

Electro-Hydraulic Proportional Valve Series

.5 to 132 gpm
3000, 3600, 4000, 5000 psi

Overview

Today's hydraulic systems demand high levels of automation, power efficiency, and energy efficiency, which is why the use of electro-hydraulic proportional valves is on the rise. Built-in electronic

components deliver outstanding response and fluid pressure that allows high output, as well as superior operation, and control. The NACHI Electrohydraulic Proportional Valve

Series includes the pressure control valves, flow control valves, and direction control valves that make it easy to meet these needs.

Features

1 Pressure Control Valve Series

- EPR Series:** Small-volume direct driver type pilot relief valve
- ER Series:** Large-volume balanced piston type relief valve
- EGB Series:** Large-volume balanced piston type pressure reducing valve with relief function

The pressure control section uses a poppet structure, which is virtually impervious to the effects of dirt in the operating fluid for outstanding pressure stability.

Flow Control Valve Series

- ES Series:** This 3-directional valve provides proportional flow control in accordance with **input current**.
- ESR Series:** With a built-in load sensing function, this 3-way valve is for use in low-energy circuits.

A force feedback mechanism is used for main spool positioning, and amplification is performed by the pilot spool. The result is superior response with small hysteresis

and outstanding flow rate reproduction.

3 Direction Flow Control Valve Series

- ESD Series:** This electro-hydraulic proportional valve provides both direction control and flow control functions. Mounting methods are the same as those for standard directional valves, which allows simple structuring and maintenance.

4 Modular Type Control Valve Series

- EOG-G01:** This reduction valve with relief function can be used in ganged configurations.
- EOF-G01:** This flow control valve combines a restrictor valve with a pressure compensation valve.

This dual configuration provides easy installation along with dramatically reduced space requirements.

5 Power Amplifiers

- EMA Series:** Amplifier type
 - EMC Series:** Controller type
- A **current-feedback** amplifier system is used to virtually eliminate **output current** fluctuation. The same power supply specifications apply to all types.

6 Compact Power Amplifiers

- EBA Series:** Amplifier type
- The highly efficient PWM control system of this new series ensures high reliability in a compact configuration.

7 Compact, Multi-function Power Amplifiers

- EDA Series:** Amplifier type
 - EDC Series:** Amplifier controller type
- A choice of inputs: 6-contact or DC 2 input/4-contact compensation valve.

Series List

Name	Maximum Working Pressure psi	Rated Flow Rate gpm							
		.26	.5	2.6	13.2	26.4	52.8	79.2	105
Electro-hydraulic Proportional Valve (EPR)	5000	01 — Size							
Electro-hydraulic Proportional Relief Valve (ER)	5000			03		06			
Electro-hydraulic Proportional Relief and Reducing Valve (EGB)	3600			03		06			
Electro-hydraulic Proportional Flow Control Valve (ES)	3000	02		03		06		10	
Load Sensitive Electro-hydraulic Proportional Relief and Flow Control Valve (ESR)	3600			03		06		10	
Electro-hydraulic Proportional Flow Control Valve (ESD)	3600	01		03		04		06	
Modular Type Electro-hydraulic Proportional Reducing Valve (EOG)	3600	01							
Modular Type Electro-hydraulic Flow Control Valve (EOF)	3000	01							
Power Amplifier (EMA) (EMC)		_____							
Compact Power Amplifier (EBA)		_____							
Compact, Multi-function Power Amplifier (EDA) (EDC)		_____							



Electro-Hydraulic Proportional Flow and Directional Control Valve

2.6 to 132 gpm
3625 psi

Features

This valve uses a DC solenoid in a traditional 4-way solenoid valve to create a solenoid valve capable of both direction switching and high-speed control. The lineup consists of the direct system O1 size and the pilot system O3, O4, and O6 sizes.

Direction control is performed by supplying **input current** to one of the two proportional solenoid valves, and the size of the flow rate is controlled in accordance with the size of the **input current**. This type of valve can be used for remote control and shockless acceleration and deceleration control, and for simple configuration of hydraulic circuits.

