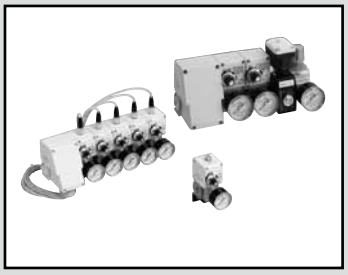


Cutting tool breakage detection switch

TLPS/MTLPS/UTLPS Series

RoHS

Overview

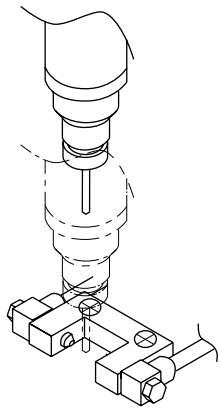
The cutting tool breakage detection switch TLPS Series is an air sensor used to detect broken or chipped drills and taps used in the metal machining line.
A dedicated nozzle unit is used for the detection nozzle to match the cutting tool. This switch is also usable in adverse environments, which is one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

Features

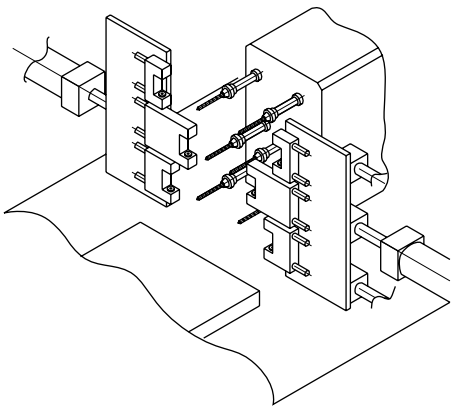
- Shorter machining tact
  Since non-contact detection makes it possible to detect the state while the tool is rotating, tact time is shortened compared to conventional methods.
- Compatible with adverse environments
  Self-cleaning by the air nozzle enables use even in environments where coolant or swarf scatter.
- Small-diameter drill and cutting edge chipping detection
  Chips are detected on a φ0.3 small drill or 1 mm drill tip.
- Low air consumption
  This switch is used with low pressure so air consumption is reduced.
  (3 ℓ/min. (ANR) at 50 kPa)
- 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 and dial scale makes it possible to adjust the detecting position easily with no worry about deviation.
- Modularization
  Modularization makes it easy to connect to the CKD module connection component.

Example of cutting tool breakage detection applications

- Nozzle unit fixed

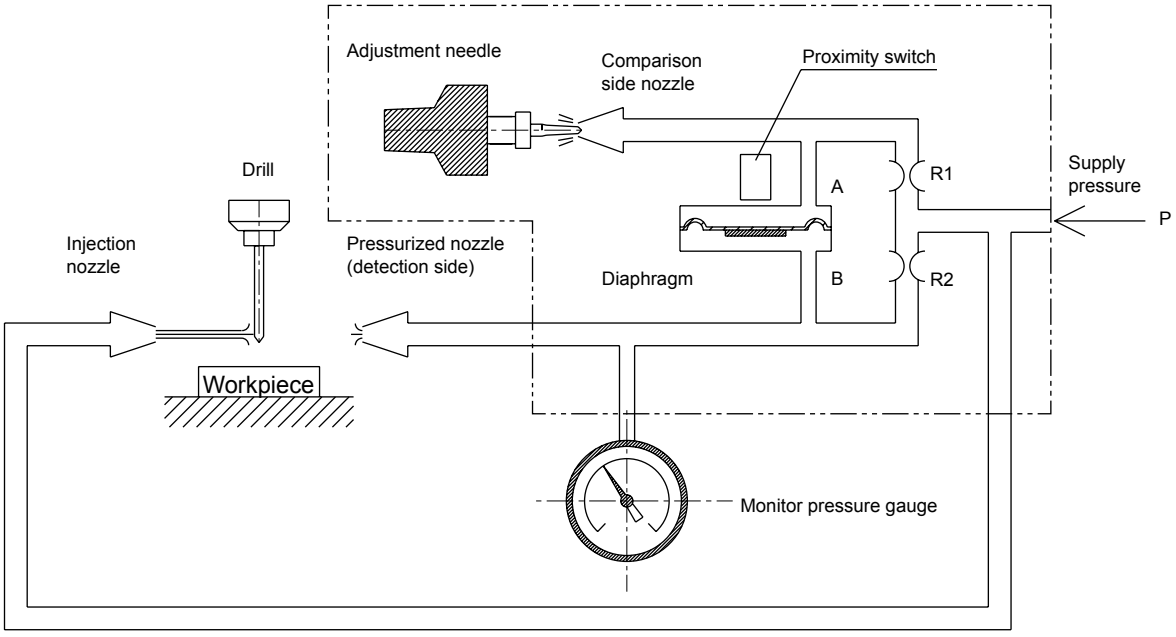


- Detecting nozzle moving type



Operational explanation

● Diagram of TLPS (facing) principle

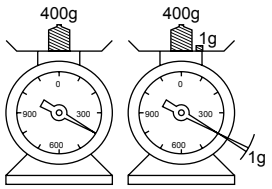


● Detecting nozzles

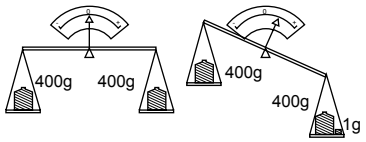
Two nozzles are used facing each other. A small amount of detection air is passed from the nozzle pressurized through the TLPS switch, and exhausted from nozzles. Conversely, air injected from the injection nozzle collides with detection air. When air collides, the back pressure of the nozzle pressurized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

● Cutting tool breakage 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. The air bridge circuit is a system which detects micro-fluctuations in pressure highly accurately. If the detection pressure with drill is P1, and the detection pressure without drill is P2,
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 breakage detection switch, single unit

