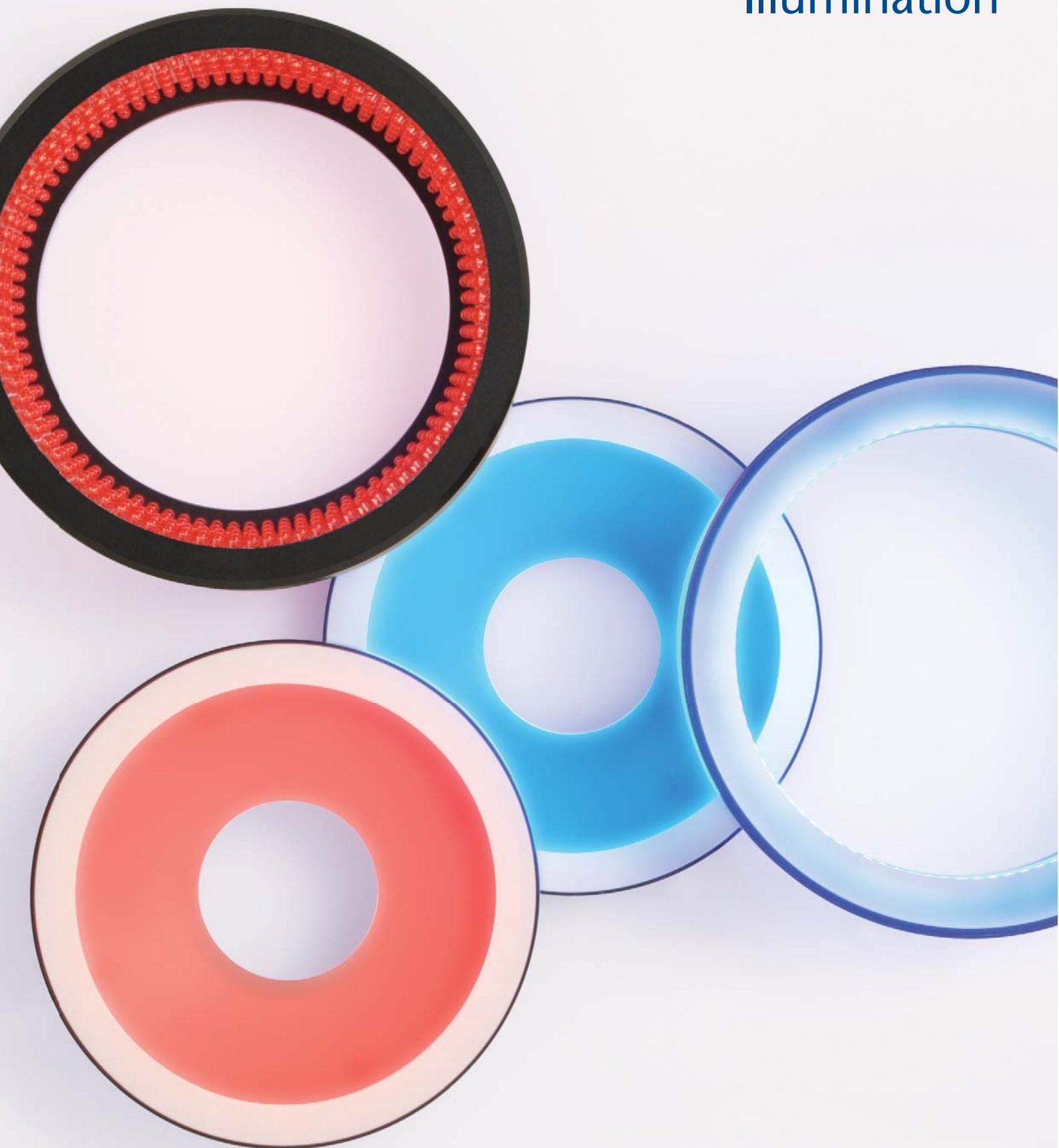


Illumination





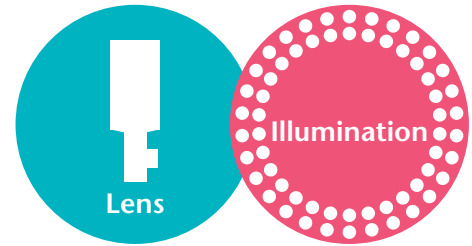
Striving for Quality and Vision technology ahead of market,
we will keep on creating Moritex Value.

MORITEX is a leading international brand in the machine vision market. With abundant experience in optical technology, we excel in markets such as flat panel display, semiconductor, electronic component mounting, and other markets requiring factory automation. Our product portfolio comprises of a full range of illumination and optical components, modules and systems for machine vision.

Markets & Locations

One-Stop Optical Technology Company

MORITEX is a one-stop company which provides various optical technology solutions based on its broad knowledge in optical design and manufacturing. Not only do we offer the excellent combination of lenses and illumination, we can also provide custom, integrated solutions for modules and systems using our core lens and illumination technology.



Global Network



Asia

- MORITEX Corporation
Saitama, Japan
- MORITEX Technologies
(Shenzhen) Co., Ltd.
Shenzhen, China

Europe

- Moritex Asia Pacific Pte Ltd.
Singapore

- Europe Representative Office
Seefeld, Germany

North America

- MORITEX North America, Inc.
San Jose, U.S.A.



MG-Wave®



High Power LED Spot Illumination **MCEP** **p.88**



Coaxial Illumination	MCEC / MCEL	p.88
Simulated Coaxial Illumination	MSCL	p.94
Direct Ring Illumination	MDRL	p.96
Low Angle Ring Illumination	MLRL	p.102
Shadowless Illumination	MSRL / MSLL	p.104
Square Bar Type Illumination	MDQL	p.106
Bar Illumination	MBRL / MHBC	p.108
Dome Illumination	MSDC	p.112
Collimated Backlights	MCBP	p.114
Direct Backlights (Chip Mount Type)	MDBC	p.116
Direct Backlights (Discrete Type)	MDBL	p.118
Edge Type Backlights	MEBL	p.120
IR Illumination	IR	p.122
UV Illumination	UV	p.126
Diffuse Chip Type Bar Illumination	MBRC	p.128
High Brightness LED Light Line	MLNC	p.130



LED Controller
for MG-Wave®

MLEK

A230W Analog Series

p.132

A230W Digital Series

p.132



Accessories **p.135**

CompaVis®

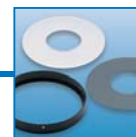


Direct Ring Illumination	CV-R / SQ	p.142
Low Angle Ring Illumination	CV-RLA / RLA-00	p.145
Shadowless Illumination	CV-FR / DR	p.148
Bar Illumination	CV-BA	p.152
Coaxial Illumination	CV-CE	p.154
Simulated Coaxial Illumination	CV-CX	p.156
Direct Backlights (Chip Mount Type)	CV-FL	p.158
IR Illumination	IR	p.160



LED Controller for CompaVis®

MLEF **p.161**



Accessories **p.165**

Broad range of lighting solutions

MORITEX has the most complete LED illumination portfolio in the industry with the **constant current controlled "MG-Wave®"** and **constant voltage controlled "CompaVis®"** providing support for the entire range of machine vision customers in various image processing environments.

Image processing total system solutions support

Our total system solutions approach provides customers with the best performance & efficiency through consideration of the 3 essential imaging fields of illumination, lens, and peripherals.

Making obscure and unrecognizable images become sharp and clear

Our comprehensive system solutions meet a wide range of needs for image processing applications.

MG-Wave®

**Constant Current Control System /
Extensive Product Variety /
Unique, High End Solutions**

MG-Wave® is our original LED illumination product line designed with our patented highly sophisticated integrated constant current sensing control system that enables our LED controllers to identify the appropriate current value for each individual LED unit connected and control them separately. The constant current design successfully reduces heat generation to improve output intensity, efficiency, and stability.



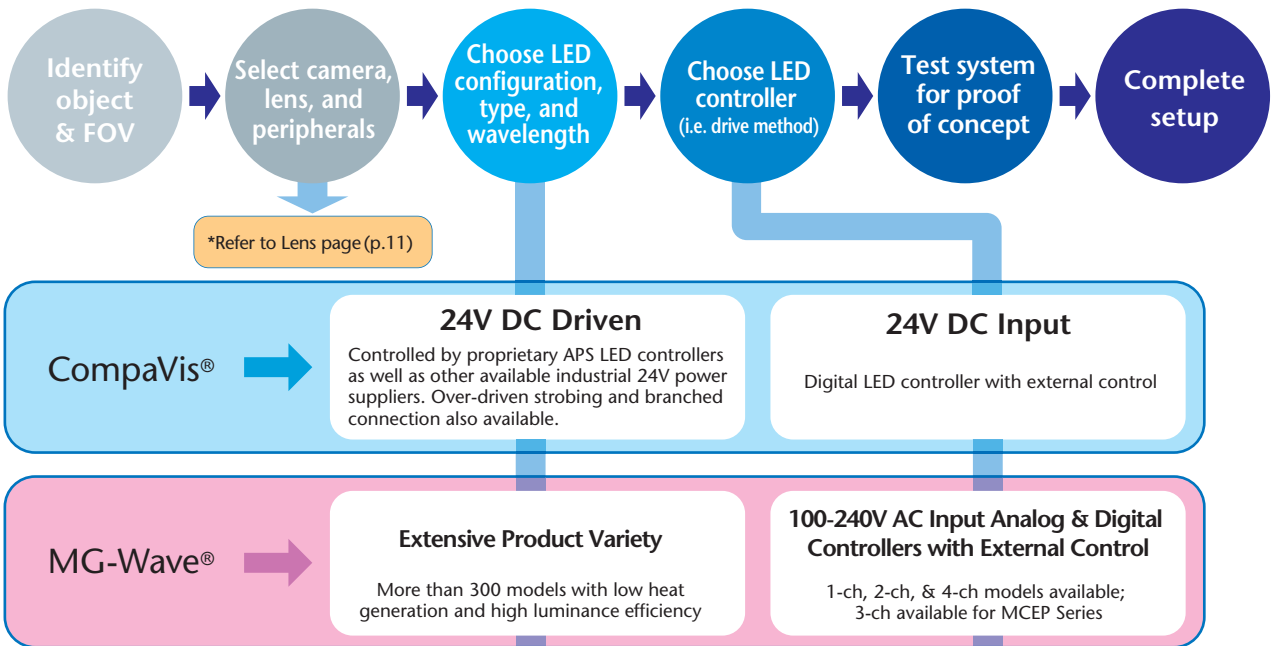
CompaVis®

Constant Voltage Control System / 24V DC

CompaVis® constant voltage control LED illumination products are 24V DC driven and can be controlled by industrial 24V power supplies. Over-driven strobing is also possible for instantaneous, high intensity illumination. This series can be used in various machine vision imaging environments providing a broad range of lighting solutions.



Selection flowchart



LED Lineup Reference Table

Illumination Type	CompaVis® Series	MG-Wave® Series
Direct Ring Illumination	CV-R/SQ	MDRL
Low Angle Ring Illumination	CV-RLA/RLA-00	MLRL
Shadowless Illumination	CV-FR/DR	MSRL/MSLL
Bar Illumination	CV-BA	MBRL
High Power Bar Illumination	—	MHBC
Square Bar Type Illumination	—	MDQL
Dome Illumination	—	MSDC
Simulated Coaxial Illumination	CV-CX	MSCL
Direct Backlights (Chip Mount Type)	CV-FL	MDBC
Direct Backlights (Discrete Type)	—	MDBL
Edge Type Backlights	—	MEBL
Collimated Backlights	—	MCBP
High Brightness LED Light Line	—	MLNC/HB-LED-LL
Diffuse Chip Type Bar Illumination	—	MBRC
High Power LED Spot Illumination	—	MCEP
Coaxial Illumination	CV-CE	MCEC/MCEL
IR Illumination	IR	IR
	—	UV

Input	CompaVis®	DC24V
	MG-Wave®	AC100V-240V
Channel	CompaVis®	2ch
	MG-Wave®	1ch, 2ch, 4ch
External Control	CompaVis®	Ethernet Digital (Pararell/8bit)
	MG-Wave®	Analog (0-5V) Digital (Pararell/8bit)

LED Controller Lineup Reference



MLEF Series Digital LED Controllers for CompaVis®

For CompaVis™
24V DC, DIN rail mountable



LED Controllers for MG-Wave®

Constant current sensing control system

LED SAFETY STANDARD (CEI/IEC 62471:2006)

Groups	Definition and Emission limit
Exempt	Not more than 1.0 W·m ⁻² . Small source defined as one with <0.011 radian.
Low Risk	Not more than 1.0 W·m ⁻²
Moderate Risk	Not more than 400 W·m ⁻²
High Risk	Higher than 400 W·m ⁻²

Lamp Classification based on IEC standards are applicable to LED lighting units. Criteria for classification is shown above. LEDs are narrow bandwidth light sources with emission levels based on "Blue light, small source" where the wavelength is from 300nm to 700nm. The LED illumination products listed in the catalog are considered to be in either the low risk or exempt group.

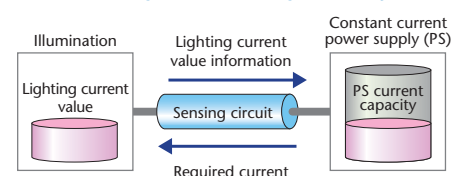


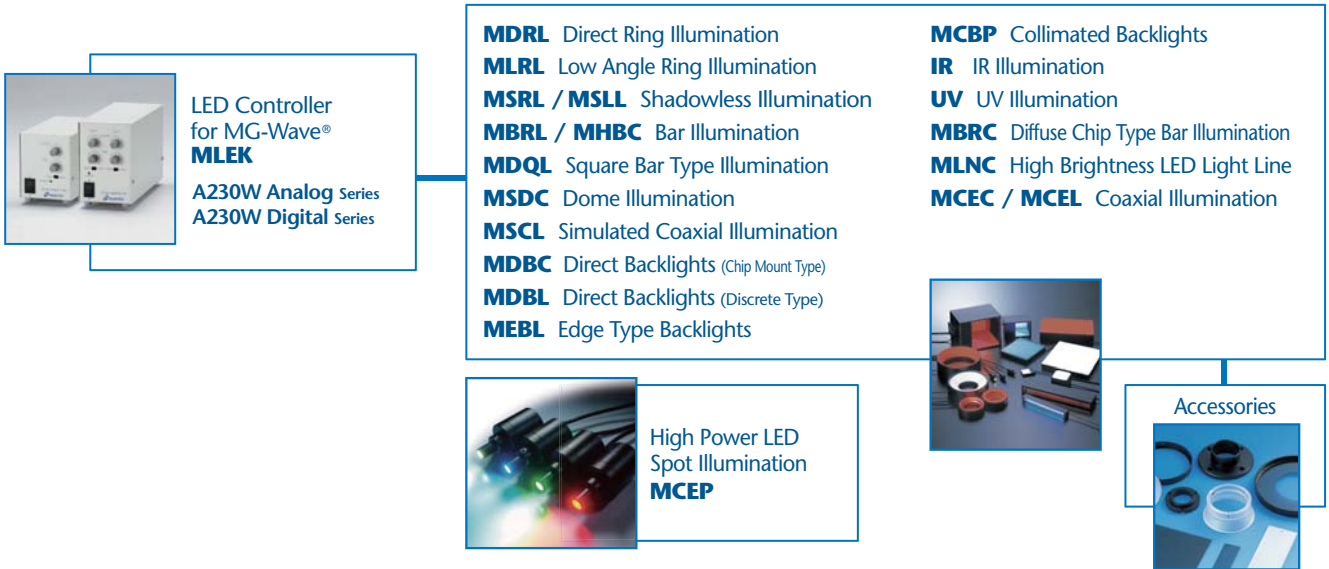
Constant Current Control System

MG-Wave®

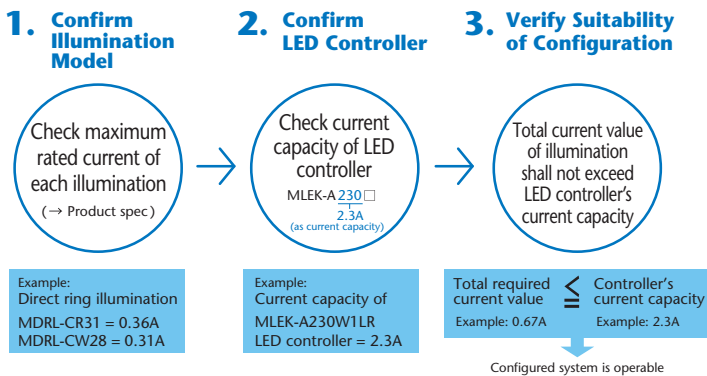
The MG-Wave® is designed and manufactured for optimum performance in Machine Vision applications operating on high-performance processing equipment and inspection systems or in critical conditions in manufacturing facilities. The "Constant Current Control System" enables reduction of heat generation and provides high intensity and stable illumination when compared to other conventional LED illumination and halogen light source systems. The unique patented sensing circuit system addresses one of the most prominent disadvantages of versatility, which other current control systems suffer from, by automatically detecting the required current value of each individual illumination unit upon connection to the controller.

Schematic Diagram of Sensing Circuit System





Before using MG-Wave®
Selection Criteria of LED Controller



- Note
- In the case of 2-channel LED controllers, they can work with up to 2 illumination devices simultaneously as long as the sum of rated current of the 2 devices stays within the current capacity of LED controller.
 - Bifurcated or branch cables cannot be used.
 - Custom-made devices and special design may be available on request.

- CE** CE Marking
- IP67** Protection of Products from Solid Foreign Objects and Water
- Digital** Digital Intensity Control
- Analog** Analog Intensity Control
- 1ch** 1 Channel Output
- 2ch** 2 Channel Output
- 3ch** 3 Channel Output
- 4ch** 4 Channel Output



High Power LED Spot Illumination and Coaxial Illumination MCEP/MCEC/MCEL Series

Four product series ranging in level of intensity from the MCEP-070 Series to MCEL Series are available for customers diverse needs. The wide variety of choices can be used for applications requiring coaxial illumination (eg. MML Series) or spot illumination.



High Power LED Spot Illumination and Coaxial Illumination

MCEP/MCEC/MCEL Series

Ultra high intensity



MCEP 070-3 Series

- Highest illumination in the industry ! By employing state of the art high-power LEDs and our unique heat dissipation technology that enhances luminance efficiency greatly, the series achieves triple illumination compared to our conventional models
- Newly developed collimator and light guiding rod ensure high illumination uniformity

MCEP Series

- High power spot illumination also optimum for MML (Machine Micro Lens) Series coaxial illumination
- 4 colors available for various test objects and applications

MCEC Series

- Optimized for MML Series with high uniformity
- Suitable for applications that require greater brightness than MCEL Series
- Space-saving design with competitive prices

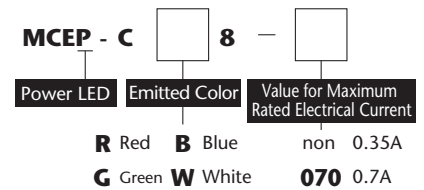
MCEL Series

- Miniaturized coaxial illumination for MML Series
- Best suited for objects with high-reflection or specular surface
- Compact and low price

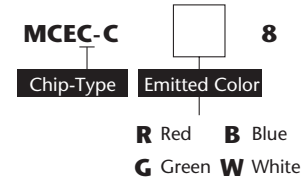
High intensity

Explanation of Model Code

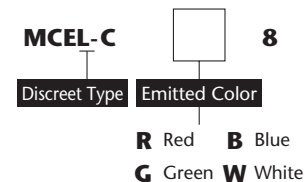
High Power LED Spot Illumination



Coaxial Illumination



Coaxial Illumination



High Power LED Spot Illumination

Model	Emitted Color	Dominant Wavelength Range	Color Temperature	Maximum Rated Current IFM(A)	Weight (g)	Connector PIN
MCEP-CR8-070-3	● Red	620.5~645nm	—	0.7	45	3 Pin
MCEP-CG8-070-3	● Green	520~550nm	—	0.7	45	3 Pin
MCEP-CB8-070-3	● Blue	460~490nm	—	0.7	45	3 Pin
MCEP-CW8-070-3	○ White	—	4500~10000K	0.7	45	3 Pin

Model	Emitted Color	Dominant Wavelength Range	Color Temperature	Maximum Rated Current IFM(A)	Weight (g)	Connector PIN
MCEP-CR8	● Red	620.5~645nm	—	0.35	50	3 Pin
MCEP-CG8	● Green	520~550nm	—	0.35	50	3 Pin
MCEP-CB8	● Blue	460~490nm	—	0.35	50	3 Pin
MCEP-CW8-2N	○ White	—	4500~10000K	0.35	50	3 Pin

Coaxial Illumination

Model	Emitted Color	Tip External Diameter(mm)	Maximum Rated Current IFM(A)	Weight (g)	Connector Pin
MCEC-CR8	● Red	∅8	0.14	35	4 Pin
MCEC-CG8	● Green	∅8	0.17	35	4 Pin
MCEC-CB8	● Blue	∅8	0.17	35	4 Pin
MCEC-CW8	○ White	∅8	0.17	35	4 Pin

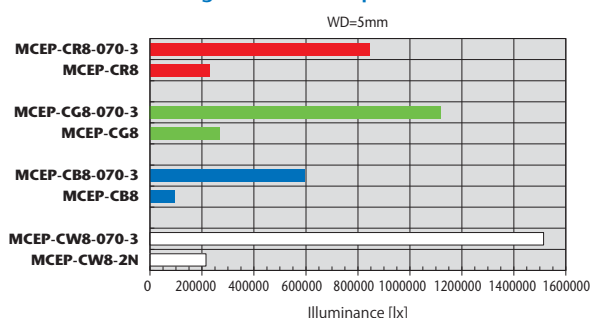
Model	Emitted Color	Tip External Diameter(mm)	Maximum Rated Current IFM(A)	Weight (g)	Connector Pin
MCEL-CR8	● Red	∅8	0.04	35	4 Pin
★ MCEL-CG8	● Green	∅8	0.03	35	4 Pin
MCEL-CB8	● Blue	∅8	0.03	35	4 Pin
MCEL-CW8	○ White	∅8	0.03	35	4 Pin

* LED Controller on P.132~133

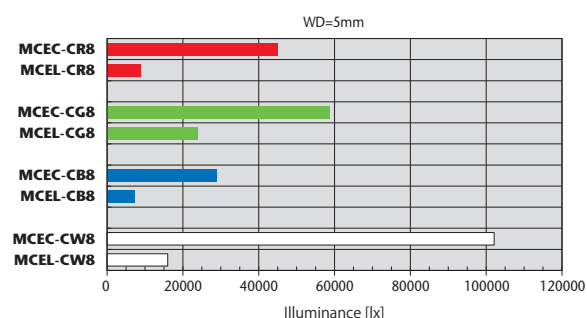
★ Made-to-order products.

* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

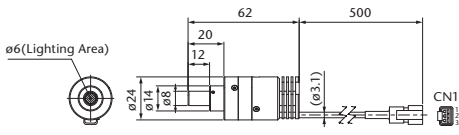
Illuminance Comparison Data High Power LED Spot Illumination



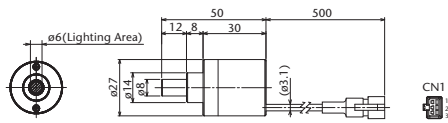
Illuminance Comparison Data Coaxial Illumination



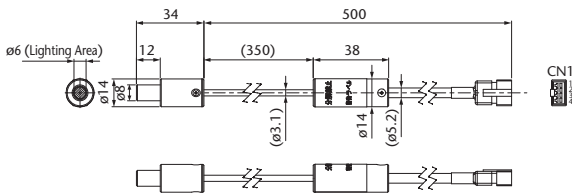
MCEP-CR(CG,CB,CW)8-070-3



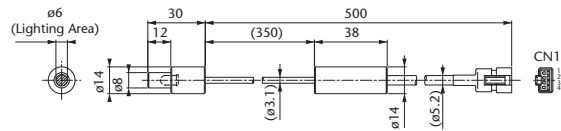
**MCEP-CR(CG,CB)8
MCEP-CW8-2N**



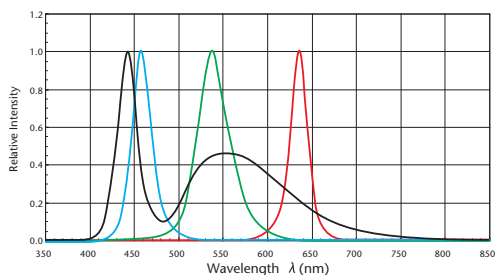
MCEC-CR (CG,CB,CW) 8



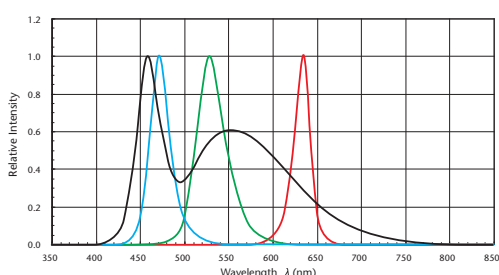
MCEL-CR (CG,CB,CW) 8



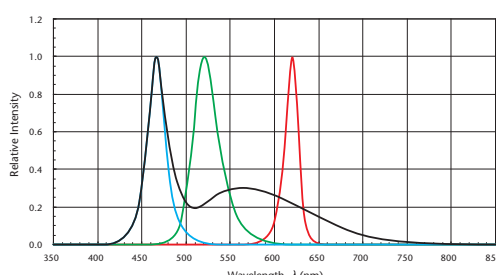
Spectral Characteristic Data



R : Peak Wavelength λ_p = 636.9 (nm) Dominant Wavelength λ_d = 625.6 (nm)
 G : Peak Wavelength λ_p = 538.1 (nm) Dominant Wavelength λ_d = 546.5 (nm)
 B : Peak Wavelength λ_p = 459.0 (nm) Dominant Wavelength λ_d = 463.6 (nm)

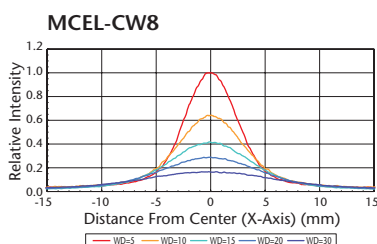
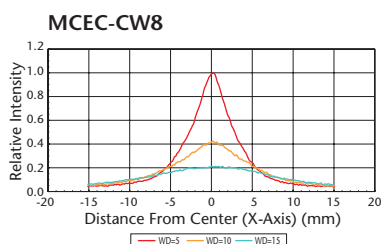
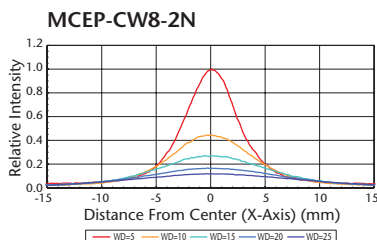
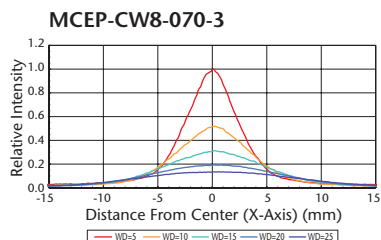


R : Peak Wavelength λ_p = 635.6 (nm) Dominant Wavelength λ_d = 625.2 (nm)
 G : Peak Wavelength λ_p = 529.1 (nm) Dominant Wavelength λ_d = 537.2 (nm)
 B : Peak Wavelength λ_p = 473.0 (nm) Dominant Wavelength λ_d = 473.6 (nm)



R : Peak Wavelength λ_p = 635.6 (nm) Dominant Wavelength λ_d = 625.2 (nm)
 G : Peak Wavelength λ_p = 529.1 (nm) Dominant Wavelength λ_d = 537.2 (nm)
 B : Peak Wavelength λ_p = 473.0 (nm) Dominant Wavelength λ_d = 473.6 (nm)

Light Distribution Characteristics

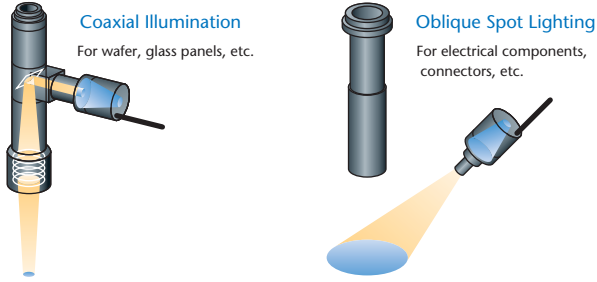


Telecentric Lens

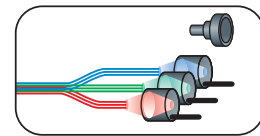
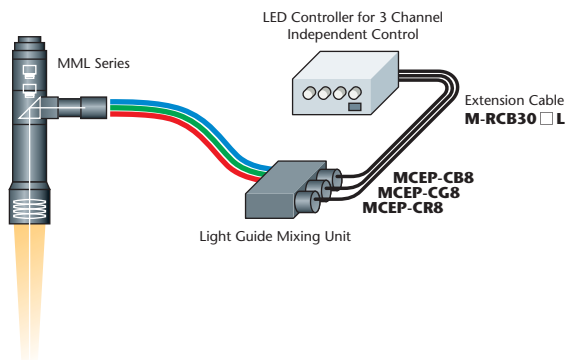


Use the MML Series for the optimal matching of high power LED spot LED illumination (MCEP Series) and a lens with coaxial incident illumination. Our telecentric optical systems with low image distortion offer a variety of supported number of pixels, magnifications, widths, and camera mounts (only with coaxial incidence function). An unparalleled variety of other illumination and lens products, along with technological know-how, is available to solve any problems that our customers may have.

