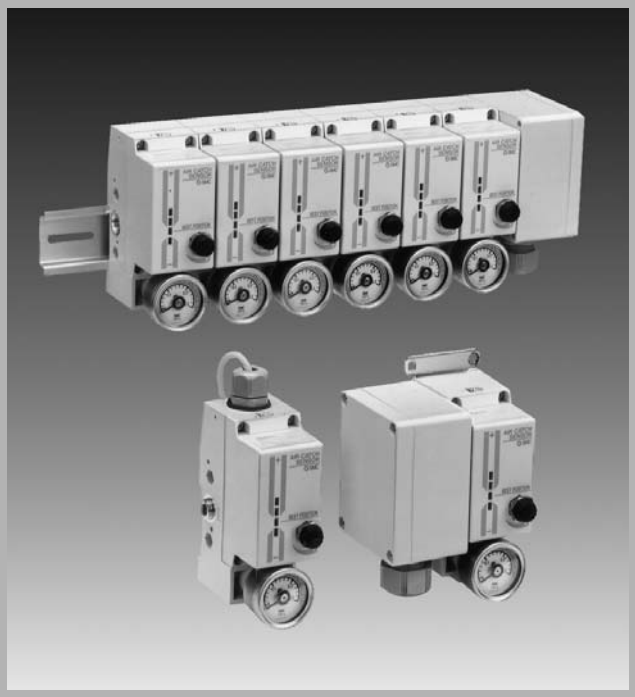
Air Catch Sensor

Series ISA

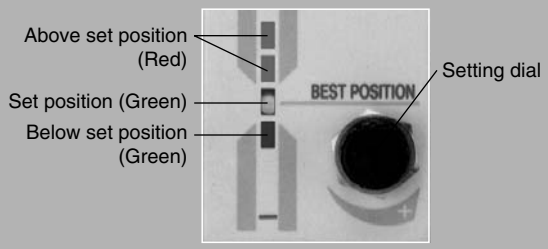
For Workpiece Placement Confirmation



No-contact sensor for confirming workpiece placement, with a configuration that is less affected by supply pressure change.

Easy-to-set-up LED level meter

Proper set position is steadily and easily set due to the LED level meter and setting dial.



Compliant with manifolds of up to 6 stations

Compliant with centralized wiring and piping

Free mounting position

Stable detection is available at any mounting position due to the pressure sensor.

Wide adjustment range

Compliant between 10 and 300 μm

Stably detects 10 μm clearance

The configuration is unlikely to be affected by supply pressure change due to the air pressure bridge circuit and semi-conductor pressure sensor.

IP66-compliant

Dustproof and dripproof type

Air Catch Sensor
Series ISA

How to Order

Individual wiring/Centralized wiring

ISA □ – □ □ – **01** □

Output specifications

11	NPT open collector output
15	PNP open collector output

Stations 1 to 6

Wiring specifications

Nil	Individual wiring (Without terminal block BOX)
L	Centralized wiring (With terminal block BOX, left side)
R	Centralized wiring (With terminal block BOX, right side)

Option

Nil *	DIN rail compliant
B	With bracket
G	With gauge

* DIN rail must be ordered separately.

Ex. 1) NPN output, 4 stations, centralized wiring terminal block BOX (left), with bracket and gauge

ISA11-4L-01BG

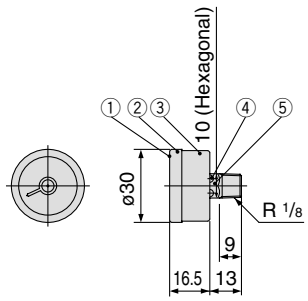
Ex. 2) PNP output, individual wiring, with gauge

ISA15-1-01G

Accessory

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

· Gauge: G33-3-01

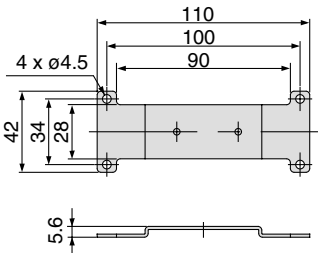


Description

No.	Description	Material
1	**Cover glass**	glass
2	**Outer frame**	Stainless steel
3	**Inner frame**	Stainless steel
4	**Round head Phillips screw**	Stainless steel
5	**Socket**	Brass

· Bracket: ISA-1-A

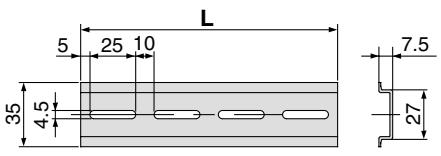
Material: SPC
(Nickel plated)



* Each part order comes with two M3 x 8 tapping screws.

· DIN rail: ISA-2-1 to 7

Material: Aluminum

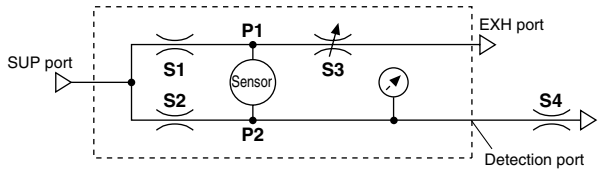


Part no.	L	Applicable model
ISA-2-1	105	ISA□-1
ISA-2-2	140	ISA□-2 · ISA□-1$^{L}_{R}$
ISA-2-3	175	ISA□-3 · ISA□-2$^{L}_{R}$
ISA-2-4	210	ISA□-4 · ISA□-3$^{L}_{R}$
ISA-2-5	245	ISA□-5 · ISA□-4$^{L}_{R}$
ISA-2-6	280	ISA□-6 · ISA□-5$^{L}_{R}$
ISA-2-7	315	ISA□-6$^{L}_{R}$

Specifications

Fluid			Dry air (filtered to 5 μm)
Operating pressure range			0.05 to 0.2 MPa
Recommended pressure range			0.1 to 0.2 MPa
Detection distance range			10 to 300 μm
Repeatability including temperature characteristics			±10 μm (0 to 60°C (standard 25°C))
Hysteresis			10 μm or less (Detection distance: 10 to 150 μm)
Detection nozzle O.D.			ø1.0 standard (Refer to page 820 for data when the nozzle diameter is modified.)
Display function			Operating indicator light (Lights ON), Deviation level indicator light
Power supply voltage			12 to 24 VDC ±10%, Ripple (p-p) 10% or less (With power supply polarity protection)
Current consumption			30 mA or less (Output ON, All LEDs ON)
Switch output	**ISA11**		NPN open collector: 30 V, 80 mA or less
	ISA15		PNP open collector: 80 mA or less
Operating temperature range			0 to 60°C (No condensation)
Operating humidity range			35 to 85 % RH (No condensation)
Noise resistance			1000 Vp-p, Pulse width 1 μs, Rise time 1 ns
Withstand voltage			1000 VAC in 50/60 Hz for 1 minute between live parts and case
Insulation resistance			2 MΩ or more between live parts and case (at 500 VDC by megameter)
Vibration resistance			1.5 mm amplitude in 10 to 500Hz or acceleration of 98 m/s², whichever is smaller for 2 hours in X, Y, Z direction each (De-energized)
Impact resistance			980 m/s² in X, Y and Z direction, 3 times each (De-energized)
Lead wire			Oil-resistant vinyl cabtire code (3 cores, ø3.4, 5 m), Cross section: 0.2 mm², Insulator O.D.: 1.1 mm
Mass			250 g (including gauge and 5-m lead wire)
Port size			Rc 1/8
Enclosure			IP66 (Dustproof and dripproof type)
Air consumption	**Supply pressure**	**0.10 MPa**	16 ℓ/min or less
		0.15 MPa	21 ℓ/min or less
		0.20 MPa	25 ℓ/min or less

Working Principle

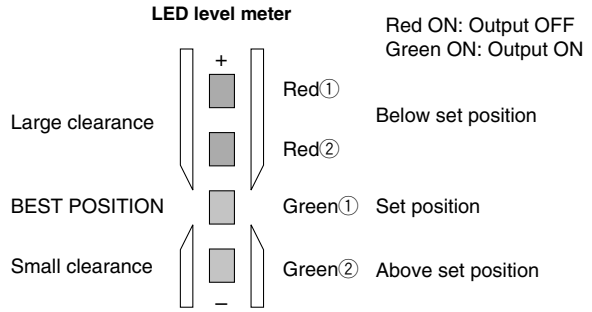


S1, S2: Fix orifice
S3: Variable orifice (adjusted by setting dial)
S4: Detection nozzle

In a bridge circuit as in the figure above, a detection gap is applied to the detection nozzle (S4) while the setting dial S3 is adjusted to balance the pressure applied to the pressure sensor (P1 = P2). The pressure sensor detects the differential pressure generated when the detection nozzle (S4) is released. When the work piece comes close to the detection nozzle, the back pressure P2 increases until it is larger than P1 (P2 ≥ P1). Then the switch output turns on to notify that the pressure is below the detection gap.

How to Set Pressure

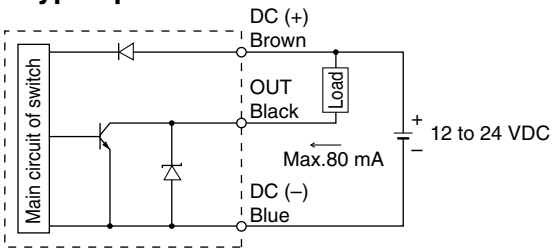
Air catch sensor is adjusted by using the LED level meter and the setting dial.



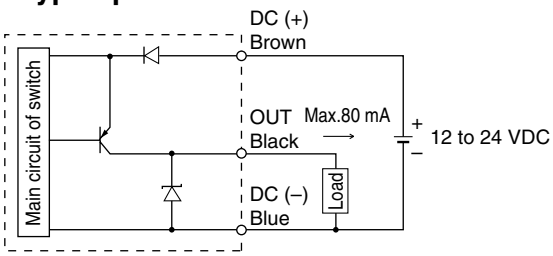
(1) For accurate setting, create the proper setting conditions by applying a clearance gauge to the detection nozzle beforehand.
(2) Confirm that pressure is being applied. At this time, if the setting dial is fully closed, all LEDs should be off.
(3) Turning the setting dial in a plus direction (counterclockwise) will cause the LEDs to turn on in order: Red 1, Red 2, Green 1, Green 2.
(4) When the Green 1 LED level meter comes on, output will be switched on, so please end the setting process at the point when Green 1 comes on.
(5) Apply a clearance gauge to the detection nozzle once more, and confirm that Green 1 has switched on.
(6) Hold the setting dial with a finger, and tighten the lock nut with a wrench. Tighten so that the setting dial will not turn.

Internal Circuit and Wiring

NPN-type open collector



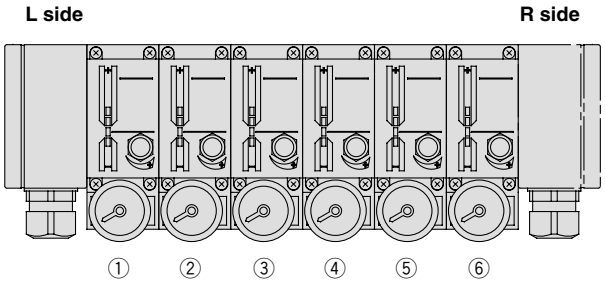
PNP-type open collector



Centralized wiring type

Refer to the below figure for the relation between terminal block wiring in terminal box and switch.

OUT 1	OUT 2	OUT 3	OUT 4	OUT 5
GND	VCC	NC	OUT 6	



⚠ Specific Product Precautions

Read before handling.
Refer to front matters 58 and 59 for Safety Instructions and pages 687 to 691 for Pressure Switch Precautions.

Mounting

⚠Caution

1. If the detection nozzle is exposed to splashes of water or cutting oil, do not allow backflow from the detection nozzle to the switch body. Install the switch body at a position higher than the detection nozzle wherever possible.

Piping

⚠Caution

1. Piping equipment

In the piping between the switch body and the detection nozzle, do not use equipment or fittings that can possibly cause leakage or serve as resistance.
Do not use One-touch fittings in an environment where the air catch sensor is exposed to water or other liquid.

Pressure Source

⚠Caution

1. Supply air

Since the orifice of the air catch sensor is small, prevent foreign matter from entering the equipment. For this purpose, use supply air that is dry and filtered 5 μm or better.

2. Operating pressure

Since the product adopts a semiconductor pressure sensor, keep the operating pressure not larger than 0.2 MPa.

Operating Environment

⚠Caution

1. When an air catch sensor is contained in a box, provide an air outlet to constantly keep the atmospheric pressure inside the box. Internal pressure rises will hinder normal air discharge and may lead to possible malfunction.
2. The air catch sensor is IP66-compliant, but when there is a possibility of water, oil, etc. from the exhaust port entering the case interior, use an M5 fitting to connect a tube, and discharge air in a place where water and oil will not enter the interior. When attached with a gauge, there is a danger of materials entering the gauge interior and causing malfunction, so please remove the gauge and use a plug instead.
When mounting a gauge to the exterior, please use piping of as short a length as possible. Failure to do so may result in slower response speed.

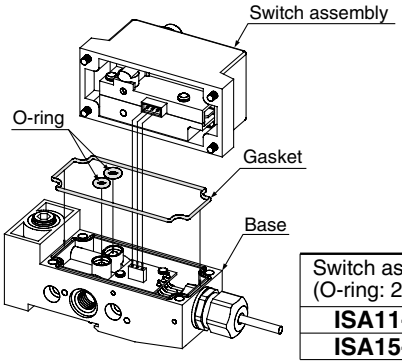
Maintenance

⚠Caution

1. How to change

After loosening the four mounting screws (M4 x 8), pull straight back on the switch body. Pulling back diagonally can result in bending of the connector pin, etc., so take precautions.

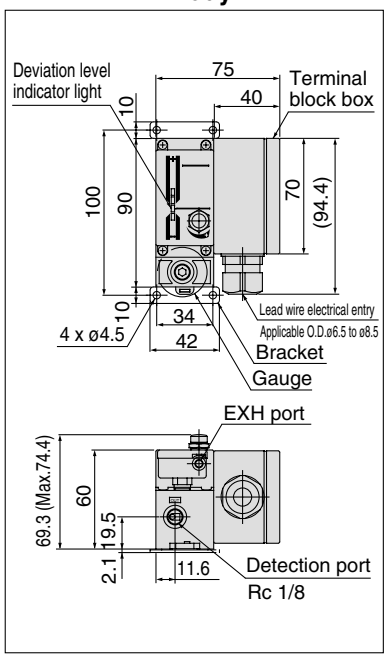
2. When mounting the switch body to the base, push the pin (main body side) straight into the connector (base side), and evenly mount with four mounting screws (M4 x 8). Be sure not to forget to include seals, etc. (Tightening torque 0.45 N·m)



Switch assembly part no. (O-ring: 2, Gasket: 1 enclosed)	
ISA11-0	For NPN output
ISA15-0	For PNP output

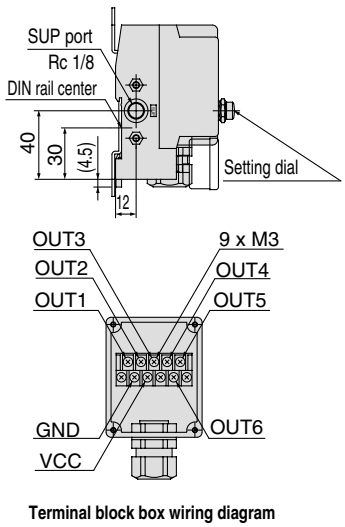
Dimensions: Centralized Wiring Type (Terminal Block Box Type)

Body



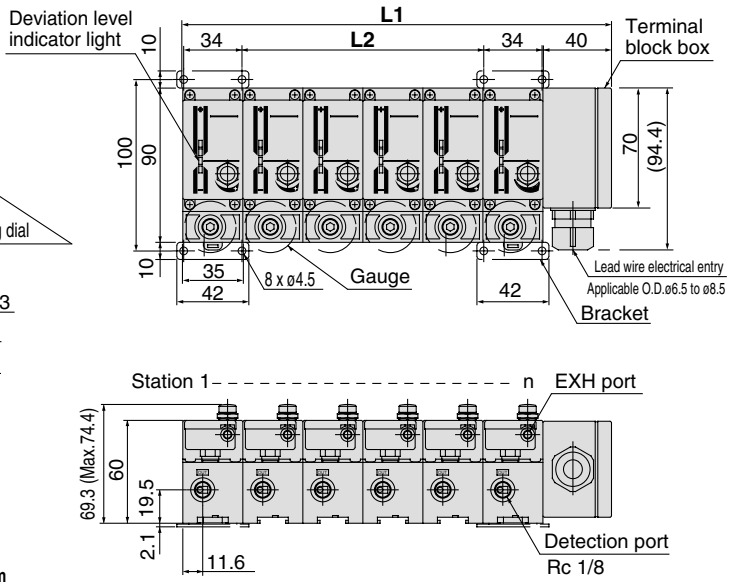
When the bracket has two stations and the terminal block box is on the right side, it attaches to the second switch, while when it is on the left side, it attaches to the first switch. With n stations, it attaches to the *n*th switch.