TLPS Series

Specifications

1 MPa = 10 bar

Descriptions			TLPS-03		
Orifice size		mm	φ0.3		
Working pressure		(*2) kPa	50 (≈7.3 psi, 0.5 bar) to 200 (≈29 psi, 2 bar) (100 (≈15 psi, 1 bar) recommended)		
Detection cutting tool diameter		mm	φ0.3 to 30		
Power supply voltage		V	DC10.2 to 26.4		
Current consumption		mA	15 or less (when using 24 VDC)		
Output style			NPN, PNP open collector		
Output rating			30 VDC, 100 mA or less		
Internal voltage drop		V	2.0 or less (when using 100 mA)		
Indicator lamp and Signal	When drill is broken		Yellow lamp ON, output ON		
	When drill is normal		Yellow lamp OFF, output OFF		
Cutting edge detecting position			1mm and over from end of the edge		
Insulation resistance			10 MΩ and over at 500 VDC megger		
Withstand voltage			No failure impressed at 1000 VAC for one minute		
Vibration resistance		m/sec^2	98		
Ambient temperature		°C	5 (41°F) to 60 (140°F)		
Degree of protection		(*1)	IP67 equivalent (connector), IP64 equivalent (DIN terminal box)		
Connection tube		mm	Inner diameter 4		
Port size			Detection port Rc1/8, supply port Rc1/4, pressure gauge port Rc1/4		
Weight		g	300 (electric connection option C0)		
Air consumption ℓ/min (ANR) *Air consumption Value when CKD's standard nozzle is selected	Nozzle		TLPS-J0310	TLPS-J0510	TLPS-J0715
	50 kPa (≈7.3 psi)		2.8	4.8	6.6
	100 kPa (≈15 psi)		4.2	7.2	9.7
	200 kPa (≈29 psi)		6.6	11.1	15.1

*1: 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.
*2: If the nozzle clogs, working pressure should be set between 100 and 200 kPa.

How to order

TLPS - 03 - N Y TL - B - GW2

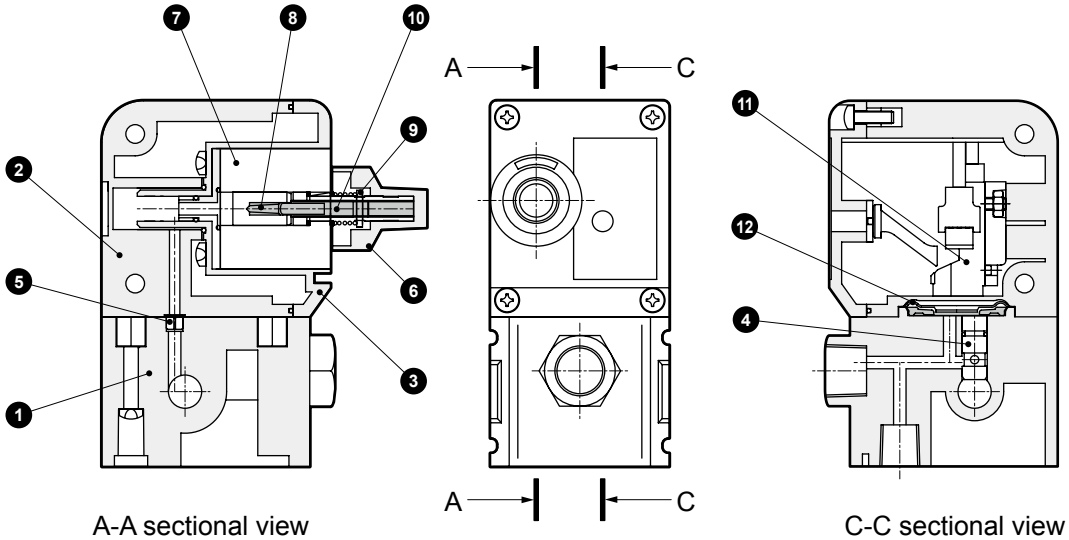
- TLPS: Cutting tool breakage detection switch
- 03: Ⓐ Orifice size
- N: Ⓑ Output style
- Y: Ⓒ Light color
- TL: Ⓓ Electric connection option
- B: Ⓔ Bracket
- GW2: Ⓕ Pressure gauge

Code	Content
Ⓐ Orifice size	
03	For φ0.3 detecting nozzle
Ⓑ Output style	
N	NPN open collector
P	PNP open collector
Ⓒ Light color	
Y	Yellow
Ⓓ Electric connection option	
F	DIN terminal box (Pg11)
C0	Connector (without cable)
C1	Connector (cable 1 m included)
C3	Connector (cable 3 m included)
C5	Connector (cable 5 m included)
CTL	Connector common terminal box left assembly
CTR	Connector common terminal box right assembly
TL	Lead wire common terminal box left assembly
TR	Lead wire 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)
Ⓔ Bracket	
Blank	Without bracket
B	With bracket
Ⓕ Pressure gauge	
Blank	No pressure gauge
G2	Pressure gauge with safety mark included (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety mark (G40D-8-P02-S501)

⚠ Precautions for model No. selection

*1: Refer to page 1173 for the model No. of the detecting nozzle.
*2: Refer to pages 1174 to 1179 for option and model No. of related components.

