



\* FASTUS is a product brand of OPTEX FA.

# Non-Contact Thermometer

- Highly resistant to changes in ambient temperature
- Ring laser pointer for visual confirmation
- Easy-to-read full color display

IO-Link Compatible Non-Contact Thermometer

**TI-S Series**

Measurement range:  
-40 ... +500°C

Sensor Head TI-S30

Controller TI-SC (E)



OPTEX FA CO., LTD.

# Designed to minimize the effects of ambient temperature changes

When designing non-contact thermometers that can perform accurate temperature measurements, one of the major challenges is making them susceptible to ambient temperature changes and to reduce temperature drift. OPTEX FA has designed a sensor head that is less susceptible to external and internal temperature changes.



## Dual-layer metal construction

A dual heat-insulating structure is employed to suppress the effects of external temperature changes.



## Split PCB Layout

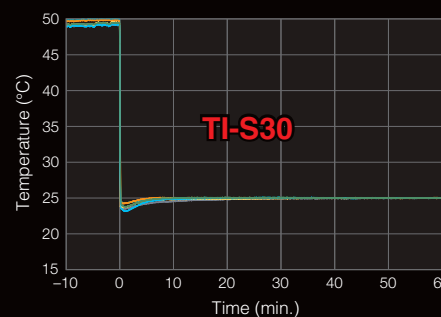
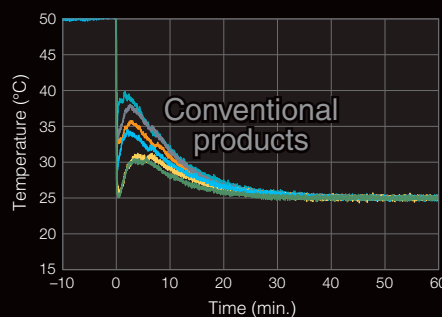
The circuit board was separated to avoid heat and noise. This design enables stable and reliable measurements.



# Measurement that is highly resistant to ambient temperature changes

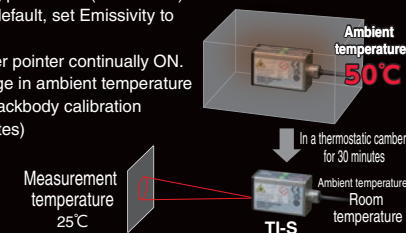
Temperature measurement in heating and cooling processes is often affected by temperature changes in the installation environment. The TI-S Series provides stable measurement even when faced with changes in ambient temperature. The graph on the right compares measured temperatures using a conventional product and the TI-S30. For the comparison, the sensor head was held in a 50°C thermostatic chamber for 30 minutes, then moved to a room-temperature environment and measured against a blackbody at 25°C.

## Comparison of conventional products and TI-S Series



## Measurement condition

- Blackbody: 25°C
- Sampling period: 1 s (TI-S30: 2 s)
- Factory default, set Emissivity to "1.0"
- Ring laser pointer continually ON.
- No change in ambient temperature during blackbody calibration (60 minutes)



## Equipped with a ring laser pointer

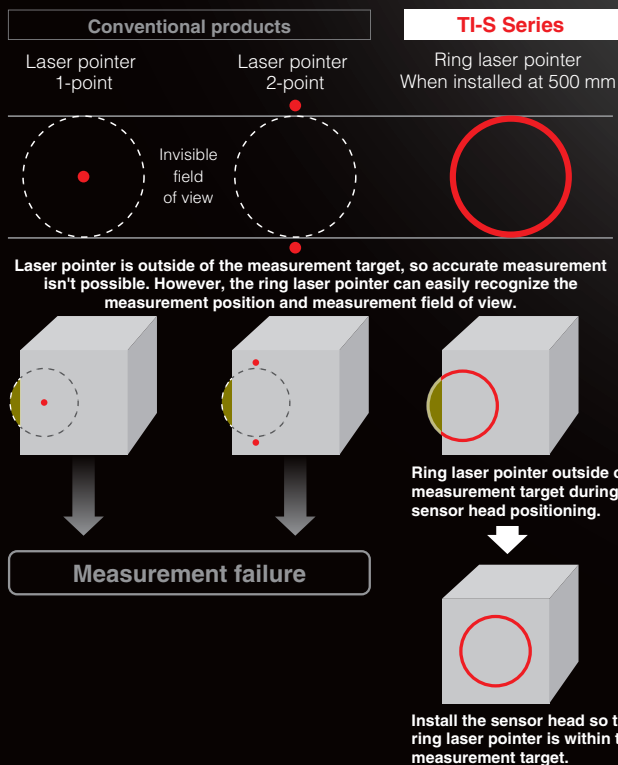
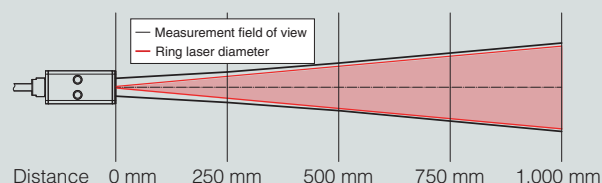
The ring laser pointer visually indicates the measurement position and measurement field of view. This allows you to make position adjustments easily while checking the measurement field of view, even in dark and small spaces. (Patent pending)

**First in Industry**

### Ring laser pointer for visual confirmation of field of view

Non-contact thermometers that measure infrared energy cannot accurately measure temperatures if part of the field of view is outside of the measurement target. Conventional laser pointers have only one or two points, so the field of view was not clear. TI-S Series has a ring laser pointer that clearly visualizes the field of view.

