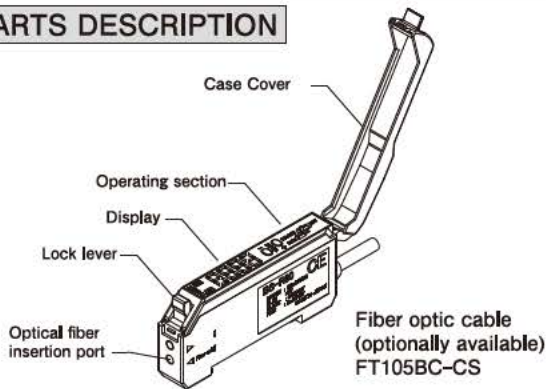


1 PARTS DESCRIPTION



2 SAFETY PRECAUTIONS

- To ensure safety, be sure to follow the precautions below.
1. Do not use this product for safety critical applications.
 2. Do not use this product when its housing or cable is damaged.
 3. Do not attempt to disassemble, repair, or modify this product.
 4. Do not use this product in an environment containing flammable, explosive, or corrosive gas.
 5. Do not use this product in an environment exposed to chemicals or oil.
 6. Do not use this product in an environment exposed to water including outdoors or underwater.
 7. Use this product within its rated specification.
 8. Do not expose this product to direct sunlight.
 9. Do not use this product in a place exposed to vibration or shock.
 10. Do not use organic solvents such as alcohol or thinner to clean the product.
 11. Perform a daily operation check, weekly periodical check, and maintenance to ensure correct operation.
 12. This product should be disposed of as industrial waste.

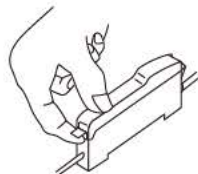
3 PRECAUTIONS FOR OPERATION

1. Be sure to route the sensor cables separate from any power transmission or high voltage line, or else use shielded cables. Using the same conduit or duct as high voltage or power lines will cause malfunctions or damage because of electromagnetic induction.
2. Do not apply excessive force to the cable.
3. When using a switching regulator, be sure to ground the frame ground (FG) terminal.
4. The sensor starts operation 2 seconds after power is applied. Always power on the sensor prior to the load.
5. Turn off the power of the load first as this product may generate an output pulse when the power is turned off.
6. Avoid turning the power on and off consecutively.
7. When extending the cables, use conductors of 0.3 mm² cross-sectional area or more.
8. Limit the current from the power supply to 2A.

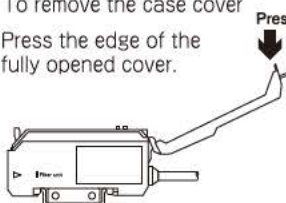
4 INSTALLATION

4-1 Amplifier case cover

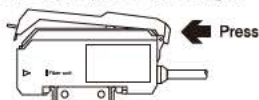
- 1) To open the case cover
Lift the cover by pulling up the tab.



- 2) To remove the case cover
Press the edge of the fully opened cover.

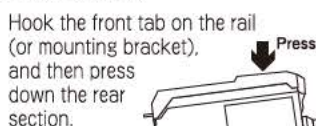


- 3) To attach the case cover
Place the cover on the amplifier unit as shown in the figure, and then press the hinge.



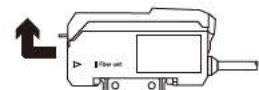
4-2 DIN rail and dedicated mounting bracket

- 1) DIN rail mount

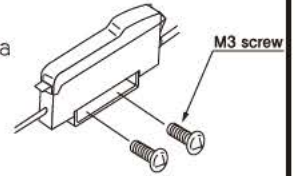


- 2) Removal

Press the unit forward and pull up the front section.

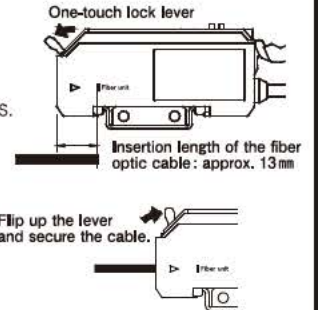


- 3) Side face mount
Install the side of the amplifier unit using a supplied mounting bracket. Tightening torque should be 0.8 N·m or less.