Internal structure and parts list



A-A sectional view

C-C sectional view

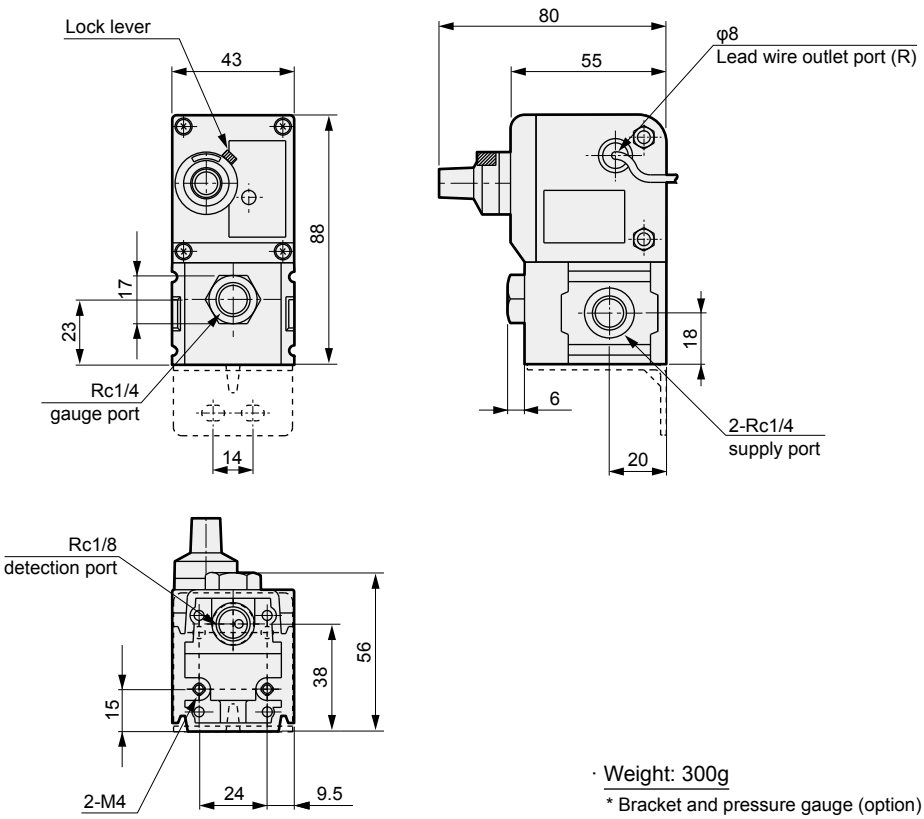
Parts list

No.	Part name	Material	No.	Part name	Material
1	Base	Aluminum	7	Needle holder	Aluminum
2	Body	Polybutylene terephthalate	8	Needle	Stainless steel
3	Front cover	Polybutylene terephthalate	9	Pin	Piano wire
4	Orifice nozzle A	Copper alloy	10	Needle shaft	Copper alloy
5	Orifice nozzle B	Copper alloy	11	Proximity switch	-
6	Dial	Aluminum alloy, polyamide, etc.	12	Diaphragm	HNBR

Dimensions CAD

R
L
W

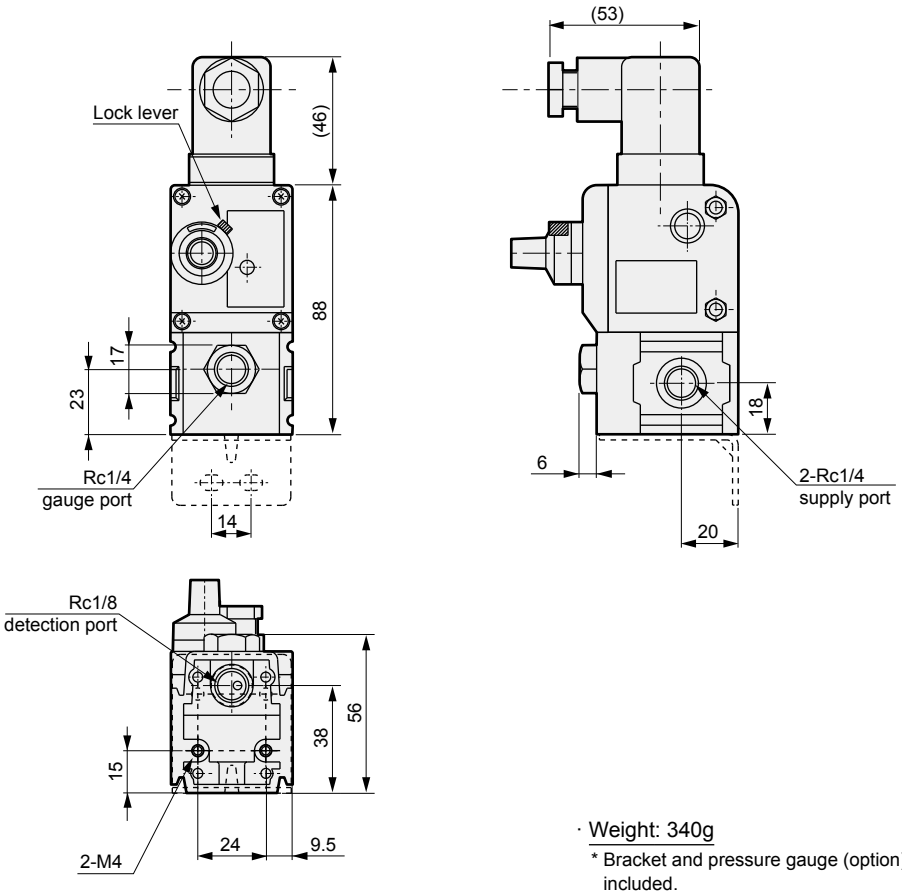
● Basic TLPS-03-**



· Weight: 300g

* Bracket and pressure gauge (option) are not included.

● DIN terminal box TLPS-03-**F

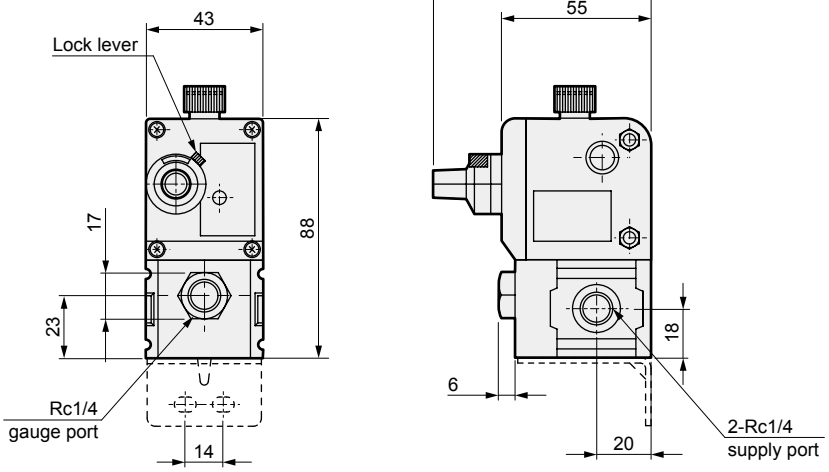


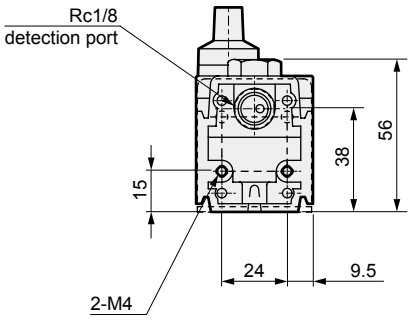
· Weight: 340g

* Bracket and pressure gauge (option) are not included.

