MORITEX Machine Vision System

Vol. 003

MORITEX
Vision Creating Value

Light Source & Light Guide

MORITEX

Vision Creating Value

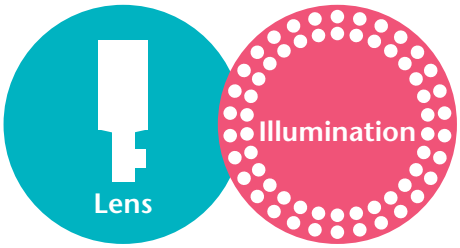
Striving for Quality and Vision technology ahead of market, we will keep on creating Moritex Value.

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
- Moritex Asia Pacific Pte Ltd.
  Singapore

Europe

- Europe Representative Office
  Seefeld, Germany

North America

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

Light Source

Light Sources and Fiber Optic Light Guides

Quartz UV Light Guides

IR-MEMS Inspector

IR-MEMS Inspector

Guidance

MG-Wave®

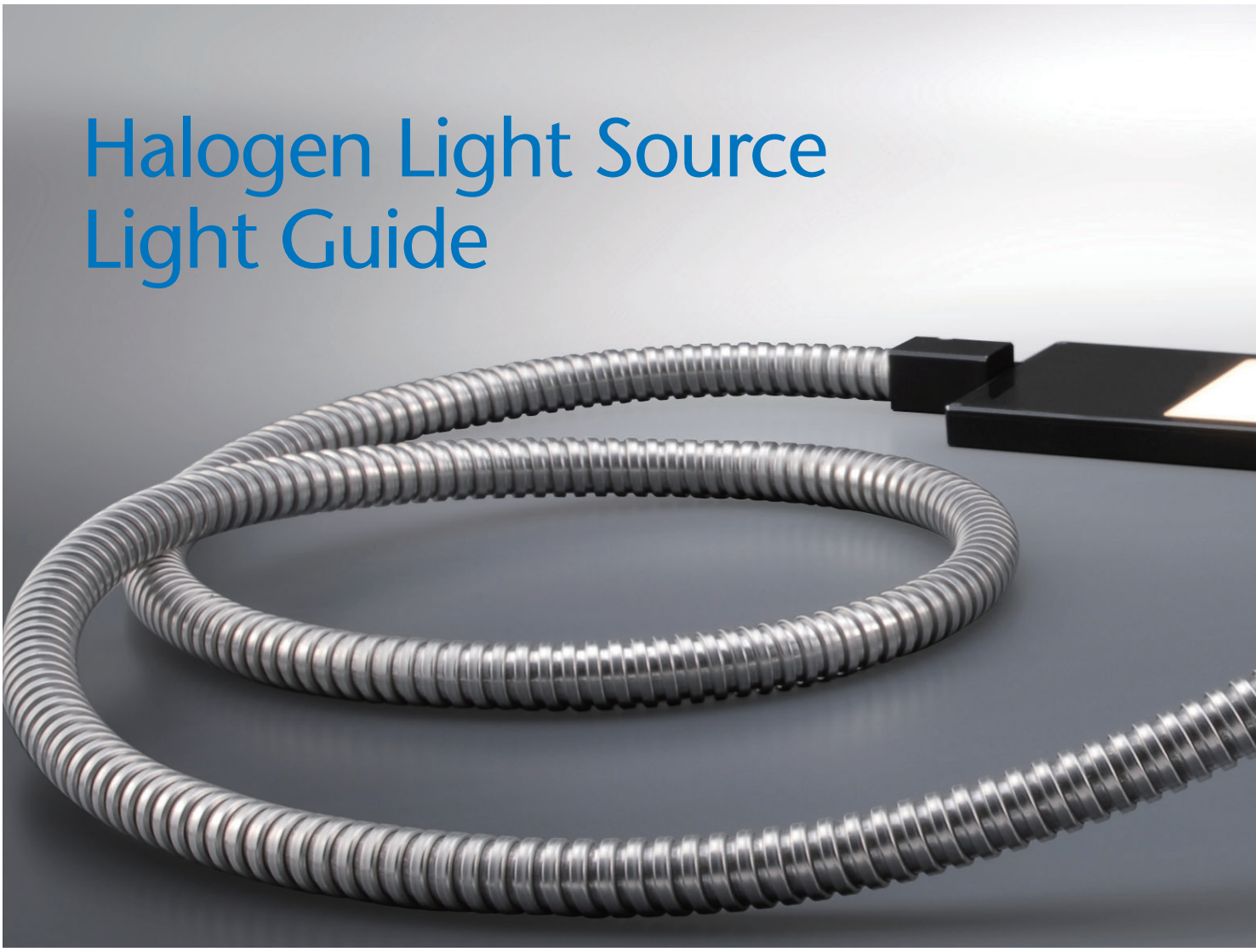
CompaVis®

Light Sources and Fiber Optic Light Guides

Quartz UV Light Guides

IR-MEMS Inspector

Halogen Light Source Light Guide



The MHAA / AB series Halogen light sources are compact with a robust design. These light sources are suitable for mounting. The complete product range includes 100W, 150W and 100W NIR (1127nm). The light source can be controlled manually and through external controls, including 0-5V analog control and parallel 8-bit digital control.

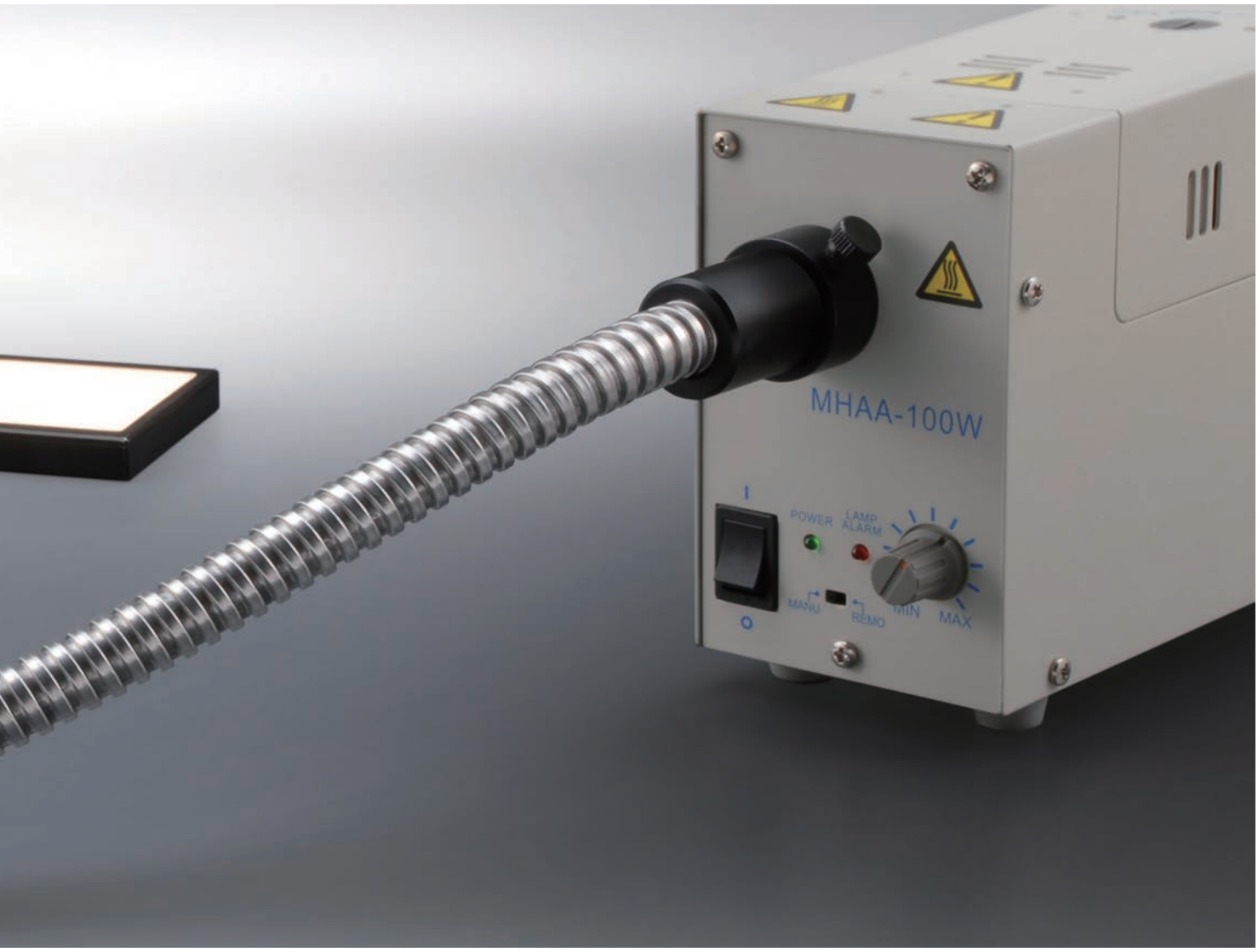
Advantages of Fiber Optic Light Guides:

- Compact Illuminating Unit Size
- Highest Intensity Output
- Uniform Light
- All Visible Wavelengths and IR When Required
- Directional Light Control
- External Heat and Noise From Illuminated Area

Light Sources and Available Light Guides

Light Source	Light Guide				Other Options
	Plastic		Compound Glass		
	Fiber Bundle Diameter (Light Source Side)		Standard	Heat Resistant	Internal Filter (*1)
	Below 6 Dia.	6 Dia. or More			
MHAA-100W	○	KA-03 (*3)	○	○	○
MHAB-100W-IR	×	×	×	○	× (*2)
MHAB-150W	×	×	○	○	△

*1 The characteristics may be changed by deterioration under the operating environment.
*2 Deterioration may be caused by use at high output.
*3 This is when the product is used at the environmental temperature of 40˚C or less.



