



**NEW** Digital Infrared Temperature Sensor

FT Series



# Infrared Temperature Sensor Lineup

*Intelligent Sensor*  
**I-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



2094

2341

**2462°F**

2415

96



# 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 32 to 2462°F (0 to 1350°C)

High Temperature,  
Ultra Long-Range  
FT-H50K



High Temperature,  
Mid-Range  
FT-H40K



Sensor head

Mid to Low Temperature Model 32 to 932°F (0 to 500°C)

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)

2732°F  
 (1500°C)

Suitable for a wide range of applications



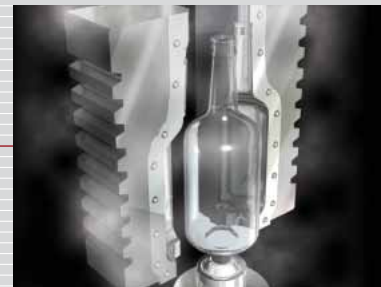
Casting, Die-casting 842 to 2462°F  
 (450 to 1350°C)



Forging 392 to 2372°F  
 (200 to 1300°C)

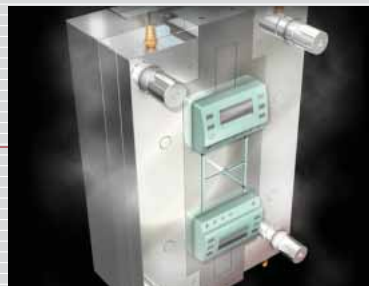


Brazing 1382 to 2012°F  
 (750 to 1100°C)

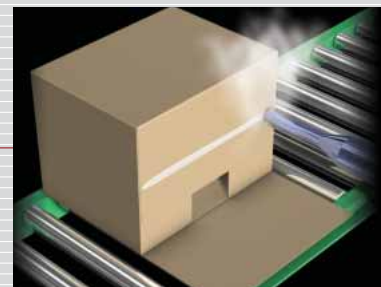


Glass Forming 842 to 2192°F  
 (450 to 1200°C)

1832°F  
 (1000°C)



Resin molding, rubber molding 176 to 392°F  
 (80 to 200°C)

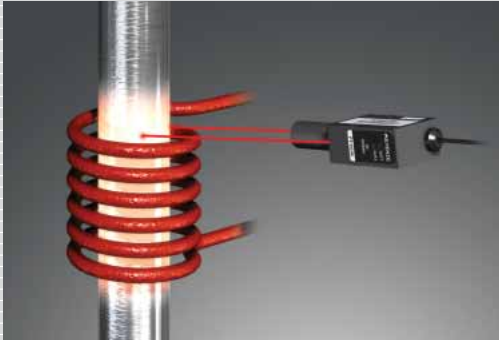


Bonding (hot melting) 122 to 302°F  
 (50 to 150°C)

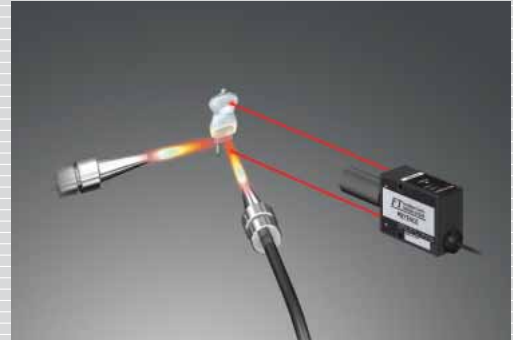
932°F  
 (500°C)

32°F  
 (0°C)

