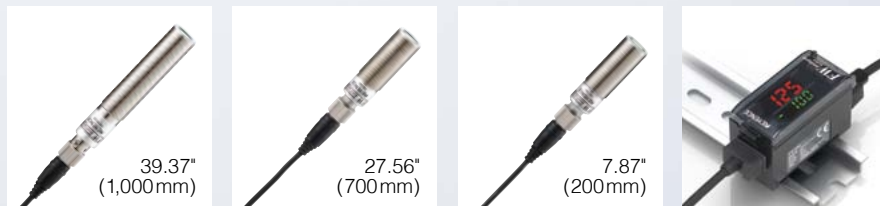




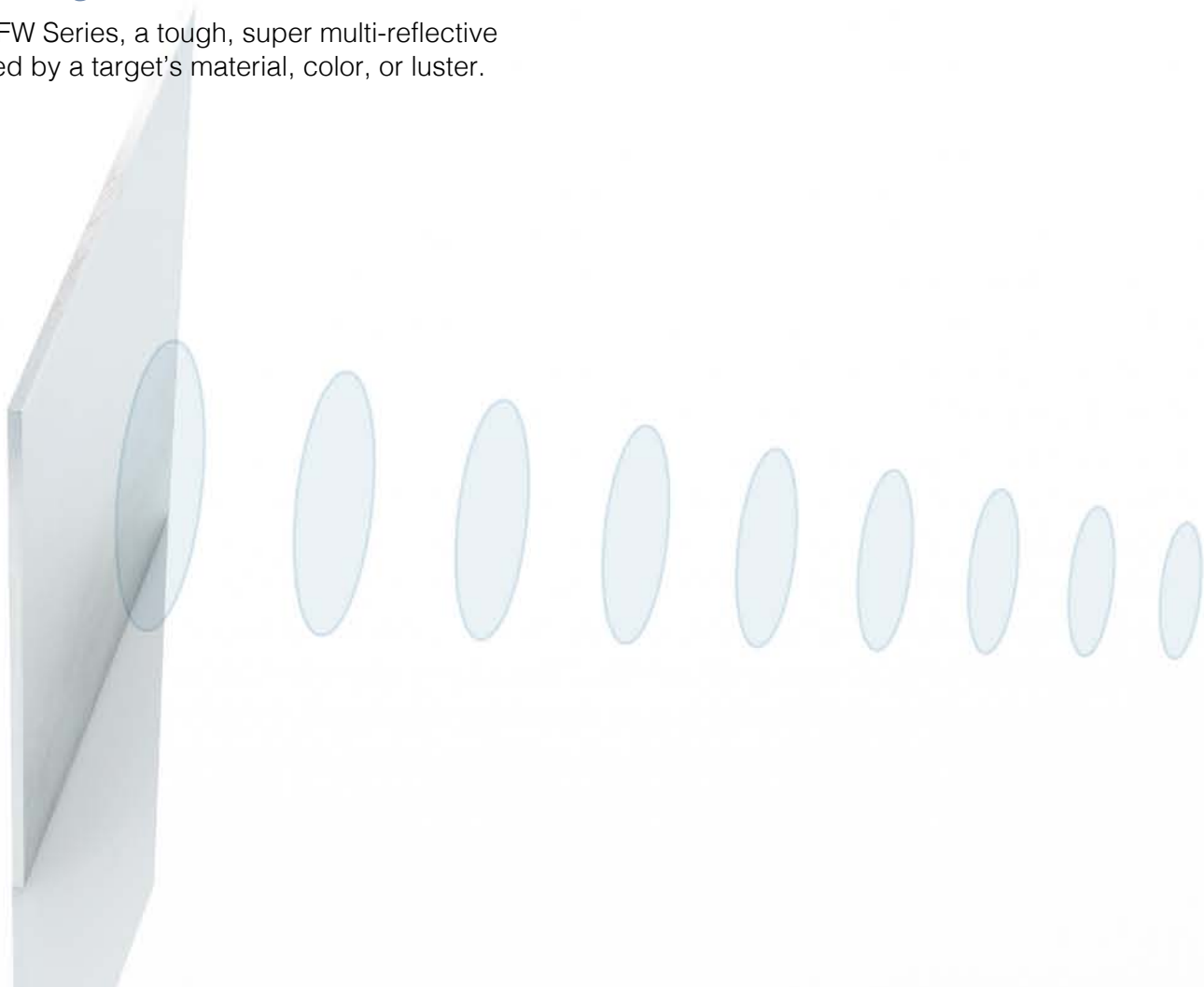
Incredible stability with any type of target

Integration of digital technology and ultrasonic waves
has produced super multi-reflective type sensors.



All-purpose digital sensor

Introducing the FW Series, a tough, super multi-reflective sensor unaffected by a target's material, color, or luster.



Reasons for its strength
1

Can be used for all types of targets

The FW Series easily detects metal, glass, liquid level or other targets that have been difficult to detect with reflective-type photoelectric sensors. Also, the detections are not influenced by the color, pattern, or luster of the target surface.



Reasons for its strength
2

High stability and reliability

First in the industry

A new algorithm A.W.S. (Active Wave Stabilizer)* stabilizes detection while avoiding the influence of target vibration or external disturbances.



* The A.W.S. (Active Wave Stabilizer) function executes optimal processing according to the detecting condition and cancels fluctuations even when the receiving condition of the ultrasonic wave changes due to target vibration.

**The long-range model features
a maximum detecting distance of 39.37" (1,000 mm)!**



FW-H10R: 39.37" (1,000 mm)
FW-H07: 27.56" (700 mm)
FW-H02: 7.87" (200 mm)



Digital amplifier
FW-V20

Smallest in its class

Metal body
M18



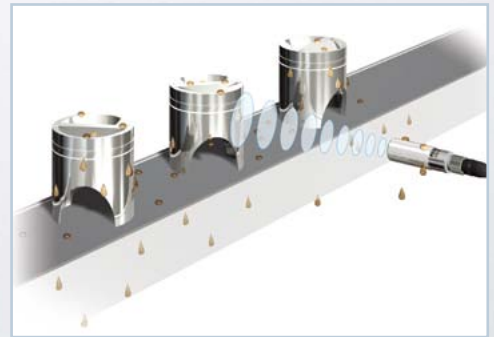
Reasons for
its strength

3

Resistant to mist and dirt

The intense ultrasonic wave penetrates dust and dirt and detects the target. Also, the sensor body is IP67 rated and has excellent environmental resistance.

