

Cutting tool breakage detection switch

# TLPS/MTLPS/UTLPS series



### **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**

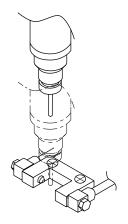
- Shorter machining tact Since non-contact detection makes it possible to detect the state while the tool is rotating, tact time is shortened compared to conventional methods.
- Compatible with adverse environments Self-cleaning by the air nozzle enables use even in environments where coolant or swarf scatter.
- Small-diameter drill and cutting edge chipping detection. Chips are detected on a Ø0.3 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)

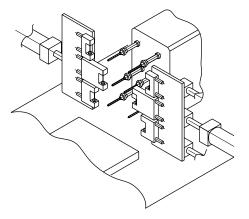
- High stability Stable cutting tool breakage, unaffected by fluctuations in supply pressure, is detectable with the air bridge.
- Easy adjustment The highly accurate needle with lock mechanism and dial scale makes it possible to adjust the detecting position easily with no worry about deviation.
- Modularization 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



1288

F.R.L. F.R. F (Filtr) R (Reg) L (Lub) Drain

Separ Press SW Res press exh valve SlowStart remove Filt

Film Resist FR Oil-ProhR Med Press FR PTFE FRL

Outdrs FRL Adapter Press Gauge CompFRL

LgFRL **PrecsR** 

VacF/R Clean FR

ElecPneuR

AirBoost Speed Ctrl

Silncr CheckV

other Fit/Tube

Nozzle Air Unit

PrecsCompr

Electro Press SW ContactSW

> AirSens PresSW Cool

Sens/Ctrl WaterRtSens TotAirSys TotAirSys (Gamma)

generator RefrDry

DesicDry HiPolymDry

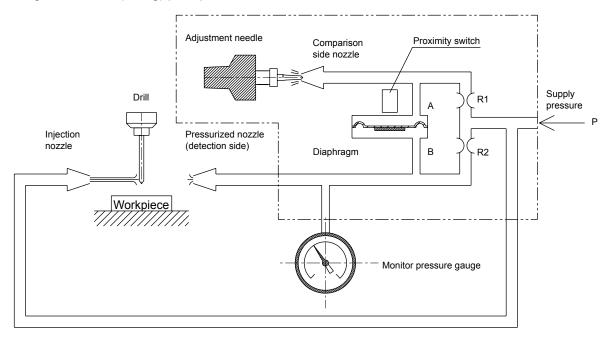
MainFiltr Dischrg etc

Ending

#### Operational explanation

### Operational explanation

#### Diagram of TLPS (facing) principle



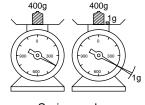
#### Detecting nozzles

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.

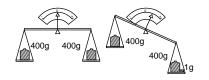
#### Cutting tool breakage detection switch

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 microfluctuations 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

F.R.L.

F.R. F (Filtr)

R (Reg)

L (Lub)

Drain Separ Mech Press SW Res press

exh valve
SlowStart
Anti-bac/Bacremove Filt

Film Resist FR Oil-ProhR

Med Press FR No Cu/ PTFE FRL Outdrs FRL

Adapter Joiner Press Gauge

CompFRL LgFRL

PrecsR VacF/R

Clean FR ElecPneuR

AirBoost

Speed Ctrl
Silncr

CheckV/ other Fit/Tube

Nozzle

Air Unit
PrecsCompn

Electro Press SW ContactSW

AirSens
PresSW
Cool
Air Flo

Sens/Ctrl
WaterRtSens
TotAirSvs

TotAirSys (Total Air) TotAirSys (Gamma) Gas

generator RefrDry

DesicDry HiPolymDry

MainFiltr Dischrg

Ending



Drain Separ

Press SW Res press exh valve SlowStart Anti-bac/Bacremove Filt Film Resist FR Oil-ProhR

Press FR PTFE FRL Outdrs FRL Adapter Press Gauge CompFRL LgFRL **PrecsR** VacF/R Clean FR ElecPneuR AirBoost