■ Relationship between the field of view and the ring laser pointer



# Flexible installation and easy operation

## [Sensor Head]

### Compact design

The compact (23 × 35 × 49.5 mm) size.

### Environmental resistance

Heat resistance up to an ambient temperature of 80°C (70°C when using the laser pointer), and IP67 degree of protection.

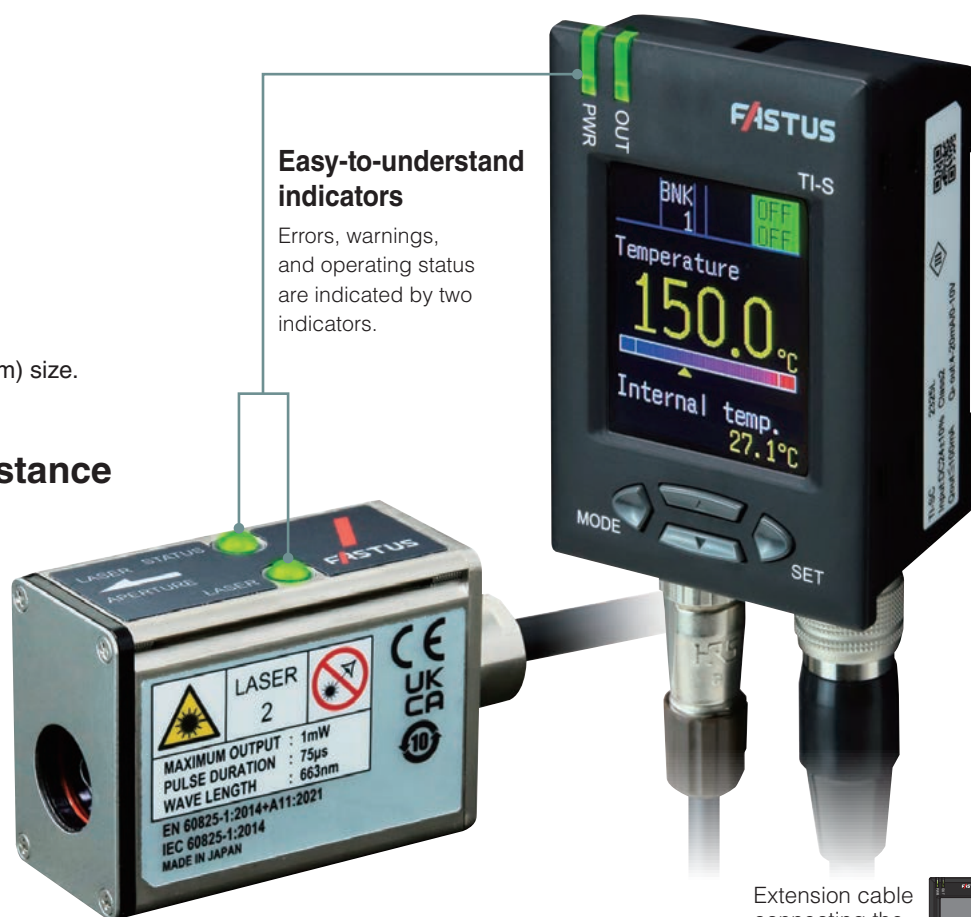
### Calibrate sensor heads directly

TI-S Series allows sensor heads to be detached from controllers, so they can be calibrated directly.



### Easy-to-understand indicators

Errors, warnings, and operating status are indicated by two indicators.



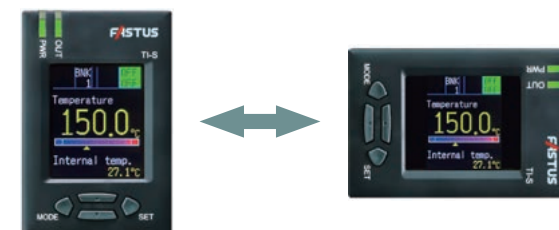
## [Controller]

### 1.8-inch full color TFT LCD

It is possible to display English, Simplified Chinese, and Japanese.

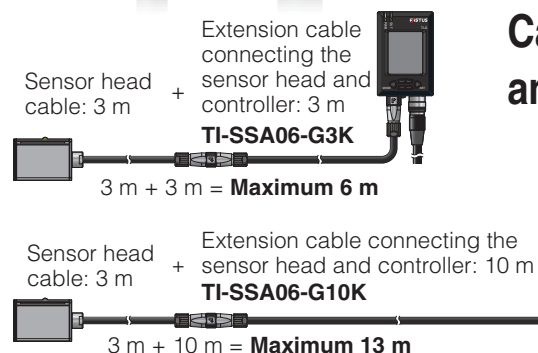
### Screen display can be rotated

The controller screen display can be rotated 360° in 90° increments.



### Cable length between sensor head and controller can be extended

Optional 3 m and 10 m extension cables are available.



# Wide-ranging interface and measurement functions

## Edge detection

### Detection of rapid temperature changes

Edge detection is provided, and detects when rapid temperature changes occurred. It is possible to only detect errors caused by temperature changes occurring within a short period of time.

