

Electro-pneumatic Proportional Valve

Series VEF/VEP

Electro-pneumatic proportional valve: Flow type (VEF)

Controls the flow rate steplessly according to current. (It is a 2/3 port valve that has an electrical throttle valve function.) A model that is suitable for operating conditions, such as the number of ports or maximum effective area, can be selected.

Electro-pneumatic proportional valve: Pressure type (VEP)

Controls the pressure steplessly according to current. Also, because the effective fully opened area of the exhaust side is identical due to its construction, this valve provides a large exhaust capacity and can be used as a relief valve. (It is a 3 port valve that has an electrical pressure reducing valve function.)



Specifications

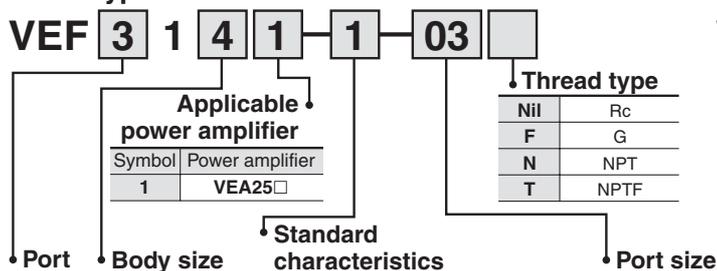
Item	Model	Flow type			Pressure type	
		VEF2121 VEF3121	VEF2121	VEF2141 VEF3141	VEP3121	VEP3141
Port size Rc		1/4, 3/8	1/4, 3/8, 1/2	3/8, 1/2, 3/4	1/4, 3/8	3/8, 1/2, 3/4
Fluid		Air (Inert gas)				
Proof pressure		1.5 MPa				
Maximum operating pressure		1.0 MPa				
Ambient and fluid temperature		0 to 50°C (With no condensation)				
Response time		0.03 s or less		0.05 s or less	0.03 s or less	0.05 s or less
Hysteresis		3% F.S.				
Repeatability		3% F.S.				
Sensitivity		0.5% F.S.				
Linearity		—			3% F.S. or less	
Lubrication		Not required (Use turbine oil Class 1, ISO VG32, if lubricated.)				
Weight (kg)		0.9	1.0	1.4	0.9	1.4

Proportional Solenoid Specifications

Proportional solenoid recognition symbol	1 (Applicable power amplifier: VEA25□)
Applicable power amplifier	VEA25□
Max. current	1 A
Coil resistance	13 Ω (20°C)
Rated power consumption	13 W (20°C, with maximum current)
Coil insulation type	Class H or equivalent (180°C)
Max. temperature	140°C (With maximum current)
Electrical entry	DIN terminal

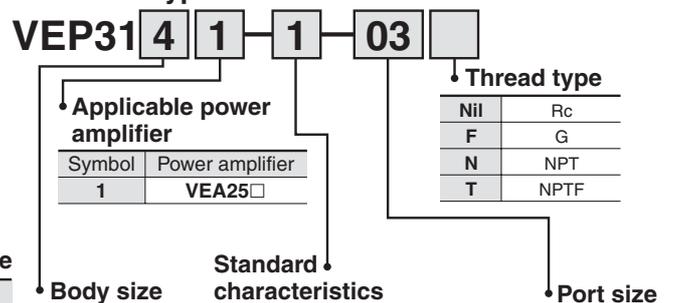
How to Order

<Flow type>

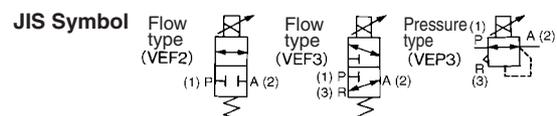


Port	Body size	Standard characteristics		Symbol	Port size
		Symbol	Max. effective area (mm ²)		
2	2	1	13	02	Without sub-plate Rc 1/4 Rc 3/8
		2	9		
		3	5		
	3	1	30	02	Rc 1/4
				03	Rc 3/8
				04	Rc 1/2
3	2	1	12	Nil	Without sub-plate Rc 1/4 Rc 3/8
		2	8		
		3	4.5		
	4	1	45	03	Rc 3/8
				04	Rc 1/2
				06	Rc 3/4

