KEYENCE

cRUus CE

Infrared Temperature Sensor Lineup

I-$\frac{\textit{Intelligent Sensor}}{\textit{SERIES}}$

Mid to Low Temperature, Small Spot
FT-H10

Mid to Low Temperature, Mid-Range
FT-H20

Mid to Low Temperature, Long-Range
FT-H30

Mid to Low Temperature, Ultra Long-Range
FT-H50

High Temperature, Mid-Range
FT-H40K

High Temperature, Ultra Long-Range
FT-H50K

1146
1283
1350℃
1324
58

New High
Temperature Sensors

View the surface temperature with non-contact technology.
New high-temperature and ultra long-range models have been added
to the lineup of FT Series Digital Infrared Temperature Sensors

Sensor head
High Temperature Model 0 to 1350℃

High Temperature,
Ultra Long-Range
FT-H50K

High Temperature,
Mid-Range
FT-H40K

Sensor head
Mid to Low Temperature Model 0 to 500℃

Mid to Low Temperature,
Ultra Long-Range
FT-H50

Mid to Low Temperature,
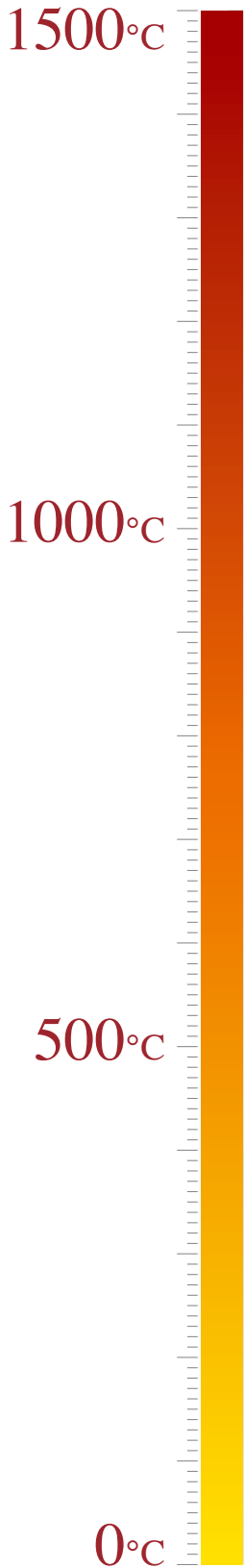Long-Range
FT-H30

Mid to Low Temperature,
Mid-Range
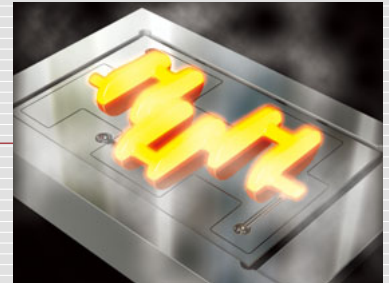FT-H20

Mid to Low Temperature,
Small-Spot
FT-H10

Amplifier Unit
FT-50AW
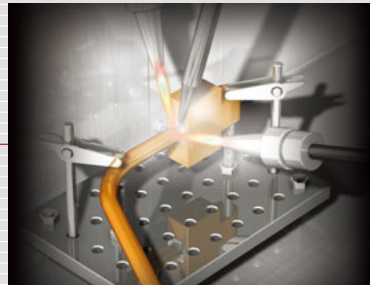(DIN rail mounting type)

Suitable for a wide range of applications

1500°C
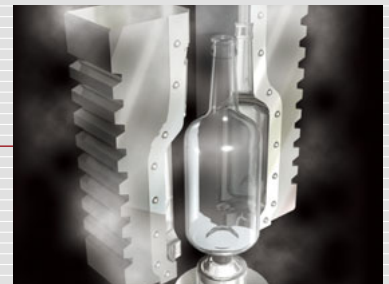
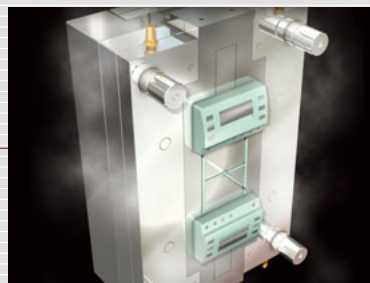Casting, Die-casting   450 to 1350°C

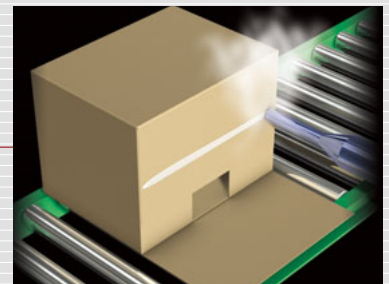Forging   200 to 1300°C
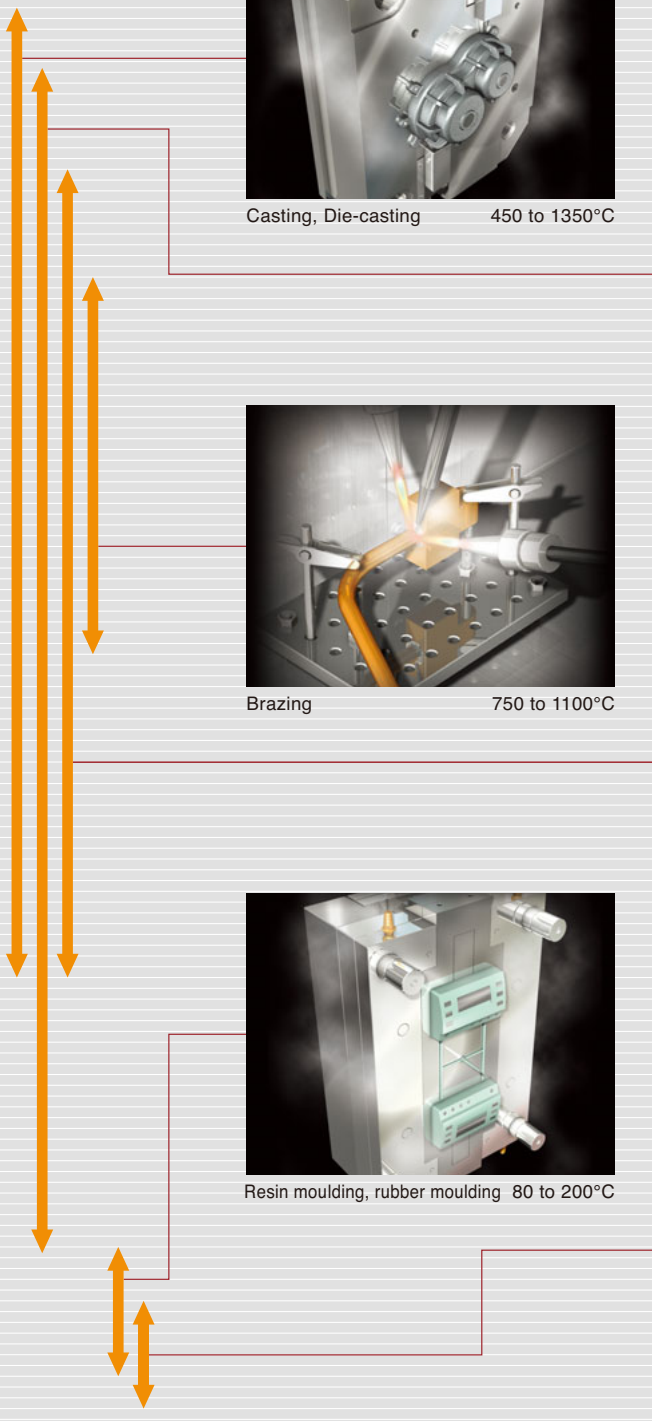
1000°C