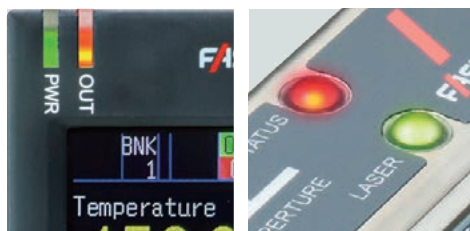
### Analog output

For analog output, current output (4 ... 20 mA) and voltage output (0 ... 10 V) can be selected.

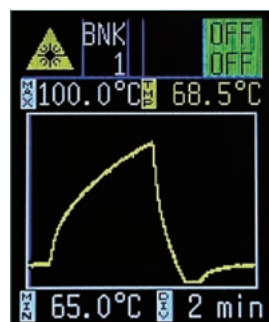
### Alarm output

(upper/lower limit settings)

An alarm can be output when the measured temperature is outside of the threshold.



Visible on sensor head status display



## First in Industry

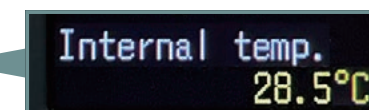
### Trend graph

A trend graph of the measured temperature can be displayed covering up to 24 hours.



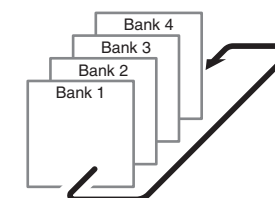
### Head internal temperature display

The head internal temperature is also continuously displayed. This allows use while checking the effects of the ambient temperature.



### Bank function (4 channels)

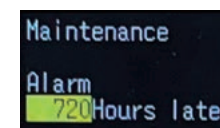
4 ch are installed for the bank function which can select (call) setting contents.



Up to four patterns can be saved for banks 1 to 4.

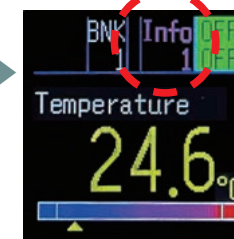
### Maintenance alarm

Maintenance timing alerts can be provided.



Presetting of maintenance timing

### Notifies by blinking



Notified automatically when the set time has elapsed.

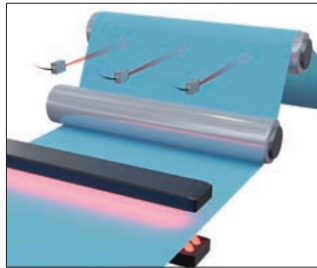
# Applications



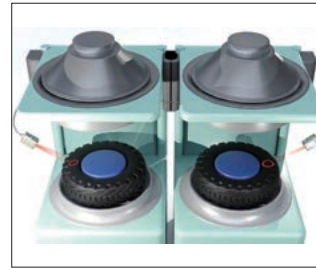
Evaluating solar panel lamination



Measuring temperature of chamber top plate



Measuring temperature of plastic



Controlling heating time in tire vulcanization processes



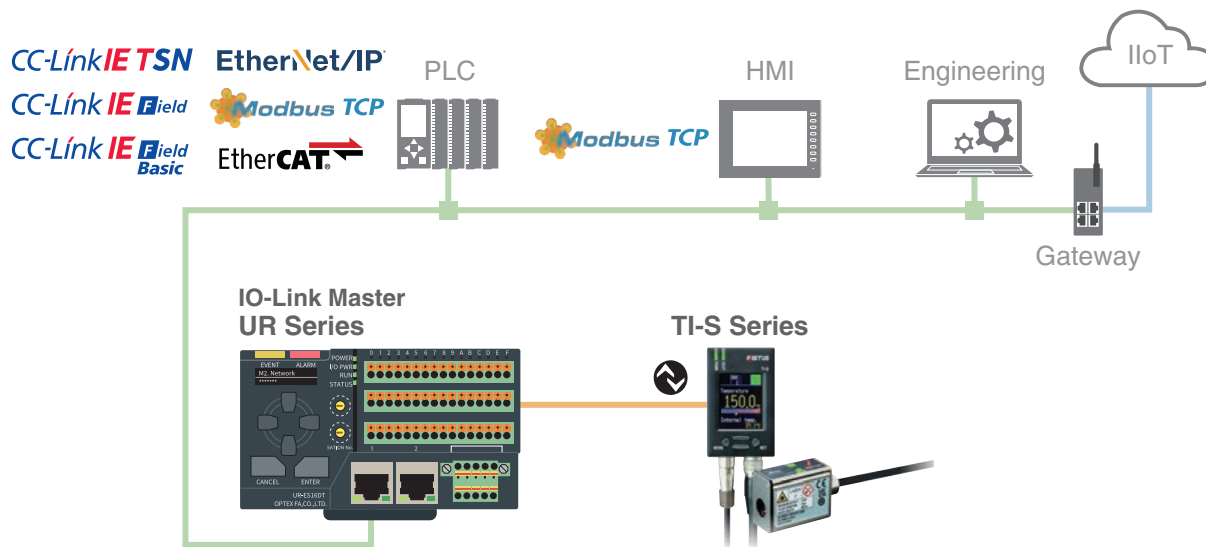
Measuring temperature in rubber extrusion processes



Detecting presence of hot-melt adhesive

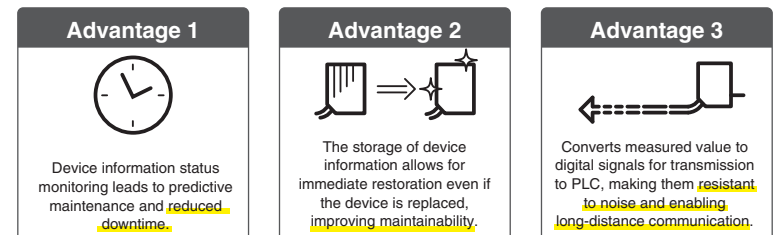
## IO-Link communication supported IO-Link

### System overview



IO-Link is a technology that connects sensors and actuators to Industrial Ethernet using digital signals to promote smart factories. Measurements can be obtained directly as digital values, reducing the need for analog input. Noise resistance, cost reduction, and predictive maintenance are achieved.

