

Proportional valves

Proportional solenoid valves for pressure and flow control



Powering Business Worldwide

Proportional valves

Section overview

This section gives basic specifications for the complete line of Vicker's screw-in proportional control valves. Its purpose is to provide a quick, convenient reference tool when choosing proportional valves or when designing a system using these components.

The **EPV10** has several outstanding performance features which give it a unique position in the screw-in cartridge valve market. flow gain linearity, flow force pressure compensation characteristics above 20 bar (300 psi) and low internal leakage.

The **EPV16** is a proportionally controlled two-way poppet type valve. The main poppet amplifies a small flow through the pilot circuit and is comparable to a transistor. As the transistor uses small currents to control larger currents, the hydraulic valve transistor or VALVISTOR uses the pilot flow to control the main stage flow with servo-like response flow to control.

The **ESV1** is a proportional two-way, pressure compensated, poppet type flow control valve. The valve is available in 8, 10, and 12 sizes, both normally open or normally closed in the de-energized position.

The **EFV1** is a proportionally controlled two-way, spool type flow control valve. Technically the valve is not pressure compensated, but it is partial flow force pressure compensated.

The **EFV2** is a three port, pressure compensated, proportional flow control valve. The valve can be used as a priority flow regulator, with regulated flow being supplied to port 3 and excess flow being by-passed to port 2. If port 2 is blocked the valve functions as a restrictive, 2 way, pressure compensated flow regulator.

The **ERV1-10** is an electric, proportionally controlled, internally pilot operated, spool type screw-in relief valve. It is capable of handling flows from 3,8-60,0 L/min (1-15 USgpm) at pressures from 35-210 bar (500-3000 psi). Also available is an **ERV1-16** which is capable of handling flows from 7,6-132 L/min. (2-35 USgpm) at pressures from 35-210 bar (100-500 psi).

The **EPRV2-8** is an electric, proportionally controlled, direct acting spool type, screw-in pressure reducing/relieving valve. It is capable of handling flows from 0-7,6 L/min (0-2 USgpm) at set pressures from 0-22 bar (0-320 psi).

The **EPRV1-10** is an electric, proportionally controlled, internally pilot operated, spool type, screw-in pressure reducing/relieving valve. It is capable of handling flows from 0-7,6 L/min (0-2 USgpm) at set pressures from 14-35 bar (200-500 psi). Also available is an **ERV1-16** which is capable of handling flows from 0-38 L/min (0-10 USgpm) at set pressures from 14-35 bar (200-500 psi).

The **EPRV3-10** is an electric, proportionally controlled, internally pilot operated, spool type, screw-in pressure reducing/relieving valve. It is capable of handling flows from 0-30 L/min (0-8 USgpm) at set pressures from 35-207 bar (500-3000 psi).

Eaton proportional pressure and flow control valves are designed to be easily controlled by the simplest of DC electrical devices such as a 12 volt battery and a potentiometer.

Varying the voltage at the coil is one of the simplest means of control available. Any of the Eaton DC coils will work on most of these valves simply by varying the voltage between 0 and 75% of the rated coil voltage. It should be noted that as the operating temperature of a coil increases, the solenoid force decreases. Therefore if the voltage is held constant as the coil heats up then valve pressure (or flow) will change.

The **IRV1** is a proportionally controlled poppet type, relief valve, with an inverse function. This valve is capable of handling flows up to 1 L/min (0.25 USgpm) and pressures up to 210 bar (3000 psi).

IRV2-10 is an inverse proportionally controlled spool type two stage relief valve. Ideal for use to control fan drive or brush pressure, where full speed or force is required under electrical failure. Valve is capable to handle flow up to 57 lpm (15 USgpm) and pressure up to 240 bar (3500 psi).

The **ESV9** is four-way, three-position proportional valve utilizes two springs to control metering of the spool. With 7% hysteresis, **ESV9** is best-in-class for precise proportional control in a variety of applications.

The **ESVL9** valve features integrated load sense check valve. By integrating the external check valve in the main cartridge, **ESVL9** valve a 21% manifold size reduction compared to the external check valves available on five-ported directional control valves today.

Electrical current controls with PWM are recommended for all Eaton proportional valves.

Closed-loop electrical control with feedback from the parameter to be monitored will provide the most accurate control.

Warning

Application of these products beyond published performance specifications may cause valve malfunction which may result in personal injury and/or damage to the machine.

Warning

For pressures over 210 bar (3000 psi) use steel housing.

EPV	ESV1	EFV	IRV	ERV	EPPV
EPV10	ESV1-8-C / 0	EFV1-10-C / 0	IRV1-10	ERV1-10	EPPV5
EPV16	ESV1-10-C / 0	EFV1-12-C / 0	IRV2-10	ERV1-16	EPPV6
	ESV1-12-C / 0	EFV2-12-C / 0			

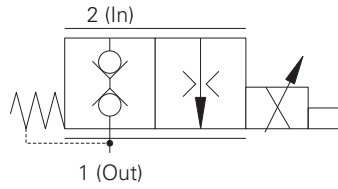
EPRV	ESV	ESVL	PFR	PDR	PPD
EPRV1-10	ESV9-8	ESVL9-10	PFR21H	PDR21A	PPD22A
EPRV3-10	ESV9-10		PFR24A		
EPRV1-16					
EPRV2-8					

Proportional valves

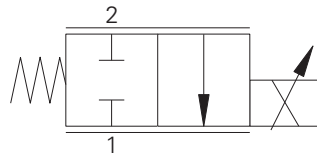
Valve locator/section contents

Note: Proportional valve solenoid coils and electronic valve drivers are covered in section C of this Catalog.

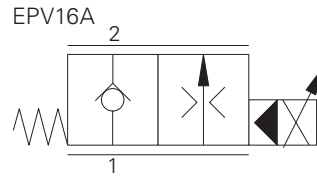
Functional symbol



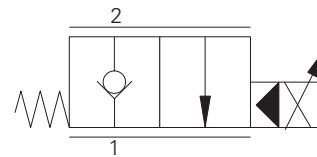
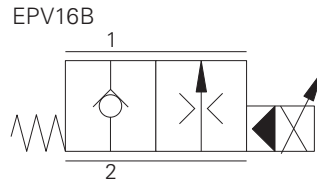
Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional bi-directional, NC, poppet</i>				
PFR21H	A879	18 (5)	210 (3000)	B-7



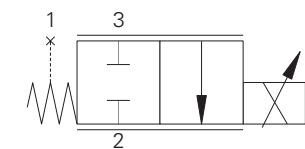
Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional bi-directional, NC, poppet uni-directional</i>				
EPV10	C-10-2	0-30 (0-8)	350 (5000)	B-9



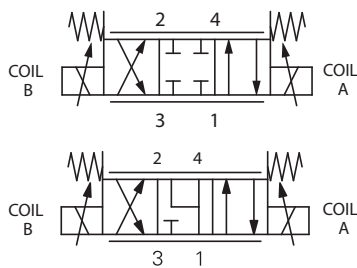
Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional flow control, NC, poppet</i>				
EPV16A	C-16-3SU (undercut)	0-160	280 (4000)	B-12
EPV16B	C-16-3SU (undercut)	0-160	280 (4000)	B-12



Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional flow control, NC, poppet</i>				
ESV1-8-C/O	C-8-2	31 (9)	210 (3000)	B-17
ESV1-10-C/O	C-10-2	70 (19)	210 (3000)	B-20
ESV1-12-C/O	C-12-2	104 (27)	210 (3000)	B-23



Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional flow control, NC, spool</i>				
EFV1-10-C/O	C-10-3	38 (10)	210 (3000)	B-25
EFV1-12-C/O	C-12-3	77 (20)	210 (3000)	B-28



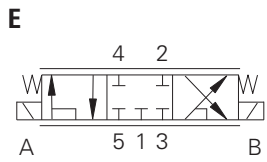
Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional flow control, NO, spool</i>				
ESV9-8-E	C-8-4	11.0 (2.9)	210 (3,000)	B-31
ESV9-8-F	C-8-4	11.0 (2.9)	210 (3,000)	B-31
ESV9-10	C-10-5S	22.0 (5.8)	250 (3,600)	B-34

Proportional valves

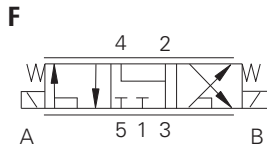
Valve locator/section contents

Functional symbol

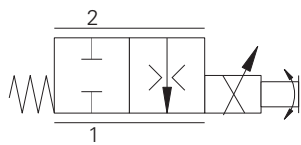
B



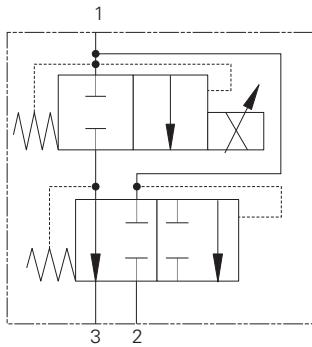
Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional flow Control, NC, spool</i>				
ESVL9-10-E	C-10-5S	23 (2.9)	250 (3600)	B-37
ESVL9-10-F	C-10-5S	23 (2.9)	250 (3600)	B-37