Brazing   750 to 1100°C

Glass Forming   450 to 1200°C

500°C

Resin moulding, rubber moulding   80 to 200°C

Bonding (hot melting)   50 to 150°C

0°C

Temperature Management Applications
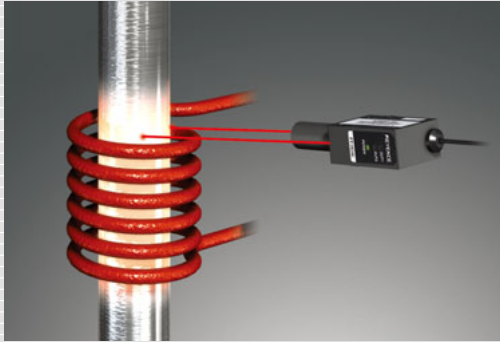
High-frequency induction heating
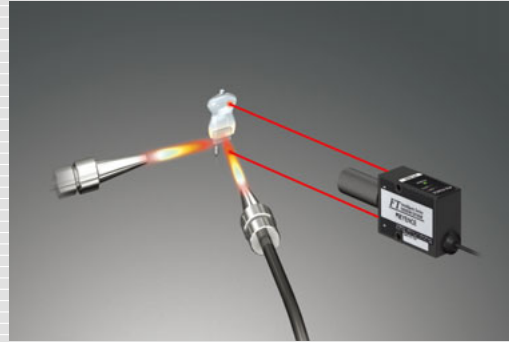
Glass sealing
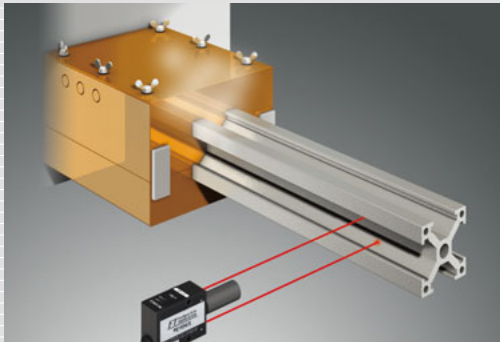
Extrusion mouldings

Cooling glass

Hardening

Temperature measurement of illuminated lamps

Drying process

Soldering

Furnace and aging for electronic components

Film moulding

Tape sealing

Laminating

Residual heat of preformed bottles (before blow-forming)

