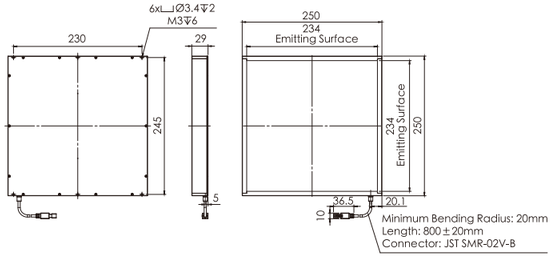
7.OPT-IFLA200200



8.OPT-IFLA225225



9.OPT-IFLA250250



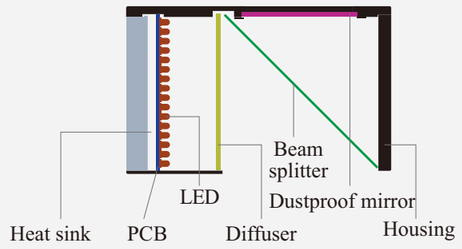
ICO Infrared Coaxial Light

Selection Guide

OPT - ICO 40

- 40 → Width
- ICO → Infrared coaxial light
- OPT → Brand name

Section Structure Drawing



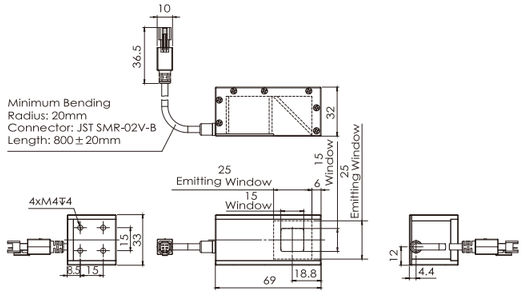
Model Table

No.	Model	* Power@850nm	* Power@940nm	Recommended controller
1	OPT-ICO30	1.9W@24V	1.9W@24V	OPT-DPA2024E
2	OPT-ICO40	2.7W@24V	2.6W@24V	
3	OPT-ICO50	4.8W@24V	4.6W@24V	
4	OPT-ICO60	5.5W@24V	5.7W@24V	
5	OPT-ICO70	7.9W@24V	8.2W@24V	
6	OPT-ICO80	9.1W@24V	9.1W@24V	
7	OPT-ICO100	13.1W@24V	13.2W@24V	
8	OPT-ICO150	24W@24V	24W@24V	
9	OPT-ICO200	45.6W@24V	45.6W@24V	

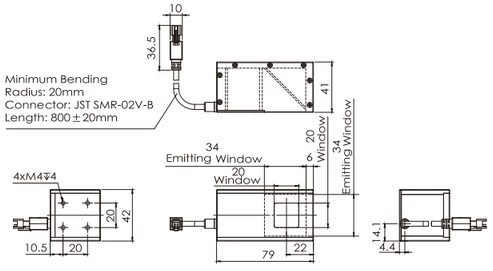
* Note: The data is for reference only.

Dimensions (mm)

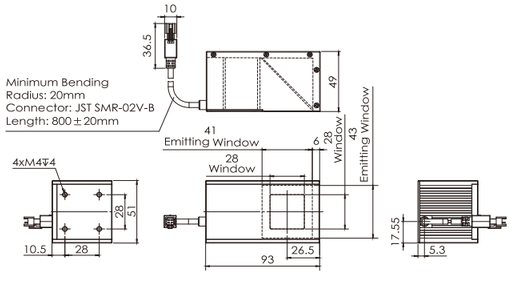
1.OPT-ICO30



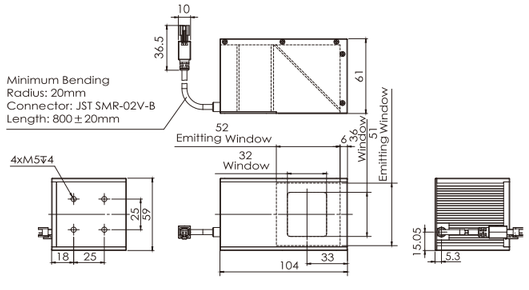
2.OPT-ICO40



3.OPT-ICO50

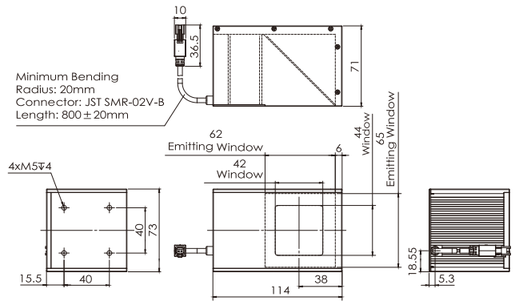


4.OPT-ICO60

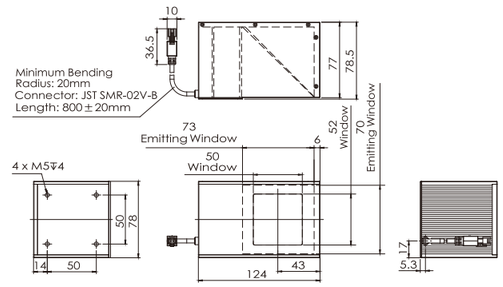


Dimensions (mm)

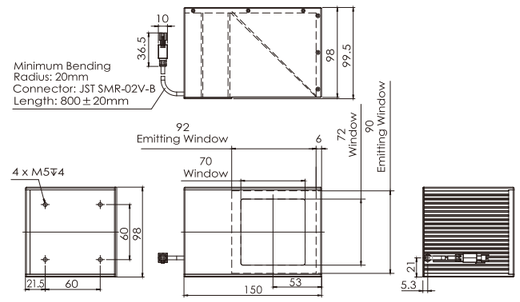
5.OPT-ICO70



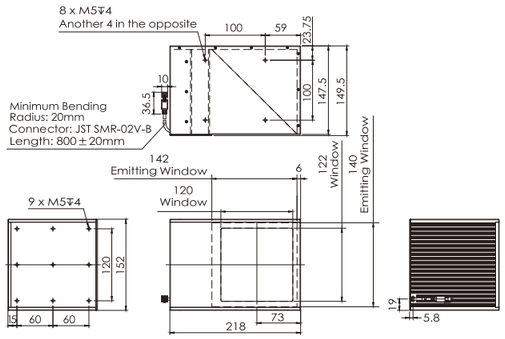
6.OPT-ICO80



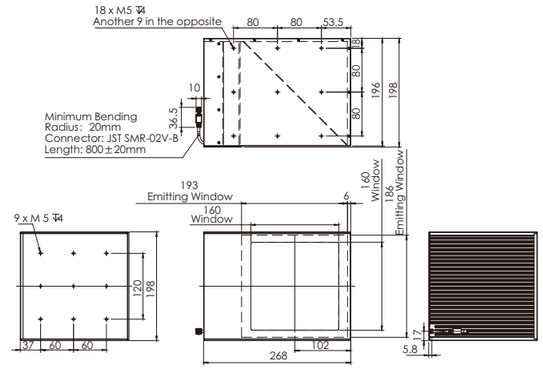
7.OPT-ICO100



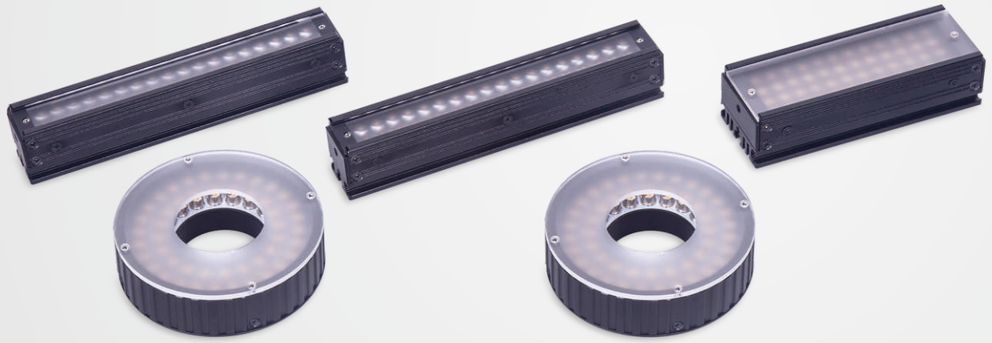
8.OPT-ICO150



9.OPT-ICO200



UV Lights OPT-UXX-UV Series



Product Features

Main Features

- Standard products of 365nm and 375nm are provided.
- LED with glass housing, long lifecycle.
- Wide irradiation with large radiation range and uniform illumination,narrow irradiation with concentrated light, long irradiation and high radiation intensity.
- Diffuser plate is optional to improve image uniformity.

Application Cases

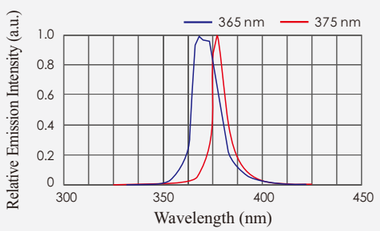
- Banknote/ticket inspection
- Inspection of fluorescent material
- Fluorescent OCR, barcodes and QR codes reading Recognition
- Detection of small case scratches and damage
- UV glue inspection

Customizable Items



Mounting | Light source type | Wavelength | Size

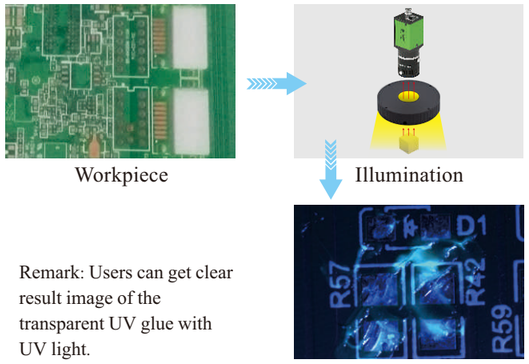
Spectrum Chart



Note: The data is for reference only.

Application Cases

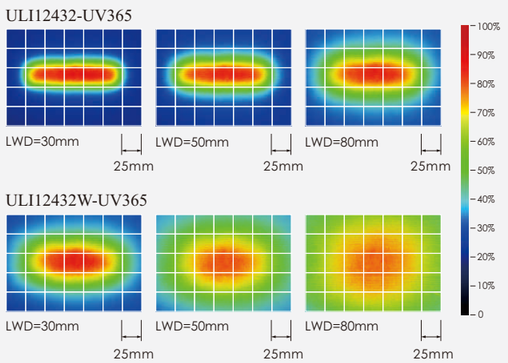
Glue detection on PCB



Remark: Users can get clear result image of the transparent UV glue with UV light.

Series Features

Relative Radiant Power Distribution

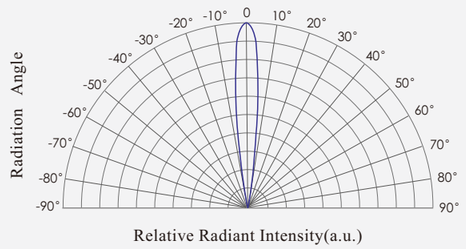


Note: The data is for reference only.

Series Features

Narrow radiation

Directional feature

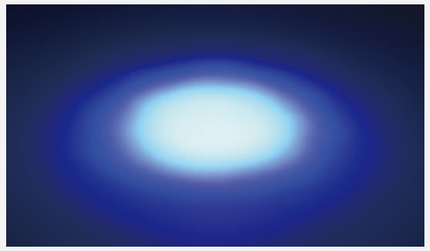


Relative Radiant Intensity(a.u.)

Spot contrast



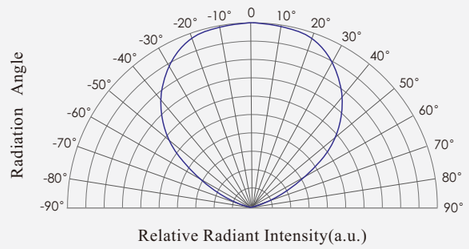
OPT-ULI12432 (375nm)



OPT-URI9030 (375nm)

Wide radiation

Directional feature

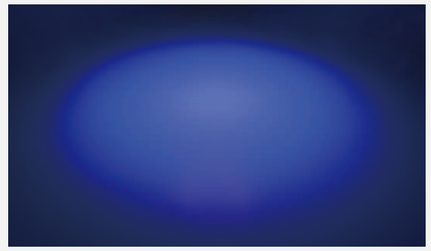


Relative Radiant Intensity(a.u.)

Spot contrast

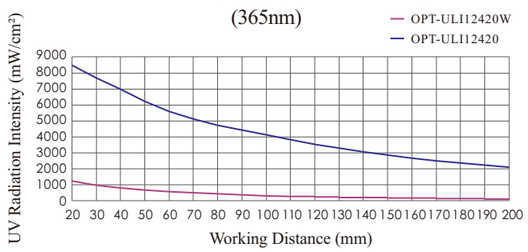


OPT-ULI12432W (375nm)



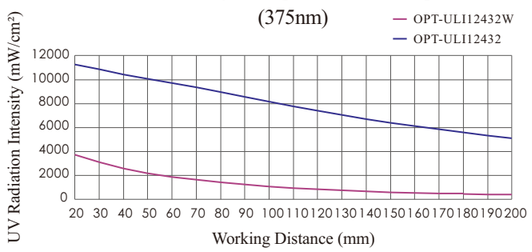
OPT-URI9030W (375nm)

Radiation Intensity Change versus Working Distance (365nm)



Note: The data is for reference only.

Radiation Intensity Change versus Working Distance (375nm)



Note: The data is for reference only.

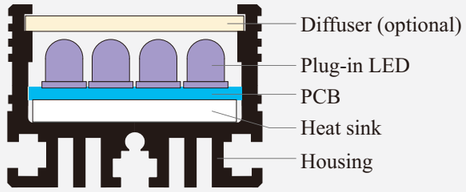
ULI UV Bar Lights

Selection Guide

OPT-ULI37632W

- With W:Wide radiation / Without W:Narrow radiation
- Width
- Length
- UV Bar Lights
- Brand name

Section Structure Drawing

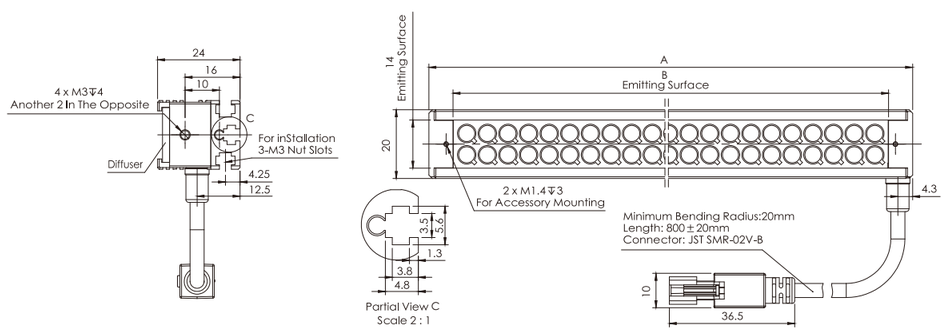


Model Table

No.	Model	∗Power@365nm	∗Power@375nm	Length A (mm)	Emitting B (mm)	Light source width (mm)	Recommended controller
1	OPT-ULI5220	1W@24V	1W@24V	52	38	20	OPT-DPA2024E
2	OPT-ULI5220W						
3	OPT-ULI8820	1.9W@24V	2W@24V	88	74		
4	OPT-ULI8820W						
5	OPT-ULI12420	2.8W@24V	2.9W@24V	124	110		
6	OPT-ULI12420W						
7	OPT-ULI16020	3.6W@24V	3.9W@24V	160	146		
8	OPT-ULI16020W						
9	OPT-ULI19620	4.6W@24V	4.8W@24V	196	182		
10	OPT-ULI19620W						
11	OPT-ULI23220	5.5W@24V	5.8W@24V	232	218		
12	OPT-ULI23220W						
13	OPT-ULI26820	6.4W@24V	6.7W@24V	268	254		
14	OPT-ULI26820W						
15	OPT-ULI30420	6.5W@24V	6.6W@24V	304	290		
16	OPT-ULI30420W						
17	OPT-ULI34020	7.3W@24V	7.4W@24V	340	326		
18	OPT-ULI34020W						
19	OPT-ULI37620	8.2W@24V	8.3W@24V	376	362		
20	OPT-ULI37620W						

∗ Note: The data is for reference only.

Dimensions (mm)

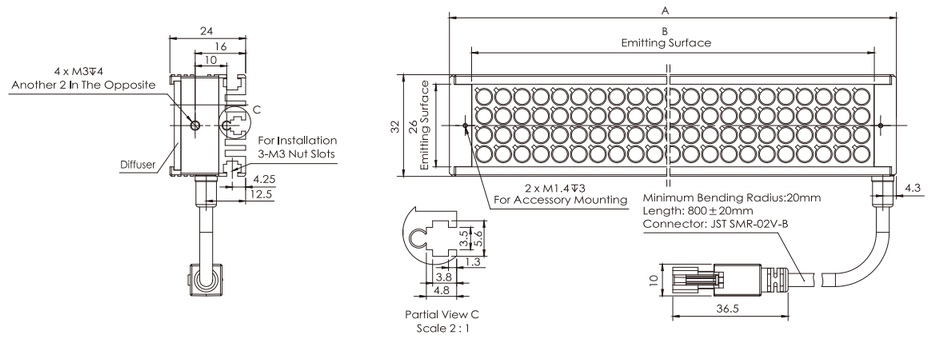


Model Table

No.	Model	∗Power@365nm	∗Power@375nm	Length A (mm)	Emitting B (mm)	Light source width (mm)	Recommended controller
1	OPT-ULI5232	1.8W@24V	1.9W@24V	52	38	32	OPT-DPA2024E
2	OPT-ULI5232W						
3	OPT-ULI8832	3.3W@24V	3.4W@24V	88	74		
4	OPT-ULI8832W						
5	OPT-ULI12432	4.7W@24V	5.1W@24V	124	110		
6	OPT-ULI12432W						
7	OPT-ULI16032	6.8W@24V	7.3W@24V	160	146		
8	OPT-ULI16032W						
9	OPT-ULI19632	7.9W@24V	8.2W@24V	196	182		
10	OPT-ULI19632W						
11	OPT-ULI23232	10.7W@24V	10.5W@24V	232	218		
12	OPT-ULI23232W						
13	OPT-ULI26832	11.6W@24V	12.2W@24V	268	254		
14	OPT-ULI26832W						
15	OPT-ULI30432	12.7W@24V	13.1W@24V	304	290		
16	OPT-ULI30432W						
17	OPT-ULI34032	14.3W@24V	14.8W@24V	340	326		
18	OPT-ULI34032W						
19	OPT-ULI37632	15.8W@24V	16.4W@24V	376	362		
20	OPT-ULI37632W						

∗ Note: The data is for reference only.

Dimensions (mm)



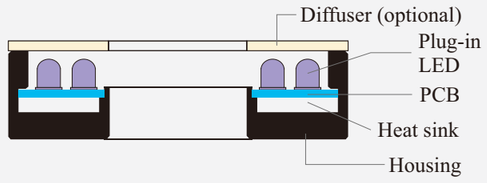
URI UV Ring Lights

Selection Guide

OPT- URI12030W

- With W: Wide radiation / Without W: Narrow radiation
- Emitting angle
- Outer diameter
- UV Ring Lights
- Brand name

Section Structure Drawing



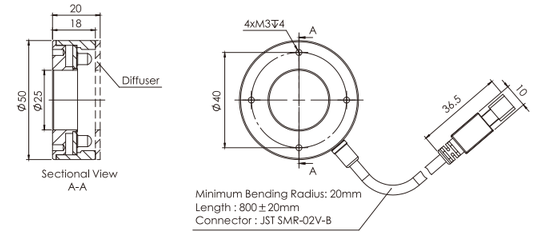
Model Table

No.	Model	∗ Power@365nm	∗ Power@375nm	Angle between the light ray and the central axis	Recommended controller
1	OPT-URI5000	1.3W@24V	1.4W@24V	0°	OPT-DPA2024E
2	OPT-URI5000W				
3	OPT-URI7000	3.3W@24V	3.4W@24V		
4	OPT-URI7000W				
5	OPT-URI9000	5.2W@24V	5.6W@24V		
6	OPT-URI9000W				
7	OPT-URI12000	7.4W@24V	7.8W@24V		
8	OPT-URI12000W				

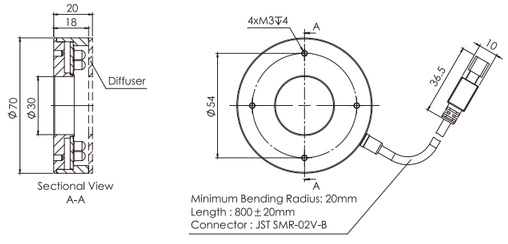
∗ Note: The data is for reference only.

Dimensions (mm)

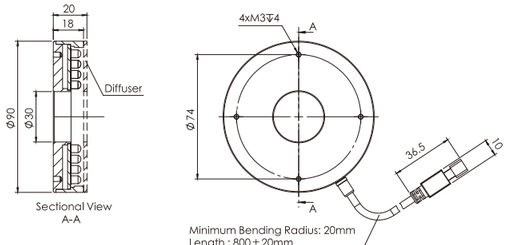
1. OPT-URI5000
2. OPT-URI5000W



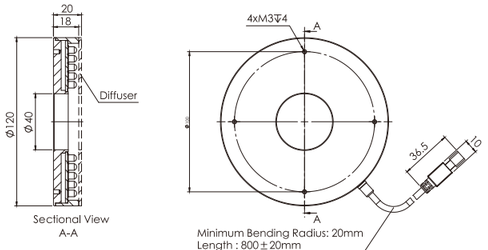
3. OPT-URI7000
4. OPT-URI7000W



5. OPT-URI9000
6. OPT-URI9000W



7. OPT-URI12000
8. OPT-URI12000W



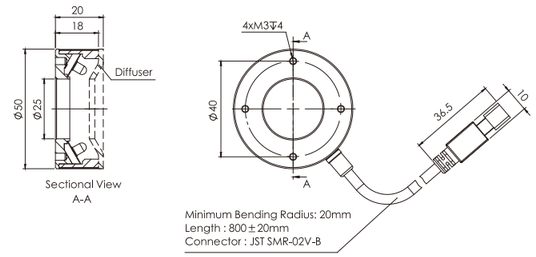
Model Table

No.	Model	∗ Power@365nm	∗ Power@375nm	Angle between the light ray and the central axis	Recommended controller
1	OPT-URI5030	1.4W@24V	1.4W@24V	30°	OPT-DPA2024E
2	OPT-URI5030W				
3	OPT-URI7030	3.4W@24V	3.6W@24V		
4	OPT-URI7030W				
5	OPT-URI9030	5.5W@24V	5.8W@24V		
6	OPT-URI9030W				
7	OPT-URI12030	7.6W@24V	8W@24V		
8	OPT-URI12030W				

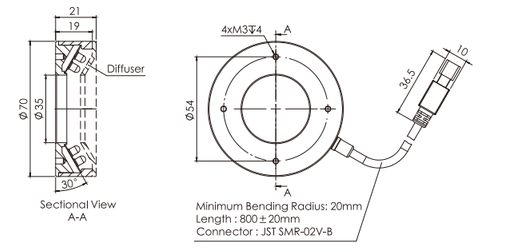
∗ Note: The data is for reference only.

Dimensions (mm)

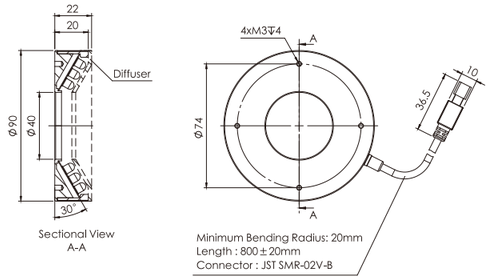
1. OPT-URI5030
2. OPT-URI5030W



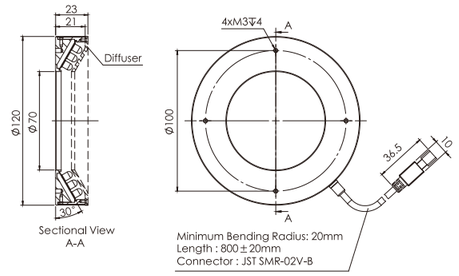
3. OPT-URI7030
4. OPT-URI7030W



5. OPT-URI9030
6. OPT-URI9030W



7. OPT-URI12030
8. OPT-URI12030W



UV Glue Curing Lights OPT-CXXX-UV Series



OPT-CPIG Glue Curing Spot Lights

Product Features

Main Features

- Light spots with 4mm/6mm/8mm/10mm/15mm diameter available
- Special lens for focused and powerful illumination
- Equipped with the flexible and durable cable for multiple motion applications
- Up to 4700mW/cm^2 light intensity at 10mm working distance (Tested with OPT-CPIG1203-04-UV405)

Application Cases

- Camera lens bonding
- Chip encapsulation; sensor production; bonding of hard disk heads
- Bonding of medical injection heads
- Bonding of small parts

Selection Guide

OPT-CPIG12 03-04-UV405

- UV wavelength
- Light spot size
- Power
- Outer diameter
- High intensity spot light
- Curing light series
- Brand name

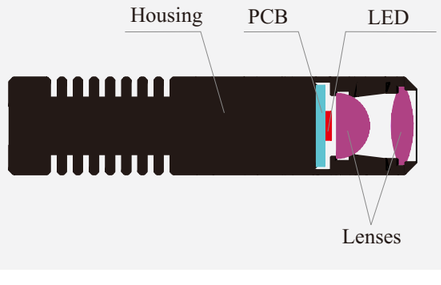
Customizable Items



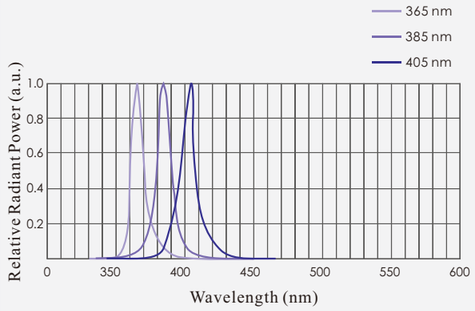
Mounting

Size

Section Structure Drawing



Spectrum Chart



Note: The data is for reference only.

Application Cases



Light spot



Illumination

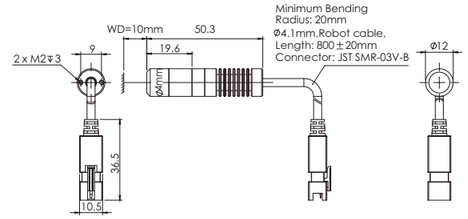
Model Table

No.	Model	Wavelength	* Power	Channels	Recommended controller
1	OPT-CPIG1203-04	365nm/385nm/405nm	3.5W@1.0A	1	OPT-DPA2005E
2	OPT-CPIG1203-06	365nm/385nm/405nm	3.5W@1.0A	1	
3	OPT-CPIG1203-08	365nm/385nm/405nm	3.5W@1.0A	1	
4	OPT-CPIG1203-10	365nm/385nm/405nm	3.5W@1.0A	1	
5	OPT-CPIG1203-15	365nm/385nm/405nm	3.5W@1.0A	1	

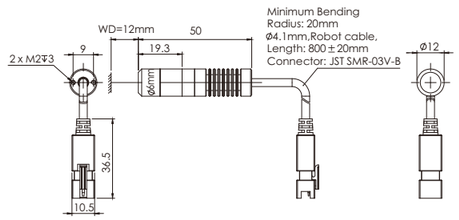
* Note: The data is for reference only.

Dimensions (mm)

1.OPT-CPIG1203-04



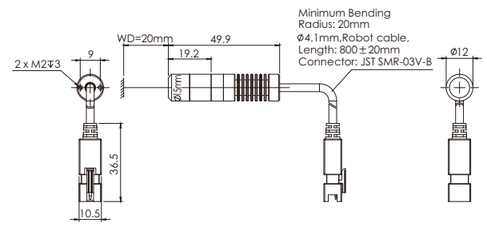
2.OPT-CPIG1203-06



3.OPT-CPIG1203-08

4.OPT-CPIG1203-10

5.OPT-CPIG1203-15



OPT-CLSG Glue Curing Line Lights

Product Features

Main Features

- With special cylinder lens for focused and powerful light
- Stable heat dissipation by cooling fan, allow for continuous mode
- Up to 5500mW/cm^2 light intensity at 20mm working distance
  (Tested with OPT-CLSG195-UV405)

Application Cases

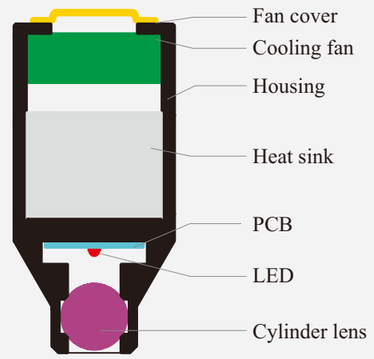
- Bonding PCB chips with UV glue
- Sealing of touch screen with glue; LCD panel encapsulation
- Bonding of medical instruments
- Curing of ink, varnish and paint

Selection Guide

OPT-CLSG195-UV405

- 195 → Length
- UV → UV wavelength
- 1 → High intensity line scan light
- 5 → Curing light series
- Brand name

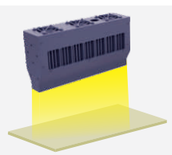
Section Structure Drawing



Application Cases



Light spot



Illumination

Customizable Items



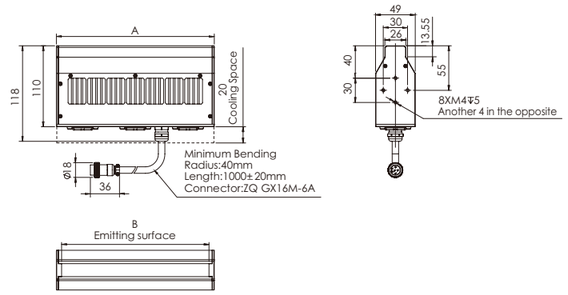
Mounting | Size | Heat dissipation

Model Table

No.	Model	Wavelength	∗Power	Total length A (mm)	Emitting surface B (mm)	Channels	Recommended controller
1	OPT-CLSG60	365nm/385nm/405nm	24W@24V	60	47	1	OPT-DPA2024E
2	OPT-CLSG105	365nm/385nm/405nm	48W@2.0A	105	92	1	OPT-DPA6024
3	OPT-CLSG150	365nm/385nm/405nm	72W@3.0A	150	137	1	
4	OPT-CLSG195	365nm/385nm/405nm	96W@4.0A	195	182	1	
5	OPT-CLSG240	365nm/385nm/405nm	120W@5.0A	240	227	1	
6	OPT-CLSG285	365nm/385nm/405nm	144W@6.0A	285	272	2	
7	OPT-CLSG330	365nm/385nm/405nm	168W@7.0A	330	317	2	
8	OPT-CLSG375	365nm/385nm/405nm	192W@8.0A	375	362	2	
9	OPT-CLSG420	365nm/385nm/405nm	216W@9.0A	420	407	2	
10	OPT-CLSG465	365nm/385nm/405nm	240W@10.0A	465	452	2	

Note:∗The data of multi-channel total power is only for reference.

Dimensions (mm)



OPT-CFLG Glue Curing Flat Lights

Product Features

Main Features

- Equipped with compact high power LED arrays for uniform illumination
- Up to 2200 mW/cm^2 light intensity at 10mm working distance
  (Tested with OPT-CFLG15658-UV405)

Application Cases

- Secondary curing of cell phones and optical communication components
- Film printing
- Curing of ink, varnish and paint
- Coating curing of building materials

Selection Guide

OPT-CFLG15658-UV405

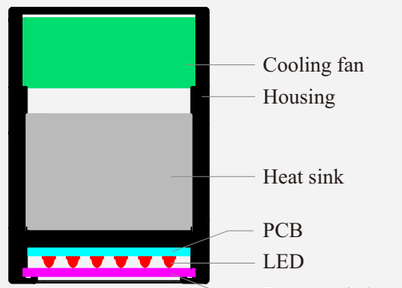
- UV → UV wavelength
- 15658 → Length and width
- 1 → High intensity area scan light
- 5 → Curing light series
- Brand name

Customizable Items

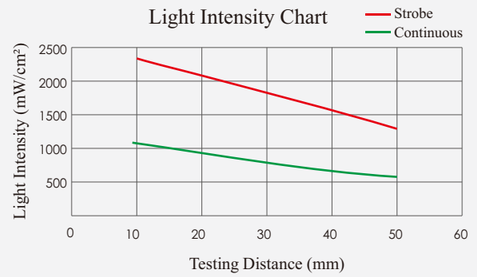


Mounting | Size | Heat dissipation

Section Structure Drawing



Series Features



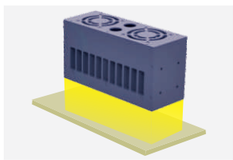
(Tested with OPT-CFLG15658-UV405)

Application Cases

- Height gauging for metal parts



Light spot



Illumination

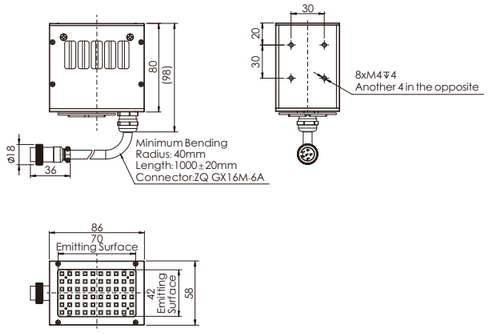
Model Table

No.	Model	Wavelength	∗Power	Channels	Recommended controller
1	OPT-CFLG8658	365nm/385nm/405nm	120W@5A	1	OPT-DPA6024
2	OPT-CFLG15658	365nm/385nm/405nm	240W@10A	2	
3	OPT-CFLG22658	365nm/385nm/405nm	360W@15A	1	OPT-DPA20024E
4	OPT-CFLG29658	365nm/385nm/405nm	480W@20A	1	
5	OPT-CFLG156100	365nm/385nm/405nm	480W@20A	1	

Note:∗The data of multi-channel total power is only for reference.

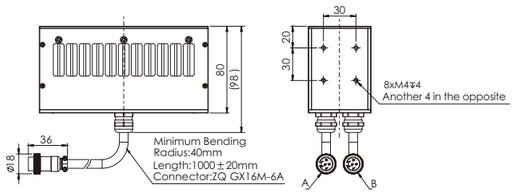
Dimensions (mm)

1.OPT-CFLG8658

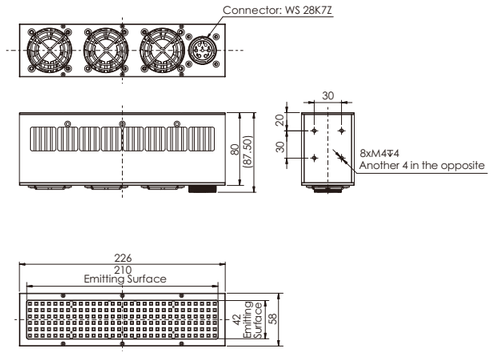


Dimensions (mm)

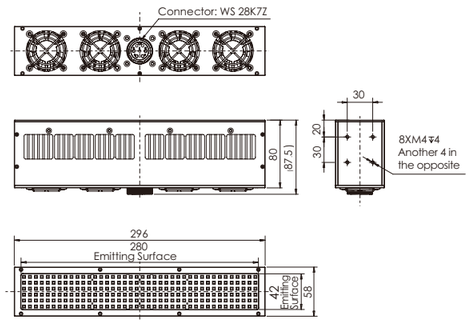
2.OPT-CFLG15658



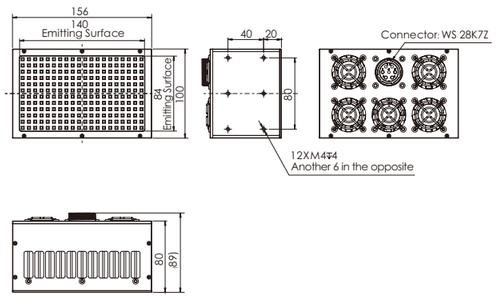
3.OPT-CFLG22658



4.OPT-CFLG29658

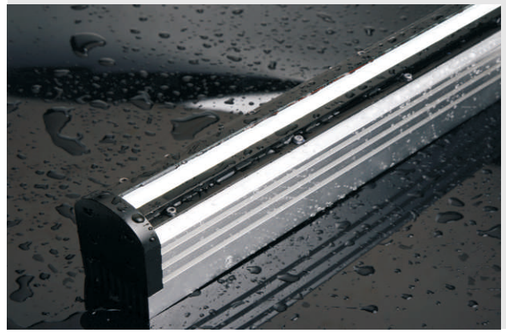


5.OPT-CFLG156100



Waterproof Lights

IP67 dustproof and waterproof

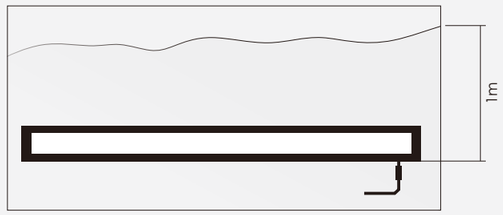




Product Features

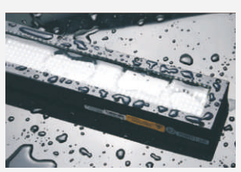
Main Features

- IP67 rating
- Applicable in humid and dusty environments
- Most of OPT lights can be designed to be waterproof.
- OPT waterproof lights have passed multiple rigorous tests and their performance has been optimized.
- Good cooling performance, long lifespan



- The distance between the light and the water surface in a tank should be ≤1m.
- Test time: 2 hours

Customizable Items



Color
Mounting
Size
Heat dissipation
IP rating
Sectional control

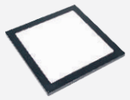
Lights Customizable to be Waterproof

Ring lights



Backlights

Highly directional backlights



Bar lights



High uniformity bar lights



High intensity line scan lights



Combined bar lights



High intensity ring lights



High Intensity Bar Lights



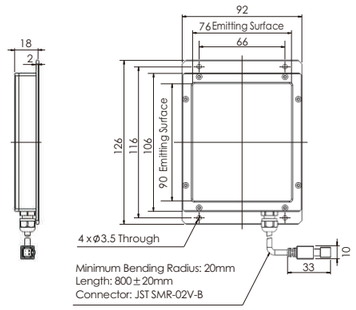
Model Table

No.	Model	＊Power 🔴	＊Power ⚪🟢🔵	Recommended controller
1	OPT-FL12692-IP67	4.1W@24V	6.1W @24V	OPT-DPA2024E
2	OPT-LI22034-IP67	2.4W@24V	4.6W@24V	
3	OPT-RI10030-IP67	4.6W@24V	5.8W@24V	

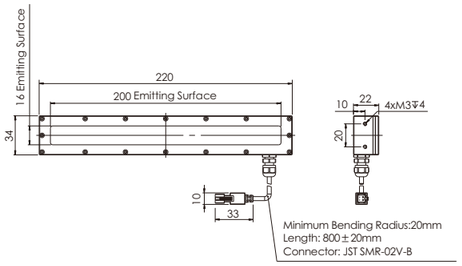
＊Note: The data is for reference only.