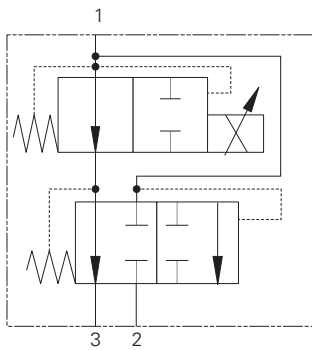
Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional bi-directional, NC, poppet</i>				
PFR24A	A6701	18 (5)	210 (3000)	B-40



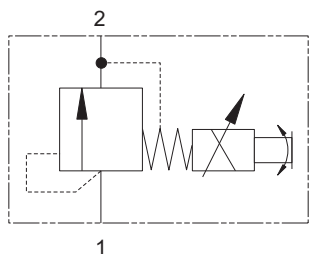
Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional flow control, NC, spool</i>				
EFV2-12-C	C-12-3	<114 (30)	210 (3000)	B-42



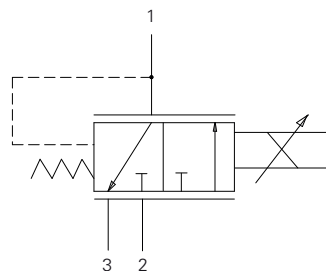
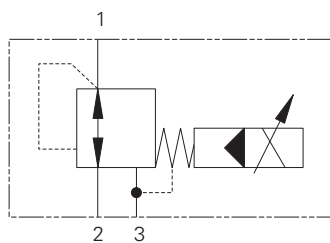
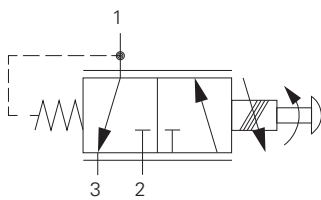
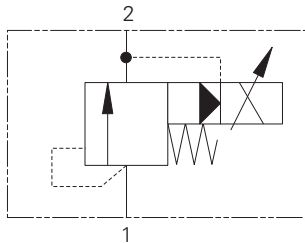
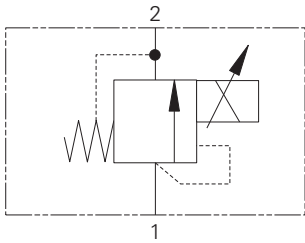
Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional flow control, NO, spool</i>				
EFV2-12-O	C-12-3	<114 (<30)	210 (3000)	B-42



Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional relief, NO, POPPET</i>				
PDR21A	A879	1.5 (.3)	350 (5000)	B-46



Functional symbol



Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional inverse relief, poppet</i>				
IRV1-10	C-10-2	1 (.25)	210 (3000)	B-48
IRV2-10	C-10-2	57 (15)	240 (3500)	B-50

Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional relief, spool</i>				
ERV1-10	C-10-2	<60 (15)	210 (3000)	B-52
ERV1-16	C-16-2	<132 (<39)	210 (3000)	B-54

Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional reducing/relief, spool</i>				
PPD22A	A879	20 (5)	210 (3000)	B-56
EPRV2-8	C-8-3	7.6 (2)	35 (500)	B-58

Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional reducing/relief, spool</i>				
EPRV1-10	C-10-3	8 (2)	35 (500)	B-66
EPRV3-10	C-10-3	30 (8)	210 (3000)	B-68
EPRV1-16	C-16-3	7.6 (2)	35 (500)	B-70

Model	Cavity	Flow rating	Typical pressure	Page
		L/min (USgpm)	bar (psi)	
<i>Proportional reducing/relief, spool</i>				
EPPV5	TC06025	8 (2.1)	50 (725)	B-60
EPPV6	TC06023	8 (2.1)	50 (725)	B-63

Application Data

Installation Information

Read this page before using any of the products/information in this catalog.

Warning

When using the “Screw Type” override, care must be taken to return the override back to its neutral position before activating the valve. Failure to take this precaution may result in personal injury or damage to the machine.

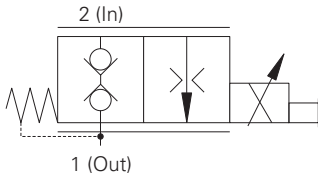
Warning

Aluminum housings can be used for pressures up to 210 bar (3000 psi). Steel housings must be used for operating pressures above 210 bar (3000 psi).

Model	Torque For Cartridge in Body		Torque on valve tube nut (Max.)
	Aluminum Housing	Steel Housing	
PFR21H	30 Nm (22 ft. lbs)	-	3.4 Nm (2.5 ft lbs)
EPV10	47-54 Nm (35-40 ft. lbs)	68-75 Nm (50-55 ft. lbs)	2.5-3.0 Nm (22-27 ft lbs)
EPV16	108-122 Nm (80-90 ft. lbs)	136-149 Nm (100-110 ft. lbs)	2.5-3.0 Nm (22-27 ft lbs)
ESV1-8-C / O	34-41 Nm (25-30 ft. lbs)	-	9-13 Nm (7-10 ft lbs)
ESV1-10-C / O	47-54 Nm (35-40 ft. lbs)	-	9-13 Nm (7-10 ft lbs)
ESV1-12-C / O	81-95 Nm (60-70 ft. lbs)	-	9-13 Nm (7-10 ft lbs)
EFV1-10-C / O	47-54 Nm (35-40 ft lbs)	68-75 Nm (50-55 ft. lbs)	4.5-5.5 Nm (40-49 in-lbf)
EFV1-12-C / O	81-95 Nm (60-70 ft. lbs)	68-75 Nm (50-55 ft. lbs)	4.5-5.5 Nm (40-49 in-lbf)
ESV9-8	34-41 Nm (25-30 ft. lbs)	34-41 Nm (25-30 ft. lbs)	5-8 Nm (4-6 ft lbs)
ESV9-10	47-54 Nm (35-40 ft lbs)	68 - 75 Nm (50 - 55 ft. lbs.)	5-8 Nm (4-6 ft lbs)
ESVL9-10	47-54 Nm (35-40 ft lbs)	68 - 75 Nm (50 - 55 ft. lbs.)	5-8 Nm (4-6 ft lbs)
PFR24A	30 Nm (22 lbs ft)	-	3.4 Nm (2.5 ft lbs)
EFV2-12-C / O	81-95 Nm (60-70 ft. lbs)	102-115 Nm (75-85 ft. lbs)	4.5-5.5 Nm (40-49 in-lbf)
PDR21A	40 Nm (29.5 lbs ft)	-	3.4 Nm (2.5 ft lbs)
IRV1-10	47-54 Nm (35-40 ft lbs)	-	5-8 Nm(4-6 ft lbs)
IRV2-10	47-54 Nm (35-40 ft lbs)	-	5-8 Nm(4-6 ft lbs)
ERV1-10	47-54 Nm (35-40 ft lbs).	-	5-8 Nm(4-6 ft lbs)
ERV1-16	108-122 Nm (80-90 ft lbs)	-	5-8 Nm(4-6 ft lbs)
PPD22A	30 Nm (22 lbs ft)	-	3.4 Nm (2.5 ft lbs)
EPRV2-8	34-41 Nm (25-30 ft lbs)	-	5-8 Nm(4-6 ft lbs)
EPPV5	3Nm (2.21 ft lbs)		-
EPPV6			-
EPRV1-10	47-54 Nm (35-40 ft. lbs)	-	5-8 Nm(4-6 ft lbs)
EPRV3-10	47-54 Nm (35-40 ft. lbs)	-	5-8 Nm(4-6 ft lbs)
EPRV1-16	108-122 Nm (80-90 ft lbs)	-	5-8 Nm(4-6 ft lbs)

PFR21H - Proportional valve

Proportional bi-directional poppet, flow control valve
Up to 18L/min (5 USgpm) • 210 bar (3000 psi)



Operation

In the de-energised position the valve is blocked in both directions. As the current to the coil is increased the valve opens proportionally. There is also an element of compensation as the pressure difference across the valve increases. See performance graphs.

Performance data

Ratings and specifications

Performance data is typical with fluid at 32 cSt (150 SSU)

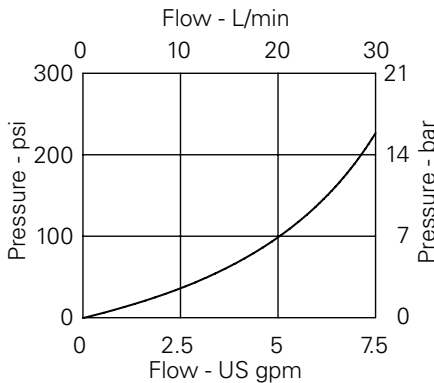
Max inlet pressure	210 bar (3000 psi)
Max regulated flow at rated current @ 50 bar	20 L/min (5.3 USgpm) @100%, 15 L/min (3.9 USgpm) @85%, 11 L/min (2.9 USgpm) @75%
PWM Frequency	200 to 400 Hz - 200 recommended
Dead band	38-60% of rated current
Response time	80ms
Internal leakage	Up to 0.67 ml/min (10dpi) 210 bar differential at 32 centistrokes
Temperature range (oil)	-30° to 120°C (-22° to 248°F)
Cavity	A6701 (see Section M)
Torque cartridge into cavity	30 Nm (22 lbs ft)
Mounting position	Unrestricted
Seal material	Standard nitrile with PTFE back up rings
Filtration	BS5540/4 Class 16/13 (25 micron or better)
Housing material	Aluminium
Nominal viscosity range	15 to 250 cSt
Standard housing materials	Aluminium
Coil model code	C16-*/*/29
Voltage available	12, 24 VDC
Coil weight	0.3 kg (0.6 lbs)
Cartridge Weight	0.2 kg (0.44 lbs)
Seal kit	SK1138 (Nitrile) SK1138V (Viton®)