Speed Ctrl

Silncr

CheckV/

Nozzle

PrecsCompn

Electro

Press SW

ContactSW

AirSens PresSW Cool Sens/Ctrl WaterRtSens TotAirSys (Total Air) TotAirSys (Gamma) generator RefrDry

other Fit/Tube Cutting tool breakage detection switch, single unit

# **TLPS** Series





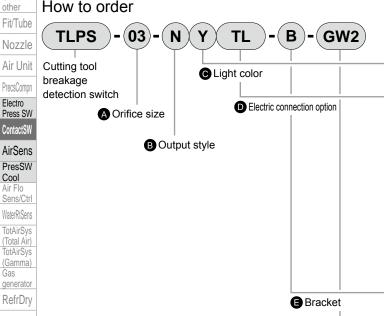


**Specifications** 1 MPa = 10 bar

	Opecinications				T MPa = 10 bar			
	Item			TLPS-03				
	Orifice size	mm	ø0.3					
	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 dia	ameter mm	ø0.3 to 30					
4	Power supply voltage V		DC10.2 to 26.4					
	Current consumption	mA		15 or less (when using 24 VDC)				
۱	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	When drill is broken		Yellow lamp ON, output ON				
4	Signal When drill is normal  Cutting edge detecting position  Insulation resistance  Withstand voltage		Yellow lamp OFF, output OFF					
4			1mm and over from end of the edge					
			10 $M\Omega$ and over at 500 VDC megger					
1			No failure impressed at 1000 VAC for one minute					
4	Vibration resistance	m/sec <sup>2</sup>		98				
	Ambient temperature	°C		5 (41°F) to 60 (140°F)				
	Degree of protection	(*1)	IP67 equivalen	t (connector), IP64 equivalent (DI	N terminal box)			
-	Connection tube	mm		Inner diameter 4				
	Port size		Detection port Ro	c1/8, supply port Rc1/4, pressure	gauge port Rc1/4			
	Weight		[	300 (electric connection option C0	)			
1	Air consumption	Nozzle	TLPS-J0310	TLPS-J0510	TLPS-J0715			
-	ℓ/min (ANR)	50 kPa (≈7.3 psi)	2.8	4.8	6.6			
	*Air consumption	100 kPa (≈15 psi)		7.2	9.7			
	Value when CKD's standard nozzle is selected	200 kPa (≈29 psi)	6.6	11.1	15.1			

gauge

- \*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.



	Code	Description		
	A Orifice	size		
	03	For ø0.3 detecting nozzle		
i				

B Output style		
NPN open collector		
Р	PNP open collector	

C Light co	olor
V	Vollow

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)			
	<u> </u>			

<b>E</b> Bracket			
Blank	Without bracket		
В	With bracket		
B Dranguiro gougo			

ure gauge Pressure Blank No pressure gauge G2 Pressure gauge with safety mark included (G40D-8-P02-S501) GW<sub>2</sub> Pressure gauge assembly with safety mark (G40D-8-P02-S501)

Precautions for model No. selection

- \*1: Refer to page 1301 for the model No. of the detecting nozzle.
- \*2: Refer to pages 1302 to 1307 for option and model No. of related components.

Dischrg Ending

DesicDry

HiPolymDry

MainFiltr

## Internal structure and parts list

C-C sectional view

### Parts list

Internal structure and parts list

A-A sectional view

No.	Part name	Material	No.	Part name	Material
1	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

F.R.L.

F.R.

F (Filtr)
R (Reg)

L (Lub)
Drain
Separ
Mech
Press SW
Res press
exh valve

exh valve
SlowStart
Anti-bac/Bac-

remove Filt
Film
Resist FR

Oil-ProhR Med

Press FR
No Cu/
PTFE FRL
Outdrs FRL

Adapter Joiner Press Gauge

CompFRL LgFRL

PrecsR

VacF/R

Clean FR ElecPneuR

AirBoost

Speed Ctrl

Silncr CheckV/

other Fit/Tube

Nozzle

Air Unit
PrecsCompn

Electro Press SW

ContactSW AirSens

PresSW Cool Air Flo Sens/Ctrl

WaterRtSens TotAirSvs

TotAirSys (Total Air) TotAirSys (Gamma) Gas generator RefrDry

DesicDry

HiPolymDry MainFiltr

Dischrg etc Ending

# TLPS Series

### **Dimensions**



F.R.

F.R.L.