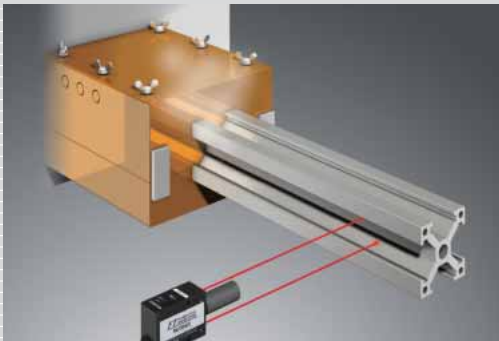
# Temperature Management Applications



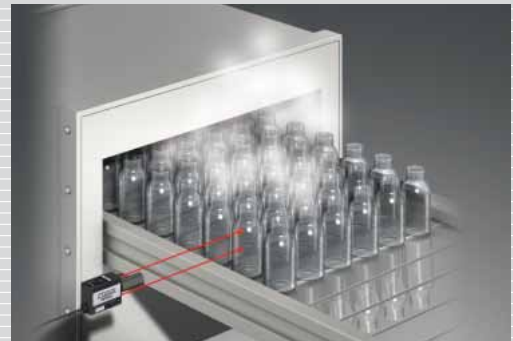
High-frequency induction heating



Glass sealing



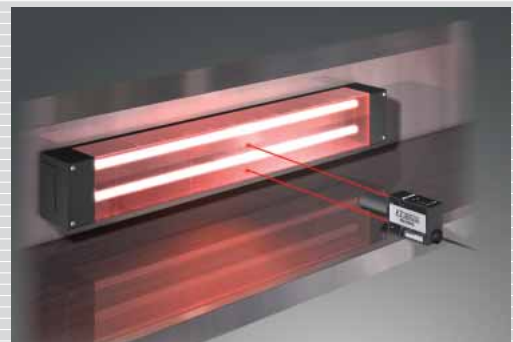
Extrusion moldings



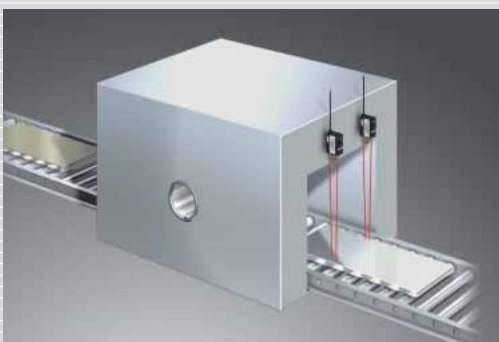
Cooling glass



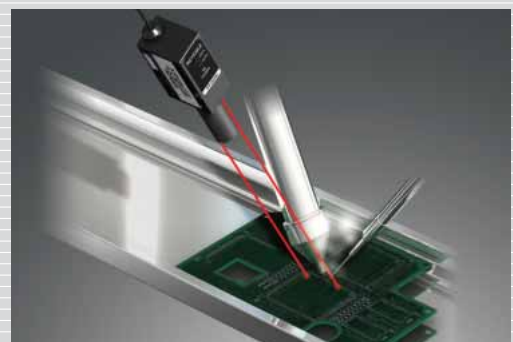
Hardening



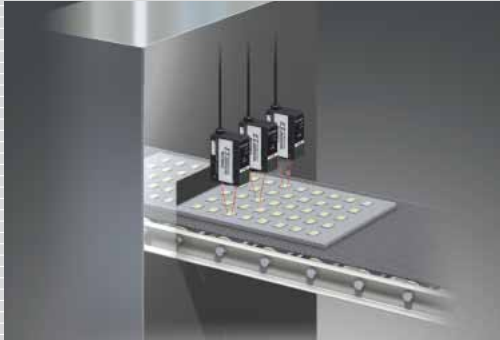
Temperature measurement of illuminated lamps



