KEYENCE

96M0633

Digital Laser Optic Sensor
LV Series

Instruction Manual

Laser Safety Precautions

⚠ CAUTION

Use of controls or adjustments, or the performance of procedures other than those specified herein, may result in hazardous radiation exposure.

The laser beam is not harmful to the skin. There is, therefore, no danger in exposing arms or hands to the beam. The only possible health hazard is in exposing the eyes to the laser beam. Damage to the eyes can occur if the operator stares directly into the beam.

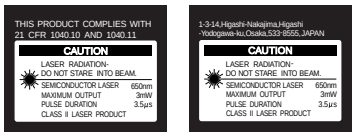
1. Classification

Model	LV-H32/H37/H42/H52/H62/H67 (LV-20A/21A/22A/21AP/22AP)	LV-H41/H51 (LV-11A)
FDA	Class II	Class I
IEC 60825-1 1998-01	Class 2	Class 1
DIN EN 60825-1 1998-01	Klasse 2	Klasse 1

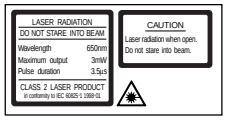
2. Warning labels

1) Warning labels

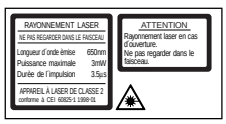
FDA Class II [LV-H32/H37/H42/H52/H62/H67]



IEC Class 2 [LV-H32/H37/H42/H52/H62/H67]

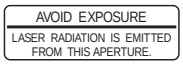


IEC (French) Class 2 [LV-H32/H37/H42/H52/H62/H67]



DIN Klasse 2 [LV-H32/H37/H42/H52/H62/H67]

2) Aperture label

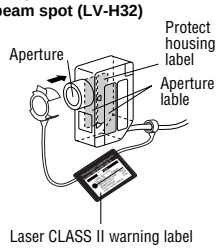


3) Protective housing label

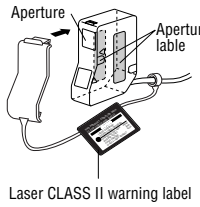
3. Label location

Warning labels are attached to the sensor head, as shown below.

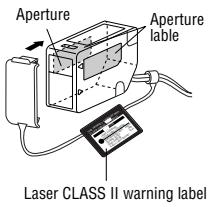
Long-distance variable beam spot (LV-H32)



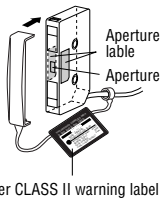
Small-spot, definite-reflective (LV-H37)



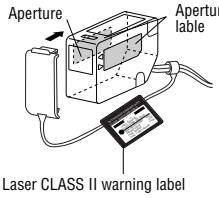
Long-distance area (LV-H42)



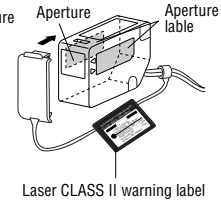
Dual-receiver port, area detection (LV-H52)



Straight beam, retro-reflective (LV-H62)



Long-distance, retro-reflective (LV-H67)



Note: When the labels other than FDA are used, stick them on to the equivalent FDA labels.

4. Safety consideration

⚠ WARNING

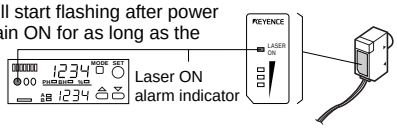
Follow the safety precautions below to ensure operator safety:

- **Operate the LV Series only according to the procedures described in this instruction manual.**
  Otherwise, injury may occur due to exposure to the laser beam.
- **Do not disassemble the sensor head.**
  Laser emission from the LV Series is not automatically stopped if the sensor head is disassembled. If you disassemble the sensor head for inspection or repair, you may be exposed to the laser beam. If the LV Series malfunctions, contact KEYENCE immediately.
- **Do not look directly at the laser beam.**
  Looking directly at the laser beam may result in serious eye injury.
- **Protective enclosure**
  It is recommended that you install a protective enclosure around the sensor head to prevent any person from getting near the sensor head during operation.
- **Protective goggles**
  It is recommended that you wear protective goggles when using the LV Series.
- **Stop laser emissions before cleaning the laser emission port.**
  Failure to stop the laser emission may expose eyes or skin to the laser beam.
- **Check the laser beam path.**
  To prevent exposure to the laser beam due to specular or diffuse reflection, install a screen which offers the appropriate reflectance and temperature characteristics to interrupt the reflected laser beam. Do not install the LV Series in such a way that the laser beam passes at eye height.

5. Safety features

■ Laser ON alarm indicator

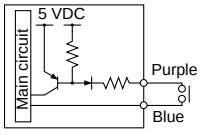
The laser ON alarm indicator will start flashing after power is turned on. The lamp will remain ON for as long as the laser light is emitting. This alarm indicator can be seen even when wearing protective goggles.



■ Laser emission stop input (LV-21A/21AP/11A)

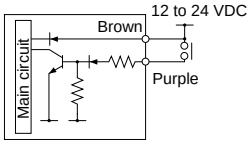
Laser emission can be stopped by short-circuiting between the purple and blue (GND) wires when LV-21A or LV-11A used. When LV-21AP is used, short-circuit between the purple and brown (12 to 24 VDC) wires to stop laser emission.

LV-21A/11A
NPN



(Short circuit current 1 mA max.)

LV-21AP
PNP



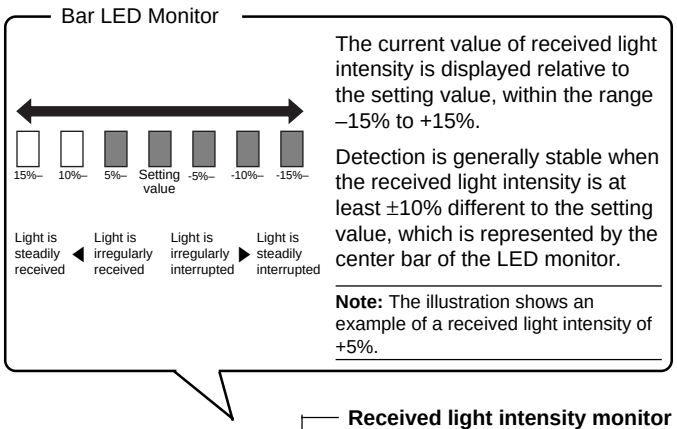
(Short circuit current 2 mA max.)