With bracket



Terminal block box wiring diagram

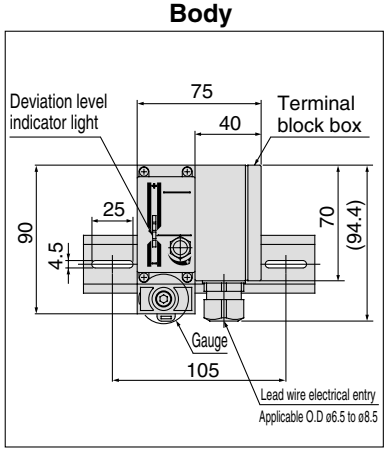
Manifold



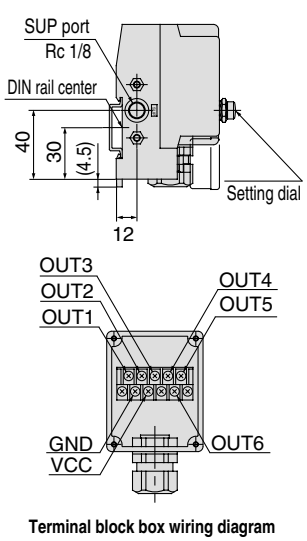
Dimensions

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

Body

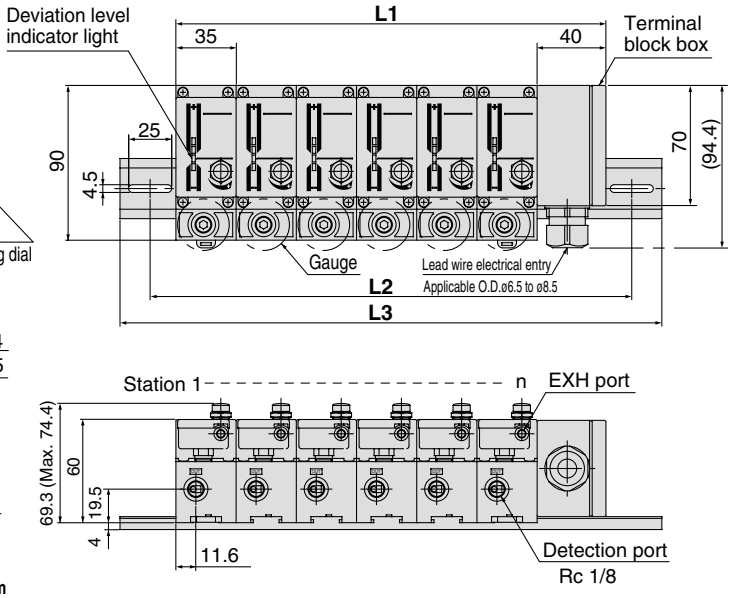


With DIN rail



Terminal block box wiring diagram

Manifold

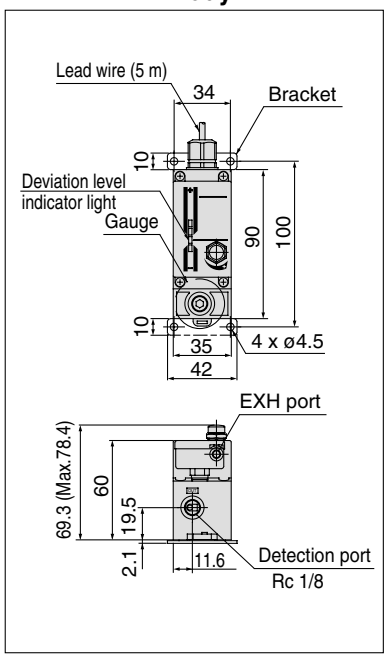


Dimensions: With DIN rail

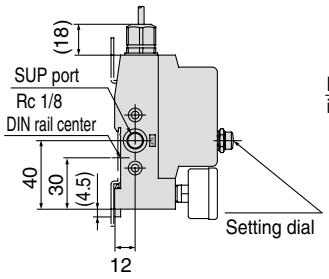
Station	2	3	4	5	6
L1	110	145	180	215	250
L2	140	175	210	245	280
L3	175	210	245	280	315

Dimensions: Individual Wiring Type (Lead Wire Type)

Body

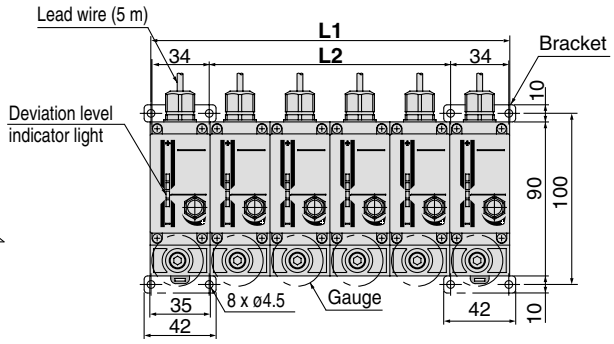


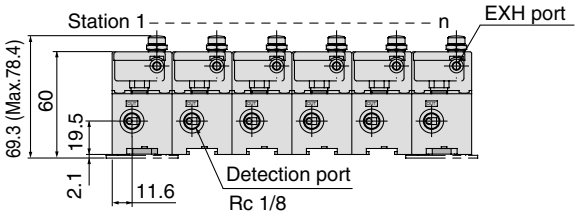
With bracket



When the bracket has two stations, it attaches to the first switch.
With *n* stations, it attaches to the first switch and the nth switch.

Manifold

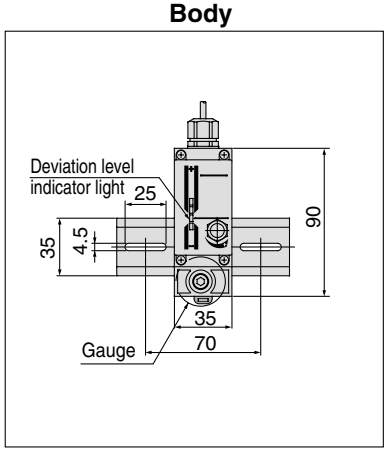




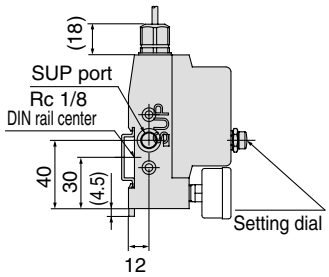
Dimensions

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

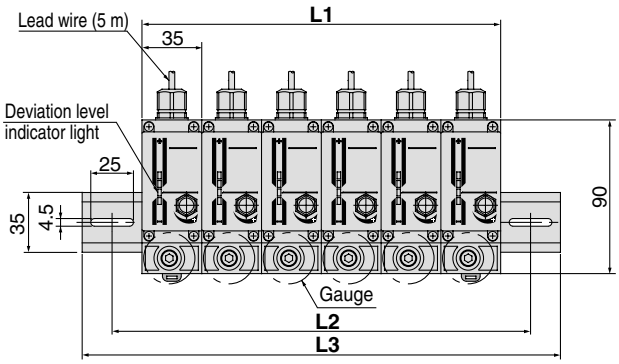
Body

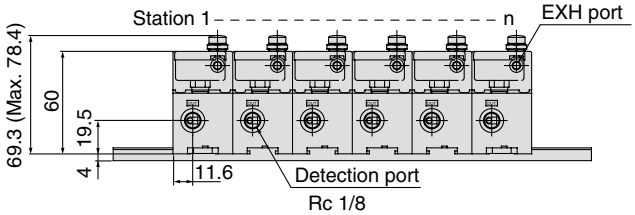


With DIN rail



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

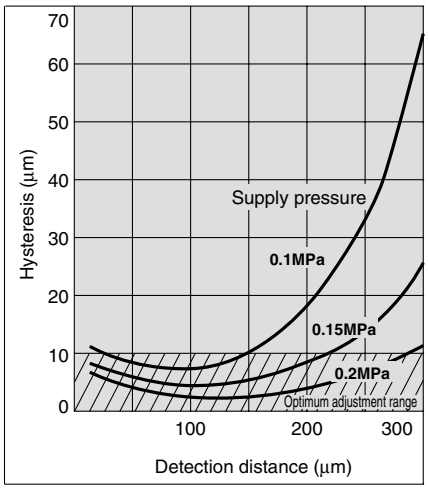
Operation guideline: Design data

When you design the pneumatic circuit using the air catch sensor, please refer to the data below. The detection distance of the air catch sensor is between 10 and 300 μm. However, please note that stable detection cannot be done when supply pressure or nozzle size are different.

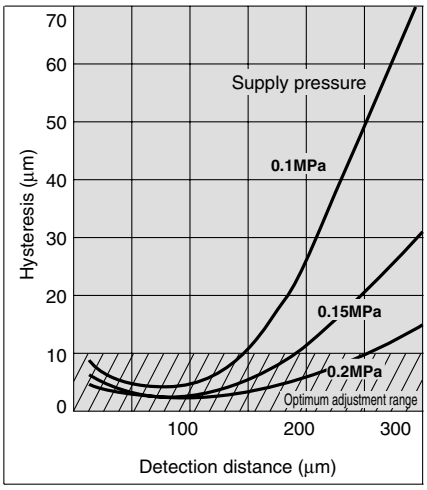
Relation between Nozzle Diameter and Detection Distance

The data in the following charts are characteristics of hysteresis at the detection distance.
In case accuracy is required by the settings, the design should be made so that the hysteresis will stay within the optimum adjustment range not larger than 10 μm.
The smaller the hysteresis, the better the sensitivity. In cases where the hysteresis exceeds 10 μm, the air catch sensor should be used to check the presence of the work piece.

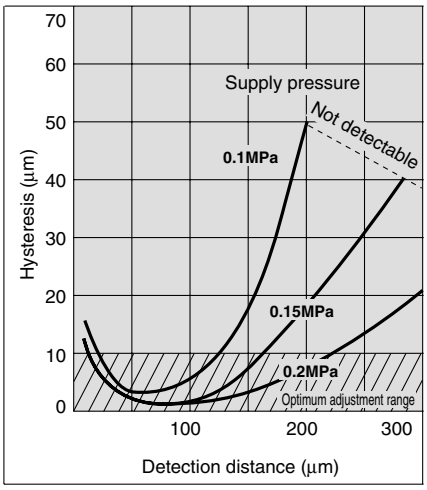
Detection nozzle: ø1.0
Detection side piping: ø6 x ø4 tubing



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



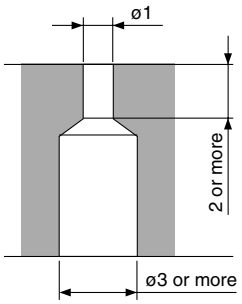
Detection nozzle: ø2.0
Detection side piping: ø6 x ø4 tubing

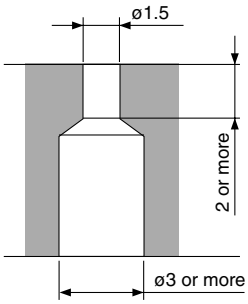


Ex. 1) To detect 300 μm, select a ø1.0 detection nozzle and supply pressure of 0.2 MPa.
Ex. 2) To detect 10 μm, select a ø1.5 detection nozzle.

Nozzle Shape

Please keep the nozzle shape as illustrated below.
Take every caution against chamfer on the detection surface and/or nozzle hole, which could affect the characteristics as illustrated in Figure (1).





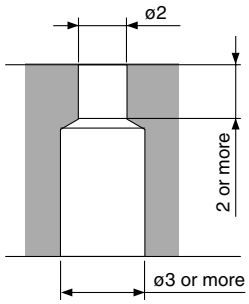
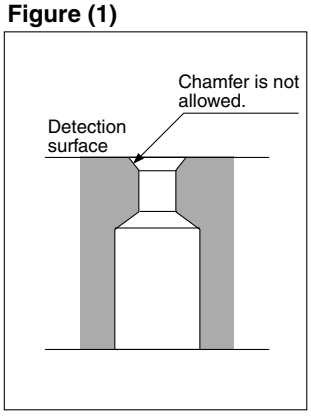


Figure (1)



Response Time

Response time changes with detection distance and piping length. It is hardly influenced by the supply pressure and nozzle diameter (ø1.0 to ø2.0).
While both graphs assume a fixed set distance with changes in the detection distance, Fig. 2 shows responses at various set values and Fig. 3 shows responses at various piping lengths. If the detection distance is equal to the set value, the response becomes quicker as the set value becomes smaller or the piping length becomes shorter.

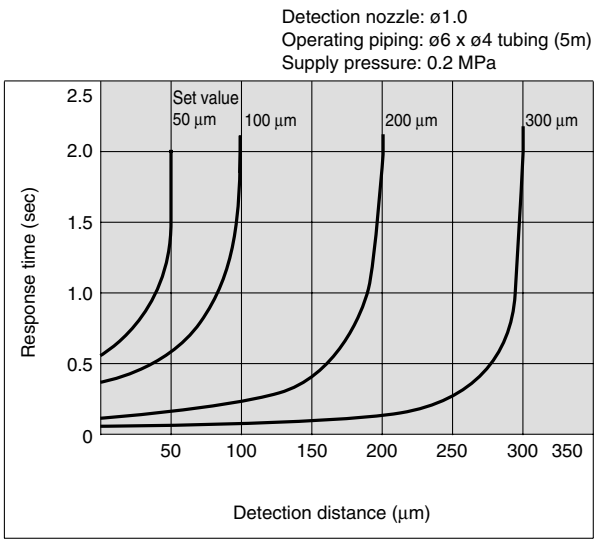


Fig. 2 Detection distance – Response time characteristics

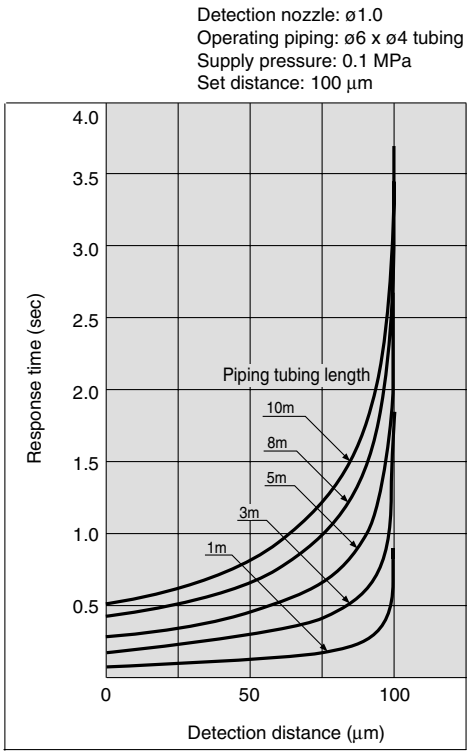
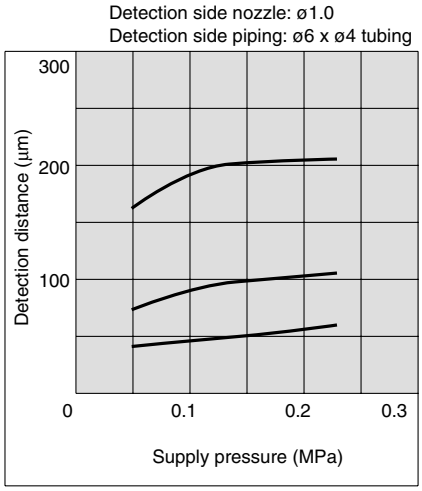
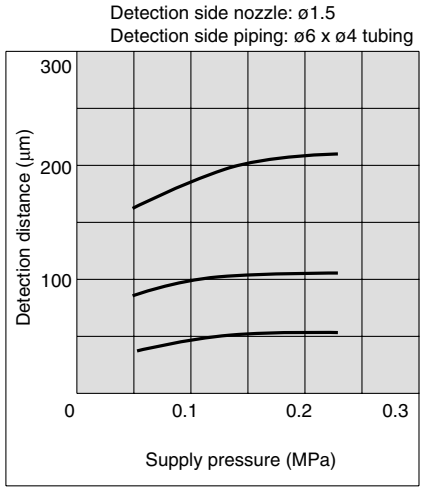


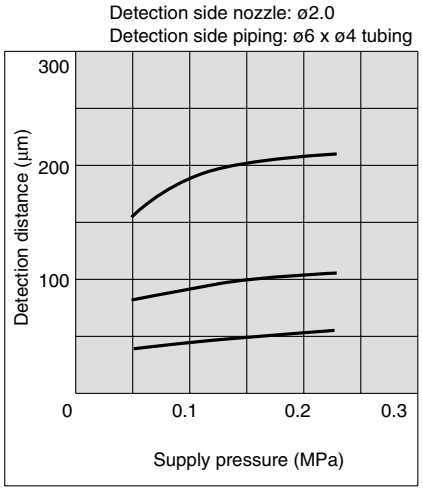
Fig. 3 Response time – Piping tubing length

Supply Pressure Dependence

The charts illustrate changes in the detection distance with fluctuations in the supply pressure.