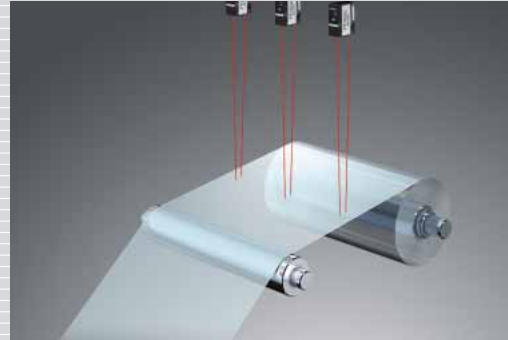
Drying process



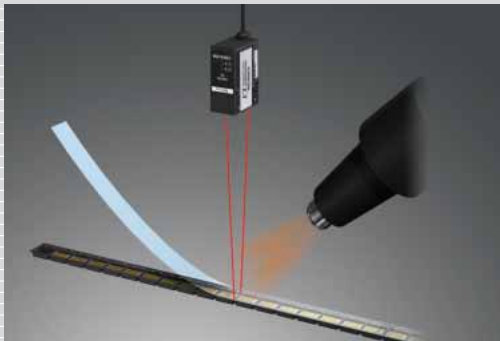
Soldering



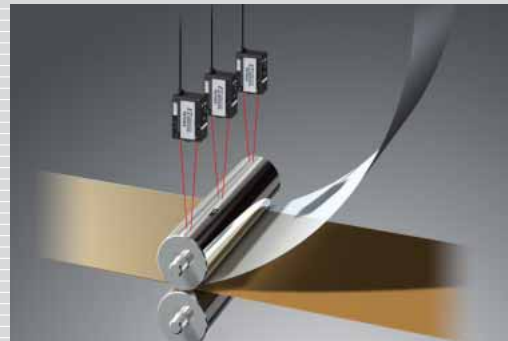
Furnace and aging for electronic components



Film molding



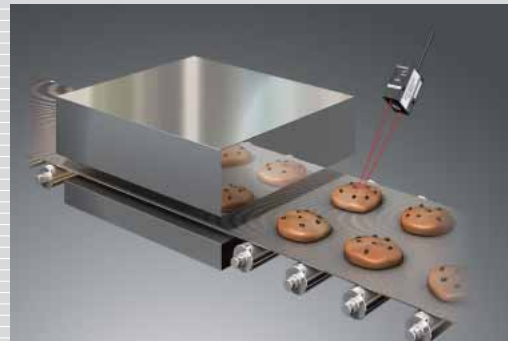
Tape sealing



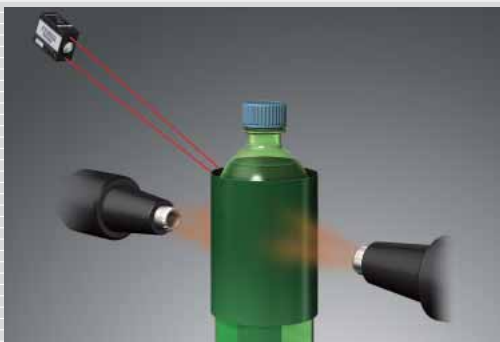
Laminating



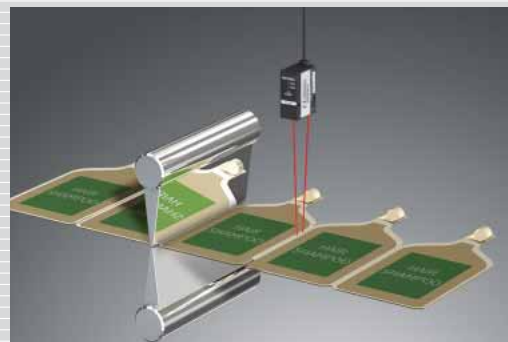
Residual heat of preformed bottles (before blow-forming)



Baked goods



Shrink Wrapping



Heat sealing

# Easily Control Surface Temperature

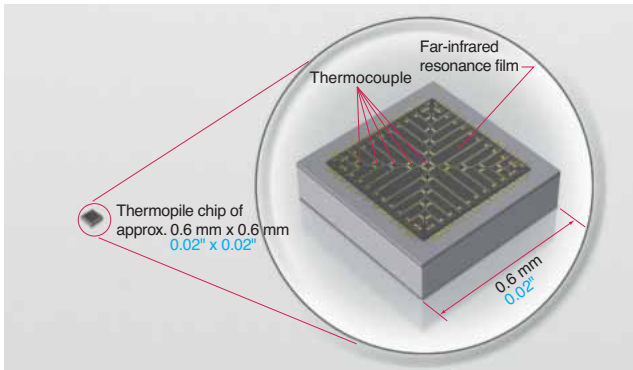
**F**ast

Fastest in its class\*

## 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.



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

**L**Aser

## 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.

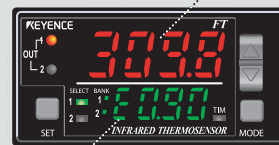
#### What is the emissivity?