Dimensions (mm)

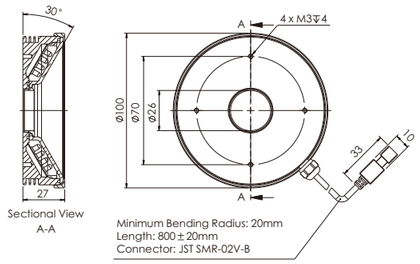
1.OPT-FL12692-IP67



2.OPT-LI22034-IP67

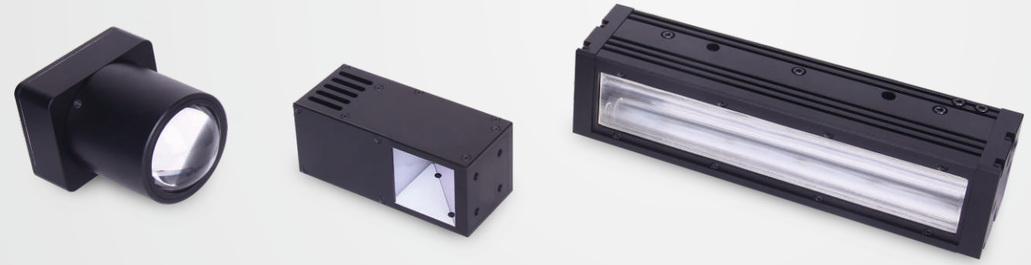


3.OPT-RI10030-IP67



Note: Please contact us for more custom designs.

Air Cooled Lights Series



Product Features

Main Features

- Efficient air cooling
- Very compact design saves space during installation
- Equipped with special cylinder lens for uniform illumination
- Applicable in dust-free and other environments that have special requirements for air pressure & air flow

Application Cases

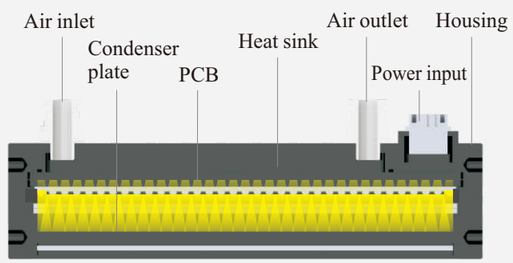
- Detection of defects on the surface of the cell phone screen
- Detection of scratches on the surface of aluminum foil
- Detection of defects on the surface of steel plates

Customizable Items



Color | Size | Mounting

Section Structure Drawing



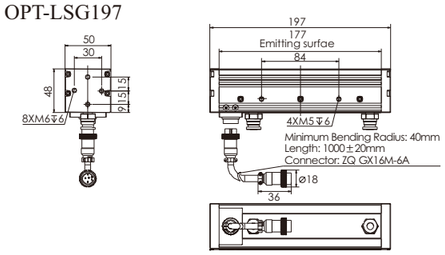
Model Table

Model	＊Power 🔴	＊Power ⚪	＊Power 🟢🔵	Recommended controller
OPT-LSG197	28.8W@1.2A	84W@3.5A	84W@3.5A	OPT-DPA6024
OPT-PIG5280	-	43.2W@1.8A	-	OPT-DPA6024
OPT-COG40	19.2W@24V	19.2W@24V	19.2W@24V	OPT-DPA2024E

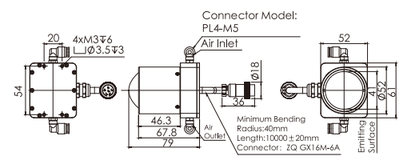
＊Note: The data is for reference only.

Dimensions (mm)

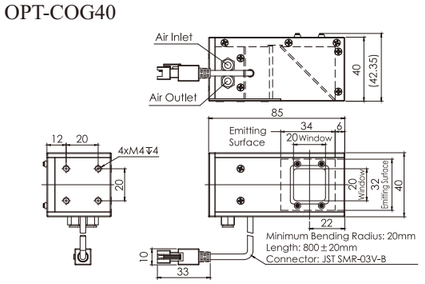
OPT-LSG197



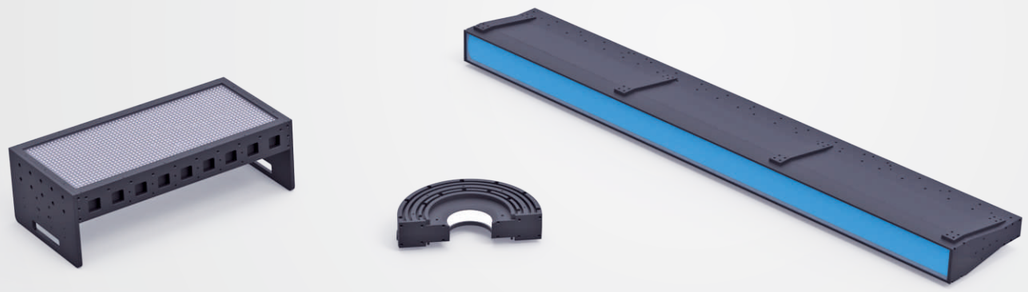
OPT-PIG5280



OPT-COG40



Water Cooled Lights Series



Product Features

Main Features

- Equipped with compact arrangement and uniform illumination high power LED.
- Efficient heat dissipation of water cooling.
- A light weight,stable and reliable alloy design.
- Applicable in dust-free and other environments that have special requirements for air pressure & air flow

Application Cases

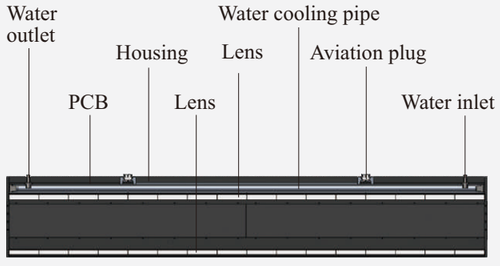
- Steel plate crack detection
- Hole defect detection

Customizable Items



Color | Size | Mounting

Section Structure Drawing



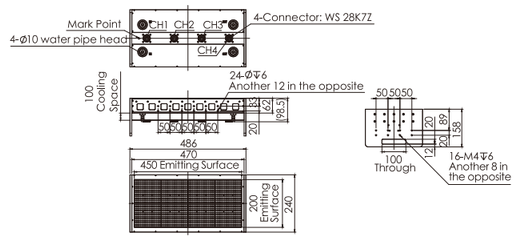
Model Table

Model	*Power○	*Power●●	Power-UV	Recommended controller
OPT-CFLG486240-UV	-	-	4×20A/4×480W	OPT-DPA20024E
OPT-LSF1820	-	2×16.8/2×403.2W	-	
OPT-RIC19390	144W@6A	-	-	OPT-DPA6024E

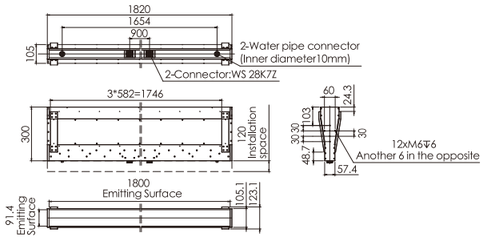
* Note: The data is for reference only.

Dimensions (mm)

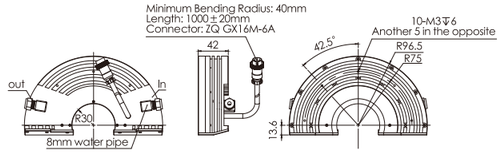
OPT-CFLG486240-UV



OPT-LSF1820



OPT-RIC19390



OPT supplied more than 30,000 lights customized to meet the needs of customers.

As one of the leading vision companies for customized lighting, OPT has developed a complete customization process and is able to deliver the customized products within 3 business days.

Customizable items

Emitting angle | Size | Light intensity | Wavelength | Color temperature | Other items

Customization process



Your idea and requirements → Engineering of possible solutions → Details discussion → Pilot production → Customer support during operation

Customization cases

Case 1: Illumination for solar battery inspection

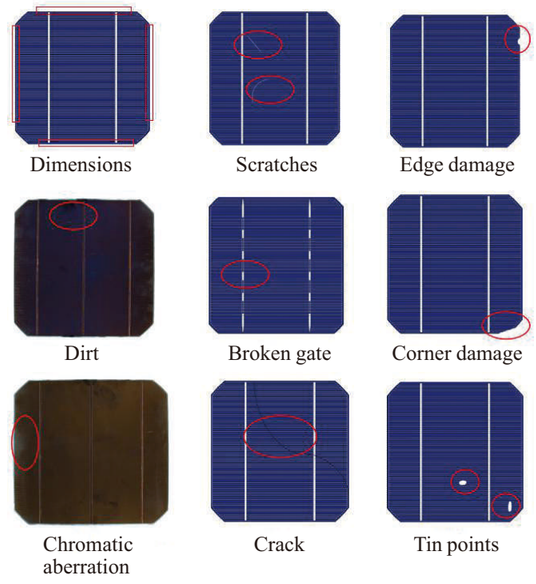
During the mass production, some invisible defects such as cracks, contamination, uneven diffusion, etc. may inevitably appear on the silicon wafer. OPT can provide the machine vision system for accurate automatic optical inspection (AOI), reduce cost and improve yield rate.

Customer requirement

The customer is a large manufacturer of silicon solar batteries. As it is difficult for operators to detect the various defects, such as debris, edge/corner damage, scratches, wrong position, broken gate, etc., a machine vision system is urgently needed for inspection to ensure quality.

Inspection items

1. Debris/edge damage that generally appears on battery edge in irregular shape.
2. Broken gate on surface, the grid line disconnects during the printing of the battery, which may lead to an open circuit.
3. Visible fingerprints or other greasy dirt on surface.
4. Scratches and cracks are mostly linear defects, mainly distributed on the surface layer and inner layer of the batteries; Defects in the inner layer are not visible to the human eyes.

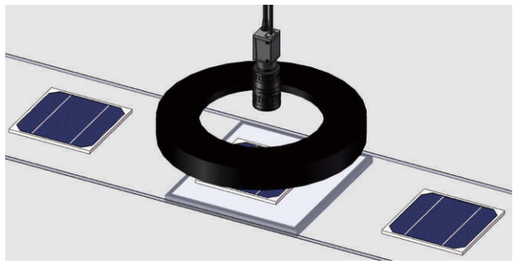


Dimensions | Scratches | Edge damage
Dirt | Broken gate | Corner damage
Chromatic aberration | Crack | Tin points

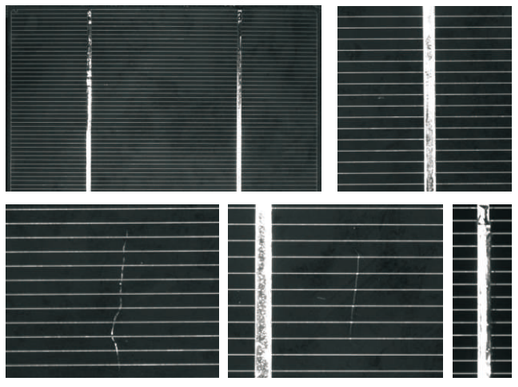
Customization requirements

1. Adequate light intensity for short exposure to ensure high-speed and stable production.
2. Uniform emitting and clear image with high contrast; eliminating bright spots and glare.
3. Threaded mounting holes on the side.
4. The light keeps on stably for a long period (24hrs) with well-designed heat sink; the intensity decreasing should be within a small range, and no frequent intensity adjustment is needed in a year.
5. The controller should have strobe function to trigger the light for photo-taking.

The OPT design can meet the above requirements.



Illumination result images



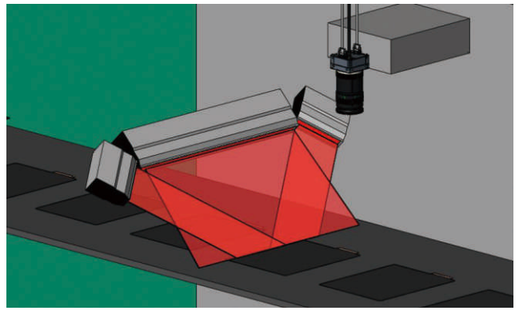
Case 2: Illuminator for Li-ion battery inspection

Li-ion battery is a must in daily life. The electrode, raw material of the battery can be easily damaged during the production. In order to ensure the quality of the battery, the surface inspection of the electrode for cracks, spots, scratches, etc. should be improved. Manual inspection, which is popular all over the country, is inefficient. Most users usually need to spend a lot buying the equipment from abroad for automated on-line inspection. The following are some features of OPT automated optical inspection system (AOI).

1. Provides efficient inspection without affecting any production conditions.
2. Reduces operators' workload and increases capacity.
3. Reduces companies' loss and protects their fame.

Customer requirement

The Li-ion battery manufacturer wants to inspect the defects on electrode surface with machine vision system to enhance the quality control efficiency. For example, the detection of copper exposure, pinhole, greasy dirt, scratches, powders, wrinkling, etc.



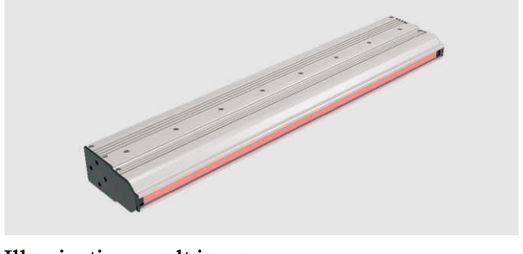
Inspection items

1. Dirt, fingerprints and foreign objects on electrode surface
2. Exposure of the copper
3. Powders (width: ⩽0.1mm; length >one-sixth of the side or one-half of the shortest side)
4. Electrode damage; bubble area >3mm^2 or more than 3 bubbles
5. Burrs or curly edges

Customization requirements

1. Real-time inspection during production and 500mm inspection of products
2. 100m/min inspection speed; above 1300kLux light intensity
3. Uniform illumination and clear imaging
4. Threaded mounting holes on both sides of the light
5. The light keeps on stably for a long period (24hrs) with well-designed heat sink; the intensity error should be within a small range, and no frequent intensity adjustment is needed in a year.

The OPT design can meet the above requirements.

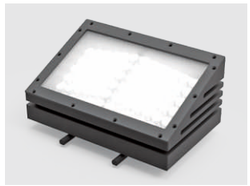


Illumination result images

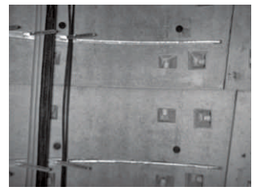


High Intensity Strobe Back Light

Model: OPT-FLG204128-X
Features: Adjustable pulse width of 1-1023μs with max. frequency of 66Hz, two-way tilt angle light. The light source is dust-proof and waterproof, IP64 protection class.
Application: Suitable for detecting scratches and cracks on high speed rails.

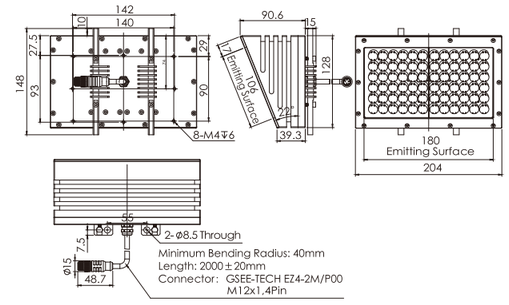


OPT-FLG204128-X



Image

Dimensions (mm)

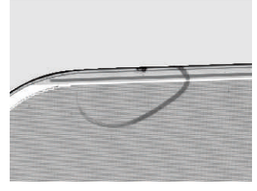


Angle Adjustable High Intensity Line Scan Light

Model: OPT-LSG514-X
Features: Adjustable illumination angles from 5° to 45°; obtains images with clear contrast; up to 90% uniformity at zero or 1m working distance
Applications: LCD scratches and dirt detection



OPT-LSG514-X



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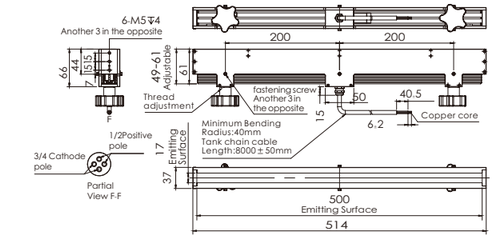
Dimensions (mm)



High Power Front Light

Model: OPT-FLM9886D-X
Features: Equipped with high density LED arrays and special lens; over 3 times the intensity compared to OPT-FL series lights; stable and uniform illumination; long service life; special for strobe; suitable for special illumination requirements
Applications: Contour locating; geometric measurement; surface defects detection and other high speed line scan applications

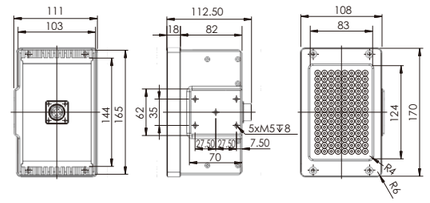


OPT-FLM9886D-X



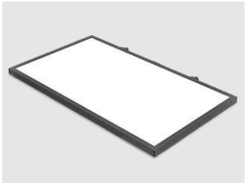
Image

Dimensions (mm)

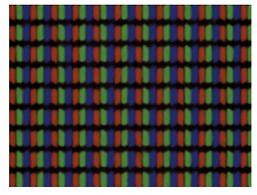


Large High Uniformity Backlight

Model: OPT-FL1300760-X
Features: High uniformity (above 95%) illumination; low flashing value within 0.02%; used for strobe, 50% duty ratio and above 30 kcd/m² light intensity; standard color temperature: 5700K±500K, customization available
Applications: Defects detection on large LCDs



OPT-FL1300760-X



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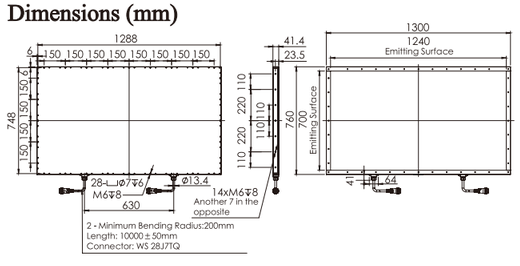
Dimensions (mm)



Spherical Shadowless Light

Model: OPT-RID180-X
Features: Uniform 360-degree illumination
Applications: Defects detection on curved and uneven surfaces

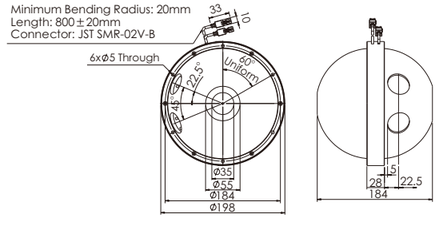


OPT-RID180-X



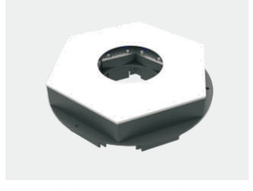
Image

Dimensions (mm)

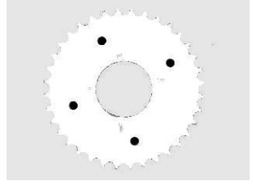


High Intensity Ring Light

Model: OPT-RIG22015-X
Features: Equipped with high power LEDs; up to 80% uniformity; 2 individually controlled channels; detachable polarizer to eliminate surface reflections
Applications: Longer distance illumination (compared to OPT-RI series); high-speed line scan illumination

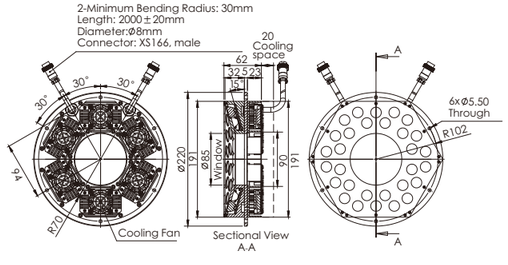


OPT-RIG22015-X



Image

Dimensions (mm)

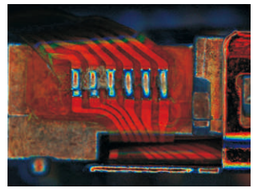


AOI Light

Model: OPT-RIA116-X
Features: Equipped with high density LED arrays and a special diffuser for high intensity and multi-color illumination; provides accurate 3D information about an object.
Applications: Soldering inspection for PCB; circuit connection inspection



OPT-RIA116-X



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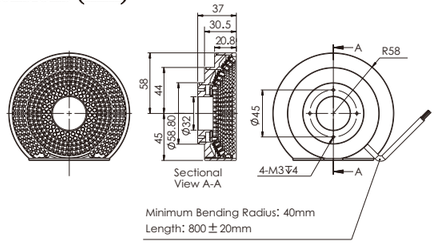
Dimensions (mm)



Multi-area Ring Light

Model: OPT-RI9060-4-X
Features: High density LED arrays; highlights object 3D information; each group of lighting areas is independently controlled; optional monochrome for objects of different sizes
Applications: OCR and surface inspection for capacitors and resistors

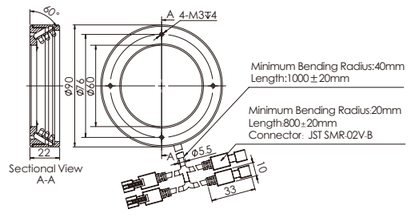


OPT-RI9060-4-X



Image

Dimensions (mm)

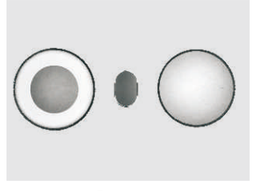


Combined Ring Light

Model: OPT-RIM7060-X
Features: Two ring light combination design, to reduce the installation space of the light source. Can be used for two cameras to improve the working efficiency.
Applications: Surface defects detection; contour positioning



OPT-RIM7060-X



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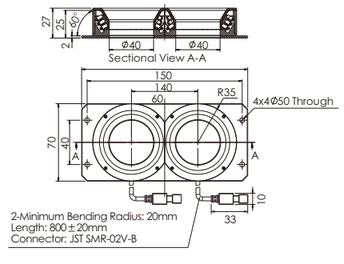
Dimensions (mm)

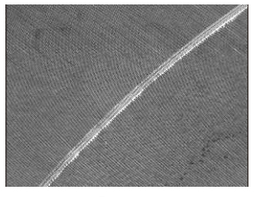


Ring Light

Model: OPT-RI11360-X
Features: Grooved in the middle for direct mounting on a motion inspection station; provides uniform illumination.
Applications: Small objects with curved edges Inspection



OPT-RI11360-X



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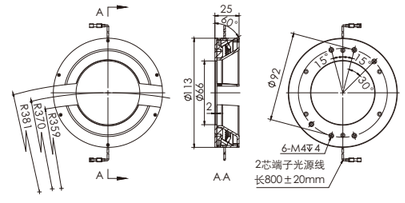
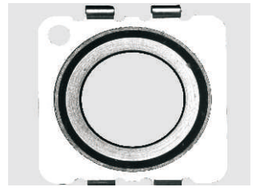


Half Ring Light

Model: OPT-RIC5030-X
Features: LED arrays in multiple colors; individually controlled channels; customizable sizes.
Applications: Contour positioning of electronic components; gauging for metal parts; surface defects detection.



OPT-RIC5030-X



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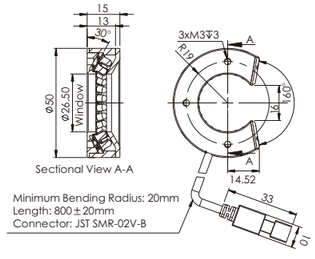
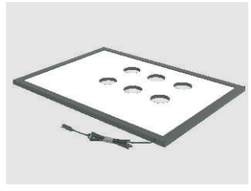
Dimensions (mm)

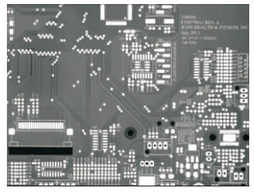


Backlight with View Windows

Model: OPT-FLC540390K-X
Features: Used as a front light to provide a large FOV uniform illumination; view windows available for clear imaging.
Applications: Inspection of mechanical parts; inspection of electronic parts inspection; detection of scratches.

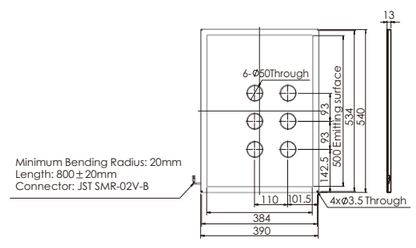


OPT-FLC540390K-X



Image

Dimensions (mm)



Vault Light

Model: OPT-LIU500C-X
Features: Provides high intensity illumination with high power LEDs; heat sink and cooling fan available; adjustable illumination angles and sizes.
Applications: Surface inspection of packaging cartons; detection of defects on curved surfaces.

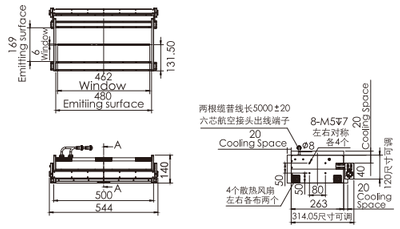


OPT-LIU500C-X



Image

Dimensions (mm)



Curved Backlight

Model: OPT-RIC62535-X
Features: Special curved emitting surface for focused and uniform illumination.
Applications: Liquid level gauging, foreign objects detection, and positioning of cell phone antennas in medical and consumer electronics industries.

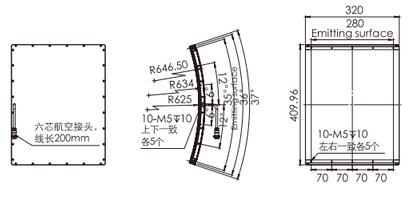


OPT-RIC62535-X



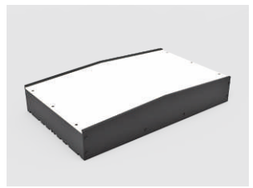
Image

Dimensions (mm)

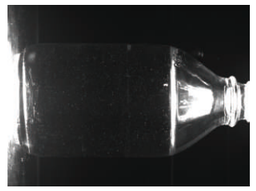


Optical Module

Model: OPT-ILS0013-RGBW
Features: For imaging 2 objects simultaneously with the lens module; integrated design; easy to install.
Applications: PCB alignment, mobile phone screen lamination in printing and consumer electronics industries.



OPT-ILS0013-RGBW



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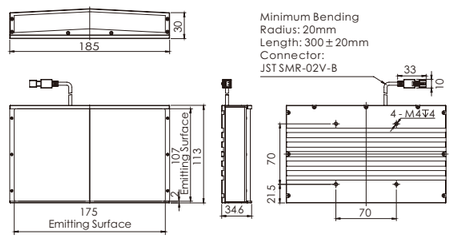
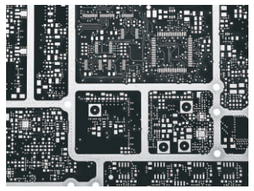


Bi-directional Backlight

Model: OPT-FLG185113-IR
Features: Bi-directional illuminating backlight, high brightness, and designed to dissipate heat. The manufacturing of the diffuser is complex and unique.
Applications: Detection of foreign objects in liquids in the machine vision medical industry.



OPT-FLG185113-IR



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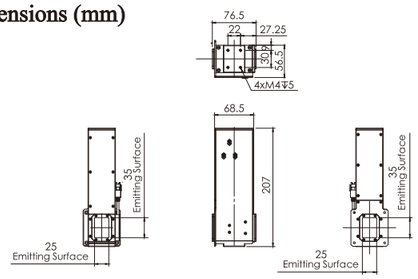
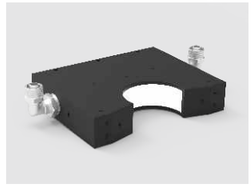


High brightness semi-ring light source

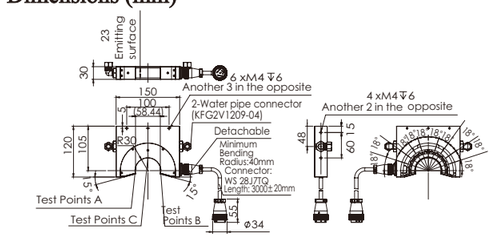
Model: OPT-RIC15090-X
Features: Ultra-high brightness C-shaped light source with brightness exceeding 1.8 million cd/m². Uniformity tested at nine points (top, middle, bottom, left, middle, right, 3x3 grid) with uniformity reaching over 85%. The light source uses water cooling for excellent thermal management, significantly extending the light source's lifespan.
Applications: Primarily used for the appearance defect detection of cylindrical products.



OPT-RIC15090-X

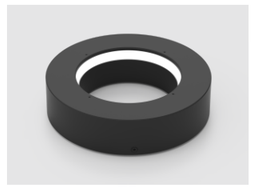
Image

Dimensions (mm)

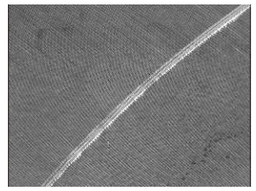


Ring spotlight source

Model: OPT-RIG11070-X
Features: The light source utilizes a ring-shaped light guide rod design and high-power surface-mount LEDs for high brightness and concentrated light emission.
Application: Used for detecting gaps in watch back covers.



OPT-RIG11070-X



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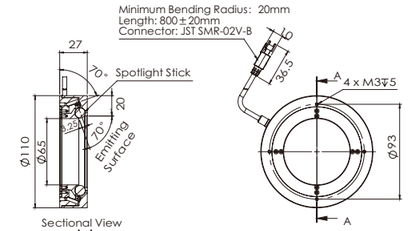
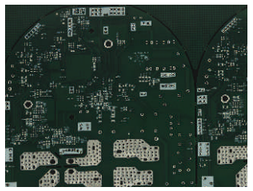


Line Scan Combination Light Source

Model: OPT-ILS0144-X
Features: High brightness line scan coaxial light source combined with six high brightness bar lights. The bar lights are set at angles of 15 degrees, 30 degrees, and 45 degrees, each pair independently controlled. The light source features high brightness, fan cooling, and four-channel control.
Application: The light source is used for PCB defect detection and print quality inspection.



OPT-ILS0144-X



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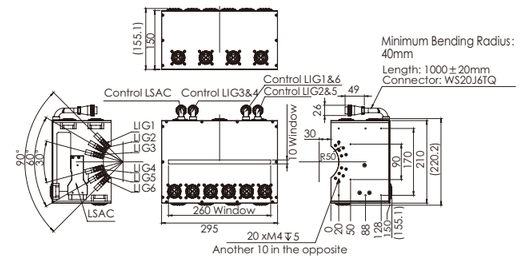
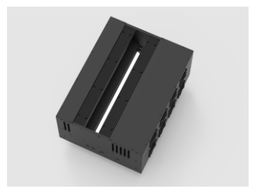


Line Scan Combination Light Source

Model: OPT-ILS0145-X
Features: High brightness line scan coaxial light source combined with an arched light source design. The arched light source uses a profile design, providing good diffusion. The light source features high brightness and uses heat sink fins combined with fan cooling for effective thermal management.
Application: The light source is used for PCB defect detection and print quality inspection.

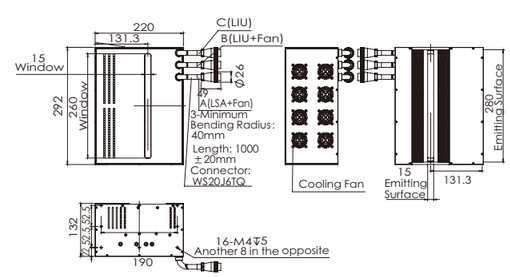


OPT-ILS0145-X



Image

Dimensions (mm)



OPT Controller

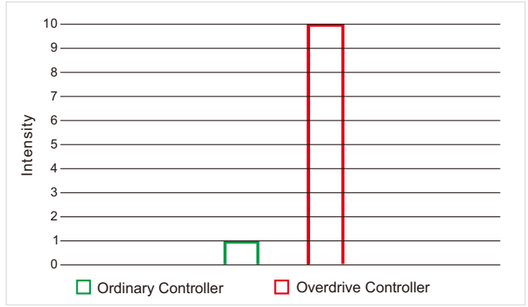
- Overview of Light Source Controller »P395
- Light Source Controller Selection Guide »P397
- Digital Current Controller DPA2024EB »P398
- Digital Current Controller DPA2012EB »P402
- Digital Current Controller for Spot Lights DPA2005EB »P405
- High Power Digital Current Controller DPA6024E(C) »P408
- High Power Digital Current Controller DPA6024EB NEW »P411
- High Power Digital Current Controller DPA10024EB »P415
- High Power Digital Current Controller DPA20024EB NEW »P418
- Strobe Overdrive Digital Controller DPH20048E »P421
- Line Scan Current-Type Digital Controller DPA6024ES NEW »P423
- Analog Voltage Controller AP1024F »P428
- High Power Analog Current Controller APA6024 »P431
- Analog Current Controller for Spot Lights APA0805F »P433
- DPM Mini Digital Current Controller NEW »P435
  DPA2024EC/DPA2012EC/DPA2005EC
- APM Mini Analog Voltage Controller APM0524B »P439
- SPM Mini Strobe Controller SPM2024 »P441
- Accessories »P444

Applications of Controller

Controller can adjust light source intensity via communication interfaces (e.g. Ethernet port and serial port). Programmable commands can also be sent via Ethernet or Serial ports. External triggers can be used for high speed applications.

Features of OPT Controllers

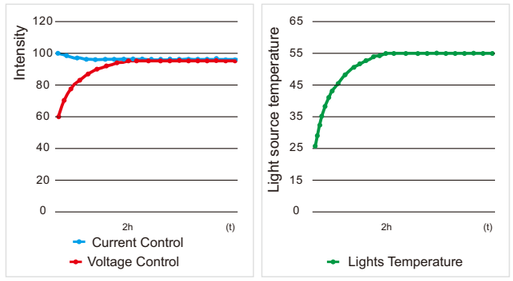
- High accuracy constant current control
- Autosense™ technology
- Overdrive® that increases light intensity
- Programmable trigger
- Efficient and flexible communication protocol
- Short response time, and high trigger frequency



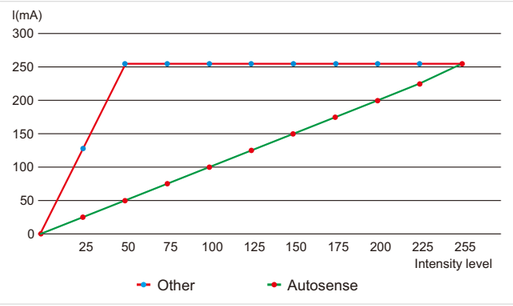
Maximum output comparison between ordinary and overdrive controllers

Autosense™ Technology

Light intensity via current control.



Automatically adjust output current based on light source current rating. Autosense will greatly reduce temperature issues thus prolongs light source life expectancy.



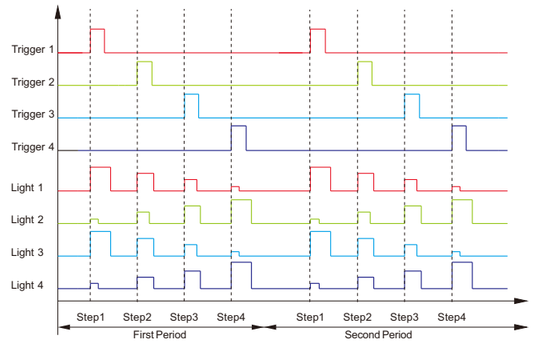
Comparison of Autosense and other controls

Overdrive® Technology

- Max. 20A instant output to increase light intensity
- Trigger pulse width setting
- Short trigger response time

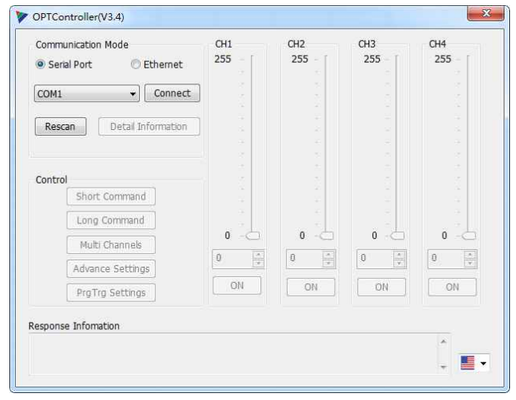
Programmable Trigger Technology

The triggers can be programmed via flowchart. Each step can be defined for expected channel intensity, pulse width and etc. Once the flowchart is set, the controller will sequentially execute each predefined steps.



Notes
1. "Trigger" indicates trigger signal, and "Light" the output signal.
2. The diagram above shows the sequence of 4 programmable triggers. Trigger 1/2/3/4 are trigger sources.

