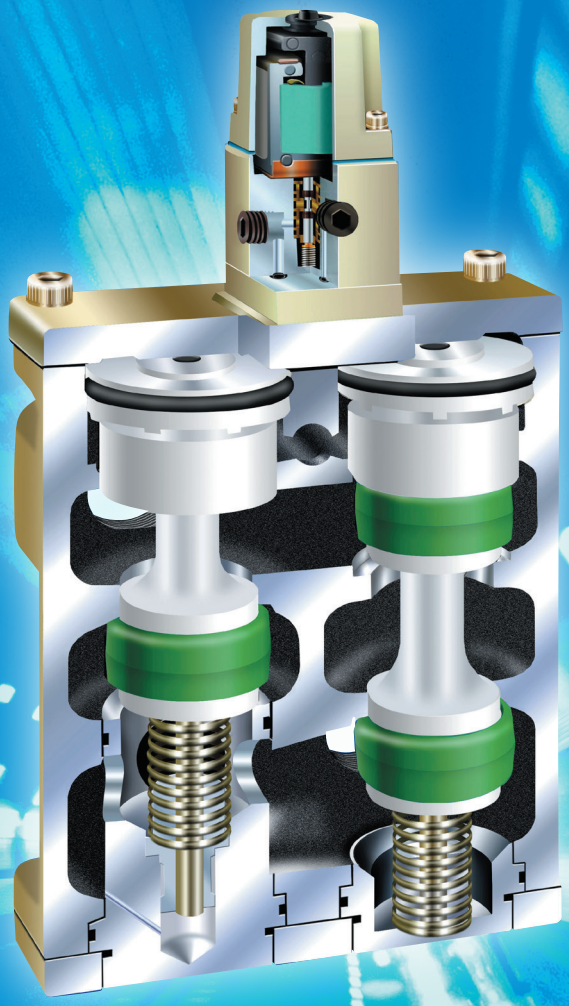
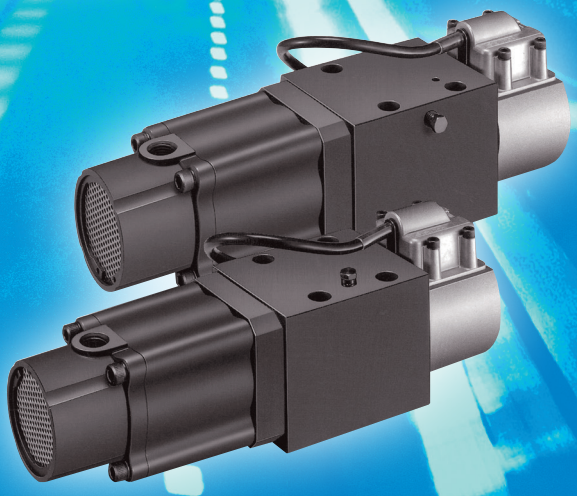
KONAN®

CAT.No.3020E

For Press Machines

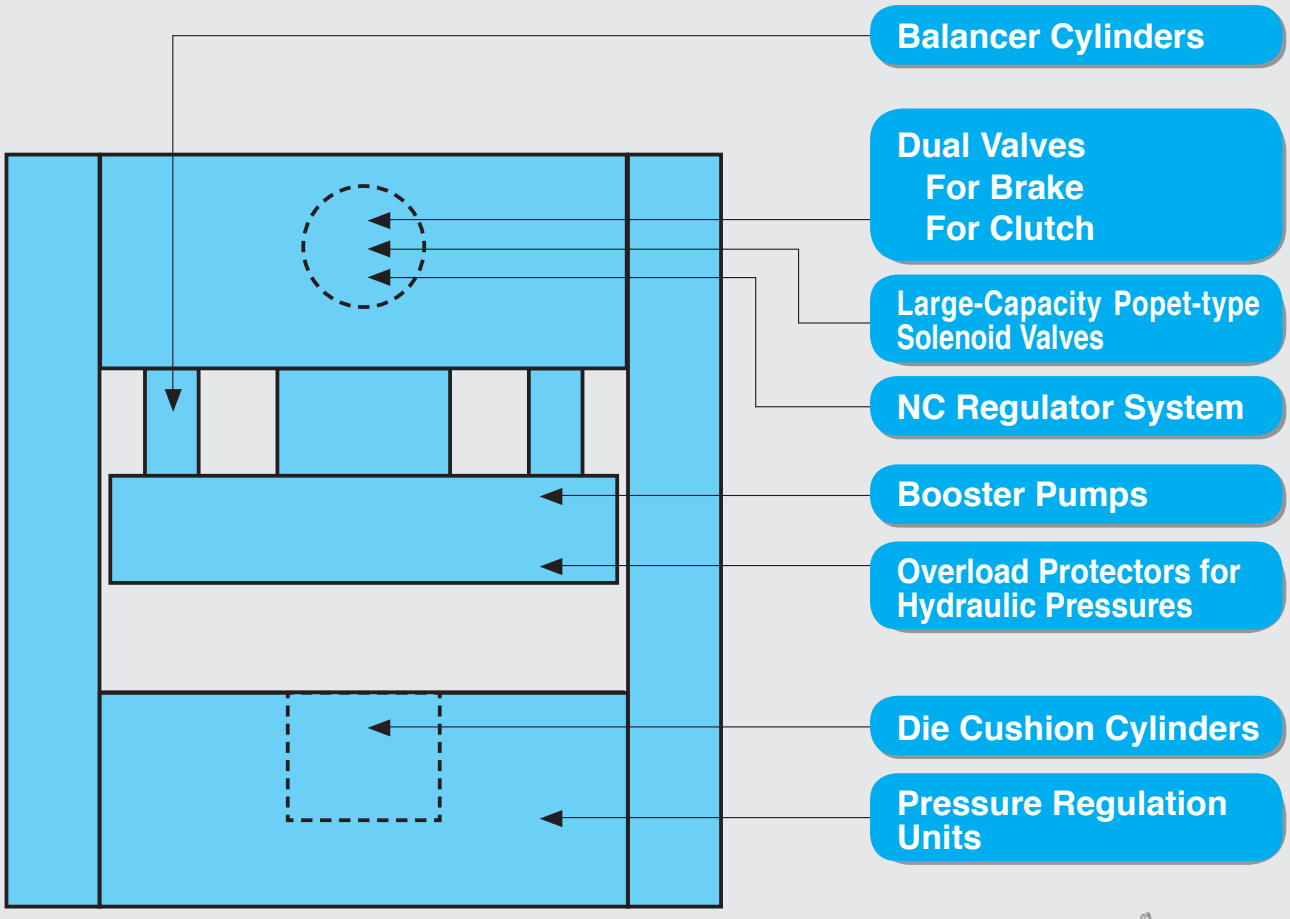
Solenoid valves Circuit component equipment

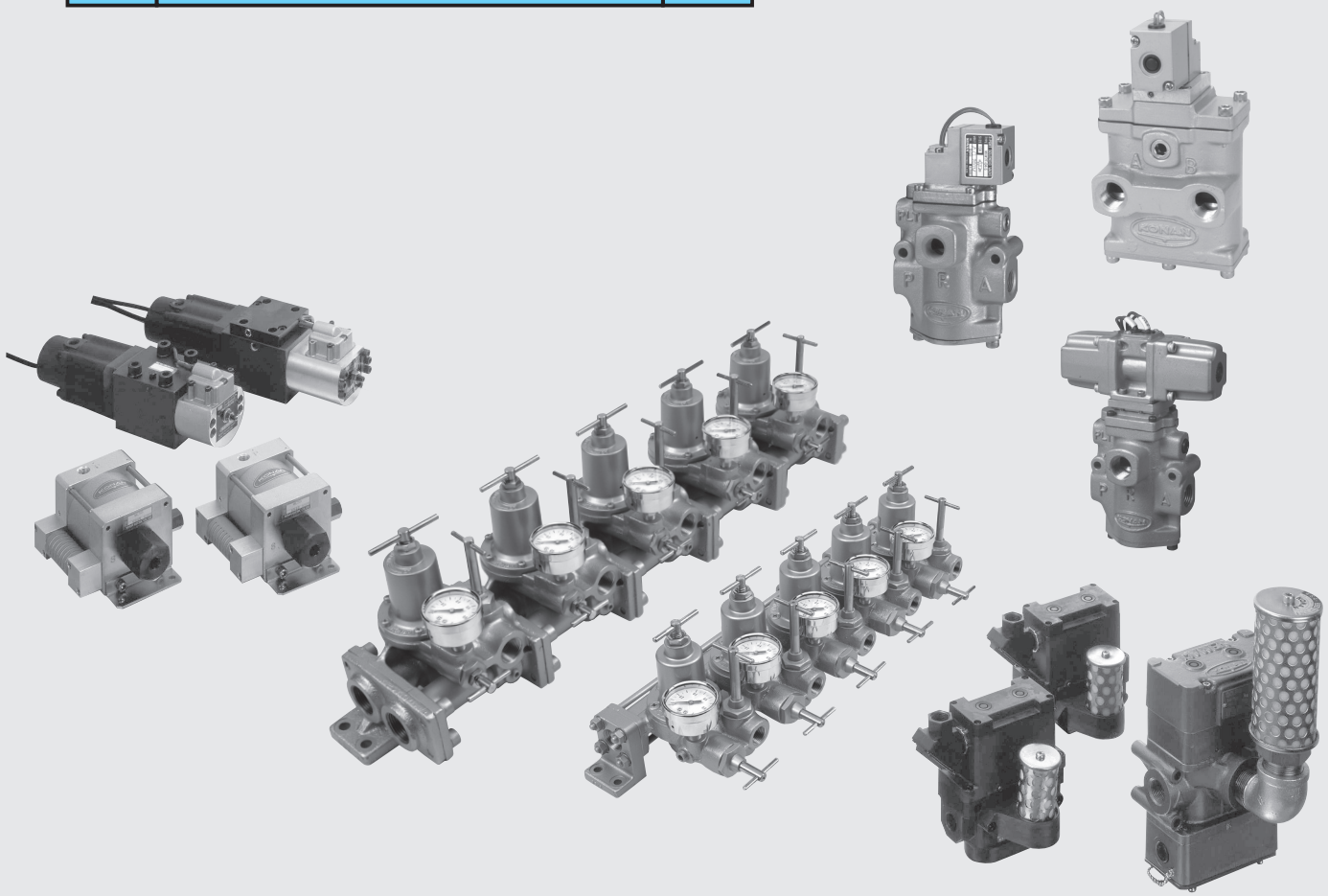




KONAN ELECTRIC CO.,LTD.

Distribution diagram of press machine





INDEX

Solenoid Valves for Fluid Control and Valve Systems
General Handling Instructions and Precautions

Please read the following general handling precautions carefully before ordering solenoid valves for fluid control.

Following information is based on a risk assessment for Konan general purpose solenoid valves used for fluid systems (hereafter referred to as Agvalve(s)Ah). Each section provides information essential for safe operation of valve systems and prevention of risk and damage that may affect operators. Please read carefully.

Safety Precautions

References: JIS B9702: Safety of machinery_ principles of risk assessment
JIS B8370: Pneumatic fluid power_general rules relating to systems

⚠ Warning A valve is operated by switching electric signals to increase / decrease or stop/supply fluid. It is widely used for fluid control systems in general. For safe operation of the valve, care should be taken especially for the following points.

① Selection of solenoid valves

1.1 Applicable fluid

A valve should be used with compressed air only, except for cases where nitrogen gas tank[1)] is used for system inspection, emergency measure, or portable pressure source. If highly dry air with dew point of no more than -40°C is to be used, make sure to use the valve with lubrication taking into consideration the dryness measure.

For a general purpose solenoid valve (for liquid and gas fluid) for which air is not specified as one of applicable fluids, do not employ compressed air as a flow media. For anything unclear regarding applicable fluids, feel free to ask our sales personnel in the planning stage.

Note1) Be careful to avoid suffocation of operators and others around the valve system. For a system that uses portable air or nitrogen tank, the High Pressure Gas Safety Law will be applied where fluid pressure exceeds 1 MPa.

1.2 Safety of a valve

A pneumatic system may be exposed to various hazardous environment, including those derived from the system components as well as the condition for use and the system structure. In selecting a valve make sure to take into consideration the valve function as well as safety in installation, adjustment, actual operation, system failure, and disposal of the valve.

1.3 Electrical safety

A solenoid valve is activated by magnetic force (solenoid). Take into consideration the following matters when selecting a valve and electric options.

1) Dust-proof/water-proof specification Water-proof indication should follow JIS C0920.
2) Sudden shut down of power source (power failure,emergency shutdown, etc.)
3) Voltage fluctuation in power source and electrical surge
4) Leakage current at PLC (sequencer) power off Konan solenoid valves are not equipped with functions that meet the following conditions. Do not use the valves in these conditions or employ a safe electric distribution.
   1) External magnetic field effect
   2) Electric current from the relevant control circuit
   3) Lightning-induced voltage

1.4 Pilot valve

A compact size pilot valve is widely used in general, as it switches large main valve with a small output. However, a certain inlet pressure is essential for the valve operation. For control of minimal pressure, select a direct-acting type valve. With optional pilot supply (separate pilot piping needed), a pilot valve can be used even when the main valve pressure is zero.

1.5 Back pressure from exhaust port

In some poppet valves, back pressure from the exhaust port may affect the valve operation. There is no problem with the back pressure generated in the silencer set at the exhaust port, but do not force to narrow the exhaust port diameter or connect a long pipe to the port. Details of the effect of back pressure are described in a separate operation manual. For anything unclear feel free to contact our sales personnel.

1.6 Reverse flow

Use a valve complying with the flow direction indicated with arrow mark in the JIS figure of the catalogue and operation manual. Safe operation cannot be guaranteed if the valve is used with reverse pressure or reverse flow. There is no problem with the slow reverse flow exhaustion during maintenance or compressor power off. If valve operation is stopped abnormally, a failure may occur when restarting operation due to the stop position of the valve. If reverse flow is detected at abnormal stop or any trouble at the restart of the valve is concerned, feel free to ask our sales personnel.

1.7 Manual operation

1) If there is a possibility that manual operation button of a valve may be pushed unexpectedly, select a valve equipped with protection cover.
2) If failure to unlock manual operation of a valve may cause serious danger, select a valve without locking function.

② Solenoid valve installation

Solenoid valves have precise operational functions and are used for applications with versatile conditions and environment. It is therefore sometimes difficult to assume all concerned risks or risk factors when designing a valve. In such cases the valve function and performance may be deteriorated in a period shorter than the maintenance period set by the manufacturer. In order to avoid the risks, install the valve as instructed below.

2.1 Installation site

Install a valve in a place where setting and maintenance is easy. As a valve is often incorporated into an existing main system, consideration for maintenance is sometimes insufficient. Secure enough space for safety of the valve operation.

2.2 Operating procedure

When operating a valve to activate a pneumatic cylinder and other actuators, install the components and complete piping, and then start operation of the actuators with small load and slow speed, gradually adjusting them to rated conditions while confirming no abnormalities or air leakage in the valve and actuators.

2.3 Bursting out of a cylinder

After installation or maintenance, supply air after confirming that a cylinder is in a targeted valve control position. If not in

the position, the cylinder may rapidly shift to the control position. In order to avoid this risk, installation of a slow-start valve at the IN port of the valve is recommended.
Note) (See Section 2.4) When installing a slow-start valve at the IN port of a pilot valve, adjust a bypass valve of the slow-start valve in order to maintain minimal operational pressure of the pilot valve. If the bypass valve diameter is excessively narrowed, the pilot pressure will become less than the minimal operational pressure, which may cause valve malfunction.
Also, when restarting air supply, open a manual valve in a short period of time while checking manometer to secure minimal operational pressure of the pilot valve, and then supply air slowly.

2.4 Securing pilot pressure

Install a pilot valve taking care for the following matters.

1) Inlet pressure of a valve should be higher than the minimal operational pressure. Especially if air supply is not enough, pressure fluctuation may occur during the valve operation and pressure may be below the lower limit of the operational pressure.
2) If long piping is employed at the inlet of a valve or the pipe diameter is smaller than the port diameter, pressure drop may occur, resulting in the inlet pressure decrease.
   Note: One countermeasure is to install a supplementary air tank in front of the inlet port. In order to confirm no decrease in inlet pressure, install a manometer around the port.
3) For a manifold type solenoid valve, make sure to connect allowable number of valves only. Simultaneous operation with excess number of valves (more than 3 units in standard) may cause centralized pressure drop at the manifold, decreasing the valve inlet pressure.
   Note: For a manifold with two inlet ports, the number of valves can be increased by supplying air from both ports.

2.5 Indication

If a valve nameplate cannot be seen due to installation environment, place an alternative indication near the valve.

2.6 Residual pressure

Compressed air in a pneumatic valve system may not be completely exhausted after the valve power shut down. Residual pressure may cause unintended cylinder operation in the system. A valve should be installed taking into consideration the risks including sudden blowout of residual air.

2.7 Air exhaustion

At an exhaust port of a valve, sonic jet flow may occur, causing noise as well as damage to operator due to the fragments and dusts spread by the jet flow. If any personnel may come closer to the exhaust port, install a silencer to avoid noise and adjust air flow.

2.8 Training

A sufficiently trained person should be responsible for installation and maintenance of a pneumatic system. (Konan provides training for operation and maintenance of pneumatic components. Feel free to contact our sales personnel for details.)

③ Maintenance of solenoid valves

Maintenance should be performed in accordance with the following steps. Feel free to contact our sales personnel for separate maintenance manual.

3.1 Daily inspection

1) Drains contained in compressed air may inhibit the valve lubrication. Set an air filter in front of the valve and routinely exhaust drains.aactuators.
2) During the valve system operation, check the valve visually and acoustically for external abnormalities or noise. Check also the loosening of screws and air leakage from exhaust port and piping joint without exhausting air from the system, and perform periodical inspection as necessary to recover any abnormalities.

3.2 Periodical inspection

Following periodical inspection should be conducted by-annually or annually.

1) Overhaul should be performed after pneumatic/electric shut-down and abnormalities recorded and repair conducted as necessary.
2) In the 2nd periodical inspection, perform an overhaul of the product, repair or exchange solenoid assAfy, coil, packings, and other components as necessary. However, even before 2 years has passed, the valve that reached the specified durable operation cycle[2)] should be over hauled and parts exchanged if necessary.
   Note2) [Laboratory durable operation cycle]: New Magstar 414 series and heavy duty series solenoid valves: 5 million cycles

Durable operation cycle for each valve is specified in the operation manual or drawing. This cycle is determined based on the Konan standard test results. Inspection interval should be determined referring to the actual installation environment or storage records.

3) If a valve is not used for a long time, the valve function may be deteriorated when restarting operation, due to precipitation or effusion of lubricant film. According to the JIS standard, minimal operation frequency of a valve is specified as once in 30 days. Before reaching that date perform periodical test operation or take other measures for preventing the valve deterioration.

3.3 Residual energy

Maintenance requiring actual operation of a system should be performed after pneumatic/electric shut-down and exhaustion of all residual electrical charge and compressed air from the system. Make sure the movable components do not move during the maintenance, and mechanically fix them if necessary for safety. Care should also be taken for components that may drop out during the maintenance operation and components with sharp edges to ensure safety.

3.4 Communication

If multiple persons are involved in the maintenance operation, keep all the personnel informed about the conditions including power-off, completion of residual pressure exhaustion, power-on, and resumption of air supply.

④ Solenoid valve installation site

Use of a valve at the following sites requires compliances with special functional specifications and regulations. Consult our sales personnel in the planning process for anything unclear. thing unclear.

1) Operating conditions not within the specified range
2) Significant risk for users, properties, or environment is anticipated

Eg: Use in explosive environment[3)], use for nuclear power plants, vehicles, medical components, components related to the Occupational Health and Safety Law and/or the High Pressure Gas Safety Law, etc.

Note3) : Select Konan explosion-proof solenoid valves for use in general gas explosive environment.

MVW6N シリーズ
3-Port Dual Valves

MVW6N series pneumatic solenoid valves are constantly-closed (normal closed) type 3-port dual solenoid valves pursuing for “stability of working time” in addition to “safety” and “durability” for brakes and clutches of press machines.

Adjustment for timing unit

This is a unit in which fixed orifices are mounted in parallel on the flowing line leading from the OUT port of pilot valve to the main valve piston and appropriate volume is provided on the upper part of the main valve piston.
Narrowing the air supply and exhausting amount to the main valve enables the time lag between the excitation of solenoid and change of the main valve to delay. The time lag length can be changed arbitrarily by changing the orifice diameter.

For clutch

Enables the time from turning ON the solenoid to opening the main valve to delay arbitrarily.

For brake

Enables the time from turning OFF the solenoid to closing the main valve to delay arbitrarily.

※ Solenoid valves for clutch and brake have undergone incorporation of securing orifice with hole diameter of ϕ1.2mm and been shipped from our factory. If changing the timing from the standard, process included (4) orifices whose holes are not processed to proper hole diameter before use.

Main Valve

A urethane rubber molded component is used for the main valve in the same manner as the pilot valve. This valve has the durability to enable operations 20 million times.

R port

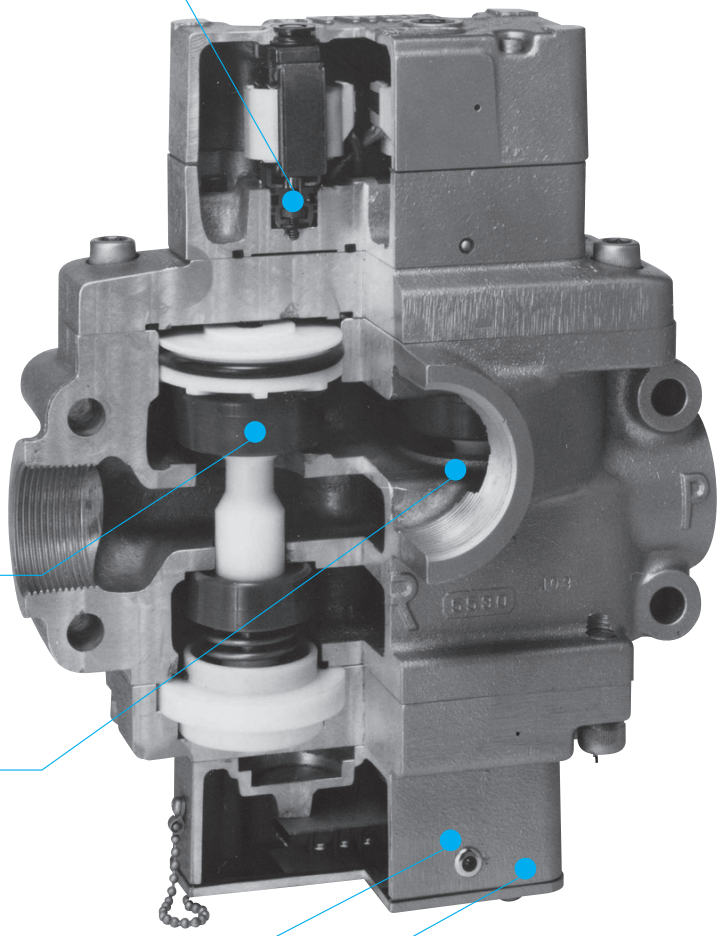
Even one of 2 valves malfunctions, the other one operates to exhaust air. In the case where pressure at supply side is 0.5MPa, the exhaust pressure is approx. 0.01 to 0.025MPa (2 to 5%) with the silencer provided.
In addition, all MVW6N series solenoid valves are equipped with silencers as standard.

Indicate Lamp

In order to identify electric signals to solenoid, all models of MVW6N series are equipped with neon lamps as standard.

Pilot Valve

A urethane rubber molded component is used for the poppet-type pilot valve, which has the durability to enable operations 20 million or more times. The separate type to prevent air from entering the solenoid part is used. As a result, this valve is not easily affected by drain, oil mist, etc., and eliminates variation in operating time after long-term use.



Terminal box

A highly-reliable round crimping terminal can be attached to this terminal box. It is unnecessary to disassemble the pilot part when attaching because wiring is made in the terminal box (proximity switch box or monitor box).
In addition, in case of a terminal box with a proximity switch or monitor, attach the box here.

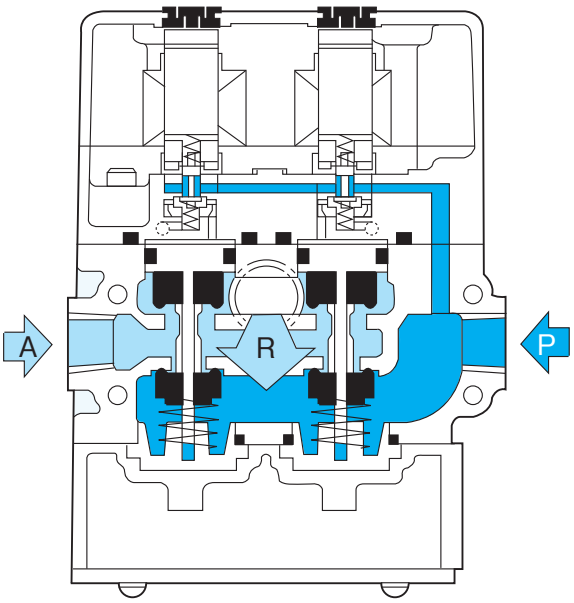
Types

- Standard Type / MVW6N-08・14
  - for Brake /MVW6N-08・14-B1
  - for Clutch /MVW6N-08・14-C1
- w/Proximity Switch / MVW6N-08・14-K
  - for Brake /MVW6N-08・14-K-B1
  - for Clutch /MVW6N-08・14-K-C1
- w/Monitor / MVW6N-08・14-M1
  - for Brake /MVW6N-08・14-M1-B1
  - for Clutch /MVW6N-08・14-M1-C1

Operation

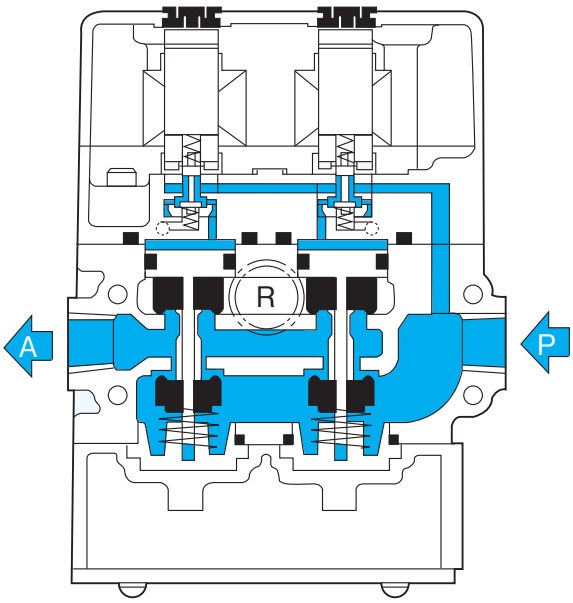
De-energized

P → Close
A → R



Energized

P → A
R → Close

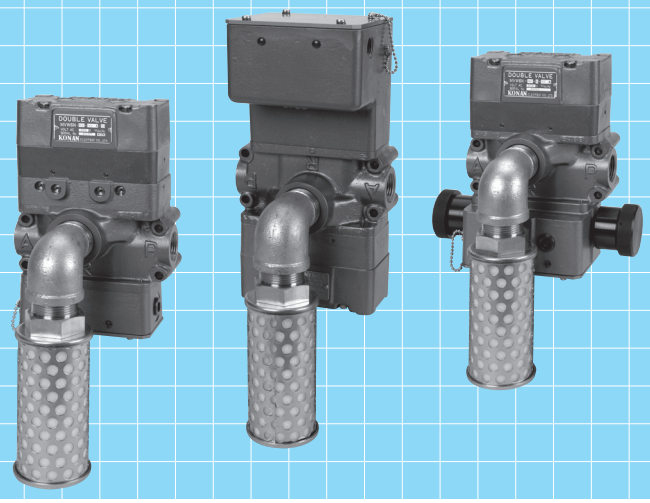


3 Port Dual Valves

Standard Type : MVW6N－08・14－B1 (C1)
w/Proximity Switch : MVW6N－08・14－K－B1 (C1)
w/Monitor : MVW6N－08・14－M3－B1 (C1)

For Brake and Clutch

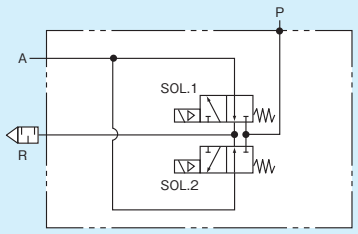
Port size Rc 3/4・1・1 1/4・1 1/2



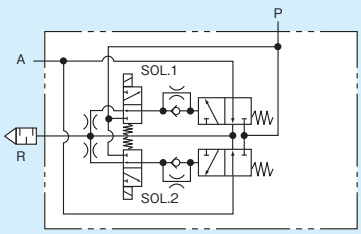
JIS symbol

Standard Type

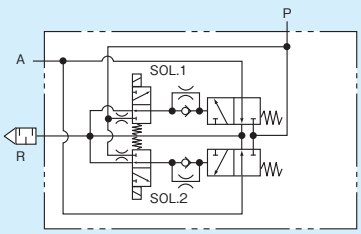
Without timing adjustment mechanism
MVW6N-08/14



For brake
MVW6N-08/14-B1

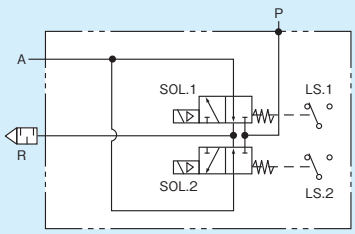


For clutch
MVW6N-08/14-C1

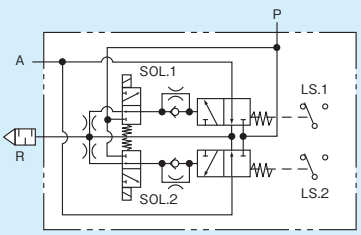


w/Proximity Switch

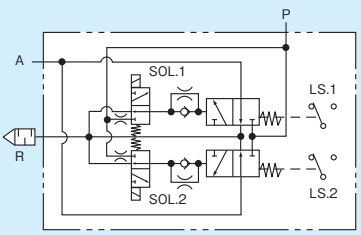
Without timing adjustment mechanism
MVW6N-08/14-K



For brake
MVW6N-08/14-K-B1

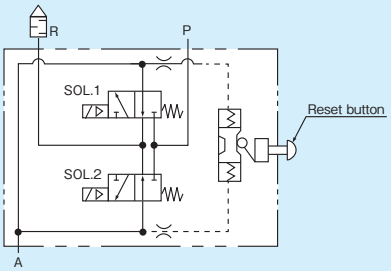


For clutch
MVW6N-08/14-K-C1

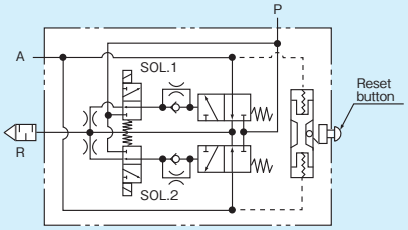


w/Monitor

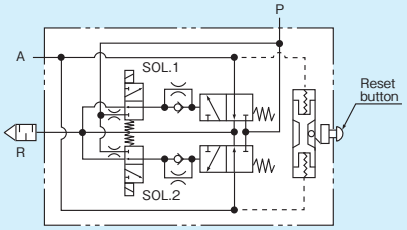
Without timing adjustment mechanism
MVW6N-08/14-M3



For brake
MVW6N-08/14-M3-B1



For clutch
MVW6N-08/14-M3-C1



Specifications

Model code	Standard Type	MVW6N-08		MVW6N-14		
	w/Proximity Switch	MVW6N-08-K		MVW6N-14-K		
	w/Monitor	MVW6N-08-M3		MVW6N-14-M3		
Port size	"P・A" Ports	Rc 3/4	Rc1	Rc1 1/4	Rc1 1/2	
	"R" Port	Rc1 1/4		Rc2		
Effective sectional area	P → A	50㎟		150㎟		
	※1 A → R	380㎟		880㎟		
Fluid		Compressed air (Dry air filter passage less than 40 μm.)				
Working pressure		0.2 ~ 0.7MPa (Normal operation pressure : 0.5MPa)				
Fluid temp.		− 5 ~ 60℃ (Normal temperature : 5 ~ 50℃)				
Ambient temp.		− 5 ~ 50℃ (remove moisture perfectry form the fluid to prevent freezing when used at 5℃ or lower.)				
Solenoid	Allowable voltage fluctuation	± 10% of the rated voltage				
	Temperature rise	Max.45℃				
	Insulation class	JIS C 4003 Class B				
	Power consumption	See coil data				
Effective sectional area	P → A	50㎟		150㎟		
	A → R	380㎟		880㎟		
※2 Response time	Sol ON → Valve open	Less than 25ms		Less than 40ms		
	Sol OFF → Valve closed	Less than 30ms		Less than 60ms		
Operating frequency		Max.100times/min				
Installation position		As desired				
Mass	Standard Type	5.5kg		13.5kg		
	w/Proximity Switch	7.0kg		16.0kg		
	w/Monitor	6.0kg		14.0kg		

Note) 1.A → R value of the above effective sectional area shows values without silencer.
2.The response time shows a value without timing adjustment mechanism. In case of brake use (B1) and clutch use (C1), consult with us separately.