Baked goods

Shrink Wrapping
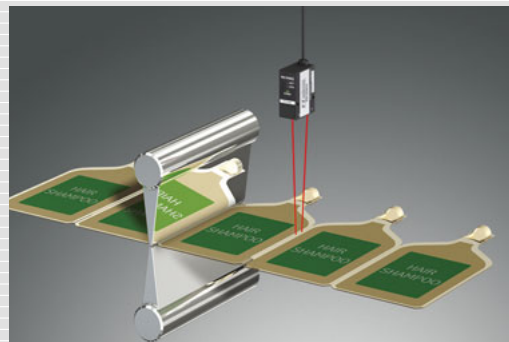
Heat sealing

Easily Control Surface Temperature

F ast

15-ms high-speed response

KEYENCE has significantly increased the responsiveness of the thermopile that detects temperatures in the FT Series by:
1. Thinning a far-infrared resonance film to the minimum thickness.
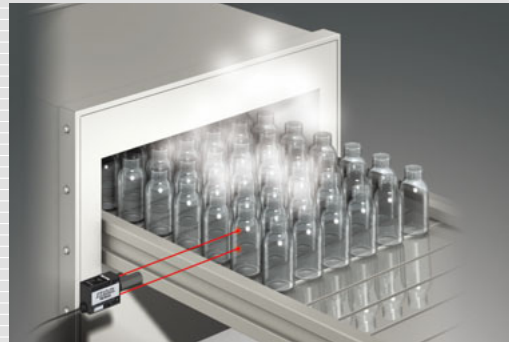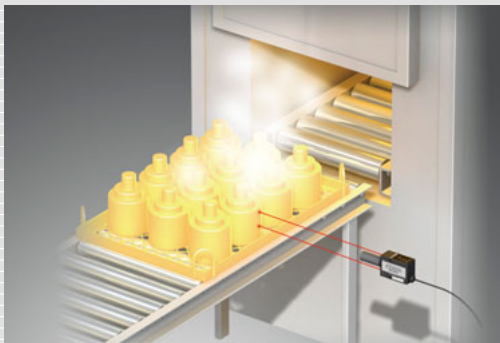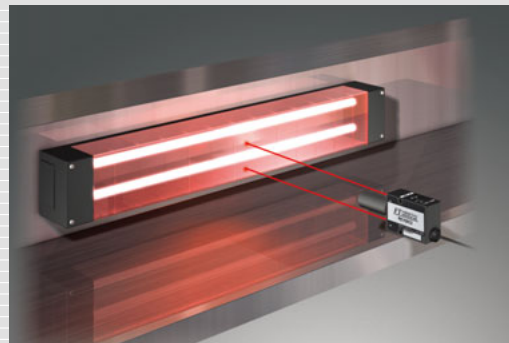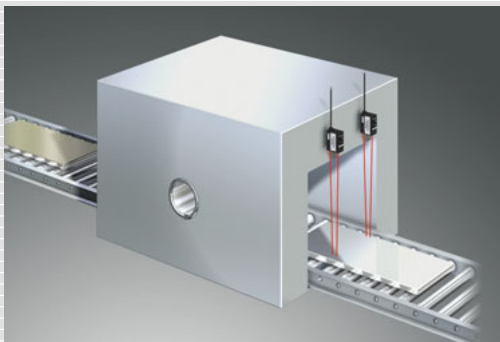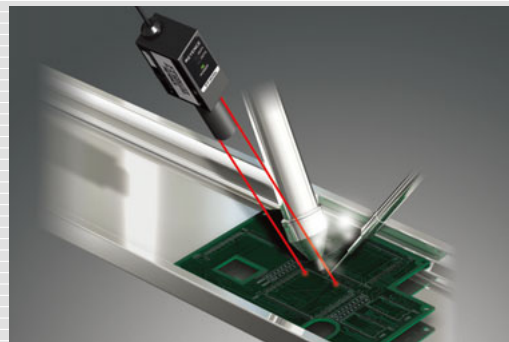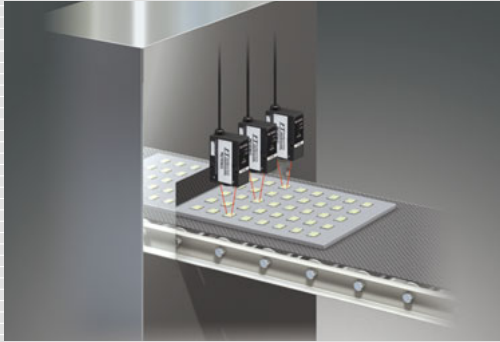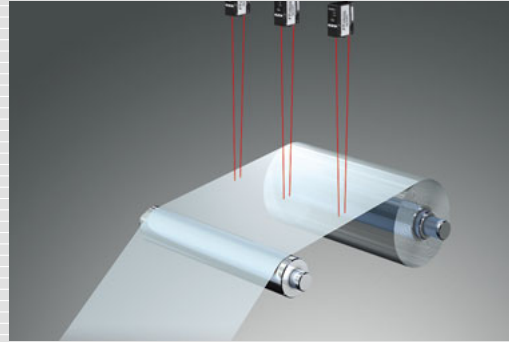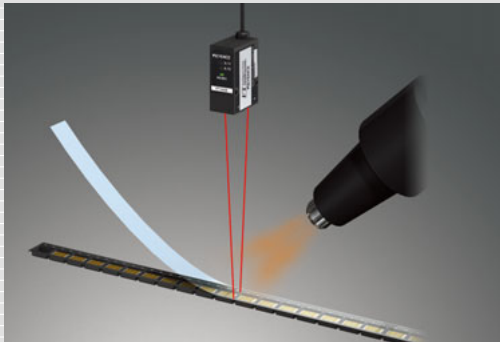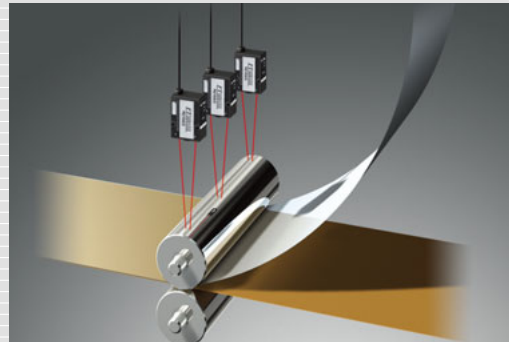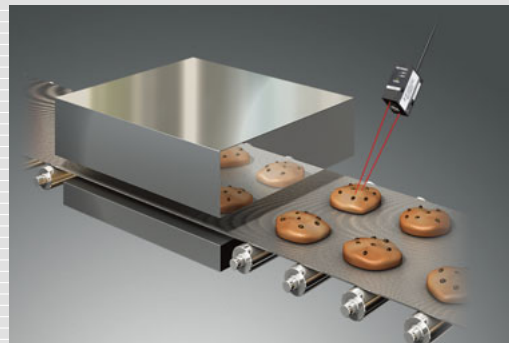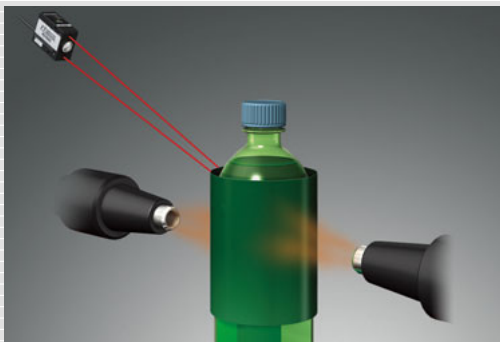2. Positioning thermocouples in a geometrically efficient way and detecting the absorbed heat quickly and accurately.

Far-infrared resonance film

Thermocouple

Thermopile chip of approx. 0.6 mm x 0.6 mm

0.6 mm
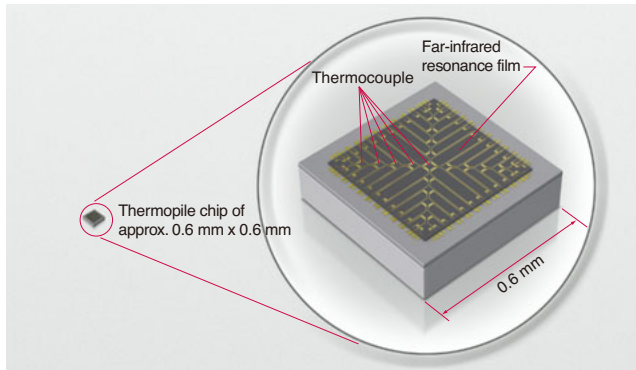
* The typical response speed is 10 ms and the highest response speed is 15 ms.

LA ser

Laser pointer

Two laser pointers* clearly indicate the detection range making sensor installation simple.

* Class 1 Laser Product
  (IEC60825-1, FDA (CDRH) Part1040.10)

Digital Amplifier Functions

KEYENCE kept the user-friendly menu structure and easy-to-read digital display.

The FT-50AW(P) and FT-55AW(P) come with functions that can be used on-site, eliminating complexity and difficulty.

Complex setting calculations are now automatic

In the past, the correct temperature was displayed only when the emissivity that matched the material of the detection object was set because each material provides a specific emissivity. For the FT Series, the user only has to enter the current temperature of the detection object. This is because the FT Series automatically calculates the emissivity from the entered current temperature. The user doesn't have to worry about complex emissivity calculations.

What is the emissivity?	Example
If two different materials have the same temperature, the quantity of far-infrared rays being emitted by each differs. Emissivity is based on a scale from 0 to 1 of the quantity of far-infrared rays being emitted from that material.	Water: 0.92 to 0.96 Plastic: 0.85 to 0.95 Stainless steel: 0.45 Ceramic: 0.90 to 0.94

Surface temperature

Emissivity

Surface temperature
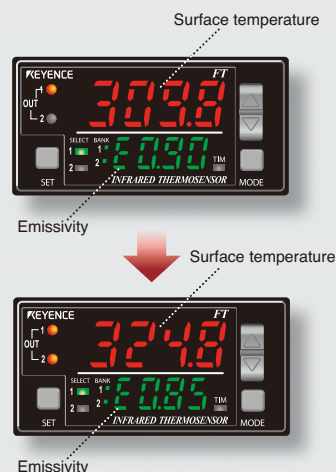
Emissivity

1. Enter the surface temperature directly.

2. Pressing the "SET" button calculates and sets the optimum emissivity automatically.

Small

5 times smaller than conventional sensors `Smallest in its class`

A cylindrical housing with the detecting element inside is suspended inside of the sensor head. This gives a thermal air-buffer between the sensor and the ambient air allowing the sensor size to be minimised.