Dimensions CAD

● Connector TLPS-03-** C0 C1 C3 C5

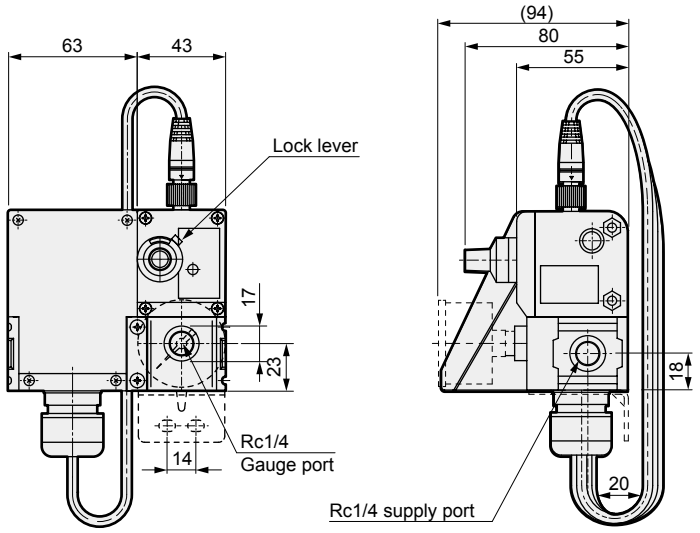




· Weight: 300g (for C0)

*1: Bracket and pressure gauge (option) are not included.
*2: Cable for C1, C3, C5 is included.
(For the cable weight, refer to the option pages.)

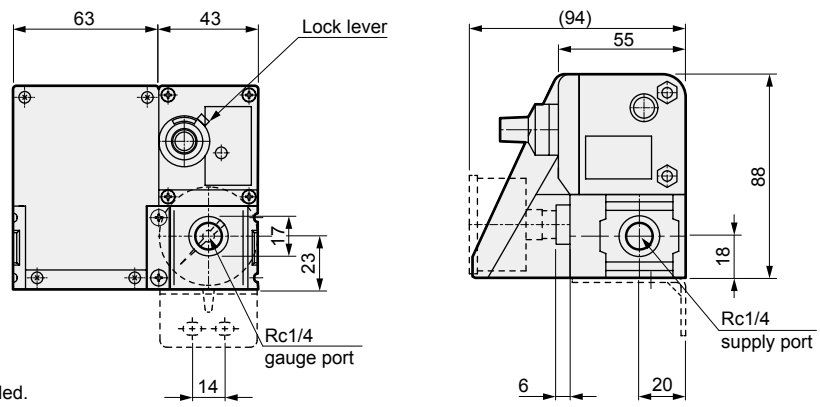
● Connector common terminal box TLPS-03-** CTL (CTR)



· Weight: 583g

* Bracket and pressure gauge (option) are not included.

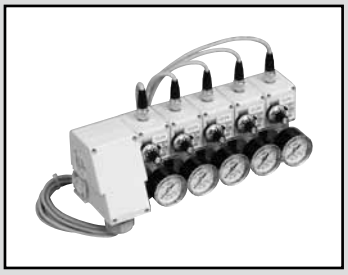
● Lead wire common terminal box TLPS-03-** TL (TR)



· Weight: 513g

* Bracket and pressure gauge (option) are not included.

● Refer to pages 1174 to 1179 for dimensions of options and peripheral devices.



Cutting tool breakage detection switch/manifold

MTLPS Series

Specifications

Basic specifications are the same as the single units on page 1162.

How to order

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

- MTLPS: Cutting tool breakage detection switch
- Ⓐ 03: Orifice size
- Ⓑ 2: Station No.
- Ⓒ N: Output style
- Ⓓ Y: Lamp color
- Ⓔ TL: Electric connection option
- Ⓕ B: Bracket
- Ⓖ GW2: Pressure gauge

Code	Content
Ⓐ Orifice size	
03	For φ0.3 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
Ⓓ Lamp color	
Y	Yellow
Ⓔ Electric connection option	
F	DIN terminal box (Pg11)
C0	Connector (without cable)
C1	Connector (cable 1 m included)
C3	Connector (cable 3 m included)
C5	Connector (cable 5 m included)
CTL	Connector common terminal box left assembly
CTR	Connector common terminal box right assembly
TL	Lead wire common terminal box left assembly
TR	Lead wire common terminal box right assembly
T1	Lead wire common terminal box intermediate assembly (1st from left)
T2	Lead wire common terminal box intermediate assembly (2nd from left)
T3	Lead wire common terminal box intermediate assembly (3rd from left)
T4	Lead wire common terminal box intermediate assembly (4th from left)
Ⓕ Bracket	
Blank	Without bracket
B	With bracket
Ⓖ Pressure gauge	
Blank	No pressure gauge
G2	Pressure gauge with safety mark included (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety mark (G40D-8-P02-S501)

⚠ Precautions for model No. selection

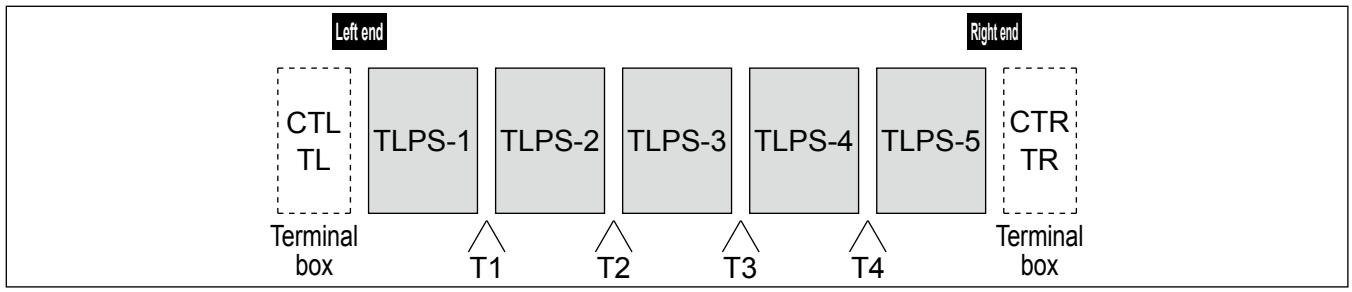
*1: Refer to page 1173 for the model No. of the detecting nozzle.
*2: Refer to pages 1174 to 1179 for option and model No. of related components.

Degree of protection

Electric connection option	Degree of protection
T*	IP66 equivalent
CT*	IP67 equivalent
F*	IP64 equivalent
C*	IP67 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.