Coil data

Rated voltage [V]	AC			
	100		200	
Frequency [Hz]	50	60	50	60
Issuance current [mA]	1290	840	612	420
Retention current [mA]	430	280	204	140

Note) Current shows the value of one solenoid.

Model Code

When ordering,specify the model as follows.

MVW6N – ① – ② – ③ – ④ – ⑤

- ① Body size
- ② Option
- ③ Port size
- ④ Adjust for timing
- ⑤ Rated voltage

① Body size

Rc 3/4	08
Rc 1	
Rc 1 1/4	14
Rc 1 1/2	

② Option

Standard Type	No entry
w/Proximity Switch	K
w/Monitor	M3

③ Port size

08	Rc 3/4	20A
	Rc 1	25A
14	Rc 1 1/4	32A
	Rc 1 1/2	40A

● The port size shows a bore of P, A port

④ Adjust for timing

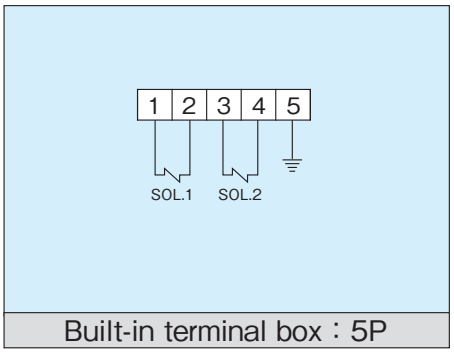
Without	No entry
For brake	B1
For clutch	C1

⑤ Rated voltage

AC100V (50/60Hz)	AC100
AC200V (50/60Hz)	AC200

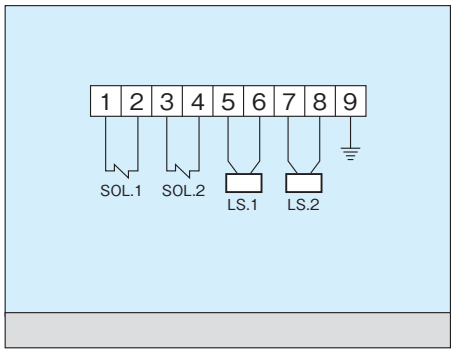
Wiring

Standard Type

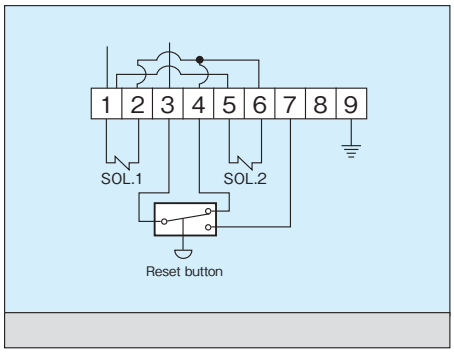


Built-in terminal box : 5P

w/Proximity Switch



w/Monitor



Note) Detection of malfunction: When malfunction occurs, the monitor mechanism functions to operate the limit switch and shut off the solenoid current. For the monitor mechanism, after eliminating the failures, re-start it by resetting.

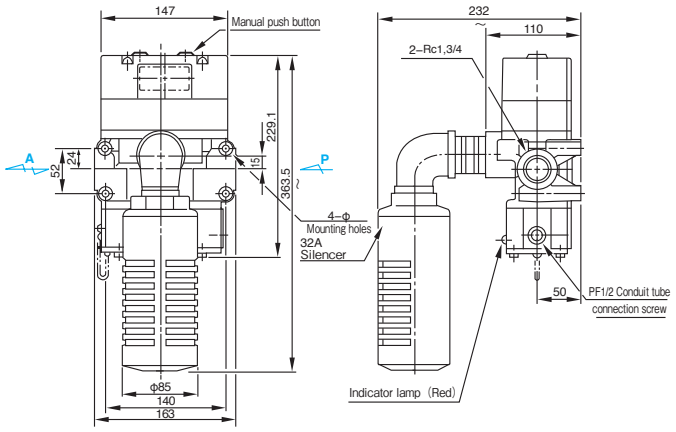
Rating of proximity switch

Voltage	AC90 ~ 250V (50/60Hz)
Power consumption	0.5VA or less (AC100V) 1.0VA or less (AC200V)
Loading current	Max.200mA (induced load)

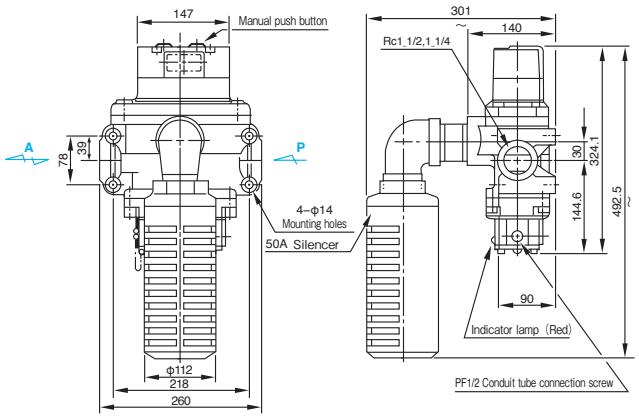
Note) 1. Be sure to connect to the current via load. Direct connection damages the internal element.

External Dimensions

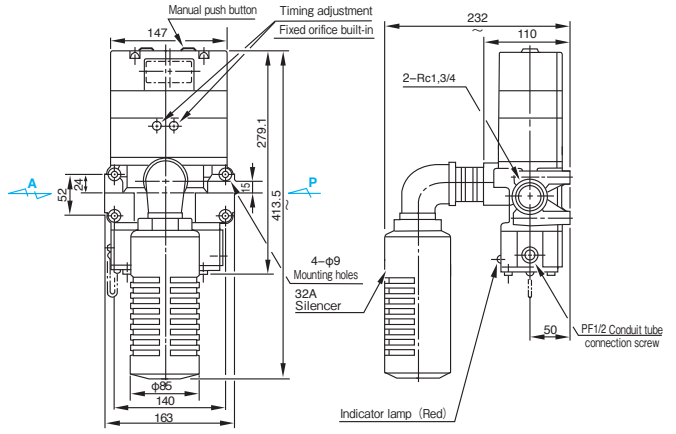
MVW6N-08



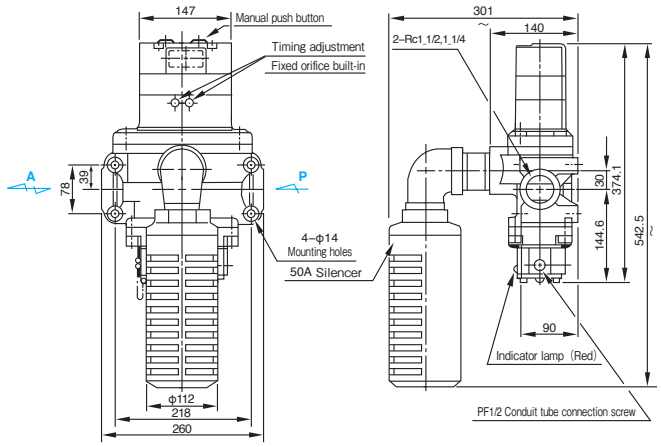
MVW6N-14



MVW6N-08-B1 (C1)

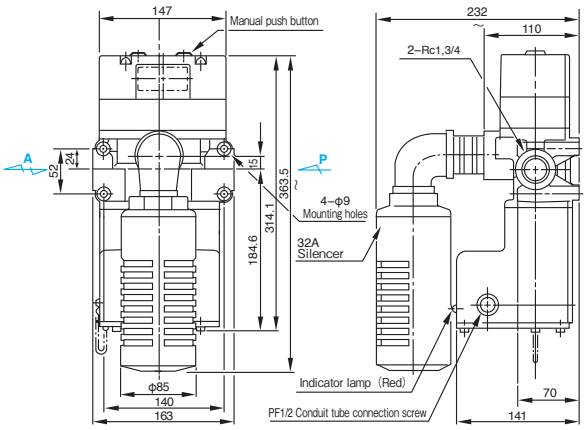


MVW6N-14-B1 (C1)

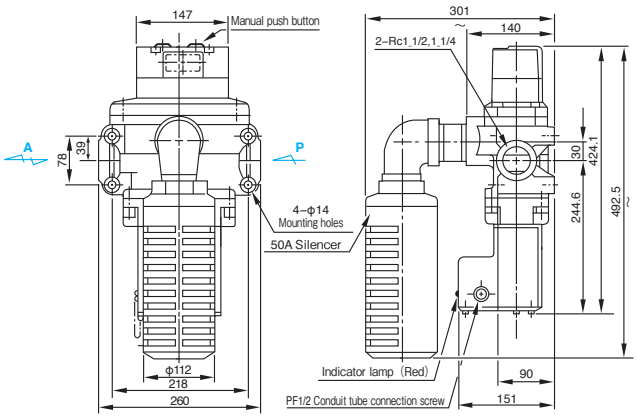


External Dimensions

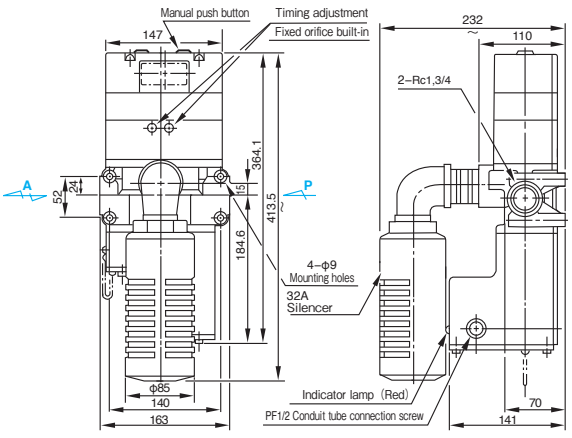
MVW6N-08-K



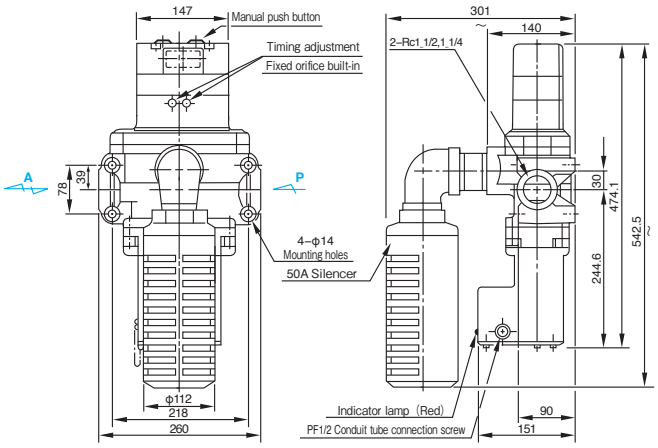
MVW6N-14-K



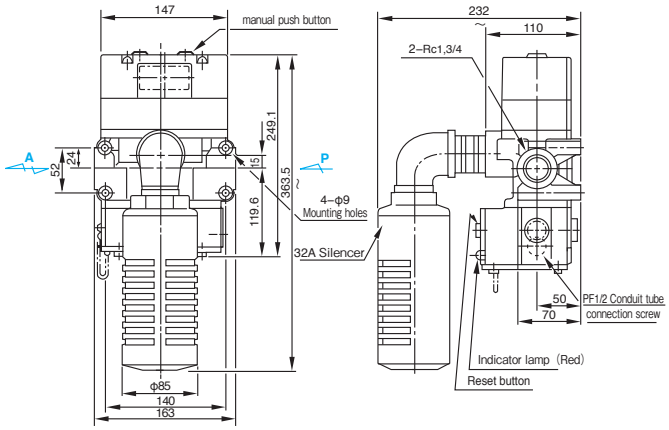
MVW6N-08-K-B1 (C1)



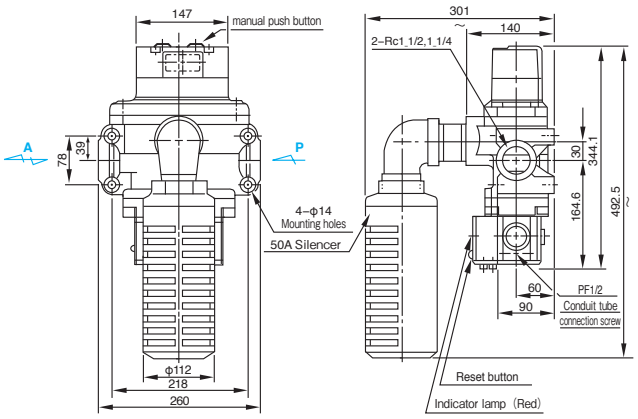
MVW6N-14-K-B1 (C1)



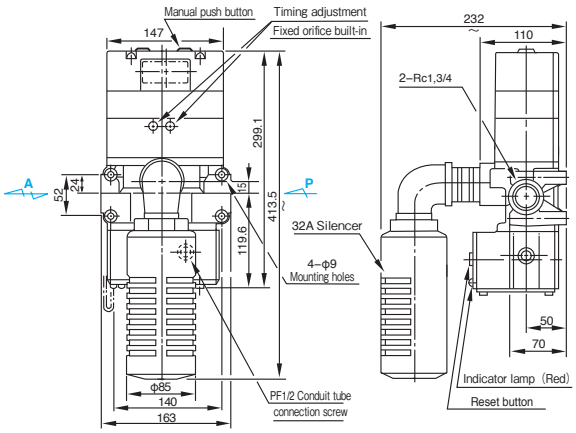
MVW6N-08-M3



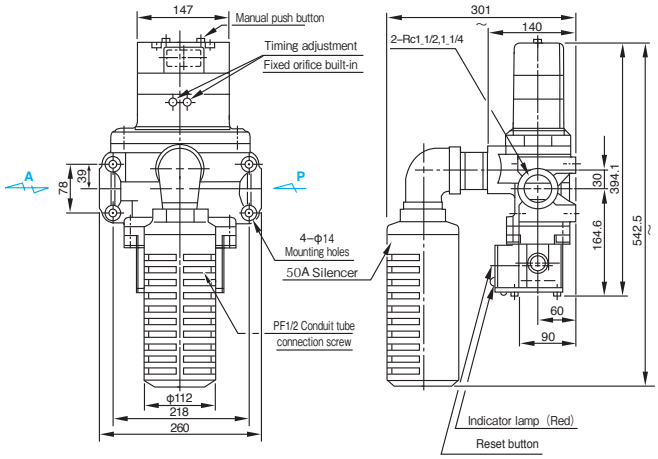
MVW6N-14-M3



MVW6N-08-M3-B1 (C1)



MVW6N-14-M3-B1 (C1)



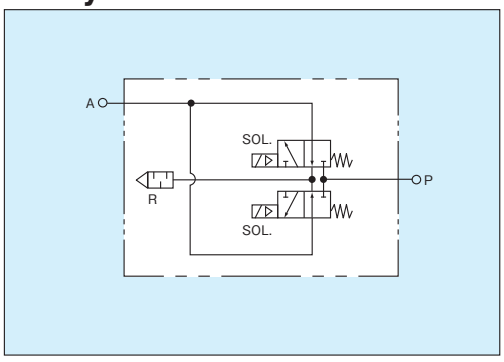
3 Port Dual Valves

MVW6D－04

Port size Rc 3/8 • 1/2

MVW6D dual valve is a solenoid valve to operate pneumatic clutch and brake for press machine, in which a construction satisfying article-29 of Power Press Machine Strauctural Standard has been adopted in accordance witch regulations in article-42 of Labor Law of Industrial Safety and Health. The valve is that of “parallel flow type” combining two units of normally open type and three port solenoid, which is a poppet seal construction of excellent durability.

JIS symbol



Residual pressure during malfunction

For MVW6D dual valves, even if one of dual valves malfunctions, the other valve operates to exhaust air. The exhaust pressure (residual pressure) at this time is as follows:

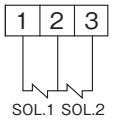
0.05MPa or less in case of supply pressure : 0.5MPa

Specifications

Model code		MVW6D-04	
Port size	P/A port	Rc 3/8	Rc 1/2
Effective area of valve	P → A	23㎟	23㎟
	※ A → R	75㎟	130㎟
Applicable fluid		Comprssed air (Dry air filter passage less than 40μm.)	
Working pressure range		0.2 ～ 1.0MPa (Normal pressure:0.4 ～ 0.6MPa)	
Fluid temperature		－ 5 ～ 80℃ (Normal temperature:5 ～ 50℃)	
Ambient temperature		－ 5 ～ 50℃ (Be care so as not to be frozen.)	
Solenoid	Allowable voltage fluctuation	± 10% of the rated voltage	
	Temperature rise	Max.60℃	
	Insulation class	JIS C 4003 Class B	
	Power consumption	See coil data	
Response time	AC	Less than 18ms (Energized and De-energized)	
	DC	Less than 24ms (Energized and De-energized)	
Operating frequency		Continuous 1time/s,inching 51times/s	
Proof pressure		1.5MPa	
Installtion position		Vertical (Horizontal piping port, solenoid shall be upward.)	
Mass		2.4kg	

● The exhaust is perfomed at the time of atmosphere relief (blow-off) through silencer.

Coil data

Rated voltage [V]	AC			
	100		200	
Frequency [Hz]	50	60	50	60
Issuance current [mA]	1056	913	485	458
Retention current [mA]	295	204	144	95
Wiring	Terminal block : 3P 			

Note) Current shows the value of one solenoid.

Model Code

When ordering,specify the model as follows.

MVW6D – 04 – N – ① – ②

● Port size ● Rated voltage

① Port size	
Rc 3/8	10A
Rc 1/2	15A

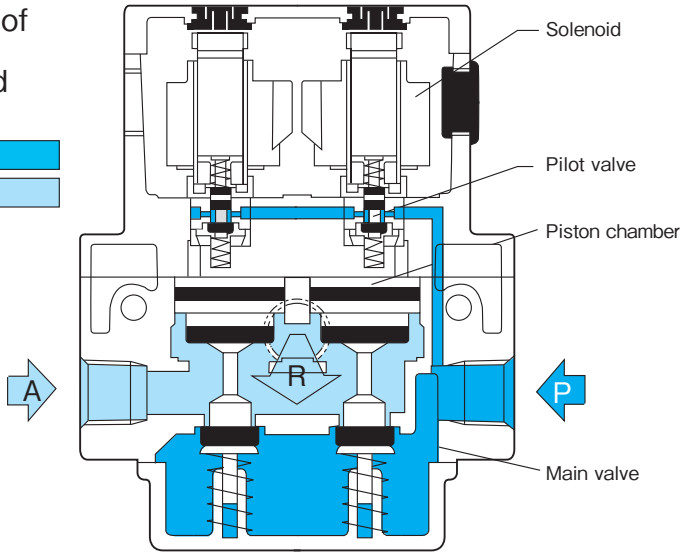
② Rated voltage	
AC100V (50/60Hz)	1
AC200V (50/60Hz)	3
DC24V	5

Operation

MVW6D-04

1. In the case of solenoid de-energized

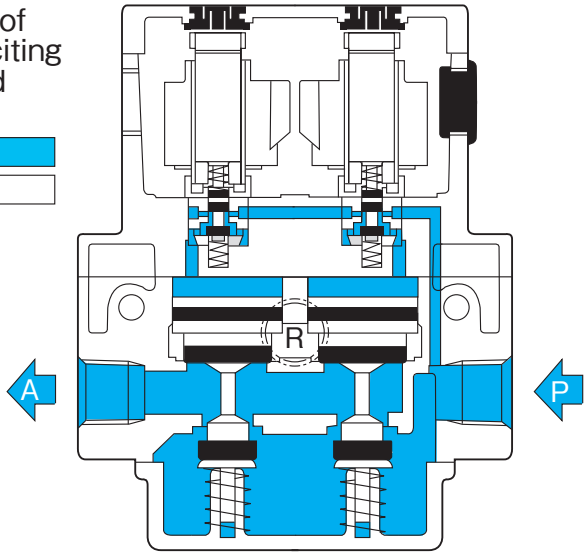
P → Close
A → R



The simultaneous solenoid degaussing resets pilot valve to exhaust air in both side piston chambers. The main valve is reset by the air pressure, then, the air supply through P-port is cut off, where the air at A-port is released to the atmosphere through silencer (R-port). The press machine is stopped.

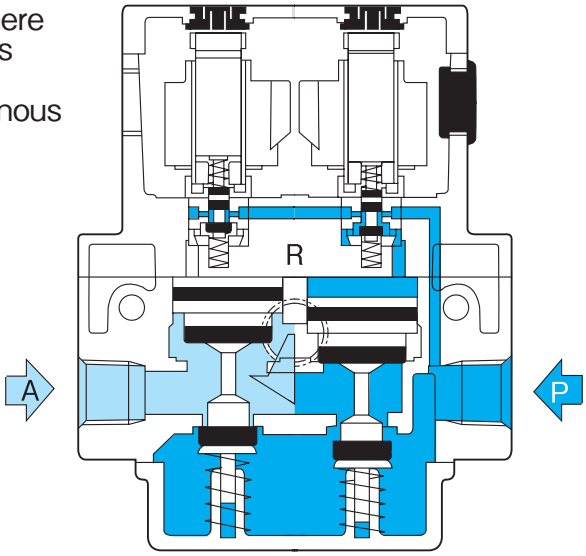
2. In the case of solenoid exciting de-energized

P → A
R → Close



The simultaneous exciting for solenoid opens pilot valve to feed air into both side piston chambers. The main valve is forcibly opened to feed air from P-port to A-port and allow press machine starting up.

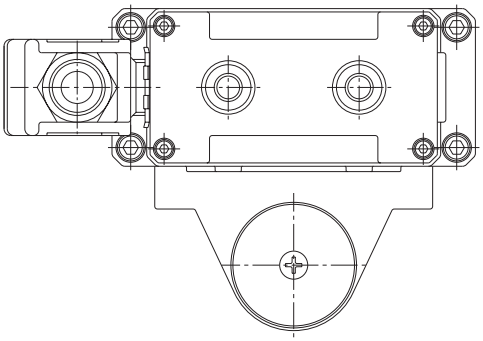
3. In cases where the valve has been under non-synchronous conditions,

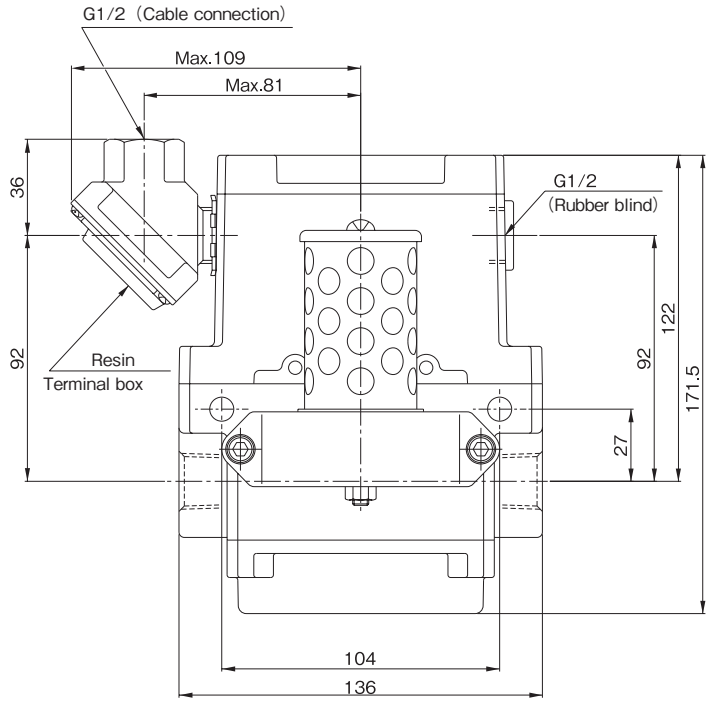


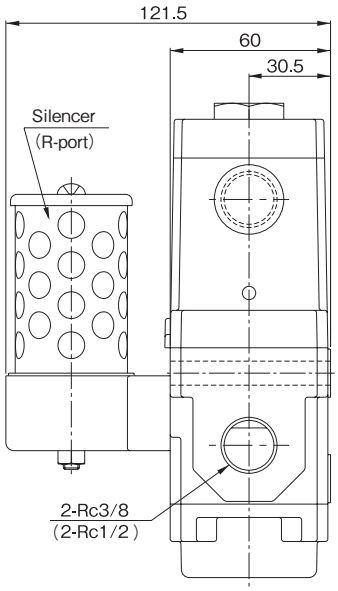
When synchronism has becn lost and either valve does not work, the air is supplied from either valve to A-port indeed, however, the same air is blown off by other valve through silcncer at the same time. Since an adequate pressure is not produced at A-port for the reason, the press machine stops.