DEMO Software



Light Source Controller SDK

Language	OS	Development Environment and Architecture
C/C++ , VB ,C#	Windows	VS
C/C++	Ubuntu	GCC

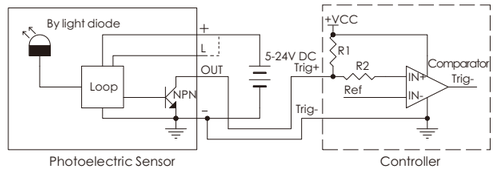
Light Source Controller Selection Guide

OPT-DPA2024E-X

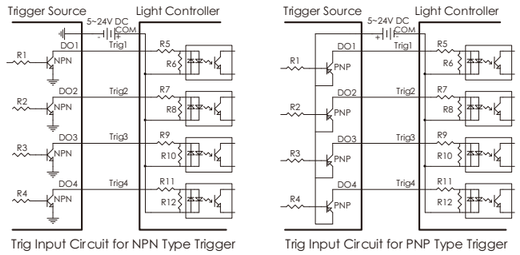
- Channels: 2 → 2 channels; 4 → 4 channels; 8 → 8 channels; 16 → 16 channels
- Additional information: E → Ethernet communication; F → Panel type; B → The 2nd generation
- Output voltage: 05 → 5V; 24 → 24V; 48 → 48V
- Output current: 07 → 0.7A; 20 → 2A; 60 → 6A
- Types: DPA-digital current; DPH-digital overdrive; AP-analog voltage; APA-analog current
- Brand name

Light Source Controller Trigger Wiring Diagrams

Switch Trigger



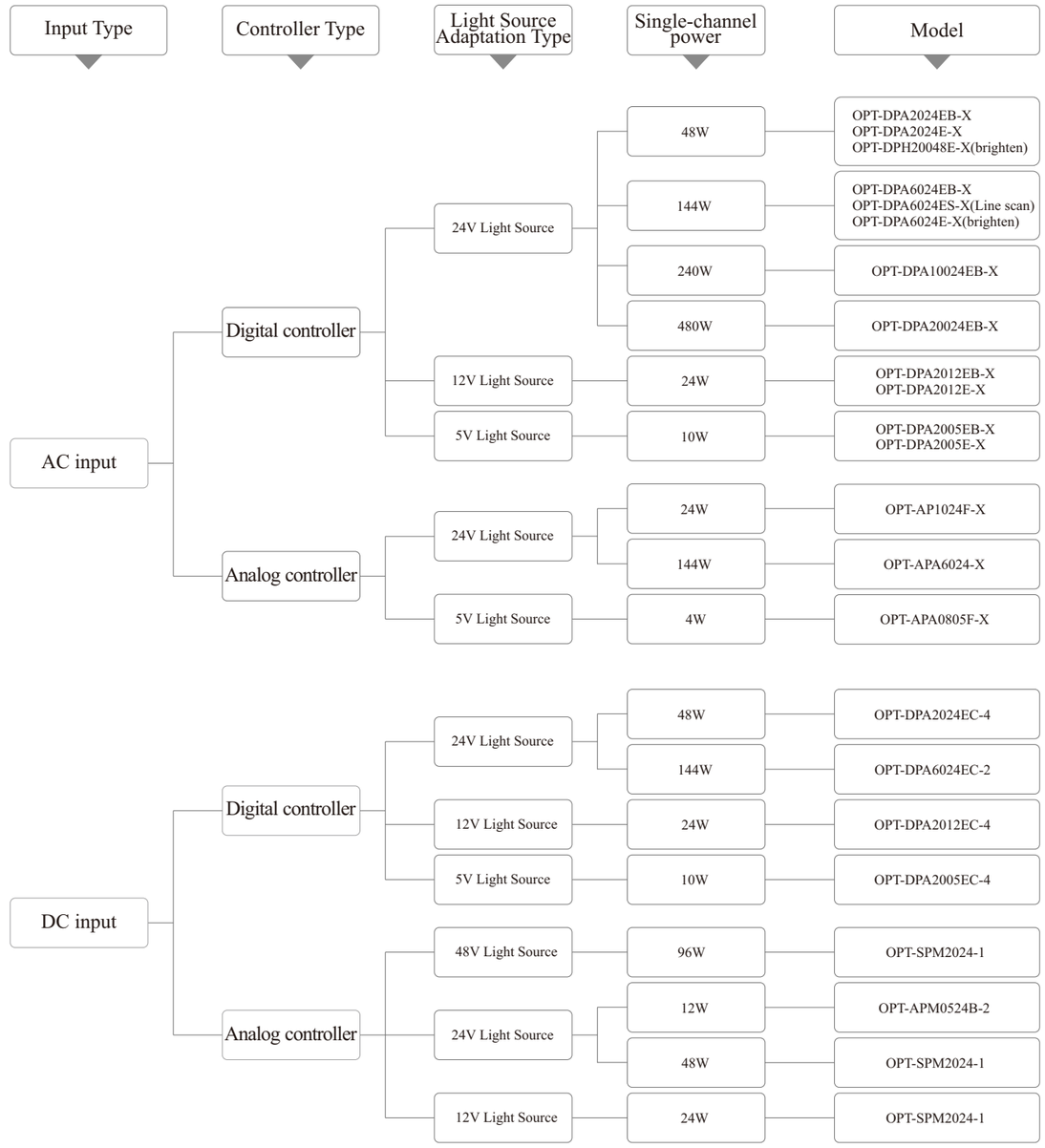
Level Trigger



Selection Table

Type	Control Type	Model	Channels	Compatible Light	Single Channel Power	Total Power	Triggering	Communication	Power Input
Digital Controller	Current	OPT-DPA2024EC-4	4 (can be extended to 8/12/16/20/24/28/32/36路)	24V	48W	100W	Level	Ethernet/RS232	DC22~25V
		OPT-DPA2012EC-4	4 (can be extended to 8/12/16/20/24/28/32/36路)	12V	24W	48W	Level	Ethernet/RS232	DC22~25V
		OPT-DPA2005EC-4	4 (can be extended to 8/12/16/20/24/28/32/36路)	5V spot light	10W	20W	Level	Ethernet/RS232	DC22~25V
		OPT-DPA2024EB-4	4	24V	48W	48W	Level	Ethernet/RS232	AC100~240V
		OPT-DPA2024E-X	4/8/16	24V	48W	4/8CH:48W 16CH:150W	Level	Ethernet/RS232	AC100~240V
		OPT-DPA2005EB-4	4	5V spot light	10W	30W	Level	Ethernet/RS232	AC100~240V
		OPT-DPA2005E-X	4/8	5V spot light	10W	4CH:30W 8CH:50W	Level	Ethernet/RS232	AC100~240V
		OPT-DPA2012EB-4	4	12V	24W	48W	Level	Ethernet/RS232	AC100~240V
		OPT-DPA2012E-4	4	12V	24W	48W	Level	Ethernet/RS232	AC100~240V
		OPT-DPA6024E-2	2	5-24V OPT 6P light	144W	288W	Level	Ethernet/RS232	AC100~240V
		OPT-DPA6024EC-2	2	5-24V OPT 6P light	144W	288W	Level	Ethernet/RS232	DC22~26V
		OPT-DPA6024EB-X	2/4/8/16	24V OPT 6P light	144W	2/4CH:122W/CH 8CH:700W 16CH:1450W	Level	Ethernet/RS232	AC100~120V OR AC200~240V
		OPT-DPA6024ES-X	4/8/16	24V OPT 6P light	144W	4/8CH:700W 16CH:1450W	Level	Ethernet/RS232	AC100~240V
		OPT-DPA10024EB-X	1/2	24V OPT 6P light	240W	240W/CH	Level	Ethernet/RS232	AC100~120V OR AC200~240V
		OPT-DPA20024EB-X	1/2	24V OPT 6P light	480W	480W/CH	Level	Ethernet/RS232	AC100~120V OR AC200~240V
	Overdrive	OPT-DPH20048E-4	4	24V	peak power: 960W	peak power: 1920W	Level	Ethernet/RS232	AC100~240V
Analog Controller	Current	OPT-APA6024-2	2	OPT 6P light	144W	288W	Switch	/	AC100~120V OR AC200~240V
		OPT-APA0805F-X	1/2/3/4	5V spot light	4W	1/2/3/4CH: 4/8/12/16W	Switch	/	AC100~240V
	Voltage	OPT-AP1024F-X	1/2/3/4	24V	24W	1/2CH:30W 3/4CH:40W	Switch	/	AC100~240V
		OPT-APM0524B-2	2	24V	12W	24W	Switch	/	DC20~24V
	Strobe	OPT-SPM2024-1	1	12~48V	96W	96W	Level	/	DC12~28V

Light Source Controller Selection Guide



Digital Current Controller Patented





Selection Guide

OPT-DPA2024EB-X

- Channels
- Additional info: E-Ethernet, B-versions
- Max. output voltage: 24V
- Max. output current: 2A
- Digital current controller
- Brand name

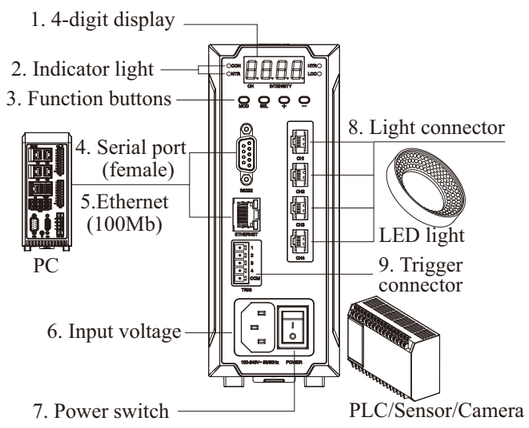
Model	Channels	Compatible Light
OPT-DPA2024EB-4	4	10mA~2A 24V
OPT-DPA2024E-4	4	10mA~2A 24V
OPT-DPA2024E-8	8	10mA~2A 24V
OPT-DPA2024E-16	16	10mA~2A 24V

Product Features

- Maximum of 64 programmable steps: intensity, pulse width and trigger source can be defined in each step.
- Autosense™ technology
- ≤ 20μs trigger response time
- Up to 20kHz trigger response frequency
- Simultaneous communication of multiple channels
- Manual setting for max. output current
- 256-level light intensity control
- External trigger: External trigger input (e.g. camera trigger signal) for related light strobes and other sequences. (Strobe mode can greatly improve light source life expectancy.)
- Rs232 interface
- 100Mb Ethernet interface
- Convenient mounting with screws or on DIN rails

Device Overview

OPT-DPA2024EB-4



No.	Item	Description
1	4-digit display	The first digit from the left indicates the operating channel, and the other 3 indicate the operating intensity or pulse width.
2	Indicator light	The current operating modes indicated:"CON" Constant mode,"NTR"Normal trigger ,mode, "HTR"High trigger mode"LOC"Key lock
3	Function keys	The (MOD) key is the working mode setting key. In the panel control mode, pressing this key for about 1S can switch the working mode to the constant light mode, common trigger mode and high light trigger mode, and the corresponding working mode indicator light will also light up; the (SEL) key is the parameter setting key. In the panel control mode, tapping this key can select the corresponding value displayed on the digital tube; the (+) key is for increasing the operation and the (-) key is for decreasing the operation.
4	Serial port (female)	Use RS232 to communicate with PC devices.
5	Ethernet (100Mb)	Communicate with PC devices via Ethernet.
6	AC input	Input: AC 100~240V, 50/60Hz
7	Power switch	Turn on/off the controller power
8	Light source interface	There are a total of 4 light source outputs, each independently controllable.
9	Trigger connector	Strobe mode can be also achieved by external trigger; trigger pulse width settable

Specifications

Model	DPA2024EB-4	DPA2024E-4	DPA2024E-8	DPA2024E-16
Input voltage	AC100~240V 50/60Hz			
Input current	1.8A/115VAC 1A/230VAC			
Lighting mode	Continuous/strobe			
Auto sensing of light rated current	For 10mA-2A 24V LED light			
Manual setting for max. output current	10mA~2A			
Intensity control	Adjustable brightness in 256 levels			
Short-circuit protection	When a controller output is short-circuited, the corresponding channel's short-circuit protection activates, which will disable the channel and display "Er2" on the digital display to indicate the error.			
Overcurrent protection	When the current output of a corresponding channel on the controller exceeds the set value, the overcurrent protection for that channel activates. It will shut down the channel and display "Er1" on the digital display to indicate the error.			
Triggering	Level triggering (Low level: 0~2V; High level: 5~24V)			
Normal trigger	Adjustable brightness in 256 levels			
Normal trigger time unit	1 μs/ 10 μs/1 ms/100 ms			
Normal trigger pulse width	1 μs~30 s			
High intensity trigger	2A output per channel			
High intensity trigger pulse width	0.01~5.00 ms			
Programmable trigger	Supports up to 64 processes, with settings for brightness, pulse width, and trigger source.			
Response time	≥ 30μs	≤20μs		
Response frequency	⩽ 10KHz	≤20kHz		
Output power	48W per channel, total power 48W			48W per channel, total power 150W
Communication	RS232/Ethernet			
Standby power consumption	3.2W	6.6W	8.7W	12.5W
Hi-Pot test	AC 1500V for 1 minute, leakage current < 10mA			
Insulation	DC500V, Insulation resistance > 20MΩ			
Operating temperature	-5℃~50℃			
Dimensions(mm^3)(L × W × H)	65×126.2×170 mm	91×132×171 mm	108×132.4×172.1 mm	140×132.4×172.1 mm
Weight (kg)	0.68	0.84	1.2	1.6

Mode Switching Settings

OPT-DPA2024EB-4

Mode	Indicator light display
Continuous light emission mode	CON light on
Normal trigger mode	NTR light on
High trigger mode	HTR light on
/	LOC light on, panel locked, can be operated via Demo software

OPT-DPA2024E-X

Mode	Working mode switch 1	Working mode switch 2
Continuous	ON	ON
Auto sensing of light rated current once	ON	OFF
Normal trigger	OFF	ON
High intensity trigger	OFF	OFF

Error Code Description

Code	Description	Display	Solution
Er0	No LED light connected	“Er0”	Connect an LED light
Er1	Overcurrent protection	“Er1”	Remove ERR and reboot
Er2	Short-circuit protection	“Er2”	Remove ERR and reboot
Er3	Overvoltage protection	“Er3”	Remove ERR and reboot
Er4	Driver hardware communication ERR	“Er4”	Return to OPT for repair
Er5	Display hardware communication ERR	“Er5”	Return to OPT for repair

Remark: “----” displays when the controller is turned on, and the corresponding value displays later.

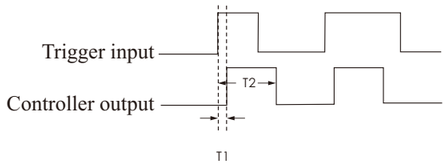
Trigger

This series of controllers features three trigger modes: normal, high , and programmable . It also supports four trigger polarities: rising edge, falling edge, positive pulse, and negative pulse. The default setting is rising edge trigger (see specific details in the table below).

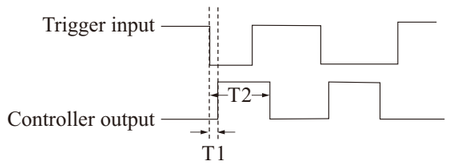
Trigger Mode	Trigger Polarity
Normal trigger	Rising edge trigger
	Falling edge trigger
	Positive follow trigger mode
	Negative follow trigger mode
High intensity trigger	Rising edge trigger
	Falling edge trigger
Programmable trigger	Rising edge trigger
	Falling edge trigger

Trigger Sequence

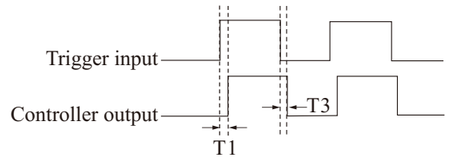
Rising edge trigger
The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



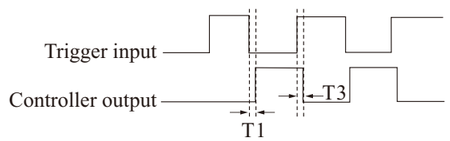
Falling edge trigger
The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



Positive follow trigger mode
When the trigger signal is at high level, the illumination time is the same as the high-level pulse width.



Negative follow trigger mode
When the trigger signal is at low level, the illumination time is the same as the low-level pulse width.



Remarks
1. T1: Enabling response time; T2: Trigger pulse width;
   T3: Disabling response time
2. T2 setting range: 1μs - 30s;
   Please refer to the table of trigger response time for T1 and T3

Trigger Tesponse Time Reference Table

OPT-DPA2024E-4

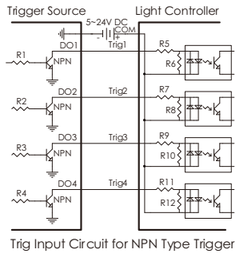
Trigger Voltage (V) \ Output Current (mA)	200		1000		2000	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	130	10	48	12	34	15
12	140	10	40	13	30	16
24	140	19	40	22	30	25

OPT-DPA2024E-X

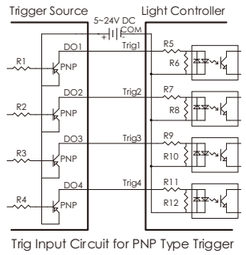
Trigger Voltage (V) \ Output Current (mA)	200		1000		2000	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	15	4	18	4	18	4
12	15	4.6	18	4.7	19	4.7
24	10	15	15	15	12	15

Level Trigger Wiring Diagrams

4 trigger channels, and bidirectional optocoupler inside.
Low level: 0 - 2V input voltage; high level: 5 - 24V input voltage. The rising edge trigger is the default trigger polarity.
The diagrams are on the right.



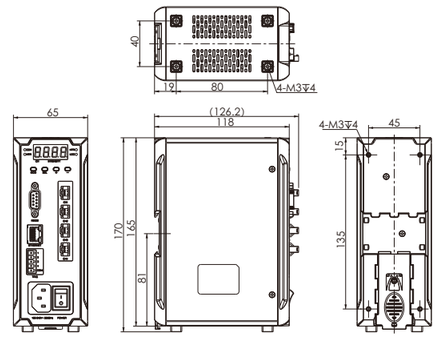
Trig Input Circuit for NPN Type Trigger



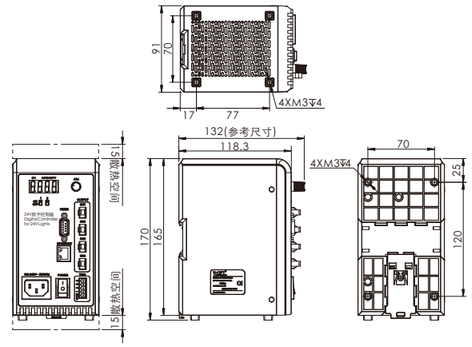
Trig Input Circuit for PNP Type Trigger

Dimensions (mm)

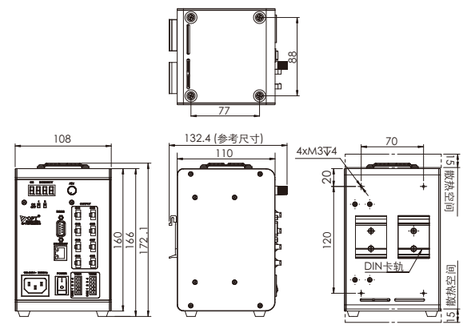
1. OPT-DPA2024EB-4



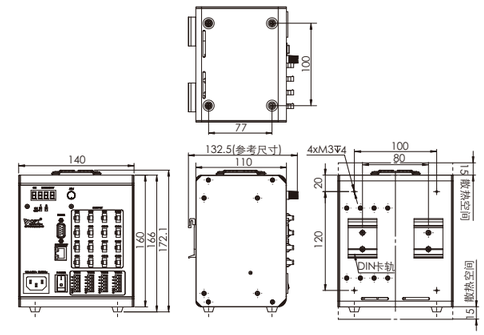
2.OPT-DPA2024E-4



3. OPT-DPA2024E-8



4. OPT-DPA2024E-16



Digital Current Controller Patented



Selection Guide

OPT-DPA2012EB-4

- Channels: 4
- Additional info: E-Ethernet, B-versions
- Max. output voltage: 24V
- Max. output current: 2A
- Digital current controller
- Brand name

Model	Channels	Compatible Light
OPT-DPA2012EB-4	4	10mA~2A 12V
OPT-DPA2012E-4	4	10mA~2A 12V

Product Features

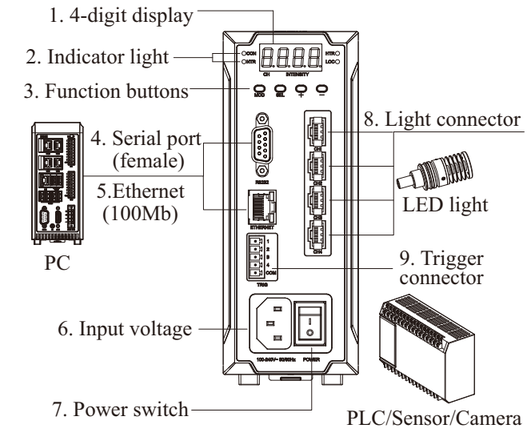
- Maximum of 64 programmable steps: intensity, pulse width and trigger source can be defined in each step.
- Autosense™ technology
- ≤ 30μs trigger response time
- Up to 20kHz trigger response frequency
- Simultaneous communication of multiple channels
- Manual setting for max. output current
- 256-level light intensity control
- External trigger: External trigger input (e.g. camera trigger signal) for related light strobes and other sequences. (Strobe mode can greatly improve light source life expectancy.)
- Rs232 interface
- 100Mb Ethernet interface
- Convenient mounting with screws or on DIN rails

Specifications

Model	DPA2012EB-4	DPA2012E-4
Input voltage	AC100~240V 50/60Hz	
Input current	1.8A/115VAC 1A/230VAC	
Lighting mode	Continuous/strobe	
Auto sensing of light rated current	For 10mA-2A 12V LED light	
Manual setting for max. output current	10mA~2A	
Intensity control	Adjustable brightness in 256 levels	
Short-circuit protection	When a controller output is short-circuited, the corresponding channel's short-circuit protection activates. It will disable the channel and display "Er2" on the digital display to indicate the error.	
Overcurrent protection	When the current output of a corresponding channel on the controller exceeds the set value, the overcurrent protection for that channel activates, which will shut down the channel and display "Er1" on the digital display to indicate the error.	
Triggering	Level triggering (Low level: 0~2V; High level: 5~24V)	
Normal trigger	Adjustable brightness in 256 levels	
Normal trigger time unit	1 μs/ 10 μs/1 ms/100 ms	
Normal trigger pulse width	1 μs~30 s	
High intensity trigger	2A output per channel	
High intensity trigger pulse width	0.01~5.00 ms	
Programmable trigger	Supports up to 64 processes, with settings for brightness, pulse width, and trigger source.	
Response time	≥ 30μs	≤30μs
Response frequency	≤10KHz	≤20KHz
Output power	24W/CH,Total power48W	
Communication	RS232/Ethernet	
Standby power consumption	3.2W	5W
Hi-Pot test	AC 1500V for 1 minute, leakage current < 10mA	
Insulation	DC500V, Insulation resistance > 20MΩ	
Operating temperature	-5°C~50°C	
Dimensions(mm^3) (L × W × H)	65×126.2×170 mm	91×132×171 mm
Weight (kg)	0.68	0.84

Device Overview

OPT-DPA2024EB-4



No.	Item	Description
1	4-digit display	The first digit from the left indicates the operating channel, and the other 3 indicate the operating intensity or pulse width.
2	Indicator light	Here are the current operating modes indicated: "CON"Constant mode,"NTR"Normal trigger , mode,"HTR"High trigger mode"LOC"Key lock
3	Function keys	The (MOD) key is the working mode setting key. In the panel control mode, pressing this key for about 1S can switch the working mode to the constant light mode, common trigger mode and high light trigger mode, and the corresponding working mode indicator light will also light up; the (SEL) key is the parameter setting key. In the panel control mode, tapping this key can select the corresponding value displayed on the digital tube; the (+) key is for increasing the operation and the (-) key is for decreasing the operation.
4	Serial port (female)	Communicate with PC devices via Rs232.
5	Ethernet (100Mb)	Communicate with PC devices via Ethernet.
6	AC input port	Input: AC 100~240V, 50/60Hz
7	Power switch	Turn on/off the controller power
8	Light source interface	There are a total of 4 light source outputs, each independently controllable.
9	Trigger connector	Strobe mode can be also achieved by external trigger; trigger pulse width settable

Mode Switching Settings

OPT-DPA2012EB-4

Mode	Indicator light display
Continuous light emission mode	CON light on
Normal trigger mode	NTR light on
High trigger mode	HTR light on
/	LOC light on, panel locked, can be operated via Demo software

OPT-DPA2024E-4

Mode	Working mode switch 1	Working mode switch 2
Continuous	ON	ON
Auto sensing of light rated current once	ON	OFF
Normal trigger	OFF	ON
High intensity trigger	OFF	OFF

Error Code Description

Code	Description	Display	Solution
Er0	No LED light connected	"Er0"	Connect an LED light
Er1	Overcurrent protection	"Er1"	Remove ERR and reboot
Er2	Short-circuit protection	"Er2"	Remove ERR and reboot
Er3	Overvoltage protection	"Er3"	Remove ERR and reboot
Er4	Driver hardware communication ERR	"Er4"	Return to OPT for repair
Er5	Display hardware communication ERR	"Er5"	Return to OPT for repair

Remark: "----" displays when the controller is turned on, and the corresponding value displays later.

Trigger

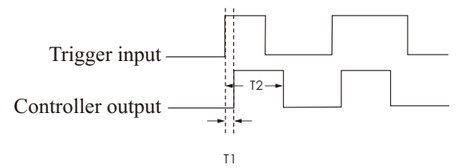
This series of controllers features three trigger modes: normal trigger, high trigger, and programmable trigger. It also supports four trigger polarities: rising edge trigger, falling edge trigger, positive pulse trigger, and negative pulse trigger. The default setting is rising edge trigger (see specific details in the table below).

Trigger Mode	Trigger Polarity
Normal trigger	Rising edge trigger
	Falling edge trigger
	Positive follow trigger mode
	Negative follow trigger mode
High intensity trigger	Rising edge trigger
	Falling edge trigger
Programmable trigger	Rising edge trigger
	Falling edge trigger

Trigger Sequence

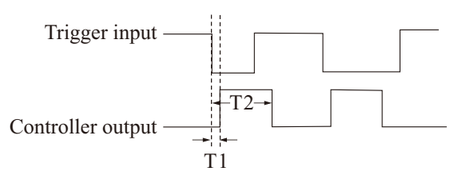
Rising edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.

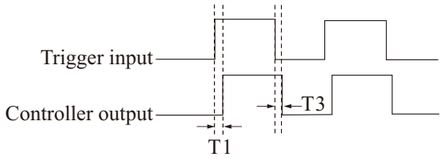


Falling edge trigger

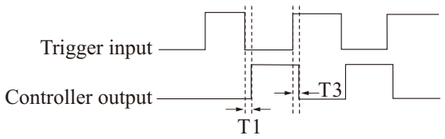
The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



Positive follow trigger mode
When the trigger signal is at high level, the illumination time is the same as the high-level pulse width.



Negative follow trigger mode
When the trigger signal is at low level, the illumination time is the same as the low-level pulse width.



Remarks
1. T1: Enabling response time; T2: Trigger pulse width;
   T3: Disabling response time
2. T2 setting range: 1μs - 30s;
   Please refer to the table of trigger response time for T1 and T3

Trigger Tesponse Time Reference Table

OPT-DPA2012EB-4

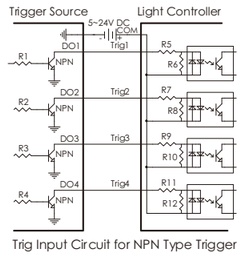
Trigger Voltage (V) \ Output Current (mA)	200		1000		2000	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	130	10	48	12	34	15
12	140	10	40	13	30	16
24	140	19	40	22	30	25

OPT-DPA2012E

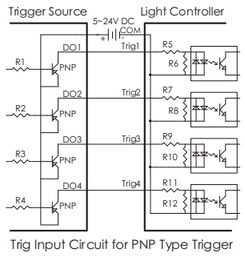
Trigger Voltage (V) \ Output Current (mA)	200		1000		2000	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	26	11	27	11	29	11
12	20	13	21	13	23	13
24	21	13	22	12	23	12

Level Trigger Wiring Diagrams

4 trigger channels, and bidirectional optocoupler inside.
Low level: 0 - 2V input voltage; high level: 5 - 24V input voltage. The rising edge trigger is the default trigger polarity.
The diagrams are on the right.



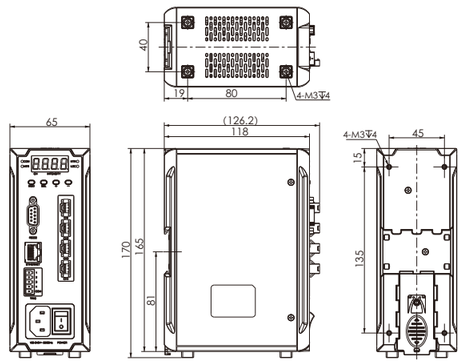
Trig Input Circuit for NPN Type Trigger



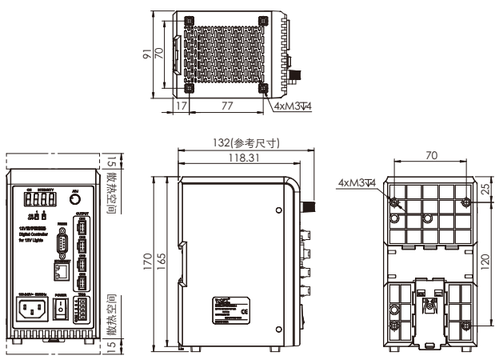
Trig Input Circuit for PNP Type Trigger

Dimensions (mm)

1.OPT-DPA2012EB-4



2.OPT-DPA2012E-4



Digital Current Controller for Spot Lights Patented





Selection Guide

OPT-DPA2005EB-X

- Channels
- Additional info: E-Ethernet, B-versions
- Max. output voltage: 5V
- Max. output current: 2A
- Digital current controller
- Brand name

Model	Channels	Compatible Light
OPT-DPA2005EB-4	4	10mA~2A 2~5V
OPT-DPA2005E-4	4	10mA~2A 2~5V
OPT-DPA2005E-8	8	10mA~2A 2~5V

Product Features

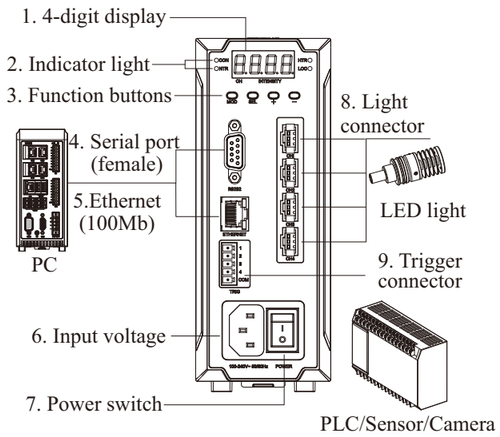
- Maximum of 64 programmable steps: intensity, pulse width and trigger source can be defined in each step.
- Autosense™ technology
- ≤ 30μs trigger response time
- Up to 20kHz trigger response frequency
- Simultaneous communication of multiple channels
- Manual setting for max. output current
- 256-level light intensity control
- External trigger: External trigger input (e.g. camera trigger signal) for related light strobes and other sequences. (Strobe mode can greatly improve light source life expectancy.)
- Rs232 interface
- 100Mb Ethernet interface
- Convenient mounting with screws or on DIN rails

Specifications

Model	DPA2005EB-4	DPA2005E-4	DPA2005E-8
Input voltage	AC100~240V 50/60Hz		
Input current	1.8A/115VAC 1A/230VAC		
Lighting mode	Continuous/strobe		
Auto sensing of light rated current	/	Connect a light source within 5V, 10mA to 2A	
Manual setting for max. output current	10mA~2A		
Intensity control	Adjustable brightness in 256 levels		
Short-circuit protection	When a controller output is short-circuited, the corresponding channel's short-circuit protection activates. It will disable the channel and display "Er2" on the digital display to indicate the error.		
Overcurrent protection	When the current output of a corresponding channel on the controller exceeds the set value, the overcurrent protection for that channel activates.It will shut down the channel and display "Er1" on the digital display to indicate the error.		
Triggering	Level triggering (Low level: 0~2V; High level: 5~24V)		
Normal trigger	Adjustable brightness in 256 levels		
Normal trigger time unit	1 μs/ 10 μs/1 ms/100 ms		
Normal trigger pulse width	1 μs~30 s		
High intensity trigger	2A output per channel		
High intensity trigger pulse width	0.01~5.00 ms		
Programmable trigger	Supports up to 64 processes, with settings for brightness, pulse width, and trigger source.		
Response time	≥ 30μs	≤30μs	
Response frequency	≤10KHz	≤20KHz	
Output power	10W/CH, Total power30W	10W/CH, Total power50W	
Communication	RS232/Ethernet		
Standby power consumption	3.2W	4.7W	5.8W
Hi-Pot test	AC 1500V for 1 minute, leakage current < 10mA		
Insulation	DC500V, Insulation resistance > 20MΩ		
Operating temperature	-5℃~50℃		
Dimensions(mm^3) (L × W × H)	65×126.2× 170 mm	91×132× 171 mm	108×132.5× 172.1 mm
Weight (kg)	0.7	0.84	1.2

Device Overview

OPT-DPA2005EB-4



No.	Item	Description
1	4-digit display	The first digit from the left indicates the operating channel, and the other 3 indicate the operating intensity or pulse width.
2	Indicator light	Here are the current operating modes indicated: "CON"Constant mode,"NTR"Normal trigger , mode,"HTR"High trigger mode"LOC"Key lock
3	Function keys	The (MOD) key is the working mode setting key. In the panel control mode, pressing this key for about 1S can switch the working mode to the constant light mode, common trigger mode and high light trigger mode, and the corresponding working mode indicator light will also light up; the (SEL) key is the parameter setting key. In the panel control mode, tapping this key can select the corresponding value displayed on the digital tube; the (+) key is for increasing the operation and the (-) key is for decreasing the operation.
4	Serial port (female)	Communicate with PC devices via Rs232.
5	Ethernet (100Mb)	Communicate with PC devices via Ethernet.
6	AC input port	Input: AC 100~240V, 50/60Hz
7	Power switch	Turn on/off the controller power
8	Light source interface	There are a total of 4 light source outputs, each independently controllable.
9	Trigger connector	Strobe mode can be also achieved by external trigger; trigger pulse width settable

Mode Switching Settings

OPT-DPA2005EB-4

Mode	Indicator light display
Continuous light emission mode	CON light on
Normal trigger mode	NTR light on
High trigger mode	HTR light on
/	LOC light on, panel locked, can be operated via Demo software

OPT-DPA2005E-X

Mode	Working mode switch 1	Working mode switch 2
Continuous	ON	ON
Auto sensing of light rated current once	ON	OFF
Normal trigger	OFF	ON
High intensity trigger	OFF	OFF

Error Code Description

Code	Description	Display	Solution
Er0	No LED light connected	“Er0”	Connect an LED light
Er1	Overcurrent protection	“Er1”	Remove ERR and reboot
Er2	Short-circuit protection	“Er2”	Remove ERR and reboot
Er3	Overvoltage protection	“Er3”	Remove ERR and reboot
Er4	Driver hardware communication ERR	“Er4”	Return to OPT for repair
Er5	Display hardware communication ERR	“Er5”	Return to OPT for repair

Remark: “----” displays when the controller is turned on, and the corresponding value displays later.

Trigger

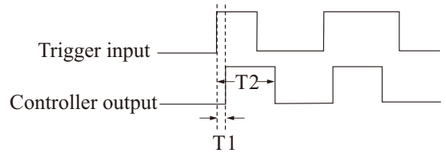
This series of controllers features three trigger modes: normal trigger, high trigger, and programmable trigger. It also supports four trigger polarities: rising edge trigger, falling edge trigger, positive pulse trigger, and negative pulse trigger. The default setting is rising edge trigger (see specific details in the table below).

Trigger Mode	Trigger Polarity
Normal trigger	Rising edge trigger
	Falling edge trigger
	Positive follow trigger mode
	Negative follow trigger mode
High intensity trigger	Rising edge trigger
	Falling edge trigger
Programmable trigger	Rising edge trigger
	Falling edge trigger

Trigger Sequence

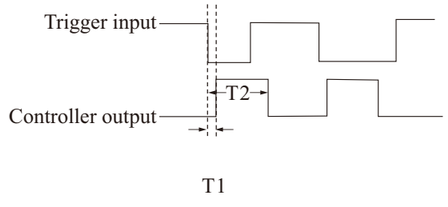
Rising edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



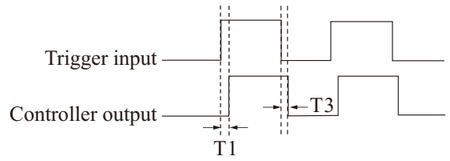
Falling edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



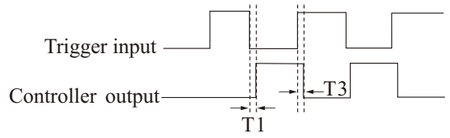
Positive follow trigger mode

When the trigger signal is at high level, the illumination time is the same as the high-level pulse width.



Negative follow trigger mode

When the trigger signal is at low level, the illumination time is the same as the low-level pulse width.



Remarks
1. T1: Enabling response time; T2: Trigger pulse width;
   T3: Disabling response time
2. T2 setting range:1μs - 30s;
   Please refer to the table of trigger response time for T1 and T3

Trigger Tesponse Time Reference Table

OPT-DPA2005EB-4

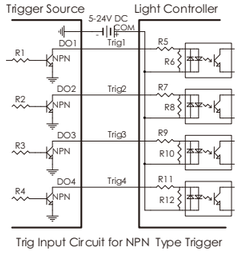
Trigger Voltage (V) \ Output Current (mA)	200		1000		2000	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	150	10	50	12	35	20
12	150	10	50	12	30	20
24	150	15	50	15	30	25

OPT-DPA2005E-X

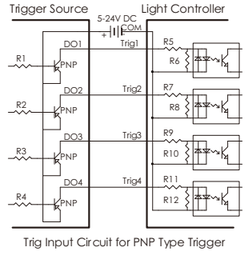
Trigger Voltage (V) \ Output Current (mA)	200		1000		2000	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	26	11	27	11	29	11
12	20	13	21	13	23	13
24	21	13	22	12	23	12

Level Trigger Wiring Diagrams

4 trigger channels, and bidirectional optocoupler inside
Low level: 0 - 2V input voltage; high level: 5 - 24V input voltage. The rising edge trigger is the default trigger polarity. The diagrams are as below.



