

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!

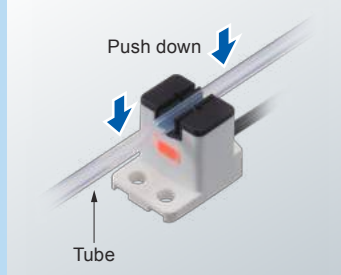
New proposals  
for ease of use

## One-touch attachment

### Simply attach the sensor with your hand!

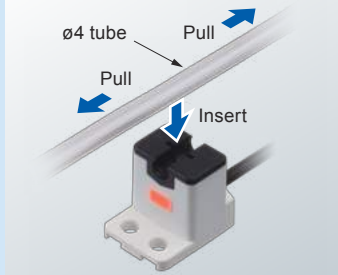
Hassle-free one-touch attachment without using tools!

In the case of BE-A201(P) / BE-A301(P)



• Push down the tube into the sensor.  
\*Tube: Equivalent to PFA

In the case of BE-A401(P)



• Stretch the tube and insert it into the sensor.  
\*ø4 tube: Equivalent to flexible PVC

New proposals  
for ease of use

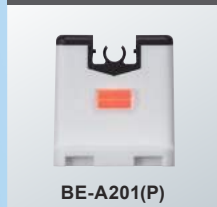
## For small diameter tubes

### For ø2 mm, ø3 mm, ø4 mm tubes

Perfect fit into applicable tubes without obstructing flow rate.

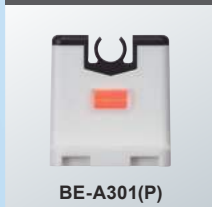
Compatible with tubes in inch size

ø2 mm tube type



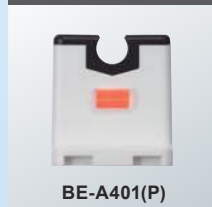
BE-A201(P)

ø3 mm tube type



BE-A301(P)

ø4 mm tube type



BE-A401(P)



Model No. : **BE-A201** (NPN output type)  
**BE-A201P** (PNP output type)  
Applicable tube : Transparent resin tube  
(Equivalent to PFA)  
Outer diameter : ø2 mm ±0.2 mm  
ø0.078 in ±0.008 in  
Inner diameter : ø1 mm ±0.2 mm  
ø0.039 in ±0.008 in  
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 µs\*.

Ideal for traceability of the analysis process.



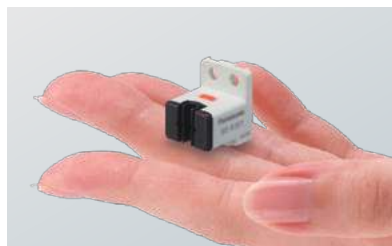
\*Refer to the specifications for detection conditions,  
BE-A201(P) has a response time of 30 µs.

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.

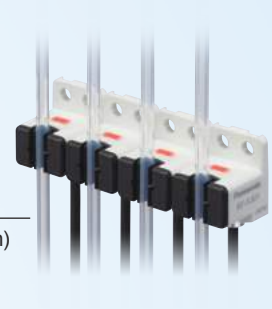
Equipped with two outputs,  
Liquid-absent-ON and Liquid-present-ON.

Allows for  
close proximity  
attachment

Staggered pattern  
(10 mm 0.394 in pitch)



Parallel pattern  
(15.5 mm 0.610 in pitch)



ø3 mm ø0.125 in  
tube type



ø4 mm ø0.156 in  
tube type

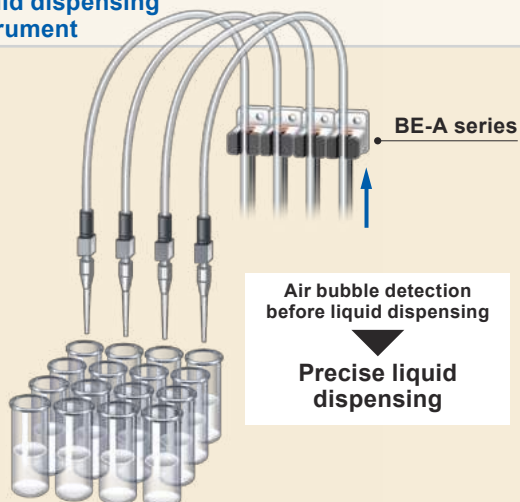


Model No. : **BE-A301** (NPN output type)  
**BE-A301P** (PNP output type)  
Applicable tube : Transparent resin tube  
(Equivalent to PFA)  
Outer diameter: ø3 mm ±0.2 mm  
ø1/8 in ±0.008 in  
Inner diameter: ø2 mm ±0.2 mm  
ø1/16 in ±0.008 in  
Output operation: Liquid-absent-ON / Liquid-present-ON  
(equipped with two outputs)

