Original instructions

Scanner Head Unit

CL-H601A EU

OPERATION MANUAL

AMADA

AA05OM1208351-06

About This Documentation

Thank you for purchasing our CL-H601A Scanner Head Unit.

Please read this manual carefully to ensure correct use of the product. Keep the manual handy after reading for future reference.

This document for the CL-H601A Scanner Head Unit describes installation, maintenance and system specifications. For instructions for welding control using the SWDraw3 application, refer to the manual for SWDraw3.

1. Note

- SUPERSCAN IV (SSIV) is either registered trademarks or trademarks of RAYLASE GmbH in Germany and other countries.
- Company and product names in this manual are trademarks or registered trademarks of their respective owners.
- Unauthorized reproduction of this manual in whole or part is prohibited.
- The contents of this manual are subject to change without notice.
- Every effort has been made to ensure the accuracy of this information. If you come across oversights or errors, please notify your dealer.
- Be sure to read the user's manuals for any equipment used in conjunction with the system (e.g., documentation for computer systems).

2. Symbols Used in this Manual

 CAUTION	Indicates instructions that must be followed to prevent hardware or software damage or operating errors.
 ATTENTION	Indicates additional information on a particular topic.

Menus, icons, buttons, windows, tabs	Enclosed in brackets. Example: Click the [OK] button.
Keyboard keys	Enclosed in angle brackets. Example: Press the <Tab> key.
References	Enclosed in quotes. Example: Refer to "Chapter 8-3.2 Changing Passwords" (page 5).

Contents

Chapter 1 Special Precautions

1. Safety Precautions

Read these Safety Precautions thoroughly before use to ensure correct use of the system.

- The precaution points indicated here are intended to ensure safe operation of the system and prevent hazards or injury to users and other personnel.

  They are important details relating to safety and must be read carefully.

- The indications have the following meanings.

⚠ DANGER	Indicates that incorrect operation risks death or serious injury to personnel.
⚠ WARNING	Indicates that incorrect operation may result in death or serious injury to personnel.
⚠ CAUTION	Indicates that incorrect operation may result in injury to personnel or damage to property.

Indicates prohibited actions and warns of actions not covered by the product warranty.

Indicates actions that must be performed by users.

The triangular symbol indicates details that supplement DANGER, WARNING, or CAUTION points.


⚠ DANGER

Never dismantle, repair, or modify the system. Doing so may result in electric shock or fire.
Otherwise there is a risk of electric shock or fire. Do not attempt maintenance other than that described in the Operation Manual.

Do not look into or touch the beam.
Direct and scattered laser light is dangerous. Looking directly at the laser source risks blindness.

⚠ WARNING

Wear protective goggles.
Protective goggles must always be worn when using the system.
Care must be taken even when wearing protective goggles, as looking directly at the laser source through protective goggles risks blindness. Protective goggles attenuate the laser beam, but does not block it.

Never subject parts of the body to laser radiation.
Otherwise there is a risk of burn injuries.

Do not damage power or connector cables.
Do not crush, twist, or pull cables. Damaged cables may result in electric shock, short-circuiting, or fire.
Contact your dealer or us. if repair or replacement is necessary.

Connect securely using the specified cables.
Using cables with inadequate capacity or improper connections may result in fire or electric shock.

Connect optical fibers securely.
Improper connection may result in burn injuries or fire.

Stop using the system if a problem arises.
If a problem occurs such as a burning smell, abnormal noise, overheating, or smoke emission, continuing to use the system may result in electric shock or fire.
Contact your dealer or us immediately.

Use a stopper.
Laser radiation is hazardous to personnel.When operating the laser during maintenance work, use a stopper (light-absorbing/scattering body capable of withstanding high temperatures) to prevent laser emission beyond the stopper.

Wear protective work clothing.
Wear protective clothing such as gloves, long-sleeved clothing, and a leather apron.
Spatter will cause burn injuries if it lands on the skin.

⚠ CAUTION

Keep away from water.
Subjecting electrical components to water may result in electric shock or short-circuiting.

Install in a firm location.
Otherwise there is a risk of injury if the system topples or falls from the installation location.

Keep away from flammable materials.
Otherwise there is a risk of fire if spatter created during laser emission lands on flammable materials.
If flammable materials cannot be removed from the vicinity, they must be covered with a non-flammable cover.

Provide fire extinguishers.
Fire extinguishers must be provided in the welding work area in case of fire.

Inspect and maintain the system periodically.
Inspect and maintain the system periodically, repairing damaged parts and components before use.

Do not point the laser beam at flammable materials.
Do not point the laser beam at flammable or combustible materials. Otherwise there is a risk of fire.

Keep connector plugs clean and insert fully.
There is a risk of overheating and fire if dust is allowed to accumulate or if plugs are not fully inserted.

Hold the plug body when inserting or removing.
There is a risk of damage to the cable and electric shock or fire if the cable is pulled to unplug.

Do not cover with blankets or sheets.
Do not cover the system with blankets or sheets while in use. Otherwise there is a risk of over-heating and fire.

2. Operating Precautions

(1) When scanning highly reflective materials (such as gold, silver, copper, or aluminum), be sure to contact us.

Depending on use conditions, the inside of the scanner head unit may be burnt.

(2) A person knowledgeable about laser radiation and laser systems should be appointed as a laser safety manager.

The laser safety manager should be responsible for managing the system key switches, providing safety instruction to laser operators, and supervising operations.

(3) Areas in which lasers are used must be partitioned from other areas by enclosing with fences.

These areas should be managed by a supervisor and marked with signs to prevent entry by unauthorized personnel.

(4) The system should be used in an ambient temperature range of 15°C to 35°C and humidity 80% RH or lower with no sudden temperature fluctuations. Avoid using the system in the following locations.