The easily detachable connector is also IP67 rated.

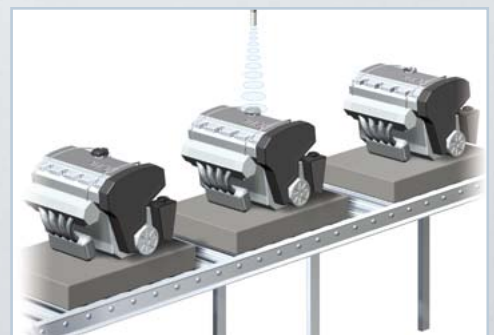


Reasons for
its strength

4

Unaffected by the background

The N.O.D. (Nearest Object Detection) function, which detects only the target located nearest to the sensor, eliminates the need to consider the background luster or shape. Reliable detection is ensured without taking measures such as tilting the sensor or changing the color of the background.



Versatile performance with user-friendly operation

Dual Digital Display

The digital indicator displays the distance in an easy-to-understand numerical display.

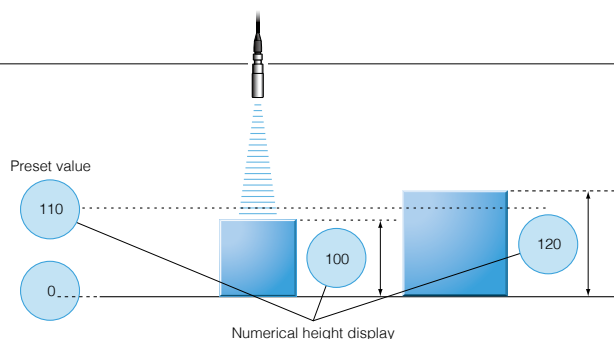
Easy set up with one-button operation

The settings can be configured by simply pressing the [SET] button with or without the target in place.



Target Height Display **First in the industry**

This function is convenient for differentiating target heights or for detecting liquid levels. The height of the target or liquid level can be displayed numerically to allow the user to determine the preset value, which makes for an easy-to-understand sensor for any user. The FW Series is the clear choice over conventional reflective sensors which feature unitless numerical displays, or LED bar indicators.

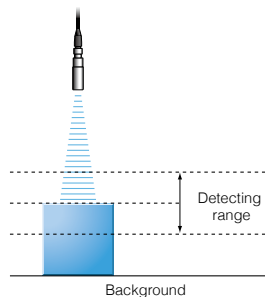


Convenient sensitivity adjustment method

1-point zone tuning

F-2 **First in its class**

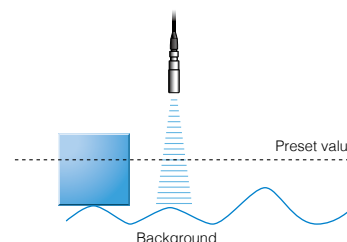
This function is useful for detection with a background. Pressing the [SET] button once will enable detection of only a target with a certain height without detecting the background.



Conveyor tuning

A-1 **First in its class**

A preset value is tuned automatically to a level unaffected by background vibrations (conveyor, etc.).



Chatter prevention function and display averaging mode

F-1 **F-2** **A-1** **A-2** **A-3**

The chatter prevention function prevents the outputs from chattering. This is possible by delaying the response time when the liquid surface ripples in liquid level detections. In addition, selecting the display averaging mode will reduce fluctuations of the display.

Power-saving function

F-1 **F-2** **A-1** **A-2** **A-3**

With this function, the display can be simplified when the sensor is not being operated. Power consumption can be reduced by approximately 20% ¹.

External shift function ² **F-1** **First in its class**

This function is effective for severe environments with slight sensitivity differences. When the displayed values fluctuate due to variations in temperature or background position, the displayed value can be compensated by an external shift input immediately before detection.

Bank switching function ² **F-1** **F-2** **A-3**

Detection of up to four types of targets is enabled by entering a bank-switching input externally.

Analog monitor output ²

F-1 **F-2** **A-1** **A-2** **A-3**

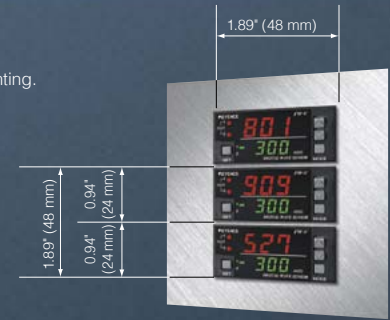
The FW Series features an analog output (4 to 20 mA).

1. When using the FW-H02/H07
2. Only one function can be used at one time.

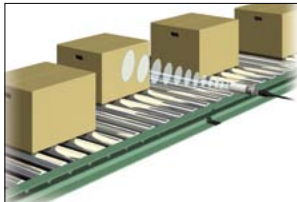
Panel-mount amplifier option

The lineup includes a panel-mount type that fully utilizes the viewer-friendly display. The compact amplifier enables contact mounting of the unit.

The FW Series supports panel mounting. Contact mounting is also available for space-saving installations when using two or more units.



Choose from 5 different detection modes for your application



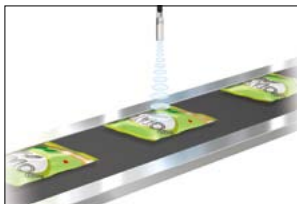
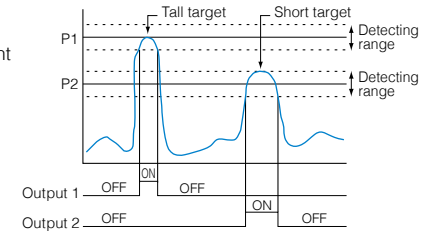
F-1 mode (General purpose)

Various sensitivity adjustments are available. For example, "two-point tuning" can be performed by pressing the [SET] button with or without the target in place, and "full-automatic tuning" can be performed automatically while the operator moves the target.