F (Filtr)

R (Reg)

L (Lub)
Drain
Separ
Mech
Press SW

Press SW Res press exh valve SlowStart

Anti-bac/Bacremove Filt Film Resist FR

Oil-ProhR Med Press FR No Cu/ PTFE FRL

Outdrs FRL Adapter

Joiner
Press
Gauge
CompFRL

LgFRL

PrecsR VacF/R

Clean FR

ElecPneuR AirBoost

Speed Ctrl Silncr

CheckV/ other

Fit/Tube Nozzle

Air Unit

PrecsCompn

Electro Press SW

Contact\$W

AirSens

PresSW

Cool Air Flo Sens/Ctrl

WaterRtSens
TotAirSys
(Total Air)
TotAirSys

(Gamma)
Gas
generator

RefrDry DesicDry

HiPolymDry

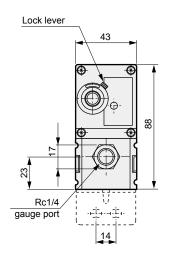
MainFiltr Dischrg

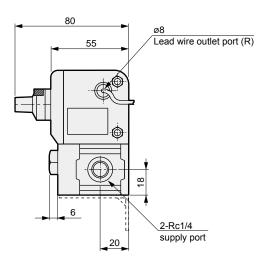
etc Ending

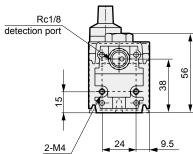
R

Basic TLPS-03-\*\* L

W



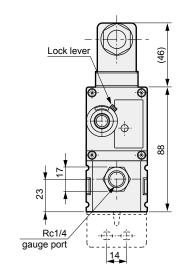


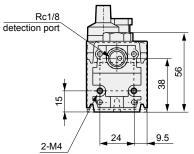


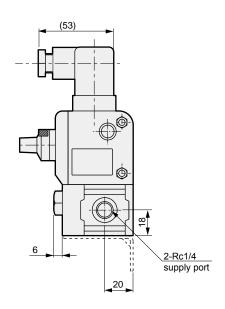
· Weight: 300g

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

#### ● DIN terminal box TLPS-03-\*\*F







· Weight: 340g

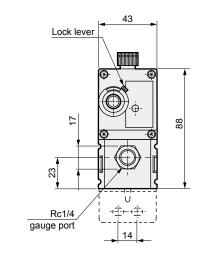
\* Bracket and pressure gauge (option) are not included.

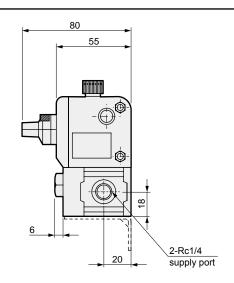
# TLPS Series

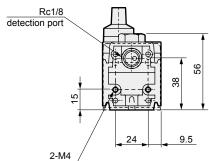
#### **Dimensions**











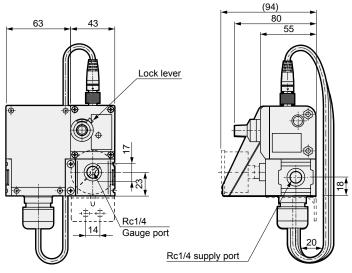
· Weight: 300g (for C0)

\*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)

63

Lock lever

CTR

Weight: 513g

(94) 55 Rc1/4 supply port

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

Refer to pages 1302 to 1307 for dimensions of options and peripheral devices.

**CKD** 

F.R.L. F.R.

F (Filtr)

R (Reg)

L (Lub)
Drain
Separ
Mech

Press SW
Res press
exh valve
SlowStart
Anti-bac/Bac-

remove Filt
Film
Resist FR

Oil-ProhR Med Press FR No Cu/

No Cu/ PTFE FRL Outdrs FRL

Adapter Joiner Press Gauge

CompFRL LgFRL

PrecsR

VacF/R

Clean FR ElecPneuR

AirBoost

Speed Ctrl
Silncr

CheckV/ other

Fit/Tube

Nozzle Air Unit

PrecsCompn

Electro Press SW ContactSW

AirSens PresSW Cool

Air Flo Sens/Ctrl

WaterRtSens
TotAirSys
(Total Air)
TotAirSys

TotAirSys (Gamma) Gas generator

RefrDry DesicDry

HiPolymDry

MainFiltr

MainFiltr
Dischrg
etc
Ending

Cutting tool breakage detection switch/manifold

# MTLPS Series







### Specifications

F.R.L. F.R. F (Filtr)