- Locations with dust or oil mist present
- Locations subject to vibration or impact
- Locations in which chemicals are used
- Locations subject to high noise
- Locations susceptible to condensation
- Locations with high concentrations of CO_2, NO_x, or SO_x (The ion-exchange resin life may be reduced by exposure to CO_2 concentrations of 0.1% or more.)

(5) There is a risk of condensation forming on the lens surface and debris adhering if the ambient temperature changes suddenly such as when turning on the heating in cold conditions. Avoid sudden temperature fluctuations. There is a likelihood that condensation has formed if the output decreases during initial operation. Stop using the system immediately, and check the lens surface if there is a likelihood of condensation.

(6) The exterior of the system should be wiped clean using a soft or moist cloth. If the exterior is particularly dirty, wipe clean using diluted detergent or alcohol.

(7) Do not drop foreign objects such as screws inside the system, as this may result in failure of the system.

(8) Operate the system as described in the attached Operation Manual.

(9) Do not turn off the power switch of the laser control unit while a computer is connected to the laser control unit.

(10) If a computer is connected, it will continue to access the memory card for about 15 seconds after going offline. During this time, do not turn off the power switch of the laser control unit.

(11) If a computer is connected, never disconnect the LAN cable before turning off the power switch of the laser control unit.

(12) For more consistent scanning allow the unit to warm up for about 10 to 30 minutes after turning it on. The warmup time varies depending on the temperature and workpiece material.

(13) When a supervisor or operator enters the area where the laser is used, safety measures not to exceed the MPE* level must be provided.

* MPE: The maximum level of permissible exposure of the eyes or skin to laser beams. Abbreviation of Maximum Permissible Exposure.

* For other information on managing laser equipment or the MPE level, refer to the following standards.

IEC Standards IEC60825-1 “Safety of laser products Part1: Equipment Classifications, requirements and use’s guide”

[Warning/Caution label details]

Chapter 2 Features

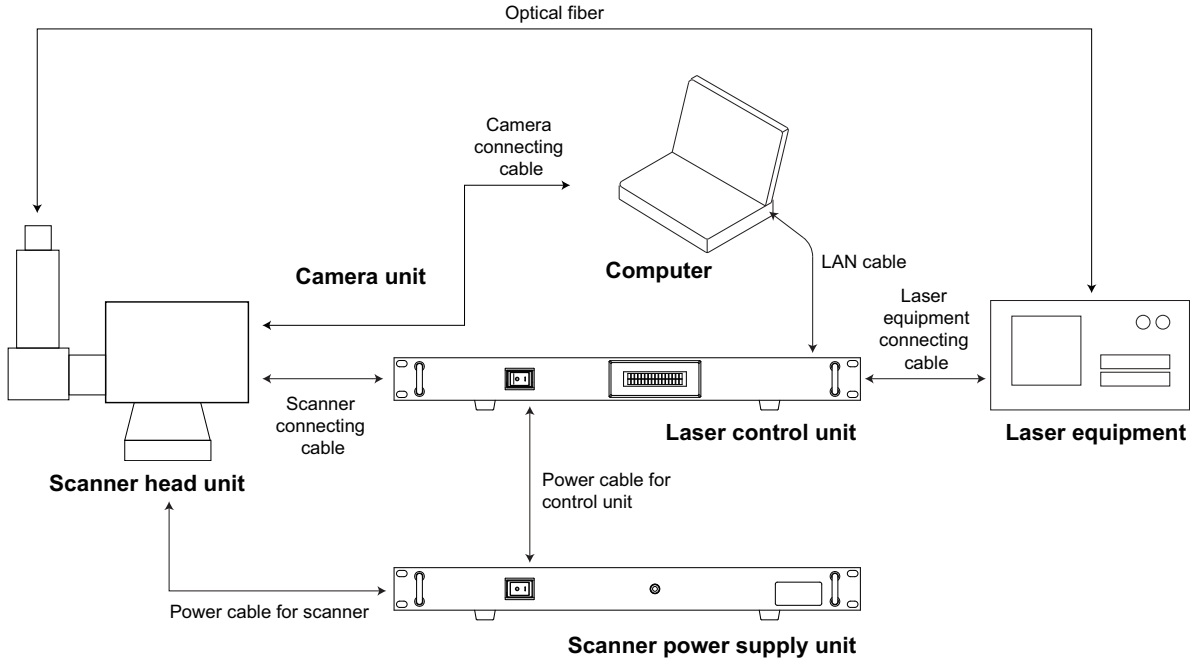
This product is a high-precision laser scanning system for welding which is used in the emitter for laser light sent via optical fiber from the laser equipment and combined with a laser control unit.

By combining the optional camera unit with the PC application SWDraw3 attached to our laser control unit CL-E100A, scanning can be used more conveniently.

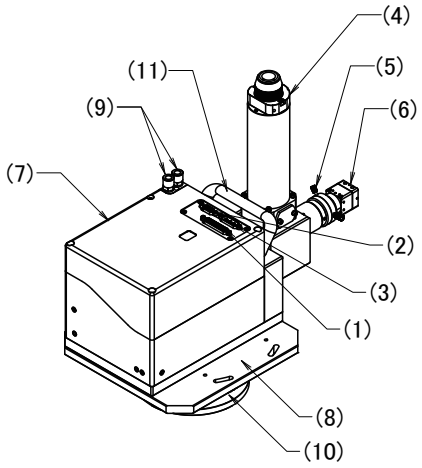
By combining the collimator and the fθ lens, various spot diameters can be realized.

Chapter 3 System Configuration

1. Overall Configuration



2. Name and Functions of Each Section



(1) Head I/F connector (XY2-100)

For connection to the XY2-100 connector of the laser control unit (CL-E100A) using the scanner cable.

(2) Head I/F connector (SL2-100)

Not used.

(3) Power supply connector

For connection to the scanner power supply unit (CL-P148A) using the scanner power cable.

