KEYENCE

96M12000

Safety Light Curtain
GL-R Series
Instruction Manual

Detailed information about functions and use of the GL-R series is also described in the "GL-R Series User's Manual", and the configuration software of "Safety Device Configurator" is needed to use all functions of the GL-R. In order to acquire the "GL-R Series User's Manual" and "Safety Device Configurator", download them from the KEYENCE website or call the nearest KEYENCE office.
<KEYENCE website> http://www.keyence.com

This Instruction manual describes handling, operation, and precautionary information for the GL-R Series Safety Light Curtain ("GL-R").
Read this Instruction manual thoroughly before operating the GL-R in order to understand the device features, and keep this Instruction manual readily available for reference. Ensure that the end user of this product receives this manual.
In this Instruction manual, "GL-RF" represents the finger protection type with the detection capability of ϕ14 mm, "GL-RH" represents the hand protection type with the detection capability of ϕ25 mm, "GL-RL" represents the body protection type with the detection capability of ϕ45 mm and "GL-R" represents all the models including the GL-RF, GL-RH and GL-RL.

Symbols

The following symbols alert you to important messages. Be sure to read these messages carefully.

DANGER	**It indicates a hazardous situation which, if not avoided, will result in death or serious injury.**
NOTICE	**It indicates a situation which, if not avoided, could result in product damage as well as property damage.**

Point **It indicates additional information on proper operation.**

Reference It indicates tips for better understanding or useful information.

Indicates reference pages in this or another manual.

Safety Information for GL-R Series

■ General precautions

DANGER

- **You must verify that the GL-R is operating correctly in terms of functionality and performance before the start of machine and the operation of the GL-R.**
- **KEYENCE does not guarantee the function or performance of the GL-R if it is used in a manner that differs from the GL-R specifications contained in this user's manual or if the GL-R is modified by the customer.**
- **When using the GL-R to protect machine operators against a hazard or hazardous zone or using the GL-R as a safety component for any purpose, always follow the applicable requirements of the laws, rules, regulations and standards in the country or region where the GL-R is used. For such regulations, you should directly contact to the regulatory agency responsible for occupational safety and health in your country or region.**
- **Depending on the type of machine on which the GL-R is to be installed, there may be special safety regulations related to the use, installation, maintenance, and operation of the safety component. In such a case, you must fulfill such safety regulations. The responsible personnel must install the GL-R in strict compliance with such safety regulations.**
- **The responsible personnel must do the training to the assigned personnel for the correct use, installation, maintenance, and operation of the GL-R. "Machine operators" refers to personnel who have received appropriate training from the responsible personnel and are qualified to operate the machine correctly.**
- **Machine operators must have specialized training for the GL-R, and they must understand and fulfill the safety regulations in the country or region in which they are using the GL-R.**
- **When the GL-R fails to operate, machine operators must immediately stop the use of the machine and the GL-R and report this fact to the responsible personnel.**
- **The GL-R is designed with the assumption that it would be correctly installed in accordance with the installation procedures described in this user's manual and correctly operated according to the instructions in this user's manual. You must perform an appropriate installation of the GL-R after performing a sufficient risk assessment for the target machine.**
- **Be sure to absolutely confirm that there is nobody in the hazardous zone, before you remove the GL-R from the machine for replacement or disposal.**
- **When disposing the GL-R, always follow the applicable requirements of the laws, rules, regulations and standards in the country or region where the GL-R is used.**
- **The GL-R should be processed as an industrial waste product when being disposed.**

■ Precaution on use

● Operators

DANGER

- **In order to operate the GL-R correctly, the responsible personnel and machine operators must fulfill all of the procedures described in this user's manual.**
- **No person other than the responsible personnel and machine operators should be allowed to install or test the GL-R.**
- **When performing electrical wiring, always fulfill the electrical standards and regulations for the country or region in which the GL-R is used.**

● Environment of use

DANGER

- **Do not use the GL-R in an environment (temperature, humidity, interfering light, etc.) that does not conform to the specifications contained in this user's manual.**
- **Be sure to confirm that the GL-R keeps normal operation when electromagnetic radiation is generated by wireless devices. (If you use wireless devices such as cellular phones or transceivers in the vicinity of the GL-R.)**
- **The GL-R is not designed to be explosion-proof. Never use it in the presence of flammable or explosive gases or elements.**
- **Be sure to confirm no deterioration in product quality if you use the GL-R in the presence of substances, such as heavy smoke, particulate matter, or corrosive chemical agents.**
- **Do not install the GL-R in areas where the GL-R is exposed to intense interference light such as direct sunlight, and direct or indirect light from an inverter-type fluorescent lamp (rapid-start type lamp, high-frequency operation type lamp, etc).**
- **Be sure to absolutely confirm that there is nobody in the hazardous zone, before the interlock is released (i.e. the machine system restarts) by the interlock reset mechanism. Failure to follow this warning results in significant harm to the machine operators, including serious injury or death.**
- **Be sure to absolutely confirm that there is nobody in the hazardous zone before the override function is activated. Failure to follow this warning results in significant harm to the machine operators, including serious injury or death.**

● Target machine

DANGER

- **The GL-R has not undergone the model certification examination in accordance with Article 44-2 of the Japanese Industrial Safety and Health Law. The GL-R, therefore, cannot be used in Japan as a "Safety Device for Press and Shearing machines" as established in Article 42 of that law.**
- **The machine on which the GL-R is to be installed must be susceptible to an emergency stop at all operating points during its operation cycle. Do not use the GL-R for machines with irregular stop times.**
- **Do not use the GL-R for power presses equipped with full-revolution clutches.**
- **The GL-R cannot be used as a PSDI because it does not fulfill the requirements of OSHA 1910.217(h). Refer to OSHA 1910.217 for the PSDI mode.**
- **Do not use the GL-R to control (stop forward motion, etc.) trains, cars and other transportation vehicles, aircraft, equipment for use in space, medical devices, or nuclear power generation systems.**
- **The GL-R is designed to protect people or objects from going into/approaching detection zone against machine's hazard or hazardous zone. It cannot provide protection against objects or materials that are expelled from the machine's hazard or hazardous zone, so you must establish additional safety measures such as installing safeguards when there is the possibility of such projectiles.**

● Installation

DANGER

- **The GL-R must be installed only after ensuring the minimum safety distance between the GL-R and the hazardous zone or hazard as established by the applicable regulations in the country or region in which the GL-R is used. (e.g. EN ISO13855 (ISO 13855) in EU countries)**
- **Choose locations for the installation of the GL-R transmitters and receivers so that they are not subject to the effects of light reflected from glossy surfaces in the area.**
- **Correct operation and detection is not possible if the receiver has a different beam axis spacing (detection capability) from that of the transmitter. You must verify that the beam axis spacing (detection capability) is the same between the transmitter and the receiver when installing the GL-R.**
- **The GL-R must be installed so that the machine operator is able to go into or approach the hazardous zone or hazards only by passing through the detection zone of the GL-R. Strictly avoid installation that allows the machine operator or a part of the machine operator's body to go into or approach the hazardous zone or hazards without passing through the detection zone of the GL-R or to remain in position between the detection zone of the GL-R and the hazardous zone or hazard. In a case where you install the GL-R units in series (series connection), you must always check the installation carefully whether you follow this warning, especially after installation and maintenance.**
- **You must always perform the pre-check tests after installing the GL-R in accordance with the pre-check test procedures, such as items specified in this user's manual, in order to verify that the test pieces can be detected in all of the detection zones.**
- **Interlock reset mechanisms (such as switches) must be installed so that the entire hazardous zone can be checked by the responsible personnel. Interlock reset mechanisms should not be accessible from within the hazardous zone.**
- **Muting is a function to allow a temporary automatic suspension of the GL-R safety functions while the GL-R is receiving a signal from muting devices (such as sensors or switches). Therefore, additional safety measures are required for the machine on which the GL-R is installed in order to ensure safety while the muting is activated.**
- **Muting devices, the installation of those devices and the procedure to activate the muting function must fulfill the conditions specified in this user's manual and the requirements of the laws, rules, regulations and standards in the country or region in which the GL-R and those devices are used. Failure to follow this warning may result in significant harm to the machine operators, including serious injury or death.**
- **When you install muting devices (such as sensors or switches) for muting, the following conditions must be fulfilled.**
  (1) Muting devices must be installed so that the muting cannot be activated if the hazardous zone of the machine is in an unsafe condition or cycle.
  (2) Muting devices must be installed so that the muting cannot be activated even if the personnel is accidentally approaching the detection zone of the GL-R.
- **The muting device must be installed such that only responsible personnel have access to that device to change the installation or orientation. Special tools must be required to ensure that only responsible personnel are capable of installation, orientation or change of muting device.**
- **Only the responsible personnel may be allowed to install or wire the devices to activate the muting function.**
- **The installation of a muting lamp may be required by the laws, rules, regulations, and standards in the country or region in which the GL-R is used if you apply the muting function. It depends on the machine application and/or the result of your risk assessment. If it is necessary for you to provide a muting lamp, you must fulfill the requirements because you are fully responsible for installation of the muting lamp.**
- **The override is a function to allow a temporary manual suspension of the safety functions of the GL-R. Therefore, additional safety measures are required for the entire machine system on which the GL-R is installed in order to ensure safety while the override is activated.**
- **The override devices, the installation of those devices and the procedures to activate the override must fulfill the conditions specified in this manual as well as the requirements of the laws, rules, regulations and standards in the country or region in which the GL-R and those devices are used. Failure to follow this warning may result in significant harm to the machine operators, including serious injury or death.**
- **The override devices, which are used for activation of override, must be manual operating devices. When installing the devices to activate the override, those devices must be installed so that the whole hazardous zone can be checked by the responsible personnel and so that it is not possible for machine operators to operate those devices in the hazardous zone.**

DANGER	• **The installation of the indication for override may be required by the laws, rules, regulations, and standards in the country or region in which the GL-R is used if you apply the override function. It depends on the machine application and/or the result of your risk assessment. If it is necessary for you to provide the indication for override, you must fulfill the requirements because you are fully responsible for installation of the indication for override.** • **The customer is fully responsible for complying with the requirements for muting and/or override. Those who use muting and/or override must fulfill all of the requirements related to muting and/or override. KEYENCE accepts NO responsibility and NO liability for any damage or any injury due to the unauthorized installation, usage or maintenance, which are not specified in this user's manual, and/or due to noncompliance with the laws, rules, regulations and standards in the country or region in which the GL-R is used.** • **When the reduced resolution function is applied, the detection capability varies according to your configuration. Make sure to accurately calculate the safety distance according to the detection capability, and install the GL-R at a distance greater than or equal to the minimum safety distance away from the hazardous zone or hazard. The installation of additional safety measures, such as safeguarding, may be required if the detection capability varies due to the configuration of reduced resolution. On your own responsibility, you must perform the risk assessment based on your configuration of reduced resolution in order to reduce the risk.** • **When the fixed blanking function is applied, a hazardous clearance that is not protected by the GL-R may be generated between the obstacle and the GL-R. You must install an additional safety measure such as a safeguard for this clearance.** • **Securely tighten mounting brackets and cable connectors used for the installation of the GL-R in accordance with the torque values specified in this user's manual.** • **When optical synchronization system is applied and Channel A or B is configured, the response time is longer than the other case. Make sure to accurately calculate the safety distance according to the response time, and install the GL-R at a distance greater than or equal to the minimum safety distance away from the hazardous zone or hazard.**