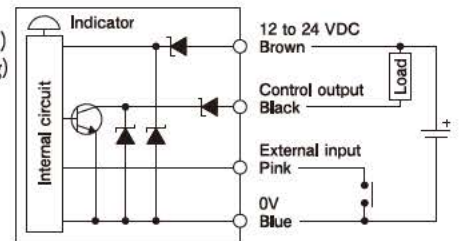
4-3 Installation of fiber optic cable Recommended fiber optic cable: FT105BC-CS

- 1) Flip down the lock lever.
- 2) Insert the fiber optic cable until it stops.
- 3) After inserting the fiber optic cable, flip up the lock lever until it clicks into place.

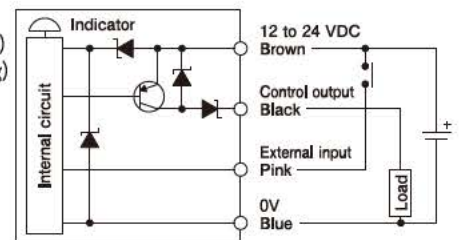


5 CONNECTION

● NPN output mode Control output (NPN) External input (teaching)

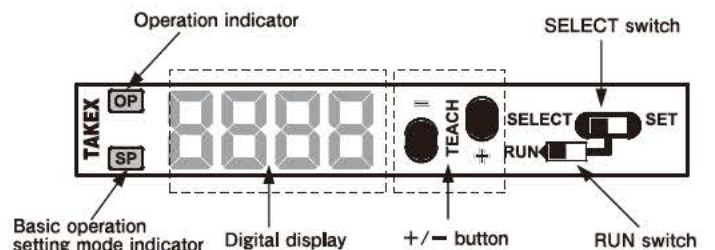


● PNP output mode Control output (PNP) External input (teaching)



※ When not using the external input, connect the external input cable (pink) to 12 to 24 VDC in NPN mode and to 0V in PNP mode.

6 OPERATION PANEL



- **Indicator**
Operation indicator (OP): Lights when output is issued.
Basic operation setting mode indicator (SP): Lights during basic operation setting.
- **Digital display**
 - ◇ During setting
 - 1 digit in orange: Indicates the selected number.
 - 3 digits in red: Indicates the status of various parameters.
 - ◇ During RUN
 - 1 digit in orange: [P] is displayed during the % indication mode.
 - 3 digits in red: Indicates the received light intensity.
- ※ The received light intensity is displayed subsequently for better visibility.
- **RUN switch** : Switches from RUN mode to setting mode.
- **SELECT switch** : Switches from SELECT mode to SET mode.
- **+/- button** : Changes values and items to set.

7 DISPLAY DURING RUN MODE

7-1 Digital display

The value increases as the received light intensity increases.



Absolute-value mode: The received light intensity is display in the range of 0 to 999.

600

% indication mode: The received light intensity is displayed in the range from 0 to 999 / (reference light level) × 100, with a maximum value of 999%.

P 100

※ The % indication cannot be used when the reference light level is 20 or less.

When the value is larger than 999 in absolute-value mode or P999 in % indication mode, the OVER indication is displayed as shown in the figure.

uuu P uuu

If excessive current flows into the open collector output, the short-circuit protection function will be activated. The output will turn OFF, and the display on the right will appear. Check and remove the cause of the excess current.

Sxrt

7-2 Operation indicator

Output OFF OP Turns OFF	Output ON OP Turns ON
-------------------------------	-----------------------------

7-3 Status check (during RUN mode)

● In % indication mode, press and hold down the [+] button when the SELECT switch is set to SELECT to change to the absolute-value mode.

SELECT RUN SET
P 100 → 500

● Press the [-] or [+] button, or [-] and [+] together, when the SELECT switch is set to SET to check following values.

SELECT RUN SET
80

The minimum value is updated and displayed while the [-] button is held down.

900

The maximum value is updated and displayed while the [+] button is held down.

5 120

The value of the reference light level (denominator for the % indication) set during teaching is displayed when [-] and [+] buttons are pressed at the same time.