Conventional sensor

FT Series
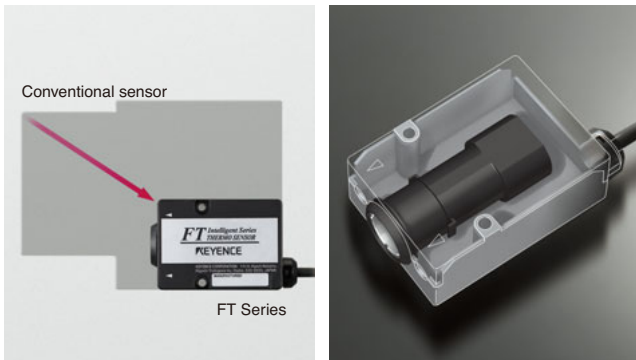
High stability

High stability

To maximise the sensor's stability (the most important element of a sensor) KEYENCE developed an IPC circuit*. This and the suspended sensor design make up the heart of **the FLASH Thermo.**

*IPC stands for Integral Protection Circuit. This circuit performs an averaging process based on integration. It is a dedicated circuit developed to increase stability.

FT Series

The FT Series displays stable temperatures under varying conditions.

Other functions that expand the scope of applications

Analogue monitor outputs*
The FT-50AW (P) and FT-55AW (P) provide analogue monitor outputs (4 mA to 20 mA) corresponding to the displayed values. Setting the upper and lower limit values provides simple scaling.

❚ **Initial status**

Analogue output (mA)
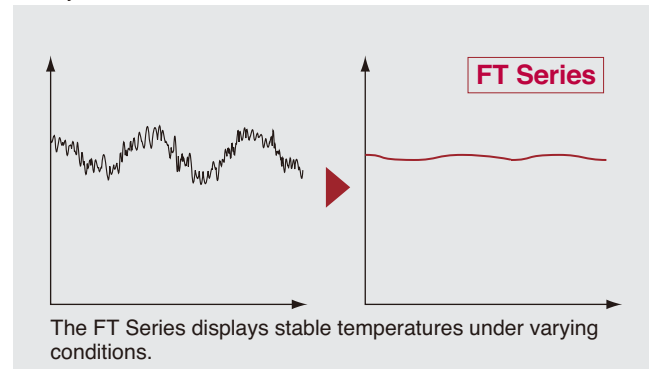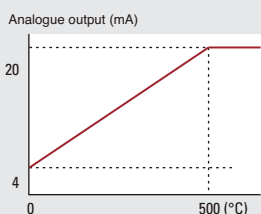
20

4

0   500 (°C)

❚ **When the lower limit value is 200°C and the upper limit value is 400°C**

Analogue output (mA)

20

4

0   200   400 500 (°C)
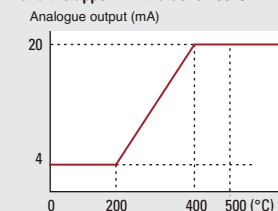
2 outputs x 4 banks
The FT-50AW (P) and FT-55AW (P) can each store two upper-limit outputs and two lower-limit outputs. They can also be configured for up to 4 emissivities. This eliminates the need to reset emissivities for each product changeover.

Display Hold function
In the past, (amplifiers before the FT-50AW (P) and FT-55AW (P)), it was difficult to confirm the surface temperature of workpieces moving at high speed. The Display Hold function enables the user to confirm the surface temperature of moving workpieces at their own speed since it can store and display the instantaneous maximum temperature.

Timing function*
The Timing function only displays the upper and lower temperatures when the timing input is on. This prevents unnecessary temperature readings like that of the conveyor or background oven regardless of where they fall with respect to the upper and lower temperature settings.

IR mode
The IR mode displays the quantity of far-infrared rays received by the thermopile so that it acts like an intensity sensor. Because of this, the FT-50AW (P) and FT-55AW (P) could be used just like a photoeye to detect presence or absence of hot materials.

Power Saving function
The Power Saving function provides simplified display when the sensor is left alone for a fixed time.

* If the Analogue Monitor Output function or the Timing function is used, up to two banks can be used. If both functions are used, only one bank can be used.

How to select an FT Series sensor

Step1 — Select a sensor head based on temperature and measuring distance

1 Select by temperature

High temperature model 0 to 1350°C
FT-H50K/FT-H40K

Mid to low temperature model 0 to 500°C
FT-H50/FT-H30/FT-H20/FT-H10

2 Select by distance

FT-H10

FT-H20

FT-H30

For the FT-H20 and FT-H30 models, the laser pointers appear to rotate clockwise as they travel farther from the source, as shown in the drawing above.
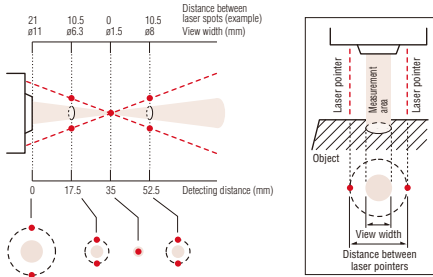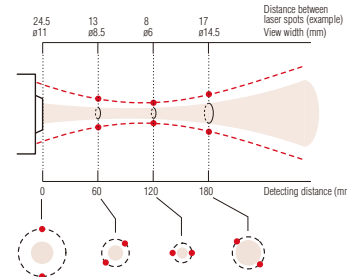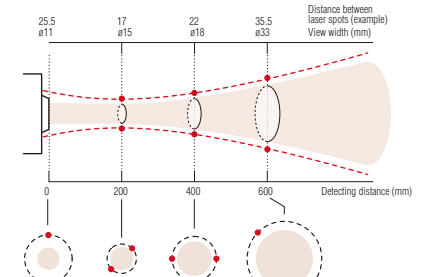
FT-H40K
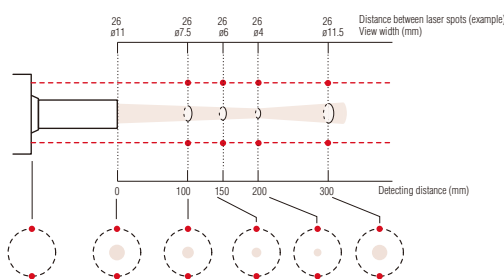
FT-H50/FT-H50K
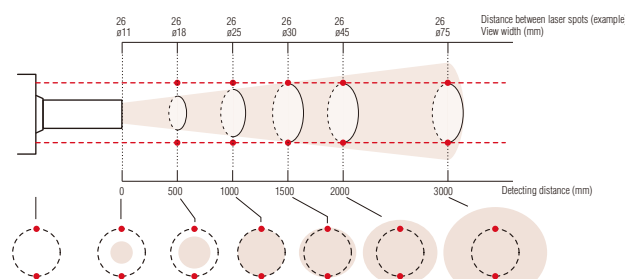
Sensor head

