Air sensor

Overview

The air sensor consists of a sensor nozzle - a hole that discharges air - and an air-electricity (air-air) converter. In principle, detection air is blown onto the workpiece and generated back pressure is converted to an electrical signal by the air-electricity converter. The sensor nozzle can be located any where, enabling compact system design.

Features

(1) Compact/sensitive
All models are in compact size. Space saving, high precision and quick response.

(2) For all objects
Noncontact detection does not damage the detection target and enables almost any solid object to be detected.

(3) A great variety of applications
For presence confirmation, position/dimension confirmation, counting, level check, and pressure control, etc.

(4) Air sensor with stable detection

CONTENTS

Category and usage

The air sensor consists of a detection nozzle and air-electricity converter (air-air converter). Basically, back pressure generated when detection air is blown onto the workpiece is converted to an electric signal by the air-electricity converter. The detection nozzle is the air blow-off port. A compact sensor can be manufactured since the nozzle is formed with hole machining.
Various air sensors are available to match your application.

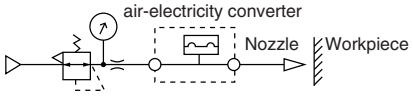
Category

Series	Detection	Detection mechanism output	Nozzle	Major applications	Page
Contact confirmation switch (gap switch) GPS2 Series	Bridge detection	Diaphragm + proximity switch Proximity (NPN, PNP)	ø1.5 standard	0.03 to 0.4mm contact confirmation	1171
Close contact confirmation switch HPS Series	Bridge detection	Diaphragm + proximity switch Proximity (NPN, PNP)	ø1.5 standard (ø1 to ø2) Back pressure type nozzle	0.01 to 0.7mm contact confirmation Tool changer close contact confirmation Enlarged detection distance (3mm)	1184
Cutting tool broken detecting switch TLPS Series	Bridge detection	Diaphragm + proximity switch Proximity (NPN, PNP)	Detecting nozzle	Drill tip braekage detection (ø0.3 to ø30)	1198
PEL switch APA1 Series	Bridge detection Gauge detection	Float + reed switch Reed	Various (Positive pressure)	Such as dimension identification and workpiece confirmation (General purpose applications)	1226
SEPEL switch DPS Series	Bridge detection Gauge detection	Pressure sensor Proximity (NPN)	ø0.15 to ø2 (Suction confirmation)	Suction confirmation	1240

● Detection

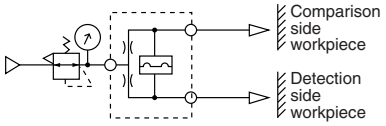
Gauge pressure detection

With this detection, the sensor reads whether detected pressure is higher or lower than atmospheric pressure.



Bridge detection

With this method, supply air is branched into two circuits, each provided with a sensor nozzle. The difference in the back pressure of nozzles is compared. Even if the supply pressure, the magnitude relation of the backpressures does not change. This is extremely stable detection.

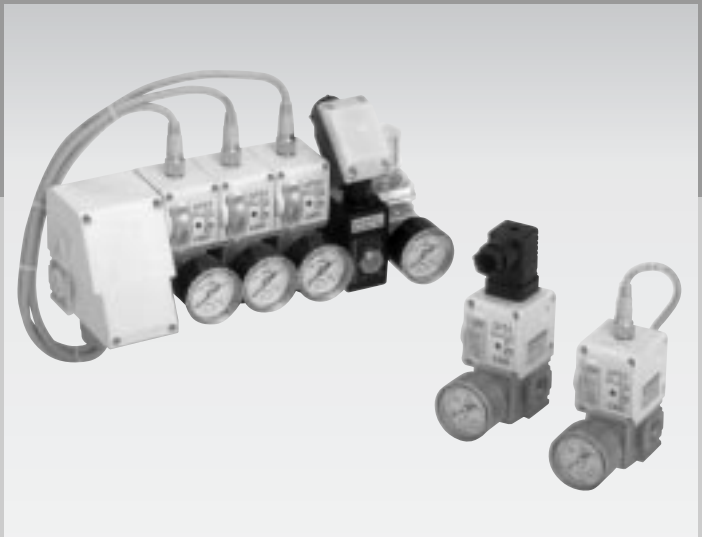


Using the contact confirmation switch (gap switch) GPS2 Series and close contact confirmation switch HPS Series

Model	Model no.	Detection distance (mm)	Features
		0.01 0.02 0.03 0.05 0.20 0.25 0.30 0.40 0.70 3.0	
Contact confirmation switch (gap switch)	GPS2-05	0.03 to 0.25	• Push-in adjustment by dial (Stepped setting) (Master gauge not required)
	GPS2-07	0.03 to 0.40	
Close contact confirmation switch	HPS-05	0.01 to 0.20	• Variable-adjustment by precise needle • Enlarged detection distance when used with back pressure nozzle
	HPS-07	0.02 to 0.30	
	HPS-10	0.05 to 0.70	
	HPS-05+ Back pressure nozzle	0.10 to 3.0	

Contact / close contact confirmation switch and Cutting tool broken detecting switch
GPS2/HPS/TLPS

■ **Sensors / air sensor**



CONTENTS

Safety precautions

Always read this section before starting use.
Refer to Intro 67 for general precautions, and to "⚠ Safety precautions" in this section for details on each series.

Contact /close contact confirmation switch, cutting tool broken detection switch GPS2, HPS and TLPS Series

Design & Selection

⚠WARNING

■ Use this product in accordance with the specifications range.
Consult with CKD when using the product outside specifications or for special applications.

- Use with exceeding the specifications range may result in insufficient performance, and safety can not be secured.

■ Confirm that the product will withstand the working environment.

- This product cannot be used in environments where functional obstacles could occur.
- The main materials of this product is aluminum and resin. Do not use in atmosphere where corrosive gases occur. For example, a special environment reaching high temperatures, with a chemical atmosphere, or where chemicals, vibration, humidity, moisture, coolant or gas are present.
- Compressed air quality must satisfy JIS 1.4.1, "oilless clean dry air."

■ Understand compressed air features before designing a pneumatic circuit.

- This product has a small orifice, so use clean air with the recommended circuit shown below (GPS2/HPS: Fig. 1, TLPS: Fig. 2) so foreign substances do not enter.

Fig. 1 Recommended circuit

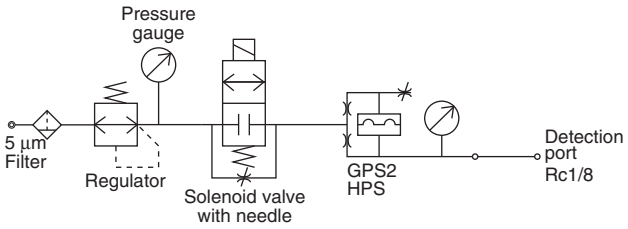
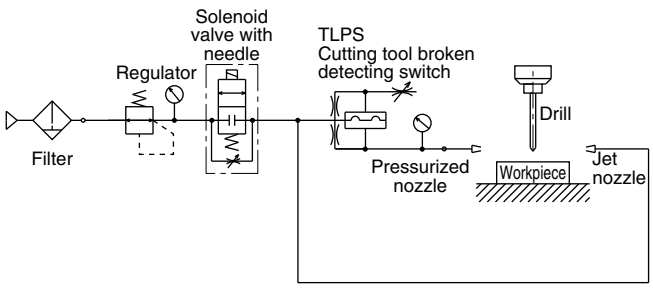
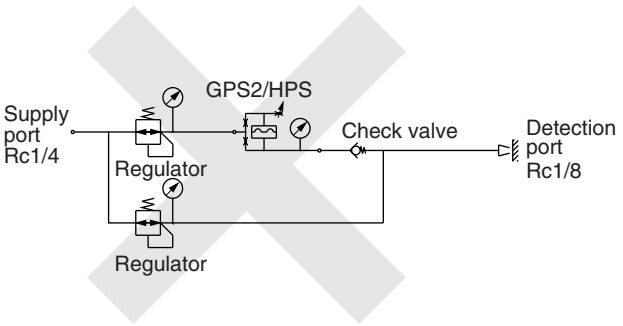


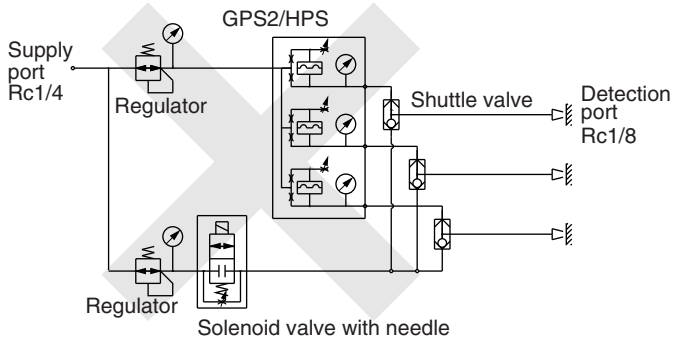
Fig. 2 Recommended circuit



■ Precautions for GPS2, HPS
Do not use following air circuit when flashing detection nozzle.

- Circuit with check valve
The check valve acts as exhaust resistance, and limits the adjustable range.
- Circuit with shuffle valve and 2-way valve
Residual pressure in the OUT side of the 2-way valve prevents a correct detection. Even if a 3-way valve is used, the shuffle valve may vibrate excessively.





⚠CAUTION

■ The entry of compressor oil tarry substances may obstruct the flow of air and result in problems. Regularly inspect the compressor and discharge drainage.

■ Keep the air flow constant so coolant and oil do not flow back from the detection nozzle, or use a solenoid valve with needle and flow a small amount of air from the bypass as shown in the recommended circuit (GPS2/HPS: Fig. 1, TLPS: Fig. 2).

■ Swarf and grinder chips. etc., could clog the nozzle. Increasing the supply pressure to blow these out has no effect. Provide a 3-way valve on the pressurized nozzle as shown below (GPS2/HPS: Fig 3, TLPS: Fig 4). The orifice for the 3-way valve should be 2.5 mm diameter and over.

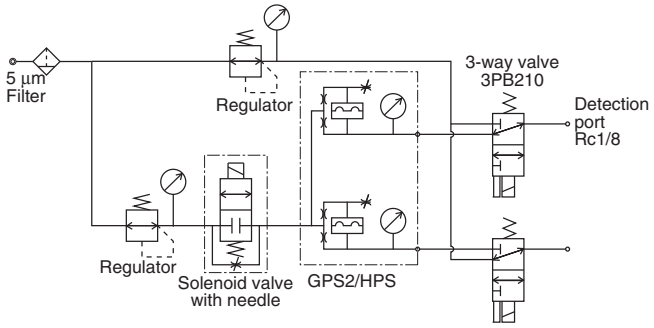


Fig. 3 Circuit for detection and air blow

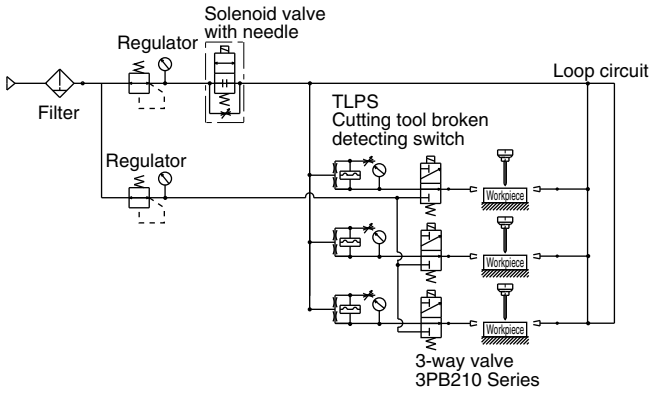


Fig. 4 With air blow used by several applications

■ Select an output format (NPN, PNP) matching the input unit of the programmable controller being used.

■ Operation may be disabled if a capacitance load such as an AC/DC buzzer is connected to the load. Turn power OFF and restart in this case.
A protection circuit is provided to prevent damage from incorrect wiring or overcurrent. A relay must be used when connecting a capacitance load.

■ Precautions for GPS2, HPS

- Use a 4mm bore and 6mm outer diameter pipe to the detection side.
- Air bridge circuit is used for this product. Even if the small air solenoid valve is turned OFF as same as the conventional pressure switch, output is not turned OFF. Output is turned ON and OFF according to the pressure of a workpiece. Care must be taken when creating the program. If the program has already been created and cannot be changed, stop the small flow of air. Note that a delay of one second occurs when output is turned ON and OFF.
- Pressure switch and solenoid valve with fine air
  When fine air solenoid valve is ON → Workpiece absent: OFF Workpiece present: ON
  When fine air solenoid valve is OFF → Workpiece absent: OFF Workpiece present: OFF
- GPS2/HPS and fine air solenoid valve
  When fine air solenoid valve is ON → Workpiece absent: OFF Workpiece present: ON
  When fine air solenoid valve is OFF → Workpiece absent: ON Workpiece present: ON

■ Precautions for TLPS

- Use a 4 mm bore and 6 mm outer diameter pipe. When using 3, 4, or 5 stations, try to keep the injection rate of each nozzle as uniform as possible. When branching, use a 8mm outer diameter, 6mm bore main pipe as shown in Fig. 4, and create a loop circuit.
- Signals for the cutting tool broken detection switch are shown below.

Drill / State	Drill present	Without drill
Air stop	OFF	OFF
Air supply	OFF	ON

- When using the recommended circuit (Fig. 2) having solenoid valve with needle, a small amount of air is supplied constantly.
  Even if the solenoid valve with needle is OFF, the cutting tool broken detection switch may activate depending on the air supply.
- The recommended supply pressure when using the standard detecting nozzle is 100 kPa. Consult with CKD on the detection nozzle shape and air circuit when a width larger than the standard nozzle detection width of 32 mm is required.
- Flowing air only during detection
  Let air flow for at least two seconds. After the solenoid valve is released, wait at least 1 second for the state to stabilize before retrieving signals. The remaining 1 second acts as judgment time, and the signal turns OFF when the drill is normal.
  • Continuously flowing air
  Response time differs with the piping length and supply pressure, but is 0.2 seconds (refer to page 1222) . As a reference, the judgment time should be set to 0.5 seconds.

Installation & Adjustment

⚠CAUTION

■ Observe the following items when installing:

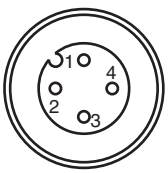
- Install this product so the detection port faces downward.
- Install this product at a position higher than the seating surface to prevent coolant from entering.
- Provide enough space for adjustment, monitoring, and maintenance.
- Use rust-resistant material such as nylon tubes or stainless steel pipes for piping material.
- Before piping, blow pipes with compressed air to remove foreign matter and swarf.
- Before piping, blow pipes with compressed air to remove foreign matter and swarf.
- When installing this product on a device, check that no load is applied to the device.
- When using steel pipes, securely fix the pipe to prevent excessive bending force from being applied to the connection.
- Do not contact or bump this product.
- When welding near this product, cover it to prevent spatter from coming in contact.
- When housing this product in a box, provide a ventilation port so atmospheric pressure is maintained in the box.

■ Observe the following items when wiring:

- When using a switching regulator for the power supply, ground the F.G. (frame ground).
- Avoid using in a transient state continuing 1s after power is turned on.
- Take special care to prevent load short-circuits or incorrect wiring as the protective circuit is activated. Turn power OFF to restart the product.
- Connector pins are arranged as shown in Fig. 5. Take special care to prevent incorrect wiring.

Brown → 24 VDC
Blue → 0 VDC
Black → Signal, open collector

Fig. 5 Connector pin array (body side)

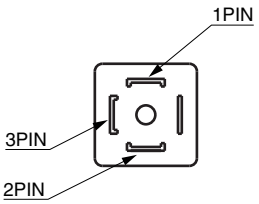


PIN array/lead wire color list

PIN No.	Wiring option (-C1, -C3, -C5) lead wire color	Applications
1PIN	Brown	Power supply +
2PIN	White	NC
3PIN	Blue	Power supply –
4PIN	Black	Output

- The assignment of the DIN terminal box terminal numbers are shown in Fig. 6.

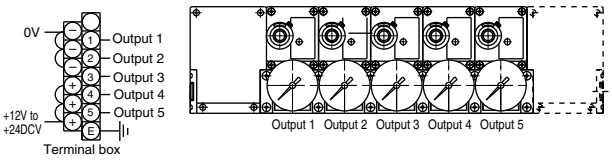
Fig. 6 DIN terminal box pin layout (body side)



PIN No.	Applications
1PIN	Power supply +
2PIN	Power supply –
3PIN	Output

- When using the common terminal box, power supply terminals are on the lower side of the gland. Signal wire terminals are on the upper row. This product is wired as shown in Fig. 7.

Fig. 7 Terminal box layout



- If terminals are wired incorrectly, the protective circuit does not function and the internal proximity switch is damaged.

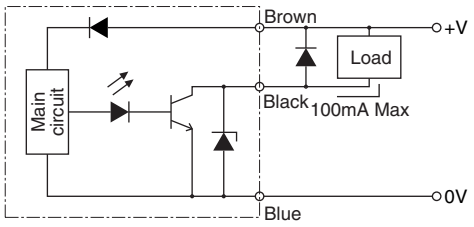
Connector 1 Brown → Output
3 Blue → 24 VDC
4 Black → 0 VDC

DIN terminal 1 → Output
2 → 24 VDC
3 → 0 VDC

- When using a load with a large rush current, such as a motor, the protective circuit functions. Use a relay in this case.
- If there is a device (motor, welder) that generates a large surge near this product, insert a surge suppressor, such as a variable resistor, at the source of the surge.
- If this product's lead is wired with the drive cable or power cable, it is affected by surge and noise deteriorating or damaging the sensor element in the contact confirmation switch. Use separate wiring.

● NPN output and PNP output contact confirmation switch are available. The light turns ON even if program controller compliance is incorrect, but signals are not retrieved. Wire the switch based on the output as shown in Fig. 8.

(NPN output)



(PNP output)

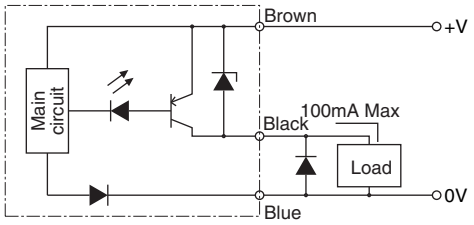


Fig. 8 Output circuit

■ If the adjustment dial (needle) is dropped, bumped against or tapped, the relation of the stamped scale and detection distance changes. Handle this adjustment dial with care.

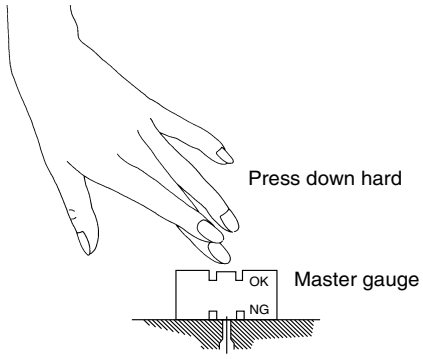
■ Precautions for GPS2, HPS

Using the master gauge and gap

● Three workers are required: one to set the gauge, one to operate the machine, and one to adjust this product. The gauge is adjusted while operating the machine, so three workers must cooperate so no one is exposed to risk. In safety, adjusting this product with the dial gauge is sufficient.

● Clearance cannot be set unless the master gauge or gap gauge is accurately pressed against the detection nozzle.

Fig. 9



■ Precautions for GPS2

Handling the gap amount adjustment dial

● The detection distance is stamped on the adjustment dial. Red indicates 0.05 mm, blue 0.1 mm, and yellow 0.2 mm. Shipment inspection is done with a 1.5 mm detection nozzle diameter, and a 5 m long 4 mm bore nylon tube. If the standard 1.5 mm nozzle diameter is not to be used, adjust the distance as shown in the following table.

◎Relationship of dial scale and detection distance

The following tale is a guide for when the following conditions are applied.

Conditions: Supply pressure : 100kPa

Piping : ø6×ø4 tube, length 5 m

(GPS2-05-15)

		Detection distance (mm)			Detect dis. per notch (mm)
Detection nozzle diameter		ø1.0	1.5 dia.	ø2.0	ø1.0 to ø2.0
Scale line	1 (red line)	0.07	0.05	0.03	0.005
	2 (blue line)	0.14	0.09	0.06	0.005 to 0.007
	3 (yellow)	–	0.20	0.14	0.008 to 0.010

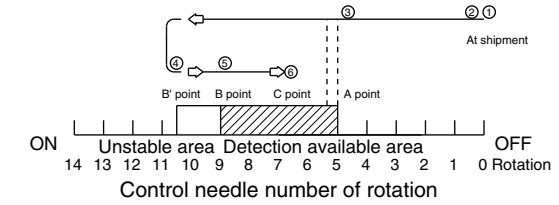
(GPS2-07-15)

		Detection distance (mm)			Detect dis. per notch (mm)
Detection nozzle diameter		ø1.0	1.5 dia.	ø2.0	ø1.0 to ø2.0
Scale line	1 (red line)	0.07	0.05	0.03	0.005
	2 (blue line)	0.15	0.10	0.06	0.005 to 0.007
	3 (yellow)	–	0.20	0.13	0.008 to 0.010

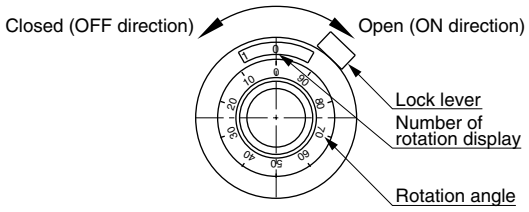
■ Precautions for HPS

Adjustment sequence

1. When this product is shipped from CKD, the adjustment needle is set to the number of rotations display 0 rotation, and rotation angle 0.
2. Supply air. The indicator light turns OFF.
3. Set a workpiece, and rotate the adjustment needle dial in the direction in which the value increases (open), and find point A where the light changes from OFF to ON.
4. Remove the workpiece (turn the light OFF), and rotate the dial more in the direction in with the valve increases (open), and find point B' where the light changes from OFF to ON.
5. Rotate the dial in the direction in which the number of rotations drops (close), and find point B where the light changes from ON to OFF. The adjustment range is seen by finding the number of rotations from point A to point B.
6. Rotate the adjustment needle in the closing direction, and set to the middle point between point A and point B. This position is point C.
   ● If point C is near point B, the signal turns ON easily and response time is short. However, it takes time to return. Stable detection is possible by setting the adjustment point C between point A and point B.
7. Lock the dial after adjusting.



Control needle number of rotation



Control needle dial

● Do not turn the dial with force at either end of the rotation. The dial can be rotated up to 14 times.

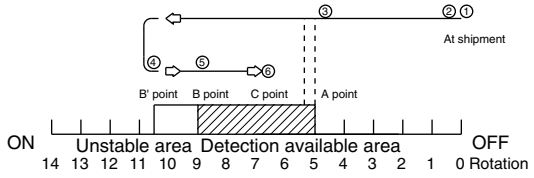
Installation & Adjustment

⚠CAUTION

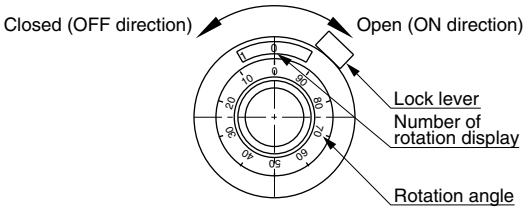
■ Precautions for TLPS

● Adjustment order

1. When this product is shipped from CKD, the adjustment needle is set to the number of rotations display 0 rotation, and rotation angle 0.
2. Supply air. The indicator light turns OFF.
3. Without the drill set, rotate the adjustment needle dial in the direction in which the value increases (open), and find point A where the light changes from OFF to ON.
4. Set 1mm of the end of the drill between the nozzle (the light will turn OFF), and rotate the dial more in the direction in which the value increase (open), and find point B' where the light changes from OFF to ON.
   - ● It may be difficult to find the point B' if more than 1mm of the end, or a nozzle other than the standard nozzle is used. In this case, turn the dial half a turn (50 scale) from point A, and set that point as setting point C.
5. Rotate the dial in the direction in which the number of rotations drops (close), and find point B where the light changes from ON to OFF. the adjustment range is seen by finding the number of rotations from point A to point B.
6. Rotate the adjustment needle in the closing direction, and set to the middle point between point A and point B. This position is point C.
   - ● If point C is near point B, the signal turns ON easily and response time is short. However, it takes time to return. Stable detection is possible by setting the adjustment point C between point A and point B.
7. Lock the dial after adjusting



Control needle number of rotation



Control needle dial

- ● Do not turn the dial with force at either end of the rotation. The dial can be rotated up to 14 times.

During Use & Maintenance

⚠CAUTION

■ One detection nozzle can be used for 1 of these product units.

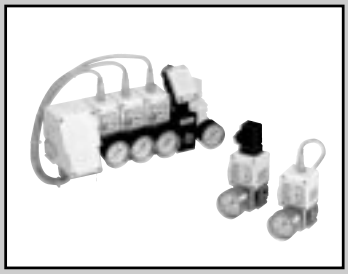
■ Immediately after work is started, the coolant from the nozzle may accumulate in the pipe and cause the sensor to turn ON for a short time. Wait for coolant to be discharged by detection air before starting the machine.

■ If nozzle is clogged, the monitor pressure gauge's needle stops at high pressure and does not return to 0. Remove the pipe on this product's side, and blow out stuck foreign matter with an air gun. If foreign matter cannot be removed, poke a needle, etc., through the detection nozzle on the end.

■ Precautions for TLPS

If the cutting tool broken detection switch signal continuously turns ON or OFF, and error has occurred. Error signals are listed below.

Continuously OFF	Continuously ON
• Without air • Improper adjustment • Clogged of injection nozzle • Leak from piping • Disconnection • Failure of internal circuit	• Cutting tool broken detection • Improper adjustment • Clogged of pressurizing nozzle • Break or bent of piping • Failure of internal circuit



Contact confirmation switch (gap switch)

GPS2/MGPS2/UGPS2 Series

RoHS

Overview

The GPS2 Series gap switch is a air sensor used to check the workpiece contact and the clamp. While retaining the features of the conventional GPS Series, a modular unit has been realized by incorporating a joiner connection structure, and the body strength has been increased by using aluminum die-cast.

Features

● Highly stability

Air bridge circuit prevents the effect of the fluctuation in the supply pressure.

● Easy adjustment

The sensitivity can be easily adjusted with the scale on the sensitivity adjustment dial.

● Non-contact detection

Non-contact measurement is taken, so the product is not directly touched. The state can be checked without damaging valuable products.

● Energy saving

The air consumption rate can be suppressed since this can be used with 0.03MPa supply pressure.

● High accuracy

● Modulization

By incorporating a joiner connection, GPS2 units can be connected together, and can also be connected easily to the CKD regulator or filter.

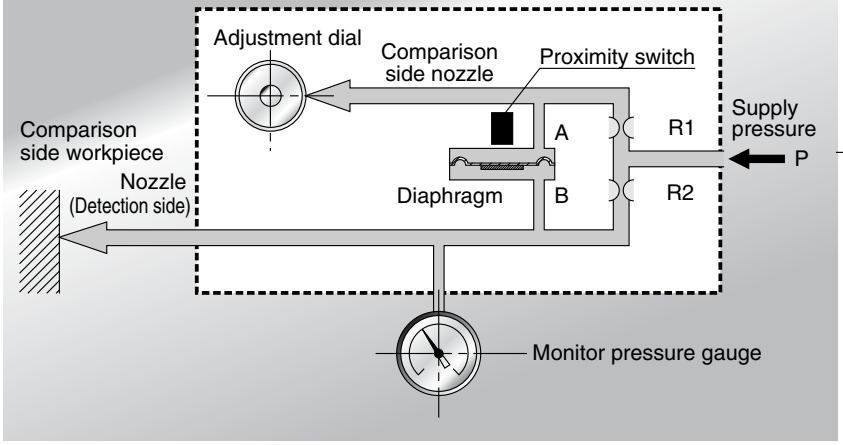
● Stationary

The body strength has been increased by using aluminum die-cast.

● Environment conditions

The product can be used in the environment where water, etc., splash, due to protective structure IP-67 (connector type).