Halogen Light Sources
MHAA / AB
MHAB-IR

Ring Light Guides
MRG/P
Straight Light Guides
MSG/P
Bifurcated Light Guides
MWG/P
Multifurcated Light Guides
M#G#
Plate Type Light Guides
MPP
Line Light Guides
MKG/P

Condenser Lenses
Light Guide Options

CE CE Marking

100 W Wattage

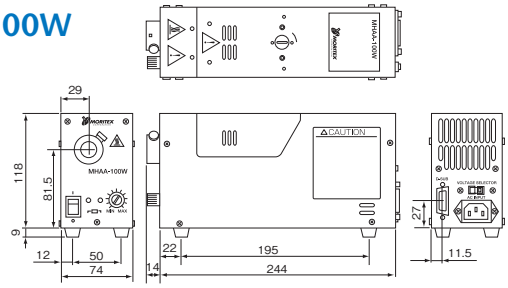
150 W Wattage

Halogen Light Sources
MHAA-100W Series

MHAA-100W Halogen Light Source is the standard model in the Halogen Light Source Series because it exhibits excellent performance in all aspects.

- **Worldwide power supply specifications(100/200V switch type)**
- **Compliance with CE Marking safety standards**

MHAA-100W



Model	MHAA-100W	
Order Code	MHAA-100W-100V	★ MHAA-100W-200V
AC Type	100V	200V
Setting At Shipping	Input Voltage Selector: At 115 With 2.0-Meter AC Cable MC-AC 100A	Input Voltage Selector: At 230 With 2.0-Meter AC Cable MC-AC 200A
Input Voltage	AC100-120V/200-240V (50/60Hz)	
Input Voltage Switch*1	Input At AC100: Setting At 115 Input At AC200: Setting At 230	
Input Current (Typ)	2.4A (At AC 100V Input) 1.2A(At AC 200V Input)	
Compatible Lamp*2	LM-100 (12.0V,100W)	
Lamp Voltage	DC11.7V ±0.2V (Max.)	
Average of Lamp Life Time*3	1,000 Hours Nominal	
Average Illuminance*4	Approximately 30,000 lx	
Color Temperature	3,100K	
Installation	Rubber legs placed on a flat surface	
Weight	Approximately 2.0kg	
Protection Function	Lamp Overcurrent Detection Function: Monitor output, cut off lamp power, LED (RED) on front panel ON Lamp Burn-out Detection Function: Monitor output, LED (RED) on front panel ON Internal High Temperature Detecting Function: Monitor output, cut off lamp power	
Operating Temperature and Humidity	0°C to 45°C :Linear Decrease Down to 80%RH at 31°C and 50%RH at 40°C	

Special Power Supply Unit Specifications(AC100V Type)

Order code	Remarks
★ MHAA-100W-SO-100V	Bult-in Shutter (Normally Open)
★ MHAA-100W-SC-100V	Bult-in Shutter (Normally Close)
MHAA-100W-D-100V	With External 8-Bit Digital Dimmer
★ MHAA-100W-D-SO-100V	With External Digital Dimmer and Built-In Shutter (Normally Open)
★ MHAA-100W-D-SC-100V	With External Digital Dimmer and Built-In Shutter (Normally Close)

★Made-to-order products.

Optional Parts

Cable with External Remote Connector	MC-EXC-02
Replacement lamp	LM-100

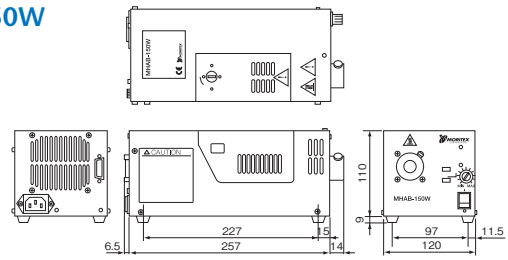
*1 When the switch is set at 115V, do not apply AC 200V. Doing so may damage the power supply. When the input voltage selector is set at 230V, the device does not run on AC 100V.
*2 Only compatible lamps can be used.
*3 Many lamps are powered on at rated current and the time measurements until their filaments blow are normally distributed. The average time from the peak time until the survival ratio of 50% is called the average life time.
*4 The average luminance is at 50mm from the fiber output at maximum volume when a MORITEX standard light guide (MSG4-2200S) is attached.
Note: May be unable to use with plastic fibers.

Halogen Light Sources
MHAB-150W Series

150W Halogen Light Source of dual wattage, designed for 150W but also available for 100W if a 100W lamp is attached. The intensity is the most powerful among the Halogen Light Source Series.

- **High illuminance model max 80,000 lx (2.6 times a 100W light source)**
- **100W/150W Dual Wattage Lamp**
- **Worldwide power supply specifications**

MHAB-150W



Model	MHAB-150W	
Order Code	MHAB-150W-100V	★ MHAB-150W-200V
AC Type	100V	200V
Setting At Shipping	With 2.0-Meter AC Cable MC-AC 100A	With 2.0-Meter AC Cable MC-AC 200A
Input voltage	AC100V-240V (50Hz/60Hz)	
Compatible Lamp*1	LM-150 LM-150C LM-100	
Lamp Voltage	DC 14.7V±0.2V (Max.) (LM-150 LM-150C) DC 11.7V±0.2V (Max.) (LM-100)	
Average Lamp Life*2	50 Hours (LM-150), 500 Hours (LM-150C), and 1,000 Hours (LM-100) Nominal	
Average Illuminance*3	Approx. 80,000 lx (LM-150), 45,000 lx (LM-150C), and 30,000 lx (LM-100)	
Color Temperature	3400K (LM-150) 3200K (LM-150C) 3100K (LM-100)	
Installation Method	Rubber legs placed on flat surface	
Weight	Approximately 3.2kg	
Operating Temperature and Humidity	0°C to 45°C:Linear Decrease Down to 80%RH At 31°C and 50%RH At 40°C	
Protection Function	Lamp Overcurrent Detection Function: Monitor output, cut off lamp power, LED (RED) on front panel ON Lamp Burn-out Detection Function: Monitor output, LED (RED) on front panel ON Internal High Temperature Detecting Function: Monitor output, cut off lamp power	

★Made-to-order products.

Special Power Supply Unit Specifications (AC100V Type)

Order code	Remarks
MHAB-150W-D-100V	With External Digital Dimmer

Optional Parts

Cable with External Remote Connector	MC-EXC-02
Replacement lamp	LM-100, LM-150, LM-150C

*1 Only compatible lamps can be used.
*2 Many lamps are powered on at rated current and the time measurements until their filaments blow are normally distributed. The average time from the peak time until the survival ratio of 50% is called the average life time.
*3 The average luminance is at 50mm from the fiber output at maximum volume when a MORITEX standard light guide (MSG4-2200S) is attached.
Note: May be unable to use with plastic fibers.

Infrared 100W Halogen Light Source
MHAB-100W-IR

100W

CE

Completed
Patent Registration

100W halogen light source which can illuminate near infrared of a halogen lamp.

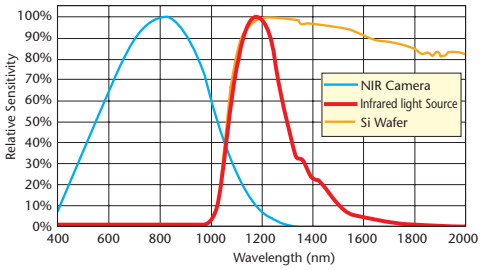
- **Irradiation of silicon transmission wavelength (1127nm or more)**
- **Radiation mechanism using unique technology**

Model	MHAB-100W-IR	
Order Code	MHAB-100W-IR-100V	★ MHAB-100W-IR-200V
AC Voltage	100V	200V
Setting At Shipping	AC cable: With MC-AC100A-2.0M	AC cable: With MC-AC200A-2.0M
Input Voltage	AC100V-240V(50Hz/60Hz)	
Compatible Lamp*1	LM-100-IR(12.0V/100W)	
Lamp Voltage	DC 10.7± 0.2V(Max.)	
Average Of Lamp Life Time*2	1,000 Hours Nominal	
Installation	Rubber Legs Placed on Flat Surface	
Weight	Approximately 3.2kg	
Intensity Control	Manual intensity control/ External volume intensity control/ External analog intensity control	
External Dimensions	W120 ×H110 ×D257mm*3	

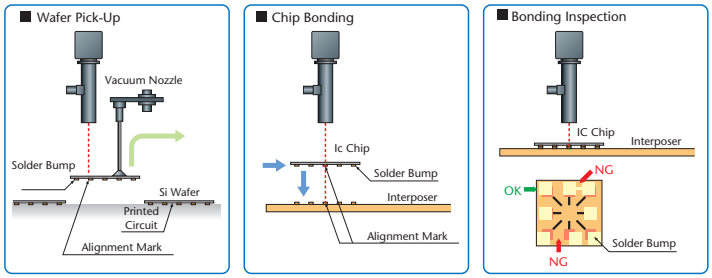
★Made-to-order products.

*1 Example application
*2 Many lamps are powered on at rated current and the time measurements until their filaments blow are normally distributed. The average time from the peak time until the survival ratio of 50% is called the average life time.
*3 Projections are not included.

