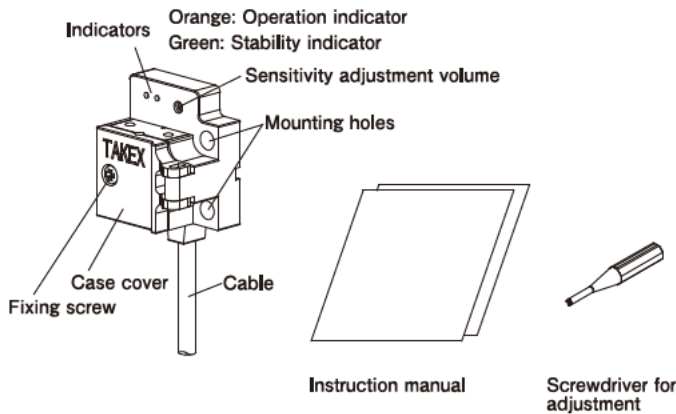


1 PART NAMES



2 SAFETY PRECAUTIONS

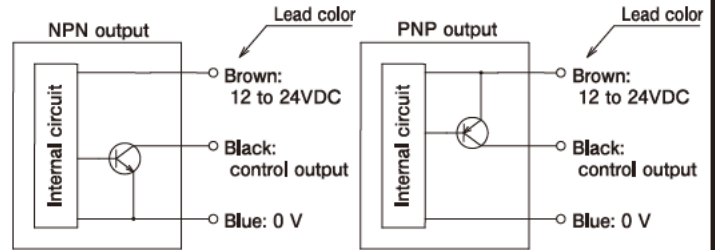
- Do not use this product for life or safety critical applications.
- Do not use this product when its housing or cable is damaged.
- Do not attempt to disassemble, repair, or modify this product.
- Do not use this product in an environment containing flammable, explosive or corrosive gas.
- Do not use this product in an environment exposed to water including outdoors or under the water.
- Use this product within the rating specifications.
- Do not expose this product to direct sunlight.
- Do not use this product in a place exposed to vibration or shock.
- Clean the optical window and case using a soft and dry cloth. Do not use organic solvent such as alcohol and thinner.
- This product should be disposed of an industrial waste.

3 PRECAUTIONS DURING USE

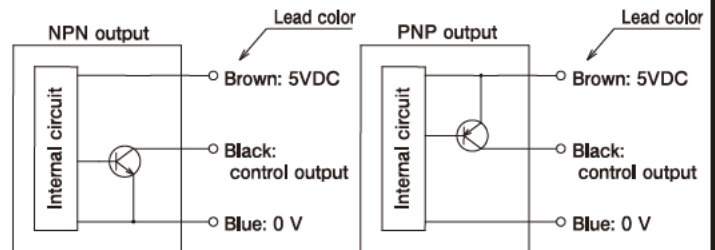
- Use transparent pipes with an outer diameter from 1.6 to 2.2mm and a pipe thickness of 0.5mm or less. Check operation in advance as the sensor may not detect the inner liquid depending on the pipe material.
- This product is designed to detect transparent liquid. Colored or opaque liquid may not be detected.
- Tightening torque for the case cover fixing screw is 0.05N · m or less.
Applying excess torque may break the pipe or the case cover.
- Use M3 screw to mount the sensor and tighten it with a torque of 0.3N · m or less.
- 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.
- Do not apply excessive force to the cable.
- When using a DC power unit with an insulated transformer or a switching regulator, be sure to ground the frame ground (FG) terminal.
- The sensor starts operation 100 msec after power is supplied. Always power on the sensor first.
- This product may generate an output pulse when the power is turned off. Turn off the power of the load first.
- Avoid turning the power on and off consecutively.
- When extending the cables, use conductors of at least 0.3mm² cross-sectional area and check the voltage drop.

4 WIRING

● Power supply: 12 to 24VDC type



● Power supply: 5VDC type

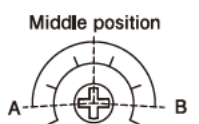


5 SETUP

● Setup for Dark ON mode : On when detecting liquid.

Operation indicator (orange LED) turns on while detecting liquid.
Operation indicator turns off while detecting no liquid.