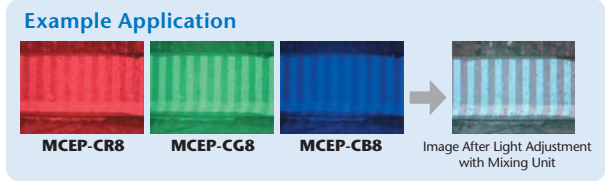
Typical Applications of the MCEP Series



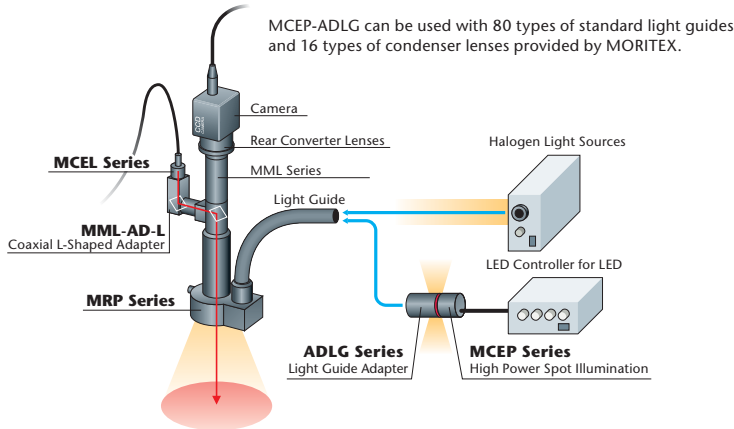
Configuration and Example Application



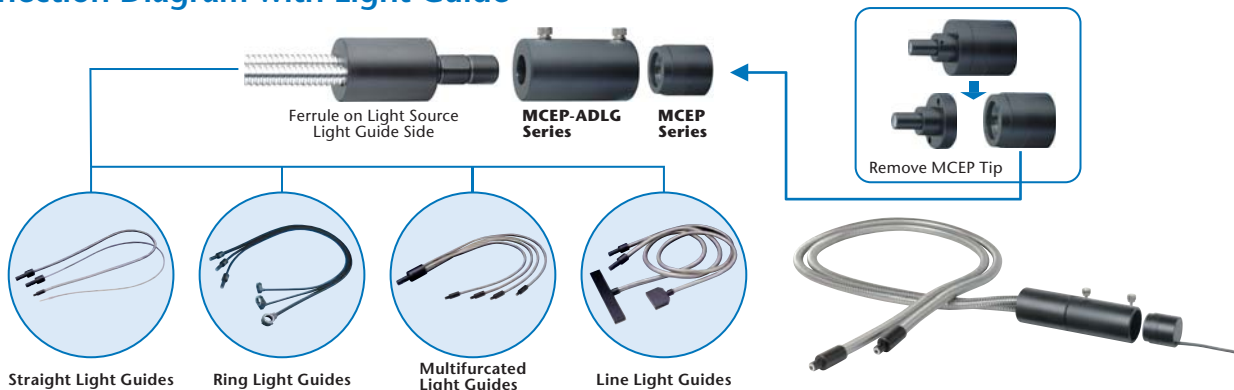
Optic Fibers Are Mixed Randomly Based On Random Numbers Enabling Uniform Illumination



Connection Diagram

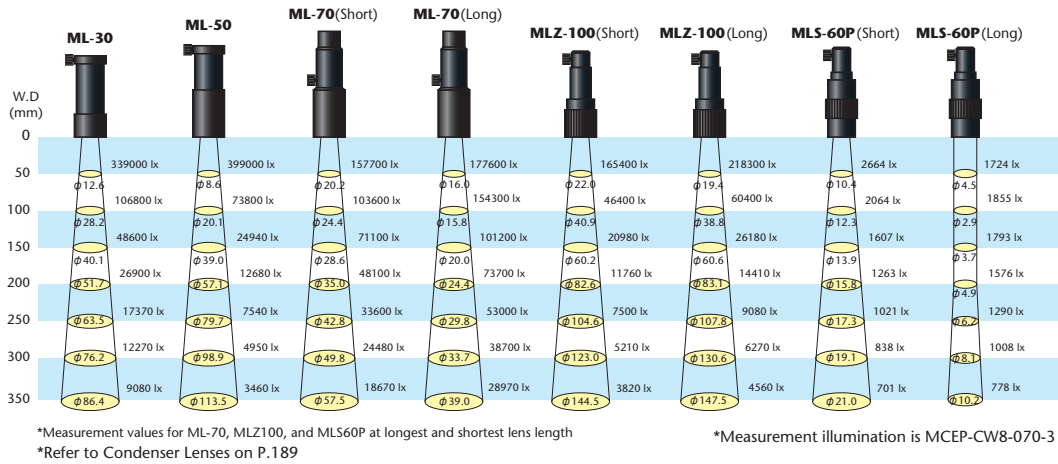


Connection Diagram with Light Guide



Refer to Light Guide on P.178~P.191

Condenser Lenses for Spot Illumination

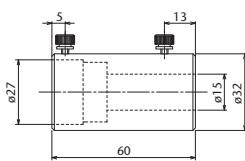


Fiber Connection Options

The MCEP Series can be connected with an optical fiber light guide and used as a small light source. A small amount of light loss and high illuminance is achieved thanks to the use of MORITEX's optical fiber technology, which allows for the efficient introduction of light to the light guide. The multi-adapter unit supports all types of standard light guides manufactured by MORITEX.

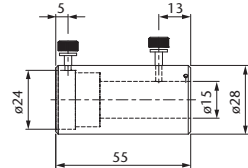
For use with MCEP-C□8

MCEP-ADLG
Light Guide Adapter



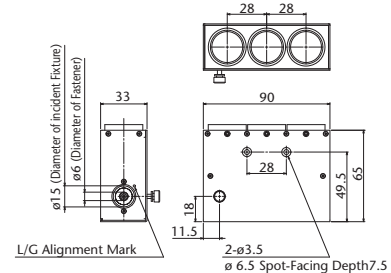
For use with MCEP-C□8-070

MCEP-ADLG24
Light Guide Adapter



For use with both MCEP-C□8 and MCEP-C□8-070

MCEP-AD3LGC
Light Guide Mixing Unit



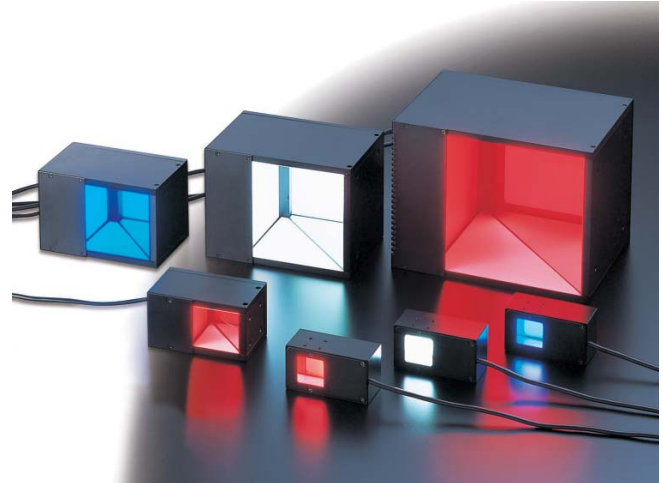
Model	Type	Weight(g)
MCEP-ADLG	1 Light Type	85
MCEP-ADLG24	1 Light Type	60
MCEP-AD3LGC	3 Light Type	200

*Remove adapter from insertion area of illumination equipment when using MCEP-C□8

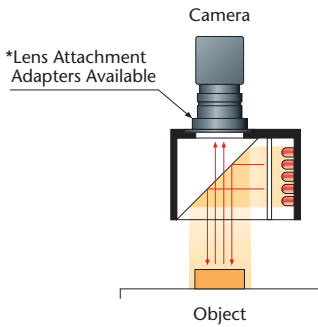
Simulated Coaxial Illumination MSCL Series



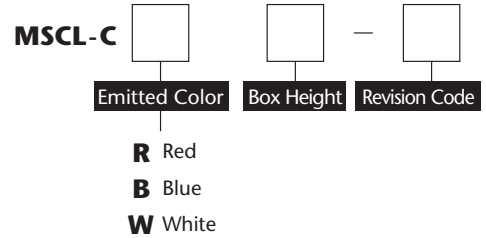
- Highly uniform pseudo-coaxial (on-axis) lighting
- Designed for use with our telecentric MML Series and other lenses without built-in coaxial illumination



Illumination Structure



Explanation of Model Code



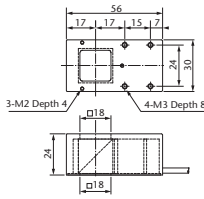
Simulated Coaxial Illumination

MSCL Series

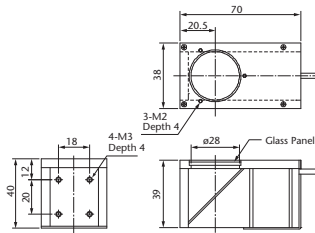
Model	Emitted Color	Maximum Rated Current IFM(A)	Box Height (mm)	Window Size (mm)	Optical Path Length Extension (mm)	Weight (g)
MSCL-CR24	● Red	0.09	24	18 × 18	6.8	110
MSCL-CB24	● Blue	0.20	24	18 × 18		
MSCL-CW24	○ White	0.20	24	18 × 18		
MSCL-CR39	● Red	0.16	39	∅28	1.2	160
MSCL-CB39	● Blue	0.31	39	∅28		
MSCL-CW39	○ White	0.31	39	∅28		
MSCL-CR56-B	● Red	0.33	56	∅28	1.2	320
MSCL-CB56-B	● Blue	0.66	56	∅28		
MSCL-CW56-B	○ White	0.66	56	∅28		
MSCL-CR74-B	● Red	0.62	74	50 × 50	1.2	520
MSCL-CB74-B	● Blue	1.11	74	50 × 50		
MSCL-CW74-B	○ White	1.11	74	50 × 50		

* LED Controller on P.132-133
 * In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.
 * MLM Series products (Light control film) on P.136 can be attached to MSCL-C **-B products. Made-to-order products

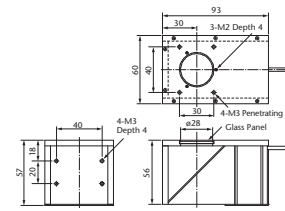
MSCL-CR (CB,CW) 24



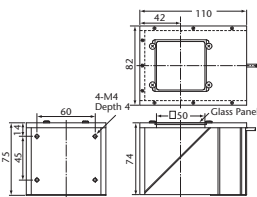
MSCL-CR (CB,CW) 39



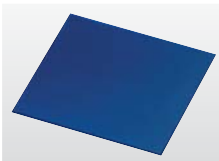
MSCL-CR (CB,CW) 56-B



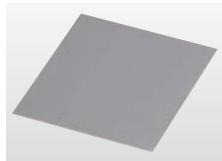
MSCL-CR (CB,CW) 74-B



Accessories



Polarizer
(P.136)



Light Control Film
(P.136)

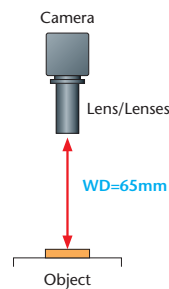


Lens Attachment Adapter
(P.137)

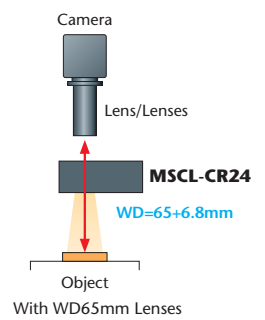
About Installation

Because glass components are used in the MSCL units, the internal optical path length will change when used. Be aware of the extended optical path when installing in a vision system.

■ Without **MSCL-CR24**



■ With **MSCL-CR24**



Sample Images

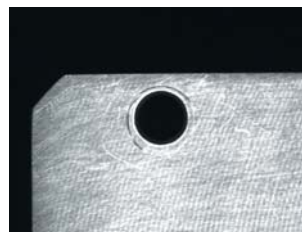
MSCL



Dry Cell



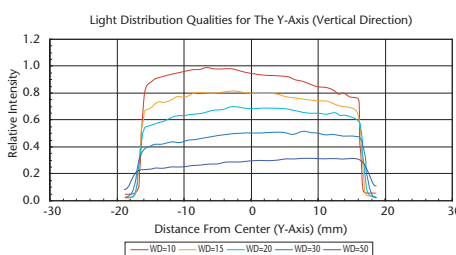
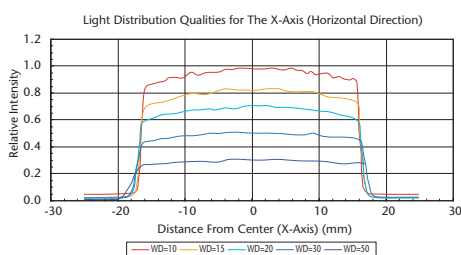
CD (Scratch)



Metal Parts

Light Distribution Characteristics

MSCL-CW56-B



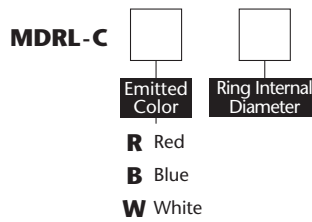
Direct Ring Illumination

MDRL Series



- High intensity LEDs deployed in high density to provide uniform direct, bright-field 360-degree lighting
- Standard LED illumination for a wide range of applications
- Models can be selected to match the diameter of our lens models

Explanation of Model Code

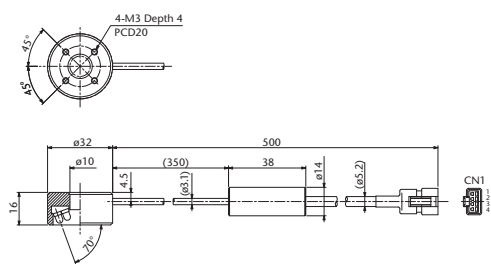


Model	Emitted Color	Maximum Rated Current IFM(A)	Ring Internal Diameter (mm)	Ring External Diameter (mm)	Lighting Angle	Weight (g)
MDRL-CR10	● Red	0.11	ø10	ø32	70°	50
MDRL-CB10	● Blue	0.17	ø10	ø32	70°	50
MDRL-CW10	○ White	0.17	ø10	ø32	70°	50
MDRL-CR16	● Red	0.24	ø16	ø48	76°	65
MDRL-CB16	● Blue	0.37	ø16	ø48	76°	65
MDRL-CW16	○ White	0.37	ø16	ø48	76°	65
MDRL-CR28	● Red	0.20	ø28	ø50	75°	65
MDRL-CB28	● Blue	0.31	ø28	ø50	75°	65
MDRL-CW28	○ White	0.31	ø28	ø50	75°	65
MDRL-CR31	● Red	0.36	ø31	ø66	75°	130
MDRL-CB31	● Blue	0.55	ø31	ø66	75°	130
MDRL-CW31	○ White	0.55	ø31	ø66	75°	130
MDRL-CR36	● Red	0.36	ø36	ø66	75°	120
MDRL-CB36	● Blue	0.55	ø36	ø66	75°	120
MDRL-CW36	○ White	0.55	ø36	ø66	75°	120
MDRL-CR50	● Red	0.64	ø50	ø90	70°	180
MDRL-CB50	● Blue	0.96	ø50	ø90	70°	180
MDRL-CW50	○ White	0.96	ø50	ø90	70°	180

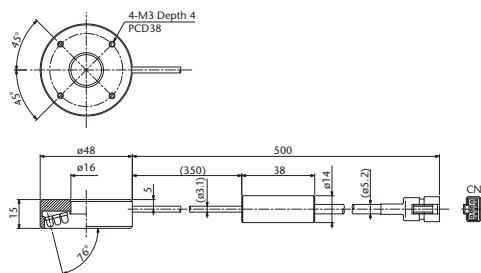
* LED Controller on P.132-133

* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

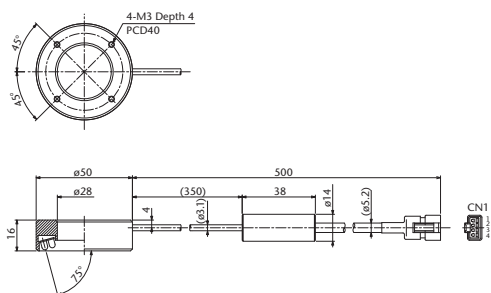
MDRL-CR (CB,CW) 10



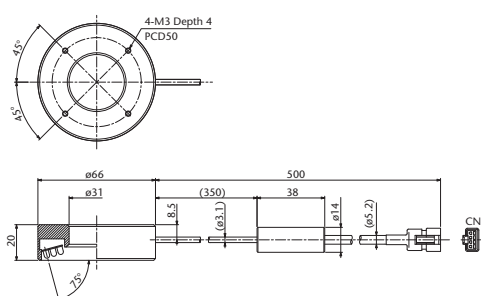
MDRL-CR (CB,CW) 16



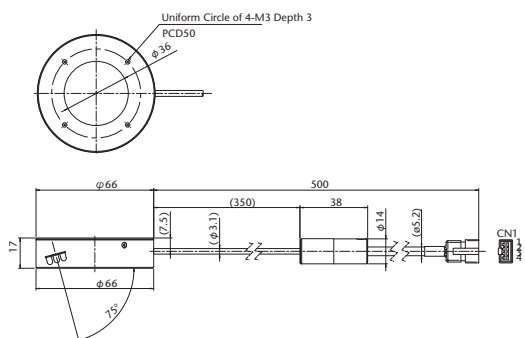
MDRL-CR (CB,CW) 28



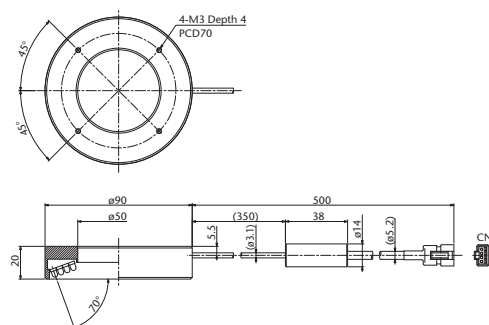
MDRL-CR (CB,CW) 31



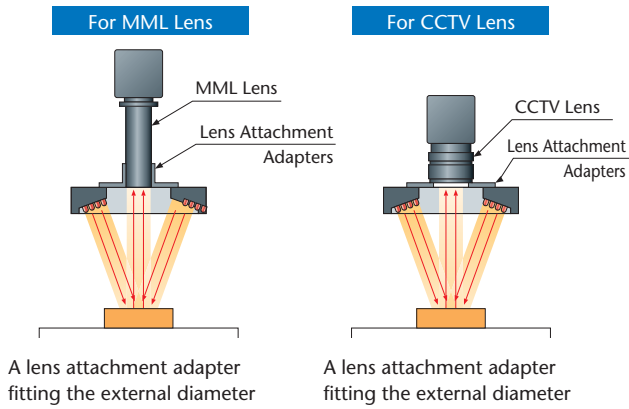
MDRL-CR (CB,CW) 36



MDRL-CR (CB,CW) 50



Illumination Structure



Sample Images



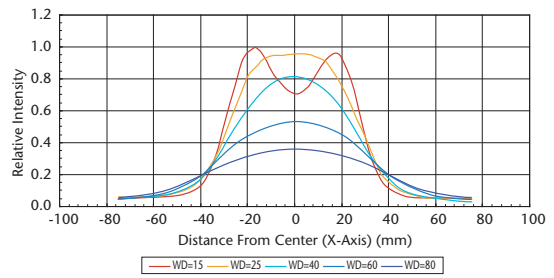
Button Components for Mobile Phone



Grooves on Top of a Pull-Top Can

Light Distribution Characteristics

MDRL-CW31



Direct Ring Options

Diffuser and Polarizer are available to prevent the vignetting of images. Adapters for attachment to MORITEX Lenses are also available.



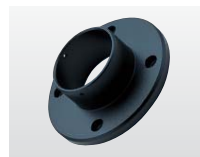
Diffuser
(P.135)



Polarizer
(P.136)

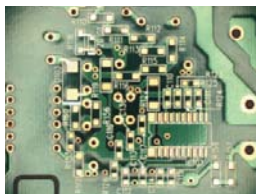


Adapters
(P.135)



Lens Attachment Adapter
(P.137)

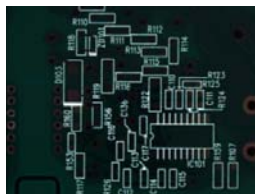
Examples of PCB images with various accessories



MDRL



With Diffuser



With Diffuser & Polarizer

In the first image significant vignetting is seen. Attaching a Diffuser alone reduced the vignetting slightly and attaching an additional Polarizer removed it completely.

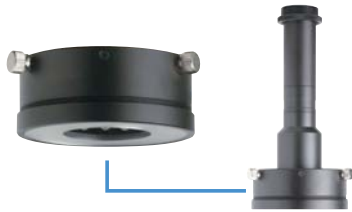


Direct Ring Illumination

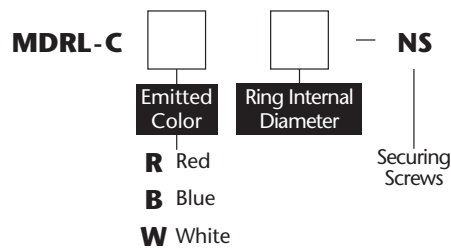
MDRL-NS Series



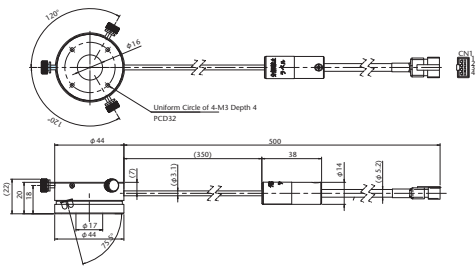
Securing screws allow these ring lights to be conveniently coupled with MORITEX MML lenses.



Explanation of Model Code



MDRL-CR (CB,CW) 16-NS



Model	Emitted Color	Maximum Rated Current IFM(A)	Ring Internal Diameter (mm)	Ring External Diameter (mm)	Lighting Angle	Weight (g)
MDRL-CR16-NS	● Red	0.15	ø16	ø44	75.5°	70
★ MDRL-CB16-NS	● Blue	0.24	ø16	ø44	75.5°	70
MDRL-CW16-NS	○ White	0.24	ø16	ø44	75.5°	70

* LED Controller on P.132~133

* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

★ Made-to-order products.

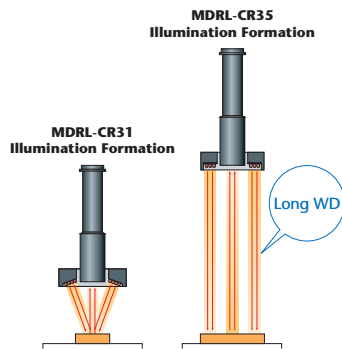
Long working distances MDRL-C□35

- This fully direct, long working distance illumination design makes a clear distinction from the conventional direct ring series
- The recommended working distance is 65 mm or greater. If the object surface is reflective, a working distance of about 200 mm is recommended.

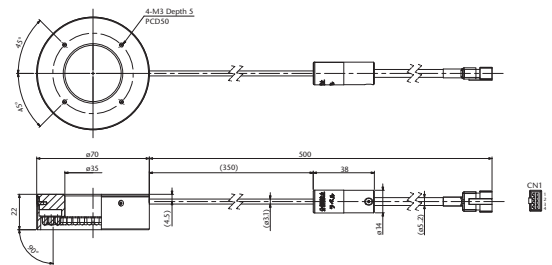
* Be sure to check performance with a demonstration model before making a selection.



Illumination Structure

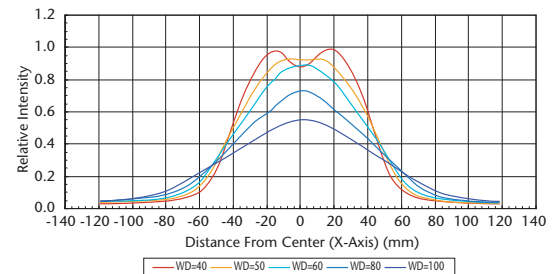


MDRL-CR (CB,CW) 35



Light Distribution Characteristics

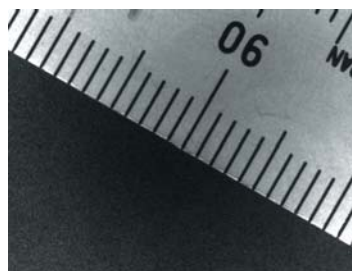
MDRL-CW35



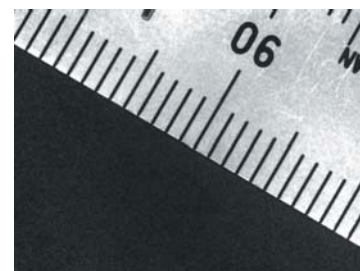
Sample Images



WD=40mm **MDRL-CR31**
Uniformly Illuminated



WD=40mm **MDRL-CR35**
Not Much Light at Short WD



WD=60mm **MDRL-CR35**
Full of Light at This WD

Model	Emitted Color	Maximum Rated Current IFM(A)	Ring Internal Diameter (mm)	Ring External Diameter (mm)	Lighting Angle	Weight (g)
MDRL-CR35	● Red	0.34	ø35	ø70	90°	150
MDRL-CB35	● Blue	0.52	ø35	ø70	90°	150
MDRL-CW35	○ White	0.52	ø35	ø70	90°	150

* LED Controller on P.132~133

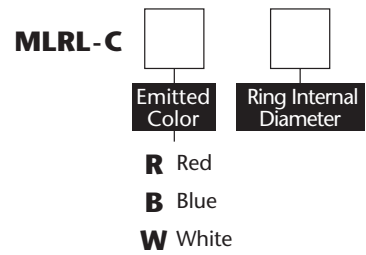
* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

Low Angle Ring Illumination MLRL Series



- Reflection can be minimized by the low-angle, dark-field lighting configuration
- Ideal for shiny or uneven surfaces, eg. embossment and surface flaw detection

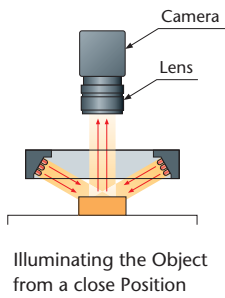
Explanation of Model Code



Low Angle Ring Illumination

MLRL Series

Illumination Structure



Sample Images

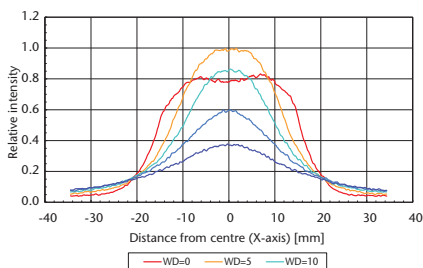
MLRL-CW100



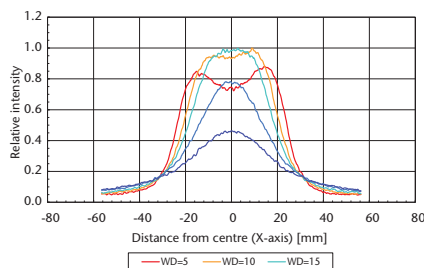
Button Components for Mobile Phone

Light Distribution Characteristics

MLRL-CW25



MLRL-CW48



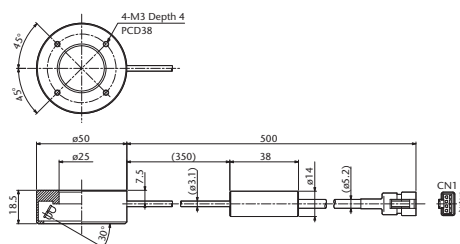
Lineup of Low Angle Ring Type LEDs

Model	Emitted Color	Maximum Rated Current IFM(A)	Ring Internal Diameter (mm)	Ring External Diameter (mm)	Lighting Angle	Weight (g)
MLRL-CR25	● Red	0.15	ø25	ø50	30°	70
MLRL-CB25	● Blue	0.24	ø25	ø50	30°	70
MLRL-CW25	○ White	0.24	ø25	ø50	30°	70
MLRL-CR48	● Red	0.30	ø48	ø74	30°	110
MLRL-CB48	● Blue	0.47	ø48	ø74	30°	110
MLRL-CW48	○ White	0.47	ø48	ø74	30°	110
MLRL-CR100	● Red	0.96	ø100	ø140	15°	320
MLRL-CB100	● Blue	1.03	ø100	ø140	15°	320
MLRL-CW100	○ White	1.03	ø100	ø140	15°	320

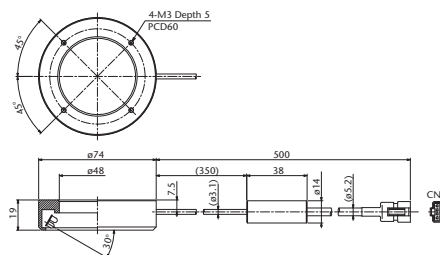
* LED Controller on P.132-133

* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

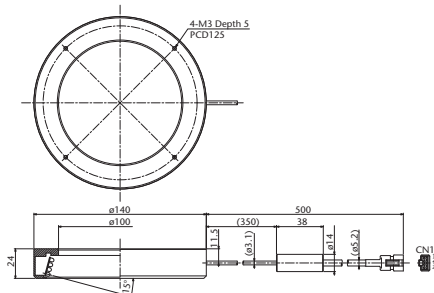
MLRL-CR (CB,CW) 25



MLRL-CR (CB,CW) 48



MLRL-CR (CB,CW) 100



Accessories for Low Angle Ring Lights

Good for producing more uniform illumination than with direct lighting and for reducing glare and reflections.