Specifications

Model No.	ESD-G01-10 20 -12	ESD-G03-40 -12	ESD-G04-140 -12	ESD-G06-250 -13
Maximum Operating Pressure psi	3625			
Rated Flow Rate l/min (gpm)	10/20 (2.6/5.2) (Note 1)	40/80 (10.5/21) (Note 1)	139 (36.9) (Note 1)	125/250 (66) (Note 1)
Maximum Flow Rate gpm	6.6 (Note 2)	26.4 (Note 2)	36.9 (Note 2)	66 (Note 2)
Pilot Pressure psi	-	At least 145 (Note 3)		
Pilot Flow Rate gpm	-	At least .5 (Note 4)	At least .79 (Note 4)	At least 1.3 (Note 4)
T Port Allowable Back Pressure psi	2.5 (25.5)	Internal Drain: 362 External Drain: 3045		
Rated Current mA	850			
Coil Resistance Ω	20 (68° F)			
Hysteresis %	5 max. (Note 5)			
Response Time s	0.04 (Note 6)	0.05 (Note 6)	0.08 (Note 6)	0.1 (Note 6)
Weight lbs	4.8	15.4	20.2	33

Note: 1. Value when pressure drop volume to P → A and P → B is ΔP = 145 psi
2. Indicates maximum throughput volume value between each port.
3. Indicates differential between the pilot port and tank port, or drain port.
4. Value when 0.1 second is assumed for the response time from zero to the rated flow volume.
5. Value when a Nachi-Fujikoshi special amplifier is used.
6. Response time is typical value for a supply pressure of 2030 psi and fluid temperature of 104° F (kinematic viscosity: 40 centistokes)

Understanding Model Numbers

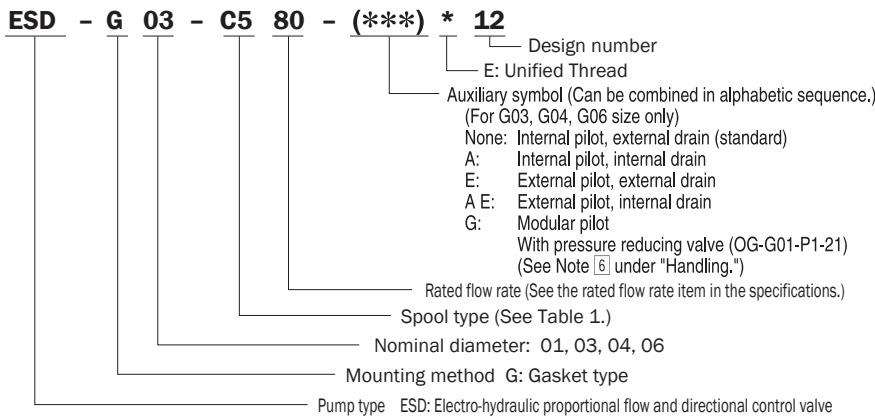


Table 1

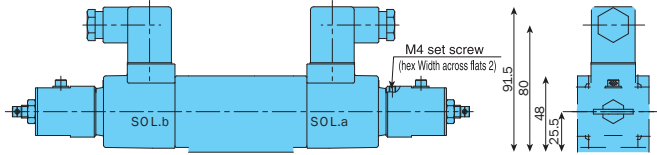
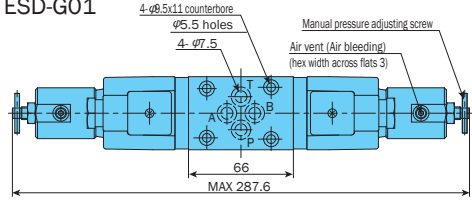
Spool Type	Hydraulic Circuit		
	ESD-G01	ESD-G03, G04	ESD-G06
C5			
C6S			

- Handling
- 1 Air Bleeding
In order to ensure stable control, loosen the air vent and bleed air from the valve before starting operation. For details, see the user's guide.
- 2 T Port Piping
When configuring piping, ensure that the T port (pilot valve T port for the G03, G04, and G06 sizes) is filled with operating fluid.
- 3 Manual Adjusting Screw
For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, the valve can be operated and valve pressure can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, the manual adjusting screw should be rotated back fully to the left (counterclockwise).
- 4 Valve Mounting Orientation
Install the valve so the spool axis line is horizontal.
- 5 Combining with a Pressure Compensation Valve
Use of the optional pressure compensation kit is recommended when higher precision flow rate control is required or in high-pressure applications. For details, see page G-20.
- 6 If pilot pressure (ESD-G03, G04, G06) exceeds 1300 psi use a modular type P port reduction valve (OG-G01-P1-21) at a setting of 290 psi.
- 7 On a system that requires large brake pressure during deceleration or a system that uses a vertical cylinder, equip a counter balance valve.
Use a single rod, if the rod exit is not slowed sufficiently, use a counter balance valve on the rod.
- 8 Maintain hydraulic operating fluid contamination so it is at least Class 9. Use of a G01 modular filter (Absolute: 8μm) is also helpful.