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.

#### Example

Water: 0.92 to 0.96  
 Plastic: 0.85 to 0.95  
 Stainless steel: 0.45  
 Ceramic: 0.90 to 0.94

Surface temperature

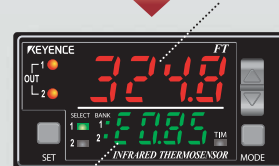


1. Enter the surface temperature directly.



Emissivity

Surface temperature



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

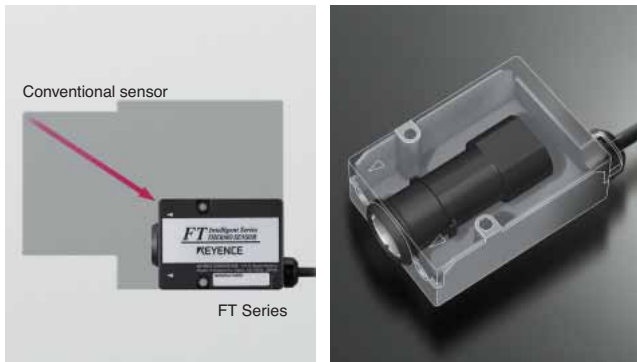


Emissivity

# 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 minimized.

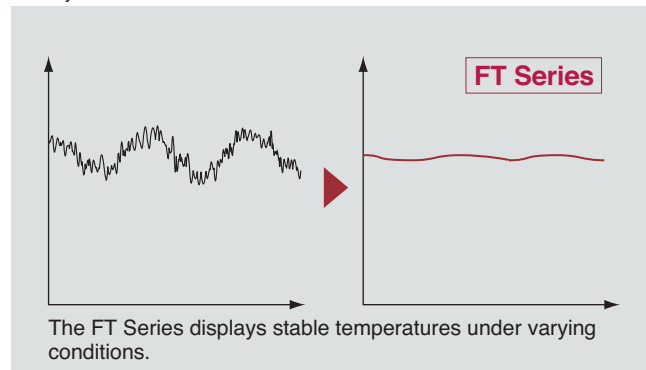


# High stability

## High stability

To maximize 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.

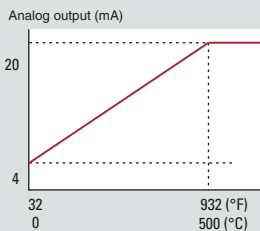


## Other functions that expand the scope of applications

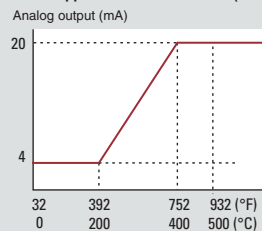
### Analog monitor outputs\*

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

#### Initial status



#### When the lower limit value is 392°F (200°C) and the upper limit value is 752°F (400°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 Analog 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 range and measuring distance