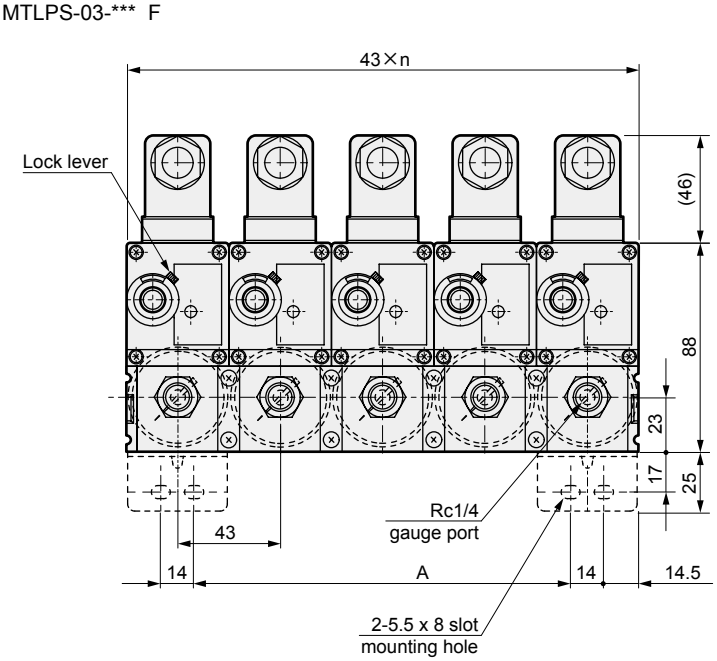
Terminal box installation position relation diagram

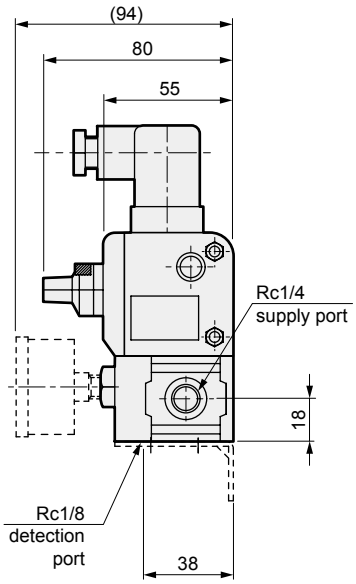


Dimensions CAD

● Manifold (DIN terminal box: F)

● MTLPS-03-*** F



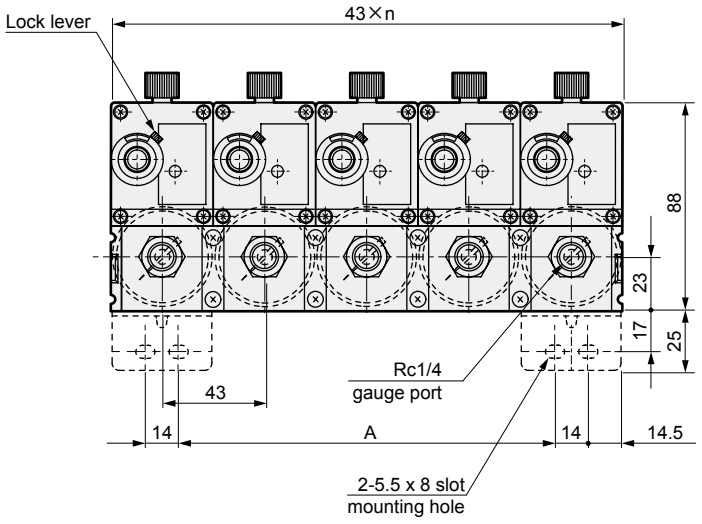


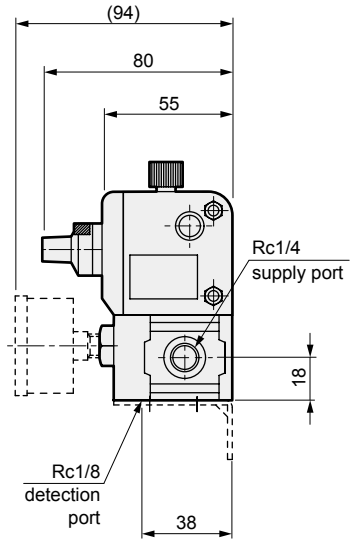
Station No.	n	A	Weight g
2 stations	2	29	680
3 stations	3	72	1030
4 stations	4	115	1370
5 stations	5	158	1710

* Bracket and pressure gauge (option) are not included.

● Manifold (connector: C*)

● MTLPS-03-*** C0 C1 C3 C5





Station No.	n	A	Weight g
2 stations	2	29	590
3 stations	3	72	890
4 stations	4	115	1190
5 stations	5	158	1490

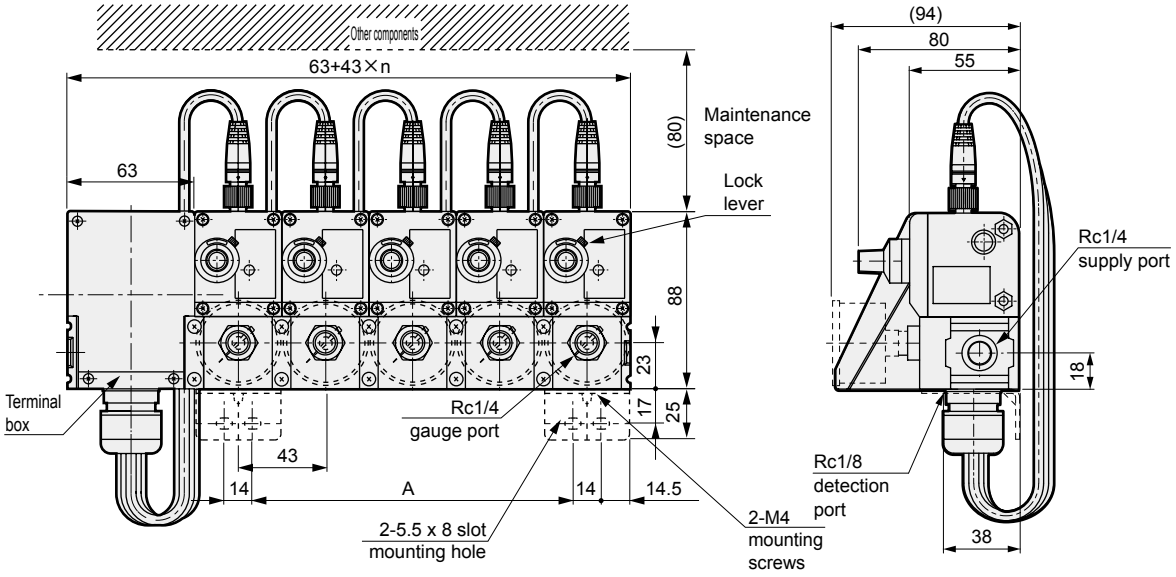
(For C0)

*1: Bracket and pressure gauge (option) are not included.
*2: Cable for C1, C3, C5 is included.
(For the cable weight, refer to the option pages.)