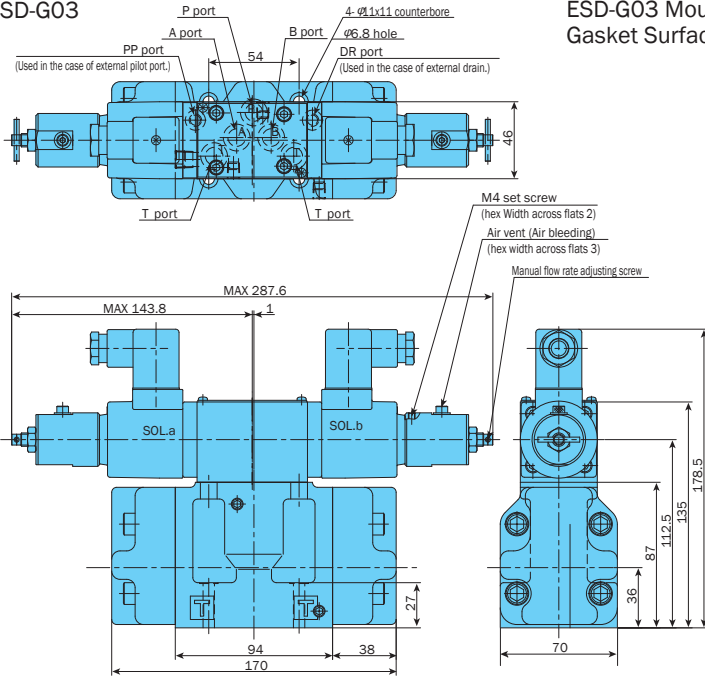
(Continued on next page)

Installation Dimension Drawings

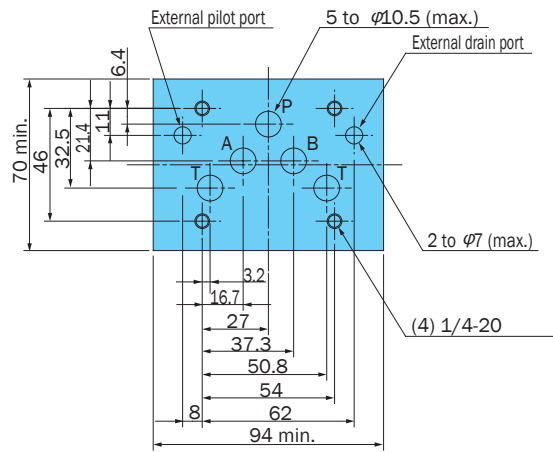
ESD-G01



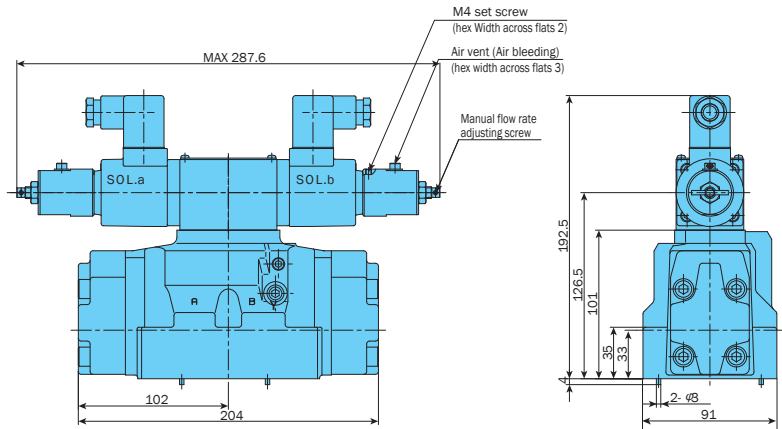
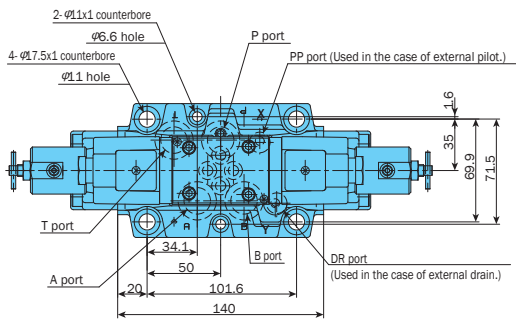
ESD-G03



ESD-G03 Mounting Gasket Surface Dimensions
Gasket Surface Mounting Dimensions (ISO4401-05-0-94)



ESD-G04



Bundled Accessories (Valve Mounting Bolts)

Model No.	Bolt Size	Q'ty	Tightening Torque ft lbs
ESD-G01	10-24 x 1 3/4	4	3.6 to 5 ft lbs
ESD-G03	1/4-20 x 1 3/8	4	7 to 9.5 ft lbs
ESD-G04	1/4-20 x 1 3/4	2	7 to 9.5 ft lbs
	3/8-16 x 2	4	33 to 40 ft lbs
ESD-G06	1/2-13 x 2 3/8	6	44 to 51 ft lbs

For information about sub plates, see MSA-01Y-E10 on page G-3.