● Gap switch principle drawing



Operational explanation

The air pressurized onto port P presses through orifice R1 and R2 of the air bridge circuit, and flows to the nozzles on the comparison side and on the detection side. When the detection side nozzle's clearance set with the adjustment dial in the comparison side nozzle, a back pressure reverses and pressures up the diaphragm. This activates the proximity switch and generates an electric signal.

Contact confirmation switch (gap switch) discrete

GPS2 Series

● Port size: Rc1/8 ● Nozzle port size: ø1.5

CE Refer to Intro 32 for details. RoHS CAD

Specifications

Descriptions			GPS2-05-15	GPS2-07-15
Working fluid			Clean compressed air (must be oil free)	
Working pressure range (Note 2) kPa			30 to 200	50 to 200
Detection distance range mm			0.03 to 0.25	0.03 to 0.4
Repeatability mm			±0.01 (detection distance range 0.03 to 0.1mm)	
Hysteresis mm			0.01 or less (detection distance range 0.03 to 0.1mm)	
Type of detection nozzle (Note 1)			Single hole nozzle 1.5 dia. Standard (ø1, ø2)	
Power voltage V			10 to 27 DC	
Current consumption mA			15 or less (at 24 VDC)	
Output style			NPN, PNP open collector	
Output rated			30 VDC, 100mA or less	
Internal voltage drop V			1.5 or less (100mA)	
Indicator light			LED green or yellow	
Insulation resistance			10MΩ and over with 500 VDC mega	
Insulation resistance			No failure impressed at 1000 VAC for one minute	
Withstanding vibration m/s²			98	
Working temperature ˚C			5 to 60	
Protective structure (Note 3)			IP67 or equivalent (connector type), IP64 or equivalent (DIN)	
Piping size mm			Inner diameter 4	
Port size			Rc1/8	
Weight g			250	
Air consumption ℓ/min. (ANR)	Supply pressure	50kPa	6 or less	11 or less
		100kPa	9 or less	15 or less
		200kPa	14 or less	24 or less

Note 1: The above specifications apply to the 1.5 diameter single-hole detection nozzle.
Note 2: If the nozzle clogs, supply pressure should be set between 100 and 200 kPa.
Note 3: This product must be used under the following conditions:
(1) Piping and wiring must be completed and pressure applied.
(2) A waterproof bushing must be used on the wires to the terminal box.
(3) A dial cover lock must be provided and the cover screw must be tightened.

How to order

GPS2 - 07 - 15 - N G TL S - B - G2

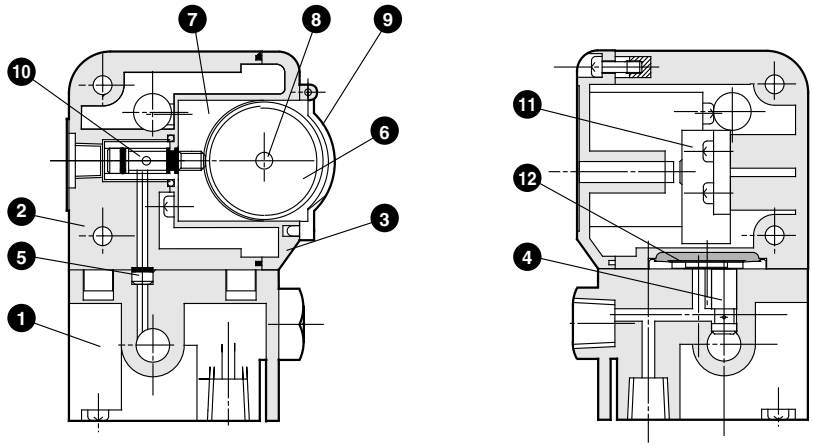
- GPS2: Gap switch
- 07: Ⓐ Orifice
- 15: Ⓑ Setting type
- N: Ⓒ Output style
- G: Ⓓ Light color
- TL: Ⓔ Electric connection
- S: Ⓕ ISO compliance, etc. Note 2
- B: Ⓖ Attachment and others
- G2: Ⓗ Pressure gauge

Symbol	Descriptions
Ⓐ Orifice	
05	ø0.5
07	ø0.7
Ⓑ Setting type	
15	Dial type detection nozzle diameter
Ⓒ Output style	
N	NPN open collector
P	PNP open collector
Ⓓ Light color	
G	Green
Y	Yellow
Ⓔ Electric connection	
F	DIN terminal box (Pg11)
C0	Connector (without cable)
C1	Connector (cable 1m attached)
C3	Connector (cable 3m attached)
C5	Connector (cable 5m attached)
CTL	Connector type common terminal box left assembly
CTR	Connector type common terminal box right assembly
TL	Lead wire type common terminal box left assembly
TR	Lead wire type common terminal box right assembly
Lead wire central terminal box type expanding manifold	
R	Lead wire outlet direction right (left end for mounting)
L	Lead wire outlet direction left (right end for mounting)
W	Lead wire outlet direction both sides (intermediate for mounting)
Ⓕ ISO compliance, etc.	
S	CE marking products
Ⓖ Attachment and others	
Blank	Without bracket
B	With bracket
L (Note 1)	With dial cover lock
Ⓗ Pressure gauge	
Blank	Without pressure gauge
G2	Pressure gauge attached with safety mark (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety mark (G40D-8-P02-S501)

⚠ Note on model no. selection

Note 1: Select L for automobile- and processingmachine- related applications.
Note 2: The “D” light color is Y (yellow) for CE-Marking- compatible parts.
Note 3: Refer to pages 1212 to 1217 on option and model no. of related components.

Internal structure and parts list



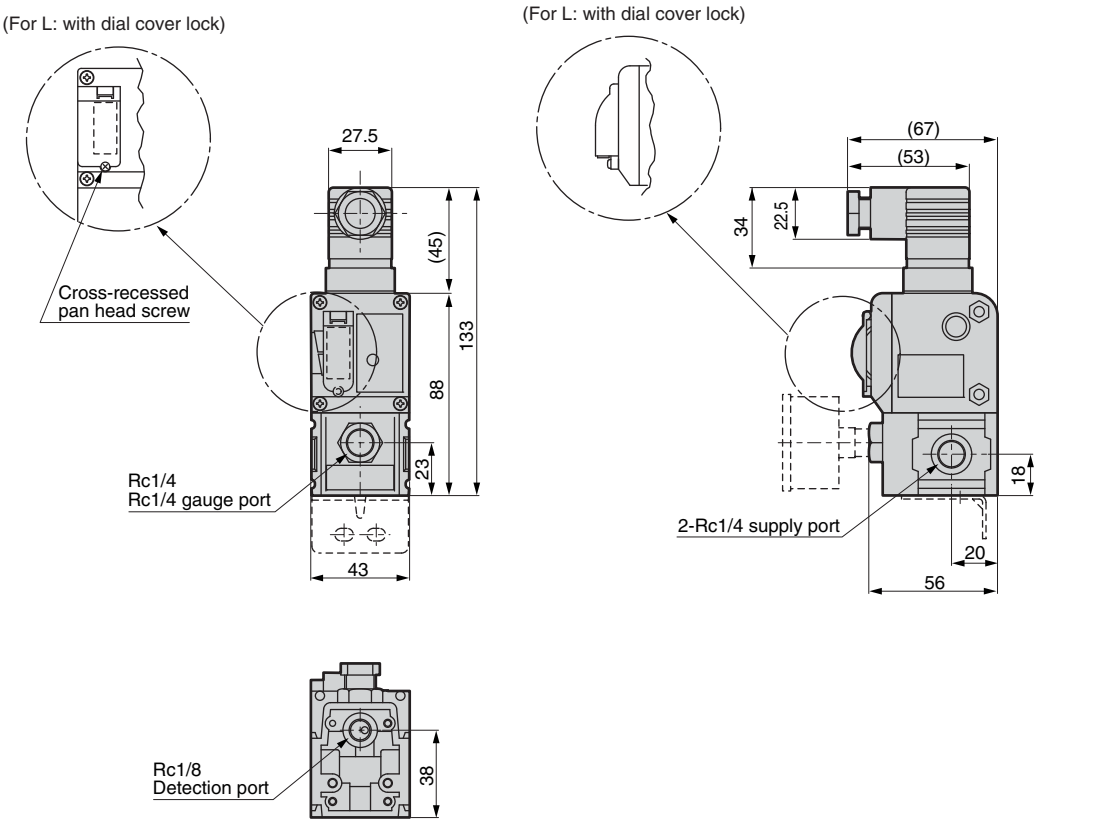
Parts list

No.	Parts name	Material	No.	Parts name	Material
1	Base	Aluminum	7	DialBracket	Aluminum
2	Body	PBT	8	Press fit pin	Stainless steel
3	Front guard	PBT	9	Dial cover	Polypropylene
4	Orifice nozzle A	Brass	10	Dial nozzle	Brass
5	Orifice nozzle B	Brass	11	Proximity switch	–
6	Dial	Stainless steel	12	Diaphragm	H-NBR

Dimensions CAD

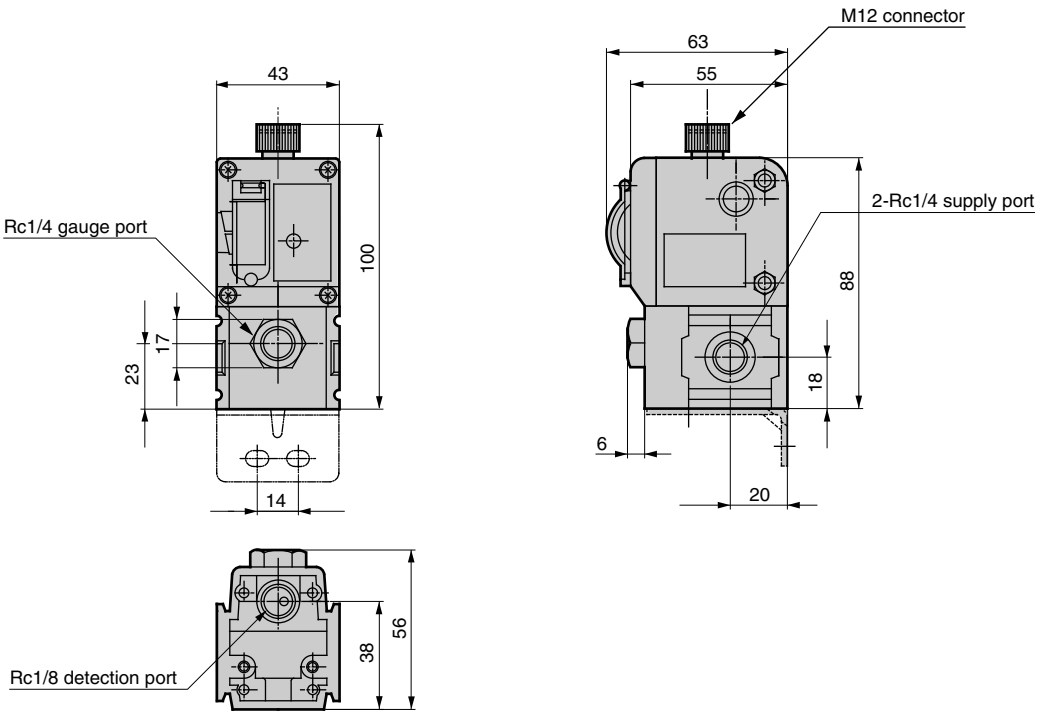
● DIN terminal type

● GPS2-*-*-** F



● Connector type

● GPS2-*-*-** C0 C1 C3 C5

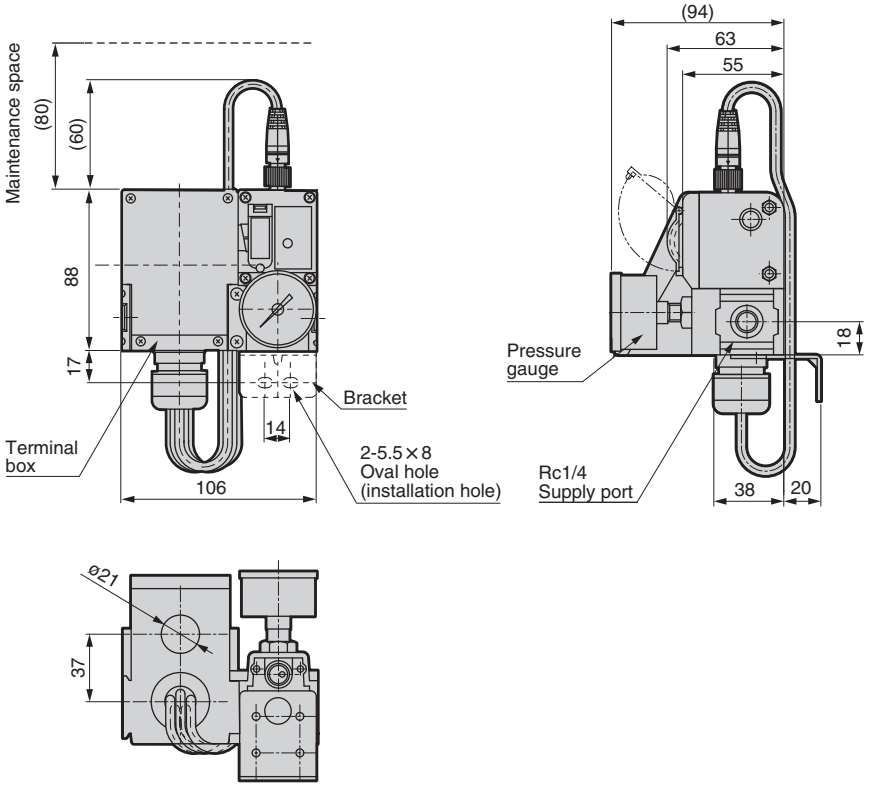


Note) A dial cover shape differs for dial cover lock. Refer to above DIN terminal type.

Dimensions

● Connector type common terminal box

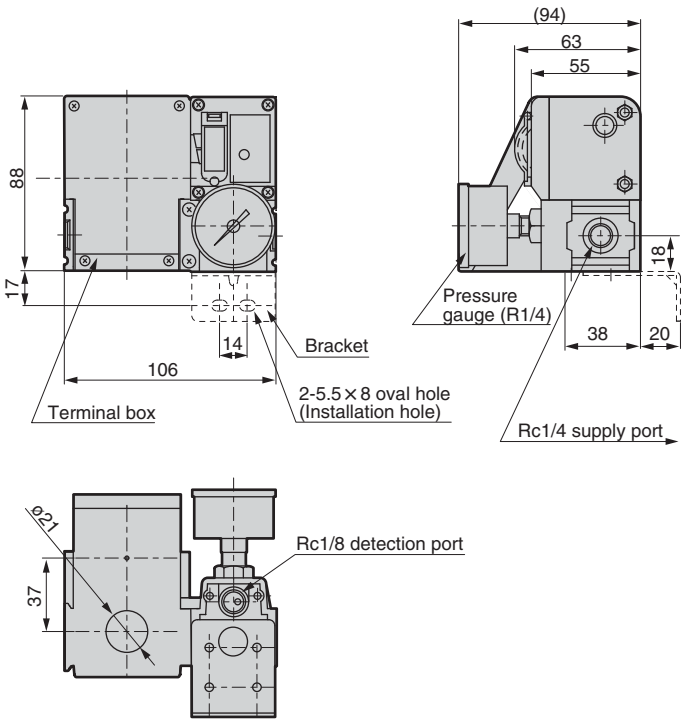
● GPS2-**-** CTL
(CTR)



Note) A dial cover shape differs for dial cover lock. Refer to the DIN terminal box type on Page 1174 for shapes.

● Lead wire common terminal box

● GPS2-*-*-** TL
(TR)

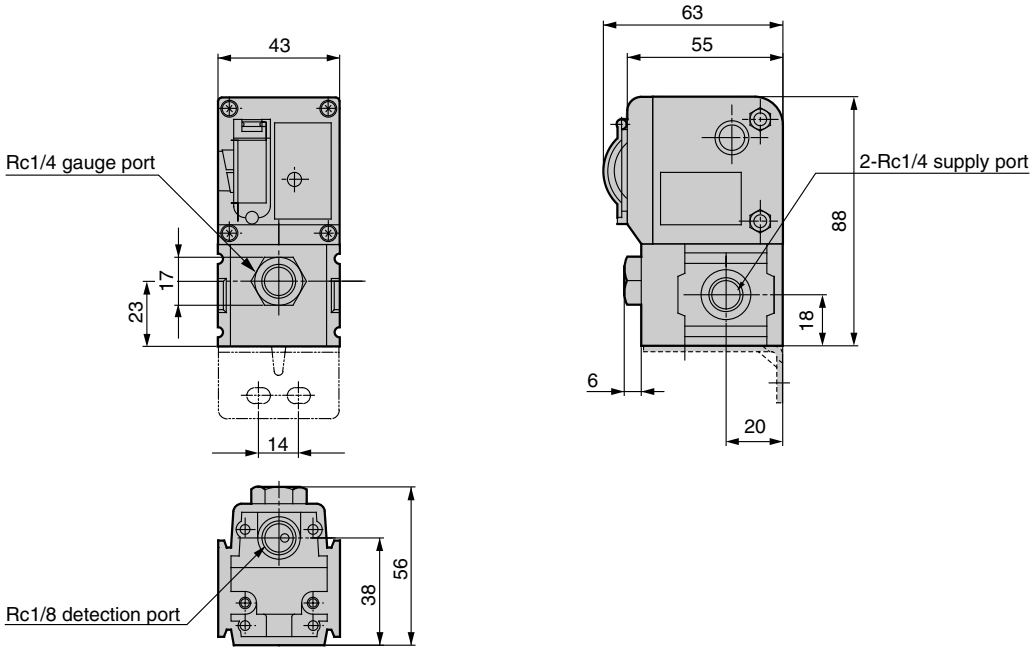


Note) A dial cover shape differs for dial cover lock. Refer to the DIN terminal box type on Page 1174 for shapes.

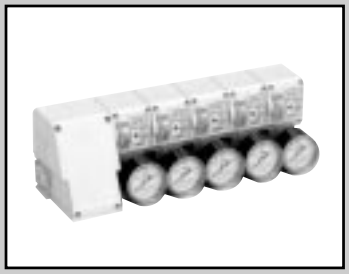
Dimensions CAD

● Discrete for lead wire common terminal box type expanding manifold

● GPS2-*-*-** R / L / W



Note) A dial cover shape differs for dial cover lock. Refer to the DIN terminal box type on Page 1174 for shapes.



Gap switch manifold

MGPS2 Series

● Nozzle diameter: ø1.5 (standard) ● Station number: 2 to 5 stations

Refer to Intro 32 for details.

Specifications

Basic specifications are the same as discrete on page 1172.

How to order gap switch manifold

MGPS2 - 07 - 15 - 2 N Y TL S - B - G2

Gap switch manifold

Symbol	Descriptions
A Orifice	
05	ø 0.5
07	ø 0.7
B Setting type	
15	Dial type detection nozzle diameter
C Station no.	
2	2 stations
3	3 stations
4	4 stations
5	5 stations
D Output style	
N	NPN open collector
P	PNP open collector
E Light color	
G	Green
Y	Yellow
F Electric connection	
TL	Lead wire type common terminal box left assembly
TR	Lead wire type common terminal box right assembly
T1	Lead wire common terminal box (1st from left)
T2	Lead wire common terminal box (2nd from left)
T3	Lead wire common terminal box (3rd from left)
T4	Lead wire common terminal box (4th from left)
CTL	Connector type common terminal box left assembly
CTR	Connector type common terminal box right assembly
F	DIN terminal box (Pg11)
C0	Connector (without cable)
C1	Connector (cable 1m attached)
C3	Connector (cable 3m attached)
C5	Connector (cable 5m attached)
G ISO compliance, etc.	
S	CE marking products
H Attachment and others	
Blank	Without bracket
B	With bracket
L (Note 1)	With dial cover lock
I Pressure gauge	
Blank	Without pressure gauge
G2	Pressure gauge with safety mark attached (G40D-8-P02-S501)
GW2	Pressure gauge with safety mark assembly (G40D-8-P02-S501)

Protective structure

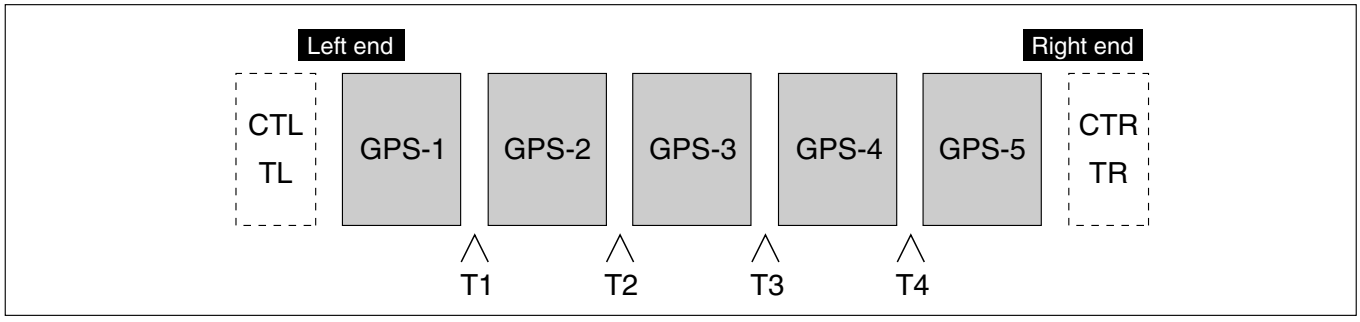
Electric connection	Protective structure
T *	IP66 or equivalent
CT*	IP67 or equivalent
F *	IP64 or equivalent
C *	IP67 or equivalent

Note: This product must be used under the following conditions:
(1) Piping and wiring must be completed and pressure applied.
(2) A waterproof bushing must be used on the wires to the terminal box.
(3) A dial cover lock must be provided and the cover screw must be tightened.

⚠ Note on model no. selection

Note 1: Select L for automobile- and processing-machine-related applications.
Note 2: The "E" light color is Y (yellow) for CE-Marking-compatible parts.
Note 3: Refer to pages 1212 to 1217 on option and model no. of related components.

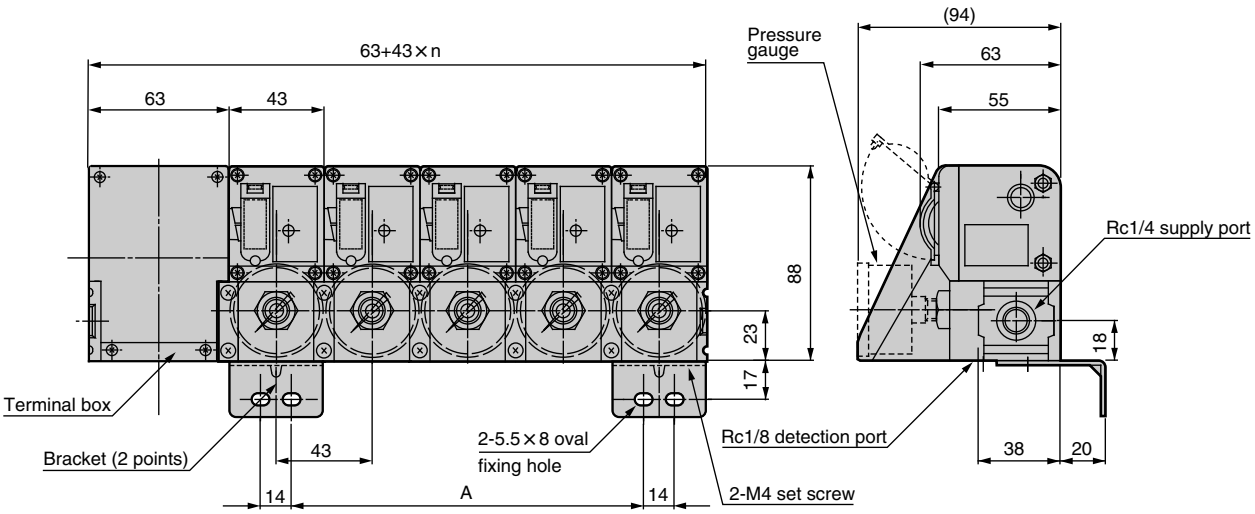
Terminal box installation position diagram



Dimensions CAD

● Manifold type (lead wire type common terminal box: TL/TR)

● MGPS2-*-*-*** TL
(TR)

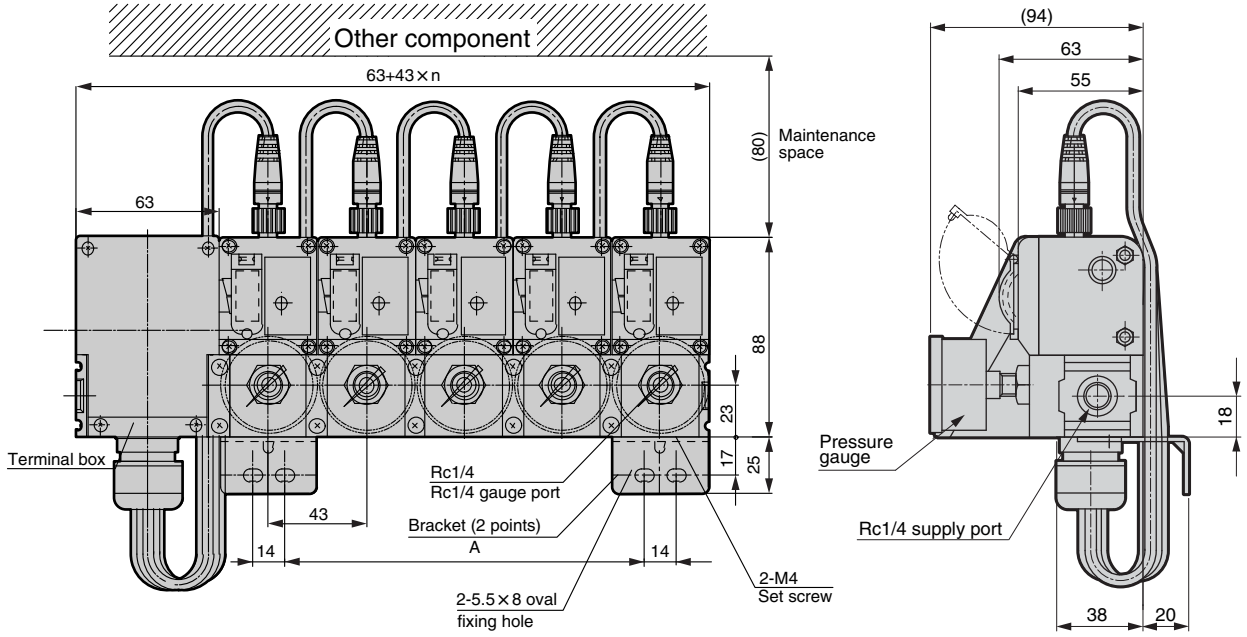


Station no.	n	A
2 stations	2	29
3 stations	3	72
4 stations	4	115
5 stations	5	158

Note) A dial cover shape differs for dial cover lock. Refer to the DIN terminal box type on page 1176 for shapes.