● Circuit design and wiring

DANGER	• **Always turn off the power to the GL-R when performing electrical wiring.** • **You must fulfill the electrical standards and regulations in the country or region in which the GL-R is being used when you perform the electrical wiring.** • **To avoid the risk of electric shock, do not connect any of the GL-R inputs to DC power sources outside of the range of 24 V DC + 20% or to any AC power source.** • **To avoid the risk of electric shock, be sure that any hazardous voltage is isolated from all wiring of the GL-R with reinforced insulation or double insulation.** • **In order to fulfill the requirements in IEC61496-1, UL61496-1, EN61496-1 and UL508, the power supply for the GL-R must fulfill the conditions listed below.** **(a) A rated output voltage of 24 V DC (SELV, Overvoltage Category II) within ±20%.** **(b) Double insulation or reinforced insulation between the primary and secondary circuits.** **(c) Output holding time of 20 ms or more.** **(d) A power supply must fulfill the requirements of the electrical safety and electromagnetic compatibility (EMC) regulations or standards in all countries and/or regions where the GL-R is used.** **(e) A secondary circuit of power supply (output) must fulfill the requirements for Class 2 Circuits or Limited Voltage/Current Circuits specified in UL508, if the GL-R is used in the United States or Canada.** • **Do not install the electric wiring of the GL-R together with or in parallel with any high-voltage electrical or power lines.** • **Both OSSD outputs provided on the GL-R must be used to establish a safety-related machine control system. Establishing a safety-related machine control system with just one of the OSSD outputs cannot stop the machine due to an OSSD output malfunction and may result in significant harm to the machine operators, including serious injury or death.** • **When using PNP output type cables, do not cause a short-circuit between the OSSD and +24V. Otherwise, the OSSDs keep staying at the ON-state and it causes a dangerous situation.** • **When using PNP output type cables, be sure to connect the load between the OSSD and 0V to avoid a dangerous situation. If the load is incorrectly connected between the OSSD and +24V, the logic of the OSSD operation will be reversed and the OSSD will change to an ON state when the GL-R detects an interruption in the detection zone. This is a dangerous situation.** • **When using NPN output type cables, do not cause a short-circuit between the OSSD and 0V. Otherwise, the OSSDs keep staying at the ON-state and it causes a dangerous situation.** • **When using an NPN output type cable, be sure to connect the load between the OSSD and +24V to avoid a dangerous situation. If the load is incorrectly connected between the OSSD and 0V, the logic of the OSSD operation will be reversed and the OSSD will change to an ON state when the GL-R detects the interruption in the detection zone. This is a dangerous situation.** • **Regardless of whether the cables are PNP or NPN type, you must fulfill the requirements of Clause 9.4.3 in IEC60204-1: 2005 for protection against maloperation due to earth fault.** • **All outputs, other than OSSDs, are not allowed to be used as safety outputs for a safety-related machine control systems. Usage of these functions as safety outputs may result in significant harm to the machine operators, including serious injury or death.** • **The wait input is not allowed to be connected to the output from any components comprising a part of the safety-related machine control system. If the wait input is connected to the output of a safety component it may result in significant harm to the machine operators, including serious injury or death.** • **The transmitter and receiver cables must be within the lengths specified in this user's manual. Usage of cables longer than the specified length may cause the improper operation of safety functions and may cause a dangerous situation.**

■ Testing and maintenance

DANGER	• **You must always perform the pre-check test in accordance with the pre-check test procedures, after maintenance, adjustment or alignment of the target machine or the GL-R and before the machine startup.** • **If the GL-R does not operate properly when you perform a pre-check test in accordance with the precheck test procedures specified in this user's manual, do not operate the machine.** • **You must periodically examine the machine to verify that all brakes, other stop mechanisms, and control devices operate reliably and correctly in addition to checking the GL-R.** • **The responsible personnel must perform maintenance procedures as specified in this user's manual to ensure safety to the machine and GL-R.**

■ Precautions on regulations and standards

● CE Marking

KEYENCE Corporation has confirmed that this product complies with the essential requirements of the applicable EC Directive, based on the following specifications.
Be sure to consider the following specifications when using this product in a member state of the European Union.

- Machinery Directive (2006/42/EC)
  The GL-R is a safety component as established by the European Union's Machinery Directive (2006/42/EC) Annex V. The GL-R complies with the following EN Standards and has been certified by TÜV SÜD Product Service GmbH.
  - EN61496-1 Type 4 ESPE
  - EN61496-2 Type 4 AOPD
  - EN50178
  - EN61508, Part 1 to 4 SIL3
  - EN62061 SIL CL3
  - EN ISO13849-1 Category4, PLe
- EMC Directive (2004/108/EC)
  The GL-R complies with the following EN Standards
  - EN55011 Class A
  - EN61496-1 Type 4 ESPE

  These specifications do not give any guarantee that the end-product with this product incorporated complies with the essential requirements of the EMC Directive. The manufacturer of the end-product is solely responsible for the compliance of the end-product itself according to the EMC Directive.

● UL Certificate and North American Regulations

The GL-R complies with the following North American and international standards and has received UL certification and C-UL certification. (CCN: NIPF/NIPF7, File No:E184802)

- UL61496-1 Type 4 ESPE
- UL61496-2 Type 4 AOPD
- UL508
- UL1998

The GL-R also complies with the following North American regulations.

- FCC Part 15B Class A Digital Device
- ICES-003 Class A Digital Apparatus

● Model Certification Examination as a "Safety Devices for Presses and Shearing Machines"

The GL-R has not obtained the model certification examination in accordance with Article 44-2 of the Japanese Industrial Safety and Health Law. Therefore, the GL-R cannot be used in Japan as a "Safety Devices for Presses and Shearing Machines" as established in Article 42 of that law.

● Other standards

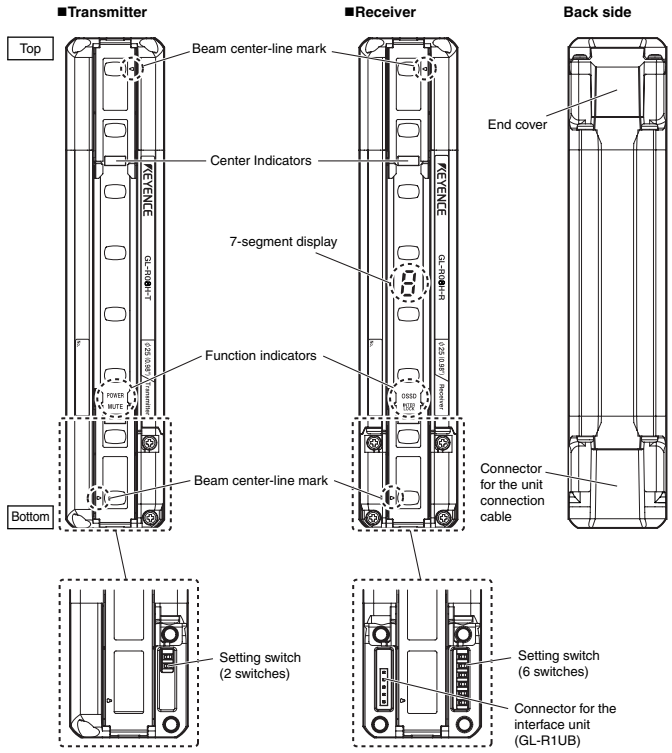
The GL-R has been designed in consideration of the following standards and regulations. For details regarding the following standards, contact the third-party certification organization, such as UL or TÜV.

- EN60204-1
- EN692
- EN693
- OSHA 29 CFR 1910.212
- OSHA 29 CFR 1910.217
- ANSI B11.1 - B.11.19
- ANSI/RIA R15.06 - 1999
- SEMI S2
- "Guidelines for Comprehensive Safety Standards of Machinery", July 31, 2007, number 0731001 issued by Ministry of Health, Labor, and Welfare in Japan.

Standard set

- GL-R transmitter (Transmitter) x 1
- GL-R receiver (Receiver) x 1
- Test piece x 1
  GL-RF : With diameter of 14 mm and length of 200 mm
  GL-RH : With diameter of 25 mm and length of 200 mm
  GL-RL : The test piece (diameter: 45 mm) is not supplied. Please acquire on your own.
- Instruction manual (this document) x 1

Part Description



* The side where the end cover has already been installed at shipment is the top side.

● Setting switch

Transmitter

Switch No.	Function	Configuration	
2	Channel	Channel 0 (Not applied) (Default)	Use Channel for light interference prevention when optical synchronization system is applied. For details, refer to the "Light interference prevention function" (page 5).
1		Channel A	
		Channel B	

Receiver

Switch No.	Function	Configuration	
6	Center indicator	ON (Green) when all beam axes are clear (Default)	
		OFF when all beam axes are clear	
5	Reduced resolution (Safety-related function)	Reduced resolution is not applied (Default).	
4		Reduced resolution (one optical beam) is applied.	
3		Reduced resolution (two optical beams) is applied.	
2	Channel	Channel 0 (Not applied) (Default)	Use Channel for light interference prevention when optical synchronization system is applied. For details, refer to the "Light interference prevention function" (page 5).
1		Channel A	
		Channel B	

DANGER

- **The response time varies according to the configuration of Channel.**
  "Response time (OSSD)" (page 9)
- **The detection capability varies according to the configuration of reduced resolution.**

Point

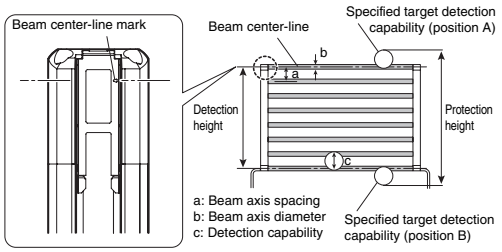
- **The configuration of the setting switch is applied when the power is supplied.**
- **When the GL-R is in series connection, the setting switch configuration of the main unit is applied regardless of the setting switch configuration of the sub unit.**
- **When the center indicator and reduced resolution are configured by using the configuration software, the setting switch must be configured by default. Otherwise an error occurs.**
- **When the GL-R operates in wire synchronization system, the setting switch for Channel must be configured by default. Otherwise an error occurs.**
  "Wiring system" (page 3)

Beam center-line : An optical path joining the optical center of the emitting element on the transmitter to the optical center of the corresponding receiving element on the receiver. The GL-R must be installed so that the beam center-line mark on the transmitter and that on the receiver face one another and are located at the same height.

