



**New Standard!** All-Purpose Laser Sensor



**NEW**  
All-Purpose  
Laser Sensor

**LR-T  
SERIES**

All-Purpose  
Laser Sensor

# LR-T SERIES



# A NEW DIMENSION TO ALL-PURPOSE LASER SENSORS

The LR-T Series of reflective sensors represents a seamless fusion of innovative technology and robust functionality. The Time of Flight (TOF) detection method and custom integrated circuit allow the LR-T Series sensors to provide consistently stable detection in all applications. Equally as impressive, this innovative technology is stored in a compact and durable metal housing for versatile installation in any environment. Lastly, the LR-T Series offers user-friendly operability to further minimise installation and set up time. All of these features combine to add a new dimension to all-purpose laser sensors.

## Superior Detection Capabilities

Innovative Technology and Adaptable Features

## Easy to Use

Flexible Mounting and Simplified Setup

## Unmatched Versatility

Utilise in Any Application

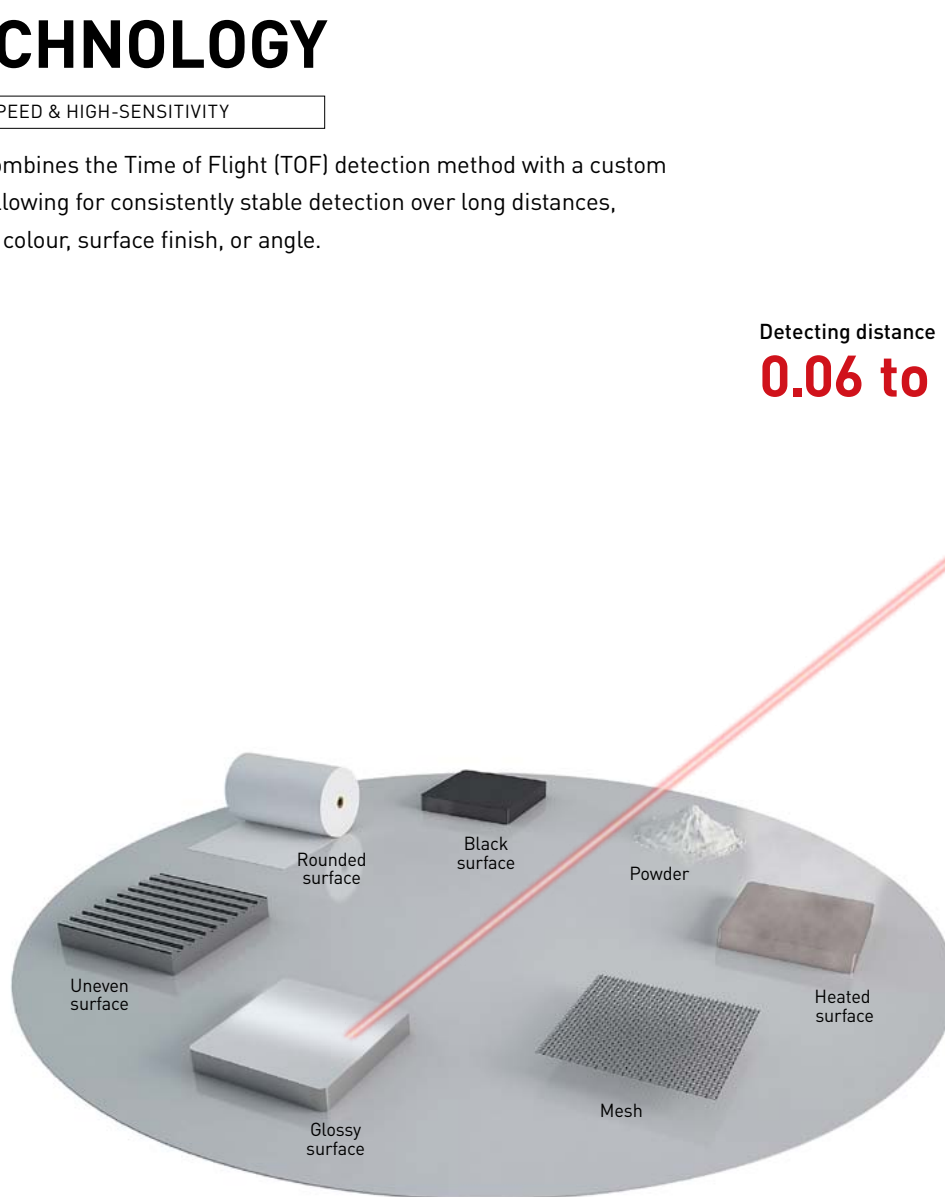
# Superior Detection Capabilities

## HS<sup>2</sup> TECHNOLOGY

HS<sup>2</sup>: HIGH-SPEED & HIGH-SENSITIVITY

"HS<sup>2</sup> Technology" combines the Time of Flight (TOF) detection method with a custom integrated circuit, allowing for consistently stable detection over long distances, regardless of target colour, surface finish, or angle.

Detecting distance  
**0.06 to 5 m**



### TOF ( Time of Flight )

The "TOF" method of detection measures distance by calculating the time it takes for a pulse-emitted beam to leave the sensor, hit the target, and then return to the sensor. This enables stable detection that is unaffected by the surface conditions of the workpiece that is being detected.

### Custom IC ( Integrated Circuit )

The newly-developed custom IC provides the LR-T with an ultra high-speed sampling rate of approx. 8 GHz, as well as increased processing capabilities. This allows for stable detection over long distances, even on targets of varying colour or angle.

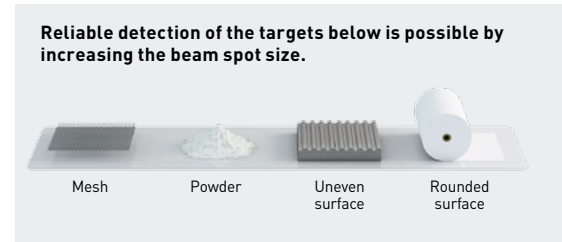
# ADAPTABLE FEATURES

The LR-T Series is full of innovative features that enable detection of targets that were previously considered undetectable. These features allow users to tailor the sensor to their specific applications and ensure optimal detection.

## Adjustable beam spot mechanism\*

By adjusting the beam spot size, users are able to guarantee reliable detection of any target, even those with irregular surfaces.

\* For LR-TB5000x only



Adjust the beam spot diameter by simply turning the rotary dial with a standard screwdriver.

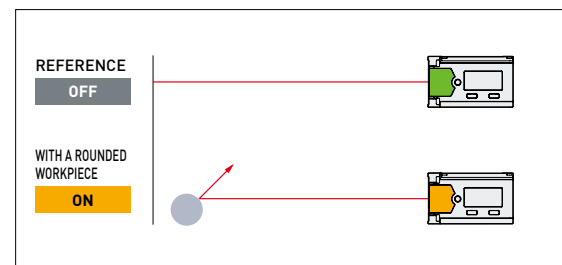
**Industry first**

### Step disc mechanism

The LR-TB5000 Series models feature a rotary dial with multiple lenses. The beam spot diameter is determined by the position of the dial. Unlike the commonly-used focusing mechanism, which adjusts the beam spot according to the position of a single lens, the step disc mechanism locks in on the optimal lens. This eliminates the potential for beam spot variation caused by the vibration of a position dependant lens.