Viton is a registered trademark of E.I. DuPont

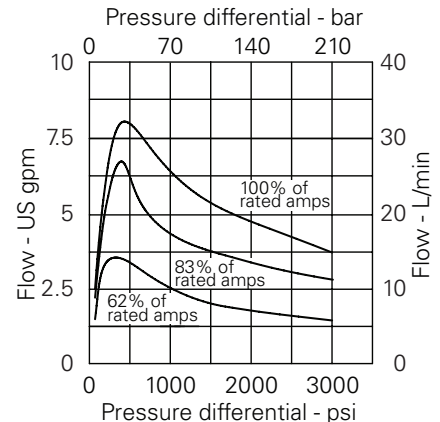
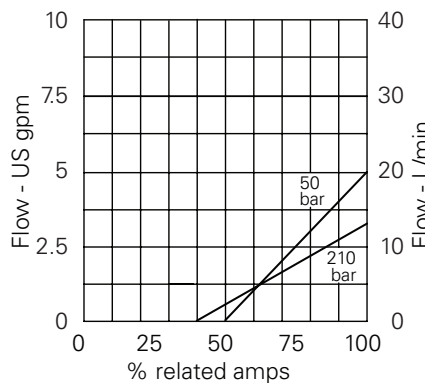
Pressure drop

Viscosity = 32 cSt (150 SSU)

PFR21H @ 100%



Performance curves

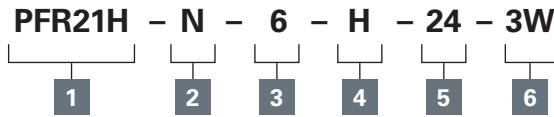


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

PFR21H - Proportional valve

Proportional bi-directional poppet, flow control valve
Up to 18L/min (5 USgmp) • 210 bar (3000 psi)

Model code



1 Function

PFR21H - Normally closed

2 Seal material

N - Nitrile
V - Viton

3 Manual override

6 - Screw

4 Coil termination

H - DIN43650
F - Flying Lead
DM - Deutsch moulded
Other terminations available on request.

5 Voltage

12 - 12 VDC
24 - 24 VDC

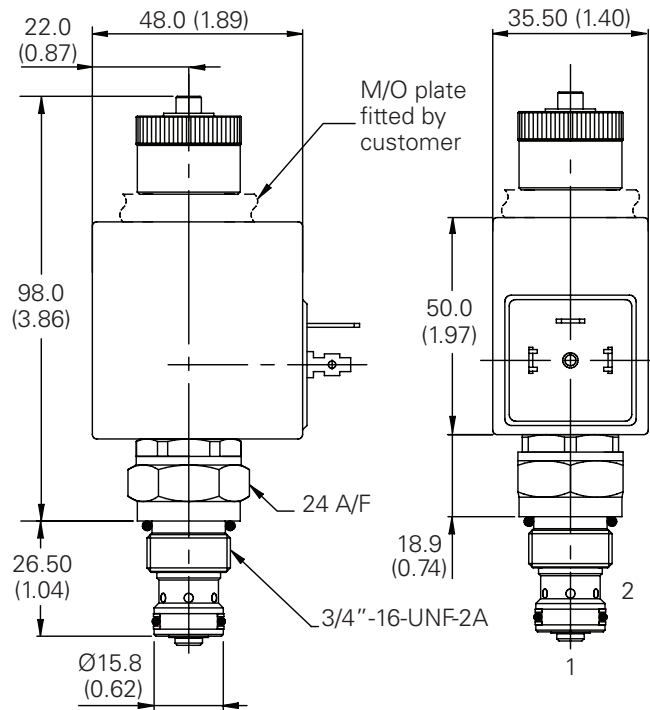
6 Port size

Code	Port size	Housing number
Blank	Cartridge only	
2W	1/4" BSP	A12592
3W	3/8" BSP	A7450
6T	3/8" SAE	A19355

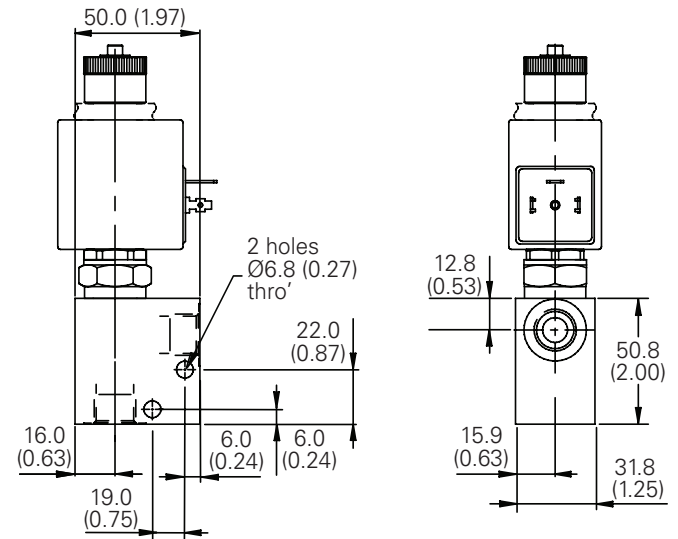
Dimensions

mm (inch)

Cartridge only



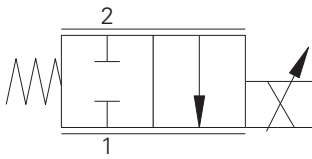
Installation drawing



Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPV10 - Proportional valve

Proportional uni-directional poppet, flow control valve
Up to 30L/min (8 USgmp) • 350 bar (5000 psi)



Operation

In the de-energized condition, blocked from port 2 to 1 with no reverse flow permitted. When energized, flow is allowed from port 2 to port 1 in direct proportion to the current applied to the solenoid coil.

Performance data

Ratings and specifications

Performance data is typical with fluid at 21,8 cSt (105 SSU) and 49°C (120°F)

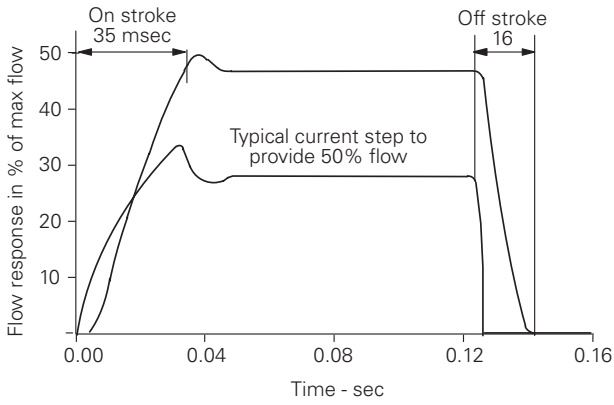
Typical application pressure (at port 2)	350 bar (5000 psi)
Rated flow	0 - 30 L/min (0 - 8 USgpm)
Operating ambient temperature	-30° to 90°C (-22° to 194°F)
Cavity	C-10-2
Weight cartridge only	0,78 kg (1.72 lbs)
Filtration	70 - 210 bar (1000 - 3000 psi) Cleanliness code 17/15/12 210+ bar (3000+ psi) Cleanliness code 15/13/11
Housing materials	Aluminum or Steel
Typical hysteresis	Less than 4% of rated current at 10 bar pressure drop – Pulse Width Modulated (PWM)
Internal leakage	10 cm ³ maximum @ 140 bar (2000 psi) and oil viscosity of 30 cSt
Oil viscosity range	10 - 800 cSt
Nominal supply voltage	12 or 24 VDC
Threshold current	Adj from 300 - 600 mA (12 VDC) Adj from 150 - 300 mA (24 VDC)
Coil current @ max flow	0.7 amps max @ 24 VDC 1.4 amps max @ 12 VDC
Recommended PWM frequency	100 - 200 Hz application dependent, 150 Hz typ
Coil resistance @ 20°C (86°F)	12V-6.5Ω 24V-25.0Ω
Power consumption @ rated current and 20°C coil temperature	12V-12.8 watts 24V-12.8 watts
Cartridge seal kit	02-317580 (Buna-N)

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPV10 - Proportional flow control valve

Proportional uni-directional poppet, flow control valve
 Up to 30L/min (8 USgpm) • 350 bar (5000 psi)

