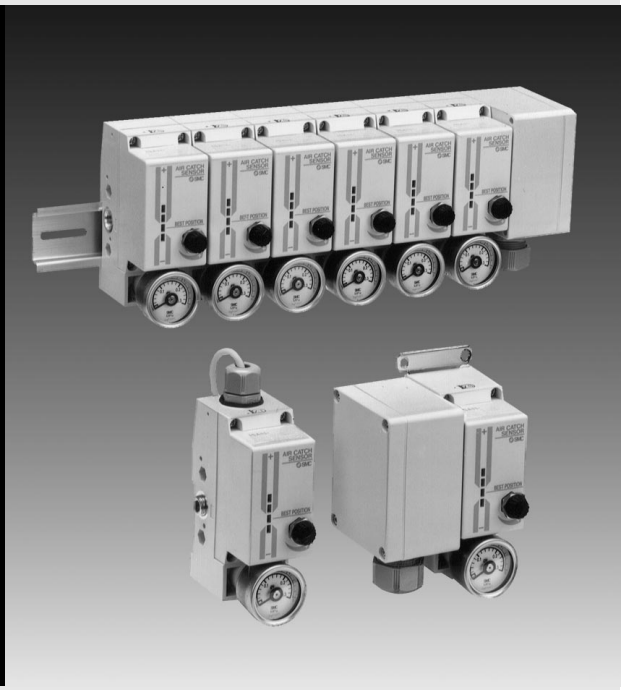
Air Catch Sensor

Series ISA

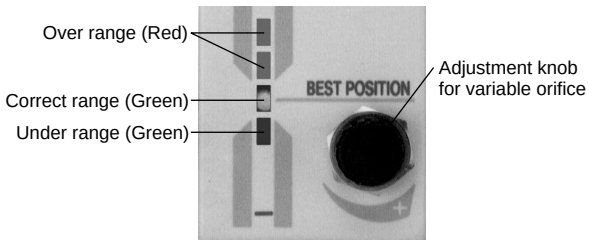
For Detection of Work Presence



Due to the construction of the sensor, fluctuations in the supply pressure do not influence operations.
Non contact style sensor for applications requiring confirmation of work present for machining operations.

LED Bar graph for easy calibration

The LED bar graph indicator in conjunction with the adjustment knob for the variable orifice allows for easy and correct calibrations.



Reliable detection of a 10μm gap

The operation of the Air-Catch Sensor is stable during supply pressure fluctuations due to the internal air bridge circuit and solid state sensors.

Up to 6 Air-Catch Sensors can be manifold mounted for centralized wiring and piping.

Mounting orientation

Due to the use of a pressure sensor, stable detection is guaranteed regardless of mounting orientation.

Wide detection range

Applicable to 10 to 300 μm

Enclosure IP66

Dust proof and drip proof

How to Order

Individual/Centralized Wiring **ISA** □ — □ □ — 01 □

Output specifications

11	NPN open collector 1 output
15	PNP open collector 1 output

Station 1 to 6

Wiring specifications

—	Individual wiring (Without terminal block box)
L	Centralized wiring (With terminal block box on left side)
R	Centralized wiring (With terminal block box on right side)

Option

—*	Applicable to DIN rail
B	With bracket
G	With gauge

∗Order DIN rail separately.

Example 1) NPN output, 4 stations, centralized wiring with terminal block box on left side, with bracket and gauge.

ISA11-4L-01BG

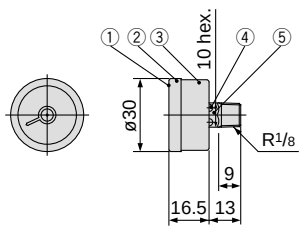
Example 2) PNP output, single unit individual wiring, with gauge.