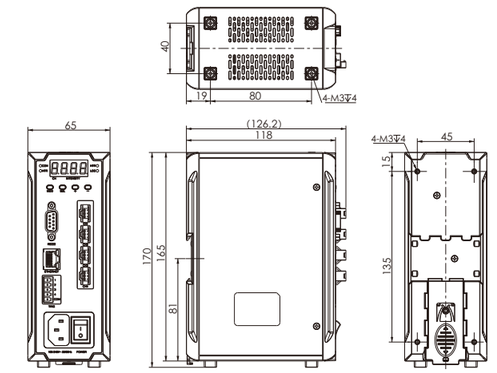
Trig Input Circuit for NPN Type Trigger



Trig Input Circuit for PNP Type Trigger

Dimensions (mm)

1.OPT-DPA2005EB-4



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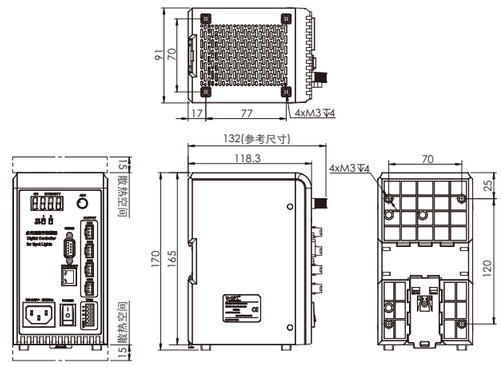
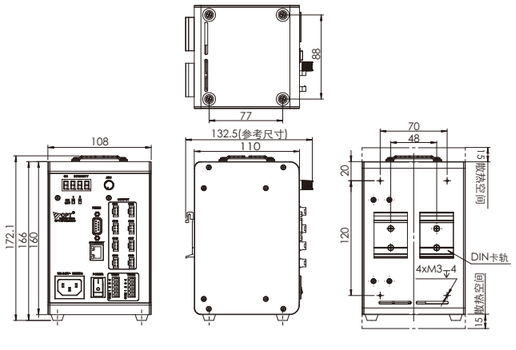


3.OPT-DPA2005E-8



High Power Digital Current Controller



Selection Guide

OPT-DPA6024E-2

- Channels:2
- Additional info: Ethernet
- No-load output voltage: 24V
- Max. continuous output current: 6A
- Digital current controller
- Brand name

Product Features

- Compact size
- Features adaptive light source voltage function. When a light source with a rated voltage of 5~24V is connected, the controller's output voltage will automatically match the light source voltage.
- Overdrive® technology allows for adjustable brightening current, with a maximum output of 20A, and automatically recognizes brightening voltage.
- Autosense™ technology
- Programmable trigger function with up to 64 configurable processes, each allowing settings for trigger source, brightness value, and trigger pulse width.
- Trigger output duty cycle setting function effectively protects the light source during brightening strobe.
- Trigger response time ≤10μs
- Trigger frequency exceeding 40kHz
- Trigger pulse width adjustable from 1μs to 30s
- RS232 interface
- 100M Ethernet interface
- Software-triggered functionality
- Temperature-controlled fan function
- Convenient mounting with screws or on DIN rails

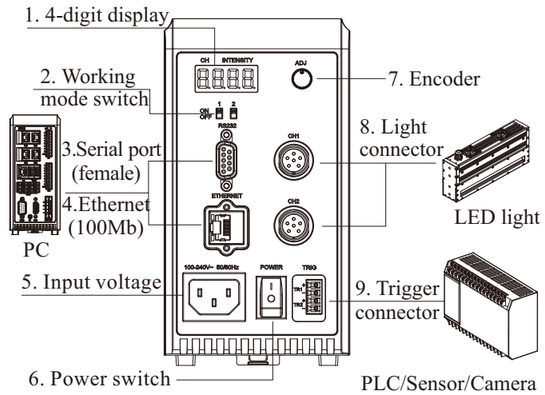
Specifications

Model	DPA6024E	DPA6024EC
Input voltage	AC100~240V 50/60Hz	DC22~26V
Input current	4.2A/115VAC 2.1A/230VAC	16.5A
Lighting mode	Continuous/strobe	
Auto sensing of light rated current	For 200mA-6A 5~ 24V LED light	
Manual setting for max. output current	256mA~6A	
Intensity control	Adjustable brightness in 256 levels	
Short-circuit protection	When a controller output is short-circuited, the corresponding channel's short-circuit protection activates. It will disable the channel and display "Er2" on the digital display to indicate the error.	
Overcurrent protection	When the current output of a corresponding channel on the controller exceeds the set value, the overcurrent protection for that channel activates.It will shut down the channel and display "Er1" on the digital display to indicate the error.	
Overload protection	When the output power of the channel is greater than 160W, the channel overload protection will be activated, the channel will be shut down, and the digital tube will display Er6.	
Normal trigger	Adjustable brightness in 256 levels	
Normal trigger time unit	1 μs/ 10 μs/1 ms/100 ms	
Normal trigger pulse width	1 μs~30 s	
High intensity trigger	The boost current is adjustable, with a maximum output of 20A.	
Highlight trigger pulse width time unit	1μs/10 μs/1 ms	
Highlight trigger pulse width	1μs~999 ms	
Programmable trigger	Supports up to 64 processes, with settings for brightness, pulse width, and trigger source.	
Response time	⩽10μs, see "Trigger Response Time Reference Table".	
Response frequency	⩽40KHz, see "Trigger Response Time Reference Table".	
The unit for setting trigger delay time	1μs/10 μs/1 ms	
Set trigger delay	1μs~6500 ms	
Output power	144W/CH,Total power288W	
Communication	RS232/Ethernet	

Specifications

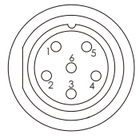
Model	DPA6024E	DPA6024EC
Standby power consumption	18.8W	1W
Hi-Pot test	AC 1500V for 1Min, leakage current < 10mA	/
Insulation	DC500V, Insulation resistance > 20MΩ	/
Operating temperature	-5℃~50℃	
Dimensions(mm³) (L × W × H)	91×132×170 mm	
Weight (kg)	1.27	0.86

Device Overview



Note: For the DPA6024EC, terminal 5 is the DC input port.

Light Connector



Pin	Description
1	Light+
2	Light-
3	Fan+
4	Fan-
5	Res
6	Res

Mode Switching Settings

Mode	Working mode switch 1	Working mode switch 2
Continuous	ON	ON
Auto sensing of light rated current once	ON	OFF
Normal trigger	OFF	ON
High intensity trigger	OFF	OFF

Error Code Description

Code	Description	Display	Solution
Er0	No LED light connected	“Er0”	Connect an LED light
Er1	Overcurrent protection	“Er1”	Remove ERR and reboot
Er2	Short-circuit protection	“Er2”	Remove ERR and reboot
Er3	Overvoltage protection	“Er3”	Remove ERR and reboot
Er4	Driver hardware communication ERR	“Er4”	Return to OPT for repair
Er5	Display hardware communication ERR	“Er5”	Return to OPT for repair

Remark: “----” displays when the controller is turned on, and the corresponding value displays later.

Trigger

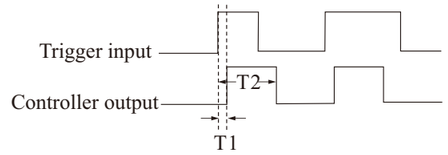
This series of controllers features three trigger modes: normal trigger, high trigger, and programmable trigger. It also supports four trigger polarities: rising edge trigger, falling edge trigger, positive pulse trigger, and negative pulse trigger. The default setting is rising edge trigger (see specific details in the table below).

Trigger Mode	Trigger Polarity
Normal trigger	Rising edge trigger
	Falling edge trigger
	Positive follow trigger mode
	Negative follow trigger mode
High intensity trigger	Rising edge trigger
	Falling edge trigger
Programmable trigger	Rising edge trigger
	Falling edge trigger

Trigger Sequence

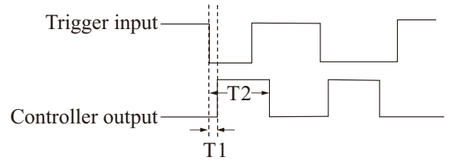
Rising edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



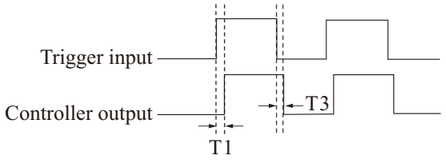
Falling edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



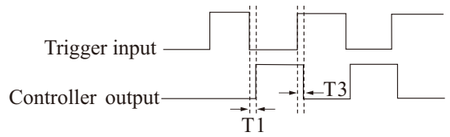
Positive follow trigger mode

When the trigger signal is at high level, the illumination time is the same as the high-level pulse width.



Negative follow trigger mode

When the trigger signal is at low level, the illumination time is the same as the low-level pulse width.



Remarks
1. T1: Enabling response time; T2: Trigger pulse width;
   T3: Disabling response time
2. T2 setting range:1μs - 30s;
   Please refer to the table of trigger response time for T1 and T3

Reference Table of Trigger Response Time

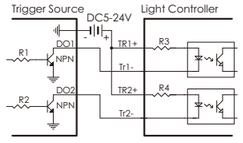
Trigger Voltage (V) \ Output Current (A)	0.4		0.6		3		6	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	10	1.5	5. 2	1.0	7.5	1.6	8.4	1.5
12	10	1.5	5. 2	1.0	7.5	1.6	8.4	1.5
24	10	1.5	5. 2	1.0	7.5	1.6	8.4	1.5

Trigger Tesponse Time Reference Table

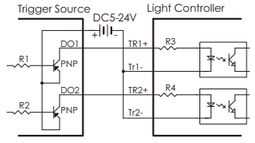
Remarks
1. T1: Enabling response time; T2: Trigger pulse width;
   T3: Disabling response time
2. T2 setting range:1μs - 30s;
   Please refer to the table of trigger response time for T1 and T3

Level Trigger Wiring Diagrams

4 trigger channels, and bidirectional optocoupler inside
Low level: 0 - 2V input voltage; high level: 5 - 24V input voltage. The rising edge trigger is the default trigger polarity.
The diagrams are as below.



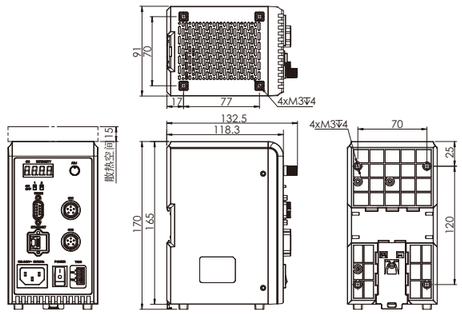
Trig Input Circuit for NPN Type Trigger



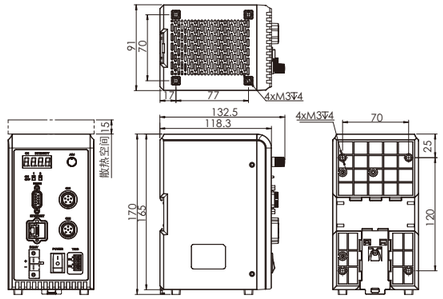
Trig Input Circuit for PNP Type Trigger

Dimensions (mm)

1.OPT-DPA6024E



2.OPT-DPA6024EC



High Power Digital Current Controller NEW



Selection Guide

OPT - DPA 60 24 EB - X

- Channels
- Additional info: E-Ethernet, B-versions
- Max. output voltage: 24V
- Max. output current: 6A
- Digital current controller
- Brand name

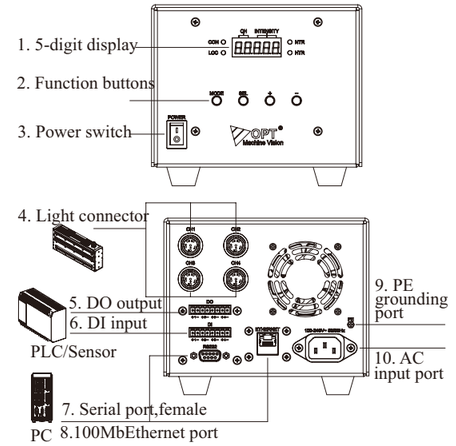
Model	Channels	Compatible Light
OPT-DPA6024EB-2	2	Connecting OPT 24V six-pole light source
OPT-DPA6024EB-4	4	Connecting OPT 24V six-pole light source
OPT-DPA6024E-8	8	Connecting OPT 24V six-pole light source
OPT-DPA6024E-16	16	Connecting OPT 24V six-pole light source

Product Features

- Programmable trigger: Maximum of 64 programmable steps and intensity, pulse width and trigger source can be defined in each step.
- ≤ 5μs trigger response time
- Up to 40KHz trigger response frequency
- 256-level light intensity control
- Provide software trigger function.
- Multi-channel simultaneous communication
- Autosense™ technology
- Manually set the maximum output current
- 100Mb Ethernet interface
- RS232 interface
- Equipped with DO output function, supporting both software and hardware trigger control

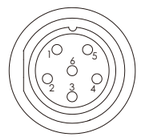
Device Overview

OPT-DPA6024EB-4



Note: For the DPA6024EB-2-V1 panel instructions, please refer to the DPA6024E-2 controller.

Light Connector



Pin	Definition	Description
1	Light+	Light source output positive
2	Light-	Light source output negative
3	Fan+	Fan voltage positive
4	Fan-	Fan voltage negative
5	Res	Marking resistance interface, the output current is positively correlated with the marking resistance (e.g., if the marking resistance is 1, the output current of the controller is 1A in auto-detect mode).
6	Res	

Mode Switching Settings

Mode	Indicator light display:
Constant Illumination Mode	CON light on
Common Trigger Mode	NTR light on
High Brightness Trigger Mode	HTR light on
/	LOC light on, panel locked, can be operated in Demo software

Specifications

Model	DPA6024EB-2-V1	DPA6024EB-2-V3	DPA6024EB-4	DPA6024EB-8	DPA6024EB-16
Input voltage	AC100~240V50/60Hz	AC100~120V / AC200~240V 50/60Hz	AC100~240V 50/60Hz		
Input current	4.2A115VAC 2.1A/230VAC	6.8A/115VAC 3.4A/230VAC	9A/115VAC 4A/230VAC		16A/115VAC 8A/230VAC
Lighting mode	Continuous/strobe				
Auto sensing of light rated current	For 200mA-6A OPT light source				
Manual setting for max. output current	25mA~6A				
Intensity control	Adjustable brightness in 256 levels				
Short-circuit protection	When a controller output is short-circuited, the corresponding channel's short-circuit protection activates. It will disable the channel and display "Er2" on the digital display to indicate the error.				
Overcurrent protection	When the current output of a corresponding channel on the controller exceeds the set value, the overcurrent protection for that channel activates.It will shut down the channel and display "Er1" on the digital display to indicate the error.				
Normal trigger	Adjustable brightness in 256 levels				
Common Trigger Pulse Width Time Units	1 μs/ 10 μs/1 ms/100 ms				
Normal trigger pulse width	1 μs~30 s				
Highlight Trigger Mode	6A output per channel				
Highlight trigger pulse width time unit	1 μs/ 10 μs/1 ms				
Highlight trigger pulse width	1 μs~500 ms				
Programmable trigger	Supports up to 64 processes, with settings for brightness, pulse width, and trigger source.				
DO output	/		5V~24V, 50mA, open-drain output		
Response time	⩽ 10μs	⩽ 300μs	⩽ 5μs		
Response frequency	⩽ 40kHz	⩽ 2kHz	⩽ 40kHz		
Setting the trigger delay time unit	1 μs/ 10 μs/1 ms/100 ms				
Set trigger delay	1 μs~6500 ms				
Output power	144W/CH			144W/CH, total power: 700W	144W/CH, total power: 1450W
Communication	RS232/Ethernet				
Standby power consumption	⩽ 13.3W	⩽ 15.4W	⩽ 16.2W	⩽ 18.5W	⩽ 22.3W
Hi-Pot test	AC 1500V for 1 minute, leakage current < 10mA				
Insulation	DC500V, Insulation resistance > 20MΩ				
Operating temperature	-5℃~50℃				
Dimensions(mm^3) (L × W × H)	91*132.5*170 mm	147*347.1*144.5 mm	158*346.1*136 mm	184*346.1*156 mm	189*381.3*309.5 mm
Weight (kg)	1. 3	2.7	3.2	4.5	8.7

Error Code Description

Code	Description	Display	Solution
Er0	No LED light connected	"Er0"	Connect an LED light
Er1	Overcurrent protection	"Er1"	Remove ERR and reboot
Er2	Short-circuit protection	"Er2"	Remove ERR and reboot
Er3	Overvoltage protection	"Er3"	Remove ERR and reboot
Er4	Driver hardware communication ERR	"Er4"	Return to OPT for repair
Er5	Display hardware communication ERR	"Er5"	Return to OPT for repair

Remark: "----" displays when the controller is turned on, and the corresponding value displays later.

Trigger

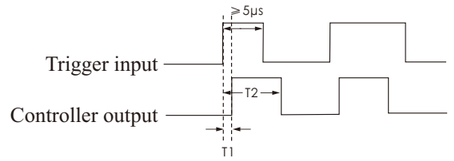
This series of controllers features three trigger modes: normal trigger, high trigger, and programmable trigger. It also supports four trigger polarities: rising edge trigger, falling edge trigger, positive pulse trigger, and negative pulse trigger. The default setting is rising edge trigger (see specific details in the table below).

Trigger Mode	Trigger Polarity
Normal trigger	Rising edge trigger
	Falling edge trigger
	Positive follow trigger mode
	Negative follow trigger mode
High intensity trigger	Rising edge trigger
	Falling edge trigger
Programmable trigger	Rising edge trigger
	Falling edge trigger

Trigger Sequence

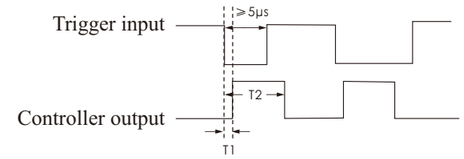
Rising edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



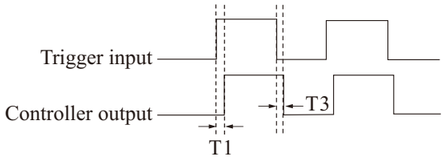
Falling edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



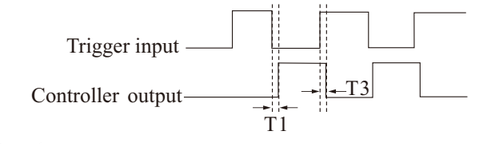
Positive follow trigger mode

When the trigger signal is at high level, the illumination time is the same as the high-level pulse width.



Negative follow trigger mode

When the trigger signal is at low level, the illumination time is the same as the low-level pulse width.



Remarks
1. T1: Enabling response time; T2: Trigger pulse width;
   T3: Disabling response time
2. T2 setting range:1μs - 30s;
   Please refer to the table of trigger response time for T1 and T3

Reference Table of Trigger Response Time

DPA6024EB-2-V1

Trigger Voltage (V) \ Output Current (A)	0.4		0.6		3		6	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	6.5	2	2.5	2	5.5	2	8	2
12	6.5	2	2.5	2	5.5	2	8	2
24	6.5	2	2.5	2	5.5	2	8	2

DPA6024EB-2-V3

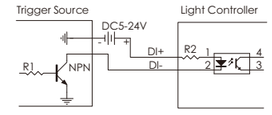
Trigger Voltage (V) \ Output Current (mA)	1		2		3	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	1250	60	500	60	300	60
12	1250	60	500	60	300	60
24	1250	60	500	60	300	60

DPA6024EB-4/8/16

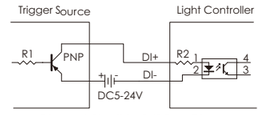
Trigger Voltage (V) \ Output Current (mA)	1		2		3	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	5	5	5	5	5	5
12	5	5	5	5	5	5
24	5	5	5	5	5	5

Level Trigger Wiring Diagrams

The DI of this series of controllers is opto-coupler isolated input, and the input voltage is low level at 0~2V and high level at 5~24V.



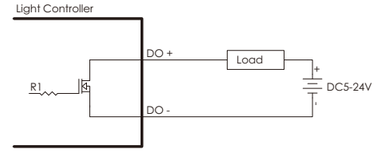
Trig Input Circuit for NPN Type Trigger



Trig Input Circuit for PNP Type Trigger

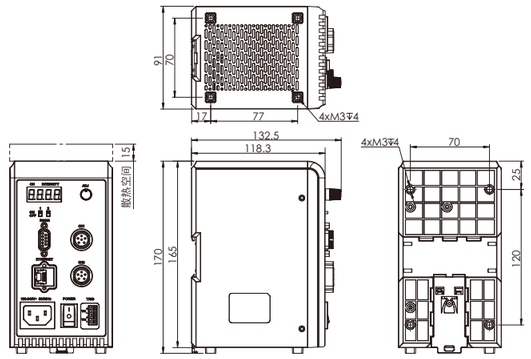
DO Wiring Diagram

Any DO of the controller is connected to the positive and negative terminals of the external device inputs, such as PLC acquisition card, etc. As shown in the figure below:

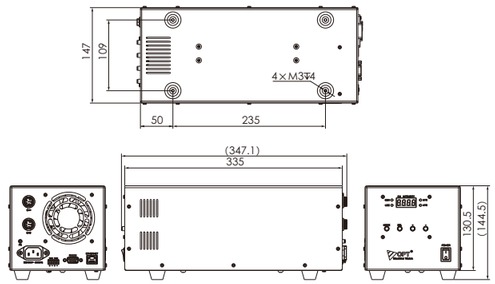


Dimensions (mm)

1.OPT-DPA6024EB-2-V1



2.OPT-DPA6024EB-2-V3



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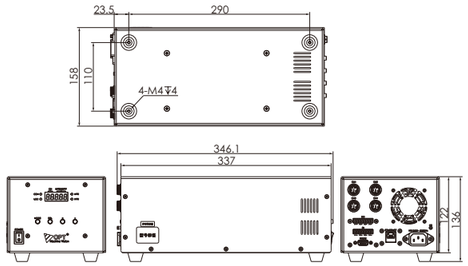

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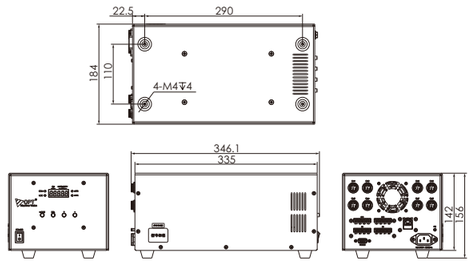

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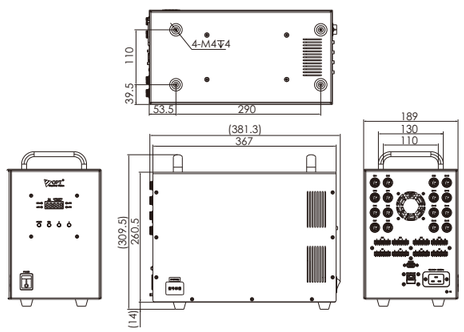


High Power Digital Current Controller



Selection Guide

OPT - DPA 100 24 EB - X

- Channels
- Additional info: E-Ethernet, B-versions
- No-load output voltage: 24V
- Max. output current: 10A
- Digital current controller
- Brand name

Model	Channels	Compatible Light
OPT-DPA10024EB-1	2	Connecting OPT 24V six-pole light source
OPT-DPA10024EB-2	4	Connecting OPT 24V six-pole light source

Product Features

- Compact size
- Autosense™ technology
- Maximum of 64 programmable steps with intensity, pulse width and trigger source can be defined in each step.
- ≤ 10μs trigger response time
- Up to 40kHz trigger response frequency
- Trigger pulse width range: 1μs - 30s
- RS232 interface
- 100Mb Ethernet interface
- Provide software trigger function
- Achieve online upgrade function of the whole device
- Temperature-controlled fan function
- Convenient mounting with screws or on DIN rails

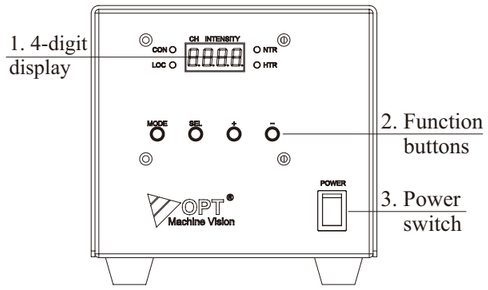
Specifications

Model	DPA10024EB-1	DPA10024EB-2
Input voltage	AC100~240V 50/60Hz	
Input current	4.2A/115VAC 2.1A/230VAC	6.5A/115VAC 3.2A/230VAC
Lighting mode	Continuous/strobe	
Auto sensing of light rated current	For 200mA~10A 24V LED light	
Manual setting for max. output current	50mA~10A	
Intensity control	Adjustable brightness in 256 levels	
Short-circuit protection	When a controller output is short-circuited, the corresponding channel's short-circuit protection activates. It will disable the channel and display "Er2" on the digital display to indicate the error.	
Overcurrent protection	When the current output of a corresponding channel on the controller exceeds the set value, the overcurrent protection for that channel activates.It will shut down the channel and display "Er1" on the digital display to indicate the error.	
Overload protection	When the output power of the channel is greater than 265W, the channel overload protection will be activated, which will cause the channel to shut down, and the digital tube will display Er6.	/
Normal trigger	Adjustable brightness in 256 levels	
Normal trigger time unit	1 μs/ 10 μs/1 ms/100 ms	
Normal trigger pulse width	1 μs~30 s	
High intensity trigger	Single channel output at 12A	Single channel output at 10A
Highlight trigger pulse width time unit	1μs/10 μs/1 ms	
Highlight trigger pulse width	1μs~500 ms	
Programmable trigger	Supports up to 64 processes, with settings for brightness, pulse width, and trigger source.	
Response time	⩽10μs	⩾150 μs
Response frequency	⩽40KHz	⩽2KHz
The unit for setting trigger delay time	1μs/10 μs/1 ms	
Set trigger delay	1μs~6500 ms	
Output power	240W/CH	

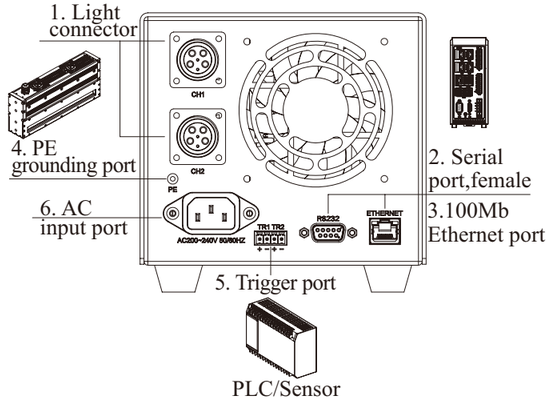
Model	DPA10024EB-1	DPA10024EB-2
Communication	RS232/Ethernet	
Standby power consumption	⩽10W	⩾17.4 W
Hi-Pot test	AC1500V 1Min, Leakage current < 10mA	
Insulation	DC500V, Insulation resistanc > 20MΩ	
Operating temperature	-5°C - 50°C	
Dimensions(mm³) (L × W × H)	91×132.5×170mm	149×353.5×145.5mm
Weight (kg)	1.3	3.26

Device Overview

OPT-DPA10024EB-2



No.	Item	Description
1	4-digit display	The first digit from the left indicates the operating channel, and the other 3 indicate the operating intensity or pulse width.
2	Working mode switch	Functional conversion;
3	Power switch	Turns on/off the controller



No.	Item	Description
1	Light connector	Connect with OPT six-core high-power light source
2	Serial port, female	Communicate with PC via RS232 interface
3	100Mb Ethernet port	Communicate with PC via Ethernet interface
4	PE grounding port	Securely connect the ground wire
5	Trigger connector	Strobe mode can be also achieved by external trigger; trigger pulse width settable
6	Input voltage	100 - 240V AC 50/60Hz

Note: For DPA10024EB-1 panel instructions, please refer to the DPA6024E-2 controller.

Light Connector



Pin	Pin Definition
1	Fan+
2	Fan-
3	Light-
4	Light+
5	Res
6	Res

Mode Switching Settings

Mode	Indicator light display:
Constant Illumination Mode	CON light on
Common Trigger Mode	NTR light on
High Brightness Trigger Mode	HTR light on
/	LOC light on, panel locked, can be operated in Demo software

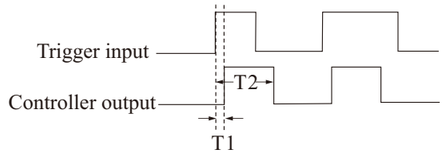
Trigger

This series of controllers features three trigger modes: normal trigger, high trigger, and programmable trigger. It also supports four trigger polarities: rising edge trigger, falling edge trigger, positive pulse trigger, and negative pulse trigger. The default setting is rising edge trigger (see specific details in the table below).

Trigger Sequence

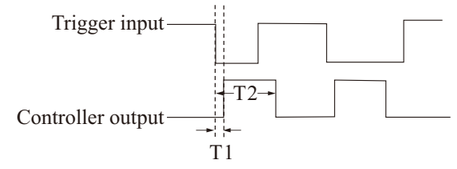
Rising edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



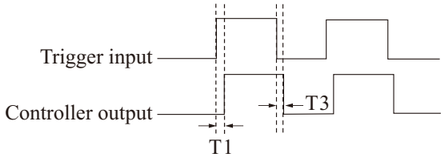
Falling edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



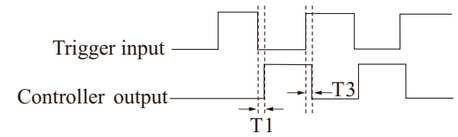
Positive follow trigger mode

When the trigger signal is at high level, the illumination time is same with the high-level pulse width.



Negative follow trigger mode

When the trigger signal is at low level, the illumination time is same with the low-level pulse width.



Remarks

1. T1: Enabling response time; T2: Trigger pulse width;
   T3: Disabling response time
2. T2 setting range: 1μs - 30s;
   Please refer to the table of trigger response time for T1 and T3

Reference Table of Trigger Response Time

DPA10024EB-1

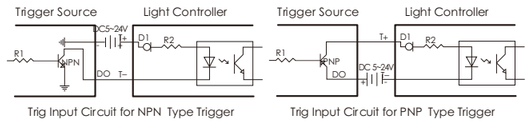
Trigger Voltage (V) \ Output Current (mA)	1		2		3	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	2.2	1.6	5.5	1.6	7.6	1.6
12	2.2	1.7	5.5	1.7	7.6	1.7
24	2.2	1.8	5.5	1.8	7.6	1.8

DPA10024EB-2

Trigger Voltage (V) \ Output Current (mA)	1		2		3	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	1250	65	300	65	150	65
12	1250	65	300	65	150	65
24	1250	65	300	65	150	65

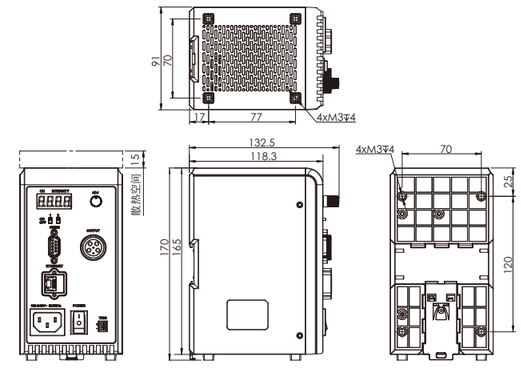
Level Trigger Wiring Diagrams

There are 1 trigger port in this series of controllers (shown in the figure below), including unidirectional optocoupler isolation inside. It is low level when the input voltage is 0~2V, and high level when the input voltage is 5~24V. Two trigger wiring diagrams are given as below:

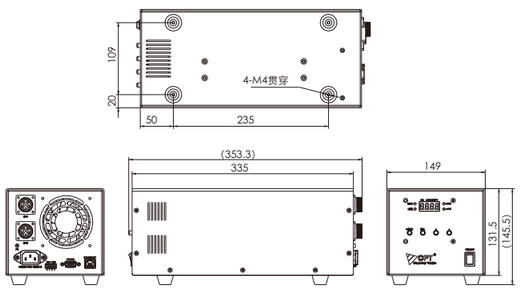


Dimensions (mm)

1.OPT-DPA10024EB-1



2.OPT-DPA10024EB-2



Ultra-high Power Digital Current Controller NEW



Selection Guide

OPT - DPA20024EB-X

- Channels
- Additional info: E-Ethernet, B-versions
- Max. output voltage: 24V
- Max. output current: 20A
- Digital current controller
- Brand name

Model	Channels	Compatible Light
OPT-DPA20024EB-1	1	Connecting OPT 24V six-pole light source
OPT-DPA20024EB-2	2	Connecting OPT 24V six-pole light source

Product Features

- Autosense™ technology
- Simultaneous communication of the two channels
- Manual setting for max. output current
- 256-level light intensity control
- External trigger: External trigger input (e.g. camera trigger signal) for related light strobes and other sequences. (Strobe mode can greatly improve light source life expectancy.)
- Trigger pulse width setting
- RS232 interface
- 100Mb Ethernet interface

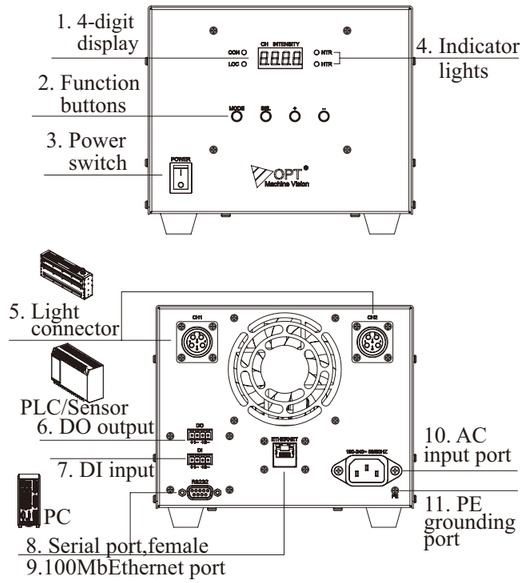
Specifications

Model	DPA20024EB-1	DPA20024EB-2
Input voltage	AC100~120V / AC200~240V 50/60Hz	AC100~120V / AC200~240V 50/60Hz
Input current	6.5A/115VAC 3.2A/230VAC	24A/115VAC 15A/230VAC
Lighting mode	Continuous/strobe	
Auto sensing of light rated current	Connect 1A~20A OPT light source	
Manual setting for max. output current	100mA~20A	

Specifications

Model	DPA20024EB-1	DPA20024EB-2
Intensity control	Adjustable brightness in 256 levels	
Short-circuit protection	When a controller output is short-circuited, the corresponding channel's short-circuit protection activates. It will disable the channel and display "Er2" on the digital display to indicate the error.	
Overcurrent protection	When the output current of the corresponding channel of the controller is greater than the set value, the overcurrent protection of the corresponding channel will be activated, the corresponding channel will be closed, and the digital tube will display Er1 error message.	
Normal trigger	Adjustable brightness in 256 levels	
Normal trigger time unit	1 μs/ 10 μs/1 ms/100 ms	
Normal trigger pulse width	1 μs~30 s	
High intensity trigger	Single channel output at 20A, with a maximum voltage output not exceeding 24V.	
Highlight trigger pulse width time unit	1μs/10 μs/1 ms	
Highlight trigger pulse width	1μs~500 ms	
Programmable trigger	Supports up to 64 processes, with settings for brightness, pulse width, and trigger source.	
DO output	/	5V~24V, 50mA, open-drain output
Response time	⩾200 μs	⩾100 μs
Response frequency	⩽2KHz	⩽10μs
The unit for setting trigger delay time	1μs/10 μs/1 ms	
Set trigger delay	1μs~6500 ms	
Output power	480W/CH	
Communication	RS232/Ethernet	
Standby power consumption	⩽17.4KHz	⩽18W
Hi-Pot test	AC1500V 1Min, Leakage current < 10mA	
Insulation	DC500V, Insulation resistance > 20MΩ	
Operating temperature	-5°C - 50°C	
Dimensions (mm^3) (L×W×H)	147×353.3×144.5mm	182×353.17×157mm
Weight (kg)	3.26	8.62

Device Overview



No.	Item	Description
1	4-digit display	The first digit from the left indicates the operating channel, and the other 3 indicate the operating intensity or pulse width.
2	Function button	(MOD) button is the work mode setting button. In panel control mode, pressing this button for about 1S will switch the work mode to constant illumination mode, common trigger mode, or high brightness trigger mode. The corresponding work mode indicator light will also turn on. The (SEL) button is the parameter setting button. In panel control mode, tapping this button will select the corresponding digit on the digital display. The (+) button is for increasing values, and the (-) button is for decreasing values.
3	Power switch	Turns on/off the controller
4	Indicator light	They indicate the current work mode: "CON" for constant illumination mode, "NTR" for common trigger mode, "HTR" for high brightness trigger mode, and "LOC" for key lock.
5	Light connector	Corresponding 6-pin aviation connector light source interface.
6	DO output	Open-drain output
7	DI trigger port	External signal input, trigger pulse width adjustable
8	Serial port, female	Communication with PC via the RS232 interface
9	100Mb Ethernet port	Communication with PC via the Ethernet interface
10	PE grounding port	Grounding protection
11	Input voltage	100 - 120V/200 - 240V AC

Light Connector



Pin	Pin Definition
1	Fan+
2	Fan-
3	Light-
4	Light+
5	Res
6	Res

Mode Switching Settings

Mode	Indicator light display:
Constant Illumination Mode	CON light on
Common Trigger Mode	NTR light on
High Brightness Trigger Mode	HTR light on
/	LOC light on, panel locked, can be operated in Demo software

Error Code Description

Code	Description	Display	Solution
Er0	No LED light connected	“Er0”	Connect an LED light
Er1	Overcurrent protection	“Er1”	Remove ERR and reboot
Er2	Short-circuit protection	“Er2”	Remove ERR and reboot
Er3	Overvoltage protection	“Er3”	Remove ERR and reboot
Er4	Driver hardware communication ERR	“Er4”	Return to OPT for repair
Er5	Display hardware communication ERR	“Er5”	Return to OPT for repair

Remark: “----” displays when the controller is turned on, and the corresponding value displays later.

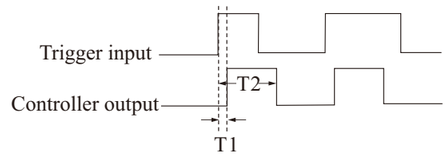
Trigger

This series of controllers features three trigger modes: normal trigger, high trigger, and programmable trigger. It also supports four trigger polarities: rising edge trigger, falling edge trigger, positive pulse trigger, and negative pulse trigger. The default setting is rising edge trigger (see specific details in the table below).

Trigger Sequence

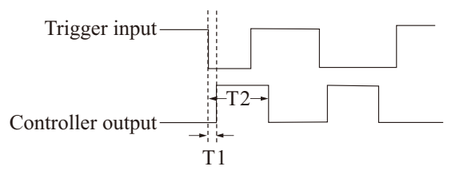
Rising edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



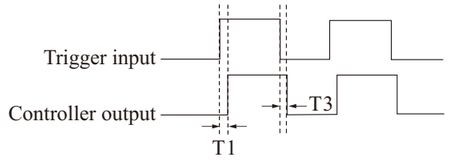
Falling edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



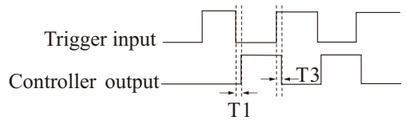
Positive follow trigger mode

When the trigger signal is at high level, the illumination time is same with the high-level pulse width.



Negative follow trigger mode

When the trigger signal is at low level, the illumination time is the same as the low-level pulse width.