External Dimensions

MVW6D-04







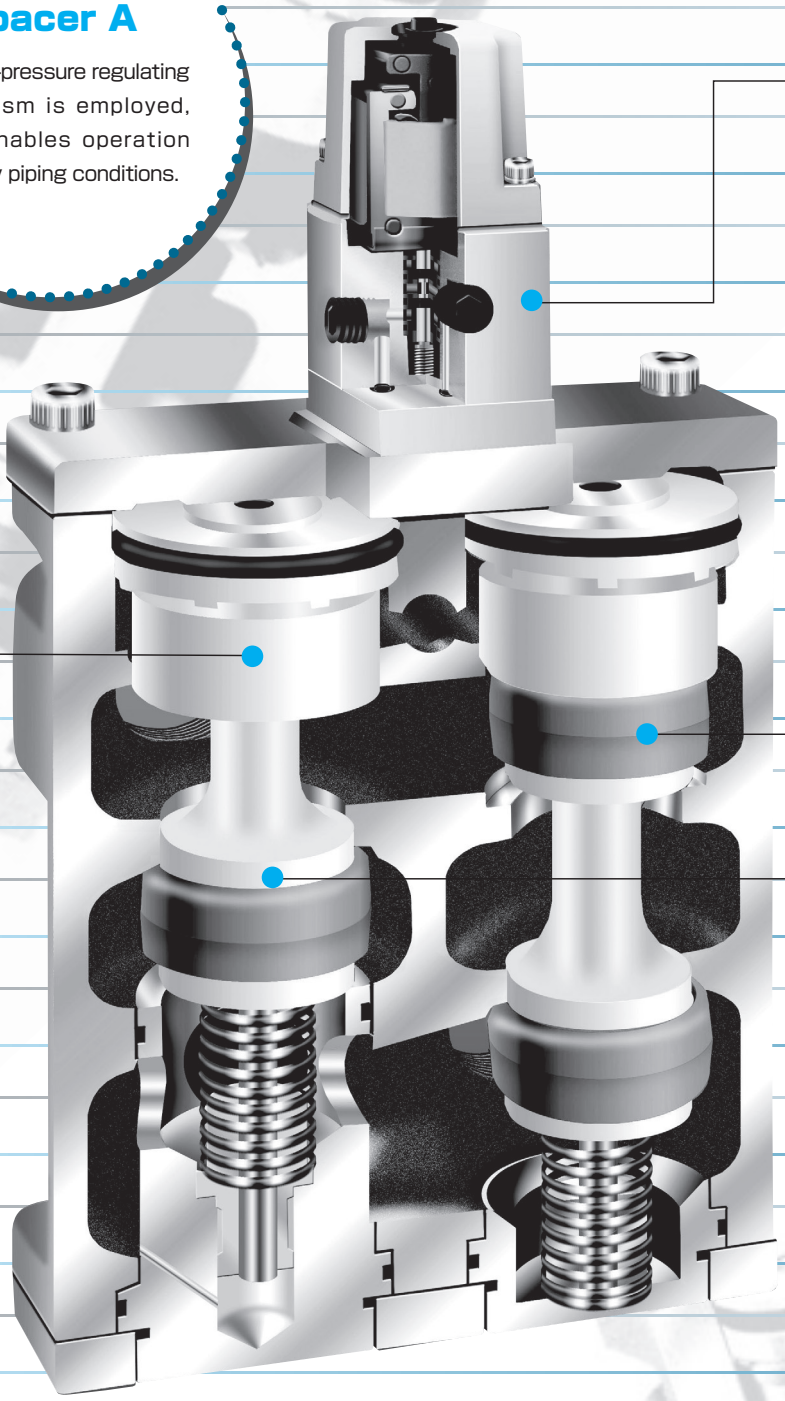
Large-Capacity Poppet-type 3 Port / 4 Port Solenoid Valves

Spacer A

The back-pressure regulating mechanism is employed, which enables operation under any piping conditions.

Pilot Valve

A molded urethane rubber part is used for a poppet-type pilot valve, which provides very high durability. In addition, since the separate type which prevents fluid from entering the solenoid part is used, operation less affected by drain and oil mist can be ensured.



MVW344N-14-S

Main Valve

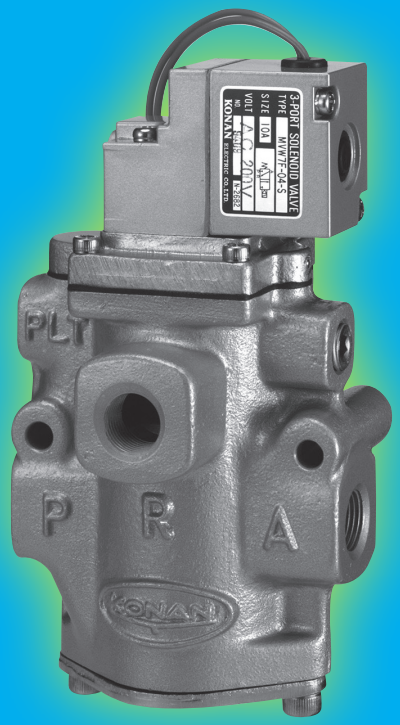
Since the main valve is lightweight and has no connection part, durability has increased greatly and the response speed has increased. Furthermore, the poppet-type structure displays remarkable strength against drain and dust.

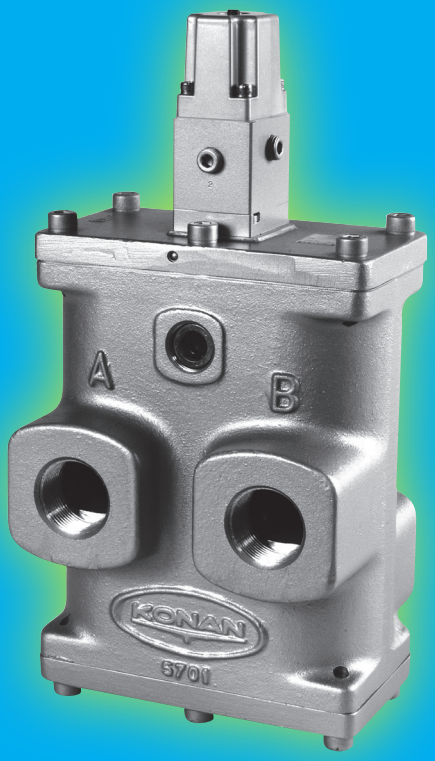
Spacer B

The valve mechanism less affected by a transient phenomenon when switching is employed to reduce air loss.

Features

1. Small and compact.
2. Employment of the back-pressure regulating mechanism enables operation under any piping conditions.
3. Employment of the valve structure less affected by a transient phenomenon when switching reduces air loss.
4. The main valve can be replaced without removal of piping.
5. Elimination of connection parts in addition to valve weight reduction has increased durability drastically.
6. Employment of the poppet structure both for the main and pilot valves displays remarkable strength against drain and dust.
7. The effective cross section area has increased greatly.
8. Operation without lubrication is possible.
9. Operation at high response speed is possible.
10. When the pilot pressure separate supply type is used, these valves can be used optimally for low-pressure application.
11. A terminal box can be attached optionally.

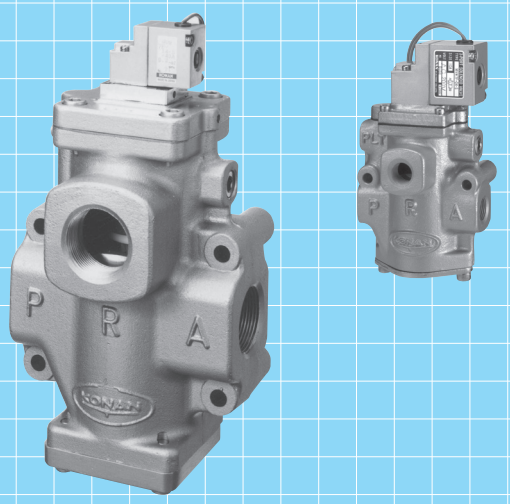




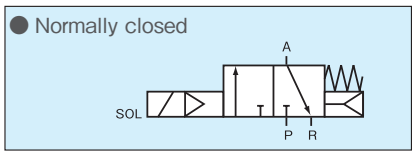
3 Port Solenoid Valves
Large-Capacity Poppet-type(Return)

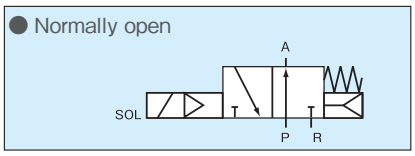
Normally closed
MVW7F − S
Port size Rc 3/8 ~ 2

Normally open
MVW7FR − S
Port size Rc 3/8 ~ 2



JIS symbol





Specifications

Model code	Normally closed	MVW7F-04-S		MVW7F-08-S		MVW7F-14-S		
	Normally open	MVW7FR-04-S		MVW7FR-08-S		MVW7FR-14-S		
Port size		Rc 3/8	Rc 1/2	Rc 3/4	Rc1	Rc1 1/4	Rc1 1/2	Rc2
Effective area of valve		70㎟	80㎟	200㎟	220㎟	700㎟	750㎟	800㎟
Fluid		Compressed air (Dry air filter passage less than 40 μm.)						
Working pressure range		0.2 ~ 0.7MPa						
Proof pressure		1.05MPa						
Ambient temperature		− 20 ~ 50℃ (remove moisture perfectry form the fluid to prevent freezing when used at 5℃ or lower.)						
Solenoid	Allowable voltage fluctuation	± 10% of the rated voltage						
	Temperature rise	Max.80℃						
	Insulation class	JIS C 4003 Class B						
	Power consumption	See coil data						
Response time		less than 0.05s		less than 0.05s		less than 0.18s		
Operating frequency		Max.2time/s						
Installtion position		As desired						
Mass ※		1.1kg		1.7kg		6.1kg		

Note) The mass marked with "※" does not include options.
● Consult factory for non-standard applications which are not coverd by above specifications.

Coil data

Rated voltage [V]	AC										Rated voltage [V]	DC			
	100		110		125		200		220			24	48	100	110
Frequency [Hz]	50	60	50	60	50	60	50	60	50	60					
Issuance current [mA]	199	177	164	144	165	143	115	100	83	72	Retention current [mA]	250	129	60	49
Retention current [mA]	93	75	86	60	79	62	57	42	43	30					

Model Code

When ordering,specify the model as follows.

MVW7F ❶ – ❷ – S – ❸ – ❹ – ❺ – ❻

- ❶ Operation type
- ❷ Body size
- S Return
- ❸ Pilot pressure External pilot type
- ❹ Port size
- ❺ Voltage
- ❻ Wiring connection

❶ Operation type

Normally closed	No entry
Normally open	R

❷ Body size

Rc 3/8	04
Rc 1/2	
Rc 3/4	08
Rc 1	
Rc 1 1/4	14
Rc 1 1/2	
Rc 2	

❸ Pilot pressure・External pilot type

Internal (Standard) pilot type	No entry
External pilot type	P

●In the case of external pilot type, working pressure is as follows. Please be careful.

Working pressure ≦ Pilot p--ressure ≧ 0.2MPa

❹ Port size

04	Rc 3/8	10A
	Rc 1/2	15A
08	Rc 3/4	20A
	Rc 1	25A
14	Rc 1 1/4	32A
	Rc 1 1/2	40A
	Rc 2	50A

❺ Voltage

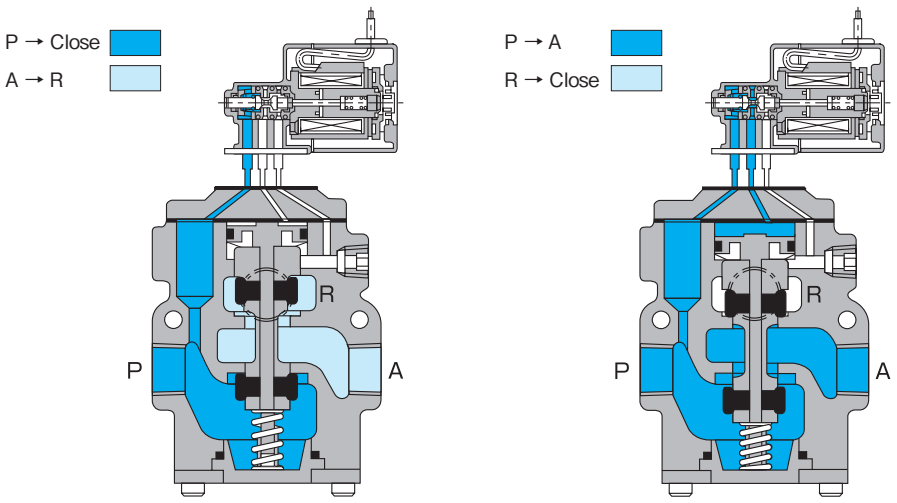
AC100V (50/60Hz)	AC100
AC110V (50/60Hz)	AC110
AC125V (50/60Hz)	AC125
AC200V (50/60Hz)	AC200
AC220V (50/60Hz)	AC220
DC 24V	DC 24
DC 48V	DC 48
DC100V	DC100
DC110V	DC110

❻ Wiring connection

Lead wire	No entry
DIN connector	DT
DIN connector (With Indicate Lamp)	DN
DIN connector (With Indicate Lamp・Surge absorber)	DNZ
TBF1 Type Terminal box	TBF1
TBF1 Type Terminal box (With Indicate Lamp)	TBF1N
TBF1 Type Terminal box (With Surge absorber)	TBF1Z
TBF1 Type Terminal box (With Indicate Lamp・Surge absorber)	TBF1ZN

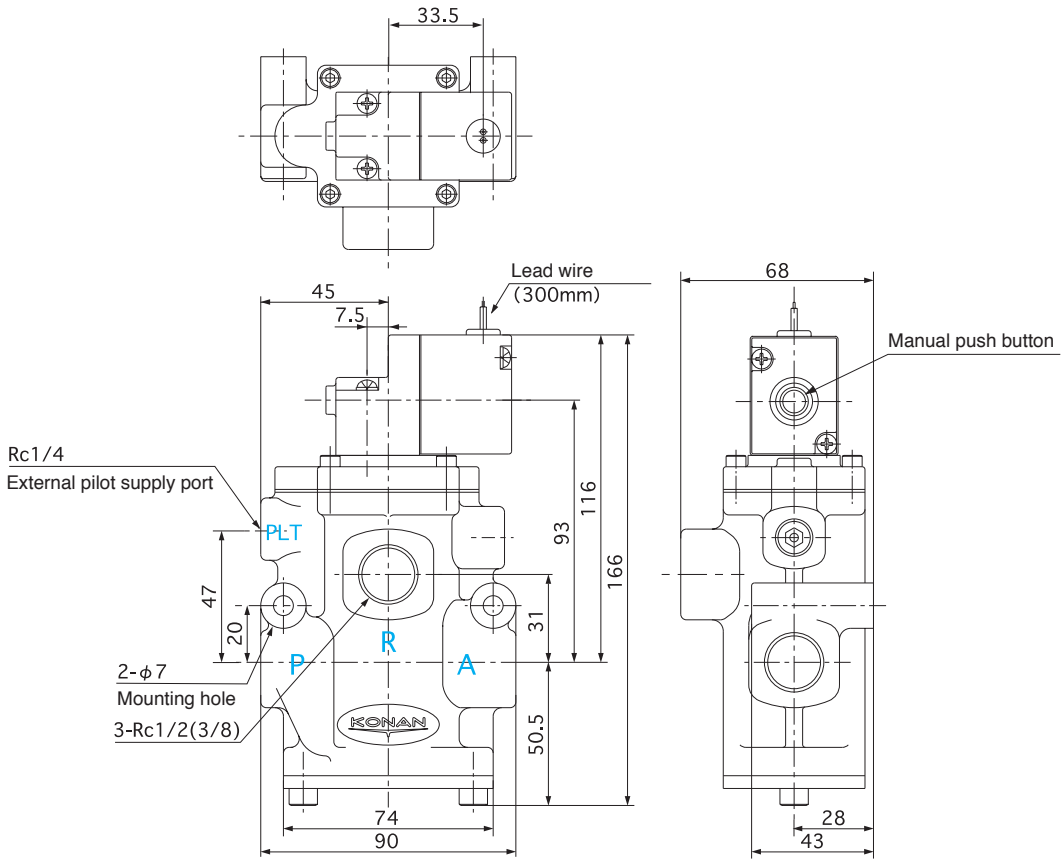
Structure / Operation

MVW7F

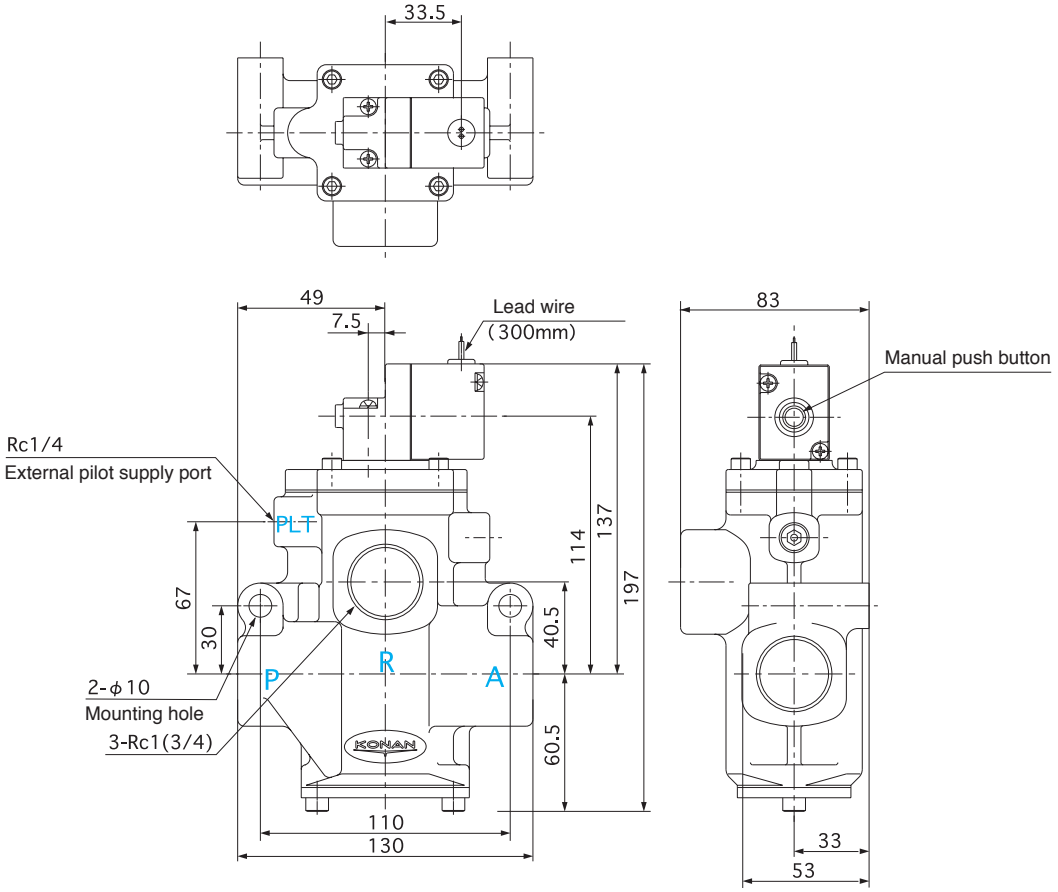


External Dimensions

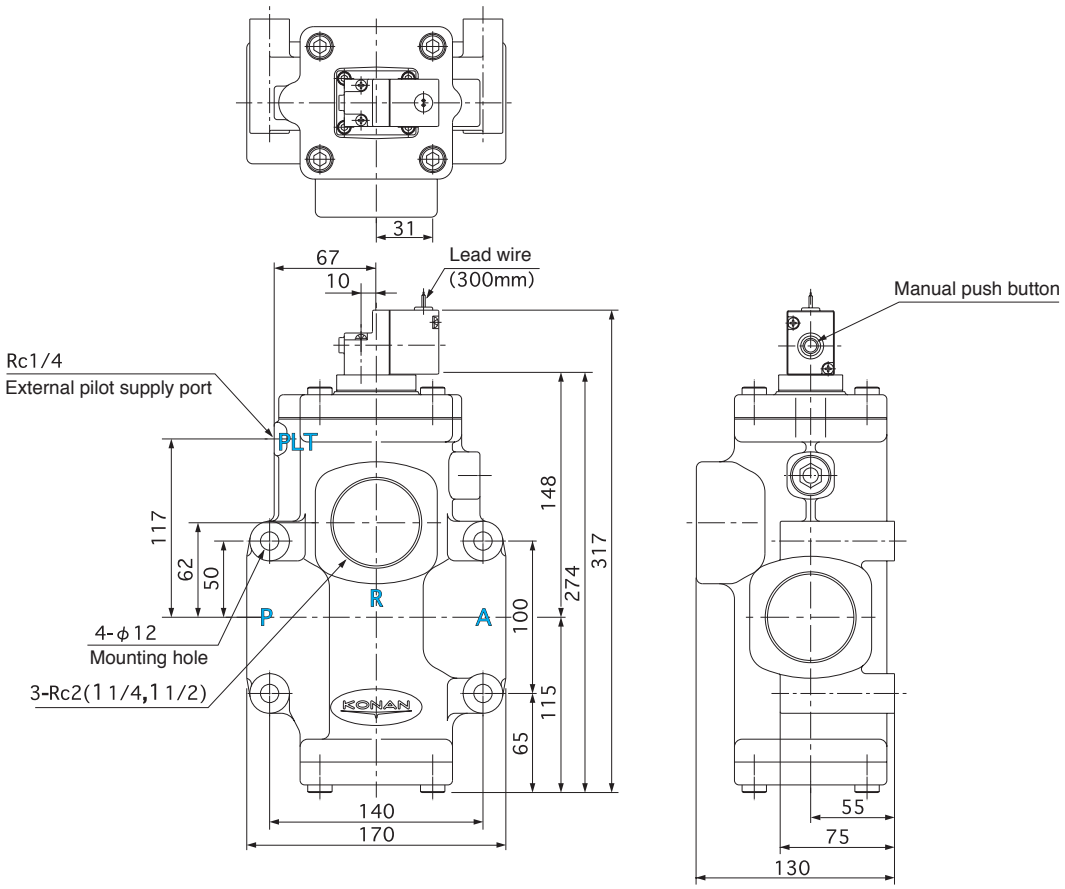
MVW7F (R) -04-S (Lead wire)



MVW7F (R) -08-S (Lead wire)

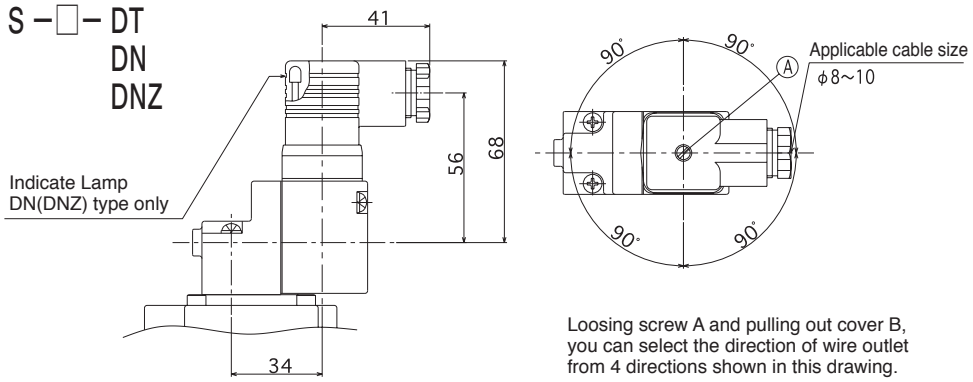


MVW7F (R) -14-S (Lead wire)



■ DIN connector (Option) Installation

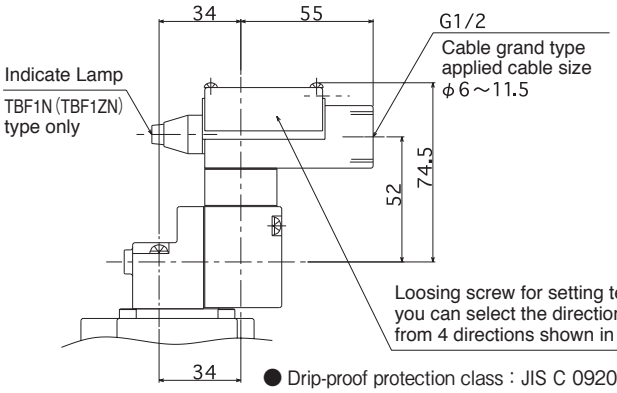
MVW7F (R) – 04・08・14 – S – □ – DT
DN
DNZ



Loosing screw A and pulling out cover B, you can select the direction of wire outlet from 4 directions shown in this drawing.

■ TBF1 type Terminal box (Option) Installation

MVW7F (R) – 04・08・14 – S – □ – TBF1
TBF1N
TBF1Z
TBF1ZN



Loosing screw for setting terninal box, you can select the direction of wire outlet from 4 directions shown in this drawing.

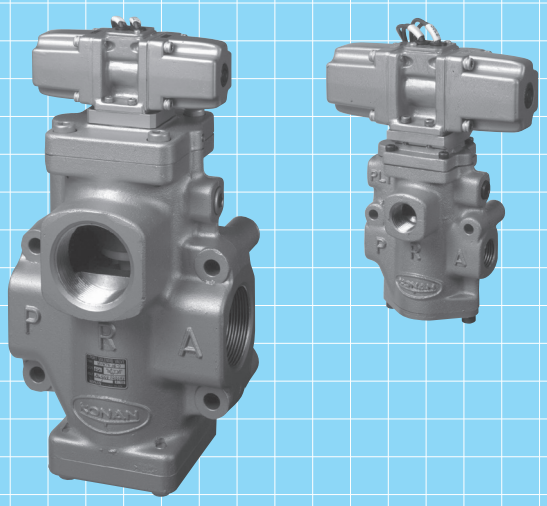
● Drip-proof protection class : JIS C 0920 (Drip-proof Ⅱ)

3 Port Solenoid Valves
Large-Capacity Poppet-type(Hold)

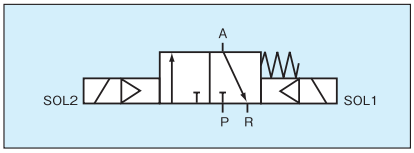
Normally closed

MVW7N − D

Port size Rc 3/8 ~ 2



JIS symbol



Note) When the pneumatic pressure of P becomes "0" at the SOL.2 position, the valve will be returned to the SOL.1 position by the spring force.

Specifications

Model code		MVW7N-04-D		MVW7N-08-D		MVW7N-14-D		
Port size		Rc 3/8	Rc 1/2	Rc 3/4	Rc1	Rc1 1/4	Rc1 1/2	Rc2
Effective area of valve		70㎟	80㎟	200㎟	220㎟	700㎟	750㎟	800㎟
Fluid		Compressed air (Dry air filter passage less than 40 μm.)						
Working pressure range		0.2 ~ 0.7MPa						
Proof pressure		1.05MPa						
Ambient temperature		− 20 ~ 50℃ (remove moisture perfectry form the fluid to prevent freezing when used at 5℃ or lower.)						
Solenoid	Allowable voltage fluctuation	− 15%~ 0% of rated voltage (Continuous), 0%~ +10% of rated voltage (Short time)						
	Temperature rise	Max.80℃						
	Insulation class	JIS C 4003 Class B						
	Power consumption	See coil data						
Response time		less than 0.03s		less than 0.05s		less than 0.3s		
Operating frequency		Max.2time/s						
Installtion position		Installation of the pilot valve with its horizontal.						
Mass ※		1.8kg		2.4kg		6.4k		

Note) The mass marked with "※" does not include options.
● Consult factory for non-standard applications which are not coverd by above specifications.

Coil data

Rated voltage [V]	AC							Rated voltage [V]	DC		
	100		110		200		220		24	48	100
Frequency [Hz]	50	60	50	60	50	60	60				
Issuance current [mA]	1415	995	1441	1200	733	500	639	Retention current [mA]	583	292	140
Retention current [mA]	283	199	288	240	147	100	128				

Model Code

When ordering,specify the model as follows.

MVW7N－❶－D－❷－❸－❹－❺－❻

- ❶ Body size
- D Hold
- ❷ Pilot pressure External pilot type
- ❸ Port size
- ❹ Voltage
- ❺ Wiring connection
- ❻ Cable gland size

❶ Body size

Rc 3/8	04
Rc 1/2	
Rc 3/4	08
Rc 1	
Rc 1 1/4	14
Rc 1 1/2	
Rc 2	

❷ Pilot pressure・External pilot type

Internal (Standard) pilot type	No entry
External pilot type	P

●In the case of external pilot type, working pressure is as follows. Please be careful.

Working pressure ≦ Pilot p--ressure ≧ 0.2MPa

❸ Port size

04	Rc 3/8	10A
	Rc 1/2	15A
08	Rc 3/4	20A
	Rc 1	25A
14	Rc 1 1/4	32A
	Rc 1 1/2	40A
	Rc 2	50A

❹ Voltage

AC100V (50/60Hz)	AC100
AC110V (50/60Hz)	AC110
AC200V (50/60Hz)	AC200
AC220V (60Hz)	AC220
DC 24V	DC 24
DC 48V	DC 48
DC100V	DC100
DC110V	DC110

❺ Wiring connection

Lead wire	No entry
DIN connector	DT
DIN connector (With Indicate Lamp)	DN
TBF1 Type Terminal box	TBF1
TBN2 Type Terminal box	TBN2
TBN2 Type Terminal box (With Indicate Lamp)	TBN2N
TBN2 Type Terminal box (With Surge absorber)	TBN2Z
TBN2 Type Terminal box (With Indicate Lamp・Surge absorber)	TBN2ZN

* In the case of TBN2 type please enter the applicable ❻ gland size.