ISA15-1-01G

Accessories (Optional)

· Bracket ISA-1-A
· Gauge G33-3-01
· DIN rail ISA-2-1 to 7

· Gauge/G33-3-01

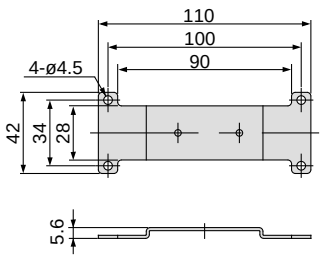


Description

No.	Description	Material
①	Cover	Glass
②	Front rim	Stainless steel
③	Retaining rim	Stainless steel
④	Cross recessed round head screw	Stainless steel
⑤	Stub	Brass

· Bracket/ISA-1-A

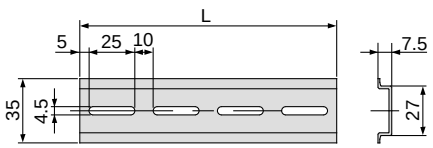
Material: SPC
(Nickel plated)



∗ Part no. includes M3 X 8 tapping screws (2 pcs.)

· DIN rail/ISA-2-1 to 7

Material: Aluminum

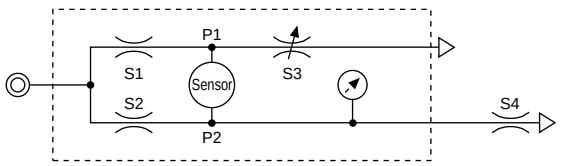


Part No.	L	Applicable model
ISA-2-1	105	ISA□-1
ISA-2-2	140	ISA□-2/ISA□-1$^{L}_{R}$
ISA-2-3	175	ISA□-3/ISA□-2$^{L}_{R}$
ISA-2-4	210	ISA□-4/ISA□-3$^{L}_{R}$
ISA-2-5	245	ISA□-5/ISA□-4$^{L}_{R}$
ISA-2-6	280	ISA□-6/ISA□-5$^{L}_{R}$
ISA-2-7	315	ISA□-6$^{L}_{R}$

Specifications

Fluid		Dry air (Filtered through a 5μm filter)
Operating pressure range		0.05 to 0.2MPa
Recommended pressure range		0.1 to 0.2MPa
Detection zone		10 to 300 μm
Repeatability including temperature characteristics		±10μm (for 0 to 60°C on the basis of 25°C)
Hysteresis		Less than 10 μm (Detection distance 10 to 150 μm)
Detection nozzle size		ø1.0 standard (Refer to p.3.8-7 when nozzle size is changed)
Indicator light		Operation indicator light (lighting under ON condition) Deflection level indicator light
Power supply voltage		12 to 24 V DC (Ripple less than ±10%)
Current consumption		Less than 30 mA (Output ON, LED ON)
Output	**ISA11**	NPN open collector less than 30V 80mA
	ISA15	PNP open collector less than 80mA
Operating temperature range		0 to 60°C (No condensation)
Operating humidity range		35 to 85% RH
Noise resistance		1000 Vp-p Pulse width 1μS, Standing 1ns pulse
Voltage resistance		1000V AC 50/60Hz for one minute between external terminals and case
Insulation resistance		2MΩ or more (at 500VDC megameter) between external terminals and case
Vibration resistance		10 to 500Hz vibration width 1.5mm or 9.8m/s^2 to X, Y, Z directions 2 hours for each direction
Impact resistance		980 m/s^2 X, Y, Z direction, 3 times for each direction
Cable		Oil-proof chloroethylene cable (ø3.4, 0.2mm^2, 5m)
Weight		250g (Including gauge, 5m lead wire)
Port size		Rc 1/8
Enclosure		IP66 (Dust proof and drip proof)
Flow consumption	**Supply pressure**	16ℓ/min at 0.10 MPa
		21ℓ/min at 0.15 MPa
		25ℓ/min at 0.20 MPa

Operation Principles

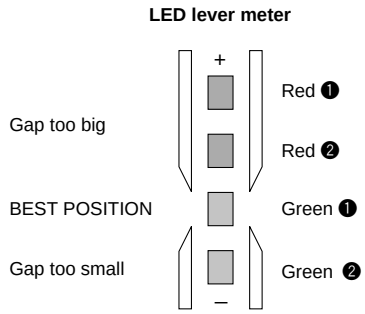


S1, S2: Fixed orifice
S3: Variable orifice (Set via adjustment knob)
S4: Detection nozzle