Detection height : The height from the top beam center-line to the bottom beam center-line (length).

Protection height : An object approaching the detection zone from the top of the detection height is first detected at point A, which is the distance of the detection capability from the top of the detection height. The equivalent position on the bottom is called point B. The height from the top edge of the specified target detection capability that exists at point A to the bottom edge of the specified target detection capability that exists at point B is called The "protection height".
The following calculation formula can be defined:
Protection height = "Detection height" + (2 x "the specified target detection capability") – "beam axis diameter".

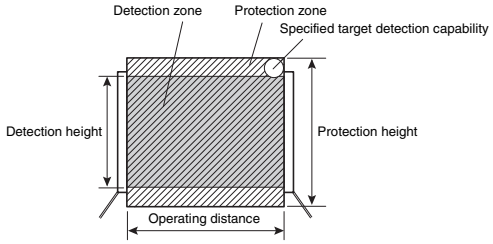
* Refer to the following diagram for an explanation of beam center-line, detection height and protection height.



Detection zone : The zone in which the specified target detection capability can be detected. The detection zone of the GL-R indicates a square area formed with the detection height and the operating distance. When an object of the specified target detection capability is present in this area, the light of the GL-R is blocked, and then the OSSD goes to OFF state.

Protection zone : The square area formed with the protection height and the operating distance, which is broader than the detection zone. When an object of the specified target detection capability is present in this area, the light of the GL-R is blocked, and then the OSSD goes to OFF state.

* Refer to the following diagram for detection zone and protection zone.



Functions and Features

The functions and features of the GL-R are described in this section.

Point **For more information about these functions, see "GL-R Series User's Manual".**

■ Wiring system

The following three types of wiring systems are available in the GL-R series.

Wiring system		Optical synchronization system	One-line system	Wire synchronization system
Wiring diagram		Transmitter Receiver	Transmitter Receiver	Transmitter Receiver
Advantage		• Wiring is not needed between the transmitter and receiver. • The Transmitter and the receiver can operate on different power supplies.	• Simplified wiring. • The unit connection cable is not needed for the transmitter.	• All functions of the GL-R are available.
Limitation		• The input and output functions on the transmitter are not available. • All indicators other than "Power" are not available on the transmitter.	• The input and output functions on the transmitter are not available. • There is a maximum limit for the total length of cables.	• Wiring is needed between the transmitter and the receiver.
Applicable cable	Transmitter	5-core cable	Series connection cable	7-core cable 11-core cable
	Receiver	5-core cable 11-core cable	5-core cable 11-core cable	7-core cable 11-core cable

Wiring system		Optical synchronization		One-line		Wire synchronization			
Cable combination	Cable for the transmitter	5-core		Series connection		7-core		11-core	
	Cable for the receiver	5-core	11-core	5-core	11-core	7-core	11-core	7-core	11-core
Available function	OSSD output	✓	✓	✓	✓	✓	✓	✓	✓
	AUX (auxiliary) output		✓		✓	🖳	✓	🖳	✓
	Error output		🖳		🖳	✓	✓	✓	✓
	Muting function		🖳		🖳		🖳	✓	✓
	Partial muting function		🖳		🖳		🖳	🖳	🖳
	Muting bank function								🖳
	Muted condition output		🖳		🖳		🖳	🖳	🖳
	Muting lamp output							✓(🖳)	✓(🖳)
	Override function							✓(🖳)	✓(🖳)
	Interlock function		✓(🖳)		✓(🖳)		✓(🖳)		✓(🖳)
	Interlock-reset-ready output		🖳		🖳		🖳		🖳
	EDM function		✓(🖳)		✓(🖳)		✓(🖳)		✓(🖳)
	Wait input					✓	✓	✓	✓
	Alert output		🖳		🖳	🖳	🖳	🖳	🖳
	Clear/Block output		🖳		🖳	🖳	🖳	🖳	🖳
	Reset input (for error)		✓		✓		✓		✓
	Reduced resolution function	✓(🖳)	✓(🖳)	✓(🖳)	✓(🖳)	✓(🖳)	✓(🖳)	✓(🖳)	✓(🖳)
	Fixed blanking function	🖳	🖳	🖳	🖳	🖳	🖳	🖳	🖳
	Channel configuration (Light interference prevention function)	✓	✓	✓	✓	✓	✓	✓	✓
	Center indicator configuration	✓(🖳)	✓(🖳)	✓(🖳)	✓(🖳)	✓(🖳)	✓(🖳)	✓(🖳)	✓(🖳)
	Monitoring function	🖳	🖳	🖳	🖳	🖳	🖳	🖳	🖳

✓ : Available without the configuration software
🖳 : Available with the configuration software
✓(🖳) : Available without the configuration software, Functionality can be expanded when using the configuration software.

■ Series connection

Up to three GL-R units can be serially connected and used as a single light curtain.

■ OSSD

The OSSD is a safety-related control output. It connects to an external device (load), such as an FSD or MPCE. The GL-R generates self-diagnosis signals on its internal control circuit to perform diagnostics on the output circuit (OSSD). These signals periodically force the OSSD into a temporary OFF state when no interruption exists in the detection zone.

■ Interlock function

Interlock is a function that prevents the OSSD from automatically going to the ON state from an OFF state.
You can prevent the unintended start-up and/or the unintended restart of the machine if an interlock is applied to the GL-R.

■ External device monitoring (EDM function)

EDM (External Device Monitoring) is a function of the GL-R that monitors the state of the control devices which are externally connected to the GL-R. The GL-R can detect a fault, such as welded contacts on external devices, as long as the EDM function is activated.
This function is available only when connecting the 11-core cable to the receiver.

■ Fixed Blanking

During normal operation, the OSSD remains in the ON state while the GL-R detects no interruption in the detection zone, and the OSSD goes to the OFF state when the GL-R detects interruption in the detection zone. On the other hand, if fixed blanking is enabled on certain beam axes, the OSSD remains in the ON state as long as the GL-R detects interruption on those beam axes and no interruption elsewhere in the detection zone.

■ Reduced resolution

During normal operation, the OSSD goes to the OFF state when the GL-R detects interruption in the detection zone.
On the other hand, if reduced resolution is enabled on the GL-R with the number of beam axes to be ignored and not monitored specified, the OSSD remains in the ON state even while the GL-R detects interruption on certain beam axes as long as the total number of interrupted beam axes is less than or equal to the number of ignored beams.

■ Muting Function

The muting function is used to temporarily suspend the GL-R's safety functions while the GL-R receives a signal from muting devices (such as sensors or switches). Before this function can be used, the outputs from the muting devices must be connected to the muting input terminal on the GL-R.
In addition, the configuration software provides the user with the opportunity to select the beam axes to be in the muted condition. You can minimize the number of beam axes to be in the muted condition by using the configuration software. Therefore, you can reduce the risk of interrupting the hazardous zone.

● Muting device

When using the muting device, it must be met with the following conditions.
- The muting device output must be N.O. (normally open).
- Output of the muting device must be the output with contacts, and must be PNP output type if PNP output type cable is used, or NPN output type if NPN output type cable is used. Also, the muting device must be capable of 2 to 3 mA current.
- Do not use one muting device with multiple outputs in place of two or more muting devices. (Only one output per one muting device must be used.)
- If the muting device has a timer function that can adjust the output timing, do not use that function.

● Muting lamp

When using the muting lamp, it must meet the following conditions.
For an incandescent lamp : rated 24 V DC, 1 to 5.5 W
For an LED indicator : rated current consumption must be 10 to 230 mA.

● Conditions for initiation of muting

Muted condition is initiated if all of the following conditions are met:
- Muting input 2 turns ON within 0.04 to 3 seconds after muting input 1 turns ON
- GL-R detects no interruption in the detection zone
- OSSD is in the ON state and remains for 0.5 seconds or more.

● Conditions for termination of muting

Muted condition is terminated if one of the following conditions is met:
- Either of the muting inputs goes to the OFF state for at least 5 ms.
- Light curtain goes into the error condition
- Wait input goes to ON state
- The power supply is interrupted or restored.
- Maximum muting period of approx. 5 minutes has been passed.

■ Changing of conditions for muting

The following muting conditions can be changed through the configuration software or a special procedures.

● Condition for Initiation of muting

1. Time period specification of 0.04 s to 3 s between muting input 1 and muting input 2 can be option.
2. Sequence specification of muting inputs can be option. (Default sequence: muting input 1 is first, muting input 2 is second.)

● Condition for termination of muting

3. Time period specification form muting input OFF to termination of muted condition. (Default is 0 seconds.)
4. Maximum muting period of approx. 5 minutes can be option.

● Condition for muting lamp

5. Error condition can be initiated if muting lamp has some failure.

If you choose these options according to your machine application, password setting and/or password input is required as a special procedure.
The responsible personnel who intends to apply these options mentioned above from 1 to 4 have to perform the risk assessment based on the machine application.

■ Muting bank function

The muting bank function can be activated through the configuration software.
You can configure up to three muting banks on the GL-R. Each muting bank is a group of beam axes that will go into a muted condition upon activation of muting.
In order to activate a muting bank, you must switch (ON and OFF) the muting bank input.

■ Override function

During normal operation, the OSSD goes to an OFF state if the muting function is deactivated and an interruption remains in the detection zone of the GL-R. The OSSD OFF state will remain until the obstruction is removed.
Override function allows a temporary manual suspension of the GL-R safety functions.
This makes it possible to remove the obstruction remaining in the detection zone of the GL-R. (Machine is able to be manually operated on a temporary basis because the safety function of the GL-R is temporarily suspended.)

● Conditions for initiation of override

Override function is initiated if all of the following conditions are met and the wait input goes to the ON state within 0.04 s to 1 s after the override input turns ON state.
- GL-R is not in the error condition.
- GL-R detects interruption in the detection zone. (One or more beam axis is blocked.)
- OSSD is OFF state. (including interlock condition)
- Either of muting inputs, or both, turns ON state

● Conditions for termination of override

Override function is terminated if one of the following conditions is met:
- All of muting inputs turn OFF.
- Either the override input or wait input, or both, turn OFF.
- Light curtain goes to into the error condition
- Maximum override period of approx. 60 seconds has been passed.

