■ LED Safety

PRECAUTIONS ON SAFETY

● Meanings of Signal Words

⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

● Alert statements

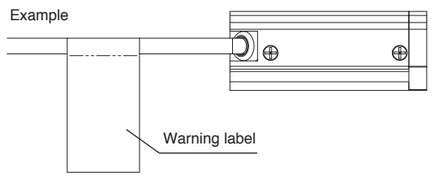
⚠ WARNING

Since this product emits a visible light, that may have an adverse effect on the eyes. Do not stare directly into the light emitted from the LED. If the subject has a specular reflective surface, take care not to allow reflected light enter your eyes.

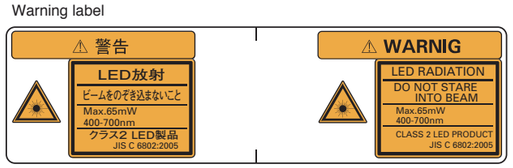
How to put warning label

Put warning label to the cable easy to see from everyone.

Example



Warning label



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NEW

OMRON

FL series Lighting for Image Processing

Next generation ODR technology

» Uniform and Stable Radiant Light

» Super High Brightness

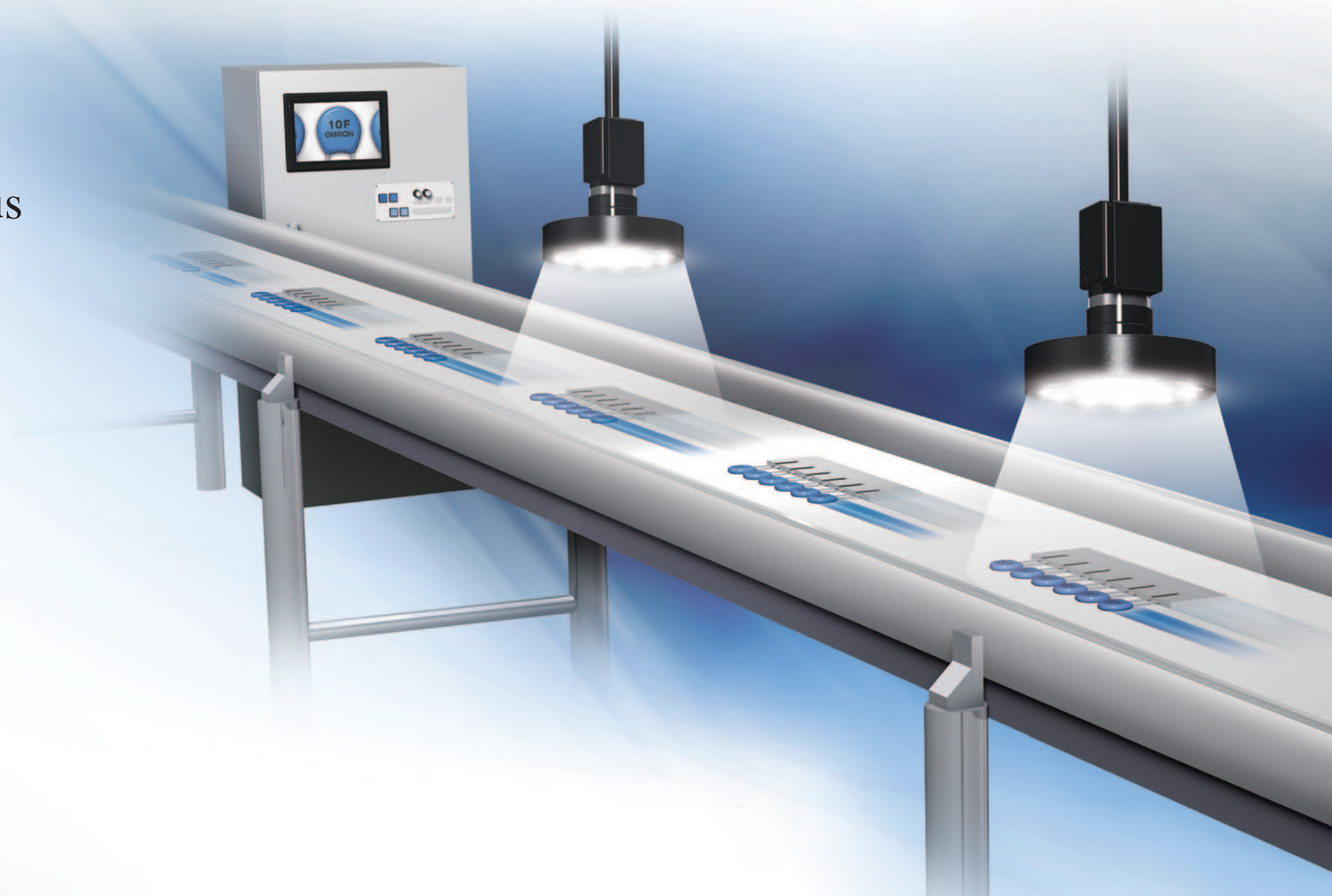
» Flexible Mounting and Installation

ODR Optical Double Reflection

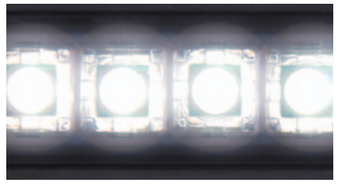
realizing

Sharp images enabled by homogeneous high power lighting

A sharp image, with a high contrast is the precondition for a stable inspection in image processing. This requires a powerful and stable illumination in the field of view (FOV) of an application.
The new Omron FL series represents the ideal lighting solution to achieve this target. The innovative ODR technology defines a new dimension in brightness and ensures, that there is always enough light for your application.
The intelligent light controller simplifies the setup of the light. An easy adjustment of the light intensity or synchronization with the camera trigger is supported. Furthermore the FL series is easy to install and to adjust. Change the angle or distance to the working area in seconds and reduces significantly the effort in operation.