Dimensions CAD

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

● MTLPS-03-*** CTL (CTR)

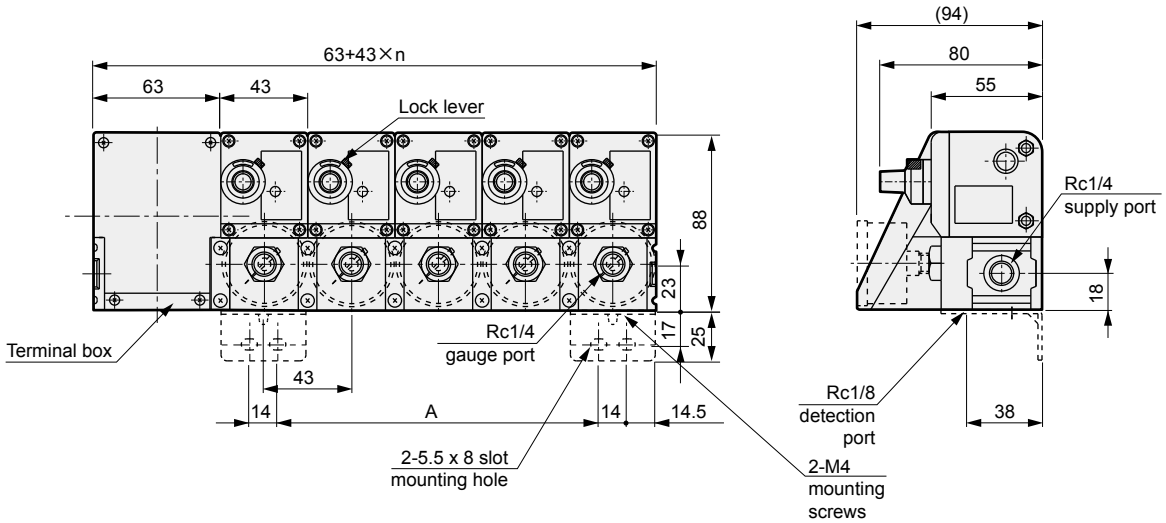


Station No.	n	A	Weight g
2 stations	2	29	930
3 stations	3	72	1270
4 stations	4	115	1620
5 stations	5	158	1980

*1: Bracket and pressure gauge (option) are not included.

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

● MTLPS-03-*** TL (TR)

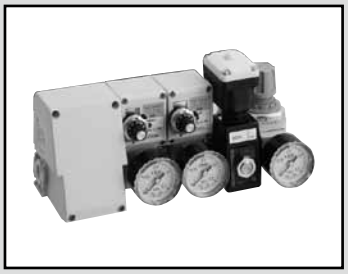


Station No.	n	A	Weight g
2 stations	2	29	830
3 stations	3	72	1140
4 stations	4	115	1460
5 stations	5	158	1770

*1: Bracket and pressure gauge (option) are not included.

● Refer to pages 1174 to 1179 for dimensions of options and peripheral devices.

MEMO



Cutting tool breakage detection switch unit

UTLPS Series

● Solenoid valve with needle, regulator integrated general purpose unit

Specifications

Basic specifications are the same as the single units on page 1162.

How to order

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

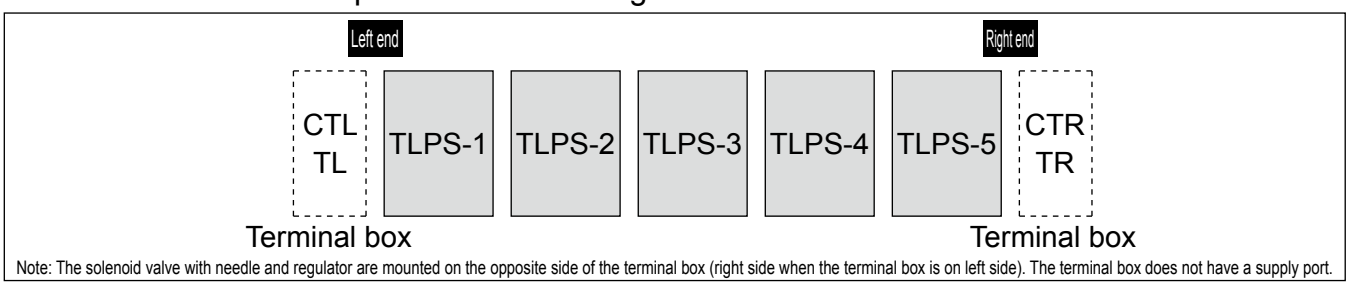
- UTLPS: Cutting tool breakage detection switch
- Ⓐ 03: Orifice size
- Ⓑ 2: Station No.
- Ⓒ N: Output style
- Ⓓ Y: Lamp color
- Ⓔ TL: Electric connection option
- Ⓕ B: Bracket
- Ⓖ GW2: Pressure gauge
- Ⓗ 3H: Solenoid valve electric connection (*3)
- Ⓘ 1: Solenoid valve voltage

Code	Content
Ⓐ Orifice size	
03	For φ0.3 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
Ⓓ Lamp color	
Y	Yellow
Ⓔ Electric connection option	
F	DIN terminal box (Pg11)
C0	Connector (without cable)
C1	Connector (cable 1 m included)
C3	Connector (cable 3 m included)
C5	Connector (cable 5 m included)
CTL	Connector common terminal box left assembly
CTR	Connector-common Term box Rt Assy
TL	Lead wire common terminal box left assembly
TR	Lead wire common terminal box right assembly
Ⓕ Bracket	
B	With bracket
Ⓖ Pressure gauge	
Blank (*4)	None
GW2	Press gauge Assy, safety mark (G40D-8-P02-S501)
Ⓗ Solenoid valve electric connection	
2E	DIN terminal box
2H	DIN terminal box with lamp
3N	HP terminal box with lamp
Ⓘ Solenoid valve voltage	
1	100 VAC
2	200 VAC
3	24 VDC

⚠ Precautions for model No. selection

*1 : Refer to page 1173 for the model No. of the detecting nozzle.
*2 : Refer to pages 1174 to 1179 for option and model No. of related components.
*3 : For CE-Marking-compatible parts, select the Ⓗ solenoid valve electric connection from 2E or 2H.
*4 : Regulator is also provided without pressure gauge.