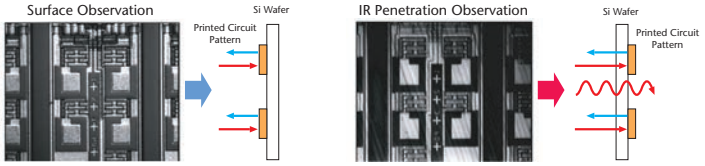
Spectral Characteristic Data



Example Application



IR Coaxial Penetration Observation



Accessories for IR Systems

Replacement Lamp

Model	LM-100-IR
Specification	IR Reflection Coating for 100W

Lens Series for IR System

Model	MML4-80D-IR	MML6-80D-IR	MML8-80D-IR
Specification	For IR x4x6x8		

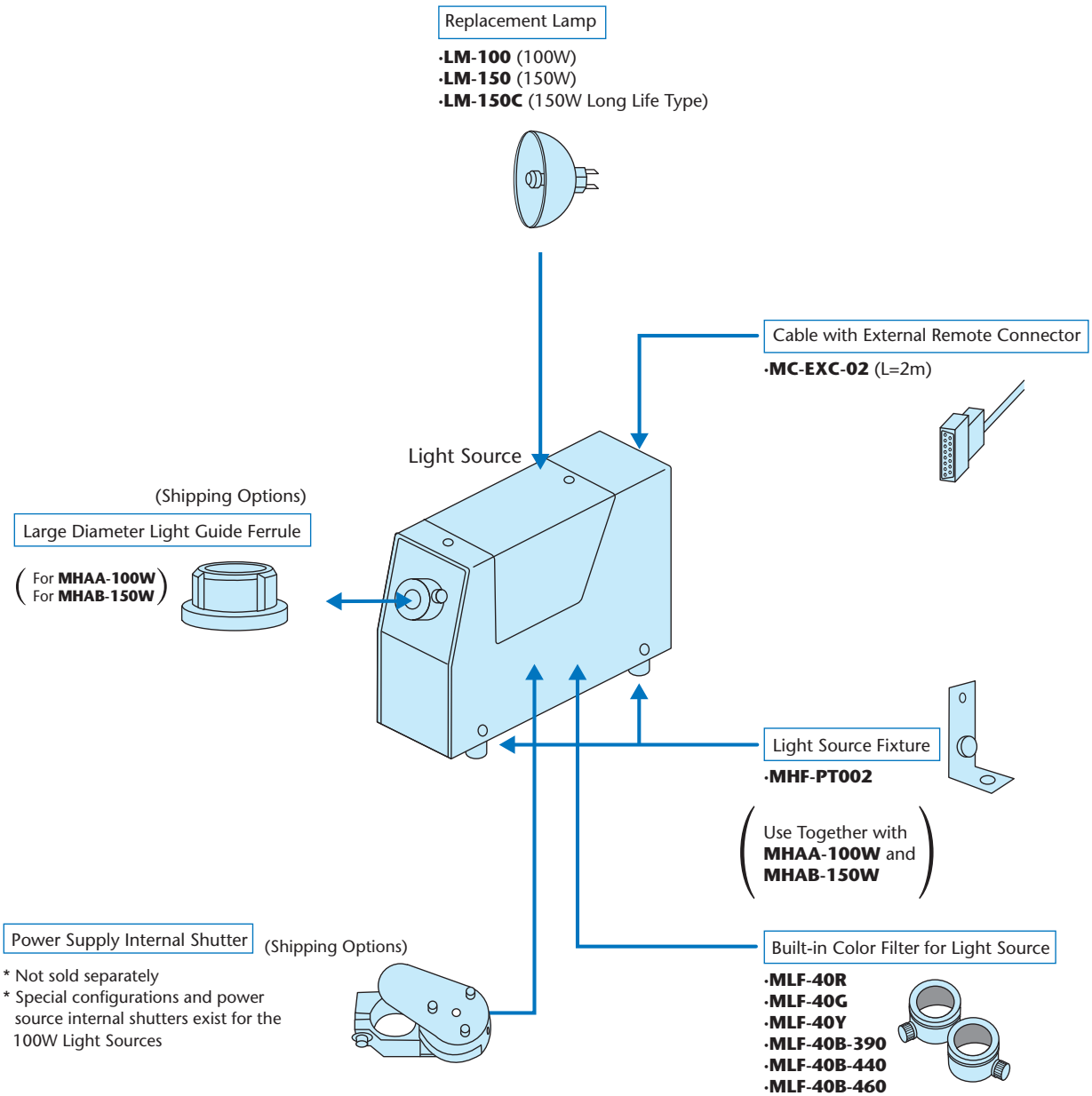
Heat Resistance Light Guide

Model	MSG4-1100S-HR
Specification	Heat Resistant

Note: Only heat-resistant light guides can be used.

Options

Option Attachment Drawing for Halogen Light Sources



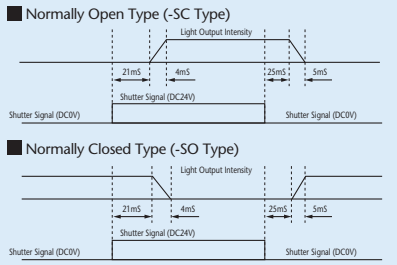
For light source compatibility, specifications and product codes of the options, see corresponding pages.

Light Source Equipment Options

Light Source Internal Shutter (optional at time of shipping) Made-to-order

- Internal shutter can save extra installation space
- Long life time enabling shutter to open and close 50 million times
- Open/close is possible regardless of light intensity control
- Users can chose opening or closing the shutter when applying voltage

Shutter ON/ OFF Specifications
(for 50W, 100W Light Sources)



* Not sold separately as an individual item.
* For each of the 50W, 100W, and 150W light sources there are customized specification models each with an built-in power supply.

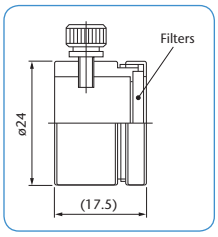
Specifications

• Operation input voltage: DC 24V 0.32A
• Shutter response speed

		50W, 100W	150W
Normally Open	Closed	25ms	33ms
	Open	30ms	
Normally Closed	Open	25ms	
	Closed	30ms	

* Response speed for a fiber with a diameter of 4mm when no protective diode exists.
Average life time for opening and closing of the shutter is approximately 50 million times (average for tests performed by MORITEX).
* The OPEN and CLOSE speed of the shutter may vary slightly depending on the capabilities of the power supply being used.
(Attachment of the model number for ordering)
(Example) When a normal open shutter is attached to MHAA-100W-100V: MHAA-100W-SO-100V.

Light Source Internal Color Filter Made-to-order



Model	MLF-40R	MLF-40G	MLF-40Y	MLF-40B-390	MLF-40B-440	MLF-40B-460
Color	Red	Green	Yellow	Bluish purple	Blue	Light blue
Peak Wavelength (nm)	-	533	-	390	440	460
Transition Wavelength (nm)	600	-	480	-	-	-

* Attach the filter to the light guide retainer inside the light source as if to cover it.
* This filter cannot be used together with a built-in shutter.

Light Source Fixture MHF-PT002 (4 pcs./set)

Model	MHF-PT002

*Contact MORITEX about the mounting dimensions.

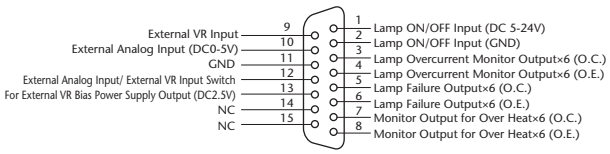
Halogen Lamp Series : Dedicated High, Highly Reliable Halogen Lamp Series

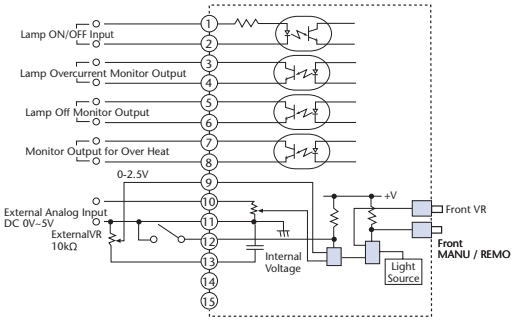
	LM-100	LM-150	LM-150C
Power Consumption	100W	150W	150W
Lamp Voltage	DC11.7V	DC14.7V	DC14.7V
Lamp Current	8.4A	10A	10A
Average Lamp Life *1	1,000hrs Nominal	50hrs Nominal	500hrs Nominal
Average Illuminance *2	Approx. 30,000 lx	Approx. 80,000 lx	Approx. 45,000 lx
Color Temperature	3,100 K	3,400 K	3,200 K

*1 Many lamps are powered on at rated current and the time measurements until their filaments blow are normally distributed. The average time from the peak illumination until the survival ratio of 50% is called the average life time.
*2 The average illuminance is measured at 50mm from the fiber end at maximum intensity when a MORITEX standard light guide (MSG4-2200S) is attached.

For Use with MHAA-100W / MHAB-150W

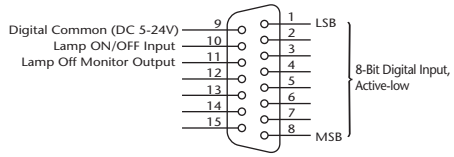
External Analog Control Connection Specifications



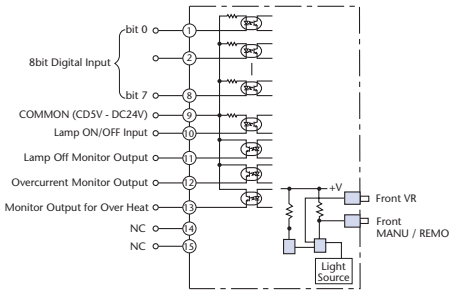


External 8-Bit Digital Control Connection Specifications

● External Analog Control Connection Specifications



● How to Use Connection Specifications and Switch Modes



● Digital Control Truth Table

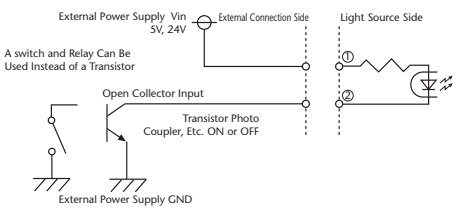
LAMP ON/OFF	LAMP Monitor	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	LAMP Output
0	0	×	×	×	×	×	×	×	×	OFF
1	1	×	×	×	×	×	×	×	×	Lamp Burn-Out
1	0	0	0	0	0	0	0	0	0	ON (Min.)
1	0	0	0	0	0	0	0	0	1	ON
1	0	0	0	0	0	0	0	1	0	ON
1	0	0	0	0	0	0	0	1	1	ON
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
1	0	1	1	1	1	1	1	0	1	ON
1	0	1	1	1	1	1	1	1	0	ON
1	0	1	1	1	1	1	1	1	1	ON (Max.)