■ Changing of the condition for override

The following condition can be changed through the configuration software.

● Conditions that deactivate the override condition

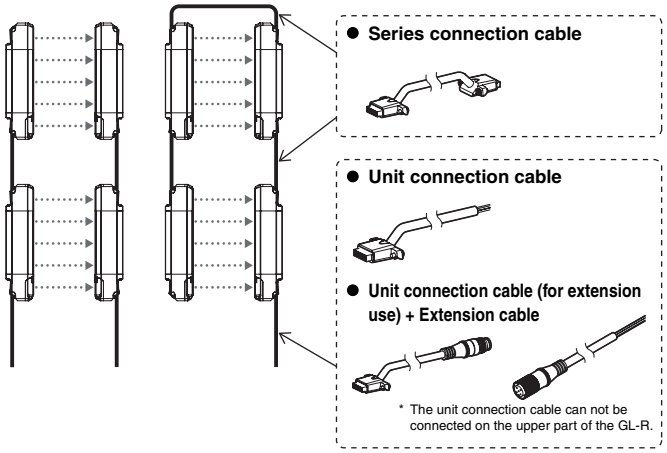
- Maximum override period of approx. 60 seconds can be option.

If you choose this option according to your machine application, password setting and/or password input is required. The responsible personnel must securely manage the password. The responsible personnel who intends to apply this option must perform the risk assessment based on the machine application.

Installation

■ Overview

● Optical/wire synchronization system ● One-line system

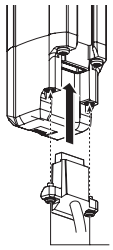


■ Cable installation

DANGER	• **Do not remove the black gasket installed on the connector. Without this gasket the requirement of IP65 and IP67 cannot be fulfilled.** • **Securely tighten the cable connector and end cover with the screw in accordance with the torque values specified in this user's manual. Without proper installation, the requirement of IP65 and IP67 cannot be fulfilled.**
NOTICE	• **Connect the unit connection cable to the connector port on the lower part of the GL-R. Removing the end cover on the upper part of the GL-R and connecting the unit connection cable may result in GL-R damage.** • **The end cover must be connected to the connector except when the series cable is connected. If both the end cover and series cable are not connected to the connector, an error occurs.**

● Cable connection to the lower part of the GL-R (The unit connection cable and extension cable)

Reference The unit connection cable and extension cable can be used for both the transmitter and receiver.

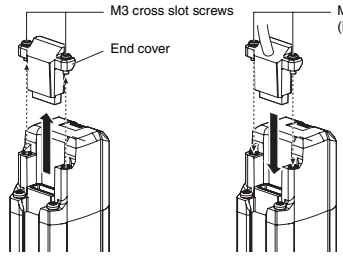


M3 cross slot screws (Recommended tightening torque of 0.3 N•m)

● Cable connection to the upper part of the GL-R (The series connection cable)

Reference The series connection cable can be used on both the transmitter and receiver.

1 **2**



DANGER	**When the GL-R units are wired by the one-line system, the end cover removed from the upper part of the GL-R must be secured to the lower part with the screw. (Recommended tightening torque of 0.3 N•m)** **Without the end cover, the requirement of IP65 and IP67 cannot be fulfilled.**

■ Installation of the GL-R unit

Point	**Connect all cables to the GL-R before installing the mounting bracket to the GL-R unit.**

The installation method differs according to the type of mounting bracket.
For details, see the manual included in the package of mounting bracket or "GL-R Series User's Manual".

■ Light interference prevention method

● Light interference prevention function

- When wire synchronization system is applied
  The light interference prevention function automatically reduces mutual interference between GL-R units.
- When optical synchronization system is applied
  The light interference prevention function is applied according to Channel configuration.
  The mutual interference is reduced between GL-R units with Channel A and Channel B.
  The mutual interference is not reduced between GL-R units with Channel 0 and Channel 0, GL-R units with Channel 0 and Channel A, or GL-R units with Channel 0 and Channel B.
  Channel is configured by using the setting switch at the lower part of front side of GL-R units.
  For more information about the setting switch, see also "Part Description" (page 3).
  When the GL-R is in series connection, the setting switch configuration of the main unit is applied regardless of the setting switch configuration of the sub unit.

DANGER	**The response time varies according to the configuration of Channel.** **"Response time (OSSD)" (page 9)**

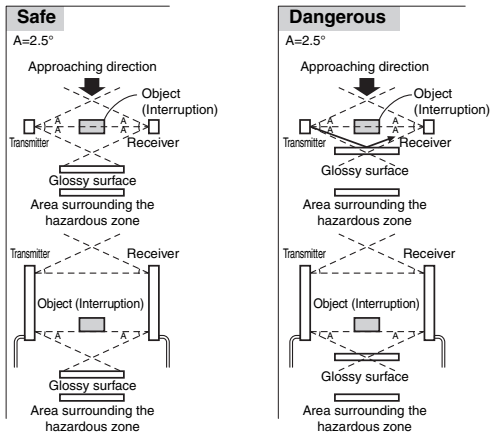
"Wiring system" (page 3)

● Series connection

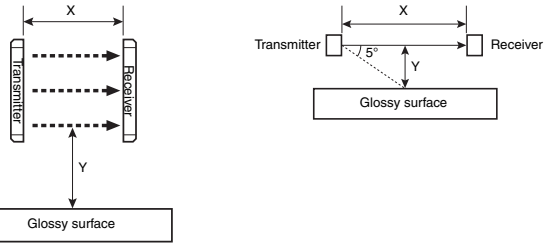
Connecting GL-R in series can prevent mutual interference.

■ Ensuring proper GL-R installation near a glossy surface

If there is a glossy surface around the GL-R, the GL-R may be affected and may not detect an interruption in the detection zone.
To avoid this problem, installation must be done according to the following:



When determining a specific installation distance, refer to the following values including the installation tolerance.



Operating distance "X"	Minimum installation distance "Y"
Less than 3 m	0.13 m
3 m or more	X/2 x tan5° = 0.0437 X

Wiring

Point	• **Each model is connected to one cable. Therefore, at least two cables are needed as a system, one for the transmitter and another for the receiver.** • **All cables can be used for both the transmitter and receiver.** • **The combination of the wiring system and cable determines the functions that can be used. Different types of Cables can be used for the transmitter and receiver.** **"Wiring system" (page 3)** • **Be sure to match the numbers of conductors (core wires) when using the unit connection cable for extension use and the extension cable.**

■ Cable specification

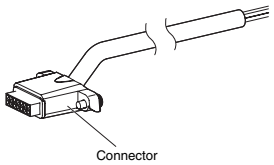
(1) Cable length

1. Optical synchronization system, wire synchronization system
   The sum of the length for the unit connection cable and extension cable must be 30 m or less.
   This limitation applies separately to the entire transmitter cable setup and the entire receiver cable setup.
2. One-line system
   The sum of the length for all of the unit connection cables, extension cables and series cables must be 30 m or less.

DANGER	• **Cables must be within the lengths specified. Failure to follow this specification may cause improper operation of safety functions, and may create a dangerous situation.** • **The series connection cable cannot be cut or extended. If the cable is cut or extended, safety features may not operate properly. Do not allow this to happen as it is extremely dangerous.**

(2) Minimum cable bending radius : 5 mm

(3) Identification of connector cables



Connector colors
PNP output type cables or series connection cables : Black connectors
NPN output type cables : Grey connectors

Point	**PNP output type cables and NPN output type cables cannot be used at the same time (mixed wiring is not possible). One type of cable must be chosen based on the application.**

■ Cable color and pin position

Reference

- When the synchronization wire 1 is wired between the transmitter and receiver, and the synchronization wire 2 is wired in the same manner, the GL-R operates in wire synchronization system.
- When the synchronization wire 1 or 2 is not connected, the GL-R operates in optical synchronization system.
- When optical synchronization system or one-line system is applied, the input and output functions on the transmitter are not available.
- The functions assigned to the input and output may differ according to the configuration when setting through the configuration software.
  "Wiring system" (page 3)

● 5-core cable

Pin No	Wire Color	Assigned function	
		Transmitter	Receiver
1	Brown	+24 V	+24 V
2	Black	(Not in use)	OSSD1
3	Blue	0 V	0 V
4	White	(Not in use)	OSSD2
5	Grey	FE	FE

Reference **M12 connector male pin assignment** **M12 connector female pin assignment**

● 7-core cable

Pin No	Wire Color	Assigned function	
		Transmitter	Receiver
1	White	Wait input	OSSD2
2	–	(Not in use)	(Not in use)
3	Black	Error output	OSSD1
4	Brown	+24 V	+24 V
5	Orange	Synchronization 1 (RS485_+)	Synchronization 1 (RS485_+)
6	Orange/Black	Synchronization 2 (RS485_–)	Synchronization 2 (RS485_–)
7	Blue	0 V	0 V
8	Grey	FE	FE

Reference **M12 connector male pin assignment** **M12 connector female pin assignment**

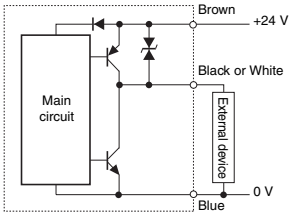
● 11-core cable

Pin No	Wire Color	Assigned function	
		Transmitter	Receiver
1	White	Wait input	OSSD2
2	–	(Not in use)	(Not in use)
3	Black	Error output	OSSD1
4	Yellow	Override input	RESET input
5	Orange	Synchronization 1 (RS485_+)	Synchronization 1 (RS485_+)
6	Orange/Black	Synchronization 2 (RS485_–)	Synchronization 2 (RS485_–)
7	Blue	0 V	0 V
8	Red	Muting lamp output	AUX (auxiliary) output
9	Red/Black	Muting input 2	EDM input
10	Brown	+24 V	+24 V
11	Pink	Muting input 1	Interlock selection input
12	Grey	FE	FE

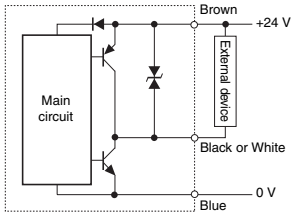
Reference **M14 connector male pin assignment** **M14 connector female pin assignment**

■ I/O circuit diagram

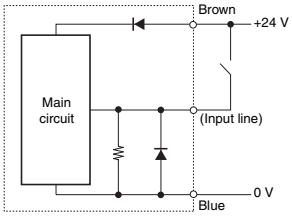
Output circuit (PNP type cable)



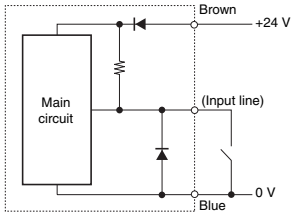
Output circuit (NPN type cable)



Input circuit (PNP type cable)



Input circuit (NPN type cable)



Examples of Wiring

NOTICE	**The functions assigned to the input and output may differ according to the configuration when configuring through the configuration software. For more information, see the "GL-R Series user's Manual".**

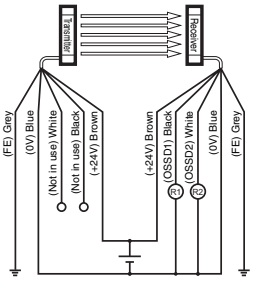
■ Symbols

R1, R2 : External device (Safety PLC, Safety relay unit, etc)
K1, K2 : External device (Force guided relay, magnet contactor, etc)
K3 : Solid state contactor*1
S1 : Switch used for reset input
S2 : Switch used for wait input*1
S3 : Switch used for override input
S4, S5, S6 : Switch used for muting bank inputs
L1 : Muting lamp (Incandescent lamp or LED lamp)
P1, P2 : Muting device (Self-contained photoelectric sensors, etc.)
M : 3-phase motor
PLC : For NON SAFETY-RELATED system control use*1
*1 These are NON SAFETY-RELATED components.