R (Reg) L (Lub) Drain Separ

Press SW

Res press exh valve SlowStart

remove Filt

Resist FR

Oil-ProhR

PTFE FRL

Outdrs FRL

Adapter

Press

Gauge

CompFRL

LgFRL

PrecsR

VacF/R

Clean FR

ElecPneuR

AirBoost

Speed Ctrl

Silncr

CheckV

Fit/Tube

Nozzle

Air Unit

PrecsCompr

Electro

Press SW

ContactSW

AirSens

PresSW

Sens/Ctrl

WaterRtSens

TotAirSys

(Total Air)

(Gamma) Gas generator

RefrDry DesicDry

HiPolymDry

MainFiltr Dischrg etc

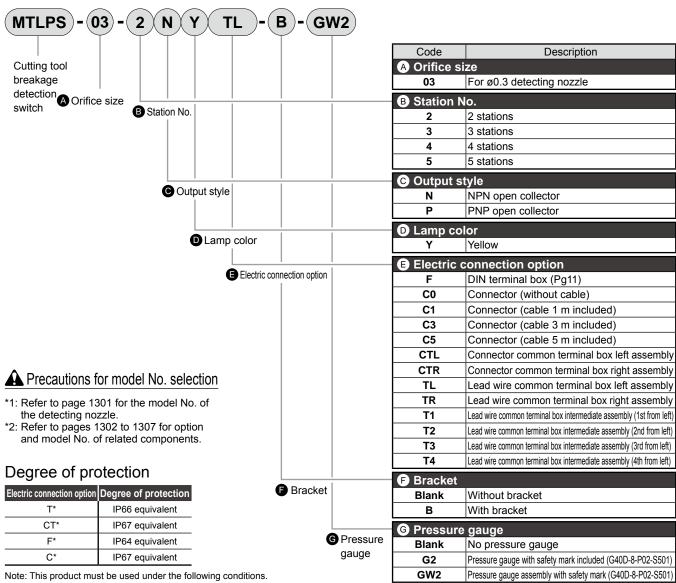
**Ending** 

Cool

other

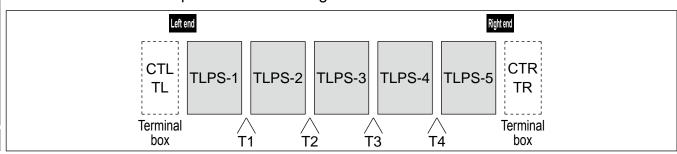
Med Press FR Basic specifications are the same as the single units on page 1290.

#### How to order



#### (1) Piping and wiring must be completed and pressure applied.

#### Terminal box installation position relation diagram



<sup>(2)</sup> A waterproof bushing must be used on the wires to the terminal box.

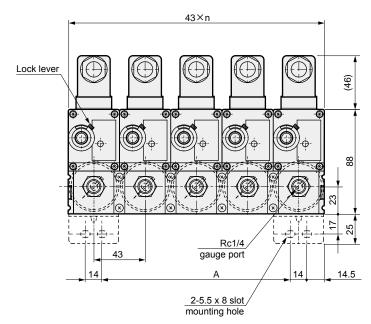
# MTLPS Series

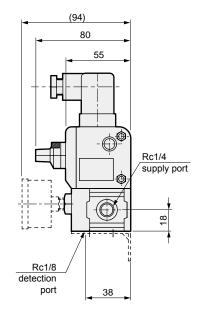
#### **Dimensions**

Dimensions CAD

Manifold (DIN terminal box: F)

● MTLPS-03-\*\*\* F

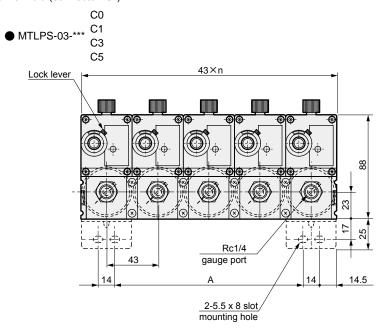


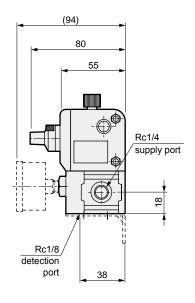


Station No.	n	Α	Weight g
2 stations	2	29	680
3 stations	3	72	1030
4 stations	4	115	1370
5 stations	5	158	1710

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

#### Manifold (connector: C\*)





Station No.	n	Α	Weight g	(For C0)
2 stations	2	29	590	
3 stations	3	72	890	
4 stations	4	115	1190	
5 stations	5	158	1490	

<sup>\*1:</sup> Bracket and pressure gauge (option) are not included.