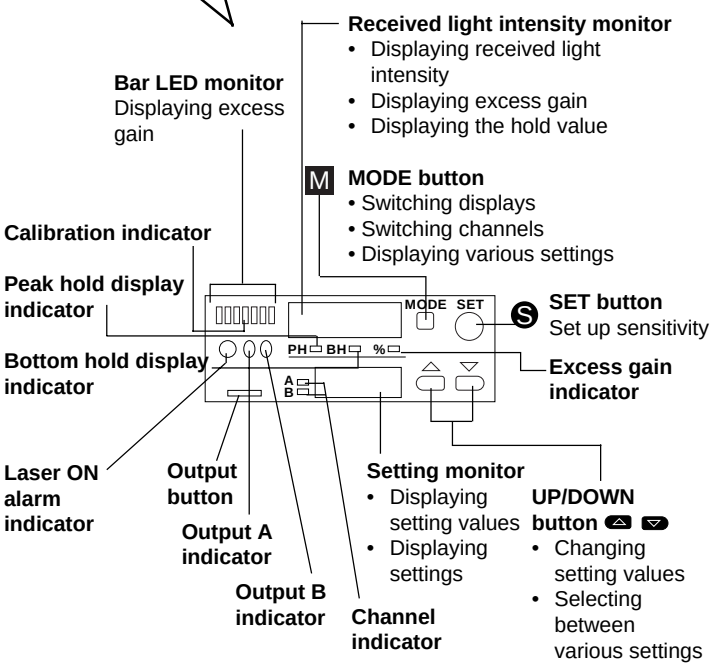
■ Laser beam shield

The LV Series is supplied with a laser beam shield that can be placed over the sensor head to avoid the risk of exposing your eyes to laser beam. For example, this can be placed over the sensor head whenever you need to work in front of the sensor head while laser emission is on.

Part Names

Amplifier

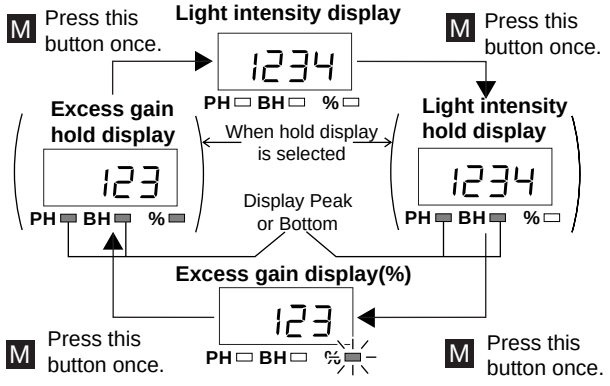




■ Selecting display modes

The display changes each time the MODE button is pressed.

The received light intensity/excess gain hold display appears only after peak/bottom hold is selected in the hold mode.



⇨ For more information about hold display, refer to “Mode Setting” (p. 3).

- **Setting value display**
  Displays setting value
- **Received light intensity display**
  Displays received light intensity up to values of 9999.
  (Max. 4095 in FINE mode *Max. 4035 with LV-H62/H67.)
- **Excess gain display**
  Shows the received light intensity as a percentage of the setting value (setting value = 100%)

Note: The displayed value for excess gain is 0 when the excess gain is less than 1%.

Important:

IEC	Class 2	Class 1
FDA	Class II	Class I
Sensor head	LV-H32/H37/H42/H52/H62/H67	LV-H41, H51
Amplifier	LV-20A/21A/22A/21AP/22AP	LV-11A

As shown above, make sure that the amplifier and sensor head are of the same class.

Sensor Head

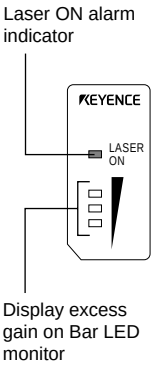
■ Bar LED monitor (sensor head)

When A, which is closer to the amplifier, is ON, the monitor displays the excess gain of output A. When B is ON, the monitor displays the excess gain of output B.

Bar Graph LED monitor (Interlocked with amplifier)

The indicator turns on according to the difference between the received light intensity and the setting value. The current level of detection stability can be determined from this difference.

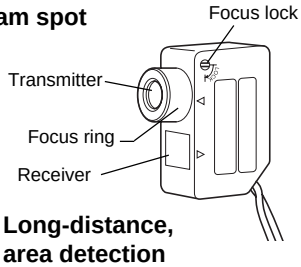
If detection becomes unstable (light cannot be “steadily received” or “steadily interrupted”) due to a change in the surroundings or the target, or for any other reason, readjust the sensitivity.



■ Long-distance adjustable beam spot

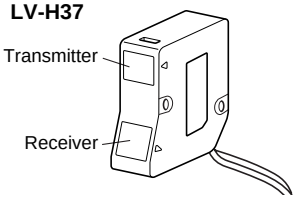
LV-H32

Adjust the beam spot size by turning the focus ring. After completing the adjustment, fix by turning the focus lock screw.



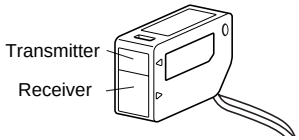
■ Small-spot, definite-reflective

LV-H37



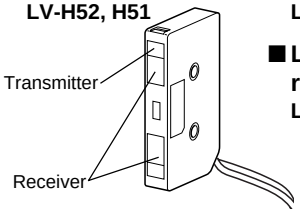
■ Long-distance, area detection

LV-H42, H41



■ Dual-receiver port, area detection

LV-H52, H51

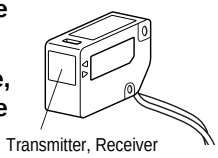


■ Straight beam, retro-reflective

LV-H62

■ Long-distance, retro-reflective

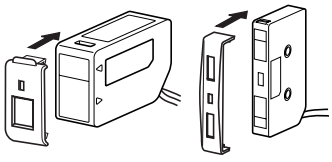
LV-H67



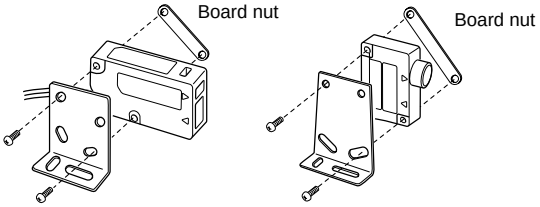
Slit for sensor head (Option for LV-H42, H41, H52, H51)

Optional slits for the long-distance, area detection/dual-receiver port, area detection types

- **Attaching the slit**
  Attach the slit to the transmitter
- **Removing the slit**
  Remove the slit by lifting up the pin on the slit with a screwdriver.



■ Attaching mounting brackets

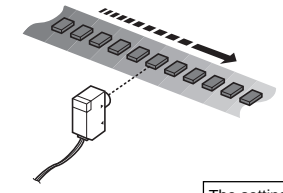


- To attach mounting brackets use the included screws (M3 x 18: 2 pieces) and board nut.
- Torque should be set to 0.3 N•m max.

Sensitivity Adjustment

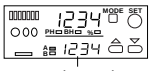
Note: Independent tuning of channel A and channel B.
➪ *"Selecting Channels" (page 5)*

■ Automatic tuning

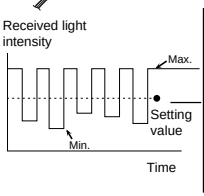


1. Pass a target through the optical axis while pressing the S button.
2. Confirm that the calibration indicator (orange LED) and setting monitor (green LED) are flashing.