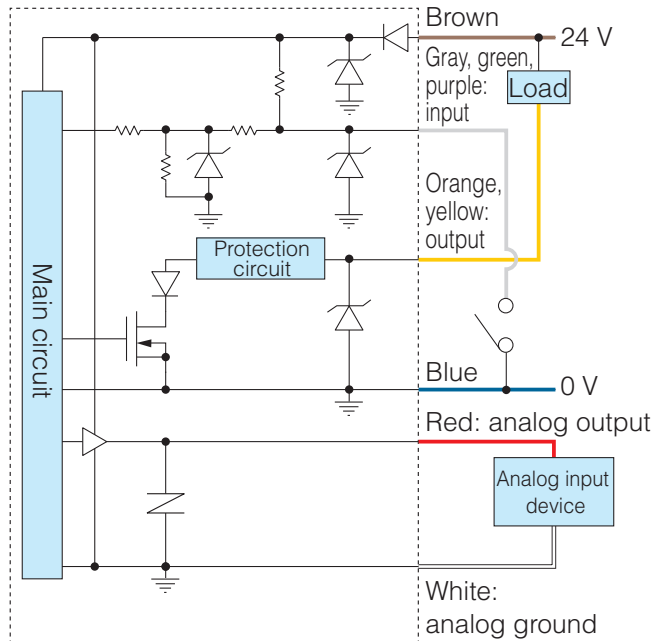
### Three advantages of introducing IO-Link



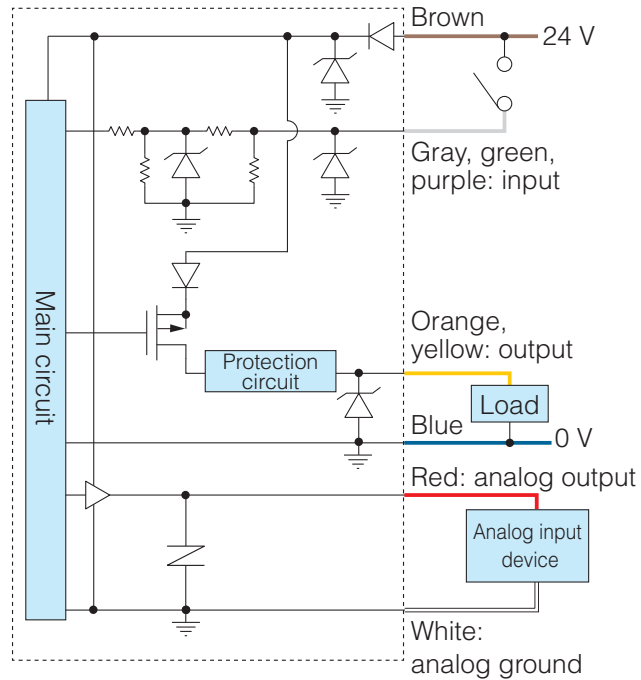
## I/O circuit diagrams

### General-purpose I/O cable

#### NPN setting



#### PNP setting



#### Lead wire functions

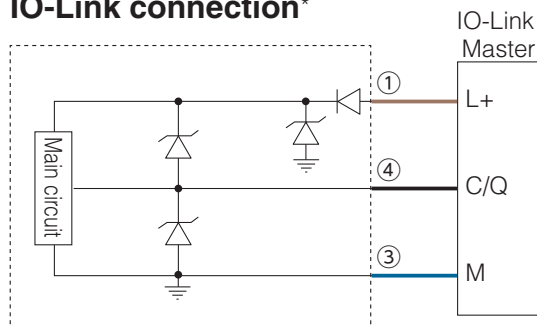
Wire color	Description
Brown	+V (24 VDC)
Gray	Laser control input
Green	Hold input/bank select*
Purple	Trigger input/bank select*
Orange	Upper limit alarm output
Yellow	Lower limit alarm output
Blue	Ground (0 V)
Red	Analog output
White	Analog ground

\* Operates as bank select input when Measurement mode is set to Normal.

#### Lead wire functions during bank select

Bank number	Lead wire color	
	Green	Purple
1	OFF	OFF
2	OFF	ON
3	ON	OFF
4	ON	ON

### IO-Link connection\*

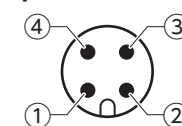


\* When using NPN settings for an IO-Link connection, use OPTEX FA's IO-Link Master UR Series or IO-Link Master with sink support.