5 120

7-4 ECO display mode

When the ECO power saving function setting is ON, the digital display will appear as shown in the right if no operation is performed for approx. 20 seconds during RUN mode. The digital display will be restored when any operation is performed.

5 120

8 TEACHING

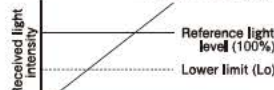
Target value setting (auto sensitivity) mode

The sensitivity is automatically set to the optimum value while receiving the reference light. The threshold is set based on the reference light level and the target value (%).

Target value setting (manual sensitivity) mode

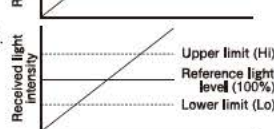
The threshold is set based on the reference light level and the target value (%). Manually set the sensitivity according to the received light intensity in advance.

Threshold = reference light level × target value (%)



Lower limit setting mode

After teaching the reference light level (100%), perform lower limit teaching to set the lower limit (Lo: threshold).



Lower and upper limits setting mode

After the lower limit is set, perform upper limit teaching to set the upper limit (Hi: threshold).

- When using in the target value setting mode (switch on the main unit / external input) → see 8-1
- When using in the lower limit setting mode / lower and upper limits setting mode (switch on the main unit) → see 8-2
- ※ When teaching cannot be performed for an intended application, manually change the various parameter settings before use.
- ※ Each teaching data is saved at the transition to RUN mode.

8-1 Target value setting mode

- For the mode transition, see "9. TEACHING SETTING PROCEDURE"

1) Teaching using switch on the main unit

Status	Operation	Switch	Display	Workpiece
RUN mode	SELECT+RUN	SELECT RUN SET	Received light intensity ※ In manual sensitivity mode, select the sensitivity in the sensitivity setting	Receives the reference light
Received light intensity teaching for the reference light	Press and hold [-] button	TEACH + Hold down for 3 seconds	Auto sensitivity mode: Sensitivity is automatically set Manual sensitivity mode: Preset sensitivity is used	
			5300 The reference value is displayed. The threshold is set based on the reference light level and the target value.	
			Lo	
			50	
			Good	
Teaching completed			[Good] is displayed when teaching is completed correctly. Status returns to the RUN mode.	

2) Teaching using external input

Status	Operation	Switch	Display	Workpiece
RUN mode	SELECT+RUN	SELECT RUN SET	Received light intensity ※ In manual sensitivity mode, select the sensitivity in the sensitivity setting	Receives the reference light
Received light intensity teaching for the reference light	Close the external input for 3 seconds		8	
			Auto sensitivity mode: Sensitivity is automatically set Manual sensitivity mode: Preset sensitivity is used	
Teaching	Open the external input		5300 The reference value is displayed. The threshold is set based on the reference light level and the target value.	
			Lo	
			50	
			Good	
Teaching completed			[Good] is displayed when teaching is completed correctly. Status returns to the RUN mode.	

· If the received light intensity of the reference light is outside the range of 20 to 999, [Err] is displayed. Teaching is canceled, and the data is not updated. Then [CXL] is displayed, and the status returns to the RUN mode.

· If the lower limit or hysteresis exceeds 999 (%), [War] is displayed as warning. The data is set to 999 (%) or less as the absolute value, and is saved. Make sure to check the set value.

8-2 Lower limit setting mode / lower an upper limits setting mode teaching

- For the mode transition, see "9. TEACHING SETTING PROCEDURE"

1) Teaching using switch on the main unit

Status	Operation	Switch	Display	Workpiece
RUN mode	SELECT+RUN	SELECT RUN SET	Received light intensity ※ Select the sensitivity in the sensitivity setting in advance	Receives the reference light
Received light intensity teaching for the reference light	Press and hold [-] button	TEACH + Hold down for 3 seconds	8 Preset sensitivity is displayed	
			5300 Reference value is displayed and set	
Receives the lower limit light			Lo	
Lower limit teaching	Press [-] button	TEACH + Press	50 Press [-] button when lower limit level appears	Receives the lower limit light
			50 Lower limited is displayed and set	
			Good	
			Lower limit mode: [Good] is displayed when teaching is completed correctly. Status returns to the RUN mode.	
Receives the upper limit light			Hi	
Upper limit teaching	Press [-] button	TEACH + Press	Hi 500 Press [-] button when upper limit level appears	Receives the upper limit light
			500 Upper limited is displayed and set	
			Good	
Teaching completed			Lower and upper limit mode: [Good] is displayed when teaching is completed correctly. Status returns to the RUN mode.	