3. Release the S button.

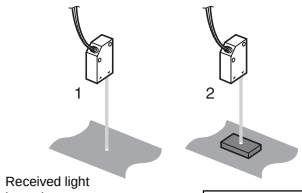


The setting value is displayed.



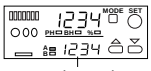
The setting value is adjusted to the midpoint of the difference between the maximum and minimum values of the received light intensity.

■ Two-point tuning

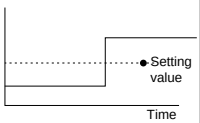


1. With no target in place, press the S button lightly.

2. Put a target in place and press the S button again lightly.

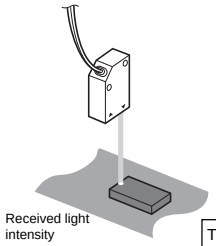


The setting value is displayed.



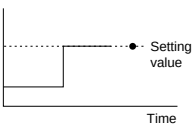
The setting value is adjusted to the midpoint of the difference in received light intensity when the target is absent and present.

■ Positioning tuning



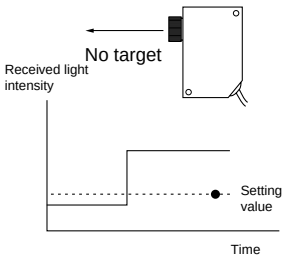
1. With no target in place, press the S button lightly (orange LED lights up).

2. Place a target in the position where it should stop.
3. Press the S button for 3 seconds or more until the calibration indicator (orange LED) and setting monitor (green LED) are flashing.



The setting value is adjusted to turn on the sensor when the target arrives at the place where it should stop.

■ Maximum sensitivity setting



If there are any objects in the background, the sensitivity is set to the maximum value for which the background objects are not detected.

1. According to the directions on the left, press the S button for 3 seconds or more.

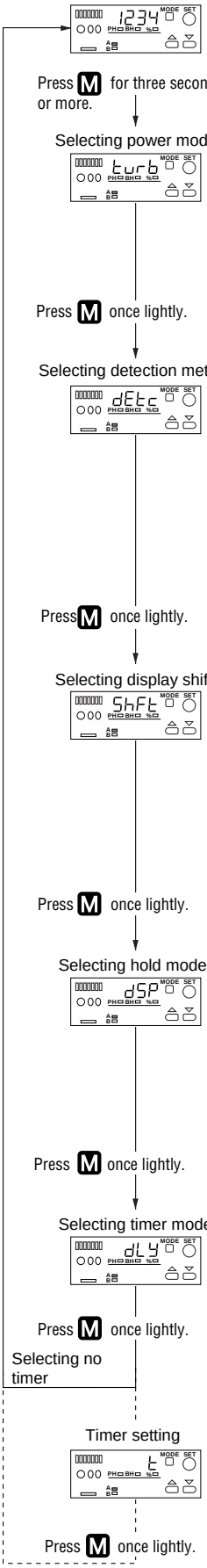
2. Confirm that the calibration indicator (orange LED) and setting monitor (green LED) are flashing.

3. Release the S button.

Mode Setting

If you press the M button for three seconds or more when either Light intensity hold display 1234 or Received light intensity 1234 is displayed, you can display the values of various settings. Each setting can be adjusted separately for channel A and channel B.
➪ *"Selecting Channels" (page 5)*

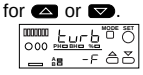
Reference: When the M button is pressed for 3 seconds or more during mode setting, the display returns to the received light intensity display.



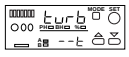
Switching power mode (for both outputs A and B)

Select a power mode to use for ▲ or ▼.

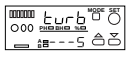
FINE: Set to this mode for detecting high-speed targets.



TURBO: Set to this mode for regular detection work.



SUPER: Set to this mode when there is insufficient light.



Be sure to adjust the sensitivity again after switching POWER mode.

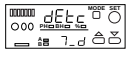
Switching detection mode

Select a detection method to use for ▲ or ▼.

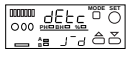
STANDARD 1: Set this mode for regular detection work.

STANDARD 2: Use this mode to increase hysteresis. (page 6)

DIFFERENTIATION (UP edge detection): Detects the UP edge of received light change.



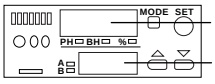
DIFFERENTIATION (DOWN edge detection): Detect the DOWN edge received light change.



"Differentiation Mode Detection" (page 6)

Switching display shift

By pressing S once, the received light intensity display will shift to a value of 0. Also, fine adjustments of display shift can be done using ▲ or ▼.



Note: Setting values will also shift.

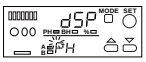
* To set the shift value to 0, press ▲ and ▼ together.

Hold mode switching

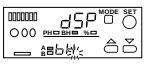
Select a hold mode to use for ▲ or ▼.

NO HOLD: Display is not held

PEAK HOLD: Peak value is held on the display



BOTTOM HOLD: Minimum value is held on the display

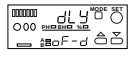


Switching timer mode

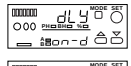
Select a timer mode to use for ▲ or ▼.

NO TIMER: Set to this mode for regular detection work.

OFF DELAY: Use for output OFF delay



ON DELAY: Use for output ON delay

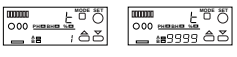


ONE SHOT: Use for one-shot output

Timer setting

Select a time setting for the timer for ▲ or ▼.

Min. 1 ms to max. 9999 ms

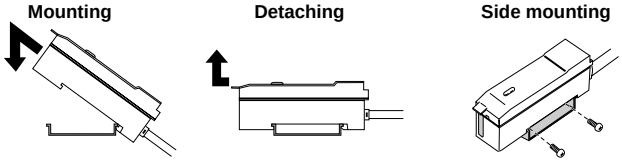


* It is possible to perform detection work while changing mode settings. To do this, switch the monitor to display received light intensity.

Mounting Amplifiers

- **Mounting and detaching amplifiers to and from the DIN rail mounting bracket**

Hook the claw on the rear of the amplifier onto the mounting bracket of the DIN rail, then hook the front claw on the bracket while pressing the amplifier forward. To detach the amplifier, unhook the front claw by simultaneously lifting and pushing the amplifier forward.