#### IO-Link cable lead wire/connector pin functions

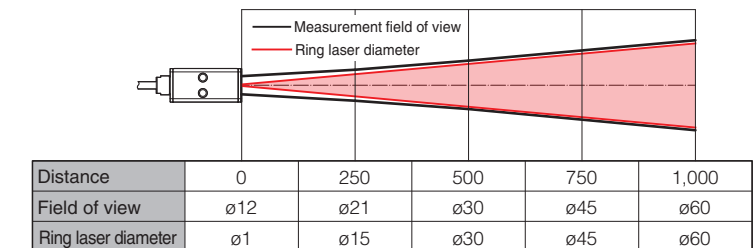
Wire color	M12 connector pin No.	Description
Brown	①	L+
Black	④	C/Q
Blue	③	M

#### M12 connector pin No.



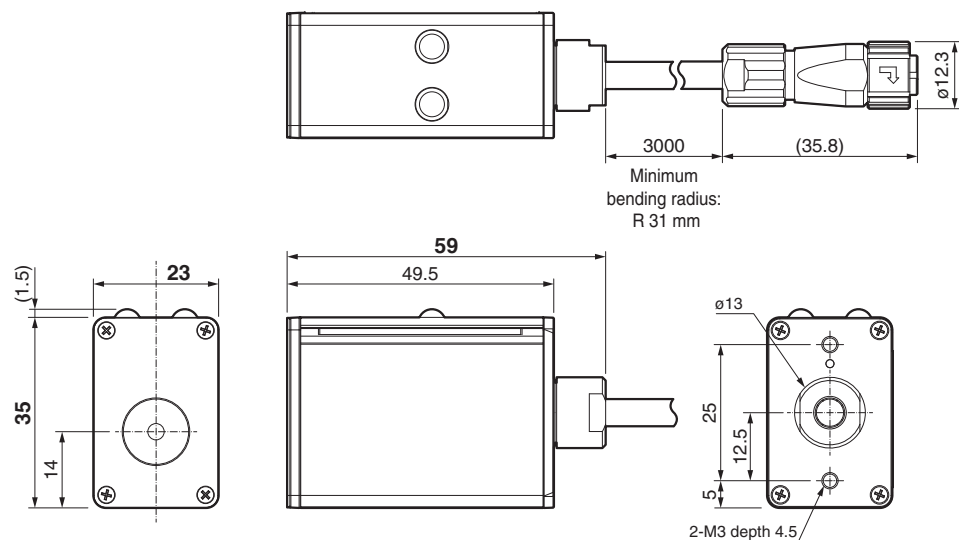
\* ② is not used.

### Field of view (Unit: mm)

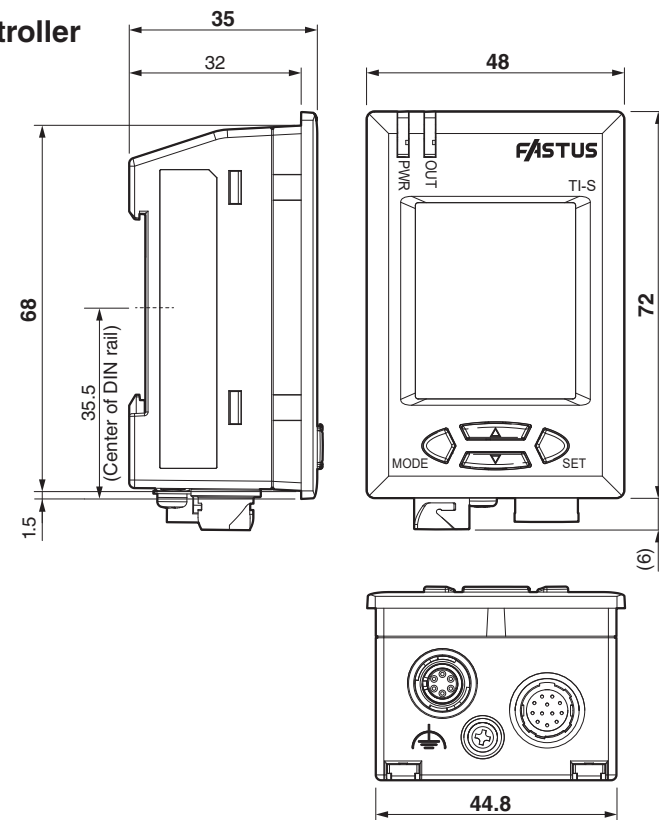


## ■ Dimensions (Unit: mm)

### Sensor head



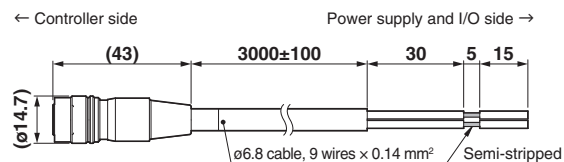
### Controller



### Connection cable (Option)

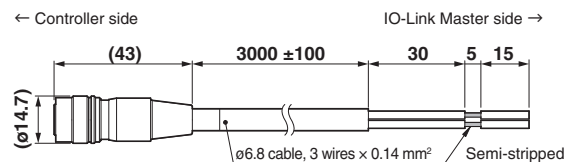
#### General-purpose I/O cable: TI-SCA09-G3K