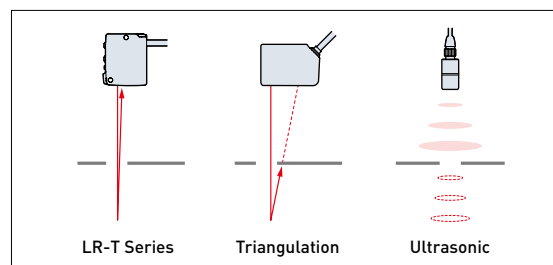
## DATUM function

This function enables the sensor to detect all conditions, except for a set "reference" state. It allows for detection of any target that passes in front of the sensor, even those that prevent laser light from returning to the unit.



## Focused detection capabilities

The influence of surrounding objects is greatly reduced by the LR-T's focused detection design when compared to other position based sensors that use triangulation or ultrasonic detection principles.



## Outstanding interference prevention

**Mutual interference prevention for up to 4 units**

Up to four sensors can operate in close proximity without the potential for mutual interference. This makes it possible to stably detect multiple points on a target without interference.

**Ambient light resistance of up to 100,000 lux**

The custom integrated circuit (IC) prevents the sensor from being affected by factory lighting, as well as various other types of light generated in production processes.

# Easy to Use

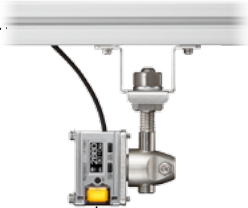
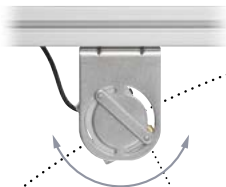
## FLEXIBLE MOUNTING

The design of the LR-T Series makes it possible to detect targets from any mounting position.

Whether they are mounted close to a target, far from a target, horizontally, vertically, or diagonally, these sensors will provide reliable and consistent detection. This makes the LR-T Series ideal for installation in new or existing equipment.

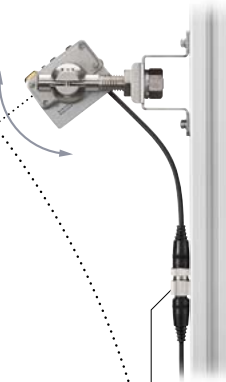
### Adjustable angle bracket

The L-shaped adjustable angle brackets quickly attach the sensor to a machine frame.

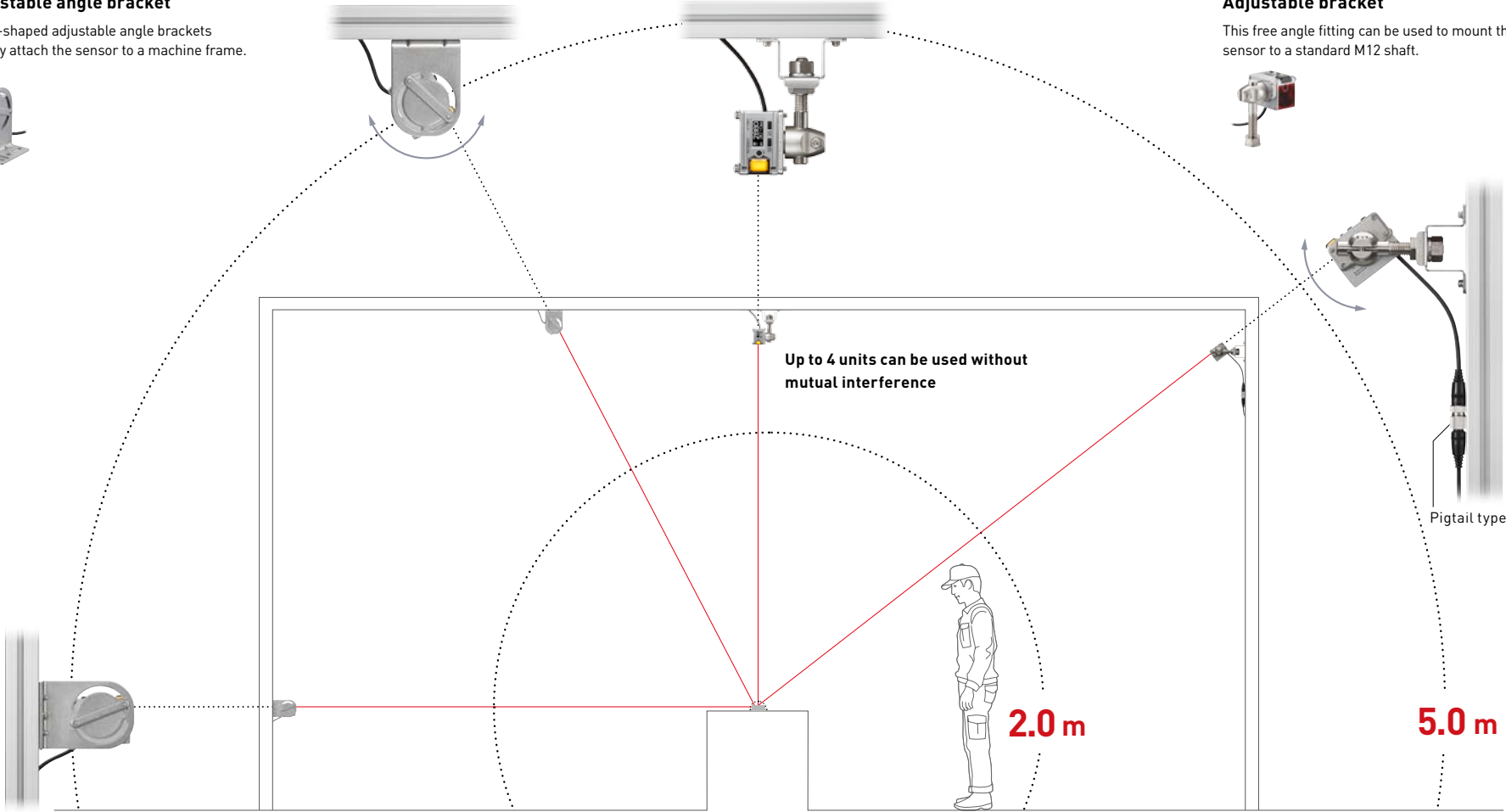


### Adjustable bracket

This free angle fitting can be used to mount the sensor to a standard M12 shaft.



Pigtail type



# SIMPLIFIED SETUP

The LR-T Series provides an intuitive user-friendly interface, as well as a highly visible indicator to provide simplified installation and troubleshooting.

## OLED display

The OLED display allows for easy operation with precisely displayed characters and intuitive navigation.



### Precise and rich expression

Characters are displayed precisely and clearly, allowing users to operate and interpret the device quicker and easier.

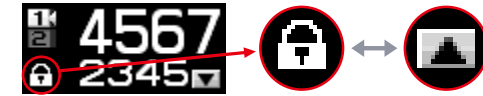
OLED Display



Conventional Display



The state of the sensor is also easily checked at a glance.



The keys are locked



The object is too close



A key is being pressed and held down

## Large indicator

With outstanding visibility over long distances, the indicator easily communicates the operational status of the sensor.



FLASHING RED:  
An error has occurred



FLASHING GREEN:  
Stability output ON

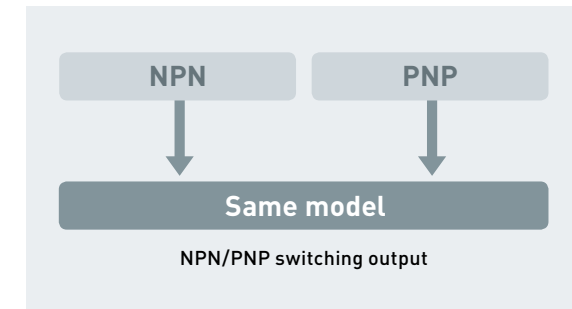
## Auto tuning

Calibrate your sensor in seconds by simply pressing the SET button while the target you would like to detect is present, and then again when it is absent. The sensor will automatically set the optimum ON/OFF set point for your output.