The bridge circuit is constructed as shown in the diagram. Position the work piece in front of the nozzle (S4).
With a gap gauge adjust the distance between work piece and the nozzle. Remove the gauge and balance the bridge circuit (P1 = P2) by adjusting the variable orifice (S3) via the adjustment knob. By moving the work piece away from the nozzle (S4) a pressure differential (P1 ≧ P2) is created. As soon as the work piece is moved within the detection range of the Air-Catch Sensor the back pressure P2 increases. If P2 is equal or greater than P1, the switch output is 'ON'. As soon as the work piece is outside of the detection zone the switch output is 'OFF'.

Method of Calibration

The Air-Catch Sensor is adjusted using the LED bar graph and the adjustment knob.

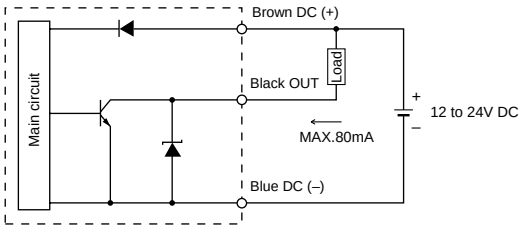


(1) Place the gap gauge on the detection nozzle for precise adjustment.
(2) Confirm applied air pressure. If the variable orifice is closed (turn the adjustment knob counterclockwise), all LED's are off.
(3) When opening the variable orifice (turn the adjustment knob clockwise) the LED's will light up in the following order:
Red ❶, Red ❷, Green ❶, Green ❷
(4) When the LED Green ❶ is on, the output is energized. This should conclude the calibration.
(5) Confirm calibration setting by removing the gap gauge from the nozzle. The LED Green ❶ should go off. Place the gap gauge on to the detection nozzle again, the Green ❶ LED should light up again.
(6) Secure the setting of the adjustment knob with the spanner nut.

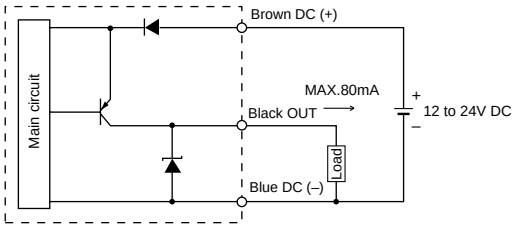
Internal Circuit/Wiring

The lead wire colors indicated inside "( )" are old colors prior to compliance with the IEC standard.

NPN Open Collector (Sinking)

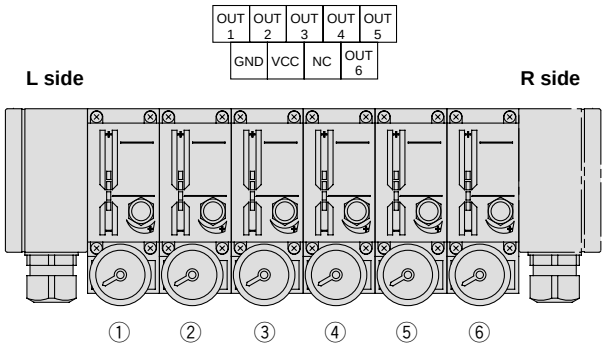


PNP Open Collector (Sourcing)



Centralized Wiring Style

Relation between terminal block wiring in terminal box and switch is shown below.



⚠ Precautions

Be sure to read before handling. Refer to p.0-26 and 0-27 for Safety Instruction and common precaution of the products mentioned in this catalog, and refer to p.3.0-7 to 3.0-9 for precautions on every series.

Installation

⚠Caution

①Do not allow water, cutting oil, etc. to flow back from the detection nozzle to the switch body. Always mount switch body higher than detection nozzle if possible.

Piping

⚠Caution

①**Piping materials**

Do not mount any equipment or fittings between the switch body and the detection nozzle in order to avoid leaks and pressure drops. Do not use one-touch fittings in applications where these fittings might be exposed to liquid being sprayed onto them.

Supply Pressure

⚠Caution

① **Supply air**

Be careful not to allow any foreign materials into the supply of the Air Catch Sensor. Contamination of the sensor will decrease the sensor's accuracy.