Step response data

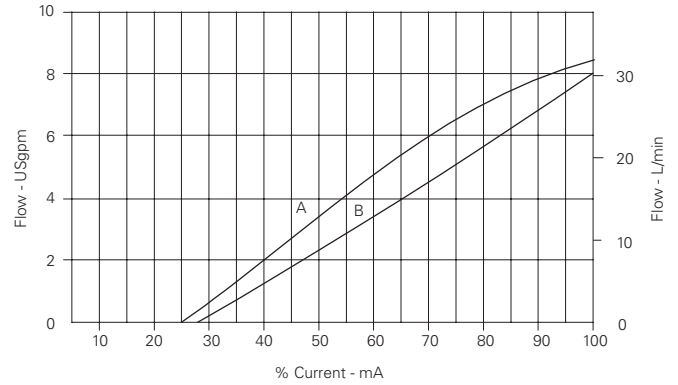


Flow vs current

With 10 bar differential between inlet and outlet

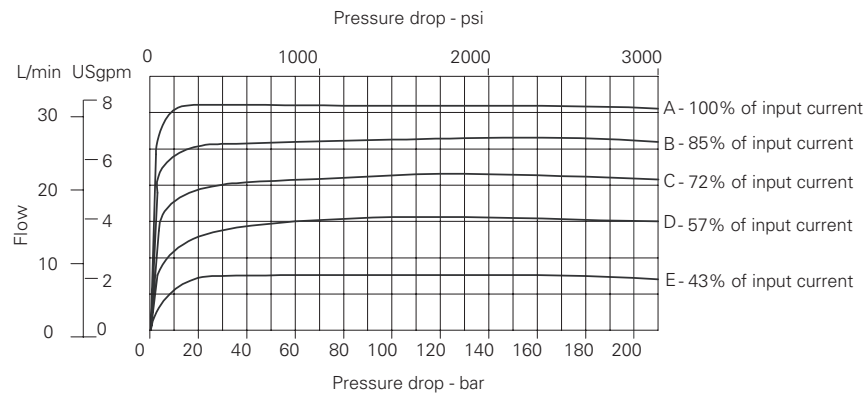
A - 210 bar (3000 psi) pressure drop from Port 2 to Port 1

B - 10 bar (150 psi) pressure drop from Port 2 to Port 1



Flow vs pressure drop

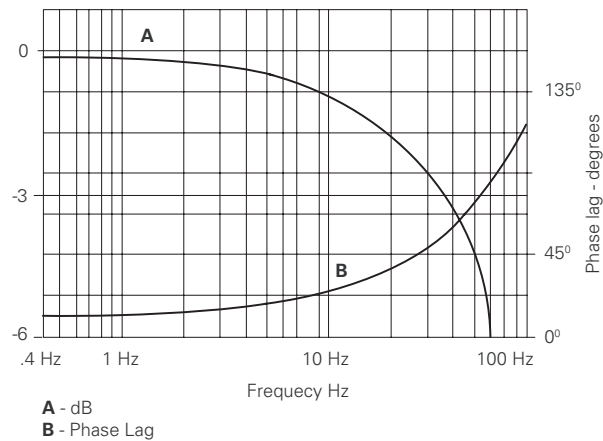
Per % of input current



Typical flow response

For an amplitude of $\pm 40\%$ maximum stroke (center to offset) about the 50% position.

$\Delta P = 10$ bar (145 psi)

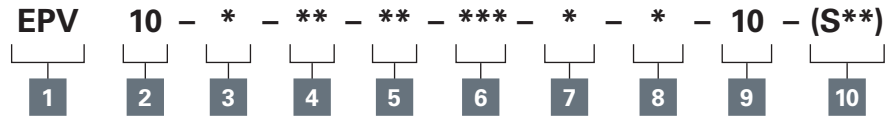


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPV10 - Proportional valve

Proportional uni-directional poppet, flow control valve
Up to 30L/min (8 USgpm) • 350 bar (5000 psi)

Model code



1 Function

EPV - Electro-proportional flow control valve, poppet type

2 Size

10 - 10 Size

3 Valve housing material

Omit for cartridge only

A - Aluminum
S - Steel

Maximum operating pressure for aluminum housing is 210 bar (3000 psi)

5 Seal material

N - Buna-N
V - Viton (standard)
NF - Buna-N and 60 mesh filter screen
VF - Viton and 60 mesh filter screen

4 Port size

Code	Port size	Housing number	
		Aluminium	Steel
0	Cartridge only		
3G	3/8" BSPP	876703	02-175103
6H	SAE 6	876700	02-175100
8H	SAE 8	876701	02-175101

See section J for housing details.

8 Coil/Connector types

Connector			
0	No connector	12VDC	24VDC
W	Leadwire (DC only)	02-361830	02-363310
U	DIN 43650	02-361837	02-363321
Y	Metri-Pack 150 male*	02-361845	02-363322
F	Weather-Pack male	02-361848	02-364328
N	Deutsch DT04-2P	02-154124	02-391571

*Preferred Packard connector.

6 Voltage rating

12D - 12VDC
24D - 24VDC
00D - No coil

7 Manual override option

0 - No manual override
M - Pin type
S - Screw type (3mm Hex)

Manual override is available in two different configurations, either push pin type is used when system pressure does not exceed 210 bar (3000 psi). The screw type can be used at any system pressure.

9 Design number

10 - Design no.

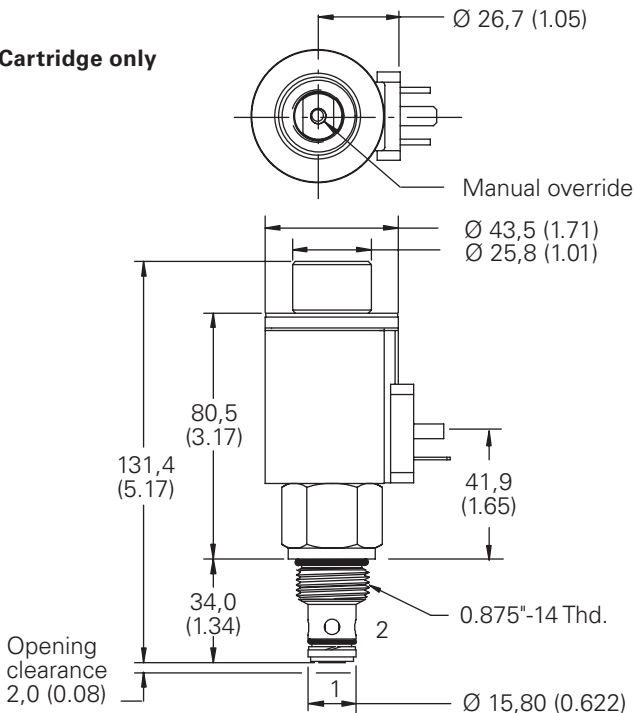
10 Special features

Blank - None

Dimensions

mm (inch)

Cartridge only

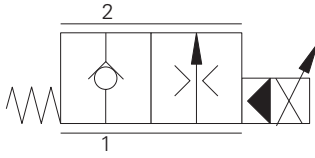


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPV16 - Proportional valve

Proportional flow control, normally closed, poppet
160L/min (42 USgpm) • 280 bar (4000 psi)

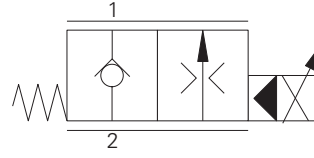
EPV16A



Operation

“A” style (nose in, side out) - In the de-energized position this valve remains closed from port 1 to port 2. When current is applied to the coil, a controlled increasing flow will be allowed from port 1 to port 2, in proportion to the current applied.

EPV16B



Operation

“B” style (side in, nose out) - in the de-energized position the valve remains closed from port 2 to port 1. When current is applied to the coil, a controlled increasing flow will be allowed from port 2 to port 1. In both examples free reverse flow is allowed in the opposite direction.

Performance data

Ratings and specifications

Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49°C (120°F)

Typical application pressure (all ports)	280 bar (4000 psi)
Rated flow	0 to 160 L/min (42 USgpm)
Internal leakage	EPV16A 50 cm ³ /min, max @ 140 bar (2000 psi) EPV16B 10 cm ³ /min, max @ 140 bar (2000 psi)
Oil viscosity range	10-800 cSt
Nominal supply voltage	12/24 VDC
Threshold current	Adj from 350-600 mA (12 VDC) Adj from 175-250 mA (24 VDC)
Coil current for maximum flow	0.7 amps @ 24 VDC 1.4 amps @ 12 VDC
Recommended PWM frequency	100-200 Hz application dependent, 150 Hz typ
Power consumption	12V-12.8 watts 24V-12.8 watts
Coil resistance	12v-6.5 V/24V-25.0 V
Temperature range	-30° to 90°C (-22° to 194°F)
Cavity	C-16-3S (undercut)
Fluids	Antiwear hydraulic oils with Buna-N seals (standard) Phosphate esters (non-alkyl) with Viton®
Filtration	70-210 bar (1000-3000 psi) Cleanliness code 17/15/12 210+ bar (3000+ psi) Cleanliness code 15/13/11
Housing material (standard)	Aluminum or steel
Typical hysteresis	less than 4% of rated current @ 10 bar pressure drop-pulse width modulated (PWM)
Weight cartridge only	1 kg (2.2 lbs)
Seal kit	02-154069 (Buna-N)

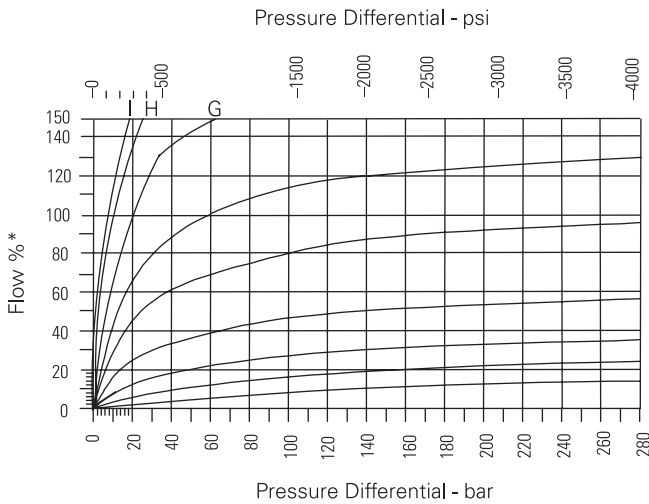
Viton is a registered trademark of E.I. DuPont