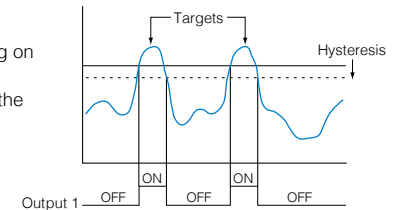
F-2 mode (Detecting a target with a background)

This mode is useful when detecting a target with a background. The target height is displayed with the background as the reference. "One-point zone tuning" is available, which detects only targets at a certain height without detecting the background.



A-1 mode (Detecting a target on a conveyor)

This mode is optimal for detecting the presence and absence of targets traveling on a conveyor. The target height is displayed with the conveyor as the reference. "Conveyor tuning" is available, which detects only the targets without detecting the vibrations of the conveyor. Output 2 serves as the alarm signal that detects unloading of the conveyor and other abnormalities.



A-2 mode (Detecting the liquid level)

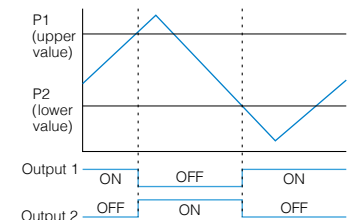
This mode is suitable for detecting the liquid level. The height of the liquid level is displayed with the bottom of the tank as the reference. Two preset values (upper and lower limits) and two additional preset values for predicting the upper and lower values can be set up to enable monitoring the following four statuses: normal, near the upper limit, near the lower limit, and abnormality of upper and lower limits.

	Output 1	Output 2
P1 (upper limit)	OFF	OFF
P2 (prediction of upper limit)	ON	OFF
P3 (prediction of lower limit)	ON	ON
P4 (lower limit)	OFF	ON
	OFF	OFF



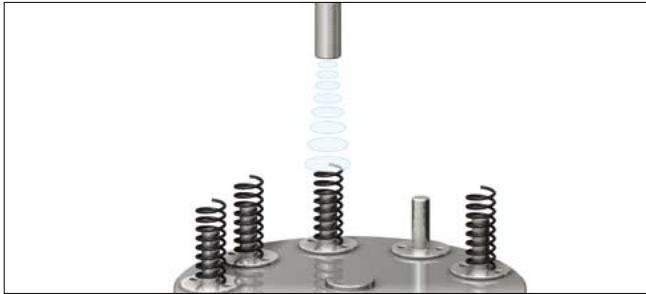
A-3 mode (Zone control)

This mode is suitable for controlling the pump by detecting the liquid level in a tank, or for controlling the tension of sheet material. The height of the liquid level or the sheet can be displayed by setting the reference level as desired. Two preset values (upper and lower limits) can be set up to control the device: When the upper limit is exceeded, the output is turned off to stop the device, and when the lower limit is exceeded, the output is turned on to activate the device.



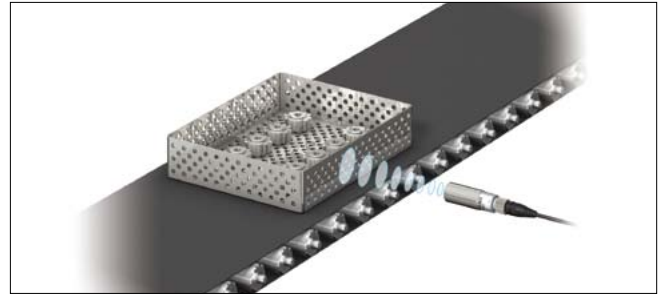
Wide range of applications

Automotive Industry



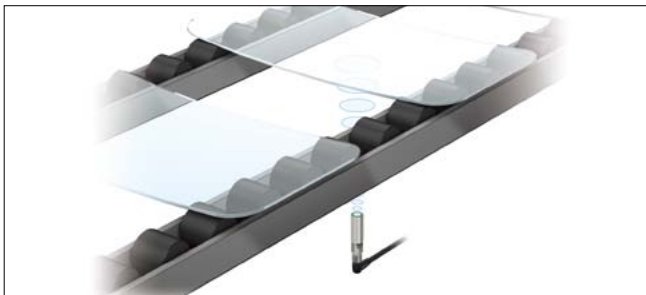
Detecting springs during the assembly process

Due to an unstable profile, detection of springs has been unreliable with conventional reflective photoelectric sensors. The FW Series ensures reliable detection without being influenced by background luster.



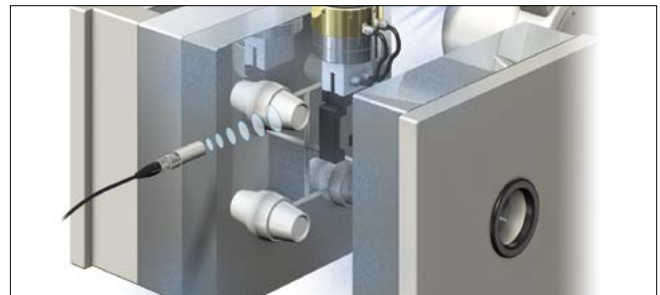
Detecting mesh trays used for quenching the targets

The FW Series ensures reliable detection of targets with metallic luster and small holes. In addition, detection is unaffected by workpieces located on the opposite side of the holes.



Detecting automotive plate glass

Reliable detection of transparent targets has been difficult with conventional reflective photoelectric sensors. The FW Series ensures reliable detection of transparent targets without being affected by the glass colors.



Checking target removal from a die-cast machine

The FW Series ensures reliable detection of multi-colored targets without being affected by the colors. In addition, detection is unaffected by mold release agents in the environment.



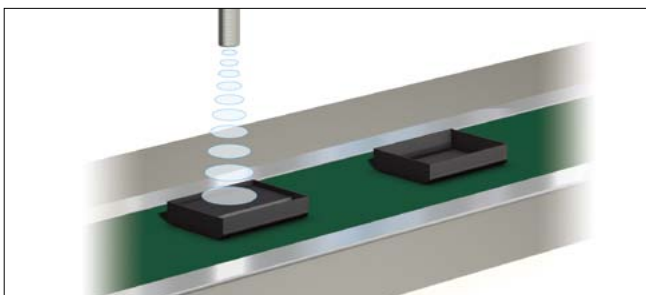
Checking the presence/absence of bolts

The FW Series is used to detect metal targets on metal boards. Detecting only the presence of bolts is possible without being affected by the luster of the metal.