Model	Shape	Type		Detectable temperature	Measuring distance/ View diameter (example)		
FT-H10		Mid to low temperature	Small-spot	0 to 500°C	17.5/ø6.3 mm	35/ø1.5 mm	52.5/ø8 mm
FT-H20			Mid-range		60/ø8.5 mm	120/ø6 mm	180/ø14.5 mm
FT-H30			Long-range		200/ø15 mm	400/ø18 mm	600/ø33 mm
FT-H50			Ultra long-range		500/ø18 mm	1500/ø30 mm	3000/ø75 mm
FT-H40K		High temperature	Mid-range	0 to 1350°C	100/ø7.5 mm	150/ø6 mm	300/ø11.5 mm
FT-H50K			Ultra long-range		500/ø18 mm	1500/ø30 mm	3000/ø75 mm

Step2 — Select amplifier based on mounting type

DIN Rail Mountable
FT-50AW (P)

Panel Mountable
FT-55AW (P)

Amplifier units

Model	Form	Type	Output type
FT-50AW		DIN rail mount	NPN
FT-50AWP			PNP
FT-55AW		Panel mount	NPN
FT-55AWP			PNP

Step3 — Select any additional options

For use in dusty environments

For use in dusty environments, use the robust box FT-S1 with air purge.

Cover mounting screws
Cover
Sensor head mounting screws
Sensor head
*Sensor head not included with FT-S1 or FT-S2 Cover
Cable packing
Tube fitting
Cap
Housing
O-ring

Robust box with air purge
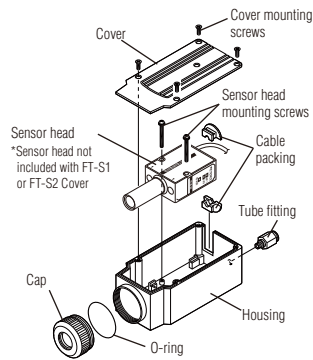
For objects with low emissivity

For objects with low emissivity, the use of black tape can increase emissivity and stabilise detection.

Black tape OP-91147
Emissivity: 0.95
Allowable temperature limit: 180°C

Option

Model	FT-S1	FT-S2	OP-84289	OP-91147	OP-76877	OP-51476	OP-42367	OP-82488
Item name	Robust box with air purge	Germanium window for robust box	Ferrite core	Black-body tape	DIN amplifier mounting bracket	Panel mount bracket set	Head connection connectors (2 pieces)	Power cable
Included/ Sold Separately	Sold separately	Sold separately	Sold separately	Sold separately	Included with DIN mounting type amplifier	Included with panel mounting type amplifier	Sold separately	Included with amplifier
Shape								
Weight	Approx. 700 g	Approx. 32 g	Approx. 65 g	Approx. 145g	Approx. 13 g	Approx. 7 g	Approx. 3 g	Approx. 55 g

Specifications

Sensor heads

Type	Mid to low temperature				High temperature	
	Small-spot	**Mid-range**	**Long-range**	**Ultra long-range**	**Mid-range**	**Ultra long-range**
Model	FT-H10	FT-H20	FT-H30	FT-H50	FT-H40K	FT-H50K
Rated temperature range [1]	0 to 500°C				0 to 1350°C	
Displayable temperature range	-50 to +520°C				-50 to +1400°C	
Detecting distance	Unlimited [2]					
Measuring distance /	17.5/ø6.3 mm	60/ø8.5 mm	200/ø15 mm	500/ø18 mm	100/ø7.5 mm	500/ø18 mm
View diameter (example)	35/ø1.5 mm	120/ø6 mm	400/ø18 mm	1500/ø30 mm	150/ø6 mm	1500/ø30 mm
	52.5/ø8 mm	180/ø14.5 mm	600/ø33 mm	3000/ø75 mm	300/ø11.5 mm	3000/ø75 mm
Sight [3]	2-point visible laser beam					
Detecting element	Thermopile					
Detecting wavelength	8 to 14 µm					
Repeatability	±0.5°C			±3°C		
Emissivity (ε) correction	0.10 to 1.99 (0.01 step)					
Environmental resistance	**Ambient temperature**	-10 to 55°C, No freezing				
	Ambient humidity	35 to 85%, No condensation				
	Vibration resistance	10 to 55 Hz, double amplitude: 1.5 mm, 2 hours in each of X, Y, and Z axis directions				
	Shock resistance	500 m/s², 10 times in each direction of each axis (X, Y, Z), 60 times in total				
Material	Case: Reinforced glass plastic, Infrared collector lens: Germanium, Laser transmitter: Polyarylate Lens tube[4]: Aluminium, Cable: Vinyl chloride, Mounting bracket: SUS304, Mounting screw: Stainless steel					
Weight	Approx. 120g				Approx. 150g	
Accessory	Mounting bracket					

*1 Repeatability is guaranteed within the rated temperature range.
*2 Place at a distance so that object appears 1.5 times larger than the view diameter.
*3 Visible semiconductor laser beam wavelength 655 nm, Class 1 Laser Product (IEC60825-1, FDA (CDRH) Part1040.10). The laser classification for FDA (CDRH) is implemented based on IEC 60825-1
  in accordance with the requirements of Laser Notice No.50.
*4 No lens tube on models FT-H10, FT-H20, and FT-H30.

Amplifiers

Type		DIN-rail mounting type	Panel mounting type
Model	**NPN**	FT-50AW	FT-55AW
	PNP	FT-50AWP	FT-55AWP
Power voltage		12 to 24 VDC, Ripple (P-P)10% max.	
Power consumption	**Normal**	1400 mW (For 12 V), 1600 mW (For 24 V)	
	Eco mode	1150 mW (For 12 V), 1350 mW (For 24 V)	
Display method		4 + 1/two-digit 7-segment LED, dual-display (red/green) display (character height in the upper display (red): 8 mm, character height in the lower display (green): 5.7 mm), Display updating cycle: 10 time/s	
Operation indicator		Red LED x 3 (control output1/control output2/timing input indicator)	
Display resolution		0.1°C or 1°C (when using H10/H20/H30), 1°C (when using H50/H40K/H50K)	
Hysteresis		Variable	
Response speed		HSP, 30, 100, 200, 500, 1000, or 5000 ms can be selected (In HSP: 15 ms max.)	
Bank selection		Pink and Purple wires can be configured for Bank Inputs #1,2 respectively for up to 4 total banks.	
Bank specifications		Emissivity (valid in temperature mode) and limit settings x 2 can be set for each bank.	
External input	**Timing input**	Input time: 2 ms min.	
	Bank input	Input time: 20 ms min.	
Control output		NPN (PNP) open collector x 2 channels (N.O./N.C. selectable), 100 mA (50 mA) max. (40 VDC (30 VDC) max.), residual voltage: 1 V max.	
Analogue output		4 to 20 mA, maximum load resistance: 260 Ω The upper- and lower-limit values of the analogue output range can be set optionally.	
Environmental resistance [1]	**Ambient temperature**	-10 to +50°C, No freezing	
	Ambient humidity	35 to 85%, No condensation	
	Vibration resistance	10 to 55 Hz, double amplitude: 1.5 mm, 2 hours in each of X, Y, and Z axis directions	
Material	**Main unit**	Main unit, Cover: Polycarbonate, Keycaps: Polyester elastomer, Cable: Vinyl chloride	
	Mounting bracket	SUS304	Panel mounting bracket: Polyacetal, front protection cover: Polycarbonate
Weight		Approx. 85g	
Accessory		DIN anchoring fixture, power cable, unit cover sticker	Panel mounting bracket, protection cover, power cable, unit cover sticker

*1 Ambient temperature when using the analogue output is -10 to 45°C.