(4) Collimator unit

For converting laser light output from the transmission fiber to parallel light.

(5) Image adjusting unit

For adjusting the focal point and the imaging position of the camera unit.

(6) CCD camera (option)

For observing the processing point.

For types, see "Chapter 5-3. Option" (page 18) .

(7) For observing the processing point.

(8) Scanner unit

The main unit of the scanner (SUPERSCAN IV manufactured by RAYLASE GmbH).

(9) Mounting plate

For dimensions of the mounting hole, see "Chapter 6-2. Dimension of the Mounting Hole" (page 24) .

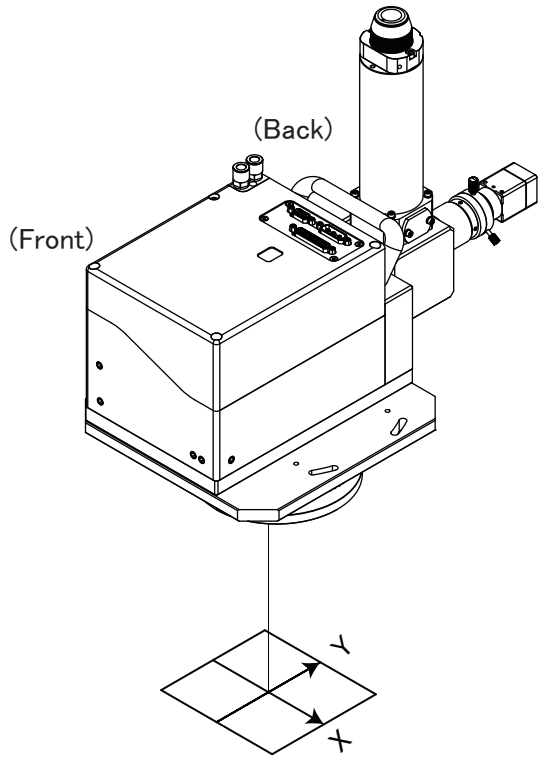
(10) Water-cooled tube connector

Not used.

(11) fθ lens

(12) Handle

Carry the Head Unit by holding this handle. Do not hold the collimator unit.

CAUTION	The positional relationship between coordinate axes XY and the center of lens is as shown below. 

Chapter 4 Installation

1. Unpacking

1.1. Lifting and Transporting Container

 CAUTION	When moving the container, use a cart or ensure at least two people carry it.

	Dimension	Mass (including contents)
Container for scanner head unit and accessories	Approx. 435 (H) x 570 (W) x 500 (D) mm	Approx. 14 kg

1.2. Checking the Contents of Container

Verify that contents of the container agree with the following list.

The components marked with * are built in the scanner head unit.

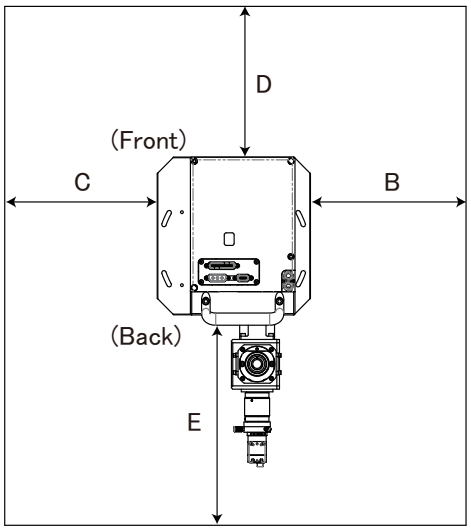
Component	Quantity
Scanner head unit	1
Label (LB1173123)	1
Label (LB1191496)	1
Operation manual	1
fθ lens *	1
Collimator lens unit *	1
Camera unit *	1

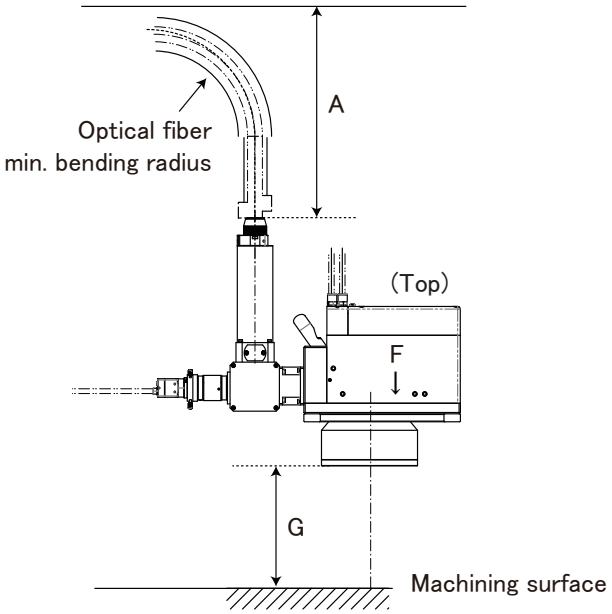
2. Installation

2.1. Installation Requirements

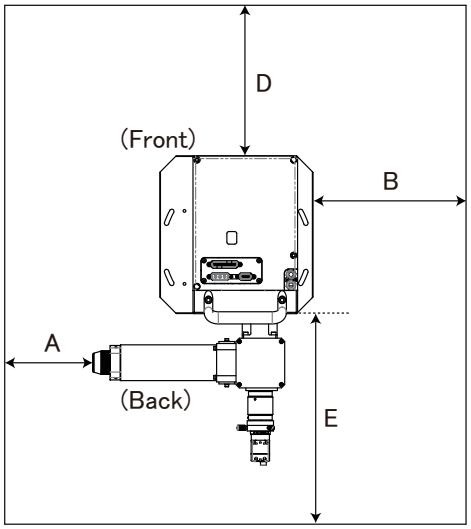
Refer to the following figure when installing the scanner head unit.
Scanning may produce dust and others, we recommend installing a dust collector.
The required clearance changes depending on the direction of the collimator unit.