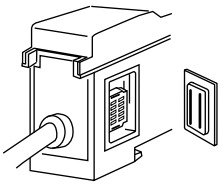


- **Mounting additional amplifiers**

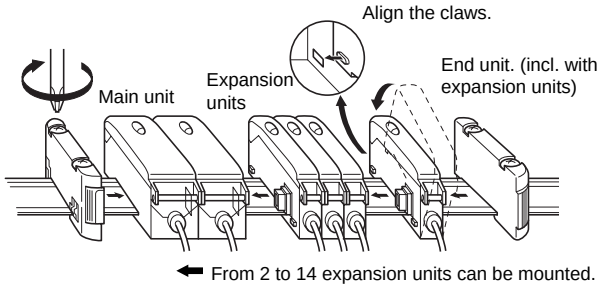
Up to 14 expansion units (LV-22A, LV-22AP, FS-T2, FS-M2, FS-V12, PS-T2) can be mounted to the side of the main unit.

Note: LV-22A and LV-20A should each be counted as two expansion units.
Ex.: LV-21A + FS-V12 x 14 max. LV-21A + LV-22A x 7 max.

1. Remove the protective cover on the side of the amplifier.
2. Mount expansion units one by one to the DIN rail.
3. Slide one expansion unit toward the main unit or other unit. Align the front claws of the units and push them together until you hear a click.



4. Secure the units together by pushing the end units (included with the expansion unit) from both sides.



* The sticker on the right is included with the expansion unit. Attach this sticker near the amplifier.

- **Detaching amplifiers**

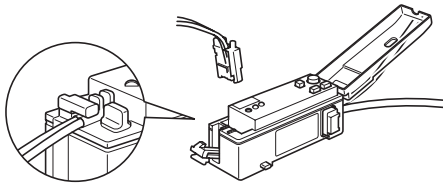
1. Take off the end unit.
2. Slide the expansion units. Remove them one by one from the DIN rail.

⚠ CAUTION

- ***When connecting several amplifiers, always use a DIN rail and end unit.***
- ***Take care to turn the power off before connecting/disconnecting amplifiers.***
- ***Do not remove the protective cover from the expansion connector of the outermost unit.***
- ***Do not detach multiple units from the DIN rail while they are still connected to each other.***
- ***If several units are connected, check that the ambient temperature is appropriate.*** ➪ *"Specifications" (page 8)*

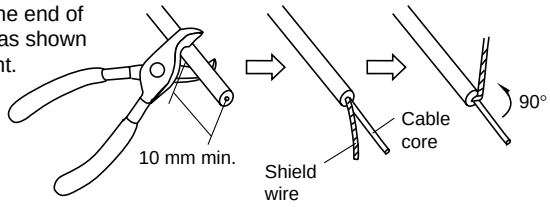
Mounting the Sensor Head

1. Insert the connector into the amplifier and lock it with the lever. Pass the cable underneath the lever and close the dust cover.

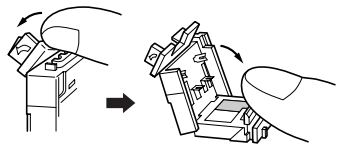


Connecting the sensor head cable to the connector

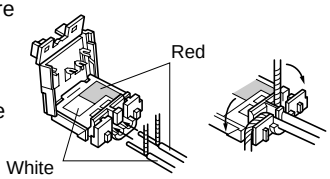
1. Process the end of the cable as shown on the right.



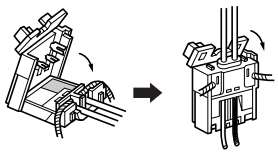
2. Tilt the top in the direction of the arrow on the left side of the top, then open the connector.



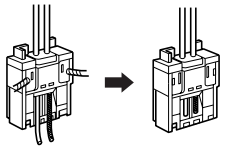
3. Insert the cable with the shield wire bent at 90°, then bend the shield wire in the direction of the arrow along the groove. Match the color of the connector to the color of the shield wire.



4. Close the connector, and lock it by pushing down the top.



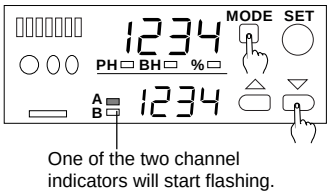
5. Using nippers or a similar tool, trim the wires sticking out from the connectors.



Selecting Channels

The LV series can perform two different types of sensitivity settings.

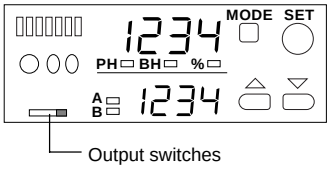
1. Press ▲ or ▼ quickly while holding down M.
2. Channel indicator for set up mode starts flashing.
3. Release M.



Note: While tuning sensitivity or setting modes such as power mode, it is not possible to select channels.

■ Selecting output mode

Three tipes of output modes can be selected.



Switch	Output A	Output B
▭▬	L.ON (Output ON when light is received)	
▭▬▭	L.ON (Output ON when light is received)	D.ON (Output ON when light is interrupted)
▬▭	D.ON (Output ON when light is interrupted)	

Key Lock

The operation button can be locked to prevent anyone accidentally touching the operation button and changing settings.

■ Turning on Key Lock

Press ▲ or ▼ for three seconds or more while pressing M.
Loc will start flashing on the display.

■ Releasing Key Lock

Press ▲ or ▼ for three seconds or more while pressing M.
unl will start flashing on the display.

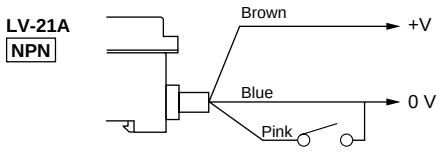
When Key Lock is on, all settings except selecting display, selecting output and display settings remain disabled until Key Lock is released.

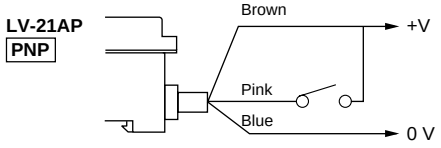
Adjusting sensitivity via external signals (External Tuning)

1. Lock the operation button

Important: The operation button must be locked to perform external tuning.

2. Connect the pink cable to a switch or PLC.
3. Making a short circuit between the pink cable and blue cable has the same effect as pressing S.



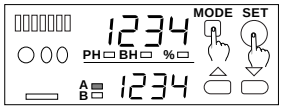


Note: Minimum input time is 20 ms.

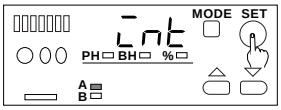
Initializing Settings (Initial Reset)

All settings can be reset to their original values (factory defaults). This can be done only when the operation button is not locked.

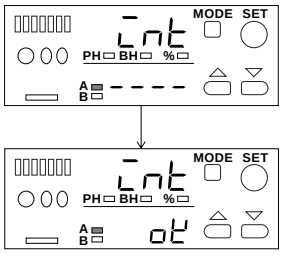
1. With the received light intensity displayed, press S five times while holding down M.



2. When Cnt is displayed on the digital LED monitor, press S once.
(When ▲ is pressed here instead of S, the monitor returns to the received light intensity display without being reset.)



3. ---- is displayed on the setting monitor for three seconds and then oU is displayed. Initialization is now complete. The received light intensity display will appear on the monitor again.