F (Filtr)

R (Reg)

F.R.L. F.R.

Drain Separ Mech Press SW Res press exh valve

SlowStart

Anti-bac/Bacremove Filt
Film

Resist FR
Oil-ProhR
Med

Press FR
No Cu/
PTFE FRL
Outdrs FRL
Adapter

Joiner Press Gauge CompFRL

LgFRL PrecsR

> VacF/R Clean FR

ElecPneuR

AirBoost

Speed Ctrl
Silncr

CheckV/ other Fit/Tube

Nozzle

Air Unit

PrecsCompn Electro Press SW

ContactSW
AirSens
PresSW

Cool
Air Flo
Sens/Ctrl

WaterRtSens
TotAirSys
(Total Air)
TotAirSys

(Gamma)
Gas
generator
RefrDry

DesicDry

HiPolymDry MainFiltr

Dischrg etc Ending

<sup>\*2:</sup> Cable for C1, C3, C5 is included. (For the cable weight, refer to the option pages.)

# MTLPS Series

### **Dimensions**



F (Filtr)

R (Reg)

F.R.L. F.R.

L (Lub) Drain Separ Mech Press SW Res press exh valve SlowStart

Anti-bac/Bacremove Filt Film Resist FR Oil-ProhR Med

Press FR

PTFE FRL Outdrs FRL Adapter Joiner Press Gauge

CompFRL LgFRL PrecsR

VacF/R Clean FR

ElecPneuR AirBoost

Speed Ctrl Silncr CheckV/ other

Nozzle Air Unit

PrecsCompn

Fit/Tube

Electro Press SW ContactSW AirSens PresSW

Cool

Sens/Ctrl WaterRtSens TotAirSys (Total Air) TotAirSys (Gamma) Gas generator

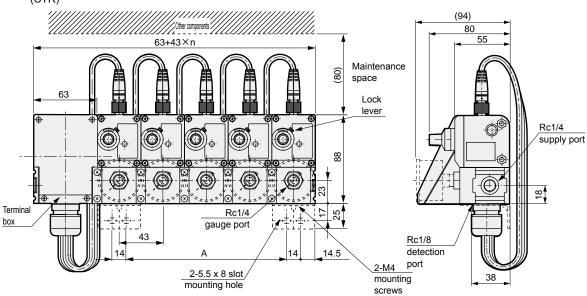
DesicDry HiPolymDry

RefrDry

MainFiltr Dischrg etc Ending

Manifold (connector common terminal box: CTL/CTR)

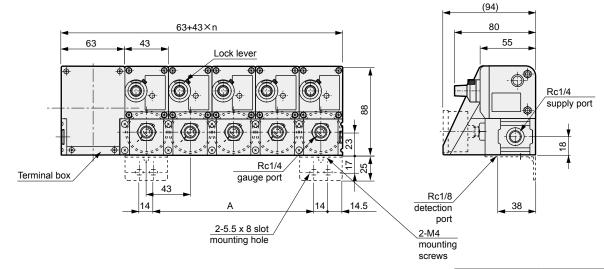
● MTLPS-03-\*\*\* CTL (CTR)



Station No.	n	Α	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-\*\*\* ,—



Refer to pages 1302 to 1307 for dimensions of options and peripheral devices.

Station No.	n	Α	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.

# MEMO

F.R.L.

F.R.

