Back Pressure Type Level Switch

LT1
Instruction Manual

IMR01C13-E1

Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference.

SYMBOLS

WARNING : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

CAUTION : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

: This mark indicates that all precautions should be taken for safe usage.

: This mark indicates important information on installation, handling and operating procedures.

: This mark indicates supplemental information on installation, handling and operating procedures.

: This mark indicates where additional information may be located.

WARNING

- To prevent injury to persons, damage to instrument and equipment, a suitable external protection device shall be required.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This product is intended for use with industrial machines, test and measuring equipment.
  (It is not designed for use with medical equipment and nuclear energy.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.
- To prevent instrument damage as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as a fuse, circuit breaker, etc.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- If this instrument is applied with strong impact, its characteristic change may result. Therefore, do not drop it nor apply the impact to it.
- This instrument is intended for the level measurement of liquids used in semiconductor cleaning equipment. The instrument has been successfully used to measure the liquids indicated below. Please note that if the surface tension or specific gravity changes due to the heat of reaction of the liquid or other reason, incorrect detection may result. The instrument has not been tested for use with liquids other than those indicated below. If you wish to use the instrument with other liquids, please test prior to use.

Relevant liquids	Surface tension (mN/m)	Gravity
Pure-water	72	1
Hydrochloric acid	72	1.19
Ethanol	22	0.79
Isopropyl alcohol (IPA)	21	0.79

- This instrument detects a change in pressure within a measuring tube inserted into a measured liquid. Leakage of the gas thorough the tube connection may cause a detection error. Therefore, correctly connect the tube.
  In addition, be careful that incorrect detection may result if used in one of the following conditions:
  - when there are rapid liquid level changes,
  - when there are pressure changes and/or air stream in the measuring tank, or
  - when a closed tank is used for level measurement.

(Continued on the next page.)

(Continued from the previous page.)

- Do not fully close the measuring tube connecting section. If so, the built-in very low pressure sensor may be damaged.
- Use the back pressure purge gas (input media pressure) at a constant pressure of 20 to 49 kPa. If a pressure of more than 49 kPa is directly applied to the LT1, the instrument may fail.
- This instrument uses the pressure inside the unit as a reference pressure. Detection and operation occur when the pressure at the measurement side changes with respect to the pressure inside the unit. Even when there is no liquid (no change in the pressure at the measurement side), changes in the ambient pressure of the installation location may cause false detection. Exercise caution to avoid changes in the ambient pressure, such as opening and closing the cover of the instrument.
- To prevent backflow of the measured liquid, set the purge pressure higher than the maximum value of input pressure.
  Input pressure:
  The pressure that is applied at the end of the measuring tube.
- When applying back pressure, use nitrogen gas of high purity which does not contaminate the liquid.
  When problem in particular does not have liquid pollution by purge gas, use air or the nitrogen gas which removed garbage and oil content of 0.3 μm greater or equal.
- Nitrogen gas used for the application of back pressure is resistant against corrosion and also for preventing backward flow. As a semiconductor pressure element is used in the detector of this instrument, the detector may be damaged if exposed to corrosive gas or liquid.
- If gas bubble forming affects product quality, etc., use a duplex tube so that they may be exhausted to the atmosphere along the inner surface of the tube.
- Do not disconnect the tube for purge gas input with the liquid filled in the tank. If disconnected under the above condition, the liquid may flow backward.
- Before stopping the supply of nitrogen gas, wash the tank and also clear away the corrosive atmosphere.
- To heighten antinoise characteristics, the orifice section is connected to the instrument internal circuit (shield). When connecting a metal piping connector, conduct insulation treatment, it necessary.
- This instrument is not clean pack product.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

1. CHECKING THE PRODUCTS

The LT1 detects a liquid level by a change in backpressure and then outputs a control signal through relay contacts. As the LT1 has a built-in orifice, it can automatically attain the rated purge flow (input media consumption) only by supplying the gas of 20 kPa.