❻ Cable gland size

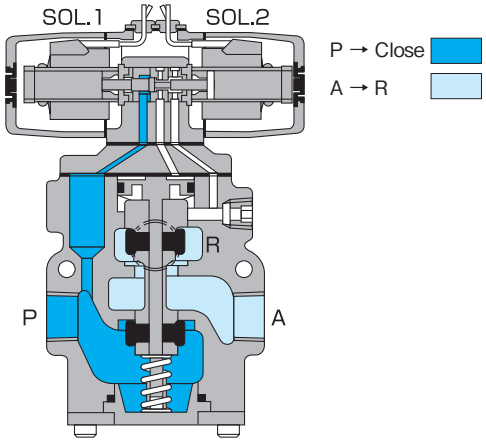
A	φ B	φ C	Code
G 1/2	10	9	15A
	11	10	15B
	12	11	15C
G 3/4	13	12	20A
	15	13	20B
	17	15	20C

* In the case of ❺ TBN2 type please enter the applicable gland size.

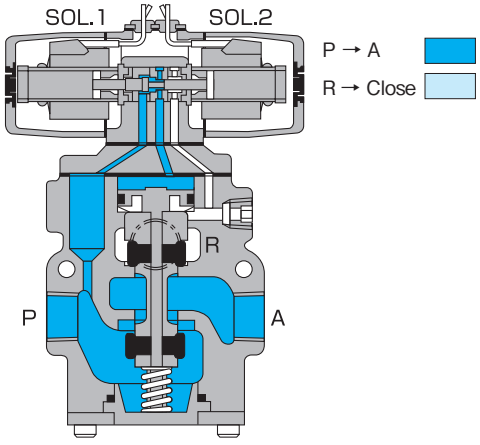
Structure / Operation

MVW7N－04－D

＜SOL.1 Energized / SOL.2 De-energized＞

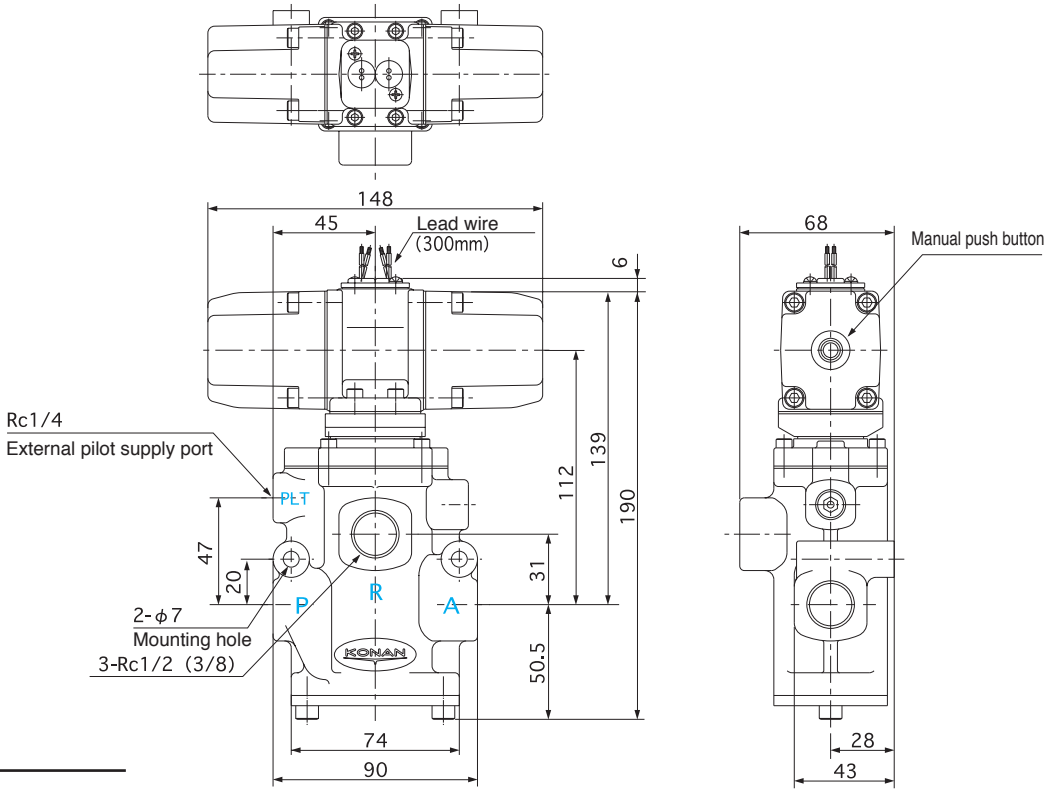


＜SOL.1 De-energized / SOL.2 Energized＞



External Dimensions

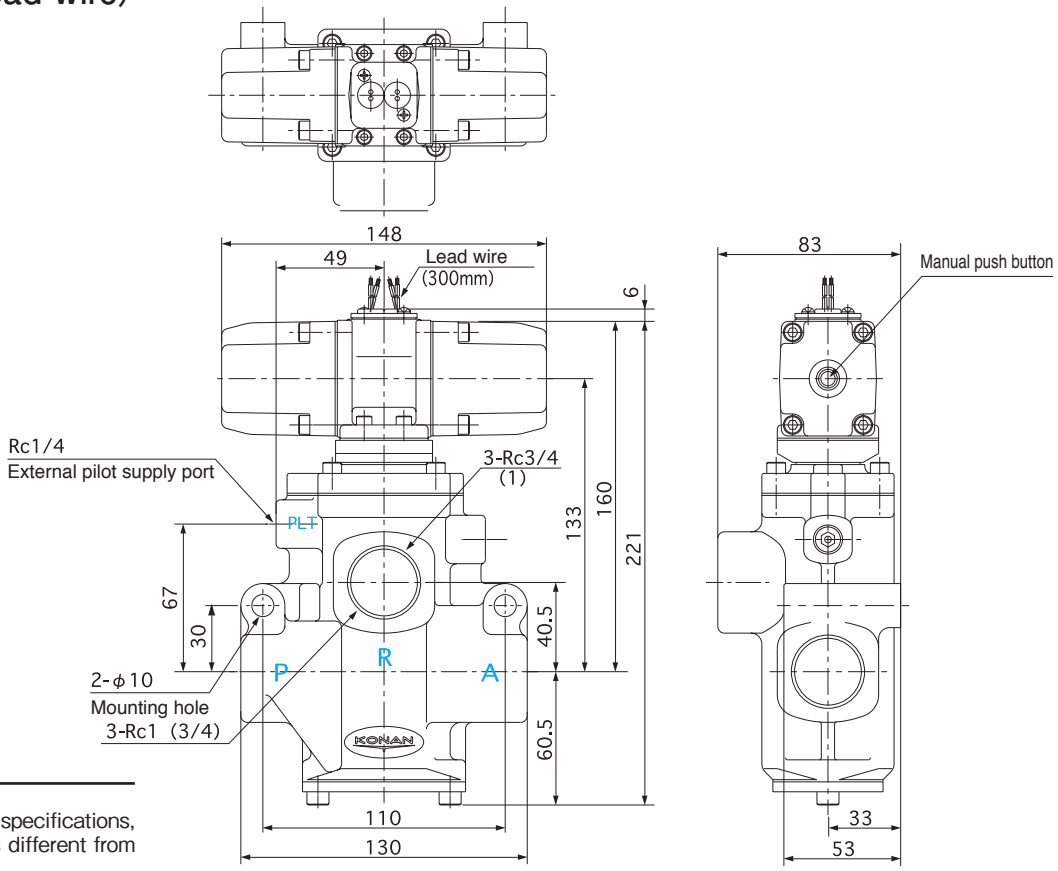
MVW7N-04-D（Lead wire）



Note

In the case of direct current specifications, the shape of the solenoid is different from this figure.
Please refer for the details separately.

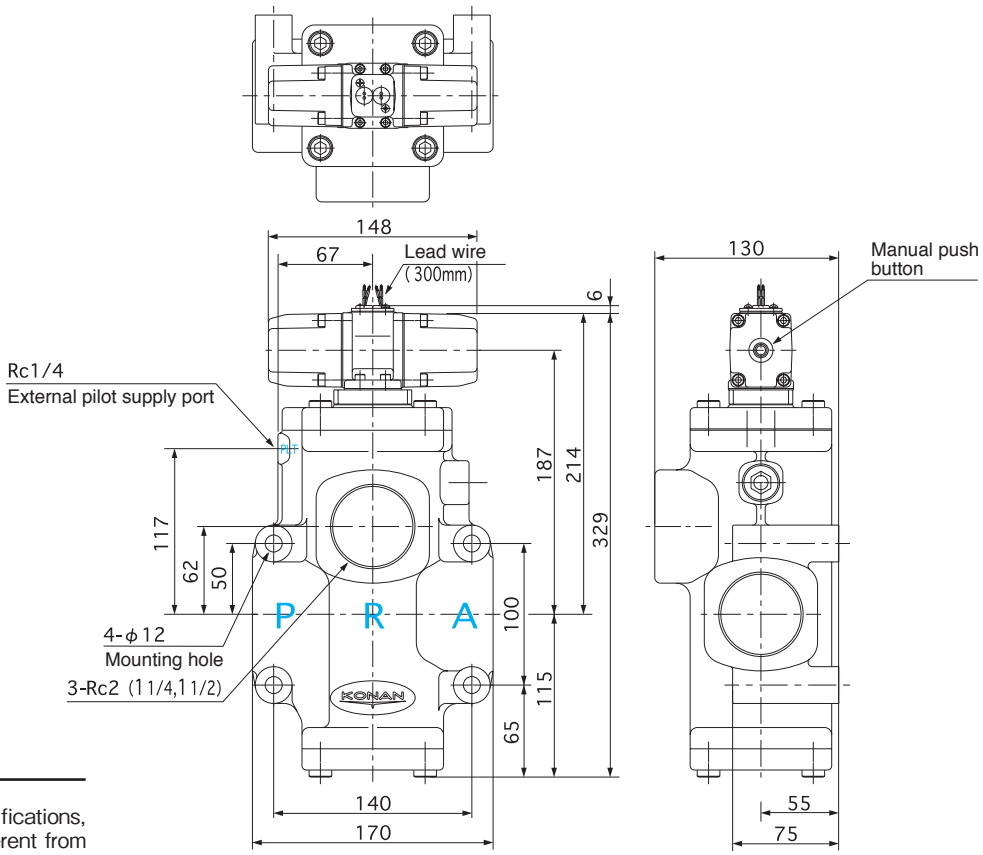
MVW7N-08-D（Lead wire）



Note

In the case of direct current specifications, the shape of the solenoid is different from this figure.
Please refer for the details separately.

MVW7N-14-D（Lead wire）

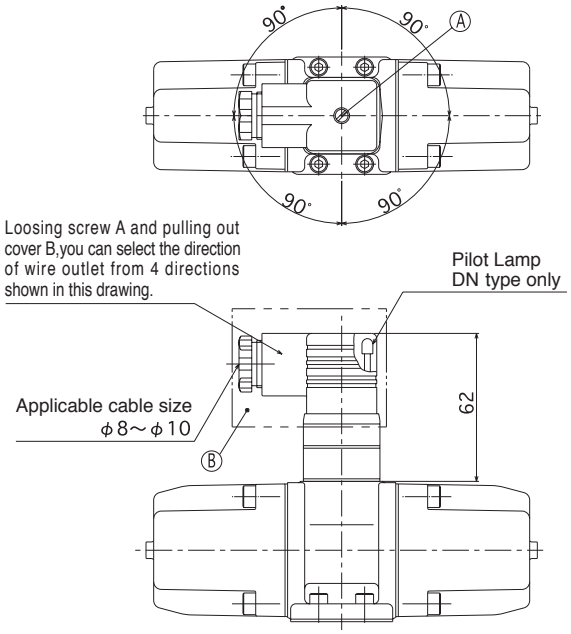


Note

In the case of direct current specifications, the shape of the solenoid is different from this figure.
Please refer for the details separately.

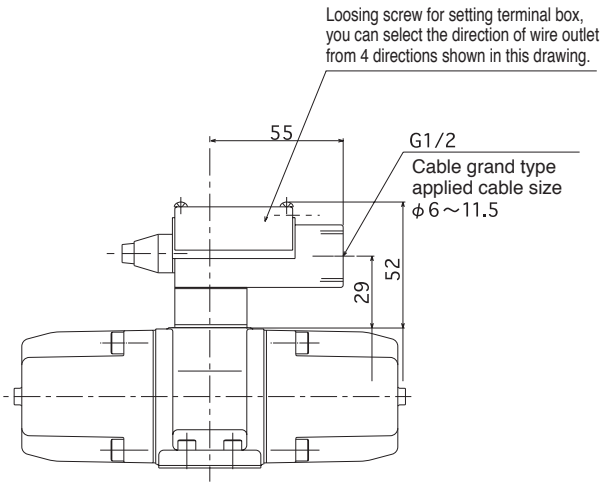
■ DIN connector (Option) Installation

MVW7N – 04・08・14 – D –□– DT
DN



■ TBF1 type Terminal box (Option) Installation

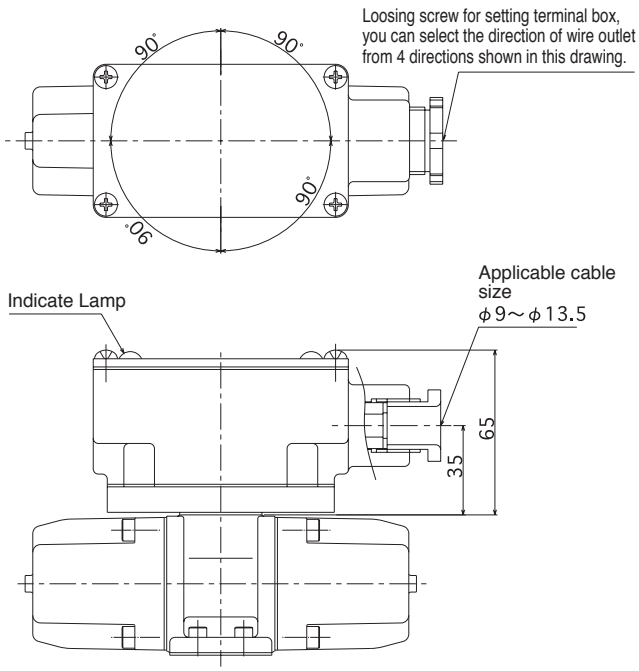
MVW7N – 04・08・14 – D –□– TBF1 –□



● Drip-proof protection class : JIS C 0920 (Drip-proof Ⅱ)

■ TBF2 type Terminal box (Option) Installation

MVW7N – 04・08・14 – D –□– TBN2 –□
TBN2N –□
TBN2Z –□
TBN2ZN –□

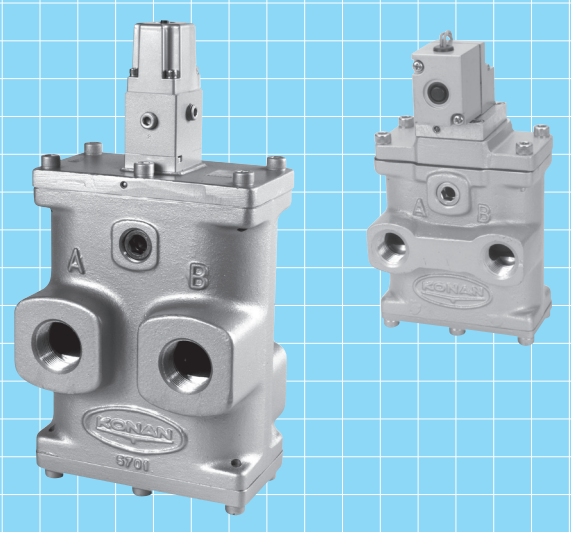


● Drip-proof protection class : JIS C 0920 (Drip-proof Ⅱ)

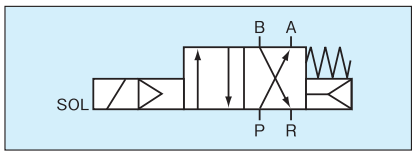
4 Port Solenoid Valves
Large-Capacity Poppet-type(Return)

MVW344F − S

口径 Rc 3/8 ～ 2



JIS symbol



Specifications

Model code		MVW344F − 04 − S		MVW344F − 08 − S		MVW344F − 14 − S		
Port size		Rc 3/8	Rc 1/2	Rc 3/4	Rc1	Rc1 1/4	Rc1 1/2	Rc2
Effective area of valve		70mm²	80mm²	200mm²	220mm²	700mm²	750mm²	800mm²
Fluid		Compressed air (Dry air filter passage less than 40 μm.)						
Working pressure range		0.2 ～ 0.7MPa						
Proof pressure		1.05MPa						
Ambient temperature		− 20 ～ 50℃ (remove moisture perfectry form the fluid to prevent freezing when used at 5℃ or lower.)						
Solenoid	Allowable voltage fluctuation	− 15%～ 0% of rated voltage (Continuous), 0%～ +10% of rated voltage (Short time)						
	Temperature rise	Max.80℃						
	Insulation class	JIS C 4003 Class B						
	Power consumption	See coil data						
Response time		less than 0.05s		less than 0.07s		less than 0.15s		
Operating frequency		Max.2time/s						
Installtion position		As desired						
Mass ※		2.1kg		3.0kg		10.6kg		

Note) The mass marked with "※" does not include options.
● Consult factory for non-standard applications which are not coverd by above specifications.

Coil data 「Model : MVW344F − 04 − S/MVW344F − 08 − S」

Rated voltage [V]	AC										Rated voltage [V]	DC			
	100		110		125		200		220			24	48	100	110
Frequency [Hz]	50	60	50	60	50	60	50	60	50	60					
Issuance current [mA]	199	177	164	144	165	143	115	100	83	72					
Retention current [mA]	93	75	86	60	79	62	57	42	43	30	Retention current [mA]	247	123	58	49

Coil data 「Model : MVW344F − 14 − S」

Rated voltage [V]	AC							Rated voltage [V]	DC			
	100		110		200		220		24	48	100	110
Frequency [Hz]	50	60	50	60	50	60	60					
Issuance current [mA]	1415	995	1441	1200	733	500	639					
Retention current [mA]	283	199	288	240	147	100	128	Retention current [mA]	583	292	140	186

Model Code

When ordering,specify the model as follows.

MVW344F－❶－S－❷－❸－❹－❺－❻

- ❶ Body size
- S Return
- ❷ Pilot pressure / External pilot type
- ❸ Port size
- ❹ Voltage
- ❺ Wiring connection
- ❻ Mounting bracket

❶ Body size

Rc 3/8	04
Rc 1/2	
Rc 3/4	08
Rc 1	
Rc 1 1/4	14
Rc 1 1/2	
Rc 2	

❷ Pilot pressure・External pilot type

Internal (Standard) pilot type	No entry
External pilot type	P

●In the case of external pilot type, working pressure is as follows. Please be careful.

Working pressure ≦ Pilot p--ressure ≧ 0.2MPa

❸ Port size

04	Rc 3/8	10A
	Rc 1/2	15A
08	Rc 3/4	20A
	Rc 1	25A
14	Rc 1 1/4	32A
	Rc 1 1/2	40A
	Rc 2	50A

❹ Voltage

AC100V (50/60Hz)	AC100
AC110V (50/60Hz)	AC110
AC125V (50/60Hz) ※	AC125
AC200V (50/60Hz)	AC200
AC220V (50/60Hz) ※	AC220
DC 24V	DC 24
DC 48V	DC 48
DC100V	DC100
DC110V	DC110

※❶ Body size 14 is not manufactured for "AC125 (50/60Hz)" and "AC220 (50Hz)".

❺ Wiring connection

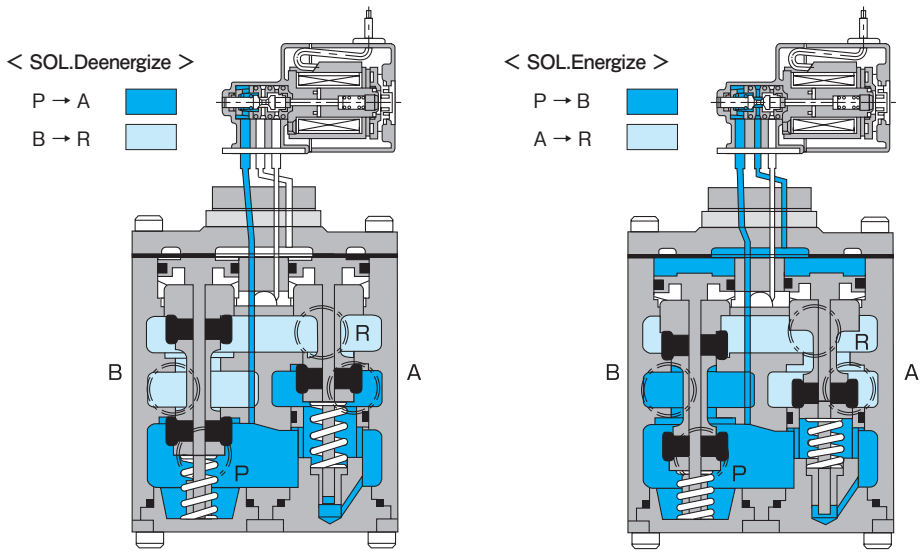
Lead wire	No entry
DIN connector	DT
DIN connector (With Indicate Lamp)	DN
DIN connector (With Indicate Lamp・Surge absorber)	DNZ
TBF1 Type Terminal box	TBF1
TBF1 Type Terminal box (With Indicate Lamp)	TBF1N
TBF1 Type Terminal box (With Surge absorber)	TBF1Z
TBF1 Type Terminal box (With Indicate Lamp・Surge absorber)	TBF1ZN

❻ Mounting bracket

Not needed	No entry
Required	BR

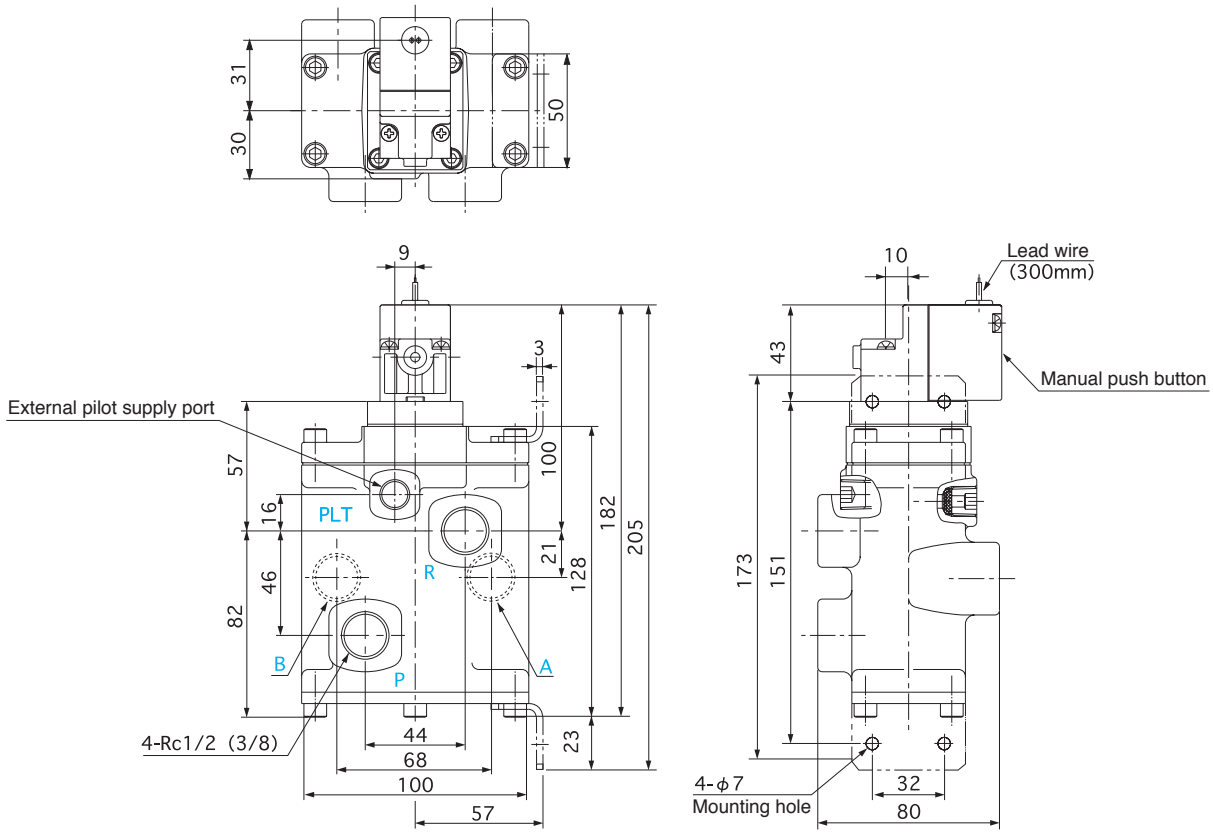
Structure / Operation

MVW344F － 04 － S

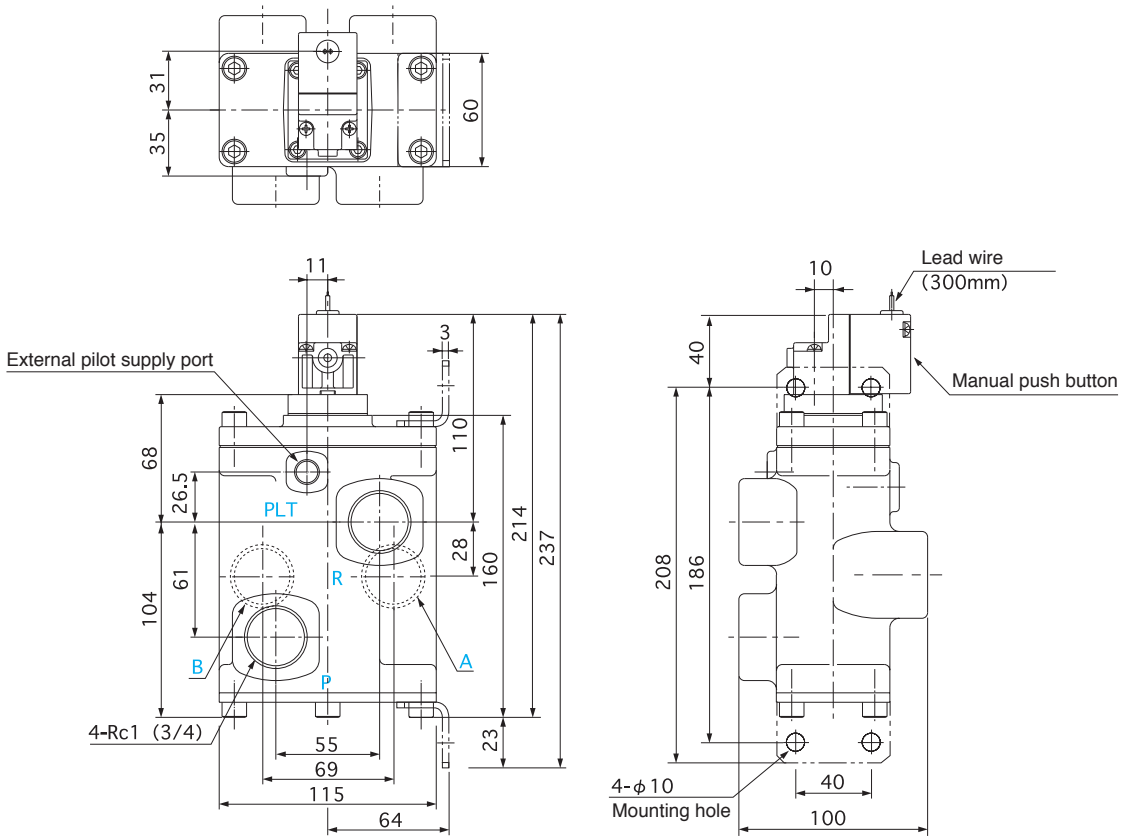


External Dimensions

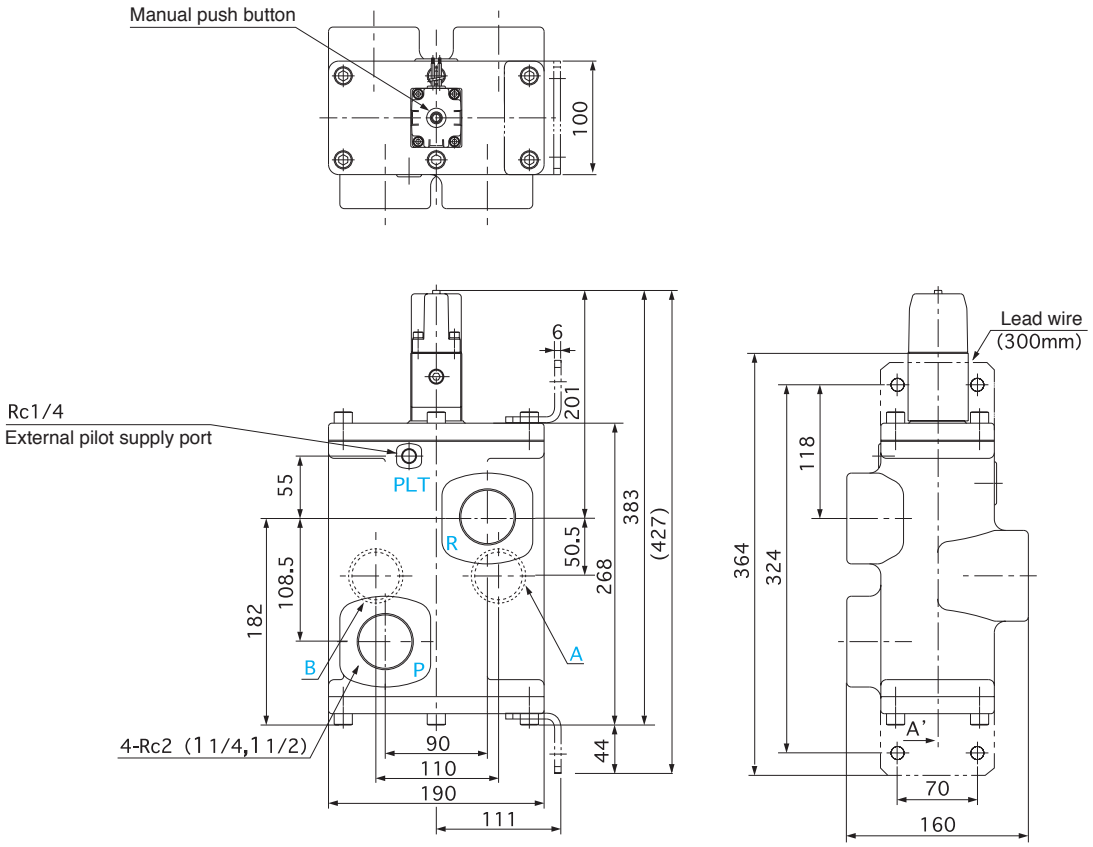
MVW344F-04-S（Lead wire）



MVW344F-08-S（Lead wire）

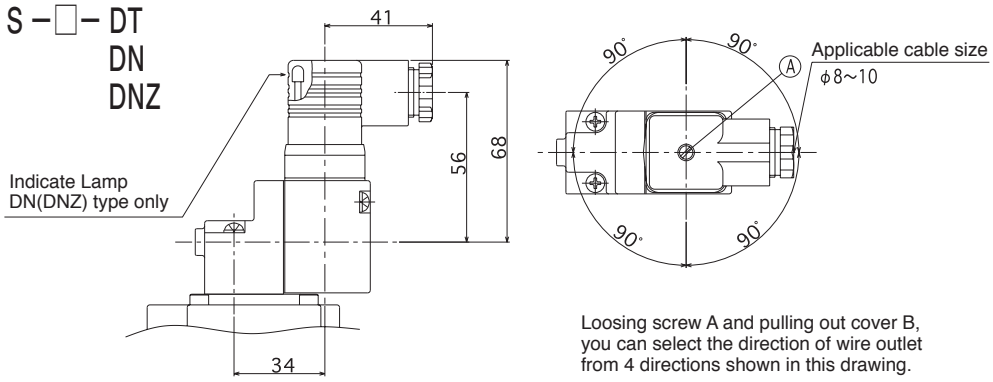


MVW344F-14-S（Lead wire）



■DIN connector（Option）Installation

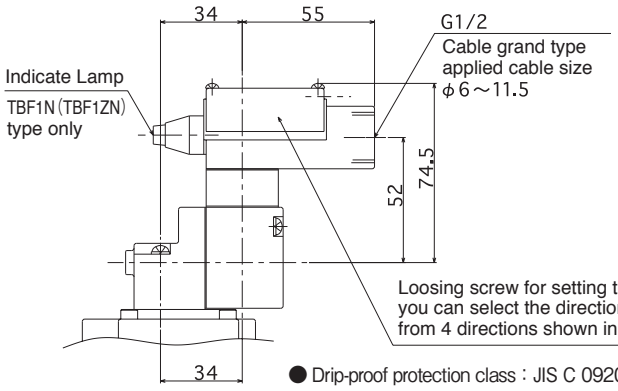
MVW344F－04・08・14－S－□－ DT
DN
DNZ



Loosing screw A and pulling out cover B, you can select the direction of wire outlet from 4 directions shown in this drawing.