Initial settings

	Output A / Output B	
Power mode	TURBO	--t
Detection methods	Standard output 1	Std
Display shift	Shift value: 0	0
Hold mode	No hold display	Std
Timer mode	No timer	oFF
Timer	10 ms	10
Output setting	D. ON: 46, L. ON: 50 (52 for LV-H62)	

Note: The value for the timer is only effective when timer mode is set to a setting other than “NO TIMER (OFF).”

Error Messages

If any of the following errors appear on the LED display, check the amplifier or sensor unit according to the countermeasures listed below.

Error message	Problem description	Countermeasures
brt	Sensor head is not connected or sensor head cable is damaged.	Check for any cuts in the head cable or reconnect the sensor head to the amplifier.
ouLd	Excessive current in output cable.	Check the load and adjust to within rated values.

Mutual Interference Suppression

The LV Series is equipped with a mutual interference suppression function. Please note, however, that this mutual interference suppression function will not work when two main units are used together.

Note: When additional sensor head units are installed, mutual interference suppression allows the units to be positioned close together. The number of units with which mutual interference suppression will work depends on the selected power mode.

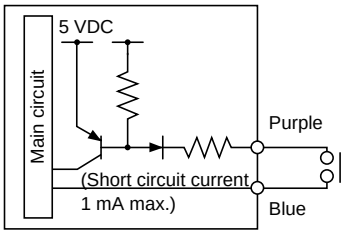
Power mode	FINE	TURBO	SUPER
No. of units free from interference	Not possible	2 *	4 *

* Total (main unit plus expansion units)

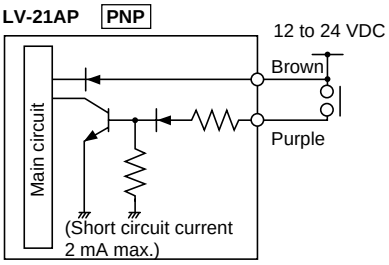
Interruption of Laser Radiation

A short circuit between the purple and blue conductors will cause laser radiation to be interrupted (min. input time: 20 ms).

LV-21A/11A **NPN**



LV-21AP **PNP**



Note: This function is available only with the LV-21A/21AP/11A. Even when expansion units (LV-22A/22AP) are connected, laser radiation stops only from the main unit.

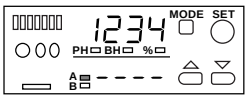
Fine Adjustment of Setting Values

The values displayed on the calibration LED monitor can be changed by pressing ▲ (to increase sensitivity) or ▼ (to decrease sensitivity). This allows you to fine-tune your setting values.

Note: If you press the S button accidentally while performing a fine adjustment of your setting values, a sensitivity calibration will start automatically and prevent you from continuing your fine adjustment until the calibration is completed. If this happens, press the S button again to cancel the setting and start your fine adjustment again.
The value may not change by 1 digit during fine-tuning adjustments. This is not a malfunction.

■ Indication of ----

When ---- is displayed on the setting monitor (green LED), it means that there is not enough change in received light intensity. So, when this appears, try to adjust your sensitivity settings again.



Differentiation Mode Detection (UP/DOWN edge)

Operation:

Detects only sudden changes in received light intensity within a certain time interval.

UP edge detection: Output is turned ON when light intensity increases by more than the setting value within a fixed time interval.

DOWN edge detection: Output is turned ON when light intensity decreases by more than the setting value within a fixed time interval.

To achieve stable detection in differentiation mode, changes in received light intensity resulting from the presence or absence of the target must be greater than the changes in received light intensity resulting from dust or vibration.

■ Setting sensitivity

Quickly press S once, to set sensitivity to its maximum value. Perform fine-tuning adjustments using ▲ or ▼, or refer to the details on hold display below.

■ Received light intensity monitor

The received light intensity monitor displays the amount of differentiation. Use hold mode switching (page 3) with hold display ON.

■ Output state

	UP edge U-d	DOWN edge d-U
D.ON	N.C. output	N.C. output
L.ON	N.O. output	N.O. output

Hints on Correct Use

- To extend the amplifier cable length, use a cable that has a cross-sectional area of at least a 0.3 mm^2. Limit the length of cable extensions to 100 m. (For further information on connecting several units contact Keyence.)
- Placing the amplifier cable together in the same conduit with power lines or high voltage lines may cause detection errors due to interference or sensor damage. For this reason, always isolate the amplifier cable from these lines.
- If using a commercial switching regulator, make sure to ground both the frame ground terminal and ground terminal.
- Do not use the LV Series outdoors, or in any location where extraneous light can directly enter the light receiving surface.
- At the maximum sensitivity setting, detection distance may vary somewhat due to slight differences in the characteristics of individual units.
- Improper wiring may cause the amplifier to become hot or alter sensitivity. (Input/Output Circuit Diagram: page 7)
- Do not use connectors for sensor head-to-amplifier connections more than 100 times.
- Displayed values may vary due to surrounding conditions (e.g. temperature changes, dust)

Cautions on using the LV-H62/H67

- Use FINE mode when there are any white or mirror-surfaced objects near the sensor head.
- When the output is unstable in standard output 1 mode (Std), change the detection mode to standard output 2 (Std2).

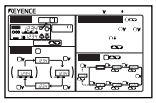
Reflector

- The values on the received light intensity display may vary depending on the surface condition of the reflector.

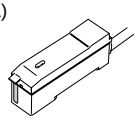
Accessories

Amplifier

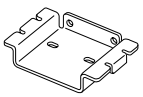
Quick reference (LV-21A/21AP/11A)



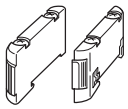
Amplifier



Mounting bracket (LV-21A/21AP/ 11A only)

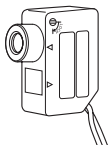


End unit (LV-22A/22AP only)



Sensor Head

• LV-H32 (long-distance, spot adjustable)

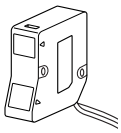


Plastic driver

Mounting bracket

Mounting bracket main body
Board nut
M3 x 18 screw: 2

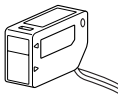
• LV-H37 (Small-spot, definite-reflective)



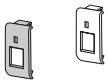
Magnifying glass

Mounting bracket main body
Board nut
M3 x 18 screw: 2

• LV-H42, H41 (Long-distance, area detection)



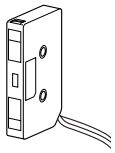
Slit (black, gray)



Mounting bracket

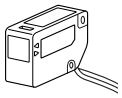
Mounting bracket main body
Board nut
M3 x 18 screw: 2

• LV-H52, H51 (Dual-receiver port, area detection)

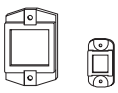


Slit

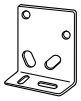
• LV-H62 (Straight beam, retro-reflective)