- Set a pipe at a given position (see 6. INSTALLATION).
- Turn the sensitivity adjustment volume counterclockwise to the MIN.
- Confirm the Operation indicator (orange LED) turns off when there is no liquid in the pipe. If the indicator turns on, turn the volume clockwise until the indicator turns off and regard the position as Point A.
- Turn the sensitivity adjustment volume clockwise to MAX and confirm the Operation indicator turns on while there is liquid in the pipe. If the indicator turn off, turn the volume counterclockwise until the indicator turns on and regard the position as Point B.
- Set the volume at the middle point between Points A and B.
- Confirm both the Operation indicator (orange LED) and the Stability indicator (green LED) turn on when liquid is present, and only the Stability indicator turns on when there is no liquid in the pipe.

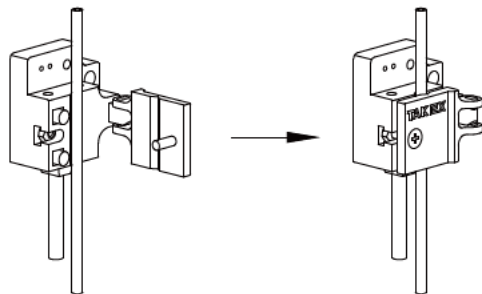


● Setup for Light ON mode : Off when detecting liquid.

Operation indicator (orange LED) turns off while detecting liquid.
Operation indicator turns on while detecting no liquid.

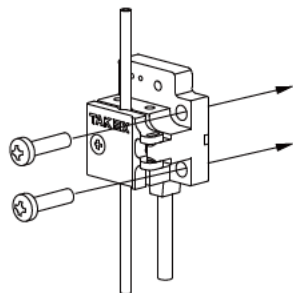
6 INSTALLATION

1. Place a pipe in the groove of the case and fix the case cover with the screw.



※ Tightening torque is 0.05N·m or less.
Do not apply excessive torque.

2. Mount the sensor by M3 screws. Be careful that the sensor does not slide on the pipe.



※ Tightening torque is 0.4N·m or less.
Do not apply excessive torque.

7 RATINGS / PERFORMANCE / SPECIFICATIONS



Model	LS-24L	LS-24D	LS-24LP	LS-24DP	LS-5L	LS-5D	LS-5LP	LS-5DP
Power supply	12 to 24VDC \pm 10% / Ripple 10% or less				5VDC \pm 10% / Ripple 5% or less			
Detection object	Liquid							
Outer diameter of mounted pipe	Transparent pipe with outer diameter of 1.6 to 2.6mm (pipe thickness: 0.5mm or less)							
Consumption power	17mA or less				24mA or less			
Output mode	NPN open collector output Rating: sink current 80mA (30VDC) or less		PNP open collector output Rating: source current 80mA (30VDC) or less		NPN open collector output Rating: sink current 80mA (30VDC) or less		PNP open collector output Rating: source current 80mA (30VDC) or less	
Operation mode (※)	Light ON	Dark ON	Light ON	Dark ON	Light ON	Dark ON	Light ON	Dark ON
Response time	0.5 ms or less							
Light source	Red LED (wave length of transmission: 647nm)							
Indicators	OPL: Operation indicator (orange LED) STB: Stability indicator (green LED)							
Volume	Sensitivity adjustment							
Material	Case: PBT, Filler: polyester							
Wiring method	Attached cable (outer diameter: 2.8mm) 0.15mm ² × 3 cores, 1m							
Weight	Approx. 20g							
Accessories	Instruction manual, screwdriver for adjustment							

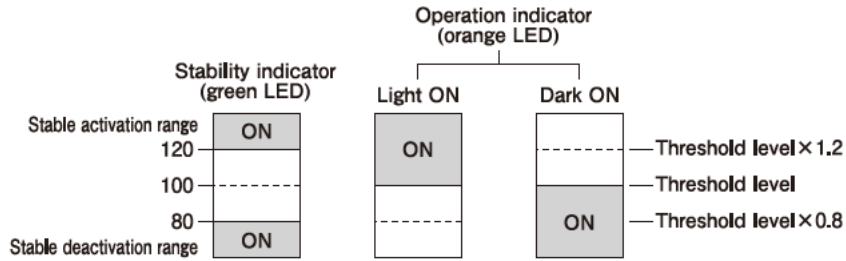
(※) Light ON : On when detecting no liquid Dark ON : On when detecting liquid

ENVIRONMENTAL SPECIFICATIONS

Ambient light	3,000 lx or less
Ambient temperature	-25 to +55°C (No freezing)
Ambient humidity	30 to 85%RH (No condensation)
Protection rating	I P50
Vibration	10-55Hz / 1.5mm double amplitude / 2 hours each in 3 directions
Dielectric tolerance	1,000VAC for 1 minute
Insulation resistance	500VDC, 20MΩ or higher