<Pressure type>

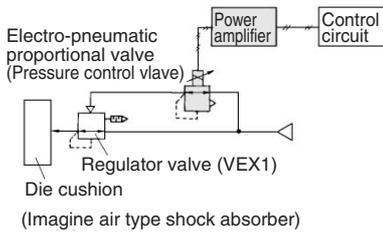


Body size	Standard characteristics		Symbol	Port size
	Symbol	Set pressure range (MPa)		
2	1	0.05 to 0.65 MPa	02	Without sub-plate Rc 1/4 Rc 3/8
	2	0.1 to 0.9 MPa		
4	1	0.005 to 0.15 MPa	03	Rc 3/8
			04	Rc 1/2
			06	Rc 3/4

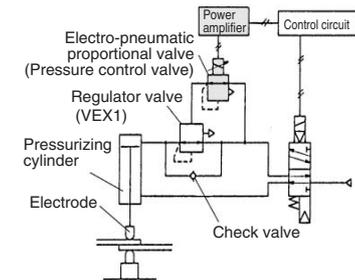


Application Example

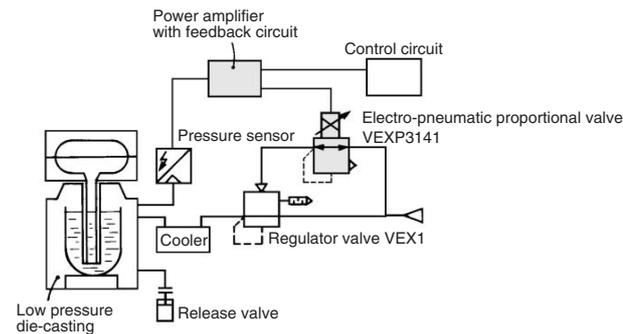
Controlling pressure for die press cushion



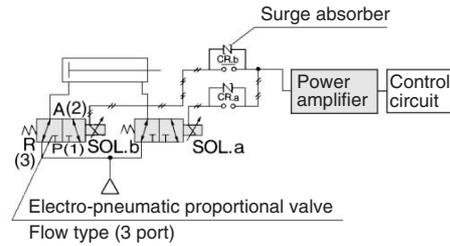
Controlling welding pressure of welding machine electrode



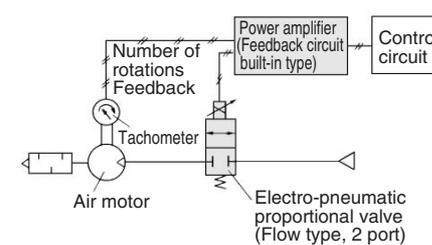
Controlling pressure of low pressure die-casting



Controlling multispeed of cylinder



Controlling rotation of air motor



How to Use DIN Terminal

⚠ Caution

Wiring procedure

1. Loosen the retaining screw and pull the connector from the pin plug.
2. Make sure to remove the retaining screw, insert the tip of a flat head screwdriver into the groove below the terminal block and pry it up to separate the terminal cover from the terminal block.
3. Securely connect the wires to the specified terminals in accordance with the wiring procedure.

Wiring



Terminal block
Connection 3 is not used for terminal 1 and 2.
* Coil has no polarity.

Pin plug shape

Applicable cable (Heavy-duty cable)

0.75 mm², 1.25 mm²/2 core, 3 core (O.D. ø6.8 to ø11.5) based on JIS C 3312 and C 3322

Outlet changing procedure

To change the wire outlet, first separate the terminal cover from the terminal block. Then, reinstall the terminal cover in the desired direction (in 90° increments).

⚠ Precautions

Be sure to read before handling.
Refer to pages 14-21-3 to 14-21-4 for Safety Instructions and Common Precautions.

⚠ Caution

1. Air supply

Poor quality air could increase the spool's sliding resistance, while preventing it from attaining its specified characteristics. Use compressor oil with a minimal generation of oxidants and install a mist separator (SMC's AM series). Refer to page 14-14-2.

2. Mounting

- Vibrations are transmitted to the valve by the proportional solenoid's dither. If it is necessary to prevent the transmission of vibrations, insert vibration isolating rubber material.
- Thoroughly flush the pipe to completely eliminate any dust or scales from the pipe inside.
- Install a silencer (AN series) on the exhaust port.
- Be careful with the molded coil because it generates heat while current is applied to it.