Vertical-type collimator unit





Horizontal-type collimator unit



Required Clearance and Mass Support

A. Clearance on fiber insertion part	At least 400 mm *1
B. Clearance on right side	At least 300 mm
C. Clearance on left side	At least 300 mm
D. Clearance in front	At least 300 mm
E. Clearance in back	At least 350 mm *1
F. Mass	Approx. 12 kg
G. Work distance	See "Chapter 5-2. Lens Unit Lineup" (page 17) .

* The type and size of the optical fiber connector are different according to the manufacturer and type of the laser equipment to use, and a sufficient clearance may not be secured. Refer to the operation manual for the laser equipment to be combined to install the scanner head unit.

	The optical fiber has its minimum bending radius. Refer to the operation manual for the laser equipment connected to install the scanner head unit so as not to bend the optical fiber beyond its minimum bending radius.

	When moving the scanner head unit, support the head on right and left to avoid touching the collimator unit or the lens. Do not hold the fiber or other cables.

Keep the following points in mind when installing the scanner head unit.

(1) The work distance is the distance from the outermost surface of the fθ lens' protective glass to the focal position. Depending on differences in scanning conditions and from device to device, the work distance may result in slight variations. Make sure the scanner head unit is installed to permit adjustment in the range of ±10 mm relative to these values.

(2) Install the scanner head unit so that you can adjust and maintain level after installation.

(3) For the scanner head unit mounting platform, use a sheet of metal at least 10 mm thick.

(4) Protect the mounting platform from vibrations.

Vibrations of 0.1 G or less during operations are generally acceptable, but even lesser vibrations under certain conditions may affect or distort scanning or lead to damage.

(5) Keep the mounting platform separate from conveyor lines or other equipment to prevent vibration and impact.

(6) When using two opposing scanner head units, install them so that the laser of neither head is aimed at the other head.

A laser directed at parts within the other scanner head unit may burn the unit interior.

(7) When scanning highly reflective materials (such as gold, silver, copper, aluminum, steel, or stainless steel), make sure the focal distance is correct.

Putting workpieces in a position other than the lens focal position may burn the inside of the scanner head unit due to reflected light from the workpiece.

(8) Install the scanner head unit so that the laser is not aimed at the ceiling.

This precaution is intended to protect users from looking directly into laser output unit and to facilitate maintenance.

2.2. Connections

(1) Avoid bundling control cables with other power cables.

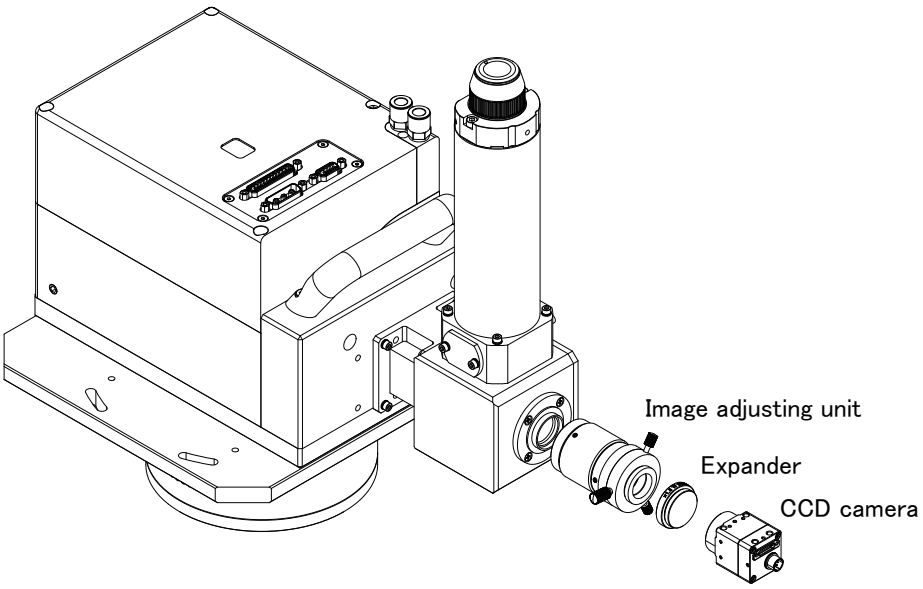
The resulting electromagnetic noise may cause malfunctions.

(2) When connecting optical fibers, take care to avoid soiling or damaging the ends of the fiber.

Retain the caps originally attached to the scanner head unit and optical fiber in a safe location for future use. You will need them again if the optical fiber is removed.

(3) Use the corresponding MF-C series or CL-P148A for the scanner power supply.

(4) In case of the camera unit attached, a camera and peripheral components are coming with it. A camera and peripheral components have been assembled. Since the angle and the focal point have been already adjusted, do not remove or move them carelessly.



Chapter 5 Specifications

1. Basic Specifications

Item		Specifications
Corresponding wavelength		1060 to 1080 nm, 650 nm (Guide beam)
Maximum allowable laser power		2000 W
Fiber connector type		QBH
Ambient temperature		15°C to 35°C Note: Contact us when using in ambient temperature below 5°C.
Ambient humidity		80% RH or lower (with no condensation or freeze)
Temperature during storage		-10°C to 60°C (with no condensation or freeze)
Humidity during storage		80% RH or lower (with no condensation or freeze)
Vibration during transport (with packaged)		ASTM D 4728 Level2
Impact during transport (with packaged)		ASTM D 4169-05 Level2
Dust, Oil mist		IP54 (scanner unit only)
Electromagnetic compatibility standards	Immunity	Complied with the following: IEC61000-4-2 (Electro-static immunity) IEC61000-4-3 (Radiated field) IEC61000-4-4 (Fast transient burst noise) IEC61000-4-5 (Lightning surge) IEC61000-4-6 (Conducted immunity) IEC61000-4-8 (Magnetic field immunity) IEC61000-4-11 (Dips/Interrupts)
	Emission	Complied with the following: EN55011 (Radiated disturbance) EN55011 (Conducted disturbance)
Power supply voltage		±48 V
Current consumption		Average: Approx. 2 A, Maximum: Approx. 5 A
External dimensions		233(W) mm × 480(D) mm × 375(H) mm (when using fθ lens: f306 and collimator: f150)
Mass		Approx. 12 kg (excluding fθ lens and collimator)

2. Lens Unit Lineup

2.1. Fθ Lens

f (mm)	Work distance (mm)	Machining area (mm)
f306	373.6±5	□150

2.2. Collimator Lens

f (mm)
f60
f80
f100
f120
f150

Depending on the laser equipment you use, some collimator lenses are not available.