Note: X ON/ OFF Can Be Selected 0 Low 1 High

*LLS2 is equipped with 8bit modulation and “On/Off” logic pins, and capable of logic inversion.

Signal Output Detection Circuit Connection Example

● Signal Input Circuit Connection Example
(Lamp ON/OFF Signal)



Operation

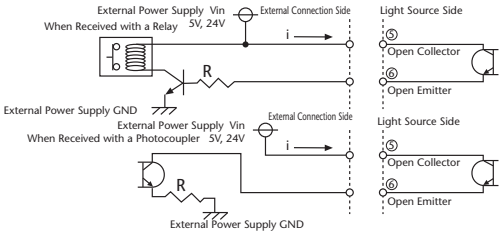
ON	OFF
OFF	Lamp on

With Transistor and Switch

* The relationship between external resistance and current is as follows:
Use a resistor of 1/4W power rating or greater capacity

Vin	Current
DC5V	Approximately 1~2mA
DC24V	Approximately 6~12mA

● Signal Output Detection Circuit Connection Example
(Lamp Burn-Out Detection Function Signal)



*When Signal Is Outputting At i = 1mA Approximately 0.2v Between Pins No.5 and 6
At i = 5mA Approximately 1v Between Pins No.5 and 6

Signal	Between Pins No.5 and 6	Current
Lamp Normal	Not Conducted	Off
Lamp Burn-Out	Conducted	On

* The relationship between external resistance and current is as follows:
Use a resistor of 1/4W power rating or greater capacity

Vin	R(Ω)	Current I (mA)
DC5V	1~3.3k	Approx. 1to 4
DC24V	4.7~22k	Approx. 1to 5

* The resistance and current values differ depending on parts used. Check all values well before use.

Ring Light Guides
MRG/P Series

Illumination from 360˚ produces uniform light. These light guides are optimum for camera and microscope inspections.

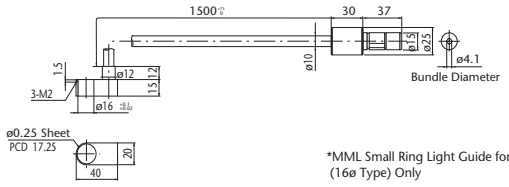
Explanation of Model Code

MR [ ] Internal Diameter — [ ] Length — [ ]

Fiber Type	Tube Material	Special Function
G Glass	**S** SUS Flexible Tube	**HR** Heat Resistant End 300°C *Glass Type Only
P Plastic	**V** SUS Flexible + PVC Tube	

MRP16-1500V

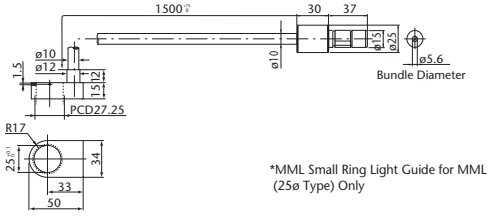
Minimum Bend R=30



*MML Small Ring Light Guide for MML (16ø Type) Only

MRP25-1500V

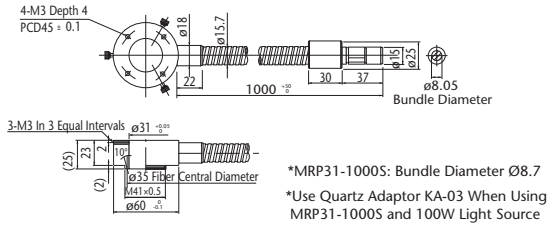
Minimum Bend R=30



*MML Small Ring Light Guide for MML (25ø Type) Only

MRG31-1000S/1500S/MRP31-1000S

Minimum Bend R=40

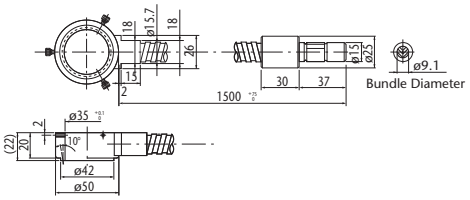


*MRP31-1000S: Bundle Diameter Ø8.7

*Use Quartz Adaptor KA-03 When Using MRP31-1000S and 100W Light Source

MRP35-1500S

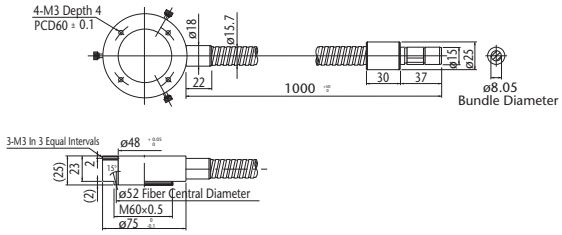
Minimum Bend R=40



*Use Quartz Adaptor KA-03 When Using 100w Light Source

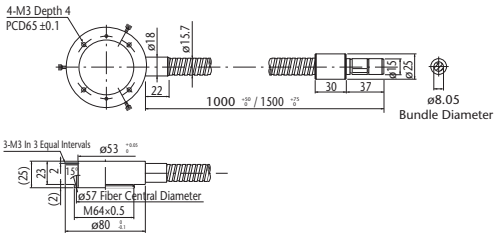
MRG48-1000S/1500S

Minimum Bend R=40



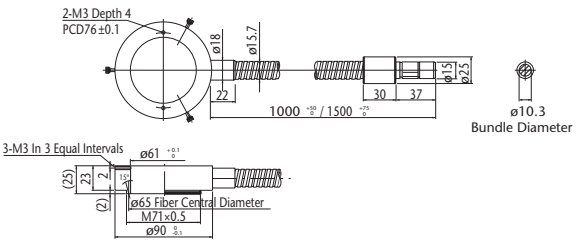
MRG53-1000S

Minimum Bend R=40



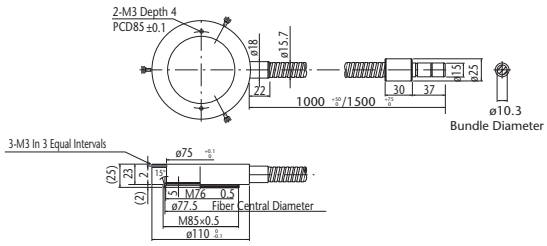
MRG61-1000S/1500S

Minimum Bend R=70



MRG75-1000S/1500S

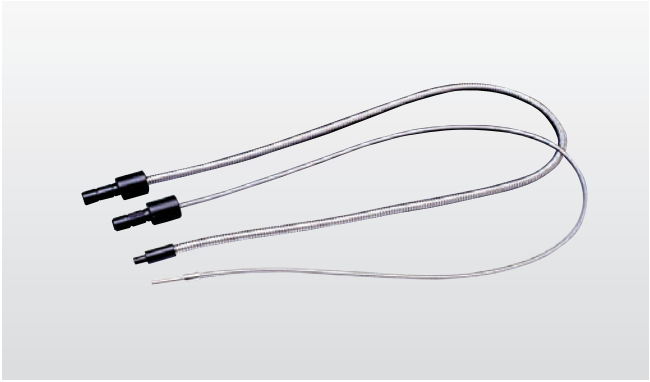
Minimum Bend R=70



Straight Light Guides
MSG/P Series

In addition to our standard straight type light guides, many different options are available such as random assembly, heat resistant, and small diameter types.

These light guides are ideal for spot and coaxial illumination.Select a product to suit the application.



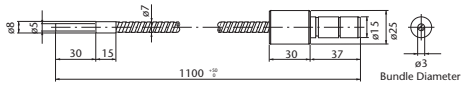
Explanation of Model Code

MS [ ][ ] — Length [ ] — [ ]

Fiber Type	Bundle Diameter	Tube Material	Special Function
G Glass	**3** ø3	**R** Interlocking Tube	**HR** Heat Resistant End 300°C *Glass Type Only
P Plastic	**4** ø4	**S** SUS Flexible Tube	**SD** Small Diameter Type
	6 ø6	**V** SUS Flexible + PVC Tube	**RM** Random Assembly
	8 ø8		
	10 ø10		

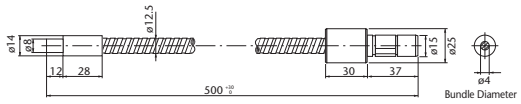
MSG3-1100S-SD

Minimum Bend R=25



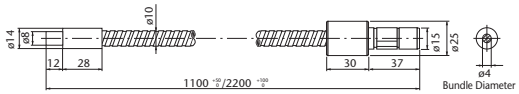
MSG4-500R (Interlocking Type)

Minimum Bend R=60



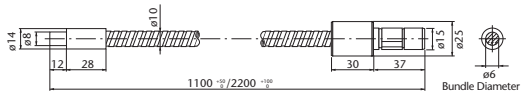
MSG4-1100S/2200S/MSP4-1100S
MSG4-1100S-RM/MSG4-2200S-RM

Minimum Bend R=30



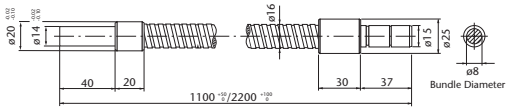
MSG6-1100S/2200S
MSG6-1100S-RM/2200S-RM

Minimum Bend R=30



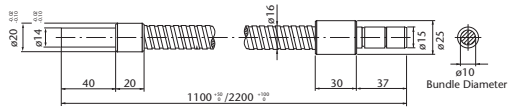
MSG8-1100S/2200S

Minimum Bend R=50



MSG10-1100S/2200S

Minimum Bend R=60



Bifurcated Light Guides
MWG/P Series

Use these light guides for applications where lighting from two directions is needed, for example when using a microscope or camera, or for pattern recognition. Coatings and tube materials can be selected to suit the purpose. Interlock type tube material allows for any necessary bending and for fixing in position SUS flexible ("goose neck") type tube material allows you to move the light guide around freely in a small space.