3. Lubrication

This product can be used without lubrication. But if lubricated, use turbin oil Class 1, ISO VG32 (with no additive). It is impossible to use spindle oil, machine oil, or grease.

4. Manual operation

To check the operation of the valve without applying a current, remove the lock nut and use a screwdriver or the like to press the tip of the core. After checking the operation, reinstall the rubber cap in its original position.

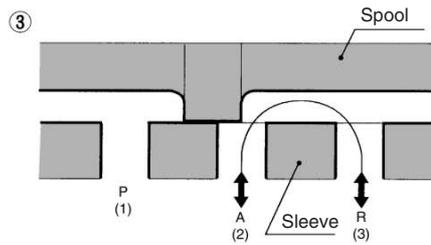
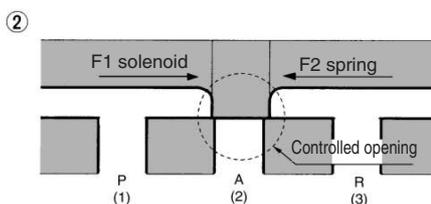
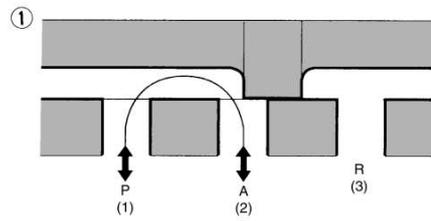
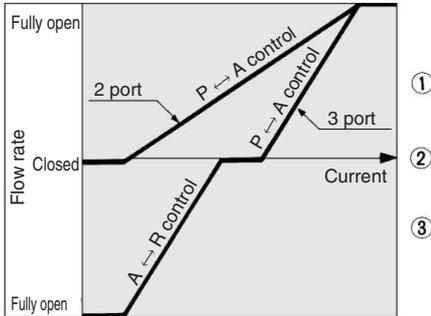
Previous Type $VE_F^P \square \square \square 0, VEA1 \square \square$

⚠ Caution

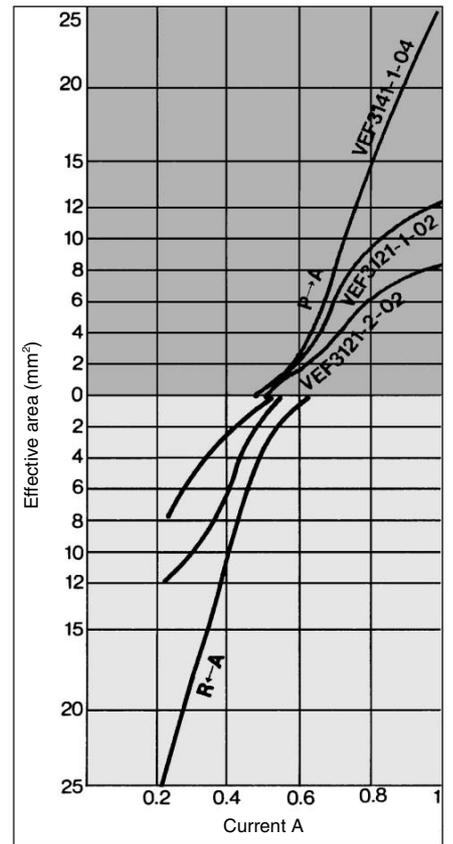
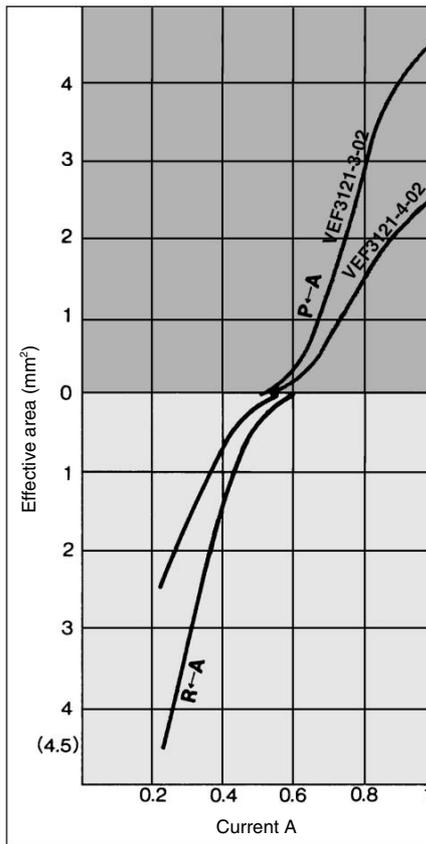
$VE_E^P \square \square \square 0$ must be used in conjunction with the power amplifier $VEA1 \square \square$.
An old $VEA1 \square \square$ cannot be used in combination with the current $VE_E^P \square \square \square 1$.