Diffuser Ring (P.135)

Shadowless Illumination MSRL/MSLL Series



Shadowless Ring Illumination: MSRL Series

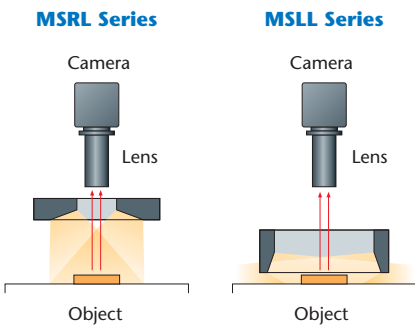
- Diffuse, shadowless illumination preventing halation effect
- Optimal soft, uniform light for shiny surfaces

Shadowless Low Angle Ring Illumination: MSLL Series

- Shallow angle LED illumination that provides very diffuse & uniform light ideal for reflective surfaces



Illumination Structure



MSLL-CR109



D-Subconnector

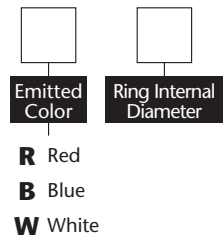


Bottom of Can

Explanation of Model Code

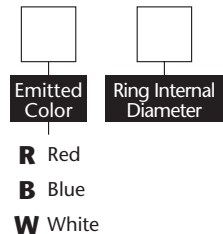
Shadowless Ring Type LEDs

MSRL-C



Shadowless, Low Angle Ring Type LEDs

MSLL-C



Lineup of Shadowless Ring Type LEDs

Model	Emitted Color	Maximum Rated Current IFM(A)	Ring Internal Diameter (mm)	Ring External Diameter (mm)	Weight (g)
MSRL-CR20	● Red	0.32	ø20	ø74	140
MSRL-CB20	● Blue	0.50	ø20	ø74	140
MSRL-CW20	○ White	0.50	ø20	ø74	140
MSRL-CR44	● Red	0.57	ø44	ø123	270
MSRL-CB44	● Blue	0.80	ø44	ø123	270
MSRL-CW44	○ White	0.80	ø44	ø123	270

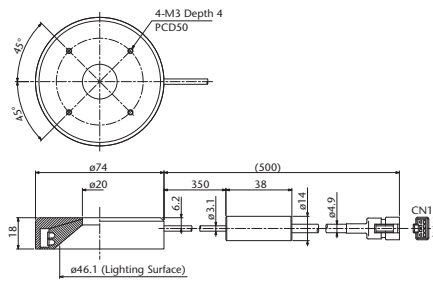
* LED Controller on P.132-133
 * In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

Lineup of Shadowless, Low Angle Ring Type LEDs

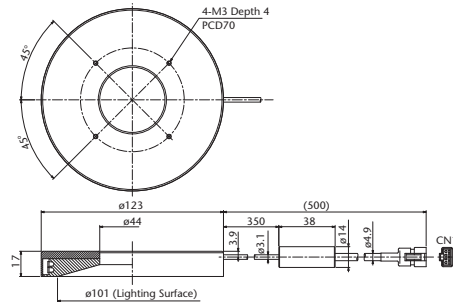
Model	Emitted Color	Maximum Rated Current IFM(A)	Ring Internal Diameter (mm)	Ring External Diameter (mm)	Weight (g)
MSLL-CR109	● Red	0.62	ø109	ø136	320
★ MSLL-CB109	● Blue	1.10	ø109	ø136	320
MSLL-CW109	○ White	1.10	ø109	ø136	320

* LED Controller on P.132-133 ★Made-to-order products.
 * In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

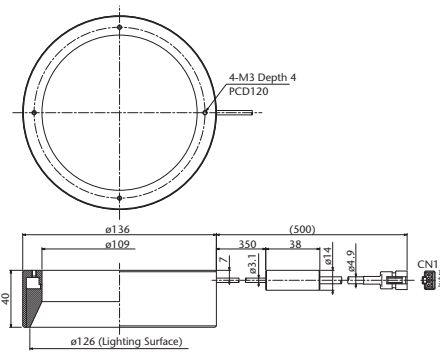
MSRL-CR (CB,CW) 20



MSRL-CR (CB,CW) 44

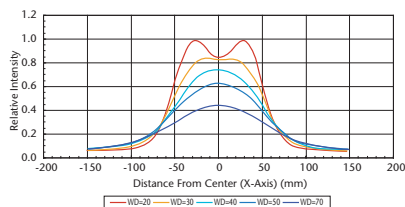


MSLL-CR (CB,CW) 109

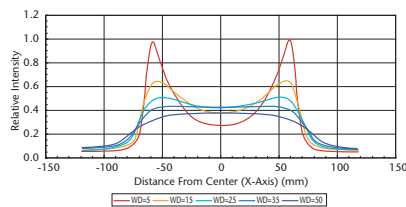


Light Distribution Characteristics

MSRL-CW44



MSLL-CW109



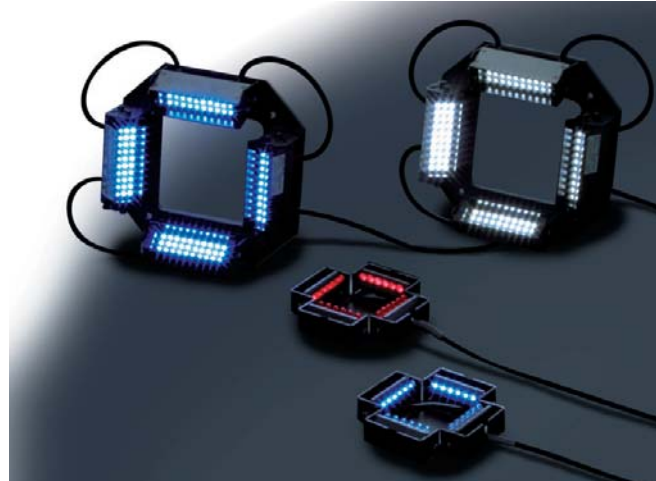
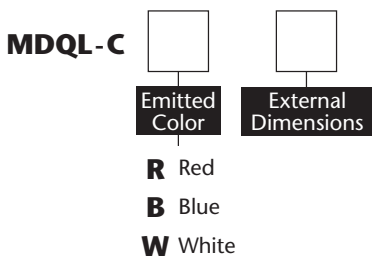


Square Bar Type Illumination

MDQL Series

- Four high-intensity bar LED arrangement
- Direct & oblique lighting from adjustable lighting angles from bright to dark-field

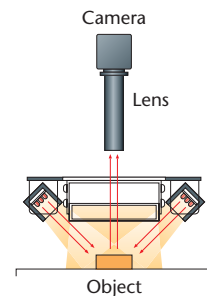
Explanation of Model Code



Model	Emitted Color	Maximum Rated Current IFM (A)	Internal Dimensions (mm)	External Dimensions (mm)	Weight (g)
MDQL-CR58	● Red	0.09	□ 25	□ 58	55
★ MDQL-CB58	● Blue	0.17	□ 25	□ 58	
MDQL-CW58	○ White	0.17	□ 25	□ 58	

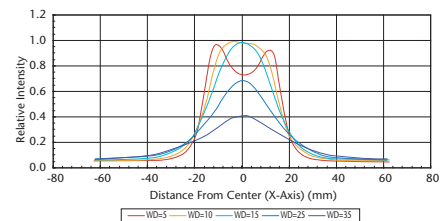
* LED Controller on P.132-133 ★ Made-to-order products.
 * In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

Illumination Structure

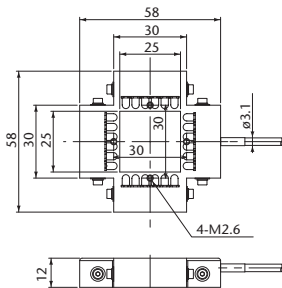


Light Distribution Characteristics

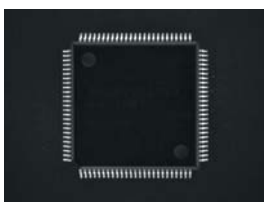
MDQL-CW58



MDQL-CR (CB,CW) 58



Sample Images



IC Pins

Accessories

Diffusion Plate



(P.135)

Polarizer



(P.136)

Diffuser and Polarizer are available to prevent the vignetting of images.



Bar Illumination

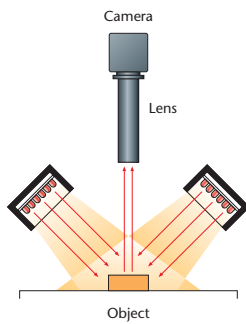
MBRL Series



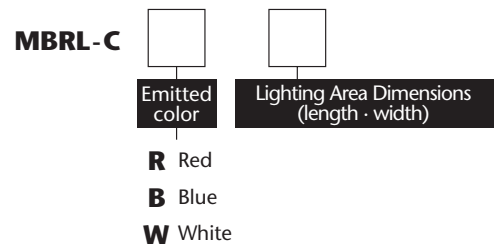
- High-intensity LED block array
- Can be directed at any angle to the surface for either direct, bright-field lighting or optimal oblique, dark-field lighting



Illumination Structure



Explanation of Model Code



Bar Illumination

MBRL Series

Model	Emitted Color	Maximum Rated Current IFM(A)	Lighting Area Dimensions (mm)	Weight (g)
MBRL-CR5015	● Red	0.13	50×15	50
MBRL-CB5015	● Blue	0.26	50×15	
MBRL-CW5015	○ White	0.26	50×15	
MBRL-CR7530	● Red	0.36	75×30	120
MBRL-CB7530	● Blue	0.52	75×30	
MBRL-CW7530	○ White	0.52	75×30	
MBRL-CR13015	● Red	0.32	130×15	85
MBRL-CB13015	● Blue	0.53	130×15	
MBRL-CW13015	○ White	0.53	130×15	

* LED Controller on P.132-133

★ Made-to-order products.

* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

Sample Images

MBRL-CW7530 with MDF-BR7530



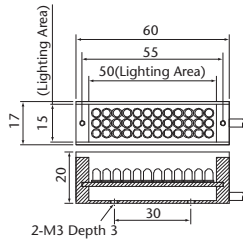
Wafer Characters

MBRL-CR7530

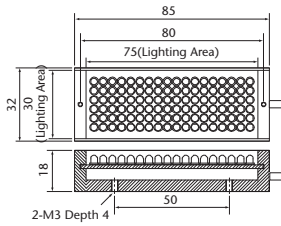


Razor Edge

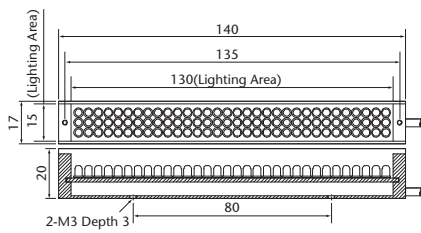
MBRL-CR (CB,CW) 5015



MBRL-CR (CB,CW) 7530

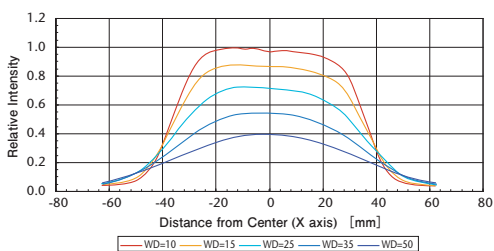


MBRL-CR (CB,CW) 13015



Light Distribution Characteristics

MBRL-CW7530



Accessories

Diffusion Plate



(P.135)

Polarizer



(P.136)

Diffuser and Polarizer are available to prevent the vignetting of images.

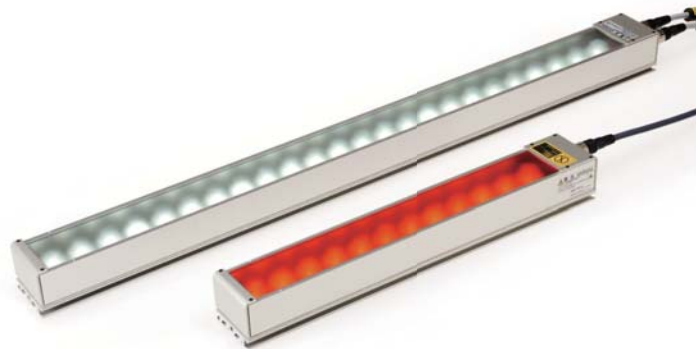
High Power Bar Illumination

MHBC Series



Bar illumination that provides high power and uniform light for large area applications.

- High intensity illumination over wide areas
- Compact body design, 50 mm (W) and 45 mm (H)
- Integrated mounting rail system for flexible installation



Model	Emitted Color	Maximum Rated Current IFM(A)	Lighting Area Dimensions (mm)	Weight (g)
MHBC-CW150-DF	○ White	1.15	42×150	450
MHBC-CW300-DF	○ White	2.3	42×300	850
MHBC-CW450-DF-2CH	○ White	3.45	42×450	1300
MHBC-CW600-DF-2CH	○ White	4.6	42×600	1600
★ MHBC-CR150-DF	● Red	1.15	42×150	450
★ MHBC-CR300-DF	● Red	2.3	42×300	850
★ MHBC-CR450-DF-2CH	● Red	3.45	42×450	1300
★ MHBC-CR600-DF-2CH	● Red	4.6	42×600	1600

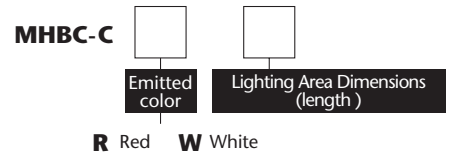


* LED Controller on P.132-133 ★ Made-to-order products.
 * In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

Conversion Cable

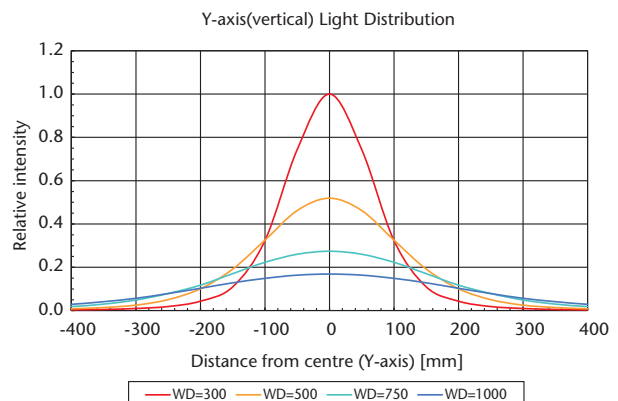
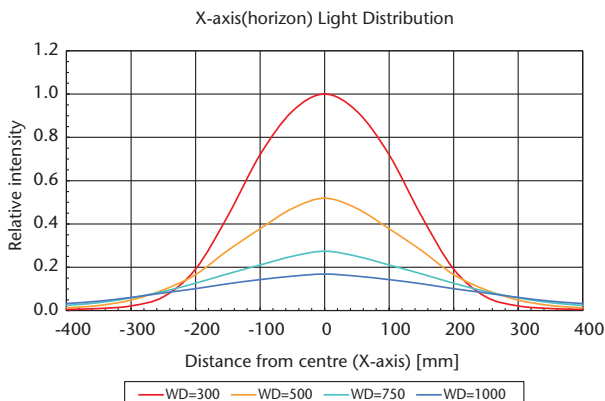
Model	Product Type	Length
M-RCB40018XS	MHBC Conversion Cable	180mm

Explanation of Model Code

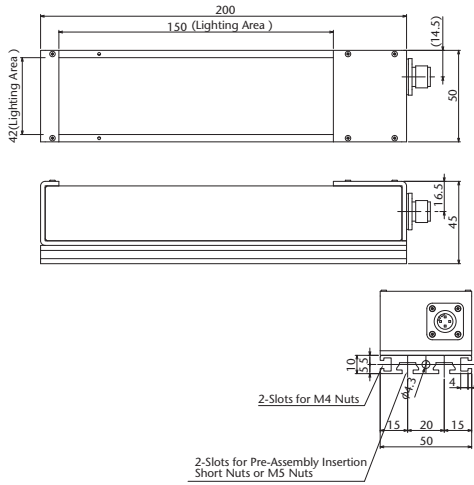


Light Distribution Characteristics

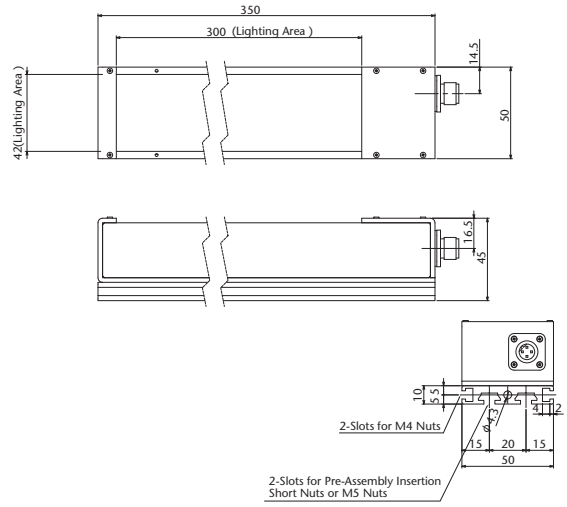
MHBC-CW300-DF



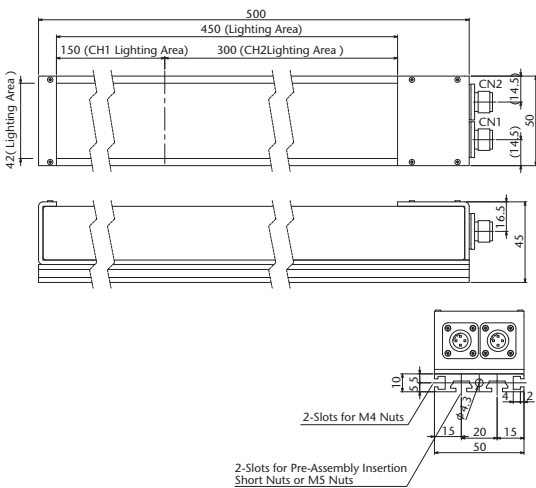
MHBC-CW(CR)150-DF



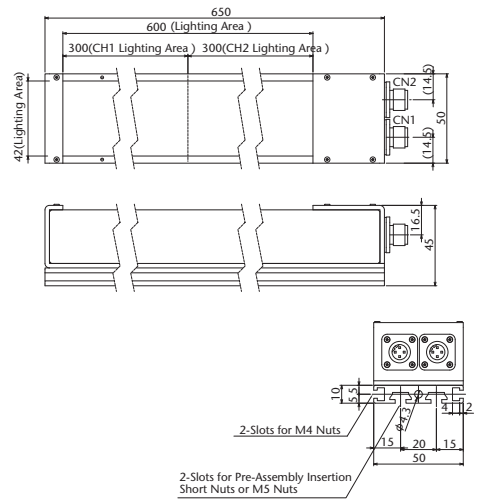
MHBC-CW(CR)300-DF



MHBC-CW(CR)450-DF-2CH

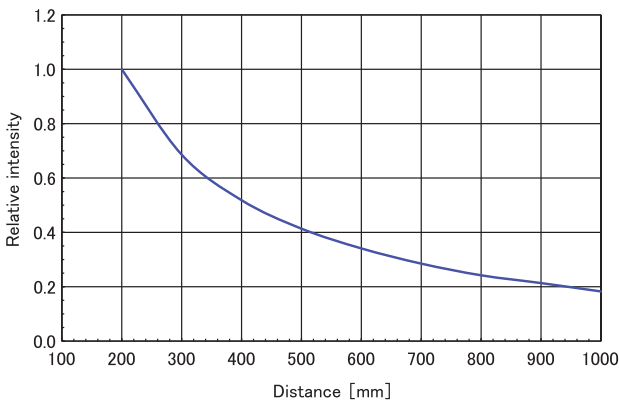


MHBC-CW(CR)600-DF-2CH



Light Intensity Characteristics

MHBC-CW600-DF-2CH
Peak intensity: 46,800[lx]/200[mm]



High Power Simple Dome Illumination

MSDC Series



High power dome illumination achieving 3× increase in brightness while maintaining uniformity at a competitive price.

- Brightness has been increased by 3× from our conventional models with the latest, state-of-the-art high power LED chips
- Perfectly diffused light provides extremely uniform illumination without glare which is ideal for curved or glossy surface inspection
- Designed for reduced weight, the lightweight 156 mm diameter version is 1/6 the weight of our conventional models

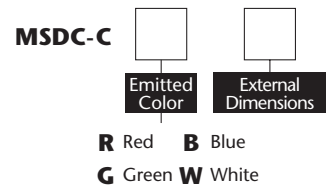


High Power Simple Dome Illumination

MSDC Series

Model Name	Emitted Color	Maximum Rated Current IFM (A)	Internal Diameter of Dome (mm)	Outside Diameter (mm)	Height (mm)	Weight (g)
MSDC-CR156	● Red	1.49	∅ 110	∅ 156	66	270
★ MSDC-CG156	● Green	1.49	∅ 110	∅ 156	66	270
★ MSDC-CB156	● Blue	1.49	∅ 110	∅ 156	66	270
MSDC-CW156	○ White	1.49	∅ 110	∅ 156	66	270

Explanation of Model Code



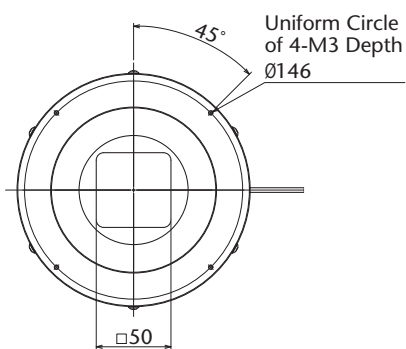
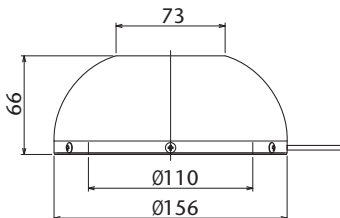
* LED Controller on P.132-133

★ Made-to-order products.

* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.



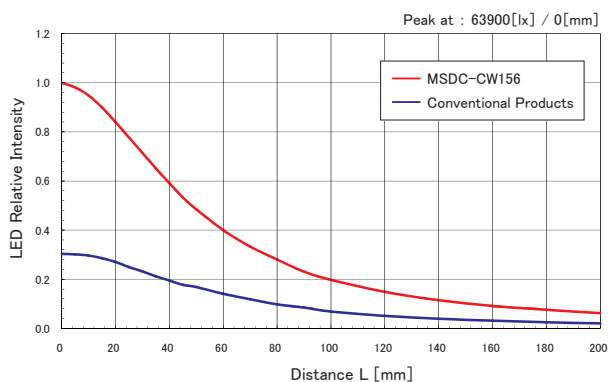
MSDC-C□156



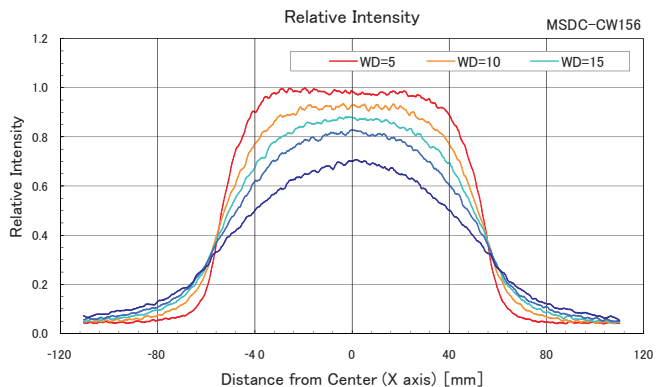
Sample Images



Light Intensity Characteristics



Light Distribution Characteristics

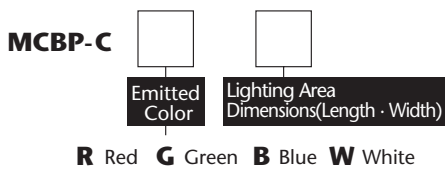




Collimated Backlights MCBP Series

- Adjustable projected, collimated back light
- Capable of capturing the profile of an object with higher precision than other backlights

Explanation of Model Code



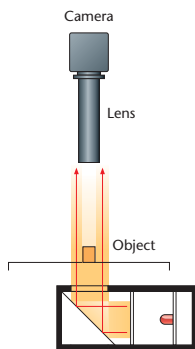
Model	Emitted Color	Maximum Rated IFM (A)	Dimensions of Lighting Surface (mm)	Weight (g)
★ MCBP-CR3430	● Red	0.07	34×30	260
★ MCBP-CG3430	● Green	0.07	34×30	260
MCBP-CB3430	● Blue	0.07	34×30	260
★ MCBP-CW3430	○ White	0.07	34×30	260

* LED Controller on P.132-133

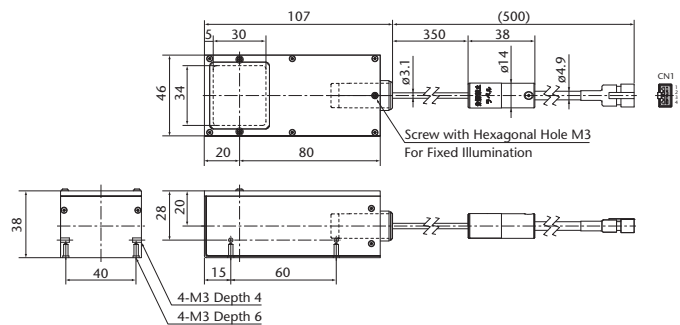
* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

★ Made-to-order products.

Illumination Structure



MCBP-CR (CG,CB,CW) 3430



Sample Images

Screw



Direct Backlight (MDBL-CB70)
Shape unclear because of stray, direct light.



Collimated Backlight (MCBP-CB3430)
Easy to identify shape because effect of stray, direct light is eased by the Collimated light.

Embossed Characters On Clear Resin



Direct Backlight (MDBL-CB70)
Ordinary light transmitted evenly through the entire object.



Collimated Backlight (MCBP-CB3430)
Reflected light directed at characters for clear identification also makes external shape identification possible.

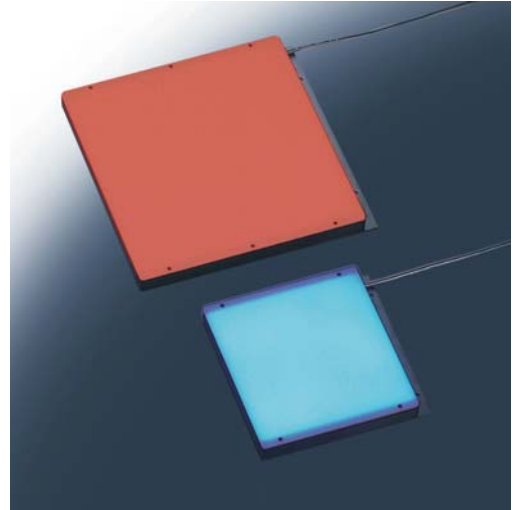


Direct Backlights (Chip Mount Type)

MDBC Series

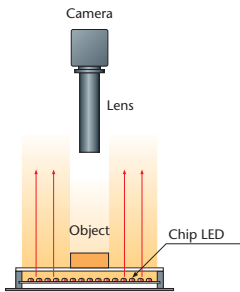


- Provide intense but diffused versatile lighting
- Because of the thin body design, these chip mounted units are ideal for saving space

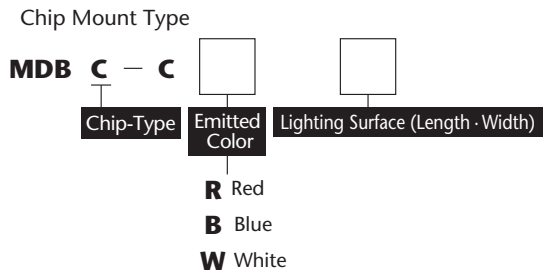


Illumination Structure

MDBC Series



Explanation of Model Code

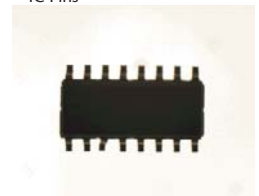


Sample Images

Beverage Bottle Liquid Level Detection



IC Pins



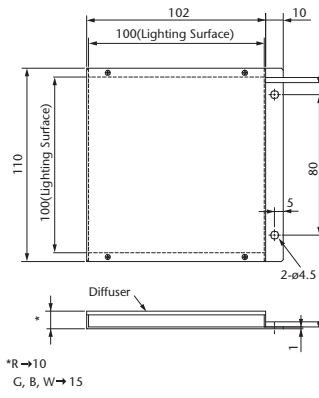
Model	Emitted Color	Maximum Rated Current IFM(A)	Dimensions of Lighting Surface (mm)	Weight (g)
MDBC-CR100	● Red	0.80	100×100	170
★ MDBC-CB100	● Blue	0.95	100×100	
MDBC-CW100-2	○ White	0.95	100×100	
MDBC-CR150	● Red	0.99	150×150	310
★ MDBC-CB150	● Blue	2.14	150×150	
MDBC-CW150-2	○ White	2.14	150×150	

* LED Controller on P.132-133

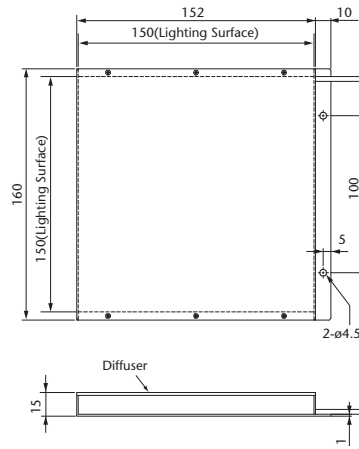
★ Made-to-order products.

* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

MDBC-CR(CB, CW) 100

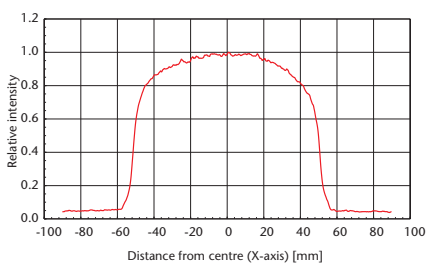


MDBC-CR(CB, CW) 150

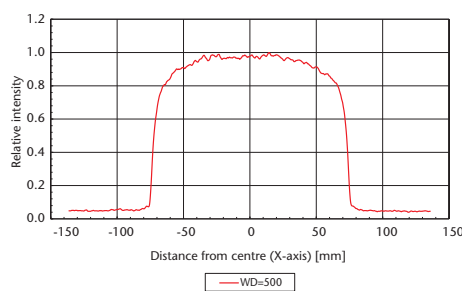


Light Distribution Characteristics

MDBC-CW100-2



MDBC-CW150-2

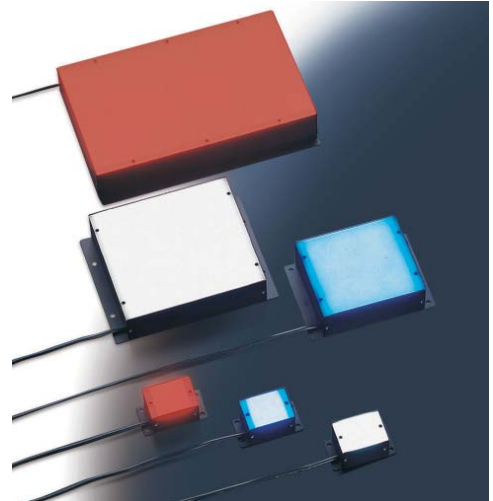


Direct Backlights (Discrete Type)

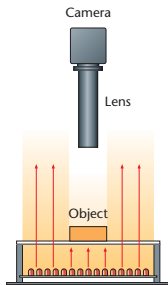
MDBL Series



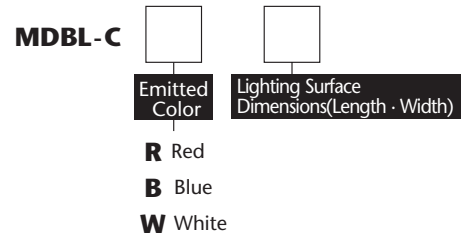
- Due to the LEDs mounted immediately beneath the diffusion plate surface, this unit achieves a higher luminance than the edge type backlights.
- Mount holds for easy installation



Illumination Structure



Explanation of Model Code



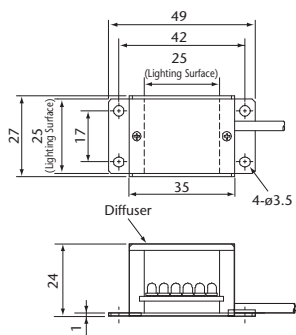
Direct Backlights (Discrete Type)

MDBL Series

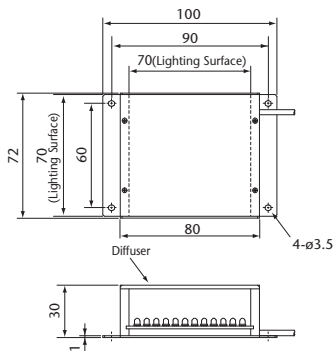
Model	Emitted Color	Maximum Rated Current IFM (A)	Dimensions of Lighting Surface (mm)	Weight (g)
MDBL-CR25	● Red	0.14	25×25	60
MDBL-CB25	● Blue	0.27	25×25	
MDBL-CW25	○ White	0.27	25×25	
MDBL-CR70	● Red	0.48	70×70	190
MDBL-CB70	● Blue	0.96	70×70	
MDBL-CW70	○ White	0.96	70×70	

* LED Controller on P.132-133
 * In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

MDBL-CR (CB,CW) 25



MDBL-CR (CB,CW) 70



Sample Images

Connector



Plaster

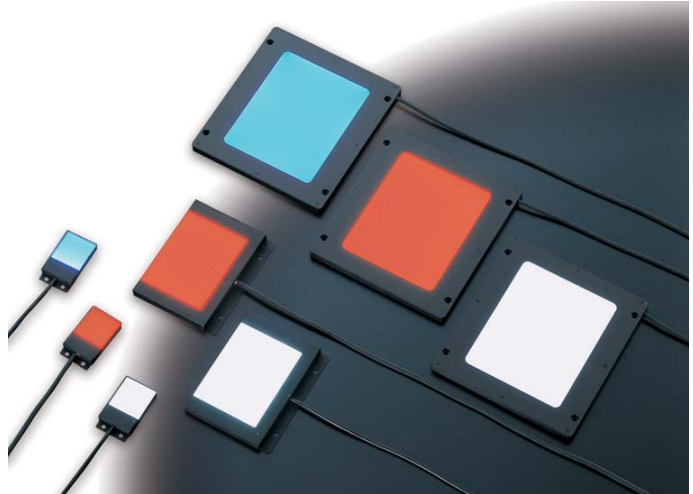




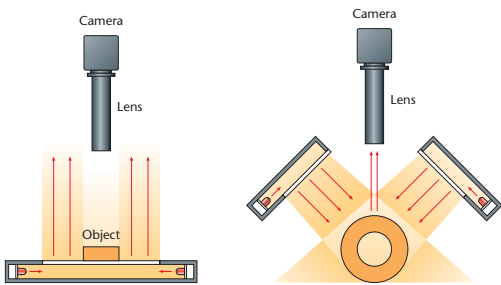
Edge Type Backlights

MEBL Series

- Requires very little space due to slim, compact design
- Provides very uniform, indirect light by means of a unique light transfer diffusion plate & additional diffusion sheets

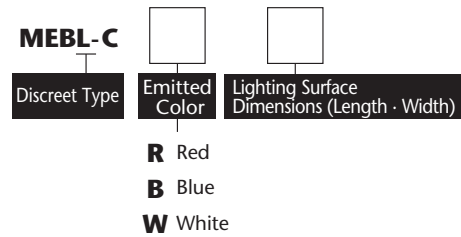


Illumination Structure



The MEBL Series can also be used as a reflective light for a samples with local reflection.