Remarks

1. T1: Enabling response time; T2: Trigger pulse width;
   T3: Disabling response time
2. T2 setting range: 10μs - 999ms;
   Please refer to the table of trigger response time for T1 and T3

Reference Table of Trigger Response Time

DPA20024EB-1

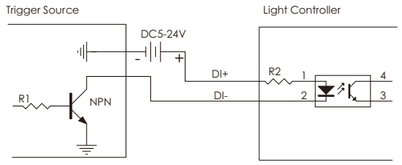
Trigger Voltage (V) \ Output Current (mA)	2		10		20	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	1000	60	300	60	200	60
12	1000	60	300	60	200	60
24	1000	60	300	60	200	60

DPA20024EB-2

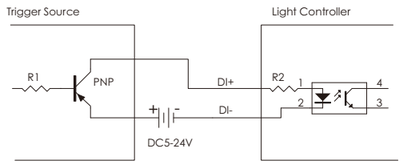
Trigger Voltage (V) \ Output Current (mA)	2		10		20	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	600	10	150	10	5	10
12	600	10	150	10	5	10
24	600	10	150	10	5	10

Level Trigger Wiring Diagrams

In this series, the controller's DI (digital input) is optically isolated. A voltage input of 0~2V represents a low level, while 5~24V represents a high level.



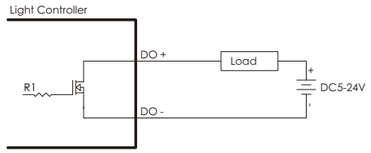
Trig Input Circuit for NPN Type Trigger



Trig Input Circuit for PNP Type Trigger

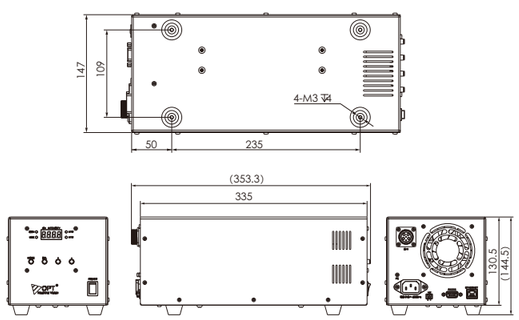
DO Wiring Diagram

Any DO of the controller is connected to the positive and negative terminals of the external device inputs. Such as PLC acquisition card, etc. As shown in the figure below:

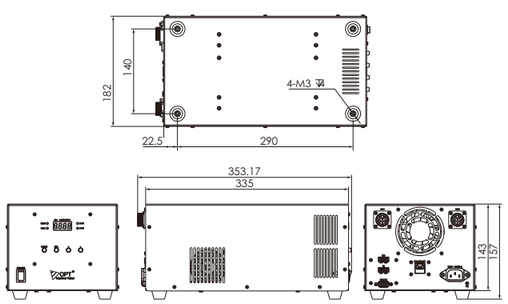


Dimensions (mm)

1.OPT-DPA20024EB-1



2.OPT-DPA20024EB-2



DPH Strobe Overdrive Digital Controller



Selection Guide

OPT-DPH20048E-4

- Channels: 4
- Additional info.: Ethernet
- Output voltage: 48V
- Max. transient output current: 20A
- Strobe overdrive digital controller
- Brand name

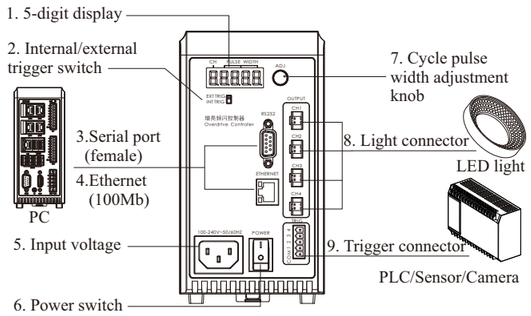
Product Features

- Maximum of 64 programmable steps with intensity, pulse width and trigger source can be defined in each step.
- Overdrive® technology
- The upper limit of external trigger frequency settable
- ≤ 10μs trigger response time
- Simultaneous communication of multiple channels
- External trigger: External trigger input (e.g. camera trigger signal) for related lights strobes and other sequences. (Strobe mode can greatly improve light source expectancy.)
- Internal trigger cycle from setting: 15 - 1000ms
- RS232 interface
- 100Mb Ethernet interface
- Temperature-controlled fan
- Convenient mounting with screws or on DIN rails

Specifications

Item	Parameter	Description
Input voltage	100 - 240V AC 50/60Hz	
Input current	3.6A/115VAC 2A/230VAC	
Output voltage	48V	
Lighting mode	Strobe	
Internal trigger	Yes	Enabled via the trigger mode switch, and the external trigger is disabled.
Internal trigger cycle	15 - 1000ms	Adjusted via the adjustment knob or DEMO software; the cycle of each channel can be different.
External trigger mode	Level trigger	
Trigger pulse width	1 - 1023μs	Adjusted via the adjustment knob or DEMO software; the pulse width of each channel can be different.
Programmable trigger	Support up to 64 processes	Both the pulse width and trigger source settable
Response time	≤ 10μs	See “Reference Table of Trigger Response Time” for details
Short-circuit protection	Yes	The related channel is shut down and “Err2” displays.
Max. transient output current	20A/CH	
Upper limit of external trigger frequency	1 - 900Hz	40Hz by default
Fan control	Via temperature	
Communication	RS232/Ethernet	
Standby power consumption	≤ 9.5W	Tested at 220V AC
Hi-Pot test	1500VAC 1Min	Leakage current < 10mA
Insulation	500VDC	Insulation resistance > 20MΩ
Operating temperature	-5°C - 50°C	
Dimensions (mm^3) (L × W × H)	91×133×171	Refer to the drawing for details
Weight (kg)	1.1	

Device Overview



No.	Item	Description
1	5-digit display	The first digit from the left indicates the operating channel, and the other 4 show the corresponding pulse width or internal trigger cycle.
2	Internal/external trigger switch	INT TRIG: Internal trigger EXT TRIG: External trigger
3	Serial port (female)	Communication with PC via the RS232 interface
4	Ethernet (100Mb)	Communication with PC via the Ethernet interface
5	Input voltage	100 - 240V AC 50/60Hz
6	Power switch	Turns on/off the controller
7	Cycle pulse width adjustment knob	Press the knob, the digit that flashes is chosen; press it again, the next digit is chosen; turn the knob in clockwise to increase the value and in anti-clockwise to reduce the value
8	Light connector	Each light (4 in total) individually controlled
9	Trigger connector	Strobe mode can be also achieved by external trigger; trigger pulse width settable

Trigger Mode Setting

Switch	Mode
EXT TRIG	External trigger
INT TRIG	Internal trigger

Error Code Description

Code	Description	Display	Solution
Err2	Short-circuit protection	"Err2"	Remove ERR and reboot
Err4	Driver hardware communication ERR	"Err4"	Return to OPT for repair
Err5	Display hardware communication ERR	"Err5"	Return to OPT for repair

Remark: "-----" displays when the controller is turned on, and the corresponding value displays later.

Trigger

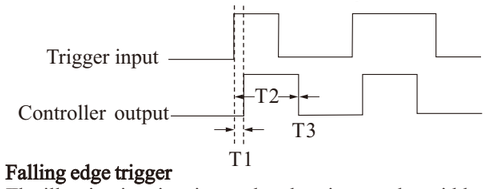
Trigger Mode	Trigger Polarity	Description
Internal trigger	Auto trigger	The controller will output the corresponding pulse width per the set trigger cycle.
External trigger	Rising edge trigger	48V single channel output; trigger pulse width setting: 1 - 1023μs
	Falling edge trigger	
Programmable trigger	Rising edge trigger	Switch to the mode via DEMO software in the external trigger mode; set a step list before entering into the mode
	Falling edge trigger	

Remark: Rising edge trigger is the default trigger polarity.

Trigger Sequence

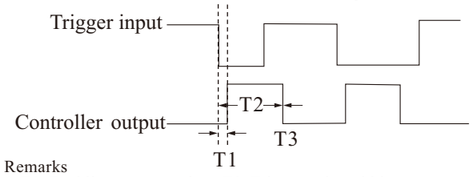
Rising edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



Falling edge trigger

The illumination time is equal to the trigger pulse width, which is set via DEMO software or the adjustment knob.



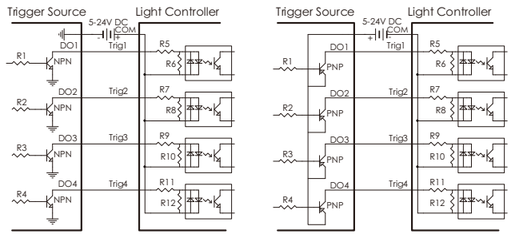
Remarks
1. T1: Enabling response time; T2: Trigger pulse width;
   T3: Disabling response time
2. T2 setting range: 1μs - 1023μs;
   Please refer to the table of trigger response time for T1 and T3

Reference Table of Trigger Response Time

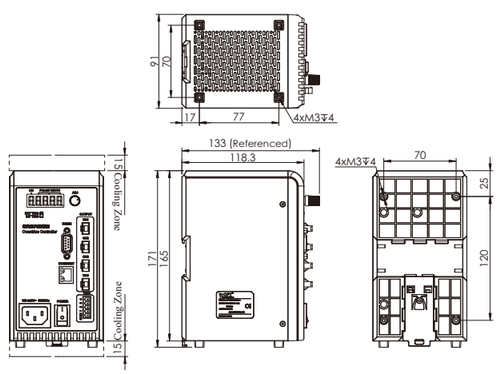
Trigger Voltage (V) \ Output Current (A)	2		5		10		20	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	9.4	0.18	9.4	0.18	9.4	0.18	9.4	0.18
12	8.6	0.18	8.6	0.18	8.6	0.18	8.6	0.18
24	8	0.18	8	0.18	8	0.18	8	0.18

Trigger Wiring Diagrams

4 trigger channels, and bidirectional optocoupler inside
Low level: 0 - 2V input voltage; high level: 5 - 24V input voltage. The rising edge trigger is the default trigger polarity. The diagrams are as below.



Dimensions (mm)



Line-scan Type Digital Current Controller New



Selection Guide

OPT - DPA 60 24 ES -X

- Channels
- Additional info:E- Ethernet S-stroboscopic
- Max. output voltage: 24V
- Max. output current: 6A
- Digital current controller
- Brand name

Model	Channels	Compatible Light
OPT-DPA6024ES-4	4	OPT 24V LED light
OPT-DPA6024ES-8	8	OPT 24V LED light
OPT-DPA6024ES-16	16	OPT 24V LED light

Product Features

- Programmable trigger function
- Line-scan rows: max. 65,000
- Frequency multiplication and division
- DO isolated differential output
- ≤5μs trigger response time
- Up to 80kHz trigger response frequency
- 256-level light intensity control
- Software trigger function
- Multi-channel simultaneous communication
- Manual setting for max.output current
- 100M Ethernet communication
- RS232 communication

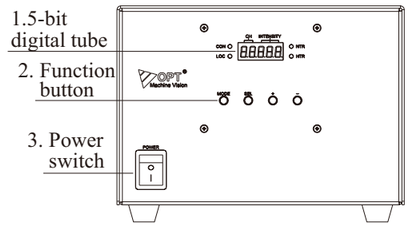
Specifications

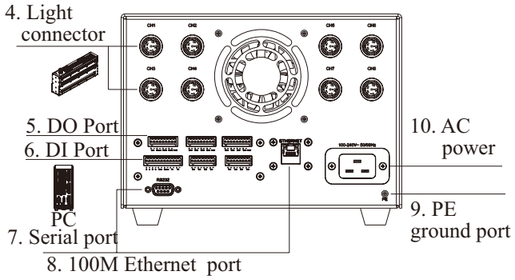
Item		Parameter	Description
Input voltage		AC100~240V 50/60Hz	
Input current	4CH/8CH	9A/115VAC 4A/230VAC	
	16CH	16A/115VAC 8A/230VAC	
Lighting mode		Continuous/strobe	Set via the working mode switch or DEMO software

Specifications

Item		Parameter	Description
Manual setting for max. output current		25mA~6A	Set via DEMO software
Intensity control		256 levels	Set via function button or DEMO software
Short-circuit protection		Yes	In case of output short circuit, the short circuit protection will be enabled to close the corresponding channel, and the digital tube will display an error message "Er2".
Normal trigger		256 intensity levels settable	
Normal trigger time unit		1μs/ 10μs/1ms/100ms	Set via DEMO software
Normal trigger pulse width		1μs~30s	Set via function button or DEMO software
High intensity trigger		6A output per channel	Maximum output voltage: no more than 24V
High intensity trigger time unit		1μs/10μs/1ms	Set via DEMO software
High intensity trigger pulse width		1μs~500ms	Set via function button or DEMO software
Programmable trigger		Support up to 64 processes	The intensity, pulse width and trigger source can be set
Number of line-scan rows		1-65000	Set via DEMO software
DI input		4CH: 4 isolated differential inputs	5V 100mA
		8/16CH: 8 isolated differential inputs	
		AB phase, Line, Frame signal input	
DO output		4CH: 4 isolated differential outputs	Low level: 0-2V; high level: 5-24V
		8/16CH: 8 isolated differential outputs	
		Line, Frame signal output	
Frequency multiplication		1、2、4、8、16、32	Set via DEMO software
Frequency division		0~200	Set via DEMO software
Trigger response time		⩽5μs	See the "Reference Table for Trigger Response Time" for details
Trigger response frequency		80kHz	See the "Reference Table for Trigger Response Time" for details
Trigger delay time unit		1μs/10μs/1ms	Set via DEMO software
Trigger delay		1μs~6500ms	Set via DEMO software
Output power		144W/CH	4/8 total output :≤700W; 16 total output :≤1450W;
Trigger delay		Rs232/ Ethernet	
Standby power consumption	4CH	≤16.2W	220V input
	8CH	≤18.5W	
	16CH	≤22.5W	
Hi-Pot test		AC1500V 1Min	Leakage current <10mA
Insulation		DC500V	Insulation resistance >20MΩ
Operating temperature		-5℃~50℃	
Dimensions (mm^3) (L×W×H)	4CH	234×357.5×176	See the dimensional drawing
	8CH	234×357.5×176	
	16CH	189×381.3×309.5	
Weight (Kg)	4CH	3.2	
	8CH	4.48	
	16CH	8. 9	

Device Overview

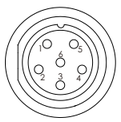




Panel

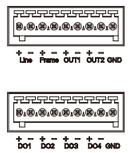
No.	Interface	Description
1	5-bit digital tube	Seen from the left, the first bit represents the tens digit of the number of channels, the second bit represents the ones digit of the number of channels, and the last three bits represent the value corresponding to the current operation.
2	Function button	“MODE” is used to set the working mode. Users can press this button for about 1s in the panel control status to enable the normal mode, common trigger mode or High intensity trigger mode, and the corresponding working mode indicator will be ON. “SEL” used to set parameters. Users can press this button in the panel control status to select the corresponding bit on the digital tube. “+” is used to increase a value, while “-” is used to decrease a value.
3	Power switch	Power on/off the controller
4	Light connector	4/8/16 independent and controllable LED light outputs
5	DO Output	Isolated differential output
6	DI Input	External signal input, trigger pulse width can be set
7	Serial port	Communication with PC via the RS232 interface
8	100M Ethernet port	Communication with PC via the Ethernet interface
9	PE ground port	Connecting the safety ground
10	AC power input	100~240V AC, 50/60Hz

LED light interface

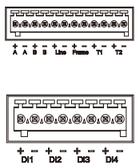


Location	Definition	Description
1	Light+	LED light output +
2	Light-	LED light output -
3	Fan+	Fan voltage +
4	Fan-	Fan voltage -
5	NC	
6	NC	

Definition of trigger terminal interface



Location	Definition	DO Description
1	Line+	Connect to the camera/ acquisition card row signal (+)
2	Line-	Connect to the camera/ acquisition card row signal (-)
3	Frame+	Connect to the camera/ acquisition card frame signal (+)
4	Frame-	Connect to the camera/ acquisition card frame signal (-)
5	GND	Grounding
6	OUT1-OUT2	Custom interface
7	DO1-DO8	High-speed differential output interface



Location	Definition	DO Description
1	A+	Connect to the A phase signal (+) of encoder
2	A-	Connect to the A phase signal (-) of encoder
3	B+	Connect to the B phase signal (+) of encoder
4	B-	Connect to the B phase signal(-) of encoder
5	Line+	Connect to row signal (+)
6	Line-	Connect to row signal (-)
7	Frame+	Connect to frame signal (+)
8	Frame-	Connect to frame signal (-)
9	T1、T2	Custom interface
10	DI1-DI8	High-speed differential output interface

Mode switching settings

Mode	Indicator Status
Continuous	CON indicator ON
Normal trigger	NTR indicator ON
High intensity trigger	HTR indicator ON
\	LOC indicator ON, panel locked and the function button is invalid when the software sets the working mode. When the working mode is set to panel mode, the button will be unlocked

Trigger function

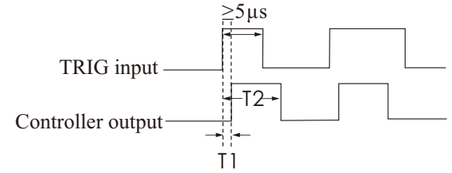
Controllers of this series have three trigger modes: normal trigger, High intensity trigger and programmable trigger modes. It has four trigger polarities: rising edge trigger, falling edge trigger, Positive follow trigger and Negative follow trigger. The default trigger mode is rising edge trigger. For details, see the table below:

Trigger Mode	Trigger Polarity
Common trigger	Rising edge trigger
	Falling edge trigger
	Positive follow trigger
	Negative follow trigger
High intensity trigger	Rising edge trigger
	Falling edge trigger
Programmable trigger	Rising edge trigger
	Falling edge trigger

Trigger Sequence

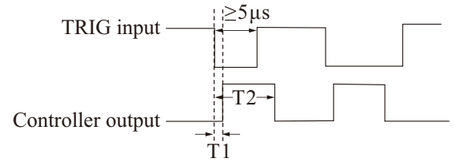
Rising edge trigger

When the trigger signal is the rising edge, the lighting time will be consistent with the set trigger pulse width. The trigger pulse width can be set by DEMO software and function buttons. See the figure below:



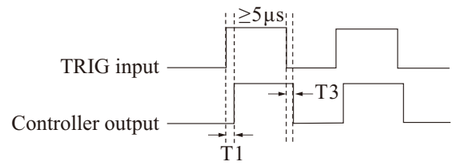
Falling edge trigger

When the trigger signal is the falling edge, the lighting time will be consistent with the set trigger pulse width. The trigger pulse width can be set by DEMO software and function buttons. See the figure below:



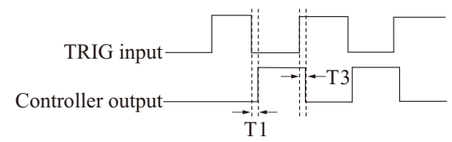
Positive follow trigger

When the trigger signal is high level, the lighting time will be consistent with the high-level pulse with of the trigger signal. See the figure below:



Negative follow trigger

When the trigger signal is low level, the lighting time will be consistent with the low-level pulse with of the trigger signal. See the figure below:



Description:

1. T1 is the time with response, T2 is the trigger pulse width, and T3 is the time without response.
2. T2 range: 1μs to 30s. For T1 and T3 settings, see the reference table for trigger response time.

Reference Table of Trigger Response Time

Trigger Voltage (V) \ Output Current (mA)	0.5		1		3		6	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	5	5	5	5	5	5	5	5
12	5	5	5	5	5	5	5	5
24	5	5	5	5	5	5	5	5

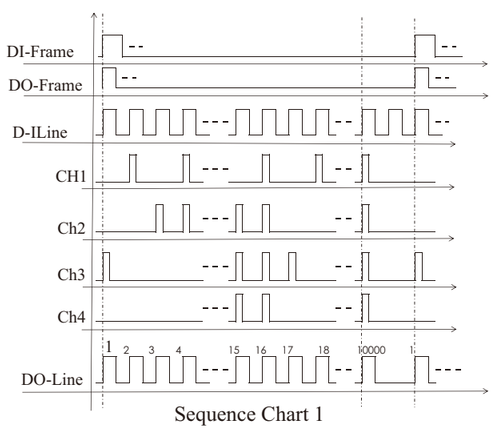
Programmable trigger mode

If the programmable trigger mode is enabled via DEMO, the controller will execute all steps in the flow chart in cycles. Set the flow chart before enabling the programmable trigger mode. See the Flow Chart and Sequence Chart 1.

Programmable trigger mode	Description
Number of line-scan rows	In the programmable trigger mode, the controller will count the number of trigger source signals. If the number is greater than the set trigger value, subsequent trigger source signals will be invalid, and triggering will be suspended until a reset signal is received to clear the current value.
Frame signal filtering parameter	=0, frame signal edge is valid; > 0, the unit of time is μs. After the edge is captured, it takes effect for a period of time
Frequency multiplication	The function of DO frequency multiplication can be applied to multiply the frequency of trigger signal, and the multiple is adjustable.
Frequency division	Frequency division can be performed after frequency multiplication. See the Frequency Division Sequence Chart 1 for Single-ended Input Process and Frequency Division Sequence Chart 2 for Double-ended Input Process.

Step	Trigger Source	Brightness				Pulse width			
		CH1	CH2	CH3	CH4	CH1	CH2	CH3	CH4
1	1	0	0	255	0	0	0	100	0
2	1	255	0	0	0	100	0	0	0
3	1	0	255	0	0	0	100	0	0
4	1	255	255	0	0	100	100	0	0
...	...	...	...	...	...	...	...	...	...
15	1	0	255	255	255	0	100	100	100
16	1	255	255	255	255	100	100	100	100

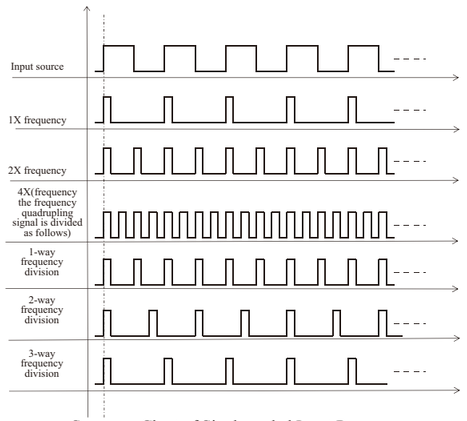
Flow Chart



Sequence Chart 1

Frequency division sequence chart

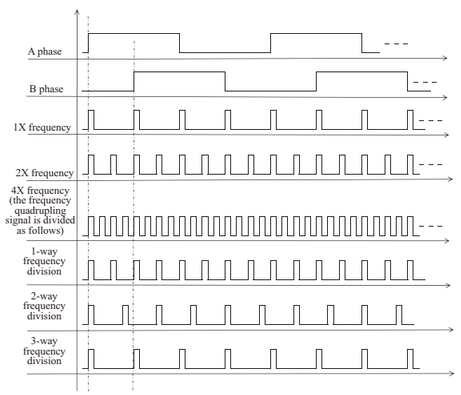
Single-ended input mode: The single-end input interface is optional. When the rising edge of the input signal is detected, there will be the corresponding pulse signal output based on the frequency multiplication parameters, as shown in the table below. Sequence Chart of Single-ended Input Process



Sequence Chart of Single-ended Input Process

Double-ended input mode: The double-ended input interface is fixed, and the DC encoder provides A/B phase input. In addition, the phase difference of 2 input signals should be 90°. When the edge of input signal is detected, there will be the corresponding pulse signal output based on frequency multiplication parameters, as show in the table below.

Sequence Chart of Double-ended Input Process

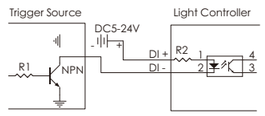


Sequence Chart of Double-ended Input Process

Trigger wiring diagram

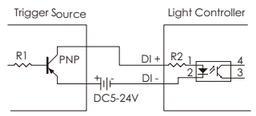
Controllers of this series have two wiring modes: DI high-speed input and fixed interface, both of which are high-speed optocoupler isolation inputs. The input voltage of 0-2V corresponds to low level, while the input voltage of 5-24V corresponds to high level.

NPN type trigger:



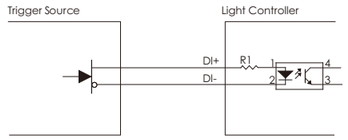
Trig Input Circuit for NPN Type Trigger

PNP type trigger:



Trig Input Circuit for PNP Type Trigger

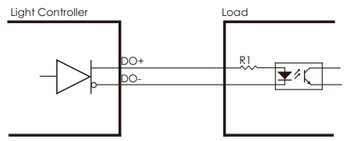
Differential type trigger:



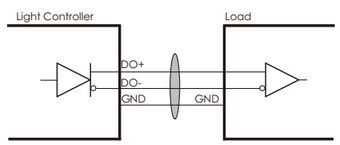
Differential DO wiring description

The Do output is differential isolation output, which can effectively isolate the influence of external interference signals on the controller and facilitate the connection of high-speed differential input devices. For example, the line-scan camera differential input and high-speed optocoupler input can be connected.

1. The differential positive and negative terminals of the controller are connected to the positive and negative terminals of the optocoupler input of an external device. For example, the PLC acquisition card can be connected. See the table below.

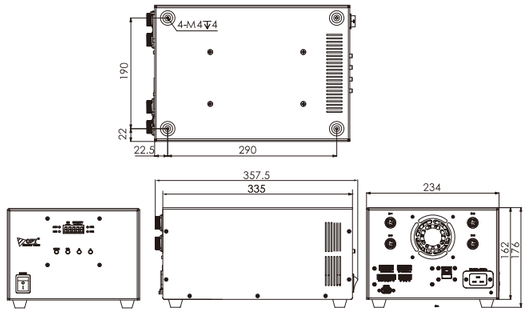


2. Differential positive and negative terminals of the controller are connected with the differential input positive and negative terminals of peripherals respectively. In order to prevent signal cables from external electromagnetic interference, the ground terminal of the differential DO signal should be connected to the signal shield layer of the external device, as shown below.

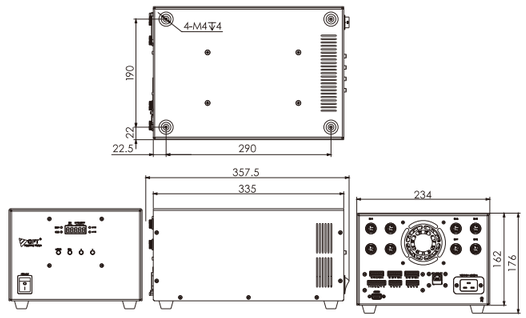


Dimensions (mm)

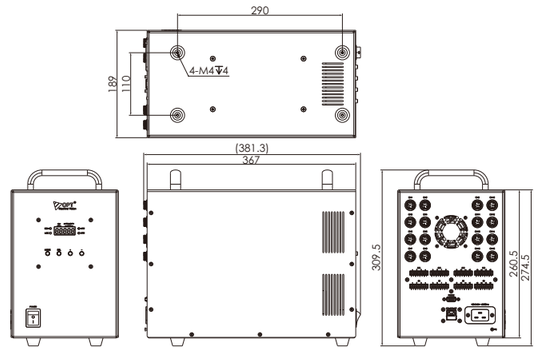
1.OPT-DPA6024ES-4



2.OPT-DPA6024ES-8



3.OPT-DPA6024ES-16



AP Analog Voltage Controller Patented





Selection Guide

OPT-AP1024F-X

- Channels
- Additional info.: panel type
- Max. output voltage: 24V
- Max. output current: 1A
- Analog voltage controller
- Brand name

Model	Channels	Compatible Light
OPT-AP1024F-1	1	10mA - 1A (24V)
OPT-AP1024F-2	2	10mA - 1A (24V)
OPT-AP1024F-3	3	10mA - 1A (24V)
OPT-AP1024F-4	4	10mA - 1A (24V)

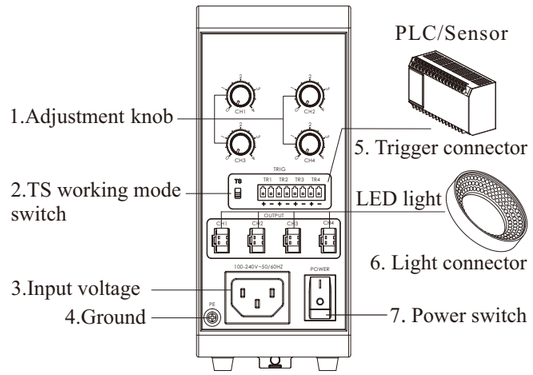
Product Features

- Manual stepless intensity control
- External trigger: External trigger input (e.g. camera trigger signal) for related light strobes and other sequences. (Strobe mode can greatly improve light source life expectancy.)
- Convenient mounting with screws or on DIN rails

Specifications

Item	Parameter		Description
Input voltage	100 - 240V AC 50/60Hz		
Input current	1.8A/115VAC 1A/230VAC		
Output voltage	14.0-24.0V (±0.2V)		Continuously adjustable
Lighting mode	Continuous/strobe		
Intensity control	Stepless		Via the adjustment knob
Triggering	Switch		
Response time	≥ 80μs		See “Reference Table of Trigger Response Time” for details
Response frequency	≤ 1kHz		See “Reference Table of Trigger Response Time” for details
ON/OFF mode conversion	Support		Via the working mode switch (TS)
Output power	24W/CH		1CH/2CH total output ≤ 30W 3CH/4CH total output ≤ 40W
Standby power consumption	1CH	< 1.1W	Tested at 220V AC
	2CH	< 1.1W	
	3CH	< 1.2W	
	4CH	< 1.2W	
Hi-Pot test	1500VAC 1min		Leakage current < 10mA
Insulation	500VDC		Insulation resistance > 20MΩ
Operating temperature	-5°C - 50°C		
Dimensions (mm^3) (L × W × H)	73.5×129.2×166		Refer to the drawing for details
Weight (kg)	1CH/2CH	0.56	
	3CH/4CH	0.66	

Device Overview



Remark: The image above is for AP1024F-4. The last number in Model AP1024F-1/2/3 indicates the number of adjustment knob, external trigger connector and light connector.

No.	Item	Description
1	Adjustment knob	Turned in clockwise to increase and in anti-clockwise to reduce light intensity.
2	TS working mode switch	Moved up for ON mode, and down for OFF mode
3	Input voltage	100 - 240V AC, 50/60Hz
4	Ground	Grounding protection
5	Trigger connector	Connects external trigger for strobe
6	Light connector	Each light is individually controlled
7	Power switch	Turns on/off the controller

Trigger Connector

AP1024F-1/2/3/4 offer 1, 2, 3, or 4 trigger channels respectively. Each channel has “+” and “-”input ports. The image below shows the trigger connector of AP1024F-4. Please refer to the “Switch Trigger Wiring Diagram” for more details.

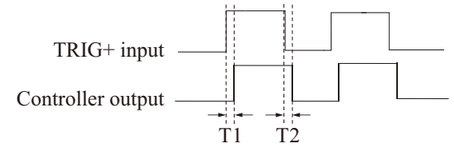


Working Mode Setting

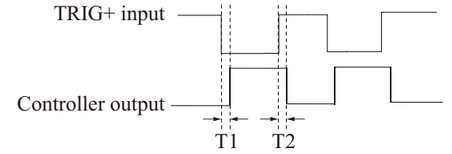
TS Switch	Working Mode	Description
Up	ON	Light is on when “Trig+” and “Trig-” are disconnected; light is off at the short circuit.
Down	OFF	Light is off when “Trig+” and “Trig-” are disconnected; light is on at the short circuit.

Trigger Sequence

ON Mode:
After an external signal is connected, light is on when “Trig+” and “Trig-” are disconnected; light is off at the short circuit.



OFF Mode:
After an external signal is connected, light is off when “Trig+” and “Trig-” are disconnected; light is on at the short circuit.

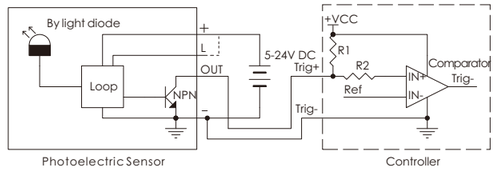


Remarks
T1: Enabling response time; T2: Disabling response time;
Please refer to the table of trigger response time for T1 and T2

Reference Table of Trigger Response Time

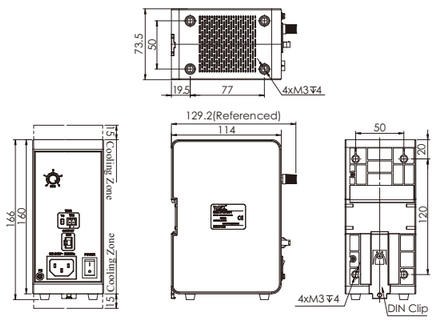
Working Mode \ Output Current (mA)	100		500		1000	
	T1 (μs)	T2 (μs)	T1 (μs)	T2 (μs)	T1 (μs)	T2 (μs)
ON Mode	300	3000	300	500	300	300
OFF Mode	80	3000	80	500	80	400

Switch Trigger Wiring Diagram



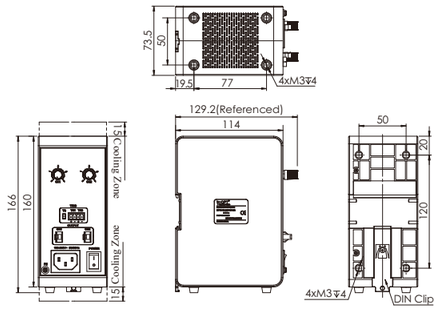
Dimensions (mm)

1.OPT-AP1024F-1

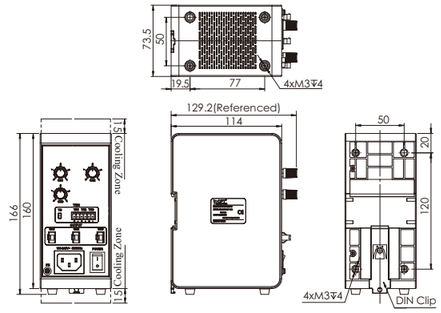


Dimensions (mm)

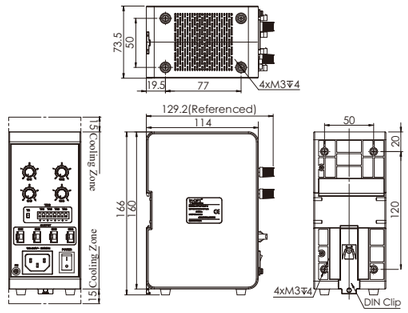
2.OPT-AP1024F-2



3.OPT-AP1024F-3



4.OPT-AP1024F-4



APA High Power Analog Current Controller



Selection Guide

OPT-APA6024-2

- Channels
- Max. output voltage: 24V
- Max. output current: 60 → 6A; 30 → 3A
- Analog current controller
- Brand name

No.	Model	Channels	Compatible Light
1	APA6024-2	2	0.8-6A LED light with 6P connector

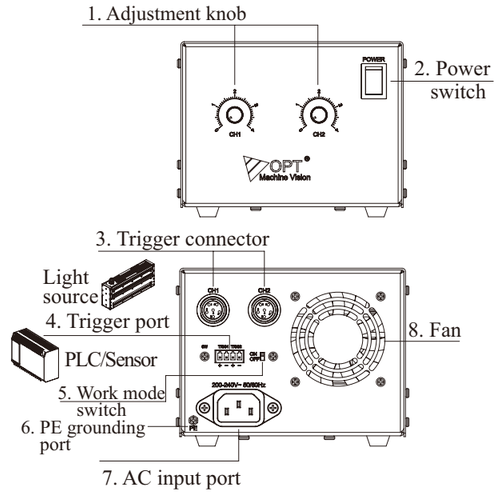
Product Features

- Autosense™ technology
- Stepless adjustment for output current
- External trigger: External trigger input (e.g. camera trigger signal) for related light strobes and other sequences. (Strobe mode can greatly improve light source life expectancy.)

Parameters

Item	Parameter	Description
Input voltage	100-120V AC 200-240V AC 50/60Hz	Converted via the internal switch; 200 - 240V AC is the default input. Choose the controller model accordingly
Input current	6.8A/115VAC 3.4A/230VAC	
Lighting mode	Continuous/strobe	
Auto sensing of light rated current	For 800mA - 6A light	
Intensity control	Stepless	Via the adjustment knob
Triggering	Switch	
Response time	≥ 200μs	See “Reference Table of Trigger Response Time” for details
Response frequency	≤ 1kHz	See “Reference Table of Trigger Response Time” for details
Channels	2CH	
Output power	144W/CH	2CH output ≤ 288W
Hi-Pot test	1500VAC 1Min	Leakage current < 10mA
Insulation	500VDC	Insulation resistance > 20MΩ
Operating temperature	-5°C - 50°C	
Standby power consumption	≤ 4.7W	
Dimensions (mm^3) (L × W × H)	136×305.8×104.5	Refer to the drawings for details
Weight (kg)	1.9	

Device Overview



No.	Item	Description
1	Adjustment knob	The 2 connected lights are controlled respectively with the 2 adjustment knobs. Turned in clockwise to increase and in anti-clockwise to reduce light intensity.
2	Power switch	Turns on/off the controller
3	Light connector	Connects OPT light with 6P connector
4	Trigger connector	Connects external trigger for strobe
5	working mode switch	Moved up for ON mode, and down for OFF mode
6	Ground	Grounding protection
7	Input voltage	100 - 120V/200 - 240V AC 50/60Hz Various controllers available for different input voltage
8	Fan	Enhances cooling

Light Connector



Pin	Description
1	Light+
2	Light-
3	Fan+
4	Fan-
5	Res
6	Res

Trigger Connector

+ and - electrode input ports form a trigger channel. 2 trigger channels are available (see the figure below). Please refer to the "Switch Trigger Wiring Diagram" for more details.



Working Mode Setting

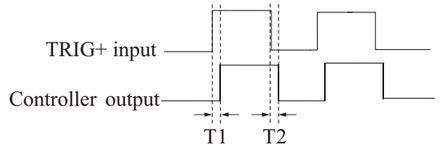
OPT-APA6024-2 has two working modes (on/off), which can only be set via the internal switch. Please refer to the table below for details.

Working Mode	Description
ON	Light is on when "Trig+" and "Trig-" are disconnected; light is off at the short circuit.
OFF	Light is off when "Trig+" and "Trig-" are disconnected; light is on at the short circuit.