F (Filtr)

R (Reg)

L (Lub)

Drain

Separ Mech Press SW Res press exh valve

SlowStart

Anti-bac/Bac-

remove Filt
Film
Resist FR

Oil-ProhR

Med Press FR No Cu/ PTFE FRL

Outdrs FRL

Adapter Joiner Press Gauge

CompFRL

LgFRL PrecsR

VacF/R Clean FR

ElecPneuR

AirBoost

Speed Ctrl

Silncr

CheckV/

other Fit/Tube

Nozzle

Air Unit

PrecsCompn

Electro Press SW

ContactSW

AirSens PresSW Cool

Air Flo Sens/Ctrl

WaterRtSens

TotAirSys (Total Air) TotAirSys (Gamma) Gas generator

RefrDry

DesicDry

HiPolymDry MainFiltr

Dischrg etc

Ending 1297

Cutting tool breakage detection switch unit

# **UTLPS** Series

Solenoid valve with needle, regulator integrated general purpose unit







### Specifications

F.R.L

F.R. F (Filtr)

R (Reg) L (Lub) Drain Separ

Press SW

Med

other

WaterRtSens

TotAirSys

(Total Air) (Gamma)

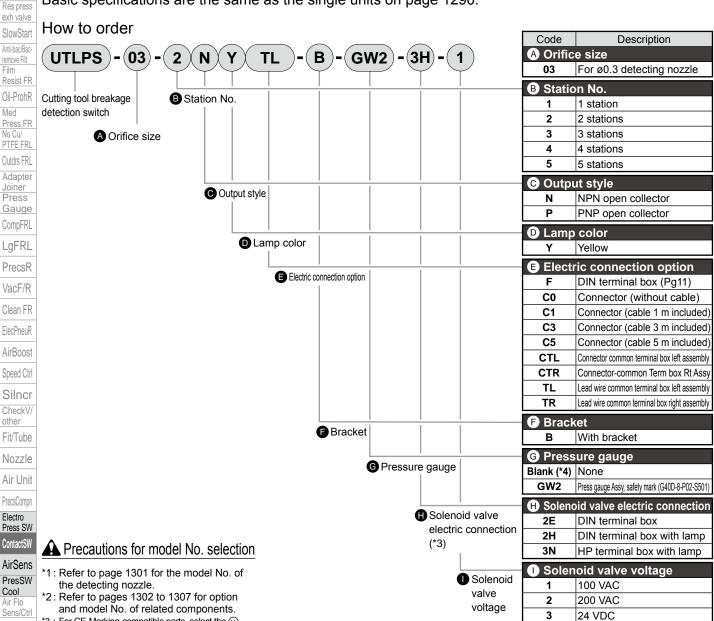
RefrDry

DesicDry HiPolymDry

MainFiltr Dischrg

Ending

Gas generator Basic specifications are the same as the single units on page 1290.

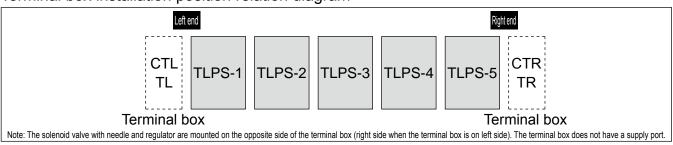


## Terminal box installation position relation diagram

For CE-Marking-compatible parts, select the (H)

\*4 : Regulator is also provided without pressure

solenoid valve electric connection from 2E or 2H.

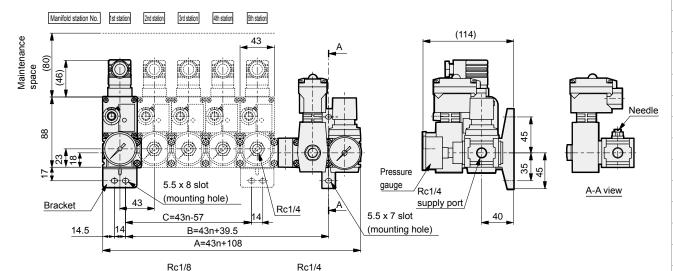


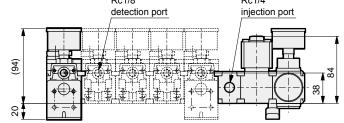
# **UTLPS** Series

CAD **Dimensions** 

- Unit (DIN terminal box: F)
  - UTLPS-03-\*\*\* F

20





			No.			
		1	2	3	4	5
	Α	151	194	237	280	323
Dimen. (mm)	В	82.5	125.5	168.5	211.5	254.5
(111111)	С	-	-	72	115	158
Bracket set		1	1	2	2	2
Weight	t g	1070	1420	1800	2150	2490