Terminal box installation position relation diagram

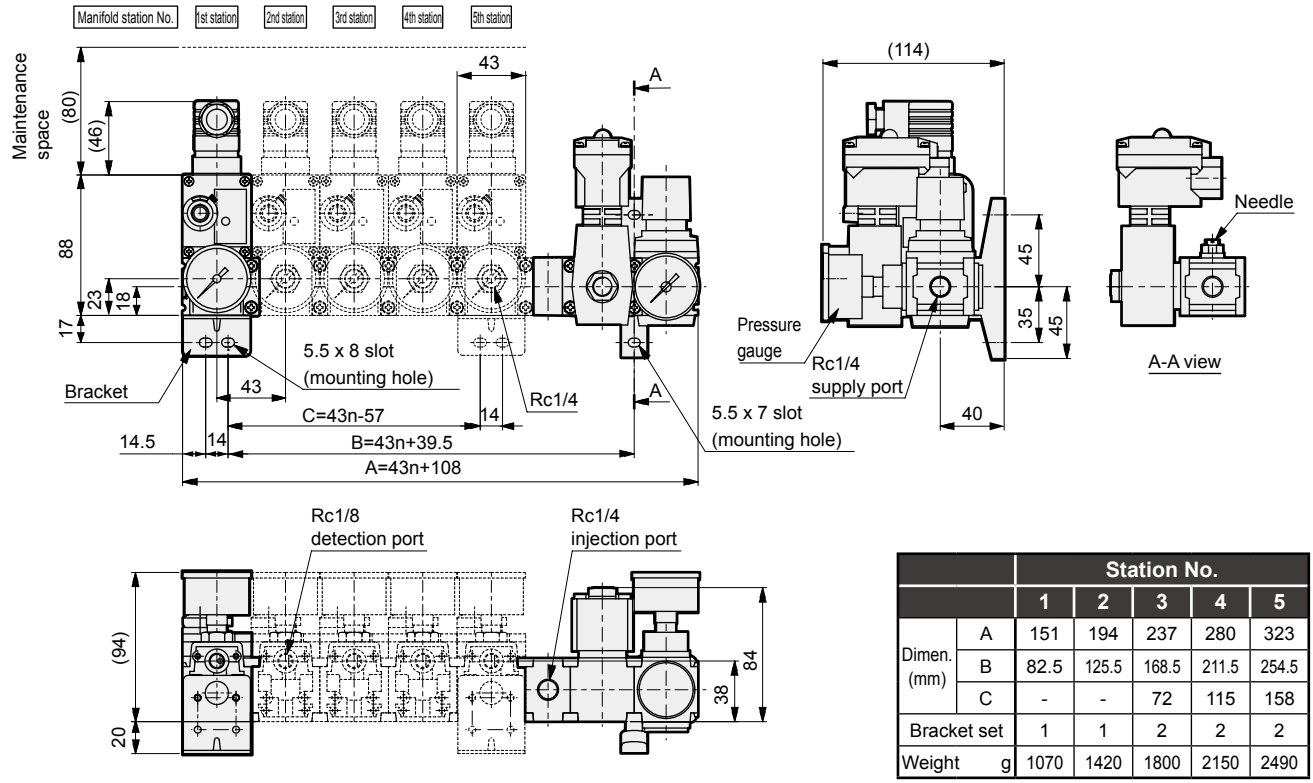


Note: The solenoid valve with needle and regulator are mounted on the opposite side of the terminal box (right side when the terminal box is on left side). The terminal box does not have a supply port.

Dimensions

● Unit (DIN terminal box: F)

● UTLPS-03-*** F

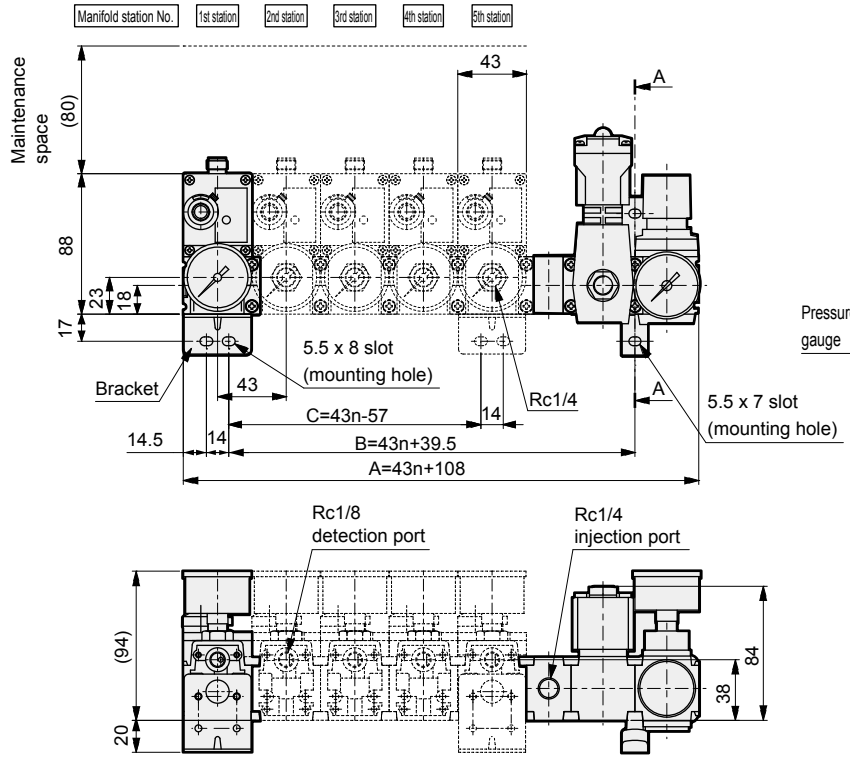


		Station No.				
		1	2	3	4	5
Dimen. (mm)	A	151	194	237	280	323
	B	82.5	125.5	168.5	211.5	254.5
	C	-	-	72	115	158
Bracket set		1	1	2	2	2
Weight g		1070	1420	1800	2150	2490

*1: Pressure gauge (option) is not included.
*2: When solenoid valve is the electric connection 3N.