Especially important when measuring small bore orifices. Use dry and filtered (5μm) supply air.

②**Operating pressure**

Do not exceed the max. operating pressure of 0.2 MPa. Damage to the solid state pressure sensor may occur.

Environment

⚠Caution

①If the Air Catch Sensor is mounted in an enclosure, make sure that the exhaust port is open to atmospheric pressure to avoid malfunction due to possible pressure build-up inside the enclosure.

②Connect the tubing via the M5 fittings to the Air Catch Sensor. Place the tubing in such a way that no water, oil, etc. can enter the sensor. The Air Catch Sensor is rated IP66. However in order to achieve this rating the gauge has to be removed from the sensor screw a fitting into the gauge port and run tubing to the gauge. When remove mounting the gauge keep the tubing as short as possible otherwise the response time will increase.

Maintenance

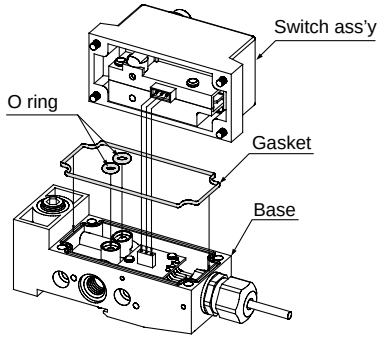
⚠Caution

①After removing the 4 mounting screws (M4 X 8) pull the switch body off vertically.

If the switch body is pulled off in an angle the connector pins may be bent.

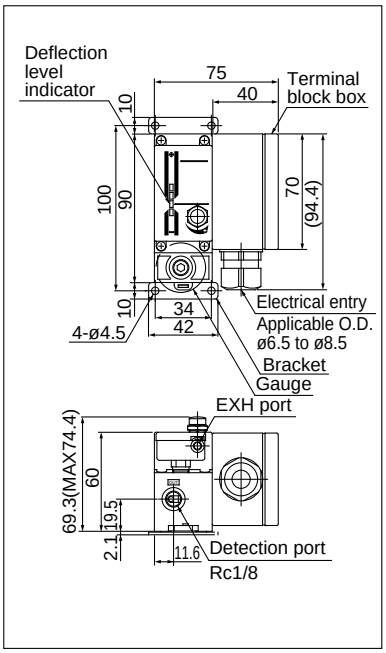
②When mounting the switch body onto the base, be careful that the body is lowered vertically onto the base and the connector pins are not bent. Tighten the 4 mounting screws equally (M4 X 8).

Note) Do not forget to insert the seals prior to mounting the body onto the base. (Tightening torque is 0.45 Nm.)



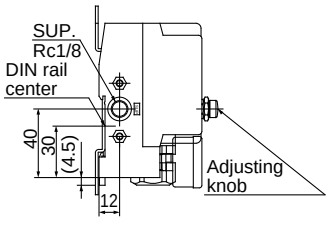
Dimensions/Centralized Wiring (Terminal Block Box Style)

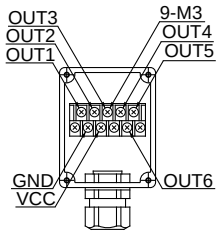
Unit



2 station manifold, if the terminal block is located on the right side of the manifold assembly, the mounting bracket is located on the second Air-Catch Sensor. If the terminal block is located on the left side of the manifold assembly, the mounting bracket is located on the first Air-Catch Sensor.
For manifolds with more than 2 stations, the mounting brackets are located on the first and last Air-Catch Sensor.