Explanation of Model Code



Edge Type Backlights

MEBL Series

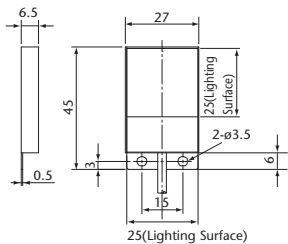
Model	Emitted Color	Maximum Rated Current IFM (A)	Dimensions of Lighting Surface (mm)	Weight (g)
MEBL-CR25	● Red	0.03	25×25	45
MEBL-CB25	● Blue	0.04	25×25	
MEBL-CW25	○ White	0.04	25×25	
MEBL-CR50	● Red	0.17	50×50	110
MEBL-CB50	● Blue	0.29	50×50	
MEBL-CW50	○ White	0.29	50×50	
MEBL-CR7050	● Red	0.15	70×50	140
MEBL-CB7050	● Blue	0.25	70×50	
MEBL-CW7050	○ White	0.25	70×50	
MEBL-CR10080	● Red	0.32	100×80	230
MEBL-CB10080	● Blue	0.57	100×80	
MEBL-CW10080	○ White	0.57	100×80	

*LED Controller on P.132-133

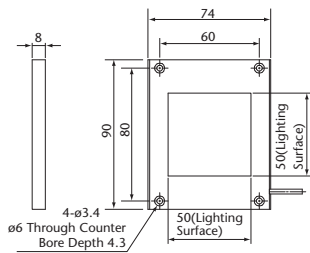
* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

★Made-to-order products.

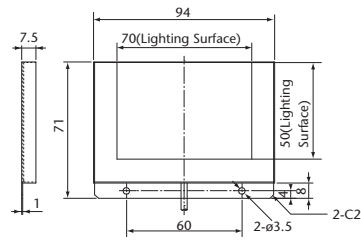
MEBL-CR (CB,CW) 25



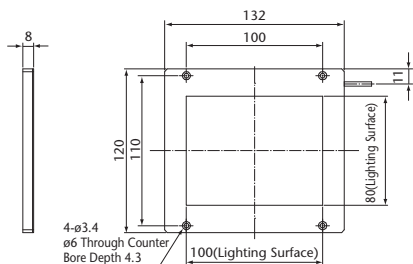
MEBL-CR (CB,CW) 50



MEBL-CR (CB,CW) 7050



MEBL-CR (CB,CW) 10080



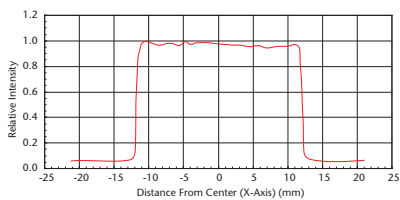
Sample Images

Electrodes on Liquid Crystal Glass
MEBL-CW7050

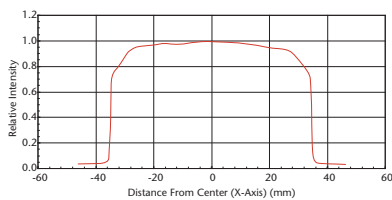


Light Distribution Characteristics

MEBL-CW25



MEBL-CW7050



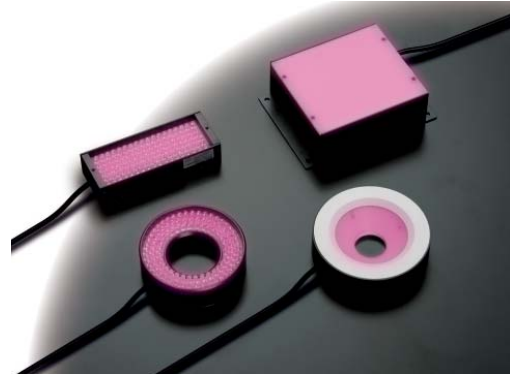
IR Illumination

IR Series

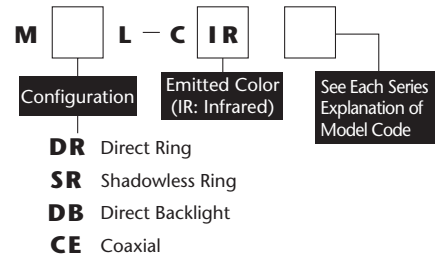


- Provides image recognition at high contrast especially for items that are difficult to view in visible light
- Lighting is also effective for materials that chemically react to visible light rays or allow IR wavelength transmission

Highly effective when used with an infrared lens and camera.
 Approximately 1.7 times higher reflecting rate for 500nm and 850 nm gold (Au).
 The peak wavelength is 850nm. (MCEL-CIR8-940 is 940nm)



Explanation of Model Code



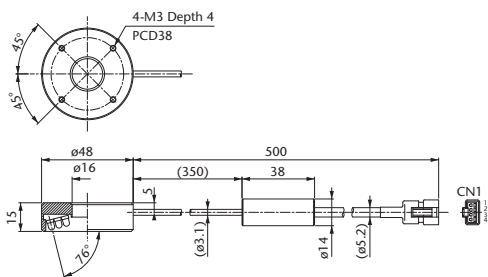
Model	Emitted Color	Maximum Rated Current IFM (A)	Dimention (mm)		Lighting Angle	Weight (g)
★ MDRL-CIR16	● Infrared	0.27	Internal Diameter ø16	External Diameter ø48	76°	65
MDRL-CIR31	● Infrared	0.42	Internal Diameter ø31	External Diameter ø66	75°	130
MSRL-CIR20	● Infrared	0.36	Internal Diameter ø20	External Diameter ø74	—	140
MDBL-CIR70	● Infrared	0.53	Lighting Surface Dimensions 70x70		—	190
★ MCEL-CIR8-940	● Infrared	0.06	Tip External Diameter ø8		—	35

* LED Controller on P.132~133

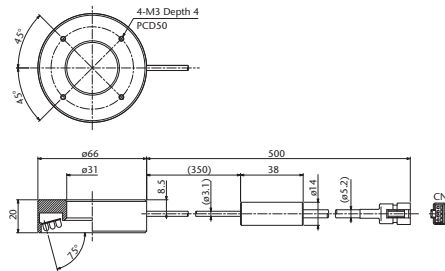
* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

★Made-to-order products.

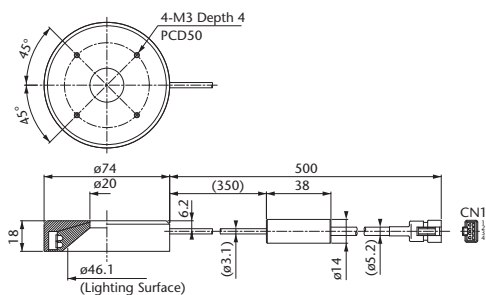
MDRL-CIR16



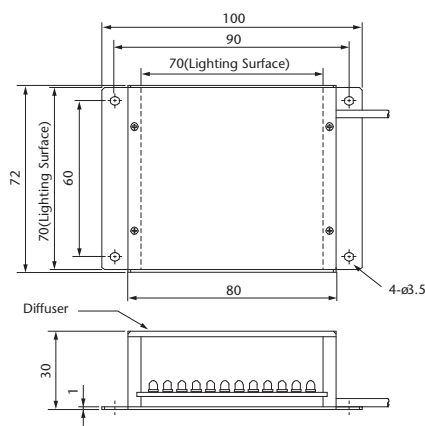
MDRL-CIR31



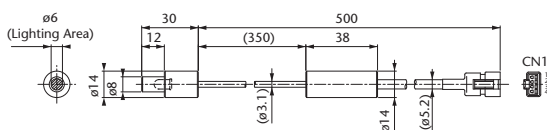
MSRL-CIR20



MDBL-CIR70



MCEL-CIR8-940

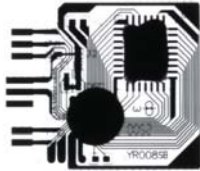


Sample Images

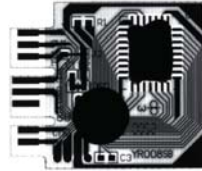
1. Substrate Pattern Recognition

(For IR, only the pattern is recognized clearly)

With an IR backlight LED (MDBL-CIR70)



With a white backlight LED (MDBL-CW70)



2. Cheese Package Recognition

(For IR, specific patterns can be made invisible)

With an IR direct ring LED (MDRL-CIR31)

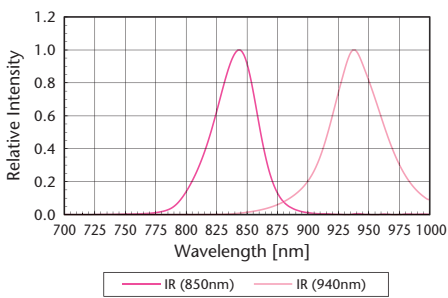


With a white, direct LED (MDRL-CW31)



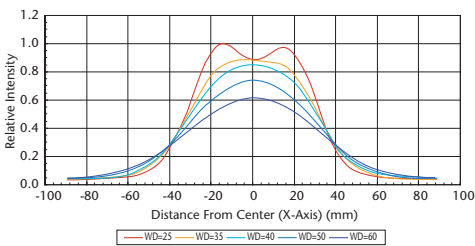
LED Spectral Characteristics

IR Series

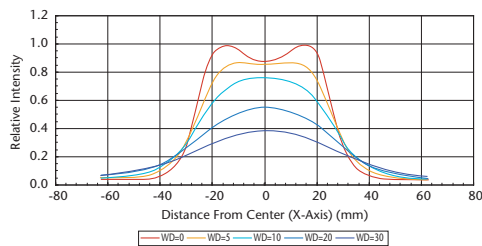


Light Distribution Characteristics

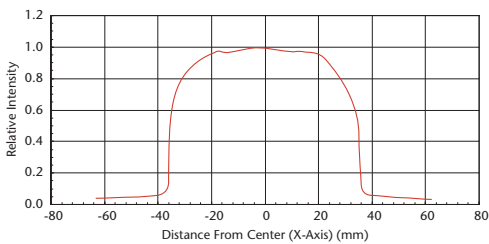
MDRL-CIR31



MSRL-CIR20



MDBL-CIR70





UV Illumination UV Series

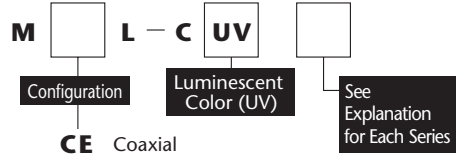


- Provides image recognition at high contrast levels especially for images that are difficult to recognize with visible light
- Can be used for fluorescence applications
- Use with a UV light range camera
- Effective in detection of dirt on glass substrates and dust on elements
- The peak wavelength is 405 nm



*Image of illumination condition

Explanation of Model Code



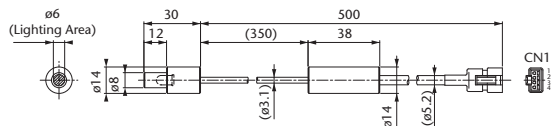
Model	Emitted Color	Maximum Rated Current IFM(A)	Dimensions (mm)	Weight (g)
★ MCEL-CUV8-405	● UV	0.03	Tip External Diameter Ø8	35

* LED Controller on P.132-133

* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

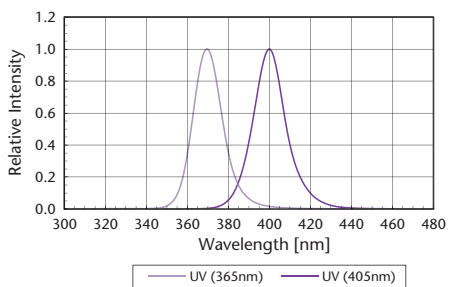
★Made-to-order products.

MCEL-CUV8-405



LED Spectral Characteristics

UV Series



Sample Images

Yogurt Package



Color camera with White LED



Visible, B/W camera with White LED



IR-camera with IR LED



UV-camera with UV LED

The print pattern not visible under IR can be seen clearly under UV

Diffuse Chip Type Bar Illumination

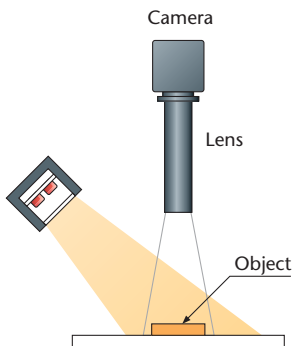
MBRC Series



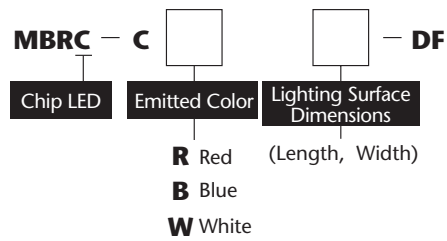
- High brightness and high uniformity achieved by high density mounting of chip type LEDs
- Available emission area lengths in 150 mm
- Realization of a slim, lightweight compact design ideal for mounting in an imaging system



Illumination Structure



Explanation of Model Code



Diffuse Chip Type Bar Illumination

MBRC Series

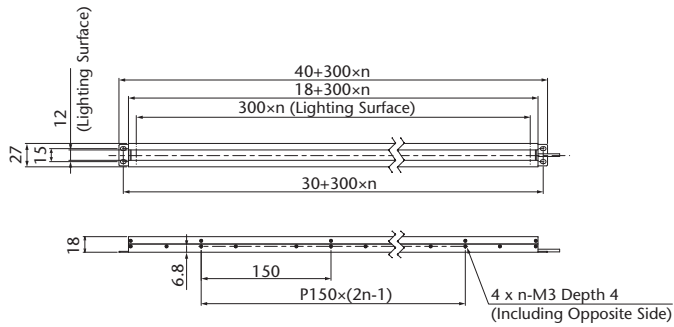
Model	Emitted Color	Dimensions(mm)		Maximum Rated Current IFM(A)	Weight (g)
		Lighting Surface	External Dimension		
★ MBRC-CR15012-DF	● Red	150	190	0.5	130
★ MBRC-CB15012-DF	● Blue			0.55	
MBRC-CW15012-DF	○ White				

* LED Controller on P.132-133

* In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

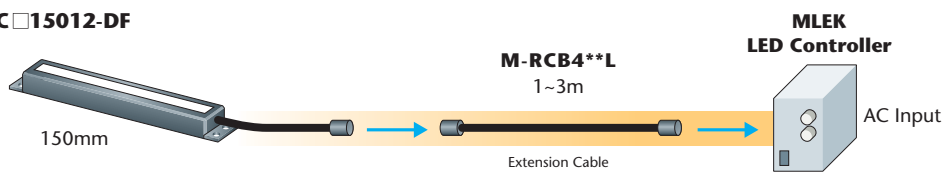
★ Made-to-order products.

MBRC-CR(CB,CW)15012-DF



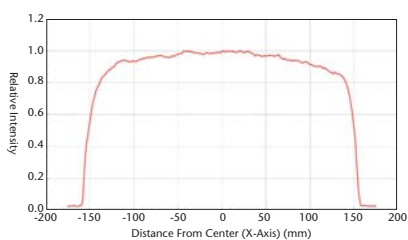
Illumination Structure

MBRC-C□15012-DF

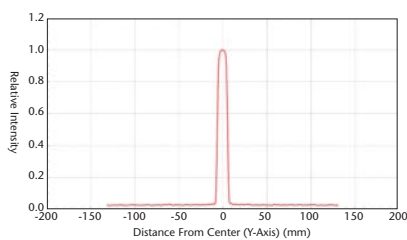


Light Distribution Characteristics

Light Distribution for the X-axis (horizontal)



Light Distribution for the Y-axis (vertical)



High Brightness LED Light Line MLNC Series

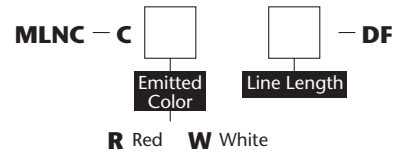


Heat-sink mounted LED light line with the highest brightness in the industry!

- **Brightest light line in the industry, 700,000 lux at W = 50 mm**
- **Equipped with a light focusing position adjustment mechanism, this unit is flexible to meet the user's requirements**
- **High power output is especially impressive considering that this unit has the thinnest body dimensions in the industry, with end width of only 25 mm**

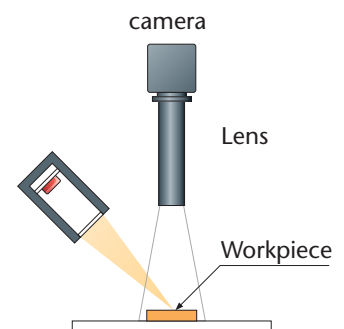


Explanation of Model Code



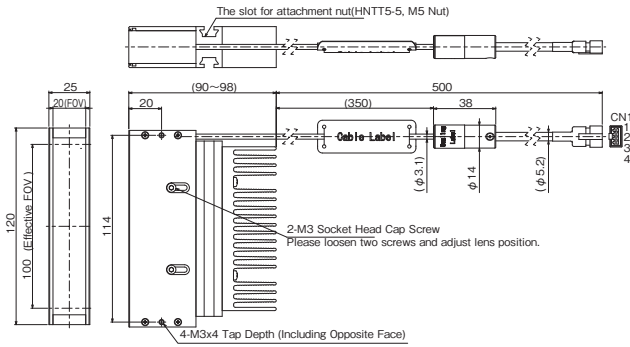
Model	Emitted Color	Maximum Rated Current IFM (A)	Dimensions of Light Emitting Section (mm)	Weight (g)
MLNC-CW100-DF	○ White	2.3	100	580
MLNC-CW200-DF-2CH	○ White	Ch1 : 2.3 Ch2 : 2.3	200	1000
MLNC-CW300-DF-3CH	○ White	Ch1 : 2.3 Ch2 : 2.3 Ch3 : 2.3	300	1400
★ MLNC-CR100-DF	● Red	2.3	100	580
★ MLNC-CR200-DF-2CH	● Red	Ch1 : 2.3 Ch2 : 2.3	200	1000
★ MLNC-CR300-DF-3CH	● Red	Ch1 : 2.3 Ch2 : 2.3 Ch3 : 2.3	300	1400

Illumination Structure

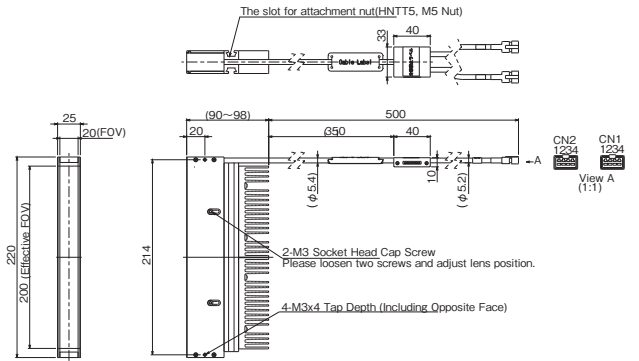


* LED Controller on P.132-133 ★Made-to-order products.
 * In case of a plurality of LED illuminations used, please check the "Selection Criteria LED Controller" on P.87.

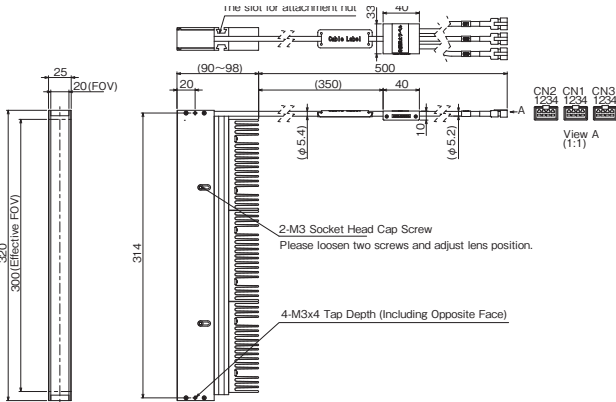
MLNC-CW(CR)100-DF



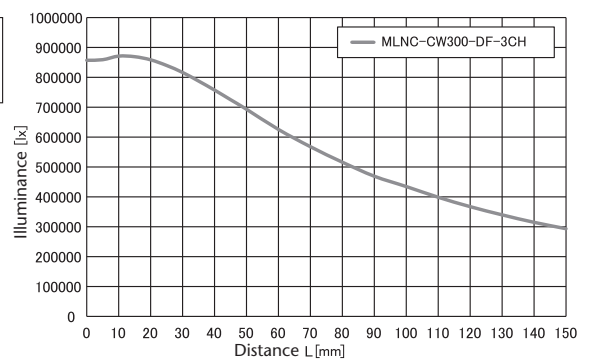
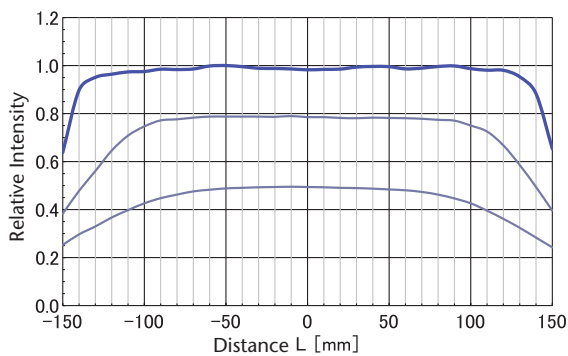
MLNC-CW(CR)200-DF-2CH



MLNC-CW(CR)300-DF-3CH



Light Intensity Characteristics



LED Controllers for MG-Wave®

MLEK Series

Analog Digital
1ch 2ch CE

Constant current LED controller designed for all MG-Wave® LEDs (except for the MCEP Series).

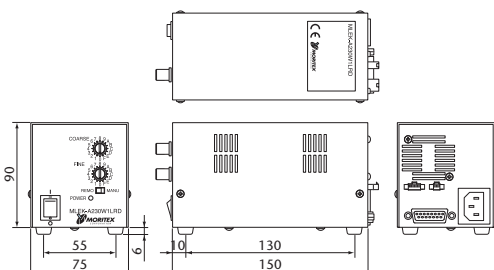
Supports up to 2.3A

A230W Analog Series
A230W Digital Series

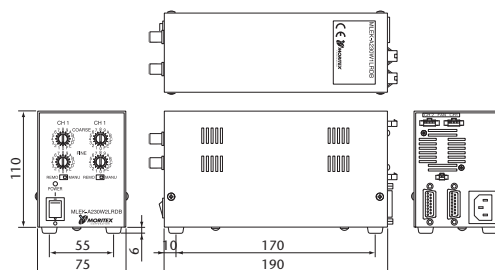


- 1 channel & 2 channel versions available in both analog and digital (8-bit, 256 level) external intensity control models

MLEK-A230W1LR / 1LRD



MLEK-A230W2LR / 2LRDB



A230W Analog Series

Model	MLEK-A230W1LR		MLEK-A230W2LR	
Order Code	MLEK-A230W1LR-100V	MLEK-A230W1LR-200V	MLEK-A230W2LR-100V	MLEK-A230W2LR-200V
AC Type	100V	200V	100V	200V
Output	1 channel output max. 2.3A (Connects to all lights except MCEP Series only)		2 channel output max. 2.3A for each channel/ Total max. 2.3A (Connects to all lights except MCEP Series only)	
Input Voltage	AC100 - 240V 50/60Hz		AC100 - 240V 50/60Hz	
Input Current	0.7/ 0.4A (at AC100/ 240V)		0.7/0.4A (at AC100/ 240V)	
Surge Current	15A or less (at AC100V) 30A or less (at AC240V)		15A or less (at AC100V) 30A or less (at AC240V)	
Operating Temperature	0°C-45°C (Humidity: 80%RH below 31°C, decreases linearly to 50%RH from 32-40°C)			
Output System	DC Continuous output		DC Continuous output	
Output Control System	Constant current control (variable current)		Constant current control (variable current)	
External Light Control	Yes (0-5V intensity control/ external VR intensity control)		Yes (0-5V intensity control/ external VR intensity control)	
Output ON/OFF Function	Yes (Photo-coupler insulation type)		Yes (Photo-coupler insulation type)	
Error Output	Yes (Photo-coupler insulation, sensing error)		Yes (Photo-coupler insulation, sensing error)	
Cooling System	Forcible air cooling		Forcible air cooling	
Installation	Rubber legs placed on flat surface		Rubber legs placed on flat surface	
Weight	Approximately 1.1kg		Approximately 1.4kg	

A230W Digital Series

Model	MLEK-A230W1LRD		MLEK-A230W2LRDB	
Order Code	MLEK-A230W1LRD-100V	MLEK-A230W1LRD-200V	MLEK-A230W2LRDB-100V	MLEK-A230W2LRDB-200V
AC Type	100V	200V	100V	200V
Output	1 channel output max. 2.3A (Connects to all lights except MCEP Series only)		2 channel output max. 2.3A for each channel/ Total max. 2.3A (Connects to all lights except MCEP Series only)	
Input Voltage	AC100 - 240V 50/60Hz		AC100 - 240V 50/60Hz	
Input Current	0.7/ 0.4A (a AC100/ 240V)		0.7/ 0.4A (a AC100/ 240V)	
Surge Current	15A or less (at AC100V) 35A or less (at AC240V)		15A or less (at AC100V) 35A or less (at AC240V)	
Operating Temperature	0°C-45°C (Humidity: 80%RH below 31°C, decreases linearly to 50%RH from 32-40°C)			
Output System	DC Continuous output		DC Continuous output	
Output Control System	Constant current control (variable current)		Constant current control (variable current)	
External Light Control	Yes (8-bit digital)		Yes (8-bit digital for each independent channel)	
Output ON/OFF Function	Yes (Photo-coupler insulation type)		Yes (Photo-coupler insulation type)	
Error Output	Yes (Photo-coupler insulation, sensing error)		Yes (Photo-coupler insulation, sensing error)	
Cooling System	Forcible cooling by air		Forcible cooling by air	
Installation	Rubber legs placed on flat surface		Rubber legs placed on flat surface	
Weight	Approximately 1.1kg		Approximately 1.4kg	

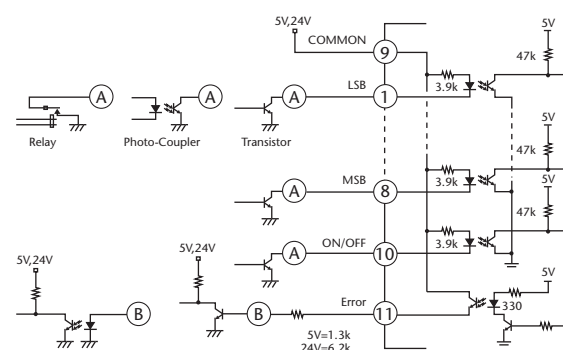
Connection Specifications

For the MLEK-A230W1LRD/2LRD

No.	Name	No.	Name
1	8-bit digital input 2 ^o (LSB)	9	COMMON (+)
2	8-bit digital input 21	10	Output ON/ OFF signal (input)
3	8-bit digital input 22	11	Sensing error signal output
4	8-bit digital input 23	12	NC
5	8-bit digital input 24	13	NC
6	8-bit digital input 25	14	NC
7	8-bit digital input 26	15	NC
8	8-bit digital input 27 (MSB)		

Input/Output Circuit Diagrams

With MLEK-A230W1LRD/2LRD





MG-Wave® Accessories



Accessories for Illumination

The following optional accessories are available to improve the functionality of the lighting devices.

Diffuser Plates: MDF Series

These diffuser plates, which can be attached to the illumination using the dedicated adapters, help prevent unwanted lighting reflection.