Reflector

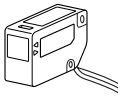


Mounting bracket



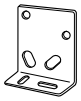
Mounting bracket main body
Board nut
M3 x 18 screw: 2

• LV-H67 (Long-distance, retro-reflective)



Reflector

Mounting bracket



Mounting bracket main body
Board nut
M3 x 18 screw: 2

Lens attachment for LV-H42/H41

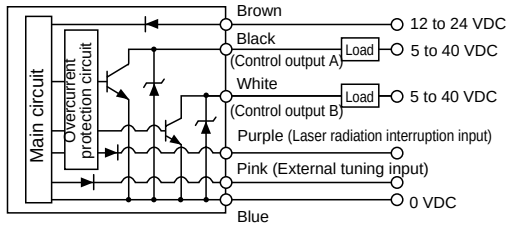
Model		LV-L01	Slit 1	Slit 2	Slit 3	Slit 4
Detection distance	FINE	200 mm	175 mm	150 mm	125 mm	100 mm
	TURBO	400 mm	350 mm	300 mm	250 mm	200 mm
	SUPER	800 mm	700 mm	600 mm	500 mm	400 mm
Area width	FINE	2.6 mm				
	TURBO	4.0 mm				
	SUPER	5.5 mm				
Area thickness	FINE	15.0 mm	11.5 mm	9.5 mm	7.5 mm	5.5 mm
	TURBO	26.0 mm	20.0 mm	17.0 mm	13.0 mm	10.0 mm
	SUPER	37.0 mm	29.0 mm	24.0 mm	19.0 mm	14.0 mm
Material		Polyacetal (Main body), Arton (Lens)				
Weight		Approx. 1g				

Refer to the LV-L01 instruction for details.

Input/Output Circuit Diagram

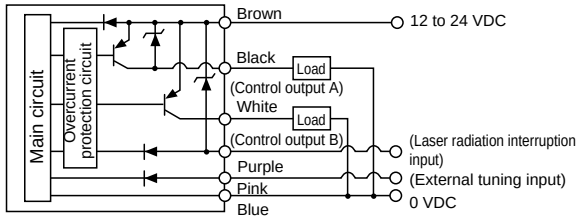
• LV-21A/11A

NPN



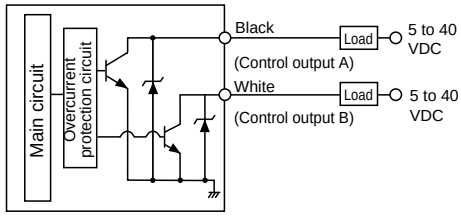
• LV-21AP

PNP



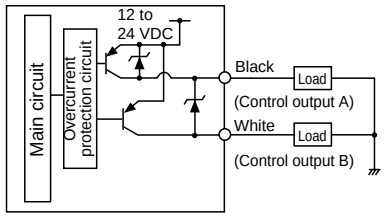
• LV-22A

NPN



• LV-22AP

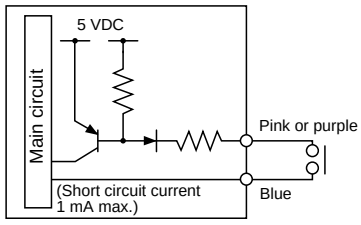
PNP



• Laser radiation interruption External tuning input circuit diagram (LV21A/21AP/11A only)

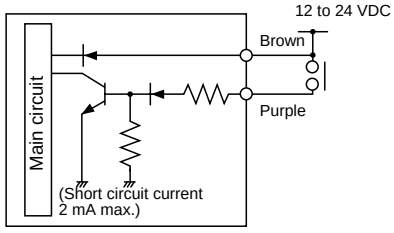
LV-21A/11A

NPN



LV-21AP

PNP



Specifications

Amplifier

Model		LV-21A/21AP	LV-22A/22AP	LV-20A	LV-11A
FDA Class [1.]		Class II			Class I
IEC Class [2.]		Class 2			Class 1
Main unit/expansion unit		Main unit	Expansion unit (1 line)	Expansion unit (0 line)	Main unit
Response time		FINE: 80 µs TURBO: 500 µs SUPER TURBO: 4 ms		280 µs to 4.7 ms [2.]	FINE: 500 µs TURBO: 2 ms SUPER TURBO: 8 ms
Operation mode		LIGHT-ON/DARK-ON (switch selectable)			
Output mode selection		1. A, B: L. ON; 2. A: L. ON, B: D. ON; 3. A, B: D. ON; 3-way slide SW			
Output		Red LED x 2ch			
Indicators	Digital LED monitor (light intensity monitor, setting monitor)	4 digits + 1/2, red 7-segment LED and green 7-segment LED Received light intensity (0 to 9999), Excess gain (0 to 9999)%, Set-up value display (0 to 9999) Negative values can be displayed when the display shift function is used. Peak hold and bottom hold switching			
	Bar LED monitor	Orange x 1, green x 6 (orange also used for tuning indicator)			
	Laser ON alarm indicator	Green LED			
Detection modes		STANDARD 1, STANDARD 2, UP edge, DOWN edge, separate settings for ch A/B			
Current value shift		±9999 variable, separate settings for ch A/B			
Timer function		OFF DELAY/ON DELAY/ONE SHOT, separate settings for ch A/B, timer 1 to 9999 ms variable			
Laser emission stop input		Non-voltage input, stop during laser radiation, input time: 20 ms min.			
Control output		NPN open-collector x 2 ch, max. 100 mA (40 V max.), residual voltage 1 max. [3.] LV-21AP/22AP: PNP open-collector x 2 ch, max. 100 mA (30 V max.), residual voltage 1 max.			
Protection circuit		Reverse-polarity protection, overcurrent protection, surge absorber			
Power voltage		DC 12 to 24V ±10% max., Ripple (P–P) 10% max. [4.]			
Power consumption (current consumption)		1.5 W max. (12V: 125 mA, 24V: 62.5 mA)			
Ambient temperature [5.]		–10 to +55°C (14 to 131°F), No freezing [5.]			
Relative humidity		35 to 85%, No condensation			
Vibration resistance		10 to 55 Hz, 1.5 mm double-amplitude in X, Y, and Z direction: 2 hours per axis			
Materials		Main body & cover: Polycarbonate			
Weight (incl. 2-m cable)		Approx. 120 g	Approx. 75 g	Approx. 35 g	Approx. 120 g

1. Use LV-H32/H37/H42/H52/H62 for FDA Class II and IEC Class 2, and use LV-H41/H51 for FDA Class I and IEC Class 1.
2. For use with FS-R0 as main unit
3. No control output cable for LV-20A
4. The power for LV-20A/22A/22AP is supplied from the main unit.
5. With several units connected, the allowable ambient temperature range varies as follows.
   3 to 5 units connected: -10 to +50°C (14 to 122°F)
   6 to 7 units connected: -10 to +45°C (14 to 113°F)
   To connect several units they must be mounted on a DIN rail (metal DIN rail). Make sure that output current is 20 mA. max. Note also that the expansion unit (LV-20A/22A/22AP) cannot be used as it is.