■TBF1 type Terminal box（Option）Installation

MVW344F－04・08・14－S－□－ TBF1
TBF1N
TBF1Z
TBF1ZN



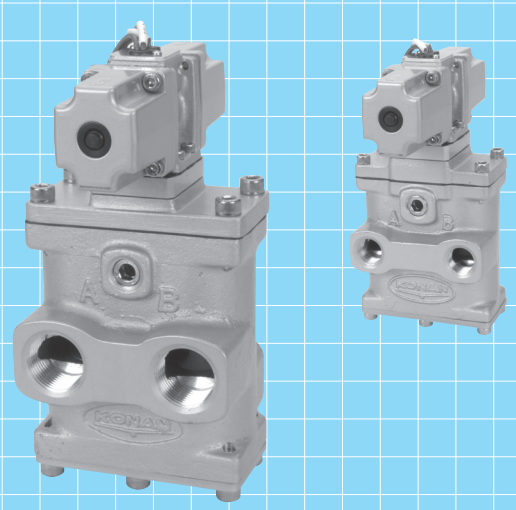
Loosing screw for setting terminal box, you can select the direction of wire outlet from 4 directions shown in this drawing.

● Drip-proof protection class：JIS C 0920（Drip-proof Ⅱ）

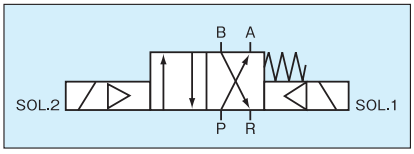
4 Port Solenoid Valves
Large-Capacity Poppet-type(Hold)

MVW344N − D

口径 Rc 3/8 ～ 1



JIS symbol



Note) When the pneumatic pressure of P becomes "0" at the SOL.2 position, the valve will be returned to the SOL.1 position by the spring force.

Specifications

Model code		MVW344N − 04 − D		MVW344N − 08 − D		MVW344N − 14 − D		
Port size		Rc 3/8	Rc 1/2	Rc 3/4	Rc1	Rc1 1/4	Rc1 1/2	Rc2
Effective area of valve		70mm²	80mm²	200mm²	220mm²	700mm²	750mm²	800mm²
Fluid		Compressed air (Dry air filter passage less than 40μm.)						
Working pressure range		0.2 ～ 0.7MPa						
Proof pressure		1.05MPa						
Ambient temperature		− 20 ～ 50℃ (remove moisture perfectry form the fluid to prevent freezing when used at 5℃ or lower.)						
Solenoid	Allowable voltage fluctuation	± 10% of the rated voltage						
	Temperature rise	Max.80℃						
	Insulation class	JIS C 4003 Class B						
	Power consumption	See coil data						
Response time		less than 0.03s		less than 0.05s		less than 0.3s		
Operating frequency		Max.2time/s						
Installtion position		Installation of the pilot valve with its horizontal.						
Mass ※		2.4kg		3.3kg		11.2kg		

Note) The mass marked with "※" does not include options.
● Consult factory for non-standard applications which are not coverd by above specifications.

Coil data

Rated voltage [V]	AC							Rated voltage [V]	DC		
	100		110		200		220		24	48	100
Frequency [Hz]	50	60	50	60	50	60	60				
Issuance current [mA]	1415	995	1441	1200	733	500	639	Retention current [mA]	583	292	140
Retention current [mA]	283	199	288	240	147	100	128				

Model Code

When ordering,specify the model as follows.

MVW344N-❶-D-❷-❸-❹-❺-❻-❼

- ❶ Body size
- D Hold
- ❷ Pilot pressure External pilot type
- ❸ Port size
- ❹ Voltage
- ❺ Wiring connection
- ❻ Cable gland size
- ❼ Mounting bracket

❶ Body size

Rc 3/8	04
Rc 1/2	
Rc 3/4	08
Rc 1	
Rc 1 1/4	14
Rc 1 1/2	
Rc 2	

❷ Pilot pressure・External pilot type

Internal (Standard) pilot type	No entry
External pilot type	P

●In the case of external pilot type, working pressure is as follows. Please be careful.

Working pressure ≦ Pilot p--ressure ≧ 0.2MPa

❸ Port size

04	Rc 3/8	10A
	Rc 1/2	15A
08	Rc 3/4	20A
	Rc 1	25A
14	Rc 1 1/4	32A
	Rc 1 1/2	40A
	Rc 2	50A

❹ Voltage

AC100V (50/60Hz)	AC100
AC110V (50/60Hz)	AC110
AC200V (50/60Hz)	AC200
AC220V (60Hz)	AC220
DC 24V	DC 24
DC 48V	DC 48
DC100V	DC100

❺ Wiring connection

Lead wire	No entry
DIN connector	DT
DIN connector (With Indicate Lamp)	DN
TBF1 Type Terminal box	TBF1
TBN2 Type Terminal box	TBN2
TBN2 Type Terminal box (With Indicate Lamp)	TBN2N
TBN2 Type Terminal box (With Surge absorber)	TBN2Z
TBN2 Type Terminal box (With Indicate Lamp・Surge absorber)	TBN2ZN

* In the case of TBN2 type please enter the applicable ❻ gland size.

❻ Cable gland size

A	φ B	φ C	Code
G 1/2	10	9	15A
	11	10	15B
	12	11	15C
G 3/4	13	12	20A
	15	13	20B
	17	15	20C

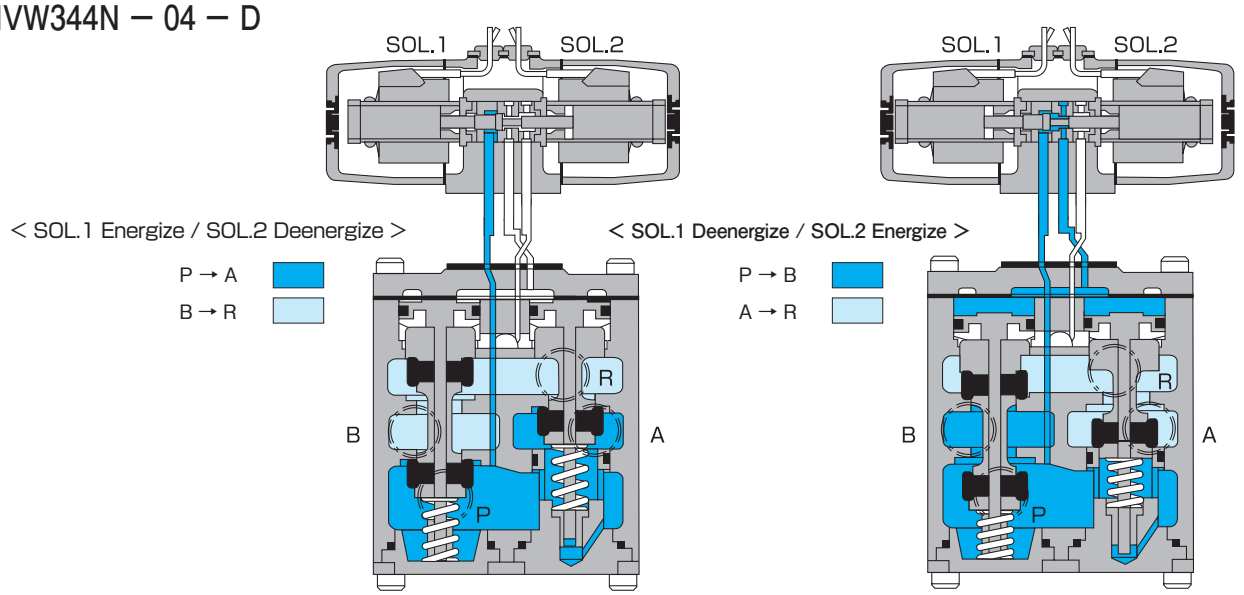
* In the case of ❺ TBN2 type please enter the applicable gland size.

❼ Mounting bracket

Without	No entry
With	BR

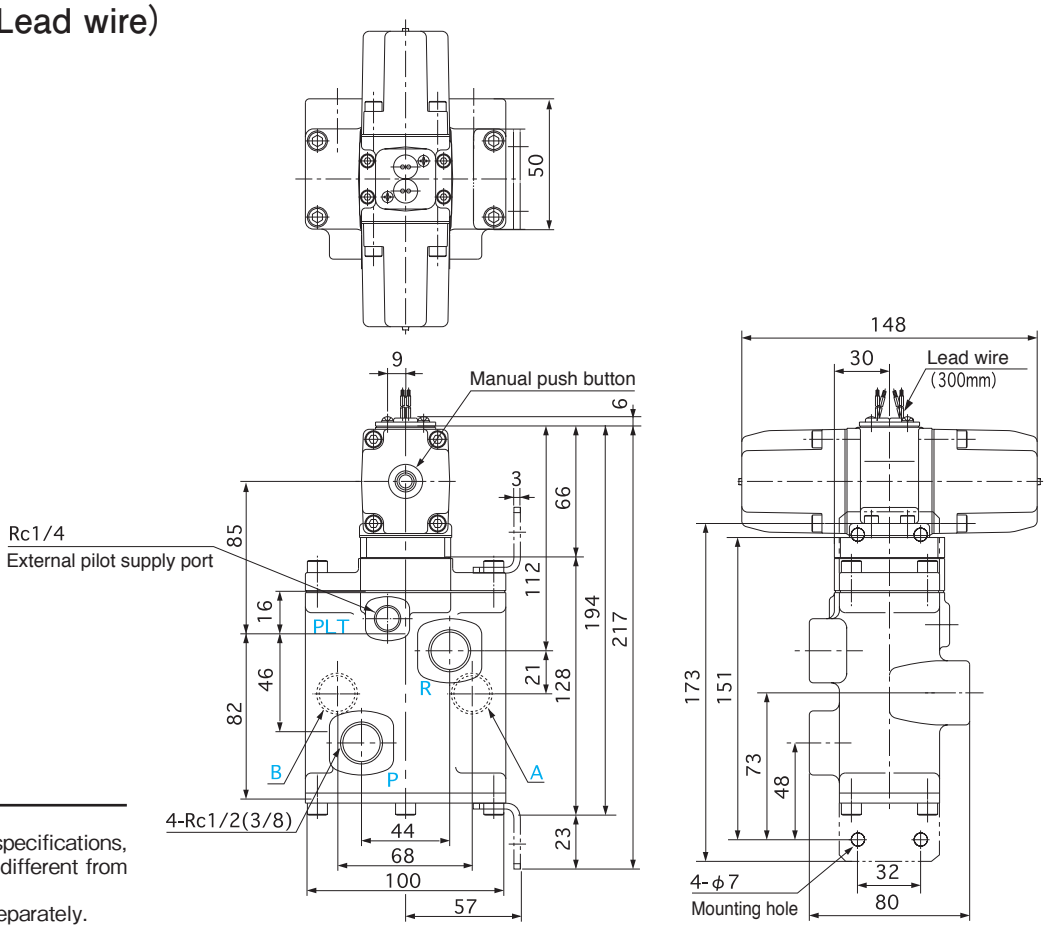
Structure / Operation

MVW344N – 04 – D



External Dimensions

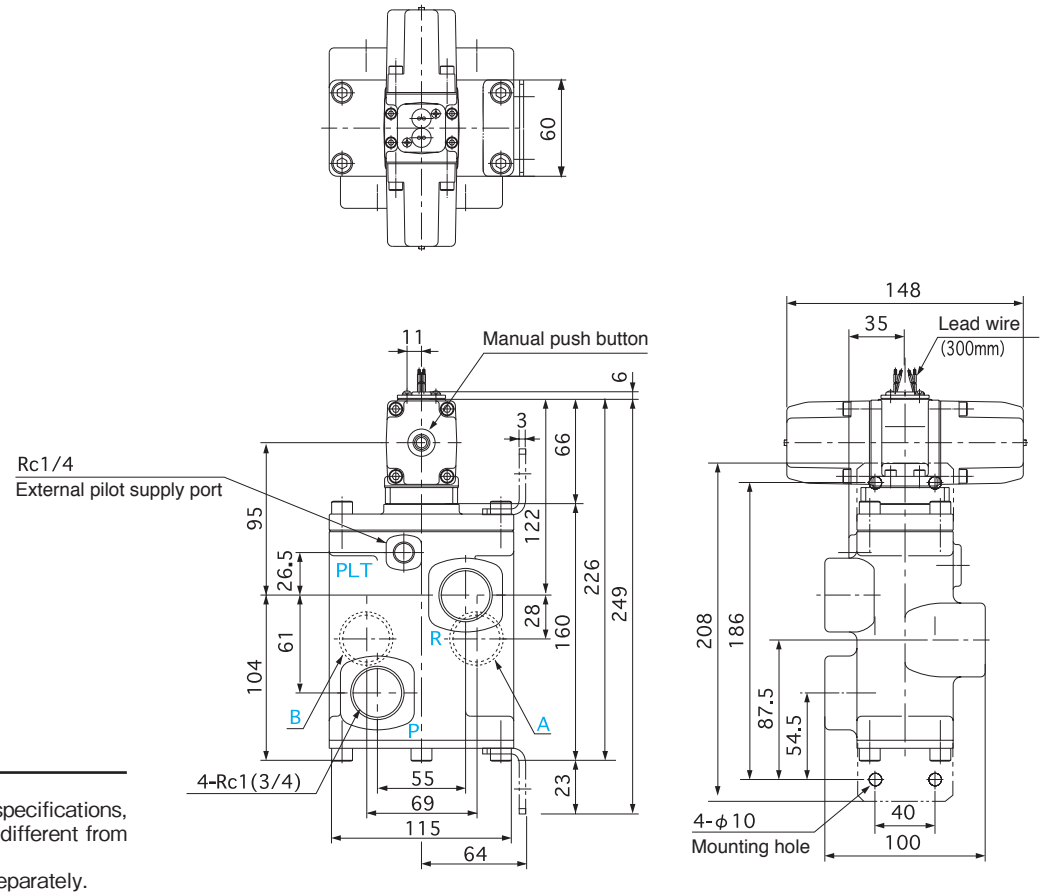
MVW344N-04-D (Lead wire)



Note

In the case of direct current specifications, the shape of the solenoid is different from this figure.
Please refer for the details separately.

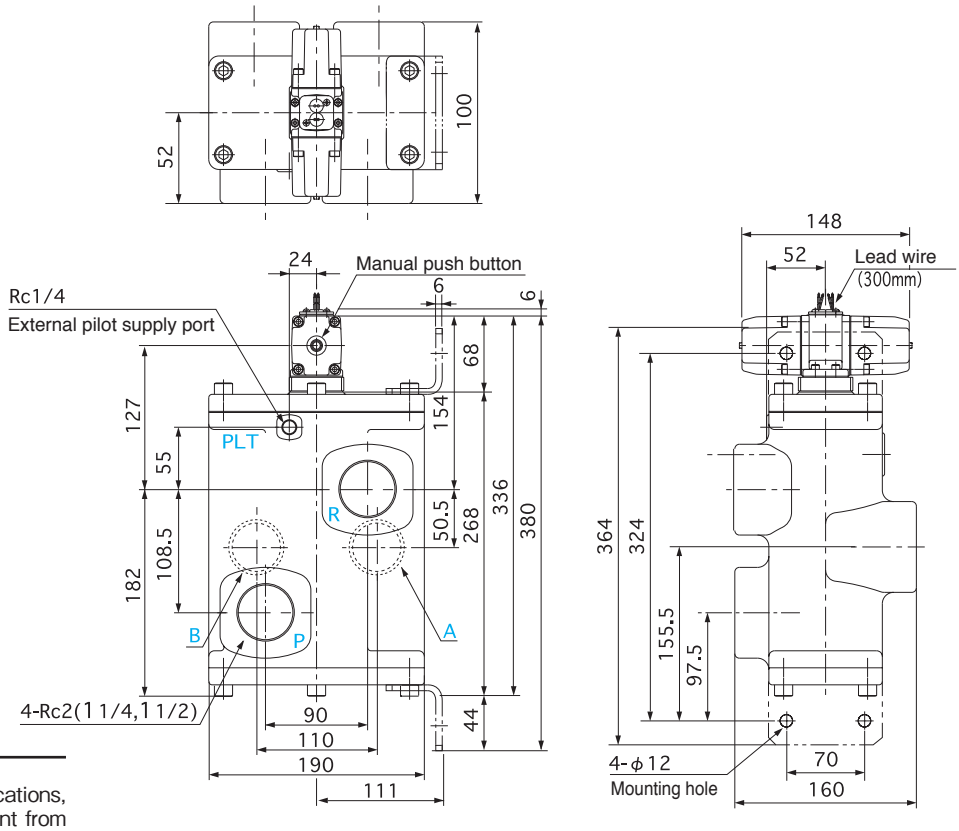
MVW344N-08-D (Lead wire)



Note

In the case of direct current specifications, the shape of the solenoid is different from this figure.
Please refer for the details separately.

MVW344N-14-D（Lead wire）

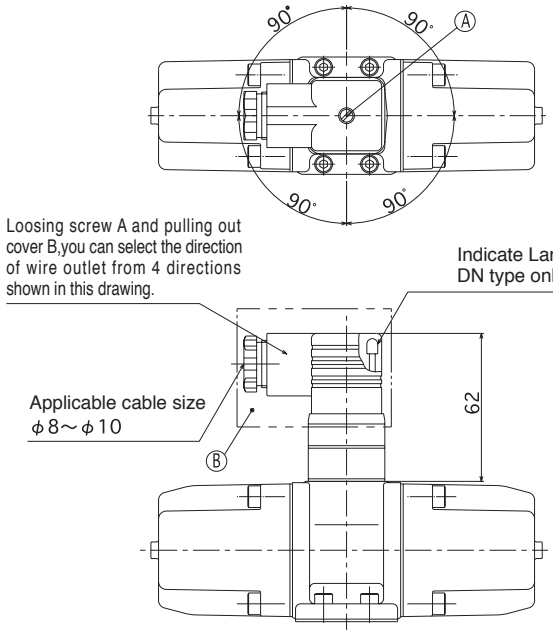


Note

In the case of direct current specifications, the shape of the solenoid is different from this figure.
Please refer for the details separately.

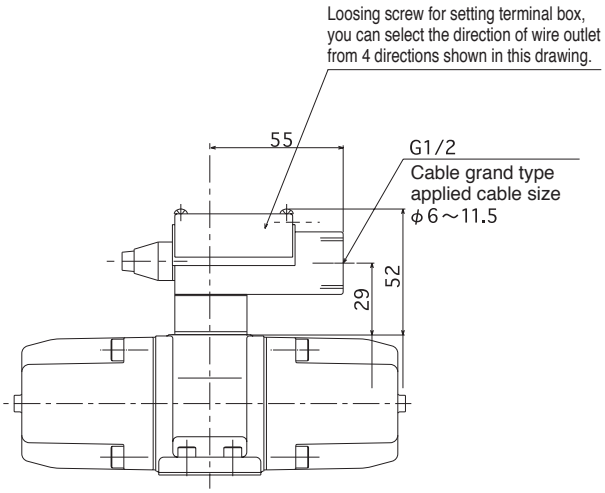
■ DIN connector（Option）Installation

MVW344N – 04・08・14 – D –□– DT
– DN



■ TBF1 type Terminal box（Option）Installation

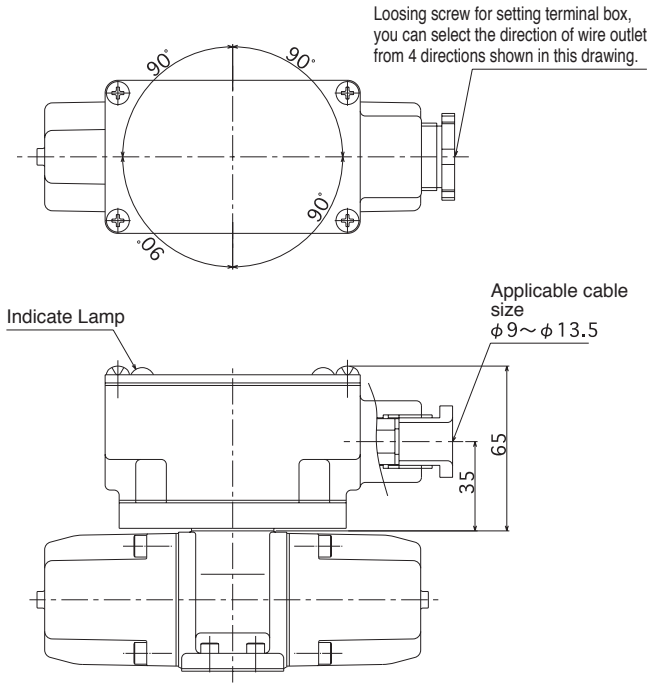
MVW344N – 04・08・14 – D –□– TBF1 –□



● Drip-proof protection class：JIS C 0920（Drip-proof Ⅱ）

■ TBF2 type Terminal box（Option）Installation

MVW344N – 04・08・14 – D –□– TBN2 –□
TBN2N –□
TBN2Z –□
TBN2ZN –□

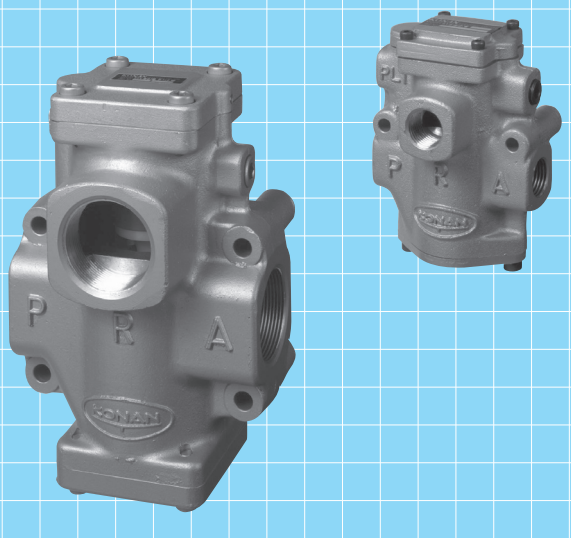


● Drip-proof protection class：JIS C 0920（Drip-proof Ⅱ）

3 Port Air Operated Valves
Large-Capacity Poppet-type

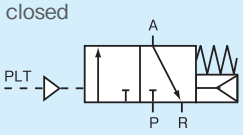
Normally closed
AVW7N
Port size Rc 3/8 ~ 2

Normally open
AVW7NR
Port size Rc 3/8 ~ 2

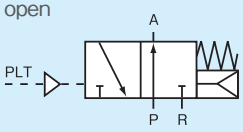


JIS symbol

● Normally closed



● Normally open



Specifications

Model code		AVW7N-04		AVW7N-08		AVW7N-14		
	Normally open	AVW7NR-04		AVW7NR-08		AVW7NR-14		
Port size		Rc 3/8	Rc 1/2	Rc 3/4	Rc1	Rc1 1/4	Rc1 1/2	Rc2
Effective area of valve		70㎟	80㎟	200㎟	220㎟	700㎟	750㎟	800㎟
Fluid		Compressed air (Dry air filter passage less than 40 μm.)						
Working pressure range		0.2 ~ 0.7MPa						
Pilot pressure		0.2 ~ 0.7MPa (Pilot pressure ≧ Working pressure)						
Proof pressure		1.05MPa						
Ambient temperature		− 20 ~ 60℃ (remove moisture perfectry form the fluid to prevent freezing when used at 5℃ or lower.)						
Operating frequency		Max.2time/s						
Installtion position		As desired						
Mass		0.7kg		1.3kg		5.3kg		

● Consult factory for non-standard applications which are not coverd by above specifications.

Model Code

When ordering,specify the model as follows.