Diagram of Working Principle

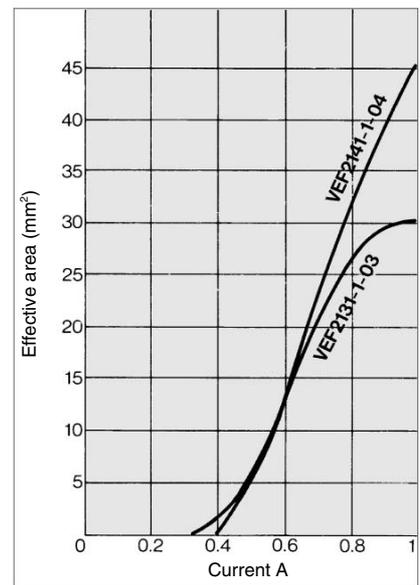
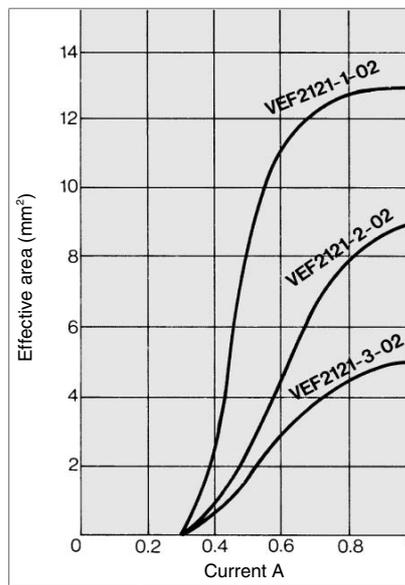
The spool controls the sleeve's opening through the balance between the proportional solenoid's pulling force (F1) and the spring's reaction force (F2). The spool moves in accordance with the amperage that is applied to the proportional solenoid, thus controlling the flow rate.



Flow Characteristics: 3 Port



Flow Characteristics: 2 Port



F.R.L.

AV

AU

AF

AR

IR

VEX

AMR

ITV

IC

VBA

VE□

VY1

G

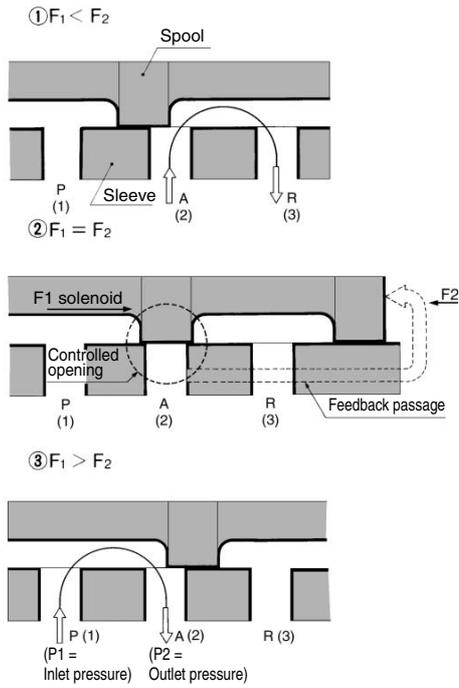
PPA

AL

Pressure Type: VEP

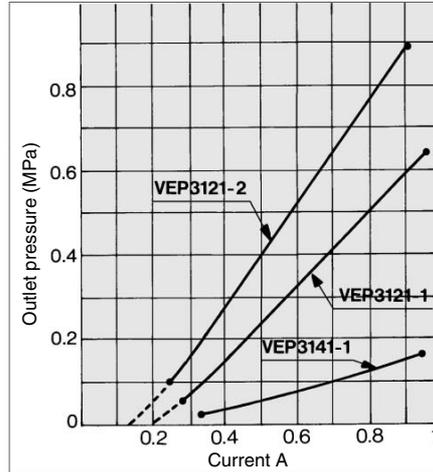
Diagram of Working Principle

The control opening becomes closed when the solenoid's pulling force (F_1) balances with the force (F_2), which is created by the outlet pressure (P_2) that passes through the feedback passage and acts on the spool surface. As a result, the outlet pressure (P_2) is established.