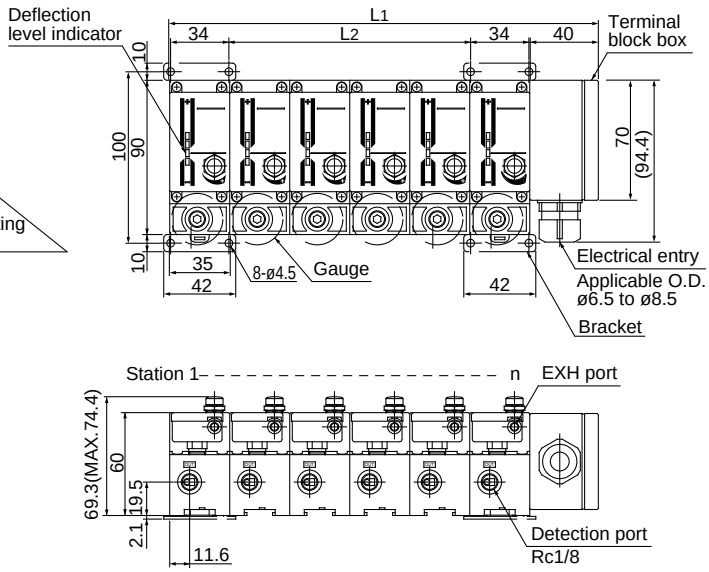
With bracket





Terminal block box wiring

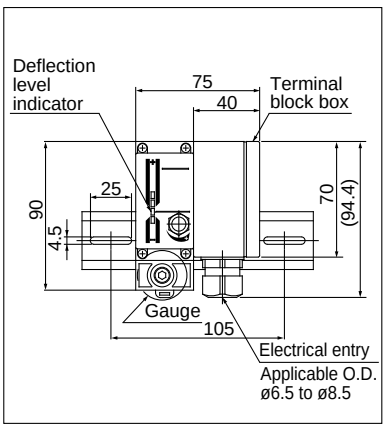
Manifold



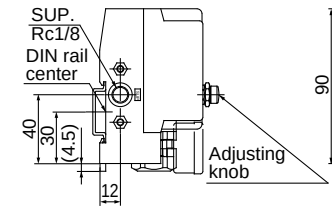
Dimensions

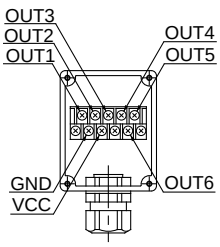
Station	2	3	4	5	6
L1	110	145	180	215	250
L2	–	36	71	106	141

Unit



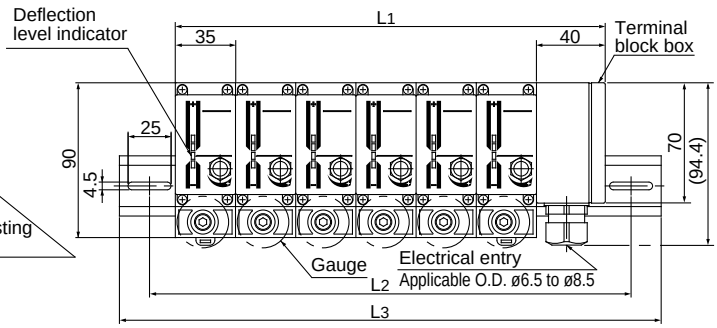
With DIN rail

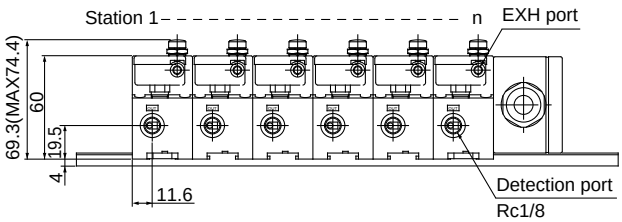




Terminal block box wiring

Manifold



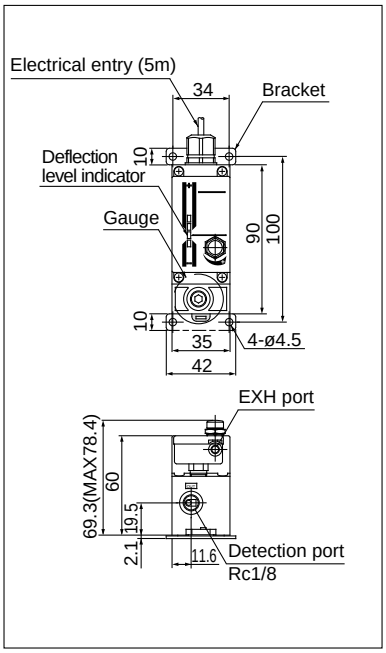


Dimensions/With DIN rail

Station	2	3	4	5	6
L1	110	145	180	215	250
L2	140	175	210	245	280
L3	175	210	245	280	315