AVW7N ① – ②

① Operation type
② Body size and Port size

① Operation type	
Normally closed	No entry
Normally open	R

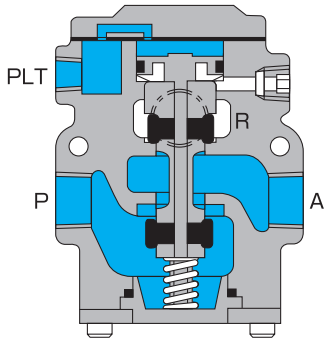
② Body size and Port size		
04	Rc 3/8	04-10A
	Rc 1/2	04-15A
08	Rc 3/4	08-20A
	Rc 1	08-25A
14	Rc 1 1/4	14-32A
	Rc 1 1/2	14-40A
	Rc 2	14-50A

Structure / Operation

AVW7N – 04

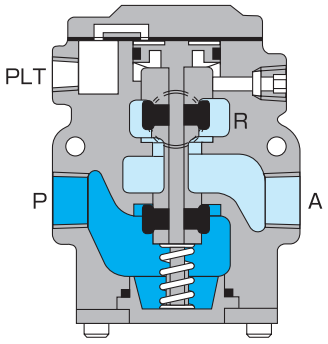
< Pilot pressure supplied >

P → A
R → Close



< Pilot pressure not supplied >

P → Close
A → R

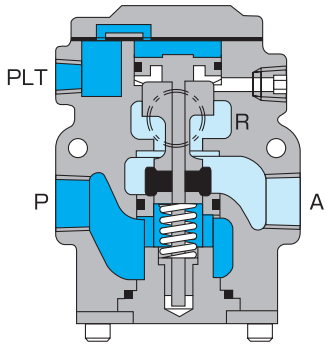


Structure / Operation

AVW7NR – 04

< Pilot pressure supplied >

P → Close
A → R



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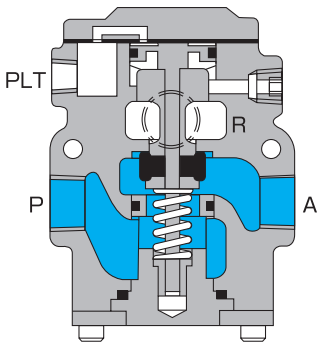
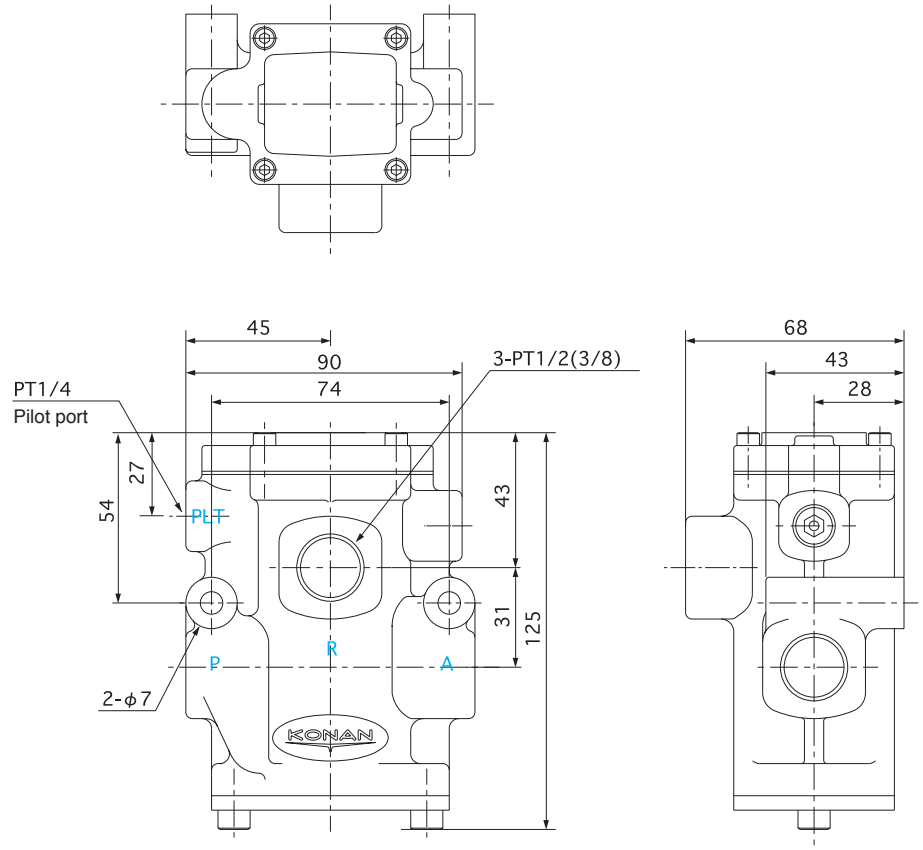
P → A
R → Close

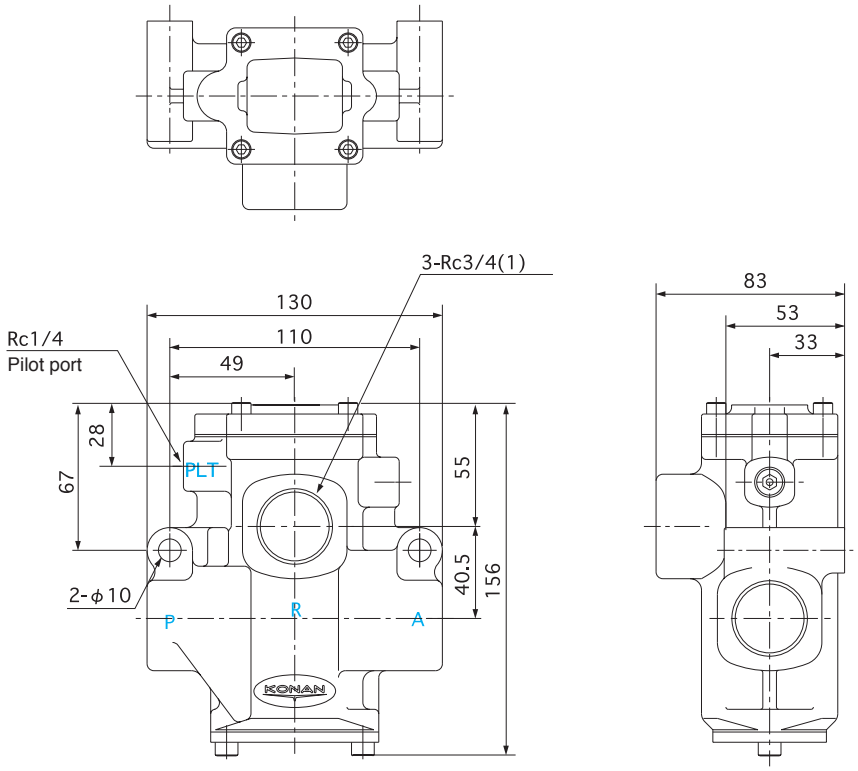


External Dimensions

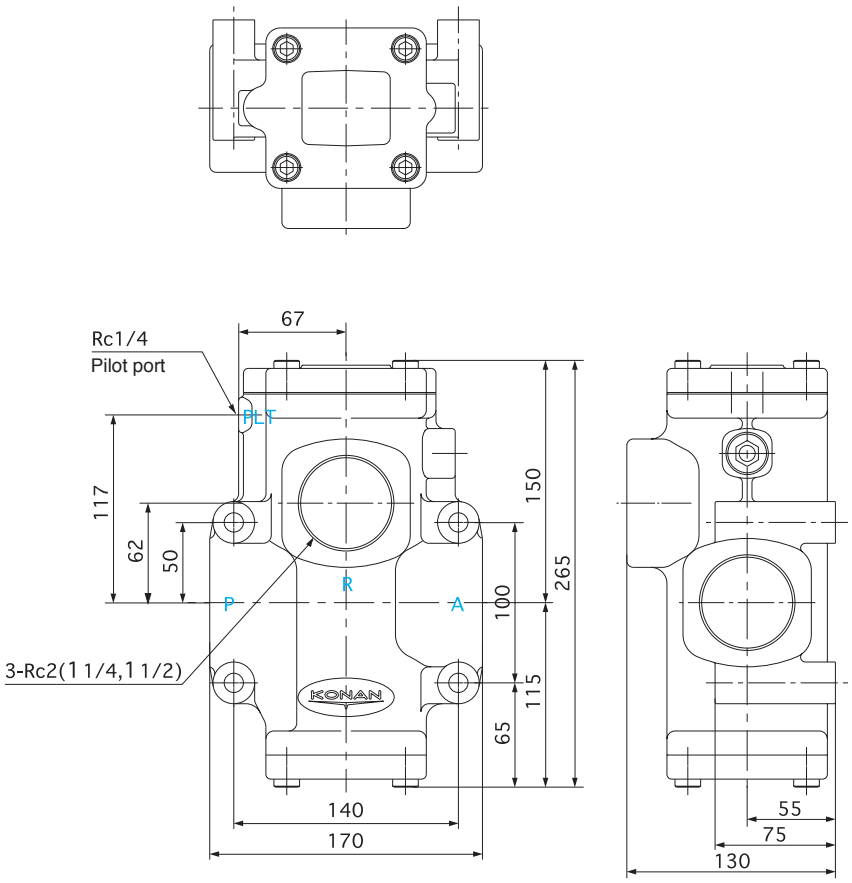
AVW7N (R) -04



AVW7N (R) -08



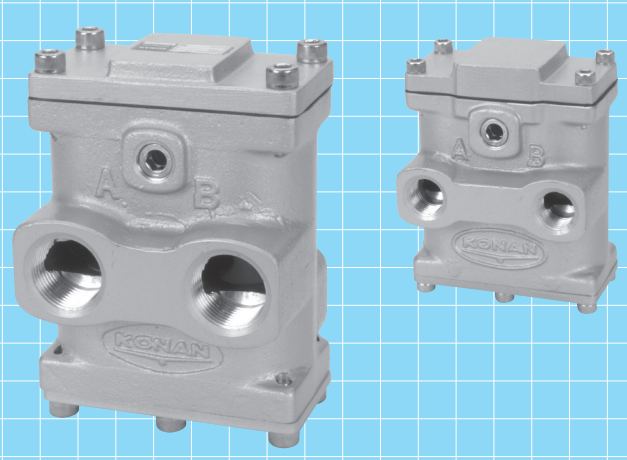
AVW7N (R) -14


67
Rc1/4
Pilot port
PLT
117
62
50
150
265
100
115
65
P
R
A
3-Rc2(1 1/4,1 1/2)
KONAN
140
170
55
75
130

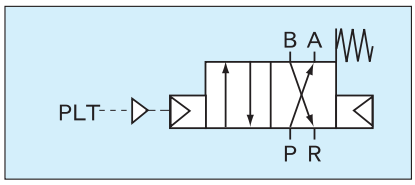
4 Port Air Operated Valves
Large-Capacity Poppet-type

AVW344N

Port size Rc 3/8 ~ 2



JIS symbol



Specifications

Model code	AVW344N-04		AVW344N-08		AVW344N-14		
Port size	Rc 3/8	Rc 1/2	Rc 3/4	Rc1	Rc1 1/4	Rc1 1/2	Rc2
Effective area of valve	70㎟	80㎟	200㎟	220㎟	700㎟	750㎟	800㎟
Fluid	Compressed air (Dry air filter passage less than 40 μm.)						
Working pressure range	0.2 ~ 0.7MPa						
Pilot pressure	0.2 ~ 0.7MPa (Pilot pressure ≧ Working pressure)						
Proof pressure	1.05MPa						
Ambient temperature	− 20 ~ 60℃ (remove moisture perfectry form the fluid to prevent freezing when used at 5℃ or lower.)						
Operating frequency	Max.2time/s						
Installtion position	As desired						
Mass	1.4kg		2.2kg		10.2kg		

● Consult factory for non-standard applications which are not coverd by above specifications.

Model Code

When ordering,specify the model as follows.

AVW344N – ❶ – ❷

❶ Body size and Port size ❷ Mounting bracket

❶ Body size and Port size		
04	Rc 3/8	04-10A
	Rc 1/2	04-15A
08	Rc 3/4	08-20A
	Rc 1	08-25A
14	Rc 1 1/4	14-32A
	Rc 1 1/2	14-40A
	Rc 2	14-50A

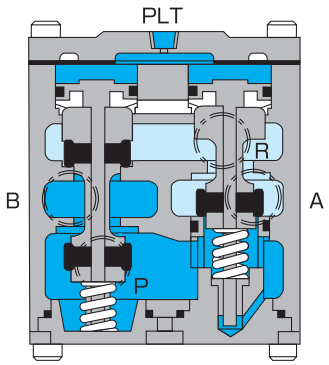
❷ Mounting bracket	
Not needed	No entry
Required	BR

Structure / Operation

AVW344N – 04

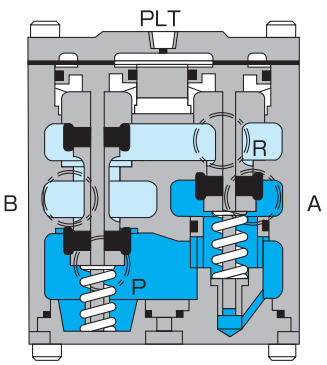
< Pilot pressure supplied >

P → B
A → R



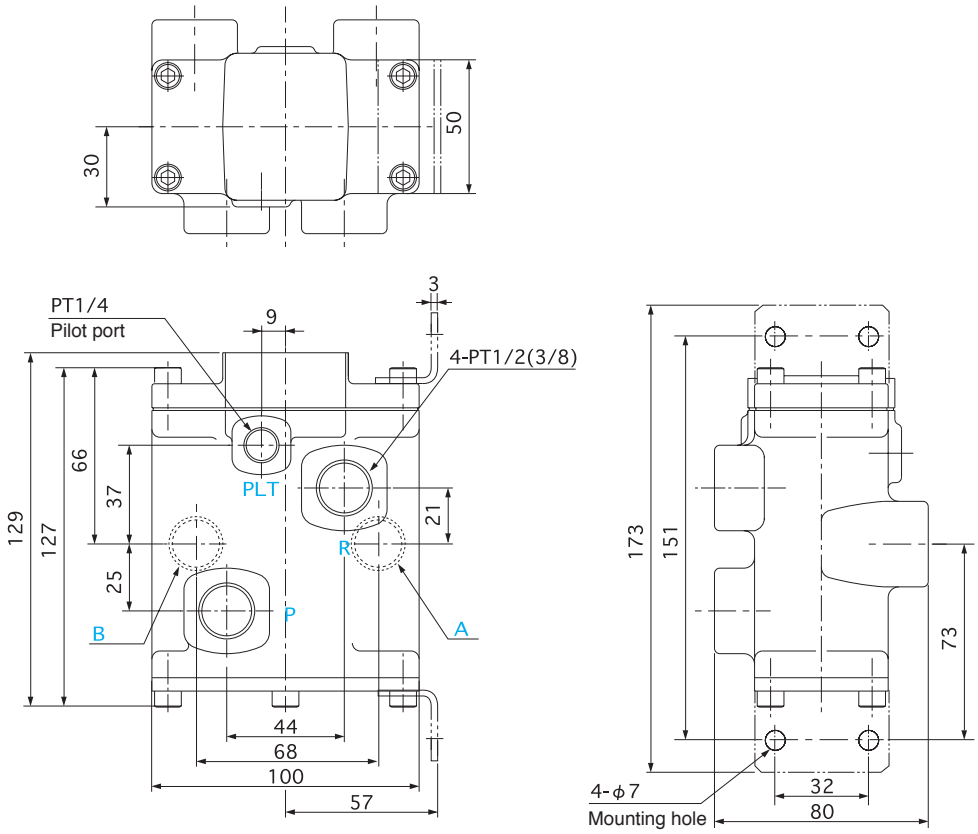
< Pilot pressure not supplied >

P → A
B → R

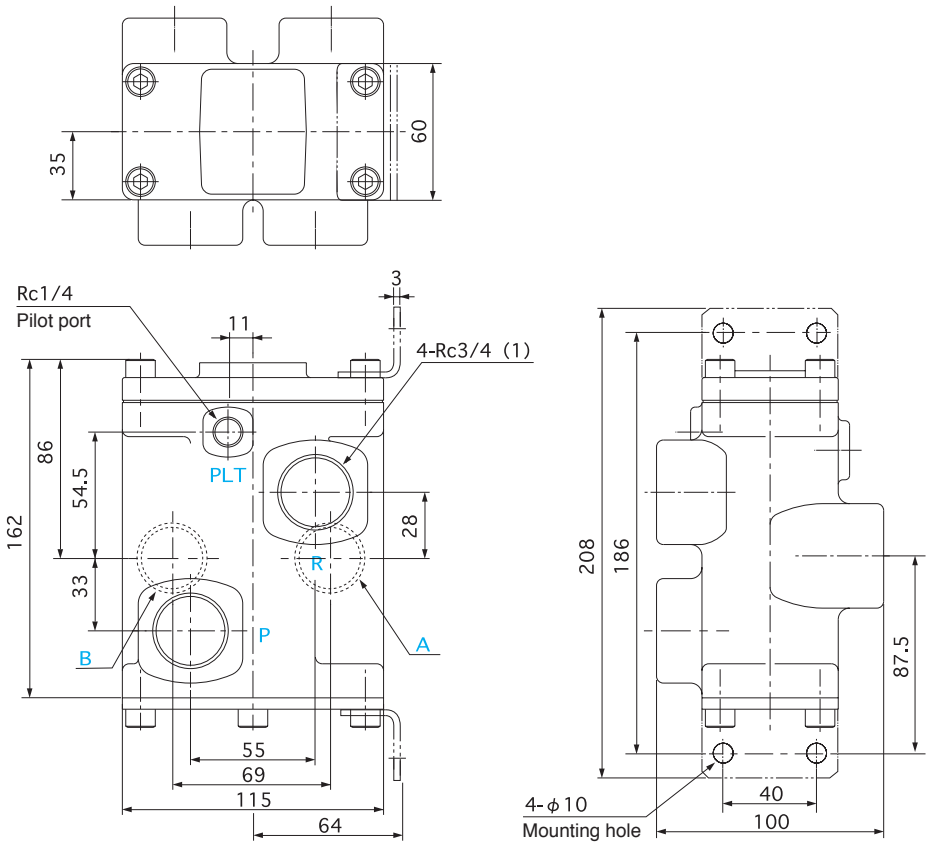


External Dimensions

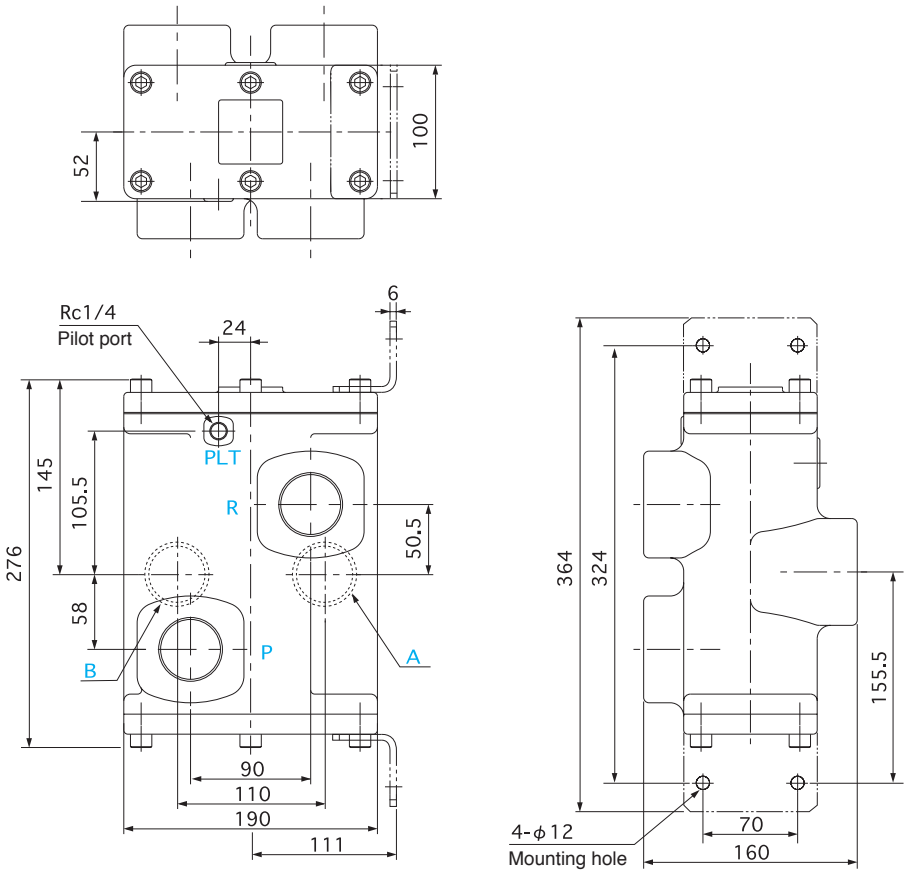
AVW344N-04



AVW344N-08



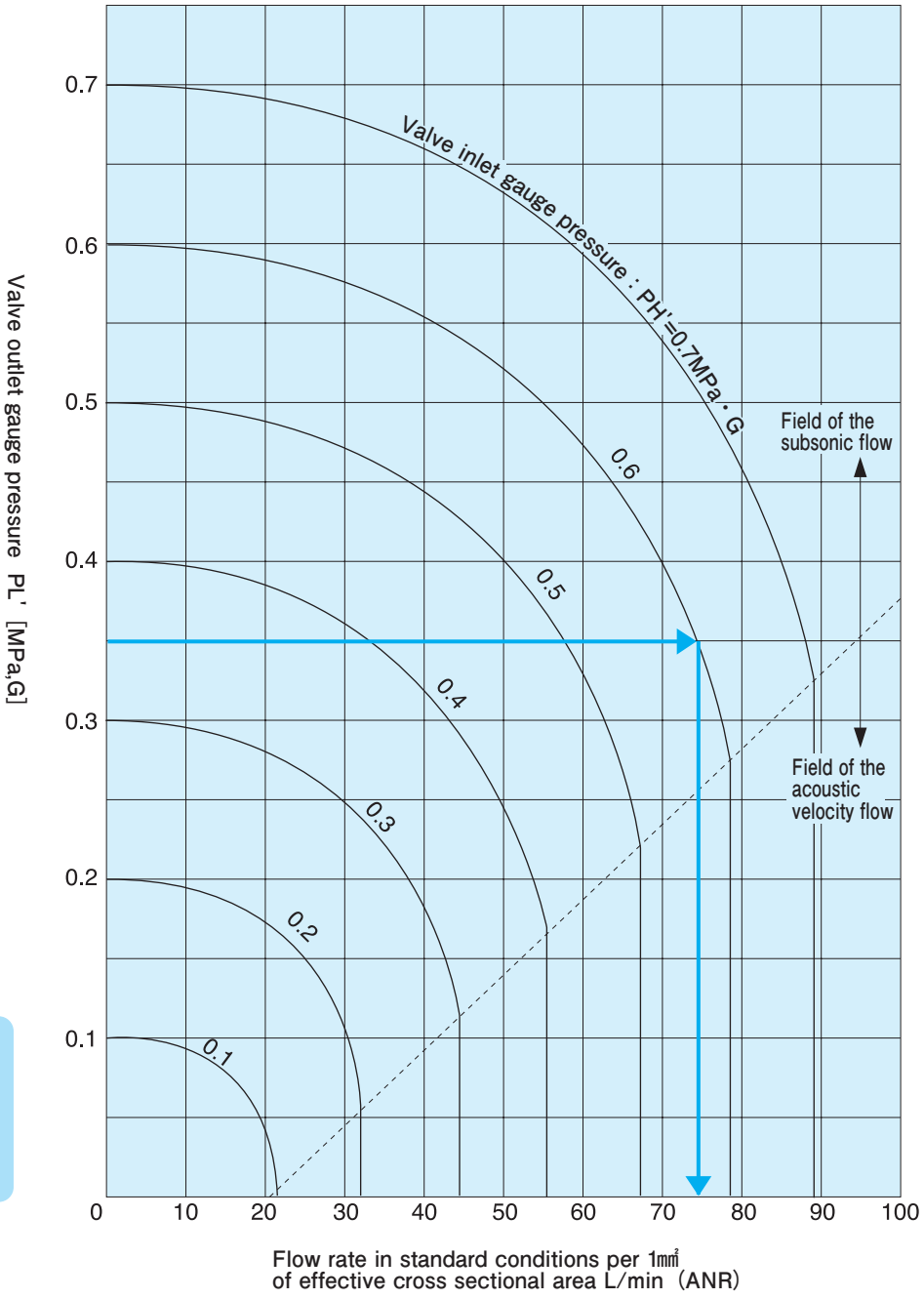
AVW344N-14


52
100
Rc1/4
Pilot port
24
6
PLT
R
P
A
B
276
145
105.5
58
50.5
90
110
190
111
364
324
155.5
4-φ12
Mounting hole
70
160

Determination of Flow-Rate 「Reference」

■ To Determine Flow Rate・1

(To calculate flow rate using effective cross sectional area of valve)



[Eg.]

When valve inlet pressure is 0.6 MPa and outlet pressure 0.35 MPa, the flow rate of the valve with effective cross sectional area 20 ㎟ is calculated as follows:
75L/min (ANR) × 20 ㎟ = 1500L/min (ANR)

◇ Flow Rate Calculation

● $P_H = (1 \sim 1.89)\ P_L$
(In the case of subsonic flow) :

$$Q = 236S\sqrt{P_L(P_H - P_L)\cdot}\sqrt{\frac{293}{T}}$$

● $P_H = > 1.89P_L$
(In the case of acoustic velocity flow) :

$$Q = 118SP_H\sqrt{\frac{293}{T}}$$

Q : Flow [L/min (ANR)]
S : Effective sectional area [mm^2]
P_H : Valve inlet absolute pressure [MPa,abs] = (Gauge pressure PH' +0.101) [MPa]
P_L : Valve outlet absolute pressure [MPa,abs] = (Gauge pressure PL' +0.101) [MPa]
T : Valve inlet absolute temperrature [K]

Note

ANR shows standard condition of the air and shows 20 degrees Celsius, pressure of air in 1 atm.

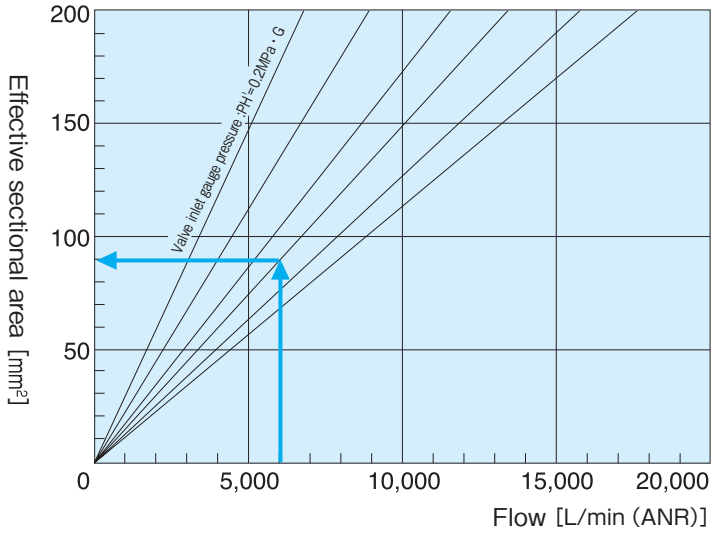
■ To Determine Flow Rate・2

(To calculate effective cross sectional area of valve using flow rate)

A

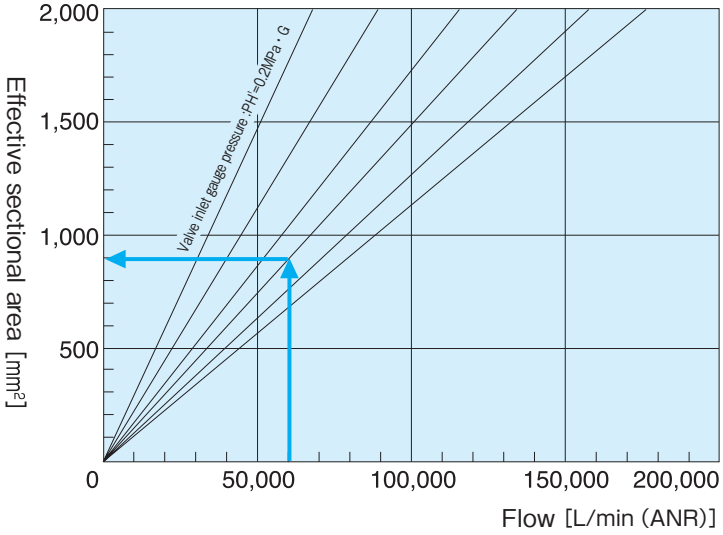
When ratio of valve inlet absolute pressure P_H (gauge pressure P_H' + 0.101) to valve outlet absolute pressure P_L (gauge pressure P_L' + 0.101) (P_H/P_L) is > 1.89
(In the case of acoustic velocity flow)

◆ When the flow rate is 20,000L/min (ANR) or less.



[Eg.]
When valve inlet pressure is 0.5 MPa, the valve effective sectional area requiring flow rate 6,000 L/min (ANR) is 90㎟.

◆ When the flow rate is 200,000L/min (ANR) or less.



[Eg.]
When valve inlet pressure is 0.5 MPa, the valve effective sectional area requiring flow rate 60,000 L/min (ANR) is 900㎟.

B

When P_H/P_L is > 1.89 :
Effective cross sectional area of the valve is determined by the following formula :
(In the case of acoustic velocity flow)

$$\text{Effective sectional area [mm}^2\text{]} = \frac{\text{Flow [L/min]}}{236 \times (\text{The coefficient that found by a lower list})}$$

P_H' \ P_L'	0.65	0.6	0.55	0.5	0.45	0.4	0.35	0.3	0.25
0.7	0.194	0.265	0.313	0.347	0.372	–	–	–	–
0.6	–	–	0.181	0.246	0.288	0.317	–	–	–
0.5	–	–	–	–	0.660	0.224	0.261	–	–
0.4	–	–	–	–	–	–	0.151	0.201	–
0.3	–	–	–	–	–	–	–	–	0.133

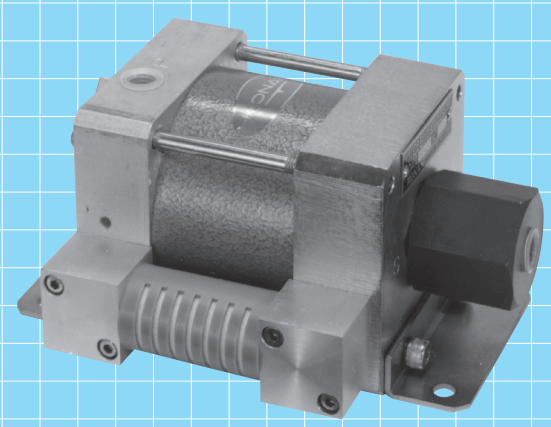
Eg.
Effective cross sectional area when PH'=0.6, PL'= 0.45, flow rate 3,000L/min (ANR) :

$$\frac{3000}{236 \times 0.288} = 44.1\text{mm}^2$$

Booster Pumps

MC5B・BP2

The booster pumps are small-sized, high-performance piston-type plunger pumps to enable you to obtain high hydraulic pressure easily using pneumatic pressure as power source.
Pressure drop at the discharge side automatically starts operation and keeps the pressure constant after increasing to the set pressure. These pumps are the most suitable for power source of press machines, etc.