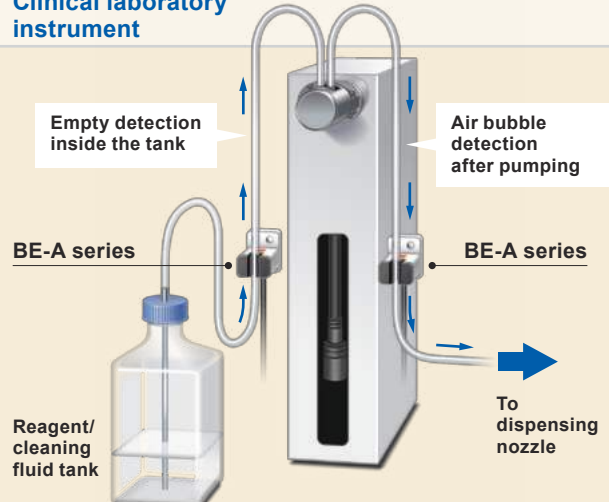
Model No. : **BE-A401** (NPN output type)  
**BE-A401P** (PNP output type)  
Applicable tube : Transparent resin tube  
(equivalent to flexible PVC)  
Outer diameter: ø4 mm ±0.15 mm  
ø5/32 in ±0.006 in  
Inner diameter: ø2.4 mm ±0.1 mm  
ø3/32 in ±0.004 in  
Output operation: Liquid-absent-ON / Liquid-present-ON  
(equipped with two outputs)

## Applications

### Liquid dispensing instrument



### Clinical laboratory instrument

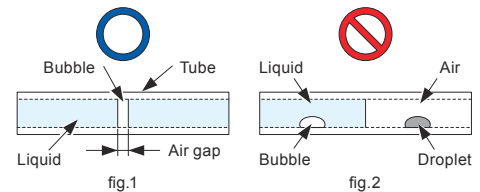


**SPECIFICATIONS**

Item	Type	for ø2 mm $\phi 0.078$ in tube	for ø3 mm $\phi 0.125$ in tube	for ø4 mm $\phi 0.156$ in tube
		Model No.	BE-A201	BE-A301
	NPN output			
	PNP output	BE-A201P	BE-A301P	BE-A401P
Regulatory compliance		EMC Directive, RoHS Directive		
Detectable air gap (Note 2)		0.8 mm $0.032$ in or more		
Sensing object		Liquid (Note 3)		
Applicable tube dia. (Note 4)	Outer dia.	$\phi 2$ mm $\pm 0.2$ mm $\phi 0.078$ in $\pm 0.008$ in	$\phi 3$ mm $\pm 0.2$ mm $\phi 1/8$ in $\pm 0.008$ in	$\phi 4$ mm $\pm 0.15$ mm $\phi 5/32$ in $\pm 0.006$ in
	Inner dia.	$\phi 1$ mm $\pm 0.2$ mm $\phi 0.039$ in $\pm 0.008$ in	$\phi 2$ mm $\pm 0.2$ mm $\phi 1/16$ in $\pm 0.008$ in	$\phi 2.4$ mm $\pm 0.1$ mm $\phi 3/32$ in $\pm 0.004$ in
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 $\pm 10$ % Ripple P-P 10 % or less		
Current consumption		15 mA or less		
Output (Incorporated with 2 outputs)		<NPN output type> NPN open-collector transistor •Maximum sink current: 50 mA •Applied voltage: 30 V DC or less (between output and 0 V) •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 •Maximum source current: 50 mA •Applied voltage: 30 V DC or less (between output and + V) •Residual voltage: 2 V or less (source current at 50 mA) 1 V or less (source current at 16 mA)
	Output operation	Switchable either Liquid-absent-ON or Liquid-present-ON		
Response time (Note 5)	When detecting bubble	30 $\mu$ s or less	20 $\mu$ s or less	
	When detecting liquid	80 $\mu$ s 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 $-13$ to $+131$ °F (No dew condensation or icing allowed), Storage: -30 to +80 °C $-22$ to $+176$ °F		
	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 M $\Omega$ , 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 $0.030$ in 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 $0.034$ mil, non-modulated)		
Material		Enclosure: PBT, Tube holder: Polyamide, Indicator: Polycarbonate		
Cable		0.09 mm <sup>2</sup> 4-core cabtyre cable 1 m $3.280$ ft		
Cable extension (Note 7)		Extension up to total 100 m $328.084$ ft is possible with 0.3 mm <sup>2</sup> , or more, cable.		
Clamping torque		0.5N·m or less		
Weight		Net weight: 15 g approx., Gross weight: 25 g approx.		