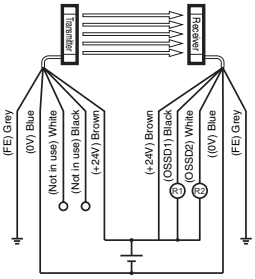
■ Optical synchronization system

● Transmitter: 5-core cable, Receiver: 5-core cable

(1) PNP output cable

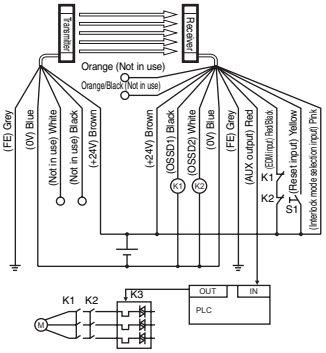


(2) NPN output cable

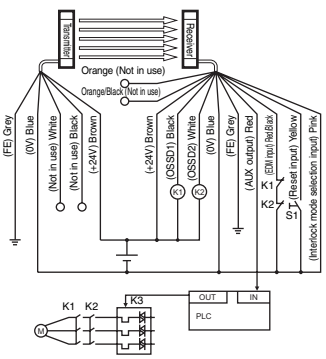


● Transmitter: 5-core cable, Receiver: 11-core cable When using the EDM function and interlock function

(1) PNP output cable



(2) NPN output cable

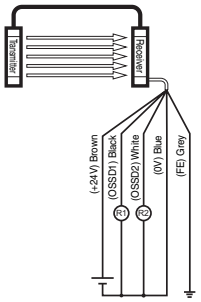


■ One-line system

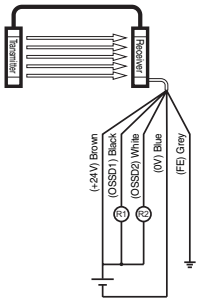
- The series connection cable must be used to connect the transmitter and receiver.
- The unit connection cable is not needed for the transmitter.
- The wiring for the receiver is the same as optical synchronization system.

● Transmitter: Series connection cable, Receiver: 5-core cable

(1) PNP output cable



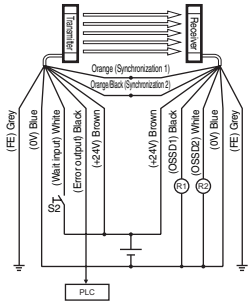
(2) NPN output cable



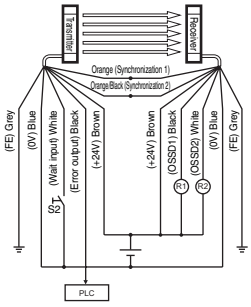
■ Wire synchronization system

● Transmitter: 7-core cable, Receiver: 7-core cable

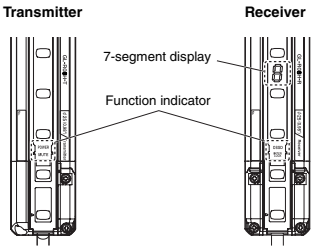
(1) PNP output cable



(2) NPN output cable



Indicators



■ Function indicators

Transmitter		
Name	**Indicator**	**Description**
POWER (Orange)	Light ON	Power ON (Transmitter)
	Light OFF	Power OFF (Transmitter)
MUTE (Orange)	Light ON	Muted condition or Override condition
	Blinking slowly	Muting input 1 ON
	Blinking	Muting input 2 ON or Muting input 1 ON and Muting input 2 ON
	Light OFF	Muting input 1 OFF and Muting input 2 OFF

Receiver		
Name	**Indicator**	**Description**
OSSD (Red/ Green)	Light in red	OSSD OFF
	Light in green	OSSD ON
	Blinking in green	Amount of received light is unstable. (Alert output ON)
	Light OFF	Power OFF (Receiver)
INTERLOCK (Yellow)	Light ON	Interlock condition
	Blinking	Interlock reset ready condition (Interlock reset ready output ON)
	Light OFF	No interlock or error condition

* When optical synchronization system is applied, only the "POWER" indicator turns ON on the transmitter.
"Wiring system" (page 3)

■ 7-segment display

● Upon power-up

Wire synchronization	Optical synchronization		
	Channel 0	Channel A	Channel B
11	3	A	b

● During normal operation

Condition		Display
Applying the reduced resolution function or fixed blanking function.		F
Wait input is activated.		U
Applying the muting function or override function.	Muting input 1 is activated.	8
	Muting input 2 is activated.	8
	Muting input 1 and 2 are both activated*1.	- -
	Muted condition	8 ⇨ 0 ⇨ 8 ⇨ 1 ⇨ 8
	Override input is activated*2.	o
	Override condition.	8 ⇨ 0 ⇨ - ⇨ 9
Other than those above.		Turn OFF

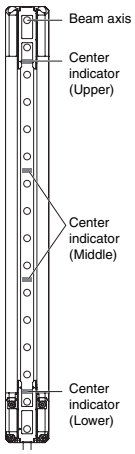
*1 When not in the muted condition because conditions for initiation of muting are not met.
*2 When not in the override condition because conditions for initiation of override are not met.

● Error condition

When an error occurs, the OSSD goes to the OFF-state and the GL-R goes to the error condition. For the 7-segment display in the error condition, refer to "Troubleshooting" (page 10).

■ Center indicator

GL-RH



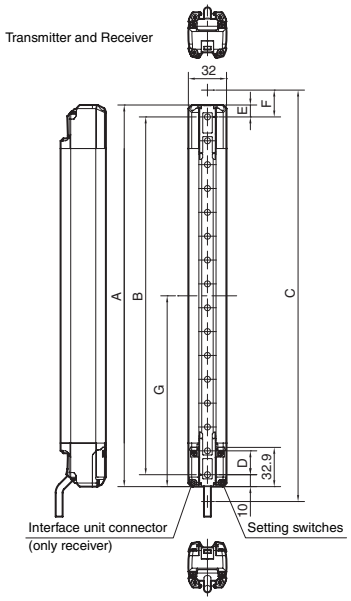
Center indicator (Upper) : indicates whether interruption is present in the top beam axis or not. (clear or blocked)
Center indicator (Middle) : indicates whether the middle axis beams are interrupted or not.
Center indicator (Lower) : indicates whether interruption is present in the bottom beam axis or not. (clear or blocked)

Center indicator	Light OFF	red light	green light	Blinking red light
Upper	Top beam axis is blocked	Although the top beam axis is unblocked, the others are blocked	No interruption is present in detection zone of the GL-R. (clear)	Error condition
Middle	Top beam axis or Bottom beam axis is blocked	Although the top and bottom beam axis are unblocked, the middle beams are blocked		
Lower	Bottom beam axis is blocked	Although the bottom beam axis is unblocked, the others are blocked		

* The center indicator on the transmitter is OFF when optical synchronization system is applied.

Dimensions

Units: mm



NOTICE

If the length for a single GL-R unit is 1280 mm or greater, use the following antivibration mounting bracket additionally as an intermediate support bracket. The antivibration mounting bracket must be selected according to the mounting bracket and installed on the center of the GL-R unit indicated as position "G".

Mounting bracket	Antivibration bracket
Angle adjustable mounting bracket	Antivibration bracket for the adjustable mounting bracket
No dead zone mounting bracket	
Straight mounting bracket	Antivibration bracket for the straight mounting bracket
L-shaped mounting bracket	L-shaped mounting bracket

■ GL-RF

Units: mm

Model	Beam axes	A: Length	B: Detection height	C: Protection height	D: Beam axis pitch	E	F	G
GL-R23F	23	240	220	244	10	10	12	120
GL-R31F	31	320	300	324				160
GL-R39F	39	400	380	404				200
GL-R47F	47	480	460	484				240
GL-R55F	55	560	540	564				280
GL-R63F	63	640	620	644				320
GL-R71F	71	720	700	724				360
GL-R79F	79	800	780	804				400
GL-R87F	87	880	860	884				440
GL-R95F	95	960	940	964				480
GL-R103F	103	1040	1020	1044				520
GL-R111F	111	1120	1100	1124				560
GL-R119F	119	1200	1180	1204				600
GL-R127F	127	1280	1260	1284				640

■ GL-RH

Units: mm

Model	Beam axes	A: Length	B: Detection height	C: Protection height	D: Beam axis pitch	E	F	G
GL-R08H	8	160	140	185	20	10	22.5	80
GL-R12H	12	240	220	265				120
GL-R16H	16	320	300	345				160
GL-R20H	20	400	380	425				200
GL-R24H	24	480	460	505				240
GL-R28H	28	560	540	585				280
GL-R32H	32	640	620	665				320
GL-R36H	36	720	700	745				360
GL-R40H	40	800	780	825				400
GL-R44H	44	880	860	905				440
GL-R48H	48	960	940	985				480
GL-R52H	52	1040	1020	1065				520
GL-R56H	56	1120	1100	1145				560
GL-R60H	60	1200	1180	1225				600
GL-R64H	64	1280	1260	1305				640
GL-R72H	72	1440	1420	1465				720
GL-R80H	80	1600	1580	1625				800
GL-R88H	88	1760	1740	1785				880
GL-R96H	96	1920	1900	1945				960