Before using this product, check each of the following:

- Model code
- Check that all of the items delivered are complete.
- Check that there are no scratch or breakage in external appearance (case, front panel, terminal, etc.).

■ Model code

LT1 - □ N N / □
(1) (2) (3) (4)

(1) Relay output type

A: Energized
The relay is in the energized state with the output turned on.

B: De-energized
The relay is in the energized state with the output turned off.

(2) Connection type

N: Single connection type

(3) Extremely small pressure detecting function

N: No function

(4) Specifications

A: High sensitivity specification

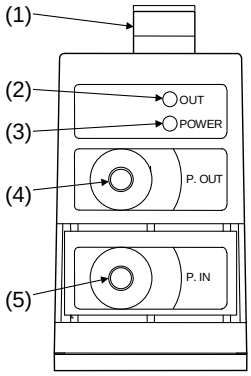
B: Low sensitivity specification

■ Accessories

Instruction Manual (IMR01C13-E1) ..... 1 copy
Mounting screw (M3 × 6) ..... 4 pieces

If any of the products are missing, damaged, or if your manual is incomplete, please contact RKC sales office or the agent.

2. PARTS DESCTIPTION



(1) Terminals
Power supply and output terminals.

(2) Output lamp [Green]
Lights when the output is turned on.

(3) Power lamp [Green]
Lights when the power is turned on.

(4) Measuring tube connecting section [P. OUT]
Connect the tube for measuring.

(5) Purge gas input tube connecting section [P. IN]
Connect the tube for purge gas input.

3. MOUNTING

WARNING

To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

3.1 Cautions for Mounting

(1) This instrument is intended to be used under the following environmental conditions. **(IEC61010-1)**
[OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]

(2) Use this instrument within the following environment conditions:
- Allowable ambient temperature: 0 to 50 °C
- Allowable ambient humidity: 35 to 85 % RH
(Absolute humidity: MAX. W. C 29 g/m^3 dry air at 101.3 kPa)
- Installation environment conditions: Indoor use,
Altitude up to 2000 m

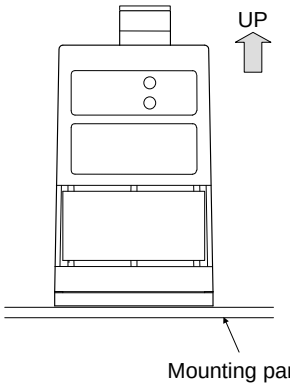
(3) Avoid the following conditions when selecting the mounting location:
- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Direct vibration or shock to the mainframe.
- Water, oil, chemicals, vapor or steam splashes.
- Excessive dust, salt or iron particles.
- Excessive induction noise, static electricity, magnetic fields or noise.
- Direct air flow from an air conditioner.
- Exposure to direct sunlight.
- Excessive heat accumulation.

(4) Mount this instrument in the panel considering the following conditions:
- Provide adequate ventilation space so that heat does not build up.
- Do not mount this instrument directly above equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors.)
- If the ambient temperature rises above 50 °C, cool this instrument with a forced air fan, cooler, etc. Cooled air should not blow directly on this instrument.
- In order to improve safety and the immunity to withstand noise, mount this instrument as far away as possible from high voltage equipment, power lines, and rotating machinery.
  High voltage equipment: Do not mount within the same panel.
  Power lines: Separate at least 200 mm.
  Rotating machinery: Separate as far as possible.

(5) In case this instrument is connected to a supply by means of a permanent connection, a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.

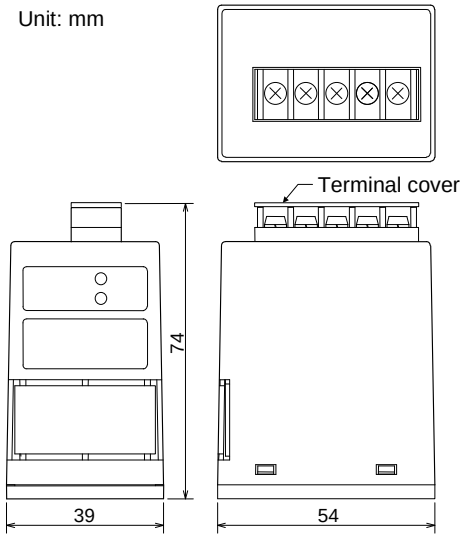
(6) Install the LT1 above the top of the tank. If the LT1 is installed below the measuring tank, malfunction may result and also the liquid may flow backward when a supply of the purge gas is suspended to cause failure.