Gasket Surface Dimensions (ISO 4401-03-02-0-94)

Use an operating fluid that conforms to both of the following.

Oil temperature: -4 to 158° F Viscosity: 12 to 400 centistokes. The recommended viscosity range is 15 to 60 centistokes.

- Auxiliary symbol G: Equipping a modular type pilot reduction valve increases the height by 1.57".
- The gasket surface dimensions comply with the ISO standards shown below.

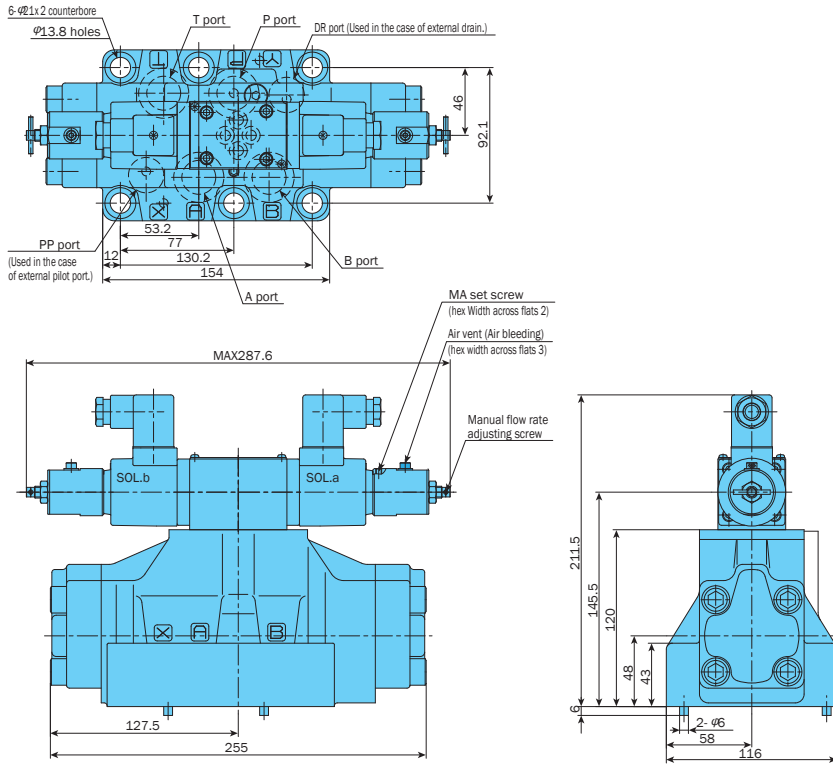
ESD-G04 - ISO 4401-07-06-0-94

ESD-G06 - ISO 4401-08-07-0-94

ESD-G10 - ISO 4401-10-08-0-94

Note: The coil cover has an M4 set screw. To change the air vent orientation, loosen the M4 screw and then rotate the cover. After bleeding air, tighten the cover and then secure it with the M4 screw.

ESD-G06



Performance Curves

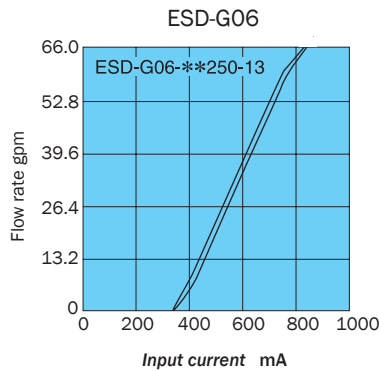
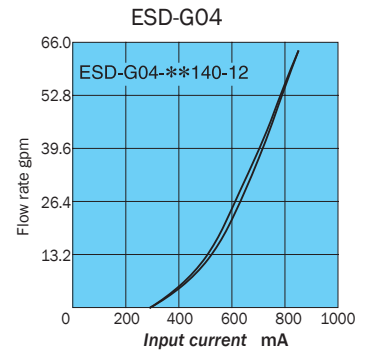
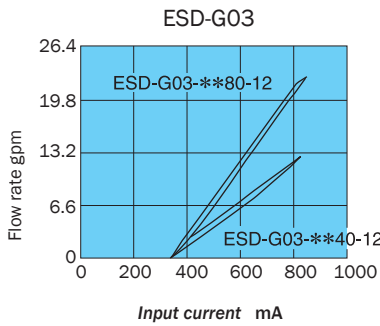
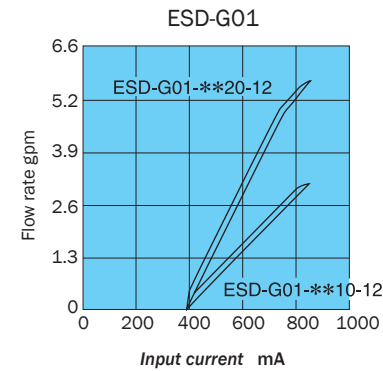
Hydraulic Operating Fluid Viscosity 32 centistokes

Input Current - Flow Rate Characteristics are characteristic when the P → A or P → B pressure drop is $\Delta P = 145$ psi.