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPV16 - Proportional valve

Proportional flow control, normally closed, poppet
160L/min (42 USgpm) • 280 bar (4000 psi)

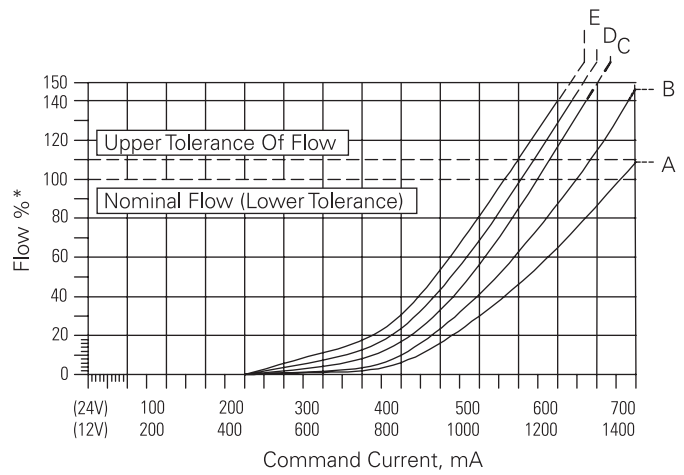
Pressure drop curves



* Flow interims of % for each poppet size

Command current

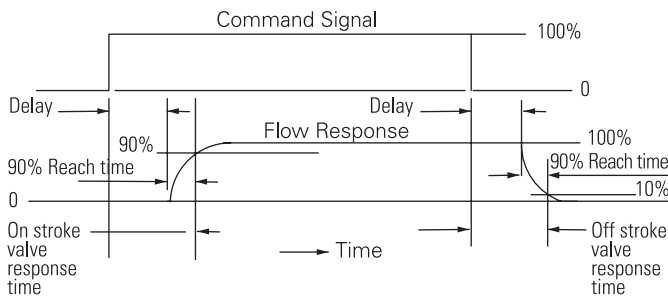
	12V	24V
A-	600 mA	300mA
B-	700 mA	350mA
C-	800 mA	400mA
D-	900 mA	450mA
E-	1000 mA	500mA
F-	1100 mA	550mA
G-	1200 mA	600mA
H-	1300 mA	650mA
I-	1400 mA	700mA



* Flow interims of % for each poppet size

Pressure differential

A-	10 bar	150 psi
B-	20 bar	300 psi
C-	50 bar	700 psi
D-	100 bar	1500 psi
E-	200 bar	3000 psi



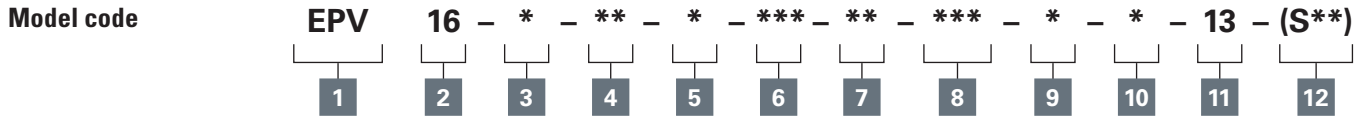
Pressure drop @ 120 L/min (30 USgpm)

Pressure drop DP	On stroke Delay/reach 90%	Off stroke delay/reach 90%
20 bar (290 psi)	24 ms/35 ms	5 ms/15 ms
100 bar (1450 psi)	24 ms/17 ms	5 ms/7 ms

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPV16 - Proportional valve

Proportional flow control, normally closed, poppet
 160L/min (42 USgpm) • 280 bar (4000 psi)



1 Function
 EPV - Solenoid valve

2 Size
 16 - 16 size

3 Flow direction
 A - Nose-in, side-out
 B - Side-in, nose-out

4 Rated flow
 4 - 40 L/min (10.5 USgpm)
 6 - 60 L/min (16 USgpm)
 10 - 100 L/min (26 USgpm)
 16 - 160 L/min (42 USgpm)

5 Valve housing material
 Omit for cartridge only
 A - Aluminum
 S - Steel

6 Port size

Code	Port size	Housing number			
		Aluminium EPV16-A	EPV16-B	Steel EPV16-A	EPV16-B
0	Cartridge only				
4G	1/2" BSPP	02-185448	02-166607	02-180050	02-165500
6G	3/4" BSPP	02-185449	02-161592	02-180051	02-164931
10H	SAE 10	02-185450	02-170238	02-180048	02-161983
12H	SAE 12	02-185447	02-166609	02-180049	02-161982
5C	CETOP5 (NFPA D05) Interface (Requires steel body)				

See section J for housing details.

7 Seal material
 N - Buna-N (standard)
 V - Viton
 NF - Buna-N and 60 mesh filter screen
 VF - Viton and 60 mesh filter screen

8 Voltage rating
 12D - 12VDC
 24D - 24VDC
 00D - No Coil

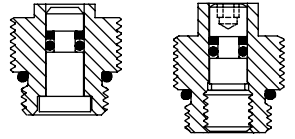
9 Manual override option
Blank - No manual override
0 - No manual override
M - Pin type
S - Screw type (3mm Hex)

Manual override is available in two different configurations, either push pin type is used when system pressure does not exceed 210 bar (3000 psi). The screw type can be used at any system pressure.

10 Connector type
0 - No connector
F - Weatherpack male
W - Flying Lead
N - Deutsch DT04-2P
Y - Metripack 150 male*
U - DIN 43650
 *Preferred Packard connector. For coil part numbers and dimensions see section C.

Manual override option

M - Pin type **S** - Screw type



11 Design number
 13 - Design no.

12 Special features
Blank - None

Caution
 A separate check valve is required down stream to isolate the EPV valve from load forces when the EPV is used to hold a load.

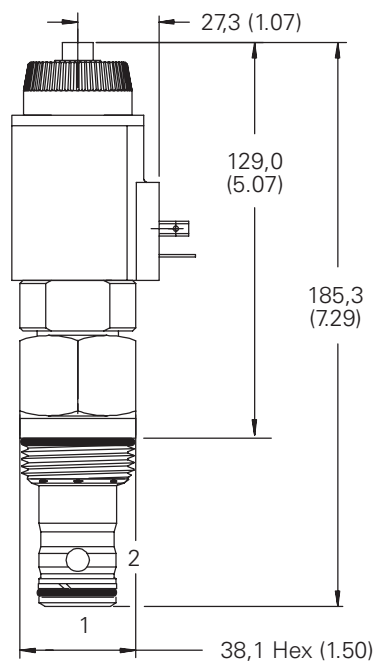
Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

Dimensions

mm (inch)

Cartridge only - EPV16A

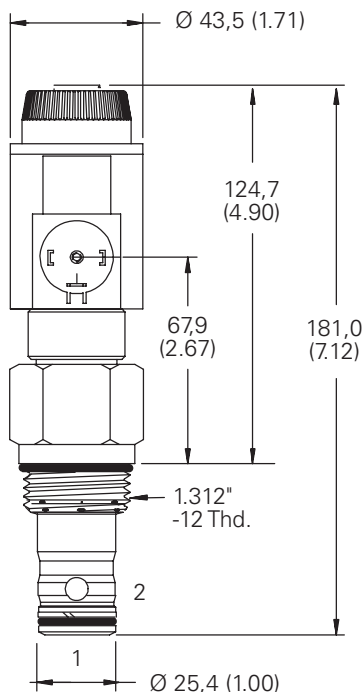
Nose-in, side out



With manual actuator

EPV16B

Side-in, nose out



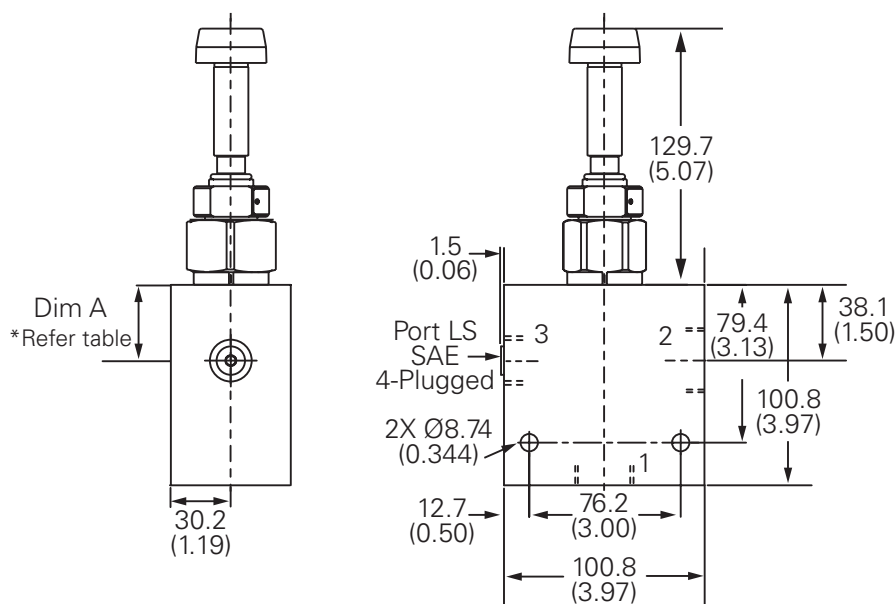
No manual actuator

EPV16A:

Port 3 is to be plugged. A separate external port connection is not required for EPV16-A (flow 1 to 2).