Sharp and Bright Images



High-brightness ODR Lighting

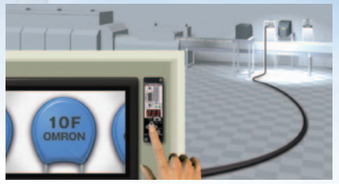
Four times the brightness of conventional LEDs can be achieved with ODR lighting (Optical Double Reflection) that uses a complete new optics technology.
High-brightness illumination was achieved by increasing light efficiency and heat dissipation, making it possible to input images this sharply for the first time.

Homogeneous Lighting

Uniform Illumination Across a Wide Field of View

Brightness is not the only thing necessary for a stable inspection process.
The FL Series evenly illuminates a broad field of view without any inconsistencies.
This enables a stable inspection process.

Easy to use



Easy and Secure Installation, Light Adjustment, and Control

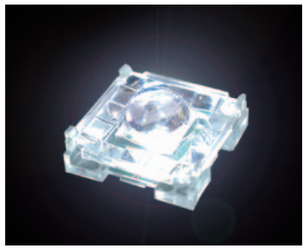
To create an ideal lighting environment more easily and in a shorter time, the structure and operations for installation and adjustment are completely simplified, which makes the FL Series the ideal system for any application.

High-luminance ODR Lighting - beyond the Limitations of LEDs

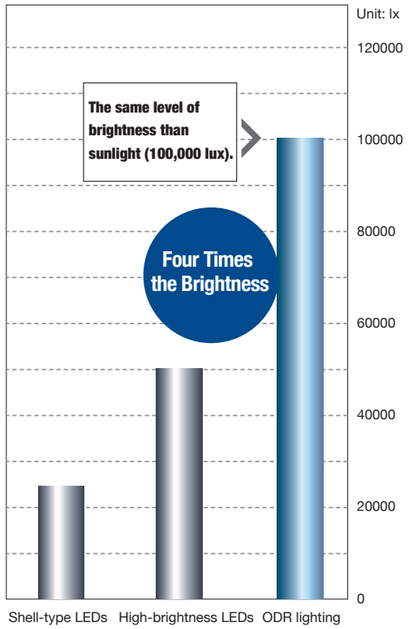
– High-brightness Models –

The Highest Brightness in the Industry*

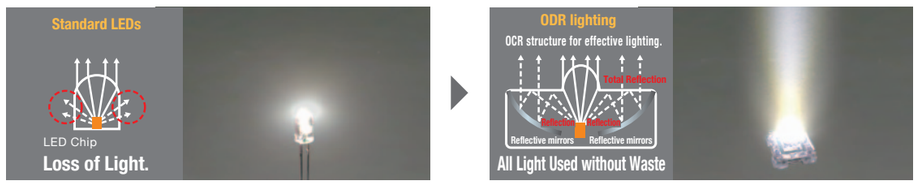
ODR lighting is the latest optics technology and has been invented during the development of a compact image processing camera with built-in lighting.
ODR is defining a new dimension in brightness, and enables the highest light efficiency in the industry.



*OMRON Investigation in November 2010



Cutting Edge ODR Optics Technology (Patent Pending)



Standard Shell-type LEDs

The light created with standard LED lighting has limited efficiency for illumination. It is possible to increase brightness, but doing so causes problems, such as deterioration of the LEDs caused by increased heat.

ODR Lighting

By applying our unique optics technology for an ODR structure to surface mounted chips with high heat dissipation and light efficiency, ODR achieves brightness levels that are approximately 4 times higher than conventional technologies.

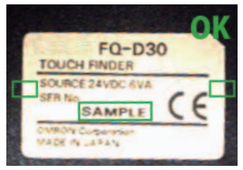
Stable Inspection for High-speed applications

Even on high-speed lines where lack of brightness inevitably results in blurred images, ODR makes it possible to produce stable images without reducing the line speed.

Standard Lighting

Inspection is not possible because of workpiece blurring or a lack of brightness.

ODR Lighting

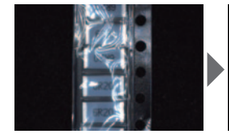


Complete extraction of edges and characters.

Bright Even through a Polarizing Filter

Because previous brightness levels were insufficient, using a polarizing filter resulted in dark images and made it impossible to create sharp images of the workpiece.
With ODR lighting, the brightness in the field of view can be maintained even through a polarizing filter . This allows to cut out only the reflected light from glossary areas, and create bright evenly lit images.

Standard Lighting
Without Polarizing Filter



It is impossible to detect the workpiece because of reflections from the film.

Standard Lighting
With Polarizing Filter

The image becomes dark overall and the workpiece cannot be detected.

ODR Lighting
With Polarizing Filter

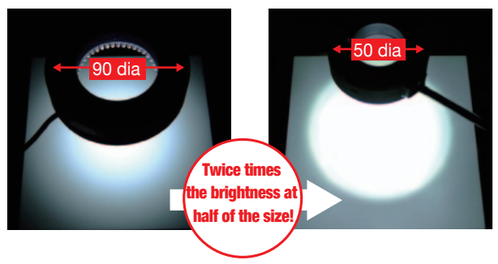
The reflections from the transparent filter is cut and the both the workpiece itself and the characters on it can be detected.