• If the received light intensity of the reference light is outside the range of 20 to 999, [Err] is displayed. Teaching is canceled, and the data is not updated. Then [CXL] is displayed, and the status returns to the RUN mode.

Err → CXL

• If the lower limit, upper limit, or hysteresis exceeds 999 (%), [War] is displayed as warning. The data is set to 999 (%) or less as the absolute value, and is saved. Make sure to check the set value.

War

• If the lower limit, upper limit, or hysteresis exceeds 999 (%), or if upper and lower limits interfere with each other, [Err] is displayed to indicate an error. Perform the lower or upper limit teaching again.

Err

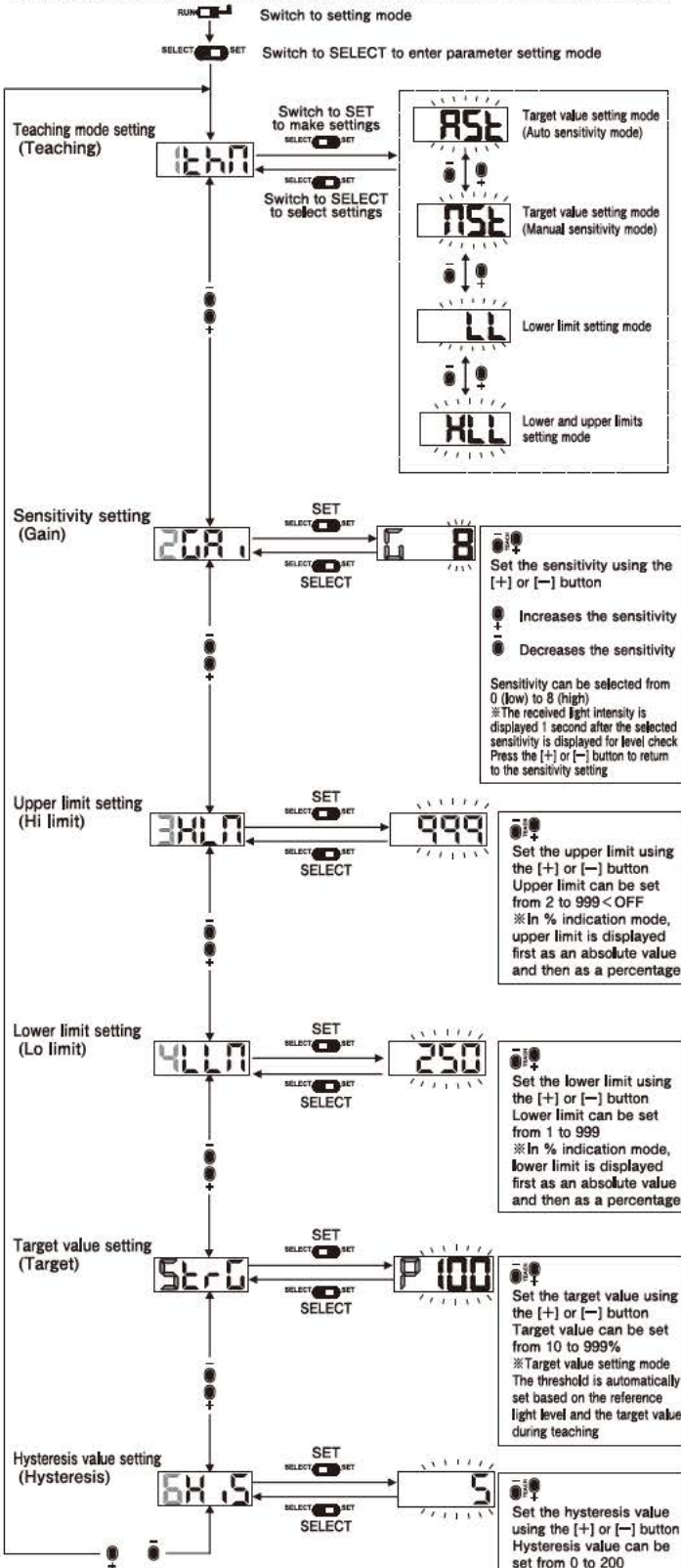
• Press [+] button to cancel lower or upper limit teaching. [CXL] is displayed, and teaching will end without updating the data.