Air Catch Sensor

Series ISA2

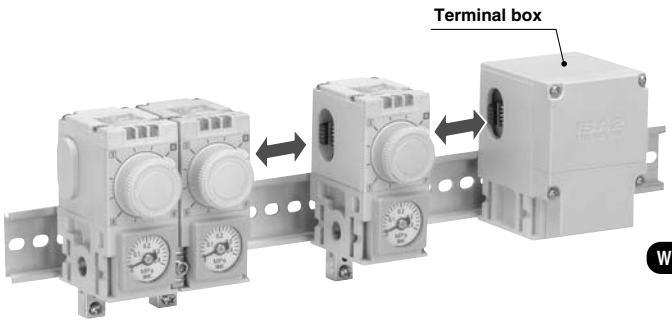
Non-Contact Sensor for Workpiece Placement Confirmation

Stable detection of 0.01 to 0.5 mm clearance

Due to the pneumatic bridge circuit and semiconductor pressure sensor, the non-contact type sensor is hardly affected by fluctuations in the supply pressure.

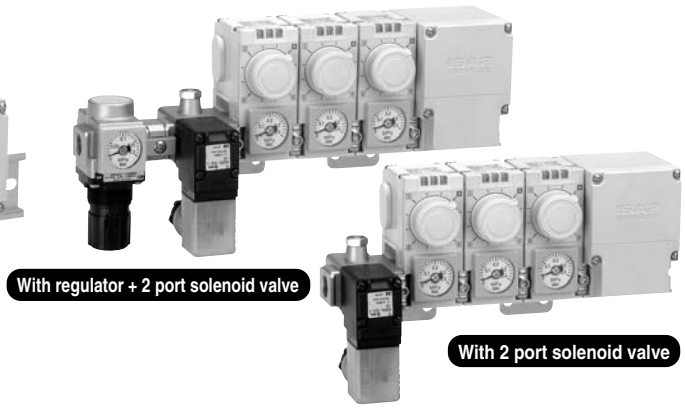
● Plug connectors (Centralized wiring)

Requires less man hours to wire.
Easy to add and remove manifold stations.

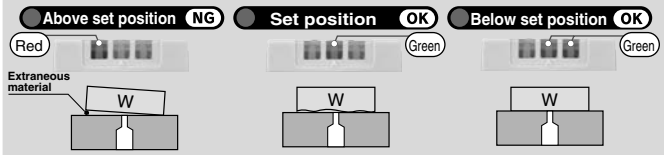


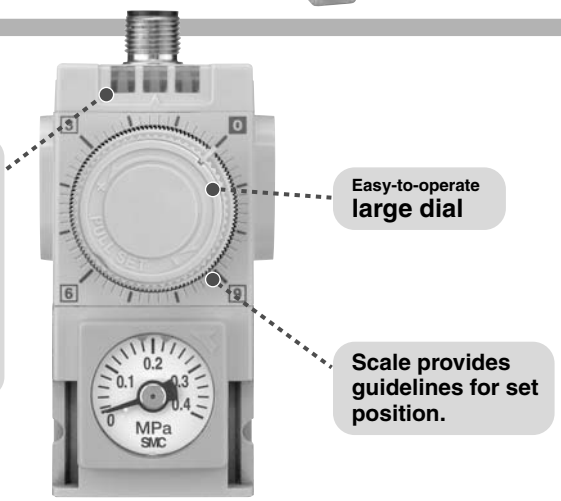
● Modular construction

Requires less man hours to wire.

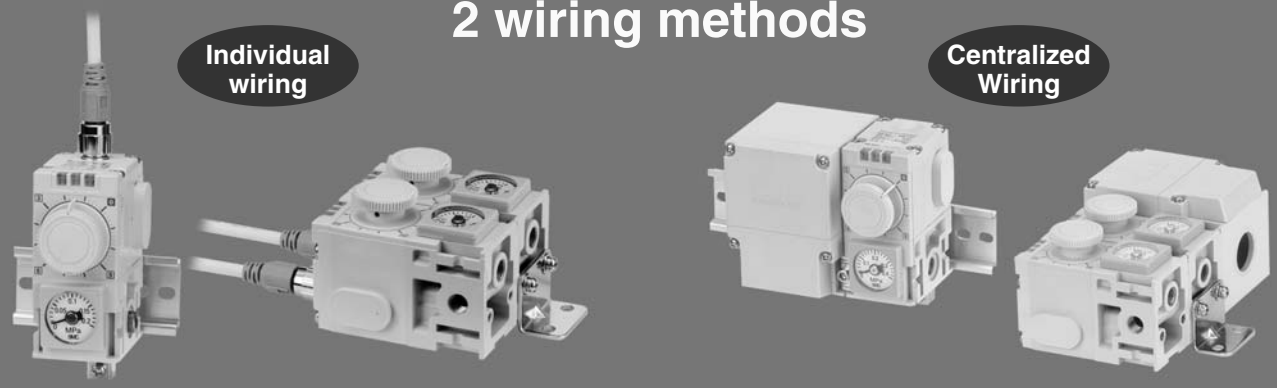


Optimum position is known at a glance. LED level meter





2 wiring methods



● Minimum operating pressure 30 kPa (ISA2-G)

Energy consumption can be reduced compared with the conventional models (Conventional models: 50 kPa)

● Position of supply port: Either right side or left side is available.

Air Catch Sensor
Series ISA2

How to Order

Manifold

Without control unit IISA2 N **PL** – **3** **B**

With control unit IISA2 **C** **SL** – **3** **B** **1** **D** **E2**

Control unit

C	With regulator + 2 port solenoid valve
V	With 2 port solenoid valve

Electrical entry and supply port position

SR	Centralized wiring with supply port on the right
SL	Centralized wiring with supply port on the left
PR	Individual wiring with supply port on the right
PL	Individual wiring with supply port on the left

Note) The supply port position is the one when the switch is viewed from the front.

Stations

1	1 station
2	2 stations
3	3 stations
4	4 stations
5	5 stations
6	6 stations

Option

Nil	Without bracket
B	With bracket
D	With mounting bracket for DIN rail

Note) DIN rail must be ordered separately. (Refer to page 808.)

Voltage of 2 port solenoid valve

1	100 VAC
2	200 VAC
3	110 VAC
4	220 VAC
5	24 VDC
6	12 VDC
36	230 VAC

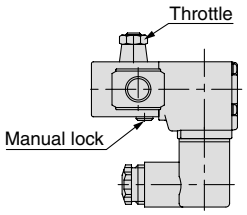
Pressure gauge of regulator Note 1)

A*	Without pressure gauge Note 2)		
E2	MPa single notation	0.2 MPa	Square embedded pressure gauge
Z2*	psi single notation		
E4	MPa single notation	0.4 MPa	
Z4*	psi single notation		
G2	MPa single notation	0.2 MPa	Round pressure gauge
P2*	MPa-psi double notation		
G4	MPa single notation	0.4 MPa	
P4*	MPa-psi double notation		

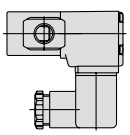
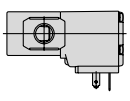
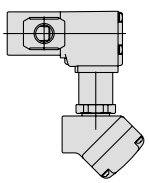
Note 1) Due to new Japanese weight and measurement legislation, psi notation type cannot be sold or used in Japan.
Note 2) The pressure gauge port is Rc 1/8.
* Manufactured upon receipt of order.

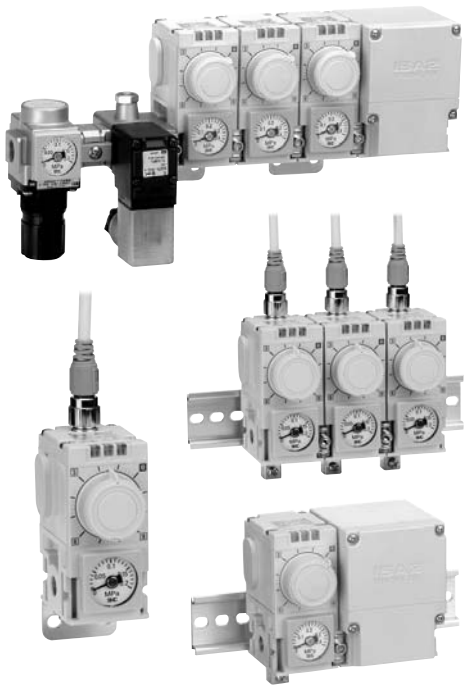
Throttle/Manual lock of 2 port solenoid valve

Nil	Without throttle, without manual lock
C	With throttle, without manual lock
W	Without throttle, with manual lock
M	With throttle, with manual lock



Electrical entry of 2 port solenoid valve

D : DIN connector **DL:** DIN connector (With indicator light)	**D0:** DIN connector (Without connector)	**T** : Conduit terminal **TL:** Conduit terminal (With indicator light)
		



How to Order

For single and double notation type and additional stations

Air catch sensor

ISA2 − G □ E2 1 □

Detection distance

G	0.01 to 0.25 mm
H	0.03 to 0.5 mm

Piping specifications

Nil	Rc 1/8
N	NPT 1/8
F*	G 1/8

* Manufactured upon receipt of order.

Output specifications

1	NPN output
5	PNP output

Pressure gauge Note 1)

A*	Without pressure gauge Note 2)		
E2	MPa single notation	0.2 MPa	Square embedded pressure gauge
Z2*	psi single notation		
E4	MPa single notation	0.4 MPa	
Z4*	psi single notation		
G2	MPa single notation	0.2 MPa	Round pressure gauge
P2*	MPa-psi double notation		
G4	MPa single notation	0.4 MPa	
P4*	MPa-psi double notation		

Note 1) Due to new Japanese weight and measurement legislation, psi notation type cannot be sold or used in Japan.
Note 2) The pressure gauge port is Rc 1/8.
* Manufactured upon receipt of order.

Electrical entry

Individual wiring	**Nil**	Straight
	L*	Right angle
	N	Without lead wire
Centralized wiring	**P**	Terminal block box

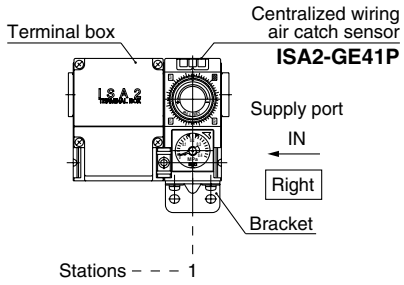
* Manufactured upon receipt of order.

ZSE ISE
ZSP
PS
ISA
PSE
IS
ISG
ZSM

Ordering Example

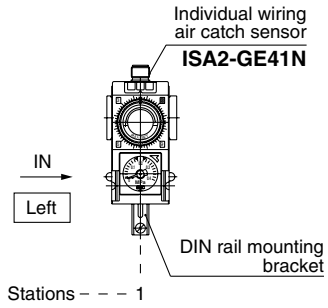
Without control unit

Centralized wiring



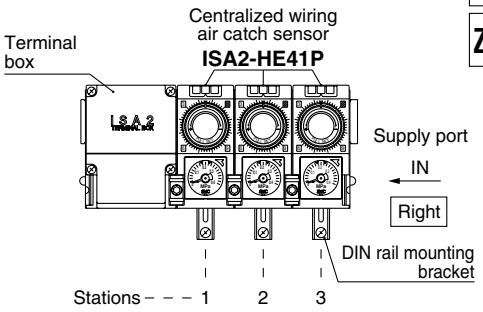
IISA2NSR-1B · · · 1 set (1 station manifold part number)
*__ISA2-GE41P__ · · · 1 set (Air catch sensor part number)
Prefix the part number of the air catch sensor with an asterisk (*).

Individual wiring



IISA2NPL-1D · · · 1 set (1 station manifold part number)
*__ISA2-GE41N__ · · 1 set (Air catch sensor part number)
Prefix the part number of the air catch sensor with an asterisk (*).

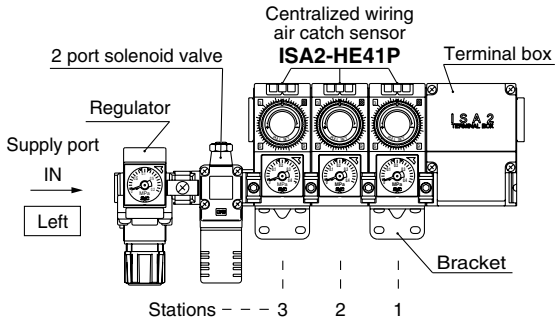
Centralized wiring/Supply port right



IISA2NSR-3D · · · 1 set (3 stations manifold part number)
*__ISA2-HE41P__ · · · 3 sets (Air catch sensor part number)
Prefix the part number of the air catch sensor with an asterisk (*).

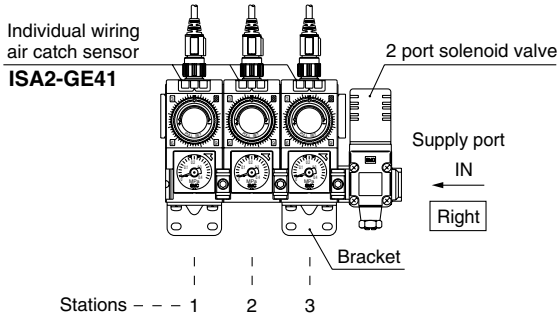
With control unit

Centralized wiring/Supply port left



IISA2CSL-3B5DLCE2 · · 1 set (3 stations manifold part number)
*__ISA2-HE41P__ · · · · · · · · · 3 sets (Air catch sensor part number)
Prefix the part number of the air catch sensor with an asterisk (*).

Individual wiring/Supply port right



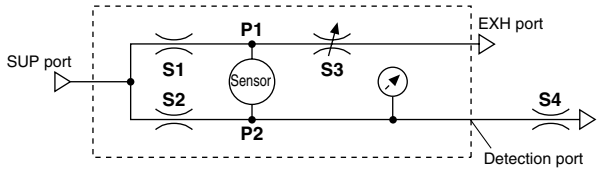
IISA2VPR-3B5DLC · · · 1 set (3 stations manifold part number)
*__ISA2-GE41__ · · · · · · · · · 3 sets (Air catch sensor part number)
Prefix the part number of the air catch sensor with an asterisk (*).