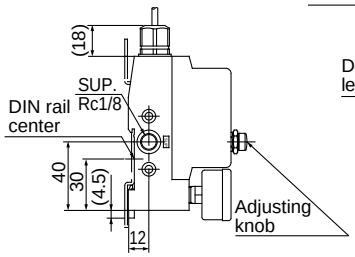
Dimensions/Individual Wiring (Lead Wire Style)

Unit

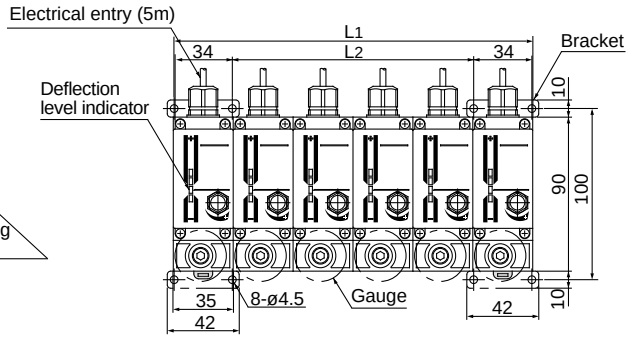


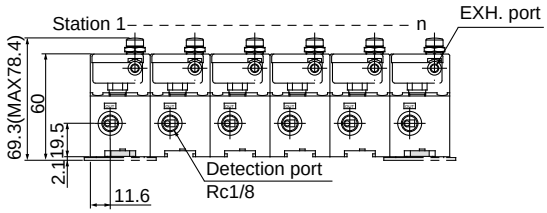
For 2 station manifold, the mounting bracket is located on the first Air-Catch Sensor.
For manfolds with more than 2 stations, the mounting brackets are located on the first and last Air-Catch Sensor.

With bracket



Manifold

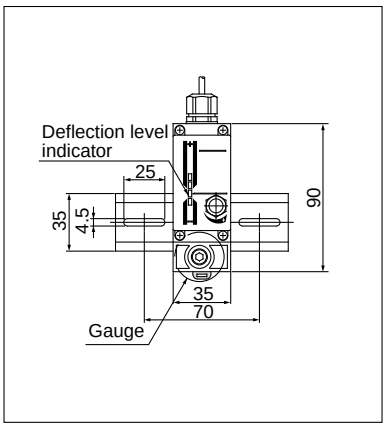




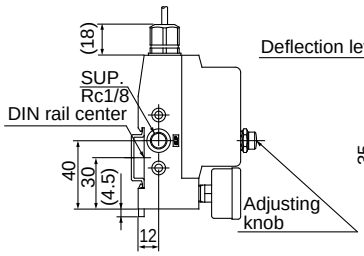
Dimensions

Station	2	3	4	5	6
L1	70	105	140	175	210
L2	–	36	71	106	141

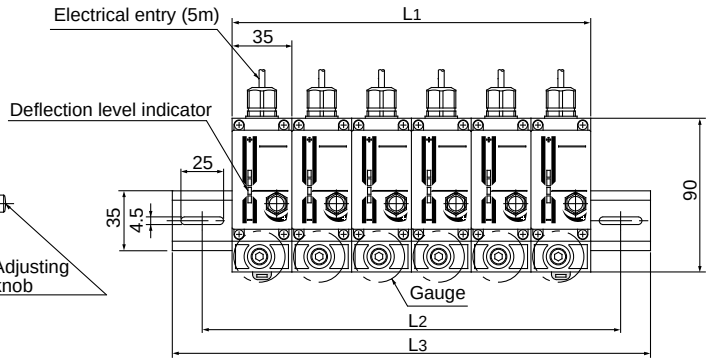
Unit

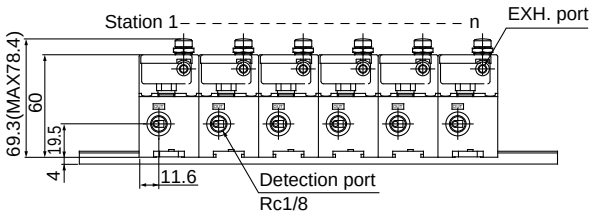


With DIN rail



Manifold





Dimensions/With DIN rail

Station	2	3	4	5	6
L1	70	105	140	175	210
L2	105	140	175	210	245
L3	140	175	210	245	280