Minimum bending radius (Stationary position): R 42 mm



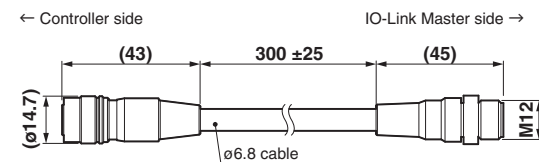
#### IO-Link cable: TI-SCA03-G3K

Minimum bending radius (Stationary position): R 42 mm



#### IO-Link cable: TI-SM1203-G03K

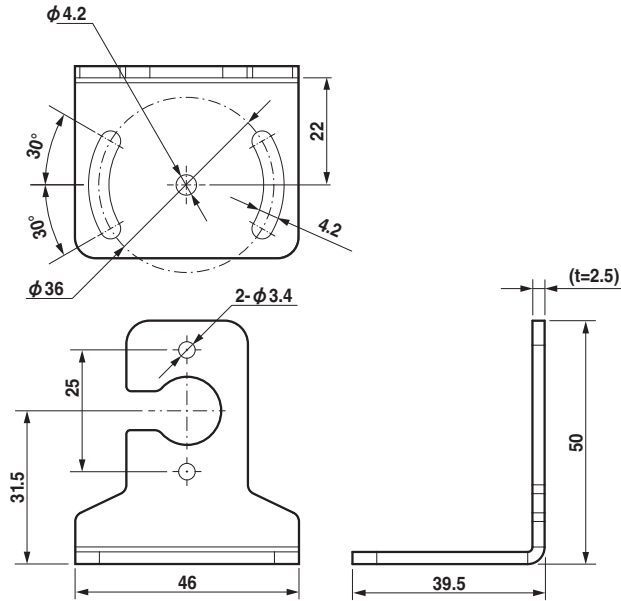
Minimum bending radius (Stationary position): R 42 mm



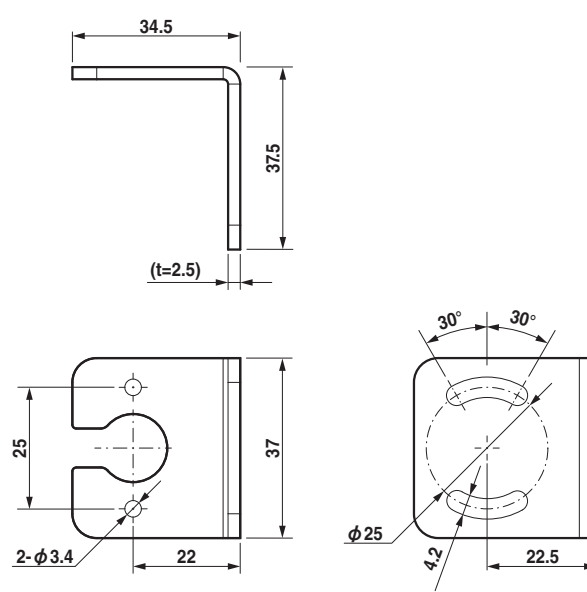
\* For the dimensions of the extension cable and mounting brackets, refer to the OPTEX FA website.

## Mounting brackets for sensor head

BEF-TISH-B (Option)

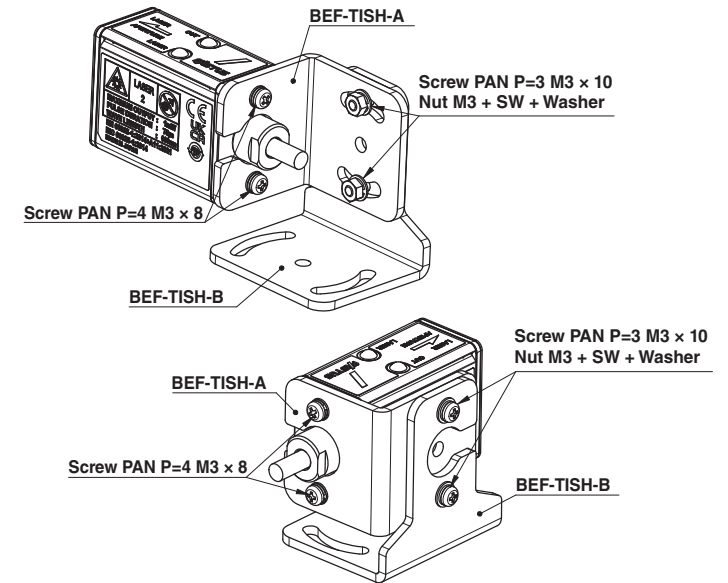


BEF-TISH-A (Option)



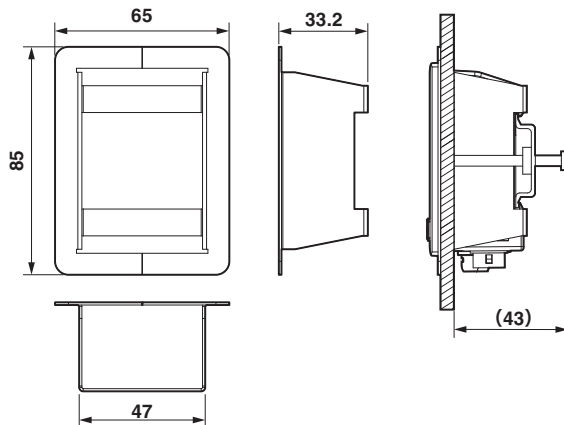
BEF-TISH-AB (Option)