(7) LT1 is designed on the assumption that it is mounted in the vertical direction. Mount the LT1 in the direction pointed by the arrow shown in figure. It installed in any direction other than

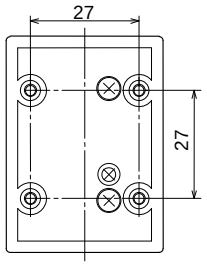


3.2 Dimensions

Unit: mm



Mounting dimensions



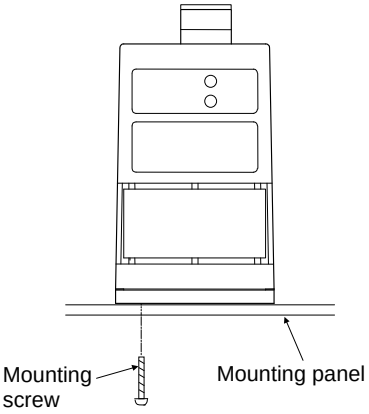
3.3 Mounting method

1. Drill holes to panel to be mounted by referring to mounting dimensions.

2. Insert a screw (M3 size) into the mounting hole from the rear of the mounting panel and then tighten the screw with a Phillips head screwdriver.
Maximum tightening torque: 0.5 N·m (5 kgf·cm)

The four mounting screws are attached to LT1.
Screw size: M3
Length: 6 mm (Mounting panel thickness: 1 mm or less *)

* If thickness of the mounting panel is more than 1 mm, the customer needs to provide the mounting screw (length suitable for the mounting location).



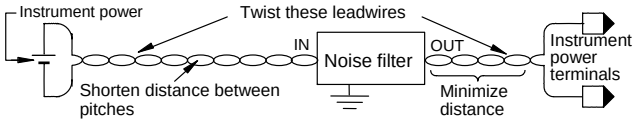
4. WIRING OF POWER/OUTPUT

WARNING

To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.

4.1 Cautions for Wiring

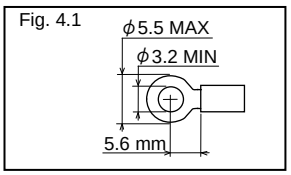
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
  - Shorten the distance between the twisted power supply wire pitches to achieve the most effective noise reduction.
  - Always install the noise filter on a grounded panel. Minimize the wiring distance between the noise filter output and the instrument power supply terminals to achieve the most effective noise reduction.
  - Do not connect fuses or switches to the noise filter output wiring as this will reduce the effectiveness of the noise filter.