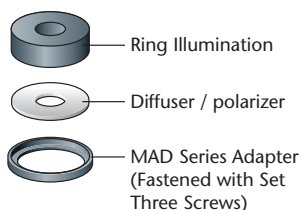
Model	Product Type	Compatible Light Models	Internal Diameter (mm)
MDF-DR10	Diffuser for Direct Ring Illumination	MDRL-CR(CB,CW)for 10	ø9
MDF-DR16	Diffuser for Direct Ring Illumination	MDRL-CR(CB,CW)for 16	ø14
MDF-DR28	Diffuser for Direct Ring Illumination	MDRL-CR(CB,CW)for 28	ø26
MDF-DR31	Diffuser for Direct Ring Illumination	MDRL-CR(CB,CW)for 31	ø28
MDF-DR35	Diffuser for Direct Ring Illumination	MDRL-CR(CB,CW)for 35	ø35
MDF-DR36	Diffuser for Direct Ring Illumination	MDRL-CR(CB,CW)for 36	ø36
MDF-DR50	Diffuser for Direct Ring Illumination	MDRL-CR(CB,CW)for 50	ø46
MDF-LR25	Diffuser for Low Angle Ring Illumination	MLRL-CR(CB,CW)for 25	ø18
MDF-LR48	Diffuser for Low Angle Ring Illumination	MLRL-CR(CG,CW)for 48	ø40
MDF-LR100	Diffuser for Low Angle Ring Illumination	MLRL-CR(CB,CW)for 100	ø82
MDF-BR5015	Diffuser for Bar Illumination	MBRL-CR(CB,CW)for 5015	—
MDF-BR7530	Diffuser for Bar Illumination	MBRL-CR(CB,CW)for 7530	—
MDF-BR13015	Diffuser for Bar	MBRL-CR(CB,CW)for 13015	—

Adapters: MAD Series

Adapter for attaching dedicated diffuser plates and polarizing plate for MG-Wave ring illumination.

Model	Product Type	Compatible Light Models
MAD-DR10	Plate Attachment Adapter for Direct Ring Illumination	MDRL-CR(CB,CW) 10
MAD-DR16	Plate Attachment Adapter for Direct Ring Illumination	MDRL-CR(CB,CW) 16
MAD-DR28	Plate Attachment Adapter for Direct Ring Illumination	MDRL-CR(CB,CW) 28
MAD-DR31	Plate Attachment Adapter for Direct Ring Illumination	MDRL-CR(CB,CW) use with both 31/36
MAD-DR35	Plate Attachment Adapter for Direct Ring Illumination	MDRL-CR(CB,CW) 35
MAD-DR50	Plate Attachment Adapter for Direct Ring Illumination	MDRL-CR(CB,CW) 50

How to Use MAD Series



Polarizing Plate: MPL Series

Attaching these polarizing plates on the lens side (inside the polarizer) cuts specular reflection in particular areas and reduces glare in the resulting image.

Model	Product Type	Compatible Light Models	Internal Diameter (mm)
MPL-SC56	Polarizer for Simulated Coaxial Illumination	MSCL-CR(CB,CW)for 56-B	—
MPL-SC74	Polarizer for Simulated Coaxial Illumination	MSCL-CR(CB,CW)for 74-B	—
MPL-DR10-B	Polarizer for Direct Ring Illumination	MDRL-CR(CB,CW)for 10	ø9
MPL-DR16-B	Polarizer for Direct Ring Illumination	MDRL-CR(CB,CW)for 16	ø14
MPL-DR28-B	Polarizer for Direct Ring Illumination	MDRL-CR(CB,CW)for 28	ø26
MPL-DR31-B	Polarizer for Direct Ring Illumination	MDRL-CR(CB,CW)for 31	ø28
MPL-DR35	Polarizer for Direct Ring Illumination	MDRL-CR(CB,CW)for 35	ø35
MPL-DR36	Polarizer for Direct Ring Illumination	MDRL-CR(CB,CW)for 36	ø36
MPL-DR50-B	Polarizer for Direct Ring Illumination	MDRL-CR(CB,CW)for 50	ø46
MPL-BR5015-B	Polarizer for Bar Illumination	MBRL-CR(CB,CW)for 5015	—
MPL-BR7530-B	Polarizer for Bar Illumination	MBRL-CR(CB,CW)for 7530	—
MPL-BR13015-B	Polarizer for Bar Illumination	MBRL-CR(CB,CW)for 13015	—

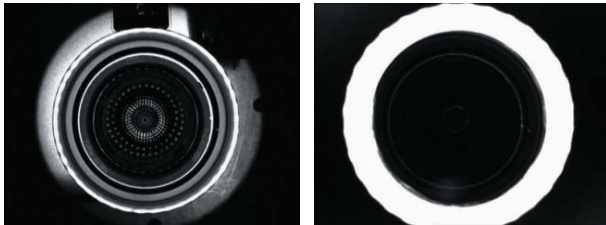
Polarizer (Analyzer): ML-PL Series

Enhanced polarizing effect can be expected by using ML-PL Series second polarizer on lens side, in combination with MPL Series polarizer.

Screw Pitch		Polarizer (LB: with Securing Screw)	
255	Model	ML-PL255	ML-PL255LB
270	Model	ML-PL270	ML-PL270LB
305	Model	ML-PL305	ML-PL305LB



Sample Images



Without polarizer

With polarizer (Sample image: A camera lens observed from the image side)

- ① Attach the polarizing plate to the light emitting part on the projection side.
- ② Attach the polarizer to the lens tip.
- ③ Rotate either of the polarizing plates (polarizer/analyzer) to change the luminance distribution of the image.

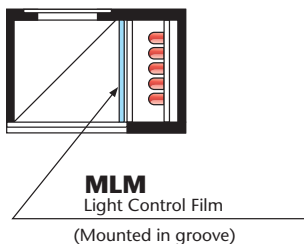
Light Control Film: MLM Series

The MLM Series are resin films that transform diffused illumination into parallel illumination. Attaching to a simulated coaxial illumination makes the light distribution pattern smoother.

Model	Product Type	Compatible Light Models
MLM-SC56	Light Control Film for Simulated Coaxial Illumination	MSCL-CR(CB,CW) 56-B
MLM-SC74	Light Control Film for Simulated Coaxial Illumination	MSCL-CR(CB,CW) 74-B

How to Use MLM Series

Cross-Section of Simulated Coaxial Unit



Illumination↔Lens Accessories

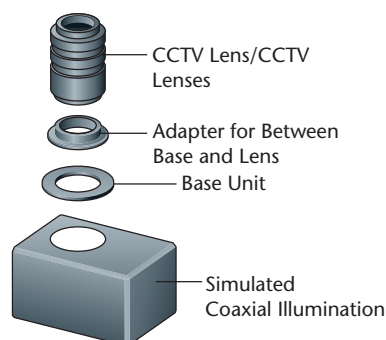
Use the options with MORITEX lenses.

Simulated Coaxial Illumination↔Lens Adapter: MLA-SC Series

Enables small simulated coaxial illumination to be mounted at the end of CCTV lenses.

Model	Product Type	Compatible Light Models	Compatible Lenses
MLA-SCBS	Base for Simulated Coaxial Lens Attachment	MSCL-CR (CB,CW) for 24/39/56	—
MLA-SCM255	Adapter for Between Simulated Coaxial Illuminating Base and Lens		M25.5P0.5 lens
MLA-SCM270	Adapter for Between Simulated Coaxial Illuminating Base and Lens		M27 P0.5 lens
MLA-SCM305	Adapter for Between Simulated Coaxial Illuminating Base and Lens		M30.5P0.5 lens

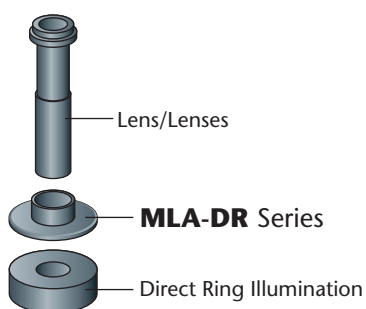
How to Use MLA-SC Series



Direct Ring Illumination↔Lens Adapters for MLA-DR Series

Enables small ring illumination to be attached to lens tips.

How to Use MLA-DR Series



Model	Product Type	Compatible Light Models	Compatible Lenses
MLA-DR1616	Lens Attachment Adapter	MDRL-CR (CB,CW) 16	Ø6 lenses
MLA-DR3125	Lens Attachment Adapter	MDRL-CR (CB,CW) 31	Ø25 lenses
MLA-DR3130	Lens Attachment Adapter	MDRL-CR (CB,CW) 35 MDRL-CR (CB,CW) 36	Ø30 lenses
MLA-DR28M255	Lens Attachment Adapter	MDRL-CR (CB,CW) 28	M25.5P0.5 lenses
MLA-DR28M270	Lens Attachment Adapter	MDRL-CR (CB,CW) 28	M27P0.5 lenses
MLA-DR28M305	Lens Attachment Adapter	MDRL-CR (CB,CW) 28	M30.5P0.5 lenses
MLA-DR31M255	Lens Attachment Adapter	MDRL-CR (CB,CW) 31 MDRL-CR (CB,CW) 35 MDRL-CR (CB,CW) 36	M25.5P0.5 lenses
MLA-DR31M270	Lens Attachment Adapter		M27P0.5 lenses
MLA-DR31M305	Lens Attachment Adapter		M30.5P0.5 lenses

Sharp Cut Filter ML-R Series

When using red illumination, attachment to the tip of the CCTV lens is effective in preventing ambient light.

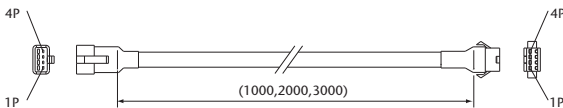
Model	Product Type	Compatible Lenses
ML-R64-27	Sharp cut filter for attachment to end of lens	M27 P0.5 lens

Extension Cables

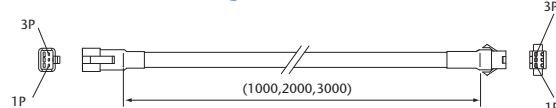
- Entire M-RCB Series meet robot cable requirements and all 1m & 2m products are CE compliant

Model	Product Type	Application	Length
M-RCB401L	4-Pin Type Extension Cable	For all illuminations (except MCEP Series)	1m
M-RCB402L	4-Pin Type Extension Cable		2m
M-RCB403L	4-Pin Type Extension Cable		3m
M-RCB301L	3-Pin Type Extension Cable	For MCEP Series	1m
M-RCB302L	3-Pin Type Extension Cable		2m
M-RCB303L	3-Pin Type Extension Cable		3m
M-RCB001L	2-Pin Type Extension Cable	For illuminations with built-in fan	1m
M-RCB002L	2-Pin Type Extension Cable		2m
M-RCB003L	2-Pin Type Extension Cable		3m

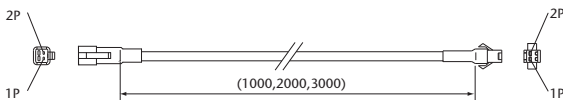
M-RCB4□□L *Straight Connection



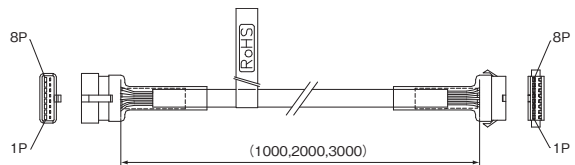
M-RCB3□□L *Straight Connection



M-RCB0□□L *Straight Connection



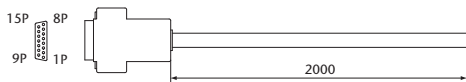
M-RCB8□□L *Straight Connection



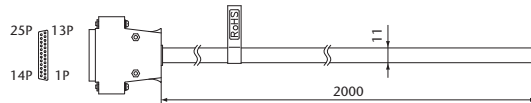
External Control Cables

Model	Product Type	Length	Product Code
MC-EXC-02	Cable for External Control of DSUB15P	2m	A-8201
MC-EXC-07	Cable for External Control of DSUB25P	2m	A-9000

MC-EXC-02



MC-EXC-07



PIN No.	Color	PIN No.	Color
1P	purple	9P	brown
2P	gray	10P	red
3P	white	11P	black
4P	sky blue	12P	orange
5P	white / red	13P	yellow
6P	white / black	14P	green
7P	white / green	15P	blue
8P	white / yellow		

PIN No.	Color	PIN No.	Color	PIN No.	Color
1P	black	11P	sky blue	21P	orange / white
2P	white	12P	bright green	22P	orange / red
3P	red	13P	white / black	23P	orange / green
4P	green	14P	white / red	24P	orange / yellow
5P	yellow	15P	white / green	25P	orange / blue
6P	brown	16P	white / yellow	—	orange / purple
7P	blue	17P	white / brown	—	sky blue / black
8P	orange	18P	white / blue	—	sky blue / white
9P	purple	19P	white / purple	—	sky blue / red
10P	gray	20P	orange / black	—	sky blue / yellow

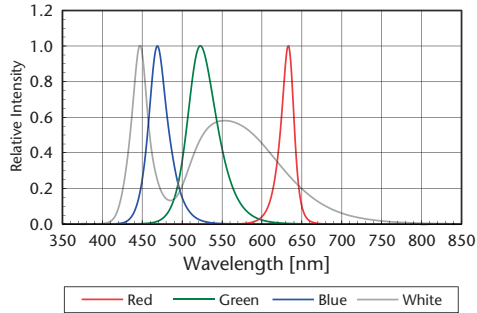
LED Controller AC Cables/Brackets

Model	Product Type	Product Code
MC-AC200A-2.0M	European Plug Type AC Cable	A-2246
LBK-001	Power Supply Unit Installation Bracket	A-2340

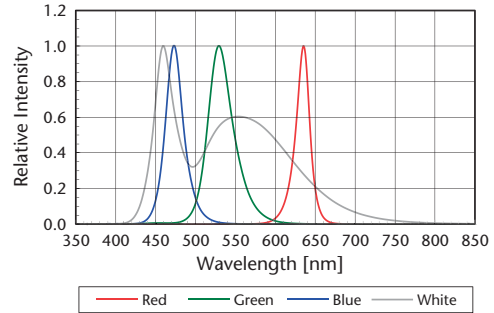
LED Spectral Characteristics

The diagrams below illustrate the spectral characteristics of major LEDs used in the MG-Wave®. We can also manufacture other lighting devices with different wavelengths. Please feel free to contact us.

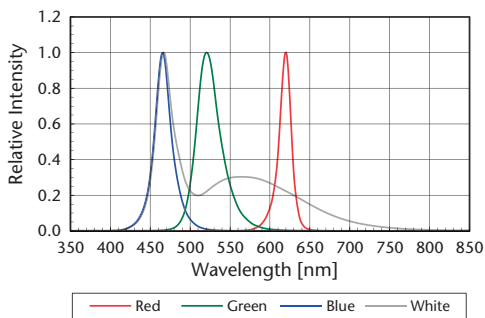
MCEP, MHBC, MLNC Series



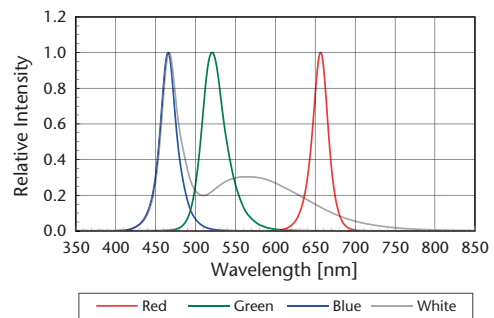
MCEC, MBRC, MCBP Series



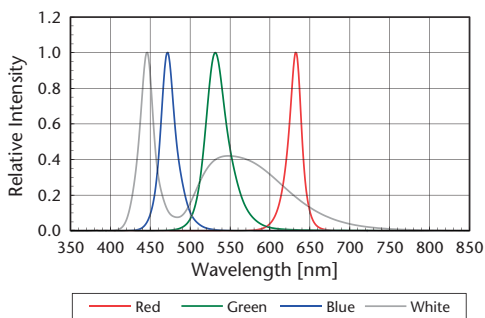
MCEL Series



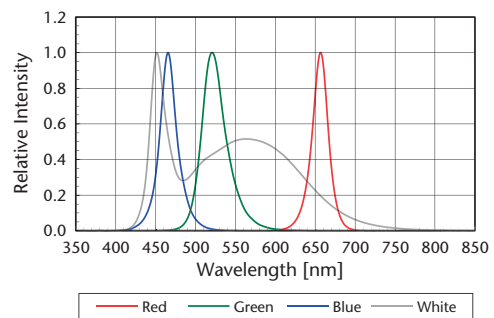
MDRL, MLRL, MSRL, MSL, MDQL, MBRL, MSCL, MDBL, MEBL Series



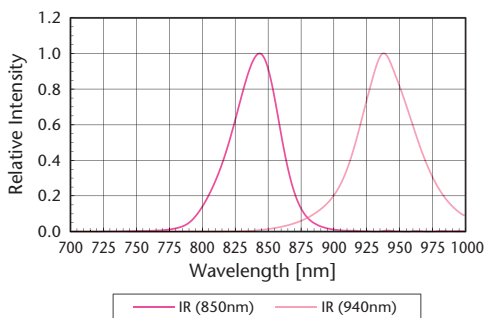
MSDC Series



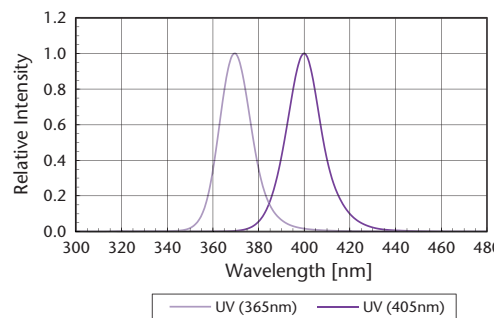
MDBC Series



IR Series



UV Series



24V DC Driven

CompaVis®



CompaVis® employs the constant voltage control system that can be controlled not only by APS MLEF LED controllers but also by industry available 24V DC power supplies directly. Overdriven strobing for instantaneous high intensity illumination is also available. The series can support customer's various image processing environments with a broad range of lighting solutions.



CE CE Marking

Digital Digital Intensity Control

2ch 2 Channel Output

Direct Ring Illumination CV-R/SQ Series



Direct Ring Illumination: CV-R Series

- High intensity, uniform direct, bright-field 360-degree lighting
- Standard LED illumination for a wide range of applications

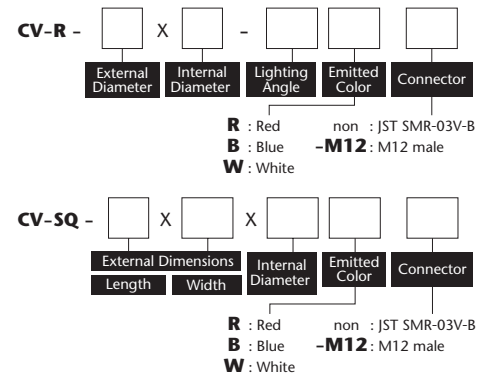
Square Ring Illumination: CV-SQ Series

- Standard LED Illumination for a wide range of application

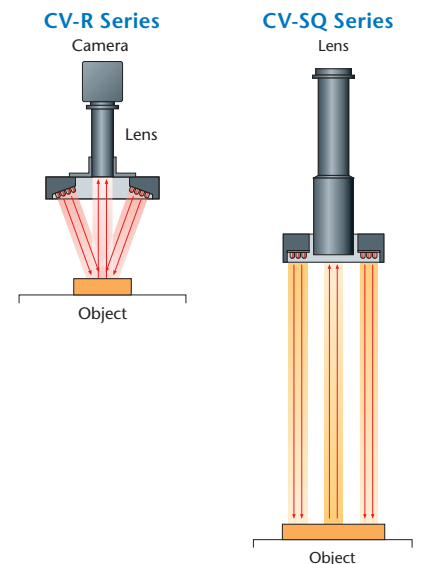


Model	Emitted Color	Power (W)	External Dimensions (mm)			Lighting Angle (Deg.)	Weight (g)*	Accessories
			External Diameter	Internal Diameter	Height			
CV-R-32X10-70R	● Red	0.9	32	10	16	70	35	CV-AD-R-32X10-70 CV-DF-R-32X10-70 CV-PL-R-32X10-70
CV-R-32X10-70B	● Blue	1.7	32	10	16	70	35	
CV-R-32X10-70W	○ White	1.7	32	10	16	70	35	
CV-R-42X18-65R	● Red	1.5	42	18	18	65	55	CV-AD-R-42X18-65 CV-DF-R-42X18-65 CV-PL-R-42X18-65
CV-R-42X18-65B	● Blue	2.7	42	18	18	65	55	
CV-R-42X18-65W	○ White	2.7	42	18	18	65	55	
CV-R-50X28-75R	● Red	0.7	50	28	16	75	55	CV-AD-R-50X28-75 CV-DF-R-50X28-75 CV-PL-R-50X28-75
CV-R-50X28-75B	● Blue	2.6	50	28	16	75	55	
CV-R-50X28-75W	○ White	2.8	50	28	16	75	55	
CV-R-70X35-90R	● Red	1.5	70	35	22	90	140	CV-AD-R-70X35-90 CV-DF-R-70X35-90 CV-PL-R-70X35-90
CV-R-70X35-90B	● Blue	5.5	70	35	22	90	140	
CV-R-70X35-90W	○ White	5.5	70	35	22	90	140	
CV-R-90X30-80R	● Red	5.3	90	30	20	83	260	CV-AD-R-90X30-80 CV-DF-R-90X30-80 CV-PL-R-90X30-80
CV-R-90X30-80B	● Blue	9.3	90	30	20	83	260	
CV-R-90X30-80W	○ White	10.3	90	30	20	83	260	
CV-R-90X50-70R	● Red	3.5	90	50	20	71	180	CV-AD-R-90X50-70 CV-DF-R-90X50-70 CV-PL-R-90X50-70
CV-R-90X50-70B	● Blue	6.2	90	50	20	71	180	
CV-R-90X50-70W	○ White	6.4	90	50	20	71	180	
CV-R-120X58-50R	● Red	3.1	120	58	31.5	52	560	CV-AD-R-120X58-50 CV-DF-R-120X58-50 CV-PL-R-120X58-50
CV-R-120X58-50B	● Blue	13.1	120	58	31.5	52	560	
CV-R-120X58-50W	○ White	13.5	120	58	31.5	52	560	

Explanation of Model Code



Illumination Structure

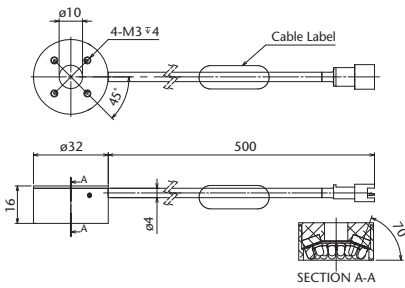


Model	Emitted Color	Power (W)	External Dimensions (mm)				Weight (g)*	Accessories
			Length	Width	Height	Internal Diameter		
CV-SQ-56X56X30R	● Red	1.0	56	56	18	30	85	CV-DF-SQ-56X56X30 CV-PL-SQ-56X56X30
CV-SQ-56X56X30B	● Blue	2.5	56	56	18	30	85	
CV-SQ-56X56X30W	○ White	2.6	56	56	18	30	85	

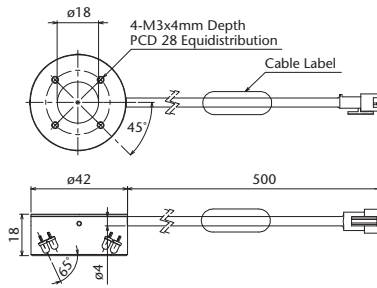
* LED Controller on P.161

* It is weighted 15g more in case "M12".

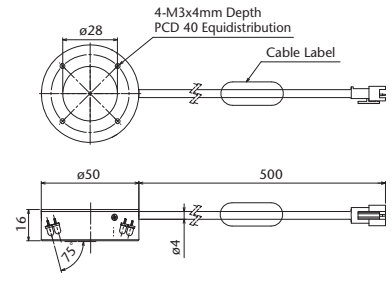
CV-R-32X10-70R (B,W)



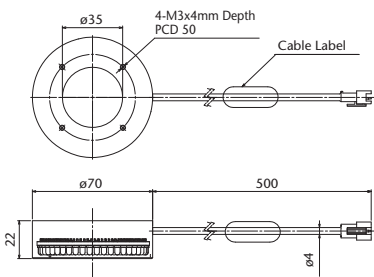
CV-R-42X18-65R (B,W)



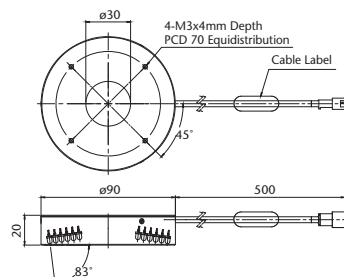
CV-R-50X28-75R (B,W)



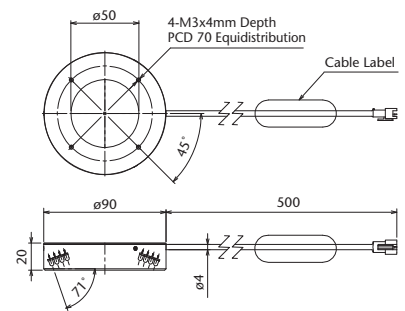
CV-R-70X35-90R (B,W)



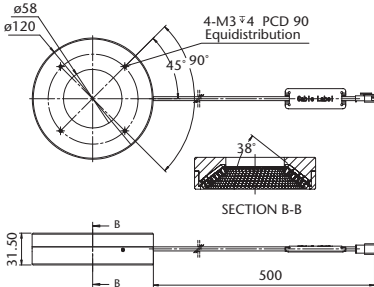
CV-R-90X30-80R (B,W)



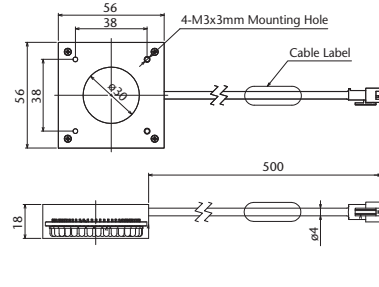
CV-R-90X50-70R (B,W)



CV-R-120X58-50R (B,W)

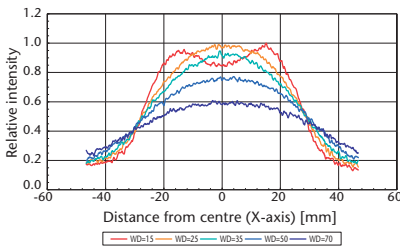


CV-SQ-56X56X30R (B,W)

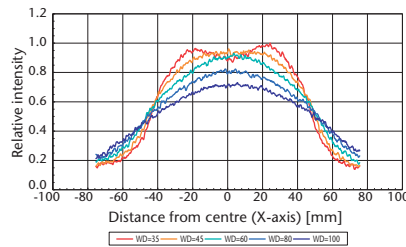


Light Distribution Characteristics

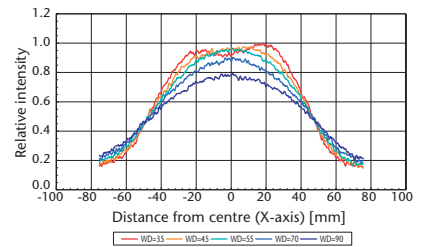
CV-R-50X28-75W



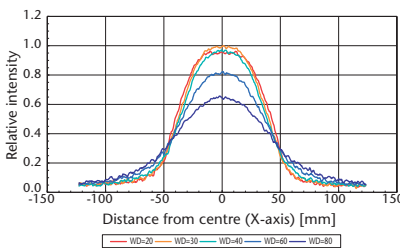
CV-R-70X35-90W



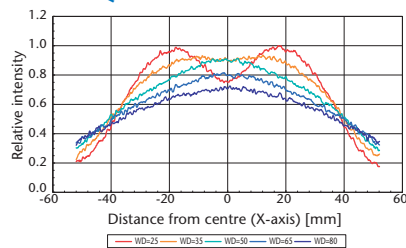
CV-R-90X30-80W



CV-R-120X58-50W



CV-SQ-56X56X30W

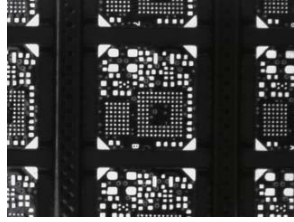


Sample Images

CV-R Series

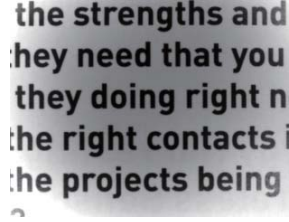


Foreign Object in Paper Cup

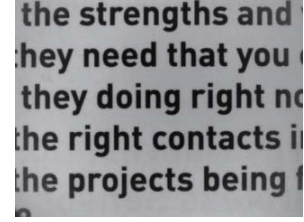


PCB Fabrication Inspection

CV-SQ Series



Not Much Light at Short WD



Full Light at Longer WD

Applications

- Lead frame inspection
- Electronic component appearance inspection
- QFP/SOP lead curve inspection
- Transparency film dirt inspection
- Various types of silhouette observation

Accessories

Adapter



(P.165)

CV-AD-Rxx

Used to mount the diffuser or polarizer onto the LED lighting.

Diffusion Plate



(P.165)

CV-DF-Rxx

To be mounted in front of the LED lighting using the adapter. Used to soften the lighting output, so as to reduce the glares on specular surface.

Polarizer Plate



(P.165)

CV-PL-Rxx

To be mounted in front of the LED lighting using the adapter. Used together with a Polarizer filter lens in front of the camera as a set. It helps to reduce glare.

Low Angle Ring Illumination CV-RLA/RLA-00 Series



Low Angle Ring Illumination: CV-RLA Series

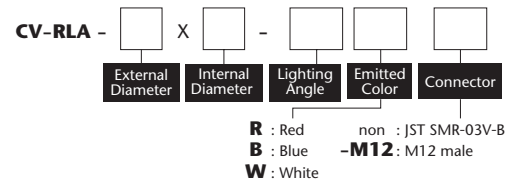
- Reflection can be minimized by the low-angle, dark-field lighting configuration
- Ideal for imaging of uneven surfaces, eg. Embossment and surface flaw detection

Zero Angle Ring Illumination: CV-RLA-00 Series

- Indirect, horizontal 360-degree inner diameter illumination
- Used at a short WD to the test object



Explanation of Model Code



Model	Emitted Color	Power (W)	External Dimensions (mm)			Lighting Angle (Deg.)	Weight (g)*	Accessories
			External Diameter	Internal Diameter	Height			
CV-RLA-74X48-30R	● Red	2.2	74	48	19	30	95	CV-DF-RLA-74X48-30
CV-RLA-74X48-30B	● Blue	5.6	74	48	19	30	95	
CV-RLA-74X48-30W	○ White	5.3	74	48	19	30	95	
CV-RLA-100X70-30R	● Red	1.8	100	70	22	30	170	CV-DF-RLA-100X70-30
CV-RLA-100X70-30B	● Blue	8.7	100	70	22	30	170	
CV-RLA-100X70-30W	○ White	8.4	100	70	22	30	170	
CV-RLA-132X96-15R	● Red	2.5	132	96	22	15	280	CV-DF-RLA-132X96-15
CV-RLA-132X96-15B	● Blue	7.1	132	96	22	15	280	
CV-RLA-132X96-15W	○ White	7.2	132	96	22	15	280	

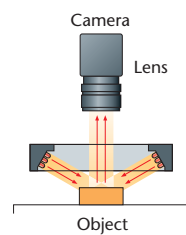
Model	Emitted Color	Power (W)	External Dimensions (mm)			Lighting Angle (Deg.)	Weight (g)*	Accessories
			External Diameter	Internal Diameter	Height			
CV-RLA-75X46-00R	● Red	0.5	75	46	10	0	70	
CV-RLA-75X46-00B	● Blue	2.5	75	46	10	0	70	
CV-RLA-75X46-00W	○ White	2.8	75	46	10	0	70	
CV-RLA-96X60-00R	● Red	0.7	96	60	10	0	110	
CV-RLA-96X60-00B	● Blue	3.1	96	60	10	0	110	
CV-RLA-96X60-00W	○ White	3.5	96	60	10	0	110	
CV-RLA-200X170-00R	● Red	2.0	200	170	10	0	160	
CV-RLA-200X170-00B	● Blue	5.9	200	170	10	0	160	
CV-RLA-200X170-00W	○ White	6.1	200	170	10	0	160	

* LED Controller on P.161

* It is weighted 15g more in case "M12".