CXL

9 PARAMETER SETTING

Following settings can be made.

※The values shown below are examples and differ from those shown on the actual display.

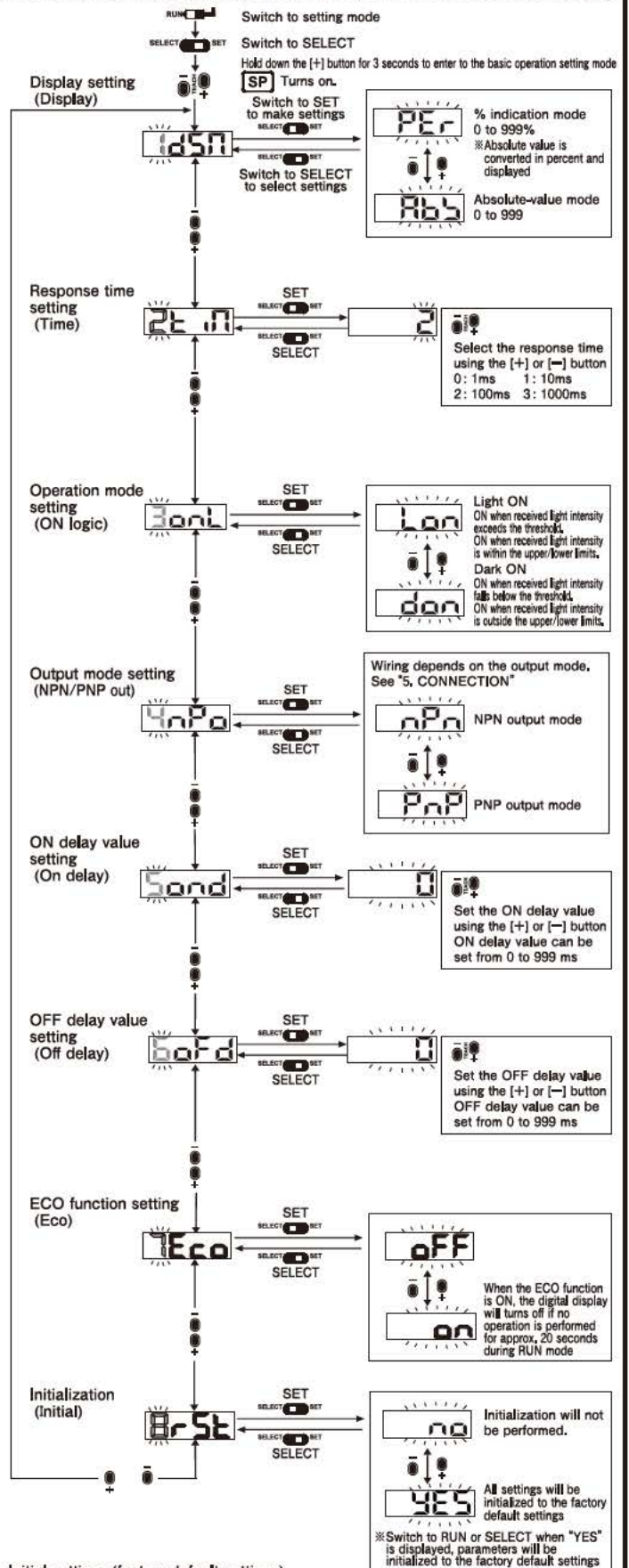


10 BASIC OPERATION SETTING

Following functions can be set.