## All-in-one outputs

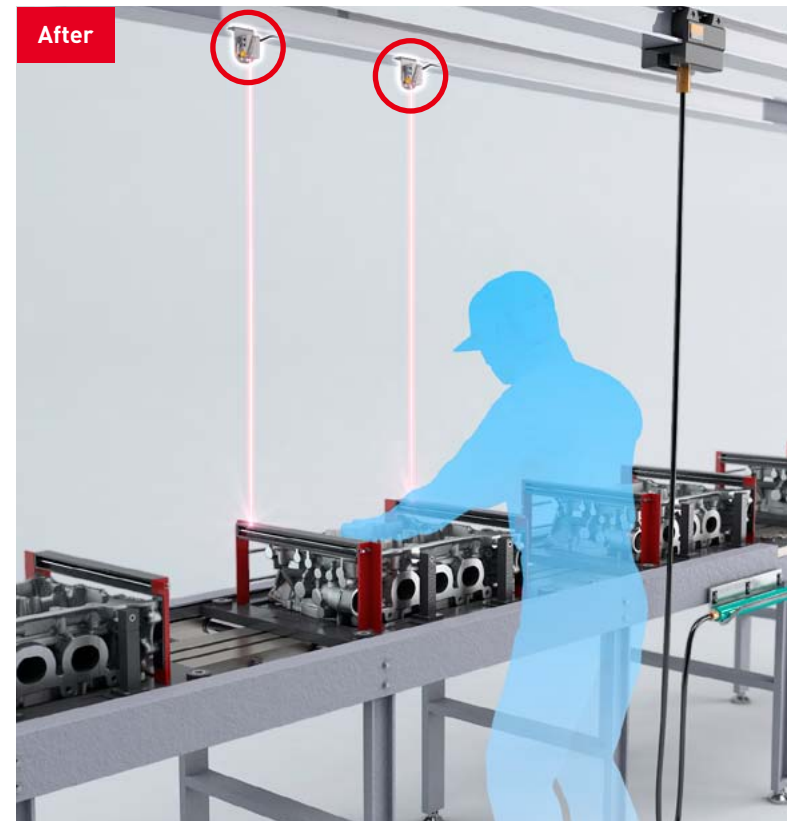
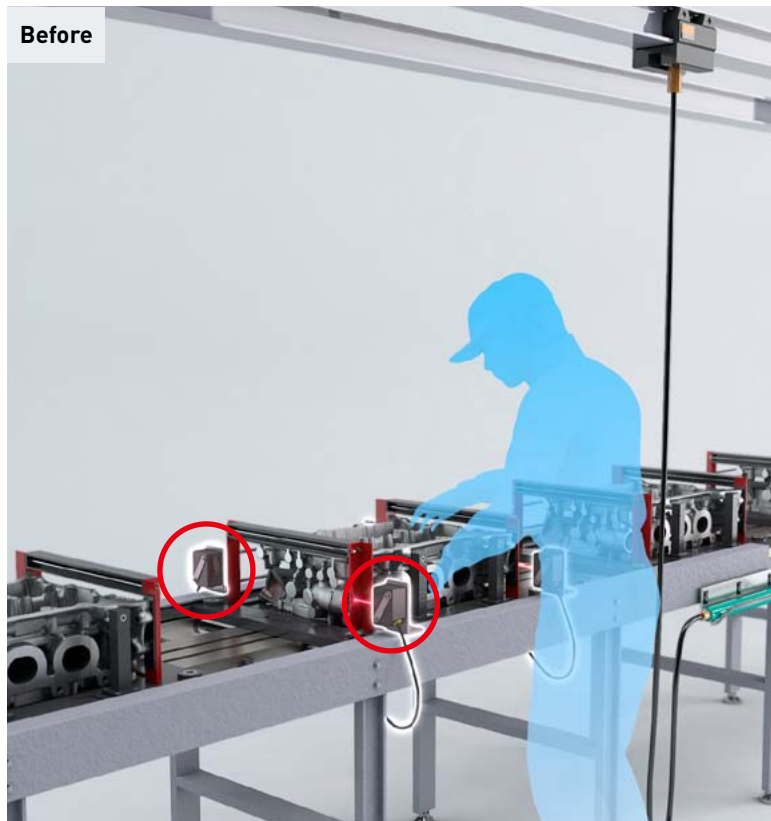
All models feature the ability to switch between NPN and PNP outputs. The LR-TB5000 Series models also feature the option for an analogue (voltage or current) output.



# Unmatched Versatility

## When a worker is involved in the process

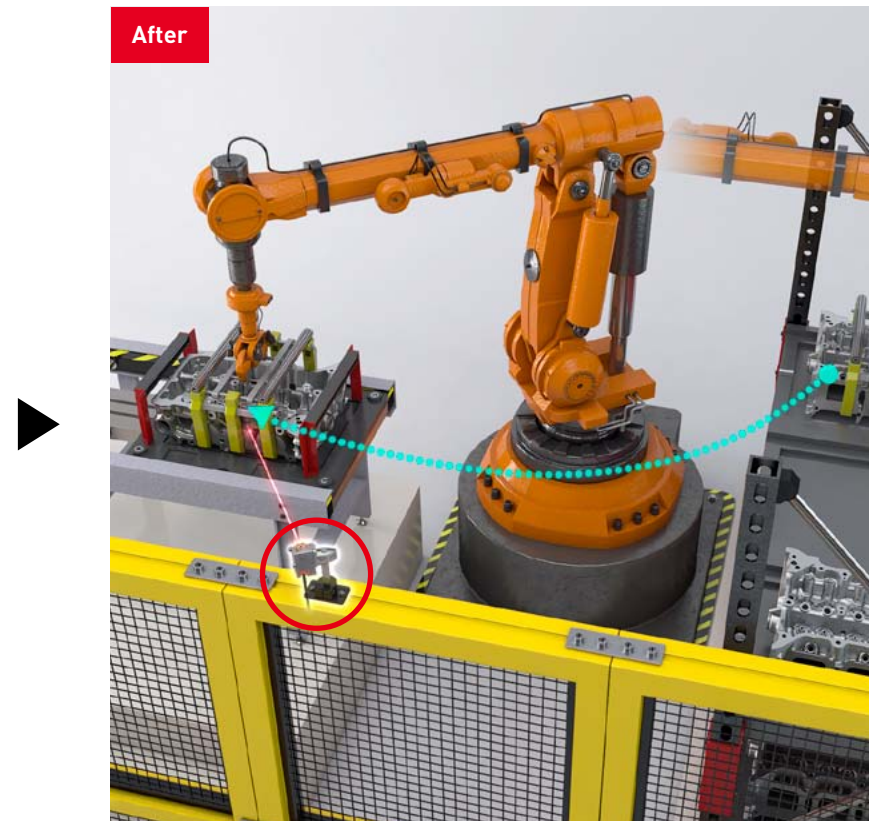
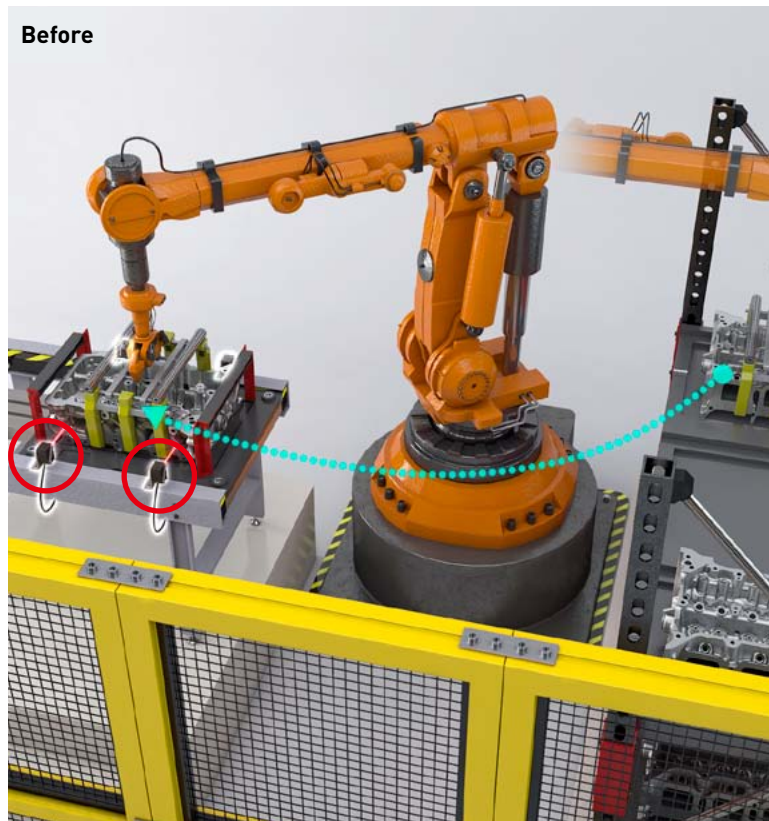
When sensors must be mounted close to a workpiece, operators run the risk of bumping into these sensors and causing misalignment. To avoid accidentally hitting these sensors, operators will typically work slower and more carefully, effectively reducing efficiency. The LR-T Series eliminates these concerns and maximises efficiency by providing stable detection from a position that is completely unobtrusive to an operator.