**Step2**  
Select an amplifier based on mounting type

**Step3**  
Select any additional options

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

### 1 Select by temperature

**High temperature model**  
32 to 2462°F (0 to 1350°C)  
FT-H50K/FT-H40K

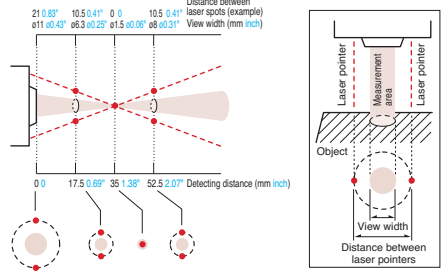


**Mid to low temperature model**  
32 to 932°F (0 to 500°C)  
FT-H50/FT-H30/FT-H20/FT-H10

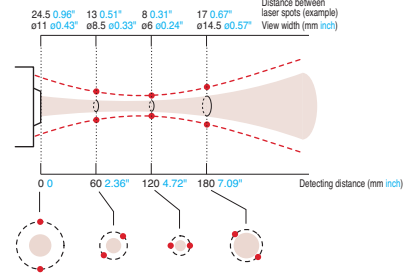


### 2 Select by distance

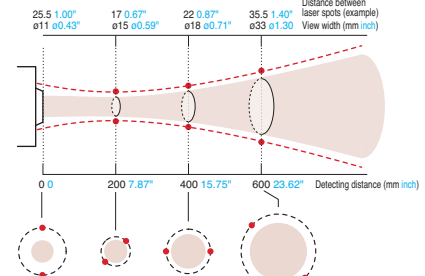
FT-H10



FT-H20

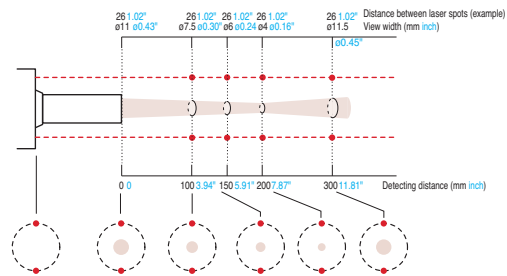


FT-H30

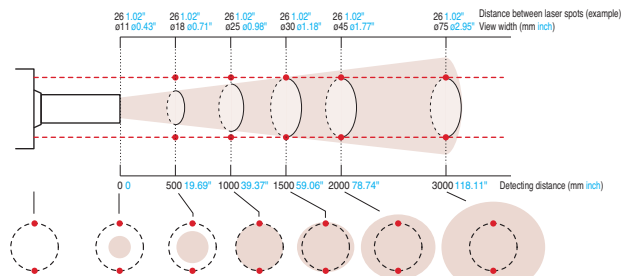


For the FT-H20 and FT-H30 models, the laser pointers appear to rotate clockwise as they travel farther from the source, as shown in the drawing above.

FT-H40K



FT-H50/FT-H50K



Sensor head

Model	Shape	Type	Detectable temperature	Measuring distance/ View diameter (example)
FT-H10		Small-spot	32 to 932°F (0 to 500°C)	17.5/ø6.3mm 0.69"/ø0.25" 35/ø1.5mm 1.38"/ø0.06" 52.5/ø8mm 2.07"/ø0.31"
FT-H20		Mid-range		60/ø8.5mm 2.36"/ø0.33" 120/ø6mm 4.72"/ø0.24" 180/ø14.5mm 7.09"/ø0.57"
FT-H30		Long-range		200/ø15mm 7.78"/ø0.59" 400/ø18mm 15.75"/ø0.71" 600/ø33mm 23.62"/ø1.30"
FT-H50		Ultra long-range		500/ø18mm 19.69"/ø0.71" 1500/ø30mm 59.06"/ø1.18" 3000/ø75mm 118.11"/ø2.95"
FT-H40K		Mid-range	32 to 2462°F (0 to 1350°C)	100/ø7.5mm 3.94"/ø0.30" 150/ø6mm 5.91"/ø0.24" 300/ø11.5mm 11.81"/ø0.45"
FT-H50K		Ultra long-range		500/ø18mm 19.69"/ø0.71" 1500/ø30mm 59.06"/ø1.18" 3000/ø75mm 118.11"/ø2.95"