Sensor head

Model		LV-H32	LV-H37	LV-H42	LV-H52	LV-H62	LV-H67	LV-H41	LV-H51
Light source		Visible red semiconductor laser, Wavelength: 650 nm, 3 mW max., Pulse duration: 3.5 µs						Invisible infrared semiconductor laser Wavelength: 785 nm, 2.5 mW max., Pulse duration: 3.5 µs	
FDA Class [1.]		Class II						Class I	
IEC Class [1.]		Class 2						Class 1	
Detection distance	FINE	30 to 250 mm	70 ±15 mm	250 mm (Slit black: 150 mm) (Slit gray: 100 mm)	15 to 120 mm (Slit: 20 to 60 mm)	2 m	20 m	250 mm (Slit black: 150 mm) (Slit gray: 100 mm)	15 to 120 mm (Slit: 20 to 60 mm)
	TURBO	30 to 500 mm		500 mm (Slit black: 300 mm) (Slit gray: 200 mm)	15 to 180 mm (Slit: 20 to 80 mm)	5 m	30 m	500 mm (Slit black: 300 mm) (Slit gray: 200 mm)	15 to 180 mm (Slit: 20 to 80 mm)
	SUPER	30 to 1000 mm		1000 mm (Slit black: 600 mm) (Slit gray: 400 mm)	15 to 240 mm (Slit: 20 to 100 mm)	7 m	30 m (Use OP-42198: 50 m)	1000 mm (Slit black: 600 mm) (Slit gray: 400 mm)	15 to 240 mm (Slit: 20 to 100 mm)
Beam spot shape		Detection distance max. 300 mm Spot diameter: 0.8 mm max.	Detection distance: 70 mm Spot diameter: Approx. 50 µm	Detection distance 150 mm Area width: approx. 37 mm (Slit black: approx. 19 mm) (Slit gray: approx. 7 mm) Thickness: 1 mm max.	Detection distance 35 mm Area width: approx. 25 mm (Slit: approx. 9 mm)	Detection distance: 1 m or less Spot diameter: Approx. 1.5 mm max.	Detection distance: 20 m Approx. 10 x 3 cm Detection distance: 30 m Approx. 15 x 4 cm	Detection distance 150 mm Area width: approx. 38 mm (Slit black: approx. 19 mm) (Slit gray: approx. 7 mm) Thickness: 1.3 mm max.	Detection distance 35 mm Area width: approx. 25 mm (Slit: approx. 9 mm)
Indicator		Laser ON alarm indicator: gren LED, Label indicator: Green x 2, red x 1 (label indicator displays excess gain from 90 to 110%.)							
Ambient illumination		Incandescent light: 10,000 lux max. Sunlight: 20,000 lux max.							
Ambient temperature		–10 to +55°C (14 to 131°F), No freezing							
Relative humidity		35 to 85%, No condensation							
Vibration resistance		10 to 55 Hz, 1.5 mm double amplitude in X, Y, and Z directions: 2 hours per direction							
Materials		Case: Reinforced glass plastic, Lens cover: Polyarylate (Acrylic for LV-H32/H62/H67), Glass (Aperture of LV-H37 only) Slit (black/gray): Polyacetal (incl. with LV-H41/H42), Slit: Polyacetal (included for LV-H51/ H52), R-2 reflector: ABS (Main body), Acrylic (Reflective body), R-6/R-7 Reflector: Polycarbonate (Main body and phase-differential film), Acrylic (Reflective sheet)							
Weight (incl. 2-m cable)		Approx. 45 g	Approx. 45 g	Approx. 45 g	Approx. 55 g	Approx. 45 g	Approx.37 g	Approx. 45 g	Approx. 55 g

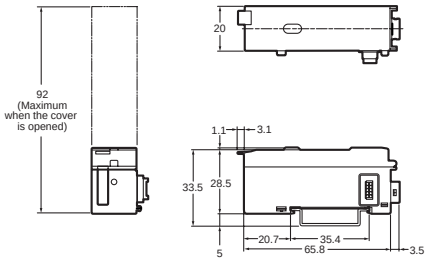
1. Use LV-20A/21A/22A/21AP/22AP for FDA Class II and IEC Class 2, and use LV-11A for FDA Class I and IEC Class 1.

Dimensions

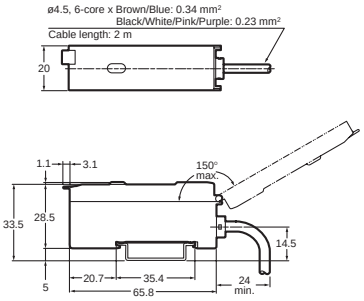
Unit: mm

Amplifier

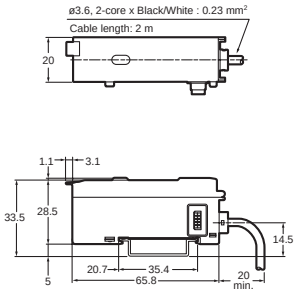
LV-20A



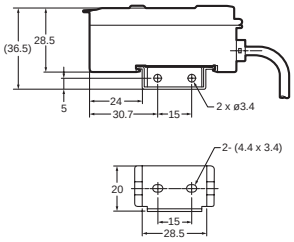
LV-21A/21AP/11A



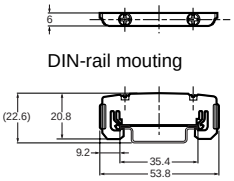
LV-22A/22AP



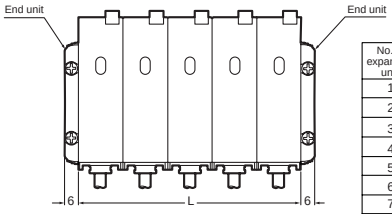
When the mounting bracket (included with LV-21A/21AP/11A) is attached:



End unit (included with LV-22A/22AP)



When several units are connected:

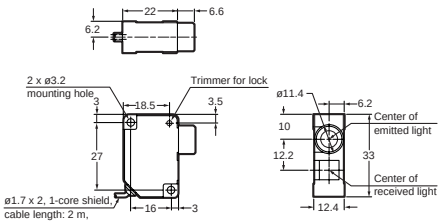


No. of expansion units	L
1	20
2	40
3	60
4	80
5	100
6	120
7	140
8	160

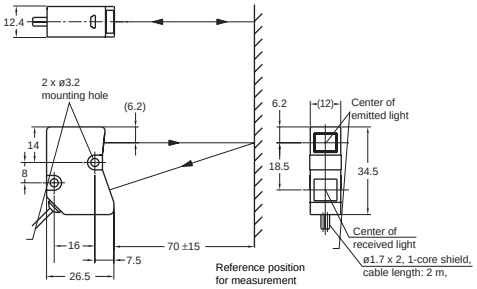
Make sure to use end units when adding expansion units.