● Manifold type (connector type common terminal box: CTL/CTR)

● MGPS2-*-*-*** CTL
(CTR)

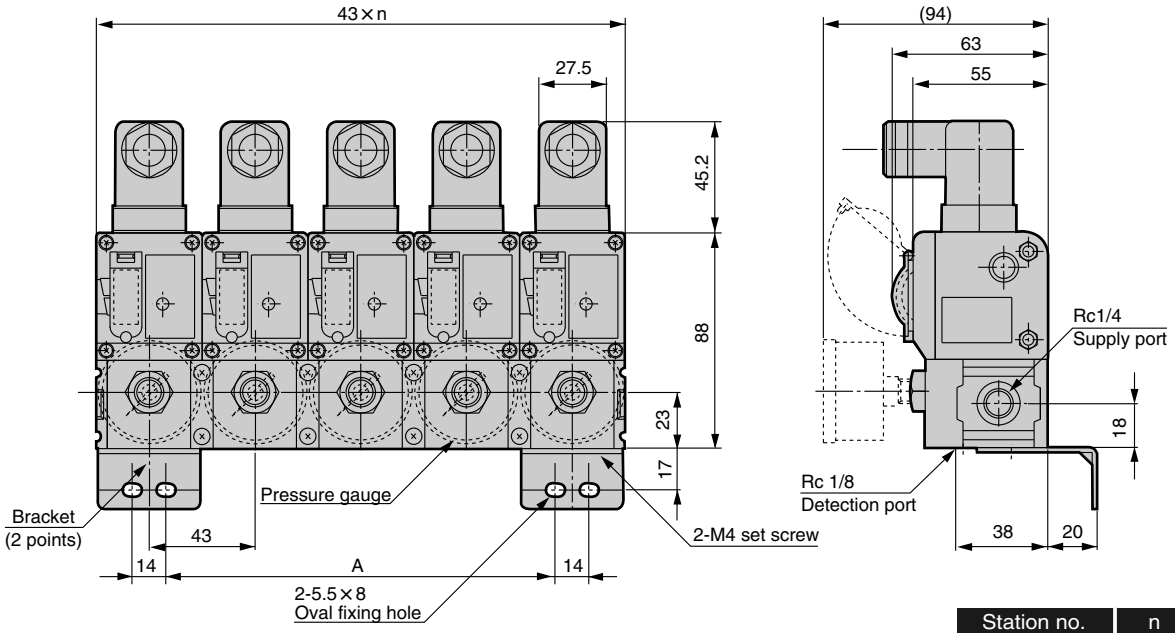


Note) A dial cover shape differs for dial cover lock. Refer to the DIN terminal box type on page 1174 for shapes.

Dimensions

● Manifold type (DIN terminal box: F)

● MGPS2-*-*-***F

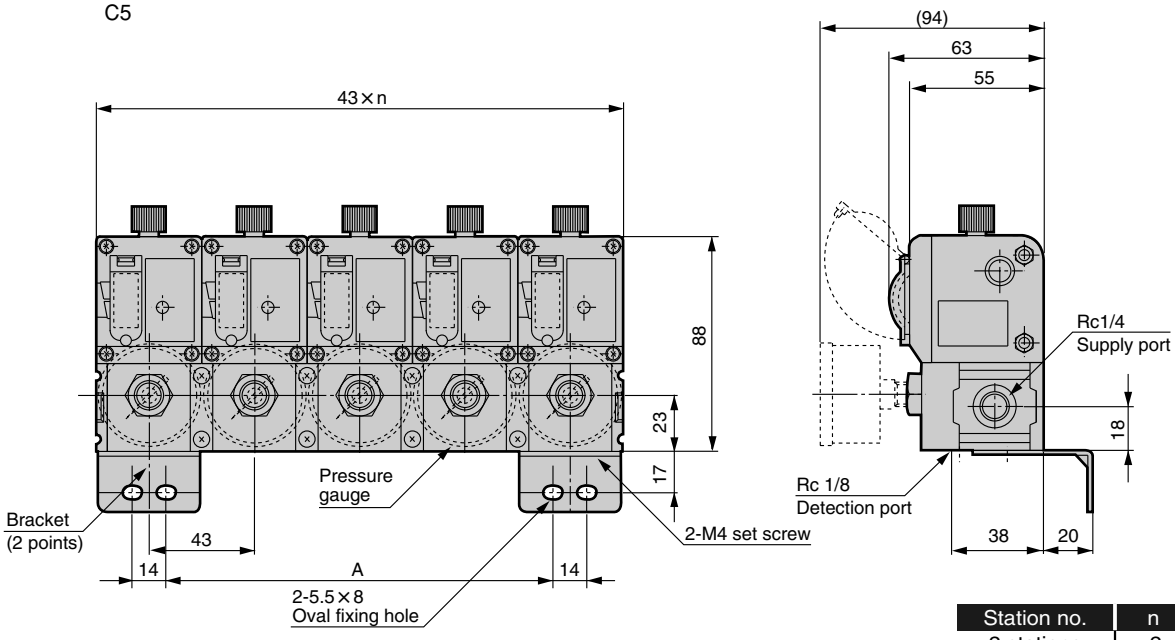


Station no.	n	A
2 stations	2	29
3 stations	3	72
4 stations	4	115
5 stations	5	158

Note) A dial cover shape differs for dial cover lock. Refer to the DIN terminal box type on Page 1174 for shapes.

● Manifold type (connector: C*)

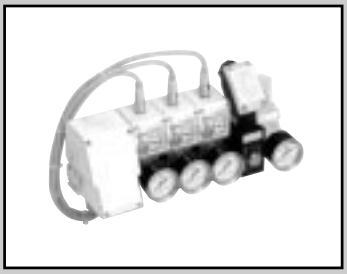
● MGPS2-*-*-* C0 C1 C3 C5



Station no.	n	A
2 stations	2	29
3 stations	3	72
4 stations	4	115
5 stations	5	158

Note) A dial cover shape differs for dial cover lock. Refer to the DIN terminal box type on Page 1174 for shapes.

* Refer to pages 1212 to 1219 for dimensions of options or peripheral devices.



Gap switch unit

UGPS2 Series

● Solenoid valve with needle, regulator integrated general purpose unit

CE Refer to Intro 32 for details. RoHS CAD

Specifications

Basic specifications are the same as discrete on page 1172.

How to order gap switch unit

UGPS2 - 07 - 15 - 2 N Y TL S - L - GW2 - 3H - 1

Gap switch standard unit

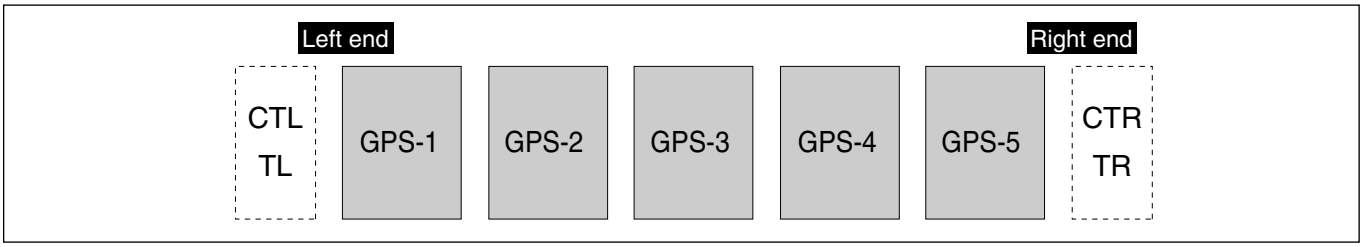
Ⓐ Orifice
Ⓑ Setting type
Ⓒ Station no.
Ⓓ Output style
Ⓔ Light color
Ⓕ Electric connection
Ⓖ ISO compliance, etc. Note 2
Ⓗ Attachment and others
Ⓘ Pressure gauge
Ⓙ Solenoid valve electric connection type Note 2
Ⓚ Solenoid valve voltage

Symbol	Descriptions
Ⓐ Orifice	
05	ø 0.5
07	ø 0.7
Ⓑ Setting type	
15	Dial type detection nozzle diameter
Ⓒ Station no.	
1	1 station
2	2 stations
3	3 stations
4	4 stations
5	5 stations
Ⓓ Output style	
N	NPN open collector
P	PNP open collector
Ⓔ Light color	
G	Green
Y	Yellow
Ⓕ Electric connection	
TL	Lead wire type common terminal box left assembly
TR	Lead wire type common terminal box right assembly
CTL	Connector type common terminal box left assembly
CTR	Connector type common terminal box right assembly
F	DIN terminal box (Pg11)
C0	Connector (without cable)
C1	Connector (cable 1m attached)
C3	Connector (cable 3m attached)
C5	Connector (cable 5m attached)
Ⓖ ISO compliance, etc.	
S	CE marking products
Ⓗ Attachment and others	
L (Note 1)	With dial cover lock
Ⓘ Pressure gauge	
Blank	None
GW2	Pressure gauge with safety mark assembly (G40D-8-P02-S501)
Ⓙ Solenoid valve electric connection type	
2E	DIN terminal box
2H	DIN terminal box with indicator light
3H	Square terminal box with indicator light
Ⓚ Solenoid valveVoltage	
1	100 VAC
2	200 VAC
3	24 VDC

⚠ Note on model no. selection

Note 1: Select L for automobile- and processing-machine-related applications.
Note 2: The "E" light color is Y (yellow) for CE-Marking-compatible parts. Select the "J" solenoid valve wire connection from 2E or 2H.
Note 3: Refer to pages 1212 to 1217 on option and model no. of related components.

Terminal box installation position diagram

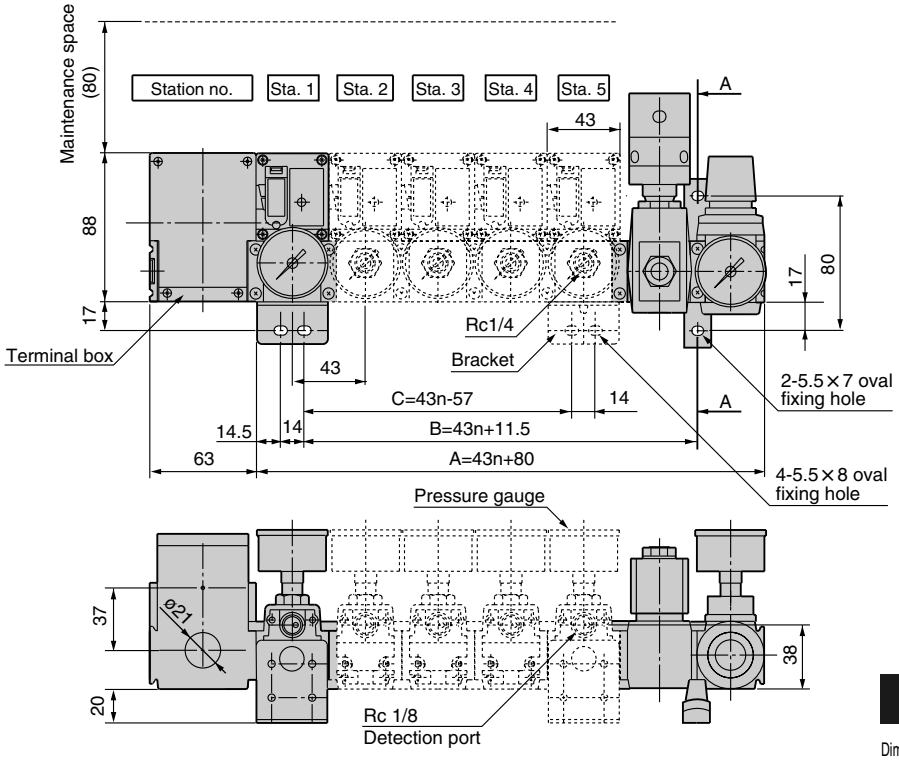


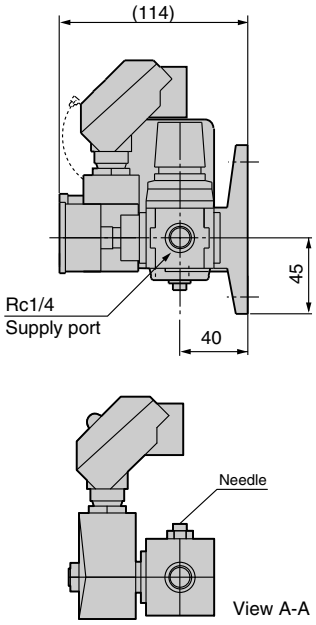
Note: The solenoid valve with needle and regulator are mounted on the opposite side of the terminal box (right side when terminal box is on left side). The terminal box does not have a supply port.

Dimensions

● Gap switch unit (lead wire type common terminal box: TL/TR)

● UGPS2-*-*-*** TL



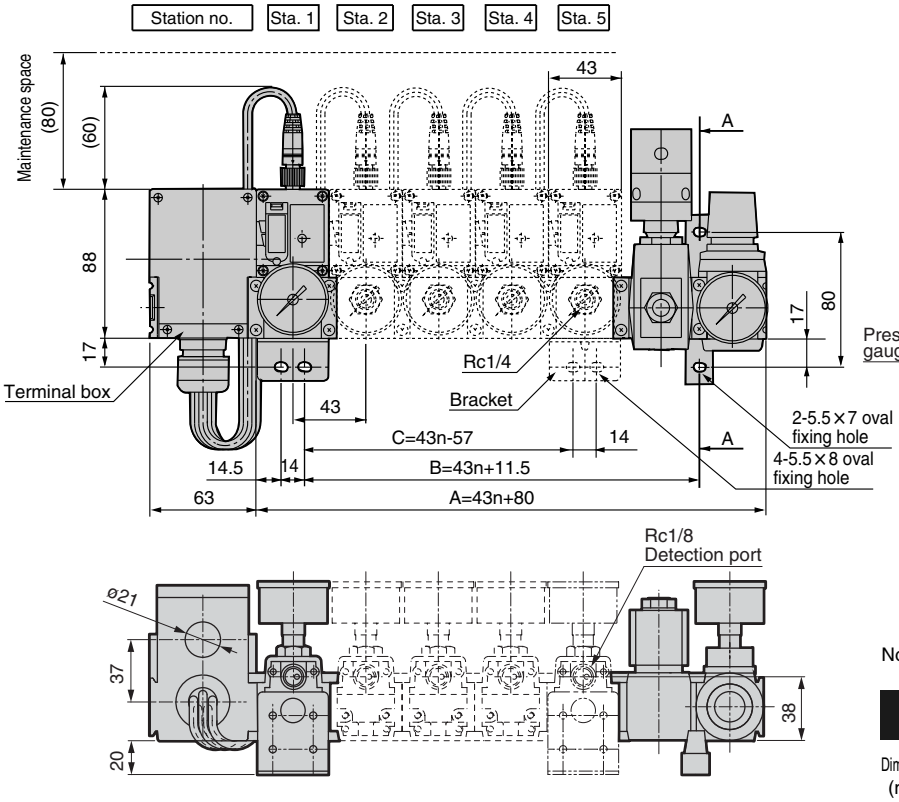


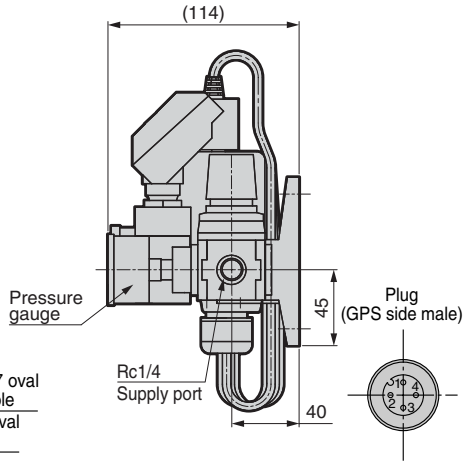
		Station no.				
		1	2	3	4	5
Dimension (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2

Note) A dial cover shape differs for dial cover lock. Refer to the DIN terminal box type on page 1174 for shapes.

● Gap switch unit (connector type common terminal box: CTL/CTR)

● UGPS2-*-*-*** CTL





Note: Refer to "A-A view " of the figure above for needle position.

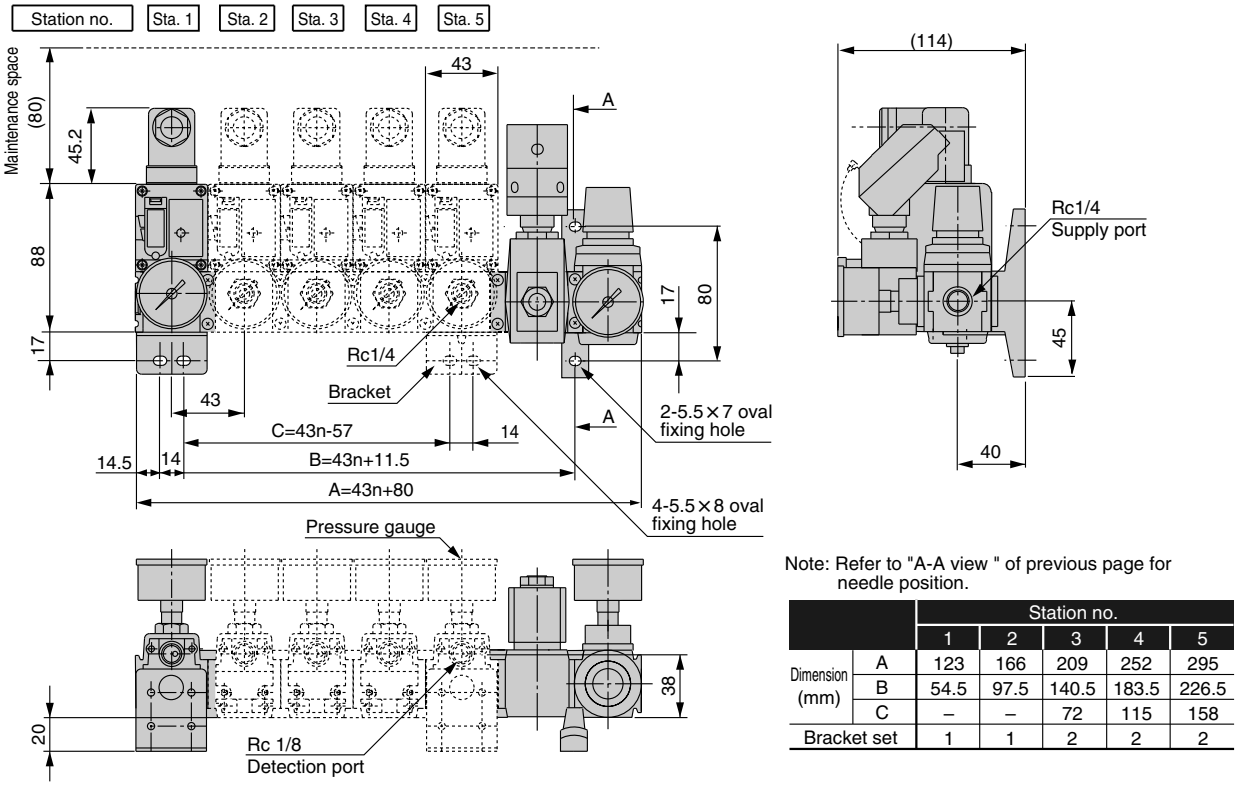
		Station no.				
		1	2	3	4	5
Dimension (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2

Note) A dial cover shape differs for dial cover lock. Refer to the DIN terminal box type on page 1174 for shapes.

Dimensions CAD

● Gap switch unit (DIN terminal box: F)

● UGPS2-*-*-*** F



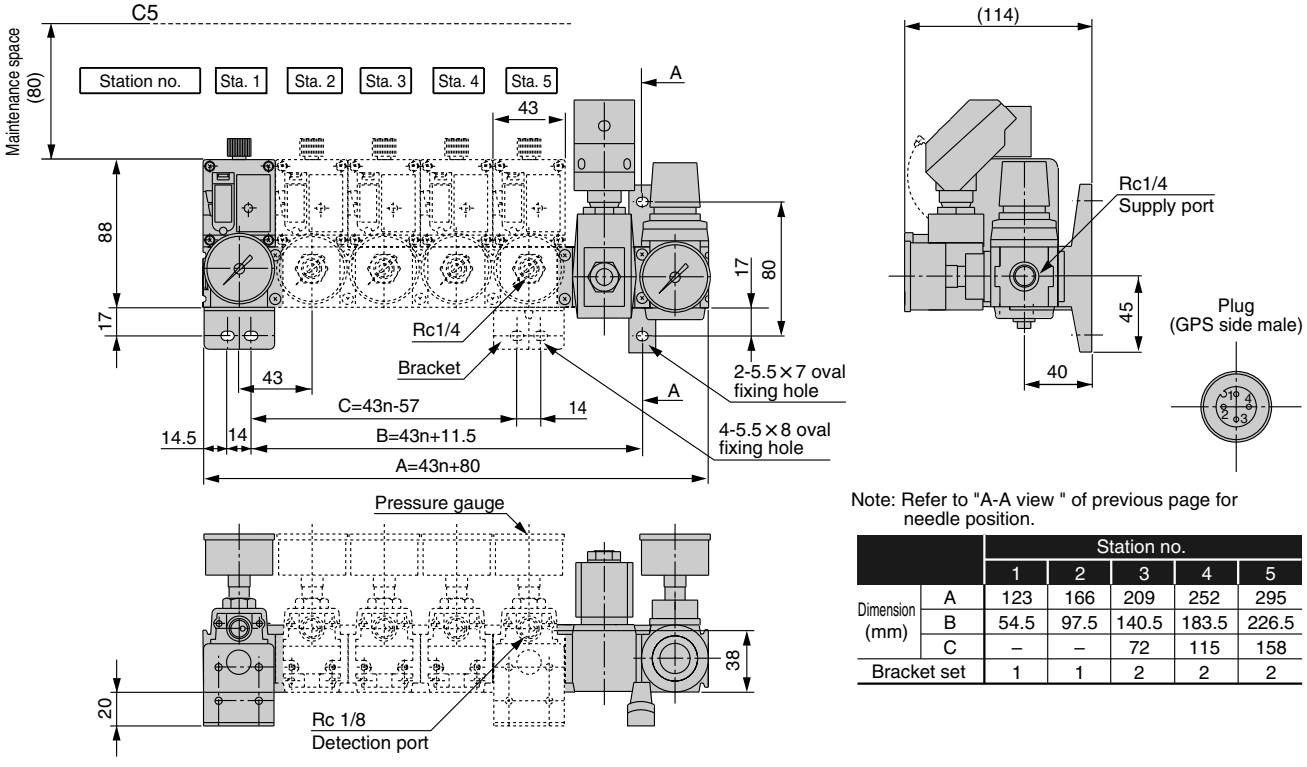
Note: Refer to "A-A view " of previous page for needle position.

		Station no.				
		1	2	3	4	5
Dimension (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2

Note) A dial cover shape differs for dial cover lock. Refer to the DIN terminal box type on page 1174 for shapes.

● Gap switch unit (connector: C*)

● UGPS2-*-*-*** C0 C1 C3 C5



Note: Refer to "A-A view " of previous page for needle position.

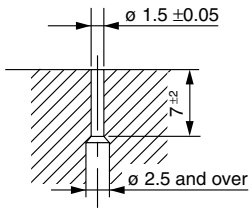
		Station no.				
		1	2	3	4	5
Dimension (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2

Note) A dial cover shape differs for dial cover lock. Refer to the DIN terminal box type on page 1174 for shapes.

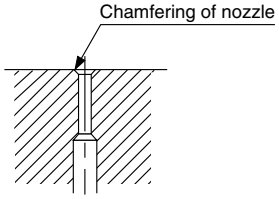
● Refer to pages 1212 to 1219 for dimensions of options or peripheral devices.

Design of detection nozzle

● Single hole nozzle



Right nozzle shape

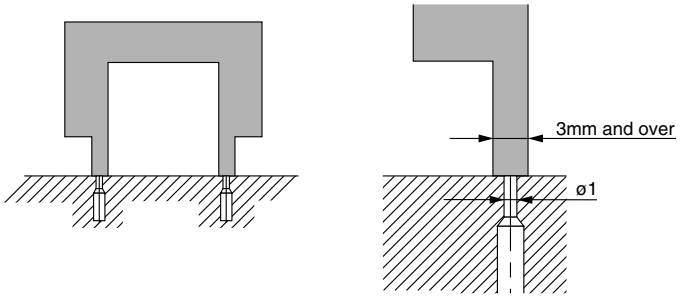


Bad nozzle shape

Design the detection nozzle with a point size of 1.5mm diameter and depth of 7 ± 2mm. The bowl-off section of the nozzle cannot be chamfered. If chamfered, the nozzle retracts from the seating place, and the scale on the adjustment dial and actual dimensions do not match.

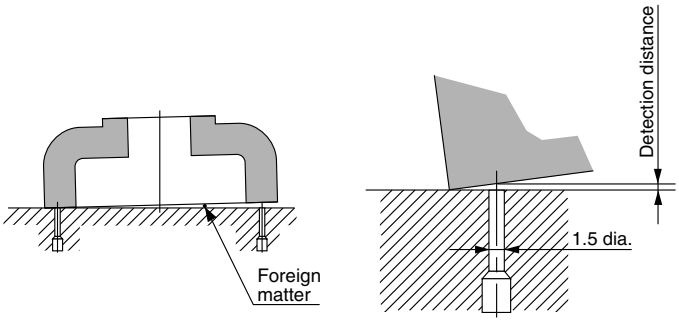
Selection of detection nozzle diameter

● When the workpiece detection surface is narrow: use ø1mm nozzle. Contact CKD if the width is less than 3mm.



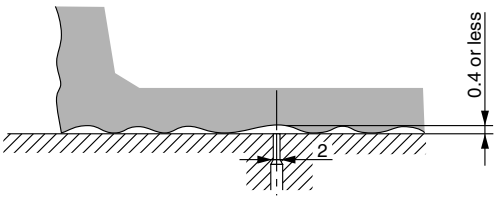
- Use with a detection distance of 0.1mm or less.
- Use with a workpiece surface roughness of Rz = 5 or less
- Check that nozzle does not separate from the detection surface.

● When the workpiece detection surface is sufficiently wide: use ø1.5mm nozzle.

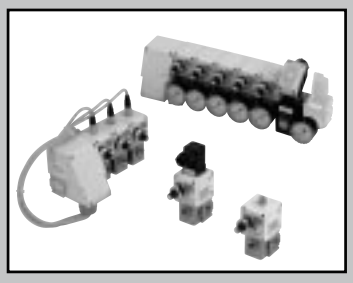


- Use with a detection distance of 0.2mm or less.
- Use with a workpiece surface roughness of Rz = 5 or less

● When detecting the presence of a workpiece with a rough detection surface: use ø1.5mm or ø2.0mm nozzle.



- The maximum detection distance of the GPS2 is 0.4mm.
  The workpiece cannot be detected if bumps exceed 0.4mm.
  In that case, use the HPS-10.



Close contact confirmation switch

HPS/MHPS/UHPS Series

RoHS

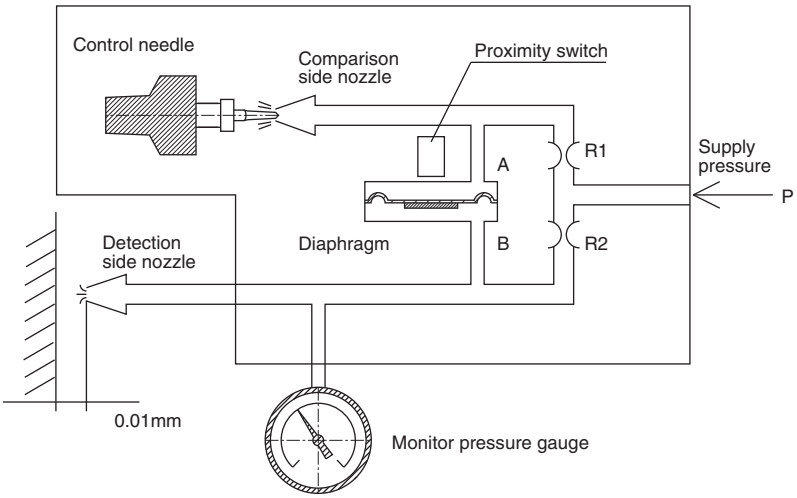
Overview

The close contact confirmation switch HPS Series incorporates a highly accurate needle mechanism to enable highly accurate detection for contact confirmation, etc.
With special nozzle, this switch is used for a variety of position detections.

Features

- Precise
  Highly accurate variable-adjustment is possible with the precise linear needle.
  Min. detection distance 0.01mm
  Resolution ±0.005mm
- Low air consumption
  This switch is used with low pressure so air consumption is reduced.
- Lock mechanism with dial scale
  The position is adjusted easily with no problem of deviation.
- Modularization
  Modularization makes it easy to connect to the CKD module connection component.
- High stability
  Stable detection, unaffected by fluctuation is supply pressure, is possible with the air bridge circuit.
- Environment condition
  IP67 protective structure is resistant to spattering coolant and other substances.
- Special nozzle usable
  The detection distance is 3mm with the back pressure nozzle.