Features

- Small-sized, high-performance power generator to enable you to obtain high hydraulic pressure easily using even commonly-available air source
- Efficiently-integrated respective functions such as cylinder, pump and change valve.
  Highly-efficient long-life structure by simple design
- A filter and muffler are built in, which prevents internal components from being damaged and provides quiet work environments by excellent silence effect.
- Because operations are automatically stopped as long as no decrease in pressure(leakage,etc.) occurs on the discharge side when the discharge pressure reaches the predetermined pressure, efficient and economic running is possible.
- These pumps are applicable to any operating fluid such as anti-corrosive fluid, etc. in addition to hydraulic operating oil. (For details, please consult with us separately.)

Specifications

Type		Direct mount type	Base mount type	
Model code		MC5B	BP2-7215-B	BP2-7215-C
Port size	Suction port	Rc 1/4	φ 14	
	Delivery port	Rc 1/4		
	Air supply port	Rc 1/4		
Operation liquid		Liquid of corrosion resistance		
Operating air pressure		0.3 ～ 0.7MPa	0.4 ～ 0.7MPa	
Fluid temperature		− 5 ～ 70℃	− 20 ～ 70℃（Common use 5 ～ 70℃）	
Ambient temperature		− 5 ～ 40℃	− 20 ～ 55℃（Common use 5 ～ 55℃）	
Proof pressure	Hydraulic Section	35MPa		
	Pneumatic Section	1.0MPa		
Delivery pressure		See p.51.	21 ×（Operating pressure − 0.045）MPa	
Discharge flow rate		【At discharge pressure 3.9 MPa.】 ◎ Discharge port A：3.6 L/min Min. ◎ Discharge port B：2.5 L/min Min.	【At discharge pressure 3.9 MPa.】 ◎ Discharge port A：1.4 L/min Min. 【At no load.】 ◎ Discharge port A：1.8 L/min Min.	
High of suction		70㎝ Max.	40㎝ Max.	
Mass		3.5kg	4.0kg	

Model Code

When ordering,specify the model as follows.

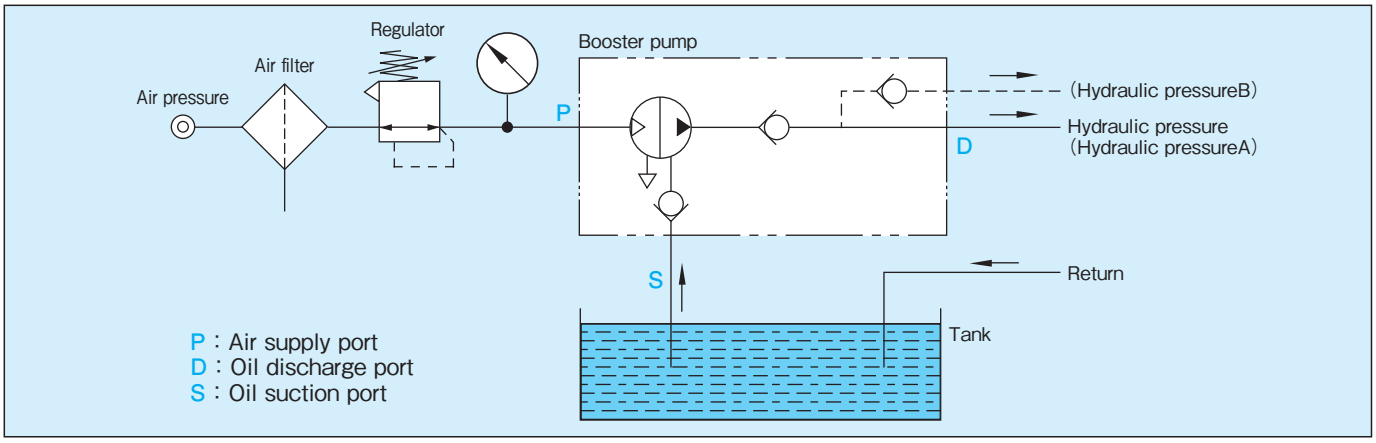
Direct mount type (Foot mounting) **MC5B**

Base mount type **BP2 –** ① ← Discharge port

① Discharge port

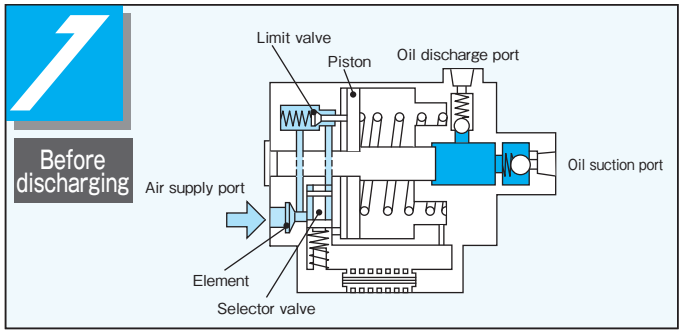
No. of out port	Code
2	7215-B
1	7215-C

Circuit

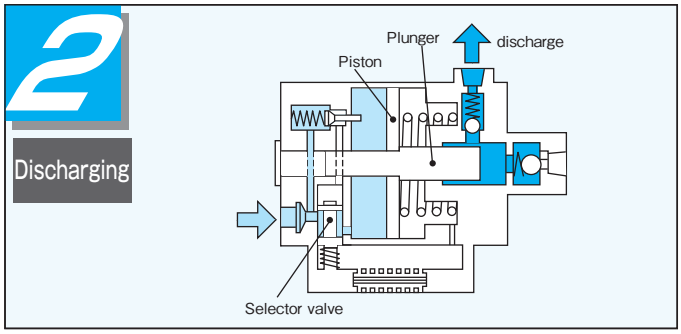


Structure / Operation

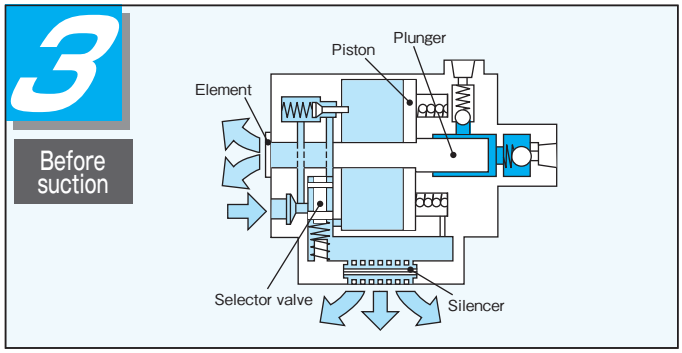
(Note that the following drawings are slightly different from the actual components because they are sketched for explanation of operations.)



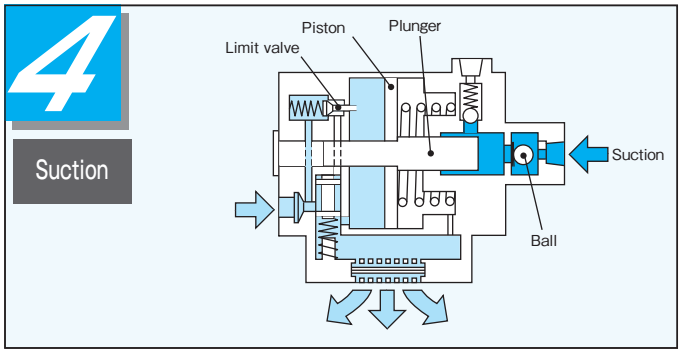
Pressurized compression air from the air supply port passes through the limit valve pressed and opened by the piston and holds the main valve.



The held main valve is moved and air passed through the main valve is flowed into the cylinder chamber, and holds the piston and plunger and move them.
Hydraulic pressure in the pump discharges only the amount of plunger moved together with the piston.



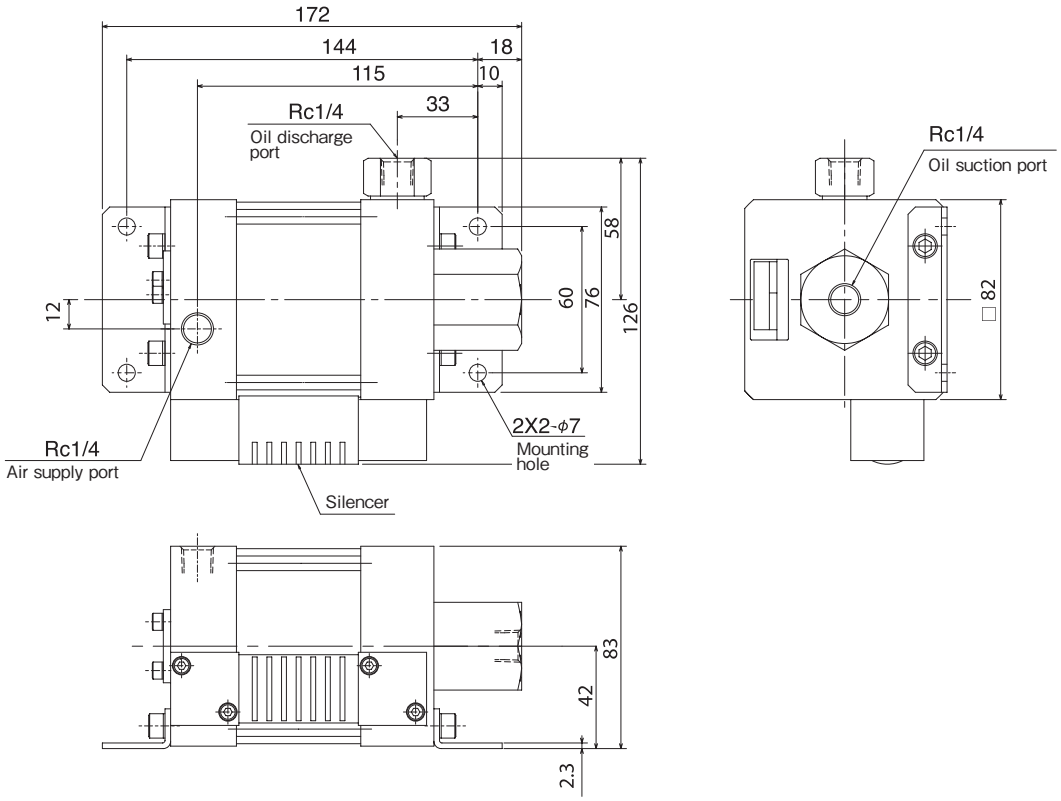
When the piston stops at the final end, the back end of plunger is opened and air pressurizing the main valve is released into the atmosphere through the filter.
Therefore, the main valve is returned and changed by spring force, and air pressurizing the piston is released into the atmosphere through the silencer.



The piston and plunger are moved and returned by spring force. At this time, the suction valve opens and sucks oil. When the piston moves to the final end, the limit valve is pressed and returned to the condition "*1*".
As shown above, operations are repeated in the order from *1* through *4* until the discharge pressure (hydraulic pressure) and the piston pressure receiving force are balanced and are automatically stopped when reaching the predetermined pressure.
When imbalance occurs due to decrease in hydraulic pressure, operations are started again.

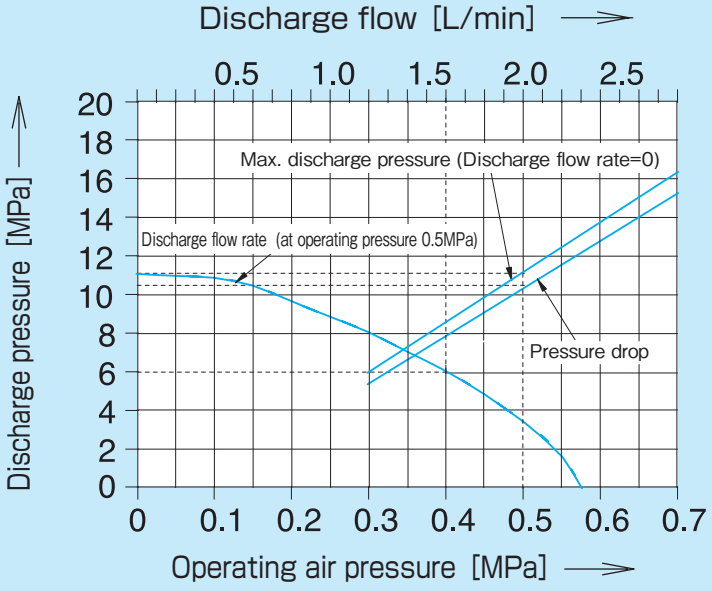
External Dimensions

MC5B



Performance Graph

MC5B



● Discharging pressure

Example

Q : Obtain the maximum discharging pressure and pressure drop when operations are started in case of 0.5 MPa as operating pressure.

A : From the intersecting point with the perpendicular line of 0.5 MPa as operating pressure, the following values are obtained.
Maximum discharging pressure = 11.1 MPa
Pressure drop when operations are started = 10.6 MPa

● Discharging flow rate

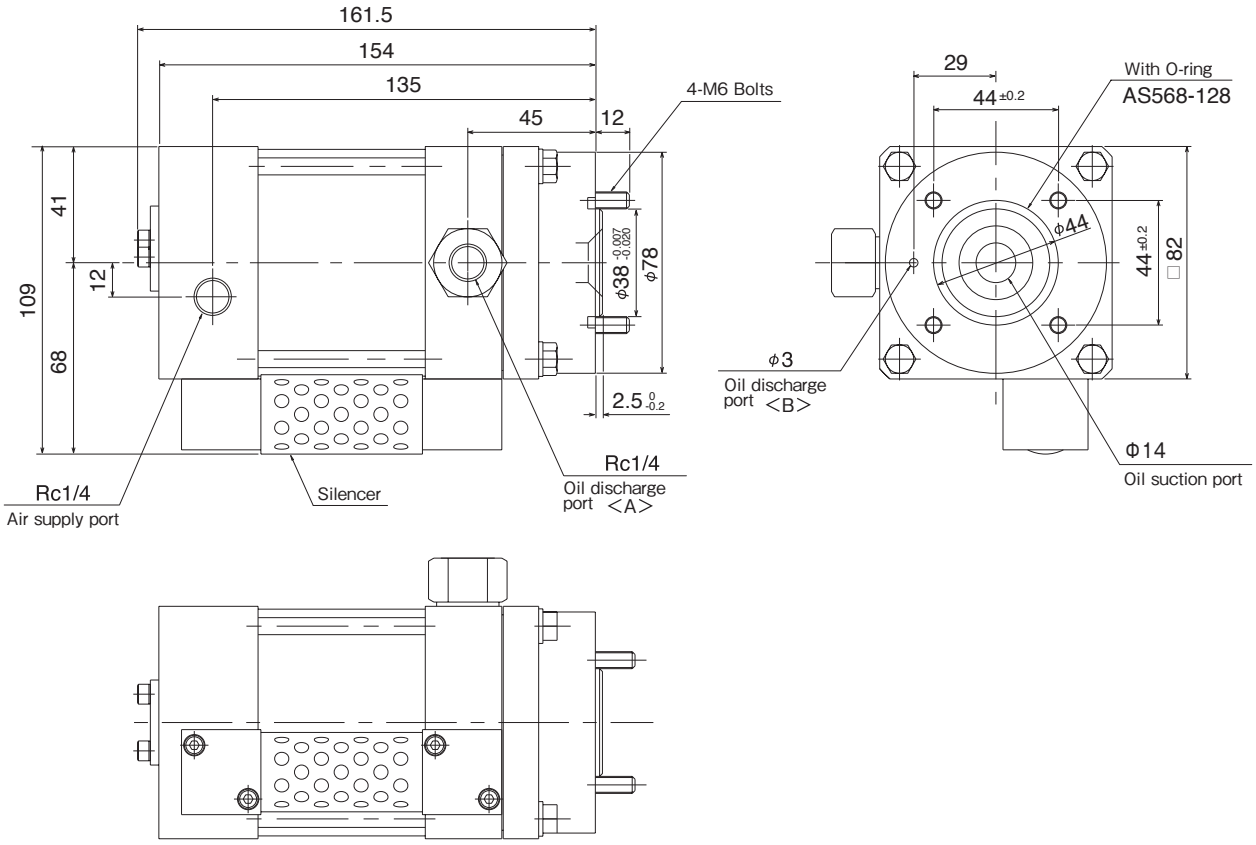
Example

Q : How much is the discharging flow rate in case of 6 MPa as discharging pressure?

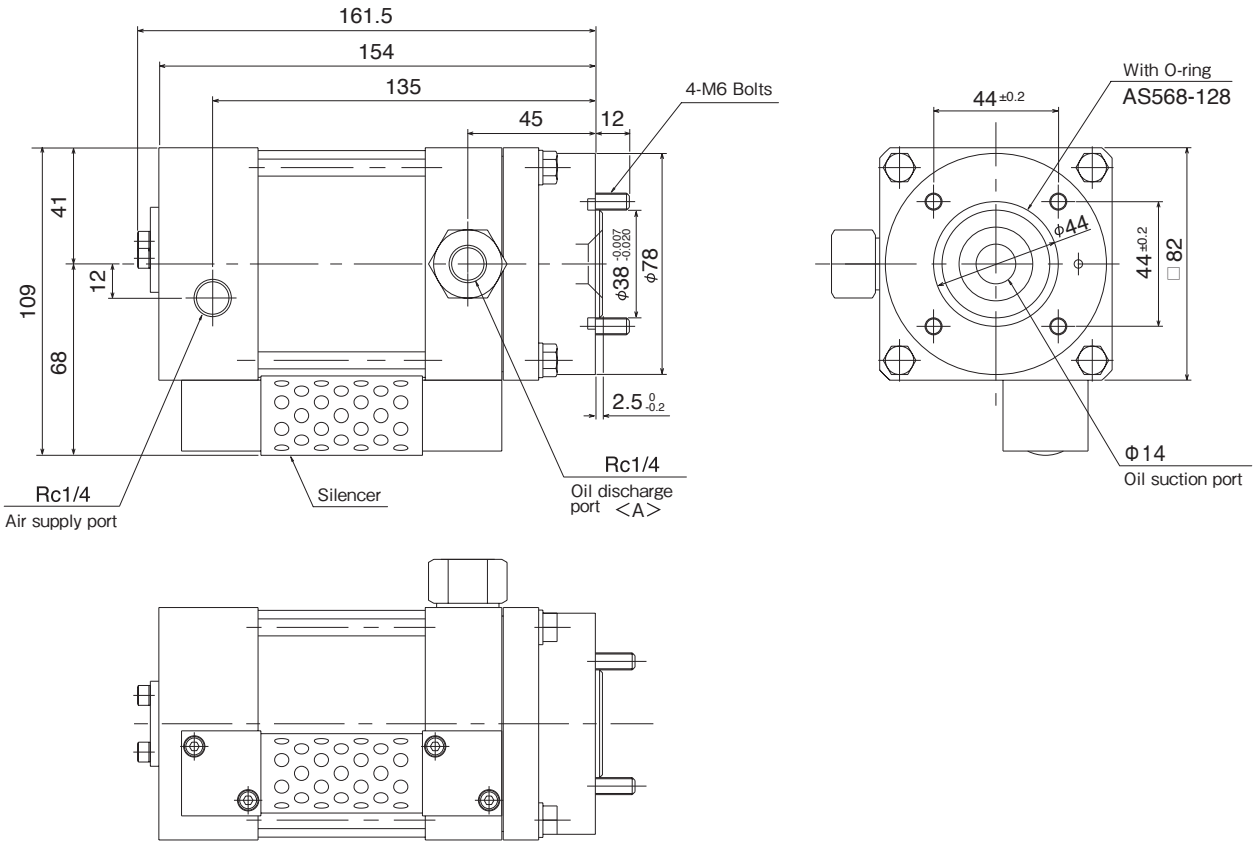
A : From the intersecting point of the discharging pressure of 6 MPa and discharging flow rate curve of 0.5 MPa as operating pressure, the following value is obtained.
Discharging flow rate = 1.6 L/min.

External Dimensions

BP2-7215-B

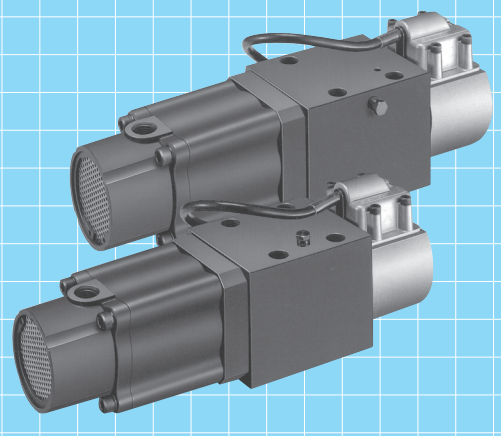


BP2-7215-C



Overload Protectors for Hydraulic Pressures

The overload protector uses pneumatic pressure as power source, in which high-precision booster pumps, a highly-sensitive relief valves and pressure switches are integrated compactly.
This protector detects hydraulic pressure at the overload cylinder of press machine and sharply grasps fluctuations in load to pressurize quickly when hydraulic pressure decreases and relieve the hydraulic pressure instantaneously when overload occurs. Further, this protector is capable of surely stopping the press machine with functions of proximity switch in any event. Excellent characteristics and sharp response protect small-sized through large-sized press machines and molds from damages due to abnormal overload of overload cylinders.



Specifications

Model Code		PG2-19-□-□-SR・PG2-19-□-□-EP
Working Fluid		Compressed air（After 40 μ m filteration）
Operating Pressure		0.25 ～ 0.7MPa（Above 1/100 of overload set pressure）
Lubricant		Turbine oil：VG10 ～ 32
Ambient Temperature		－ 20 ～ 55℃（Common use：5 ～ 40℃）
Oil Temperature		－ 20 ～ 70℃（Common use：5 ～ 70℃）
Overload Set Pressure		Static pressure：20 ～ 34MPa ± 2%
Relief Flow Rate		Less than 1400L / min
Pumping Height		Less than 700mm above oil level
Vibration		Less than 30G（300Hz）
Booster Pump	Min.Operating Pressure	Less than 0.12MPa
	Delivery Pressure	Vent press. = 24 ×（Operating press. － 0.05）MPa
	Delivery Flow	More than 1L/min when unloaded （In operating press. 0.5MPa , oil viscosity 20 mm²/s）
	Operating Sound Level	Less than 80dB at a distance of 1m
Proof Pressure	Pneumatic Section	1.0MPa
	Hydraulic Section	44MPa（In high press. line only）

Model Code

When ordering,specify the model as follows.

PG2 – 19 – ① – ② – ③

- ① Voltage of Pressure Switch
- ② Overload Set Pressure
- ③ Type of Overload Protector

① Voltage of Pressure Switch

AC80V ～ 120V・50/60Hz	A
DC24V	D

② Overload Set Pressure

Please specify the real number（Unit：MPa）
pressure：20 ～ 34MPa

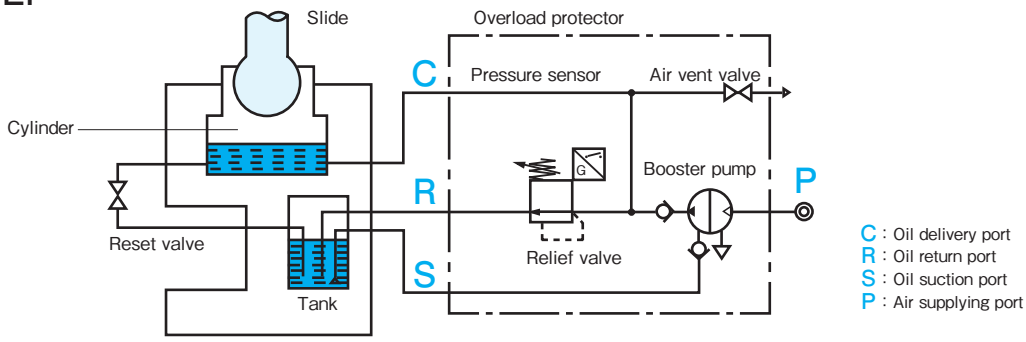
● As overload pressure set value, consider tolerance values by ± 2%.

③ Type of Overload Protector

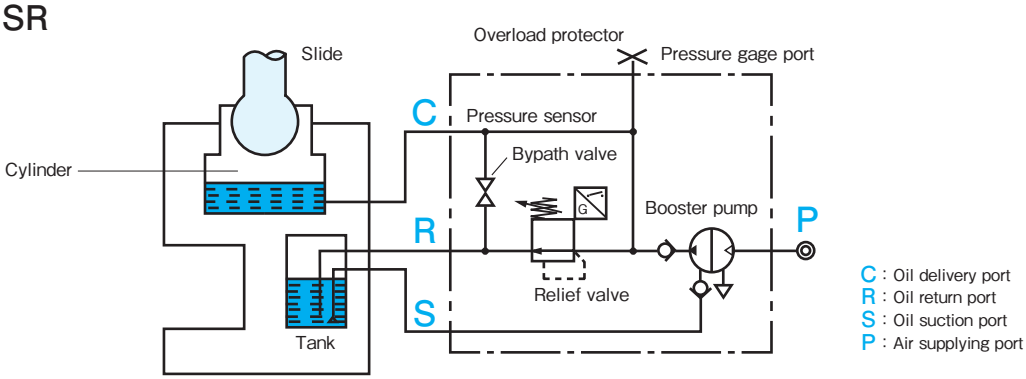
C-port（high press.）Bottom Piping		EP
C-port（high press.）Side Piping		SR
w/Tank	Tank Cylinder Volume 0.7L	T7
	Tank Cylinder Volume 1.2L	T12
	Tank Cylinder Volume 2.3L	T23

Circuit

PG2-19-□-□-EP



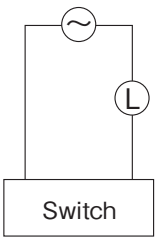
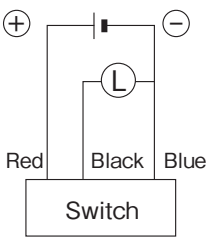
PG2-19-□-□-SR



Specifications for Pressure Switch

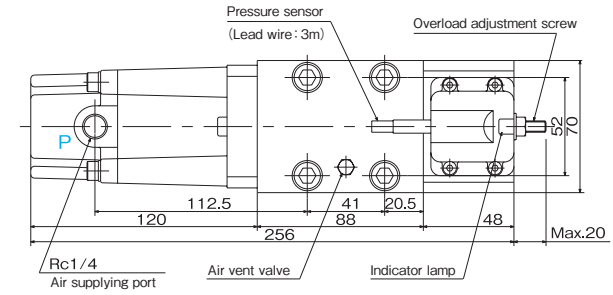
Type	For AC (TYPE : A)	For DC (TYPE : D)
Structure	Ferrous plate proximity switch	
Voltage	AC80 ~ 120V	DC24V ± 10%
Max. contact capacity	50VA	24W
Indicator lamp	OFF during operation	ON during operation
Leakage current	Less than 0.3mA	—
Dielectric pressure	AC1500V / min	
Insulation resistance	More than 100M Ω (500V megger test)	