Sensor head

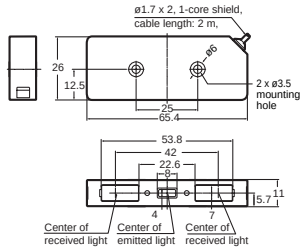
LV-H32



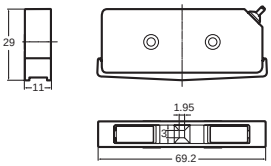
LV-H37



LV-H52/H51

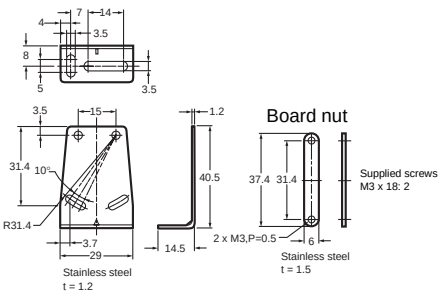


With slit (accessory) attached

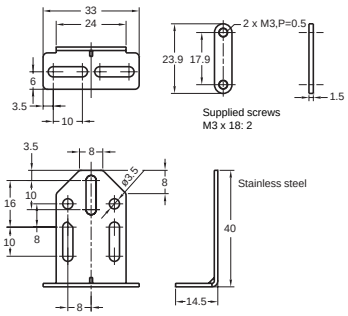


Sensor head mounting bracket

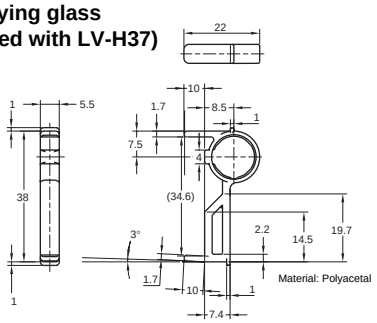
LV-H32 accessory



LV-H37 accessories

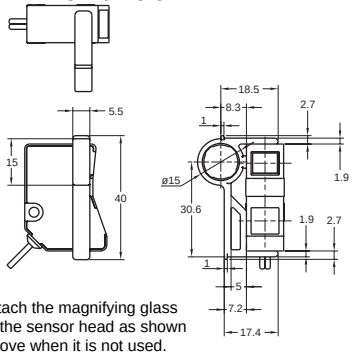


Magnifying glass (included with LV-H37)



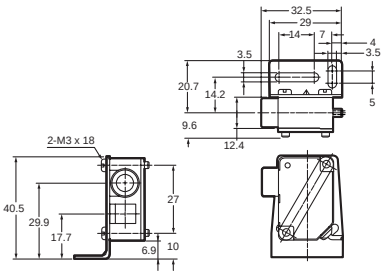
Use the magnifying glass included with the LV-H37 to check the position of detection spot during setting.

LV-H37 + Magnifying glass

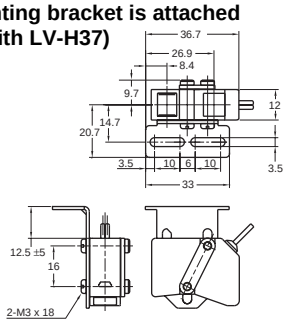


Attach the magnifying glass to the sensor head as shown above when it is not used.

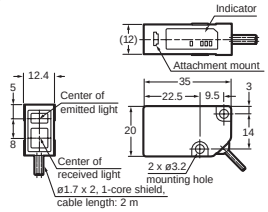
With mounting bracket is attached (included with LV-32)



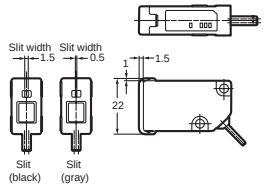
When mounting bracket is attached (included with LV-H37)



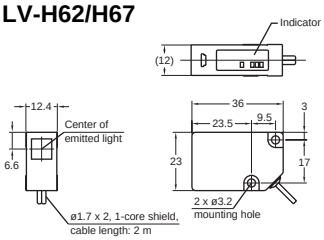
Sensor head
LV-H42/H41



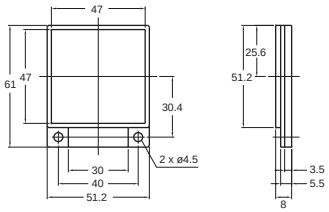
With slit (accessory) attached



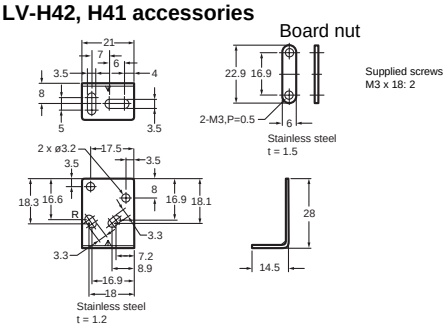
LV-H62/H67



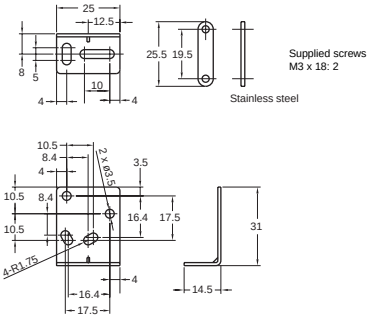
Reflector R-2 (mcluedwith LV-H67)



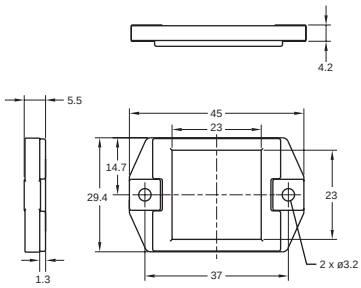
LV-H42, H41 accessories



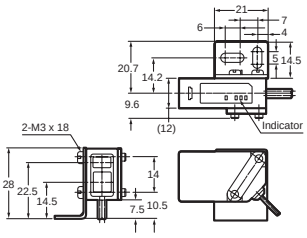
LV-H62/H67 accessories



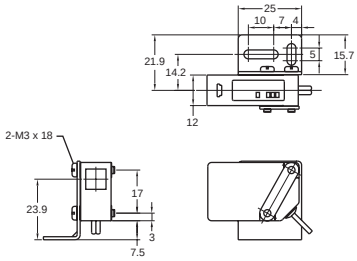
Reflector R-6 (included with LV-H62)



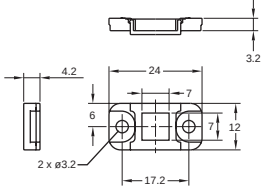
When mounting bracket is attached (included with LV-H42, H41)



When mounting bracket is attached (included with LV-H62/H67)



Reflector R-7 (included with LV-H62)



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