Close contact confirmation switch principle drawing



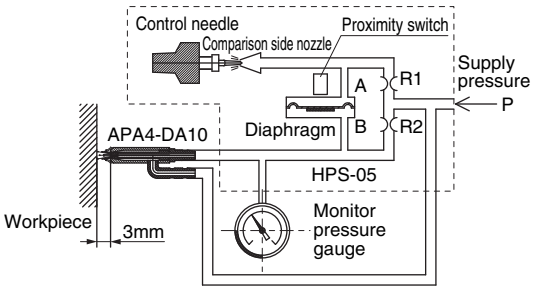
Operational explanation

● HPS body

Compressed air pressurized on the supply port P passes through orifice R1 and R2 of the air bridge circuit, and flows to nozzles on the comparison and detection sides. When detection side nozzle clearance becomes smaller than the clearance set with the adjustment needle in the comparison side nozzle, back pressure reverses and presses up the diaphragm. This activates the proximity switch and generate an electrical signal.

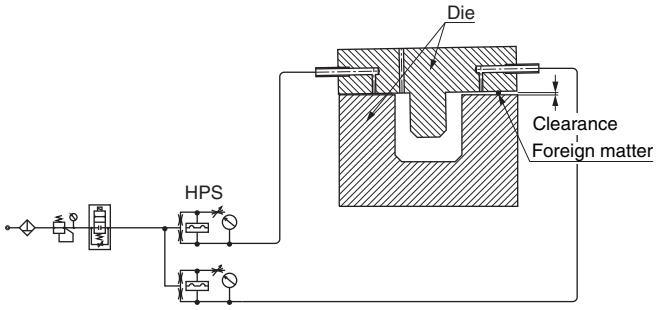
● Back pressure type nozzle

The detection air is diffused as the clearance widens, and returns to atmospheric pressure at 0.7mm when using the single-hole nozzle. However, if the outside circumference of the detection nozzle is shielded with air from another system, detection air is not diffused as easily, making it possible to detect up to 3mm.

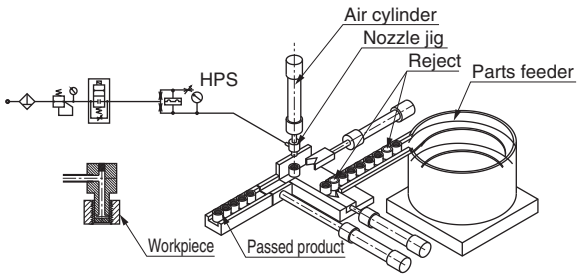


Applications

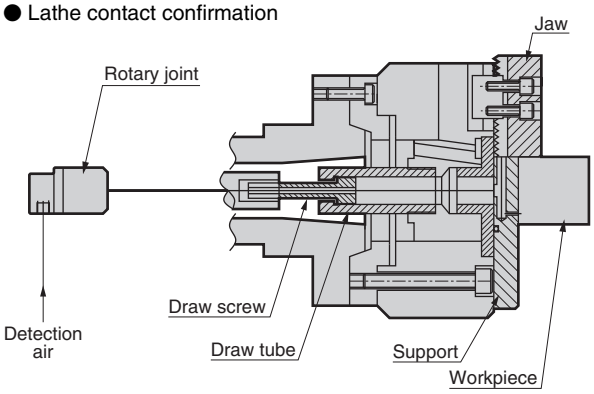
● Melted aluminum alloy die-casting leak detection



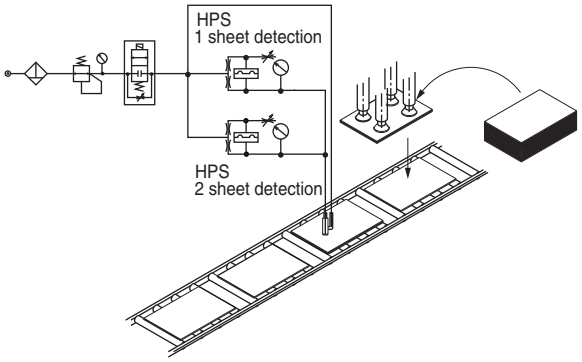
● Screw hole confirmation



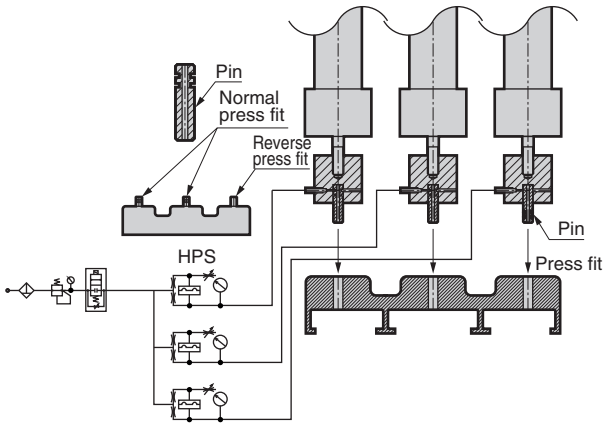
● Lathe contact confirmation



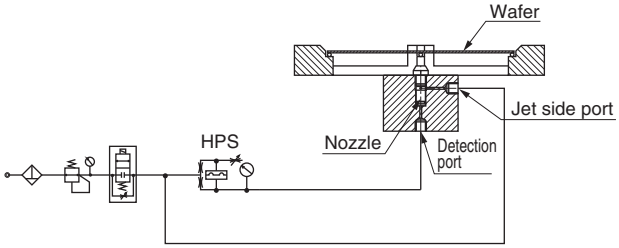
● 2 sheets feed detection

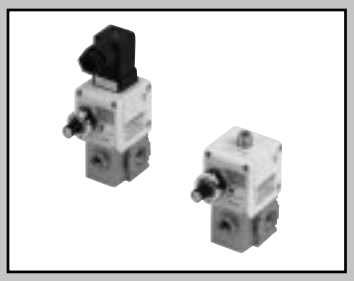


● Workpiece installation confirmation



● Wafer presence confirmation





Discrete close contact confirmation switch

HPS Series

CE Refer to Intro 32 for details. RoHS CAD

Specifications

Descriptions			HPS-05	HPS-07	HPS-10
Orifice		mm	ø0.5	ø0.7	ø1.0
Working pressure range		(Note 2) kPa	50 to 200	50 to 200	100 to 200
Detection distance range		mm	0.01 to 0.2	0.02 to 0.3	0.05 to 0.7
Repeatability		mm	±0.005 (detection distance range 0.01 to 0.1)	±0.005 (detection distance range 0.02 to 0.1)	±0.02 (detection distance range 0.05 to 0.3)
Hysteresis		mm	0.005 or less (detection distance range 0.01 to 0.1)	0.005 or less (detection distance range 0.02 to 0.1)	0.01 or less (detection distance range 0.05 to 0.3)
Detection nozzle		(Note 1)	Single hole nozzle ø1.5		
Power voltage		V	10~27 DC		
Current consumption		mA	15 or less (at 24 VDC)		
Output style			NPN,PNP open collector		
Output rated			30 VDC, 100mA or less		
Internal voltage drop		V	1.5 or less (at 100mA)		
Indicator light			LED green or yellow		
Insulation resistance			10MΩ and over with 500 VDC mega		
Withstand voltage			No failure impressed at 1000 VAC for one minute		
Withstanding vibration		m/sec²	98		
Working temperature		˚C	5 to 60		
Protective structure		(Note 3)	IP67 or equivalent (connector type), IP64 or equivalent (DIN)		
Piping size		mm	Inner diameter 4		
Port size			Detection port Rc1/8, supply port Rc1/4, pressure gauge port Rc1/4		
Weight		g	300		
Air consumption ℓ/min. (ANR)	50	kPa	6	11	-
	100	kPa	9	15	24
	200	kPa	14	24	38

Note 1: The above specifications apply to the 1.5 diameter single-hole detection nozzle.
Note 2: If the nozzle clogs, supply pressure should be set between 100 and 200 kPa.
Note 3: This product must be used under the following conditions:
(1) Piping and wiring must be completed and pressure applied.
(2) A water-proof bushing must be used on the wires to the terminal box.

How to order

HPS - 05 - N G TL S - B - G2

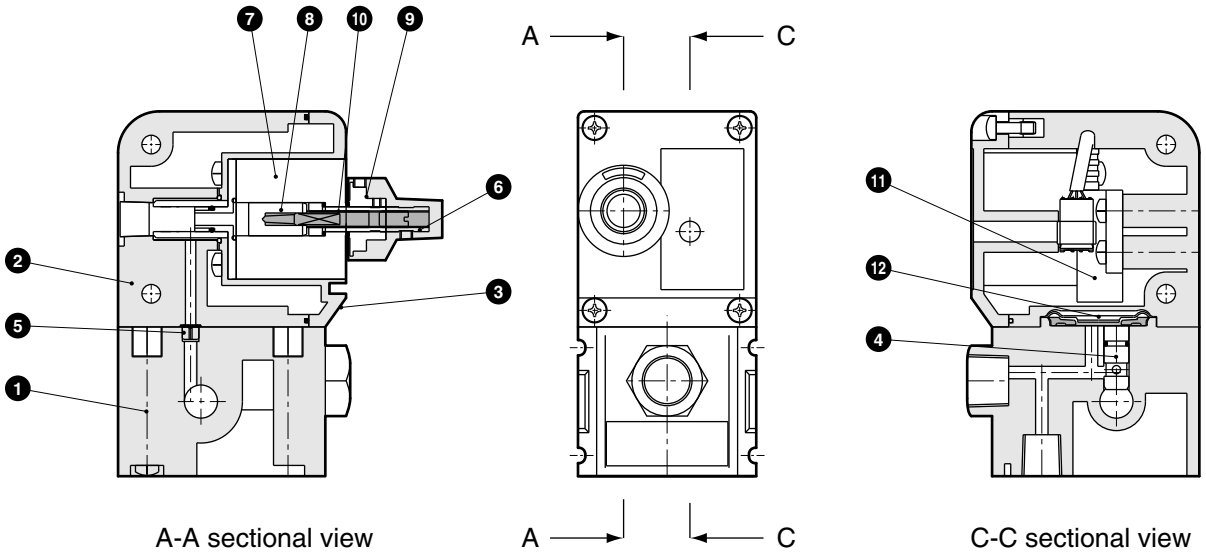
- HPS: Close contact confirmation switch
- Ⓐ 05: Orifice
- Ⓑ N: Output style
- Ⓒ G: Light color
- Ⓓ TL: Electric connection
- Ⓔ S: ISO compliance, etc. (Note 1)
- Ⓕ B: Bracket
- Ⓖ G2: Pressure gauge

Symbol	Descriptions
Ⓐ Orifice	
05	ø 0.5
07	ø 0.7
10	ø 1.0
Ⓑ Output style	
N	NPN open collector
P	PNP open collector
Ⓒ Light color	
G	Green
Y	Yellow
Ⓓ Electric connection	
F	DIN terminal box (Pg11)
C0	Connector (and without cable)
C1	Connector (cable 1 m attached)
C3	Connector (cable 3 m attached)
C5	Connector (cable 5 m attached)
CTL	Connector type common terminal box left assembled
CTR	Connector type common terminal box right assembled
TL	Lead wire type common terminal box left assembly
TR	Lead wire type common terminal box right assembly
R	Lead wire direction right (left end for mounting)
L	Lead wire direction left (right end for mounting)
W	Lead wire direction both sides (intermediate for mounting)
Ⓔ ISO compliance, etc.	
S	CE marking products
Ⓕ Bracket	
Blank	Without bracket
B	With bracket
Ⓖ Pressure gauge	
Blank	Without pressure gauge
G2	Pressure gauge attached with safety mark (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety mark (G40D-8-P02-S501)

Note on model no. selection

Note 1: The "C" light color is Y (yellow) for CE-Marking-compatible parts.
Note 2: Refer to page 1197 for model no. of a back pressure type nozzle.
Note 3: Refer to pages 1212 to 1217 for discrete model no. of options and related components.

Internal structure and parts list



A-A sectional view

C-C sectional view

Parts list

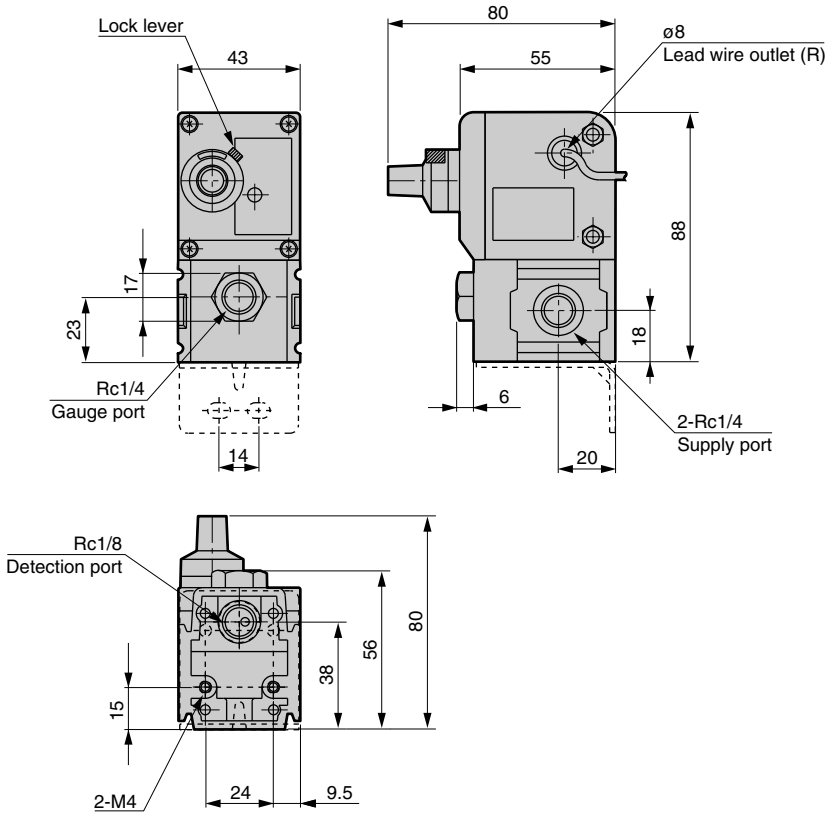
No.	Parts name	Material	No.	Parts name	Material
1	Base	Aluminum	7	Needle holder	Aluminum
2	Body	PBT	8	Needle	Stainless steel
3	Front guard	PBT	9	Lock disk	Brass
4	Orifice nozzle A	Brass	10	Needle shaft	Brass
5	Orifice nozzle B	Brass	11	Proximity switch	–
6	Control needle dial	Aluminum	12	Diaphragm	H-NBR

Repair Parts list

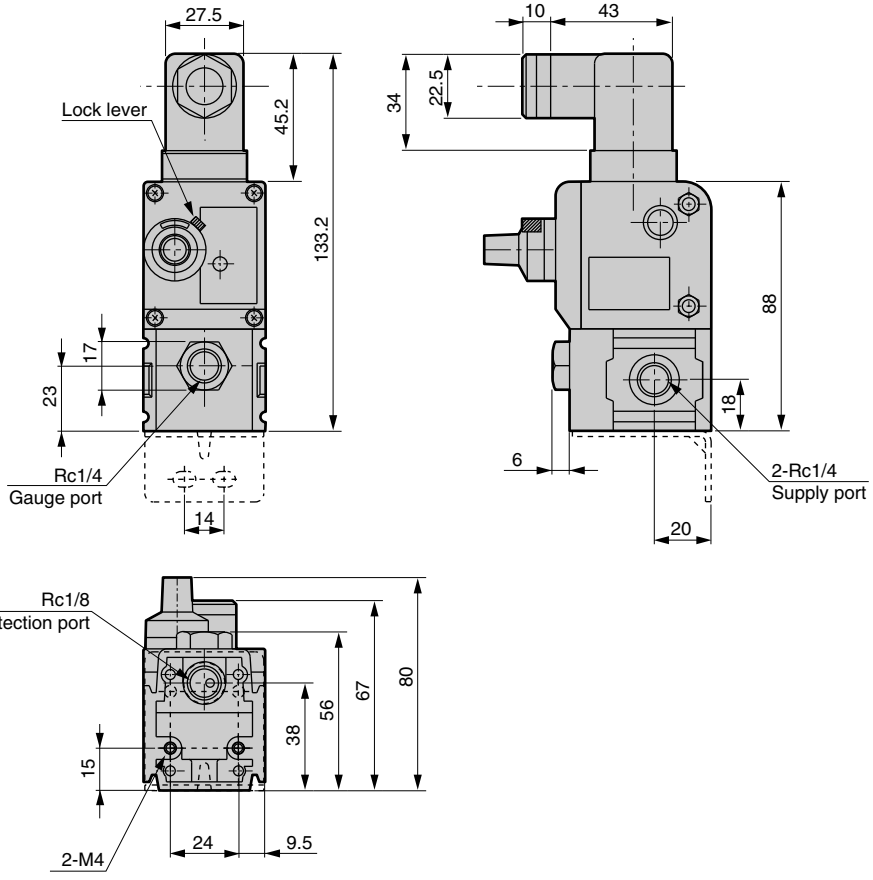
No.	Parts name	Model no.
12	Diaphragm	GPS2-D

Dimensions CAD

● Basic type HPS-*-***$^{R}_{L}$W

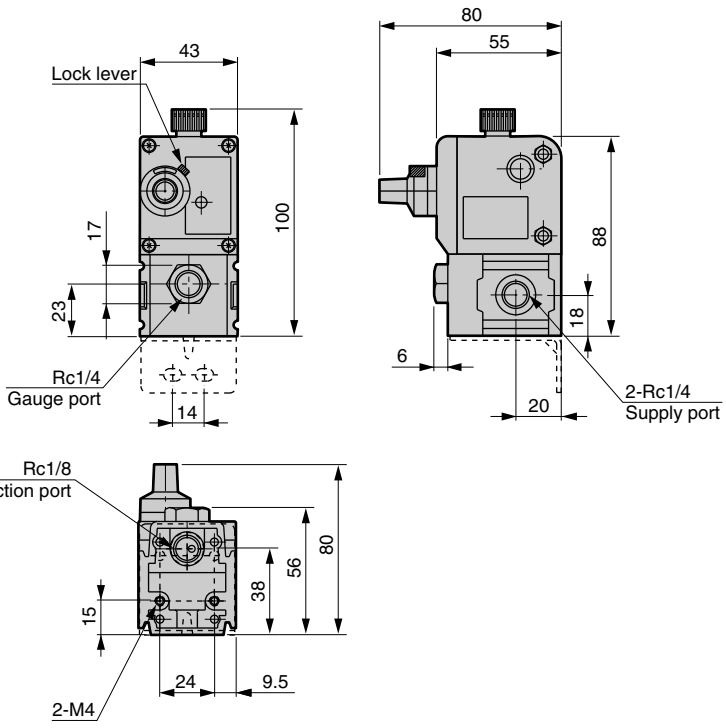


● DIN terminal box type HPS-*-***F

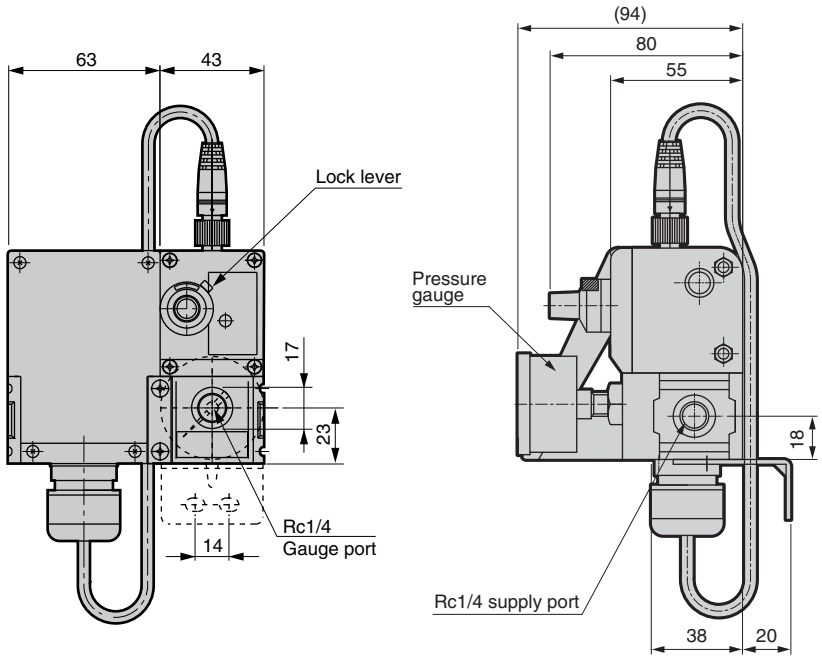


Dimensions

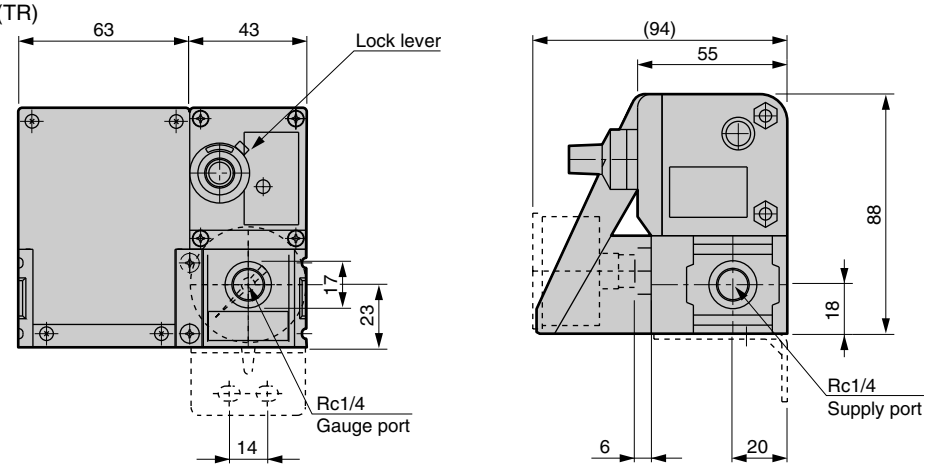
● Connector type HPS-*-*** C0 C1 C3 C5



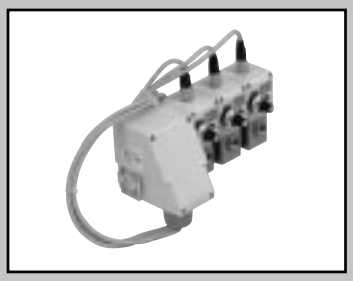
● Connector type common terminal box HPS-*-*** CTL (CTR)



● Lead wire common terminal box HPS-*-*** TL (TR)



● Refer to pages 1212 to 1217 for dimensions of options or peripheral devices.



Close contact confirmation switch manifold

MHPS Series

Refer to Intro 32 for details.

Specifications

Basic specifications are the same as discrete on page 1186.

How to order

MHPS - 05 - 2 N Y TL S - B - G2

- MHPS: Close contact confirmation switch
- 05: A Orifice
- 2: B Station no.
- N: C Output style
- Y: D Light color
- TL: E Electric connection
- S: F ISO compliance, etc. Note 1
- B: G Bracket
- G2: H Pressure gauge

Symbol	Descriptions
A Orifice	
05	ø 0.5
07	ø 0.7
10	ø 1.0
B Station no.	
2	2 stations
3	3 stations
4	4 stations
5	5 stations
C Output style	
N	NPN open collector
P	PNP open collector
D Light color	
G	Green
Y	Yellow
E Electric connection	
F	DIN terminal box (Pg11)
C0	Connector (without cable)
C1	Connector (cable 1m attached)
C3	Connector (cable 3m attached)
C5	Connector (cable 5m attached)
CTL	Connector type common terminal box left assembly
CTR	Connector type common terminal box right assembly
TL	Lead wire type common terminal box left assembly
TR	Lead wire type common terminal box right assembly
T1	Lead wire common terminal box (1st from left)
T2	Lead wire common terminal box (2nd from left)
T3	Lead wire common terminal box (3rd from left)
T4	Lead wire common terminal box (4th from left)
F ISO compliance, etc.	
S (Note 1)	CE marking products
G Bracket	
Blank	Without bracket
B	With bracket
H Pressure gauge	
Blank	Without pressure gauge
G2	Pressure gauge attached with safety mark (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety mark (G40D-8-P02-S501)

Note on model no. selection

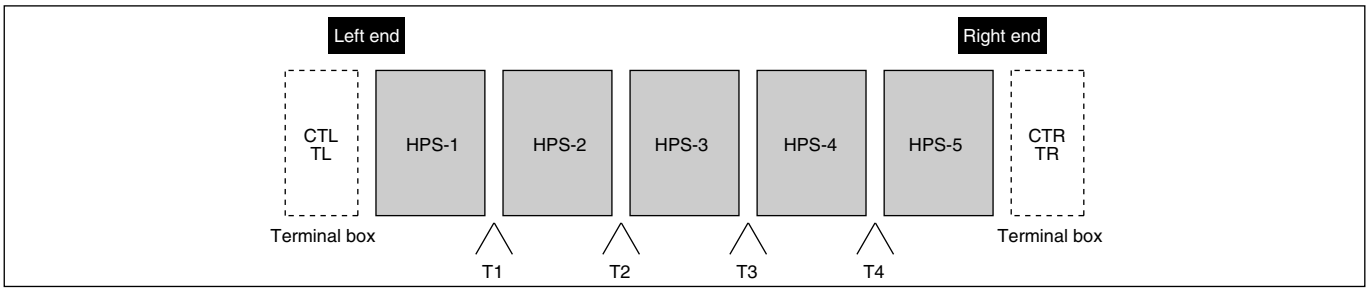
Note 1: The "D" light color is Y (yellow) for CE-Marking-compatible parts.
Note 2: Refer to page 1197 for model no. of a back pressure type nozzle.
Note 3: Refer to pages 1212 to 1217 for discrete model no. of options and related components.

Protective structure

Electric connection	Protective structure
T*	IP66 or equivalent
CT*	IP67 or equivalent
F*	IP64 or equivalent
C*	IP67 or equivalent

Note: This product must be used under the following conditions:
(1) Piping and wiring must be completed and pressure applied.
(2) A water-proof bushing must be used on the wires to the terminal box.