2-axis mounting bracket assembly image



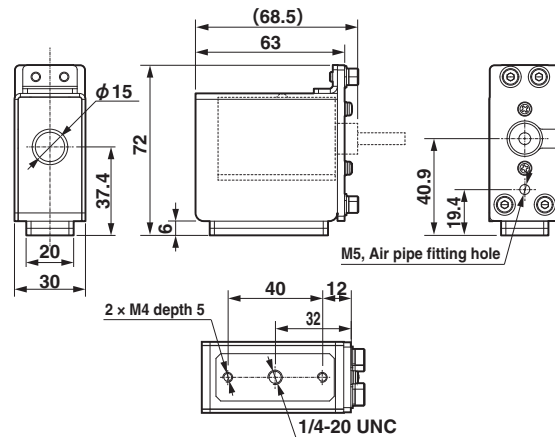
## Mounting bracket for controller

BEF-TISC-BKT (Option)

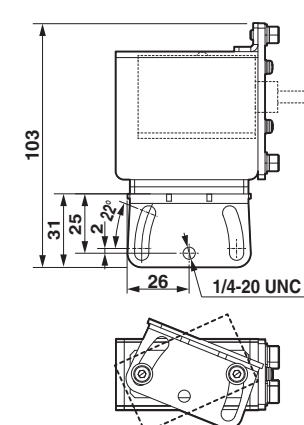


## Air purge kit

TI-S30-AP (Option)



With mounting bracket



# Options

## ■ Connection cables

\* The controller does not come with a cable to connect an external device.  
To connect the controller with an external device, please purchase one of the following connection cables.

### General-purpose I/O cable

TI-SCA09-G3K Open-end cable

### IO-Link cable

TI-SCA03-G3K Open-end cable

Minimum bending radius

(Stationary position):

R 42 mm



### IO-Link cable

TI-SM1203-G03K

M12 4-pin plug

Minimum bending radius

(Stationary position):

R 42 mm



## ■ Extension cables

### Extension cable connecting the head and controller

TI-SSA06-G3K (Cable length: 3 m)

TI-SSA06-G10K (Cable length: 10 m)

Minimum bending radius (Stationary position):

R 31 mm



## ■ Mounting brackets

For sensor head

BEF-TISH-B

(Floor mounting bracket)



For sensor head

BEF-TISH-A

(Wall mounting bracket)



For sensor head

BEF-TISH-AB

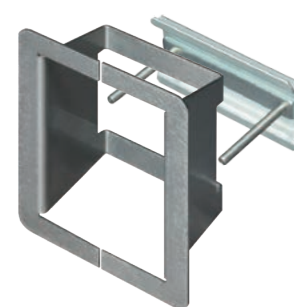
(2-axis mounting bracket)



For controller

BEF-TISC-BKT

(Panel mounting bracket)



Panel mounting bracket  
installation image



## ■ Air purge kit

### Air purge kit for TI-S30

TI-S30-AP

Air purge kit for TI-S30 to prevent lens contamination  
Air flows in front of the lens to protect it from dust and dirt

\*Air pipe fitting are not included. Please attach a commercially available product.

Model	TI-S30-AP
Air flow rate	2 ... 10 L/min
Ambient temperature	0 ... +80°C
Ambient humidity	35 ... 85% RH (no condensation)
Applicable standards	EU RoHS (2011/65/EU)
Material	Stainless steel
Weight	Approx 300 g



Air purge kit assembly image



## ■ Black body tape for non-contact thermometer

HB-250

Heat resistance temperature: 250°C

Tape width: 60 mm, Tape length: 2 m



## Specifications

### [Sensor Head]

Model	TI-S30
Measurement range <sup>*1</sup>	-40 ... +500°C
Display range <sup>*1</sup>	-50 ... +510°C
Field of view	ø30 mm at 500 mm
Optics	Silicon lens
Sensing element/spectral response	Thermopile 8 ... 14 µm
Response time (operating mode)	High speed, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s * Output response 90% <sup>*2</sup>
Accuracy <sup>*3</sup>	-40 ... 0°C: ±1.5°C +1 ... +200°C: ±1°C +201 ... +500°C: ±0.5% of reading value
Repeatability	±0.5°C (when operating mode is 100 ms)
Temperature drift	Within ±0.25°C/°C
Emissivity adjustment	0.100 ... 1.200
Supply voltage	5 VDC (Supplied from controller)
Current consumption	30 mA or less/5 VDC
Connection type	Pigtail cable 3 m
Minimum bending radius	R 31 mm
Total cable length	Max. 13 m (pigtail cable 3 m + extension cable 10 m)
Laser pointer	Medium Red semiconductor laser
	Wavelength 663 nm
	Maximum output 1 mW
Laser class (JIS/IEC/FDA) <sup>*4</sup>	CLASS 2
Environmental resistance	Degree of protection IP67 (IEC 60529)
	Ambient temperature 0 ... +80°C (up to +70°C during laser emission)
	Ambient humidity 35 ... 85% RH (no condensation)
	Storage temperature -20 ... +80°C
	Vibration resistance 10 ... 55 Hz Double amplitude 1.5 mm 2 hours in each of the X,Y and Z directions
	Shock resistance 500 m/s <sup>2</sup> (Approx. 50 G) 3 times in each of the X,Y and Z directions
Applicable regulations	EMC EMC Directive (2014/30/EU) UK EMC (The Electromagnetic Compatibility Regulations 2016) FCC Part 15 subpart B
	Environment RoHS Directive (2011/65/EU), China RoHS (MIIT Order No. 32) UK RoHS (The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012)
	Safety FDA Regulation (21 CFR 1040.10 and 1040.11 <sup>*5</sup> )
Applicable standards	EN/IEC 61326-1
Material	Case: Aluminum, Front plate: Stainless steel
Weight	Approx. 180 g (including connector cable)