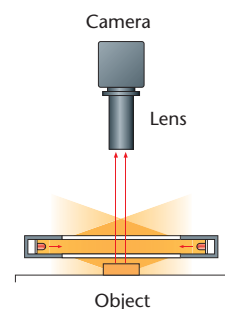
Illumination Structure

CV-RLA Series



Illuminating the Object from a Low Position

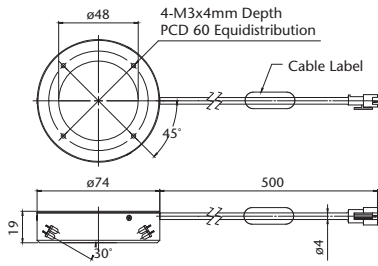
CV-RLA-00 Series



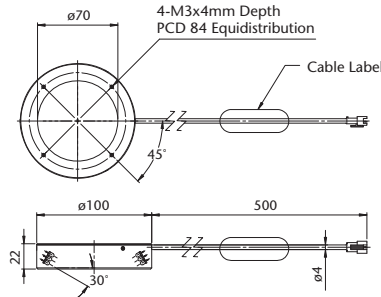
Low Angle Ring Illumination

CV-RLA/RLA-00 Series

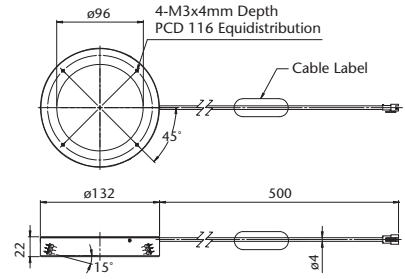
CV-RLA-74X48-30R (B,W)



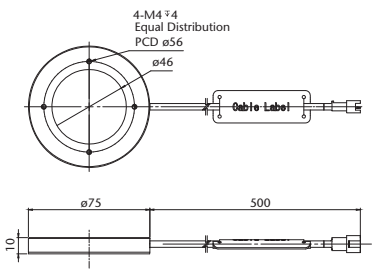
CV-RLA-100X70-30R (B,W)



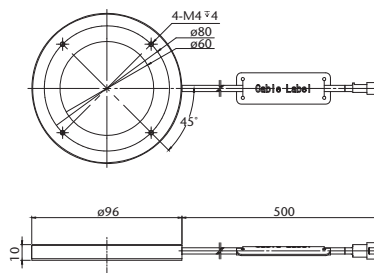
CV-RLA-132X96-15R (B,W)



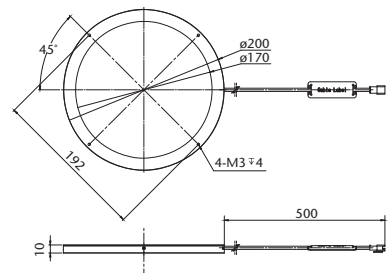
CV-RLA-75X46-00R (B,W)



CV-RLA-96X60-00R (B,W)



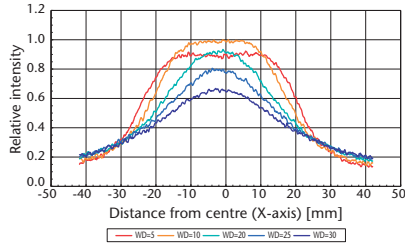
CV-RLA-200X170-00R (B,W)



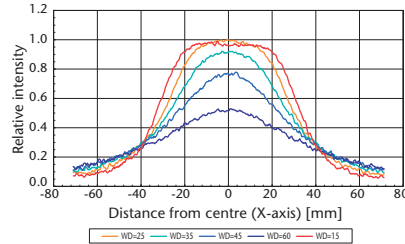
Light Distribution Characteristics

Low Angle Ring Illumination

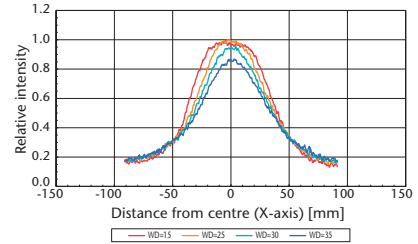
CV-RLA-74X48-30W



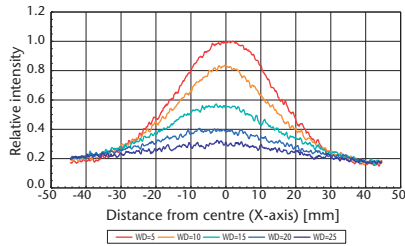
CV-RLA-100X70-30W



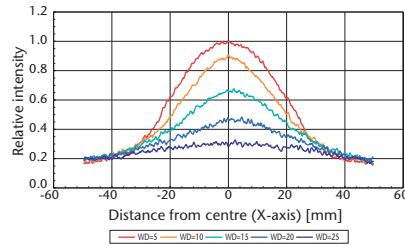
CV-RLA-132X96-15W



CV-RLA-75X46-00W



CV-RLA-96X60-00W



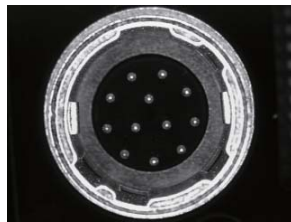
CV-RLA/RLA-00 Series

Sample Images

CV-RLA Series



Chamfer Checking on Metal Ring

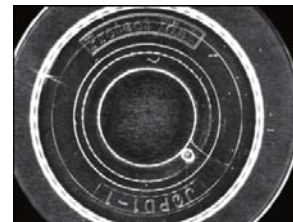


12-Pin Connector

CV-RLA-00 Series



Scratch on Glass Plate



CD Imprint Inspection

Applications

- Substrate and PCB positioning
- Chip component inspection
- LCD alignment
- Plastic container inspection
- Label inspection
- Mounter
- IC marking inspection, etc.

Accessories

Diffusion Ring



(P.165)

CV-DF-RLAxx

Used to create a relatively non-directional light. Reducing glare on specular surfaces. Easily mount onto a Low-Angle Ring Illumination.

Shadowless Illumination CV-FR/DR Series



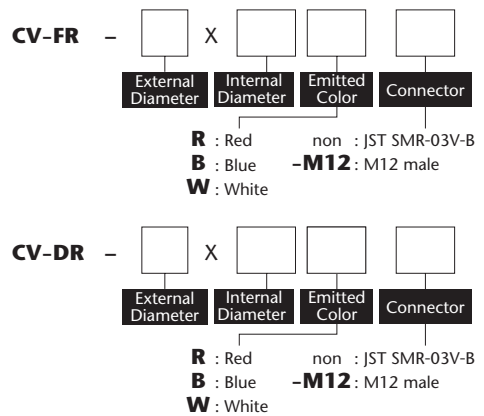
Shadowless Ring Illumination: CV-FR Series

- Diffuse, shadowless illumination*
- Optimal soft, uniform light for shiny surfaces

Shadowless Low Angle Ring Illumination: CV-DR Series

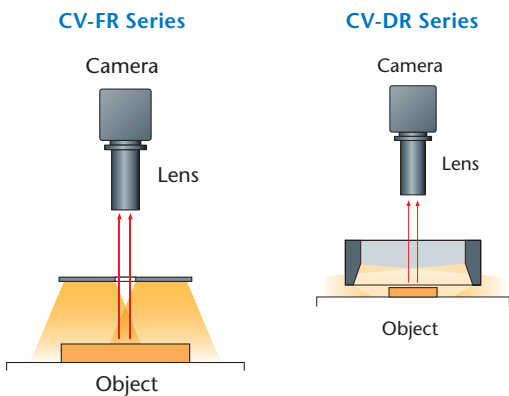
- Shallow angle LED illumination that provides diffused, soft light
- Ideal for flaw or edge detection on reflective surfaces

Explanation of Model Code



Shadowless Illumination

Illumination Structure



CV-FR/DR Series

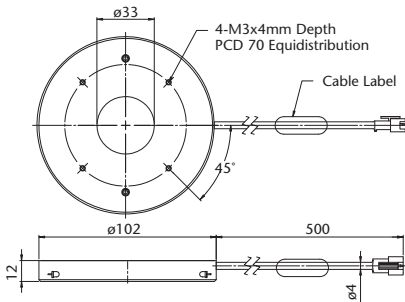
Model	Emitted Color	Power (W)	External Dimensions (mm)			Emitting Diameter (mm)	Weight (g) *
			External Diameter	Internal Diameter	Height		
CV-FR-102X33R	● Red	1.2	102	33	12	80	190
CV-FR-102X33B	● Blue	3.3	102	33	12	80	190
CV-FR-102X33W	○ White	3.2	102	33	12	80	190
CV-FR-125X44R	● Red	2.3	125	44	12	102.5	280
CV-FR-125X44B	● Blue	3.8	125	44	12	102.5	280
CV-FR-125X44W	○ White	4.0	125	44	12	102.5	280

Model	Emitted Color	Power (W)	External Dimensions (mm)			Emitting Diameter (mm)	Weight (g) *
			External Diameter	Internal Diameter	Height		
CV-DR-100X73R	● Red	1.7	100	73	40	93.5	230
CV-DR-100X73B	● Blue	5.0	100	73	40	93.5	230
CV-DR-100X73W	○ White	5.8	100	73	40	93.5	230
CV-DR-136X109R	● Red	1.7	136	109	40	129.5	340
CV-DR-136X109B	● Blue	8.6	136	109	40	129.5	340
CV-DR-136X109W	○ White	8.4	136	109	40	129.5	340
CV-DR-180X153R	● Red	2.3	180	153	40	173.5	420
CV-DR-180X153B	● Blue	10.3	180	153	40	173.5	420
CV-DR-180X153W	○ White	11.6	180	153	40	173.5	420

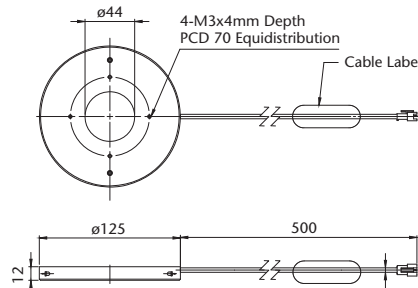
* LED Controller on P.161

* It is weighted 15g more in case "M12".

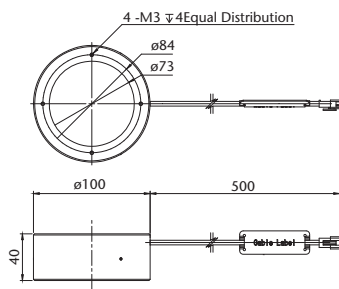
CV-FR-102X33R (B,W)



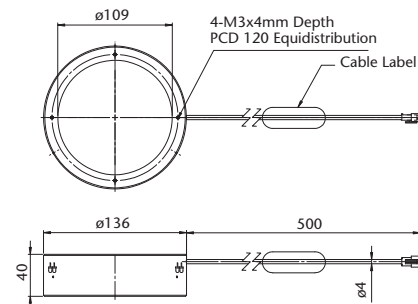
CV-FR-125X44R (B,W)



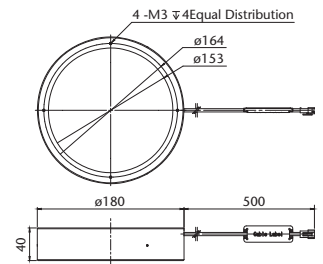
CV-DR-100X73R (B,W)



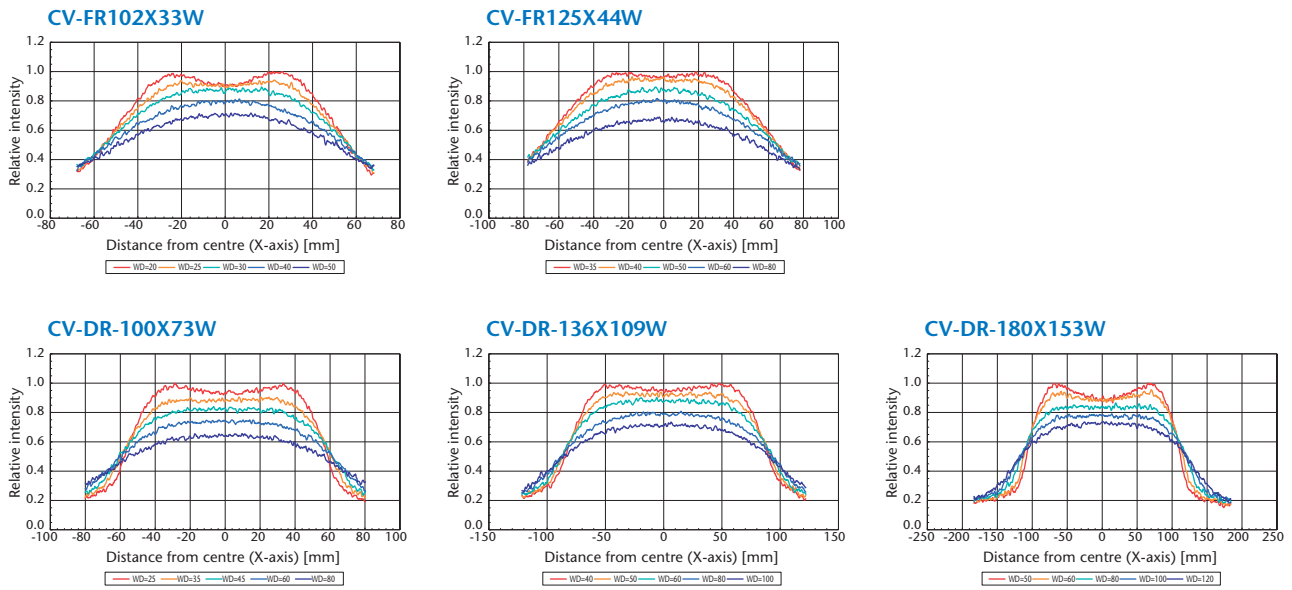
CV-DR-136X109R (B,W)



CV-DR-180X153R (B,W)



Light Distribution Characteristics



Sample Images

CV-FR Series

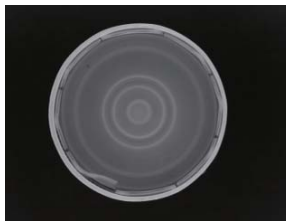


CD Inspection



OCR on Brushed Metal Surface

CV-DR Series



Cap Inspection



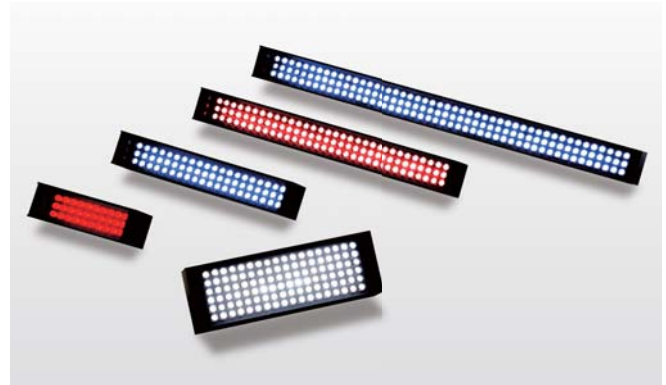
Silkscreen Printing Verification for Remote Control



Bar Illumination CV-BA Series



- High-intensity LED block array
- Can be directed at any angle to the surface for either direct brightfield or optimal oblique darkfield lighting



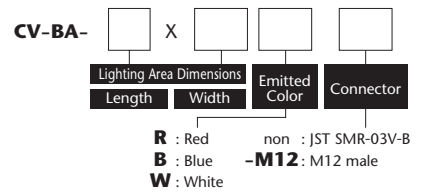
Sample Images



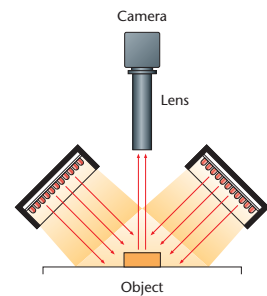
Character on Flexible Ribbon Cable

Silkscreen Printing on Faceplate

Explanation of Model Code



Illumination Structure

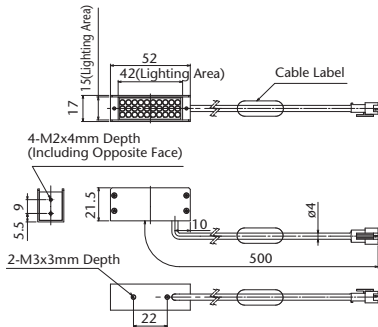


Model	Emitted Color	Power (W)	External Dimensions (mm)			Emitting Area Dimensions (mm)		Weight (g) *	Accessories
			Length	Width	Height	Length	Width		
CV-BA-42X15R	● Red	0.8	52	17	21.5	42	15	35	CV-DF-BA-42X15
CV-BA-42X15B	● Blue	1.4	52	17	21.5	42	15	35	
CV-BA-42X15W	○ White	1.5	52	17	21.5	42	15	35	
CV-BA-74X27R	● Red	1.8	86	29	18.5	74	27	110	CV-DF-BA-74X27
CV-BA-74X27B	● Blue	3.9	86	29	18.5	74	27	110	
CV-BA-74X27W	○ White	3.8	86	29	18.5	74	27	110	
CV-BA-82X15R	● Red	0.7	92	17	21.5	82	15	45	CV-DF-BA-82X15 CV-PL-BA-82X15
CV-BA-82X15B	● Blue	2.8	92	17	21.5	82	15	45	
CV-BA-82X15W	○ White	2.7	92	17	21.5	82	15	45	
CV-BA-130X15R	● Red	1.0	140	17	21.5	130	15	65	CV-DF-BA-130X15 CV-PL-BA-130X15 CV-SP-BA-130X15
CV-BA-130X15B	● Blue	4.5	140	17	21.5	130	15	65	
CV-BA-130X15W	○ White	4.4	140	17	21.5	130	15	65	
CV-BA-200X15R	● Red	1.7	204	17	21.5	194	15	80	CV-DF-BA-200X15 CV-PL-BA-200X15 CV-SP-BA-200X15
CV-BA-200X15B	● Blue	6.8	204	17	21.5	194	15	80	
CV-BA-200X15W	○ White	7.2	204	17	21.5	194	15	80	

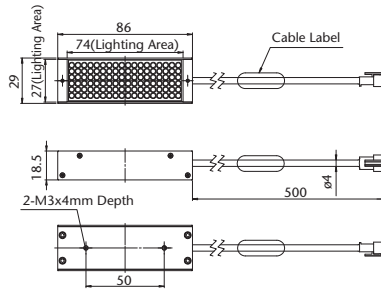
* LED Controller on P.161

* It is weighted 15g more in case "M12".

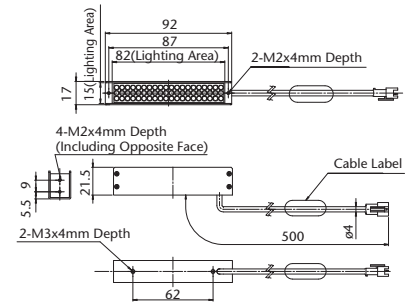
CV-BA-42X15R (B,W)



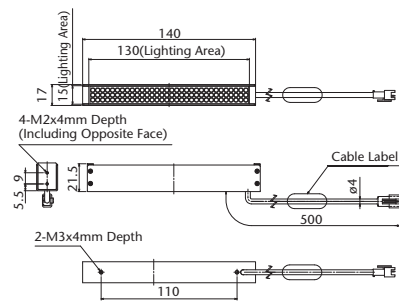
CV-BA-74X27R (B,W)



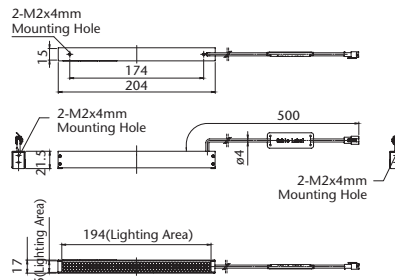
CV-BA-82X15R (B,W)



CV-BA-130X15R (B,W)

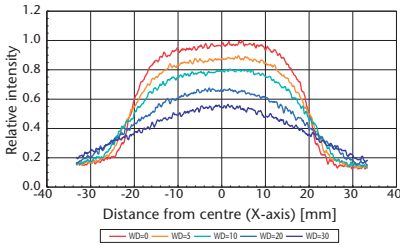


CV-BA-200X15R (B,W)

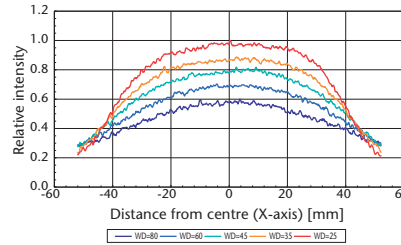


Light Distribution Characteristics

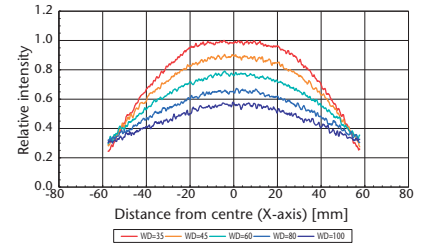
CV-BA-42X15W



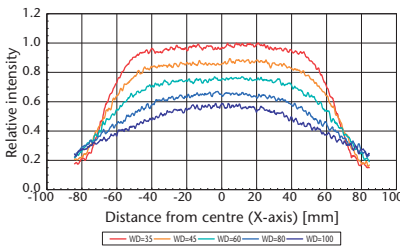
CV-BA-74X27W



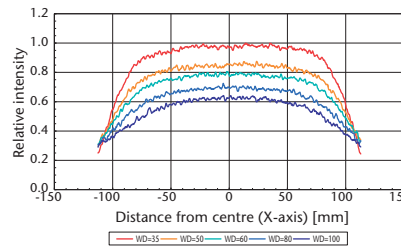
CV-BA-82X15W



CV-BA-130X15W



CV-BA-200X15W



Applications

- IC marking inspection, inspection of components on glass substrates
- Dirt inspection on cap sides and inside surfaces
- Wafer appearance inspection
- Solder inspection and connector pitch inspection
- Inspection, etc. of BGA, QFP, etc.

Accessories

Diffusion Plate



(P.165)

CV-DF-BAxxx

To be mounted in front of the LED lighting using screws provided. Used to soften the lighting output, so as to reduce the glares on specular surface.

Polarizer



(P.165)

CV-PL-BAxxx

To be mounted in front of the LED lighting using screws provided. Used together with a polarizer filter lens in front of the camera as a set. It helps to reduce glare.

Coaxial Illumination

CV-CE Series

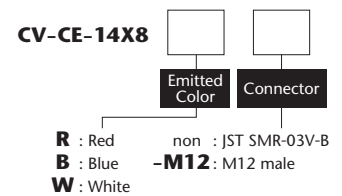


Compact coaxial LED that only requires minimal installation space.

- Fully compatible with our MML Series telecentric lenses that set the industry standard for coaxial illumination, these LEDs are a perfect match
- Body design has been miniaturized and this series is even smaller than its compact predecessors
- L-shaped (right angle) illumination cable design enables further space savings



Explanation of Model Code

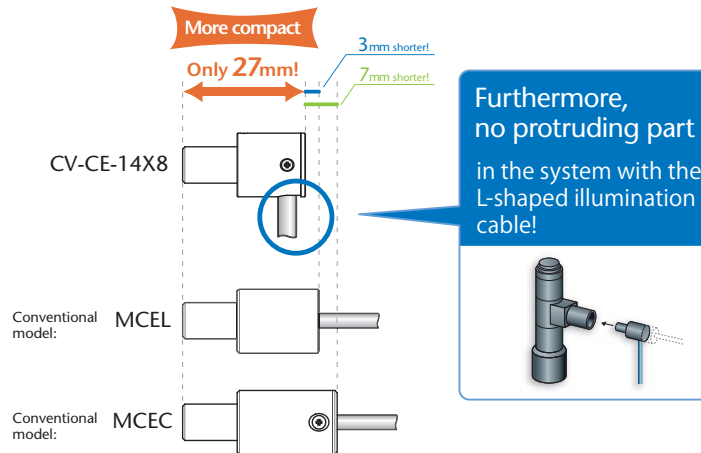


Model	Emitted Color	Power (W)	External Dimensions (mm)			Emitting Diameter (mm)	Weight (g)*
			Tip Diameter	Maximum External Diameter	Length		
CV-CE-14X8R	● Red	0.4	8	14	27	6	20
CV-CE-14X8B	● Blue	0.8	8	14	27	6	20
CV-CE-14X8W	○ White	0.8	8	14	27	6	20

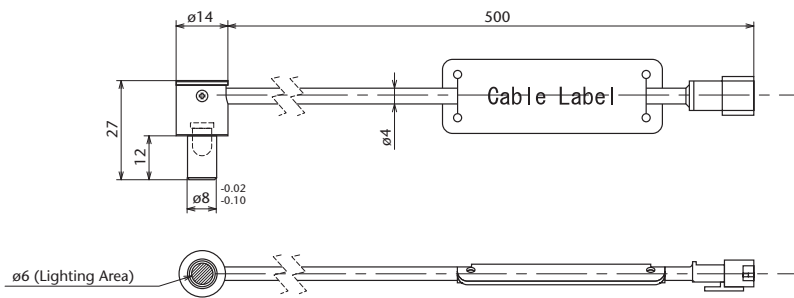
* LED Controller on P.161

* It is weighted 15g more in case "M12".

Size Comparison with Conventional Models



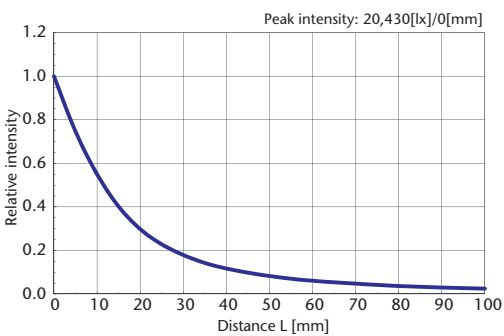
CV-CE-14X8R (B,W)



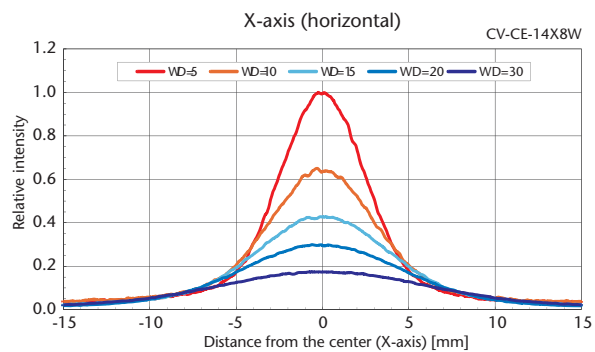
Applications

- Alignment mark recognition on LCD
- Character recognition on wafer
- Other semiconductor and electronic component inspections

Light Intensity Characteristics



Light Distribution Characteristics



Simulated Coaxial Illumination CV-CX Series



- Highly uniform pseudo-coaxial (on-axis) lighting
- Designed for use with our telecentric MML Series and other lenses without built-in coaxial illumination

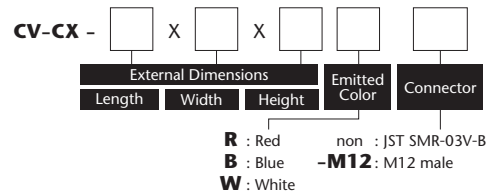


Model	Emitted Color	Power (W)	External Dimensions (mm)			FOV Dimensions (mm)		Weight (g) *
			Length	Width	Height	Length	Width	
CV-CX-75X46X40R	● Red	1.5	75	46	41	26	28	190
CV-CX-75X46X40B	● Blue	2.2	75	46	41	26	28	190
CV-CX-75X46X40W	○ White	2.1	75	46	41	26	28	190
CV-CX-94X60X58R	● Red	1.1	94	60	59	32	36	350
CV-CX-94X60X58B	● Blue	6.4	94	60	59	32	36	350
CV-CX-94X60X58W	○ White	6.2	94	60	59	32	36	350
CV-CX-120X84X79R	● Red	4.9	120	84	80	50	50	580
CV-CX-120X84X79B	● Blue	5.8	120	84	80	50	50	580
CV-CX-120X84X79W	○ White	6.1	120	84	80	50	50	580

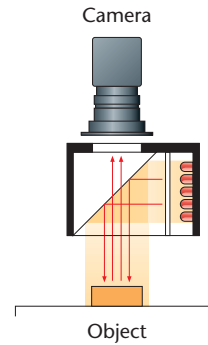
* LED Controller on P.161

* It is weighted 15g more in case "M12".