Robust box with air purge

Model		FT-S1
Air supply	**Recommended flow rate**	15ℓ/min
	Withstanding pressure	1 MPa or less (at inlet)
Conforming tube diameter		ø6 mm
Material		Housing: zinc, cap: aluminium, cable packing and O-ring: NBR, fitting: Brass nickel-plated
Weight		Approx. 700 g

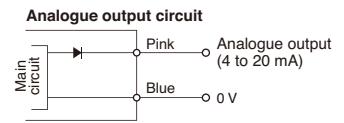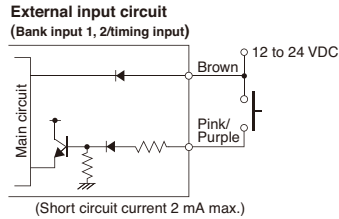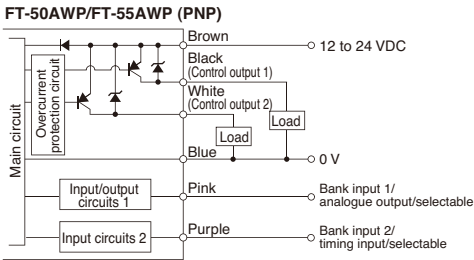* FT-S1 does not provide cooling.
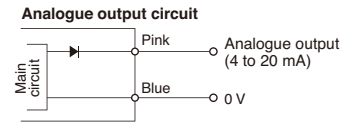
Germanium window for robust box

Model	FT-S2
Infrared transmissivity*	85% or more
Material	Cap: aluminium, lens: aluminium, O-ring: NBR
Weight	Approx. 32 g

* Infrared transmissivity for wavelength of 8 to 14 µm.

Black-body tape

Model	OP-91147
Emissivity	0.95
Allowable temperature limit	180°C
Size	Width: 50 mm, length: 10 m
Weight	Approx. 145 g

Input / Output Circuits

FT-50AW/FT-55AW (NPN)

- Brown — 12 to 24 VDC
- Black (Control output 1) — Load — 5 to 40 VDC
- White (Control output 2) — Load — 5 to 40 VDC
- Blue — 0 V
- Pink — Bank input 1/ analogue output/selectable
- Purple — Bank input 2/ timing input/selectable

Main circuit / Overcurrent protection circuit / Input/output circuits 1 / Input circuits 2

External input circuit (Bank input 1, 2/timing input)

Main circuit — Pink/Purple / Blue

(Short circuit current 1 mA max.)

Analogue output circuit

Main circuit — Pink — Analogue output (4 to 20 mA) / Blue — 0 V

FT-50AWP/FT-55AWP (PNP)

- Brown — 12 to 24 VDC
- Black (Control output 1)
- White (Control output 2) — Load / Load
- Blue — 0 V
- Pink — Bank input 1/ analogue output/selectable
- Purple — Bank input 2/ timing input/selectable

Main circuit / Overcurrent protection circuit / Input/output circuits 1 / Input circuits 2

External input circuit (Bank input 1, 2/timing input)

Main circuit — Brown — 12 to 24 VDC / Pink/Purple

(Short circuit current 2 mA max.)

Analogue output circuit

Main circuit — Pink — Analogue output (4 to 20 mA) / Blue — 0 V

For proper use.

For low emissivity

Detection may be inconsistent for objects with low emissivity such as certain metals. In these cases, follow the corrective measures described below.

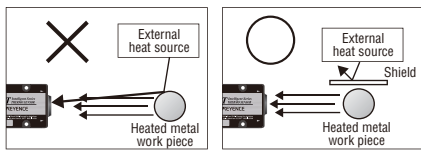### (1) Use black-body tape (to increase emissivity)

Emissivity can be increased for stable detection by applying black-body tape (OP-91147) to the surface of the object. Apply to an area that covers 1.5 times the view diameter (at mounted distance and including sensor mounting tolerances).

(2) Place a shield between the object and adjacent heat sources

Adjacent heat sources allowed to reflect off the measured object can amplify the infrared beam received from objects with low emissivity resulting in high temperature readings. If the sensor has been adjusted to admit a low infrared beam, the interference from the adjacent heat source can cause readings to fluctuate.

Countermeasure

Place a shield plate with high reflectivity (metal plate with glossy surface) between the adjacent heat source and work piece to bounce the infrared beams away from the object.

External heat source / Heated metal work piece

External heat source / Shield / Heated metal work piece
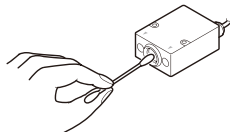
Note: The shield should be made of highly reflective metal (aluminium or other metal with a glossy surface).

Cleaning

A dirty lens can cause erroneous readings. Clean the lens by following the procedures outlined here. Always turn the power off when cleaning.
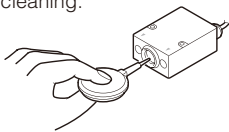
Remove dust on the lens with an air blower used for cleaning camera lenses. Do not blow the dust off with your breath.

For difficult stains, lightly wipe the lens with a cotton swab. If the stain cannot be removed, soak the swab with a small amount of alcohol and wipe the stain off. Never use organic solvents other than alcohol.

For use in dusty environments, use the robust box with air purge (FT-S1). Ask your nearest KEYENCE Sales Office for details on the FT-S1.

Notes about measuring high temperature objects

When measuring high temperature objects, install a shield to deflect radiated heat from the object.

Note: The shield should be made of highly reflective metal (aluminium or other metal with a glossy surface).