Specifications

Model			ISA2-G□□□1□	ISA2-G□□□5□	ISA2-H□□□1□	ISA2-H□□□5□
Detection distance			0.01 to 0.25 mm		0.03 to 0.50 mm	
Fluid			Dry air (filtered to 5 μm)			
Operating pressure range			30 to 200 kPa		50 to 200 kPa	
Recommended detection nozzle			ø1.5		ø2.0	
Consumption flow rate ℓ/min (ANR)	Supply pressure	50 kPa	5 or less		10 or less	
		100 kPa	8 or less		15 or less	
		200 kPa	12 or less		22 or less	
Power supply voltage			12 to 24 VDC ± 10%, Ripple (p-p) 10% or less (With power supply polarity protection)			
Current consumption			15 mA or less			
Switch output			NPN open collector: one output	PNP open collector: one output	NPN open collector: one output	PNP open collector: one output
	Maximum load current		80 mA			
	Maximum load voltage		30 VDC (at NPN output)			
	Residual voltage		1.5 V or less (at 80 mA)			
	Output protection		Yes			
Repeatability (Including temperature characteristics)			0.01 mm or less (Detection distance range 0.01 to 0.15 mm, supply pressure 100 to 200 kPa)		0.01 mm or less (Detection distance range 0.03 to 0.15 mm, supply pressure 100 to 200 kPa)	
Hysteresis Note 1)			0.01 mm or less (Detection distance range 0.01 to 0.15 mm)		0.01 mm or less (Detection distance range 0.03 to 0.15 mm)	
Indicator light			LED level meter Note 2) with 1 red, 2 green (Set value < detection distance: red, Set value = detection distance: green 1, Set value > detection distance: green 1 + green 2)			
Environmental resistance	Enclosure		IP66: with pressure gauge IP40: without pressure gauge			
	Operating temperature range		Operating: 0 to 60°C, Stored: –20 to 70°C (No condensation or no freezing)			
	Operating humidity range		Operating/stored: 35 to 85%RH (No condensation)			
	Withstand voltage		1000 VAC or more in 50/60 Hz for 1 minute between live parts and case			
	Insulation resistance		2 MΩ or more between live parts and case (at 500 VDC by megameter)			
	Vibration resistance		1.5 mm amplitude in 10 to 500Hz or acceleration of 98 m/s² without control unit and bracket mounted, Others 30 m/s², whichever is smaller for 2 hours in X, Y, Z direction each (De-energized)			
	Impact resistance		Without control unit and bracket mounted: 980 m/s², Others: 150 m/s² in X, Y and Z direction, 3 times each (De-energized)			
Port size			Nil: Rc 1/8, N type: NPT 1/8, F type: G 1/8			
Lead wire (Individual wiring type)			4 cores, oil-resistant cable (ø6, 5m) with M12 4-pin pre-wired connector, Conductor O.D.: 0.90 mm, Insulator O.D.: 1.72 mm			
Terminal block box (Centralized wiring type)			Front wiring (Electrical entry ø21)			
Mass			Individual wiring type (body only): 253 g, common wiring type (body only): 250 g, Terminal box: 205 g, lead wire: 278 g, connecting bracket with sealing for additional station: 4 g			
Standard			Compliant with CE marking			

Note 1) Refer to "Relation between Nozzle Diameter and Detection Distance" (page 798) for hysteresis.
Note 2) Refer to "Setting Procedure" (page 801) for LED level meter.

Working Principle

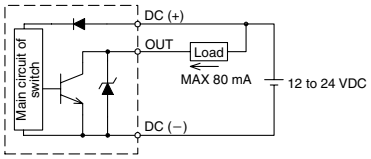


S1, S2: Fix orifice
S3: Variable orifice (adjusted by setting dial)
S4: Detection nozzle

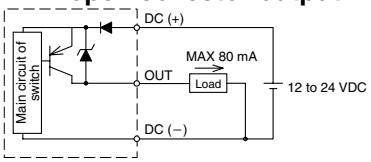
In a bridge circuit as in the left figure, a detection gap is applied to the detection nozzle (S4) while the setting dial S3 is adjusted to balance the pressure applied to the pressure sensor (P1 = P2). The pressure sensor detects the differential pressure generated when the detection nozzle (S4) is released. When the work piece comes close to the detection nozzle, the back pressure P2 increases until it is larger than P1 (P2 ≥ P1). Then the switch output turns on to notify that the pressure is below the detection gap.

Internal Circuit and Wiring

NPN open collector output

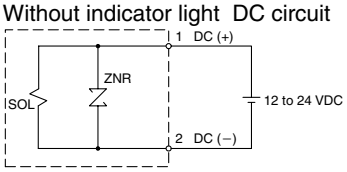


PNP open collector output

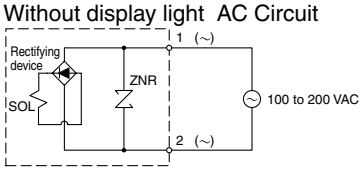


Circuit and Wiring for 2 Port Solenoid Valve

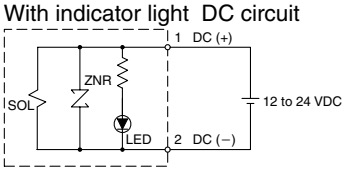
Without indicator light DC circuit



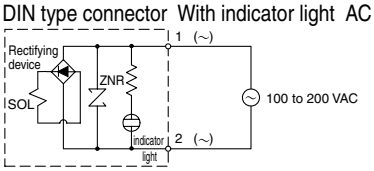
Without display light AC Circuit



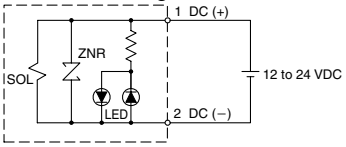
Conduit terminal
With indicator light DC circuit



Conduit terminal
DIN type connector With indicator light AC Circuit



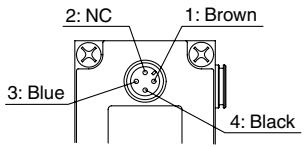
DIN type connector
With indicator light DC circuit



Refer to catalog and instruction manual of Series VCA for wiring.
Pay attention to the power supply voltage. Use of incorrect power supply will cause damage to equipment.

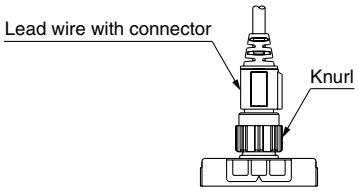
Wiring

Individual wiring



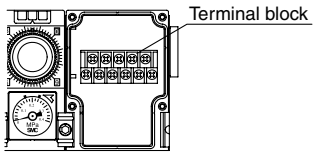
1	Brown	DC (+)
2	–	NC
3	Blue	DC (−)
4	Black	OUT

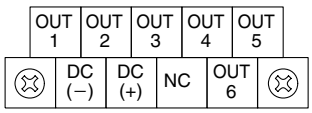
1. Insert the connector of the lead wire with its key groove at the proper position.
2. Hold the knurl with 2 fingers and rotate it clockwise. Do not use tools.



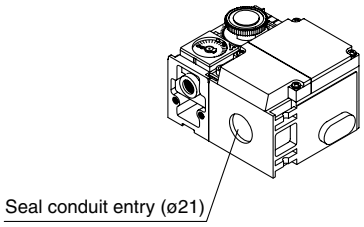
3. Connect the colored wires coming from the cable terminal. Refer to the circuit diagram and table above to avoid mistakes.

Centralized wiring





1. Mount the seal conduit on the terminal box. For mounting procedure, refer to the catalog and instruction manual provided by the manufacturer of the seal conduit.
2. Thread the cable through the seal conduit and arrange wiring according to the polarity of the terminal block illustrated above.
3. Fasten the seal conduit with a tightening torque not greater than 5 N·m. Do not hold the terminal box or the switch.

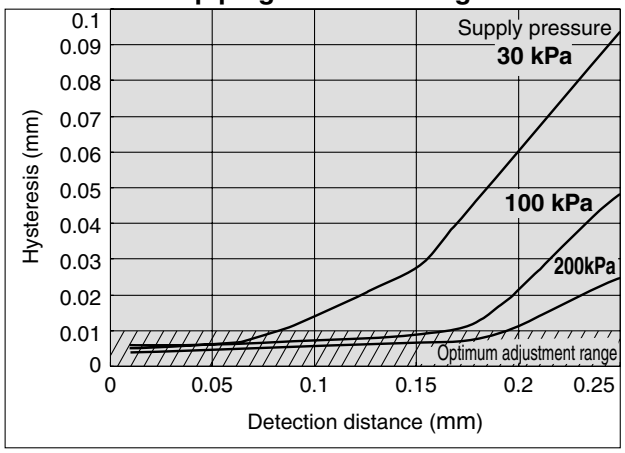


Relation between Nozzle Diameter and Detection Distance

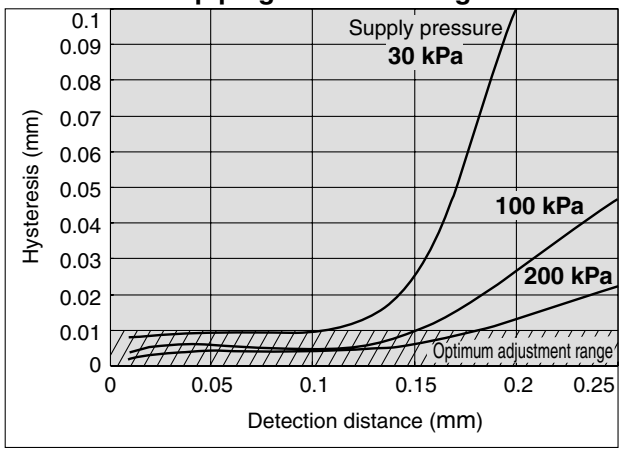
The data in the following charts are characteristics of hysteresis at the detection distance.
In case accuracy is required by the settings, the design should be made so that the hysteresis will stay within the optimum adjustment range not larger than 0.01 mm.
The smaller the hysteresis, the better the sensitivity. In cases where the hysteresis exceeds 0.01 mm, the air catch sensor should be used to check the presence of the work piece.

ISA2-G□□□□□

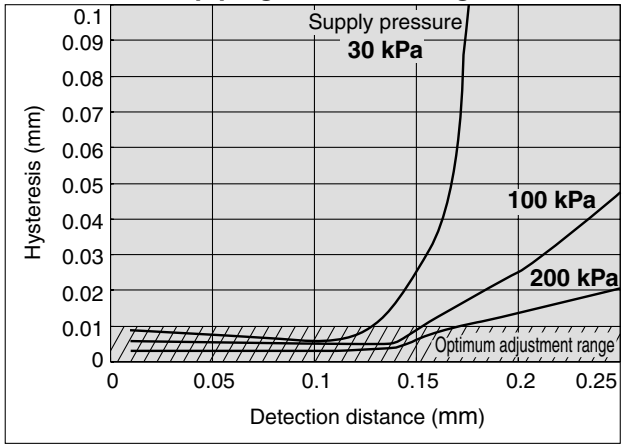
Detection nozzle: ø1.0
Detection side piping: ø6 x ø4 tubing 5 m



Detection nozzle: ø1.5
Detection side piping: ø6 x ø4 tubing 5 m

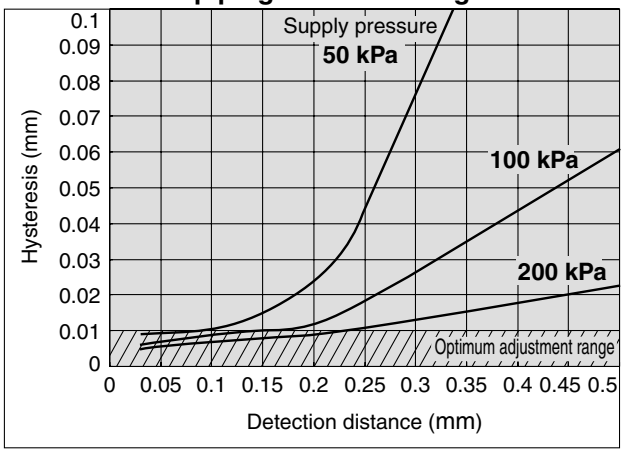


Detection nozzle: ø2.0
Detection side piping: ø6 x ø4 tubing 5 m

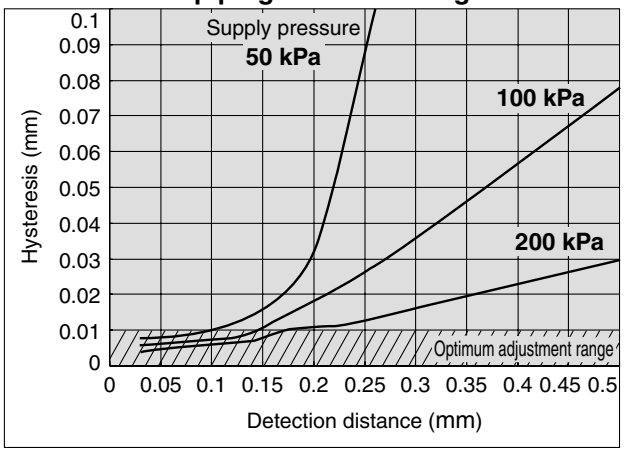


ISA2-H□□□□□

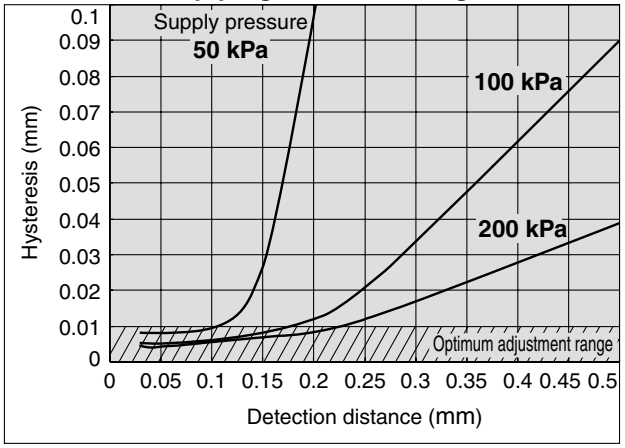
Detection nozzle: ø1.0
Detection side piping: ø6 x ø4 tubing 5 m



Detection nozzle: ø1.5
Detection side piping: ø6 x ø4 tubing 5 m



Detection nozzle: ø2.0
Detection side piping: ø6 x ø4 tubing 5 m

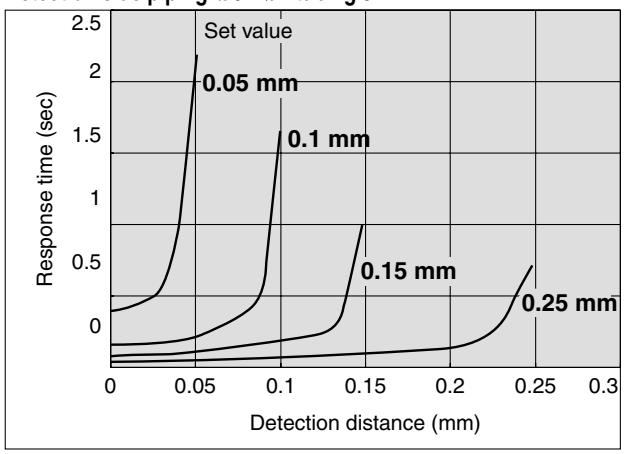


Response Time

Response time changes with detection distance and piping length. It is hardly influenced by the supply pressure and nozzle diameter (ø1.0 to ø2.0).
While all graphs assume a fixed set distance with changes in the detection distance, the upper charts show responses at various set values and the lower charts show responses at various piping lengths. If the detection distance is equal to the set value, the response becomes quicker as the set value becomes bigger or the piping length becomes shorter.