High Brightness in a Small Package

It is possible to provide sufficient illumination by using a smaller light.
It is not necessary to use a large light to achieve the necessary brightness or customize lights to fit into small spaces.

Standard Lighting

ODR Lighting



Highest inspection stability with Uniform, wide-area Illumination

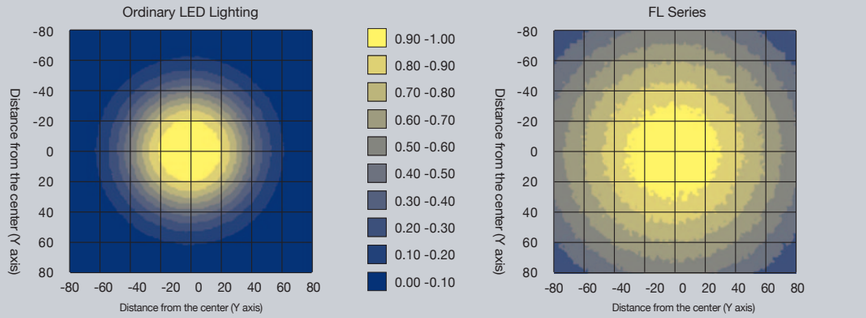
– Wide Area Models –

Uniform and wide-area Illumination over the Field of View

The uniform illumination area* is broader than previous lighting systems (up to 1.5 times).
By illuminating uniformly from corner to corner over the field of view, a sharp image of the workpiece is created to stabilize inspections and measurements.

**Area of illumination with a relative illuminance of 0.50 or higher.*

Illumination Distribution Chart*



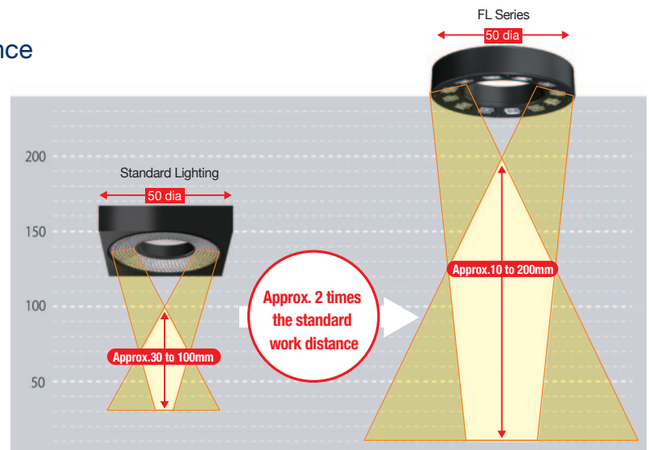
It is not possible to illuminate the corners of the field of view.

It is possible to illuminate across the field of view uniformly and brightly.

*Reference values for a 90-mm-dia. light at a working distance of 100 mm.

Wide Range of Working Distance

The area of uniform illumination for the FL Series is wide and the working distance that can be handled by 1 light is approximately 2 times larger than of a standard light.
This gives more flexibility for the installation location of the light.



Inspection in the Corners

The FL Series consistently illuminates the field of view, so it is not necessary to change the inspection parameters for the central or outside areas. Thanks to the uniform illumination, the same inspection results can be achieved in corners or center of the FOV.

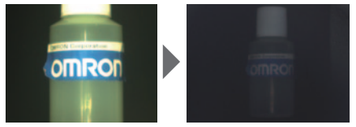
It was necessary to create different inspection standards for each section

With uniform lighting from corner to corner, it is possible to inspect

Easy Handling for Changing Field of View

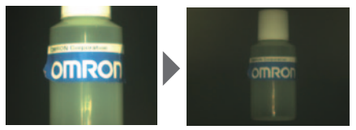
The inspection area is wide, so even if the camera's field of view changes because of a change in the product model or production line, it is possible to use the same lighting

Standard Lighting



A slight increase in the work distance results in images that are dark and unclear.

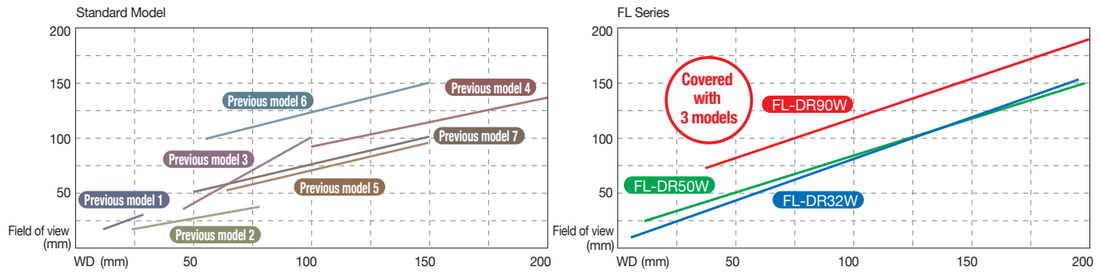
FL Series



Even if the work distance is increased, the images are bright and inspections are stable.

Cover a Broad Area with One Model

There is a broad area of stable illumination, and this increases the area that can be covered with one product model.



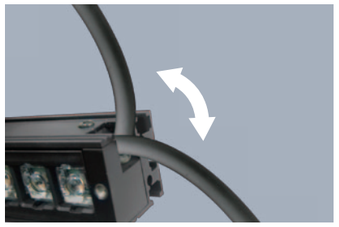
*The graph data are reference values.
*WD=Work Distance

Simple Installation and Control

Easy Design and Installation

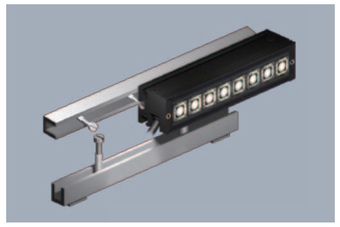
Bar Lighting Fit in any location.