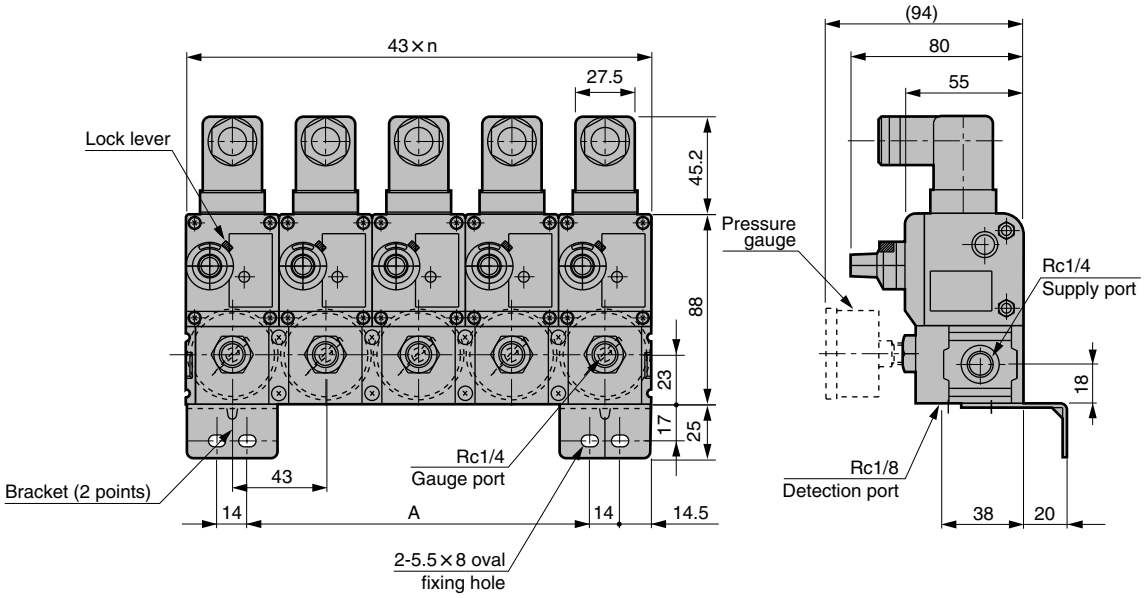
Terminal box installation position diagram



Dimensions

● Manifold type (DIN terminal box: F)

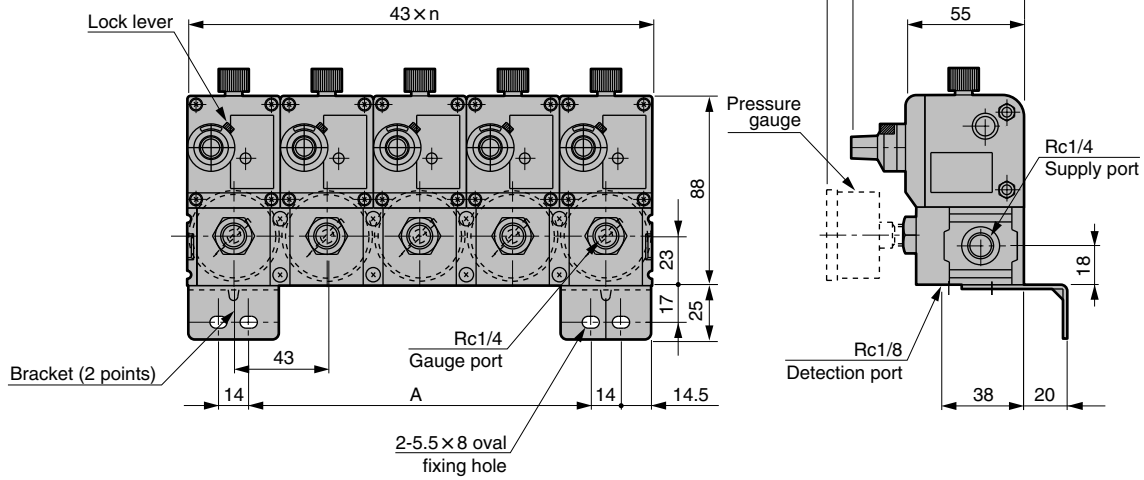
● MHPS-*-*** F



Station no.	n	A
2 stations	2	29
3 stations	3	72
4 stations	4	115
5 stations	5	158

● Manifold type (connector: C*)

● MHPS-*-*** C0 C1 C3 C5

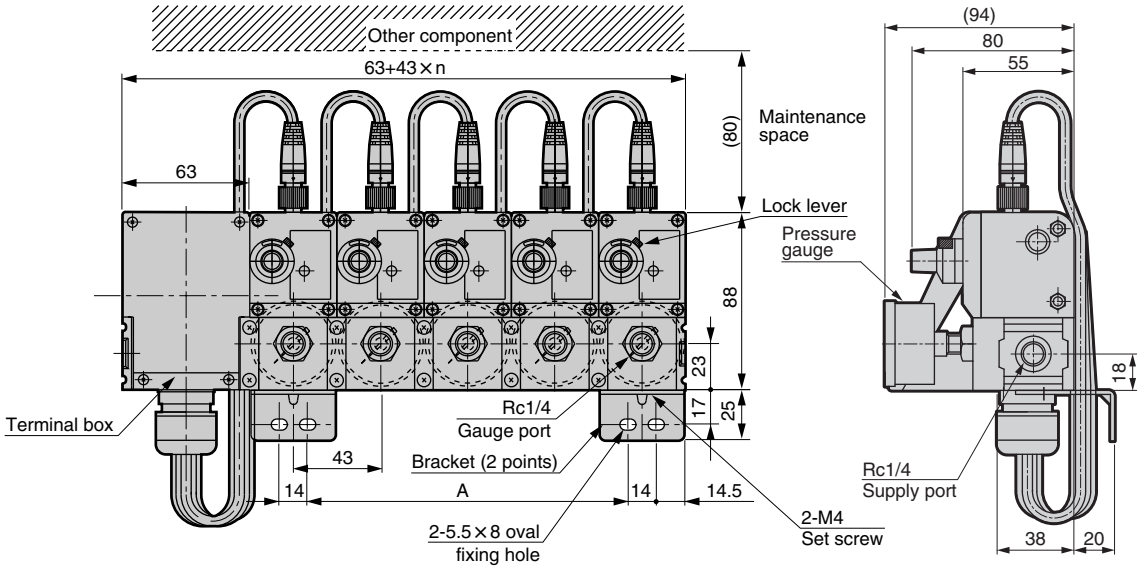


Station no.	n	A
2 stations	2	29
3 stations	3	72
4 stations	4	115
5 stations	5	158

Dimensions CAD

● Manifold type (connector type common terminal box: CTL/CTR)

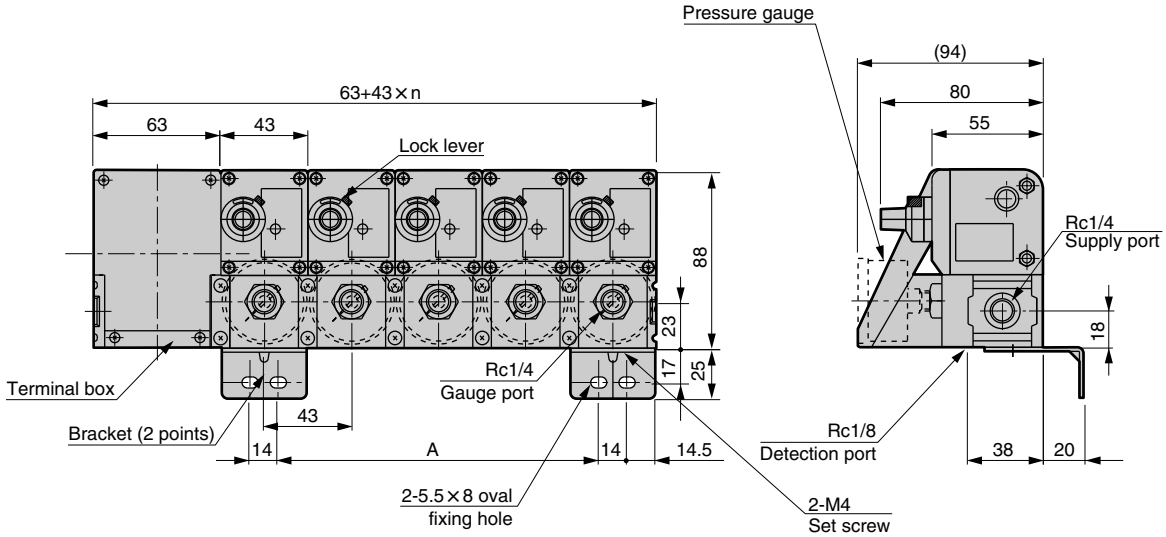
● MHPS-*-*** CTL (CTR)



Station no.	n	A
2 stations	2	29
3 stations	3	72
4 stations	4	115
5 stations	5	158

● Manifold type (lead wire type common terminal box: TL/TR)

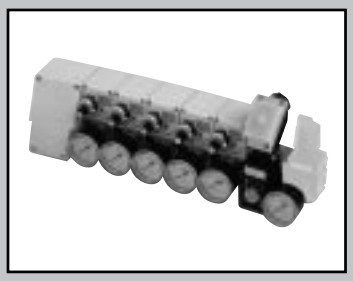
● MHPS-*-*** TL (TR)



Station no.	n	A
2 stations	2	29
3 stations	3	72
4 stations	4	115
5 stations	5	158

● Refer to pages 1212 to 1217 for dimensions of options or peripheral devices.

MEMO



Close contact confirmation switch unit

UHPS Series

● Solenoid valve with needle, regulator integrated general purpose unit

CE Refer to Intro 32 for details. RoHS CAD

Specifications

Basic specifications are the same as discrete on page 1186.

How to order

UHPS - 05 - 2 N G TL S - B - GW2 - 3H - 1

- UHPS: Close contact confirmation switch
- Ⓐ Orifice: 05
- Ⓑ Station no.: 2
- Ⓒ Output style: N
- Ⓓ Light color: G
- Ⓔ Electric connection: TL
- Ⓕ ISO compliance, etc. Note 1: S
- Ⓖ Bracket: B
- Ⓗ Pressure gauge: GW2
- Ⓘ Solenoid valve electric wire connection type Note 1: 3H
- Ⓙ Solenoid valve voltage: 1

Symbol	Descriptions
Ⓐ Orifice	
05	ø 0.5
07	ø 0.7
10	ø 1.0
Ⓑ Station no.	
1	1 station
2	2 stations
3	3 stations
4	4 stations
5	5 stations
Ⓒ Output style	
N	NPN open collector
P	PNP open collector
Ⓓ Light color	
G	Green
Y	Yellow
Ⓔ Electric connection	
F	DIN terminal box (Pg11)
C0	Connector (without cable)
C1	Connector (cable 1m attached)
C3	Connector (cable 3m attached)
C5	Connector (cable 5m attached)
CTL	Connector type common terminal box left assembly
CTR	Connector type common terminal box right assembly
TL	Lead wire type common terminal box left assembly
TR	Lead wire type common terminal box right assembly
Ⓕ ISO compliance, etc.	
S (Note 1)	CE marking products
Ⓖ Bracket	
Blank	Without bracket
B	With bracket
Ⓗ Pressure gauge	
Blank	None
GW2	Pressure gauge assembly with safety mark (G40D-8-P02-S501)
Ⓘ Solenoid valve electric connection type	
2E	DIN terminal box
2H	DIN terminal box with indicator light
3H	Square terminal box with indicator light
Ⓙ Solenoid valve voltage	
1	100 VAC
2	200 VAC
3	24 VDC

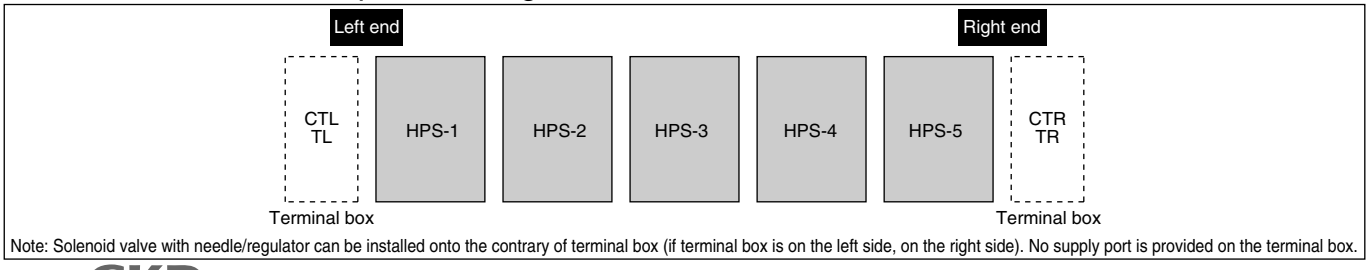
Note on model no. selection

Note 1: The "D" light color is Y (yellow) for CE-Marking-compatible parts. 2E or 2H is selected for solenoid valve electric wire connection.

Note 2: Refer to page 1197 for model no. of a back pressure type nozzle.

Note 3: Refer to pages 1212 to 1217 for discrete model no. of options and related components.

Terminal box installation position diagram

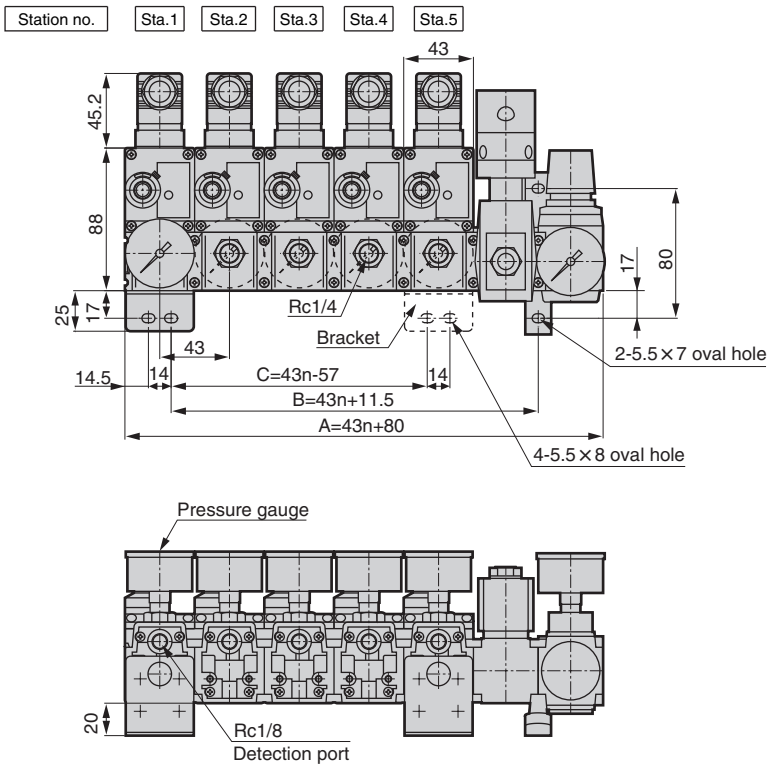


Note: Solenoid valve with needle/regulator can be installed onto the contrary of terminal box (if terminal box is on the left side, on the right side). No supply port is provided on the terminal box.

Dimensions

● Unit type (DIN terminal box: F)

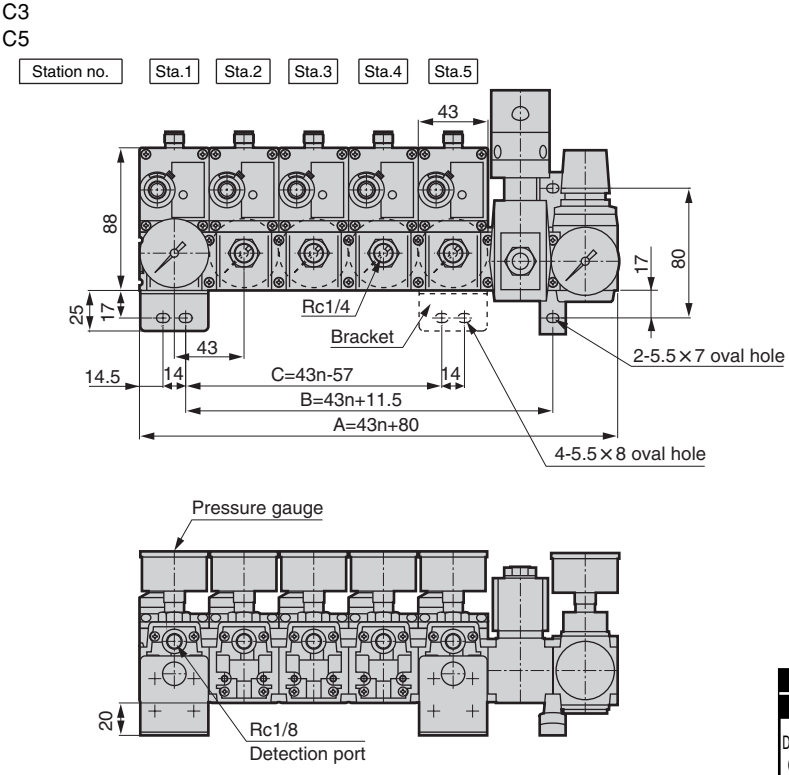
● UHPS-*-*** F



		Station no.				
		1	2	3	4	5
Dimension (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2

● Unit type (connector: C*)

● UHPS-*-*** C0 C1 C3 C5

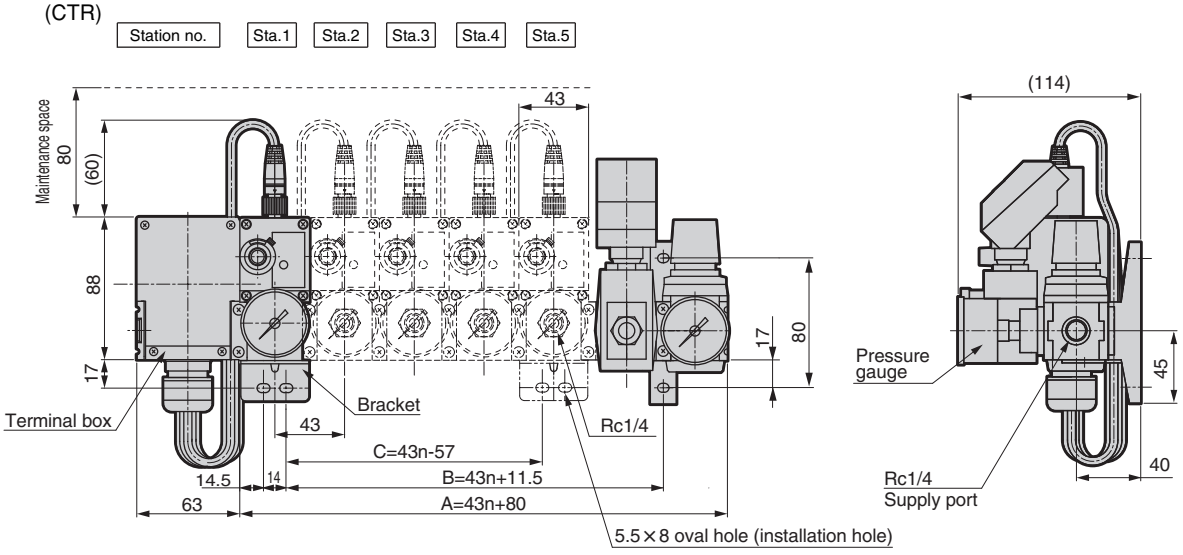


		Station no.				
		1	2	3	4	5
Dimension (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2

Dimensions CAD

● Unit type (connector type common terminal box: CTL/CTR)

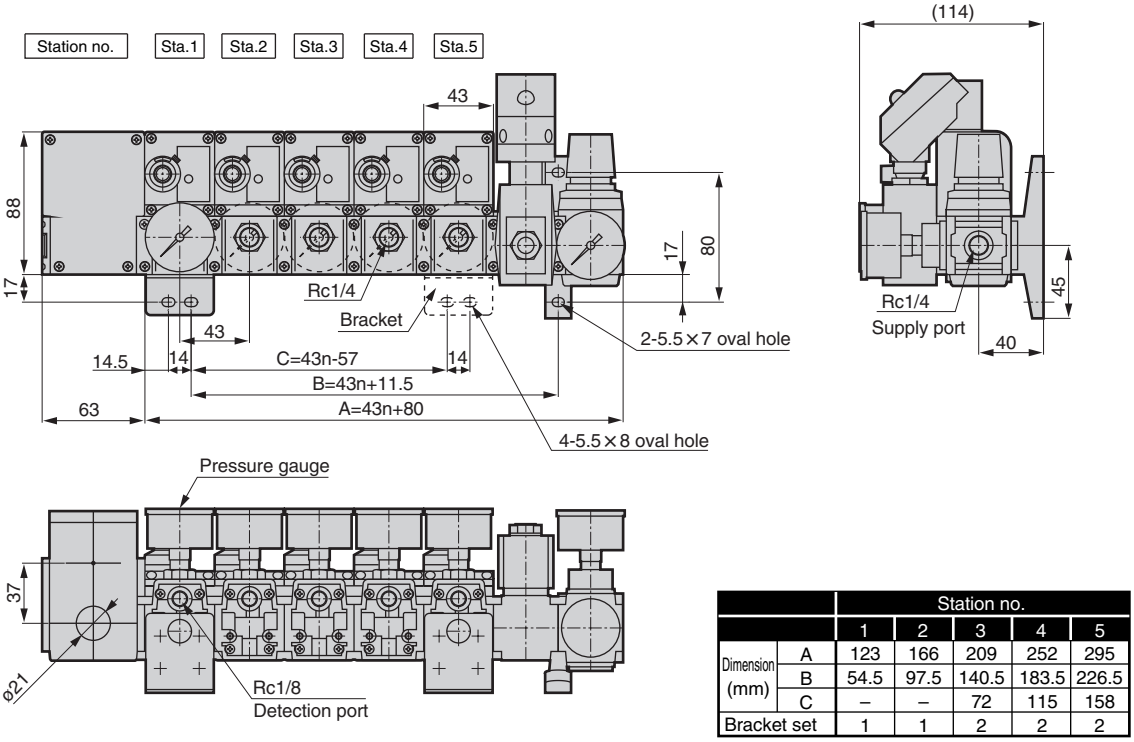
● UHPS-*-*** CTL (CTR)



		Station no.				
		1	2	3	4	5
Dimension (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2

● Unit type (lead wire type common terminal box: TL/TR)

● UHPS-*-*** TL (TR)



		Station no.				
		1	2	3	4	5
Dimension (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2

● Refer to pages 1212 to 1217 for dimensions of options or peripheral devices.

Optional nozzle

How to order

APA4 - DA 10

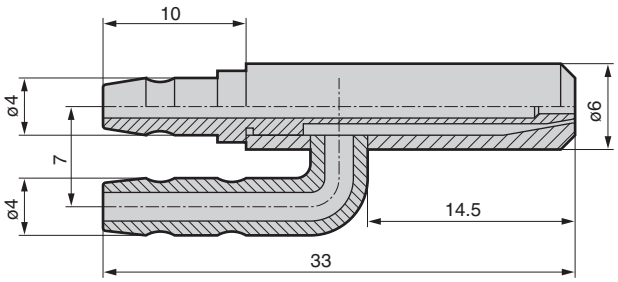
Symbol	Descriptions
DA10	O.D. ø6, back pressure type nozzle
DA20	O.D. M6×P0.5, back pressure type nozzle
DH10	Back pressure type nozzle embedding

Note 1: Optional nozzle is combined with HPS-05.
Note 2: Refer to Page 1219 for the characteristics data.
Note 3: When using HPS with standard specifications, use a single-hole nozzle the same as for the GPS2. (Refer to page 1183)

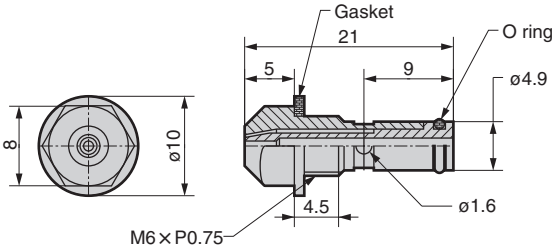
Dimensions

● Back pressure type nozzle CAD

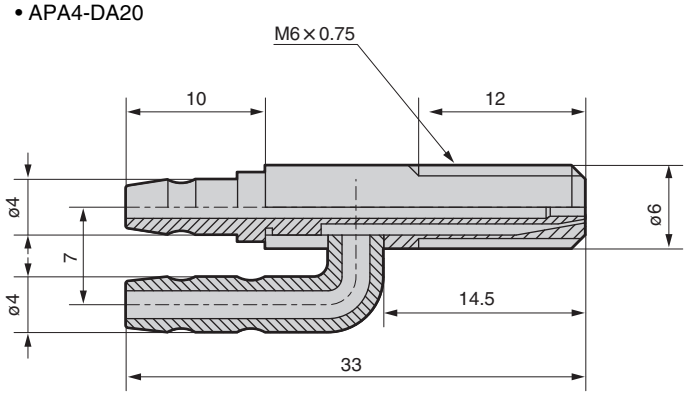
• APA4-DA10



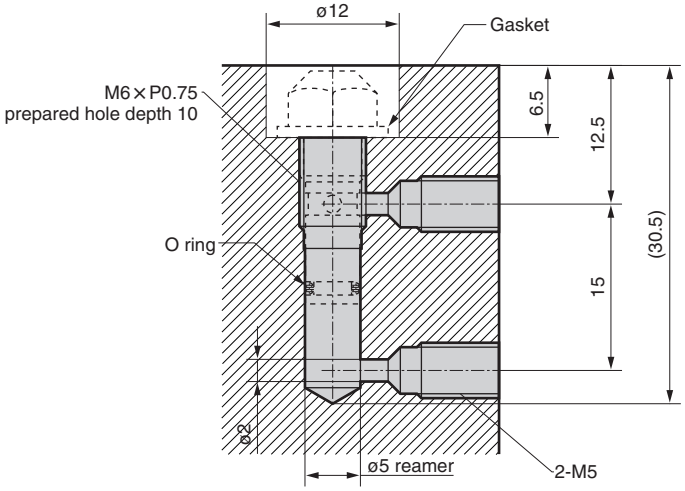
APA4-DH10

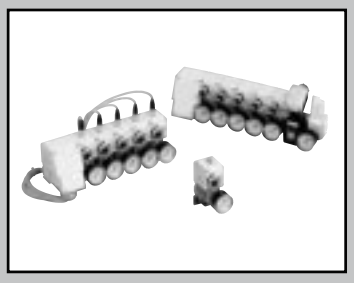


• APA4-DA20



● Example of embedding type jig design





Cutting tool broken detection switch

TLPS/MTLPS/UTLPS Series

RoHS

Overview

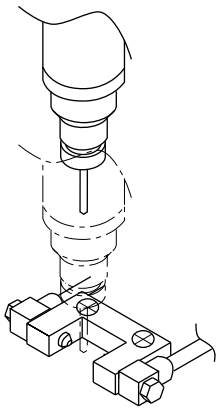
The cutting tool broken detection switch TLPS Series is an air sensor used to detect broken or chipped drills and taps used in the metal machining line.
A detected nozzle unit is used for the detection nozzle to match the cutting tool. This switch is also used in an adverse environment, which is one of the features of the air sensor.

Features

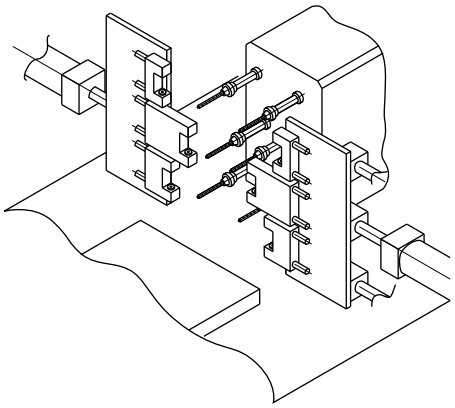
- Shorter machining tact
  Since noncontact detection makes it possible to detect the state while the tool is rotating, tact time is shortened compared to the conventional.
- Compatible with adverse environments
  Self-cleaning by the air nozzle enables use even in environments where coolant or swarf scatter.
- Small-diameter drill and cutting edge chipping detection
  Chips are detected on a 0.3 small diameter drill or 1mm drill tip.
- Low air consumption
  This switch is used with low pressure so air consumption is reduced. (3 ℓ /min. (ANR) at 50kPa)
- High stability
  Stable cutting tool breakage, unaffected by fluctuations in supply pressure, is detectable with the air bridge.
- Easy adjustment
  The highly accurate needle with lock mechanism with dial scale makes it possible to adjust the detection position easily with no worry of deviation.
- Modularization
  Modularization makes it easy to connect to the CKD module connection component.