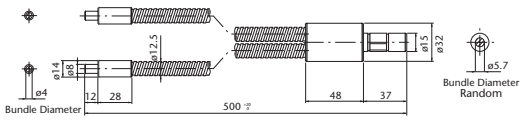
Explanation of Model Code

MW □ – Length □ – □

Fiber Type	Tube Material	Special Function
G Glass	**R** Interlocking Tube	**HR** Heat Resistant End 300°C *Glass Type Only
P Plastic	**S** SUS Flexible Tube	**SD** Small Diameter Type
	V SUS Flexible + PVC Tube	**L** L-shape Type
	SR SUS Flexible + Interlock	

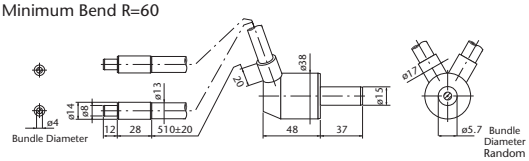
MWG-500R (Interlocking Type)

Minimum Bend R=120



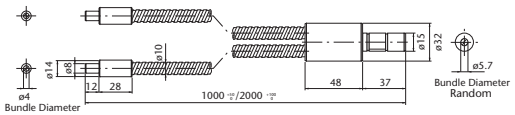
MWG-L-650R (Interlocking Type)

Minimum Bend R=60



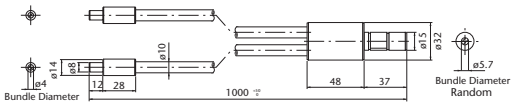
MWG-1000S/2000S

Minimum Bend R=30



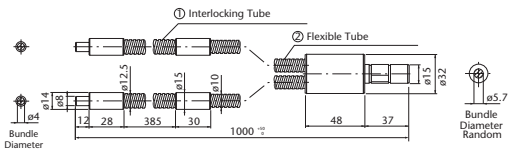
MWG-1000V/MWP-1000V

Minimum Bend R=30



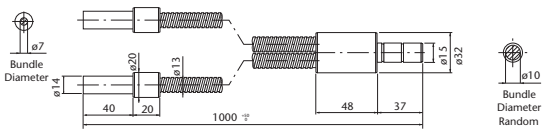
MWG-1000SR

Minimum Bend R(1)=120、(2)=30



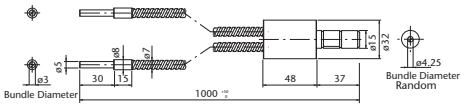
MWG7-1000S

Minimum Bend R=50



MWG-1000S-SD

Minimum Bend R=25



Multifurcated Light Guides
M3G/M4G Series

A 3 to 4 multifurcated light guide can be used when it is necessary to illuminate an object from many different angles, for example in the case of IC pin inspection.

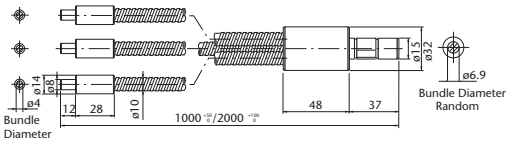
Explanation of Model Code

M □ **G** □ — Length **S** —

Number of Branches		Bundle Diameter		Special Function	
3	3-Branch	**3**	ø3	**SD**	Small Diameter Type
4	4-Branch	**4**	ø4		

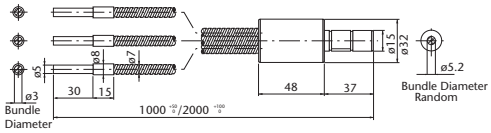
M3G4-1000S/2000S

Minimum Bend R=30



M3G3-1000S-SD

Minimum Bend R=25



M4G3-1000S-SD/2000S-SD

Minimum Bend R=25

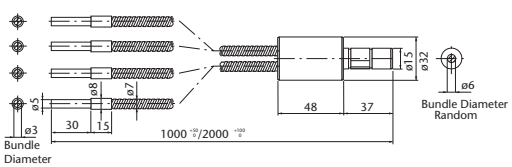


Plate Type Light Guides
MPP Series

These plate type light guides do not require much space due to their slim, compact design.

MORITEX's unique reflected light inducer allows for even and bright illumination. They can be used for multi-observation inspections that require transmitted and uniform illumination such as backlighting electronic components or semi-transparent surfaces.

Explanation of Model Code

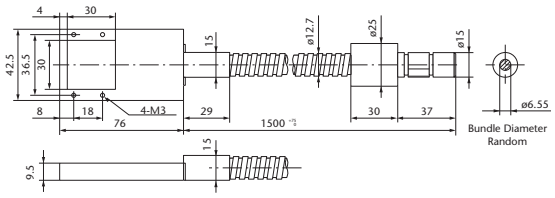
MPP □ – **1500S-2**

Illuminating Area

30 30×30mm
60 60×60mm

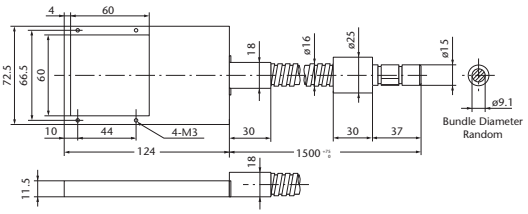
MPP30-1500S-2

Minimum Bend R=40



MPP60-1500S-2

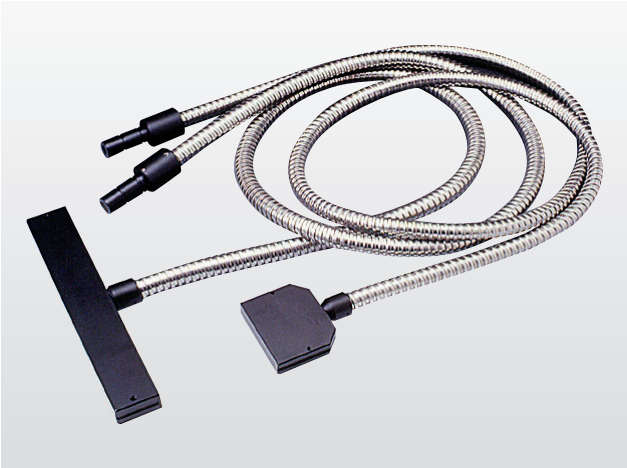
Minimum Bend R=50



*Plastic light guides that cannot be used with 150W light sources: MPP30-1500S-2 and MPP60-1500S-2. Use quartz adapter (KA-03) when using a 100W light source.

Line Light Guides
MKG/P Series

These light guides can be used when line illumination or line scan lighting is necessary.



Explanation of Model Code

MK [ ] [ ] [ ] — [Length] S

[ ] Fiber Type
- **G** Glass
- **P** Plastic

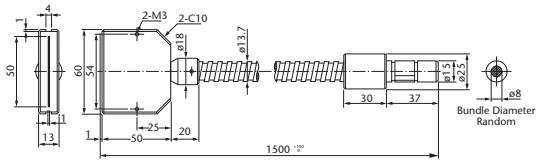
[ ] Line Length
- **50** 50mm
- **180** 180mm

[ ] ×0.5W 2-Branch

[Length]

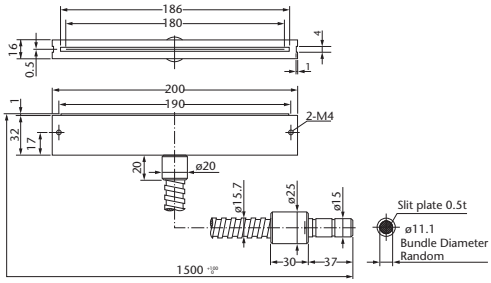
MKG50-1500S

Minimum Bend R=40



MKP180-1500S

Minimum Bend R=40

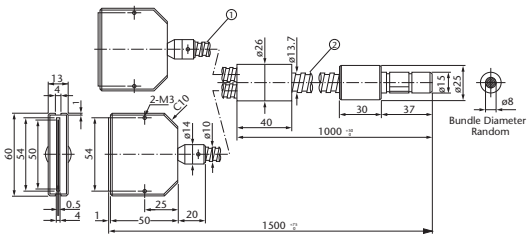


*150W light sources cannot be used with MKP180-1500S. Use quartz adapter (KA-03) when using a 100W light source.

MKG50×0.5W-1500S

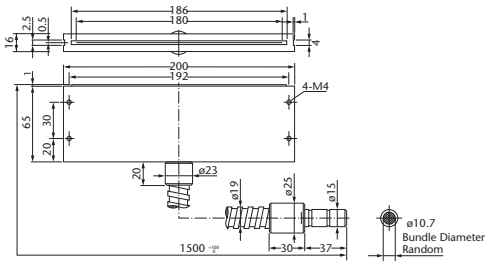
Made-to-order

Minimum Bend (1)=30、(2)=40



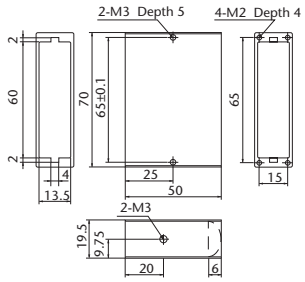
MKG180-1500S

Minimum Bend R=60



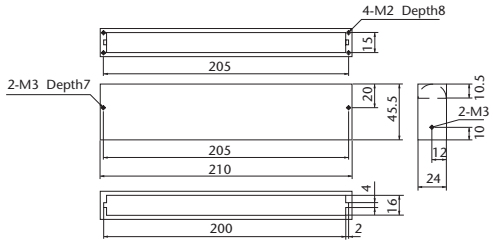
Condenser Lenses for Line Light Guides

MLK-50

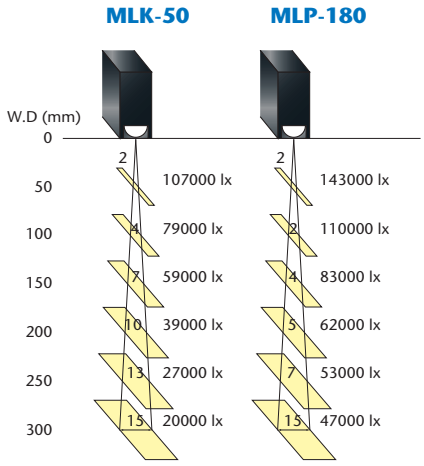


Cylindrical focusing lens with the MKG50 light guide achieves a highly uniform beam with greater illuminance.