● Unit (connector: C*)

● UTLPS-03-*** C0 C1 C3 C5



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

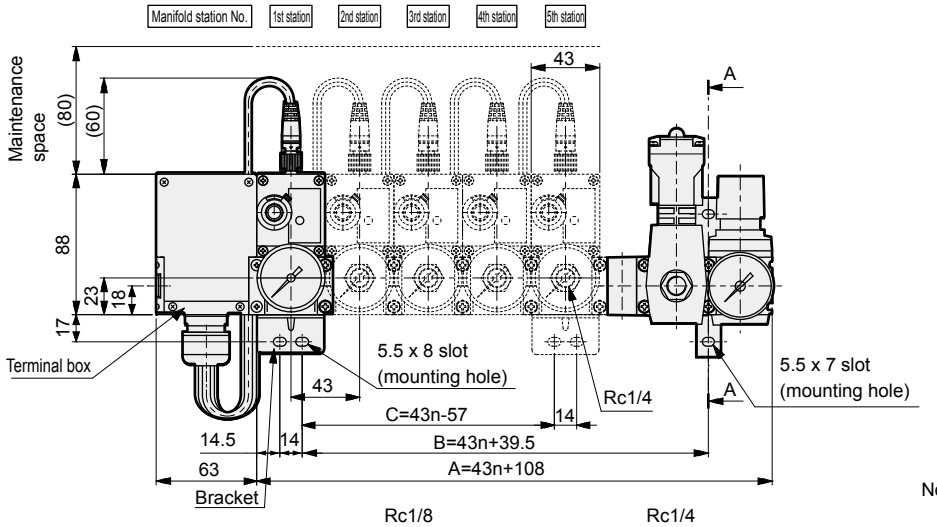
		Station No.				
		1	2	3	4	5
Dimen. (mm)	A	151	194	237	280	323
	B	82.5	125.5	168.5	211.5	254.5
	C	-	-	72	115	158
Bracket set		1	1	2	2	2
Weight (For C0) g		1030	1330	1670	1970	2270

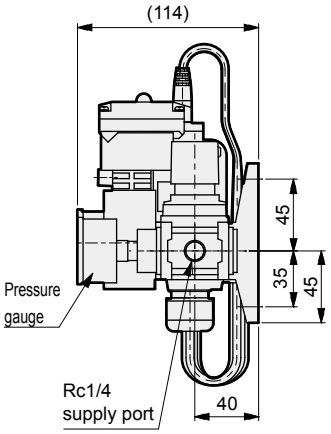
*1: Pressure gauge (option) is not included.
*2: When solenoid valve is the electric connection 3N.
*3: Cable for C1, C3, C5 is included. (For the cable weight, refer to the option pages.)

Dimensions CAD

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

● UTLPS-03-*** CTL (CTR)





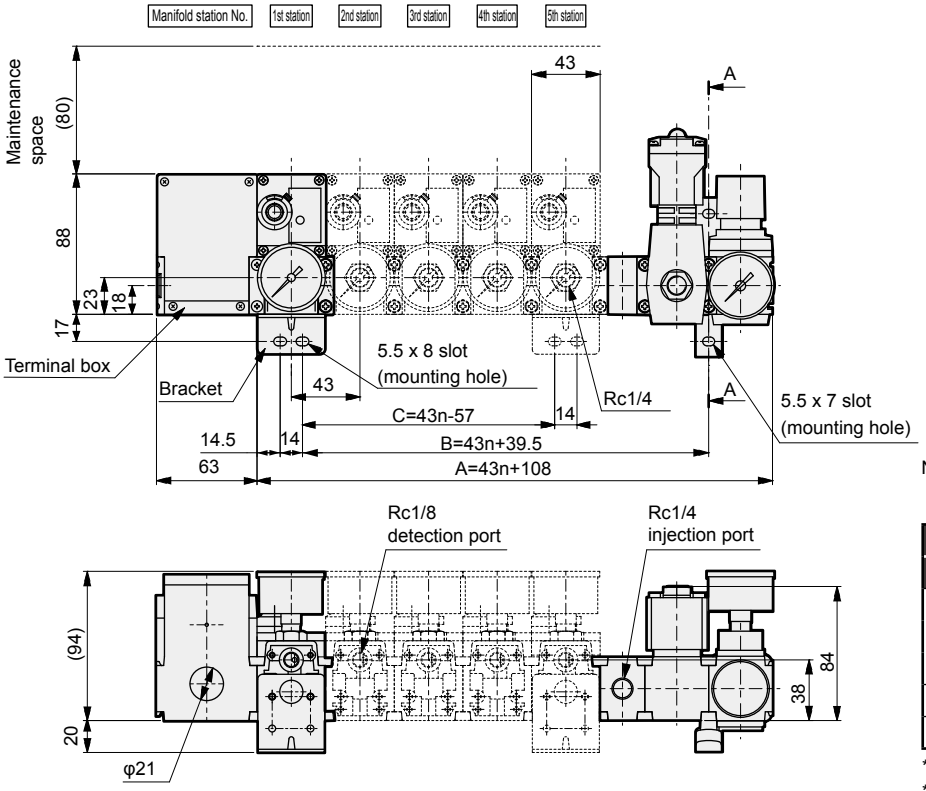
Note: Refer to the “A-A view” on the previous page for needle position.

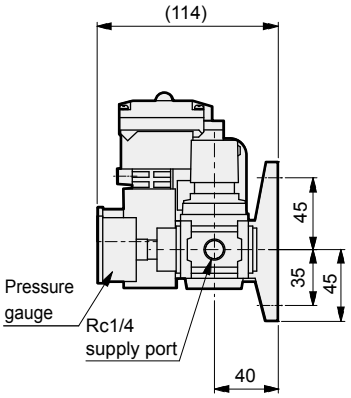
		Station No.				
		1	2	3	4	5
Dimen. (mm)	A	151	194	237	280	323
	B	82.5	125.5	168.5	211.5	254.5
	C	-	-	72	115	158
Bracket set		1	1	2	2	2
Weight g		1320	1660	2050	2400	2750

*1: Pressure gauge (option) is not included.
*2: When solenoid valve is the electric connection 3N.

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

● UTLPS-03-*** TL (TR)





Note: Refer to the “A-A view” on the previous page for needle position.

		Station No.				
		1	2	3	4	5
Dimen. (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
Weight g		1250	1560	1920	2230	2540

*1: Pressure gauge (option) is not included.
*2: When solenoid valve is the electric connection 3N.

● Refer to pages 1174 to 1179 for dimensions of options and peripheral devices.