Example of cutting tool broken detection applications

- Nozzle unit fixed

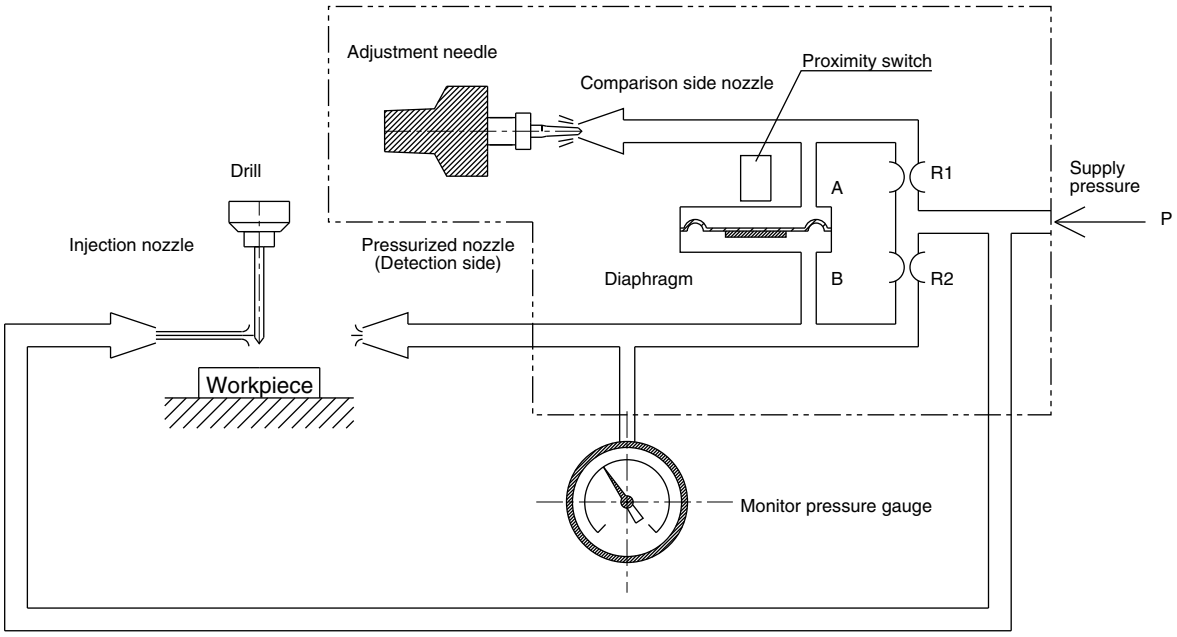


- Detecting nozzles moving



Operational explanation

● Diagram of TLPS (facing) principle



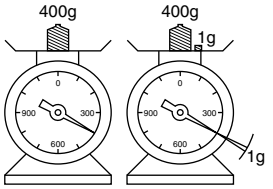
● Detecting nozzles

Two nozzles are used facing. A small amount of detection air is passed from the nozzle pressurized through the TLPS switch, and exhausted from nozzles. Conversely, air injected from the injection nozzle collides with detection air. When air collides, the back pressure of the nozzle pressurized rises, and the proximity switch in the TLPS switch is activated, generating an electrical signal. If there is a drill or other object between facing nozzles, injection air is diffused and does not reach the nozzle pressurized, so the proximity switch in the TLPS is not activated.

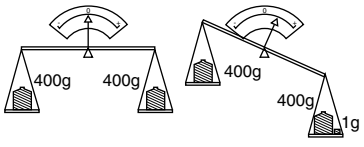
● Cutting tool broken detection switch

The difference of pressure when a drill is present and absent is amplified by the air bridge circuit. When expressed as a scale, the balance is the bridge type. The air bridge circuit detects micro-fluctuations in pressure highly accurately. If detected pressure when a drill is present is P1, and the detected pressure when a drill is absent is P2, then,
Adjusted pressure = (P1 + P2) / 2

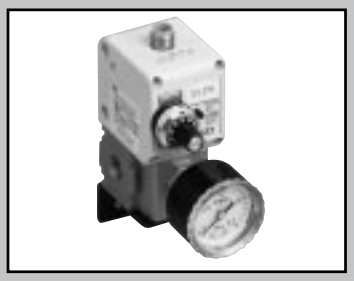
If the drill is present, then P1 is smaller than the adjusted pressure and the diaphragm lowers. If the drill is absent, then P2 is greater than the adjusted pressure, so the diaphragm rises, the proximity switch is activated, and an electrical signal is generated.



Spring scale



Balance



Cutting tool broken detecting switch discrete

TLPS Series

CE Refer to Intro 32 for details. RoHS CAD

Specifications

Descriptions			TLPS-03		
Orifice		mm	ø0.3		
Working pressure range		(Note 2) kPa	50 to 200 (recommended 100)		
Detection cutting tool diameter		mm	ø0.3 to 30		
Power voltage		V	DC10 to 27		
Current consumption		mA	15 or less (at 24 VDC)		
Output style			NPN,PNP open collector		
Output rated			30 VDC, 100mA or less		
Internal voltage drop		V	1.5 or less (at 100mA)		
Indicator light and signal	At drill broken		Yellow light ON, output ON		
	At drill normal		Yellow light OFF, output OFF		
Cutting edge detecting position			1 mm and over from end		
Insulation resistance			10MΩ and over with 500 VDC mega		
Withstand voltage			No failure impressed at 1000 VAC for one minute		
Withstanding vibration		m/sec²	98		
Working temperature		˚C	5 to 60		
Protective structure		(Note 1)	IP67 or equivalent (connector type), IP64 or equivalent (DIN)		
Piping size		mm	Inner diameter 4		
Port size			Detection port Rc1/8, supply port Rc1/4, pressure gauge port Rc1/4		
Weight		g	300		
Air consumption ℓ/min. (ANR) *Air consumption Value when CKD standard nozzle is selected.	Nozzle type		TLPS-J0310	TLPS-J0510	TLPS-J0715
	50	kPa	2.8	4.8	6.6
	100	kPa	4.2	7.2	9.7
	200	kPa	6.6	11.1	15.1

Note 1: This product must be used under the following conditions:
(1) Piping and wiring must be completed and pressure applied.
(2) A water-proof bushing must be used on the wires to the terminal box.
Note 2: If the nozzle clogs, supply pressure should be set between 100 and 200 kPa.

How to order

TLPS - 03 - N Y TL S - B - GW2

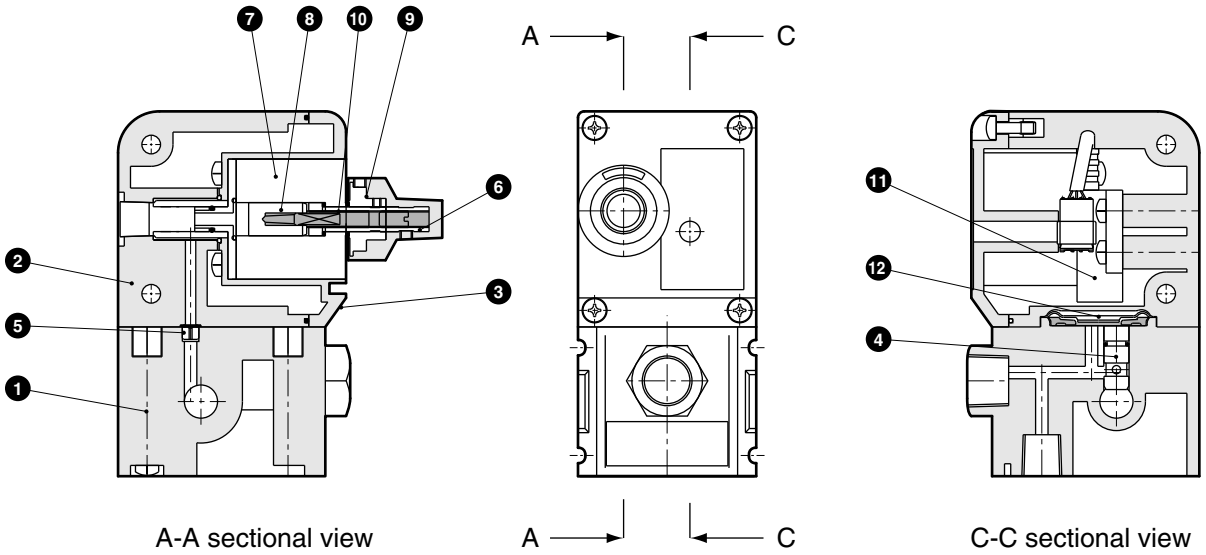
- TLPS: Cutting tool broken detecting switch
- 03: A Orifice
- N: B Output style
- Y: C Light color
- TL: D Electric connection
- S: E ISO compliance, etc.
- B: F Bracket
- GW2: G Pressure gauge

Symbol	Descriptions
A Orifice	
03	For 0.3 dia. detecting nozzle
B Output style	
N	NPN open collector
P	PNP open collector
C Light color	
Y	Yellow
D Electric connection	
F	DIN terminal box (Pg11)
C0	Connector (without cable)
C1	Connector (cable 1m attached)
C3	Connector (cable 3m attached)
C5	Connector (cable 5m attached)
CTL	Connector type common terminal box left assembly
CTR	Connector type common terminal box right assembly
TL	Lead wire type common terminal box left assembly
TR	Lead wire type common terminal box right assembly
R	Lead wire direction right (left end for mounting)
L	Lead wire direction left (right end for mounting)
W	Lead wire direction both sides (intermediate for mounting)
E ISO compliance, etc.	
S	CE marking products
F Bracket	
Blank	Without bracket
B	With bracket
G Pressure gauge	
Blank	Without pressure gauge
G2	Pressure gauge attached with safety mark (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety mark (G40D-8-P02-S501)

Note on model no. selection

Note 1: Refer to page 1211 for model no. of detecting nozzle.
Note 2: Refer to pages 1212 to 1217 for discrete model no. of options and peripheral devices.

Internal structure and part list



A-A sectional view

C-C sectional view

Parts list

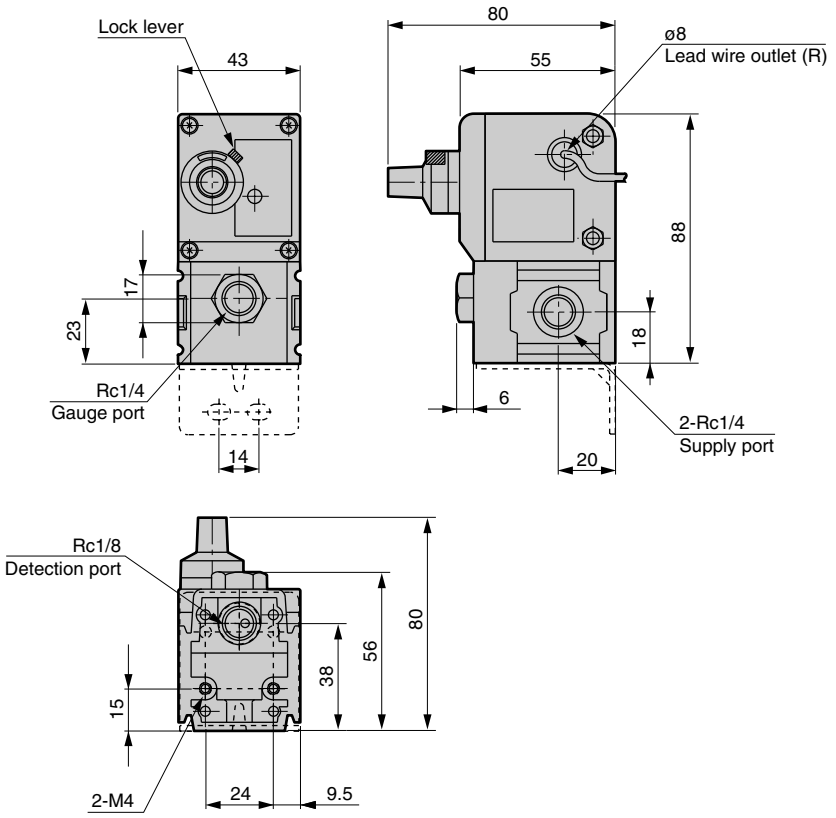
No.	Parts name	Material	No.	Parts name	Material
1	Base	Aluminum	7	Needle holder	Aluminum
2	Body	PBT	8	Needle	Stainless steel
3	Front guard	PBT	9	Lock disk	Brass
4	Orifice nozzle A	Brass	10	Needle shaft	Brass
5	Orifice nozzle B	Brass	11	Proximity switch	–
6	Control needle dial	Aluminum	12	Diaphragm	H-NBR

Repair Parts list

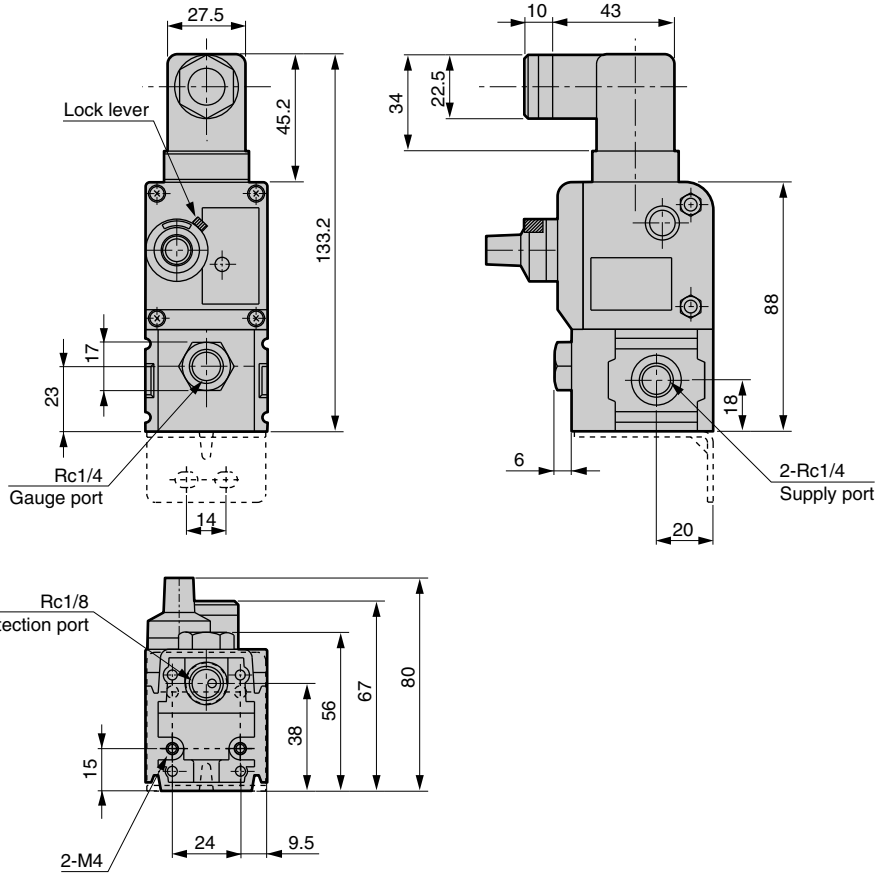
No.	Parts name	Model no.
12	Diaphragm	GPS2-D

Dimensions CAD

R
● Basic type TLPS-03-** L
W

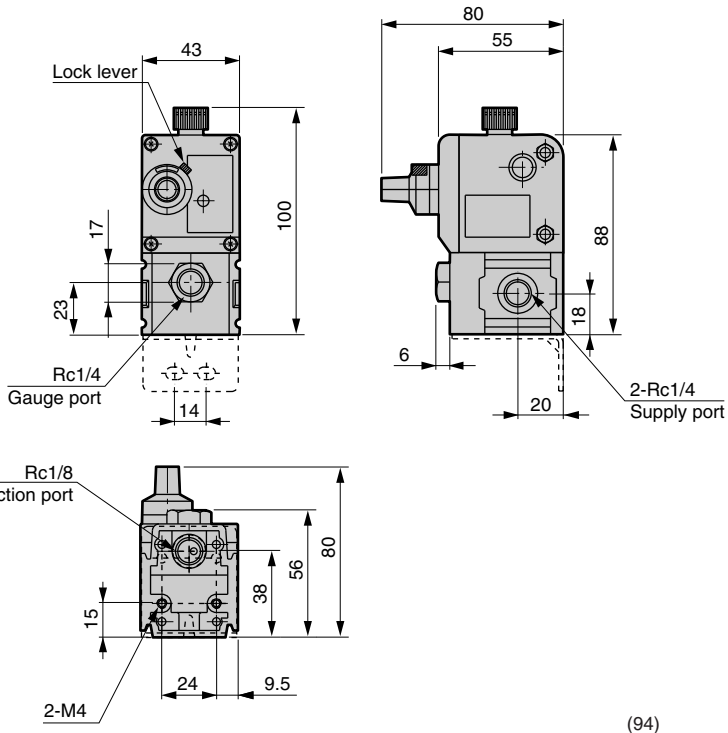


● DIN terminal box type TLPS-03-**F

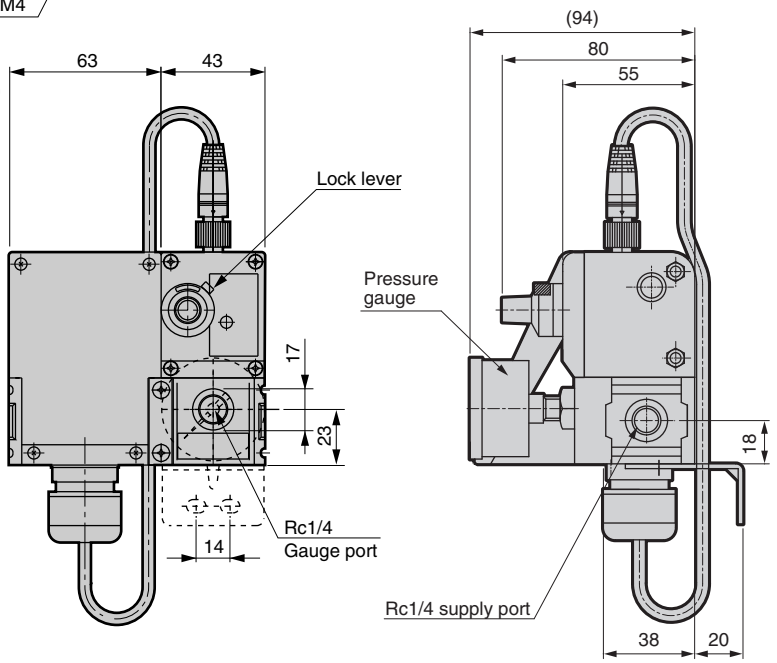


Dimensions

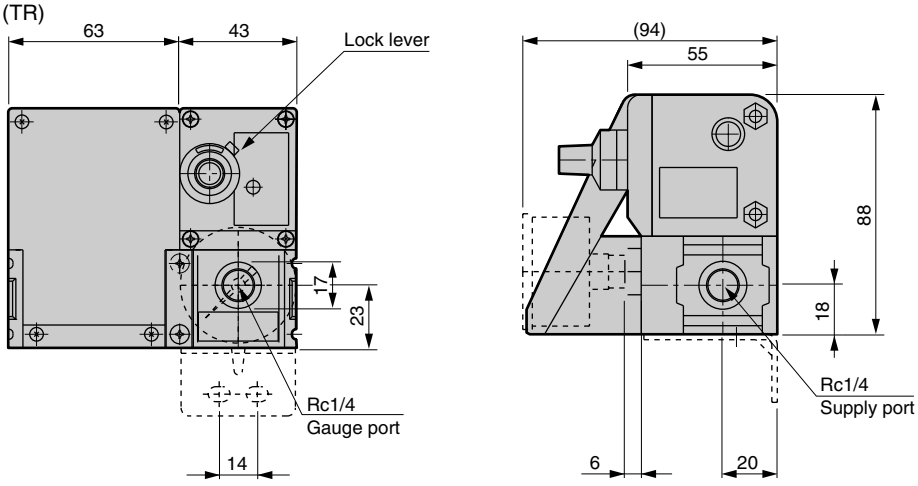
● Connector type TLPS-03-** C0 C1 C3 C5



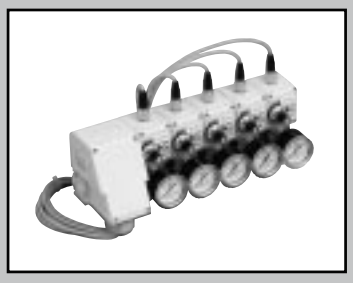
● Connector type common terminal box TLPS-03-** CTL (CTR)



● Lead wire type common terminal box TLPS-03-** TL (TR)



● Refer to pages 1212 to 1217 for dimensions of options or peripheral devices.



Cutting tool broken detecting switch manifold

MTLPS Series

Refer to Intro 32 for details.

Specifications

Basic specifications are the same as discrete on page 1200.

How to order

MTLPS - 03 - 2 N Y TL S - B - GW2

- MTLPS: Cutting tool broken detecting switch
- 03: Ⓐ Orifice
- 2: Ⓑ Station no.
- N: Ⓒ Output style
- Y: Ⓓ Light color
- TL: Ⓔ Electric connection
- S: Ⓕ ISO compliance, etc.
- B: Ⓖ Bracket
- GW2: Ⓗ Pressure gauge

Symbol	Descriptions
Ⓐ Orifice	
03	For 0.3 dia. detecting nozzle
Ⓑ Station no.	
2	2 stations
3	3 stations
4	4 stations
5	5 stations
Ⓒ Output style	
N	NPN open collector
P	PNP open collector
Ⓓ Light color	
Y	Yellow
Ⓔ Electric connection	
F	DIN terminal box (Pg11)
C0	Connector (without cable)
C1	Connector (cable 1m attached)
C3	Connector (cable 3m attached)
C5	Connector (cable 5m attached)
CTL	Connector type common terminal box left assembly
CTR	Connector type common terminal box right assembly
TL	Lead wire type common terminal box left assembly
TR	Lead wire type common terminal box right assembly
T1	Lead wire type common terminal box intermediate assembly (1st from left)
T2	Lead wire type common terminal box intermediate assembly (2nd from left)
T3	Lead wire type common terminal box intermediate assembly (3rd from left)
T4	Lead wire type common terminal box intermediate assembly (4th from left)
Ⓕ ISO compliance, etc.	
S	CE marking products
Ⓖ Bracket	
Blank	Without bracket
B	With bracket
Ⓗ Pressure gauge	
Blank	Without pressure gauge
G2	Pressure gauge attached with safety mark (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety mark (G40D-8-P02-S501)

Note on model no. selection

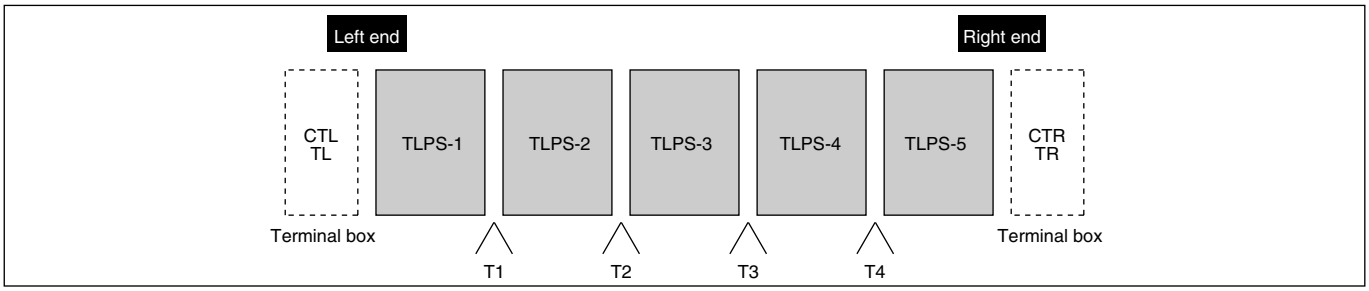
Note 1: Refer to page 1211 for model no. of detecting nozzle.
Note 2: Refer to pages 1212 to 1217 for discrete model no. of options and peripheral devices.

Protective structure

Electric connection	Protective structure
T*	IP66 or equivalent
CT*	IP67 or equivalent
F*	IP64 or equivalent
C*	IP67 or equivalent

Note: This product must be used under the following conditions:
(1) Piping and wiring must be completed and pressure applied.
(2) A water-proof bushing must be used on the wires to the terminal box.

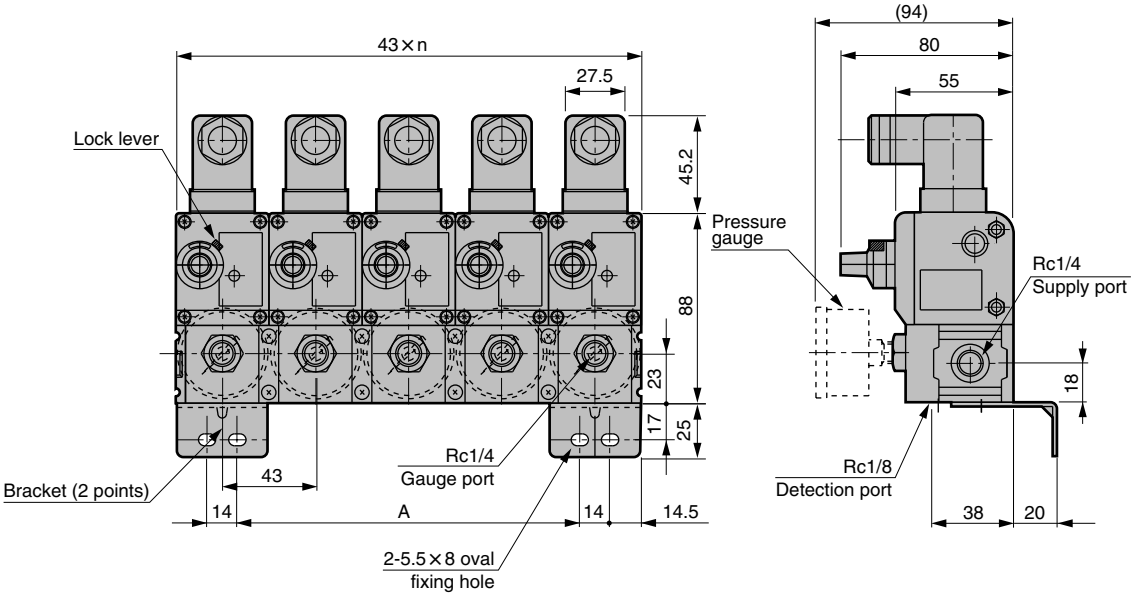
Terminal box installation position diagram



Dimensions CAD

● Manifold type (DIN terminal box: F)

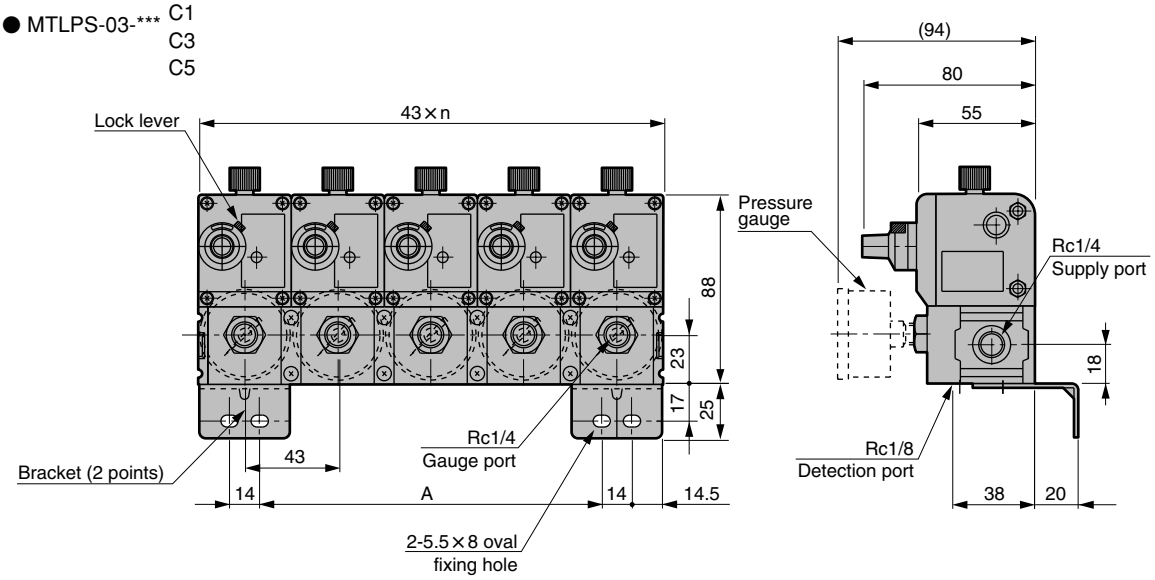
● MTLPS-03-*** F



Station no.	n	A
2 stations	2	29
3 stations	3	72
4 stations	4	115
5 stations	5	158

● Manifold type (connector: C*)