3. Option

3.1. Camera

The processing point can be observed by using the optional cameras.

By combining with the PC application SWDraw3, the USB3.0 camera SET and the PoE camera SET can also use the Gridwork function and the Auto position alignment function. For details of each function, see the operation manual for SWDraw3.

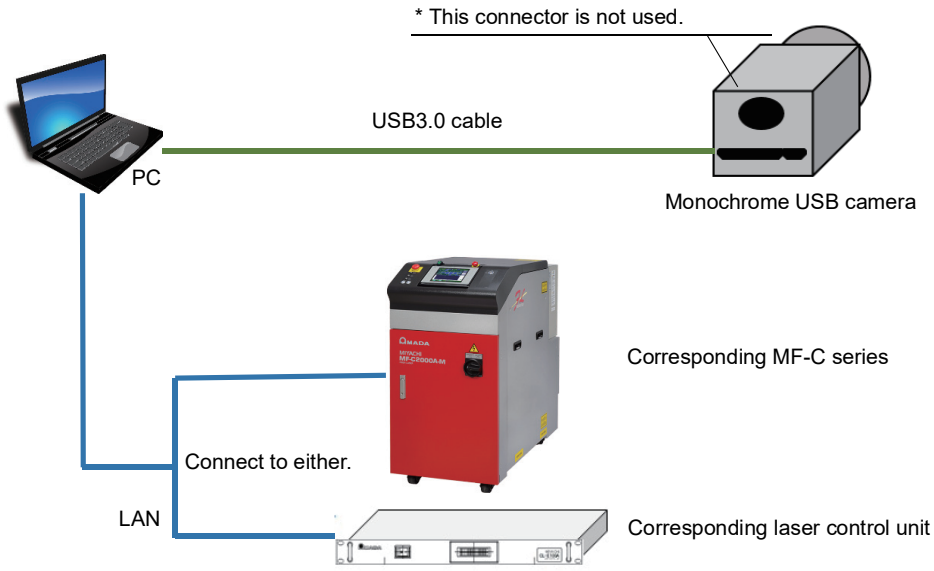
Each camera and image adjusting unit have been assembled to the scanner head unit and adjusted. Do not remove them carelessly or rotate it.

3.1.1. USB3.0 camera SET

- Accessories

Name	Specification
Monochrome USB3.0 camera	Monochrome 400,000 pixcels, USB3.0-supported camera
Image adjusting unit (x1.5)	Magnification: x1.5
Cable for USB3.0 camera	5 m, black

- Block diagram

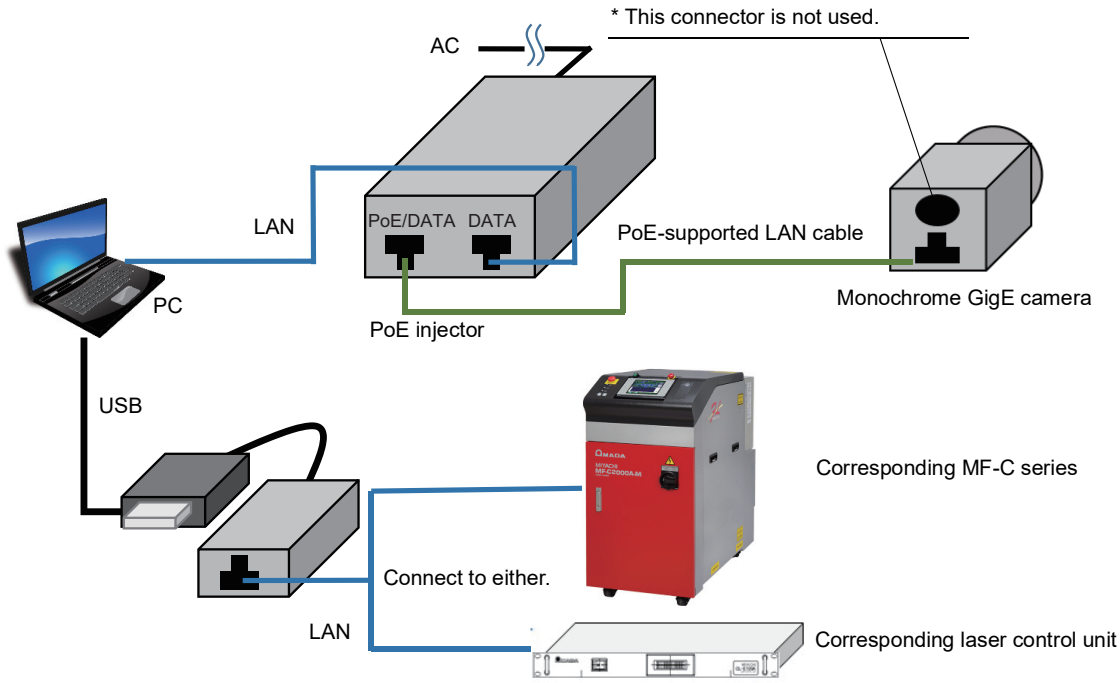


3.1.2. PoE camera SET

- Accessories

Name	Specification
Monochrome GigE camera	Monochrome 400,000 pixcels, PoE-supported GigE camera
Image adjusting unit (x1.5)	Magnification: x1.5
PoE-supported LAN cable	5 m, black, CAT6
PoE injector	IEEE802.3af
LAN cable	5 m, blue, CAT7
USB LAN conversion adapter	USB3.0, 19 cm-long