Sequence

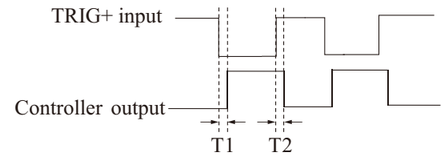
ON Mode

After an external signal is connected, light is on when "Trig+" and "Trig-" are disconnected; light is off at the short circuit.



OFF Mode

After an external signal is connected, light is off when "Trig+" and "Trig-" are disconnected; light is on at the short circuit.

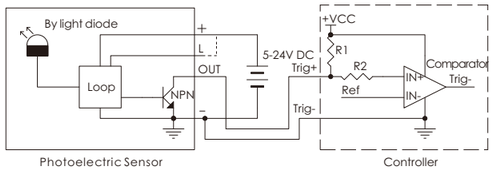


Remarks
T1: Enabling response time; T2: Disabling response time;
Please refer to the table of trigger response time for T1 and T2

Reference Table of Trigger Response Time

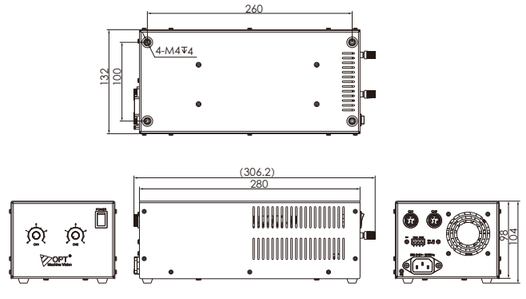
Working Mode \ Output Current (A)	1		3		4	
	T1 (μs)	T2 (μs)	T1 (μs)	T2 (μs)	T1 (μs)	T2 (μs)
ON Mode	500	5	200	5	170	5
OFF Mode	500	5	200	5	150	5

Switch Trigger Wiring Diagram



Dimensions (mm)

1.OPT-APA6024-2



Analog Current Controller for Spot Lights



Selection Guide

OPT-APA0805F-X

- Channels
- Additional info.: panel type
- Max. output voltage: 5V
- Max. output current: 0.8A
- Analog current type
- Brand name

Model	Channels	Compatible Light
OPT-APA0805F-1	1	0.8A/5V
OPT-APA0805F-2	2	0.8A/5V
OPT-APA0805F-3	3	0.8A/5V
OPT-APA0805F-4	4	0.8A/5V

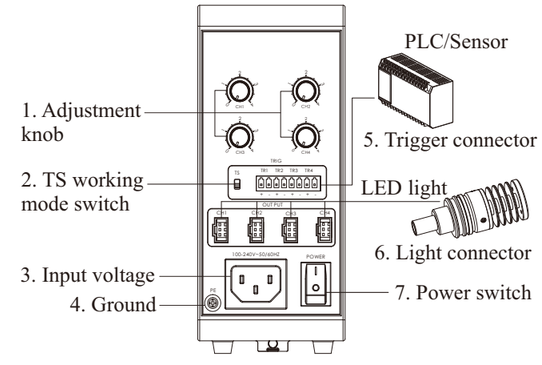
Product Features

- Manual stepless intensity control
- External trigger: External trigger input (e.g. camera trigger signal) for related light strobes and other sequences. (Strobe mode can greatly improve light source expectancy.)
- Convenient mounting with screws or on DIN rails

Specifications

Item	Parameter	Description
Input voltage	100 - 240V AC 50/60Hz	
Input current	1.8A/115VAC 1A/230VAC	
Output current	0 - 0.8A	Continuously adjustable
Lighting mode	Continuous/strobe	
Intensity control	Stepless	Via the intensity adjustment knob
External trigger input	Strobe in synchronization with input	
Triggering	Switch	
Response time	≤ 200μs	See "Reference Table of Trigger Response Time" for details
Response frequency	≤ 1kHz	See "Reference Table of Trigger Response Time" for details
ON/OFF mode conversion	Support	Via the TS switch
Output power	4W/CH	
Standby power consumption	< 4W	Tested at 220V AC
Hi-Pot test	1500VAC 1Min	Leakage current < 10mA
Insulation	500VDC	Insulation resistance > 20MΩ
Operating temperature	-5°C - 50°C	
Dimensions (mm^3) (L × W × H)	73.5×129.2×166	Refer to the drawing for details
Weight (kg)	0.7	

Device Overview

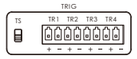


Remark: The image above is for APA0805F-4. The last number in Model APA0805F-1/2/3 indicates the number of adjustment knob, external trigger connector and light connector.

No.	Item	Description
1	Adjustment knob	Turned in clockwise to increase and in anti-clockwise to reduce light intensity.
2	TS working mode switch	Moved up for ON mode, and down for OFF mode
3	Input voltage	100 - 240V AC, 50/60Hz
4	Ground	Grounding protection
5	Trigger connector	Connects external trigger for strobe
6	Light connector	Each light is individually controlled
7	Power switch	Turns on/off the controller

Trigger Connector

APA0805F-1/2/3/4 has 1, 2, 3, or 4 channels respectively. Each channel has "+" and "-" electrode input ports. The image below shows the trigger connector of APA0705F-4. Please refer to the "Switch Trigger Wiring Diagram" for more details.

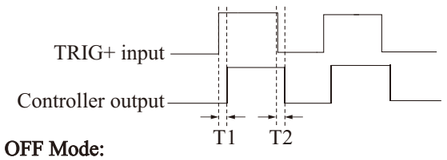


Working Mode Setting

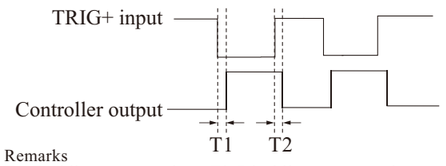
TS Switch	Working Mode	Description
Up	ON	Light is on when "Trig+" and "Trig-" are disconnected; light is off at the short circuit.
Down	OFF	Light is off when "Trig+" and "Trig-" are disconnected; light is on at the short circuit.

Trigger Sequence

ON Mode:
After an external signal is connected, light is on when "Trig+" and "Trig-" are disconnected; light is off at the short circuit.



OFF Mode:
After an external signal is connected, light is off when "Trig+" and "Trig-" are disconnected; light is on at the short circuit.

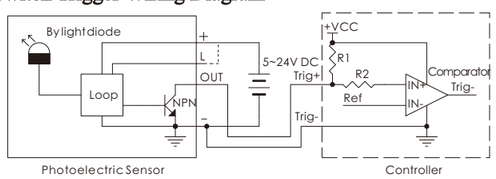


Remarks
T1: Enabling response time; T2: Disabling response time;
Please refer to the table of trigger response time for T1 and T2

Reference Table of Trigger Response Time

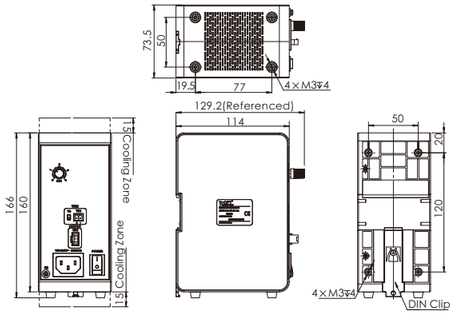
Working Mode \ Output Current (mA)	100		400		700	
	T1 (μs)	T2 (μs)	T1 (μs)	T2 (μs)	T1 (μs)	T2 (μs)
ON Mode	200	5	200	5	200	5
OFF Mode	70	200	70	200	70	200

Switch Trigger Wiring Diagram

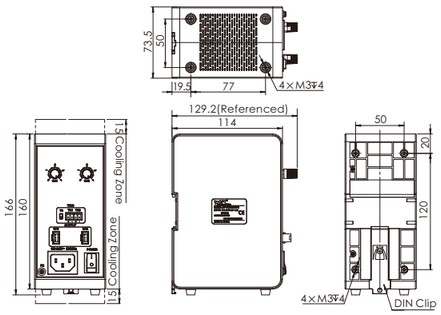


Dimensions (mm)

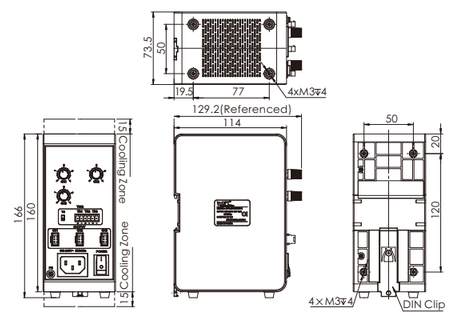
1.OPT-APA0805F-1



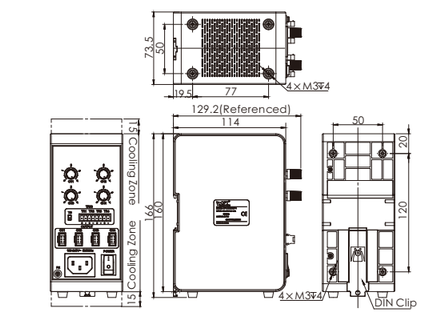
2.OPT-APA0805F-2



3.OPT-APA0805F-3



4.OPT-APA0805F-4



DPA Mini Digital Current Controller NEW



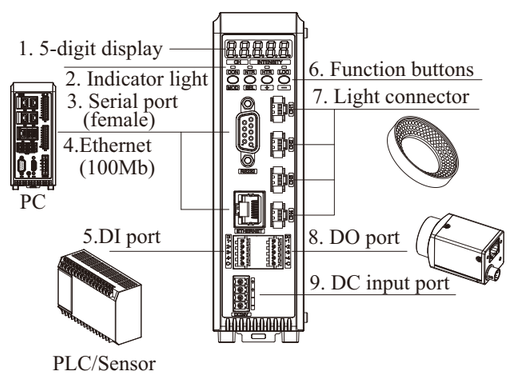
Selection Guide

OPT-DPA2024EC-4

- Channels
- Additional info.: Ethernet / C - DC input
- Output voltage: 24V
- Continuous max.output current
- Digital current type
- Brand name

Type	Model	Control light source type	Comment
Main controller	DPA2024EC-4	15mA~3A, 24V light source	Can be expanded with the following models of expansion modules to increase more channels
Main controller	DPA2012EC-4	15mA~3A, 12V light source	
Main controller	DPA2005EC-4	10mA~2A, 2-5V light source	
Expansion module	EMA2024EC-4	15mA~3A, 24V light source	Requires use with the above model main controller.
Expansion module	EMA2012EC-4	15mA~3A, 12V light source	
Expansion module	EMA2005EC-4	10mA~3A, 2-5V light source	

Device Overview



Product Features

- DC power supply
- Compact size, saves space
- This controller has 4-channel output and can be used with different EMA series expansion modules, with a maximum expansion capacity of up to 36 channels.
- The strobe function supports up to 3A current output.
- Equipped with DO output function, supports both software and hardware control.
- Fastest trigger response time can reach 30μs, maximum trigger frequency can reach 20kHz
- Trigger pulse width adjustable from 30μs to 30s
- RS232 interface
- 100Mb Ethernet interface
- Maximum of 64 programmable steps with intensity, pulse width and trigger source can be defined in each step.

Panel

No.	Interface	Description
1	5-digit display	Seen from the left, the first bit represents the tens digit of the number of channels, the second bit represents the ones digit of the number of channels, and the last three bits represent the value corresponding to the current operation.
2	Indicator light	Here are the current operating modes indicated: "CON" Constant mode, "NTR" Normal trigger mode, "HTR" High trigger mode, and "LOC" Key lock.
3	Serial port (female)	Use RS232 to communicate with PC devices
4	Ethernet (100Mb)	Communicate with PC devices via Ethernet.
5	DI port	Connect an external trigger signal source for synchronized strobe operation; trigger pulse width time can be set.
6	Function buttons	The (MOD) key is the working mode setting key. In the panel control mode, pressing this key for about 1S can switch the working mode to the constant light mode, common trigger mode and high light trigger mode, and the corresponding working mode indicator light will also light up; the (SEL) key is the parameter setting key. In the panel control mode, tapping this key can select the corresponding value displayed on the digital tube; the (+) key is for increasing the operation and the (-) key is for decreasing the operation.
7	Light connector	There are a total of 4 light source outputs, each independently controllable.
8	DO port	4 channels of open-collector outputs
9	DC input port	″+″ ″−″Port inputDC22−25V

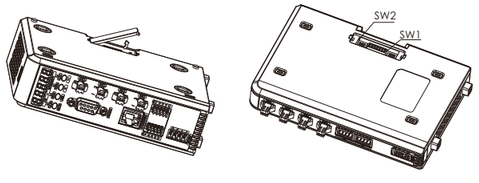
Specifications

Model	DPA2024EC-4	EMA2024EC-4	DPA2012EC-4	EMA2012EC-4	DPA2005EC-4	EMA2005EC-4
Input voltage	DC 22~25V					
Input current	5A/4CH	2.5A/4CH		1.5A/4CH		0.8A/4CH
Lighting mode	Continuous/strobe					
Light source connection type	24V light source		12V light source		5V light source	
Auto sensing of light rated current	For 15mA-3A 24V light source		For 15mA-3A 12V light source		/	
Manual setting for max. output current	15mA~3A				10mA~2A	
Intensity control	Adjustable brightness in 256 levels					
Short-circuit protection	Supports the function.; the panel's digital display shows Can restore the operation by removing the fault and restarting.					
Overcurrent protection	The panel's digital display shows "ER1." Removing the fault and restarting can restore operation.					
Normal trigger	Brightness 256 levels programmable					
Common Trigger Pulse Width Time Units	1 μs/ 10 μs/1 ms/100 ms					
Normal trigger pulse width	30 μs~30 s					
Highlight Trigger Mode	Single channel output at 3A（Max）				Single channel output at 2A	
Highlight trigger pulse width	0.03 μs~5.00 ms					
Programmable trigger	Supports up to 64 processes, with settings for brightness, pulse width, and trigger source.					
Response time	⩾ 30μs					
Response frequency	⩽ 20kHz					
Setting the trigger delay time unit	1 μs/ 10 μs/1 ms					
Set trigger delay	1 μs~6553 ms					
DO output	4-channel open-collector output					
DO pulse width time unit	/	1μs/10μs/1ms/100ms	/	1μs/10μs/1ms/100ms	/	1μs/10μs/1ms/100ms
DO pulse width	/	1μs-30μs	/	1μs-30μs	/	1μs-30μs
DO delay time unit	/	1μs/10μs/1ms	/	1μs/10μs/1ms	/	1μs/10μs/1ms
DO delay	/	1μs-6553ms	/	1μs-6553ms	/	1μs-6553ms
Output power	48W/CH 100W/4CH	48W/CH 48W/4CH	48W/CH 24W/4CH	24W/CH 24W/4CH	10W/CH 20W/4CH	10W/CH 10W/4CH
Maximum strobe output current	3A				2A	
Communication	RS232/Ethernet	/	RS232/Ethernet	/	RS232/Ethernet	/
Standby power consumption	⩽ 2W; tested at 24V DC					
Operating temperature	-5℃~50℃					
Dimensions(mm^3) (L × W × H)	41.5×103.7×145	28.24×103×145	41.5×103.7×145	28.24×103×145	41.5×103.7×145	28.24×103×145
Weight (kg)	0.22	0.16	0.22	0.16	0.22	0.16

Channel expansion functionality

This controller has 4-channel output and can be used with different series of EMAexpansion modules. Up to 8 expansion modules can be connected, allowing the total number of channels to be expanded to a maximum of 36. The installation steps for the main controller and expansion modules are as follows:

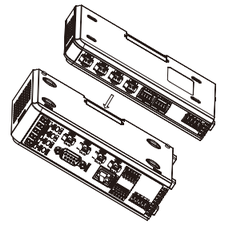
Step 1: Open the interface covers of the main controller and expansion modules, and set the DIP switches.



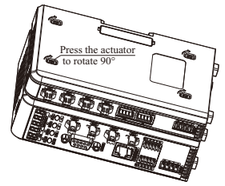
Set the 8-bit DIP switch address on the expansion modules as follows:
1. For the first expansion module, set the first bit of SW1 to ON, and set the other three bits of SW1 and all of SW2 to OFF (default factory setting).
2. For the second expansion module, set the second bit of SW1 to ON, and set the other three bits of SW1 and all of SW2 to OFF.
3. Continue in this manner. For the eighth expansion module, set the fourth bit of SW2 to ON, and set the other three bits of Sw2 and all of SW1 to OFF.

Finally, close the interface cover on the last expansion module.
Note: If only one expansion module is connected, this DIP switch setting step can be ignored.

Step 2:Align the assembly direction and connect.



Step 3: Rotate the latch 90 degrees.



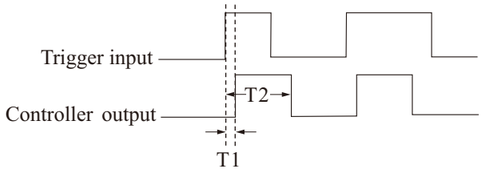
Trigger

This series of controllers features three trigger modes: normal trigger, high trigger, and programmable trigger. It also supports four trigger polarities: rising edge trigger, falling edge trigger, positive pulse trigger, and negative pulse trigger. The default setting is rising edge trigger (see specific details in the table below).

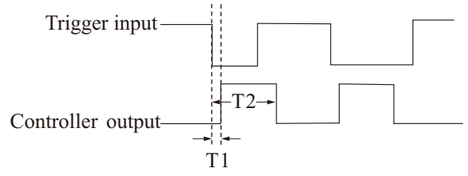
Trigger Mode	Trigger Polarity
Normal trigger	Rising edge trigger
	Falling edge trigger
	Positive follow trigger mode
	Negative follow trigger mode
High intensity trigger	Rising edge trigger
	Falling edge trigger
Programmable trigger	Rising edge trigger
	Falling edge trigger

Trigger Sequence

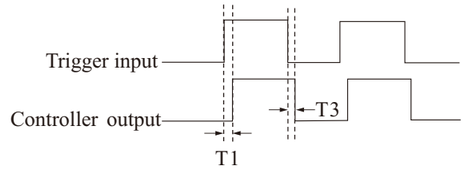
Rising edge trigger
The illuminating time is equal to the set trigger pulse width. Trigger pulse width set via DEMO or function key.



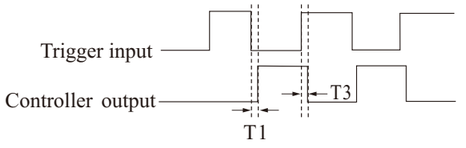
Falling edge trigger
The illuminating time is equal to the set trigger pulse width. Trigger pulse width set via DEMO or function key.



Positive follow trigger mode
When the trigger signal is high level, illuminating time is equal to pulse width of high level.



Negative follow trigger mode
When the trigger signal is low level , illuminating time is equal to pulse width of low level.



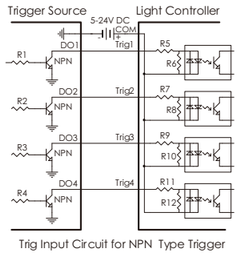
Remarks
1. T1: Enabling response time; T2: Trigger pulse width;
   T3: Disabling response time
2. T2 setting range: 1μs - 30s;
   Please refer to the table of trigger response time for T1 and T3

Trigger Tesponse Time Reference Table

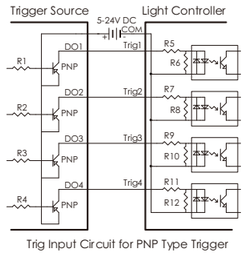
Trigger Voltage (V) \ Output Current (mA)	200		1000		2000		3000	
	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)	T1 (μs)	T3 (μs)
5	180	10	35	12	30	15	28	18
12	180	10	35	13	30	16	28	19
24	180	19	35	22	30	25	28	28

Level Trigger Wiring Diagrams

4 trigger channels, and bidirectional optocoupler inside
Low level: 0 - 2V input voltage; high level: 5 - 24V input voltage. The rising edge trigger is the default trigger polarity. The diagrams are as below.



Trig Input Circuit for NPN Type Trigger



Trig Input Circuit for PNP Type Trigger

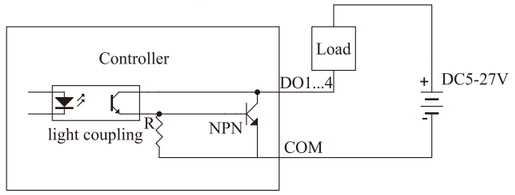
DO Function

The EC series light source controller and expansion modules feature 4 channels of DO (Digital Output), each independently controllable with configurable output logic.

Software Control: Send commands to control the DO to open/close, where the DO is directly controlled by the command.

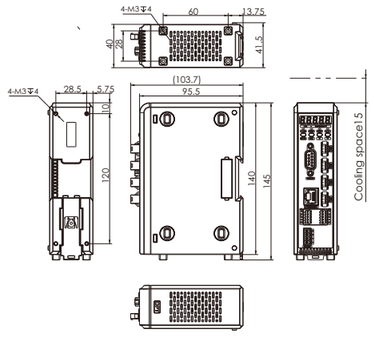
Trigger Control: Receives hardware or software trigger signals. The DO follows channel outputs, or the DO outputs based on the DO pulse width.

DOwiringreference:An open-controller output with an output load voltage range of DC5-27V and a maximum output load current of 50mA. The wiring is shown in the diagram below. (Note: When DO is connected to an inductive load, an external flyback diode is required to prevent reverse current from damaging the internal components of the light source controller and expansion modules.)

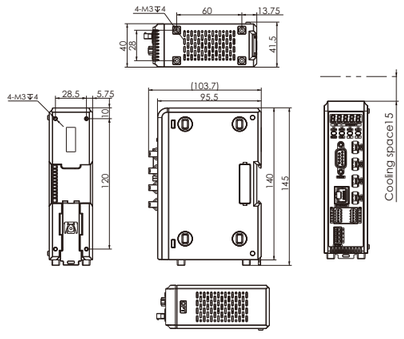


Dimensions (mm)

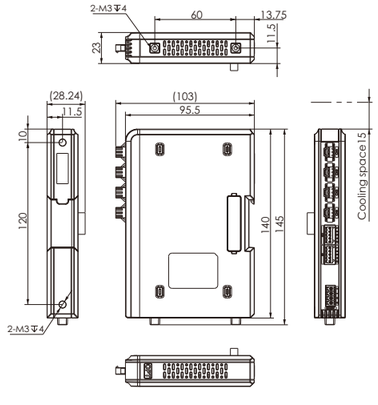
1. OPT-DPA2012EC-4/DPA2005EC-4



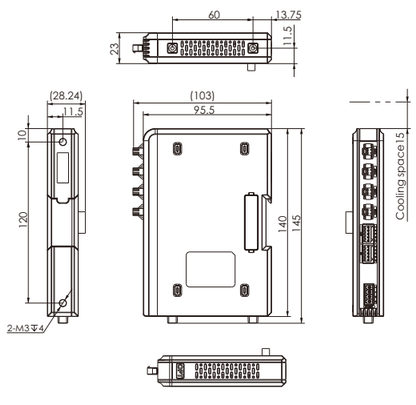
2. OPT-DPA2024EC-4



3. OPT-EMA2012EC-4/EMA2005EC-4



4. OPT-EMA2024EC-4



APM Mini Analog Voltage Controller



Selection Guide

OPT-APM0524B-2

- Channels
- Additional info.: The 2nd generation
- Max. output voltage: 24V
- Max. output current: 0.5A
- Analog voltage controller
- Brand name

Item	Parameter	Description
ON/OFF Mode Conversion	Support	Via the working mode switch
Output power	12W/CH	2CH total output ≤ 24W
Standby power consumption	≤ 3W	Tested at 24V DC
Operating temperature	-5°C - 50°C	
Dimensions (mm^3) (L×W×H)	24×62×108.3	Refer to the drawing for details
Weight (kg)	0.1	

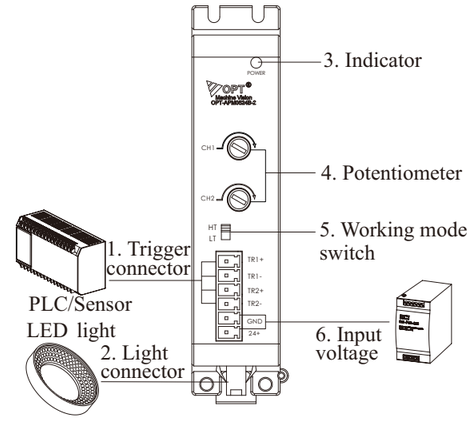
Product Features

- Compact size
- 20 - 24V DC input; convenient to use DC power on other devices
- Manual stepless light intensity control
- Convenient mounting with screws or on DIN rails
- External trigger: External trigger input (e.g. camera trigger signal) for related light strobes and other sequences. (Strobe mode can greatly improve light source life expectancy.)

Specifications

Item	Parameter	Description
Input voltage	20-24V DC	
Input current	1.8A	
Output voltage	14.0 - 24.0V (±0.2V)	Continuously adjustable
Lighting mode	Continuous/strobe	
Intensity control	Stepless	Adjusted via potentiometer
Protection for reverse polarity connection	Yes	Protects controller from the damage caused by wrong power connection
Triggering	Switch	
Response time	≥ 40μs	See “Reference Table of Trigger Response Time” for details
Response frequency	≤ 1kHz	See “Reference Table of Trigger Response Time” for details

Device Overview

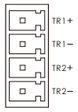


No.	Item	Description
1	Trigger connector	Connects external trigger for strobe
2	Light connector	14 - 24V DC output; each channel individually controlled
3	Power indicator	Indicates the power status: ON or OFF
4	Potentiometer	To adjust light intensity; one knob for each channel

No.	Item	Description
5	Working mode switch	HT: ON mode LT: OFF mode
6	Input voltage	20 - 24V DC

Trigger Connector

APM0524B has two trigger channels. Each channel has “+” and “-” input ports (see the figure below). Please refer to the “Switch Trigger Wiring Diagram” for more details.



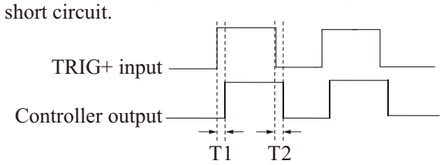
Working Mode Setting

Switch	Working Mode	Description
HT	ON	Light is on when “Trig+” and “Trig-” are disconnected; light is off at the short circuit.
LT	OFF	Light is off when “Trig+” and “Trig-” are disconnected; light is on at the short circuit.

Trigger Sequence

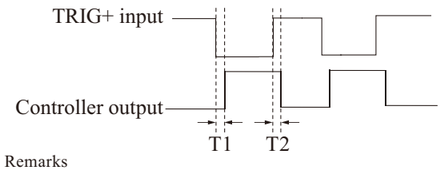
ON Mode

After an external signal is connected, light is on when “Trig+” and “Trig-” are disconnected; light is off at the short circuit.



OFF Mode

After an external signal is connected, light is off when “Trig+” and “Trig-” are disconnected; light is on at the short circuit.

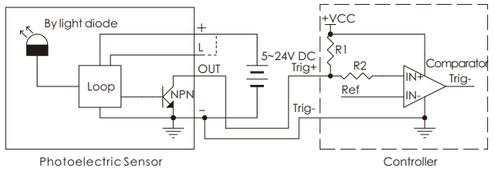


Remarks
T1: Enabling response time; T2: Disabling response time;
Please refer to the table of trigger response time for T1 and T2

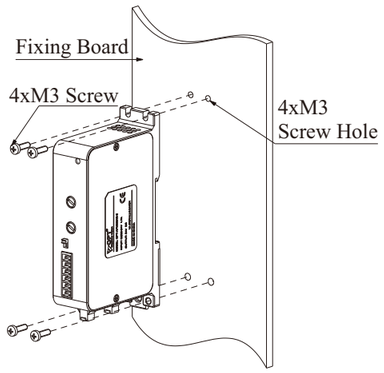
Reference Table of Trigger Response Time

Working Mode \ Output Current (mA)	50		250		500	
	T1 (μs)	T2 (μs)	T1 (μs)	T2 (μs)	T1 (μs)	T2 (μs)
ON Mode	500	1000	500	1000	500	1000
OFF Mode	40	1000	50	1000	50	1000

Trigger Wiring Diagram



Mounting



Mounting with screws

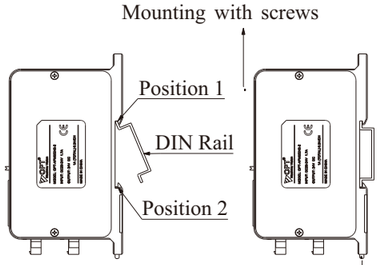
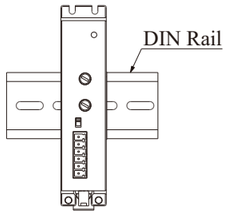


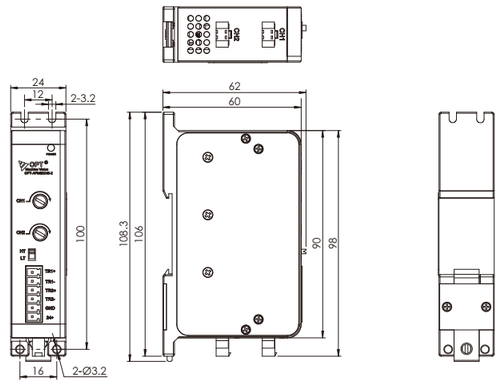
Figure 1 Assembly step

Figure 2 Disassembly step



Mounting on DIN rail

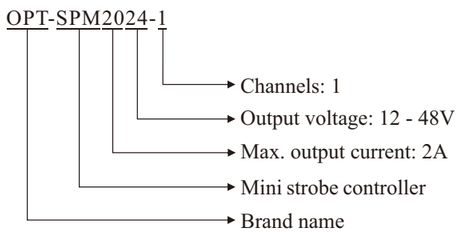
Dimensions (mm)



SPM Mini Strobe Controller Patented



Selection Guide



Product Features

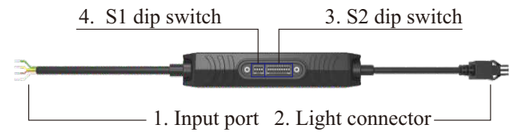
- Compact size
- Up to 50kHz trigger response frequency
- ≤ 10μs trigger response time
- 6 trigger polarities available for various working environments
- Wide input voltage range: 12 - 48V DC; convenient to use the DC power on other devices, and increases strobe intensity
- Trigger pulse width range: 10μs - 1023ms

Parameters

Item	Parameter	Description
Input voltage	12 - 48V DC 4.5A	
Output voltage	$V_o = V_{in} - I * R$	V_{in}: Input voltage V_o: Output voltage I: Light operating current R: Resistance≈7.5mΩ
Lighting mode	Strobe	
Protection for reverse polarity connection	Yes	Protects controller from the damage by wrong power connection
External trigger	Yes	

Item	Parameter	Description
Trigger polarities	1. Rising edge trigger 2. Falling edge trigger 3. Positive follow trigger mode 4. Negative follow trigger mode 5. Time limited positive trigger 6. Time limited negative trigger	Set via the S1 switch
Trigger pulse width	10μs - 1023ms	Set via the S2 switch
Trigger level	Low level: 0 - 2V High level: 5 - 24V	
Trigger response frequency	≤ 50kHz	
Trigger response time	≤ 10μs	
Output current	Max. constant output current: 2A Max. transient output current: 4A	Input I_a - Output I_a > 0.5A (I_a: Average current; have to be followed)
Standby power consumption	≤ 1W	
Operating temperature	-5°C - 50°C	
Dimensions (mm^3) (L×W×H)	113.4×24.1×25.3	Refer to the drawing for details
Weight (kg)	0.1	

Device Overview



No.	Interface	Description
1	Input port	For power and trigger signal input
2	Light connector	JST SMP-02V-B 2 Pin
3	10-position toggle switch S2	Used to set pulse width
4	4-position toggle switch S1	Used to switch trigger modes

Input connection

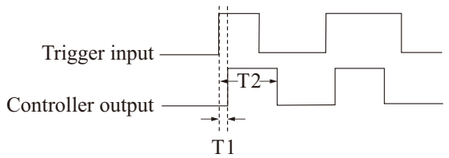
The input port is formed by 4 wires of different colors, which has optocoupler inside. See the chart below for their connection with power anode and cathode.
Low level: 0 - 2V input; high level: 5 - 24V input
Please refer to the “Wiring Diagrams” for more details.

Wire Color	Connection
White	Power+
Brown	Power-
Green	Trigger+
Yellow	Trigger-

Trigger Sequence

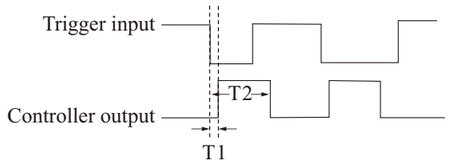
Rising edge trigger

The illumination time is equal to the trigger pulse width, which is set via the relative switch.



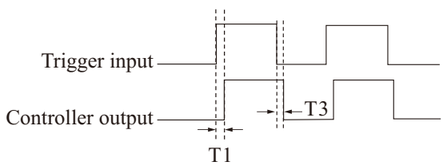
Falling edge trigger

The illumination time is equal to the trigger pulse width, which is set via the relative switch.



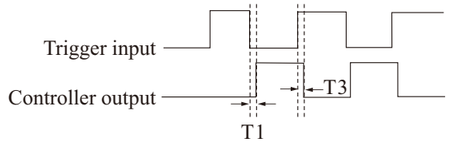
Positive follow trigger mode

When the trigger signal is at high level, the illumination time is the same as the high-level pulse width.



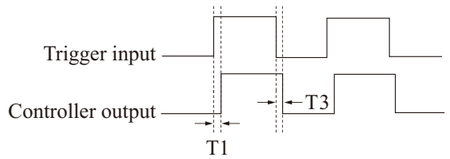
Negative follow trigger mode

When the trigger signal is at low level, the illumination time is the same as the low-level pulse width.

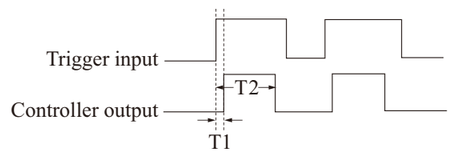


Time limited positive trigger

When the trigger signal is at high level, if the pulse width is less than the preset value, the illumination time is the same as the high-level pulse width.

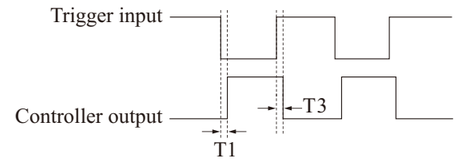


When the trigger signal is at high level, if the pulse width ≥ the preset value, the illumination time is the same as the preset value.

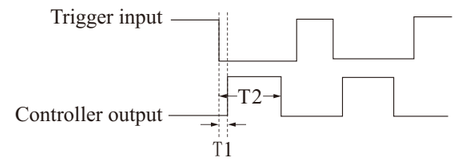


Time limited negative trigger

When the trigger signal is at low level, if the pulse width is less than the preset value, the illumination time is the same as the low-level pulse width.



When the trigger signal is at low level, if the pulse width ≥ the preset value, the illumination time is the same as the preset value.



Remarks
T1: Enabling response time ≤ 10μs;
T2: Trigger pulse width, range: 10μs - 1023ms
T3: Disabling response time ≤ 10μs

Trigger Polarities Setting

Trigger Polarity	S1.3	S1.2	S1.1
Rising edge trigger	OFF	OFF	X
Falling edge trigger	OFF	ON	OFF
Positive follow trigger mode	OFF	ON	ON
Negative follow trigger mode	ON	OFF	OFF
Time limited positive trigger	ON	OFF	ON
Time limited negative trigger	ON	ON	X

Notes
1. Sx.x indicates the exact switch. E.g. S1.1 is the first switch of S1 and S1.2 the second switch of S1, and so on.
2. ON and OFF indicate the connection status; X shows the on/off status of switch.

Trigger Pulse Width Setting

Unit

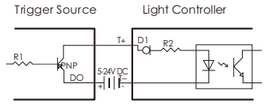
Unit	S1.4
ms	OFF
μs	ON

Value

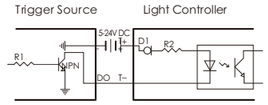
S2.10	S2.9	S2.8	S2.7	S2.6	S2.5	S2.4	S2.3	S2.2	S2.1	Value
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	1
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	2
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	3
OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	4
…	…	…	…	…	…	…	…	…	…	…
ON	ON	ON	ON	ON	ON	ON	OFF	ON	ON	1019
ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	1020
ON	ON	ON	ON	ON	ON	ON	ON	OFF	ON	1021
ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	1022
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	1023

Notes
1. Sx.x indicates the exact switch. E.g. S2.1 is the first switch of S2 and S2.2 the second switch of S2, and so on.
2. Pulse width values can be presented with the 10 binary numbers formed by the switches from S2.10 (the highest bit) to S2.1 (the lowest bit). ON indicates 1, and OFF 0.
3. When μs is the unit of trigger pulse width, the pulse width will be 10μs if the preset value is ≤ 10.