MLP-180



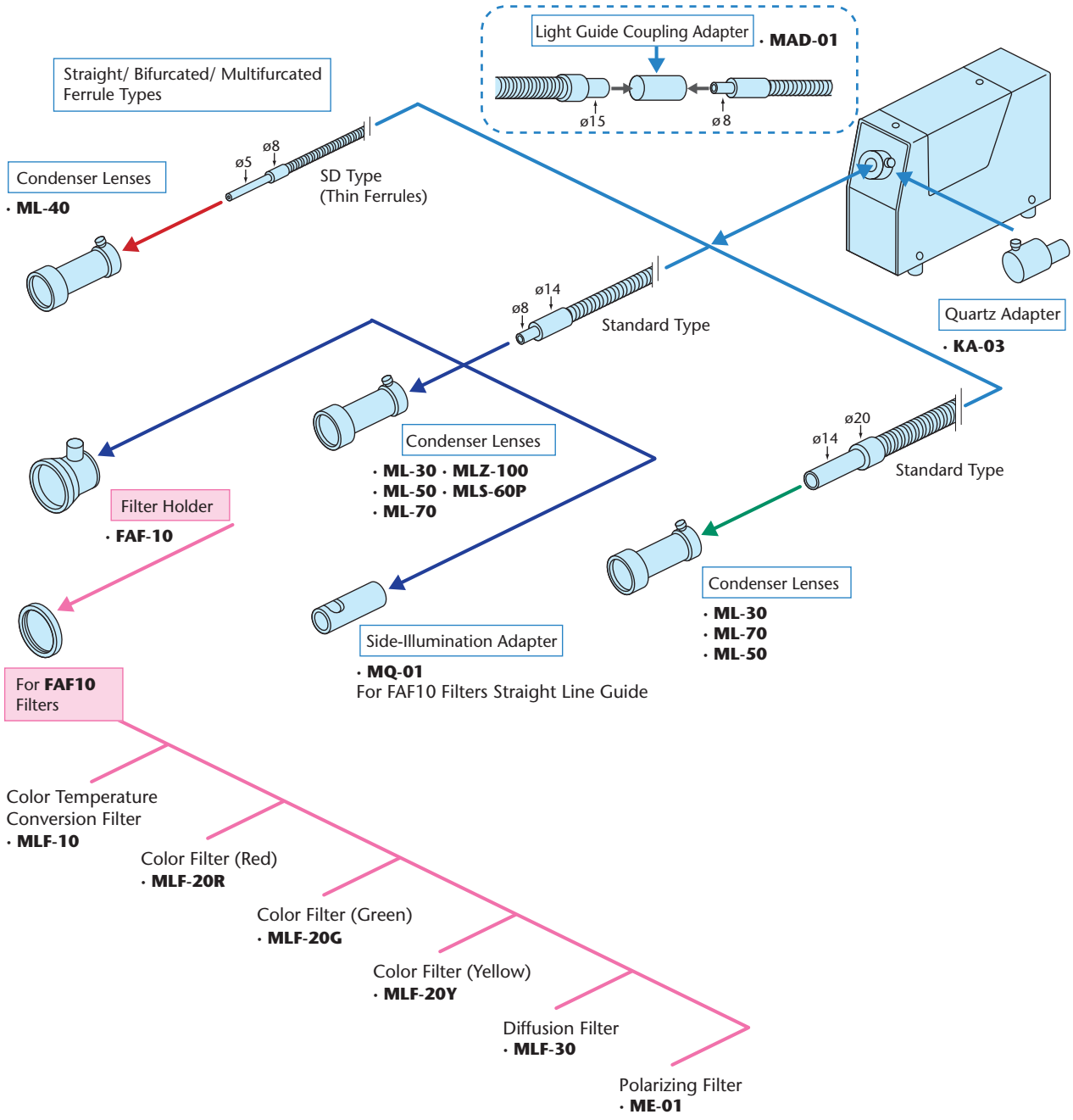
Cylindrical focusing lens with the MKP180/ MKG180 light guides achieves a highly uniform beam with greater illuminance.



- **Light source: 100W halogen light source (Volume: max)**
- **Fiber: MKG50-1500S for MLK-50**
  MKP180-1500S for MLP-180

Light Guide Options

Option Attachment Drawing for Straight/ Bifurcated/ Multifurcated Light Guides



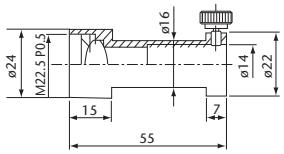
See corresponding pages for light guide compatibility, specifications, and option commodity codes.

For Straight/ Bifurcated/ Multifurcated Light Guides

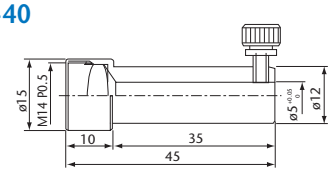
Condenser Lenses

These high performance condenser lenses were uniquely developed by MORITEX for optical fiber light guides. Through careful design and production, MORITEX ensures high quality performance at reasonable cost.

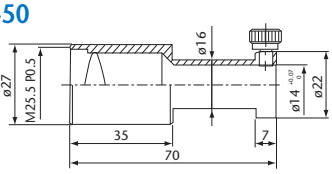
ML-30



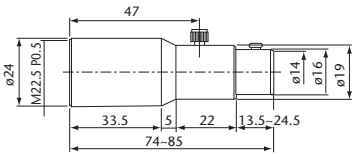
ML-40



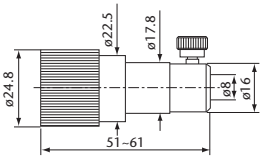
ML-50



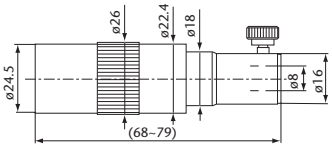
ML-70



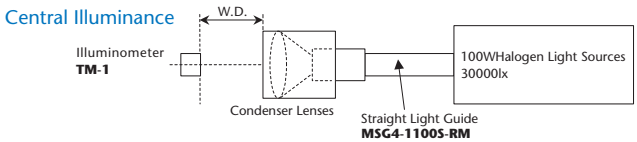
MLZ-100



MLS-60P



Illuminance Characteristic and Illumination Range of Condenser Lenses

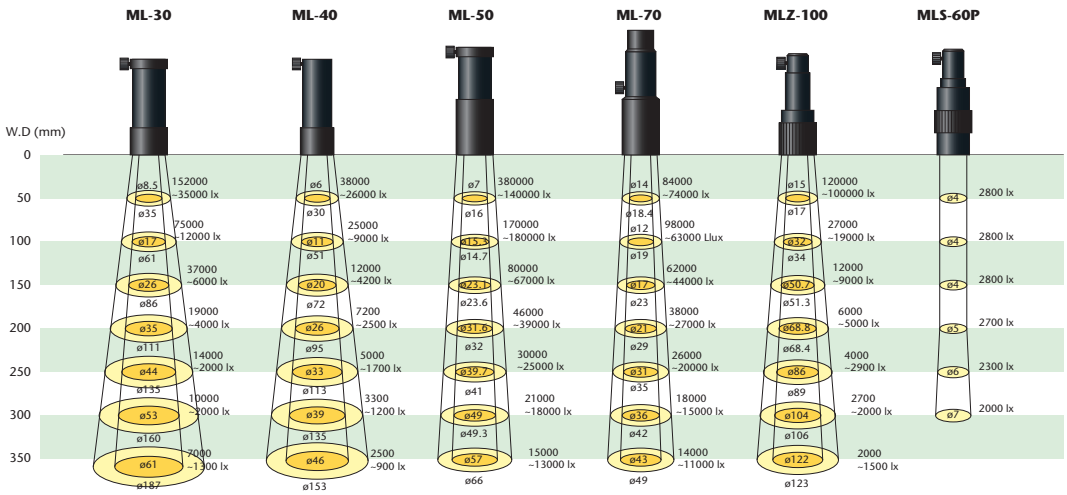


Measuring Method:

Position the illuminometer visually at the center of the illumination range (narrow or wide) and measure the illuminance. Set the illuminance of the light source to 30,000lx for standard measurement (measurement using the standard light guide and measuring instrument).

If the illuminance of the light source set to 30,000lx exceeds 99,900lx (upper limit of the measuring instrument) in standard measurement, reduce the luminous energy to the measurable range and convert the value into the range of 30,000lx later.

Model	Key Features
ML-30	For straight or 2-branch light guides
ML-40	For small diameter type (-SD)
ML-50	Provides almost double the illuminance of the ML-30
ML-70	For two lenses of two groups. Condenses into A uniform, comparatively small spot beam.
MLZ-100	Uniform spot beam with each working distance. Adjustable focus function by helicoid.
MLS-60P	Fine spot beam, focused by helicoid. Adjustable focus function by helicoid.



• Light source: 100W halogen light source (volume: max) • Fiber: MSG4-1100S-RM for ML-30, ML-50, ML-70, MLZ-100, and MLS-60P MSG3-1100S-SD for ML-40

Filters and Adapters

A filter or adapter can be attached to the illumination port of MORITEX straight, bifurcated, or multifurcated light guide to change the color temperature of the fiber illumination, or to change the color to red, green, or yellow.

Filter Holder

Made-to-order

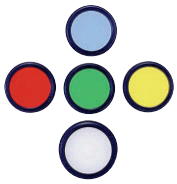
FAF-10

This filter holder fits a straight, bifurcated, or multifurcated light guide with irradiation port of 8.0 in the outside diameter. A color temperature conversion filter (MLF-10), color filter (MLF-20 Series of R, G, and Y colors) and diffusion filter (MLF-30) can be installed.