■ GL-RL

Units: mm

Model	Beam axes	A: Length	B: Detection height	C: Protection height	D: Beam axis pitch	E	F	G
GL-R04L	4	160	120	205	40	25	42.5	80
GL-R06L	6	240	200	285				120
GL-R08L	8	320	280	365				160
GL-R10L	10	400	360	445				200
GL-R12L	12	480	440	525				240
GL-R14L	14	560	520	605				280
GL-R16L	16	640	600	685				320
GL-R18L	18	720	680	765				360
GL-R20L	20	800	760	845				400
GL-R22L	22	880	840	925				440
GL-R24L	24	960	920	1005				480
GL-R26L	26	1040	1000	1085				520
GL-R28L	28	1120	1080	1165				560
GL-R30L	30	1200	1160	1245				600
GL-R32L	32	1280	1240	1325				640

Specifications

■ Specifications

Model			GL-R□□F	GL-R□□H	GL-R□□L
Beam axis spacing/Lens diameter			10 mm/ϕ4	20 mm/ϕ5	40 mm/ϕ5
Detection capability			ϕ14 mm	ϕ25 mm	ϕ45 mm
Operating distance			0.2 to 10 m *1	0.2 to 15 m *1	
Effective aperture angle			Max. ±2.5° (When operating distance is 3 m (9.84 ft.) or more)		
Light source			Infrared LED (870 nm)		
Response time			Optical synchronization (Channel 0) or Wire synchronization: 6.6 to 18.1 ms Optical synchronization (Channel A or B): 6.9 to 27.4 ms		
OSSD operation			Turns on when no interruptions are present in the detection zone		
Synchronization between the transmitter and receiver			Optical synchronization or Wire synchronization (Determined by wiring)		
Light interference prevention function			Prevents mutual interference in up to two GL-R systems. Optical synchronization: prevented by Channel A and B with setting switch Wire synchronization: prevented automatically		
Control output (OSSD)	Output		2 transistor outputs. (PNP or NPN is determined by the cable type)		
	Max. load current		500 mA *2		
	Residual voltage (during ON)		Max. 2.5 V (with a cable length of 5 m (16.4 ft.))		
	OFF state voltage		Max. 2.0 V (with a cable length of 5 m (16.4 ft.))		
	Leakage current		Max. 200 μA		
	Max. capacitive load		2.2 μF		
	Load wiring resistance		Max. 2.5 Ω		
Supplemental output (Non-safety-related output)	AUX		2 transistor outputs. (PNP or NPN is determined by the cable type) Load current: Max. 50 mA, Residual voltage: Max. 2.5 V (with a cable length of 5 m (16.4 ft.))		
	Error output				
	Muting lamp output		Incandescent lamp (24 VDC, 1 to 5.5 W) or LED lamp (load current :10 to 230 mA) can be connected		
Input	EDM input		< with PNP cable > ON-voltage: 10 to 30 V OFF-voltage: Open or 0 to 3 V Short-circuit current: Approx. 2.5 mA (Approx. 10 mA for EDM)	< with NPN cable > ON-voltage: 0 to 3 V OFF-voltage: Open or 10 V to Power voltage Short-circuit current: Approx. 2.5 mA (Approx. 10 mA for EDM)	
	Wait input				
	Reset input				
	Muting input 1, 2				
	Override input				
Power supply	Power voltage		DC24 V ± 20% (Ripple P-P 10% or less, Class2)		
	Current consumption		Transmitter: 32 to 71 mA, Receiver: 50 to 75 mA		
Protection circuit			Reverse current protection, short-circuit protection for each output, surge protection for each output		
Environmental resistance	Enclosure rating		IP65 / IP67 (IEC60529)		
	Overvoltage category		Ⅱ		
	Ambient temperature		-10 to +55°C (No freezing)		
	Storage ambient temperature		-25 to +60°C (No freezing)		
	Relative humidity		15% to 85%RH (No condensation)		
	Storage relative humidity		15% to 95%RH		
	Ambient light		White incandescent lamp: 3,000 lx or less, Sunlight: 20,000 lx or less		
	Vibration		10 to 55 Hz, 0.7 mm compound amplitude, 20 sweeps each in X, Y and Z directions		
	Shock		100 m/s^2 (Approx. 10 G) 16 ms pulse in X, Y and Z directions 1,000 times each axis		
Material	Main unit case		Aluminum		
	Upper case/Lower case		Nylon (GF30%)		
	Front cover		Polycarbonate, SUS304		
Weight			see "Weight" (page 10)		
Approved standard	EMC	EMS	IEC61496-1, EN61496-1, UL61496-1		
		EMI	EN55011 ClassA, FCC Part15B ClassA, ICES-003 ClassA		
	Safety		IEC61496-1, EN61496-1, UL61496-1 (Type 4 ESPE)		
			IEC61496-2, EN61496-2, UL61496-2 (Type 4 AOPD)		
			IEC61508, EN61508 (SIL3), IEC62061, EN62061 (SIL CL3)		
			EN ISO13849-1:2008 (Category 4, PL e)		
			UL508		
			UL1998		

*1 When the option front protection cover is installed on the one of transmitter or receiver, the Operating distance is shorten by 0.5 m. When the front covers are installed on both of the transmitter and receiver, the Operating distance is shorten by 1.0 m.

*2 When the GL-R is used under surrounding air temperatures between 50 to 55°C, the Maximum load current should not exceed 350 mA.

■ Response time (OSSD)

● GL-RF

Units: ms

Model	Response time (OSSD)					
	Wire synchronization, One-line or Optical synchronization system (Channel 0)			Optical synchronization system (Channel A or B)		
	ON→OFF	OFF→ON *1	All blocked→ON *2	ON→OFF	OFF→ON *1	All blocked→ON *2
GL-R23F	6.9	49.2	64.4	9.3	52.7	74.0
GL-R31F	7.8	50.5	67.9	10.7	54.8	79.5
GL-R39F	8.6	51.8	71.3	12.1	56.9	85.1
GL-R47F	9.5	53.1	74.8	13.5	59.0	90.7
GL-R55F	10.4	54.3	78.3	14.9	61.1	96.3
GL-R63F	11.2	55.6	81.7	16.3	63.2	101.8
GL-R71F	12.1	56.9	85.2	17.6	65.3	107.4
GL-R79F	13.0	58.2	88.6	19.0	67.4	113.0
GL-R87F	13.8	59.5	92.1	20.4	69.4	118.5
GL-R95F	14.7	60.8	95.5	21.8	71.5	124.1
GL-R103F	15.5	62.1	99.0	23.2	73.6	129.7
GL-R111F	16.4	63.4	102.4	24.6	75.7	135.2
GL-R119F	17.3	64.7	105.9	26.0	77.8	140.8
GL-R127F	18.1	66.0	109.4	27.4	79.9	146.4

● GL-RH

Units: ms

Model	Response time (OSSD)					
	Wire synchronization, One-line or Optical synchronization system (Channel 0)			Optical synchronization system (Channel A or B)		
	ON→OFF	OFF→ON *1	All blocked→ON *2	ON→OFF	OFF→ON *1	All blocked→ON *2
GL-R08H	6.6	48.7	63.1	6.9	49.1	64.2
GL-R12H	6.6	48.7	63.1	7.4	49.9	66.3
GL-R16H	6.6	48.7	63.1	8.1	50.9	69.1
GL-R20H	6.6	48.7	63.1	8.8	52.0	71.9
GL-R24H	7.0	49.3	64.9	9.5	53.0	74.7
GL-R28H	7.4	50.0	66.6	10.2	54.0	77.5
GL-R32H	7.9	50.6	68.3	10.9	55.1	80.2
GL-R36H	8.3	51.3	70.0	11.6	56.1	83.0
GL-R40H	8.7	51.9	71.8	12.3	57.2	85.8
GL-R44H	9.2	52.6	73.5	12.9	58.2	88.6
GL-R48H	9.6	53.2	75.2	13.6	59.3	91.4
GL-R52H	10.0	53.9	77.0	14.3	60.3	94.2
GL-R56H	10.5	54.5	78.7	15.0	61.4	96.9
GL-R60H	10.9	55.2	80.4	15.7	62.4	99.7
GL-R64H	11.3	55.8	82.1	16.4	63.4	102.5
GL-R72H	12.2	57.1	85.6	17.8	65.5	108.1
GL-R80H	13.1	58.4	89.1	19.2	67.6	113.7
GL-R88H	13.9	59.7	92.5	20.6	69.7	119.2
GL-R96H	14.8	61.0	96.0	22.0	71.8	124.8

● GL-RL

Units: ms

Model	Response time (OSSD)					
	Wire synchronization, One-line or Optical synchronization system (Channel 0)			Optical synchronization system (Channel A or B)		
	ON→OFF	OFF→ON *1	All blocked→ON *2	ON→OFF	OFF→ON *1	All blocked→ON *2
GL-R04L	6.6	48.7	63.1	6.9	49.1	64.2
GL-R06L	6.6	48.7	63.1	6.9	49.1	64.2
GL-R08L	6.6	48.7	63.1	6.9	49.1	64.2
GL-R10L	6.6	48.7	63.1	7.0	49.3	64.9
GL-R12L	6.6	48.7	63.1	7.4	49.9	66.3
GL-R14L	6.6	48.7	63.1	7.7	50.4	67.7
GL-R16L	6.6	48.7	63.1	8.1	50.9	69.1
GL-R18L	6.6	48.7	63.1	8.4	51.4	70.5
GL-R20L	6.6	48.7	63.1	8.8	52.0	71.9
GL-R22L	6.8	49.0	64.0	9.1	52.5	73.3
GL-R24L	7.0	49.3	64.9	9.5	53.0	74.7
GL-R26L	7.2	49.6	65.7	9.8	53.5	76.1
GL-R28L	7.4	50.0	66.6	10.2	54.0	77.5
GL-R30L	7.7	50.3	67.5	10.5	54.6	78.9
GL-R32L	7.9	50.6	68.3	10.9	55.1	80.2

*1 If the interruption is present in the detection zone for less than 80 ms, the response time (OFF to ON) will be 80 ms or more to ensure that the OSSD maintains the OFF state for more than 80 ms.

*2 "All blocked" means the situation where the GL-R operates in optical synchronization system and the transmitter and receiver is not synchronized (top and bottom beam axes are both blocked). In this situation, the response time is longer because the GL-R synchronizes the transmitter and receiver first and then determines the clear or blocked.