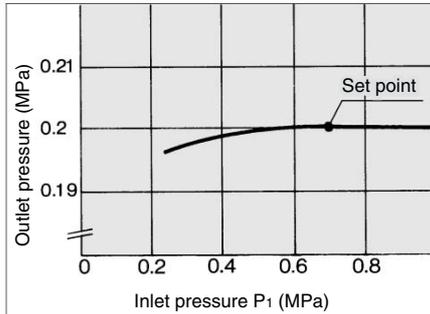
Current-Pressure Characteristics

The horizontal axis of the characteristics represents the output amperage of the power amplifier VEA25□. (If NULL and GAIN are in the shipping condition, 0 to 1 A can be viewed by substituting them with command signals 0 to 5 V.)

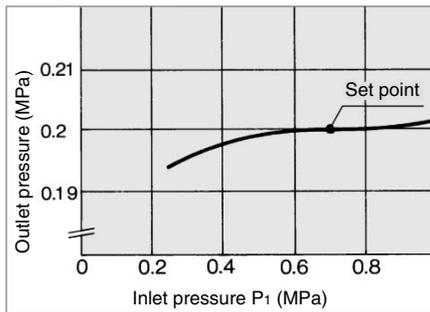


Pressure Characteristics JIS B 8372 (In accordance with air regulator)