Detecting con-rods

Due to the coolant on the target surface, reliable detection of an atomized area has been difficult with conventional reflective photoelectric sensors. The FW Series ensures reliable detection unaffected by the coolant on the target surface.



Detecting black-colored cushioning material on black resin

Detection of black-colored targets has been difficult with conventional reflective photoelectric sensors. The FW Series ensures reliable height differentiation without being affected by color.



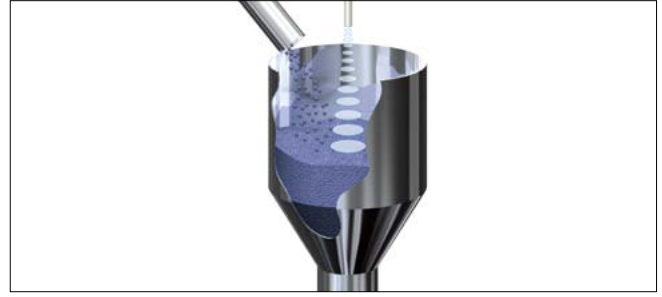
Detecting the liquid level of hydraulic fluid for a press

Dirty oil has been difficult to detect with conventional contact liquid level sensors. The FW Series enables non-contact detection reducing the need for costly maintenance services.



Detecting the fluid level of adhesive on a roll coater

Detection of adhesive with high viscosity has been difficult with conventional contact liquid level sensors. The FW Series enables non-contact detection. In addition, outputs of upper and lower limits can be performed separately.



Detecting remaining pellet quantity in a hopper

Due to shape and color variations of pellets, detection has been unstable with conventional reflective photoelectric sensors. The FW Series ensures reliable detection regardless of pellet color or shape.

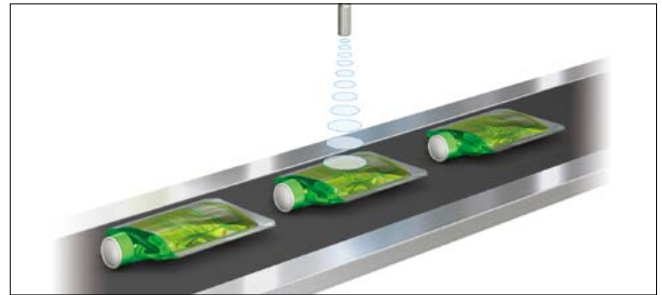


Food, Chemical, and Cosmetics Industries



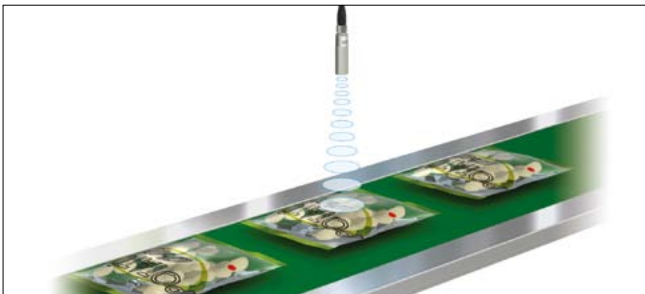
Detecting transparent bottles in the cleaning process

The FW Series ensures reliable detection of transparent targets with a rounded shape. In addition, detection is unaffected by an environment where water splashes on the target surface.



Detecting vinyl packages on a conveyer

Due to the transparency of the target and the unstable surface profile, detection has been difficult with photoelectric sensors. The FW Series can reliably detect targets with a rippled surface profile.



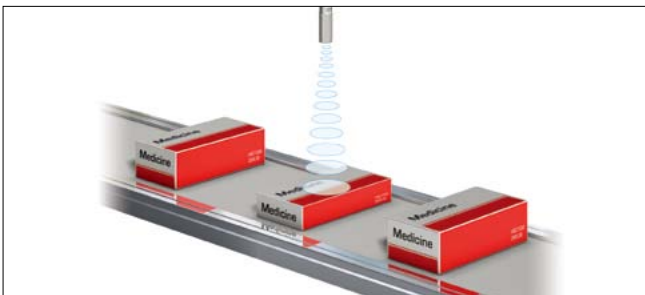
Detecting confectionery packaging on a conveyer

Depending on the condition of the contents, stable detection of transparent confectionery packaging has been difficult with conventional photoelectric sensors. The FW Series reliably detects only the outside transparent package without being affected by the contents.



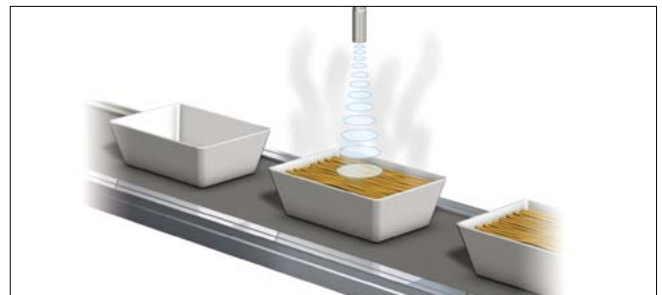
Detecting transparent lids of containers

The FW Series ensures reliable detection even if the target surface is rippled. In addition, detection is not affected by the inner contents when covered with a transparent lid.



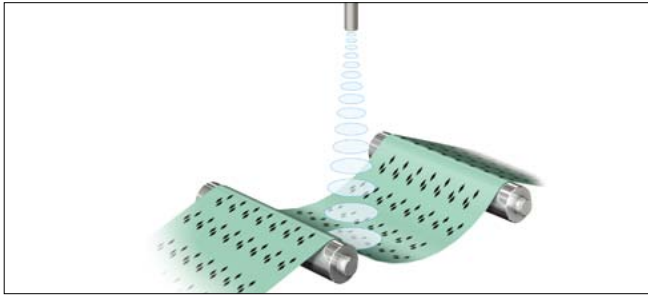
Differentiating the presence / absence of product packaging and product varieties

The FW Series is capable of differentiating only the height without being affected by the color or pattern of the targets. In addition, it is capable of differentiating product variety by using two outputs.