Guide for Use/Design Data

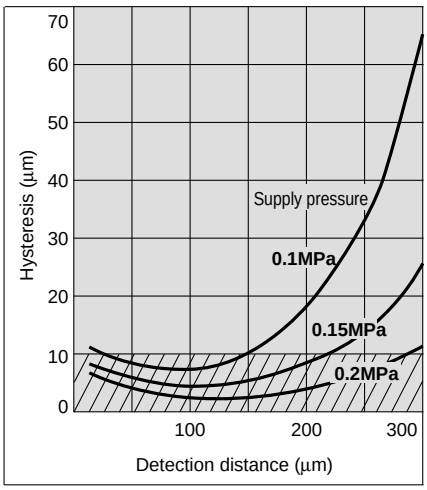
When designing a pneumatic circuit with an Air-Catch Sensor, please refer to the data below.
The detection distance for the Air-Catch Sensor is between 10 to 300µm.
When the supply pressure of the nozzle diameter changes reliable detection is not possible.

Nozzel Diameter and Detection Distance

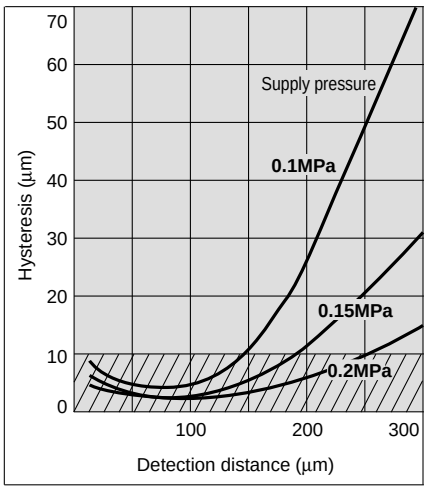
The graphs below show the hysteresis in relationship to the detection distance.
When high accuracy is required, design the system so the hysteresis is within the 10µm detection distance.
When the Hysteresis exceeds 10µm use the Air-Catch Sensor as a confirmation of position of work piece.

▨: Stable adjustment range

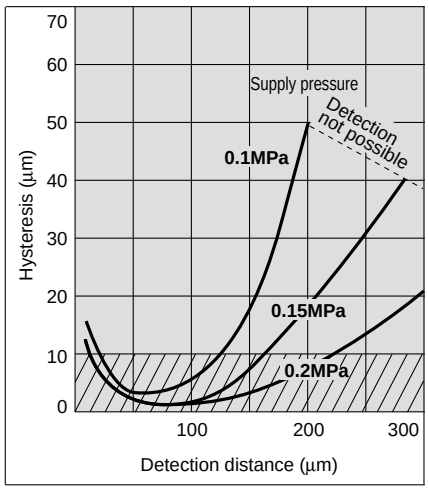
Detection side nozzle: ø1.0
Detection side piping: ø6 X ø4 tubing



Detection side nozzle: ø1.5
Detection side piping: ø6 X ø4 tubing



Detection side nozzle: ø2.0
Detection side piping: ø6 X ø4 tubing



Example 1) When requiring 300µm detection, select the detection nozzle of ø1.0 with supply pressure 0.2MPa.
Example 2) When requiring 10µm detection, select the detection nozzle of ø1.5.

Nozzle Shape

Nozzle shape should be designed as follows.
Pay attention to detection surface and the chamfer of nozzle hole as shown in Fig.1 since they can affect performance.