Wiring

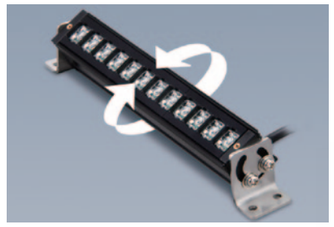


The cable can extend from either direction, allowing for horizontal or vertical wiring layouts on the mounting surface.

Mounting and Adjustment



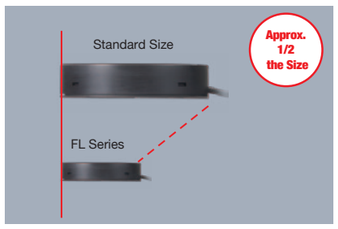
The light is structured for mounting with nuts to an arm on the back or side surfaces.
Minute changes in the position can be achieved by sliding the light.



Specialized mounting brackets enable mounting at a flexible angle.

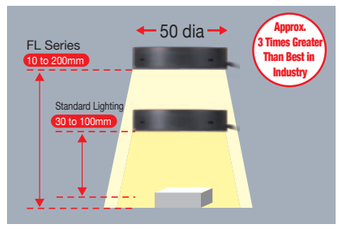
Ring Lighting smallest and lightest in the industry- the FL Series can fit in places where lights could not be installed before.

Size



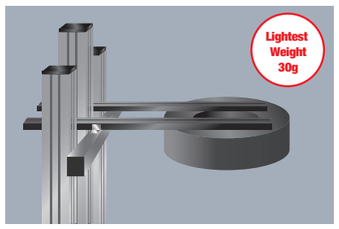
The superior brightness of ODR lights enables an adequate illumination with a smaller unit. It is possible to mount lighting even in narrow locations.

Installation Distance



Because a large area in the field of view can be inspected, the installation location can be selected more flexibly.

Light Weight



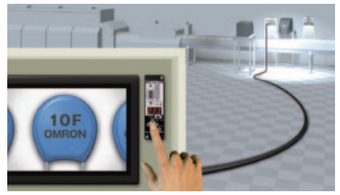
With the lightest body in the industry, this light can be attached to thin arms and fixtures. The arms won't be distorted by the weight.

Easy Control and Adjustment of the Lighting

Lighting Controller

With a compact design small enough to fit in the palm of your hand, the Controller can be built into the control panel or in the gap between production lines.
By using the longest lighting cable in the industry (25 m), the Controller can be installed along with the image processing monitor in a variety of locations. It is possible to adjust the lighting while looking at the screen.

Connect to a Remote Control Panel



Mount to a DIN Rail underneath the Line or in the Gap between Tables

Lighting Control without Programming

This enables light emission synchronized with the camera using essentially any trigger, such as a photoelectric sensor. The Controller be connected to an image processing device to control lighting without any programming on a PLC.

[Control Output]
- PNP/NPN compatible
- Power source: 24 V

[Lighting Emission Controls]
- Lighting triggers can be used individually for each channel.
- Lighting delay and lighting time can be controlled.

Intuitive Digital Light Controls

Digital adjustment of light emission makes it easy to reproduce the lighting environment after line switchovers.

The quantity of light is displayed digitally in 400 levels.
Adjust the light in fine detail.

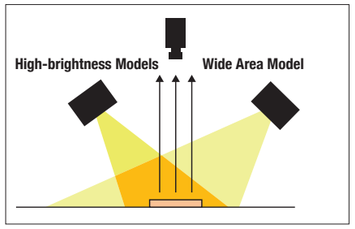
▲ Increases brightness

▼ Decreases brightness

Model

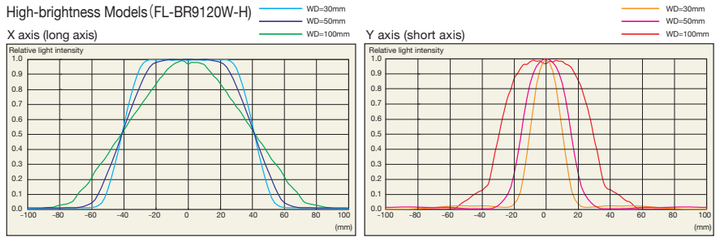
Standard Models	Model	Light color
Wide Area Model	FL-BR5020W	White LEDs
High-brightness Models	FL-BR5020W-H	
Wide Area Model	FL-BR9120W	
High-brightness Models	FL-BR9120W-H	
Wide Area Model	FL-BR13120W	
High-brightness Models	FL-BR13120W-H	

Illumination Structure

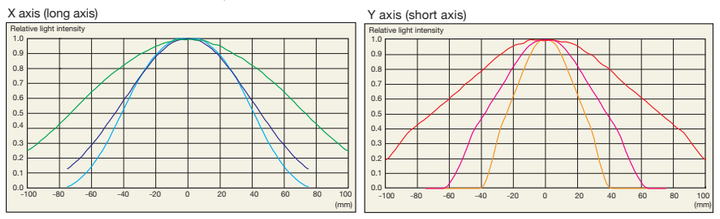


Lighting Intensity Distribution Characteristics

High-brightness Models (FL-BR9120W-H)



Wide Area Model (FL-BR9120W)



Application

Standard Lighitng

It is difficult to read characters with low contrast.

FL Series

Sharp images are created of both two-dimensional codes and characters.