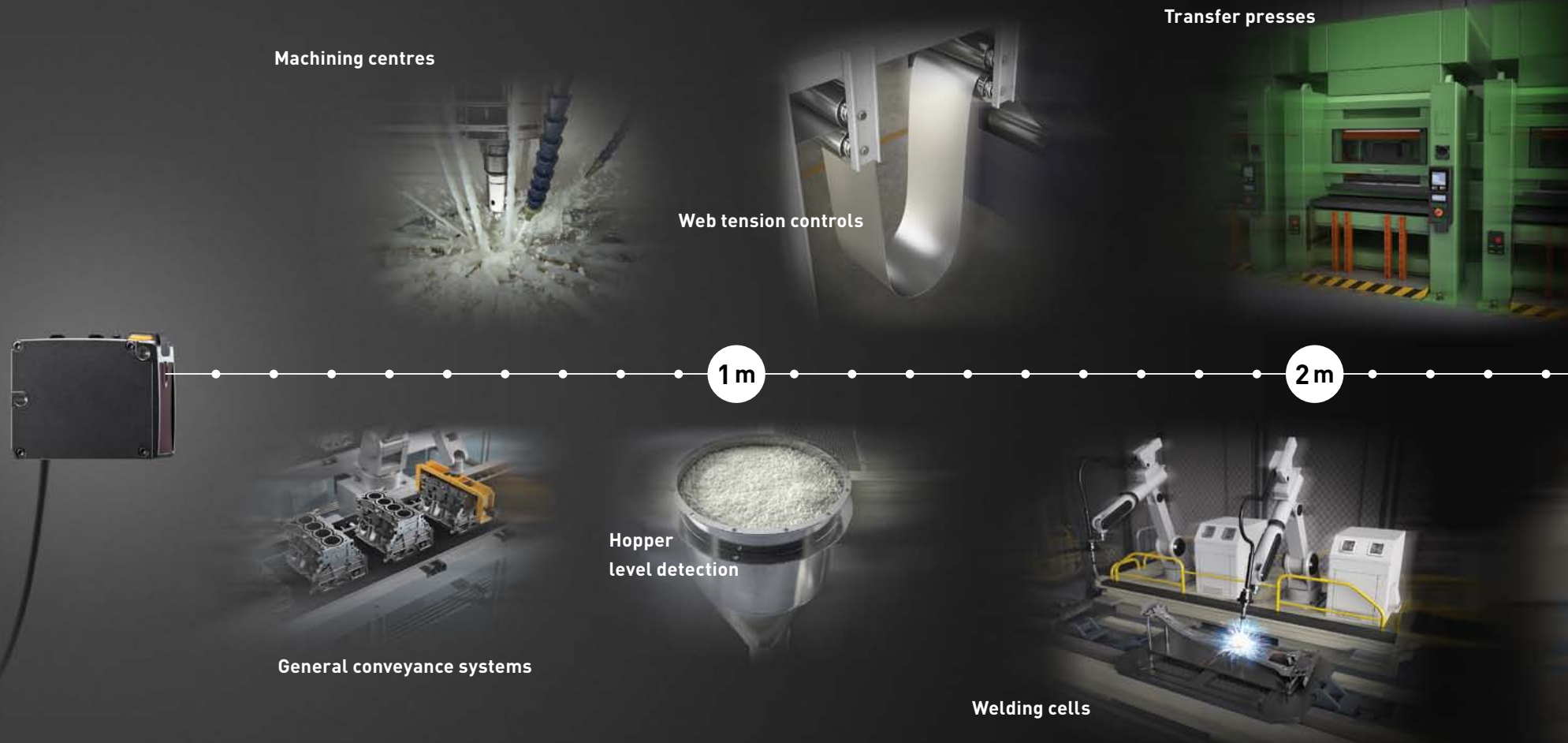
## When a robot is involved in the process

It is generally not preferable to install a sensor near the path of a moving robotic arm; however if a sensor has a short detecting range, it is necessary to place the sensors closer to the path and risk potential damage due to impact. The LR-T Series allows for stable detection from a distance, preventing potential damage to the sensor and machine.



# WHAT CAN BE DETECTED WITH A MULTI-PURPOSE LASER SENSOR?

While the LR-T Series is perfect for applications that require the detection of a target at a pre-determined position; it is also designed to perform detection based on variations in distance for applications such as level sensing or web tension control. A single LR-T laser sensor makes it possible to detect targets in the range of 0.06 m to 5 m on any type of machine for any application.



Palletisers



Roll-to-roll coating



3m

4m

5m

Moulding



Metal assembly







Automated warehousing











## ■ Lineup

	Type	Detecting distance	Spot diameter	Input/Output	Model
	Cable (2 m)	 60 to 5000 mm	Adjustable	[Control Output + Control Output], [Control Output + External Input], [Control Output + Analogue Output], or [External Input + Analogue Output]	LR-TB5000
	M12 connector (Cable sold separately)				LR-TB5000C/ LR-TB5000CL
	Cable (2 m)	 60 to 2000 mm	Fixed (Approx. ø4 mm)	[Control Output + Control Output], or [Control Output + External Input]	LR-TB2000
	M12 connector (Cable sold separately)				LR-TB2000C/ LR-TB2000CL



## ■ Mounting bracket

Type	Model	Material/Weight
 Adjustable angle bracket (For LR-TB5000 Series) (M4 screw x 2 supplied)	OP-87773	SUS304 Approx. 150 g
 Adjustable angle bracket (For LR-TB2000 Series) (M3 screw x 2 supplied)	OP-87771	SUS304 Approx. 110 g
 Small bracket (For LR-TB2000 Series) (M3 screw x 2 supplied)	OP-87770	SUS304 Approx. 80 g

## ■ Mounting bracket

Type	Model	Material/Weight
 Adjustable bracket (For LR-TB5000 Series) (M4 screw x 2 supplied)	OP-87774	Zinc nickel plating, etc. Approx. 120 g
 Adjustable bracket (For LR-TB2000 Series) (M3 screw x 2 supplied)	OP-87772	Zinc nickel plating, etc. Approx. 110 g
 Locking screw (For adjustable bracket) (85 mm)	OP-87775	Iron nickel plating Approx. 120 g