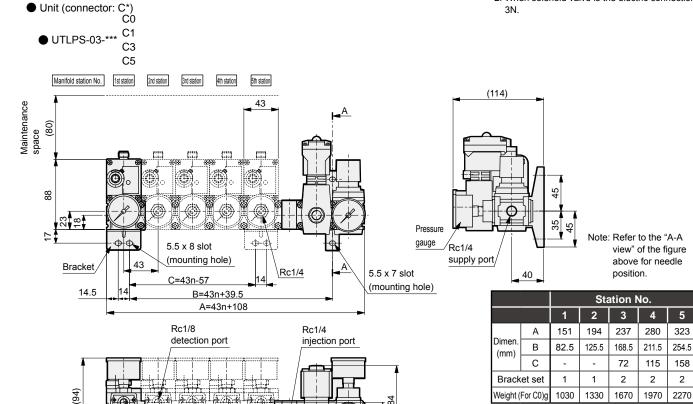
\*1: Pressure gauge (option) is not included.

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

\*3: Cable for C1, C3, C5 is included.

3N.

\*2: When solenoid valve is the electric connection 3N.



(For the cable weight, refer to the option pages.) 1299

F.R. F (Filtr)

F.R.L.

R (Reg)

L (Lub) Drain Separ Press SW Res press

exh valve SlowStart Anti-bac/Bac remove Filt Film

Resist FR Oil-ProhR Med

Press FF No Cu/ PTFE FRI Outdrs FRL Adapter

Joiner Press Gauge CompFRL

LgFRL PrecsR

VacF/R Clean FR

ElecPneuR AirBoost

Speed Ctrl

Silncr CheckV/ other

Fit/Tube Nozzle

Air Unit PrecsCompn

Electro Press SW

ContactSV AirSens PresSW

Cool Sens/Ctrl

WaterRtSens TotAirSys (Total Air) TotAirSys (Gamma

generato RefrDry DesicDry

HiPolymDry MainFiltr

Dischrg

**Ending** 

2

# UTLPS Series

### **Dimensions**



- F (Filtr)
- R (Reg)

F.R.L F.R.

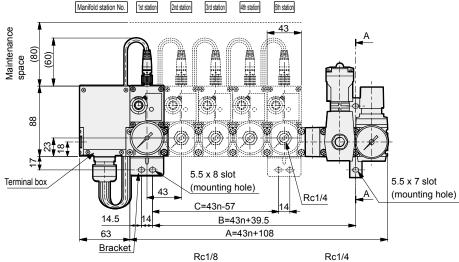
- L (Lub) Drain Separ Press SW
- Res press exh valve SlowStart Anti-bac/Bac-
- remove Filt Film Resist FR Oil-ProhR Med
- PTFE FRL Outdrs FRL Adapter Joiner\_
- Gauge CompFRL
- **PrecsR**

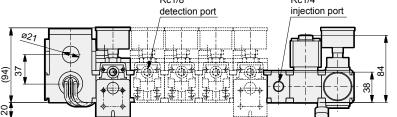
- Speed Ctrl
- other Fit/Tube
- Nozzle Air Unit
- Electro Press SW ContactSW
- AirSens PresSW Cool Sens/Ctrl
- WaterRtSens TotAirSys (Total Air) TotAirSys (Gamma) Gas
- RefrDry DesicDry
- HiPolymDry MainFiltr Dischrg

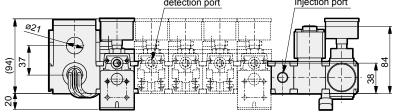
- Press FR
- Press
- LgFRL
- VacF/R Clean FR
- ElecPneuR AirBoost
- Silncr CheckV/
- PrecsCompn
- generator

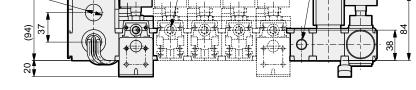
- Ending

- Unit (connector common terminal box: CTL/CTR)
  - UTLPS-03-\*\*\* CTL (CTR)