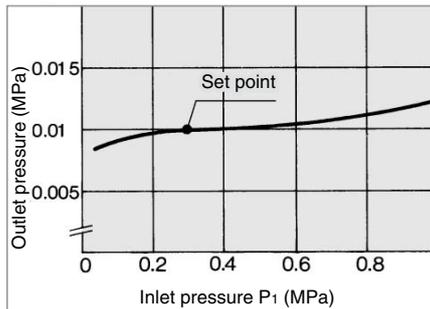
VEP3121-1



VEP3121-2



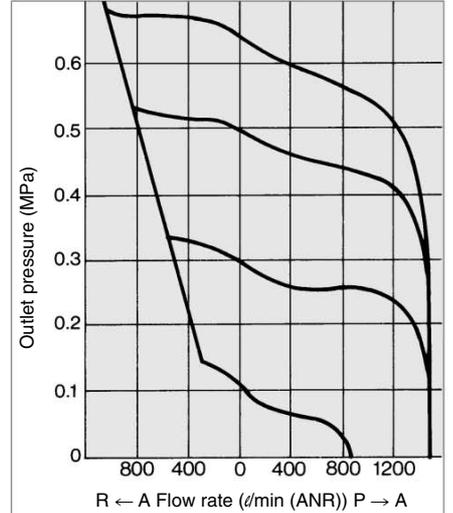
VEP3141-1



Flow Characteristics

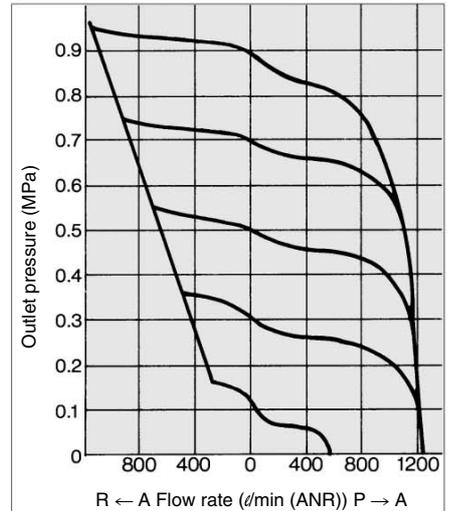
VEP3121-1-02

Inlet pressure: 1.0 MPa



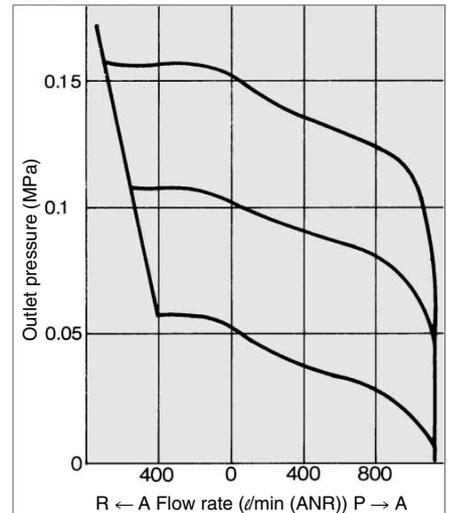
VEP3121-2-02

Inlet pressure: 1.0 MPa



VEP3141-1-04

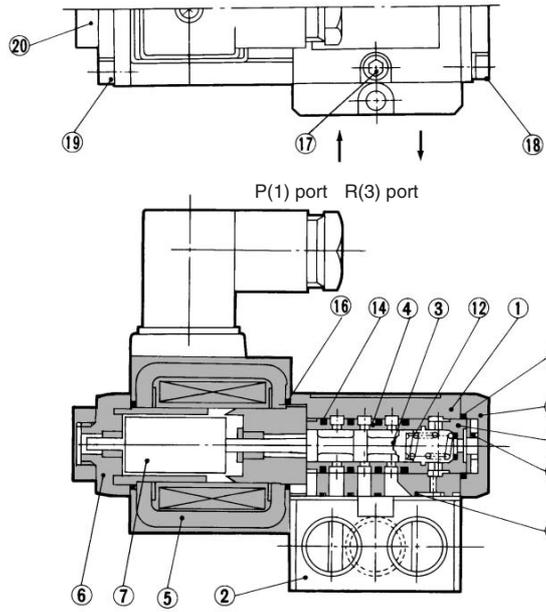
Inlet pressure: 0.3 MPa



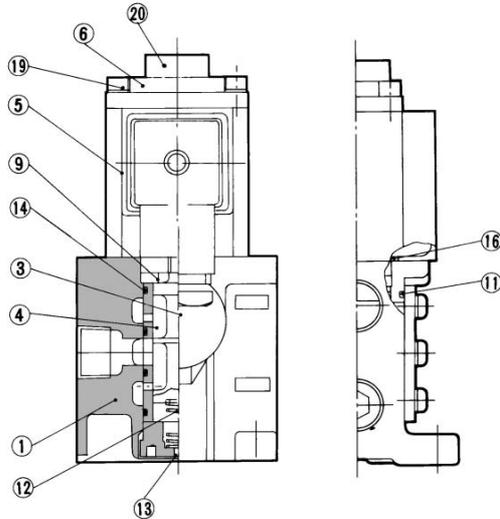
Electro-pneumatic Proportional Valve Series VEF/VEP

Construction

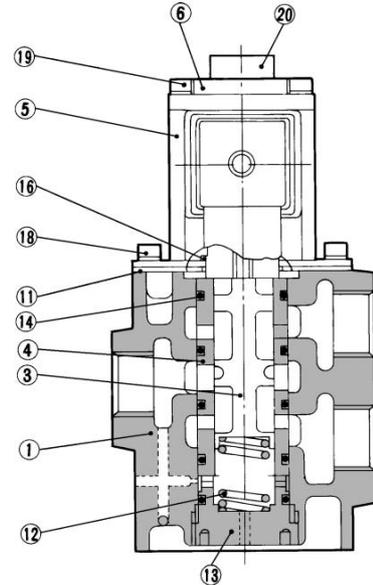
Flow type: VEF2121 (2 port)
 VEF3121 (3 port)
 Pressure type: VEP3121 (3 port)



Flow type: VEF2131 (2 port)



Flow type: VEF2141 (2 port)
 VEF3141 (3 port)
 Pressure type: VEP3141 (3 port)



Component Parts

No.	Description	Material	Note	No.	Description	Material	Note
①	Body	Aluminum alloy	Metallic painted	⑪	Gasket	NBR	—
②	Sub-plate	Aluminum alloy	Metallic painted	⑫	Spring	Stainless steel/Piano wire	—
③	Spool	Special stainless steel	—	⑬	Spring seat	Brass	—
④	Sleeve	Special stainless steel	—	⑭	O-ring	NBR	—
⑤	Mold coil	—	—	⑮	O-ring	NBR	—
⑥	Solenoid cap assembly	Aluminum alloy	Metallic painted	⑯	O-ring	NBR	—
⑦	Movable core assembly	—	—	⑰	Hex. socket head cap screw	Chromium-molybdenum	—
⑧	End cover	Aluminum alloy	—	⑱	Hex. socket head cap screw	Chromium-molybdenum	—
⑨	Bush	Resin	—	⑲	Hex. socket head cap screw	Chromium-molybdenum	—
⑩	Set bushing	Brass	—	⑳	Lock nut	NBR	—

F.R.L.