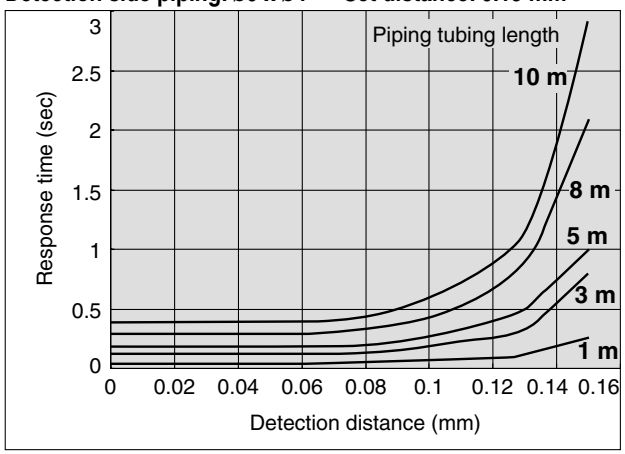
ISA2-G□□□□□

Detection nozzle: ø1.5 **Supply pressure: 100 kPa**
Detection side piping: ø6 x ø4 tubing 5 m



Detection distance−Response time characteristics

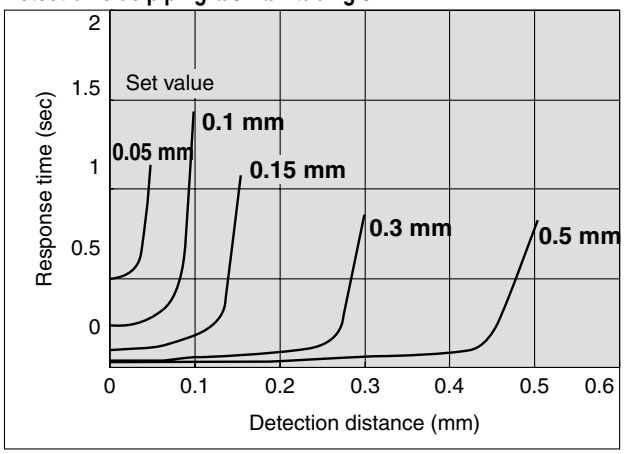
Detection nozzle: ø1.5 **Supply pressure: 100 kPa**
Detection side piping: ø6 x ø4 **Set distance: 0.15 mm**



Piping tubing length−Response time

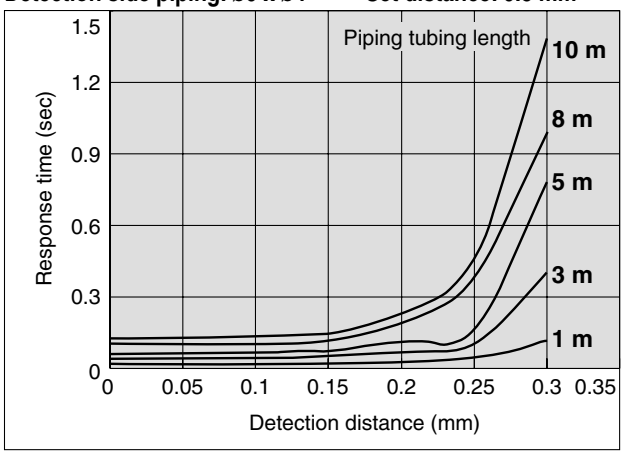
ISA2-H□□□□□

Detection nozzle: ø2.0 **Supply pressure: 100 kPa**
Detection side piping: ø6 x ø4 tubing 5 m



Detection distance−Response time characteristics

Detection nozzle: ø2.0 **Supply pressure: 100 kPa**
Detection side piping: ø6 x ø4 **Set distance: 0.3 mm**



Piping tubing length−Response time

Nozzle Shape

Please keep the nozzle shape as illustrated below.
Take every caution against chamfer on the detection surface and/or nozzle hole, which could affect the characteristics as illustrated in Figure (1).

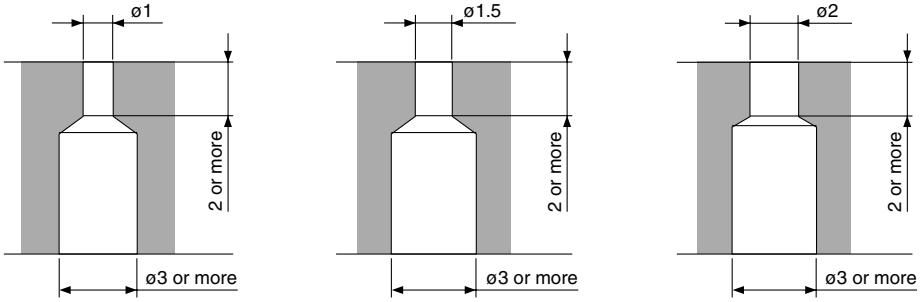
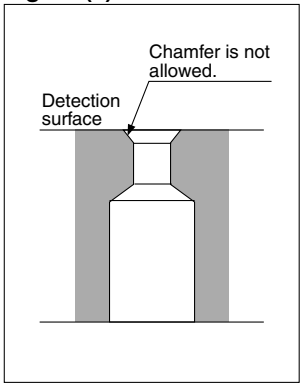


Figure (1)

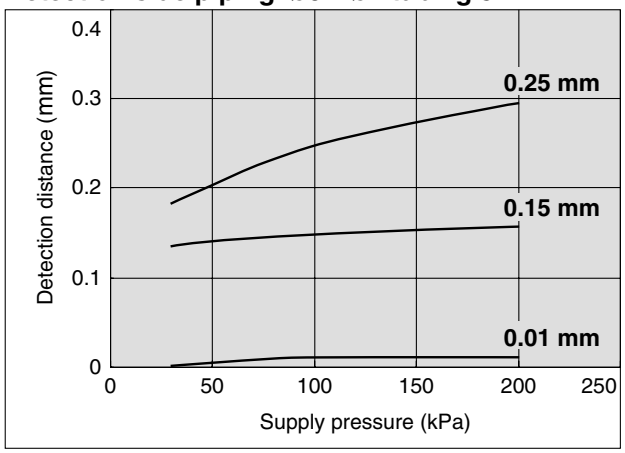


Supply Pressure Dependence

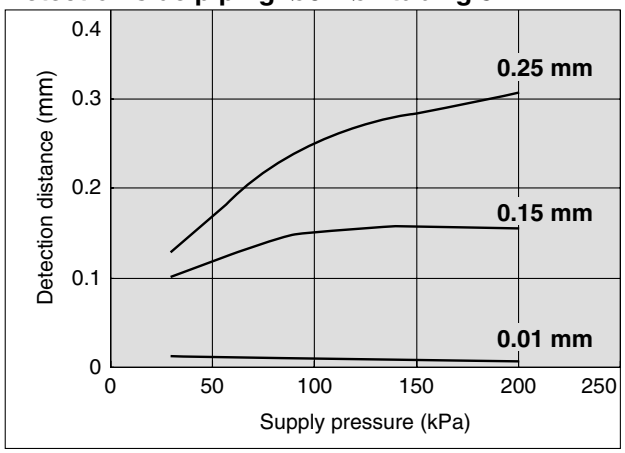
The charts illustrate changes in the detection distance with fluctuations in the supply pressure.

ISA2-G□□□□□

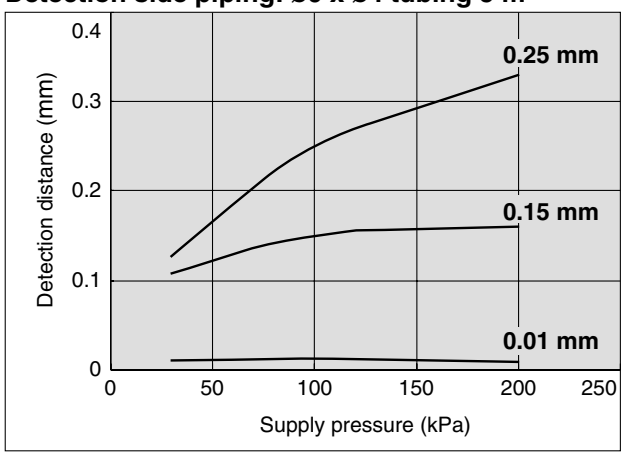
Detection nozzle: ø1.0
Detection side piping: ø6 x ø4 tubing 5 m



Detection nozzle: ø1.5
Detection side piping: ø6 x ø4 tubing 5 m

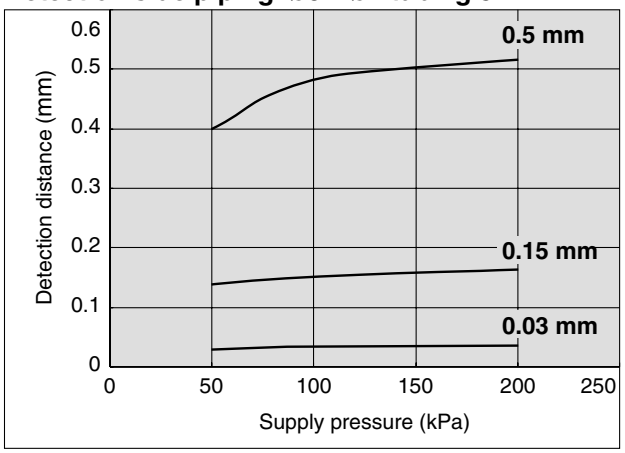


Detection nozzle: ø2.0
Detection side piping: ø6 x ø4 tubing 5 m

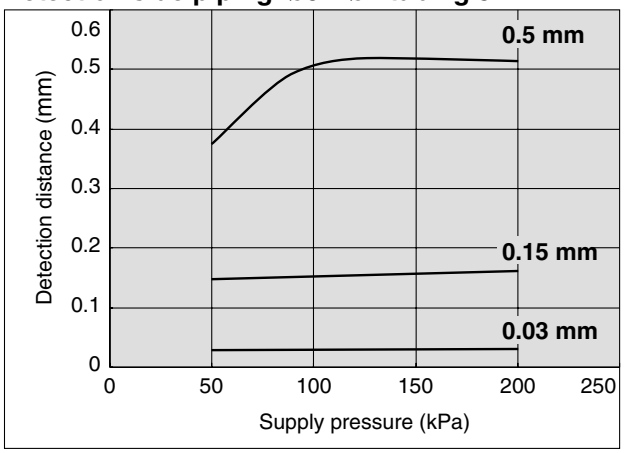


ISA2-H□□□□□

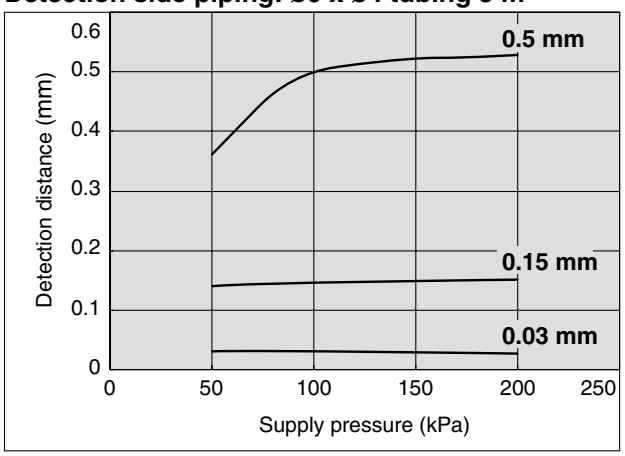
Detection nozzle: ø1.0
Detection side piping: ø6 x ø4 tubing 5 m



Detection nozzle: ø1.5
Detection side piping: ø6 x ø4 tubing 5 m

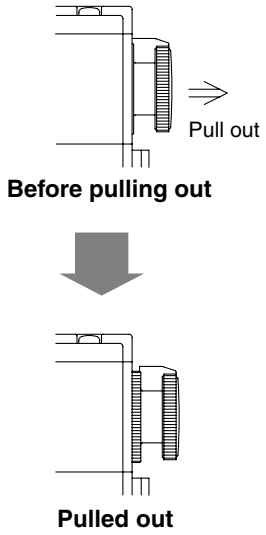


Detection nozzle: ø2.0
Detection side piping: ø6 x ø4 tubing 5 m

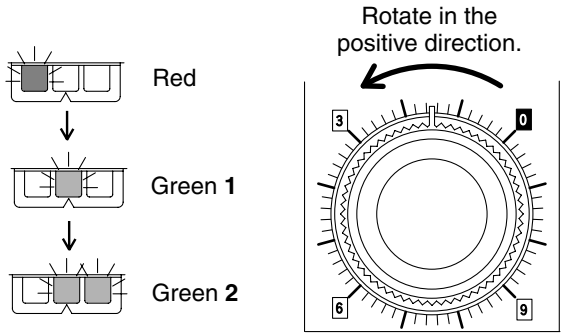


Setting Procedure

The detection distance is set with the LED level meter and setting dial.
Keep the setting dial pulled out while in use. If released, it will return to its original position and become unable to rotate.



1. For accuracy in setting, apply a clearance gauge to the detection nozzle to replicate the set condition in advance.
2. Confirm that the set pressure is applied. If the setting dial is fully open, the LED level meter appears as □□□.
3. Pull the setting dial and rotate it in the positive direction. The lights will turn on in the order shown below.



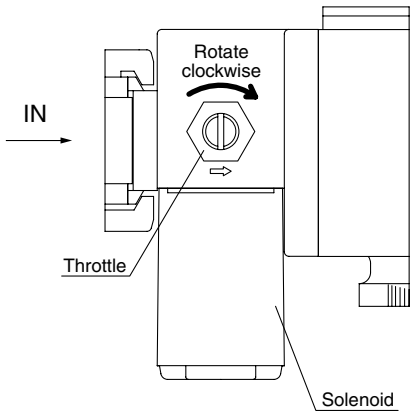
4. The sensor output comes on when the lights on the LED level meter turn on as ■■■. Complete the setting when this condition is observed.
5. Apply the clearance gauge again to confirm that the lights turn on as ■□■.

Handling and setting of 2 port solenoid valve

Throttle setting for blowing to prevent water and cutting oil from entering the nozzle.
(Clockwise: Close throttle; Counterclockwise: Open throttle)

∗ The setting is not applicable to valves without throttle.

1. Power off the valve.
2. Rotate the throttle clockwise for adjustment so that the detection nozzle will not suck up water or cutting oil.

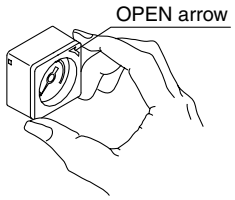


3. Power on the valve, then off again.
Confirm that the detection nozzle does not suck up water or cutting oil.
Note) Do not rotate the throttle more than 5 turns or it will fall out.

Handling and setting of limit gauge indicator

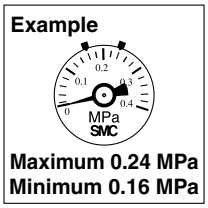
1. Removal of cover

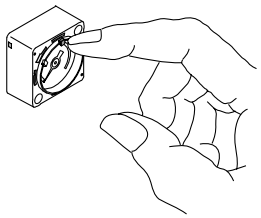
Hook the finger on the front cover ridge and rotate it in the direction of the OPEN arrow until it stops (15°).
Then pull out and remove the cover.



2. Setting the installation needle

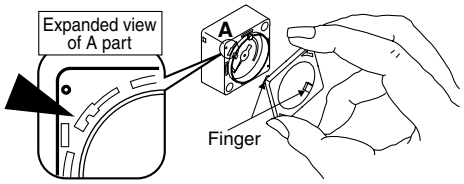
The installation needle should be moved by the fingertip.
Set the 2 green installation needles at the maximum and minimum limits of pressure.





3. Installation of cover

After setting the installation needles, locate the OPEN arrow at the top right position and insert the claws on the cover into the grooves on the case (indicated by ▼ in the expanded view of A part). Rotate the cover clockwise until it stops. Confirm that the cover is firmly secured.



Relation between Dial Scale and Detection Distance

Test procedure and conditions

Dial scales when the detection nozzle is under the following conditions;

Supplied pressure: 100 kPa

Piping: ø6 x ø4 tubing, 5 m in length.