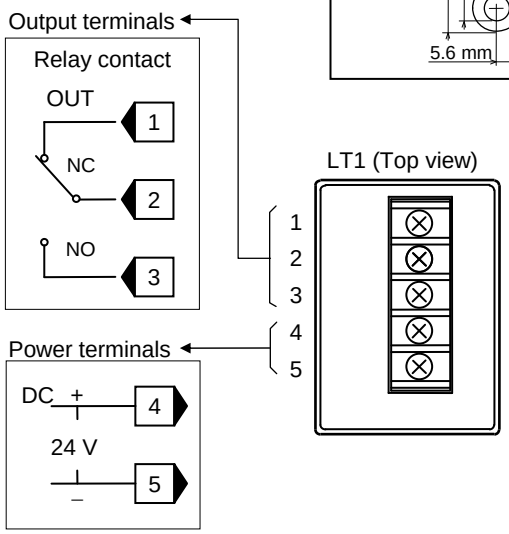


- This instrument with 24 V power supply is not provided with an overcurrent protection device. For safety install an overcurrent protection device (such as fuse) with adequate breaking capacity close to the instrument.
  - Fuse type: Time-lag fuse (Approved fuse according IEC60127-2 and/or UL248-14)
  - Fuse rating: Rated current: 0.4 A
- For an instrument with 24 V power supply input, supply power from "SELV" circuit defined as IEC 60950-1.
- A suitable power supply should be considered in end-use equipment. The power supply must be in compliance with a limited-energy circuits (maximum available current of 8 A).
- Use the solderless terminal appropriate to the screw size.
  - Screw size: M3 x 6
  - Recommended tightening torque: 0.5 N·m [5 kgf·cm]
  - Applicable wire: Solid/twisted wire of 0.5 to 1.65 mm^2
  - Specified dimension: Refer to Fig. 4.1
  - Specified solderless terminals:
    Ring tongue terminal (R-type, Vinyl-insulated) (straight) V1.25-MS3 [Manufactured by J.S.T MFG CO., LTD.]
- Make sure that during field wiring parts of conductors can not come into contact with adjacent conductive parts.

4.2 Terminal Configuration

Fig. 4.1





● Power terminals

Power supply voltage:
21.6 to 26.4 V DC [Power supply voltage range],
Rating: 24 V DC

Consumption current:
45 mA max. (at 24 V DC)

● Output terminals

Contact type: 1c contact
Rating: 250 V AC, 3 A (Resistive load)
30 V DC, 3 A (Resistive load)

5. CONNECTIONS

5.1 Cautions for Connection

- Use a tube without any scratches on its surface. If it is scratched after its frequent use, cut its scratched section.
- Do not extremely bend it at the location near the connector.
- Its bending or curving may cause a measurement error. Therefore, it should always be straight.
- Place the end of the measuring tube at a distance of 50 mm or more from the bottom of the measuring tank. And finally fix the end to the position corresponding to the liquid level to be detected.
- Connect the measuring tube to the LT1 so that the distance between the end of the tube and the LT1 can be 5 m or less.
- This instrument detects a change in pressure within a measuring tube inserted into a measured liquid. Leakage of the gas thorough the tube connection may cause a detection error. Therefore, correctly connect the tube.
- The instrument will detect minute fluctuations in pressure due to foaming. Do not allow the measurement tube to be subjected to vibration or shock.

5.2 Connection

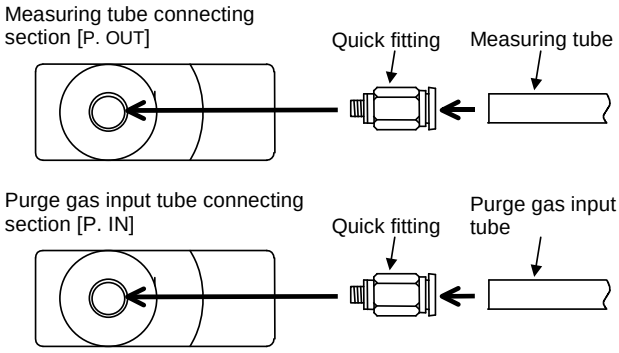
The customer must prepare the connector and tube.

Recommended connector
Quick fitting PC6-M5SUS
(Manufactured by NIHON PISCO Co., LTD.)
Quick fitting TS6-M5-SUS
(Manufactured by KOGANEI CORPORATION)