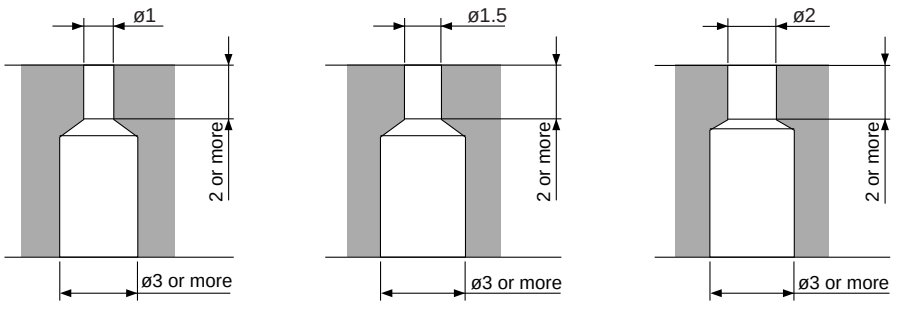
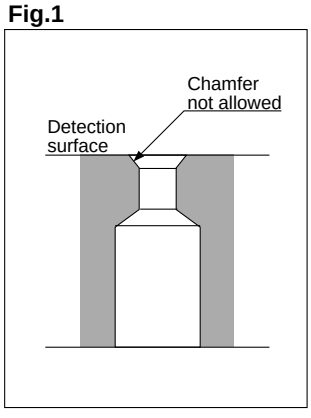


Fig.1



Response Time

The response time is dependent on the detection distance and the piping length. The supply pressure and the nozzle diameter do not influence the response time. Table 2 shows the response time for different detection distance settings and a constant piping length. Table 3 shows the response time when the detection distance is constant but the piping length changes. As can be seen from the graphs below, if the piping length is kept short and the detection distance is small, the response time is faster.

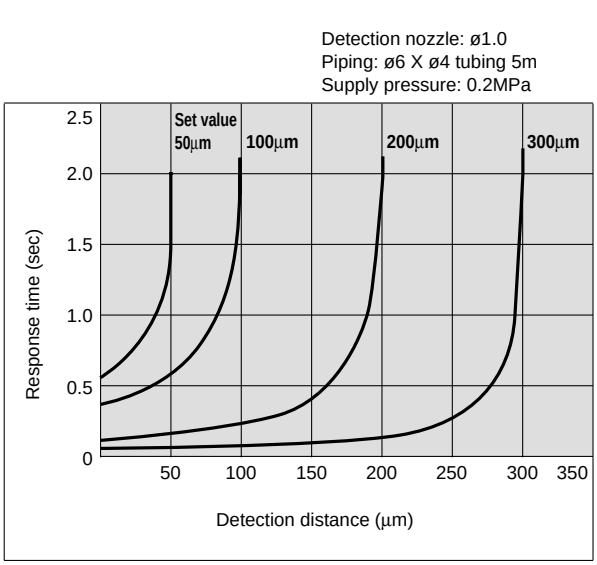


Fig.2 Detection distance vs. Response time

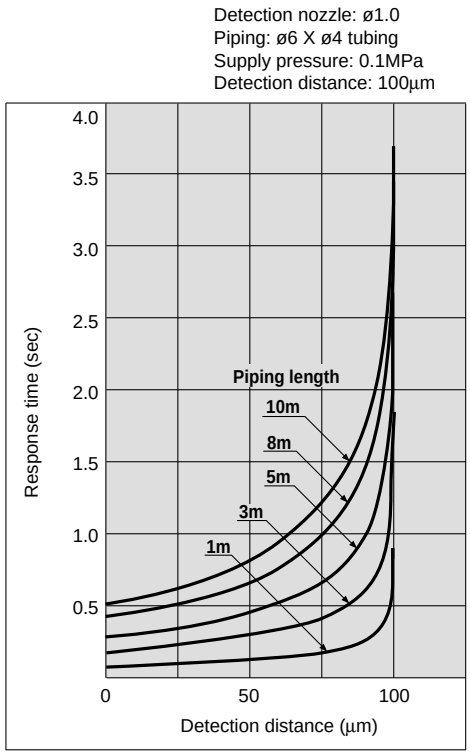


Fig.3 Response time vs. Piping length

Supply Pressure vs. Detection Distance

The graphs below show the detection distance for different supply pressure setting.