Results of measurement Note 1)

● **Relation between the detection distance and set dial scales Note 2) (Scale numbers)**

ISA2-G□

Detection distance	Detection nozzle diameter		
	ø1.0	ø1.5	ø2.0
0.05 mm	0.3 to 0.7	0.9 to 1.4	0.3 to 0.7
0.10 mm	1.1 to 1.5	2.3 to 2.8	2.0 to 2.5
0.15 mm	1.9 to 2.3	3.4 to 4.1	3.7 to 4.6
0.20 mm	2.5 to 3.0	4.4 to 5.5	5.3 to 7.0
0.25 mm	3.0 to 3.5	5.2 to 7.0	6.6 to 10.7

ISA2-H□

Detection distance	Detection nozzle diameter		
	ø1.0	ø1.5	ø2.0
0.1 mm	1.1 to 1.5	2.4 to 2.8	2.6 to 3.4
0.2 mm	2.4 to 2.9	4.5 to 5.1	5.4 to 6.4
0.3 mm	3.0 to 3.5	5.5 to 6.3	7.0 to 8.3
0.4 mm	3.3 to 3.8	6.0 to 7.0	7.9 to 9.6
0.5 mm	3.5 to 4.0	6.5 to 7.5	8.6 to 10.7

● **Average variation per scale (Detection distance [mm])**

ISA2-G□

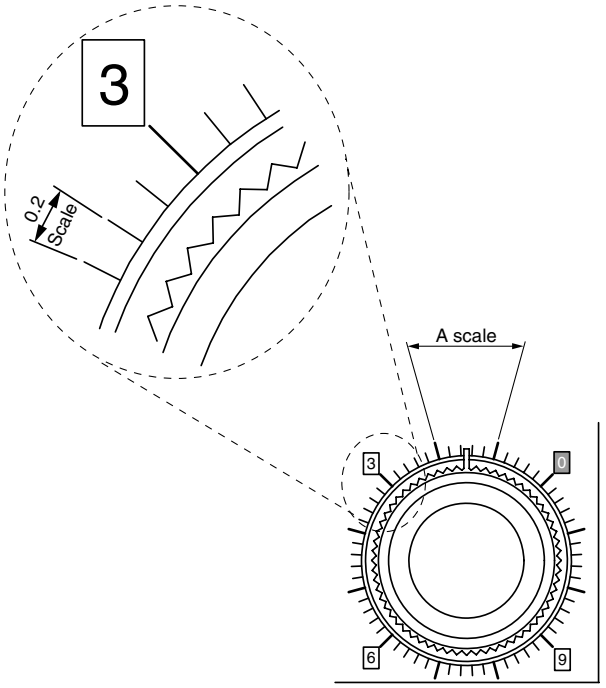
Detection distance	Detection nozzle diameter		
	ø1.0	ø1.5	ø2.0
0.05 mm	0.010	0.005	0.006
0.10 mm	0.007	0.004	0.003
0.15 mm	0.010	0.005	0.004
0.20 mm	0.010	0.005	0.003
0.25 mm	0.010	0.007	0.003

ISA2-H□

Detection distance	Detection nozzle diameter		
	ø1.0	ø1.5	ø2.0
0.1 mm	0.008	0.004	0.003
0.2 mm	0.008	0.005	0.004
0.3 mm	0.025	0.011	0.007
0.4 mm	0.046	0.019	0.011
0.5 mm	0.050	0.021	0.012

Note 1) This data provides reference values as a guide only, this should not be viewed as a guarantee of our products performance.

Note 2) Set dial scales are as follows;

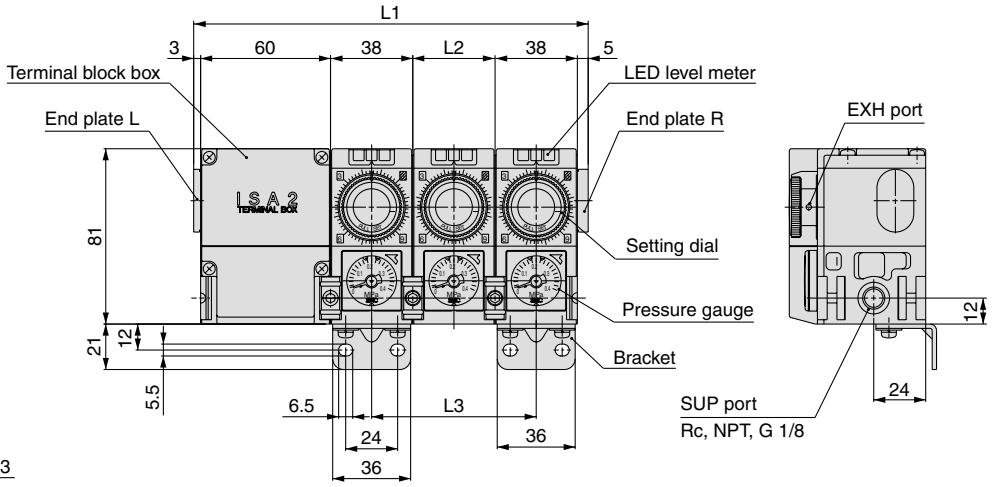


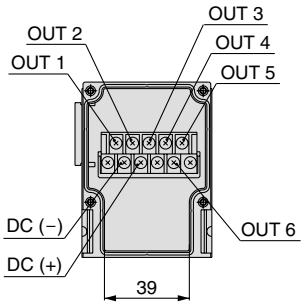
Between each major scales, it is sub divided into ten smaller settings (for example, between 2.0 to 3.0—2.1, 2.2, 2.3 etc.), settings are possible at 0.1 scale.

Dimensions: Centralized Wiring Type

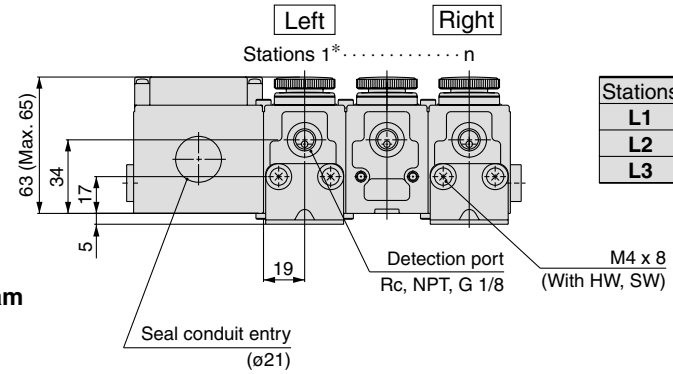
∗ When the SUP port is on the left, the stations are sequentially numbered from the side of the terminal block box.

With bracket





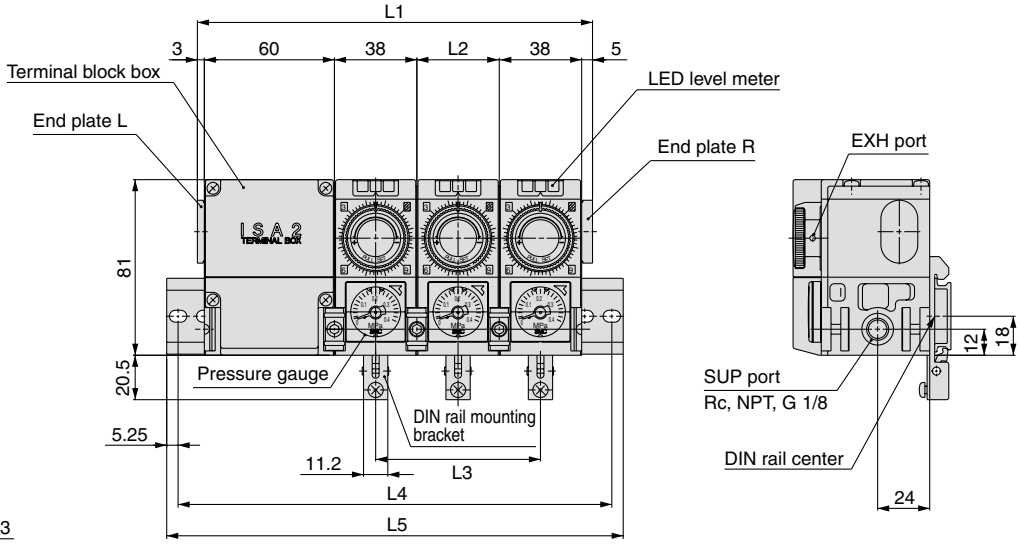
Terminal block box wiring diagram

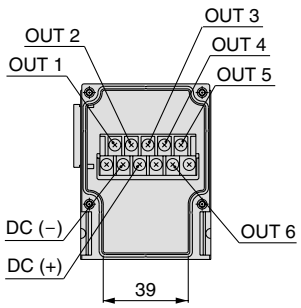


Stations	1	2	3	4	5	6
L1	106	144	182	220	258	296
L2	—	—	38	76	114	152
L3	—	38	76	114	152	190

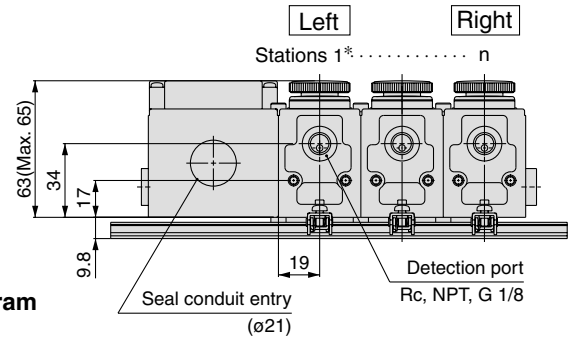
For the bracket attachment position, refer to page 806.

With DIN rail





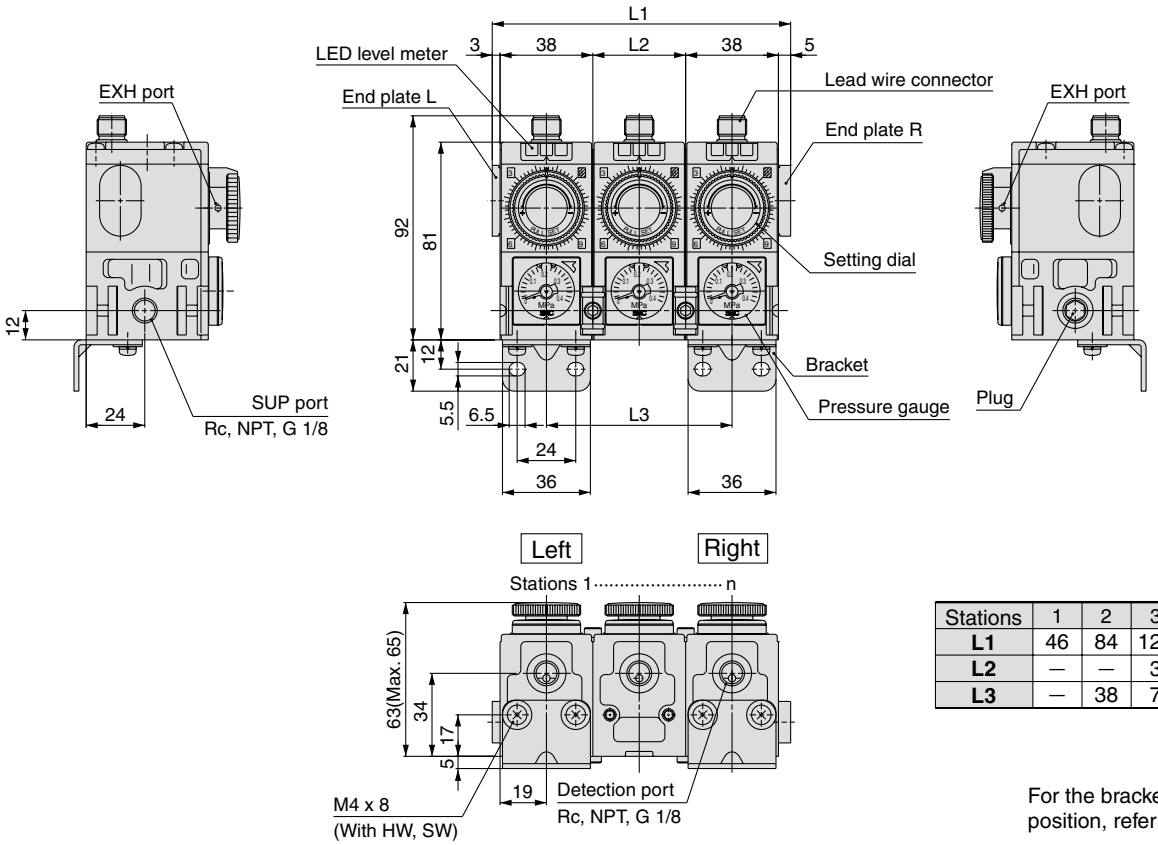
Terminal block box wiring diagram



Stations	1	2	3	4	5	6
L1	106	144	182	220	258	296
L2	—	—	38	76	114	152
L3	—	38	76	114	152	190
L4	120	162.5	200	237.5	275	312.5
L5	135.5	173	210.5	248	285.5	323

Dimensions: Individual Wiring Type

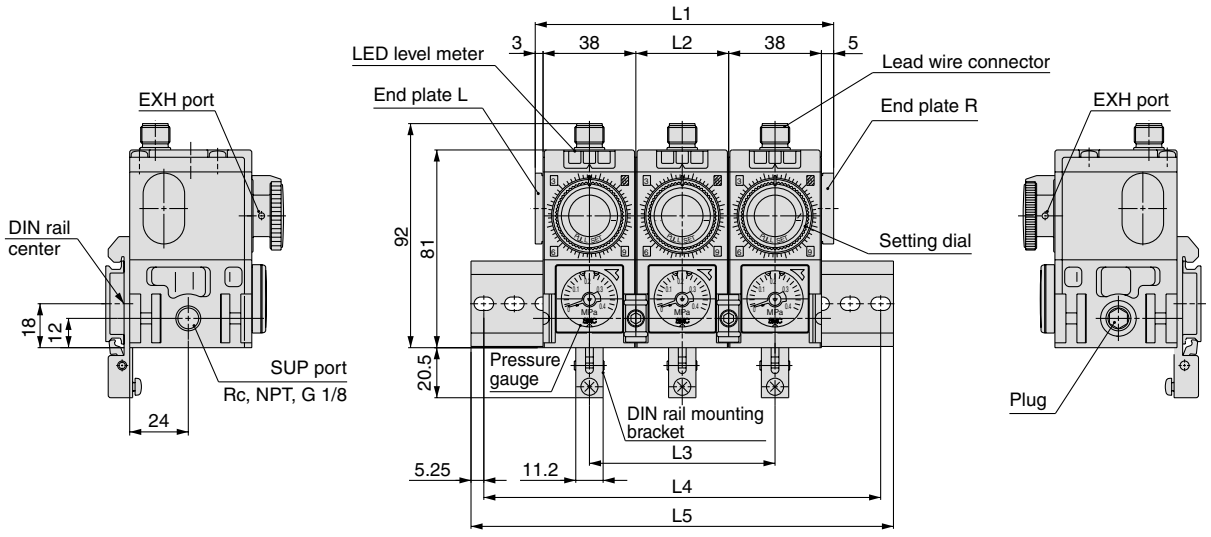
With bracket



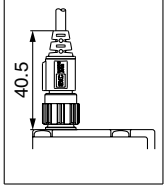
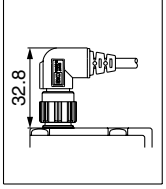
Stations	1	2	3	4	5	6
L1	46	84	122	160	198	236
L2	—	—	38	76	114	152
L3	—	38	76	114	152	190

For the bracket attachment position, refer to page 806.