● MTLPS-03-*** C0 C1 C3 C5

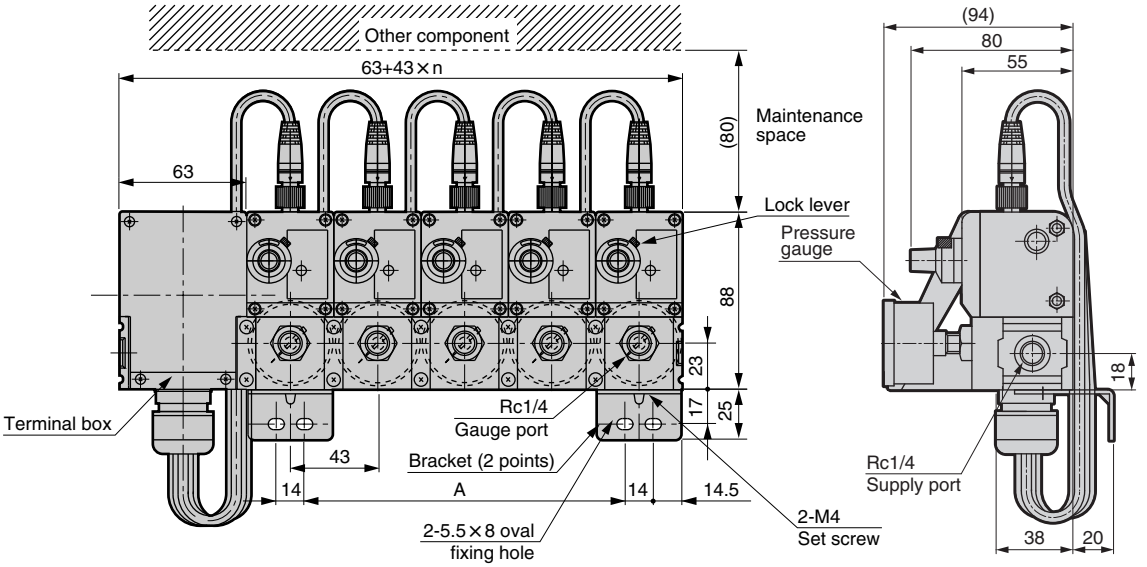


Station no.	n	A
2 stations	2	29
3 stations	3	72
4 stations	4	115
5 stations	5	158

Dimensions CAD

● Manifold type (connector type common terminal box: CTL/CTR)

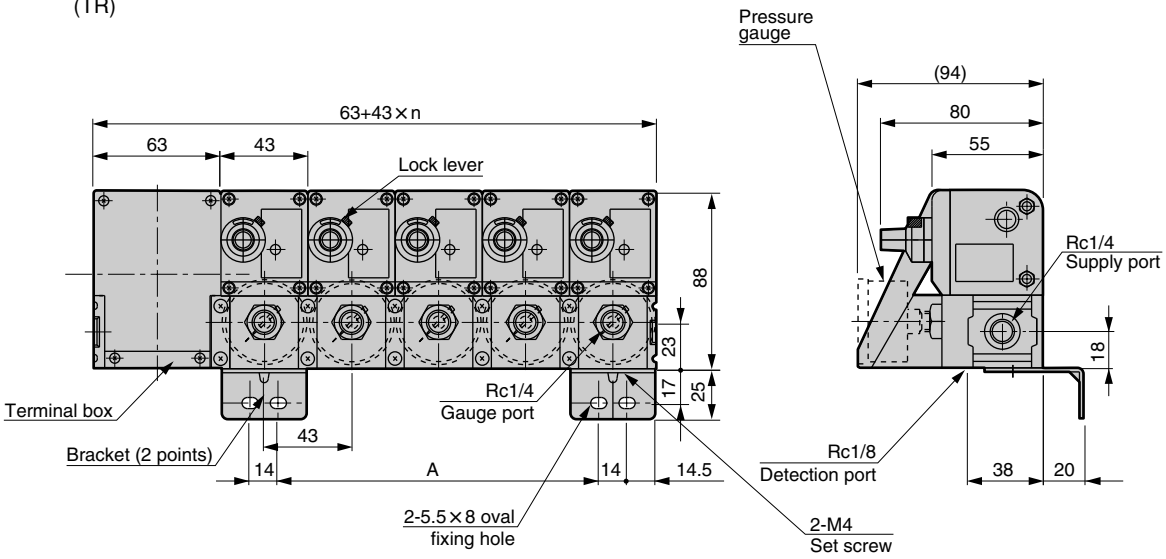
● MTLPS-03-*** CTL (CTR)



Station no.	n	A
2 stations	2	29
3 stations	3	72
4 stations	4	115
5 stations	5	158

● Manifold type (lead wire type common terminal box: TL/TR)

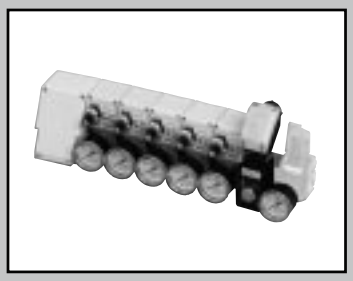
● MTLPS-03-*** TL (TR)



Station no.	n	A
2 stations	2	29
3 stations	3	72
4 stations	4	115
5 stations	5	158

● Refer to pages 1212 to 1217 for dimensions of options or peripheral devices.

MEMO



Cutting tool broken detecting switch unit

UTLPS Series

● Solenoid valve with needle, regulator integrated general purpose unit

CE Refer to Intro 32 for details. RoHS CAD

Specifications

Basic specifications are the same as discrete on page 1200.

How to order

UTLPS - 03 - 2 N Y TL S - B - GW2 - 3H - 1

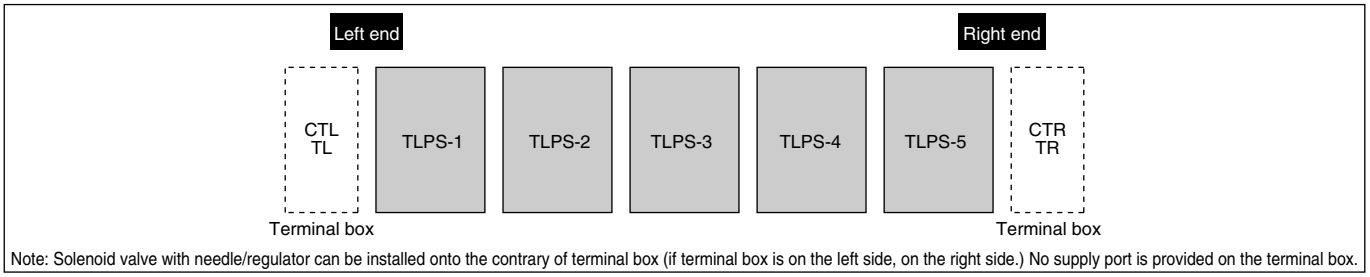
- UTLPS: Cutting tool broken detecting switch
- Ⓐ 03: Orifice
- Ⓑ 2: Station no.
- Ⓒ N: Output style
- Ⓓ Y: Light color
- Ⓔ TL: Electric connection
- Ⓕ S: ISO compliance, etc.
- Ⓖ B: Bracket
- Ⓗ GW2: Pressure gauge
- Ⓘ 3H: Solenoid valve electric wire connection type Note 3
- Ⓙ 1: Solenoid valve voltage

Symbol	Descriptions
Ⓐ Orifice	
03	For 0.3 dia. detecting nozzle
Ⓑ Station no.	
1	1 station
2	2 stations
3	3 stations
4	4 stations
5	5 stations
Ⓒ Output style	
N	NPN open collector
P	PNP open collector
Ⓓ Light color	
Y	Yellow
Ⓔ Electric connection	
F	DIN terminal box (Pg11)
C0	Connector (without cable)
C1	Connector (cable 1m attached)
C3	Connector (cable 3m attached)
C5	Connector (cable 5m attached)
CTL	Connector type common terminal box left assembly
CTR	Connector type common terminal box right assembly
TL	Lead wire type common terminal box left assembly
TR	Lead wire type common terminal box right assembly
Ⓕ ISO compliance, etc.	
S	CE marking products
Ⓖ Bracket	
Blank	Without bracket
B	With bracket
Ⓗ Pressure gauge	
Blank	None
GW2	Pressure gauge assembly with safety mark (G40D-8-P02-S501)
Ⓘ Solenoid valve electric connection type	
2E	DIN terminal box
2H	DIN terminal box with indicator light
3H	Square terminal box with indicator light
Ⓙ Solenoid valveVoltage	
1	100 VAC
2	200 VAC
3	24 VDC

Note on model no. selection

Note 1: Refer to page 1211 for model no. of detecting nozzle.
Note 2: Refer to pages 1212 to 1217 for discrete model no. of options and peripheral devices.
Note 3: Select the "I" Solenoid valve wire connection from 2E or 2H for CE-Marking-compatible parts.

Terminal box installation position diagram

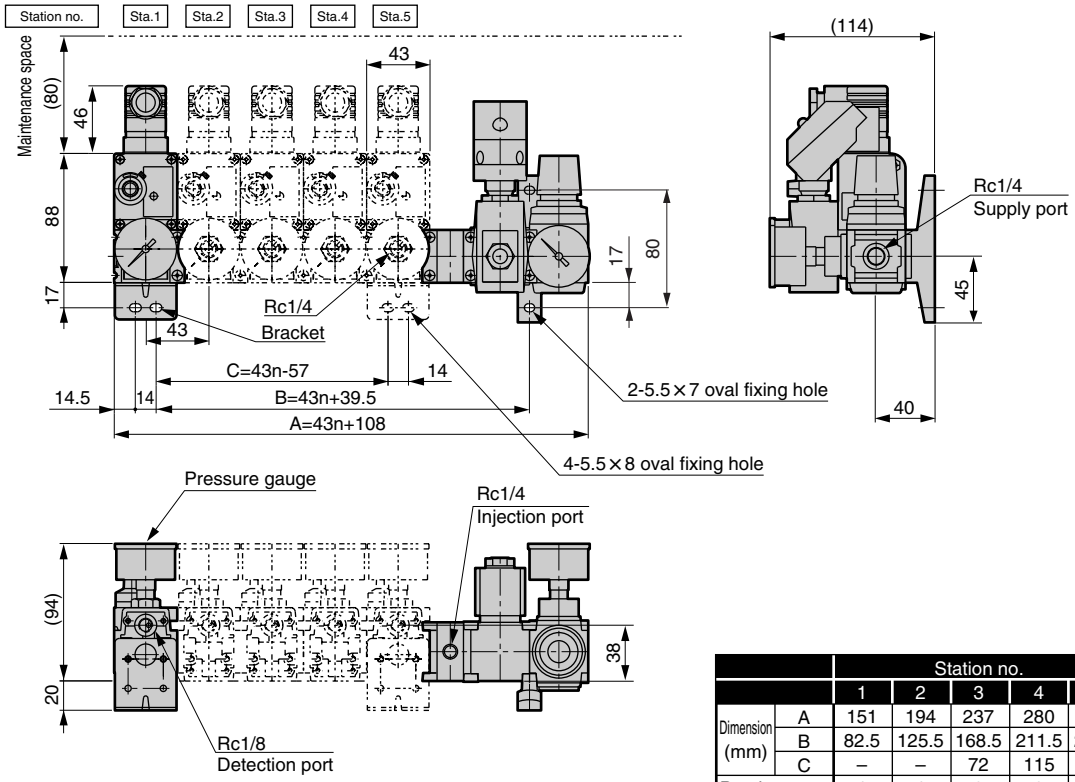


Note: Solenoid valve with needle/regulator can be installed onto the contrary of terminal box (if terminal box is on the left side, on the right side.) No supply port is provided on the terminal box.

Dimensions CAD

● Unit type (DIN terminal box: F)

● UTLPS-03-*** F

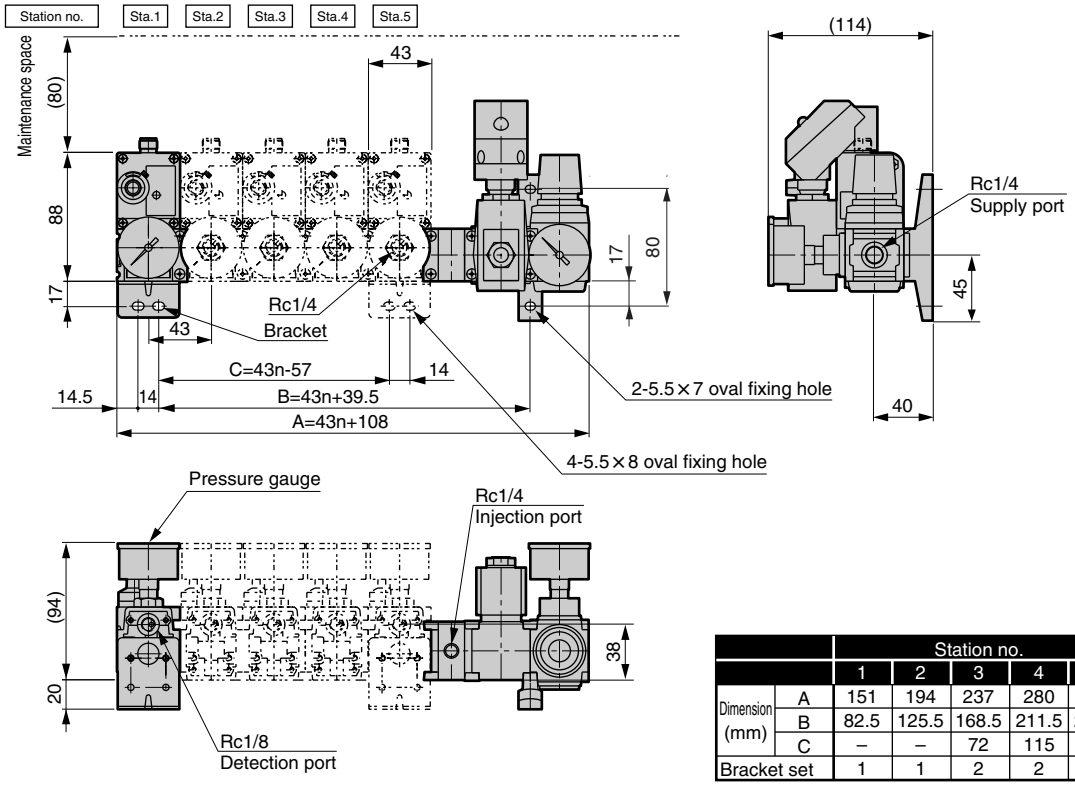


		Station no.				
		1	2	3	4	5
Dimension (mm)	A	151	194	237	280	323
	B	82.5	125.5	168.5	211.5	254.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2

● Unit type (connector: C*)

C0
C1
C3
C5

● UTLPS-03-***

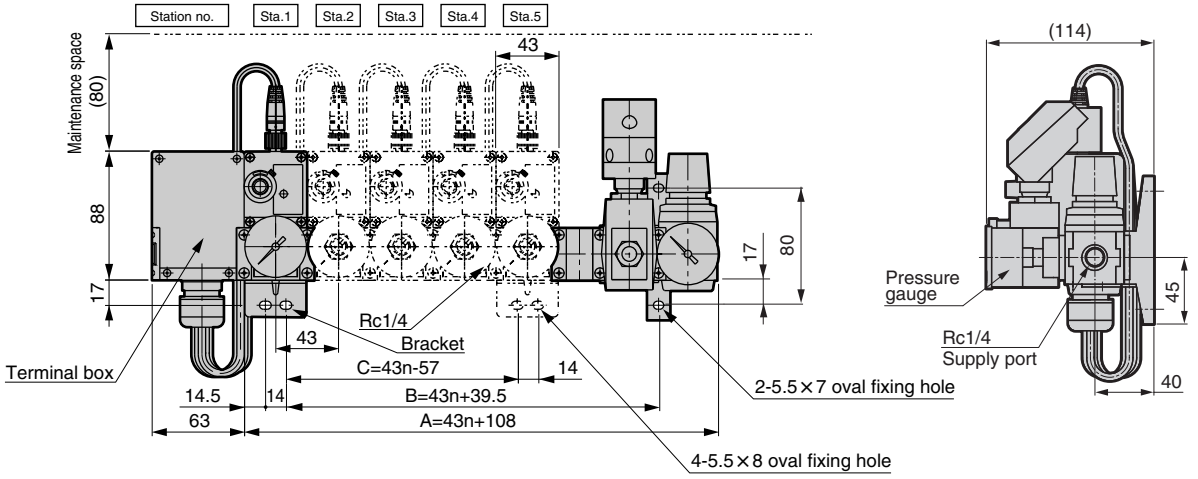


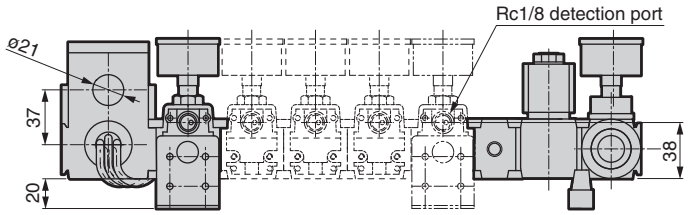
		Station no.				
		1	2	3	4	5
Dimension (mm)	A	151	194	237	280	323
	B	82.5	125.5	168.5	211.5	254.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2

Dimensions CAD

● Unit type (connector type common terminal box: CTL/CTR)

● UTLPS-03-*** CTL (CTR)

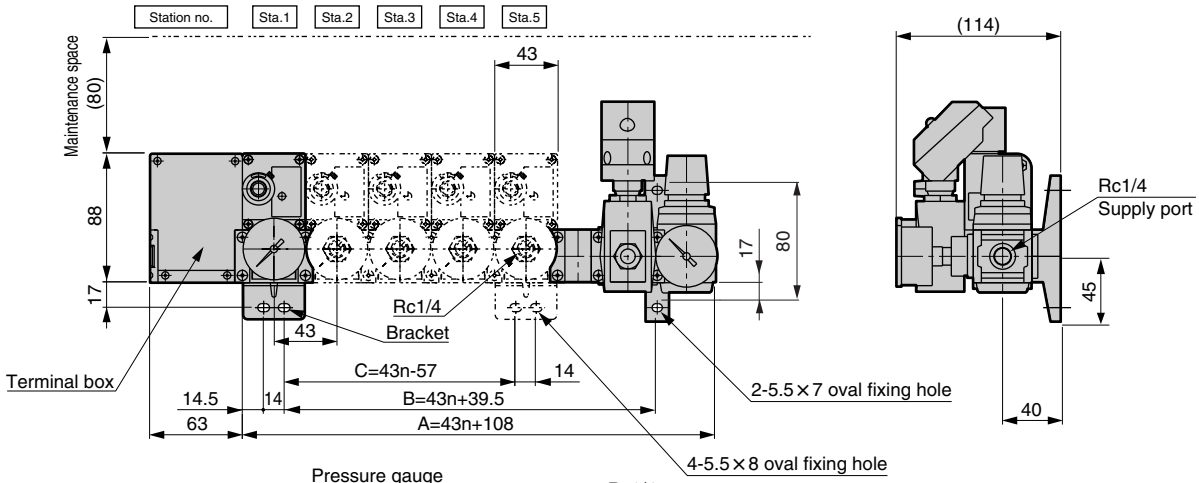


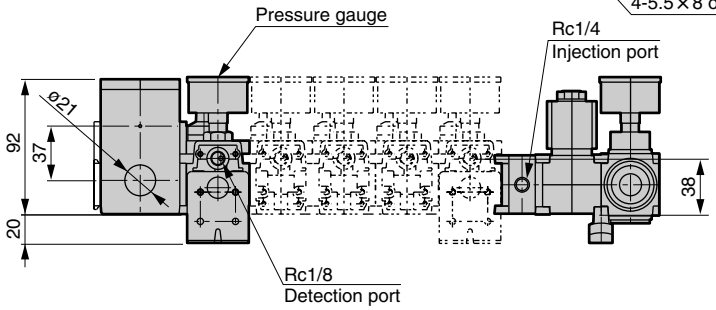


		Station no.				
		1	2	3	4	5
Dimension (mm)	A	151	194	237	280	323
	B	82.5	125.5	168.5	211.5	254.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2

● Unit type (lead wire type common terminal box: TL/TR)

● UTLPS-03-*** TL (TR)





		Station no.				
		1	2	3	4	5
Dimension (mm)	A	151	194	237	280	323
	B	82.5	125.5	168.5	211.5	254.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2

● Refer to pages 1212 to 1217 for dimensions of options or peripheral devices.

Detecting nozzle

Specifications

Descriptions	TLPS-J0310	TLPS-J0510	TLPS-J0715
Applicable drill diameter mm	ø0.3 to 3	ø1 to 10	ø3 to 30
Distance between nozzles mm	5	12	32
Guide to number of needle turn Rotation	1.8 to 2.2	2.3 to 2.7	5.3 to 5.7

Note 1: Table above shows reference value where supply pressure is 0.1MPa and pipe length is 5m.
Note 2: Consult with CKD for custom order nozzle and multi spindle.
Note 3: Jet nozzle is indicated as A, and nozzle pressurized is as B.
Note 4: Pipe the injection nozzle (A side) to the supply source (injection port for units) and the pressurized nozzle (B side) to the TLPS detection port.

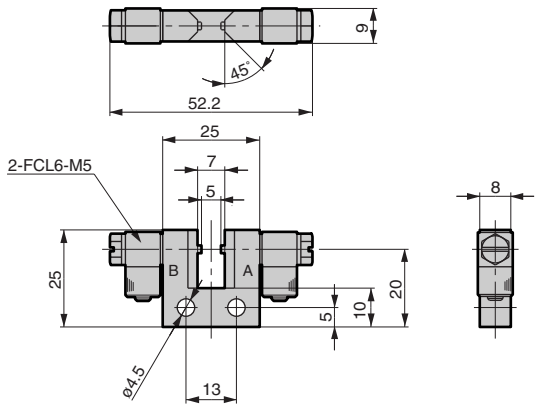
How to order

TLPS - J 0310

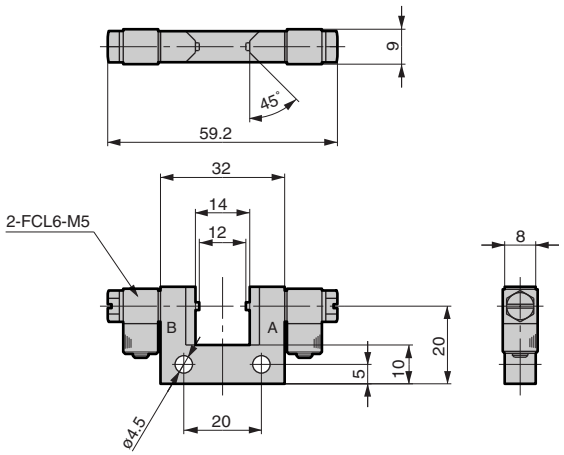
Symbol	Descriptions	
	Jet nozzle diameter (A side)	Nozzle pressurized diameter (B side)
0310	ø0.3	ø1.0
0510	ø0.5	ø1.0
0715	ø0.7	ø1.5

Dimensions

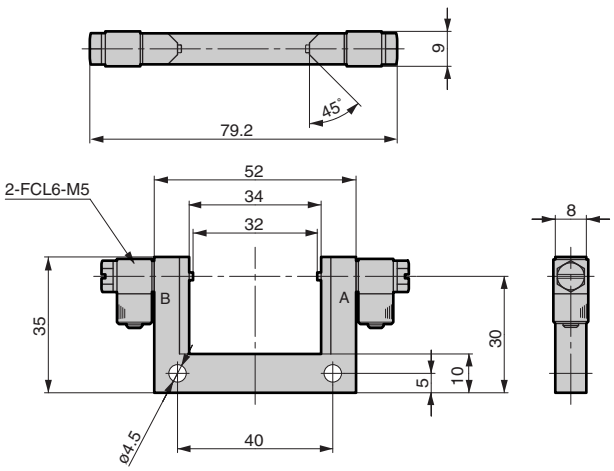
● J0310



● J0510



● J0715



Option

How to order

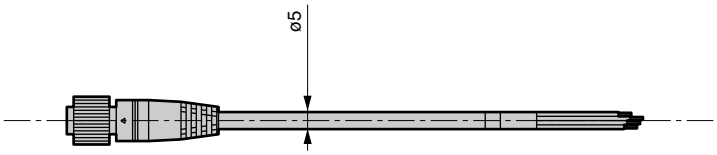
Dimensions

● How to order connector cable

GPS2 - C1

Ⓐ cable length

Ⓐ		
	C1	1m
	C3	3m
	C5	5m



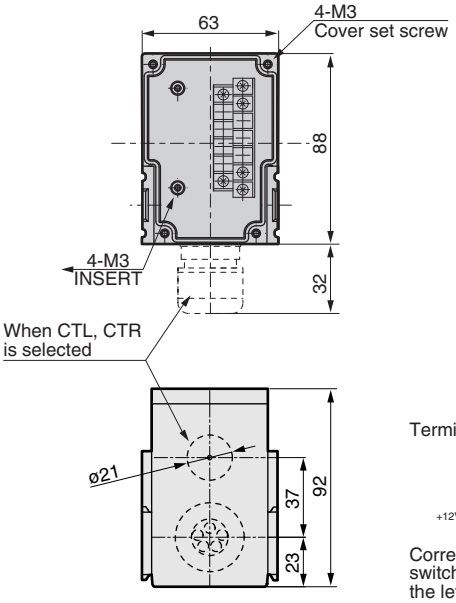
Lead wire color	Applications
Brown	Power supply +
White	NC
Blue	Power supply –
Black	Output

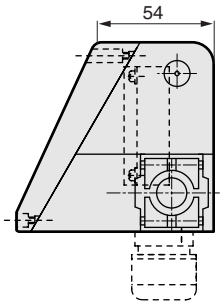
● How to order terminal box

GPS2 - CTL

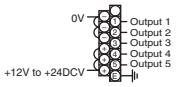
Ⓐ Terminal box

Ⓐ		
	CTL	Connector type common terminal box left assembly
	CTR	Connector type common terminal box right assembly
	TL	Lead wire type common terminal box left assembly
	TR	Lead wire type common terminal box right assembly
	TW	Lead wire type common terminal box intermediate assembly





Terminal box terminal array drawing



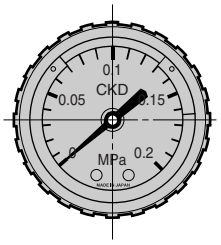
Corresponding close contact confirmation switches are arranged from 1 to 5 from the left as seen from the front.