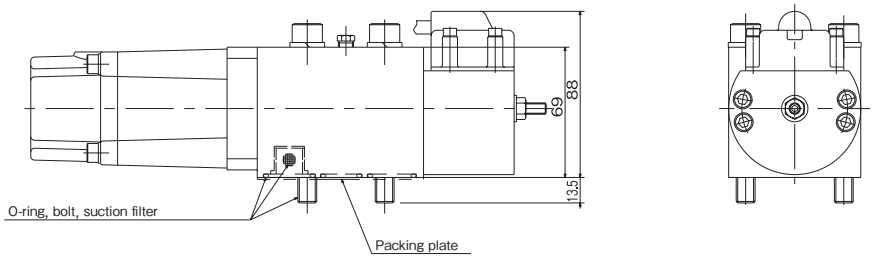
Pressure Switch / Wiring

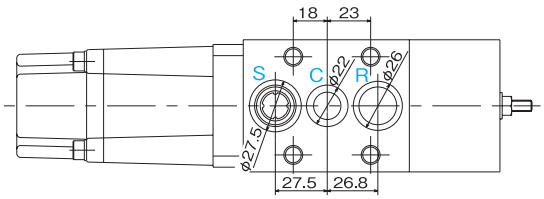
TYPE : A	TYPE : D
	
L : LOAD	L : LOAD

External Dimensions

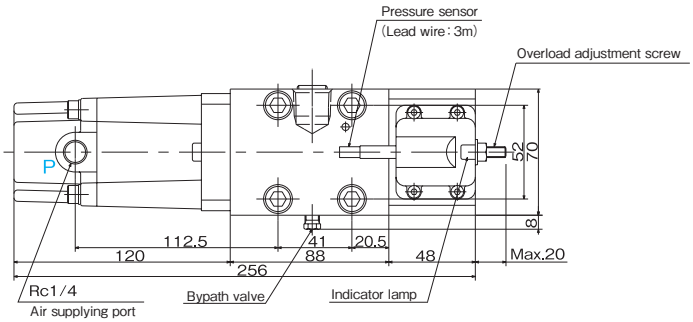
PG2-19-□-□-EP

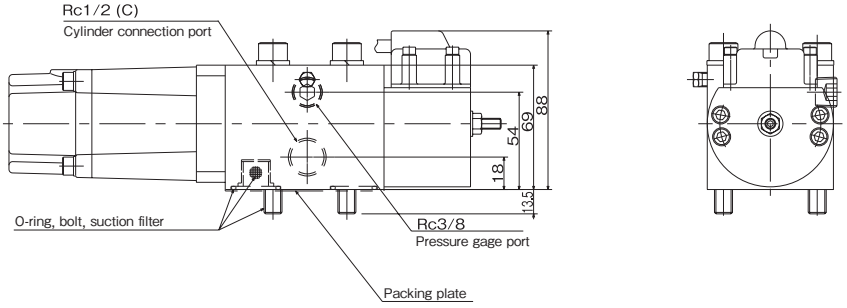


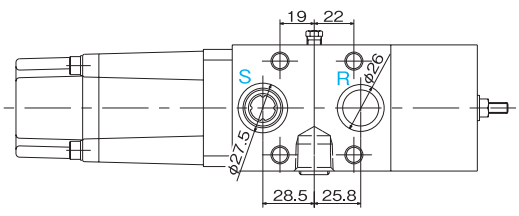




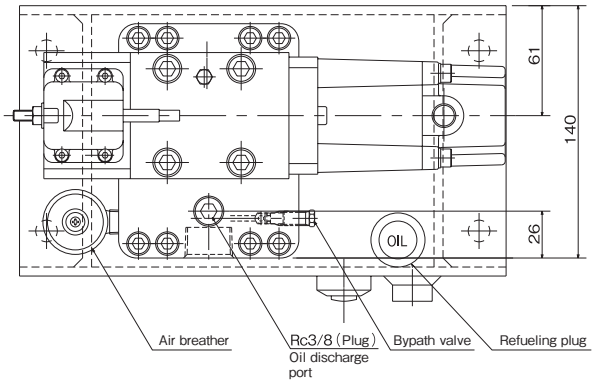
PG2-19-□-□-SR

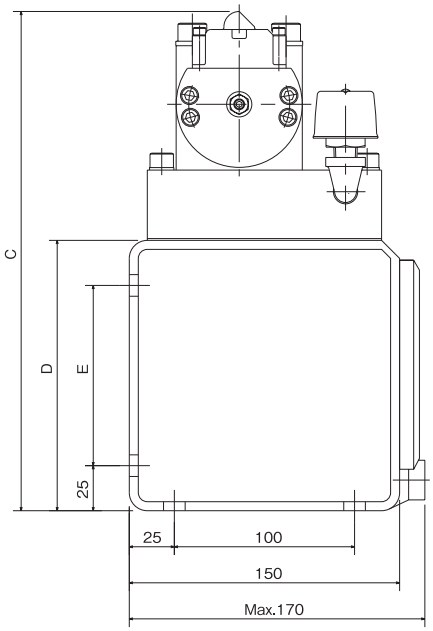


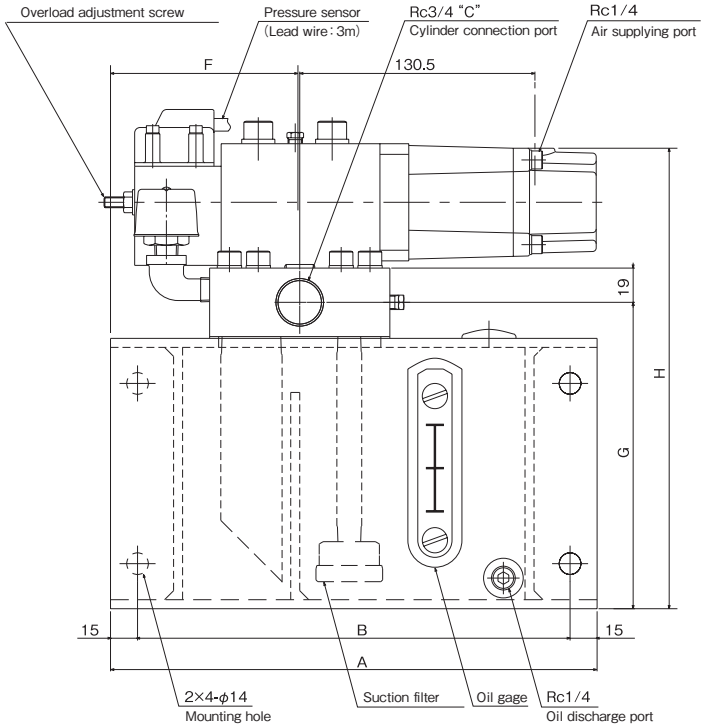




PG2-19-□-□-T□ (w/Tank)







■ Dimensional Table

Body	Cylinder volume	Tank nominal capacity	Dimensions								Mass (About)
			A	B	C	D	E	F	G	H	
T7	0.7L	3.0L	270	240	280	150	100	105	170	255	17kg
T12	1.2L	4.6L	370	340	280	150	100	205	170	255	20kg
T23	2.3L	6.2L	370	340	330	200	150	205	220	305	22kg

Technical data

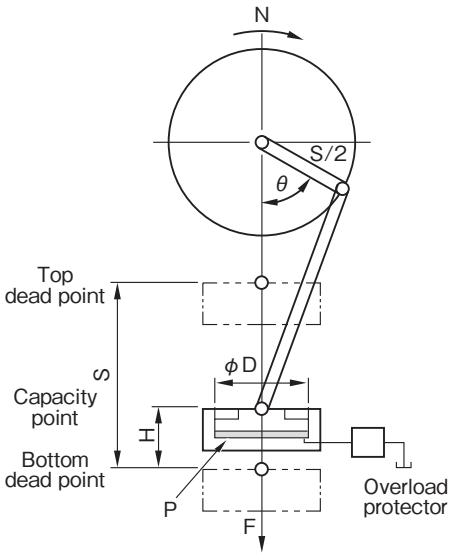
Selection of overload protectors

Method of the choice

To select suitable overload protectors, the following use conditions of press machines are required.

【Specifications for press machines】

1) Pressurizing capacity : F [KN]
   The maximum pressurizing force which the press machine can generate (also called pressurizing capacity)
2) Capacity generation position : H [mm]
   Height from the bottom dead center where the press machine can generate the maximum pressurizing force
3) Length of stroke : S [mm]
   Movement distance of slide per one stroke
4) Number of strokes : N [cycle/min]
   Number of strokes of slide per one minute
5) Overload cylinder diameter : D [mm]
   Cylinder for overload



Method of the setting pressure

To make the relief valve operate when the hydraulic pressure equivalent to 110% of pressurizing capacity is generated in the overload cylinder, determine the overload setting pressure: P.

$$P = 1.4 \times F \times 10^3 \div D^2 \quad [MPa]$$

Note) 1. It is ideal to set the setting pressure to high (minimize the cylinder diameter) as much as possible.
2. This formula shows a case where one overload cylinder is installed.

Reference

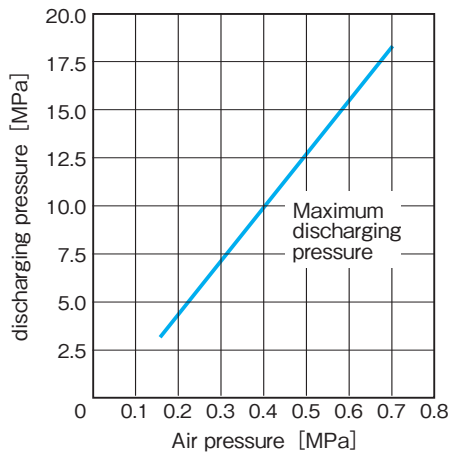
$$P = F \times 1.1 \times 10^3 \times 4 \div \pi \div D^2 \fallingdotseq 1.4 \times F \times 10^3 \div D^2 \quad [MPa]$$

- Cylinder area [mm²]
- Unit conversion
- Increasing rate of pressurizing capacity
- Pressurizing capacity [KN]

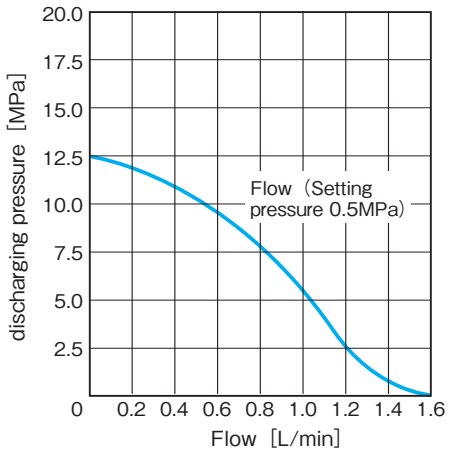
Plan to set the increasing rate of pressurizing capacity to 100 to 120%.
In this formula, the increasing rate is simply set to 110%.

Characteristic graph

● Maximum discharging pressure characteristics



● Flow rate characteristics



Method of the relief flow rate

Flow rate of fluid to be discharged from the overload cylinder in case of overloading. Calculate the relief flow rate by obtaining the slide speed in the capacity position. However, obtain the angle θ in the capacity position with ρ =0.2.

$$\theta = \cos^{-1} 5 \times (-1 + \sqrt{1.44 - 0.8 \times H \div S}) \quad [^\circ]$$

Slide speed: Obtain V by assigning the angle: θ to the following formula.

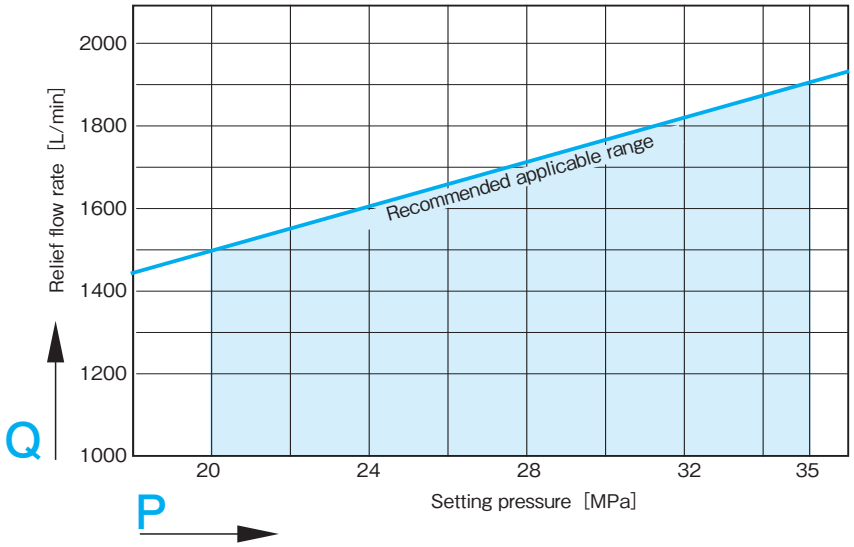
$$V = 0.052 \times S \times N \times (\sin\theta + 0.1 \times \sin 2\theta) \quad [\text{mm/s}]$$

Calculate the relief flow rate: Q by the following formula.

$$Q = 47 \times D^2 \times V \times 10^{-6} \quad [\text{L/min}]$$

Range that applies over load protector

Check whether or not the relation of the setting pressure: P and the relief flow rate: Q is within the applicable range. Even if it is out of applicable range, the protectors may be usable by actual measurement in some cases, therefore, consult with us separately



Reference

【Exercise 1】

- **Setting conditions**
  ● Pressurizing capacity 2000KN ● Number of strokes 50 cycle/min ● Length of stroke 250mm
  ● Capacity generation position 10mm ● Overload cylinder diameter 310mm (1 pc.)
- **Calculation method**

$$P = 1.4 \times F \times 10^3 \div D^2 = 1.4 \times 2000 \times 10^3 \div 310^2 \fallingdotseq 29.1 \quad [\text{MPa}]$$

$$\theta = \cos^{-1} 5 \times (-1 + \sqrt{1.44 - 0.8 \times H \div S})$$

$$= \cos^{-1} 5 \times (-1 + \sqrt{1.44 - 0.8 \times 10 \div 250}) \fallingdotseq 21 \quad [^\circ]$$

$$V = 0.052 \times S \times N \times (\sin\theta + 0.1 \times \sin 2\theta)$$

$$= 0.052 \times 250 \times 50 \times (\sin 21 + 0.1 \times \sin 2 \times 21) \fallingdotseq 276 \quad [\text{mm/s}]$$

$$Q = 47 \times D^2 \times V \times 10^{-6} = 47 \times 310^2 \times 276 \times 10^{-6} \fallingdotseq 1246 \quad [\text{L/min}]$$

- **Selection of overload protector**
  From P = 29.1 [MPa] and Q = 1246 [L/min] , it falls within the use range of PG2-19 type.

【Exercise 2】

- **Setting conditions**
  ● Pressurizing capacity 3500KN ● Number of strokes 30 cycle/min ● Length of stroke 300mm
  ● Capacity generation position 12mm ● Overload cylinder diameter 290mm (2 pc.)
- **Calculation method**

$$P = 1.4 \times F \times 10^3 \div D^2 \div pc. = 1.4 \times 3500 \times 10^3 \div 290^2 \div 2 \fallingdotseq 29.1 \quad [\text{MPa}]$$

$$\theta = \cos^{-1} 5 \times (-1 + \sqrt{1.44 - 0.8 \times H \div S})$$

$$= \cos^{-1} 5 \times (-1 + \sqrt{1.44 - 0.8 \times 12 \div 300}) \fallingdotseq 21 \quad [^\circ]$$

$$V = 0.052 \times S \times N \times (\sin\theta + 0.1 \times \sin 2\theta)$$

$$= 0.052 \times 300 \times 30 \times (\sin 21 + 0.1 \times \sin 2 \times 21) \fallingdotseq 199 \quad [\text{mm/s}]$$

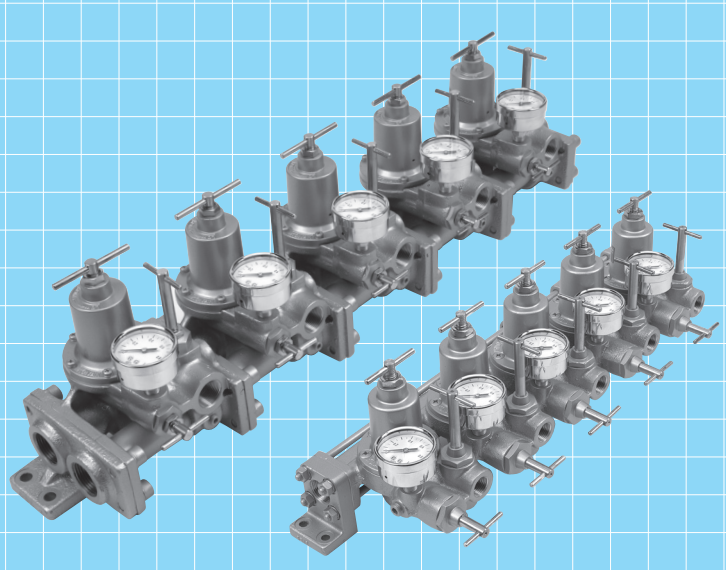
$$Q = 47 \times D^2 \times pc. \times V \times 10^{-6} = 47 \times 290^2 \times 2 \times 199 \times 10^{-6} \fallingdotseq 1573 \quad [\text{L/min}]$$

- **Selection of overload protector**
  From P = 29.1 [MPa] and Q = 1573 [L/min] , it falls within the use range of PG2-19 type.

Pressure Regulation Units

RDU1
RDU5

Port size Rc 1/2 • 3/4 • 1

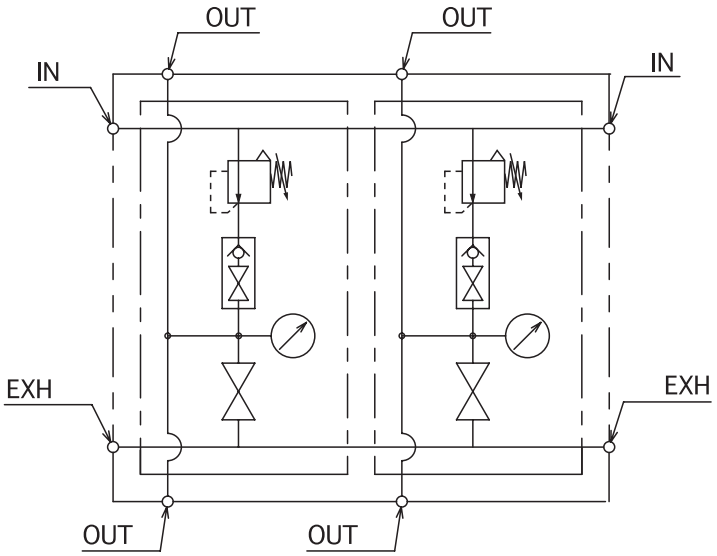


This pressure regulator unit is consisting of pressure reducing valve, check valve and pressure gage.There are designed for mounting into any desired number of units to simplify piping and central control.In particular for press machine, to supply various kinds of pressure. Each pressure and exhaust port is connected to common pressure and exhaust port.Each unit is independent with each other and can be set independent by at any pressure. Each load can be operated independently.

Specifications

Model Code		RDU1F	RDU5F	
Port size	OUT	Rc 1/2	Rc 3/4	Rc 1
	IN	Rc 3/4	Rc 1	Rc1 1/4
Working pressure	Primary Press. (IN)	Max.1.0MPa		
	Secondary Press. (OUT)	0.05 ~ 0.7MPa		
Proof Pressure		1.5MPa		
Working Temperature		5 ~ 60℃		
Leakage Quantity from Valve		0 ㎤/min (ANR) (at Primary side : 0.7MPa, at Secondary side : Atomosphere)		
Leakage Quantity from Relief port		15 ㎤/min (ANR) (at Primary side : 0.7MPa, at Secondary side : 0.5MPa)		
Mounting Direction		As desired		
Mass		See External Dimensions		

JIS symbol



Note) In case of RDU1 type, the EXH port is for individual discharging.

Model Code

When ordering,specify the model as follows.

RDU1F – ① – ②

● Unit number ● Port size

RDU5F – ① – ③

● Unit number ● Port size

① Unit number	
1	1
2	2
3	3
4	4
5	5
6	6

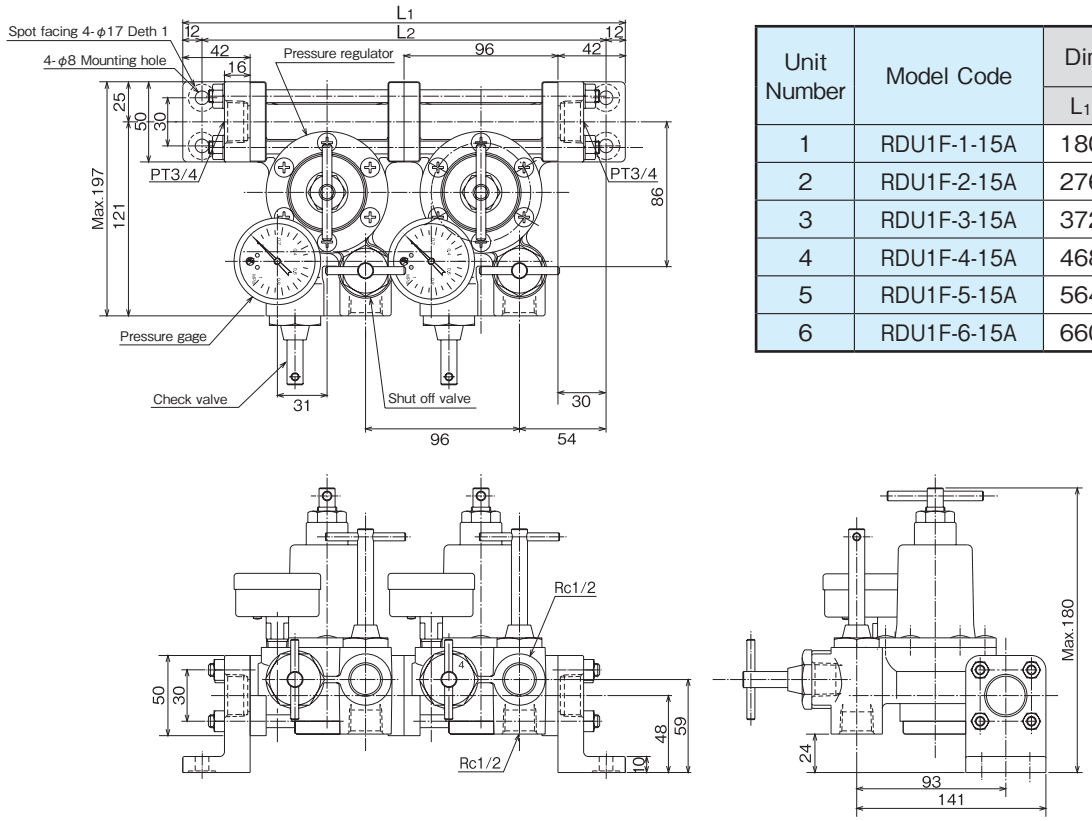
* For RDU5F type, the maximum number of contatenation is “5”.

② OUT Side Port size	
Rc 1/2	15A

③ OUT Side Port size	
Rc 3/4	20A
Rc 1	25A

External Dimensions

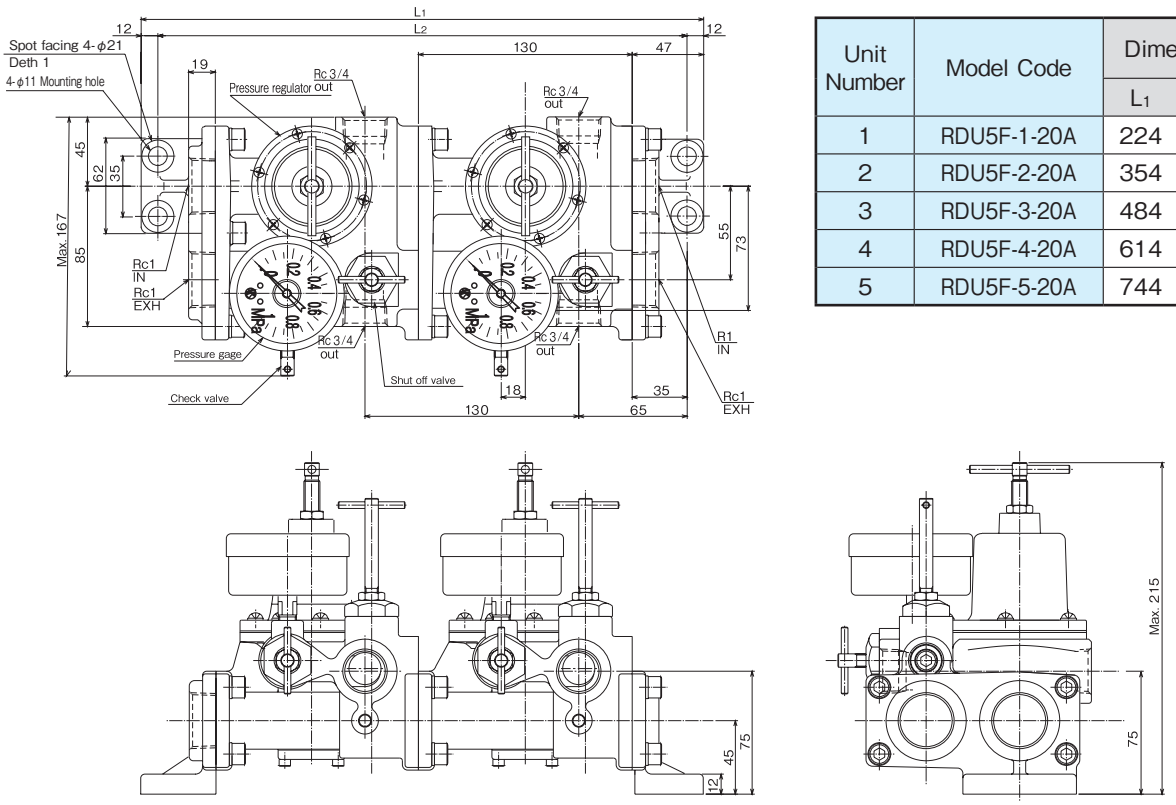
RDU1F- □ -15A



Unit Number	Model Code	Dimension		Mass
		L_1	L_2	
1	RDU1F-1-15A	180	156	about 5kg
2	RDU1F-2-15A	276	252	8
3	RDU1F-3-15A	372	348	11
4	RDU1F-4-15A	468	444	14
5	RDU1F-5-15A	564	540	17
6	RDU1F-6-15A	660	636	20

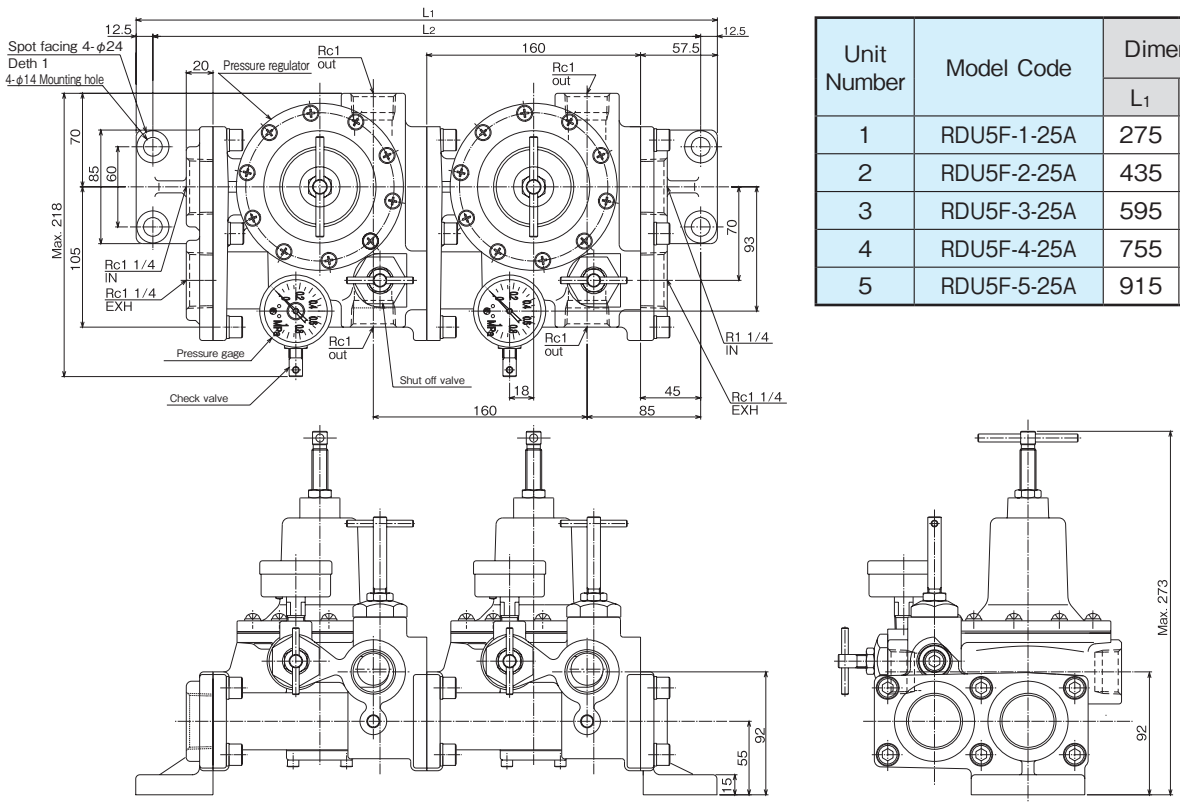
External Dimensions

RDU5- □ -20A



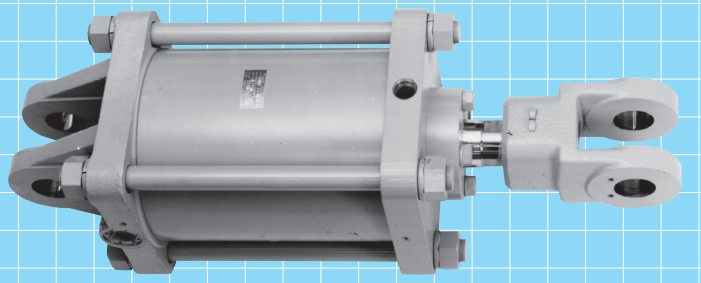
Unit Number	Model Code	Dimension		Mass
		L_1	L_2	
1	RDU5F-1-20A	224	200	about 7kg
2	RDU5F-2-20A	354	330	12
3	RDU5F-3-20A	484	460	17
4	RDU5F-4-20A	614	590	22
5	RDU5F-5-20A	744	720	27

RDU5- □ -25A



Unit Number	Model Code	Dimension		Mass
		L_1	L_2	
1	RDU5F-1-25A	275	250	about 11kg
2	RDU5F-2-25A	435	410	19
3	RDU5F-3-25A	595	570	27
4	RDU5F-4-25A	755	730	35
5	RDU5F-5-25A	915	890	43

Actuators for Press Machine



Die Cushion Cylinders

Die cushion cylinders are attached to the inside of bed to perform drawing and push up products in press work generally. As a die cushion device, pneumatic type, hydraulic type and pneumatic and hydraulic hybrid type are available, however, the pneumatic type is employed as our type.

Balancer Cylinders

Balancer cylinders support weights of the slide, crank pin connecting rod, etc. to smooth the vertical motion of the slide.
Balancer cylinders are widely used in medium-and large-sized press machines.

Specifications

Working pressure	0.5 ～ 0.7MPa
Ambient temp.	5 ～ 60℃
Piston speed	380 ～ 450㎜ /s (for balancers)
Installation position	Vertical (Piston rod shall be downward.)

● Please contact us, for details.

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