Shield / Sensor head / High temperature object / Through-hole for measuring
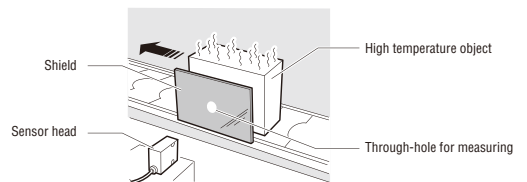
Use the table below to determine the drilling diameter of the measuring hole in the shield

Detecting distance (mm)	200	400	600	800	1000	1200	1400	1600
Measuring hole dia. (mm)	30	60	90	120	150	180	210	240

Notes on CE Marking

- EMC Directive (2004/108/EC)
  · Applicable standard EMI: EN61326-1, Class A
  　　　　　　　　　　　　EMS: EN61326-1
  · For FT-H50/H40K/H50K, KEYENCE has confirmed the conformity to the requirements with a ferrite core (OP-84289) attached to the sensor head cable.
    When using the FT-H50/H40K/H50K in EU Member states, make sure to prepare a ferrite core (OP-84289).
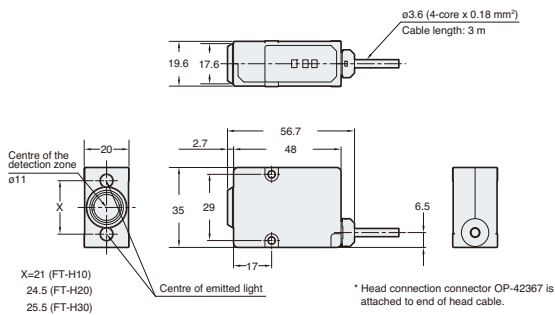
Attaching the ferrite core

Attach the ferrite core (OP-84289) near the sensor head, and wind the head cable through the core making one loop as shown below.
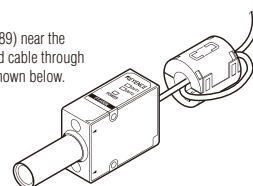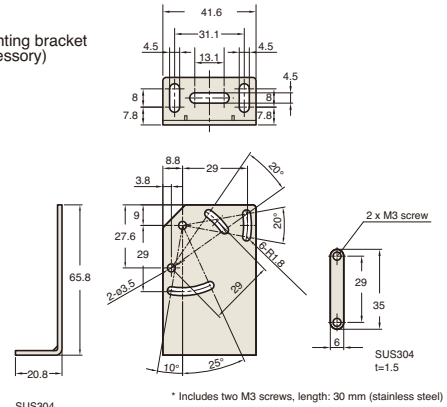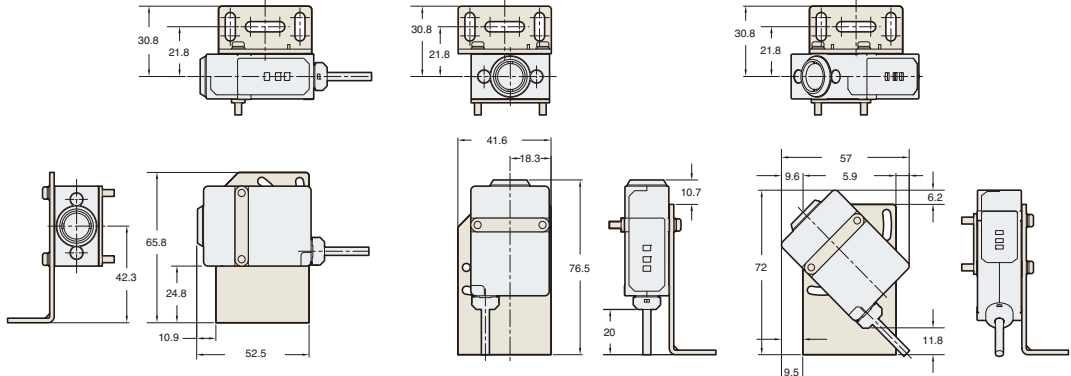
Dimensions

Sensor heads FT-H10/20/30

ø3.6 (4-core x 0.18 mm²)
Cable length: 3 m

19.6 17.6

Centre of the detection zone
ø11

20

2.7 56.7
48

35 29

6.5

17

X=21 (FT-H10)
24.5 (FT-H20)
25.5 (FT-H30)

Centre of emitted light

* Head connection connector OP-42367 is attached to end of head cable.

Mounting bracket (accessory)

41.6
31.1
13.1
4.5   4.5
8   8   4.5
7.8   7.8

8.8 29 20°
3.8   20°
9
27.6
29   6 x R1.8
29
2-ø3.5

2 x M3 screw

29

35

6

SUS304
t=1.5

65.8

20.8

10°   25°

SUS304
t=2.0

* Includes two M3 screws, length: 30 mm (stainless steel)

Horizontal mounting

30.8
21.8

65.8

42.3

24.8

10.9

52.5

Vertical mounting

30.8
21.8

41.6
18.3

10.7

76.5

20

When installed at 45 degrees

30.8
21.8

57
9.6   5.9

6.2

72

11.8

9.5

Sensor heads FT-H40K/50/50K
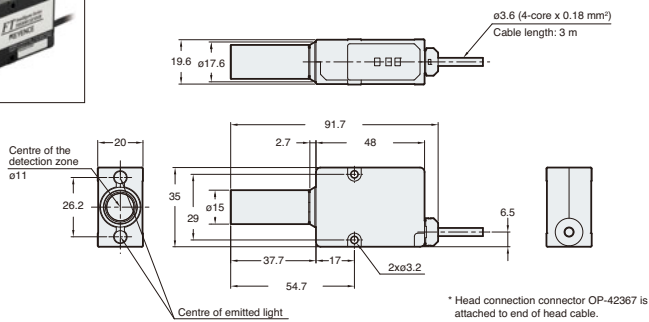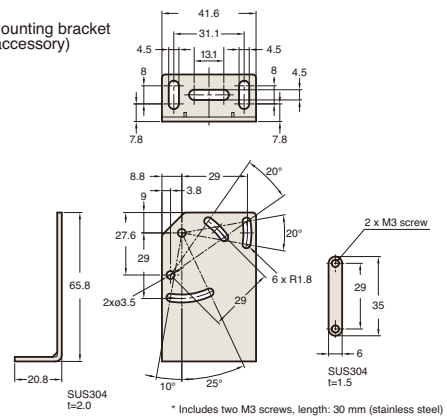
ø3.6 (4-core x 0.18 mm²)
Cable length: 3 m

19.6 ø17.6

Centre of the detection zone
ø11

20
26.2

2.7   91.7
48

35   ø15
29

6.5

37.7   17
54.7

2xø3.2

Centre of emitted light

* Head connection connector OP-42367 is attached to end of head cable.