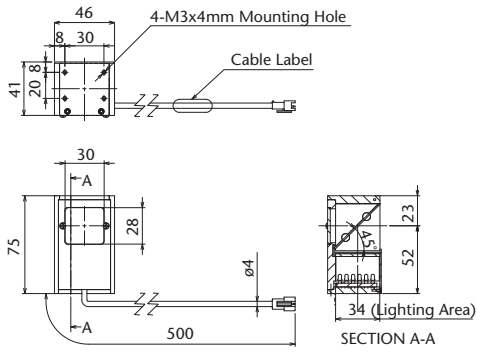
Explanation of Model Code



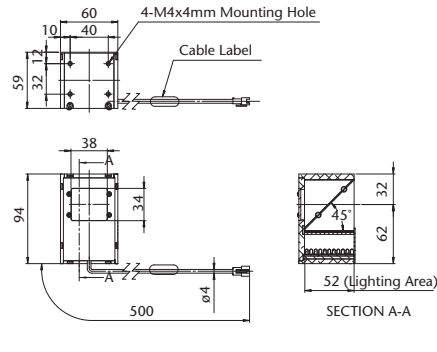
Illumination Structure



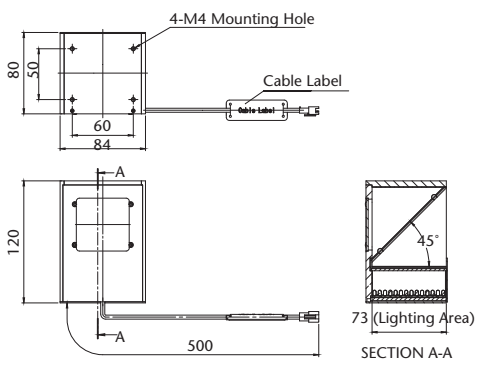
CV-CX-75X46X40R (B,W)



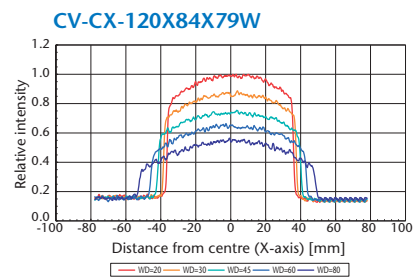
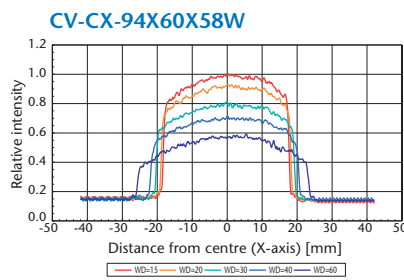
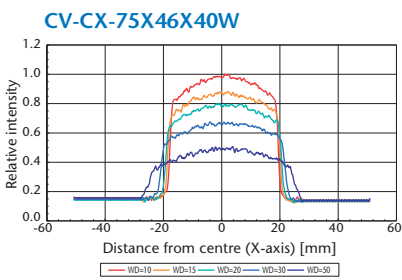
CV-CX-94X60X58R (B,W)



CV-CX-120X84X79R (B,W)



Light Distribution Characteristics



Sample Images



Screw Head Inspection



Glass Bottle Opening

Applications

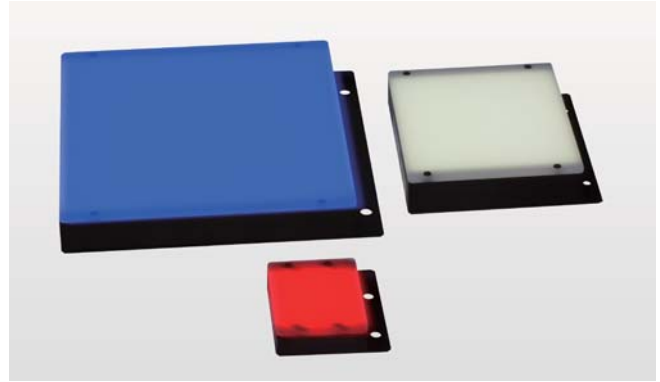
- QFP and SOP inspection
- Metal plate surface inspection
- Ceramic package appearance inspection

Direct Backlights (Chip Mount Type)

CV-FL Series



- Densely packaged chip LEDs in thin chassis (Height: 15 mm)
- Provides diffuse area lighting



Sample Images

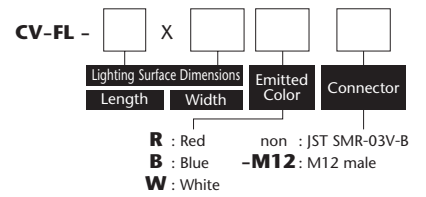


Cutter Disc Roundness Check

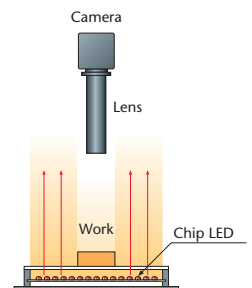


Candle Size Measurement

Explanation of Model Code



Illumination Structure

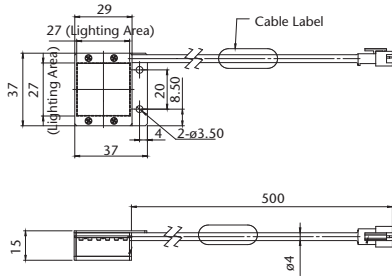


Model	Emitted Color	Power (W)	External Dimensions (mm)			Lighting Surface (mm)		Weight (g) *	Accessories
			Length	Width	Thickness	Length	Width		
CV-FL-27X27R	● Red	0.6	37	37	15	27	27	35	CV-LC-FL-27X27
CV-FL-27X27B	● Blue	1.4	37	37	15	27	27	35	
CV-FL-27X27W	○ White	1.5	37	37	15	27	27	35	
CV-FL-51X51R	● Red	4.5	61	61	15	51	51	70	CV-LC-FL-51X51
CV-FL-51X51B	● Blue	5.9	61	61	15	51	51	70	
CV-FL-51X51W	○ White	6.3	61	61	15	51	51	70	
CV-FL-63X60R	● Red	1.2	73	70	15	63	60	85	CV-LC-FL-63X60
CV-FL-63X60B	● Blue	3.4	73	70	15	63	60	85	
CV-FL-63X60W	○ White	3.2	73	70	15	63	60	85	
CV-FL-83X75R	● Red	4.7	85	95	15	75	83	110	CV-LC-FL-83X75
CV-FL-83X75B	● Blue	7.2	85	95	15	75	83	110	
CV-FL-83X75W	○ White	6.9	85	95	15	75	83	110	
CV-FL-100X100R	● Red	3.5	110	112	15	100	100	160	CV-LC-FL-100X100
CV-FL-100X100B	● Blue	10.4	110	112	15	100	100	160	
CV-FL-100X100W	○ White	9.9	110	112	15	100	100	160	
CV-FL-230X230R	● Red	25.0	240	268	15	230	230	760	CV-LC-FL-230X230
CV-FL-230X230B	● Blue	24.0	240	268	15	230	230	760	
CV-FL-230X230W	○ White	24.2	240	268	15	230	230	760	

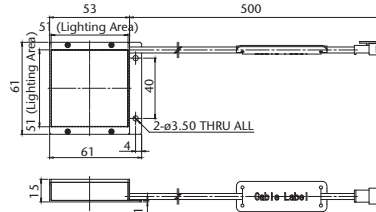
* LED Controller on P.161

* It is weighted 15g more in case "M12".

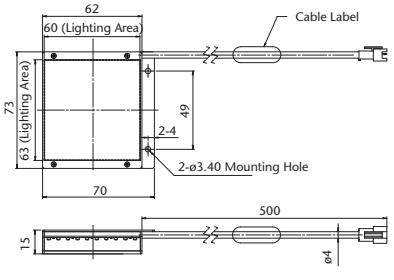
CV-FL-27X27R (B,W)



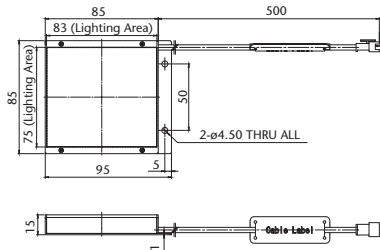
CV-FL-51X51R (B,W)



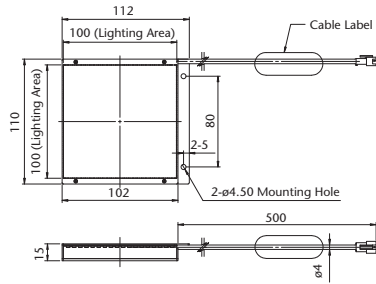
CV-FL-63X60R (B,W)



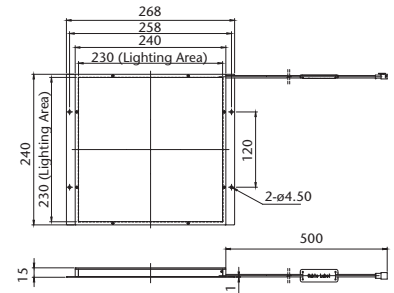
CV-FL-83X75R (B,W)



CV-FL-100X100R (B,W)

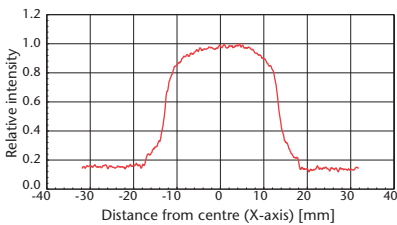


CV-FL-230X230R (B,W)

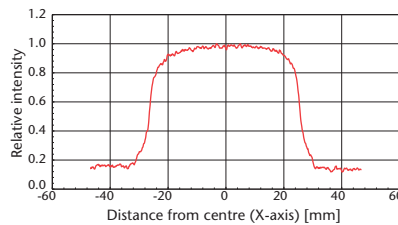


Light Distribution Characteristics

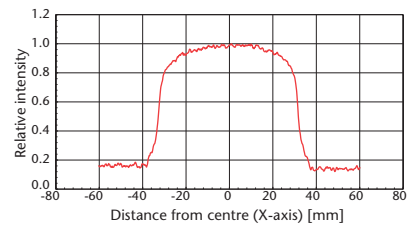
CV-FL-27X27W



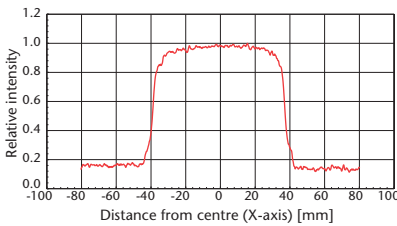
CV-FL-51X51W



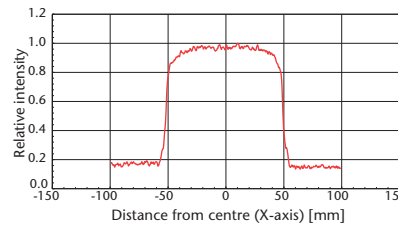
CV-FL-63X60W



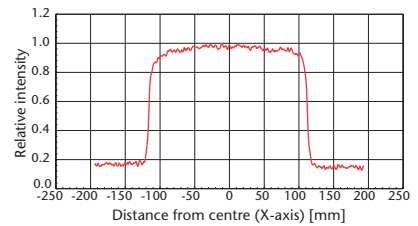
CV-FL-83X75W



CV-FL-100X100W



CV-FL-230X230W

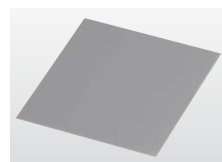


Applications

- Alignment inspection on specular surfaces, including wafers, metal surfaces, film, liquid crystal, and glass
- PCB pattern work

Accessories

Light Control Plate



(P.166)

CV-LC-FLxxx

To be mounted on the top of the LED lighting using the screws provided. To collimate the light from the flat light so as to produce a sharper edged image.



IR Illumination

IR

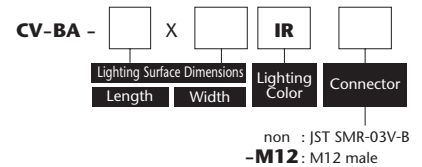
- Provides image recognition at high contrast especially for items that are difficult to view in visible light
- Lighting is also effective for materials that chemically react to visible light rays or allow IR wavelength transmission



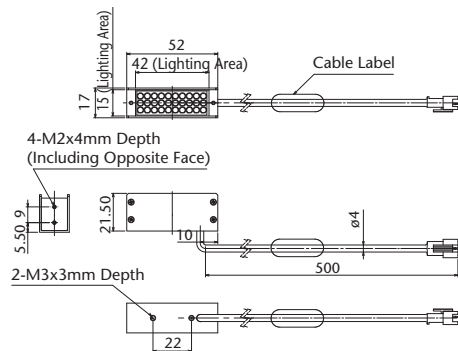
Model	Emitted Color	Power (W)	External Dimensions (mm)			Emitting Area Dimensions (mm)		Weight (g)*
			Length	Width	Height	Length	Width	
CV-BA-42X15IR	IR	0.9	52	17	21.5	42	15	35

* LED Controller on P.161
 * It is weighted 15g more in case "M12".
 * IR is currently available for bar illumination, and other illumination types are under consideration.

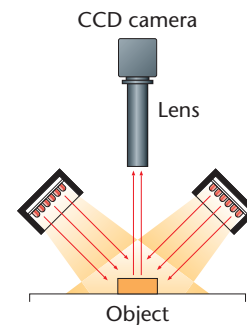
Explanation of Model Code



CV-BA-42x15IR



Illumination Structure

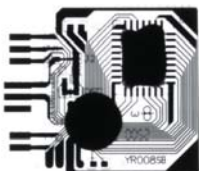


Sample Images

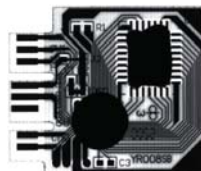
1.Substrate Pattern Recognition

(For IR, only the pattern is recognized clearly)

With an IR backlight LED



With a white backlight LED



2.Cheese Package Recognition

(For IR, specific patterns can be made invisible)

With an IR direct ring LED



With a white, direct LED



Dedicated LED Digital Controller

MLEF Series



Two-in-one multifunctional digital controllers for Strobe/PWM

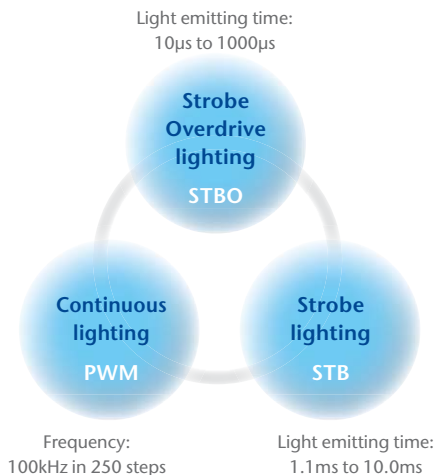
LED controllers compatible with lighting modes from strobe overdrive to continuous lighting. Allows adjustment of not only light emitting time but also voltage for dimming control in strobe overdrive mode—invaluable for maintaining a constant light emitting time for setting cameras. This proprietary function is an industry first for DIN-rail-mountable compact controllers.



- **Mode selectable between strobe overdrive, strobe, and PWM**
Adaptable to various lighting modes ranging from strobe overdrive to continuous lighting
- **Ethernet communication**
Ethernet/parallel (8-bit) port provided for external interfacing
- **Strobe dimming control**
Allows adjustment of not only light emitting time but also voltage for dimming control in strobe overdrive mode. This proprietary function is an industry first for DIN-rail-mountable compact controllers
- **Compact, lightweight body design**
Compact and lightweight body allows flexible installation to a DIN rail or direct mounting
- **Panel indication for easy operation**
User-friendly panel indication allows easy operation

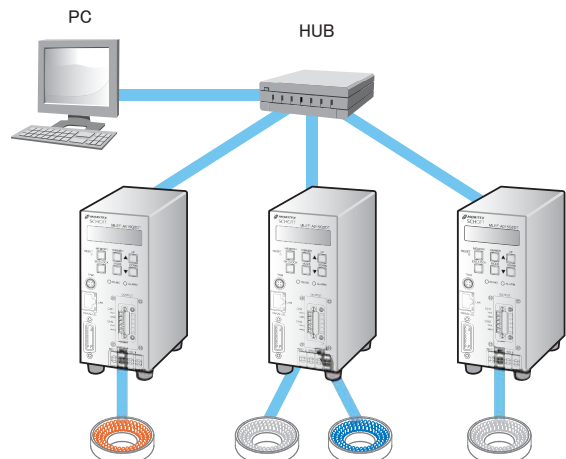
Selectable 3 Lighting Modes

Selectable three LED lighting modes, Strobe Overdrive, Strobe and PWM are available for user's precise lighting adjustment.



Ethernet LAN/Parallel Digital Networking

The Ethernet port and conventional parallel port interfaces are equipped as standard. Setting up a LAN can be made by using the existing IT assets, e.g. cabling, without additional cost.



Easy Operation

Simple push-button operation makes settings easy

User-friendly and informative front display panel indicates the current operation mode.

Lighting mode!
Changing
Pulse Width Modulation (PWM) mode is selected. The display shows CH1: 50, MODE [PWM], and CH2: 250. A callout indicates: "Select a lighting mode among 3 modes by pushing DIMMER button".

Control type!
Changing
Control type is selected. The display shows CTRL TYPE SEL [MANU] PARA LAN. A callout indicates: "Select a control type by pushing MODE button".

Light emitting time and lighting setting
Changing
Light emitting time and intensity are set. The display shows CH1: 1000u, MODE [STBO], and CH2: 10u. A callout indicates: "Set a desirable light emitting time and intensity by pushing UP/DOWN buttons".

Long push: Jump
Short push: Steps

Lighting/dimming level repeatability

Repeating previous lighting/dimming settings can be perfectly done with the digitalized setting values.

Strobe Overdrive Feature

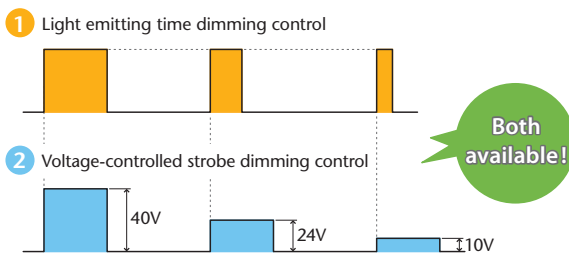
Feature 1 Voltage-controlled dimming control available!

Using both the light emitting time dimming control and voltage-controlled strobe dimming control are possible for lighting control under the Strobe Overdrive (STBO) mode. It saves the trouble of light emitting time adjustment with multiple cameras, since the user can change the light intensity only with the power (load voltage).

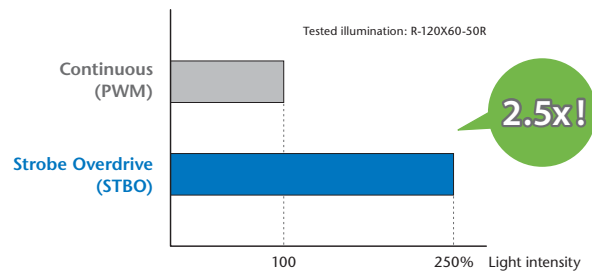
Feature 2 2.5x brighter!

The Strobe Overdrive can give out about 2.5x brightness instantaneously compared to the PWM continuous lighting. This is desirable for high-speed machine vision image processing such as an IC chip appearance inspection.

Two strobe dimming methods available (STBO mode)



Light intensity comparison



Adjustment Range

Strobe Overdrive lighting STBO

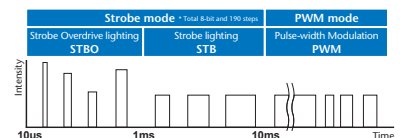
Trigger synchronization with signal shall be set for the Strobe Overdrive lighting. Light emitting time (i.e. duration) range is 10μs to 1000μs in 100 steps with 10μs increments, also the variable output voltage ranges from 10V-40V.

Strobe lighting STB

Trigger synchronization with signal shall be set for the Strobe lighting. Light emitting time range is 1.1ms to 10.0ms in 90 steps with 100μs (0.1ms) increments.

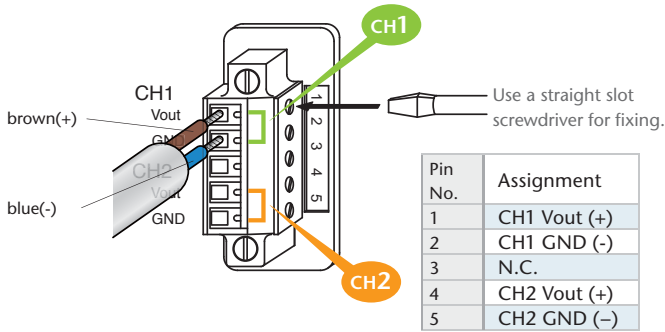
Continuous lighting PWM

250 control steps at 100kHz. Continuous DC lighting with the control value range from (light off) 0 to 250 (maximum).



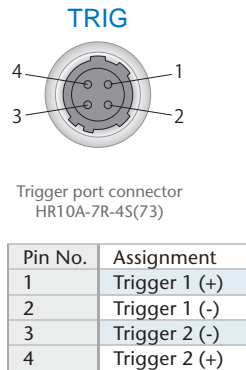
Connecting with LED Illumination

The dedicated extension cable is available for connecting the terminal with each LED illumination.



Trigger Input

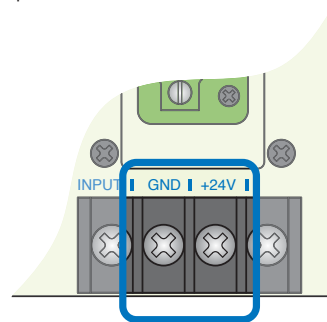
Trigger signal setting is necessary for both Strobe Overdrive and Strobe modes. Recommended trigger cable connector: HR10A-7P-4P(73), Hirose, or equivalent product.



24 VDC Input Terminal Block

Use the boxed terminals for connecting 24 VDC input as shown below. M3-type round crimping terminal is recommended for connection.

*Using an excessively large crimping terminal may damage the terminal block and its resin screw part.



External Interface

Parallel interface

Pin assignment details for parallel connection.

* External control cable MC-EXC-02 is available on request.

Pin No.	Signal	I/O	Note
1	CH	Input	Designate output channel; L: CH1, H: CH2
2	MODE0	Input	Lighting mode selection between PWM, STB, VoutADJ and MEMORY
3	MODE1	Input	
4	D0	Input	Function changes according to selected mode D0-D7 Used for indicated values in PWM or STB mode D0-D7 Used for indicated values in VoutADJ mode D0 Used for reading and writing when MODE is MEMORY D1-D2 Used for address indication when MODE is MEMORY
5	D1	Input	
6	D2	Input	
7	D3	Input	
8	D4	Input	
9	D5	Input	
10	D6	Input	
11	D7	Input	
12	WE	Input	Used for writing and fixing settings onto internal register
13	COMMON	—	5 to 24V can be applied, but no input variation while in use
14	ERRc	Output	Alarm when controller operates abnormally
15	ERRe	Output	Normal operation: PD off / Abnormal operation: PD on

Ethernet LAN

Communication protocol for external control through Ethernet LAN.

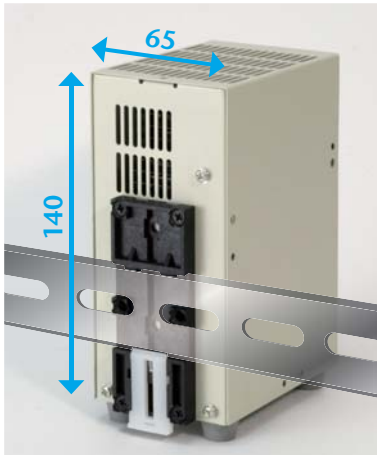
Protocol hierarchy	Specification	
TCP protocol	Applicable standard	RFC793
IPv4 protocol	Applicable standard	RFC791
Ethernet	Applicable standard	IEEE 802.3 IEEE 802.3u IEEE 802.3x
	Transfer rate (automatic detection)	10Mbps 100Mbps
	Data transmission media	10BASE-T 100BASE-TX

* Automatic negotiation compatible

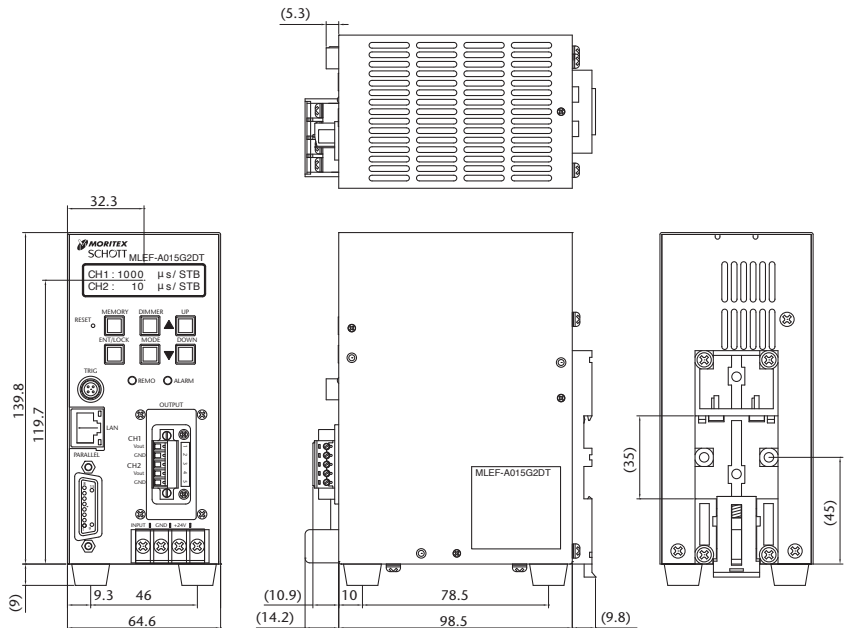
Small and Lightweight Design

65mm slimline body

Small and lightweight body (only 800g weight and 65mm width) makes it easy to fix onto DIN rail or simply use standalone.

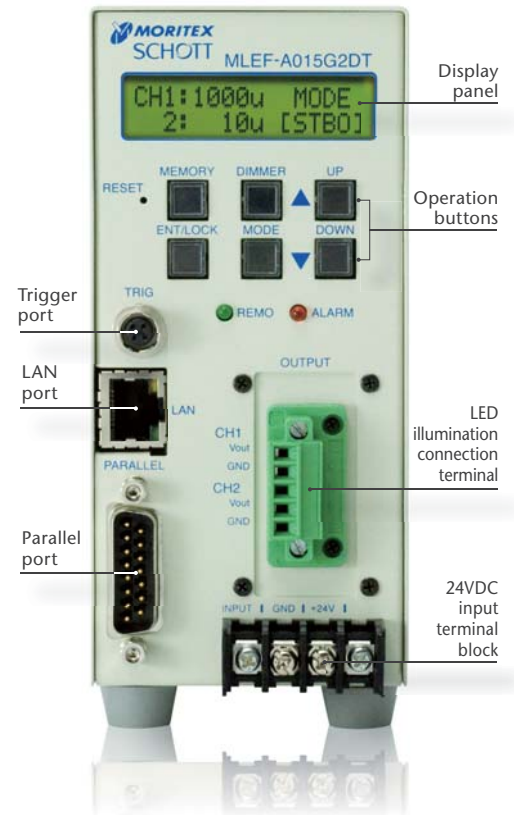


External View



Specifications

Model name	MLEF-A015G2DT
Input voltage	24VDC +/-10% (21.6-26.4V)
Input current	1.8A (Maximum)
Output channel	2 channels
Output power	PWM : 30W (Two channel total), STB : 15W (Maximum for a channel)
Output voltage	PWM/STB : 24Vp-p, STBO : 40Vp-p
Output current	PWM/STB : 1.25Ap-p, STBO : 4.0Ap-p
Variable output range	PWM/STB : 0 to 100%, STBO : 10 to 40V *1
Remote control	Ethernet LAN port / Parallel port
PWM mode	PWM frequency: 100kHz (Control step: 250 steps)
STB mode	Light emitting time: 1.1 to 10.0ms (90 steps in 0.1ms increments) * Effective bit setting: From 101 to 190 among the 8 bits
STBO mode	Light emitting time: 10 to 1000µs (100 steps in 10µs increments) Flashing duty cycle limit: 10% * Effective bit setting: From 0 to 100 among the 8 bits Vout adjustment : 0 to 100% (256 steps)
Trigger input range	5 to 24VDC STB/STBO_TRG Input response time : Less than 10µs PWM_ON/OFF Input response time : Less than 10µs
Setup mode	STB : 5ms / 10ms, STBO : 10µs / 1000µs
Memory function	Manual memory (ROM) : Up to 3 memory settings Remote LAN memory (RAM) : Up to 3memory settings Remote parallel memory (RAM) : Up to 4 memory settings
Safety feature	Overcurrent / Overvoltage / STB(O) output overtime protection Fuse rating: 4.0A (input) *2
Set reclosing interval	Not less than 1 second
Operating condition	Indoor use only, Maximum altitude for use : 2000m above sea level, Operating temperature : 0 to 45°C Operating humidity limits : Less than 80% RH until 30°C, then decline linearly to 50% RH at 40°C. Pollution level 2
Storage temperature/humidity range	-20 to 80°C / 20 to 85% RH (No condensation)
Cooling method	Natural cooling
Ingress Protection code	IP20 (EN 60529) *3
External dimensions	W655 x H140 x D99mm (Projecting parts excluded)
Weight	Approx. 800g
CE-Marking	EMC Directive: EN55011:2009+A1:2010, EN61000-6-2:2005 *4



*1 The minimum voltage is a reference value.
 *2 To reset a protection function (but not applicable to blowout of a fuse), restore the main supply with a 2 to 3 second interval after turning it off.
 *3 Protected against a solid object greater than 12.5mm in diameter, such as a finger. No protection against ingress of water.
 *4 Compatible with an extension or branch cables (for CompaVis®) of up to 10m.

CompaVis®

Accessories

Diffuse Plates: CV-DF Series

These diffuser plates, which can be attached to the illumination using the dedicated adapters, help prevent unwanted lighting reflection.

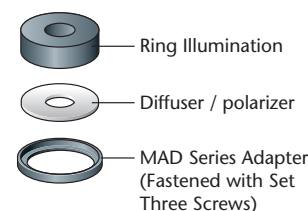
Model	Product Type	Compatible Light Models	Internal Diameter (mm)
CV-DF-R-32X10-70	Diffuser for Direct Ring Illumination	CV-R-32X10-70R(B,W)	ø10
CV-DF-R-42X18-65	Diffuser for Direct Ring Illumination	CV-R-42X18-65R(B,W)	ø14
CV-DF-R-50X28-75	Diffuser for Direct Ring Illumination	CV-R-50X28-75R(B,W)	ø25
CV-DF-R-70X35-90	Diffuser for Direct Ring Illumination	CV-R-70X35-90R(B,W)	ø35
CV-DF-R-90X30-80	Diffuser for Direct Ring Illumination	CV-R-90X30-80R(B,W)	ø30
CV-DF-R-90X50-70	Diffuser for Direct Ring Illumination	CV-R-90X50-70R(B,W)	ø40
CV-DF-R-120X58-50	Diffuser for Direct Ring Illumination	CV-R-120X58-50R(B,W)	ø60
CV-DF-SQ-56X56X30	Diffuser for Square Ring Illumination	CV-SQ-56X56X30R(B,W)	ø30
CV-DF-RLA-74X48-30	Diffuser for Low Angle Ring Illumination	CV-RLA-74X48-30R(B,W)	ø40
CV-DF-RLA-100X70-30	Diffuser for Low Angle Ring Illumination	CV-RLA-100X70-30R(B,W)	ø56
CV-DF-RLA-132X96-15	Diffuser for Low Angle Ring Illumination	CV-RLA-132X96-15R(B,W)	ø82
CV-DF-BA-42X15	Diffuser for Bar Illumination	CV-BA-42X15R(B,W)	—
CV-DF-BA-74X27	Diffuser for Bar Illumination	CV-BA-74X27R(B,W)	—
CV-DF-BA-82X15	Diffuser for Bar Illumination	CV-BA-82X15R(B,W)	—
CV-DF-BA-130X15	Diffuser for Bar Illumination	CV-BA-130X15R(B,W)	—
CV-DF-BA-200X15	Diffuser for Bar Illumination	CV-BA-200X15R(B,W)	—

Adapters: CV-AD Series

Adapter for attaching dedicated diffuser plates and polarizing plate for CompaVis® ring illumination.