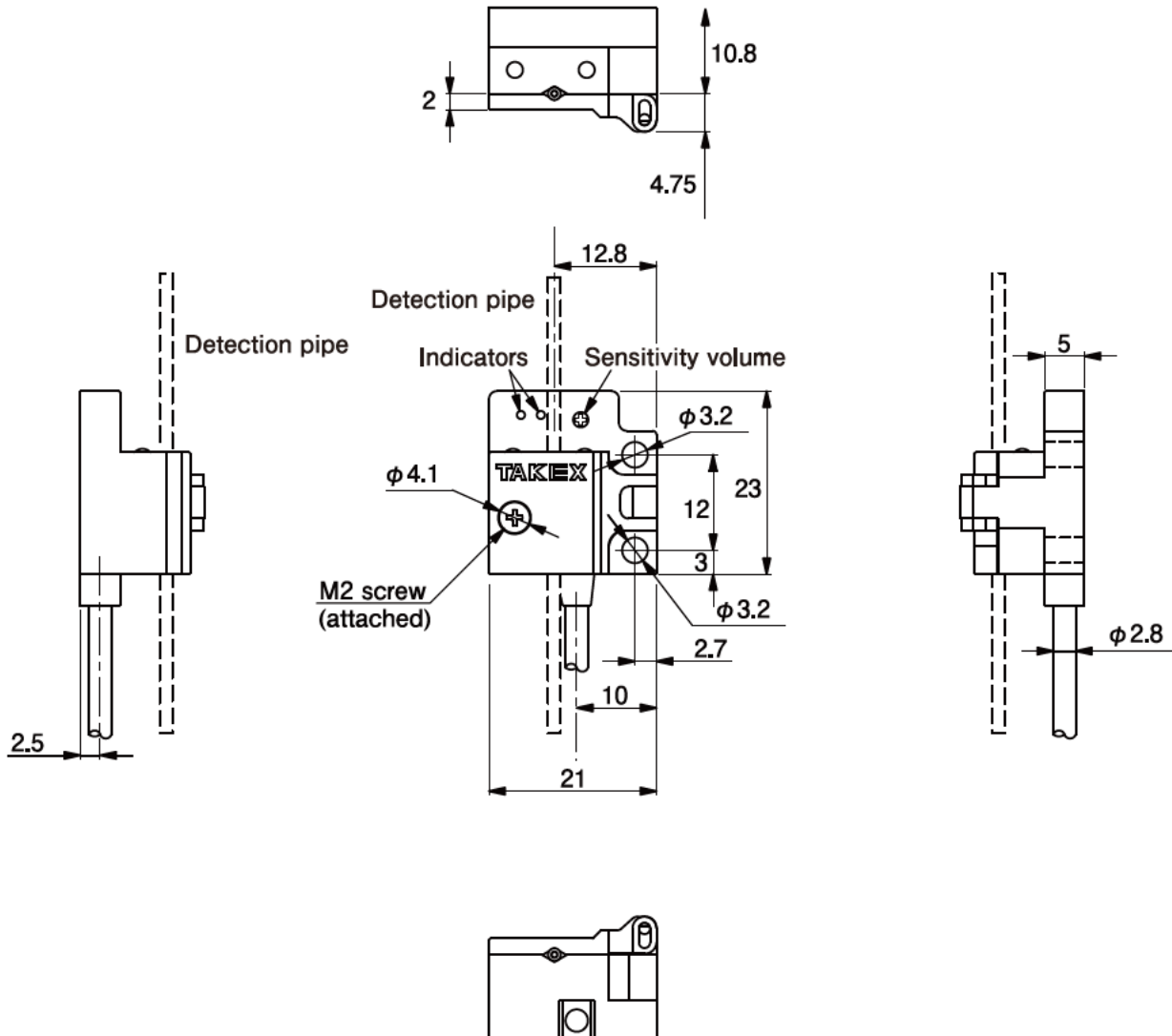
8 INDICATORS

- The operation indicator (orange LED) and stability indicator (green LED) show the levels of received light intensity as described in the figure.
- After setting the sensitivity, fill and drain the liquid in the pipe several times to make sure that the both states are within the range that allows stable activation and deactivation.
- Setting which allows activation and deactivation with in the stable ranges achieves higher reliability against chages in the operating environment generated after installation.



- The orange LED is the Operation indicator.
 Light ON mode : It turns on when receiving light (detecting no liquid).
 Dark On mode : It turns on when receiving no light (detecting liquid).

9 DIMENSIONS (unit : mm)



10 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, lighting 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 detail 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.

11 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 spend 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.