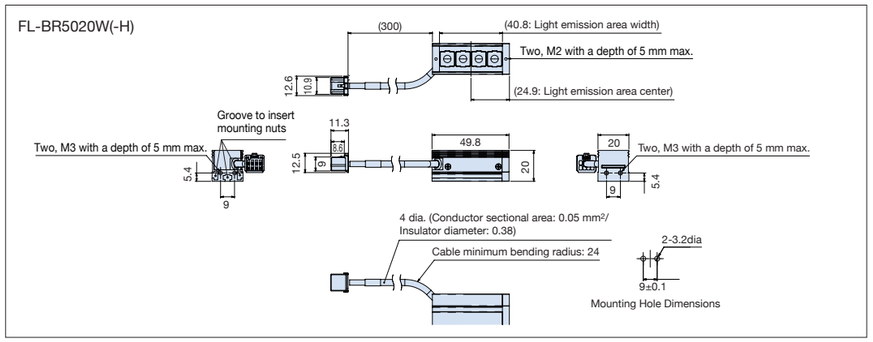
Ratings and Specifications

Model	Wide Area Model	High-brightness Models	Wide Area Model	High-brightness Models	Wide Area Model	High-brightness Models
	FL-BR5020W	FL-BR5020W-H	FL-BR9120W	FL-BR9120W-H	FL-BR13120W	FL-BR13120W-H
Light source	White LEDs					
Vibration resistance	10 to 150 Hz (Double amplitude: 0.7 mm), 80 min each in X, Y, and Z directions					
Shock resistance	150 m/s^2 3 times each in 6 directions					
Ambient temperature	Operation: 0 to 40°C, Storage: –15 to 60°C (with no icing or condensation)					
Ambient humidity	Operation or storage: 35% to 85% (with no condensation)					
Ambient atmosphere	No corrosive gases.					
Degree of protection	IEC60259 IP20					
Weight	Approx. 40g		Approx. 70g		Approx. 100g	
Materials	Light: Case: Aluminum; Cover, side parts, and lens: Heat resistant polyvinyl chloride; Connector: Thermoplastic resin with glass					
LED Class	Class2 (JIS C 6802:2005)					
Accessories	Instruction manual					

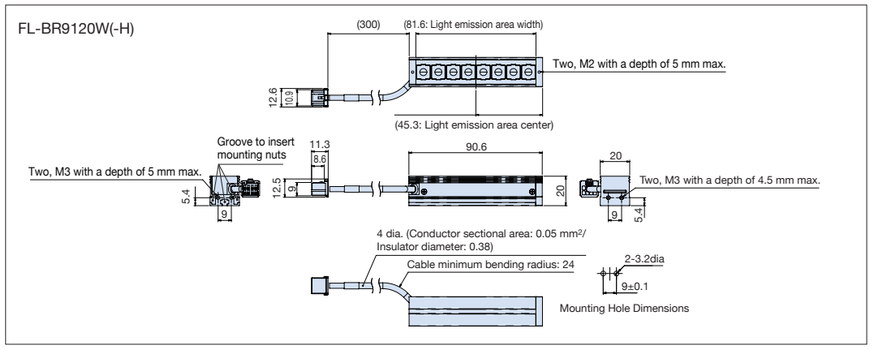
The color of white LEDs can vary due to intrinsic characteristics. Confirm suitability for the application in advance.

Dimensions (Unit: mm)

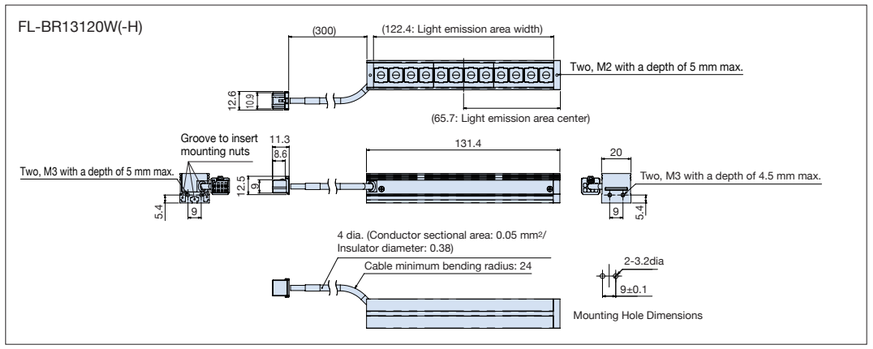
FL-BR5020W(-H)

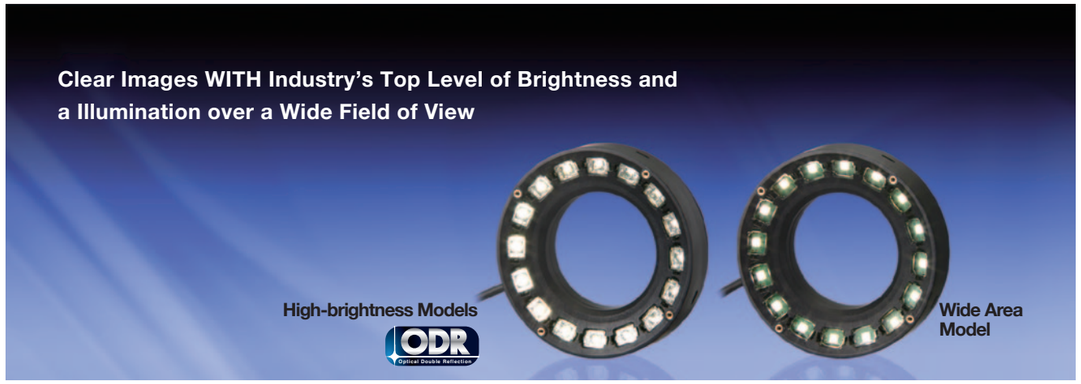


FL-BR9120W(-H)