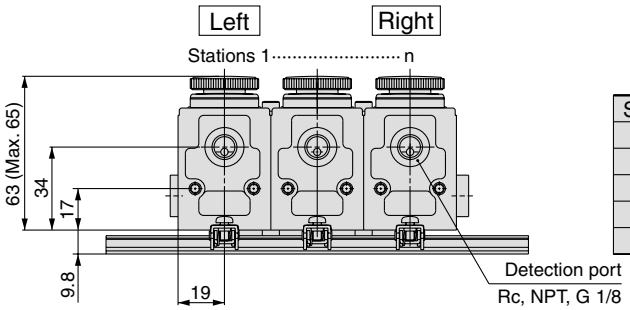
With DIN rail



Electrical entry dimensions

Straight union	Right angle
	

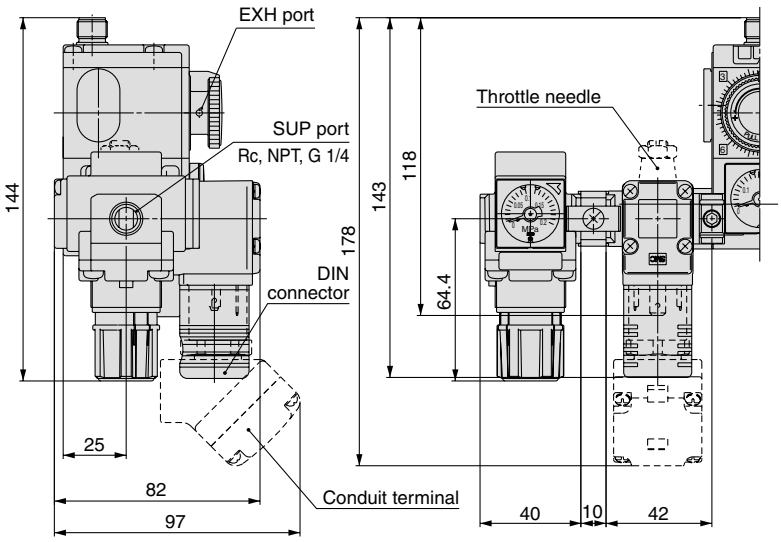
The direction of a right angle connector cannot be changed.



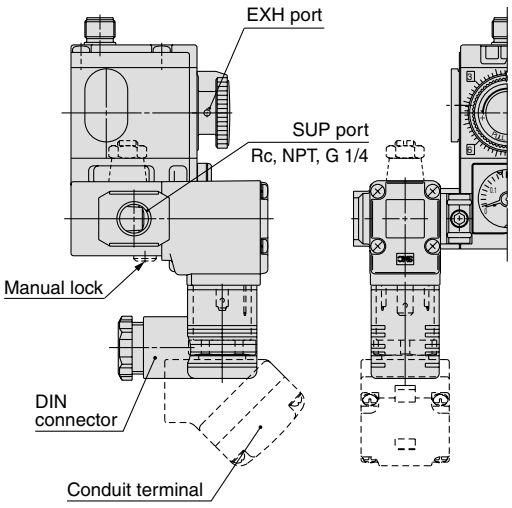
Stations	1	2	3	4	5	6
L1	46	84	122	160	198	236
L2	—	—	38	76	114	152
L3	—	38	76	114	152	190
L4	62.5	120	162.5	200	237.5	275
L5	73	135.5	173	210.5	248	285.5

Dimensions: With Control Unit

SUP port on the left

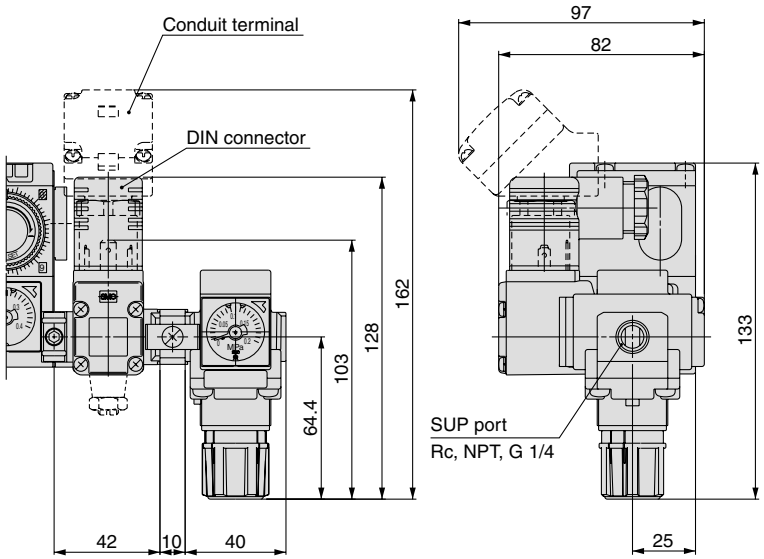


With regulator + 2 port solenoid valve

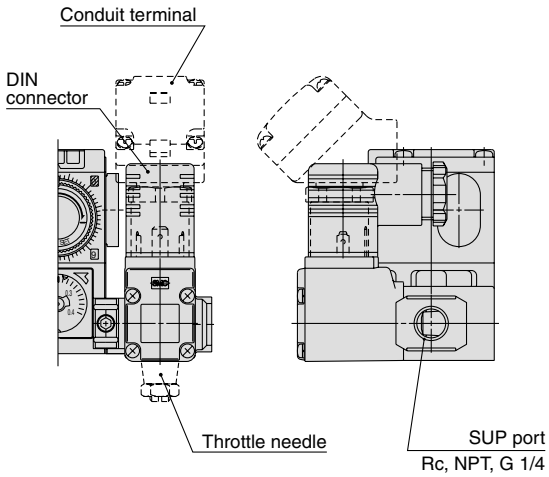


With 2 port solenoid valve

SUP port on the right



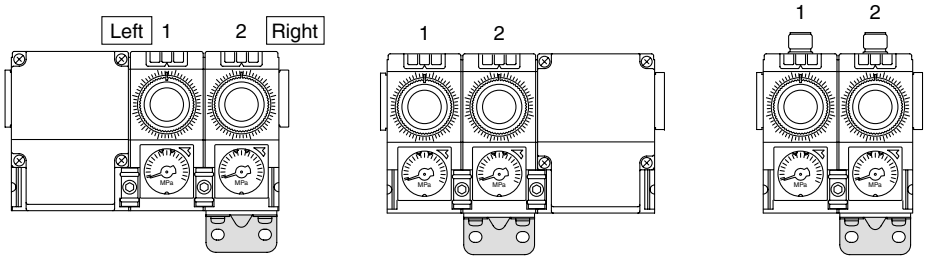
With regulator + 2 port solenoid valve



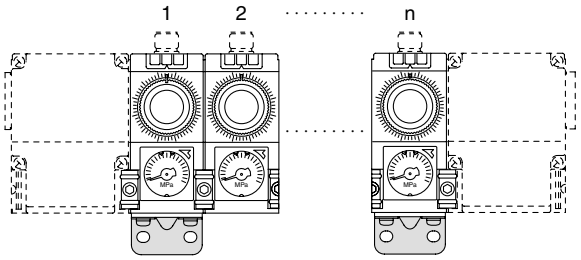
With 2 port solenoid valve

Bracket Mounting Position

With 2 stations, the bracket is mounted on the second sensor from the left.

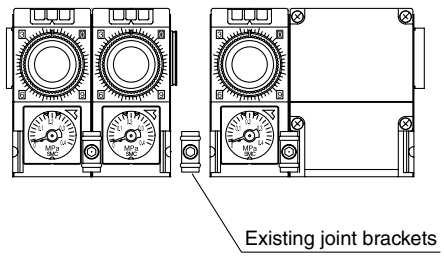


With n stations, the bracket is mounted on the first and "n" th sensor from the left.



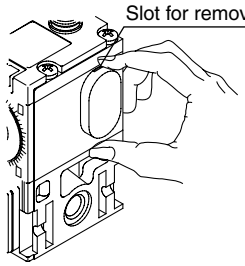
Addition of Manifold Stations

1. Disassembly



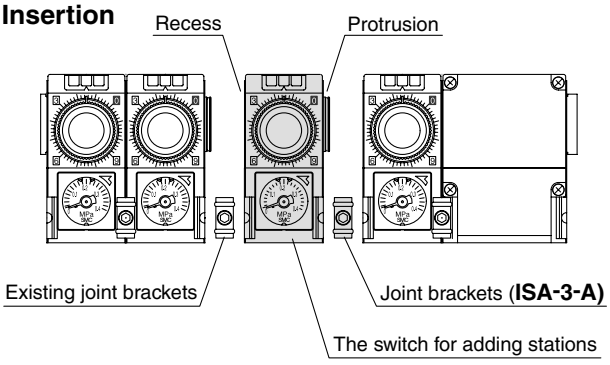
1. Loosen the screws and remove the 2 mounting brackets on the front and back side.
2. Disassemble the switch carefully so that the O-ring on the SUP port will not be detached.

End plate removal



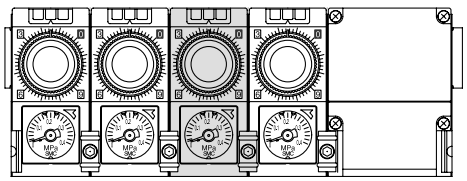
Hook the fingers on the top and bottom removal grooves to pull out the plate.
It can be removed by pulling horizontally.

2. Insertion



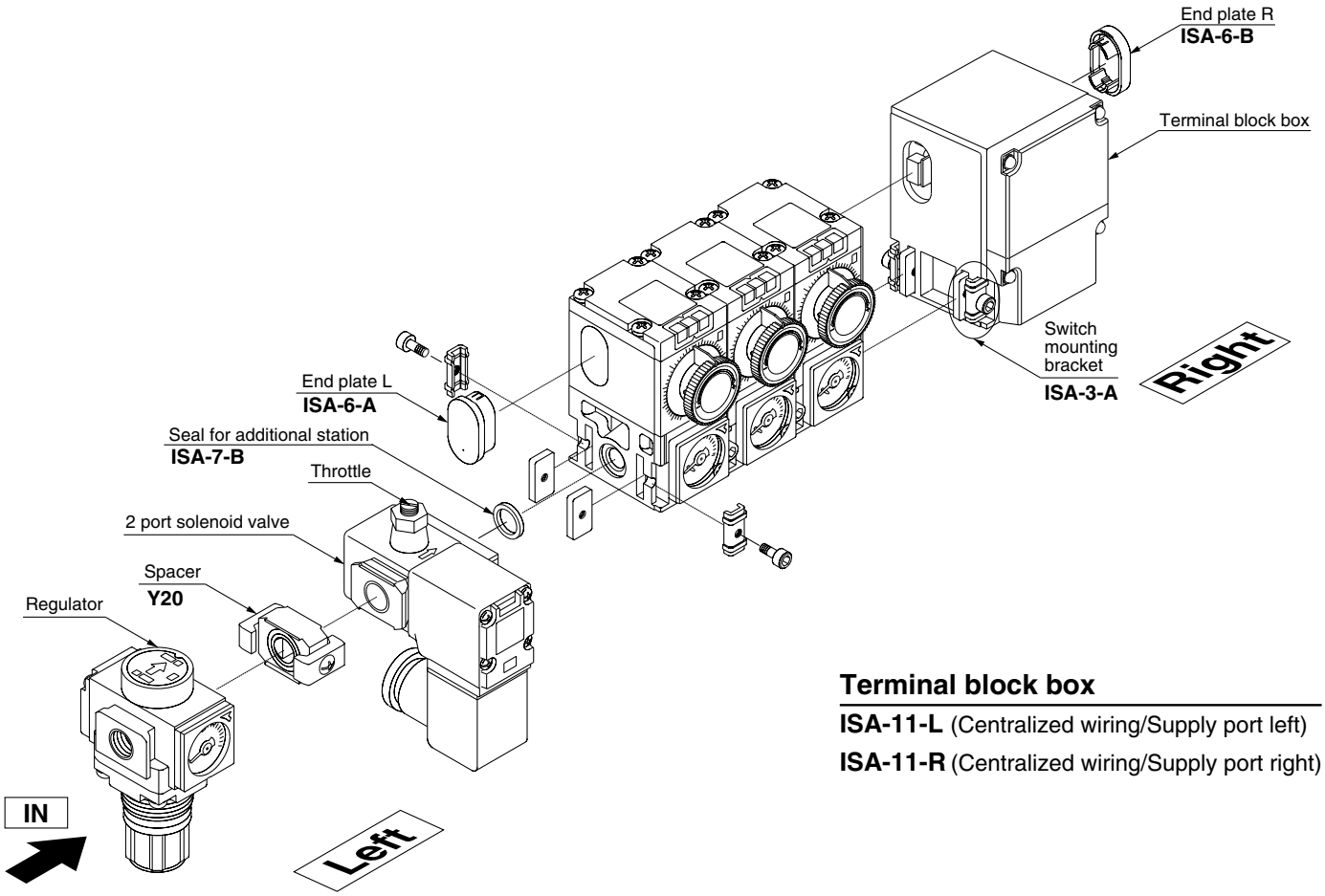
1. Fit seal for additional station (**ISA-7-B**) to the recess of the SUP port of the additional switch.
2. Fit the protrusion of the additional switch into the existing switch.
3. Mount joint brackets (**ISA-3-A**) at 2 positions.
Note) Perform temporary tightening of screws.
4. Confirm that the recess of the SUP port of the existing switch has seal for additional station attached.
5. Fit the protrusion of the existing switch into the recess of the additional switch.
6. Mount the existing joint bracket.
Note) Perform temporary tightening of screws.

3. Assembly



1. Tighten the joint brackets with the prescribed tightening torque of 1.2 N·m.
2. Arrange pneumatic piping and confirm that there is no air leakage from new joints.

Parts List



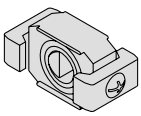
Terminal block box

ISA-11-L (Centralized wiring/Supply port left)

ISA-11-R (Centralized wiring/Supply port right)

Spacer

Y20



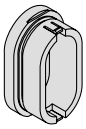
Seal for additional station

ISA-7-B
When 2 air catch sensors are connected or when a 2 port solenoid valve is connected to the left:

ISA-7-A
When a 2 port solenoid valve is connected to the right:

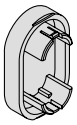
End plate L

ISA-6-A



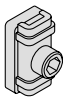
End plate R

ISA-6-B



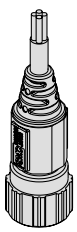
Joint bracket

ISA-3-A
A pair consists 1 set.

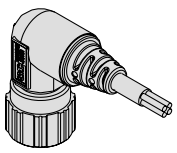


Lead wire with connector (Individual wiring type)

ISA-8-A
Straight, 5 m

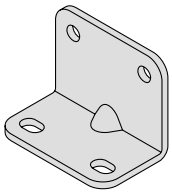


ISA-8-B
Right angle, 5 m



Bracket

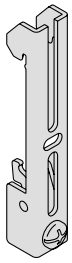
ISA-4-A



With mounting screw 2 pcs.

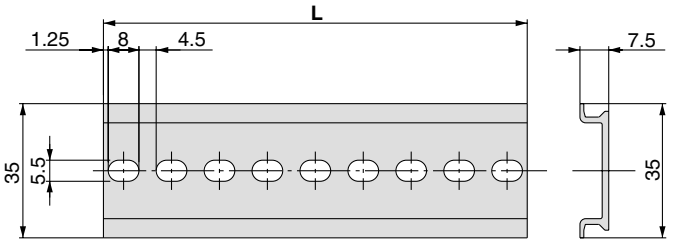
DIN rail mounting bracket

ISA-9-A



DIN Rail

ISA-5-□



Part no.	L	Applicable models	
		Individual wiring type	Centralized wiring type
ISA-5-1	73.0	IISA2□P□-1	—
ISA-5-2	135.5	IISA2□P□-2	IISA2□S□-1
ISA-5-3	173.0	IISA2□P□-3	IISA2□S□-2
ISA-5-4	210.5	IISA2□P□-4	IISA2□S□-3
ISA-5-5	248.0	IISA2□P□-5	IISA2□S□-4
ISA-5-6	285.5	IISA2□P□-6	IISA2□S□-5
ISA-5-7	323.0	—	IISA2□S□-6

Pressure Gauge for Air Catch Sensor

Square embedded pressure gauge

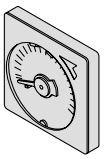
GC3-□4AS

Notation specifications

Nil	MPa single notation
P	psi single notation

Maximum pressure indication

2	0.2 MPa
4	0.4 MPa



Round pressure gauge

G36-□4-□01

Notation specifications

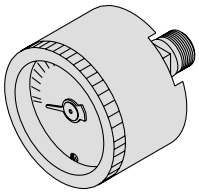
Nil	MPa single notation
P Note)	MPa-psi double notation

Maximum pressure indication

2	0.2 MPa
4	0.4 MPa

Connection thread

Nil	R 1/8
P	NPT 1/8



Note) For double notation of MPa and psi, add "-X30" at the end of part number.
Example) G36-P4-01-X30

Regulator

AR 20-□02E-1□

Thread type

Nil	Rc
N	NPT
F	G

Option (The shape of pressure gauge) Note 2)

Nil	None
E	Square embedded pressure gauge (With limit indicator)
G Note 1)	Round pressure gauge (With limit indicator)

Note 1) The pressure gauge port is 1/8. The pressure gauge is included in the package (not assembled).
Note 2) Order individually when 0.4 MPa gauge is required.