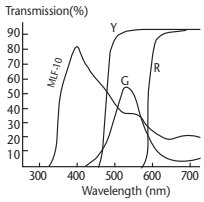
Filters

Made-to-order

MLF-10
MLF-20
MLF-30



*Screw pitch M22.5x0.5



By using a filter holder (FAF-10), the following filters can be attached:

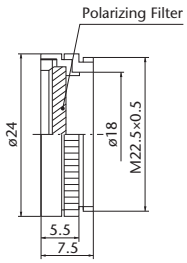
Model	Product Name
MLF-10	Color Temperature Conversion Filter
MLF-20	Color Filter Set (R/G/Y)
MLF-30	Diffusion Filter
MLF Filter Frame	MLF Filter frame

Polarizing Filter for Straight Light Guides

Made-to-order

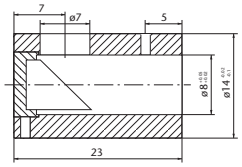
ME-01

- **Can be attached to either the filter holder (FAF-10) or various lenses.**



Side-Illumination Adapter

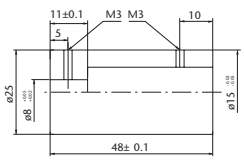
MQ-01



*Used to bend illumination 90° from the light guide output axis.

Light Guide Coupling Adapter

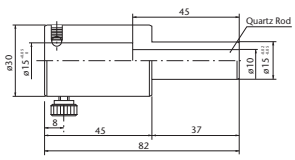
MAD-01



*This adapter joins the ferrules on the output side of one light guide to the input side of another.

Quartz Adapter

KA-03

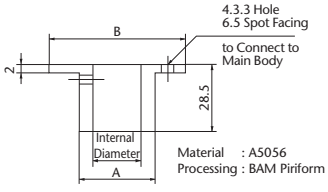


*Use this adapter when combining a 100W light source and a plastic light guide.

Inner Diameter Adapt

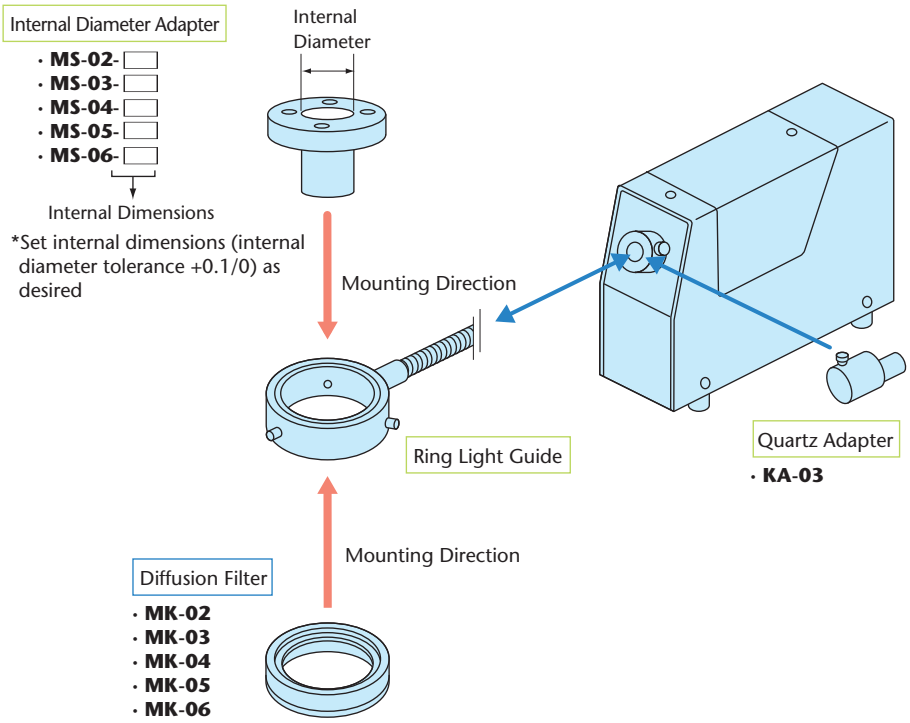
Made-to-order

Model	Compatible model	Dimension A (mm)	Dimension B (mm)
MS-02-□	MRG-31	ø31	ø60
MS-03-□	MRG-48	ø48	ø75
MS-04-□	MRG-53	ø53	ø80
MS-05-□	MRG-61	ø61	ø90



* Specify the bore or internal diameter as required. The tolerance for the internal diameter is +0.1/+0.
* Coating processing not performed for the internal diameter.

System Chart for Ring Light Guides



See corresponding pages for light guide compatibility, specifications, and option commodity codes.

Ring Light Guide Options

Diffusion Filter

Model	Compatible Model	External Diameter	Thickness (mm)
MK-02	MRG-31	ø46	5.5
MK-03	MRG-48	ø65	
MK-04	MRG-53	ø69	
MK-05	MRG-61	ø76	
MK-06	MRG-75	ø90	

Setting this filter at the light irradiation end of a ring light guide suppresses illuminance irregularity, achieving a soft illumination effect.

Quartz UV Light Guides

Our Quartz fiber light guides are ideal for light transmittance and high-power spot curing in combination with a UV light source.

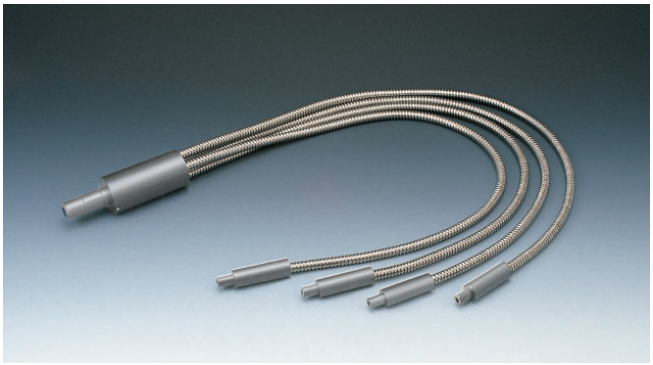
Because we control the entire production process from fiber drawing to final assembly, we can not only offer an assortment of standard products, but also a multitude of custom solutions ranging in shapes, branches, lengths and diameters. Depending on the application, we can adapt and meet many different requirements.

Quartz Fiber Light Guide Applications

- UV Curing
- Florescence Analysis
- Lighting in Vacuum & Special Environments
- Specialized Medical Illumination
- LCD & Semiconductor Lithography

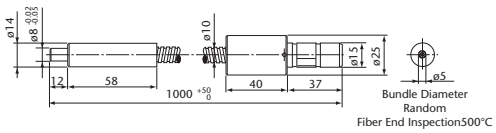
Quartz UV Light Guide
UV

- **MORITEX draws raw quartz fibers, processes, and bundles them according to application**
- **Straight, multi-branch, and other various configurations of light guides can be manufactured including light guides made to customer specifications**

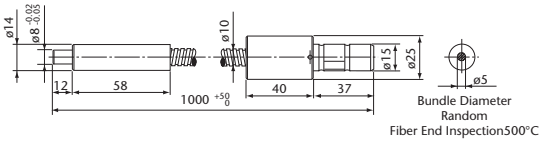


Model	Notes
MSS5-1000S-UVIII	ø5×1000L
MWS5-1000S-UVIII	ø5 x 2-Branch x 1000L
M4S5-1000S-UVIII	ø5 x 4-Branch x 1000L

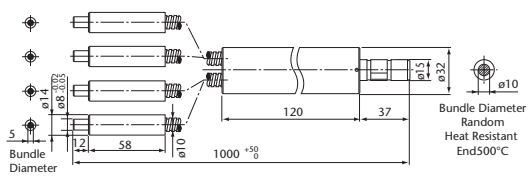
MSS5-1000S-UV III



MWS5-1000S-UV III

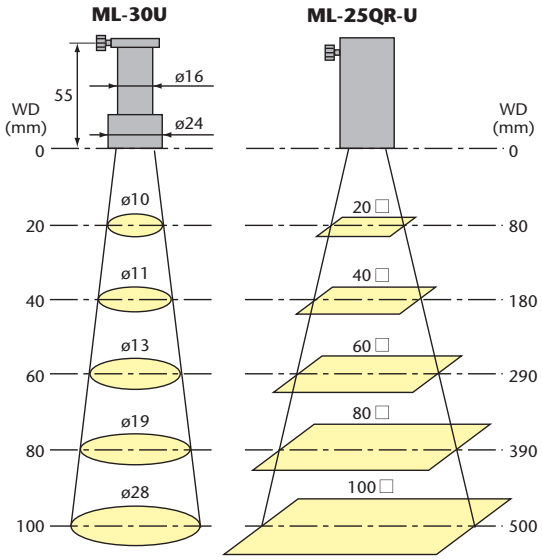


M4S5-1000S-UV III



Quartz UV Light Guide Options

Unit for Condenser Lenses



Model	Notes
ML-30U	Condenser Lenses
ML-25QR-U	Uniform Light Irradiate Quartz Lens

Quartz UV Light Guide Data

UV Visible Range Quartz Fiber Characteristics

Optical Fiber Data

NA and Stucture Dimensions	NA		0.22±0.02
	Diameter	Core (μm)	200±5
		Clad (μm)	208±5
		Primary Coating (μm)	240±10
	Permissable Bend Radius (mm)		20
Materials	Core		Pure SiO^2
	Clad		With F SiO^2

Note: Fiber diameter (core/ clad) may be changed without any notice.

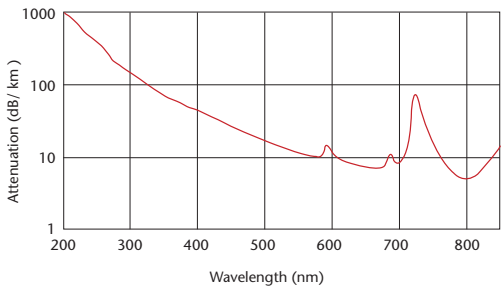
Features

- Suitable for UV-ray transmittance because of high OH contents
- Prices are low because of rational production system.
- Transmittance rate is stable for a long time when used for UV light guides.
- Can be used for i, g, and h rays
- The thorough quality control of transmittance performance and dimensional precision realizes easy processing with less dispersion and produces good-quality products.
- The technology, experience, and know-how of MORITEX, accumulated over a long period enables various fiber processing.