**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

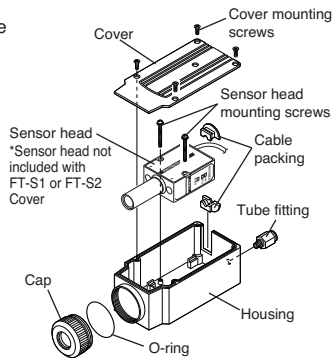
**Step3** Select any additional options

**For use in dusty environments**

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



Robust box with air purge



**For objects with low emissivity**

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



Black tape OP-91147  
Emissivity: 0.95  
Allowable temperature limit: 356°F (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	32 to 932°F (0 to 500°C)				32 to 2462°F (0 to 1350°C)	
Displayable temperature range	-58 to +968°F (-50 to +520°C)				-58 to 2552°F (-50 to +1400°C)*C	
Detecting distance	Unlimited *2					
Measuring distance / View diameter (example)	17.5/ø6.3 mm 0.69"/ø0.25"	60/ø8.5 mm 2.36"/ø0.33"	200/ø15 mm 7.87"/ø0.59"	500/ø18 mm 19.69"/ø0.71"	100/ø7.5 mm 3.94"/ø0.30"	500/ø18 mm 15.69"/ø0.71"
	35/ø1.5 mm 1.38"/ø0.06"	120/ø6 mm 4.72"/ø0.24"	400/ø18 mm 15.75"/ø0.71"	1500/ø30 mm 59.06"/ø1.18"	150/ø6 mm 5.91"/ø0.24"	1500/ø30 mm 59.06"/ø1.18"
	52.5/ø8 mm 2.07"/ø0.31"	180/ø14.5 mm 7.09"/ø0.57"	600/ø33 mm 23.62"/ø1.30"	3000/ø75 mm 118.11"/ø2.95"	300/ø11.5 mm 11.81"/ø0.45"	3000/ø75 mm 118.11"/ø2.95"
Sight *3	2-point visible laser beam					
Detecting element	Thermopile					
Detecting wavelength	8 to 14 μm 0.31 to 0.55 Mil					
Repeatability	±0.9°F (±0.5°C)			±5.4°F (±3°C)		
Emissivity (ε) correction	0.10 to 1.99 (0.01 step)					
Environmental resistance	Ambient temperature 14 to 131°F (-10 to 55°C), No freezing					
	Ambient humidity 35 to 85%, No condensation					
	Vibration resistance 10 to 55 Hz, double amplitude: 1.5 mm 0.06", 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*: Aluminum, 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 0.31", character height in the lower display (green): 5.7 mm 0.22"), Display updating cycle: 10/s		
Operation indicator	Red LED x 3 (control output1/control output2/timing input indicator)		
Display resolution	0.2°F or 1.8°F (0.1°C or 1°C) (when using H10/H20/H30), 1.8°F (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.		
Analog output	4 to 20 mA, maximum load resistance: 260 Ω The upper- and lower-limit values of the analog output range can be set optionally.		
Environmental resistance*1	Ambient temperature	-14 to +122°F (-10 to +50°C), No freezing	
	Ambient humidity	35 to 85%, No condensation	
	Vibration resistance	10 to 55 Hz, double amplitude: 1.5 mm 0.06", 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 analog output is 14 to 113°F (-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 0.24"	
Material	Housing: zinc, cap: aluminum, 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: aluminum, lens: aluminum, O-ring: NBR
Weight	Approx. 32 g

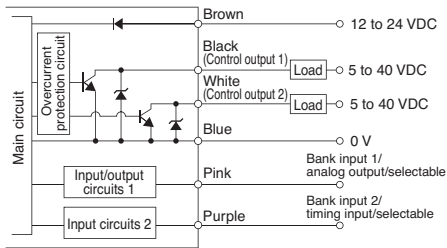
\* Infrared transmissivity for wavelength of 8 to 14 μm.

