

## Optical Bubble Sensor

### BE-A SERIES



**Fits perfectly with applicable tube sizes!**  
**Detects liquid and air bubbles without fail!**

# Experience its ease of use!

Optical bubble sensor is handy, simple, and precise!

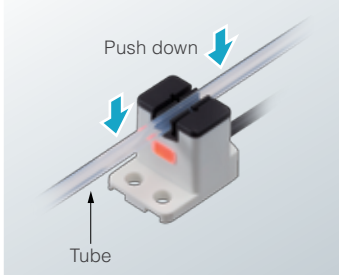
New proposals  
for ease of use

## One-touch attachment

### Simply attach the sensor with your hand!

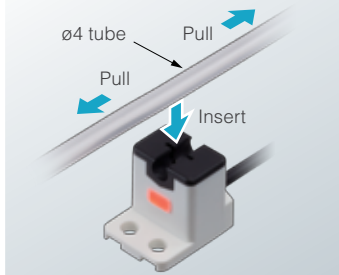
Hassle-free one-touch attachment without using tools!

In the case of BE-A201□ / BE-A301□



Push down the tube into the sensor.

In the case of BE-A401□



Stretch the tube and insert it into the sensor.  
\* $\phi 4$  tube: Equivalent to flexible PVC

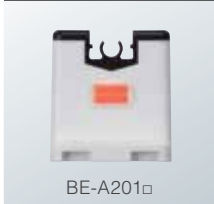
New proposals  
for ease of use

## For small diameter tubes

### For $\phi 2$ mm, $\phi 3$ mm, $\phi 4$ mm tubes

Perfect fit into applicable tubes without obstructing flow rate.  
Compatible with tubes in inch size

$\phi 2$  mm tube type



BE-A201□

$\phi 3$  mm tube type



BE-A301□

$\phi 4$  mm tube type



BE-A401□



- Model No. : **BE-A201** (NPN output type)  
**BE-A201P** (PNP output type)
- Applicable tube : Transparent resin tube (PFA equivalent)  
Outer diameter  $\phi 2$  mm  $\times$  inner diameter  $\phi 1$  mm
- Output operation: Liquid-absent-ON / Liquid-present-ON (equipped with two outputs)

New proposals  
for ease of use

## High speed response time

### High speed detection

0.8 mm  $0.032$  in air gaps are reliably detected by optical technology at a response time of  $20 \mu\text{s}^*$ .  
Ideal for traceability of the analysis process.



\*Refer to the specifications for detection conditions, BE-A201□ has a response time of  $30 \mu\text{s}$ .

New proposals  
for ease of use

## Ultra compact

### Fingertip size

Allows for installation in a narrow space.



New proposals  
for ease of use

## For a wide-range of power supply voltages

### 5 to 24 V DC compliant

Allows for direct power supply from PC board.

New proposals  
for ease of use

## Built-in Amplifier

### No requirement of sensitivity adjustment

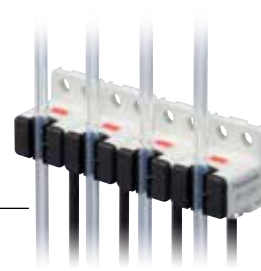
Can be used immediately after installation by built-in amplifier.  
Equipped with two outputs, Liquid-absent-ON and Liquid-present-ON.

Allows for  
close proximity  
attachment

Staggered pattern  
(10 mm pitch)



Parallel pattern  
(15.5 mm pitch)



ø3 mm  
tube type



Model No. : **BE-A301** (NPN output type)  
**BE-A301P** (PNP output type)  
Applicable tube : Transparent resin tube  
(PFA equivalent)  
Outer diameter ø3 mm ×  
inner diameter ø2 mm  
Output operation: Liquid-absent-ON / Liquid-present-ON  
(equipped with two outputs)

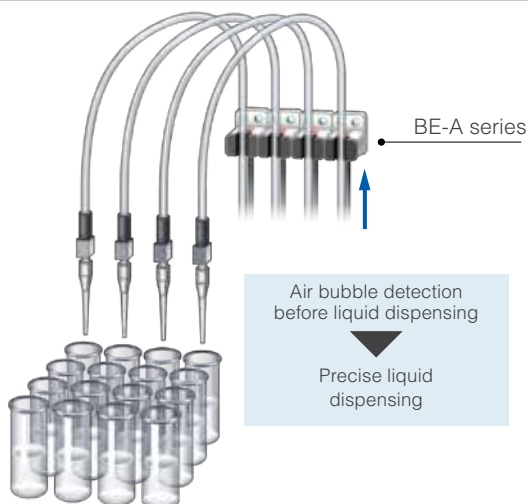
ø4 mm  
tube type



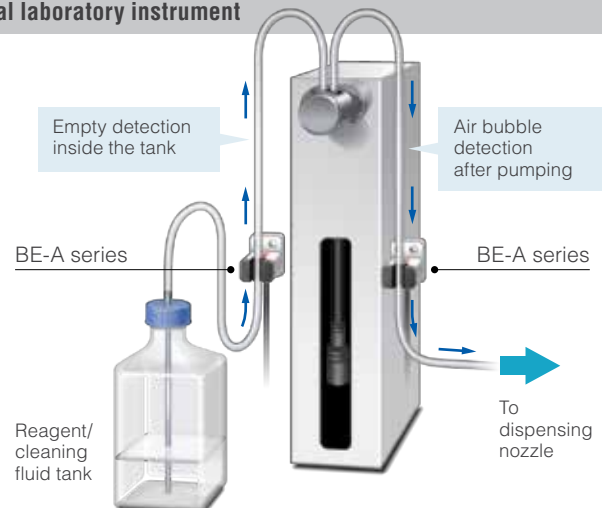
Model No. : **BE-A401** (NPN output type)  
**BE-A401P** (PNP output type)  
Applicable tube : Transparent resin tube  
(equivalent to flexible PVC)  
Outer diameter ø4 mm ×  
inner diameter ø2.4 mm  
Output operation: Liquid-absent-ON / Liquid-present-ON  
(equipped with two outputs)