Detecting the presence / absence of contents in containers

Pasta or targets with an uneven surface profile can be detected reliably. In addition, detection is not affected by steam from fresh-cooked targets.



Detecting slack in films

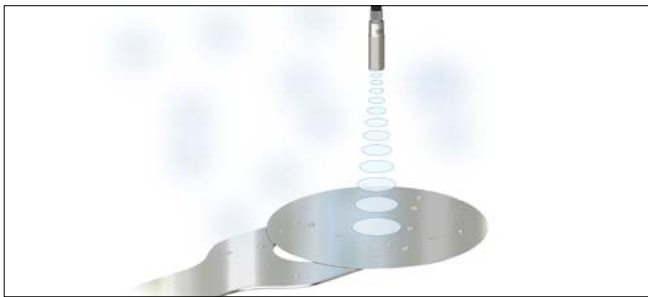
Reliable detection is ensured regardless of surface color, pattern, and luster. In addition, upper and lower limits can be output separately.



Detecting the level of chocolate

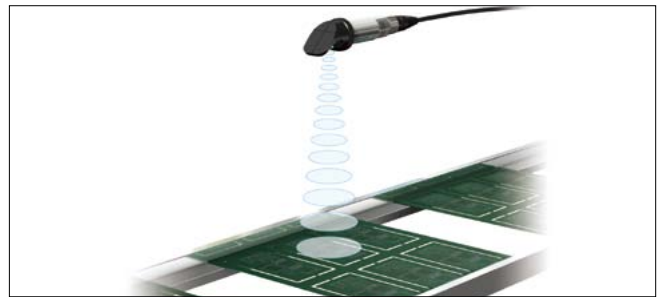
Since the targets are food products, contact liquid level sensors cannot be used. In addition, detection with photoelectric sensors is adversely affected by the target color and luster. The FW Series ensures reliable detection regardless of target color and luster.

Semiconductor/ Electronics/ Electrical Industry



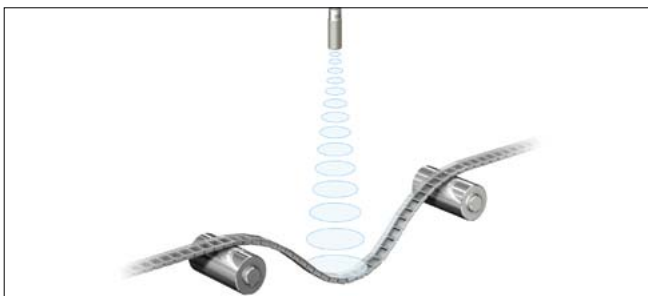
Detecting wafers in the cleansing process

Reliable detection of sweating wafers is ensured even in a vaporous atmosphere immediately after the slicing process.



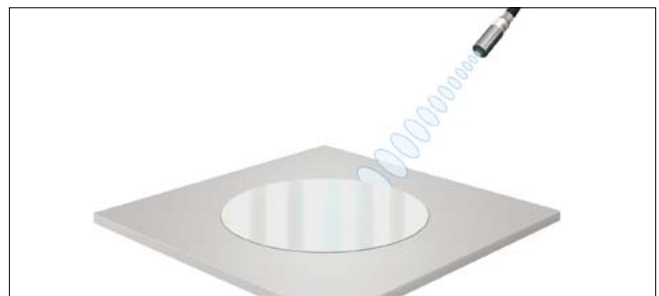
Detecting slit substrates in the transfer process

Due to the colors and slits of the substrate, instability and chattering of outputs have been inevitable with conventional photoelectric sensors. The FW Series ensures reliable detection unaffected by colors and small slits.



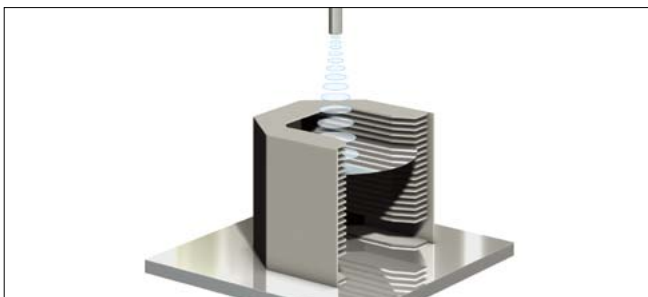
Controlling web tension

Due to transparency and surface irregularities, detection with photoelectric sensors has been difficult. The FW Series ensures reliable detection unaffected by projections and depressions. In addition, the two outputs can be used for making outputs of upper and lower limits separately.



Detecting wafers from an angle

Detection has been difficult because of the minute height difference between the thin wafer and background. The FW Series ensures reliable detection by applying ultrasonic waves from an angle to cause slight reflections from the edge.



Detecting wafers in a magazine rack

The FW Series is used to detect the remaining wafers. Detection with reflective-type sensors has been difficult because the light was absorbed by the surface film of the wafers. The FW Series is not affected by surface films or glossy backgrounds.

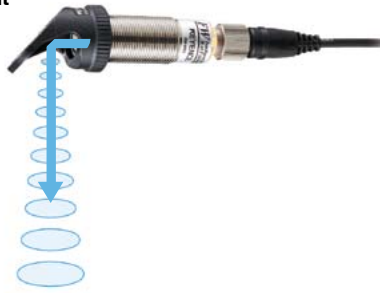


Controlling the fluid level of a cleaning solution

The FW Series is used for controlling the liquid level. The two outputs can be used for making outputs of upper and lower limits separately. In addition, the special liquid level detection mode enables various controls with simple setup.

Side viewer attachment FW-SV01

Enhances mounting flexibility by bending the ultrasonic waves.

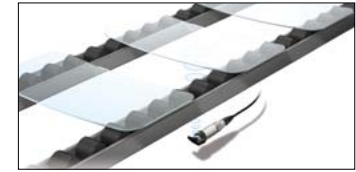


Applications



Detecting baskets

Cage-type targets with an open structure can be detected reliably with the FW Series with a wide detection range.