Recommended measuring tube
Fluorine contained resin tube (New PFA) ϕ 6 × ϕ 4

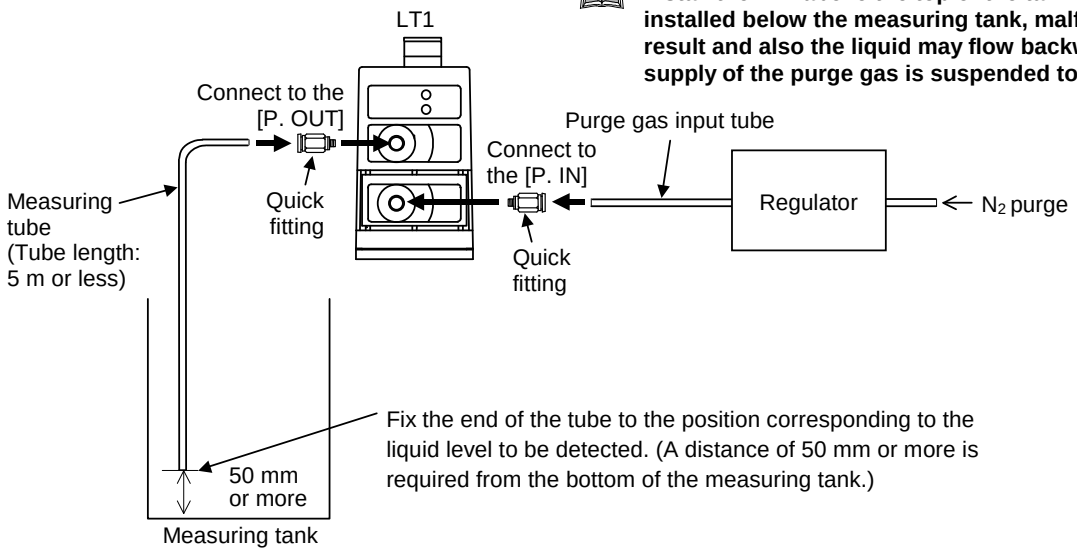
1. Engage the quick fitting with the tube connecting section (M5 × 10).

2. Insert the tube into the quick fitting. Check that it is firmly connected to the quick fitting by pulling it out.



5.3 Connection Example

Install the LT1 above the top of the tank. If the LT1 is installed below the measuring tank, malfunction may result and also the liquid may flow backward when a supply of the purge gas is suspended to cause failure.



6. OPERATIONS

■ Operation procedure

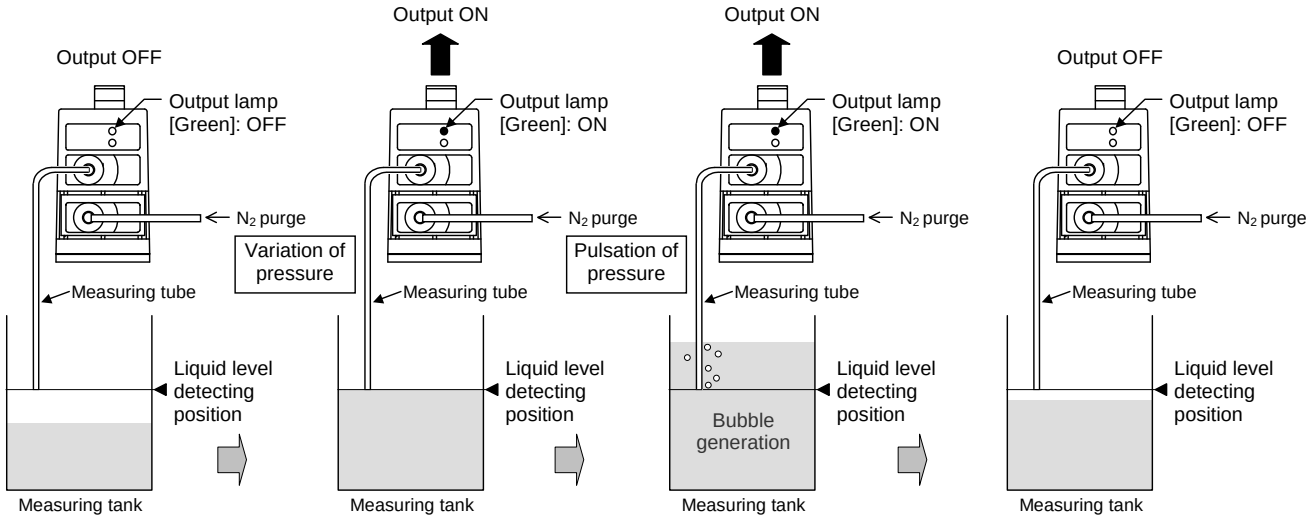
- **When applying back pressure, use nitrogen gas of high purity which does not contaminate the liquid. When problem in particular does not have liquid pollution by purge gas, use air or the nitrogen gas which removed garbage and oil content of 0.3 μm greater or equal.**
- **Use the back pressure purge gas (input media pressure) at a constant pressure of 20 to 49 kPa. If a pressure of more than 49 kPa is directly applied to the LT1, the instrument may fail.**
- **Do not pressurize the measuring tank.**
- **Measure only one tank using one set of the LT1.**
- **No normal operation is assured for about 1 minute (warming-up time) after the power is turned on.**