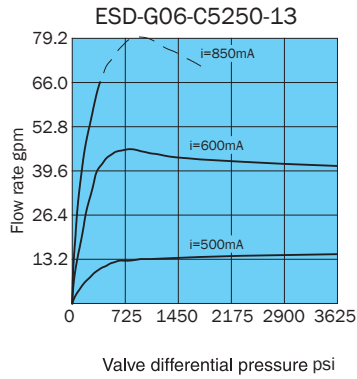
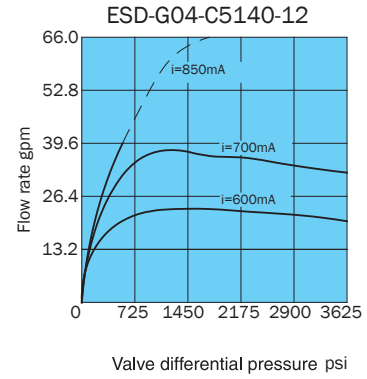
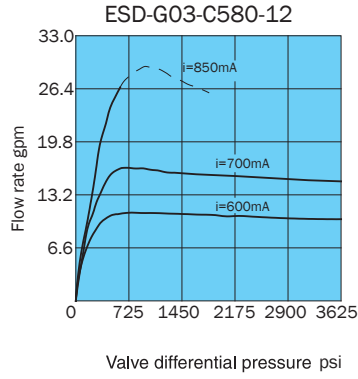
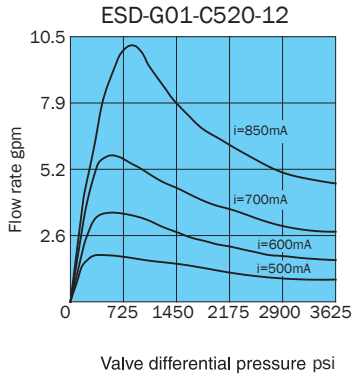
For Pressure - Flow Rate Characteristics, the horizontal shaft valve differential pressure indicates the pressure drop volume of the entire control valve

(between P, A, B, T), and flow rate is measured at the oil motor.

Input Current - Flow Rate Characteristics

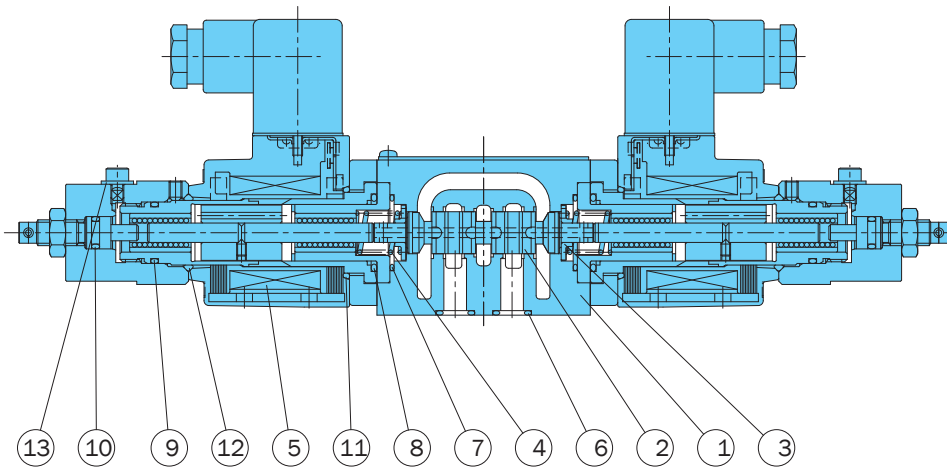


Pressure - Flow Rate Characteristics



Cross-sectional Drawing

ESD-G01-***-12



Part No.	Part Name
1	Body
2	Spool
3	Retainer
4	Spring
5	Coil
6	O-ring
7	O-ring
8	O-ring
9	O-ring
10	O-ring
11	O-ring
12	O-ring
13	Seal