- Block diagram



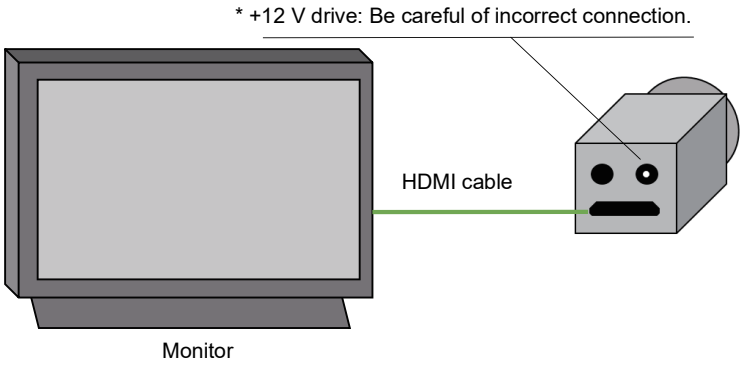
3.1.3. HDMI camera SET

The following options are selected in addition to a set of camera, remote switch and adapter.

- Selective required options

Name	Specification
Image adjusting unit	Magnification: x1, x1.5, x2, x3, x4
HDMI cable	Length: 5 m, 10 m
Monitor	Size: 10.1 inch, 15.6 inch

- Block diagram



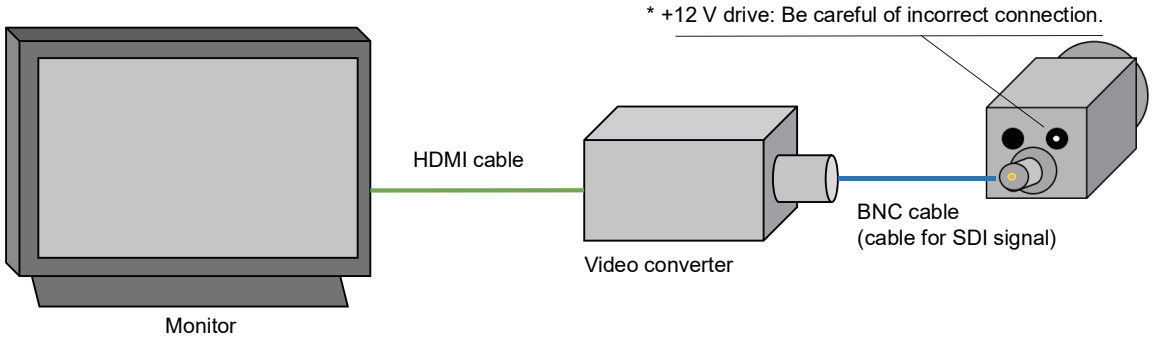
3.1.4. SDI camera SET

The following options are selected in addition to a set of camera, remote switch and adapter.

- Selective required options

Name	Specification
Image adjusting unit	Magnification: x1, x1.5, x2, x3, x4
HDMI cable	Length: 5 m, 10 m
Monitor	Size: 10.1 inch, 15.6 inch
BNC cable	Length: 5 m, 10 m
Video converter	Converts SDI signal to HDMI.

- Block diagram



Chapter 6 Outline Drawing

1. Scanner Head Unit

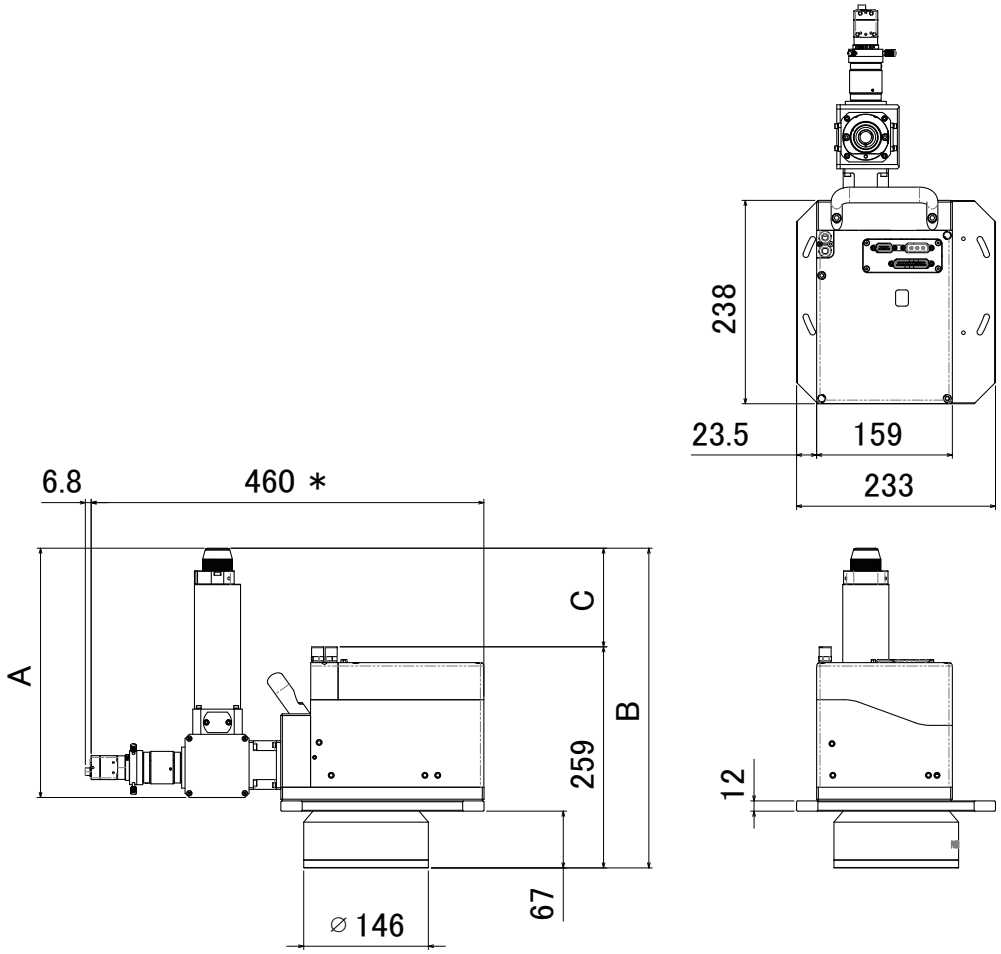
For dimensions of the mounting hole of the mounting plate, see "Chapter 6-2. Dimension of the Mounting Hole" (page 24) .