EPV16-B (flow 2 to 1), Port 3 must be connected to Port 1 externally to the cartridge, either by passages in the cavity block or external plumbing. When purchased with undercut body, this connection is included in the body and Port 3 is not machined.

Installation drawing (Steel)



	EPV16A	EPV16B
Dim.A	39.1 (1.50)	63.5 (2.50)

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPV16 - Proportional valve

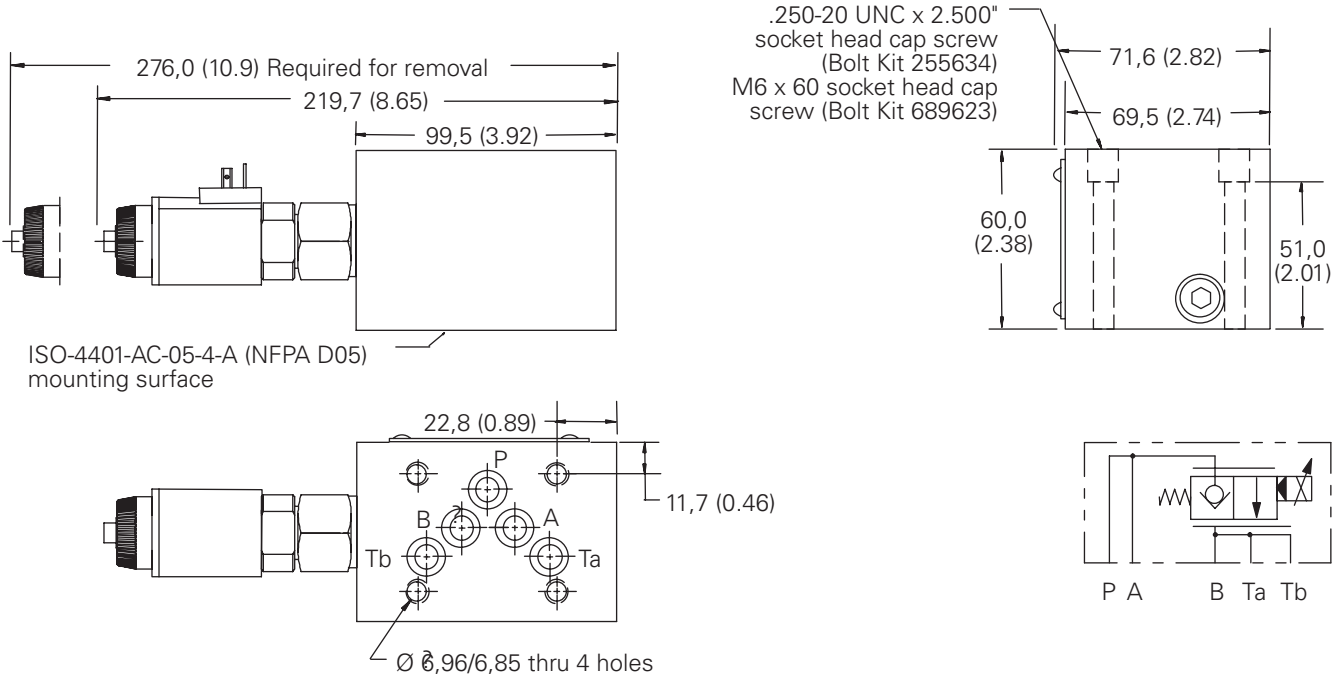
Proportional flow control, normally closed, poppet
 160L/min (42 USgpm) • 280 bar (4000 psi)

EPV16-A-**-S-5C-**-D-(-)-*-12

CETOP 5 Interface

mm (inch)

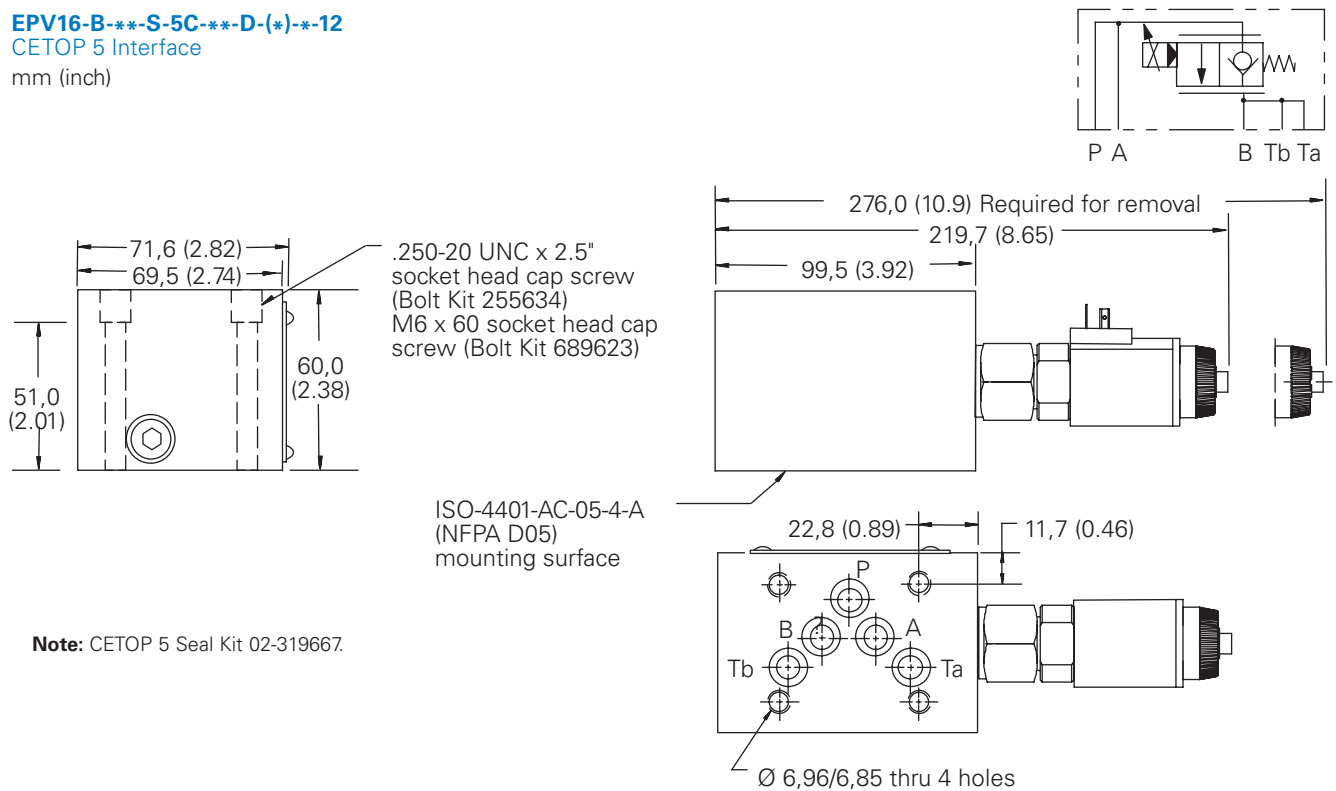
B



EPV16-B-**-S-5C-**-D-(-)-*-12

CETOP 5 Interface

mm (inch)

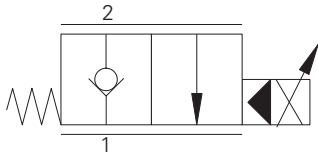


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ESV1-8-C / O - Proportional valve

Proportional flow control, normally closed & normally open, poppet
Up to 32 L/min (8.4 USgpm) • 210 bar (3000 psi)

Normally closed

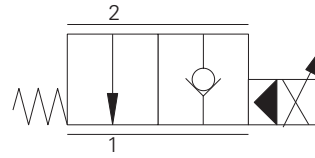


Operation

In the de-energized position, this valve blocks flow from port 2 to port 1 and free flow is allowed from port 1 to port 2.

In the energized position, flow from port 1 to port 2 is restricted while free flow is allowed from port 2 to port 1. The valve flow is proportional to the current applied to the coil.

Normally open



Operation

In the de-energized position, this valve allows free flow from port 2 to port 1 and restricts flow from port 1 to port 2.

In the energized position, flow is blocked from port 2 to port 1, and free flow is allowed from port 1 to port 2. The valve flow is proportional to the current applied to the coil.