Option specification

Nil	None
N	Non-relieving
R	Flow direction: Right to left
Z Note 1)	Unit representations on the label and pressure gauge are psi and °F

When specifying more than one option, enter symbols first in numerical, then in alphabetical orders.

Note 1) Compatible with thread type NPT. Under the New Measurement Law, this type is only sold outside Japan. (The SI unit is used inside Japan.) In all cases, with the exception of NPT, add "-X2025" at the end of the order number. Example) AR20-02E-1-X2025

Standard Specifications

Model			AR20
Port size			1/4
Fluid			Air
Proof pressure			1.5 MPa
Maximum operating pressure			1.0 MPa
Set pressure range			0.02 to 0.2 MPa
Gauge port size Note 1)			1/8
Relief pressure			Set pressure + 0.05 MPa {at relief flow of 0.1 ℓ/min(ANR)}
Ambient and fluid temperature			–5 to 60°C (No freezing)
Construction			Relieving type
Mass (kg)			0.29
Pressure gauge	**0.2 MPa**	**Round** Note 2)	G36-2-□01
		Square embedded Note 3)	GC3-2AS

Note 1) The type with square embedded pressure gauge does not have connection.
Note 2) The "□" in the part number of the round pressure gauge indicates the type of connection threads, no symbol for R and N for NPT. Contact SMC for supply of the connection thread type NPT and the pressure gauge of psi unit representation.
Note 3) With an O-ring (1 pc.) and mounting screws (2 pcs.).

2 Port Solenoid Valve

VCA27A-5DLS-4-02-Q

Voltage

1	100 VAC
2	200 VAC
3	110 VAC
4	220 VAC
5	24 VDC
6	12 VDC
36	230 VAC

Port size

02	Rc 1/4
02N	NPT 1/4
02F	G 1/4

CE marked

Throttle

Nil	Without throttle and manual lock
S	With throttle
B	With manual lock
K	With manual lock and throttle

Electrical entry

D	DIN connector
DL	DIN connector (With light)
D0	DIN connector (Without connector)
T	Conduit terminal
TL	Conduit terminal (With light)

Standard Specifications

Valve specifications	**Valve type**			Direct operation poppet
	Fluid			Air, Inert gas
	Withstand pressure MPa			2.0
	Body material			Al
	Seal material			HNBR
	Ambient temperature °C			–20 to 60
	Fluid temperature °C			–10 to 60 (No freezing)
	Enclosure			Dustproof and jetproof (Equivalent to IP65)
	Atmosphere			Environment with no corrosive or explosive gas
	Valve leakage cm³/min (ANR)			0.2 or less
	Mounting orientation			Free
	Vibration resistance/Impact resistance m/s² Note 2)			30/150 or less
Coil specifications	**Rated voltage**			24/12 VDC, 100/110/200/220 VAC (50/60 Hz)
	Allowable voltage fluctuation			±10% rated voltage
	Type of coil insulation			B type
	Power consumption	**DC**		VCA2: 6.5 W
	Apparent power	Note 1) **AC**	**50 Hz**	VCA2: 7.5 VA
			60 Hz	

Note 1) Since the AC specifications include a rectifying device, there is no difference between the apparent power required for starting and holding.
Note 2) Vibration resistance: No malfunction resulted in a one-sweep test in a 10 to 300 Hz range in the axial and right angle directions of the main valve and armature, for both energized and de-energized states.
Shock resistance: No malfunction resulted in an impact test using a drop impact tester. The test was performed in the axial and right angle directions of the main valve and armature, for both energized and de-energized states.

Series ISA2
Specific Product Precautions 1

Be sure to read before handling. Refer to front matters 58 and 59 for Safety Instructions and pages 687 to 691 for Pressure Switch Precautions.

Air Catch Sensor *Series ISA2*

Operating Environment

⚠ Warning

1. Do not use in an environment where vibration or impact occurs. Use a bracket in an environment with vibration exceeding 30 m/s^2.

2. The enclosure of the switch conforms to IP66 and that for the solenoid valve to IP65. The pressure gauge and the regulator have open constructions. Take proper protection measures in an environment where water splashes, oil or spatters from welding may adhere to the product.

3. Since steel piping lacking flexibility is easily affected by moment loads or propagation of vibration, employ flexible tubing, etc., to prevent interactions of such factors.

4. Although CE accredited, this air catch sensor is not equipped with surge protection against lightning. Necessary countermeasures for possible lightning surge should be fitted to system components as required.

5. Do not operate in locations having an atmosphere of flammable, explosive or corrosive gases, which can result in fire, explosion or corrosion. The air catch sensor does not have an explosion proof rating.

⚠ Caution

1. When an air catch sensor is contained in a box, provide an air outlet to constantly keep the atmospheric pressure inside the box.
Internal pressure rises will hinder normal air discharge and may lead to possible malfunction.

2. The air outlet is provided on the setting dial section of the air catch sensor. Do not turn off air supply to the switch if water or cutting oil splashes around the setting dial.

Mounting

⚠ Caution

1. If the detection nozzle is exposed to splashes of water or cutting oil, do not allow backflow from the detection nozzle to the switch body. Install the switch body at a position higher than the detection nozzle wherever possible.

Piping

⚠ Caution

1. Piping equipment
In the piping between the switch body and the detection nozzle, do not use equipment or fittings that can possibly cause leakage or serve as resistance.
Do not use One-touch fittings in an environment where the air catch sensor is exposed to water or other liquid.

Pressure Source

⚠ Caution

1. Supply air
Since the orifice of the air catch sensor is small, prevent foreign matter from entering the equipment. For this purpose, use supply air that is dry and filtered 5 μm or better.

2. Operating pressure
Since the product adopts a semiconductor pressure sensor, keep the operating pressure not larger than 0.2 MPa.

2 Port Solenoid Valve *Series VCA*

Precautions on Design

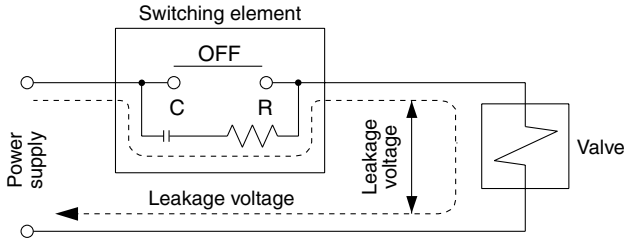
⚠ Warning

1. Energized continuously
Please consult with SMC if the product is to be energized continuously for long periods of time.

Selection

⚠ Caution

1. Leakage voltage
Take special precautions if a resistor is used in parallel with the switching element or a C-R element (for surge voltage protection) is used for protection of the switching element. The valve may fail to turn off due to leakage current flowing through the resistor or C-R element.



AC coil
10% or less rated voltage

DC coil
2% or less rated voltage

Mounting

⚠ Warning

1. Do not use the air catch sensor if the leakage amount increases or the equipment does not operate properly.
After installation, connect compressed air and electricity and conduct an appropriate functionality inspection to confirm that the air catch sensor is installed properly.

2. Do not apply external force to the coil.
Apply a wrench to the exterior surface of the piping joint at the time of tightening.

3. Do not use heat insulators, etc. to keep the temperature at the coil assembly.
Do not use a tape heater for freeze prevention except on the piping and body. If may cause the coil to burn.

Series ISA2
Specific Product Precautions 2

Be sure to read before handling. Refer to front matters 58 and 59 for Safety Instructions and pages 687 to 691 for Pressure Switch Precautions.

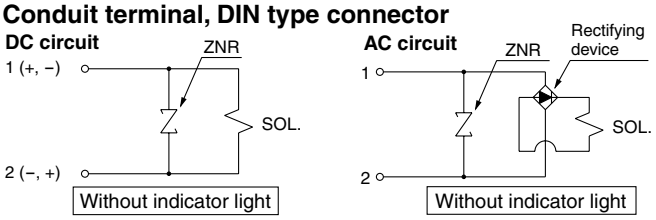
2 Port Solenoid Valve Series VCA

Electric Circuit

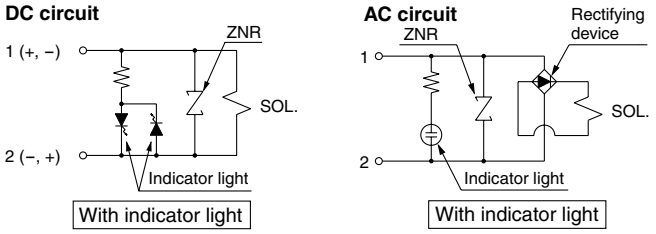
⚠ Caution

In case of series VC (B type coil)

Conduit terminal, DIN type connector



Conduit terminal, DIN type connector



Maintenance

⚠ Warning

1. Low-frequency operation

Perform valve switching at least every 30 days to prevent malfunction. Also, conduct a periodic inspection at intervals of approximately 6 months to use the product in its best condition.

Manual Operation

⚠ Warning

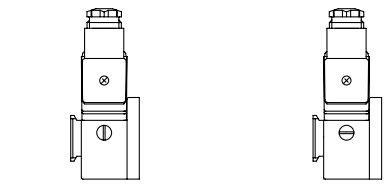
How to operate manually

Locking type (tool required)

To open valve: Rotate to the right by 90° using a flat head screwdriver. It will still hold open even when the driver removed.

To close valve: Rotate to the left by 90° to achieve the former closed position.

Electrical operations should be undertaken when the valve is closed.



Valve closed (vertical slit) Valve open (horizontal slit)

Regulator Series AR

Mounting and Adjustment

⚠ Warning

1. The adjustment knob must be handled manually. Use of tools may cause damage to the product.

2. Check the inlet and outlet pressure indications on the pressure gauge while setting. If the knob is turned to excess, it may cause internal parts to fracture.

3. Since products for 0.02 to 0.2 MPa settings come with a pressure gauge for 0.2 MPa, do not apply pressure exceeding 0.2 MPa. It may cause damage to the pressure gauge.

⚠ Caution

1. Unlock the knob before pressure adjustment and lock it again when the adjustment is over.
Incorrect procedure may cause damage to the knob or lead to the outlet pressure fluctuation.
- Pull the adjustment knob to release the lock. An orange colored line is provided at the bottom of the adjustment handle for visual checking.
- Push the pressure regulation knob to engage the lock. If it does not lock easily, turn the knob slightly clockwise or counterclockwise until the orange colored line goes out of sight.

2. When the product is installed, leave a space of 60 mm on the side of the valve guide (opposite to the knob) for maintenance and inspection.

Series ISA2
Specific Product Precautions 3

Be sure to read before handling. Refer to front matters 58 and 59 for Safety Instructions and pages 687 to 691 for Pressure Switch Precautions.

2 Port Solenoid Valve Series VCA

Disassembly and Assembly

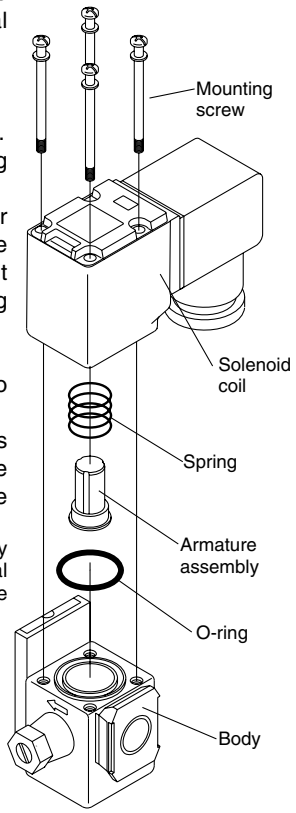
⚠ Caution

• Before the product is disassembled, shut off the power and pressure supply and exhaust the residual pressure.

• Disassembly procedure
1. Remove the top mounting screws.
2. Remove the solenoid coil, spring and armature assembly.
3. If there is any foreign matter adhering on the surface, take appropriate measures to clear it off such as an air blow or washing with neutral detergent.

• Assembly procedure
Reverse the above procedure to assemble the product.
In case the electrical entry is changed, also change the mounting orientation of the solenoid coil before assembly.

Note 1) Tighten the 4 mounting screws by each pair of corners on a diagonal line at the proper tightening torque shown below.



Proper Tightening Torque N·m

VCA27	0.4 to 0.5

Wiring

⚠ Caution

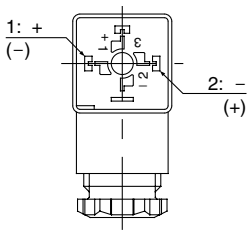
1. Use electrical wires with a conductive sectional area of 0.5 to 1.25 mm². Make sure that no excessive force is applied to the wires.
2. Adopt an electrical circuit which will not cause chattering at the contact.
3. The voltage variation must stay within the –10% to +10% range of the rated voltage. In case importance is attached to response characteristics due to use of a DC power source, keep the variation within the –5% to +5% range. The voltage drop is the value at the lead wire to which the coil is connected.

Wiring

⚠ Caution

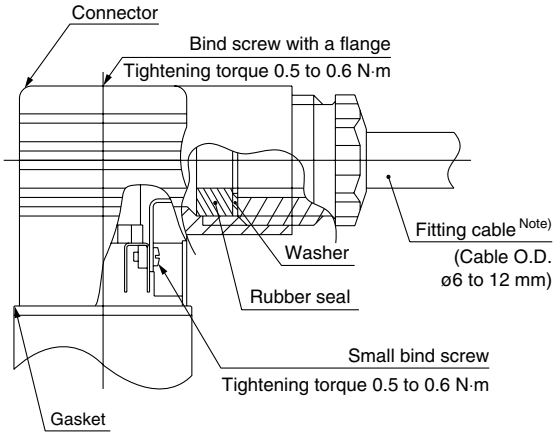
DIN connector (B type only)

The internal wiring of the DIN connector is illustrated below. Connect each terminal to the power supply.



Terminal no.	1	2
DIN terminal	+ (–)	– (+)

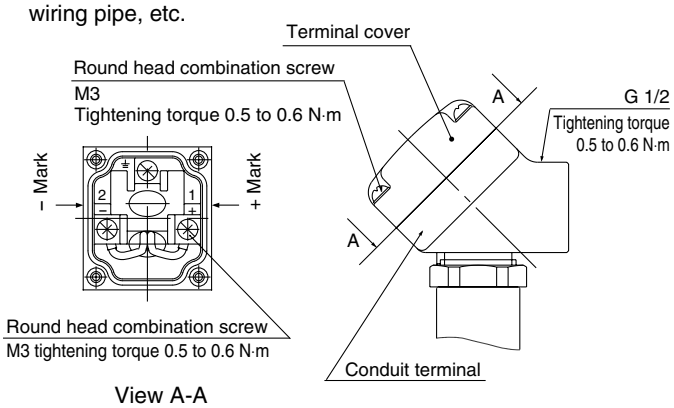
∗ No polarity.
• A cabtire cable with an O.D. ø6 to 12 mm is applicable.
• Tighten each part with an appropriate tightening torque shown below.



Note) With a cable O.D. ø9 to 12 mm, hollow the rubber sealing before use.

Conduit terminal

In case of a conduit terminal, refer to the marks below for wiring.
• Tighten each part with an appropriate tightening torque shown below.
• Seal the piping part (G 1/2) securely with a dedicated electric wiring pipe, etc.



View A-A
(Internal connection diagram)