AV

AU

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VEX

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VE□

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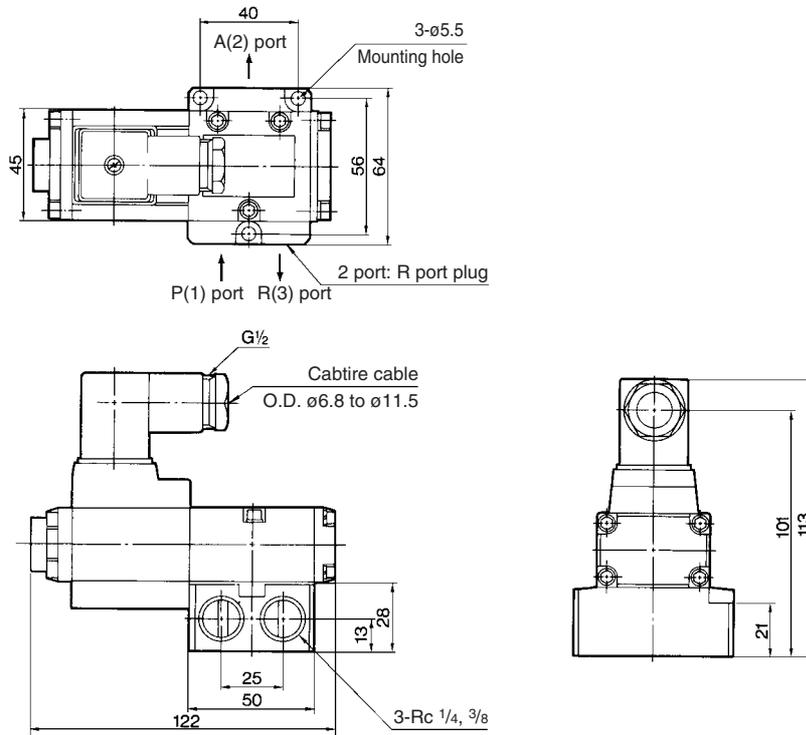
PPA

AL

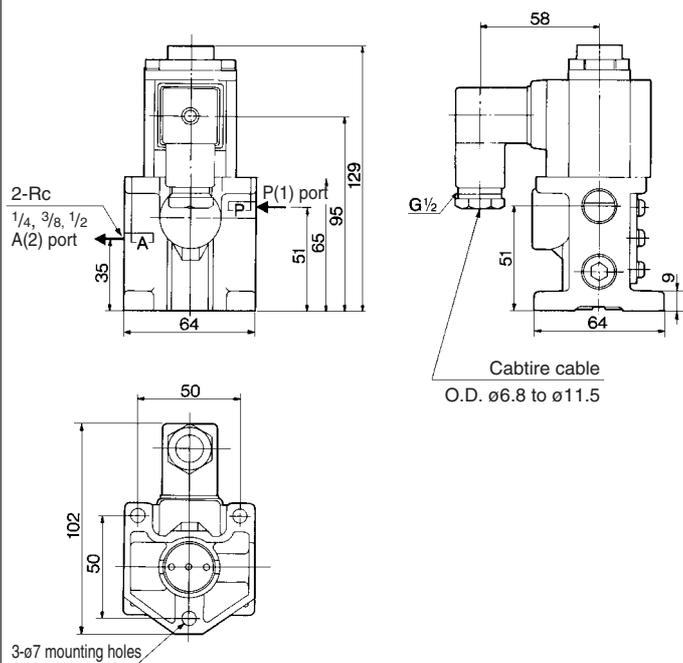
Series VEF/VEP

Flow Type: VEF, Pressure Type: VEP Dimensions

Flow type: VEF2121, VEF3121
Pressure type: VEP3121



Flow type: VEF2131



Flow type: VEF2141, VEF3141
Pressure type: VEP3141