Performance data

Ratings and specifications

Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

Typical application pressure	210 bar (3000 psi)
Cartridge endurance rating	1 million cycles
Rated flow	@ 500 psid, 8.4 gpm min, 9.3 gpm nom
Leakage (fully closed)	5 drops/min max @ 3000 psi
Nominal supply voltage	12/24 VDC
Current to open valve for normally closed	1350-1450 mA (12V coil), 075-725 mA (24V coil)
Current to fully close valve for normally open	1100-1250 mA (12V coil), 550-625 mA (24V coil)
Temperature range	-30° to 90°C (-22° to 194°F)
Maximum oil temperature	120°C (248°F)
Maximum internal oil temperature	200°C (392°F)
Cavity	C-8-2
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc.
Filtration	Cleanliness code 18/16/13
Housing material	Aluminum
Hysteresis	1 Usgpm with dither
Weight cartridge only	0.11 kg (0.24 lbs)
Seal kit	02-165875 (Buna-N), 02-165877 (Viton®)

Viton is a registered trademark of E.I. DuPont

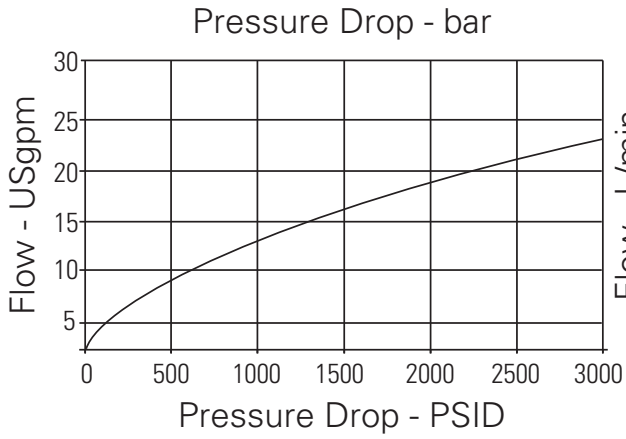
Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ESV1-8-C / O - Proportional valve

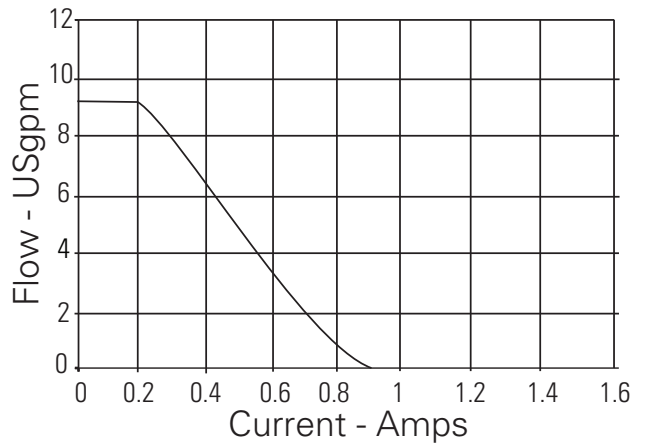
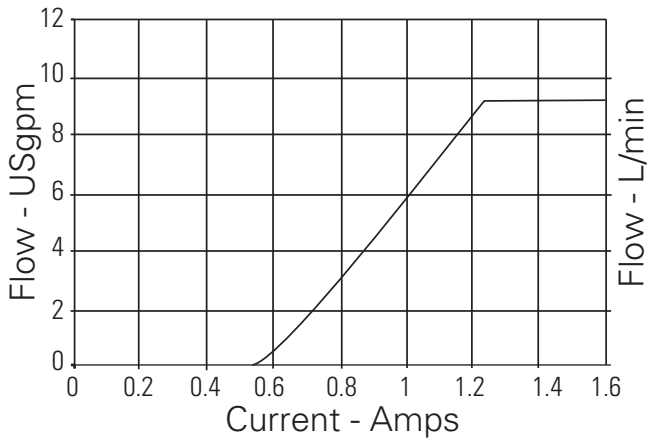
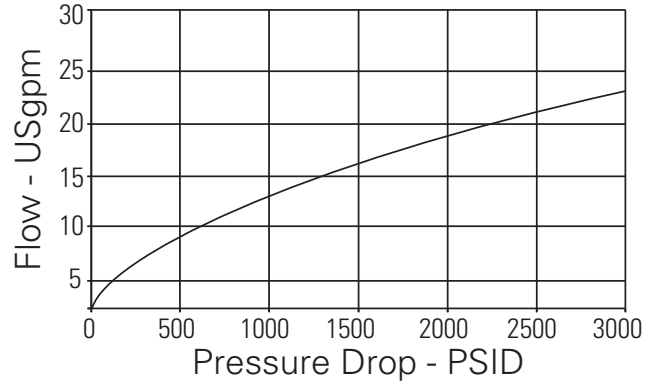
Proportional flow control, normally closed & normally open, poppet
Up to 32 L/min (8.4 USgpm) • 210 bar (3000 psi)

Pressure drop curves

Normally closed



Normally open

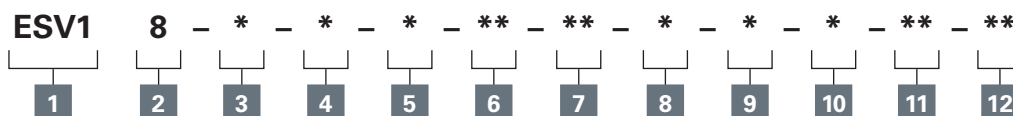


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ESV1-8-C / O - Proportional Valve

Proportional flow control, normally closed & normally open, poppet
Up to 31 L/min (8 USgpm) • 210 bar (3000 psi)

Model code



1 Function

ESV1 - Proportional flow control

2 Size

8 - 8 size

3 Seal material

N - Buna-N

V - Viton

4 Style

C - Normally open

O - Normally close

5 Housing material

Blank - Cartridge only

A - Aluminum

6 Port size

Code	Port size	Housing number Aluminium
0	Cartridge only	
2G	1/4" BSPP	02-160727
3G	3/8" BSPP	02-160728
4T	SAE 4	02-150730
6T	SAE 6	02-160731
8T	SAE 8	02-160732

See section J for housing details.

7 Coil voltage

0 - No coil

12D - 12VDC

24D - 24VDC

8 Type of power

Blank - No coil

B - DC/with diode

D - DC w/o diode

9 Connector types

Blank - No coil

G - ISO 4400 DIN 43650

W - Flying lead

N - Deutsch (DC only)

Y - Amp JR (DC only)

D - Metripack 150 male (DC only)

J - Metripack 280 male (DC only)

E - Weather-Pack female

F - Weather-Pack male

For coil part numbers and dimensions see section C.

10 Coil series

Blank - No coil

S - S Series, 20 W

For coil part numbers and dimensions see section C.

11 Coil special features

Blank - No coil

00 - No special feature

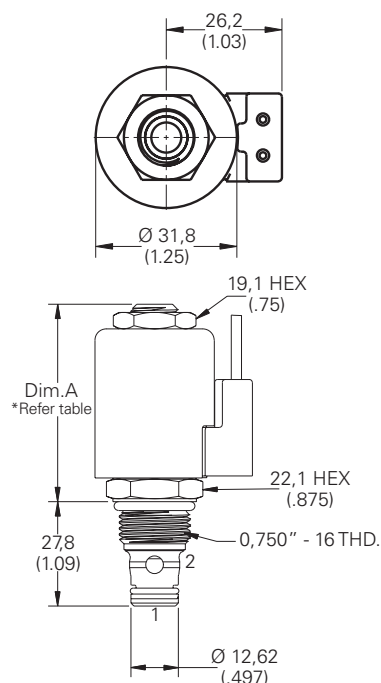
12 Valve special features

Blank - None

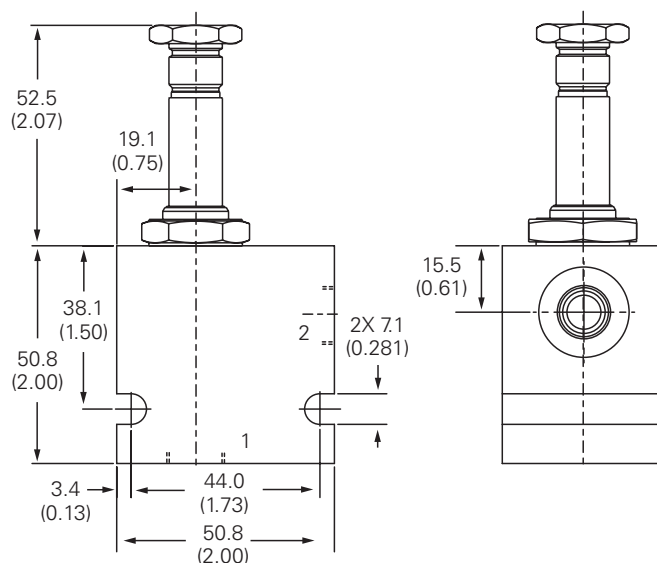
Dimensions

mm (inch)

Cartridge only



Installation drawing



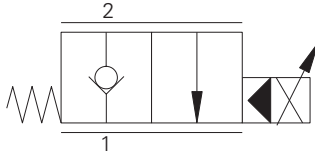
	ESV1-8-C	ESV1-8-O
Dim.A	52.5 (2.07)	64.3 (2.53)

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ESV1-10-C / O - Proportional valve

Proportional flow control, normally closed & normally open, poppet
Up to 70 L/min (18.5 USgpm) • 210 bar (3000 psi)

Normally closed

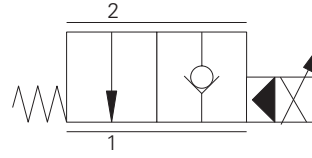


Operation

In the de-energized position, this valve blocks flow from port 2 to port 1 and free flow is allowed from port 1 to port 2.

In the energized position, flow from port 1 to port 2 is restricted while free flow is allowed from port 2 to port 1. The valve flow is proportional to the current applied to the coil.

Normally open



Operation

In the de-energized position, this valve allows free flow from port 2 to port 1 and restricts flow from port 1 to port 2.

In the energized position, flow is blocked from port 2 to port 1, and free flow is allowed from port 1 to port 2. The valve flow is proportional to the current applied to the coil.