FL-BR13120W(-H)

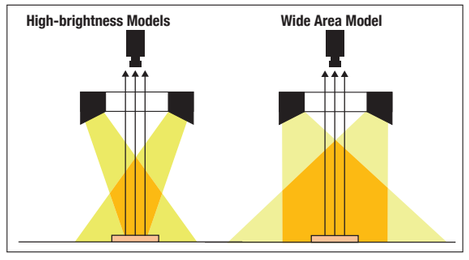




Model

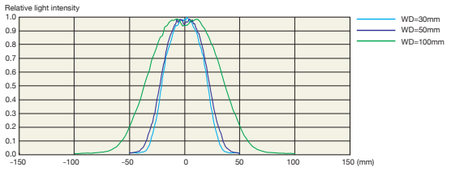
Standard Models	Model	Light color
Wide Area Model	FL-DR32W	White LEDs
High-brightness Models	FL-DR32W-H	
Wide Area Model	FL-DR50W	
High-brightness Models	FL-DR50W-H	
Wide Area Model	FL-DR90W	
High-brightness Models	FL-DR90W-H	

Illumination Structure

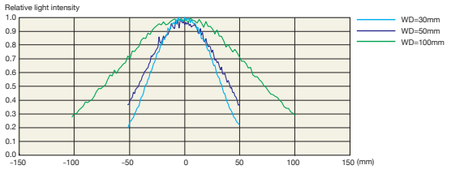


Lighting Intensity Distribution Characteristics

High-brightness Models (FL-DR50W-H)

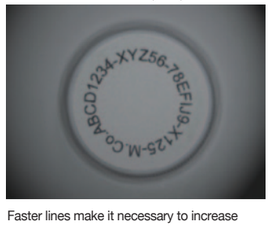


Wide Area Model (FL-DR50W)



Application

Standard Lighitng



Faster lines make it necessary to increase shutter speeds, but then the clarity of workpiece images decreases.

FL series

More than sufficient brightness is provided for high-speed lines.

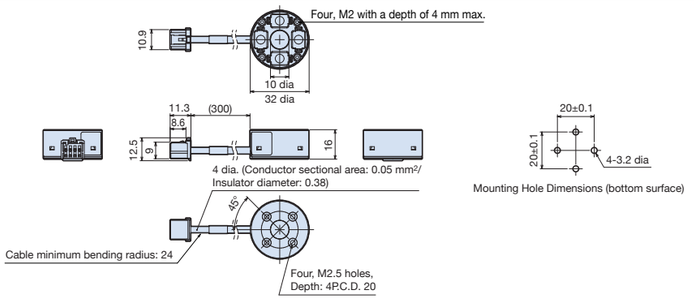
Ratings and Specifications

Model	Wide Area Model	High-brightness Models	Wide Area Model	High-brightness Models	Wide Area Model	High-brightness Models
	FL-DR32W	FL-DR32W-H	FL-DR50W	FL-DR50W-H	FL-DR90W	FL-DR90W-H
Light source	White LEDs					
Vibration resistance	10 to 150 Hz (Double amplitude: 0.7 mm), 80 min each in X, Y, and Z directions					
Shock resistance	150 m/s^2 3 times each in 6 directions					
Ambient temperature	Operation: 0 to 40°C, Storage: –15 to 60°C (with no icing or condensation)					
Ambient humidity	Operation or storage: 35% to 85% (with no condensation)					
Ambient atmosphere	No corrosive gases.					
Degree of protection	IEC60259 IP20					
Weight	Approx. 25g		Approx. 30g		Approx. 70g	Approx. 80g
Materials	Light: Case: Aluminum; Cover, side parts, and lens: Heat resistant polyvinyl chloride; Connector: Thermoplastic resin with glass					
LED Class	Class2 (JIS C 6802:2005)					
Accessories	Instruction manual					

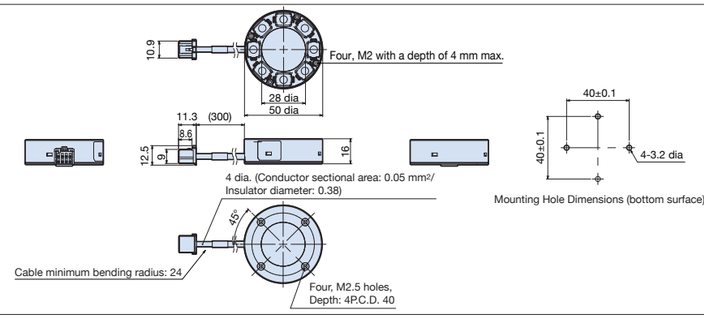
The color of white LEDs can vary due to intrinsic characteristics.
Confirm suitability for the application in advance.

Dimensions (Unit: mm)

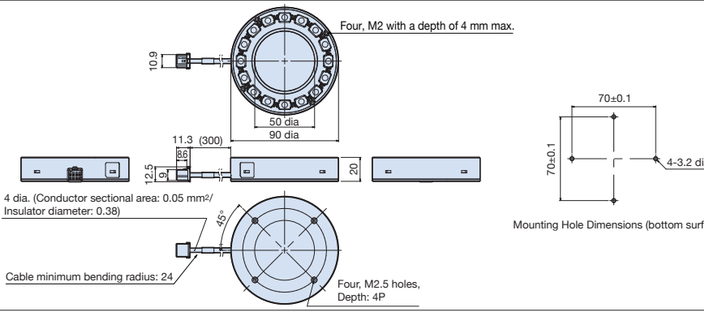
FL-DR32W(-H)



FL-DR50W(-H)



FL-DR90W(-H)



The smallest body in the industry is combined with the industry's longest cable at 25 m. Install in essentially any location.