Detecting the passage of plate glass

Detection is ensured unaffected by the curvature, color, and luster of the surface.

Lineup

Sensor head

Model	Shape	Detecting range (inch mm)	Size (inch mm)
FW-H02		1.97" to 7.87" 50 to 200mm	M18 x P1 P0.04", Length = 2.5" 63.5
FW-H07		5.91" to 27.56" 150 to 700mm	
FW-H10R		5.91" to 39.37" 150 to 1000mm	M18 x P1 P0.04", Length = 4.1" 104

Digital amplifier

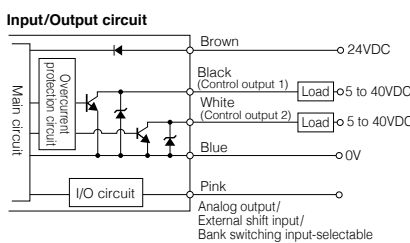
Model	Shape	Shape	Type of output
FW-V20		DIN mounting	NPN
FW-V20P			PNP
FW-V25		Panel mounting	NPN
FW-V25P			PNP

Options

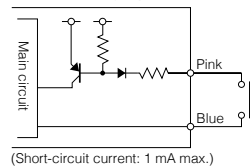
Side-view attachment FW-SV01	Light guide attachment FW-LG01	L-shaped cable connector OP-51691	Right-angled mounting bracket (PPS made) FW-B01	Straight mounting bracket (PPS made) FW-B02	Panel mounting bracket kit OP-51476 (Accessory to the FW-V25/V25P)
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Input/Output circuits

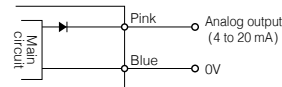
FW-V20/FW-V25 NPN



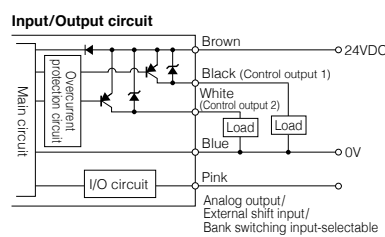
External shift input/ Bank switching input circuit



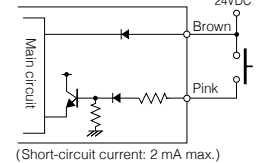
Analog output circuit



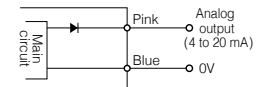
FW-V20P/FW-V25P PNP



External shift input/ Bank switching input circuit



Analog output circuit



Specifications

Sensor head

Model	Standard type		Precision type
	FW-H02	FW-H07	FW-H10R
Detecting range ¹ .	2.0" to 7.9" 50 to 200 mm	5.9" to 27.6" 150 to 700 mm	5.9" to 39.4" 150 to 1000 mm
Response speed	250 ms	300 ms	1000 ms
Temperature characteristics ² .	0.25% of F.S./°C ³ .		0.06% of F.S./°C
Indicator lamp	Operation indicator (orange) x1 (FW-H02/07: Turns on when the power is turned on. FW-H10R: Turns on when the target is within the detecting range.)		
Protective construction	IP67		
Ambient temperature	-25 to +70°C (-13 to 158°F), No condensation		
Relative humidity	35 to 85%, No condensation		
Resistance to vibrations	10 to 55 Hz, Horizontal amplitude: 1.5 mm, 2 hours each in the X, Y, and Z axis		
Dimensions	M18 x P1 P0.04", Length = 2.5" 63.5		M18 x P1 P0.04", Length = 4.09" 104
Weight (Including a 6.6' 2-m head cable)	Approx. 89 g		Approx. 106 g
Material	Brass-nickel plating, PBT, Polyurethane, Polyamide resin		
Accessories	M18 nut: 2, Head cable: 6.6' 2 m		

1. Dead zones of approx. 2% of F.S. exist at both ends of the detecting range.

2. The errors for the indicated value at 25°C (77°F).

3. The variation of sonic velocity in air generates errors in the negative direction at 25°C (77°F) and above, or in the positive direction at 25°C (77°F) and below.

Digital amplifier

Model	NPN	FW-V20/FW-V25	
	PNP	FW-V20P/FW-V25P	
Power-supply voltage	24 VDC, Ripple (P-P): 10% max.		
Current consumption		When connected to the FW-H02/H07	When connected to the FW-H10R
	Normal mode	1680 mW (70 mA) max.	2640 mW (110 mA) max.
	ECO mode	1370 mW (57 mA) max.	2330 mW (97 mA) max.
Display format [inch/mm selectable]	2-row display with signed 3-digit, 7-segment LED (Character height: Upper row: 0.32" 8 mm, red; Lower row: 0.22" 5.7 mm, green) Refresh rate: 10 times/sec. (5 times/sec. when using the display averaging function)		
Operation indicator	Red LED x 2 (corresponding to Control output 1 and Control output 2) Green LED x 2 (Display CH indicator)		
Chattering prevention function	Selectable from OFF, 0.5, 1, 2, 5, and 10s (Selectable from OFF, 1, 2, 5, and 10s when connected to the FW-H10R)		
Bank/external shift input	Input time: 25 ms min. (This input/analog output is selectable.)		
Control output	NPN (PNP) open collector, 100 mA 40 V max. (30 V max. for PNP) Residual voltage: 1 V max., 2 outputs (N.O./N.C. switch-selectable)		
Protective circuit	Reverse connection protection, over-current protection, surge absorber		
Analog output	4 to 20 mA, maximum load resistance: 260 Ω (Bank/external shift input/analog output selectable)		
Ambient temperature	-10 to +55°C (14 to 131°F) No condensation		
Relative humidity	35 to 85%, No condensation		
Resistance to vibrations	10 to 55 Hz, Horizontal amplitude: 1.5 mm, 2 hours each in the X, Y, and Z axis		
Housing material	Main unit and cover: Polycarbonate, Keycaps: elastomer		
Weight (Including a 6.6' 2-m power cable)	Approx. 85 g		
Accessories	FW-V20 (P): Mounting bracket, power cable, and instruction manual FW-V25(P): Panel mounting bracket, front protective cover, power cable, and instruction manual		

Specifications of options

Side-view attachment FW-SV01

Sensor head model combination	FW-H02	FW-H07	FW-H10R
Detecting range 1.	2.0" to 7.1" 50 to 180 mm	5.9" to 24.8" 150 to 630 mm	5.9" to 35.4" 150 to 900 mm
Ambient temperature	-25 to +70°C (-13 to 158°F), No condensation		
Relative humidity	35 to 85%, No condensation		
Resistance to vibrations	10 to 55 Hz, Horizontal amplitude: 0.06" 1.5 mm, 2 hours each in the X, Y, and Z axis		
Weight	Approx. 15 g		
Material	PPS		
Accessories	M18 nut: 1, Wave washer: 1		

1. Indicates the distance from the detecting reference (zero point). Refer to the dimensions below for the detecting reference.