Point

- **When the GL-R units are connected in series, the response time is calculated according to the following steps;**
  1. Sum up the response time of all unit.
  2. Subtract the following time from the result of previous step.
  ■ ON to OFF
  One sub unit : 2 ms
  Two sub unit : 4.2 ms
  (When Optical synchronization system and Channel A or B)
  One sub unit : 2.7 ms
  Two sub unit : 5.7 ms
  ■ OFF to ON
  One sub unit : 42 ms
  Two sub unit : 84 ms
  When connecting the GL-R32H (32 beam axes), GL-R24H (24 beam axes), and GL-R12L (12 beam axes) in series for one-line system, the response time of each unit is 7.9 ms, 7.0 ms, and 6.6 ms respectively, and the response time (ON to OFF) is 7.9 ms + 7.0 ms + 6.6 ms - 4.2 ms = 17.3 ms.
  the response time (OFF to ON) is 50.6 ms + 49.3 ms + 48.7 ms - 84 ms = 64.6 ms.
- **2.0 m/s is the maximum object detection speed of the GL-R series.**

● Current consumption

Units: mA

Model	Current consumption (Max.)	
	Transmitter	Receiver
GL-R23F	50	70
GL-R31F	54	71
GL-R39F	57	72
GL-R47F	60	74
GL-R55F	62	75
GL-R63F	64	77
GL-R71F	66	78
GL-R79F	67	80
GL-R87F	69	81
GL-R95F	71	83
GL-R103F	72	84
GL-R111F	74	85
GL-R119F	76	87
GL-R127F	78	89

Units: mA

Model	Current consumption (Max.)	
	Transmitter	Receiver
GL-R08H	43	66
GL-R12H	46	68
GL-R16H	50	69
GL-R20H	53	71
GL-R24H	57	72
GL-R28H	59	73
GL-R32H	61	74
GL-R36H	63	75
GL-R40H	65	76
GL-R44H	66	77
GL-R48H	68	79
GL-R52H	69	80
GL-R56H	71	81
GL-R60H	72	82
GL-R64H	73	83
GL-R72H	75	85
GL-R80H	77	87
GL-R88H	79	89
GL-R96H	81	91

Units: mA

Model	Current consumption (Max.)	
	Transmitter	Receiver
GL-R04L	37	66
GL-R06L	39	67
GL-R08L	41	68
GL-R10L	43	69
GL-R12L	46	70
GL-R14L	48	71
GL-R16L	50	72
GL-R18L	52	73
GL-R20L	54	75
GL-R22L	56	75
GL-R24L	57	76
GL-R26L	59	77
GL-R28L	60	78
GL-R30L	61	79
GL-R32L	62	80

● Weight

Units: g

Model	Weight	
	Transmitter	Receiver
GL-R23F	320	330
GL-R31F	430	440
GL-R39F	550	550
GL-R47F	660	670
GL-R55F	780	780
GL-R63F	890	900
GL-R71F	1000	1010
GL-R79F	1200	1200
GL-R87F	1300	1300
GL-R95F	1400	1400
GL-R103F	1500	1500
GL-R111F	1600	1600
GL-R119F	1700	1700
GL-R127F	1800	1900

Units: g

Model	Weight	
	Transmitter	Receiver
GL-R08H	210	210
GL-R12H	320	330
GL-R16H	430	440
GL-R20H	550	550
GL-R24H	660	660
GL-R28H	770	770
GL-R32H	880	890
GL-R36H	1000	1000
GL-R40H	1110	1110
GL-R44H	1220	1220
GL-R48H	1330	1340
GL-R52H	1440	1450
GL-R56H	1560	1560
GL-R60H	1670	1680
GL-R64H	1780	1790
GL-R72H	2010	2010
GL-R80H	2230	2240
GL-R88H	2450	2460
GL-R96H	2680	2690

Units: g

Model	Weight	
	Transmitter	Receiver
GL-R04L	210	210
GL-R06L	320	330
GL-R08L	430	440
GL-R10L	550	550
GL-R12L	660	660
GL-R14L	770	770
GL-R16L	880	890
GL-R18L	1000	1000
GL-R20L	1110	1110
GL-R22L	1220	1220
GL-R24L	1330	1340
GL-R26L	1440	1450
GL-R28L	1560	1560
GL-R30L	1670	1680
GL-R32L	1780	1790

Troubleshooting

If the GL-R is not functioning normally, check the GL-R indicators first.

The GL-R is in an error condition under the following situations.
- The center indicators blink in red.
- The 7-segment display indicates "E".

If the GL-R does not demonstrate the above situations, the GL-R is not in an error condition.

■ If the GL-R is in an error condition

Indication	Error name	Cause	Check and corrective action
E→2	Wiring error	The end cover on the receiver is not connected.	Check that the end cover is installed on the receiver correctly. 🕮 "Cable installation" (page 5)
		The unit connection cable is connected to the upper part of the GL-R.	Connect the unit connection cable to the lower part of the GL-R. 🕮 "Cable installation" (page 5)
		Transmitter and receiver are not the same model.	Check that all transmitter and receiver models are paired correctly.
		When the GL-R operates in wire synchronization system	
		The synchronization wire is not wired correctly or disconnected.	Check the wiring of the synchronization wire. 🕮 "Cable color and pin position" (page 6)
		When the GL-R operates in one-line system	
		The unit connection cable is connected to the transmitter.	• Connect the unit connection cable to the receiver. • Do not connect the unit connection cable to the transmitter. 🕮 "Cable installation" (page 5)
		The series connection cable is connected to the lower part of the GL-R.	Connect the series connection cable to the upper part of the transmitter and receiver. 🕮 "Cable installation" (page 5)
		When the GL-R is in series connection.	
		The sub unit is not connected correctly.	• Check for the direction of the sub unit installation. • Check whether the receiver of sub unit is connected to the transmitter of main unit. • Check whether the total number of beam axes is more than 240. 🕮 "Series connection" (page 4)
		The sub unit is broken.	Check that the sub unit operates correctly when not in series connection.
		When the error is cleared by restarting the GL-R.	
		The synchronization wire is affected by external noise.	Check for noise source (inverter, servomotor, etc.) around the GL-R installation location and cables.
E→4	Setting switch error	The configuration of the setting switch is out of specification.	Check the configuration of the setting switch. 🕮 "Setting switch" (page 3)
		The setting switch is configured to something other than Channel 0 in wire synchronization system.	
E→5	Configuration error	The configuration of the setting switch overlaps the configuration uploaded from the configuration software.	Modify the configuration of the setting switch or modify the configuration by the configuration software. 🕮 "Setting switch" (page 3)
		The unit configuration is different from the configuration uploaded from the software.	Check the model name of main unit and sub unit and whether the unit configuration from the software is identical to the actual unit configuration.
		The upload of configuration has not been completed correctly when using the configuration software.	Upload the configuration again.
E→7	Interlock error	Interlock mode selection input or reset input are wired incorrectly.	Rewire the interlock mode selection input or reset input correctly. 🕮 "Examples of Wiring" (page 6)
E→8	EDM error	EDM input is not connected correctly.	• If EDM function is needed, rewire the EDM correctly. • If EDM function is not needed, rewire the EDM and AUX correctly or deactivate the EDM function by the configuration software. 🕮 "Examples of Wiring" (page 6)
		There is a welded contact on the external device.	Replace the external device.
E→10	Receiver error	The receiver is affected by ambient light.	Shield the receiver from ambient light.
E→12	Transmitter error	The transmitter is broken.	Replace the transmitter.
		When the error is cleared by restarting the GL-R.	
		The transmitter is affected by external noise.	Check for a noise source (inverter, servomotor, etc.) around the GL-R installation location and cables.
E→14 E→15	OSSD1 error OSSD2 error	When the error is cleared by restarting the GL-R.	
		OSSD is affected by external noise.	Check for a noise source (inverter, servomotor, etc.) around the GL-R installation location and cables.
		There is a voltage surge affecting the OSSD due to an inductive load.	When the load is inductive such as relay, use a load with a surge absorption device.
		The power supply voltage has fallen continuously or experienced a sudden drop.	Take measures by replacing the power supply, increasing the power capacity, or dedicating the power supply to the GL-R.
		When the error is not cleared by restarting the GL-R.	
		• OSSD is short-circuited to 0 V or 24 V of power supply. • OSSDs are short-circuited to each other. • OSSD is short-circuited to other wires.	Rewire the OSSD correctly. 🕮 "Examples of Wiring" (page 6)
		Too much current is flowing through the OSSD.	Check that the load does not consume more current than the OSSD can handle. 🕮 "Specifications" (page 9)
		OSSD is broken.	Replace the receiver.
E→18	Sub unit error	The sub unit is broken.	Replace the sub unit.
		When the error is cleared by restarting the GL-R.	
		The sub unit or series cable is affected by external noise.	Check for a noise source (inverter, servomotor, etc.) around the GL-R installation location and cables.
E→20	Communication error*1	When the error is cleared by restarting the GL-R.	
		The synchronization wire is not wired correctly or is disconnected.	Check the connection of the synchronization wire.
		The synchronization lines in the cable are affected by external noise.	Check for a noise source (inverter, servomotor, etc.) around the GL-R installation location and cables.
		The power supply voltage has fallen continuously or experienced a sudden drop.	Take measures by replacing the power supply, increasing the power capacity, or dedicating the power supply to the GL-R.
		When the error is not cleared by restarting the GL-R.	
		The synchronization wire is not connected correctly or is disconnected.	Check the connection of the synchronization wire.
		The connection with the GL-R in series is broken.	Replace the GL-R unit connected in series. 🕮 "Series connection" (page 4)
E→24	Muting lamp disconnection error*2	The muting lamp is not connected correctly.	Check the connections.
		The muting lamp is broken.	Replace the muting lamp.
E→25	Muting lamp over current error*2	The muting lamp is not connected correctly.	Check the connections.
		Too much power is consumed by the muting lamp.	Make sure the muting lamp does not consume more power than the GL-R can handle.
		The muting lamp is broken.	Replace the muting lamp.
E→27	Synchronization beam axis error	When the GL-R operates in optical synchronization system, the fixed blanking or muting function is applied to both the upper and lower beam axes (for synchronization control).	• Do not apply the fixed blanking or muting function to at least the upper or lower axis. • Make the GL-R operate in one-line system or wire synchronization system. 🕮 "Wiring system" (page 3)
E→40 : E→59	System error	The power supply voltage has fallen continuously or experienced a sudden drop.	Take measures by replacing the power supply, increasing the power capacity, or dedicating the power supply to the GL-R.
		The GL-R is broken.	Replace the GL-R.

*1 All indicators on the transmitter may turn OFF.

*2 This error occurs only when the muting lamp error is configured to cause error condition by using the configuration software.

■ If the GL-R is not in an error condition

If the OSSD is not functioning normally, perform the following measures regardless of whether the display lights indicate that the GL-R is in an error condition or not.