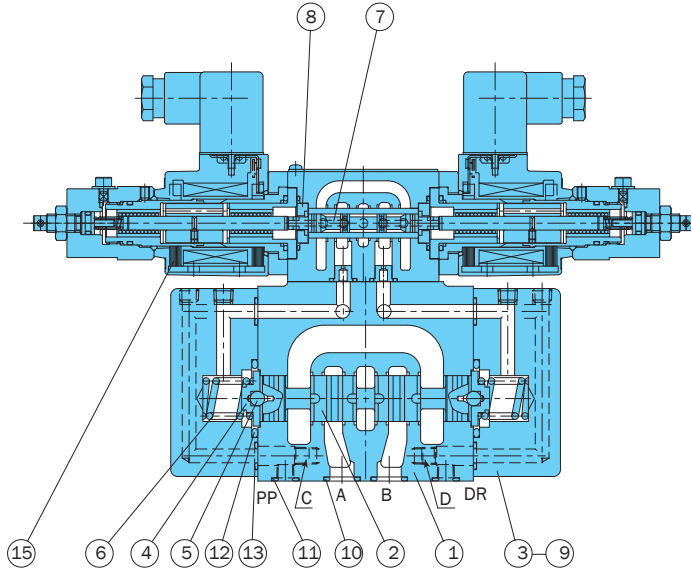
Note: Coil model number JD64-D2

Seal Part List (Kit Model Number JDS-G01-1A)

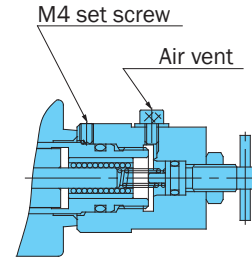
Part No.	Part Name	Part Number	Q'ty
6	O-ring	AS 568-012(Hs90)	4
7	O-ring	AS 568-019(Hs90)	2
8	O-ring	1B-P22	2
9	O-ring	AS 568-016(Hs90)	2
10	O-ring	1B-P7	2
11	O-ring	S-25	1
12	O-ring	1A-P20	1
13	Seal	CW1000F0	2

Note: O-ring 1A/B-** refers to JIS B2401-1A/B-**.

ESD-G03-***-(**)-12



Manual adjustment section
(ESD-G03, G04, G06, G10)

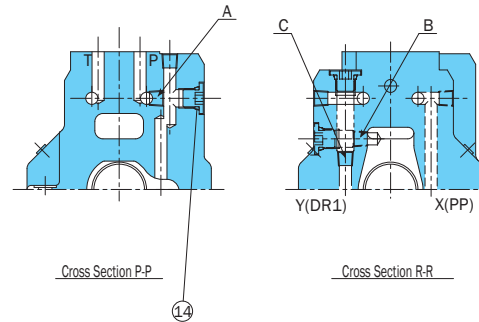
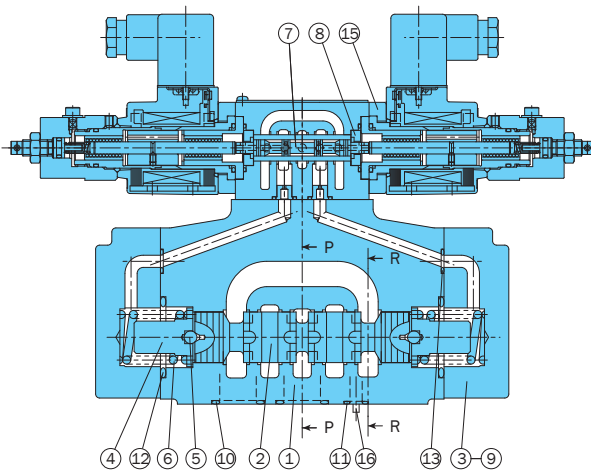


Note: The coil cover has an M4 set screw.
When changing the orientation of the air vent, loosen the M4 screw and rotate the cover. Retighten after bleeding the air.

Methods for Changing the Pilot/Drain System

After Change		Hexagon Socket Head Plug
Pilot	Internal	Change to PP port from C.
	External	Change from PP port to C.
Drain	Internal	Change from D to DR port.
	External	Change from DR port to D.

ESD-G04-***-(**)-12



Methods for Changing the Pilot/Drain System

After Change		Hexagon Socket Head Plug
Pilot	Internal	Remove from A
	External	Insert from A
Drain	Internal	Change from B to C
	External	Change from C to B

Note: A single hex head plug (NPTF 1/16) is required when changing to external pilot.
Hex Head Plug: TPUA-1/16

Part No.	Part Name
1	Body
2	Spool
3	Cover
4	Retainer
5	Ball
6	Spring
7	Pilot spool
8	Stopper
9	Screw
10	O-ring
11	O-ring
12	O-ring
13	O-ring
14	O-ring
15	Proportional solenoid