- \*1: If the measured temperature is below -50°C (lower limit display temperature), the displayed temperature is -50°C.  
If the measured temperature is above 510°C (upper limit display temperature), the displayed temperature is 510°C.
- \*2: The response time is the time it takes for the output change to reach 90%.
- \*3: Measurement conditions: Emissivity: 1.000, Ambient temperature: 23 ±5°C, Size of the measurement target; sufficiently larger than the field of view.
- \*4: In accordance with the FDA provisions of Laser Notice No. 56, the laser is classified per the IEC 60825-1:2014 standard.
- \*5: Excluding differences per Laser Notice No. 56.
- \* To convert temperature values such as measurement temperature range and accuracy to Fahrenheit temperature, use (Fahrenheit temperature = Celsius temperature x 1.8 + 32).
- \* To convert relative values such as repeatability and temperature drift to Fahrenheit temperatures, use 1°C = 1.8°F.



### [Controller]

Model	TI-SC (E)
Rating	Supply voltage 24 VDC ±10% (when using a general-purpose I/O cable) 18 ... 30 VDC (when using an IO-Link cable)
	Current consumption 180 mA (when using a general-purpose I/O cable) <sup>*1</sup> 50 mA (when using an IO-Link cable)
Display resolution	0.1°C/°F
Temperature unit	Celsius "°C"/Fahrenheit "°F"
Measurement mode	Normal/Sample hold/Peak hold/Valley hold/Edge detection
Response time (operating mode)	High speed, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s Output response 90% <sup>*2</sup>
Analog output/IO-Link update time	High speed: 2.5 ms 50 ms ... 2 s: 5.0 ms 5 s ... 20 s: 100 ms
Analog output	Resolution 10,801 steps
	Accuracy Voltage ±0.2% of F.S. (at ambient temperature of 25°C) Temperature coefficient (typical): ±22 ppm/°C (±0.0022%/°C)
	Current ±0.2% of F.S. (at ambient temperature of 25°C) Temperature coefficient (typical): ±4 ppm/°C (±0.0004%/°C)
Indicator	Display 1.8-inch TFT LCD Display language: English, Simplified Chinese, Japanese
	Power indicator When power is ON: lights in green, IO-Link communication: blinks in green
	Output indicator Normal measurement alarm output is OFF: lights green Normal measurement alarm output is ON: lights red When minor warning occurs: blinks green When major warning occurs: blinks orange When error occurs: blinks red
Interface	Alarm output NPN/PNP open collector (selectable by setting) 1 output: Max. 100 mA, 2 outputs: Max. 100 mA Residual voltage NPN: 1.6 V or less, PNP: 3.4 V or less
	Output mode N.O./N.C.
	External input Laser off, Hold, Trigger
	Analog output Current 4 ... 20 mA load impedance: 150 ... 500 ohm
	Voltage 0 ... 10 V output impedance: 200 ohm or less
Timer mode	One shot/delay (ON delay, OFF delay) One shot: 0.01 ... 10.00 sec, Delay: 0.00 ... 10.00 sec
IO-Link	Revision 1.1.3
	Baud rate COM 3 (230.4 kbps)
	Number of process input data bytes 4 bytes
	Number of process output data bytes 1 byte
	Minimum cycle time 0.5 ms
	Data storage class Data Storage Class 1: automatic DS

Model	TI-SC (E)
Connection type	General-purpose I/O cable 3 m cable 9 wires, Minimum bending radius: R 42 mm
	IO-Link cable Open-end 3 m cable 3 wires, Minimum bending radius: R 42 mm
	M12 4-pin connector 0.3 m cable, Minimum bending radius: R 42 mm
Environmental resistance	Degree of protection IP40 (IEC 60529)
	Ambient temperature 0 ... +50°C
	Ambient humidity 35 ... 85% RH (no condensation)
	Storage temperature -20 ... +70°C
	Vibration resistance 10 ... 55 Hz Double amplitude 1.5 mm 2 hours in each of the X,Y and Z directions
	Shock resistance 500 m/s <sup>2</sup> (Approx. 50 G) 3 times in each of the X,Y and Z directions
Applicable regulations	EMC EMC Directive (2014/30/EU) UK EMC (The Electromagnetic Compatibility Regulations 2016) FCC Part 15 subpart B
	Environment RoHS Directive (2011/65/EU) UK RoHS (The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012) China RoHS (MIIT Order No. 32)
Applicable standards	EN/IEC 61326-1
Material	Case: ABS
Weight	Approx. 80 g

- \*1: Includes alarm output load current and analog output current.
- \*2: The response time is the time it takes for the output change to reach 90%.
- \* To convert temperature values such as measurement temperature range and accuracy to Fahrenheit temperature, use (Fahrenheit temperature = Celsius temperature x 1.8 + 32).
- \* To convert relative values such as repeatability and temperature drift to Fahrenheit temperatures, use 1°C = 1.8°F.

## ■ Product calibration

The non-contact thermometers of OPTEX FA are calibrated based on our traceability system using a standard traceable to national standards. OPTEX FA can carry out periodic calibration (for a fee) after purchase. If you require calibration certificate documents, we provide a set of three documents: Certificate of Calibration, Report of Calibration, and Traceability Chart.



**OPTEX  
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