Error name	Cause	Countermeasure
All Indicators are OFF.	The power is not turned ON or the power supply voltage is insufficient.	Adjust the power supply voltage to be within the range of specifications. Correctly wire the power supply. "Examples of Wiring" (page 6)
	Cables are disconnected or not connected correctly	Check the connection and reconnect the cables if necessary. "Cable installation" (page 5)
The OSSD does not turn ON. (Center indicator lights in red or does not turn ON)	Are the beam axes properly aligned?	Perform optical alignment.
	Are there objects within the detection zone?	Remove all objects from the detection zone. Ensure the transmitter to receiver distance fall within the specified range.
	Is the transmitter to receiver distance within the specified range?	
	Have dust or other particles adhered to the detection surface, thus blocking the beam axes?	Clean the surface. Gently wipe the dirt away by using a cloth dampened with a mild detergent.
The OSSD does not turn ON. (Center indicator lights in green)	If the function indicator for interlock turns ON, the GL-R is in the interlock condition.	During manual start / manual restart mode, OSSD only turns ON when light is received from all of the beam axes and reset input is activated. "Interlock function" (page 4)
	If the 7-segment display indicates "ɹ", the wait input is active.	Correctly connect the wait input.
	When connected in series, are the beam axes for the other GL-R units aligned?	Check the status of the other GL-R units connected in series.
Beam axes are aligned, but sometimes OSSD turns OFF.	The receiver is affected by ambient light or light from other photoelectric devices.	Shield the receiver from ambient light. "Light interference prevention method" (page 5)
	The synchronization wire in the communication cable is affected by external noise.	Check for noise around the cables.
The device connected to the OSSD turns ON and OFF very quickly (chattering).	The self-diagnosis function periodically turns OFF OSSD, so the device may be recognizing this short OFF signal.	Connect a device that will not detect the regular OSSD OFF signal. "OSSD" (page 4)
All indicator on the transmitter except "POWER" turn OFF.	The GL-R operates in optical synchronization system.	If you intend optical synchronization system, the GL-R operates correctly and there is nothing to do. If you do not intend optical synchronization system, check the connection of the synchronization 1 and 2 wire in the cable. "Wiring system" (page 3)

Checklist before operation

You are fully responsible for performing the risk assessment on your machine application, taking into account performing maintenance and inspections, which are a critical factor for appropriate risk assessment. In addition, it is the responsibility of the responsible personnel to train the machine operators regarding inspection and maintenance of the machine and the GL-R.

■ Inspection before operation (Initial inspection)

When installation of the GL-R is completed, the responsible personnel must verify the operation of the GL-R in accordance with the checklist shown below. Note that the following inspection items comprise only a bare minimum inspection. KEYENCE Corporation strongly recommends including the necessary checking items into this checklist based on the judgment of the responsible personnel since additional criteria may be necessary depending on both the machine to which the GL-R is installed and the laws, rules, regulations and standards in the country or region in which the GL-R is used/installed.

(1) Pre-check for installation condition

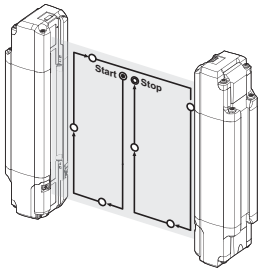
- ❑ The machine under GL-R control can be caused to stop running by the OFF-state of OSSD.
- ❑ The GL-R is installed so that the machine operator cannot go into or approach the hazardous area without passing through the detection zone.
- ❑ The interlock reset mechanism is installed so that it cannot be operated if there are any personnel within the hazardous area.
- ❑ The device to activate the override is installed so that it cannot be operated if there are any personnel within the hazardous area.
- ❑ The GL-R has been installed at a distance greater than or equal to the minimum safety distance required.
- ❑ If there are glossy surfaces nearby, move them so that they are beyond the minimum installation distance according to "Installation Distance From Glossy Surfaces".
- ❑ The GL-R is installed at a location free from light interference, for example fluorescent lamps.
- ❑ The transmitters and receivers are paired correctly.
- ❑ The beam axis spacing (detection capability) is the same between the transmitter and the receiver when installing the GL-R.
- ❑ The muting devices fulfill the conditions specified in this user's manual and the requirements of the laws, rules, regulations and standards in the country or region in which the GL-R and those devices are used.
- ❑ The devices used to activate the override fulfill the conditions specified in this manual and requirements of the laws, rules, regulations and standards in the country or region in which the GL-R and those devices are used.
- ❑ When the reduced resolution function is applied, the safety distance is accurately calculated based on the detection capability, and the GL-R is installed at a distance greater than or equal to the minimum safety distance away from the hazardous zone or hazard.
- ❑ Risk assessment was performed on your own responsibility based on your machine application, and then the installation of GL-R was also based on its result.
- ❑ When the fixed blanking function is applied, a hazardous clearance that is not protected by the GL-R may be generated between the obstacle and the GL-R. When such a hazardous clearance is generated, an additional protective device such as a safeguard is installed.

(2) Pre-check for wiring

- ❑ The GL-R power supply is 24 V DC, fulfill the conditions for the power supply as specified in this user's manual.
- ❑ The transmitter and receiver cables are installed correctly.
- ❑ The two of OSSD outputs provided in the GL-R are both used as a safety-related machine control system.
- ❑ The polarity is not reversed with the connection to the power supply.
- ❑ In case of using PNP output type cable, the OSSD is not short-circuited to +24V, and the load is between the OSSD and 0V.
- ❑ In case of using NPN output type cable, the OSSD is not short-circuited to 0V, and the load is between the OSSD and +24V.
- ❑ When two or more GL-R are connected in series, they are connected using the dedicated series connection cable, which is not cut or extended.
- ❑ Alert output, AUX output, Clear/Blocked output, Error output, and Interlock-reset-ready output are not used as safety output for safety systems.
- ❑ The cable sheaths are not damaged. The protection against the disconnection or short-circuit of cable, which might be caused by crushing or being caught in a machine, is taken into account.
- ❑ If two or more sets of the GL-R units are used in the vicinity of each other, the protection measures against light interference is done through a series connection method or light interference prevention method.
- ❑ All of NON-SAFETY-RELATED functions described in this user's manual are not a part of / whole of safety-related machine control system.

(3) Pre-check test while the machine is stopped.

You should do the following pre-check test with the test piece in order to make sure the operation of the GL-R while the machine is stopped. In case of the detection capability of 45 mm, you should use the test piece with a diameter of 45 mm.
The OSSD indicator on the GL-R lights in red and the OSSD turns OFF while the test piece is present in the detection zone. The following figure shows the movement procedure of the test piece.



- ❑ The OSSD indicator and all bar LEDS light in green if no test piece is present in the detection zone.
- ❑ When the EDM function is applied, the GL-R goes to an error condition and the OSSD indicator on the GL-R lights in red if the EDM input opens while the test piece is present in the detection zone.
- ❑ The bar LEDs lights in green, the OSSD indicator continues to light in red, and the interlock indicator lights in yellow, if the test piece is removed from the detection zone. This is only applicable in case of manual reset mode.
- ❑ The OSSD indicator lights in green and the interlock indicator lights OFF if the reset input is activated. This is only applicable in case of manual reset mode.

(4) Pre-check test while the machine is operating.

The purpose of this pre-check test is to make sure that the machine (hazards) stops its operation. This test must be done after you completely make sure that there is nobody in the hazardous zone.

- ❑ The machine stops if the test piece is present in the detection zone. It is recommended to try three locations of test piece: near the transmitter, near the receiver, and in the central area of the detection zone.
- ❑ The machine (hazard) still stops its operation as long as the test piece is present in the specified protection zone. This test should be done for the whole detection zone.
- ❑ The machine (hazard) stops its operation when the power for the GL-R is disconnected.
- ❑ Minimum safety distance is ensured, which has been calculated according to the laws, regulations, and standards of the country and region in which the GL-R is installed.

■ Inspection prior to daily operation (Daily inspection)

You should check the GL-R operation and the machine operation according to the following checklist prior to daily operation.
Note that the following inspection items comprise only a bare minimum inspection. KEYENCE Corporation strongly recommends including the necessary checking items into this checklist based on the judgment of the responsible personnel since additional criteria may be necessary depending on both the machine to which the GL-R is installed and the laws, rules, regulations and standards in the country or region in which the GL-R is used/installed.
The result of this inspection must be kept on record along with the machine log.

(1) Pre-check for installation condition

- ❑ The GL-R is installed so that the machine operator cannot go into or approach the hazardous area without passing through the detection zone.
- ❑ The GL-R has been installed at a distance greater than or equal to the minimum safety distance required.
- ❑ When the reduced resolution function is applied, the safety distance is accurately calculated based on the detection capability, and the GL-R is installed at a distance greater than or equal to the minimum safety distance away from the hazardous zone or hazard.
- ❑ When the fixed blanking function is applied, a hazardous clearance that is not protected by the GL-R may be generated between the obstacle and the GL-R. When such a hazardous clearance is generated, an additional protective device such as a safeguard is installed.
- ❑ The GL-R is installed at a location free from light interference, for example fluorescent lamps.
- ❑ The cable sheaths are not damaged. The protection against the disconnection or short-circuit of cable, which might be caused by crushing or being caught in a machine, is taken into account.
- ❑ Additionally, you should perform the following inspections as described in "Inspection before operation".
  (3) Pre-check test while the machine is stopped
  (4) Pre-check test while the machine is operating
- ❑ There is no change of installation that would influence the result of your original risk assessment.

■ Regular (periodical) inspection

The responsible personnel must perform a regular inspection.
It is recommended to perform a regular inspection at least once every six months.
Note that the following inspection items comprise only a bare minimum inspection. KEYENCE Corporation strongly recommends including the necessary checking items into this checklist based on the judgment of the responsible personnel since additional criteria may be necessary depending on both the machine to which the GL-R is installed and the laws, rules, regulations and standards in the country or region in which the GL-R is used/installed.
The result of this inspection must be kept on record along with the machine log.

(1) Additional inspection items

- ❑ The actual distance between the hazardous zone or hazards and the GL-R still keeps greater than the calculated safety distance.
- ❑ When the reduced resolution function is applied, the safety distance is accurately calculated based on the enlarged detection capability, and the GL-R is installed at a distance greater than or equal to the minimum safety distance away from the hazardous zone or hazard.
- ❑ When the fixed blanking function is applied, a hazardous clearance that is not protected by the GL-R may be generated between the obstacle and the GL-R. When such a hazardous clearance is generated, an additional protective device such as a safeguard is installed.
- ❑ The stop time of the machine connected to the GL-R has not increased.
- ❑ There are no loose screws in the mounting bracket.
- ❑ The unit connection cable or the series connection cable is fastened tightly to the GL-R with no loose screws.
- ❑ The OSSD is connected correctly to the machine.
- ❑ There is no damage to the GL-R that may influence IP65 structure.
- ❑ The surface of the GL-R is not polluted or damaged.
- ❑ Beam axes must be aligned. If it is out of alignment, beam axes are aligned.
- ❑ There is no change of installation that would influence the result of your original risk assessment.

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