※Perform teaching again after changing parameters in the basic operation setting mode.

※The values shown below are examples and differ from those shown on the actual display.



Initial settings (factory default settings)

1 Teaching mode: Target value setting (auto sensitivity) mode (AS)

2 Sensitivity setting: 5

3 Upper limit: OFF

4 Lower limit: 500

5 Target value: 50

6 Hysteresis: 5

Reference light level: 500

※1 Display setting: % mode (PER)

※2 Response time: 3

※3 Operation mode: Light ON (Lon)

※4 Output mode: NPN output (nPn)

※5 ON delay: 0

※6 OFF delay: 0

※7 ECO function: OFF (oFF)

※8 Initialization: NO (no)

11 UNSTABLE DETECTION

- ◆ This sensor is affected by ambient light. Avoid using it in an environment where the brightness changes, such as by a window.
- ◆ If the ambient light is brighter than the workpiece light source, detection may become unstable. Place the tip of the fiber optic cable as close as possible to the workpiece light source so that ambient light does not enter.
- ◆ If the workpiece light source is bright and received light intensity is excessive even at [GAIN 0], use a fiber optic cable with a core of smaller diameter.
- ◆ Chattering may occur depending on the installation environment and setting status. Chattering can be suppressed by delaying the response time, increasing the amount of hysteresis, or enabling the ON delay or OFF delay timer.

12 SPECIFICATION

Model		BS-R80
Detection method		Identifying brightness
Light sensitivity		DC lighting 10 to 1000lx (white LED) / pulse lighting depends on conditions
Standard detection target		Light source that emits visible light and near-infrared light / DC lighting / pulse lighting
Power supply		12 to 24 VDC, Ripple 10% or less
Current consumption		500mW or less (20mA or less at 24V)
Standard light wavelength		400 to 900nm
External teaching input		No-voltage input (contact / no-contact) (During target value setting mode teaching only)
Output	NPN mode	NPN open collector output Rating: Sink current 50mA (30 VDC) or less / Residual voltage 2V or less
	PNP mode	PNP open collector output Rating: Source current 50mA (30 VDC) or less / Residual voltage 2V or less
Operation mode		Light ON/Dark ON (operation mode selectable)
Timer		ON delay / OFF delay Delay timer: 0ms to 999ms (set in millisecond)
Response time		0: 1ms / 1: 10ms / 2: 100ms / 3: 1000ms ※1
Indicator		Operation indicator: "OP" LED (orange) lights when output is issued Basic operation setting mode indicator: "SP" LED (red) lights up during basic operation setting
Display		Function display (orange) / numeric display 3-digits (0 to 999, red)
Operation switch		(+) and (-) push button switches: setting selection / reference light level teaching / parameter change. Selector switches: RUN / SELECT / SET selection
Protection circuit		Power reverse connection / Output short-circuit protection / Output reverse connection
Material		Polycarbonate
Wiring		Attached cable (o.d. ϕ 3.7), 0.2mm ² × 4-cores, 2m
Weight		Approx. 60g (Cable 2m, including mounting bracket)
Accessory		Mounting bracket / Instruction manual

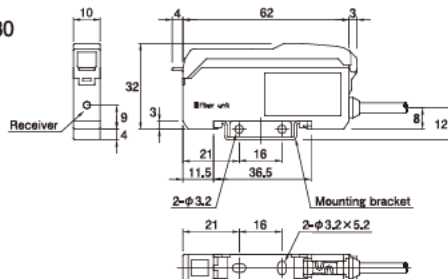
- ※1 Detection is enabled 2 seconds after power is applied.
 ※2 Fiber optic cable is optionally available. Recommended fiber optic cable: FT-105BC-CS (core diameter ϕ 1.5)

ENVIRONMENTAL SPECIFICATION

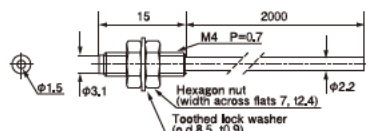
Ambient temperature	-25 to +55°C (no freezing)
Ambient humidity	35 to 85%RH (no condensation)
Protective structure	I P40
Vibration	10 to 55Hz / 1.5mm double amplitude / 2 hours each in X, Y and Z directions
Shock	500m/s ² / 3 times each in X, Y, Z directions
Dielectric withstanding	1000 VAC for 1 minute
Insulation resistance	20M Ω or more with 500 VDC Megger