## ■ Protection cover

Type	Model	Material/Weight
 Front protection cover (For LR-TB5000 Series)	OP-87778	SUS304, PC, etc. Approx. 6 g
 Front protection cover (For LR-TB2000 Series)	OP-87776	SUS304, SUS430, PC, etc. Approx. 50 g



LR-TB5000 + OP-87774 + OP-87775



LR-TB2000 + OP-87772 + OP-87775



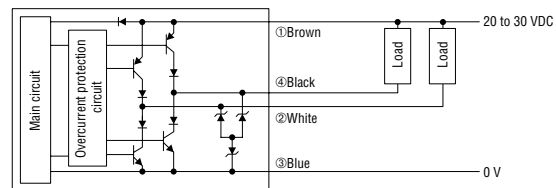
### ■ Cable (For M12 connector type models)

Specifications	Appearance	Model	Material	Sensor side	Terminal side	Length
Standard		OP-87634	Cable: PVC (Vinyl chloride) Connector: Zinc nickel plating	M12 4-pin (Straight)	Loose wires	2 m
		OP-87635				10 m
Oil resistant		OP-87636	Cable: PUR (Polyurethane) Connector: Zinc nickel plating			2 m
		OP-87637				10 m

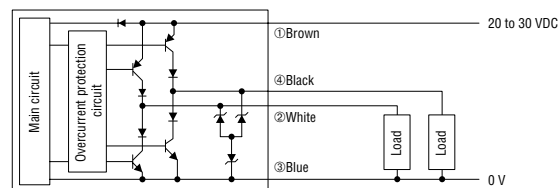
### ■ I/O circuit diagram

When I/O wires (④ black, ② white) are set to Out 1 (Output 1)/Out 2 (Output 2)

When NPN is selected

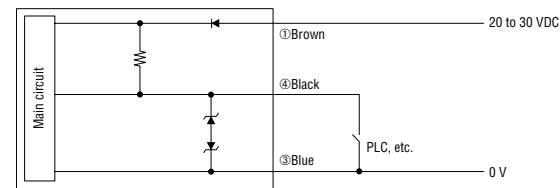


When PNP is selected

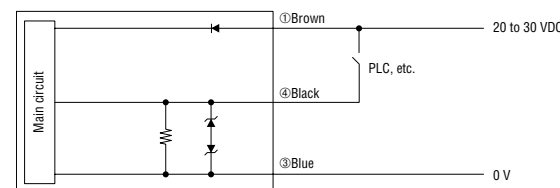


When I/O wire (④ black) is set to Input (external input)

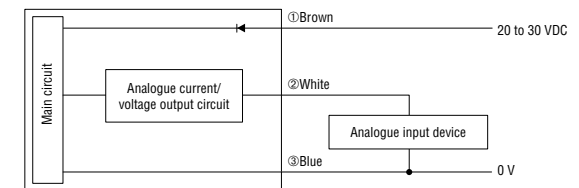
When NPN is selected



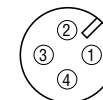
When PNP is selected



When I/O wire (② white) is set to Analogue (analogue output)



M12 Connector pin layout



## Specifications



Model	Cable	LR-TB5000	–	LR-TB2000	–
	Cable with connector M12	LR-TB5000C	LR-TB5000CL	LR-TB2000C	LR-TB2000CL
<b>Detectable distance</b>		60 to 5000 mm <sup>*1</sup>		60 to 2000 mm <sup>*2</sup>	
<b>Spot diameter</b>		Variable (use a spot diameter of 40 mm or less)		Approx. 4 mm	
<b>Response time</b>		1 ms/10 ms/25 ms/100 ms/1000 ms selectable	2 ms/20 ms/50 ms/200 ms/2000 ms selectable	1 ms/10 ms/25 ms/100 ms/1000 ms selectable	2 ms/20 ms/50 ms/200 ms/2000 ms selectable
<b>Light source</b>	<b>Type</b>	Red laser (660 nm)			
	<b>Laser class</b>	Class 2 laser product (IEC60825-1,FDA(CDRH) Part1040.10 <sup>-3</sup> )	Class 1 laser product (IEC60825-1,FDA(CDRH) Part1040.10 <sup>-3</sup> )	Class 2 laser product (IEC60825-1,FDA(CDRH) Part1040.10 <sup>-3</sup> )	Class 1 laser product (IEC60825-1,FDA(CDRH) Part1040.10 <sup>-3</sup> )
<b>Mutual interference prevention function</b>		4 units (when using the interference prevention function)			
<b>Timer</b>		OFF/OFF delay/ON delay/One-shot			
<b>Power voltage</b>		20 to 30 VDC, including 10% ripple (P-P), Class 2 or LPS			
<b>Current consumption</b>		50 mA or less (without load) <sup>*4</sup>		45 mA or less (without load) <sup>*5</sup>	
I/O <sup>*6,7</sup>	<b>Control output</b>	NPN open collector/PNP open collector selectable 30 VDC or less, 50 mA or less, residual voltage: 2 V or less, N.O./N.C. selectable			
	<b>External input</b>	Transmission OFF/Tuning/Reference surface update (when using the DATUM mode) selectable Short-circuit current: 1 mA or less for both NPN and PNP For the applied voltage, see the wiring diagrams in the instruction manual. For the input times, see the time charts in the instruction manual.			
	<b>Analogue output</b>	Current output/Voltage output selectable Current output: 4 to 20 mA with a max. load resistance of 500 Ω Voltage output: 0 to 10 V with an external load resistance of 5 kΩ or more		–	
<b>Protection circuit</b>		Protection against reverse power connection, power supply surges, output overcurrent, reverse output connection, and output surge			
<b>Environmental resistance</b>	<b>Enclosure rating</b>	IP65/IP67 (IEC60529)			
	<b>Ambient light</b>	Incandescent lamp/Sunlight: 100000 lux or less			
	<b>Ambient temperature</b>	-20 to +55°C (no freezing)			
	<b>Ambient humidity</b>	35 to 85% RH (no condensation)			
	<b>Shock resistance</b>	1000 m/s <sup>2</sup> in X, Y, Z axis directions respectively 6 times			
	<b>Vibration resistance</b>	10 to 55 Hz Double amplitude 1.5 mm in the X, Y, Z axis directions respectively, 2 hours			
<b>Material</b>		Case: Zinc die cast (Nickel chrome plating), Indicator cover and buttons: PES, Lens cover and display: PMMA (scratch-resistant coating specifications), Cable bushing: PBT, Cable: PVC, M12 connector (only for the cable with connector M12 type): TPE, PBT, Nickel-plated brass			
<b>Weight</b>		Cable type: Approx. 200 g (Including cable) Cable with connector M12 type: Approx. 160 g		Cable type: Approx. 125 g (Including cable) Cable with connector M12 type: Approx. 85 g	
<b>Accompanying items</b>		Instruction manual, Laser warning and explanation labels (except LR-TB5000CL/TB2000CL)			

\*1 The range for displayable distance is from 50 to 5200.

\*2 The range for displayable distance is from 50 to 2200.

\*3 The laser classification for FDA (CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No.50.

\*4 150 mA or less (with load)

\*5 145 mA or less (with load)

\*6 You can select the I/O from the following combinations.

- Control output × 2, control output + external input
  - Control output + analogue output (LR-TB5000/TB5000C/TB5000CL only)
  - External input + analogue output (LR-TB5000/TB5000C/TB5000CL only)
- (For details on the setting method, see the instruction manual.)