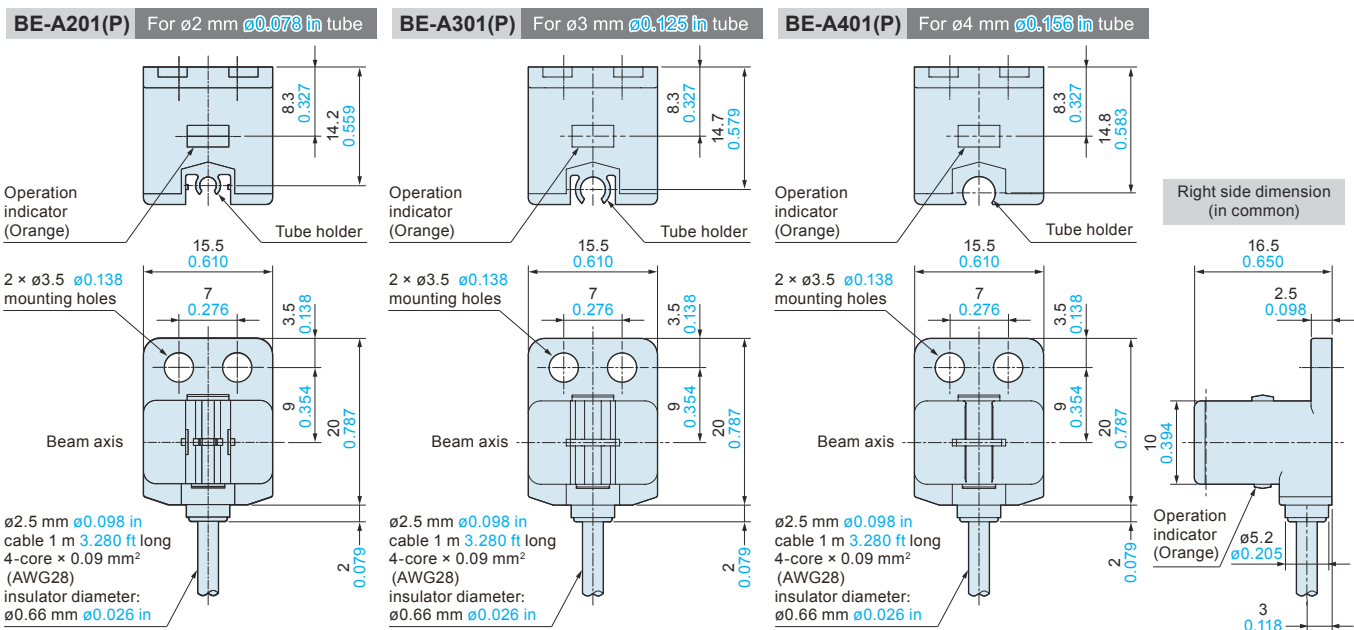
Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C +73.4 °F.

- 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.
- Sensing is affected by dirt or residues adhered to the inner wall of the tube. Please maintain the tube regularly.
- When using a tube out of specifications or it doesn't have a smooth surface, please test sensing on the actual machine before use.
- 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.
- Liquid being detected should also be kept within the rated ambient temperature range.
- Confirm that the power supply voltage at the end of cable is more than 4.5 V when using an extension of over 20 m  $65.167$  ft.



**DIMENSIONS (Unit: mm in)**

The CAD data can be downloaded from our website.



● If you have any question about Optical Bubble Sensor, please contact us by E-mail . USA customers : usa-bmpj@ml.jp.panasonic.com EURO customers : euro-bmpj@ml.jp.panasonic.com