13 DIMENSIONS (in mm)

Model BS-R80



Model FT105BC-CS (optionally available)



14 WARRANTY

The product is covered by a warranty based on the Quality Regulations of Takenaka Electronic Industrial Co., LTD. (Takenaka). Regarding the warranty, please feel free to ask any questions to Takenaka, Takex sales office or authorized distributors.

1 (Warranty period)

The warranty period is one (1) year after delivery to a designated location. This warranty does not apply to expendable supplies like batteries or relays, and products of other manufacturers which Takenaka markets.

2 (Scope of warranty)

If any defect is found during the warranty period. Takenaka will, at its option, repair or replace the defective product at the location of delivery. This warranty is void and of no effect if the product is subject to improper use or handling, improper maintenance, modification, repair made by persons not authorized by Takenaka or a lack of reasonable care. The warranty does not cover defects caused by the other product, reason including fire, flood, earthquake, lightning surge and other natural disasters.

- ① If the product is used inappropriately or used under inappropriate conditions that are not described in the instruction manual or specifications.
- ② If the defect is caused by improper maintenance, including a failure to replace consumable or periodical parts as described in the instruction manual or specifications.
- ③ If the defect is not directly caused by the warranted product.
- ④ If the products is modified or repaired by persons not authorized by Takenaka.
- ⑤ If the defect is caused by rough handling, dropping, or collision after the product is delivered.
- ⑥ If the defect could not be predicted from a technical viewpoint at the time Takenaka made the agreement for, manufactured, or installed the product.
- ⑦ If the defect is caused by a natural disaster such as a fire, flood, earthquake, lightning (including a lightning surge) and so on, or an accident such as an abnormal voltage that Takenaka is not responsible for.

The warranty provided here is only for the Takenaka product and does not cover any secondary damage caused by problems related to the product.

3 (Target of Warranty)

- (1) In case that the product is used in combination with other products or as a part of a system, Buyer should confirm the compatibility of the product to the application by relevant laws, decrees, standards and regulations.
- (2) This product is designed and manufactured for use in general industries. This warranty does not cover the application of the product to:
 - ① Nuclear power facilities including power station, incineration plant, public utilities including railway, vehicle and airway facilities, medical devices, amusement machines, safety devices and facilities that are governed by regulation of government or industrial organization.
 - ② Facilities that may cause danger or serious effects on human life and assets.
 - ③ Utilities like electricity, gas or water facilities. Facilities that are required 24 hour continuous operation.
 - ④ Outdoor use or use in improper conditions or environment.
 - ⑤ Other facilities which requires broad and detailed consideration concerning safety and reliability equivalent to the above.

This warranty may cover these application in case that Takenaka is notified about the application of the product before sale and Buyer approves the compatibility and the specifications of the product by written agreement and / or by providing required safety measures.

15 DISCLAIMER

- This product is designed to detect a presence or passage of an object. This product does not have any function to prevent accidents, death or injuries. Takenaka will assume no responsibility for damages or losses resulting from accidents or disasters caused by a failure of the product, complete wiring or installation or any act that does not follow the instruction manual.
- Earthquakes, lightning (including lightning surges), fires that we are not responsible for, acts or incidents caused by third parties, intentional or accidental misuse, or usage under other abnormal conditions.
- Any secondary damage caused by the usage, faulty operation, or malfunction of the product like suspended operation or malfunction of a connected device or system, damage to a device, loss of profit, interruption of business, corruption or loss of memory contents, cost of restoration, etc.
- Misuse, failure related to maintenance, installation or deinstallation, or failure to follow the contents of the instruction manual.
- Any malfunction (including false alarm or lost alarm) caused by the combination with a connected device or software over that we have no control.
- The responsibility of Takenaka is limited to the extent of repair or replacement of the product. The expenses we are liable for will not exceed the original product cost.