Trigger Wiring Diagrams

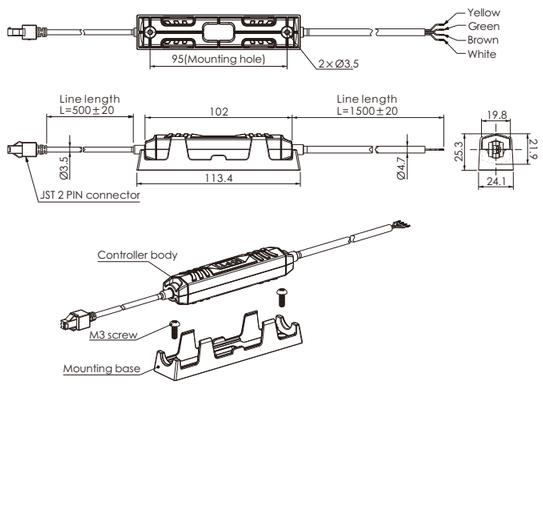


Trig Input Circuit for PNP Type Trigger



Trig Input Circuit for NPN Type Trigger

Dimensions (mm)



Extension Cables



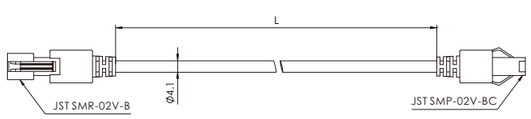
OPT-EX1M-2P-S-6A

- Max current
- S: Ordinary cable, for fixed installation
- D: Drag chain cable, for tank chain installation
- R: Robot cable, for multi-directional torsion installation
- Number of connector pins
- Cable length
- Extension cable
- Brand name

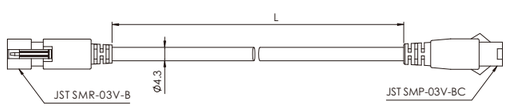
2 Pin / 3 Pin Extension Cable

Connector	Model	Length	Diameter D	Min. Bending Radius	
				Fixed Installation	Motion Installation
2 Pin JST connector	OPT-EX1M-2P-D/R	1m	4.1 mm	5D	10D
	OPT-EX2M-2P-D/R	2m			
	OPT-EX3M-2P-D/R	3m			
	OPT-EX5M-2P-D/R	5m			
	OPT-EX10M-2P-D/R	10m			
3 Pin JST connector	OPT-EX1M-3P-D/R	1m	4.3 mm		
	OPT-EX2M-3P-D/R	2m			
	OPT-EX3M-3P-D/R	3m			
	OPT-EX5M-3P-D/R	5m			
	OPT-EX10M-3P-D/R	10m			

2 Pin Connector Extension Cable Drawing



3 Pin Connector Extension Cable Drawing

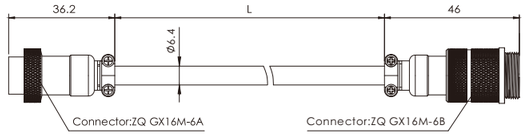


6 Pin Connector Extension Cable

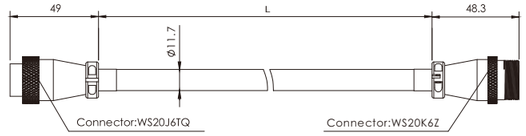
Connector	Model	Length	Diameter D	Min. Bending Radius
6 Pin connector (6A)	OPT-EX3M-6P-S-6A	L=3m	6.4 mm	Fixed Installation: 5D
	OPT-EX5M-6P-S-6A	L=5m		
	OPT-EX10M-6P-S-6A	L=10m		
	OPT-EX20M-6P-S-6A	L=20m		
6 Pin connector (20A)	OPT-EX3M-6P-S-20A	L=3m	11.7 mm	
	OPT-EX5M-6P-S-20A	L=5m		
	OPT-EX10M-6P-S-20A	L=10m		
	OPT-EX20M-6P-S-20A	L=20m		

Note: Different controller may need to be matched with different cable length,please confirm with engineer in advance.

6 Pin Connector Extension Cable Drawing (6A)



6 Pin Connector Extension Cable Drawing (20A)



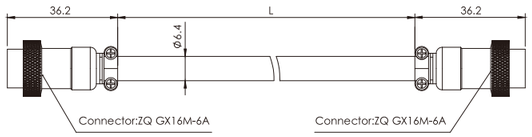


6 Pin Connector Light Source Cable

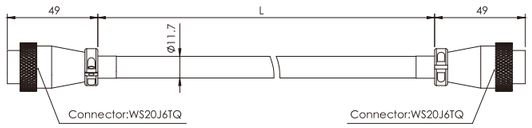
Connector	Model	Length	Diameter D	Min. Bending Radius
6 Pin connector (6A)	OPT-DGYX1M-6P-S-6A	1m	6.4 mm	Fixed Installation: 5D
	OPT-DGYX2M-6P-S-6A	2m		
	OPT-DGYX3M-6P-S-6A	3m		
	OPT-DGYX5M-6P-S-6A	5m		
	OPT-DGYX10M-6P-S-6A	10m		
6 Pin connector (20A)	OPT-DGYX1M-6P-S-20A	1m	11.7 mm	
	OPT-DGYX2M-6P-S-20A	2m		
	OPT-DGYX3M-6P-S-20A	3m		
	OPT-DGYX5M-6P-S-20A	5m		
	OPT-DGYX10M-6P-S-20A	10m		

Note: Different controller may need to be matched with different cable length, please confirm with engineer in advance.

6 Pin Connector Extension Cable Drawing (6A)



6 Pin Connector Extension Cable Drawing (20A)



Branched Extension Cables

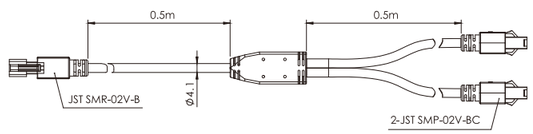
OPT-EX1M-2P-4B

- Branches, e.g.: 4 branches
- Number of connector pins
- Cable length, e.g.: 1 meter
- Extension cable
- Brand name

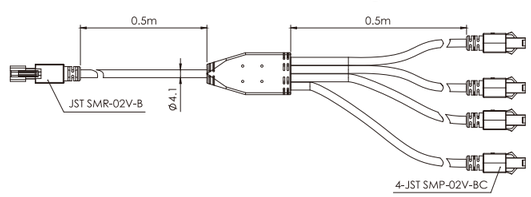
2 Pin / 3 Pin Connector Branched Extension Cable

Connector	Branches	Model	Diameter D	Min. Bending Radius	
				Fixed Installation	Motion Installation
2 Pin JST connector	1 to 2	OPT-EX1M-2P-2B	4.1 mm	5D	10D
	1 to 4	OPT-EX1M-2P-4B			
3 Pin JST connector	1 to 2	OPT-EX1M-3P-2B	4.3 mm		
	1 to 4	OPT-EX1M-3P-4B			

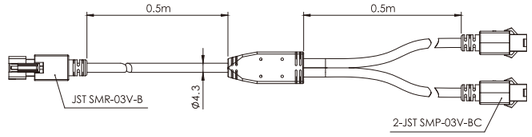
2 Pin 2 Branch Extension Cable Drawing



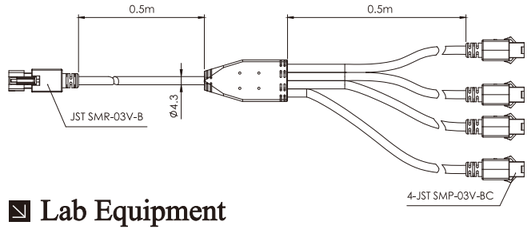
2 Pin 4 Branch Extension Cable Drawing



3 Pin 2 Branch Extension Cable Drawing

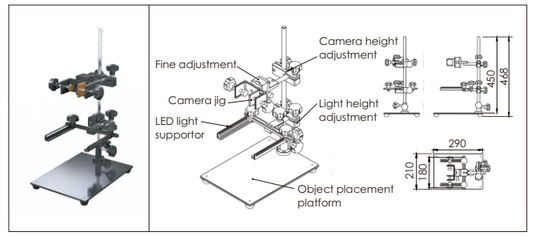


3 Pin 4 Branch Extension Cable Drawing

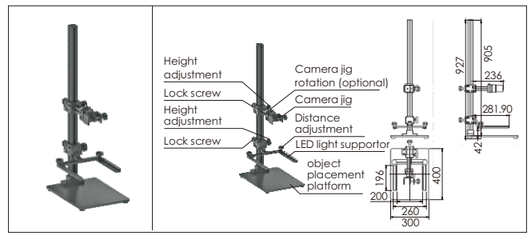


Lab Equipment

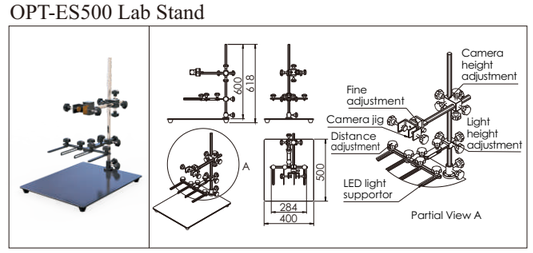
OPT-ES300 Lab Stand



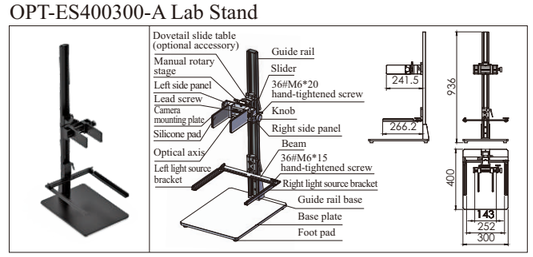
OPT-ES400 Lab Stand



OPT-ES500 Lab Stand



OPT-ES400300-A Lab Stand

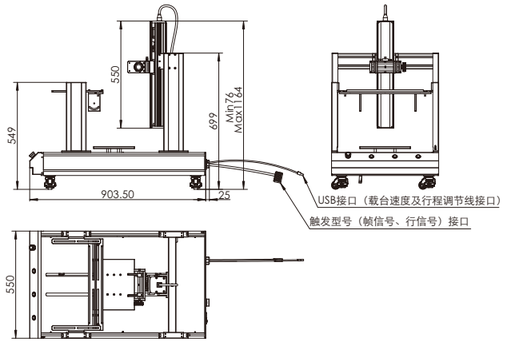


Motion Platform

Features

- Flexible installation, easy to use.
- A system that simulates inspection on a high-speed moving production line can repeatedly inspect the same or multiple workpieces, testing the system's stability. It is suitable for area scan cameras and line scan cameras with relatively slower speeds for simulating production line inspections.

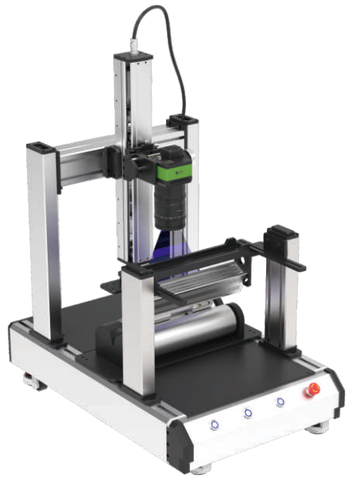


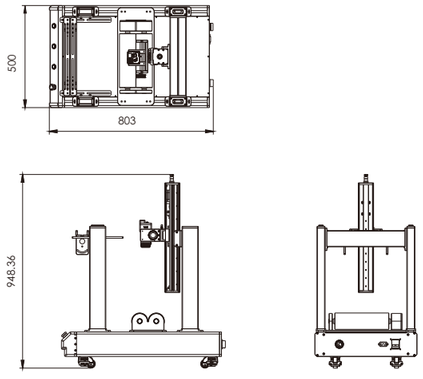


Rolling Motion Platform

Features

- The motion speed can reach up to 1500 r/min, meeting the visual inspection requirements for on-the-fly imaging.
- The main body is made of full aluminum alloy, providing the platform with both high stability and durability.
- Driven by a servo motor with a built-in encoder, the motion control is more precise and the response speed is faster.



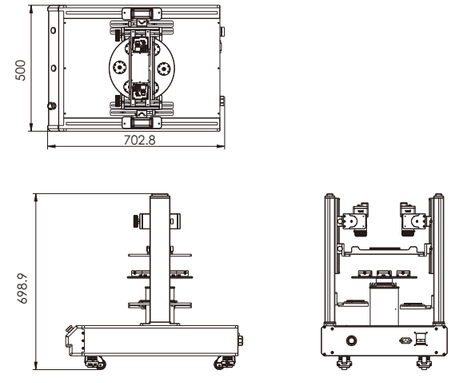


Turntable Motion Platform

Features

- The motion speed of up to 1500 revolutions per minute (r/min) meets the requirements for high-speed vision inspection, suitable for applications such as high-speed imaging or flying inspections.
- The main body is made of full aluminum alloy material, ensuring a platform structure that combines high stability and durability.
- The platform is driven by a servo motor, ensuring precise control over rotation angles and operating speeds.
- Internal encoder and photoelectric sensor for real-time signal transmission.



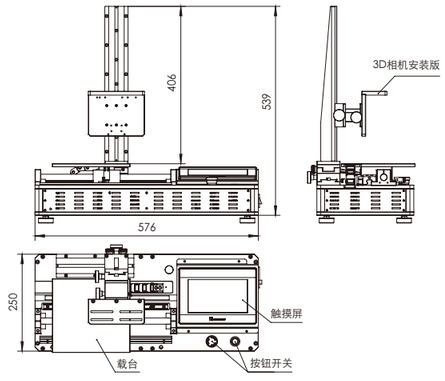


3D Camera Test Platform

Features

- Using linear motor drive to achieve higher precision and stability in reciprocating motion.
- Built-in PLC with touchscreen control.



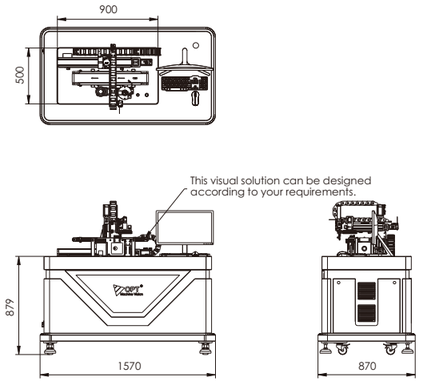


Visual Experiment Display Stand

Features

- Sheet metal fabrication with excellent heat dissipation design.
- Built-in electronic control board, adaptable to different test scenarios.





Classic Applications

- Multi-Angle Illumination »P450
- Surface Inspection Applications »P451
- Optical 5-Side-View Solution »P452
- Light Wavelength and Applications »P453
- Polarizers: Introduction and Applications »P454

Industrial Applications

- Consumer Electronics Industry »P456
- Semiconductor Industry »P458
- Automotive Industry »P460
- Tobacco Industry »P462
- Medical Industry »P464
- Printing Industry »P466
- Food and Beverage Industry »P468
- Lithium Battery Industry »P470

Multi-Angle Illumination

Button Battery Inspection

Workpiece Description:
Diameter of 20mm, smooth reflective surface with engraved characters, clear outer edge contour.



1. Coaxial Illumination

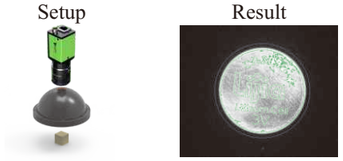
Setup Result



Frontal illumination with high and uniform brightness.

2. Anti-Shadow Illumination

Setup Result



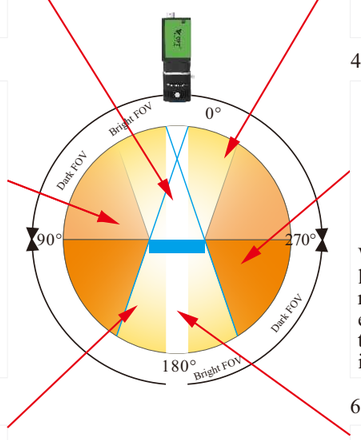
Light diffuses from the battery surface in multiple directions, showing a uniform surface of the battery.

3. Low Angle Illumination

Setup Result

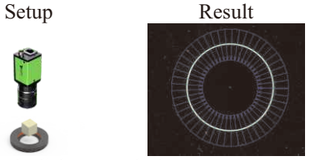


The low angle illumination of the battery surfaces brings out uneven areas such as engraved characters and the rim.



4. Negative Low Angle Illumination

Setup Result



When the light enters the battery at a negative low angle from bottom to top, there are no reflected light from the surface of the battery enters the lens, showing that the surface of the battery is dark and the chamfer of the arc is highlighted.

5. Backlight Illumination

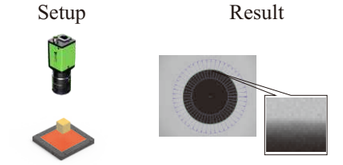
Setup Result



In front of a diffuse backlight, the battery creates a shadow in the camera image. Due to the diffuse character of the light, the outer edge of the battery appears less crisp in the camera image.

6. Collimated Backlight Illumination

Setup Result



When the collimated light is incident perpendicularly from the bottom of the battery, the corners of the cell chamfer are sharp and with fewer pixel transitions.

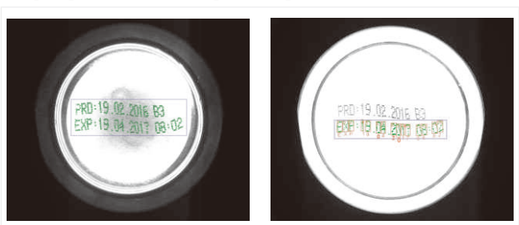
Diffuse Backlight and Collimated Backlight Comparison



Result with Diffuse Backlight Result with Collimated Backlight

Diffuse backlight illumination creates a more uniform appearance of the bottle, allowing for the detection of defects, dirt, and scratches. Under the illumination of the collimated backlight, the light is refracted through the edge of the bottle body, the outline is black, fewer transition pixels, sharp edge, obvious contrast and the accuracy of the edge inspection, positioning and size measurement of the object is higher.

Ring Light and Dome Light Comparison



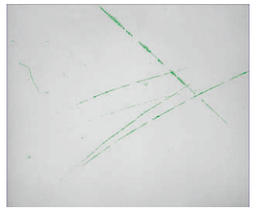
Result with Ring Light Result with Dome Light

Ring lights bring out the unevenness of surfaces. In case this is unwanted, dome lights can eliminate the effects of uneven surfaces, as they are highly uniform, diffuse and omnidirectional front light sources.

Surface Inspection Applications

Industrial Applications

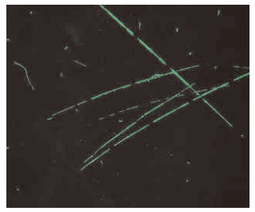
Glass, metal, LCD panels, mobile screens, plastics surface inspection etc.
For the scratches, stains, etc. on the surface of highly reflective materials inspection, coaxial/low angle lights and backlights are widely used. The result images are shown as below.



Result with Coaxial Light



Result with Backlight

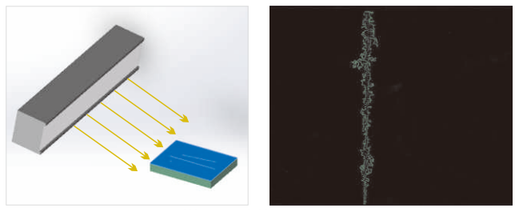


Result with Low Angle Light

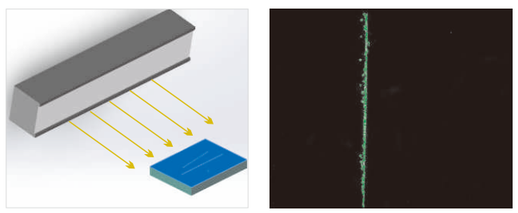
The above method has obvious effects for hard scratches, but the effect on soft scratching is not obvious. However, for detailed inspection, low angle lights create the best results.

Low Angle Illumination from Multiple Directions

The scratches can have arbitrary orientation, and the illumination from different directions creates different results. The illumination, in parallel direction to the scratches does not create good contrast in the camera image, while the illumination, in vertical direction make them shine out from the background.

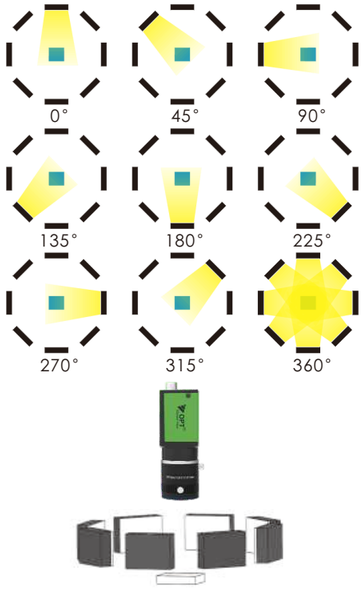


Collimated illumination

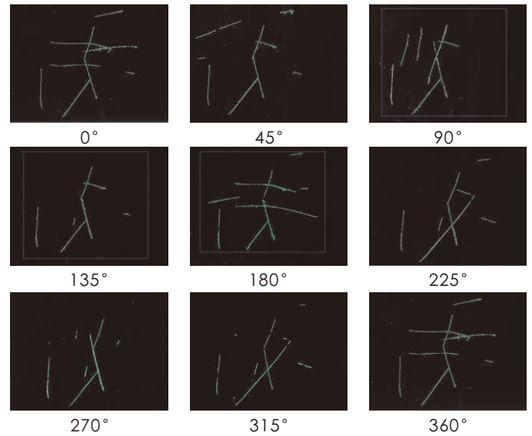


Vertical illumination

Such scratch detection can be implemented with eight bar lights, which are individually controlled. And 9 different images can be taken with the same camera without moving the workpiece.



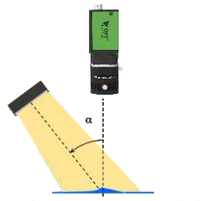
Another way to implement multi-directional illumination is using a special ring light, with eight individually controlled areas. Again, images from all directions can be taken with the same camera for scratch detection.



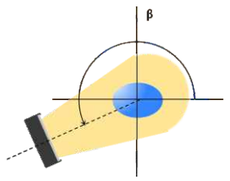
Photometric Stereopsis

In classical 3D reconstruction methods, the geometric shape or motion parameters of a 3D object are typically calculated using the positions of image points and the camera's geometric model. The grayscale values of points in the image are used to determine features of the image points, such as detecting edges using the zero-crossing of the second derivative of the grayscale function. In fact, the grayscale values of points in the image reflect the intensity of reflected light from corresponding points on the 3D object. Analysis combining physical optics and geometric optics indicates a direct relationship between the intensity of reflected light and the surface properties and geometric shape of the material. Therefore, using image grayscale to recover the collective shape of a 3D object is an important direction in computer vision research.

Photometric stereo can detect subtle surface changes on objects or be used for character inspection, avoiding the influence of light on imaging quality.
For example:
1.Detecting bulges on the surface of metal cylinders.
2.Inspecting dents and impressions on plastic shells.
3.Detecting scratches, dents, and depressions on metal surfaces.
Photometric stereo requires selecting a multi-channel light source and reconstructing the shape of objects under multi-angle illumination to achieve detection.

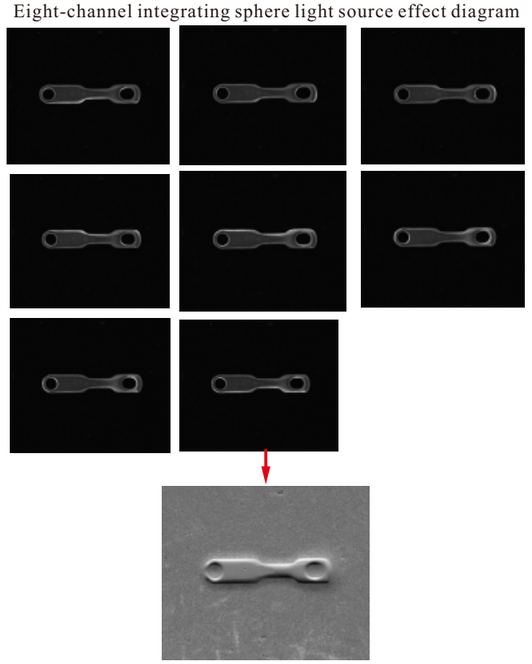


α angle between camera optical axis and light source direction

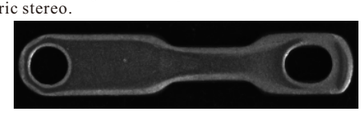


β angle between the projection of light on the plane of the object to be measured and the horizontal axis

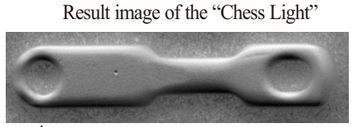
Eight-channel integrating sphere light source effect diagram



The following diagram compares the effects of photometric stereo and conventional one-shot imaging methods. From the analysis of the diagram, it can be concluded that under the same resolution, the image quality differs significantly between the one-shot imaging method and the photometric stereo method. Many concave and convex defects are not clearly captured with the one-shot imaging method. Therefore, for cases where defects in the object are not prominent, it is recommended to use photometric stereo.



Result image of the “Chess Light”



(Photometric Stereo Imaging)

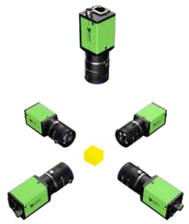
Optical 5-Side-View Solution

Application Solution

Applications: Surface inspection of metal parts in the electronics and automotive industries.
Usually for objects with more than two sides (solution 1), a camera is used to take the pictures from different sides. For this solution, workpiece needs to be rotated, and this requires costly mechanical equipment and it is time consuming. While for the other option (solution 2), five sets of cameras are used to capture the object from five different sides. The solution usually will not be used as it is complicated and the cost is high.



Solution 1



Solution 2

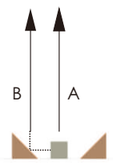
However, there is a third solution, which is sketched in the picture below: A single camera is able to take pictures from five sides of the object at a single shot with prisms. This reduces the cost and time but the images of the sides cannot be captured with the same resolution as the top side (see the right image below). Further optics are required to address this issue.



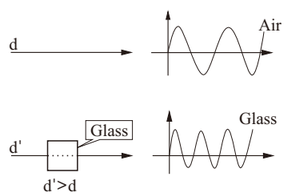




Solution 3

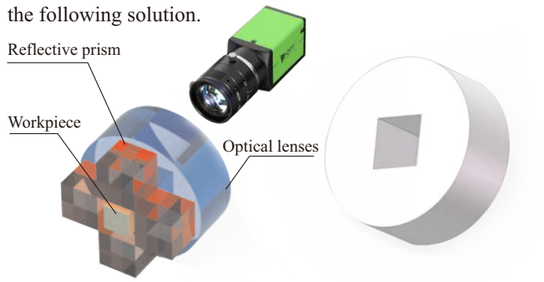


Additionally, the light refraction effect needs to be considered. This effect occurs when light is changing the medium during its travel, due to different speed levels of light in different mediums. See the picture below for illustration.

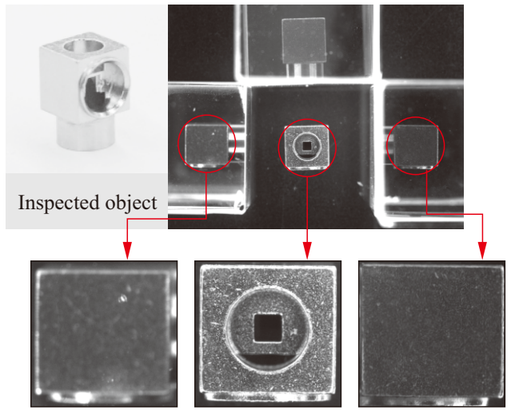




The experienced engineering team of OPT finally designed the following solution.



The figure below shown the camera takes pictures from the top and sides via special reflective glasses, forming the top surface and the side surface simultaneously to improve the efficiency of the inspection. Please take note of the result difference between normal reflective glasses and our specially coated reflective glasses.



Result image without reflective glass

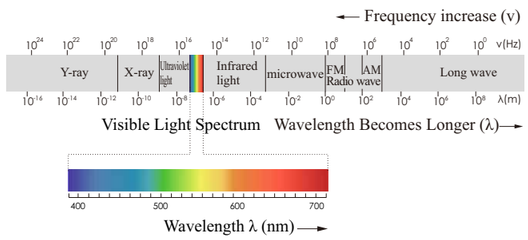
Result image with normal reflective glass

Result image with specially coated reflective glass

Light Wavelength and Applications

Light Wavelength

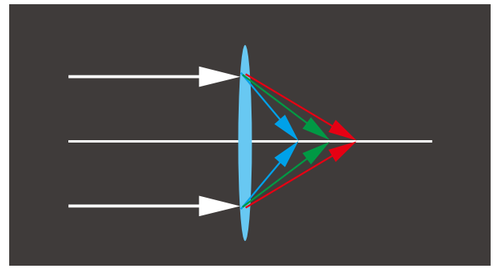
Light is an electromagnetic wave. Visible light is only a small part of the spectrum. The light with vacuum wavelength from 380nm to 780nm is visible. IR light and UV light are located at the end of the two visible light spectrum respectively. From IR light to UV light, the wavelength becomes short, the frequency and the refractive index gradually increases when the light passes through the same transparent medium.



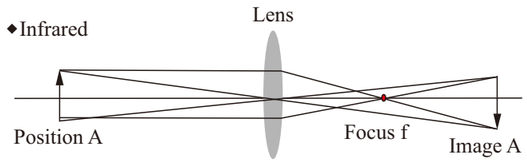
Electromagnetic Spectrum

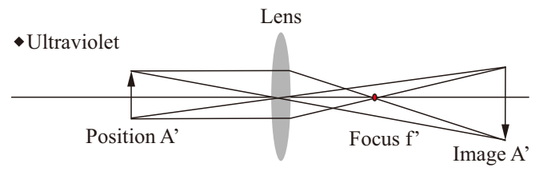
Chromatic Aberration

White light is formed by homogeneous light of different wavelength. Light with different wavelength refract to a medium in different rate. Chromatic aberration is the difference of light imaging position and the size among different color lights formed after white light is refracted by the same medium at the first time and dispersed in optical system. Lenses with different specs (models) can remove chromatic aberration in different levels.

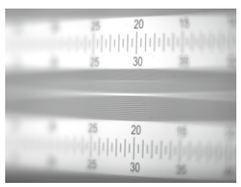


According to the above feature, when illuminating a workpiece, the different colors are refracted at different intervals, and vice versa. Take IR light and UV light as an example, use them to illuminate two targets in different places respectively with the same camera lens (no focusing ring adjustment), and they can focus clearly.

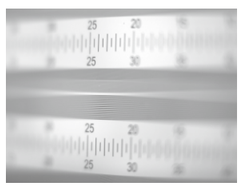




Below shows the two images of 365nm UV light and 940nm IR light tests with 2MP CCD camera (OPT-C3516-2M lens, F1.6) in the same condition. The former test result focuses at 20-scale depth of field, and the latter at 23-scale. To conclude, the longer the wavelength, the farther the position of the clearly focused lens.



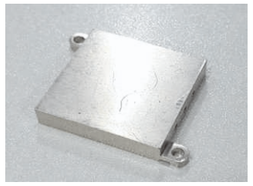
Ultraviolet Light



Infrared Light

Application

The image shows a hardware component, the plane of its body is higher than the two extended parts. Users request to position the whole component contour and assemble it to a product by a manipulator. Telecentric lens should be selected as high assembly accuracy and small field of view are required. The two targets cannot be focused clearly at the same time if a general lighting method is used.

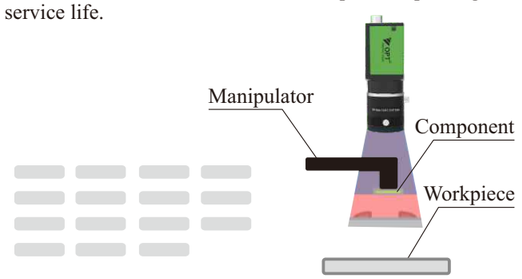


Solution

Based on the above principle and project requirements, OPT has designed an integrated ring light which combines infrared and ultraviolet LEDs. The camera takes two shots, first triggering the infrared light to focus on the plane of the two extended parts; then triggering the ultraviolet light to focus on the two right angle sides of the body after the infrared light is out. Focusing position can be changed by switching between different color lights instead of moving camera lens to solve the problem of insufficient depth of field.

Extended Application

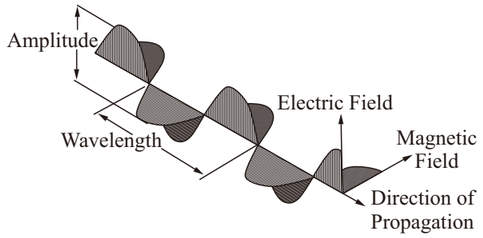
In the image shown below, users get a clear images of the part and the workpiece respectively by moving the lens in Z axis direction, then assemble after positioning them precisely. However, if a light with LEDs of different wavelength can be designed, the two objects can be taken at once by lights switching based on the principle, the longer the wavelength, the farther the position of the clearly focused lens. The light not only able to improve efficiency, but also reduce the cost of some visual part and prolong its service life.



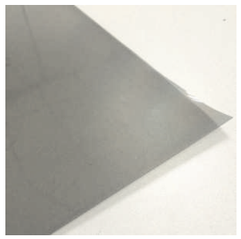
Polarizers: Introduction and Applications

Polarized Lighting

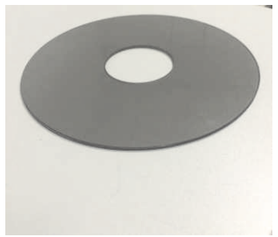
Light is an electromagnetic wave, which is an energy propagation that is interactively induced by a changing electric and magnetic field. The vibration direction is characterized by electric vector. During the propagation of light, the spatial distribution of electric vibration of light wave shows asymmetry with respect to the direction of propagation. The phenomenon is called the polarization of light (see the following image). The plane formed by the vibration direction and the direction in which the light wave travels is called a vibration surface. The light with the plane of the vibrating surface limited to a certain fixed direction is called plane polarized light or linearly polarized light.



The common types of polarizers are linear and circular polarizers. Polarizers are used by many optical techniques and instruments such as in photography and liquid crystal display.



Polarizer film



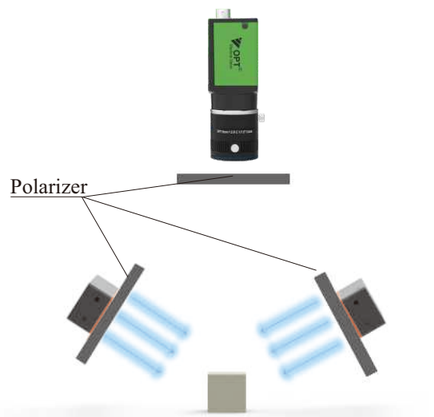
Polarizer glass

The Effect of Polarizers

Polarizers can be used to eliminate or weaken the reflections. This exploits the characteristics of reflected light, which only comprises the vertical components of the oscillation.

Applications of Polarizers

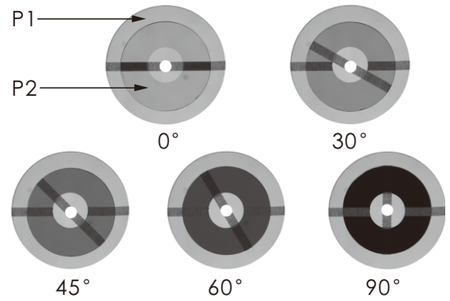
In machine vision applications, we apply linear polarizers to the lighting and another polarizer to the camera lens.



Polarizer Mounting

Common Polarizer Mounting

The images below shown two polarizers (P1, P2). If we keep the position of the P1 and turn the P2, we can observe periodic changes of the intensity.
By turning any of the polarizers, we can optimize the result image.



Polarizers in Real Life Applications

Photographers apply polarizers to their lens in special conditions, e.g. to reduce reflections and make colors more vivid. The reflections on the floor surface are reduced by the polarizer.



Image taken without polarizer



Image taken with polarizer

Polarizers in Machine Vision Applications

Surface inspection in medical, semiconductor, electronics, automotive, and more industries.
Below are some images taken with or without polarizer for reference.



Image taken without polarizer

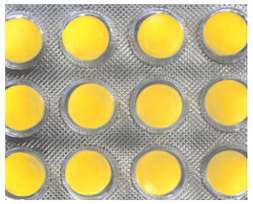


Image taken with polarizer

Pill Inspection

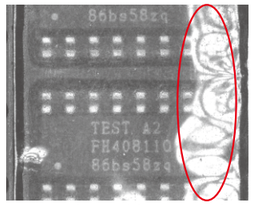


Image taken without polarizer

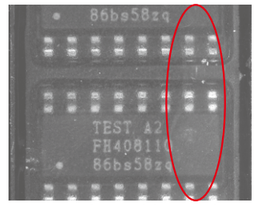


Image taken with polarizer

SMD Package Inspection



Image taken without polarizer



Image taken with polarizer

Capacitor Inspection

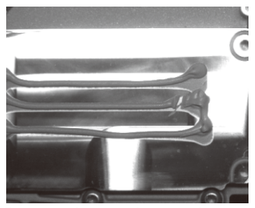


Image taken without polarizer

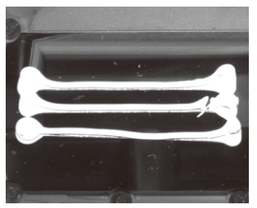
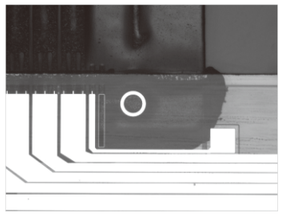


Image taken with polarizer

Gluing Contour Inspection

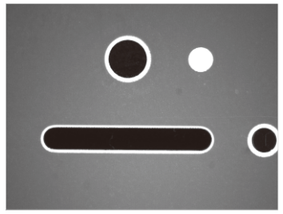
Consumer Electronics Industry



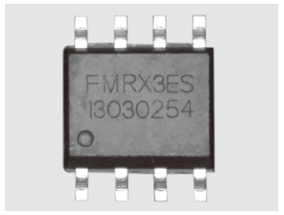
1. Positioning of fiducial marks on touch panel



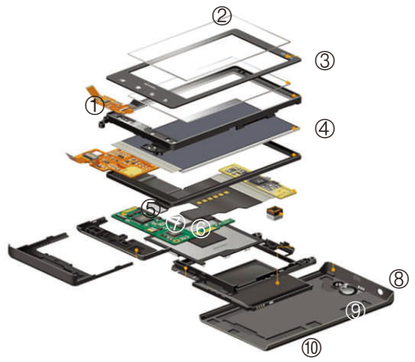
2. Scratches on mobile phone' s screen detection

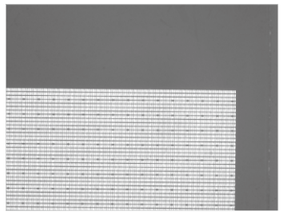


3. Positioning of the microphone hole in the phone covers

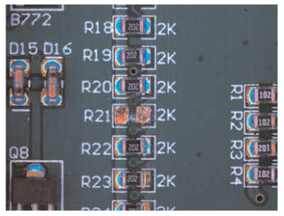


5. Pin inspection of integrated circuit (IC)

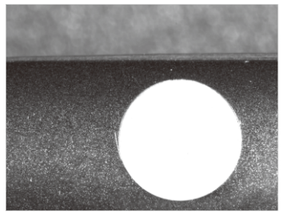




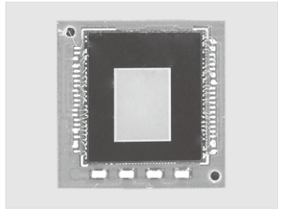
4. Positioning of AA area for LCDs



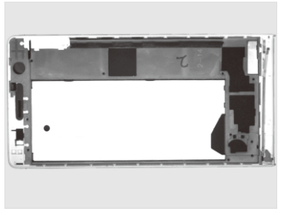
6. PCB inspection



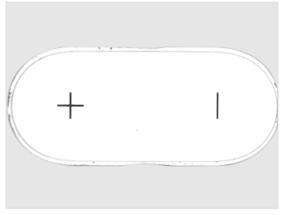
8. Positioning of the earphone plugs hole



7. Surface inspection of mobile phone chips

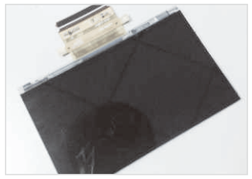


10. Gauging of mobile phone cases

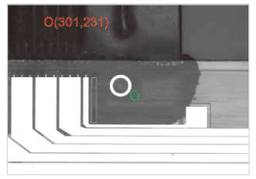


9. Positioning of signs and characters on keys

Mobile Touch Screen Mark Point Positioning



Workpiece



Result

High precision and small field of view. The point light source combined with a coaxial telecentric lens solution ensures image quality in a compact installation.