1. Connect the measuring tube, LT1, purge gas input tube and regulator by referring to **5. CONNECTIONS (P. 4)**.
2. Gradually open the regulator to set the gas pressure to 20 kPa.
3. Turning on the LT1 power starts detecting the liquid level.

■ Principle of operation

If the liquid surface is in the same level as the end of the measuring tube:
If the liquid surface is in the same level as the end of the measuring tube, gas bubbles are formed to vary the tube inner pressure. Variation and pulsation of the tube inner pressure at this time are detected to turn on the output. As far as they are detected, the output remains turned on.

If the liquid surface is apart from the end of the measuring tube:
If the liquid surface is apart from the end of the measuring tube and as a result no more gas bubbles are formed, variation and pulsation of the tube inner pressure disappear. Thus, the output is turned off. (Hysteresis time: Within 3 seconds)



7. SPECIFICATIONS

■ Input

Number of inputs: 1 point
Input media: Non corrosive gas
Input pressure range: 0 to 49 kPa

■ Output

Number of outputs: 1 point
Output type: Relay contact output
Contact type: 1c contact
Contact rating: 250 V AC, 3 A (Resistive load)
30 V DC, 3 A (Resistive load)
Specify energized/de-energized when ordering.
Electrical life: 100,000 times or more (Rated load)
Mechanical life: 50 million times or more (Opening and closing frequency: 180 times/minute)

■ Performance (At the purge gas pressure 20 kPa and the ambient temperature 23 ± 2 °C)

Response time: Event high: Within 0.2 seconds
The output is turned on and the output lamp (green) is lit within 0.2 seconds after gas bubbles are formed as the end of the measuring tube began to be immersed into the liquid.
Hysteresis time: Within 3 seconds
The output is turned off and the output lamp (green) is extinguished within 3 seconds after no gas bubbles are formed at the end of the measuring tube.

The output may be released it gas bubble forming intervals exceed a hysteresis time of about 3 seconds due to pressure variations corresponding to gas bubble forming (decrease in purge gas pressure, etc.).

Input media consumption: 40 to 100 ml/min (At input media pressure 20 kPa)
Input media pressure: 20 to 49 kPa

■ Power

Power supply voltage: 21.6 to 26.4 V DC [Power supply voltage range]
Rating: 24 V DC
Consumption current: 45 mA max. (at 24 V DC)

■ General specifications

Insulation resistance: Between power and output terminals: 20 MΩ or more at 500 V DC
Withstand voltage: Between power and output terminals: 1 minute at 2300 V AC
Allowable ambient temperature: 0 to 50 °C
Allowable ambient humidity: 35 to 85 % RH (Non-condensing)
Absolute humidity: MAX.W.C 29 g/m^3 dry air at 101.3 kPa
Ambient atmosphere: There should be neither corrosive gases nor much dust.

■ Standard

Safety standard: UL: UL61010-1
cUL: CAN/CSA-C22.2 No.61010-1
CE making: LVD: EN61010-1
EMC: EN61326-1

■ Mounting and structure

Mounting procedure: Tightening of the bottom plate at 4 places with M3 screws
Weight: Approx. 170 g
Dimensions: 39 (W) × 74 (H) × 54 (D) mm

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