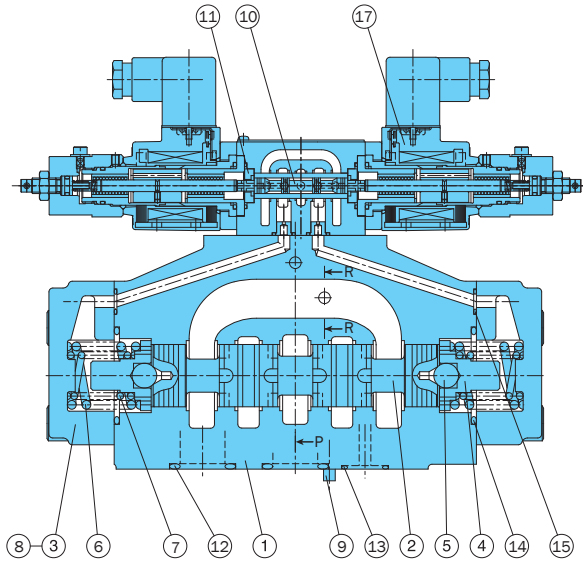
Note: Coil model number JD64-D2

Seal Part List (Kit Model Number JHS-***)

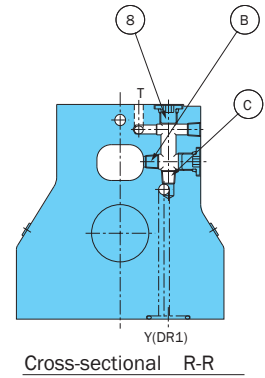
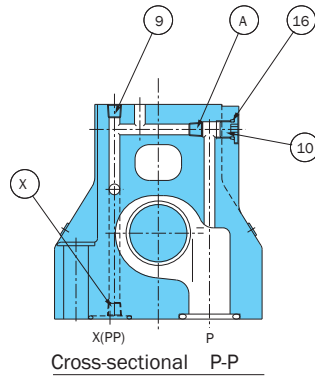
Part No.	Part Name	ESD-G03		ESD-G04	
		Part Number	Q'ty	Part Number	Q'ty
10	O-ring	1B-P12	5	1B-P22	4
11	O-ring	1B-P9	2	1B-P10A	2
12	O-ring	1B-P28	2	1B-P34	2
13	O-ring	1B-P9	6	1B-P9	2
14	O-ring	---	-	1B-P8	3
Kit Model No.		JHSG03		JHSG04	

Note: O-ring 1B-*** refers to JIS B 2401-1B-***.

ESD-G06-***-(***)-13



Pilot, Drain System Change



Changing the Pilot and Drain Connections

After Change		Hexagon Socket Head Plug
Pilot	Internal	Switch from A to x .
	External	Switch from x to A .
Drain	Internal	Switch from B to C .
	External	Switch from C to B .

Seal Part List (Kit Model Number JHS-G06)

Part No.	Part Name	Part Number	Q'ty
12	O-ring	1B-P28	4
13	O-ring	1B-P20	2
14	O-ring	1B-G45	2
15	O-ring	1B-P10	2
16	O-ring	1B-P8	3

Note: O-ring 1B-** refers to JIS B 2401-1B-**.

Part No.	Part Name
1	Body
2	Spool
3	Cover
4	Retainer
5	Ball
6	Spring
7	Spring
8	Screw
9	Pin
10	Pilot spool
11	Stopper
12	O-ring
13	O-ring
14	O-ring
15	O-ring
16	O-ring
17	Proportional solenoid

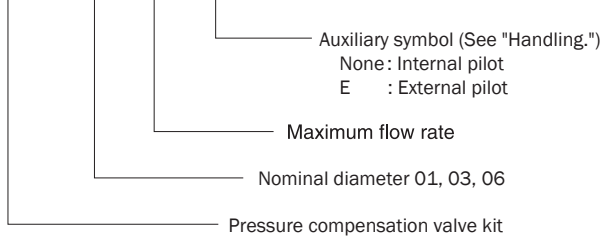
Pressure Compensation Valve Kit

Specifications

Item	Model No.	JHF-01027	JHF-03040(E)	JHF-03080(E)	JHF-06170(E)
Maximum Operating Pressure psi		3045	3625	3625	3045
Pressure Compensation Differential Pressure psi		145	87	203	116
Maximum Flow Rate ℓ/min (gpm)		27 (7.1)	40 (10.5)	80 (21.1)	170 (44.9)
Weight lbs		3.3	10.3	11.0	26.4

Understanding Model Numbers

JHF - 03 040 (E)