Two-channel models

One-channel models

Model

Standard Models	Model	I/O specifications	Input voltage
One-channel models	FL-STC10	NPN	DC24V
	FL-STC15	PNP	
Two-channel models	FL-STC20	NPN	
	FL-STC25	PNP	

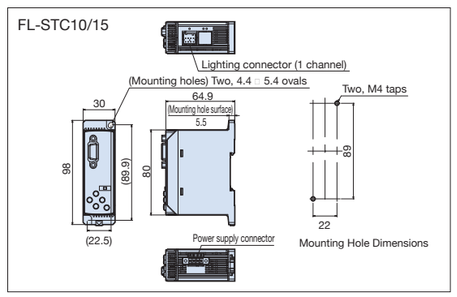
Ratings and Specifications

Product name		One-channel models		Two-channel models	
I/O type		NPN	PNP	NPN	PNP
Model		FL-STC10	FL-STC15	FL-STC20	FL-STC25
Power supply voltage		DC24V±10% (including ripple)			
Power consumption		36 W, 1.5 A max. (including the lighting section)		72 W, 3 A max. (including the lighting section)	
Number of output channels		1		2	
Applicable lights		FL-☒ Series*1			
Light control modes	Continuous light emission mode	While the Strobe Controller power source is ON, light is continuously emitted. PWM frequency: 100 kHz, Light adjustment: 400 levels			
	Triggered light emission mode	Light emission is synchronized with an external trigger input. Light emission: Continuous while the trigger is input, or 0.1 to 99.9 ms (set in 0.1-ms increments) PWM frequency: 100 kHz, Light adjustment: 400 levels			
	Strobe light emission mode	Light emission is synchronized with the external trigger input, but twice the amount of light is emitted in comparison with the trigger light emission mode. Light emission pulse width: 0.01 to 5 ms (light adjustment: 500 levels equivalent)			
Light adjustment setting	Operation on the light	Light adjustment mode settings and light adjustment value input: slide switch and directional pad			
	Remote operation	Light adjustment value input: 9-bit binary input			
External interface		Parallel I/O connector (D-sub 15-pin), Terminal block (external trigger input with 2 terminals, power source voltage input with 2 terminals)			
Ambient temperature		Operation: 0 to 40°C, Storage: –15 to 60°C (with no icing or condensation)			
Ambient humidity		Operation or storage: 35% to 85% (with no condensation)			
Vibration resistance		10 to 150 Hz (Double amplitude: 0.7mm), 80 min each in X, Y, and Z directions			
Shock resistance		150 m/s² 3 times each in 6 direction (up-down, left-right, front-back)			
Materials		Case: PC			
Degree of protection		IEC60529 IP20			
Weight		Approx. 100 g			
Accessories		Instruction manual,Terminal block Connector			

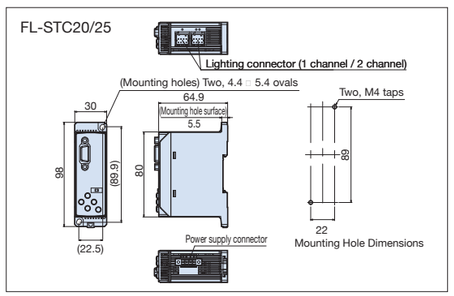
(*1) Ask your OMRON representative for details on applicable models.

Dimensions (Unit: mm)

FL-STC10/15

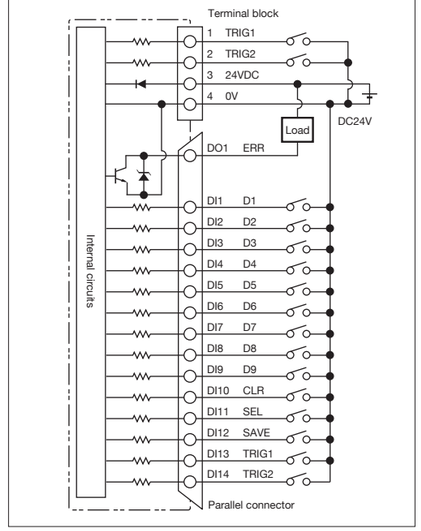


FL-STC20/25



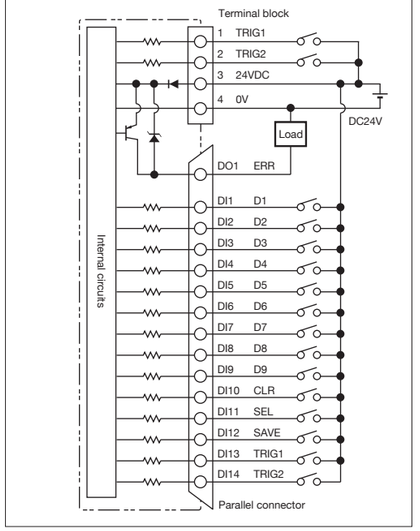
I/O Circuit Diagrams

• NPN type
(FL-STC20/10)



(*1) no use for FL-STC10

• PNP type
(FL-STC25/15)



(*2) no use for FL-STC15

•Electrical Specifications

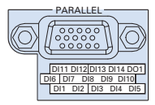
Output circuit	Input circuit
NPN Open-collector 30VDC 50mA max. ON:residual voltage 1.2V max. OFF:leakage current 0.1mA max.	ON: Connected to 0 V or 1.5 V max. OFF: Open (Leakage current: 0.1 mA max.)