\*7 IO-Link specification v.1.1/COM2 (38.4 kbps) is supported. You can download a setup file from the KEYENCE website (<http://www.keyence.com>).

If you are using the product in an environment in which you cannot download files over the Internet, contact your nearest KEYENCE office.

## ■ Repetition Accuracy (Typical)

### LR-TB5000/TB5000C (Class 2 laser)

Unit: mm

		White Paper (Reflectivity: 90%)					Grey Paper (Reflectivity: 18%)				
		Response Time [ms]					Response Time [ms]				
		1	10	25	100	1000	1	10	25	100	1000
Detecting distance [mm]	60	±25	±7	±6	±3	±3	±52	±19	±14	±6	±4
	200	±8	±4	±3	±3	±3	±15	±5	±4	±3	±3
	1000	±7	±3	±3	±3	±3	±11	±4	±3	±3	±3
	2000	±11	±4	±3	±3	±3	±32	±10	±7	±5	±3
	3000	±18	±6	±4	±3	±3	±59	±16	±12	±6	±3
	5000	±42	±12	±9	±5	±3	±154	±40	±29	±14	±6

### LR-TB2000/TB2000C (Class 2 laser)

Unit: mm

		White Paper (Reflectivity: 90%)					Grey Paper (Reflectivity: 18%)				
		Response Time [ms]					Response Time [ms]				
		1	10	25	100	1000	1	10	25	100	1000
Detecting distance [mm]	60	±36	±12	±7	±4	±3	±100	±32	±21	±12	±5
	200	±8	±3	±3	±3	±3	±10	±4	±3	±3	±3
	500	±7	±3	±3	±3	±3	±9	±3	±3	±3	±3
	1000	±9	±4	±3	±3	±3	±26	±7	±6	±3	±3
	1500	±13	±6	±3	±3	±3	±43	±12	±10	±4	±3
	2000	±25	±7	±6	±3	±3	±69	±21	±13	±6	±4

### LR-TB5000CL (Class 1 laser)

Unit: mm

		White Paper (Reflectivity: 90%)					Grey Paper (Reflectivity: 18%)				
		Response Time [ms]					Response Time [ms]				
		2	20	50	200	2000	2	20	50	200	2000
Detecting distance [mm]	60	±27	±9	±6	±5	±3	±55	±20	±14	±8	±4
	200	±9	±6	±6	±3	±3	±15	±5	±6	±3	±3
	1000	±9	±6	±6	±3	±3	±12	±6	±4	±3	±3
	2000	±12	±7	±6	±3	±3	±33	±11	±8	±5	±3
	3000	±19	±8	±6	±4	±3	±60	±18	±12	±7	±4
	5000	±42	±14	±10	±5	±5	±159	±42	±31	±15	±8

### LR-TB2000CL (Class 1 laser)

Unit: mm

		White Paper (Reflectivity: 90%)					Grey Paper (Reflectivity: 18%)				
		Response Time [ms]					Response Time [ms]				
		2	20	50	200	2000	2	20	50	200	2000
Detecting distance [mm]	60	±39	±13	±9	±5	±3	±104	±33	±25	±14	±8
	200	±8	±5	±3	±3	±3	±11	±6	±3	±3	±3
	500	±7	±3	±3	±3	±3	±10	±3	±3	±3	±3
	1000	±10	±5	±3	±3	±3	±26	±9	±6	±3	±3
	1500	±14	±6	±5	±5	±3	±44	±13	±11	±5	±3
	2000	±26	±8	±7	±5	±3	±71	±22	±15	±9	±5

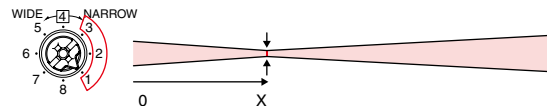
## ■ Adjusting the Spot Diameter (LR-TB5000/TB5000C/TB5000CL)



Use the dial on the back of the sensor to adjust the spot diameter. The correlations between the spot size and the position of each dial are as follows.

- When detecting objects that have holes in them, stable detection can be achieved by using a larger spot diameter.
- Set the spot diameter so that it is 40 mm or less at the desired detecting distance.

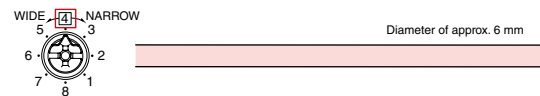
### Narrow Spot Setting



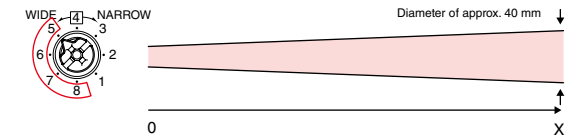
Unit: mm

NARROW	1	2	3
X (Approx.)	500	1000	2000

### Parallel Light Setting



### Wide Spot Setting

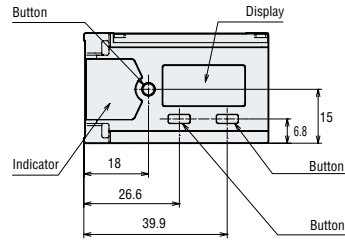


Unit: mm

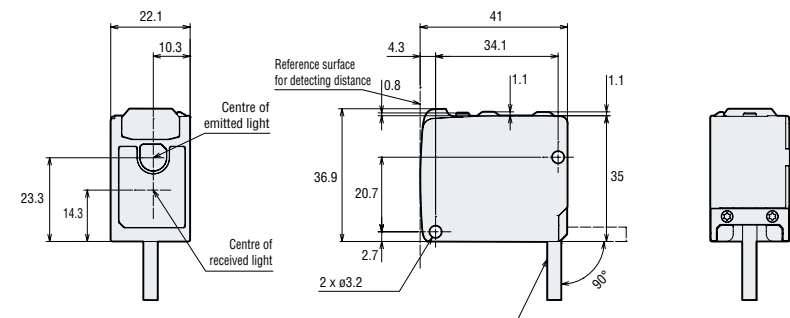
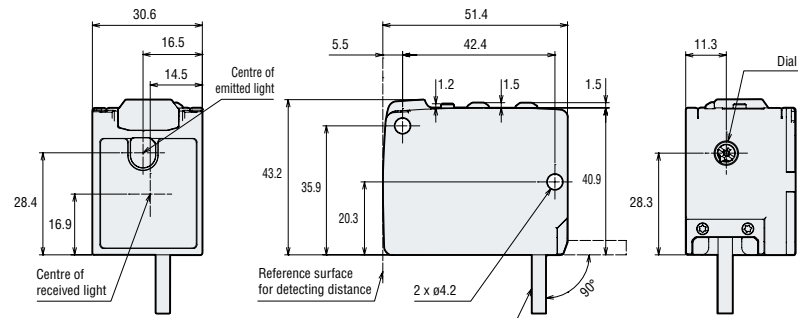
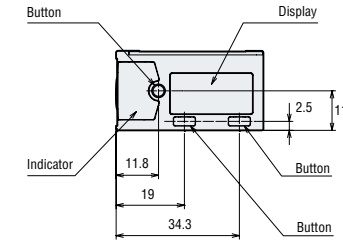
WIDE	5	6	7	8
X (Approx.)	5000	3000	1500	750

**Dimensions**

**LR-TB5000/  
TB5000C/TB5000CL**

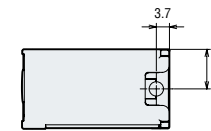
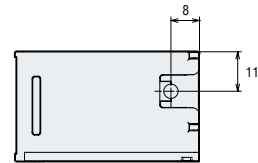


**LR-TB2000/  
TB2000C/TB2000CL**

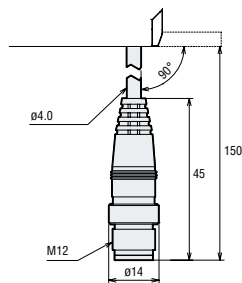


ø4.0 4 cores (brown/blue/black/white) x 0.20 mm<sup>2</sup>  
Cable length 2 m (cable type models)