## Black-body tape

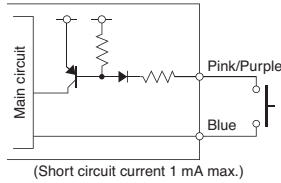
Model	OP-91147
Emissivity	0.95
Allowable temperature limit	356°F (180°C)
Size	Width: 50 mm 1.97", length: 10 m 32.81'
Weight	Approx. 145 g

## Input / Output Circuits

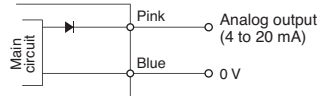
### FT-50AW/FT-55AW (NPN)



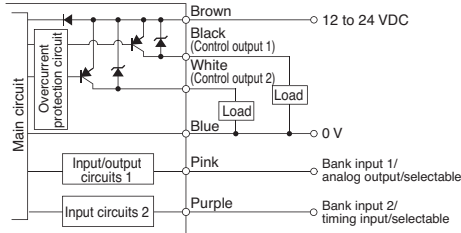
### External input circuit (Bank input 1, 2/timing input)



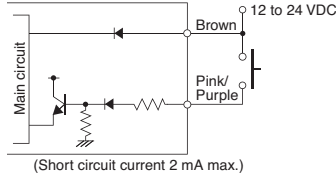
### Analog output circuit



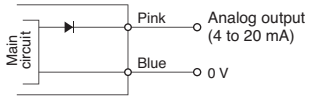
### FT-50AWP/FT-55AWP (PNP)



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



### Analog output circuit



## 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)

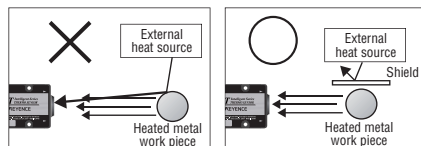
Emissivity can be increased for stable detection by applying black-body tape (OP-91147) to the surface of the object. Apply to an area that covers 1.5 times the view diameter (at mounted distance and including sensor mounting tolerances).

#### (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

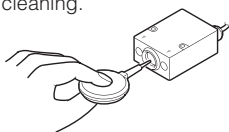
Place a shield plate with high reflectivity (metal plate with glossy surface) between the adjacent heat source and work piece to bounce the infrared beams away from the object.



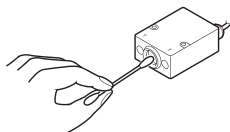
Note: The shield should be made of highly reflective metal (aluminum or other metal with a glossy surface).

### 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.



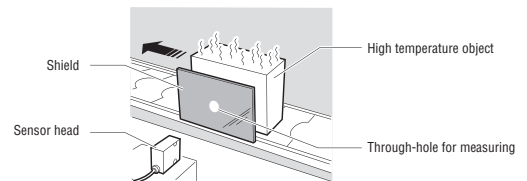
For difficult stains, lightly wipe the lens with a cotton swab. If the stain cannot be removed, soak the swab with a small amount of alcohol and wipe the stain off. Never use organic solvents other than alcohol.

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 (aluminum or other metal with a glossy surface).



Use the table below to determine the drilling diameter of the measuring hole in the shield

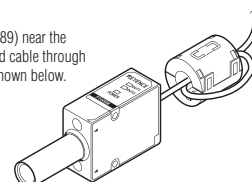
Detecting distance (mm)	200	400	600	800	1000	1200	1400	1600
(inch)	7.87"	15.75"	23.62"	31.50"	39.37"	47.24"	55.12"	62.99"
Measuring hole dia. (mm)	30	60	90	120	150	180	210	240
(inch)	1.18"	2.36"	3.54"	4.72"	5.91"	7.09"	8.27"	9.45"

## 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.







## Related Products

### Digital Fiber Optic Sensors FS-N



### Digital CMOS Laser Sensor GV-Long Distance Detection

The 1 m **39.37"** detecting range of the GV-H1000 allows it to be mounted away from the heat.



### Multi-Fluid Pressure Sensors AP-V80W

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



### SL-VM Series - SUPER HEAVY-DUTY Safety Light Curtains



# KEYENCE

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1-888-539-3623

[www.keyence.com](http://www.keyence.com)



#### SAFETY INFORMATION

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

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KA1-1012