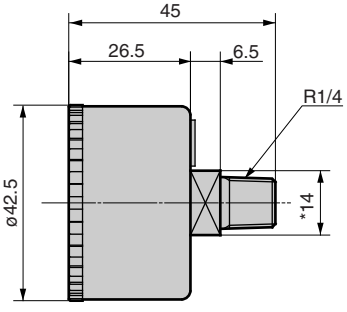
● How to order pressure gauge with safety mark

GPS2 - G40D - 8 - P02 - S501

Ⓐ Model no
Ⓑ Port size
Ⓒ Pressure display

Ⓐ	G40D	Pressure gauge with safety mark
Ⓑ	8	R1/4
Ⓒ	P02	0 to 0.2MPa
	P04	0 to 0.4MPa
	P10	0 to 1.0MPa





* 1. Safety zone setting range: 0.03 to 0.2MPa
* 2. Safety zone setting max. range: 0.09MPa
* 3. Gauge accuracy: JIS B 7505, old class 3.0
* 4. Cover material: Transparent nylon

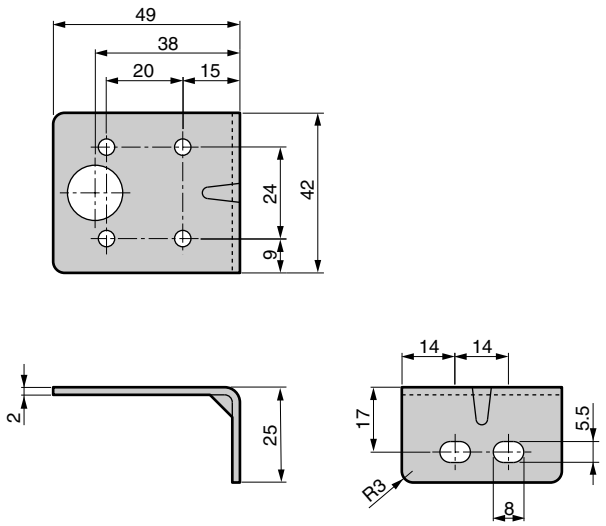
Option

How to order

Dimensions CAD

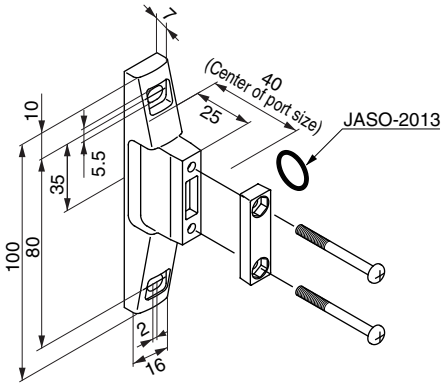
● How to order L type bracket

GPS2 - B



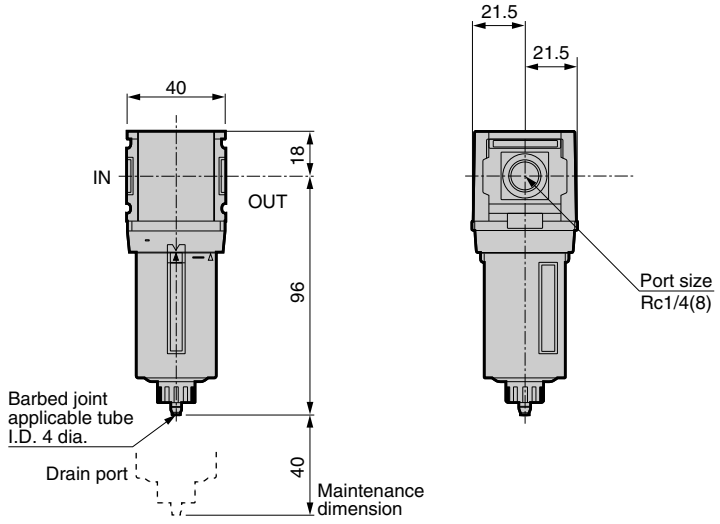
● How to order T type bracket set

B110 - W



● How to order air filter

F1000 - 8 - W



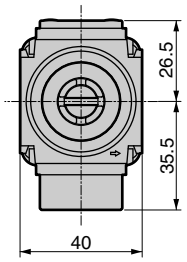
Peripheral devices

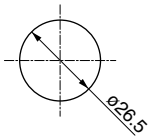
How to order

● How to order regulator

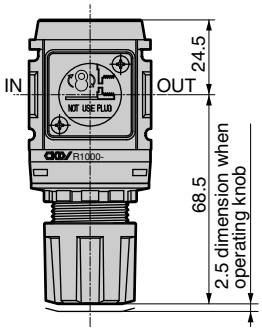
R1000 - 8 - W - LT

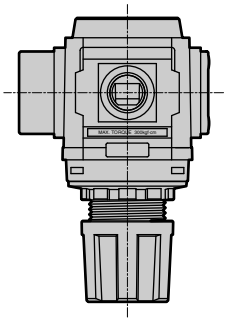
Dimensions CAD





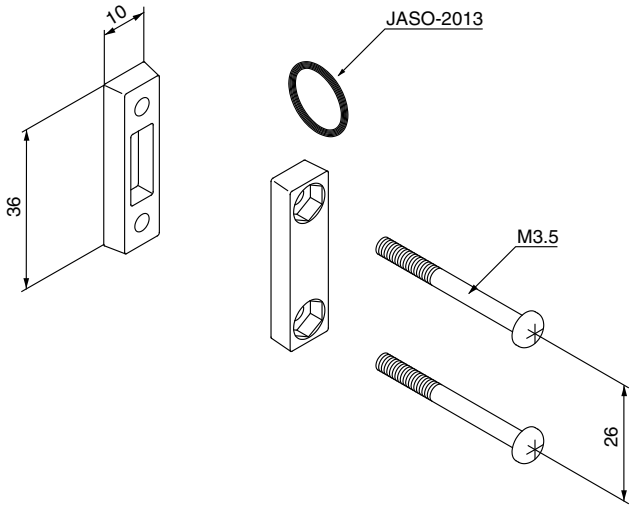
Panel cut dimension
(Panel plate thickness: Max. 6mm)





● How to order joiner set

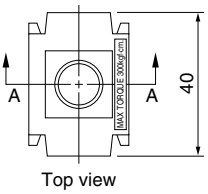
C1000 - J100 - W



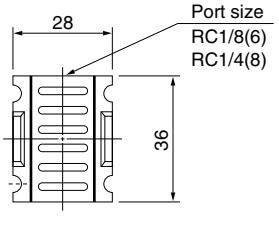
● How to order distributor

D101 - 00 - 8 - W

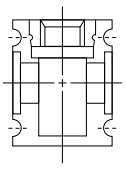
Note: A joiner set and one gasket are included.



Top view



Front view



Cross section A-A

Peripheral devices

How to order

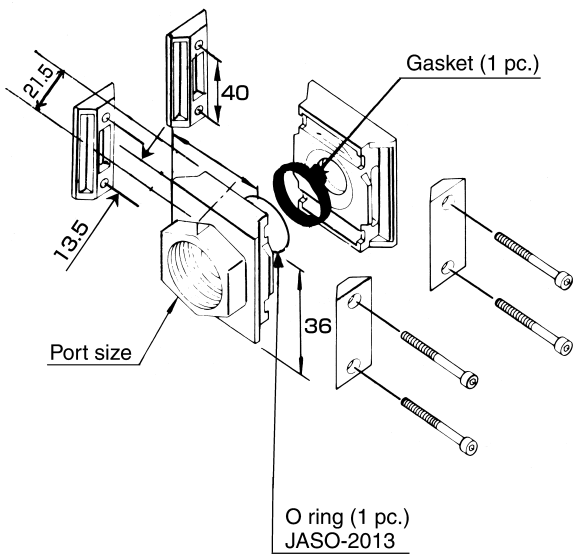
● Piping adaptor set
(With joiner set)

A100 - 8 - W

Ⓐ Port size

Ⓐ		
	8	Rc1/4
	10	Rc3/8

Dimensions CAD

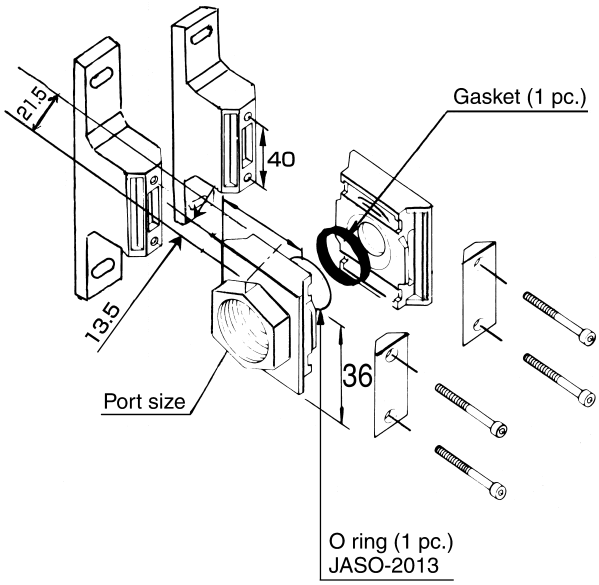


● Piping adaptor set
(With T type bracket set)

A100 - 8 - W - B11

Ⓐ Port size

Ⓐ		
	8	Rc1/4
	10	Rc3/8



Peripheral devices

Solenoid valve with needle

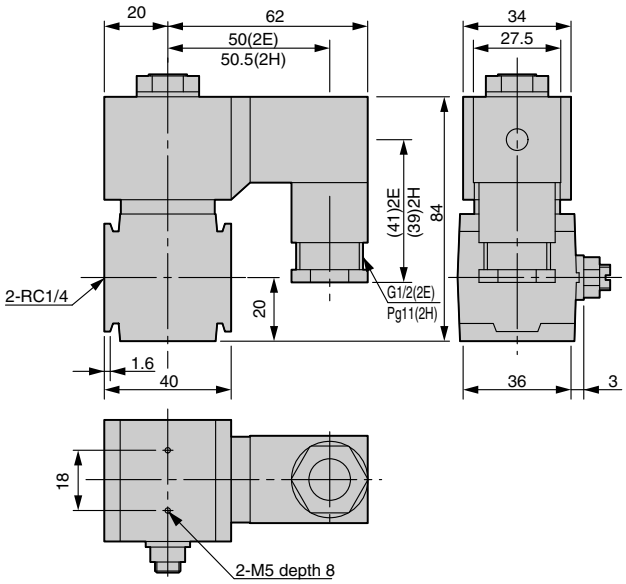
How to order

GPS2 - AB3X - 2E - FL - AC100V

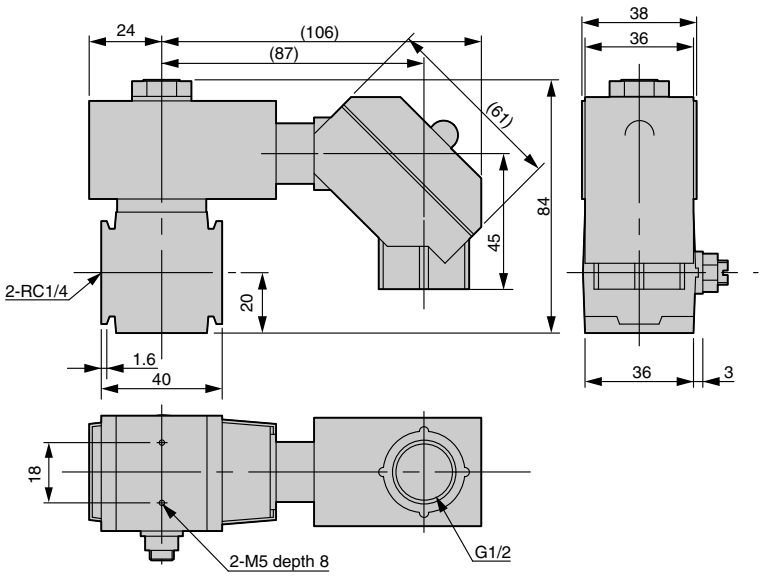
Ⓐ Terminal box		Ⓑ Voltage
2E	DIN terminal box	100VAC
2H	DIN terminal box with indicator light	200VAC
3H	Square terminal box with indicator light	24VDC

Dimensions CAD

● GPS2-AB3X-$\frac{2E}{2H}$-FL-$\frac{AC100V}{AC200V}$

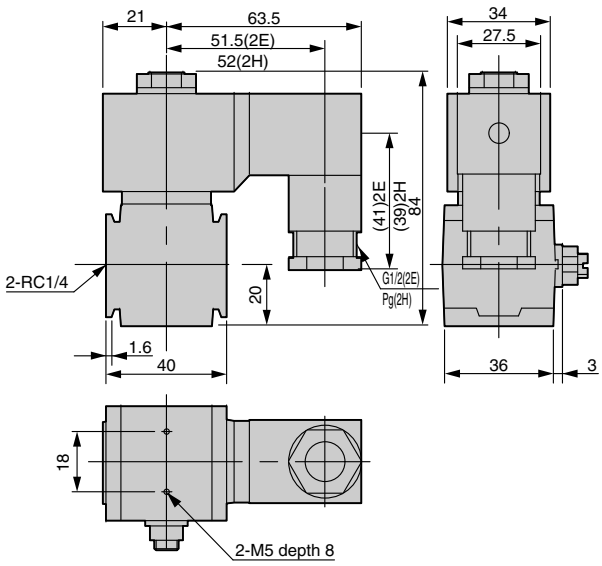


● GPS2-AB3X-3H-FL-$\frac{AC100V}{AC200V}$

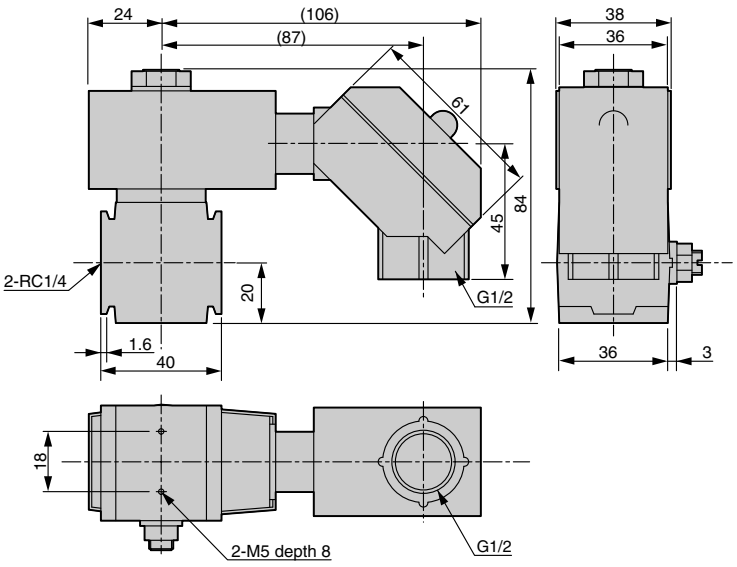


Solenoid valve with needle Dimensions CAD

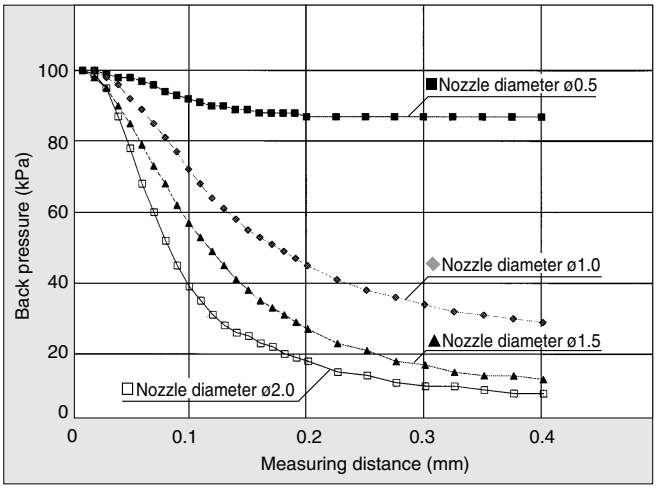
● GPS2-AB3X-$\frac{2E}{2H}$-FL-DC24V



● GPS2-AB3X-3H-FL-DC24V



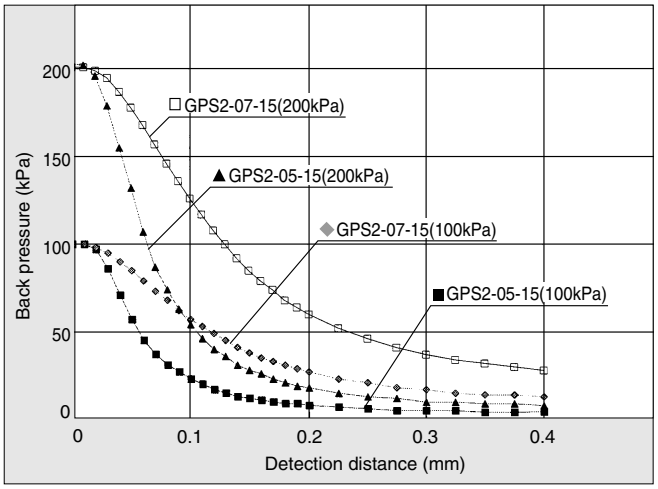
Characteristics data



● Back pressure characteristics 1- change of nozzle diameter

Measuring conditions

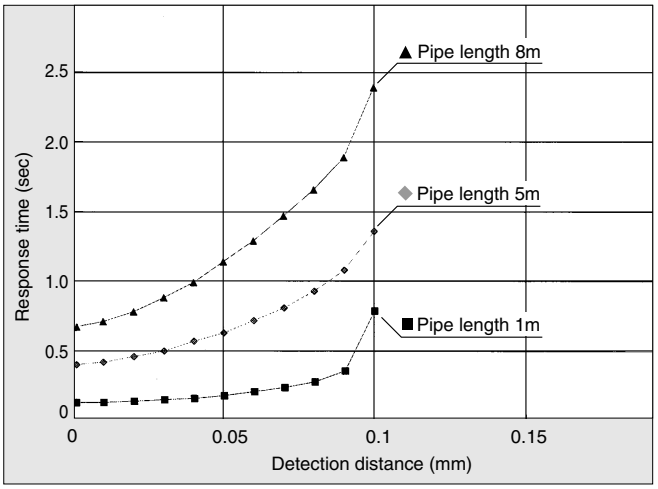
• Type : GPS2-07-15 • Piping diameter : 6 dia. x 4 dia. • Pipe length : 5m
• Setting distance : 0.1mm • Average supply pressure : 100kPa



● Back pressure characteristics 2 - GPS2 difference in model

Measuring conditions

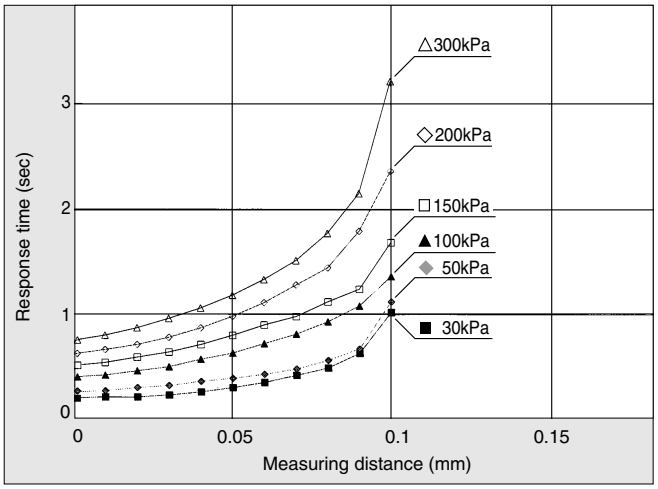
• Piping diameter : 6 dia. x 4 dia. • Pipe length : 5m
• Nozzle diameter : 1.5 dia. • Setting distance : 0.1mm



● Response time 2 - influence by pipe length (OFF→ON)

Measuring conditions

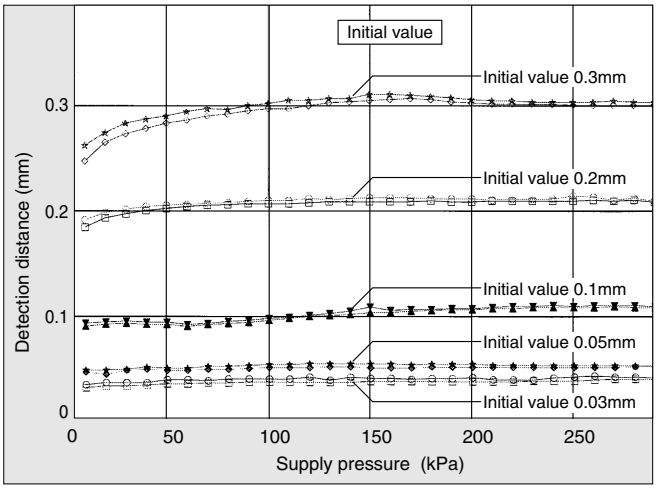
• Type : GPS2-07-15 • Piping diameter : 6 dia. x 4 dia.
• Nozzle diameter : 1.5 dia. • Supply pressure : 100kPa



● Response time 2 - influence by supply pressure (OFF→ON)

Measuring conditions

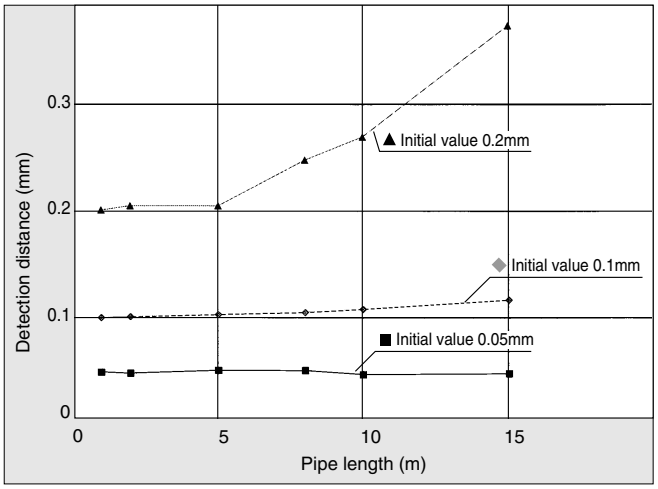
• Type : GPS2-07-15 • Piping diameter : 6 dia. x 4 dia.
• Nozzle diameter : 1.5 dia. • Pipe length : 5.0m • Setting distance : 0.1mm



● Supply pressure change - recommended range 50 to 200kPa

Measuring conditions

• Type : GPS2-07-15 • Piping diameter : 6 dia. x 4 dia.
• Pipe length : 5m • Nozzle diameter : 1.5 dia.



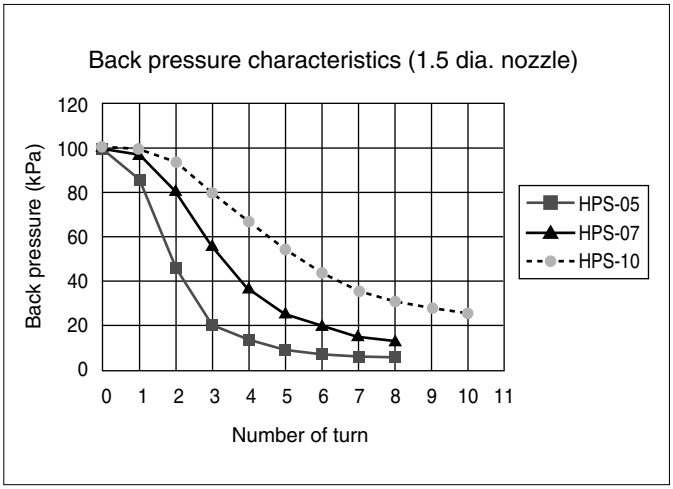
● Influence to initial setting distance by pipe length

Measuring conditions

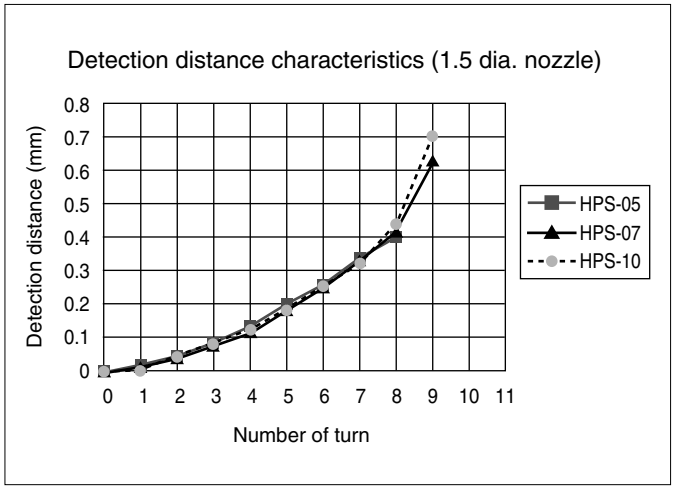
• Type : GPS2-07-15 • Piping diamete r : 6 dia. x 4 dia.
• Nozzle diameter : 1.5 dia. • Supply pressure : 100kPa • Initial pipe length : 5m

Characteristics data(HPS Series)

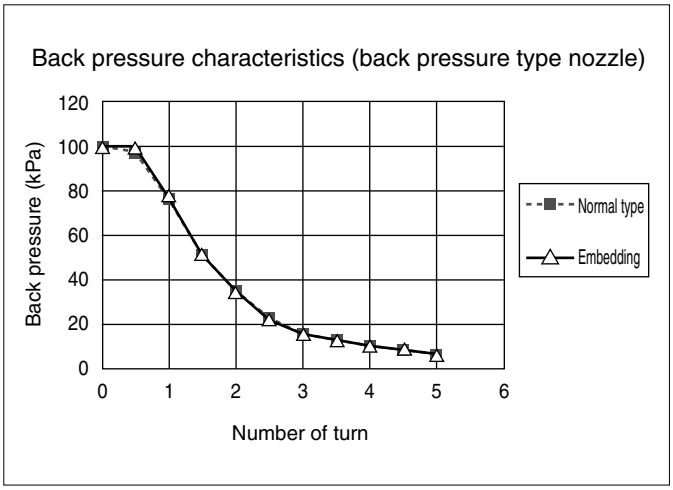
● Back pressure characteristics 1 (1.5 dia. nozzle)
Measuring conditions
Piping diameter : 6 dia. x 4 dia.
Pipe length : 5m
Supply pressure : 100kPa
Nozzle diameter : 1.5 dia.



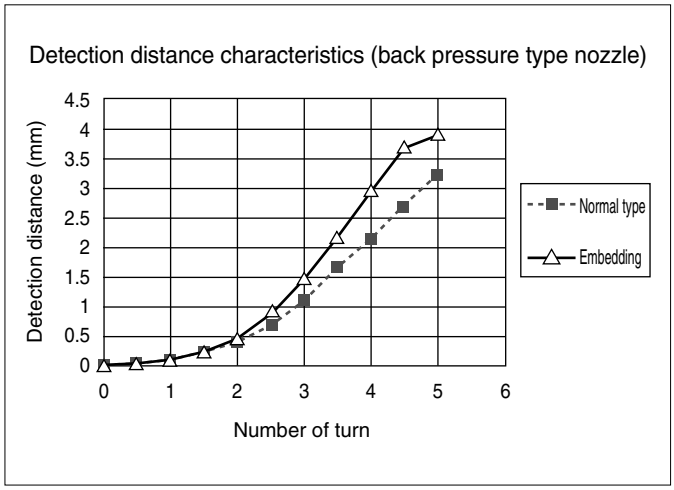
● Detection distance characteristics 1 (1.5 dia. nozzle)
Measuring conditions
Piping diameter : 6 dia. x 4 dia.
Pipe length : 5m
Supply pressure : 100kPa
Nozzle diameter : 1.5 dia.



● Back pressure characteristics 2 (back pressure type nozzle)
Measuring conditions
Piping diameter : 6 dia. x 4 dia.
Pipe length : 5m
Supply pressure : 100kPa

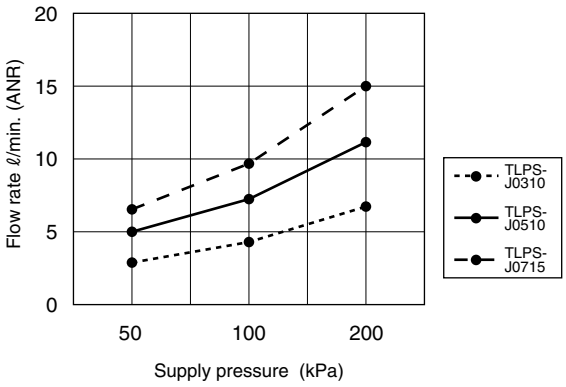


● Detection distance characteristics 2 (back pressure type nozzle)
Measuring conditions
Piping diameter : 6 dia. x 4 dia.
Pipe length : 5m
Supply pressure : 100kPa



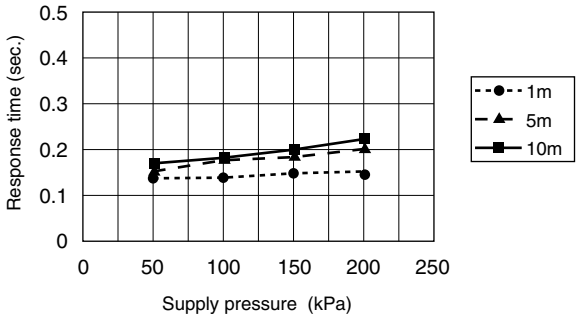
Characteristics data (TLPS Series)

Air consumption

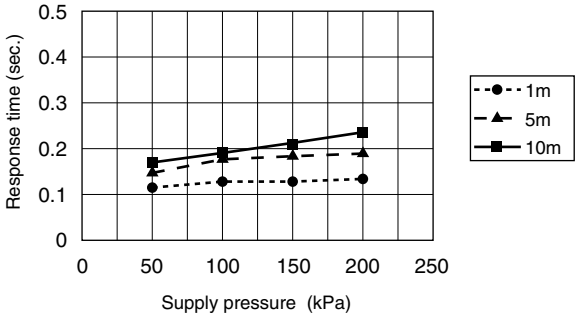


Response time - influence by pipe length

● TLPS-J0310



● TLPS-J0510



● TLPS-J0715