• Handling

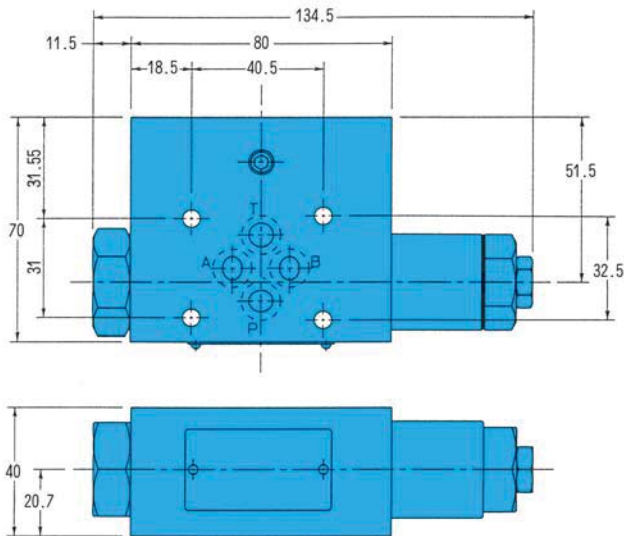
When using the pressure compensation kit, use an external pilot type for the ESD valve (G03, O6).

An internal pilot type pressure compensation valve kit is used when the pilot flow rate is supplied from the P port, without an external pilot port (Pp port) on the manifold. An

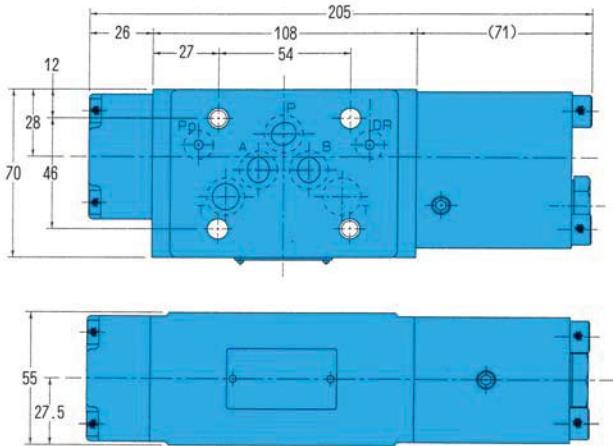
external pilot type pressure compensation valve kit is used when there is an external pilot port (Pp port) on the manifold.

Installation Dimension Drawings

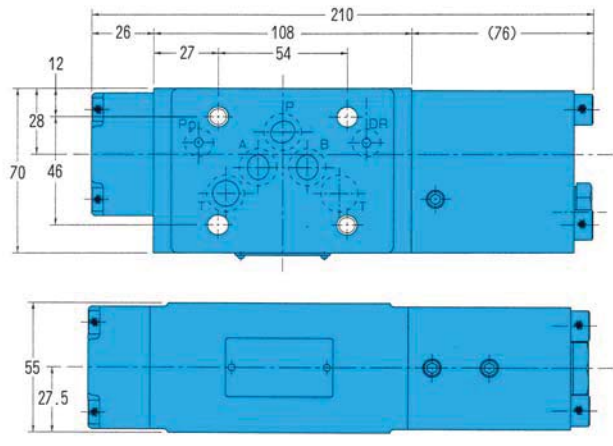
Pressure compensation valve kit
JHF-01027



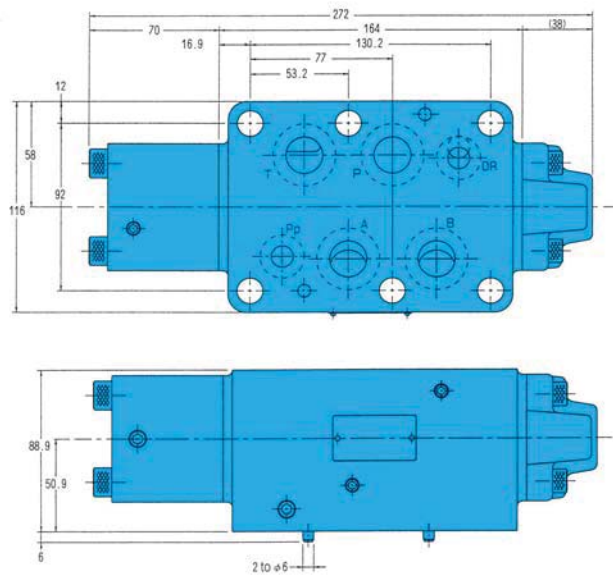
JHF-03040(E)



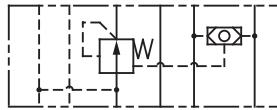
JHF-03080(E)



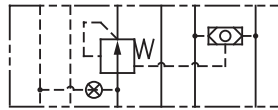
JHF-06170(E)



Note: Mounting bolts are not included with the pressure compensation kit. Use the valve mounting bolt lists on pages F-87 through F-89 to select mounting bolts.



Internal pilot



External pilot