1.1. f306

Collimator lens	f60	f80	f100	f120	f150
A	201	221	241	262	292
B	284	303	324	344	375
C	25	44	65	85	116
D	62	82	102	122	153

1.1.1. Vertical-type collimator unit

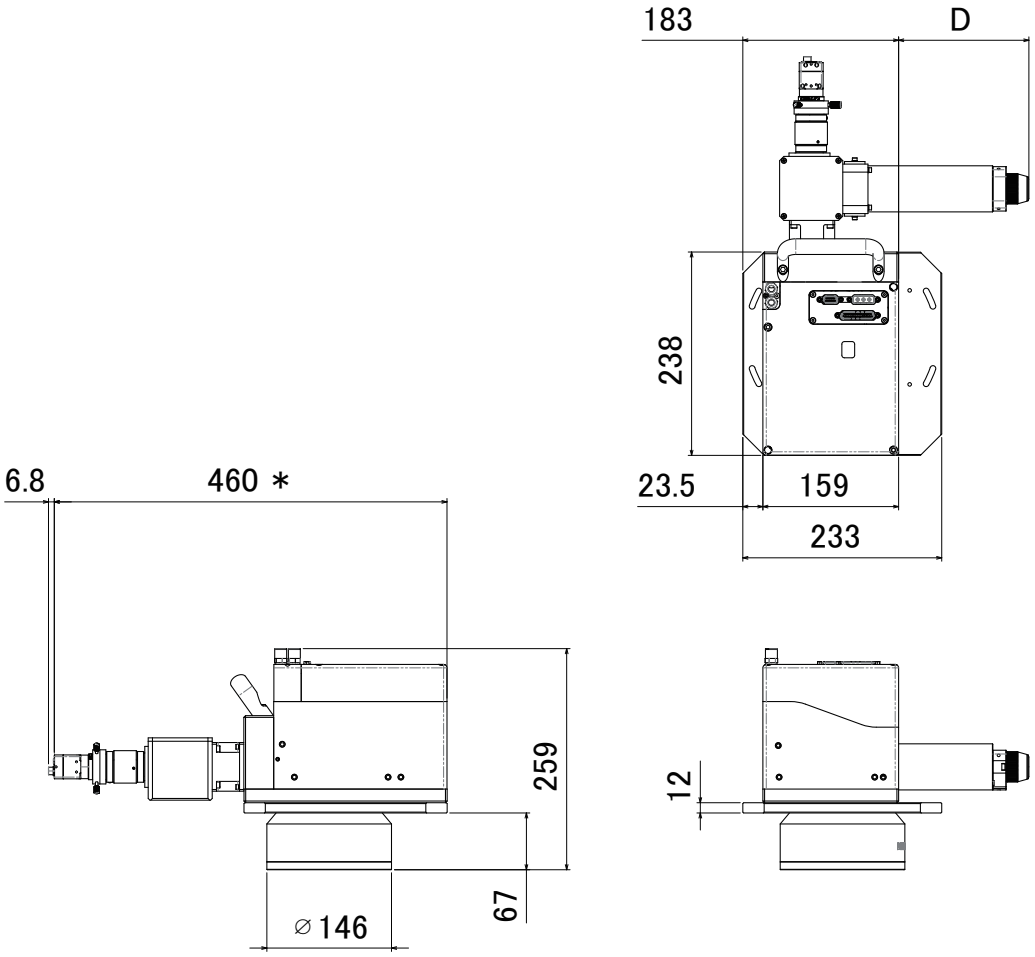
Dimensions in mm



* The length may be up to +60 mm depending on the selected camera. Pay attention to peripheral design in assembly.