•Electrical Specifications

Output circuit	Input circuit
PNP Open-collector 50mA max. ON:residual voltage 1.2V max. OFF:leakage current 0.1mA max.	ON: Connected to power supply voltage or power supply voltage – 1.5 V max. OFF: Open (Leakage current: 0.1 mA max.)

Wiring diagram

Pin Arrangement



Pin No.	Signal	Signal direction	Function	
DI1	D1	Input	Bit 1 of light control data (least significant bit)	(1)CONT/TRIG Mode Light control data is specified using 9 bits of binary data from D1 to D9. The specifiable range is the 400 levels from 1 to 400 (binary 000000001 to 110010000). (2)STB Mode Strobe light emission data is specified in 9 bits of binary data from D1 to D9 The specifiable range is the 500 values from 0.01 to 5.00 ms (binary 000000001 to 111110100). Each bit is 1 for ON and 0 for OFF (open).
DI2	D2	Input	Bit 2 of light control data	
DI3	D3	Input	Bit 3 of light control data	
DI4	D4	Input	Bit 4 of light control data	
DI5	D5	Input	Bit 5 of light control data	
DI6	D6	Input	Bit 6 of light control data	
DI7	D7	Input	Bit 7 of light control data	
DI8	D8	Input	Bit 8 of light control data	
DI9	D9	Input	Bit 9 of light control data (most significant bit)	
DI10	CLR	Input	Error reset input.Errors are reset when the error reset input changes from OFF (open) to ON.	
DI11	SEL	Input	Lighting control channel selection input . OFF (open) specifies channel 1, ON specifies channel 2.	
DI12	SAVE	Input	The light control data (D1 to D9) is saved in the built-in memory when the input changes from OFF (open) to ON.	
DI13	TRIG1	Input	Inputs the light emission trigger signal for channel 1.	
DI14	TRIG2	Input	Inputs the light emission trigger signal for channel 2.(*)	
DO1	ERR	output	Turns ON when an error occurs.	

*An input with the same function as the lighting emission trigger input is also available on the terminal block (pins 1 and 2).When using the trigger input, connect the input line only to the parallel connector or only to the terminal block.It is not possible to use both input lines at the same time.

Cable

Model

• Extension Cable, Standard Cables

Model	Cable Length	Weight
FL-XC1	1m	Approx. 50 g
FL-XC2	2m	Approx. 80 g
FL-XC3	3m	Approx. 120 g
FL-XC5	5m	Approx. 190 g
FL-XC10	10m	Approx. 400
FL-XC25	25m	Approx. 1000 g

• Extension Cables, Flexible Cables

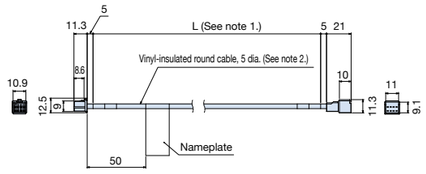
Model	Cable Length	Weight
FL-XC1R	1m	Approx. 60 g
FL-XC2R	2m	Approx. 100 g
FL-XC3R	3m	Approx. 150 g
FL-XC5R	5m	Approx. 240 g
FL-XC10R	10m	Approx. 500 g
FL-XC25R	25m	Approx. 1200 g

• Parallel Cable

Model	Cable Length	Weight
FL-XCP2	2m	Approx. 180 g

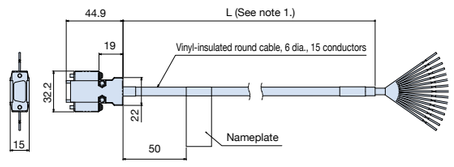
Dimensions (Unit: mm)

• Extension Cable



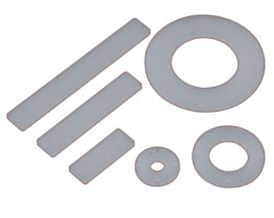
Note 1. Depends on the cable length.
Note 2. The cable diameter is 6.2 for robot cables.

• Parallel Cable



Note 1. Depends on the cable length.

Diffusion Plates and Polarization Plates



Model

• Diffusion Plates

Standard Models	Model	Outer diamete (mm)	Weight
Bar Lighting	FL-BR5020DF	49.8×18×4	Approx. 5 g
	FL-BR9120DF	90.6×18×4	Approx. 10 g
	FL-BR13120DF	131.4×18×4	Approx. 15 g

Standard Models	Model	Outer diameter/Inner diameter/Thickness (mm)
Direct Ring Lighting	FL-DR32DF	32/10/4
	FL-DR50DF	50/28/4
	FL-DR90DF	90/50/4

• Polarization Plates

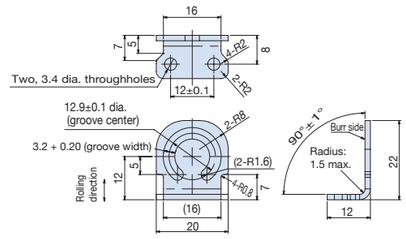
Standard Models	Model	Outer diameter/Inner diameter/Thickness (mm)
Direct Ring Lighting	FL-DR32PL	32/10/2
	FL-DR50PL	50/28/2
	FL-DR90PL	90/50/2

Mounting Brackets

Model

Standard Models	Model
Bar Lighting	FL-XBK1

Dimensions (Unit: mm)



Burrs must extend less than 0.1 mm.

MEMO