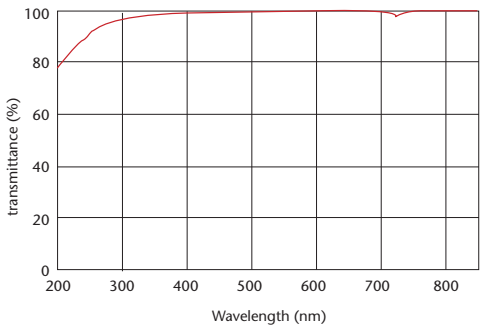
Applications

- Light guides for UV spot light sources
- Advanced light guides for semiconductors and liquid crystal exposure devices
- Light guides for analyzers
- Fiber probes for sensors
- Light guides for fluorometric analysis
- Light guides for medical use

Wavelength Attenuation Characteristics



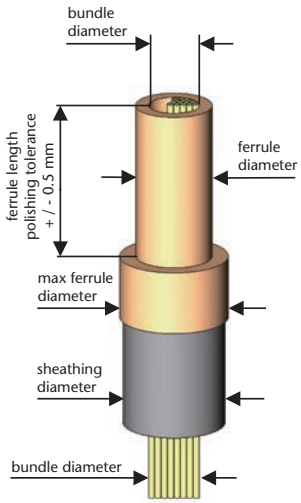
Wavelength Transmittance Rate Characteristics (Per Meter Excluding Fresnel Reflection)



Special Application Light Guides

We offer the following choices for the light guide end termination:

Epoxy Process



Epoxy End Termination:

Standard temperature resistance up to 200°C depending on application
High Temperature resistance up to 300°C on request

Note: Transmittance of glued bundle is approximately 10 % lower than the fused bundle with same diameter after fusing.

*Note: All dimensions in the drawings depend on the bundle diameter

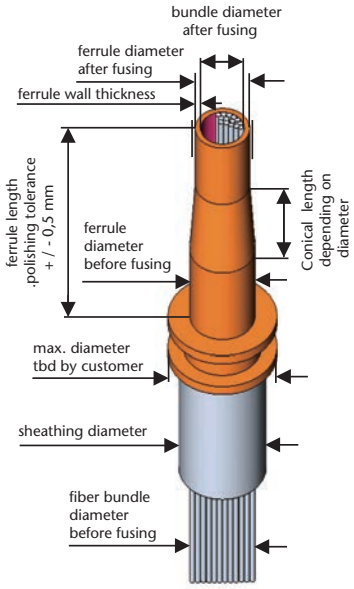
Fused Fiber Bundle Termination:

The end face of these light guides have a temperature resistance up to 350°C and approximately 10 % higher transmission values than epoxied fibre bundles with the same bundle diameter

Hot Forming Process

Hot Forming

Diameter range 2.5 – 21.0 mm after fusing



Sheathings:

Stainless steel, metal / PVC or metal / silicone sheathings, other sheathings on request

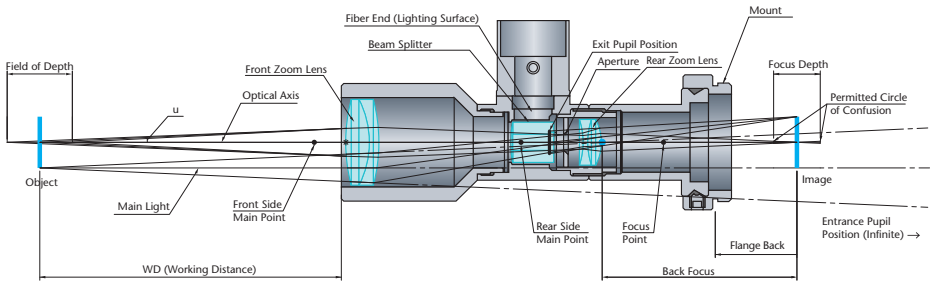
Fiber diameter values:

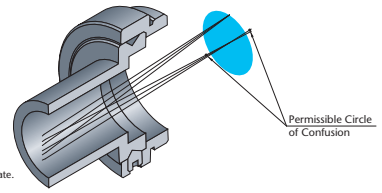
50 µm and 70 µm

Special applications:

Temperature resistance at the proximal end of up to 500°C can be achieved using quartz fibres and a special epoxy

Data and Glossary



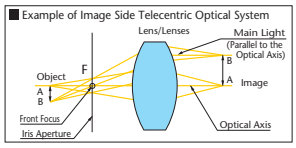


*This diagram is intended for the purpose of explaining technology.
The positions and distances shown in this diagram are not necessarily accurate.

Performance

Telecentric Optics

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 a 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.



Resolution (μm)

Resolution is a 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)

$$\text{Resolution}=\frac{0.61\times\lambda}{NA}$$ λ : Wavelength 0.61: Fixed Number

Resolving Power (Lines/ mm)

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).

Horizontal TV Resolution (TV lines)

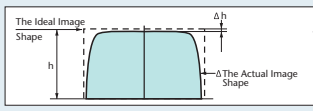
The total number of black and white horizontal stripes in the width, equivalent to the height of the vertical height on a TV monitor screen. The total stripes in the horizontal width would be 3/4, because the ratio of vertical and horizontal length of the screen is usually 3:4. When the horizontal TV 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.

Distortion (%)

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

TV Distortion (%)

Image distortion on a TV monitor.
The closer to zero, the better the performance.



$$\text{TV distortion (\%)}=\frac{\Delta h}{2h}\times 100$$

The curve amount on the long side is considered as distortion. Percentage of the depth of distortion h against vertical screen is TV distortion

Aperture Efficiency Marginal Light Quantity (%)

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.

Shading (%)

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.

Chromatic Aberration

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.

Floating Mechanism

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.

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.

$$\text{Depth of Field} = 2\,(\text{Permissible Circle of Confusion} \times \text{Effective F No} \times \text{Magnification}^2)$$

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

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.

$$NA = n \times \sin u \qquad NA' = n' \times \sin u'$$

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.

$$F\ No = f/D$$

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.

$$\text{Effective F No} = \beta/(2 \times NA) = 1/(2 \times NA')$$

$$\text{Effective F No} = (1+\beta) \times F\ No^{*}$$

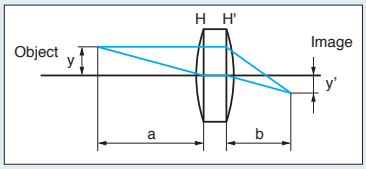
*Approximation for Thin-Walled Systems

Magnification

Optical Magnification β

Image size ratio against the object size.

$\beta = y'/y$
$= b/a$
$= NA/NA'$
$=$ Camera Element Size / Actual Size of Dield 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.

$$\text{Monitor Magnification} = (\text{Optical Magnification } \beta) \times (\text{Electronic Magnification})$$

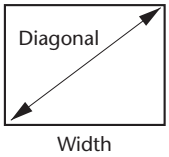
(Calculation Example) Optical Magnification β= 0.2x, camera Size 1/2" (Diagonal Line 8mm), Monitor 14" :
Electronic Magnification =14 x 25.4 β 8 = 44.45 (Times)
Monitor Magnification = 0.2 x 44.45= 8.89 (Times) (1 Inch = 25.4mm)

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) ÷ (optical magnification β).

(Calculation Example) Optical Magnification β=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



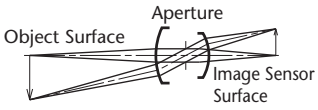
Type	Aspect Ratio	Length mm	Width mm	Diagonal mm
1/6"	4:3	1.73	2.3	2.878
1/4"	4:3	2.4	3.2	4
1/3"	4:3	3.6	4.8	6
1/2"	4:3	4.8	6.4	8
1/1.8"	4:3	5.3	7.2	8.9
2/3"	4:3	6.6	8.8	11
1"	4:3	9.6	12.8	16
4/3"	4:3	13.5	18	22.5

Formula

Resolution (μm)	=	0.61(Fixed Number)×0.55(Design Wavelength)÷NA
Effective F No	=	Magnification / 2NA
Depth of Field (mm)	=	2 (Permissible Circle of Confusion Diameter × Effective F No ÷ Magnifications^2)
Light Flux Diameter (ø)	=	2NA × Height from Object + Size of Field of View (Angle)

Features of Telecentric Optical System

Non-Telecentric Lens



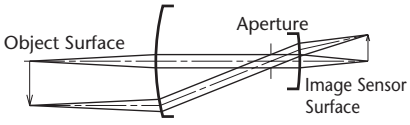
Advantages

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



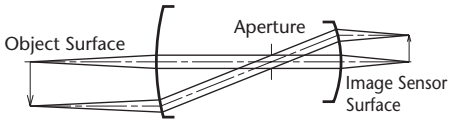
Advantages

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



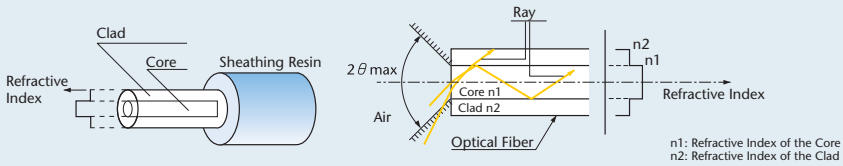
Advantages

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 Flex (lumen)	The quality of light emitted from a light source. The unit is lumen (lm) 1lm=1cd×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) 1lx=1lm/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) 1nt=1cd/m^2 or 1sb=1cd/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 applys 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.

Index

Lens

Illumination

IR-MEMS Inspector

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

Dimensions and specifications in this catalog may vary. Before purchasing, please check the delivery specifications or diagrams.

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2019.07 Printed in Japan