Mounting bracket (accessory)

41.6
31.1
13.1
4.5   4.5
8   8   4.5
7.8   7.8

8.8 29 20°
9   3.8   20°
27.6
29   6 x R1.8
29
2xø3.5

2 x M3 screw

29

35

6

SUS304
t=1.5

65.8

20.8

10°   25°

SUS304
t=2.0

* Includes two M3 screws, length: 30 mm (stainless steel)

Horizontal mounting

30.8
21.8

65.8

42.3

24.8

45.9

87.5

Vertical mounting

30.8
21.8

41.6
18.3

45.7

111.5

20

When installed at 45 degrees

30.8
21.8

77.3
5.2

5.9

26.5

92.3

11.8

29.8
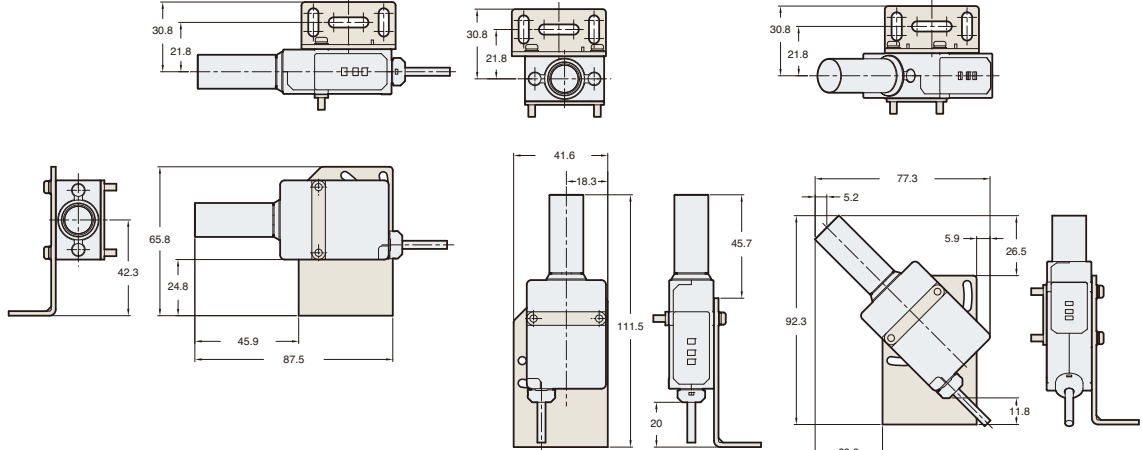
Digital amplifier FT-50AW(P)

DIN-rail mounting
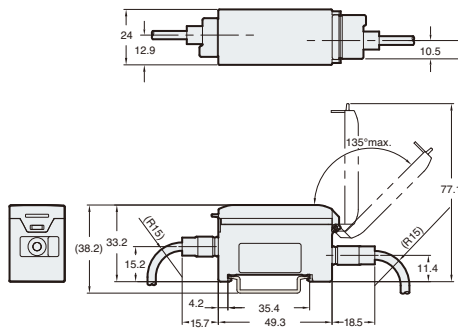
When the mounting bracket is attached
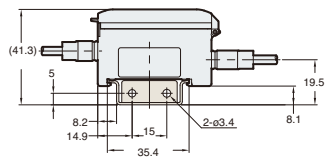
Mounting bracket OP-76877(accessory)
SUS304

Digital amplifier FT-55AW(P)
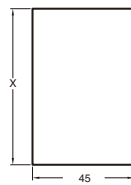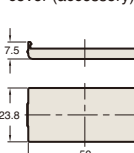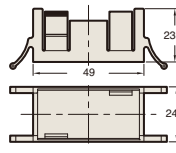
ø3.9 (6-core x 0.13 mm²)
Cable length: 2 m
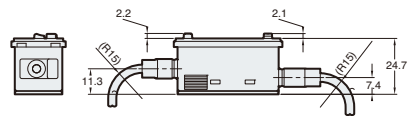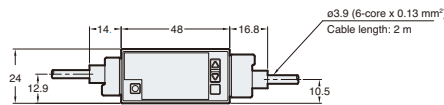
Panel mounting bracket (Panel mounting bracket, Front protection cover) OP-51476
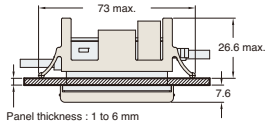
(included with FT-55AW(P)) Panel mounting bracket

Front protection cover (accessory)

Panel cutout
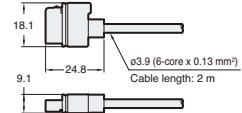
X=24 x (A-1)+21
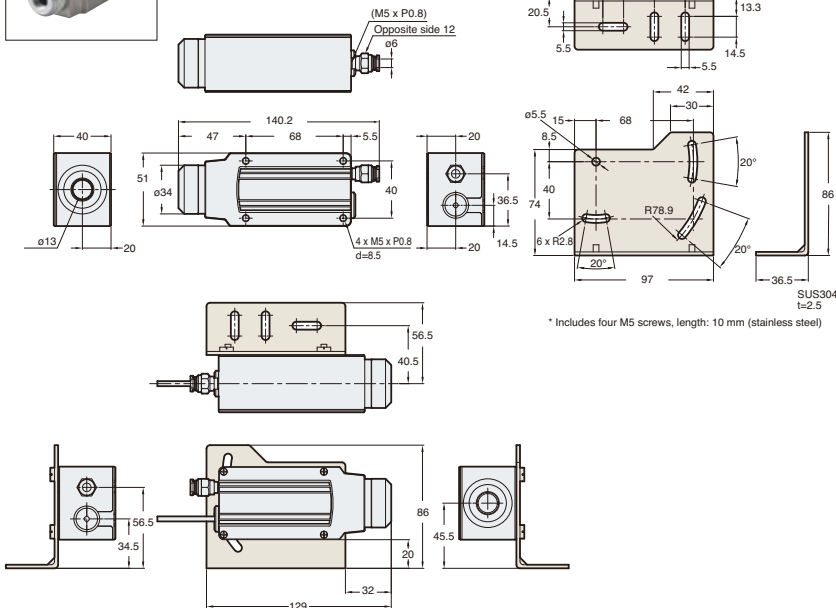When A FT-55AWs are installed close to each other

When the panel is attached

Panel thickness : 1 to 6 mm

Power cable OP-82488

(included with FT-50AW(P)/FT-55AW(P))

ø3.9 (6-core x 0.13 mm²)
Cable length: 2 m

FT-S1 (optional)

(M5 x P0.8)
Opposite side 12
ø6

Mounting bracket (accessory)

4 x M5 x P0.8
d=8.5

SUS304
t=2.5

* Includes four M5 screws, length: 10 mm (stainless steel)

FT-S2 (optional)

Centre of detection zone
ø13 detection zone
ø34

M32 P=1.5
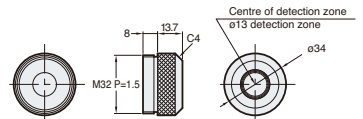
OP-84289 (optional)
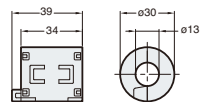
❚ Related Products

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Digital CMOS Laser Sensor
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The 1 m detecting range of the GV-H1000 allows it to be mounted away from the heat.

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AP-Pressure gauges for high pressure, high heat applications.

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IP 67

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