## Applications

### Liquid dispensing instrument



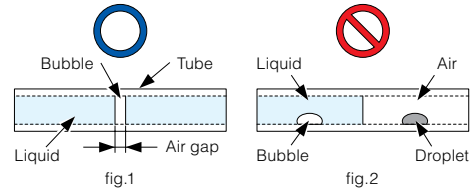
### Clinical laboratory instrument



# SPECIFICATIONS

| Item                                 | Model No.                    | Type   | for ø2 mm tube   | for ø3 mm tube | for ø4 mm tube                                      |
|--------------------------------------|------------------------------|--|--|----------------|---|
|                                      |                              | NPN output   | BE-A201  | BE-A301        | BE-A401   |
|                                      |                              | PNP output   | BE-A201P   | BE-A301P       | BE-A401P  |
| Detectable air gap (note 2)          |                              |  | 0.8 mm or more   |                |   |
| Sensing object                       |                              |  | Liquid (note 3)  |                |   |
| Applicable tube dia. (OD×ID)(note 4) |                              |  | ø2 mm × ø1 mm  | ø3 mm × ø2 mm  | ø4 mm × ø2.4 mm                                     |
| Applicable tube type (note 4)        |                              |  | Transparent resin tube (equivalent to PFA)   |                | Transparent resin tube (equivalent to flexible PVC) |
| Supply voltage                       |                              |  | 5 to 24 V DC ±10 % Ripple P-P 10 % or less   |                |   |
| Current consumption                  |                              |  | 15 mA or less  |                |   |
| Output (Incorporated with 2 outputs) |                              | < NPN output type >  | NPN open-collector transistor<br>• Maximum sink current: 50 mA<br>• Applied voltage: 30 V DC or less (between output and 0 V)<br>• Residual voltage: 2 V or less (sink current at 50 mA) 1 V or less (sink current at 16 mA) |                | < PNP output type >                                 |
|                                      |                              |  | PNP open-collector transistor<br>• Maximum source current: 50 mA<br>• Applied voltage: max. 30 V DC (between output and + V)<br>• Residual voltage: max. 2 V (source current at 50 mA) max. 1 V (source current at 16 mA)    |                |   |
|                                      | Output operation             |  | Switchable either Liquid-absent-ON or Liquid-present-ON  |                |   |
|                                      | Short-circuit protection     |  | Incorporated   |                |   |
| Response time (note 5)               | When detecting bubble        |  | 30 µs or less  |                | 20 µs or less                                       |
|                                      | When detecting liquid        |  |  | 80 µs or less  |   |
| Operation indicator                  |                              |  | Orange LED (lights up with absent liquid)  |                |   |
| Protection circuits                  |                              |  | Power supply reverse polarity protection , Output reverse polarity protection  |                |   |
| Environmental resistance             | Protection                   |  | IP40 (IEC)   |                |   |
|                                      | Ambient temperature (note 6) |  | -25 to +55 °C (No dew condensation or icing allowed), Storage: -30 to +80 °C   |                |   |
|                                      | Ambient humidity             |  | 35 to 85 % RH, Storage: 35 to 85 % RH  |                |   |
|                                      | Ambient illuminance          |  | Fluorescent light: 1,000 lx at the light-receiving face  |                |   |
|                                      | Voltage withstandability     |  | 1,000 V AC for between one min. between all supply terminals connected together and enclosure  |                |   |
|                                      | Insulation resistance        |  | 20 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure   |                |   |
|                                      | Vibration resistance         |  | 10 to 150 Hz frequency, 0.75 mm double amplitude or maximum acceleration 49 m/s <sup>2</sup> , in X, Y and Z directions for two hours each   |                |   |
| Shock resistance                     |                              | 100 m/s <sup>2</sup> acceleration in X, Y, and Z directions three times each |  |                |   |
| Emitter element                      |                              |  | Infrared LED(Peak emission wavelength: 855 nm, non-modulated)  |                |   |
| Material                             |                              |  | Enclosure: PBT, Tube holder: Polyamide, Indicator: Polycarbonate   |                |   |
| Cable                                |                              |  | 0.09 mm <sup>2</sup> 4-core cabtyre cable 1 m  |                |   |
| Cable extension (Note 7)             |                              |  | Extension up to total 100 m is possible with 0.3 mm <sup>2</sup> , or more, cable.   |                |   |
| Clamping torque                      |                              |  | max. 0.5N•m  |                |   |
| Weight                               |                              |  | Net weight: 15 g approx., Gross weight: 25 g approx.   |                |   |
| Compliant regulation                 |                              |  | EMC Directive compliance, RoHS Directive compliance  |                |   |

- Notes: 1. Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23°C.  
 2. Sensing air gap refers to the width of an air bubble formed in the entire area of the inner diameter of the tube. Please note that this product cannot sense very small air bubbles or water drops. Refer to the figure 1 and 2.  
 3. Sensing is affected by dirt or residues adhered to the inner wall of the tube. Please maintain the tube regularly.  
 4. When using a tube out of specifications or it doesn't have a smooth surface, please test sensing on the actual machine before use.  
 5. Actual response time may differ from specification (typical example using applicable tube) due to dimension, light transmission or surface state of test tube in use.  
 6. Liquid being detected should also be kept within the rated ambient temperature range.  
 7. Confirm that the power supply voltage at the end of cable is more than 4.5V when using an extension of over 20m.



## DIMENSIONS (Unit: mm)

The CAD data can be downloaded from our website.