1.1.2. Horizontal-type collimator unit

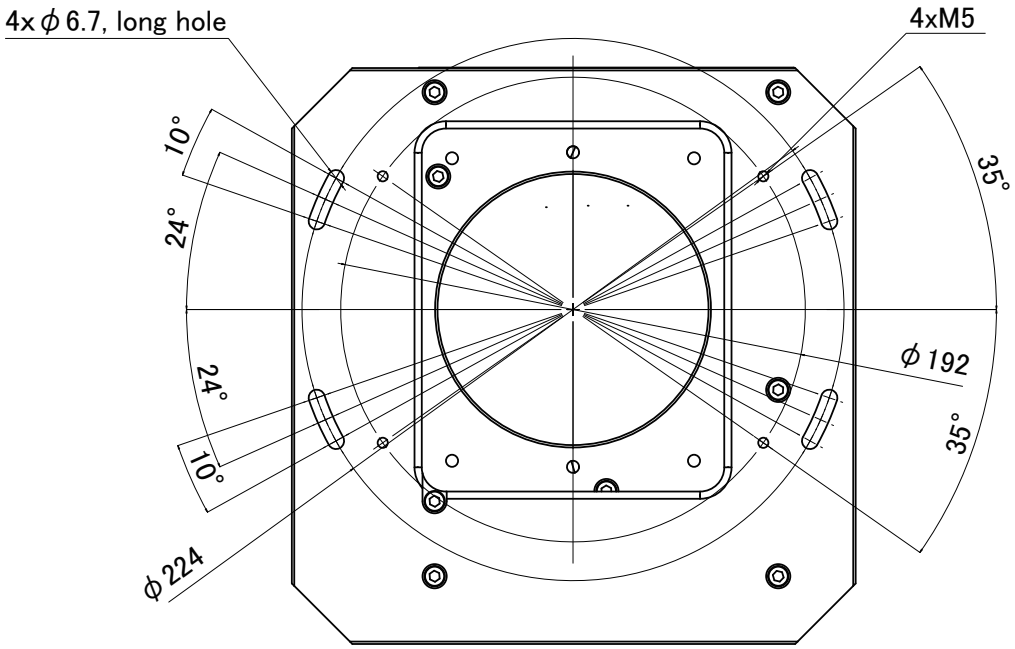
Dimensions in mm



* The length may be up to +60 mm depending on the selected camera. Pay attention to peripheral design in assembly.

2. Dimension of the Mounting Hole

Dimensions in mm



Chapter 7 Inspection and Parts Replacement

1. Before Inspection and Parts Replacement

This section describes simple maintenance tasks that can be performed by users.

 CAUTION	Turn OFF the equipment and wait enough time to perform maintenance tasks safely. The equipment may be heating up and it may result in burn injury.

 CAUTION	Before performing any maintenance tasks, turn OFF the equipment and wait at least five minutes to stop the equipment safely. Touching the equipment interior when it is on may result in electric shock.

 CAUTION	• Use our genuine maintenance parts. • For defect caused by non-genuine maintenance parts or use of non-genuine maintenance parts, the repair is charged even if it is still within the maintenance contract period or the warranty period.

 CAUTION	Confirm that the fθ lens is not loosened.

For optimal performance, we recommend performing annual inspections and comprehensive overhauls once every two years. For more information, please contact us.

2. Parts Replacement

As user-serviceable parts wear with use, performance will decline, eventually requiring repairs or replacement.
Inspect the unit regularly, referring to the guidelines provided in the following table:

Component		Model No.	Item No.	Schedule*1 (Recommended)	Maintenance*2
fθ lens	f306	PO1160337	1160337	5 years	Replace

Component		Model No.	Item No.	Schedule*1 (Recommended)	Maintenance*2
fθ lens' protective glass	f306	PO1162296	1162296	Daily 1 year*3	Clean Replace
Scanner unit		SSIV-30	1206960	10 years*3	Replace

*1 The schedule means the maintenance time or expected life of the part, and is different from the warranty period.
*2 Replace parts when their service lives expire or if they are burned or defective.
*3 Depends on the usage of equipment.

3. Protective Glass Inspection and Replacement

The protective glass is designed to prevent the lens from atmospheric dust, spatter from the workpiece, and so on. If dirty, this may lead to laser power loss. Therefore, regular cleaning and replacement is necessary.

Clean or replace if the protective glass becomes dirty.

3.1. Preparation

Have the following ready when cleaning or replacing the protective glass.

- Air blow
- Lens cleaning paper
- Ethanol

When using gloves so as not to leave fingerprints, it is recommended to use a powder-free and disposable type.

3.2. Cleaning the Protective Glass

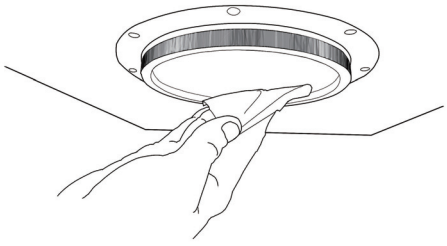
1 Turn OFF the power for the laser welder.

2 Blow off foreign particles by using the air blow.

3 If the foreign particles cannot be eliminated, apply a few drops of ethanol to the lens cleaning paper. Wipe the protective glass as shown, in a spiraling motion from the center out.

If the ethanol fails to clean the protective glass, replace the protective glass with a new one.

Bottom of scanner head unit



Wipe in a spiraling motion

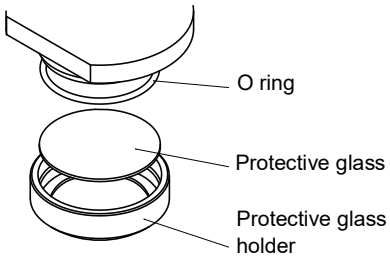
3.3. Replacing the Protective Glass

CAUTION	• Inspect and replace the protective glass periodically. • Replace the protective glass in a clean environment. • Remove the dirt on the surface of the protective glass with a lens cleaning paper before mounting it. Also, do not touch the surface with hands.

1 Turn OFF the power for the laser welder.

2 Turn the screw-type protective glass holder carefully not to turn the fθ lens together to remove the protective glass holder from the output unit body.

3 Remove the old protective glass and the O ring. (Some fθ lenses have no O ring.)

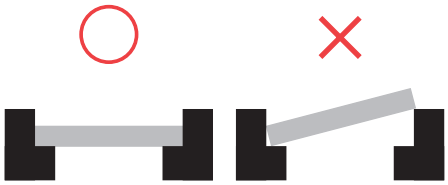


CAUTION	To avoid damage, be careful to avoid dropping the protective glass.

4 Fit a clean and new protective glass and the O ring into the protective glass holder's stepped section.

CAUTION	• The protective glass may be damaged if it is not properly fitted into the stepped section. • Depending on the protective glass, be careful of its orientation.

Protective glass sectional view



5 Reattach the protective glass holder to the scanner head unit.