Light guide attachment FW-LG01

Model	FW-LG01
Power-supply voltage	6 VDC (button battery LR43 x 4)
Light source	Blue LED (wave length: 470 nm)
Ambient temperature	0 to 45°C (32 to 113°F), No condensation
Resistance to vibrations	10 to 55 Hz, Horizontal amplitude: 0.06" 1.5 mm, 2 hours each in the X, Y, and Z axis
Housing material	Main unit: ABS; Keycap: Silicon rubber
Weight	Approx. 21 g (Including batteries)
Accessories	Test button batteries (LR43): 4, instruction manual * Batteries are loaded to the casing.

* It is recommended that the product be used with a maximum detecting distance of 19.69" 500 mm due to the visibility and consistency of the spot and the detecting distance.

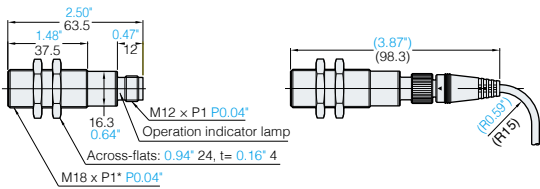
L-shaped relay connector OP-51691

Model	OP-51691
Ambient temperature	-25 to +70°C (-13 to 158°F), No condensation 10 to 55 Hz, Horizontal amplitude:
Resistance to vibrations	0.06" 1.5 mm, 2 hours each in the X, Y, and Z axis
Weight	Approx. 70 g

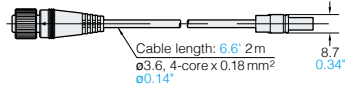
Dimensions

Unit: inch mm

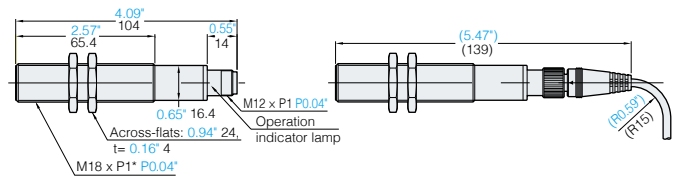
Sensor head FW-H02/FW-H07



Head cable

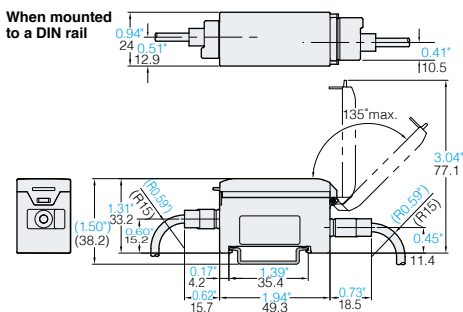


Sensor head FW-H10R

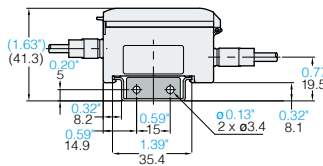


* Compatible female screw: Min. internal diameter 17.1 0.68"

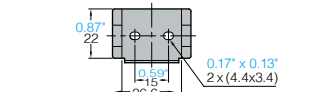
Digital amplifier FW-V20/V20P



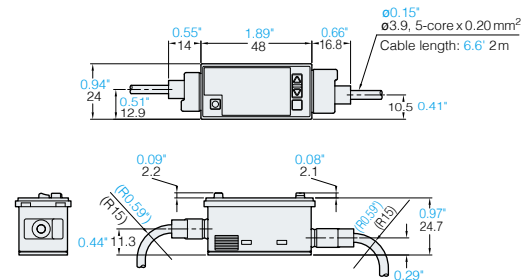
When attaching a bracket (standard)



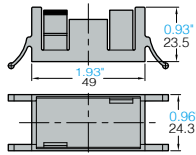
Mounting bracket TYPE304 stainless steel



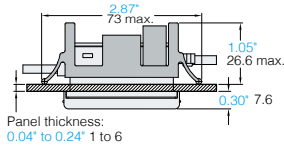
Digital amplifier FW-V25/V25P



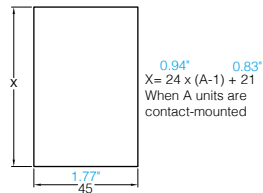
**Panel-mounting bracket kit
OP-51476**



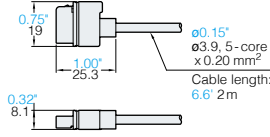
When mounted to a panel:



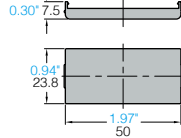
Panel cutout



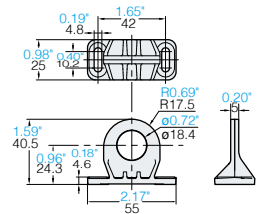
Power cable



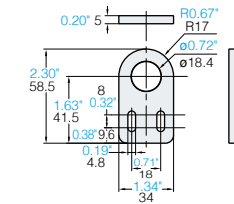
Front protective cover



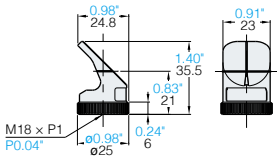
Right-angled mounting bracket FW-B01



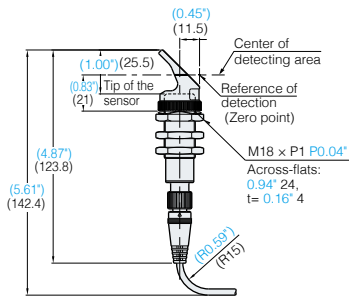
Straight mounting bracket FW-B02



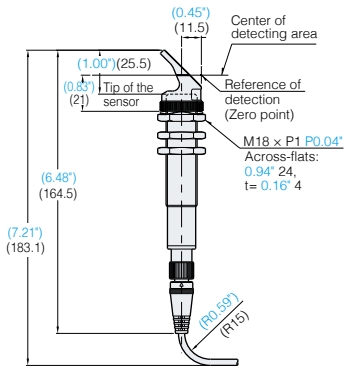
**Side-view attachment
FW-SV01**



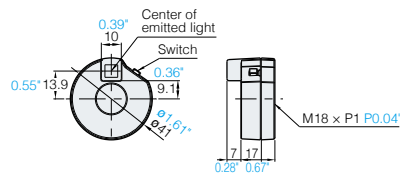
FW-H02/H07 with FW-SV01



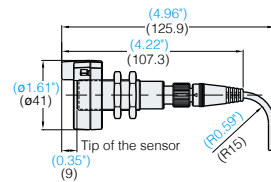
FW-H10R with FW-SV01



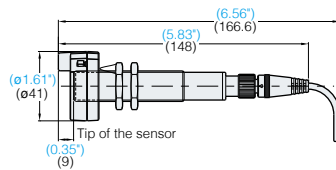
**Light guide attachment
FW-LG01**



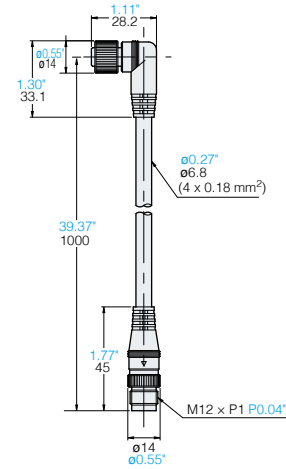
FW-H02/H07 with FW-LG01



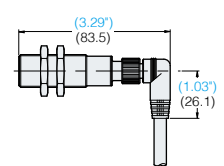
FW-H10R with FW-LG01



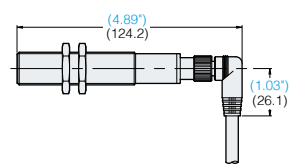
**L-shaped cable connector
OP-51691**



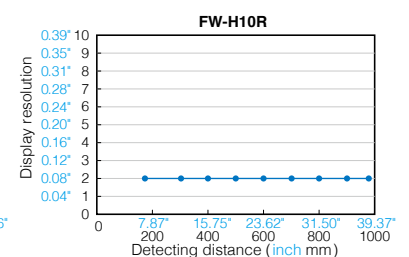
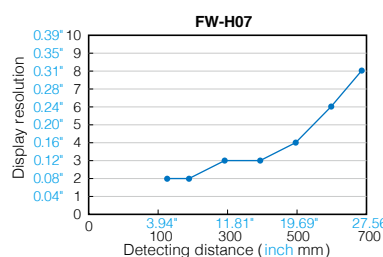
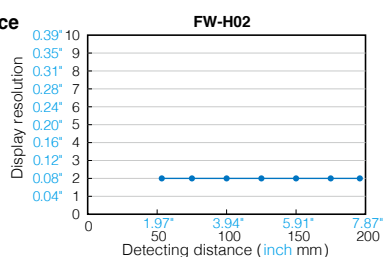
FW-H02/H07 with OP-51691



FW-H10R with OP-51691



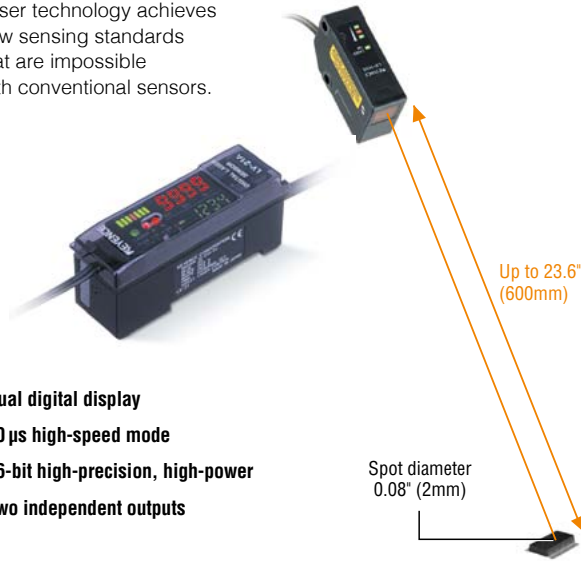
Display resolution-distance characteristics (Typical)



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LV-H300 (30 mm spot)

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Up to 23' (1m)

Long-distance, adjustable spot LV-H32

Up to 39' (1000mm)

Long-distance, area detection LV-H42

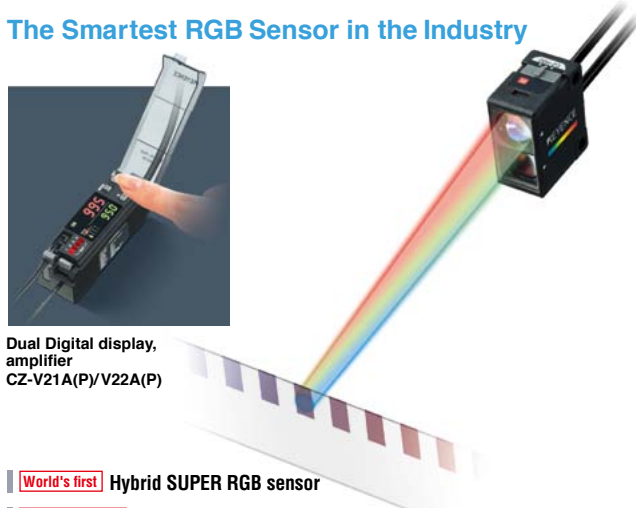
1.46" (48mm) width

Area detection, definite-reflective LV-H47

2.2" to 3.3" (55 to 85mm) range

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