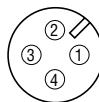
ø4.0 4 cores (brown/blue/black/white) x 0.20 mm<sup>2</sup>  
Cable length 2 m (cable type models)



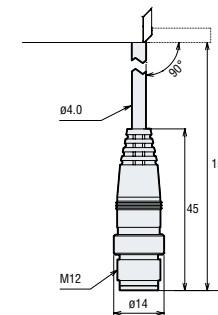
**M12 connector type models:  
LR-TB5000C/TB5000CL**



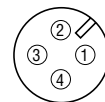
**Pin layout**



**M12 connector type models:  
LR-TB2000C/TB2000CL**

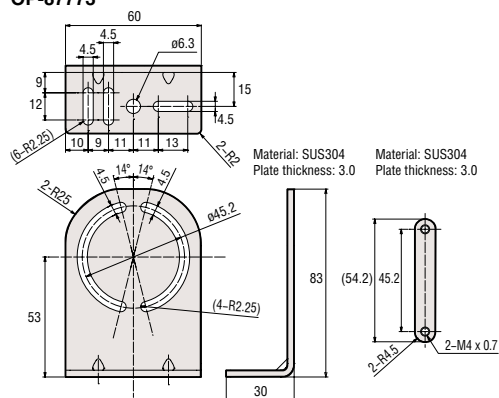


**Pin layout**

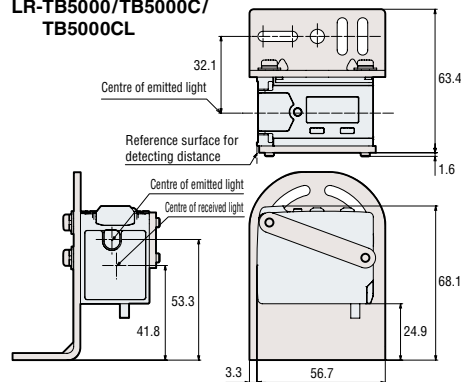




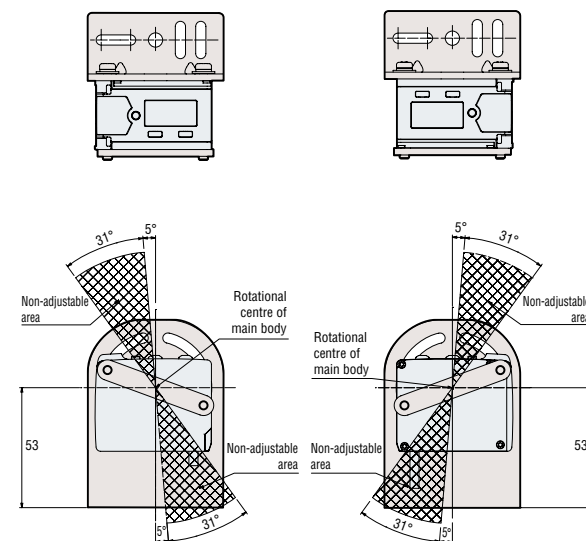
**OP-87773**



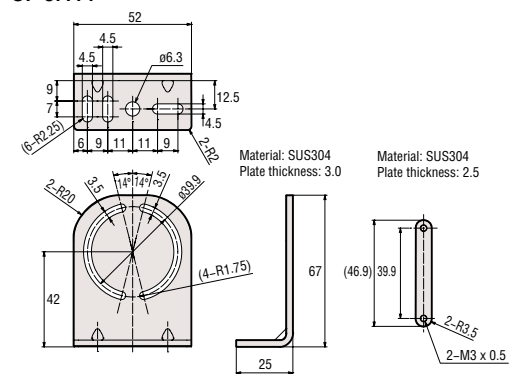
**OP-87773 +  
LR-TB5000/TB5000C/  
TB5000CL**



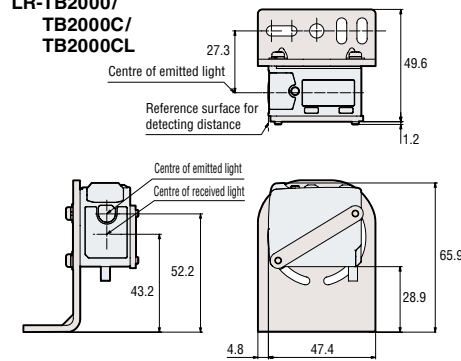
**■ Non-adjustable area when OP-87773 is used**



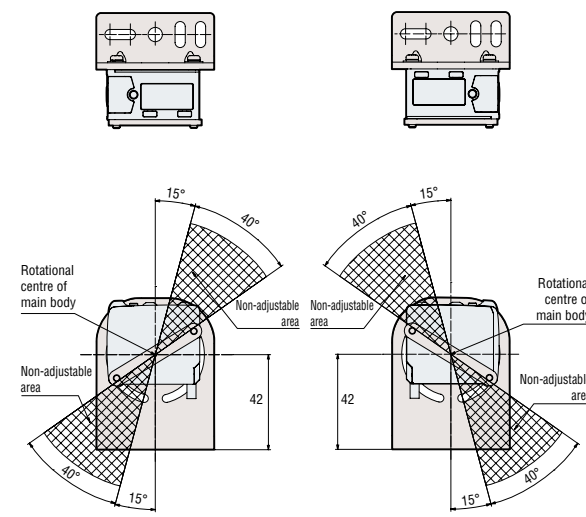
**OP-87771**



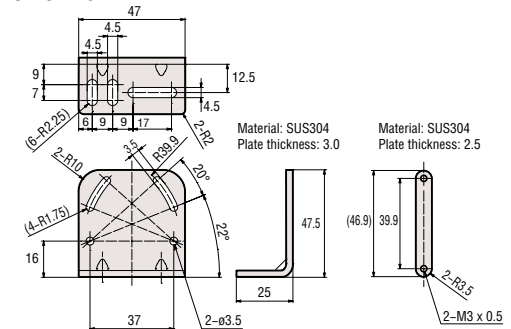
**OP-87771 +  
LR-TB2000/  
TB2000C/  
TB2000CL**



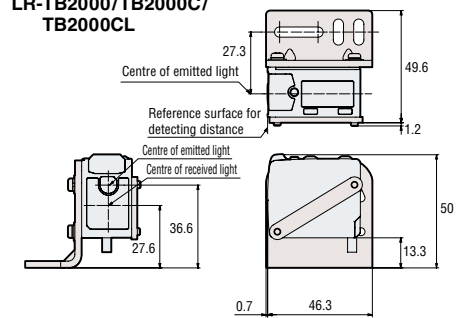
**■ Non-adjustable area when OP-87771 is used**



**OP-87770**

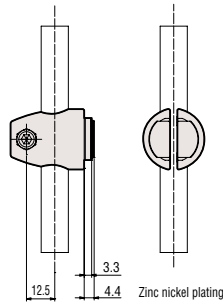
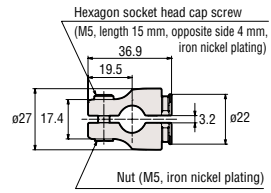