Model	Product Type	Compatible Light Models
CV-AD-R-32X10-70	Plate Attachment Adapter for Direct Ring Illumination	CV-R-32X10-70R(B,W)
CV-AD-R-42X18-65	Plate Attachment Adapter for Direct Ring Illumination	CV-R-42X18-65R(B,W)
CV-AD-R-50X28-75	Plate Attachment Adapter for Direct Ring Illumination	CV-R-50X28-75R(B,W)
CV-AD-R-70X35-90	Plate Attachment Adapter for Direct Ring Illumination	CV-R-70X35-90R(B,W)
CV-AD-R-90X30-80	Plate Attachment Adapter for Direct Ring Illumination	CV-R-90X30-80R(B,W)
CV-AD-R-90X50-70	Plate Attachment Adapter for Direct Ring Illumination	CV-R-90X50-70R(B,W)
CV-AD-R-120X58-50	Plate Attachment Adapter for Direct Ring Illumination	CV-R-120X58-50R(B,W)

How to Use CV-AD Series



Polarizing Plate: CV-PL Series

Attaching these polarizing plates on the lens side (inside the polarizer) cuts specular reflection in particular areas and reduces glare in the resulting image.

Model	Product Type	Compatible Light Models	Internal Diameter (mm)
CV-PL-R-32X10-70	Polarizer for Direct Ring Illumination	CV-R-32X10-70R(B,W)	ø10
CV-PL-R-42X18-65	Polarizer for Direct Ring Illumination	CV-R-42X18-65R(B,W)	ø14
CV-PL-R-50X28-75	Polarizer for Direct Ring Illumination	CV-R-50X28-75R(B,W)	ø26
CV-PL-R-70X35-90	Polarizer for Direct Ring Illumination	CV-R-70X35-90R(B,W)	ø35
CV-PL-R-90X30-80	Polarizer for Direct Ring Illumination	CV-R-90X30-80R(B,W)	ø30
CV-PL-R-90X50-70	Polarizer for Direct Ring Illumination	CV-R-90X50-70R(B,W)	ø40
CV-PL-R-120X58-50	Polarizer for Direct Ring Illumination	CV-R-120X58-50R(B,W)	ø60
CV-PL-SQ-56X56X30	Polarizer for Square Ring Illumination	CV-SQ-56X56X30R(B,W)	ø30
CV-PL-BA-42X15	Polarizer for Bar Illumination	CV-BA-42X15R(B,W)	—
CV-PL-BA-74X27	Polarizer for Bar Illumination	CV-BA-74X27R(B,W)	—
CV-PL-BA-82X15	Polarizer for Bar Illumination	CV-BA-82X15R(B,W)	—
CV-PL-BA-130X15	Polarizer for Bar Illumination	CV-BA-130X15R(B,W)	—
CV-PL-BA-200X15	Polarizer for Bar Illumination	CV-BA-200X15R(B,W)	—

Support Plates: CV-SP Series

This supporter plate to reduce the deflection of polarizing plate for bar.

Model	Product Type	Compatible Light Models
CV-SP-BA-130X15	Support Plate for Bar Illumination	CV-BA-130X15R(B,W)
CV-SP-BA-200X15	Support Plate for Bar Illumination	CV-BA-200X15R(B,W)

Light Control Film: CV-LC Series

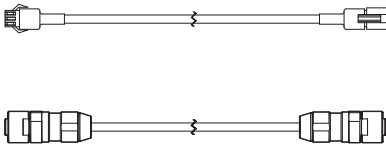
Diffused illumination are transformed into collimated illumination by this films.

Model	Product Type	Compatible Light Models
CV-LC-FL-27X27	Light Control Film for Back Lights	CV-LC-FL-27X27R(B,W)
CV-LC-FL-51X51	Light Control Film for Back Lights	CV-LC-FL-51X51R(B,W)
CV-LC-FL-63X60	Light Control Film for Back Lights	CV-LC-FL-63X60R(B,W)
CV-LC-FL-83X75	Light Control Film for Back Lights	CV-LC-FL-83X75R(B,W)
CV-LC-FL-100X100	Light Control Film for Back Lights	CV-LC-FL-100X100R(B,W)
CV-LC-FL-230X230	Light Control Film for Back Lights	CV-LC-FL-230X230R(B,W)

Cable

The cable of M12 connector also is possible provided.

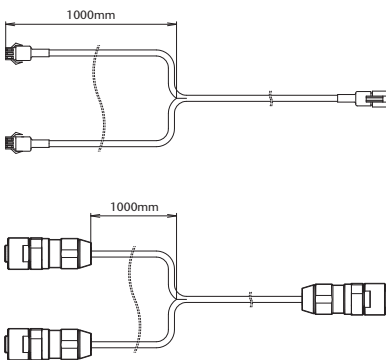
Extension Cable



Model	Product Type	Length	Connector
JST-1M-JST-1W	Extension Cable	1m	SM(3P) to SM(3P)
JST-2M-JST-1W	Extension Cable	2m	SM(3P) to SM(3P)
JST-3M-JST-1W	Extension Cable	3m	SM(3P) to SM(3P)
JST-5M-JST-1W	Extension Cable	5m	SM(3P) to SM(3P)
★ M-JST-1M-JST-1W	Extension Robot Cable	1m	SM(3P) to SM(3P)
★ M-JST-2M-JST-1W	Extension Robot Cable	2m	SM(3P) to SM(3P)
★ M-JST-3M-JST-1W	Extension Robot Cable	3m	SM(3P) to SM(3P)
★ M-JST-5M-JST-1W	Extension Robot Cable	5m	SM(3P) to SM(3P)
★ M12-1M-M12-1W	Extension Cable	1m	M12 to M12
★ M12-2M-M12-1W	Extension Cable	2m	M12 to M12
★ M12-3M-M12-1W	Extension Cable	3m	M12 to M12
★ M12-5M-M12-1W	Extension Cable	5m	M12 to M12
★ M-M12-1M-M12-1W	Extension Robot Cable	1m	M12 to M12
★ M-M12-2M-M12-1W	Extension Robot Cable	2m	M12 to M12
★ M-M12-3M-M12-1W	Extension Robot Cable	3m	M12 to M12
★ M-M12-5M-M12-1W	Extension Robot Cable	5m	M12 to M12

★Made-to-order products.

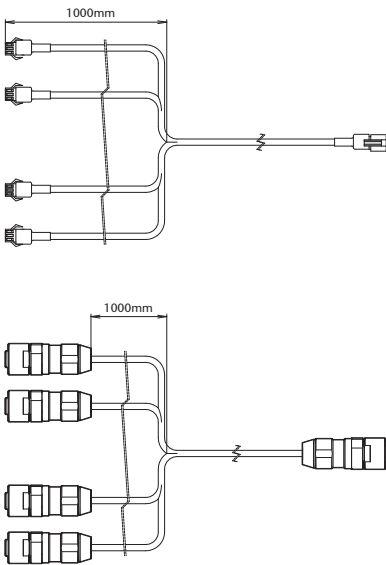
Branch Cable - 2 Way



Model	Product Type	Length	Connector
JST-2M-JST-2W	Branch Cable - 2 Way	2m	SM(3P) to SM(3P)
JST-3M-JST-2W	Branch Cable - 2 Way	3m	SM(3P) to SM(3P)
JST-5M-JST-2W	Branch Cable - 2 Way	5m	SM(3P) to SM(3P)
★ M-JST-2M-JST-2W	Branch Robot Cable - 2 Way	2m	SM(3P) to SM(3P)
★ M-JST-3M-JST-2W	Branch Robot Cable - 2 Way	3m	SM(3P) to SM(3P)
★ M-JST-5M-JST-2W	Branch Robot Cable - 2 Way	5m	SM(3P) to SM(3P)
★ M12-2M-M12-2W	Branch Cable - 2 Way	2m	M12 to M12
★ M12-3M-M12-2W	Branch Cable - 2 Way	3m	M12 to M12
★ M12-5M-M12-2W	Branch Cable - 2 Way	5m	M12 to M12
★ M-M12-2M-M12-2W	Branch Robot Cable - 2 Way	2m	M12 to M12
★ M-M12-3M-M12-2W	Branch Robot Cable - 2 Way	3m	M12 to M12
★ M-M12-5M-M12-2W	Branch Robot Cable - 2 Way	5m	M12 to M12

★Made-to-order products.

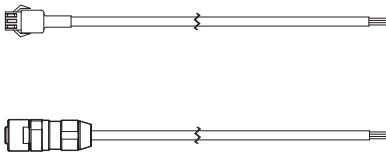
Branch Cable - 4 Way



Model	Product Type	Length	Connector
JST-2M-JST-4W	Branch Cable - 4 Way	2m	SM(3P) to SM(3P)
JST-3M-JST-4W	Branch Cable - 4 Way	3m	SM(3P) to SM(3P)
JST-5M-JST-4W	Branch Cable - 4 Way	5m	SM(3P) to SM(3P)
★ M-JST-2M-JST-4W	Branch Robot Cable - 4 Way	2m	SM(3P) to SM(3P)
★ M-JST-3M-JST-4W	Branch Robot Cable - 4 Way	3m	SM(3P) to SM(3P)
★ M-JST-5M-JST-4W	Branch Robot Cable - 4 Way	5m	SM(3P) to SM(3P)
★ M12-2M-M12-4W	Branch Cable - 4 Way	2m	M12 to M12
★ M12-3M-M12-4W	Branch Cable - 4 Way	3m	M12 to M12
★ M12-5M-M12-4W	Branch Cable - 4 Way	5m	M12 to M12
★ M-M12-2M-M12-4W	Branch Robot Cable - 4 Way	2m	M12 to M12
★ M-M12-3M-M12-4W	Branch Robot Cable - 4 Way	3m	M12 to M12
★ M-M12-5M-M12-4W	Branch Robot Cable - 4 Way	5m	M12 to M12

★Made-to-order products.

Connection Cable for MLEF



Model	Product Type	Length	Connector
JST-0.1M-1W	Connection Cable for MLEF	0.1m	SM(3P) to Free
JST-1M-1W	Connection Cable for MLEF	1m	SM(3P) to Free
JST-2M-1W	Connection Cable for MLEF	2m	SM(3P) to Free
JST-3M-1W	Connection Cable for MLEF	3m	SM(3P) to Free
JST-5M-1W	Connection Cable for MLEF	5m	SM(3P) to Free
★ M-JST-1M-1W	Connection Robot Cable for MLEF	1m	SM(3P) to Free
★ M-JST-2M-1W	Connection Robot Cable for MLEF	2m	SM(3P) to Free
★ M-JST-3M-1W	Connection Robot Cable for MLEF	3m	SM(3P) to Free
★ M-JST-5M-1W	Connection Robot Cable for MLEF	5m	SM(3P) to Free
★ M12-0.1M-1W	Connection Cable for MLEF	0.1m	M12 to Free
★ M12-1M-1W	Connection Cable for MLEF	1m	M12 to Free
★ M12-2M-1W	Connection Cable for MLEF	2m	M12 to Free
★ M12-3M-1W	Connection Cable for MLEF	3m	M12 to Free
★ M12-5M-1W	Connection Cable for MLEF	5m	M12 to Free
★ M-M12-1M-1W	Connection Robot Cable for MLEF	1m	M12 to Free
★ M-M12-2M-1W	Connection Robot Cable for MLEF	2m	M12 to Free
★ M-M12-3M-1W	Connection Robot Cable for MLEF	3m	M12 to Free
★ M-M12-5M-1W	Connection Robot Cable for MLEF	5m	M12 to Free

★Made-to-order products.

Pin Assign

Illumination Connector

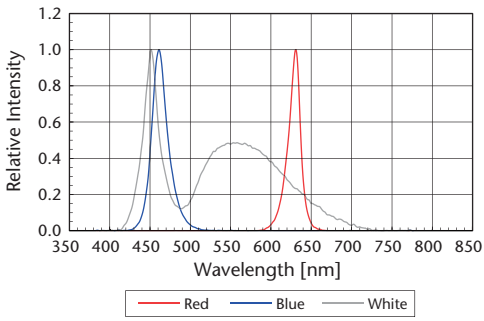
JST SMR-03V-B Connector			
Ref. Drawing	No.	Assign	Wire Color
	1	+V	Red / Brown
	2	NC	
	3	-V	Black / Blue

M12 Male Connector			
Ref. Drawing	No.	Assign	Wire Color
	1	+V	Red / Brown
	2	NC	
	3	-V	Black / Blue
	4	NC	

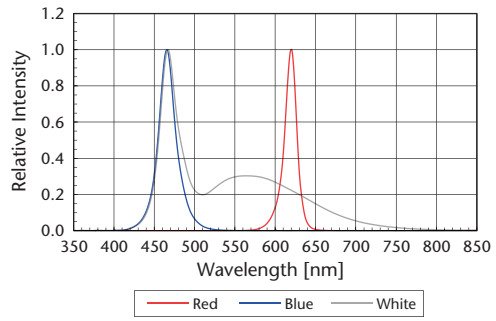
LED Spectral Characteristics

The diagrams below illustrate the spectral characteristics of major LEDs used in the CompaVis®. We can also manufacture other lighting devices with different wavelengths. Please feel free to contact us.

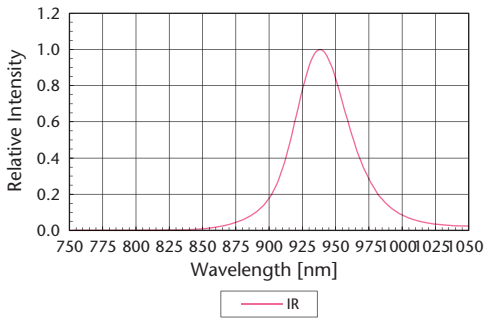
CV-R, CV-SQ, CV-RLA, CV-FR, CV-DR, CV-BA, CV-CX, CV-FL Series



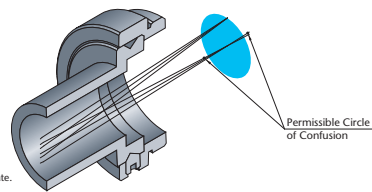
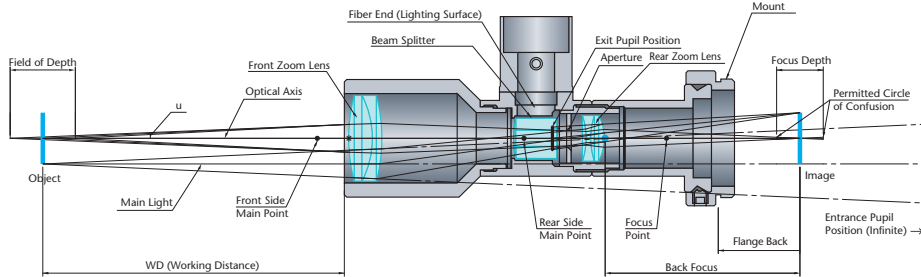
CV-CE Series



IR Series



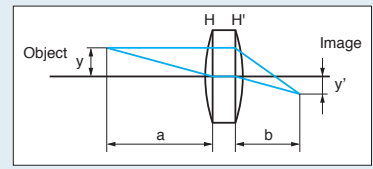
Data and Glossary



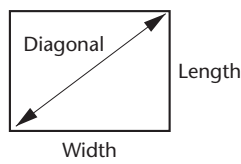
*This diagram is intended for the purpose of explaining technology. The positions and distances shown in this diagram are not necessarily accurate.

Performance	Telecentric Optics	<p>An optical system where the principal ray is parallel to the lens optical axis. An optical system where the light comes from an object toward a lens and stays parallel to the optical axis, even outside the axis, is called object side telecentric optics. A system where the light comes from lens toward an image and stays parallel to the optical axis, even outside the axis, is called image side telecentric optics. Telecentric optics indicated in this catalog are object side telecentric optics.</p>	
	Resolution (μm)	<p>Resolution is measured by how closely 2 points can be before they cannot be distinguished. For example, 1μm resolution means that 2 points that are 1μm away from each other can be distinguished. Resolution values in this catalog are theoretical resolutions for the lenses. The following is a formula to calculate theoretical resolution based on a lens's ray diffraction with no aberration. (Rayleigh formula)</p> $\text{Resolution} = \frac{0.61 \times \lambda}{NA}$ <p>λ: Wavelength 0.61: Fixed Number</p>	
	Resolving Power (Lines/mm)	<p>Resolving power indicates the number of black and white lines distinguished within 1mm in an image through a black and white grid-like chart lens. Resolving power is expressed by lines/mm. For example, 100 lines/mm means that black and white pitch 1/100mm (10μm) can be distinguished. Width of both the black and white lines is 1/200mm (5μm).</p>	
	Horizontal TV Resolution (TV lines)	<p>The total number of black and white horizontal stripes in the width, equivalent to the height of the vertical height on a TV monitor screen. The total stripes in the horizontal width would be 3/4, because the ratio of vertical and horizontal length of the screen is usually 3:4. When the horizontal TV resolution is 240TV lines, total stripes in the horizontal width of the TV monitor would be 320 lines. When measuring resolution of a lens, a pair of black and white lines is counted as one line. However, for TV lines, one pair is counted as 2TV lines.</p>	
	Distortion (%)	<p>Distortion is the aberration of a lens where a straight object outside of the optical axis appears curved. Distortion of a straight line towards the center is called pincushion distortion, while distortion expanding outwards is called barrel distortion</p>	
	TV Distortion (%)	<p>Image distortion on a TV monitor. The closer to zero, the better the performance.</p>	$\text{TV distortion (\%)} = \frac{\Delta h}{2h} \times 100$ <p>The curve amount on the long side is considered as distortion. Percentage of the depth of distortion h against vertical screen is TV distortion</p>
	Aperture Efficiency Marginal Light Quantity (%)	<p>Aperture efficiency indicates the brightness difference between the optical axis of the image formation plane and its surrounding area when an evenly bright object is captured with a lens. It is expressed by percent (%) assuming that the center brightness is 100. It is one of the optical characteristics of a lens. Marginal light quantity in this catalog indicates aperture efficiency.</p>	
	Shading (%)	<p>Shading is the brightness difference between the center of a TV monitor and its edges when an evenly bright object is captured with a lens and a camera. It is expressed by percent (%). Generally, this percentage is calculated based on power ratio of light receiving elements. Shading indicates comprehensive performance of a lens and TV camera. To make shading smaller, telecentric optics is used.</p>	
	Chromatic Aberration	<p>In lens optics, positions where images are formed and image magnification differ according to the light's wavelength. Rays of different wavelengths have different colors. This is called chromatic aberration. Aberration on the optical axis is called chromatic aberration on the axis, and magnification difference is called magnification chromatic aberration.</p>	
Floating Mechanism	<p>This system is used to compensate for lens aberration which occurs in shooting an image of an object in close proximity. When moving (extending) the lenses for close-up shooting or adjusting the object distance, the aberration changes in accordance with the magnification or shooting distance, resulting in degraded resolution in some cases. The floating mechanism minimizes the change in aberration by moving some of the lenses according to the shooting conditions, thus correcting for the aberration.</p>		

Distance	WD (Working Distance) (mm)	Distance from the front end of a lens system to the object under inspection.							
	Focal Distance f (mm) Back Focus / Front Focus	Focal distance is the distance from the optical system's principle point to the focal point. Distance from the vertex of the last lens to the back focal point is called back focus. Distance from the vertex of the first lens to the front focal point is called front focus.							
	Depth of Field	Depth is the distance between the nearest and farthest points that appear in acceptably sharp focus when an object is shifted back and forth from the best focal point. Depth range of the object side is called depth of field. Depth of Field = 2 (Permissible Circle of Confusion x Effective F No Magnification²) Images through lenses theoretically form as points. Acceptable blur on an acceptably clear image is called the permissible circle of confusion							
	Depth of Focus	Depth is the distance between the nearest and farthest points that appear in acceptably sharp focus when a sensors is shifted back and forth from the best focal point. Depth range of the image side is called depth of focus.							
	Flange Back (mm)	Distance from the front of the camera mount plane to the image.							
	C-Mount Specifications	<table border="1"> <thead> <tr> <th>Name</th> <th>Standard External Diameter</th> <th>No. of Screw Threads (for 25.4mm)</th> <th>Flange Back</th> </tr> </thead> <tbody> <tr> <td>U1</td> <td>25.400mm</td> <td>32 Threads</td> <td>17.526mm</td> </tr> </tbody> </table>	Name	Standard External Diameter	No. of Screw Threads (for 25.4mm)	Flange Back	U1	25.400mm	32 Threads
Name	Standard External Diameter	No. of Screw Threads (for 25.4mm)	Flange Back						
U1	25.400mm	32 Threads	17.526mm						
Brightness	Numerical Aperture NA, NA'	When the half angle that an object makes on the entrance pupil is u, and refractive index is n, n x sin u is called object side numerical aperture, NA. When the half angle that an image makes on exit pupil is u', and refractive index is n', n' x sin u' is called image side numerical aperture, NA'. NAs in this catalog indicate object side numerical apertures. Numerical aperture is an important value that expresses lens resolution and brightness. $NA=n \times \sin u$ $NA'=n' \times \sin u'$ The higher the NA, the greater the resolution and brightness are of the lens.							
	F Number F No	The value indicates lens brightness. It is calculated by dividing the focal distance of the lens by its effective diameter (entrance pupil diameter D mm) looking from its object side. It can also be calculated by NA and the lens' optical magnification (β). The smaller the number the brighter the lens is. $F \text{ No}=f/D$							
	Effective F No	The value indicates lens brightness when an object is located in finite distance, the value which indicates the brightness when actually operated. The higher the optical magnification (β), the darker the lens is. $Effective \ F \ No=\beta / (2 \times NA)=1/(2 \times NA')$ $Effective \ F \ No= (1+\beta) \times F \ No^*$ *Approximation for Thin-Walled Systems							
Magnification	Optical Magnification β	Image size ratio against the object size. $\beta = y'/y$ $=b/a$ $=NA/NA'$ $=\text{Camera Element Size} / \text{Actual Size of Diel of View}$							
	Electronic Magnification	Electronic magnification is the magnification of an image on a camera when it is displayed on a monitor screen.							
	Monitor Magnification	Monitor magnification is the magnification of an object displayed on a monitor screen through a lens. Monitor Magnification = (Optical Magnification β) x (Electronic Magnification) (Calculation Example) Optical Magnification $\beta=0.2x$, camera Size 1/2" (Diagonal Line 8mm), Monitor 14" : Electronic Magnification =14 x 25.4 β 8 = 44.45 (Times) Monitor Magnification = 0.2 x 44.45= 8.89 (Times) (1 Inch = 25.4mm)							
	Field of View	Field of view is the size of an object that can be shot when the lens is attached to a camera. The size of field of view is (sensor size) \div (optical magnification β). (Calculation Example) Optical Magnification $\beta=0.2x$, camera Size 1/2" (4.8mm Long, 6.4mm Wide) : Size of Field of View Length =4.8/0.2=24 (mm) Width =6.4/0.2=32 (mm)							



Size of Camera Elements



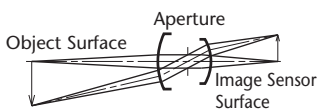
Type	Aspect Ratio	Length mm	Width mm	Diagonal mm
1/6"	4:3	1.73	2.3	2.878
1/4"	4:3	2.4	3.2	4
1/3"	4:3	3.6	4.8	6
1/2"	4:3	4.8	6.4	8
1/1.8"	4:3	5.3	7.2	8.9
2/3"	4:3	6.6	8.8	11
1"	4:3	9.6	12.8	16
4/3"	4:3	13.5	18	22.5

Formula

- Resolution (μm)** = $0.61(\text{Fixed Number}) \times 0.55(\text{Design Wavelength}) \div \text{NA}$
- Effective F No** = $\text{Magnification} / 2\text{NA}$
- Depth of Field (mm)** = $2(\text{Permissible Circle of Confusion Diameter} \times \text{Effective F No} \div \text{Magnifications}^2)$
- Light Flux Diameter (θ)** = $2\text{NA} \times \text{Height from Object} + \text{Size of Field of View (Angle)}$

Features of Telecentric Optical System

Non-Telecentric Lens



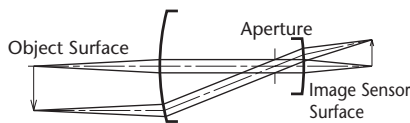
Advantages

Smaller size.
Cost-saving because the number of lenses is fewer.

Disadvantages

Object size or position varies as the object surface moves up and down.

Object Side Telecentric Lens



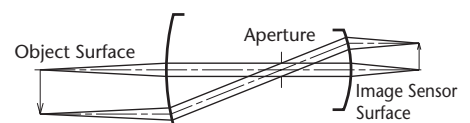
Advantages

Object size does not change even when the object surface moves up and down.
Smaller size is possible when coaxial illumination is used.

Disadvantages

Larger than regular lenses when coaxial illumination is not used.

Double-Sided Telecentric Lens



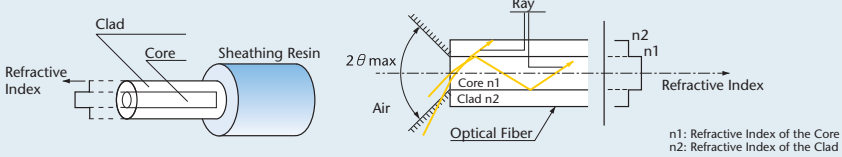
Advantages

Similar to MML. However, accuracy improves when the size of camera flange back differs greatly.

Disadvantages

Similar to MML. However, higher cost than MML.

Glossary

Measured Light Quantity	Light Flux (lumen)	The quantity of light emitted from a light source. The unit is lumen (lm) $1\text{lm}=1\text{cd}\times\text{sr}$
	Luminous Intensity (candela)	Light source quantity representing the quantity of light emitted from a light source per unit solid angle. The unit is candela (cd)
	Intensity (lux)	Brightness on an object surface irradiated by light emitted from a light source. The unit is lux (lx) $1\text{lx}=1\text{lm}/\text{m}^2$ where m^2 is the area of the object surface
	Illuminance (nit)	Light source quantity representing the luminous intensity of light emitted from a light source per unit area. The unit is nit (nt) $1\text{nt}=1\text{cd}/\text{m}^2$ or $1\text{sb}=1\text{cd}/\text{cm}^2$
Filter	Color Temperature K	Color temperature representing the spectral energy distribution of light emitted from a light source. The unit is kelvin (K). A light source of a low value is reddish and one of a high value is bluish. To change the color temperature of a light source, use a color temperature conversion filter.
	Polarizing Filter	A filter to block light being reflected from glass, metal, or liquid surfaces that is too strong and detrimental.
	ND Filter	A filter to reduce the light quantity only, without affecting color reproduction. Also known as a gray filter.
	Color Temperature Conversion Filter	A filter to change the color temperature. The wavelength can be selected.
	Diffusion Filter	A filter to diffuse light from a light source and suppress illumination irregularity.
	IR Cut Filter	This filter can be classified into two types: heat-ray absorbing filters (or, catathermic filters), which absorb infrared rays, and cold filters, which reflect infrared rays by a multilayer film.
	Light Control Film	By laminating a micro-louver film with PET or other types of film, diffused light becomes more parallel.
Lamp	Halogen Lamp	An incandescent lamp with a trace of halogen gas added to the sealed gas. The halogen cycle prevents the blackening of the bulb wall. The optical output and color temperature are stable with less attenuation compared with that of an ordinary incandescent.
	Metal Halide Lamp	A lamp of great color rendering and high intensity using illumination by various metal halogen compounds and mercury.
	LED	A Light Emitting Diode (LED) is a semi-conductor element that applies a fixed-direction current to a crystalline substance with a semi-conductor PN junction, generating energy in the substance and emitting the energy as light. The basic theory was found early in the 20th century and silicon carbide was confirmed, experimentally, to emit light if a current was applied. Following this research, the current technology was established in the 1960's. Red and green were developed first, yellow in the 1970's, blue in 1993 and white in 1996.
	Constant-Current Power Supply	A power supply that can supply a fixed current even if infinite impedance and load voltage change.
	Constant-Voltage Power Supply	A power supply that can supply a fixed voltage even if 0 impedance and load voltage change.
	Resistance	Resistance (R) represents the difficulty of a current to pass: $R = V/I$. The unit is ohm (Ω). If the potential of a current drops by 1 volt (V) per ampere (A), the resistance is 1Ω .
Fiber	Optical Fiber	
	Numerical Aperture NA	The characteristic of receiving rays transmitted through the end face of an optical fiber. This is determined by the refractive indexes of the core and clad of the optical fiber. $NA = \sqrt{n_1^2 - n_2^2}$
	Light-Reception Angle θ	An angle where the optical fiber can receive light. $\theta = 2\sin^{-1}(NA)$
	Transmittance	The amount of incident light that passes through an optical fiber, typically at a given wavelength, represented as a fraction or rate. The higher the transmission rate or transmittance, the better.
	Attenuation	The reduction or loss in intensity of light as it travels through an optical fiber, also known as transmission loss. Lower attenuation means better performance. Unit is dB/km.

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Lens

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Catalog Icon Key



The CE marking (CE mark) is a mandatory conformity mark on many products placed on the single market in the European Economic Area (EEA). The CE marking certifies that a product has met EU consumer safety, health or environmental requirements.



IP (Ingress Protection) is a set of standard measurements related to the protection of products from solid foreign objects and water. IP is prescribed by the Japanese Industrial Standards Committee (JISC0920) and the International Organization for Standardization (IEC60529). IP67 is a level of protection that can withstand being submerged in water at a depth of 1 meter for 30 minutes.



Indicates Wattage i.e. 50 W = 50 Watt



External intensity control type - Analog = 0-5 V, Digital = 8 bit or 10 bit



The number of channels for output power
i.e. 1 ch = 1 channel output, 2 ch = 2 channel output



LED color
W = White, R = Red, G = Green, B = Blue, (R/G/B) = Made-to-order

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