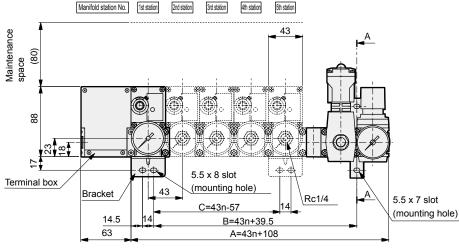


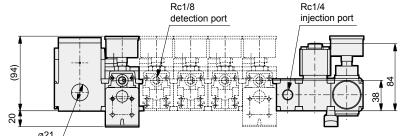




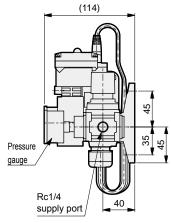


- Unit (lead wire common terminal box: TL/TR)
  - UTLPS-03-\*\*\* TL





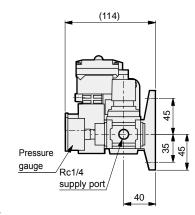
Refer to pages 1302 to 1307 for dimensions of options and peripheral devices.



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

		Station No.				
		1	2	3	4	5
<u></u>	Α	151	194	237	280	323
Dimen. (mm)	В	82.5	125.5	168.5	211.5	254.5
()	С	-	-	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



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

			Station No.				
			1	2	3	4	5
<u>.</u>		Α	151	194	237	280	323
Dimen. (mm)	- 1	В	82.5	125.5	168.5	211.5	254.5
		С	-	-	72	115	158
Bracket set		1	1	2	2	2	
Weig	Weight g		1250	1560	1920	2230	2540

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

# TLPS Series

### Detecting nozzle

## **Specifications**

Detecting nozzle

Item		TLPS-J0310	TLPS-J0510	TLPS-J0715	
Applicable drill diameter m		ø0.3 to 3	ø1 to 10	ø3 to 30	
Distance between nozzles	mm	5	12	32	
Guide to dial value (needle position) (times		1.8 to 2.2	2.3 to 2.7	5.3 to 5.7	

- \*1: The table above shows reference values when supply pressure is 0.1 MPa and pipe length is 5 m.
- \*2: Contact CKD for custom-made nozzle and multi spindle.
- \*3: Jet nozzle is indicated as A, and pressurizing nozzle is indicated as B.
- \*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.

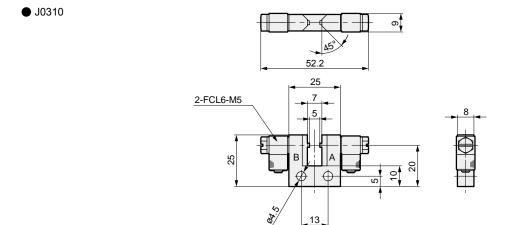
#### How to order



Code	Description			
Code	Inject nozzle ø (A side)	Nozzle press ø (B side)		
0310	ø0.3	ø1.0		
0510	ø0.5	ø1.0		
0715	ø0.7	ø1.5		

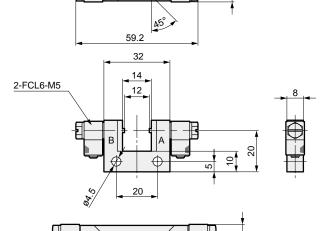
### **Dimensions**





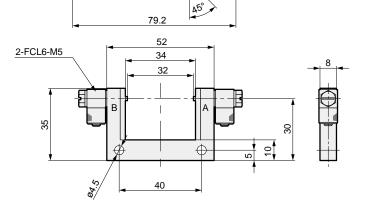
Weight: 30g

**J**0510



Weight: 31g

● J0715



Weight: 39g

CKD

F.R.L. F.R.

F (Filtr)

R (Reg)

L (Lub)

Drain Separ Mech Press SW Res press

exh valve
SlowStart
Anti-bac/Bac-

remove Filt
Film
Resist FR

Oil-ProhR

Med Press FR No Cu/ PTFE FRL

Outdrs FRL Adapter

Joiner Press Gauge

LgFRL

PrecsR VacF/R

Clean FR

ElecPneuR AirBoost

Speed Ctrl

Silncr CheckV/ other

Fit/Tube

Nozzle Air Unit

PrecsCompn

Electro Press SW

ContactSW AirSens

PresSW Cool Air Flo

Air Flo Sens/Ctrl WaterRtSens

TotAirSys (Total Air) TotAirSys (Gamma)

Gas generator

RefrDry DesicDry

HiPolymDry

MainFiltr Dischrg

Ending

1301