**OP-87770 +  
LR-TB2000/TB2000C/  
TB2000CL**

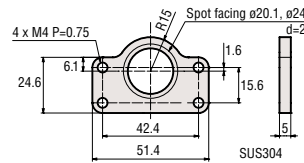


■ Dimensions

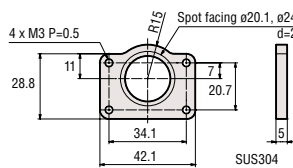
OP-87774/87772



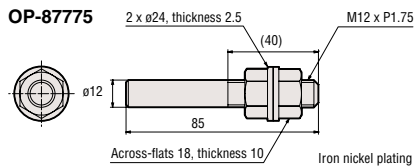
OP-87774



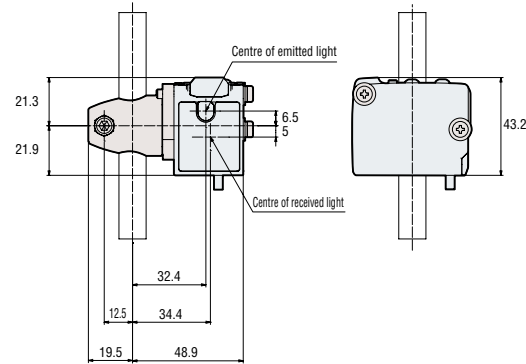
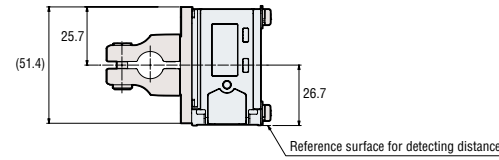
OP-87772



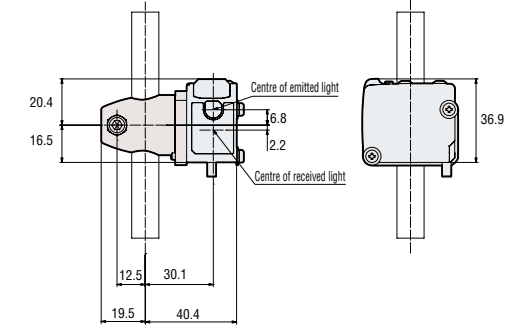
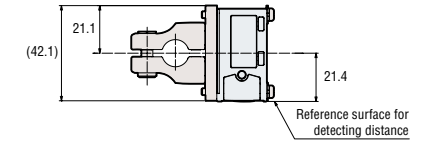
OP-87775



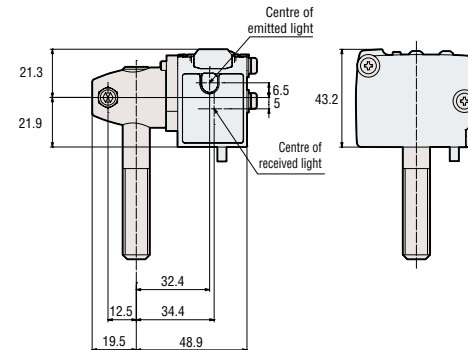
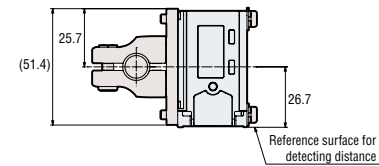
OP-87774 + LR-TB5000/TB5000C/TB5000CL



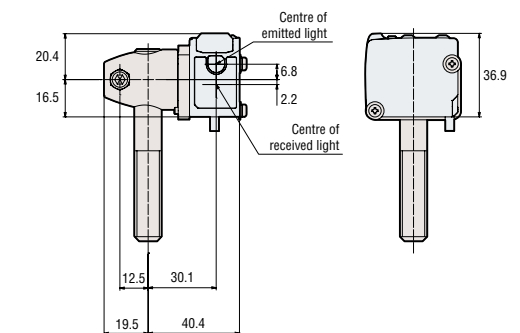
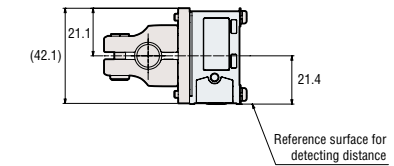
OP-87772 + LR-TB2000/TB2000C/TB2000CL



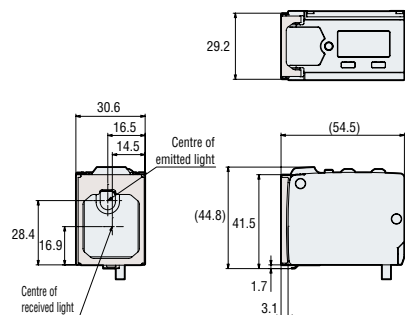
OP-87774 + OP-87775 + LR-TB5000/TB5000C/TB5000CL



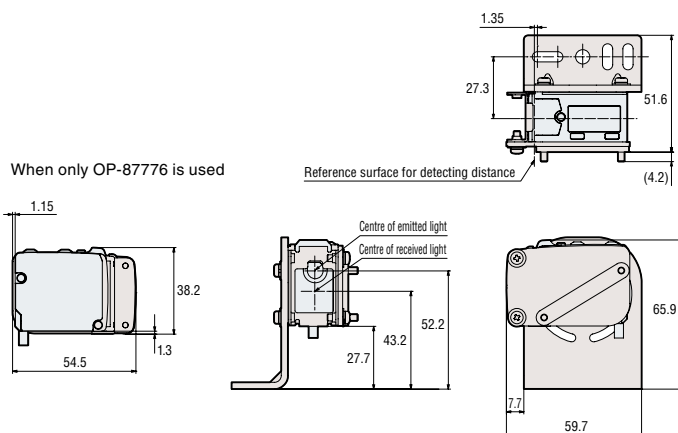
OP-87772 + OP-87775 + LR-TB2000/TB2000C/TB2000CL



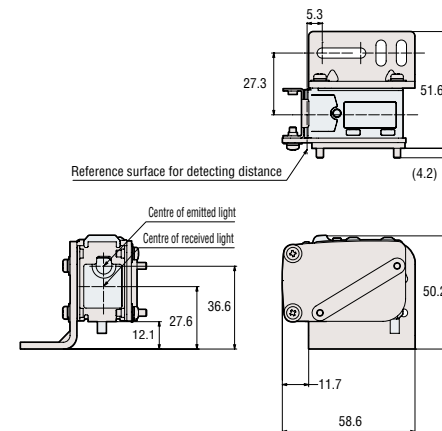
**OP-87778 +  
LR-TB5000/TB5000C/TB5000CL**



**OP-87776 + OP-87771 +  
LR-TB2000/TB2000C/TB2000CL**



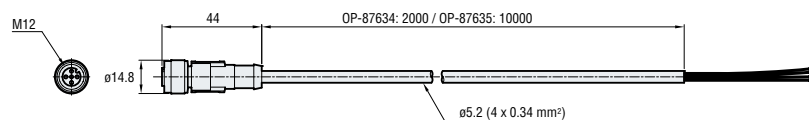
**OP-87776 + OP-87770 +  
LR-TB2000/TB2000C/TB2000CL**



M12 connector cable

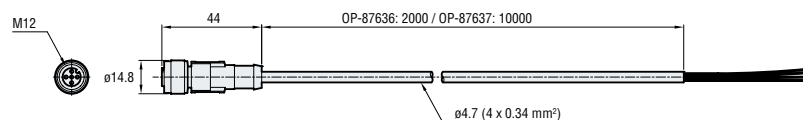
**OP-87634/87635**

OP-87634: Approx. 75 g  
OP-87635: Approx. 430 g



**OP-87636/87637**

OP-87636: Approx. 75 g  
OP-87637: Approx. 330 g



Pin layout

No.	Colour
①	Brown
②	White
③	Blue
④	Black

CAD DATA DOWNLOAD  
[www.keyence.co.uk/CADG](http://www.keyence.co.uk/CADG)



All-Purpose  
Laser Sensor

# LR-T SERIES

# KEYENCE

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#### SAFETY INFORMATION

Please read the instruction manual carefully in order to safely operate any KEYENCE product.

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