Detection of scratches on mobile phone screen



Workpiece



Result

For products with a smooth mirror surface, a line scan camera and high-uniformity line scan light source are used. By adopting a symmetrical tilt method, defects such as scratches can be effectively displayed.

Positioning of the microphone hole in the phone covers



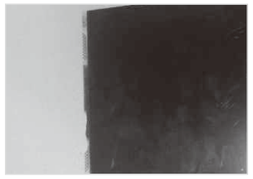
Workpiece



Result

Using low-angle lighting can illuminate the inner edges of the Mic hole based on its shape characteristics, achieving precise positioning effects.

Positioning of AA area for LCDs



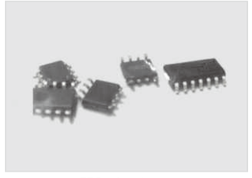
Workpiece



Result

It highlights the AA area underneath the phone cover by utilizing the strong penetration capabilities of infrared light, effectively illuminating through the LCD screen surface for clear imaging.

Pin inspection of integrated circuit (IC)



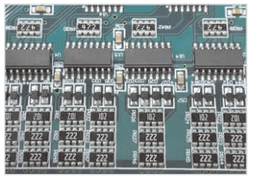
Workpiece



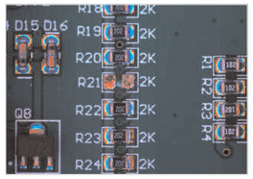
Result

It's clear that using a spherical integrated light source for uniform illumination can accommodate multiple inspection tasks, including checking the flatness and spacing of IC component pins, as well as characters engraved on the surface by laser.

PCB inspection



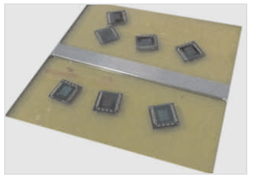
Workpiece



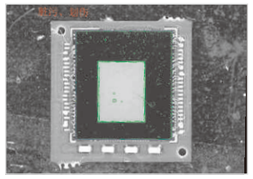
Result

The AOI light source can render solder joints at different heights with varying color information, thereby highlighting the 3D information of the solder. This allows for accurate detection of defects such as missing solder, insufficient solder, and solder bridging on PCB boards.

Surface inspection of mobile phone chips



Workpiece



Result

By combining low-angle ring light with high-angle ring light, this setup can detect various types of defects, clearly presenting issues like dirt and scratches.

Headphone jack positioning and cutting.



Workpiece



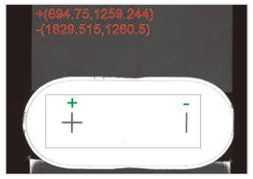
Result

Due to the curvature on the middle frame surface, front lighting results in poor uniformity. Using a linear light source from the bottom side of the product provides better backlighting effects.

Mobile phone volume button detection



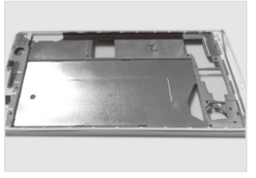
Workpiece



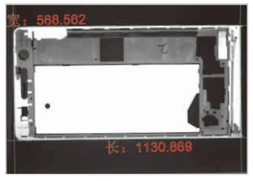
Result

Choosing a light source that emits uniform and soft illumination helps eliminate surface reflections on the product, enabling precise positioning of the volume key edges and detection of surface characters.

Measurement of mobile phone case and LCD window dimensions



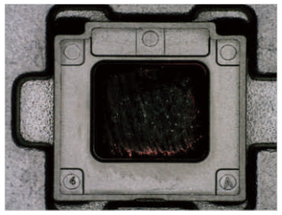
Workpiece



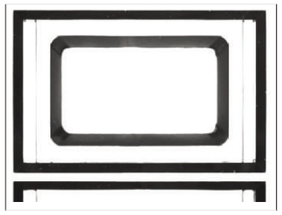
Result

Choosing a coaxial light source ensures that the inspection is not affected by the product's smooth surface or reflections, thereby highlighting the flat contour information effectively.

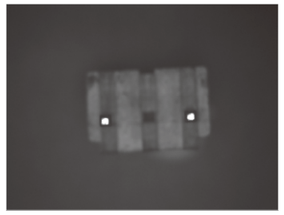
Semiconductor Industry



1. Detection of glue overflow and dirt on IC chips



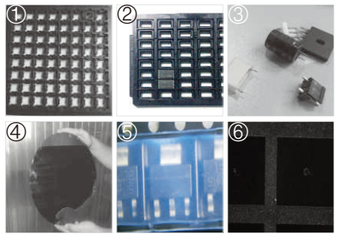
2. Positioning of IC chips for pick and place

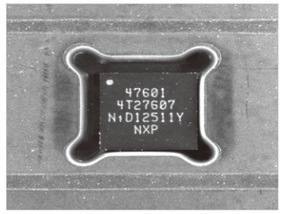


3. Positioning of IC chips pins

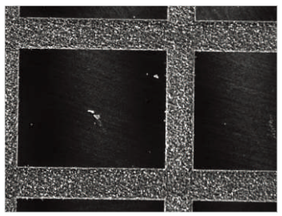


4. Wafer inspection

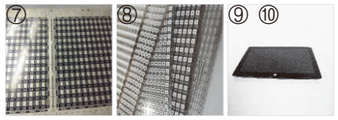


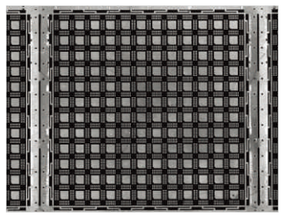


5. SMD package inspection

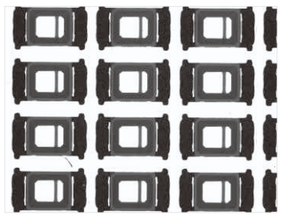


6. Defect detection on silicon surfaces



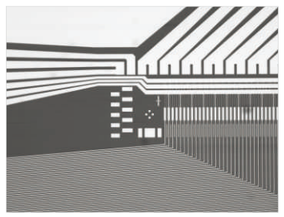


7. Defect detection on chip surfaces



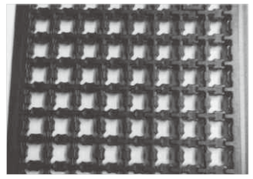
8. LED defect detection

9. Silicon bars cross section geometric measurement



10. Touch screen inspection

IC surface inspection



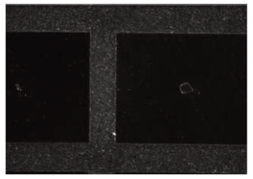
Workpiece



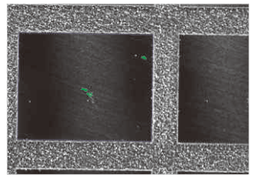
Result

Due to the structure of the plastic frame, select a uniform integrating sphere light source, which can effectively highlight dirt and excess glue.

Silicon wafer surface defect detection



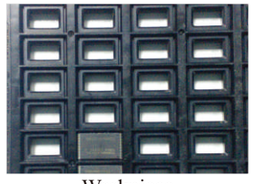
Workpiece



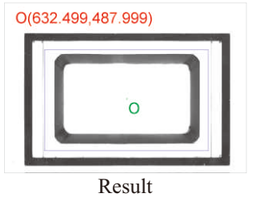
Result

Select a 60° low-angle ring light source. By reducing the working distance of the light source, defects such as chipping, missing corners, cracks, and fragments are highlighted.

IC chip positioning



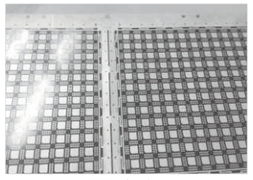
Workpiece



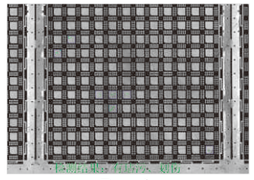
Result

The placement groove of the tray is higher than the chip surface. If a low-angle lighting method is used, the tray will partially block the light. Therefore, a high-angle lighting method is used to illuminate the chip surface, achieving precise positioning.

Defect detection on chip surfaces



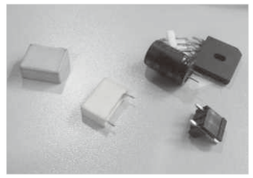
Workpiece



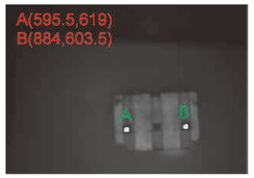
Result

Detection of defects such as copper leakage, overflow, scratches, bent pins, pin burrs, solder bridging after chip plating; silver paste contamination, broken corners, and pin collapse before plating. Using a coaxial light source ensures uniformity while highlighting defects effectively.

Detection of the pitch and flatness of electronic component pins



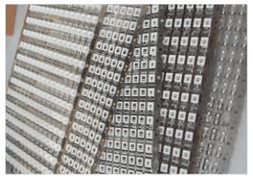
Workpiece



Result

Due to the height difference between the end surface and the bottom surface of the PIN pins, a low-angle light source is used to ensure more light falls on the end surface of the PIN pins, enhancing the contrast between the pins and the background.

LED defect detection



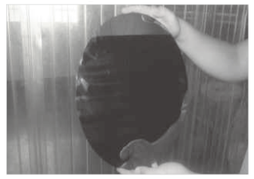
Workpiece



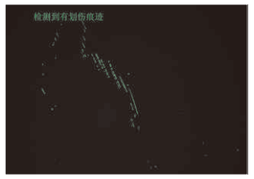
Result

Using a line scan camera for online detection, a linear coaxial light source eliminates surface glare interference, accurately detecting defects such as damage, dirt, and scratches on the LED chip surface.

Wafer inspection



Workpiece



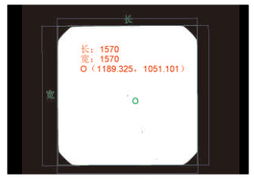
Result

Due to the smooth and reflective surface of the workpiece, and considering its large area, using a larger-sized linear combination light source with low-angle illumination can effectively avoid glare interference and make defects more visible.

Geometric measurement of the cross section of silicon bars



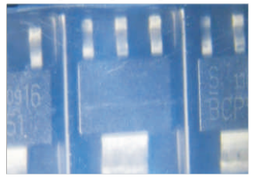
Workpiece



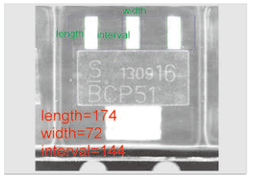
Result

The product is large in size, with a diffuse planar surface material. Using a medium aperture area light source can illuminate the entire surface of the product, making the contours clearer and enhancing measurement precision.

SMD package inspection



Workpiece



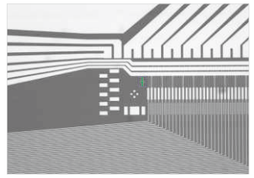
Result

Use a 15° high-angle circular light source to mark points on the outer contour or surface of the workpiece for detection of missing assembly, pin spacing, length, etc.

Touch screen inspection



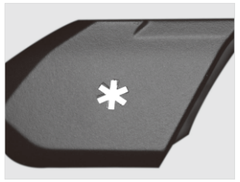
Workpiece



Result

The product's circuitry is made of fine metal material, offering high detection accuracy with a narrow field of view. It uses a high-magnification telecentric lens paired with a red dot light source, which highlights the contours of integrated circuits for more precise inspection.

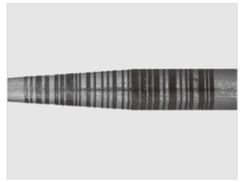
Automotive Industry



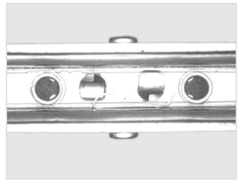
1. Inspection of printing signs



2. OCR on buckle surface



3. Barcode reading



4. Windshield wipers inspection

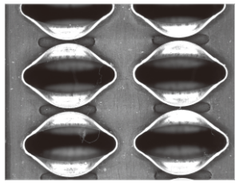


5. OCR on label surface

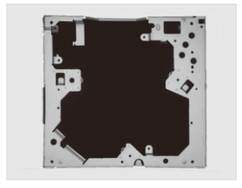




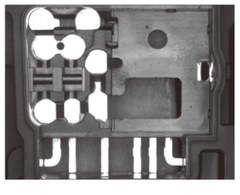
6. OCR on lampshade surface



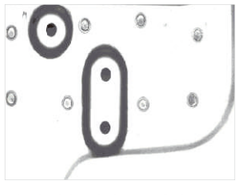
7. Hole inspection



8. Special parts inspection



9. Pitch inspection of metal parts



10. Solder joints of sheet metal inspection



11. Bearing inspection



12. Markers in user panel inspection

Inspection of printing signs



Workpiece



Result

Use a high-uniformity spherical integrated light source for even illumination, ensuring accurate detection of multiple issues such as incomplete or unclear key character engraving, double imaging, misalignment, bubbles, and yellowing lamp defects.

OCR on buckle surface



Workpiece



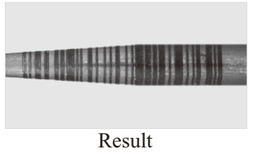
Result

Utilizing the strong uniformity of an arc-shaped light source to eliminate the impact of uneven surfaces on the image quality; and using a linear light source to illuminate characters for the purpose of inspection.

Barcode reading



Workpiece



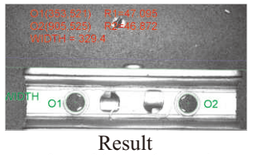
Result

When the barcode color is similar to that of the workpiece itself, a blue ring light can be used for side lighting to achieve uniform illumination and ensure clear barcode visibility.

Windshield wiper blade clip dimensions and positioning



Workpiece



Result

Due to the complex shape and uneven surface of the product, using a spherical integrated light source achieves uniform illumination, making contour information more distinct and improving detection accuracy.

OCR on label surface



Workpiece



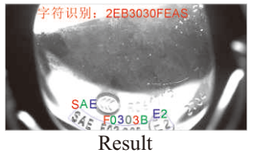
Result

Using a quadrilateral composite light source can highlight characters while preventing reflections from surface films on the workpiece, accurately detecting defects such as missing or misaligned labels.

OCR on lampshade surface



Workpiece



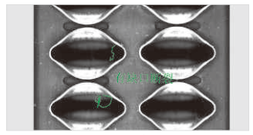
Result

The lampshade surface has irregular arc shapes with varying thickness and curvature across different areas, making it difficult to achieve uniform imaging with standard light sources. Using a customized non-standard side surface light source for directional illumination can achieve the desired result.

Inspection of holes



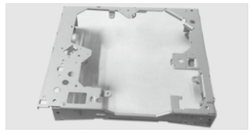
Workpiece



Result

Based on the shape characteristics of the openings, use low-angle lighting to illuminate the inner edges of the openings, clearly displaying whether circular holes haveany gaps or fractures.

Automotive sheet metal part visual inspection



Workpiece



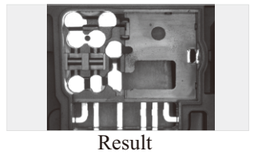
Result

The products are diverse in type and shape, but relatively flat on the surface. Using a large-size open-face light source can accommodate all products.

Pitch inspection of metal parts



Workpiece



Result

Using coaxial lighting, light is projected vertically onto the surface of the metal sheet, providing uniform illumination and emphasizing sharp edge effects.

Inspection of solder joints of sheet metal



Workpiece



Result

Due to the large size of the workpiece, numerous weld points, and uneven surfaces, multiple linear light sources can be combined for uniform illumination from various angles, ensuring effective coverage and illumination.

Bearing inspection



Workpiece



Result

To avoid ghosting at the curved edges of bearings and make the edges sharper, a parallel backlight source is chosen, along with a telecentric lens to reduce distortion, ensuring more precise dimensional measurements.

Markers in user panel inspection



Workpiece



Result

The workpiece is large in size and requires uniform illumination with a large emitting surface. Choosing a large-size diffuse aperture light source achieves large-area uniform illumination.

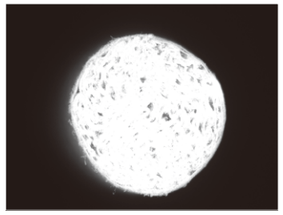
Tobacco Industry



1. OCR on cigarette paper



2. Inspection of package deformation



3. Filter inspection

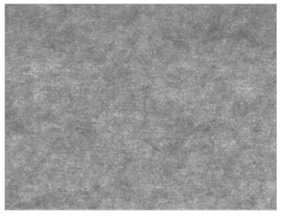


4. Filter size measurement

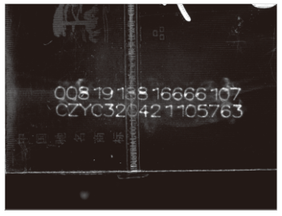




5. Barcode reading



6. Cigarette paper inspection



7. Laser-marked letters inspection



8. Packaging box counting

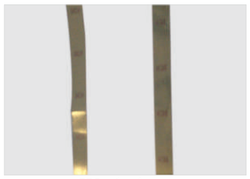


9. Paper package surface inspection

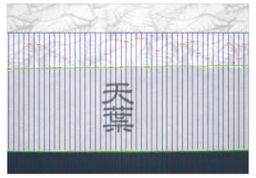


10. Printing inspection on paper package

OCR on cigarette paper



Workpiece



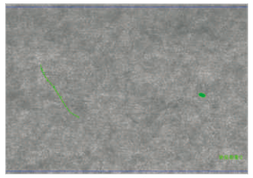
Result

The product is of diffuse material. Using a planar shadowless light source ensures a more uniform image effect, enabling precise measurement of cigarette paper gold edge width and detection of surface defects such as missing or blurry characters.

Inspection of cigarette paper



Workpiece



Result

The cigarette paper is made of diffuse material. Using a diffuse light source for illumination can achieve a more uniform image effect.

Package deformation inspection



Workpiece



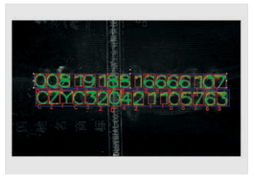
Result

The product has a square shape with a relatively flat surface. Based on the deformation patterns, using low-angle lighting can reveal the product's contour information. If there is any deformation, the collected image contour will also show changes.

Laser marked letters inspection



Workpiece



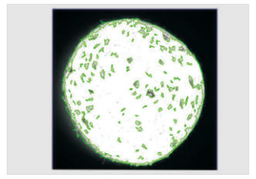
Result

The product surface has a plastic film that is prone to reflection, and there are multiple color varieties. Using low-angle lighting can eliminate reflections and accommodate various colors, achieving better image quality.

Filter inspection



Workpiece



Result

The fibers have a certain light-guiding property. Using a high-brightness surface light source to illuminate from the side of the cigarette can effectively reveal the state of the fibers.

Packaging box counting



Workpiece



Result

With a large field of view, long working distance, and high production line speed requiring short exposure times, multiple high-brightness linear lights are used to provide uniform illumination of the field of view.

Filter size measurement



Workpiece



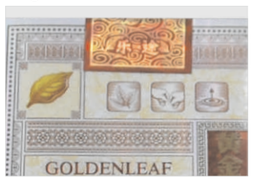
Result

Due to the filter tip being filled with different materials from other parts, with varying densities, using backlighting can reveal the contour of the filter tip. Alternatively, using a high-directionality surface light source can achieve better inspection results.

Surface inspection of paper package



Workpiece



Result

The packaging film is highly reflective. To eliminate reflection interference, the camera and light source are tilted to achieve the desired image effect.

Barcode reading



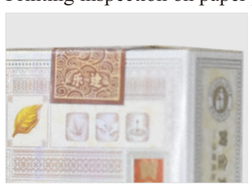
Workpiece



Result

The product packaging film is prone to reflection. Using low-angle lighting can eliminate most of the interference caused by reflections. Additionally, if some reflections still persist, a polarizing filter can be used to eliminate them.

Printing inspection on paper package



Workpiece



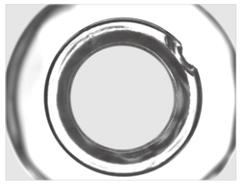
Result

This process requires high speed, and the packaging film is prone to reflection. Using a customized high-brightness arc-shaped light source can ensure better image quality while maintaining detection speed.

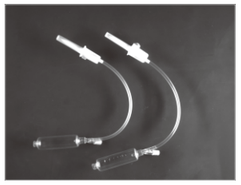
Medical Industry



1. Medical bottles inspection



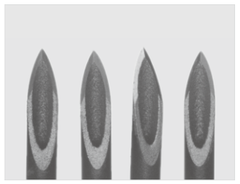
2. The rim of the bottle inspection



3. Covers for iv tubes inspection



4. Injector inspection



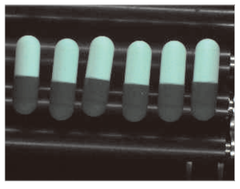
5. Needle tips inspection



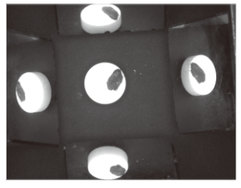




6. Barcode reading



7. Capsules inspection



8. Pills inspection



9. Capsule contour inspection



10. Bottle caps inspection



11. Foreign objects in liquid detection



12. Vial inspection

Inspection of medical bottles



Workpiece Result

Using a diffuse backlight source for illumination can highlight the product's condition, providing uniform images that clearly reveal defects.

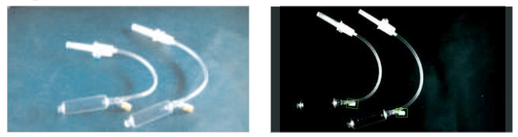
Inspection of the rim of the bottle



Workpiece Result

Using a parallel backlight source to illuminate from the bottom of the bottle produces images with sharp edges, enabling accurate detection of bottle mouth defects such as chipping, burrs, and bubbles.

Inspection of covers for IV tubes



Workpiece Result

To detect whether there is a cap on the infusion tube and whether there are connections between infusion tubes, a large field of view is required. Therefore, a linear light source suitable for large-area illumination is selected.

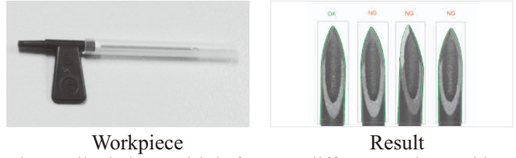
Inspection of injector



Workpiece Result

The product has varying thicknesses in different parts, which also affects the refractive index of light. Using a high-directionality surface light source for backlighting can create higher grayscale differences in different areas, achieving higher precision in detection.

Inspection of needle tips



Workpiece Result

The needle tip has multiple facets at different angles, making it difficult for conventional light sources to illuminate all facets simultaneously. Using a spherical integrated light source can achieve multi-angle illumination.

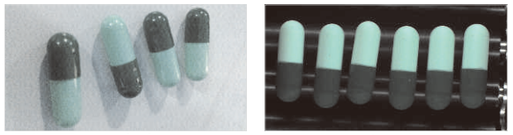
Barcode reading



Workpiece Result

This process requires motion capture at high speed. Considering the diffuse nature of the one-dimensional barcode label, a high-intensity ring light source is chosen to meet the requirements.

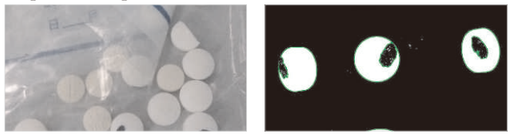
Inspection of capsules



Workpiece Result

Combining with coaxial lighting can meet the requirements for uniformity, achieving effective defect detection.

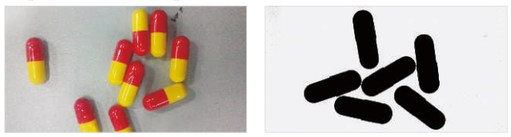
Inspection of pills



Workpiece Result

Due to the pill packaging inside a plastic bag, there is a risk of reflection interference. Using a polarizing filter can eliminate the reflection effects and achieve better image quality.

Capsule contour inspection



Workpiece Result

To avoid reflections on the surface of capsules, a white parallel backlight source can be used to better highlight the contour information.

Inspection of bottle caps



Workpiece Result

A high-angle ring light is suitable for the inspection of printed characters, scratches and deformation of bottle caps.

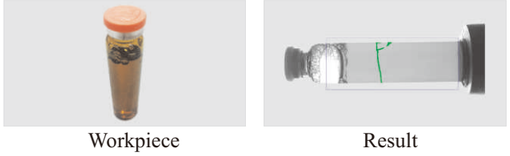
Detection of foreign objects in liquid



Workpiece Result

Detection of impurities in oral liquid bottles: hair, metal fragments, sand, etc. The bottle is cylindrical and prone to reflection, so backlighting is used. Additionally, because the bottle is opaque, a more penetrative infrared surface light source is chosen.

Vial inspection



Workpiece Result

Due to the liquid in the bottle leaning towards a red color, following the principle of similar color elimination, using a red surface light source can achieve better image results.

Printing Industry



1. Label inspection for electronic products



2. Printed logo inspection



3. Reading of QR codes

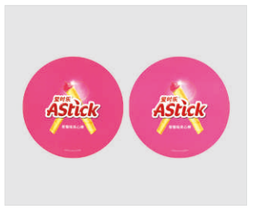


4. Label inspection for daily necessities





5. Cap surfaces inspection



6. Printing inspection



7. OCR for keyboards



8. Print inspection for mobile phone package box



9. Label inspection for pens



10. Inspection of printed characters on SIM cards

Label inspection for electronic products



Workpiece



Result

Using a linear light source at a certain angle to illuminate the label accurately identifies the QR code and character information on the packaging box.

Inspection of printed logo



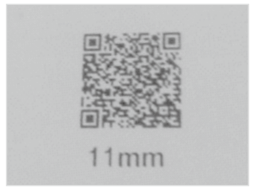
Workpiece



Result

Using a spherical integrated light source combined with coaxial lighting can eliminate surface reflections, achieve uniform image results, and accurately detect defects such as missing prints, partial prints, incomplete fonts, blackened edges, scratches, etc.

Reading of QR codes



Workpiece



Result

The contrast between the product background and characters is already significant. Using low-angle lighting can make the image more uniform.

Label inspection for daily necessities



Workpiece



Result

With a variety of product types and complex shapes, using a linear light source allows for flexible adjustment of light source height and angle to achieve the desired effect.

Inspection of cap surfaces



Workpiece



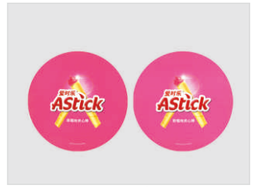
Result

Using a combination light source to complete different inspection tasks at the same workstation, while simultaneously inspecting scratches, dents, characters, etc., on the bottle cap surface.

Printing inspection



Workpiece



Result

Using a high Color Rendering Index (CRI) light source paired with a color camera to accurately reproduce the true surface information of the product, ensuring precise detection of printing colors, overlaps, dirt, etc.

OCR for keyboards



Workpiece



Result

The keyboard is large in size, with uneven surfaces on the keys. Using a color camera combined with a diffuse large aperture light source for segmented imaging can achieve better image quality.

Print inspection for mobile phone package box



Workpiece



Result

Using a red side surface light source with the camera and light source tilted at a certain angle can create a more uniform image.

Label inspection for pens



Workpiece



Result

The product surface is smooth and curved. Using an arc-shaped light source can make the image more uniform and effectively overcome glare interference.

Inspection of printed characters on SIM cards



Workpiece



Result

Using coaxial lighting to enhance the contrast between the chip and the background, ensuring accurate detection of SIM card surface printing quality and chip misalignment.

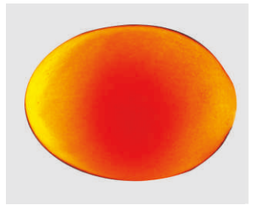
Food and Beverage Industry



1. OCR on packaging box



2. Tea inspection



3. Egg inspection



4. Defects detection on the bottom of milk powder can





5. Scratches detection for beverage can



6. Soy sauce bottle level detection



7. Gum package inspection



8. Plastic package sealing inspection



9. OCR on the bottom of can



10. Areca nuts inspection

OCR on packaging box



Workpiece



Result

The selected linear light source is angled appropriately to illuminate the characters on food packaging boxes.

Tea inspection



Workpiece



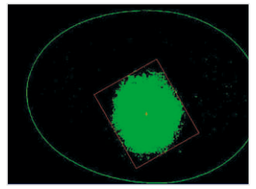
Result

Using a combination of backlighting and front lighting for inspection: backlighting detects the outline of tea leaves to identify foreign objects, while front lighting displays the color of the tea leaves. Any color discrepancies are considered defects.

Egg inspection



Workpiece



Result

Utilizing the high wavelength and strong penetration characteristics of an infrared light source, penetrate through the eggshell and egg white to determine the exact position of the egg yolk.

Defects detection on the bottom of milk powder can



Workpiece



Result

Using a diffuse light source to uniformly illuminate the entire field of view, avoiding glare interference, accurately detecting the bottom profile, edge glue, and surface defects of milk powder cans.

Scratches detection for beverage can



Workpiece



Result

The product surface has uneven sections and a relatively complex structure. Using a spherical integrated light source for uniform illumination achieves better results, clearly revealing fine defects such as scratches and bumps.

Soy sauce bottle level detection



Workpiece



Result

The bottle is transparent and translucent. Using backlighting can reveal the separation line between soy sauce and air, highlighting the liquid's outline, which can be used to determine the height of the soy sauce.

Gum package inspection



Workpiece



Result

Using a diffuse light source to uniformly illuminate the entire field of view, accurately detecting defects such as cracks and poor printing on chewing gum packaging boxes.

Plastic package sealing inspection



Workpiece



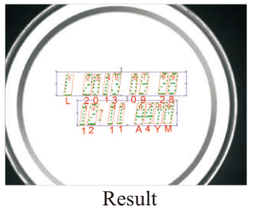
Result

Surfaces without complete adhesive sealing may exhibit wrinkles and uneven height differences. The product's smooth surface is prone to reflections. Using coaxial lighting can achieve better image results.

OCR on the bottom of can



Workpiece



Result

Using a spherical integrated light source provides better uniformity and higher contrast imaging results.

Inspection of areca nuts



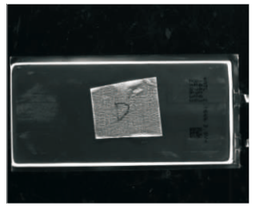
Workpiece



Result

Using a low-angle linear light source for illumination to detect defects on both sides of betel nuts, and for positioning the betel nut contours and guiding adhesive application.

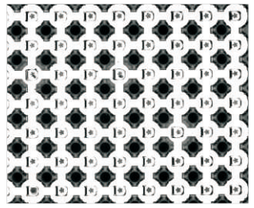
Lithium Battery Industry



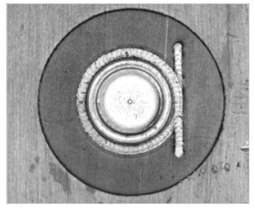
1. Cell phone battery positioning



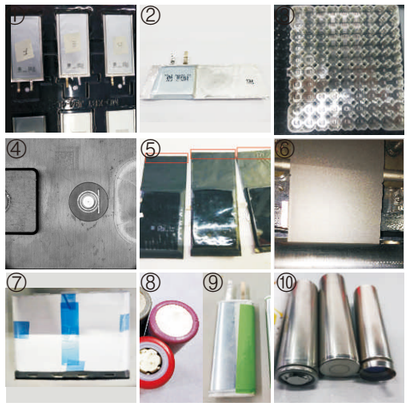
2. QR code reading

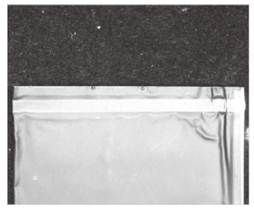


3. Cell module solder joint inspection

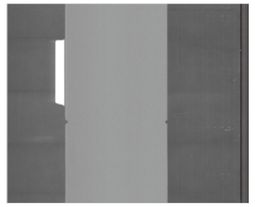


4. Detecting weld seams on battery cells.





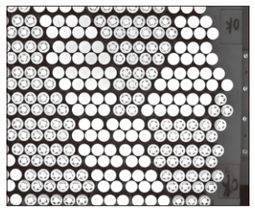
5. Package inspection after sealing



6. Electrode inspection on die-cutting machine



7. Square battery related size measurement



8. Cell polarities inspection

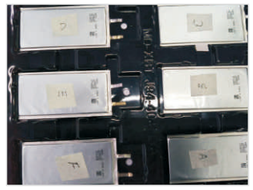


9. Electrode tab size measurement

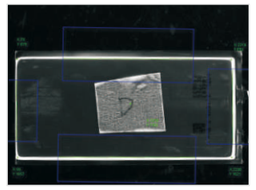


10. Cylindrical battery bottom gasket size measurement

Cell phone battery positioning



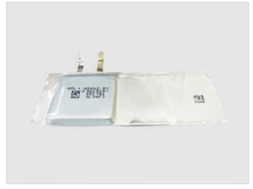
Workpiece



Result

Using low-angle lighting to highlight the outer contour of the battery cell, achieving higher positioning accuracy.

QR code reading



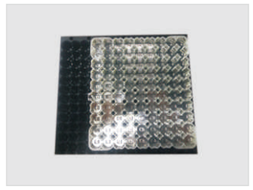
Workpiece



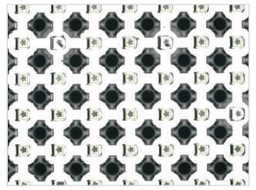
Result

Due to the reflective surface of the battery, using coaxial lighting can effectively reduce interference caused by reflections, making the contrast between the QR code and the background more distinct.

Cell module solder joint inspection



Workpiece



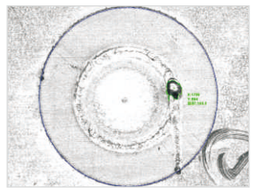
Result

The product is large, and using a perforated surface light source can ensure that the light covers the detection area effectively and produces a good imaging effect.

Battery slice solder joint inspection



Workpiece



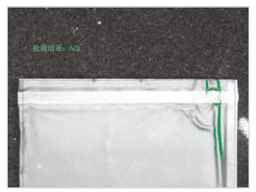
Result

Using a high-angle lighting method and adjusting the working distance vertically to achieve the best imaging state.

Package inspection after sealing



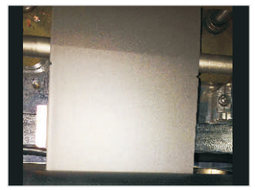
Workpiece



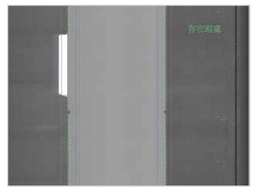
Result

The product is large in size with various types of defects. Using a perforated surface light source, increasing the working distance, to highlight detection features.

Electrode inspection on die-cutting machine



Workpiece



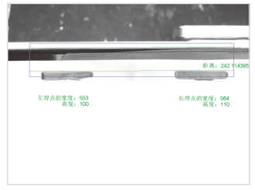
Result

This process requires fast detection speed and high accuracy. Using a high-resolution line scan camera combined with OPT ultra-bright line light can achieve better inspection results.

Square battery related size measurement



Workpiece



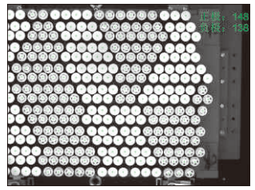
Result

The surface of the weld bead is uneven, and the workpiece is smooth and prone to reflections. Using a high uniformity arc-shaped light source can avoid interference caused by reflections and improve detection stability.

Cell module solder joint inspection



Workpiece



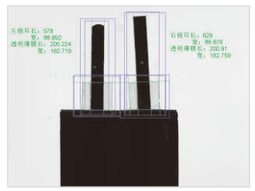
Result

The workpiece end face is prone to reflections. Using a combination of linear light sources, adjusted to a specific angle, illuminates the battery end face to clearly distinguish positive and negative pole characteristics.

Electrode tab size measurement



Workpiece



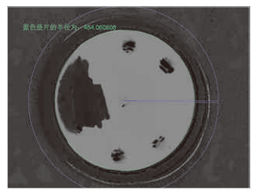
Result

There are various types of workpieces. Using a high-directional backlighting method can better highlight contour information.

Cylindrical battery bottom gasket size measurement



Workpiece

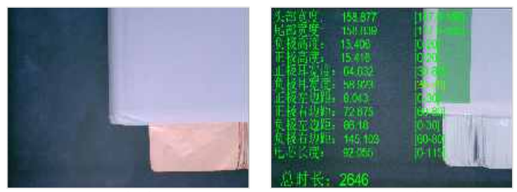


Result

The gasket is made of blue metal and has strong reflectivity. Following the principle of similar color elimination, using a blue ring light source with bright field illumination can achieve ideal imaging results.

Lithium Battery Industry

Winding Machine - Discharging Station

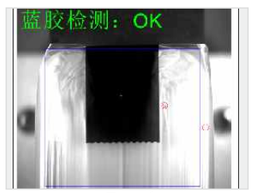

Workpiece

Result

Measure the cell width, cell tab misalignment, left tab margin, core pulling, blue label, and tab folding (standard: tab folded onto the main body).

Presence of bottom blue adhesive


Workpiece



Result

Bottom blue adhesive falling off or misaligned.

Mylar weld mark area


Workpiece



Result

Distance between Mylar and the lower edge of the top cover.

Tab positioning


Workpiece



Result

Eliminate cumulative errors in the material feed direction when using the laser tab cutting function.

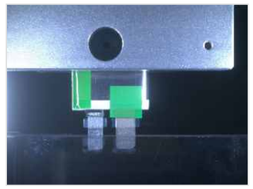
Tab cutting

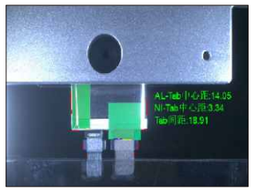

Workpiece


Result

Detecting aluminum and nickel material tabs for cuts and adhesion; tabs are positioned in the direction of cell movement.

Welding Machine - Discharge Inspection


Workpiece



Result

Detecting center distance between AL and NI.