Performance data

Ratings and specifications

Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

Typical application pressure	210 bar (3000 psi)
Cartridge endurance rating	1 million cycles
Rated flow	@ 500 psid, 18.5 gpm min, 19.4 gpm nom
Leakage (fully closed)	5 drops/min max @ 3000 psi
Nominal supply voltage	12/24 VDC
Current to open valve for normally closed	900-1000 mA (12V coil), 450-500 mA (24V coil)
Current to fully close valve for normally open	1000-1200 mA (12V coil), 500-600 mA (24V coil)
Temperature range	-30° to 90°C (-22° to 194°F)
Maximum oil temperature	120°C (248°F)
Maximum internal oil temperature	200°C (392°F)
Cavity	C-10-2
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc.
Filtration	Cleanliness code 18/16/13
Housing material (standard)	Aluminum
Hysteresis	1 USgpm with dither
Weight cartridge only	0.13 kg (0.28 lbs)
Seal kit	0565803 (Buna-N), 0566086 (Viton®)

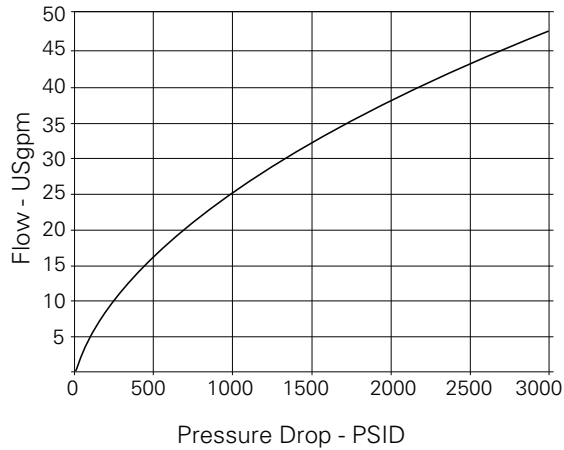
Viton is a registered trademark of E.I. DuPont

ESV1-10-C / O - Proportional valve

Proportional flow control, normally closed & normally open, poppet
Up to 70 L/min (18.5 USgpm) • 210 bar (3000 psi)

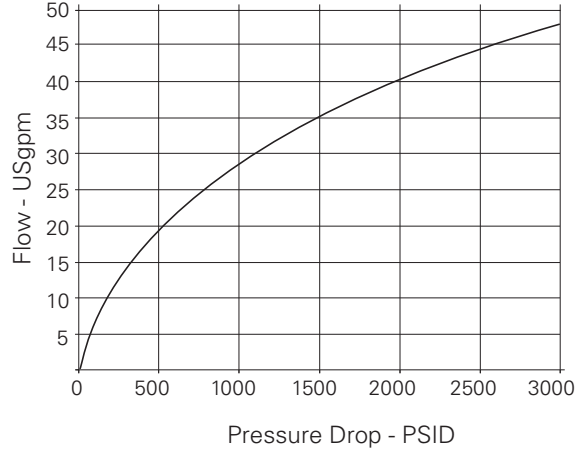
Pressure drop curves Normally closed

Pressure Drop At Max Poppet Opening

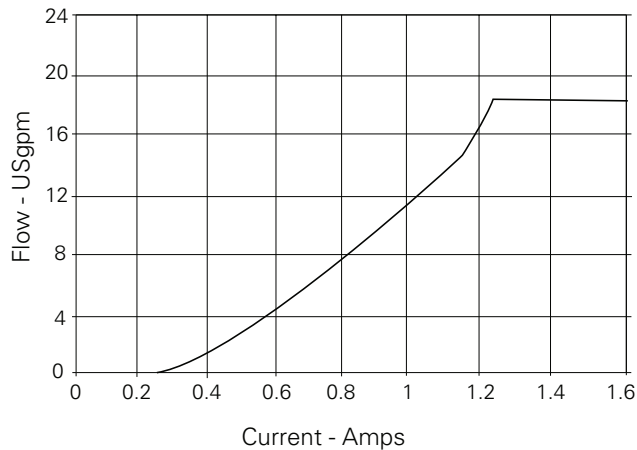


Pressure drop curves Normally open

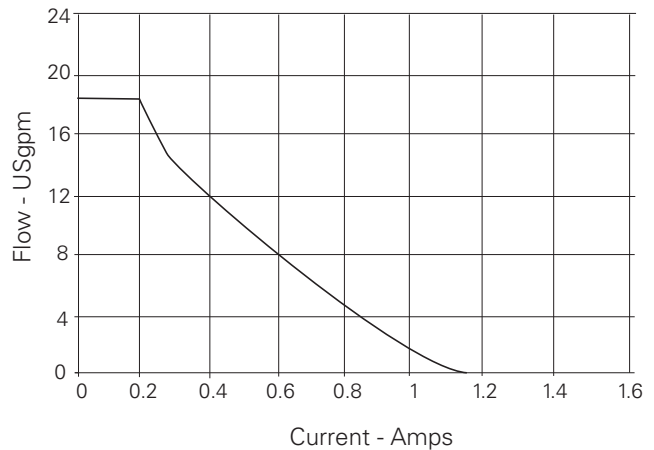
Pressure Drop At Max Poppet Opening



Flow vs. Current at 500 PSID



Flow vs. Current at 500 PSID

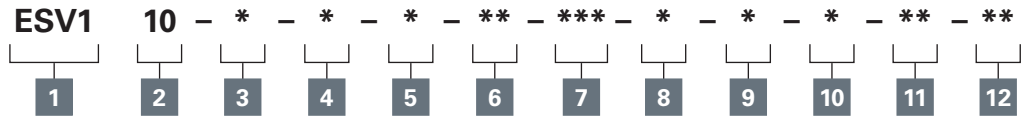


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ESV1-10-C / O - Proportional valve

Proportional flow control, normally closed & normally open, poppet
Up to 70 L/min (18.5 USgpm) - 210 bar (3000 psi)

Model code



1 Function

ESV1 - Proportional flow control

2 Size

10 - 10 size

3 Seal material

Blank - Buna-N
V - Viton

4 Style

C - Normally closed
O - Normally open

5 Housing material

Blank - Cartridge only
A - Aluminium

6 Port size

Code	Port size	Housing number Aluminium
0	Cartridge only	
3B	3/8" BSPP	02-175462
6T	SAE 6	566151
3G	3/8" BSPP	876703
6H	SAE 6	876700
8H	SAE 8	876701

See section J for housing details.

7 Coil voltage

0 - No coil
12D - 12VDC
24D - 24VDC

8 Type of power

Blank - No coil
B - DC/with diode
D - DC w/o diode

9 Connector type

Blank - No coil
G - ISO 4400 DIN 43650
W - Flying lead
N - Deutsch (DC only)
Y - Amp JR (DC only)
D - Metripack 150 male (DC only)
J - Metripack 280 male (DC only)
E - Weather-Pack female
F - Weather-Pack male
For coil part numbers and dimensions see section C.

10 Coil series

Blank - No coil
J - J Series, 23 W

For coil part numbers and dimensions see section C.

11 Coil special features

Blank - No coil
00 - No special feature

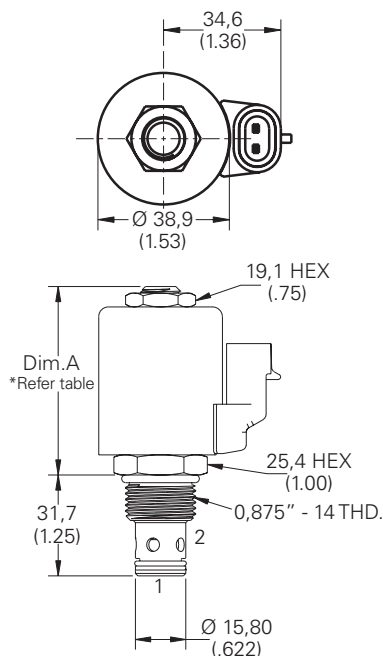
12 Valve special features

Blank - None

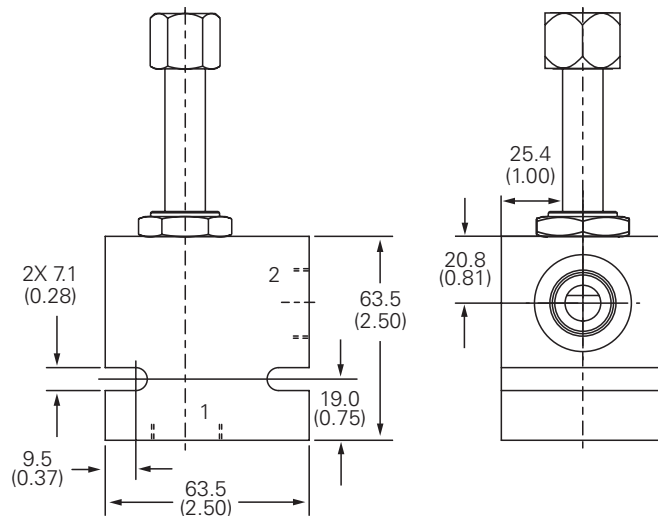
Dimensions

mm (inch)

Cartridge only



Installation drawing



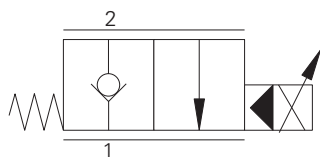
	ESV1-10-C	ESV1-10-O
Dim.A	59.2 (2.33)	70.3 (2.77)

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ESV1-12-C / O - Proportional valve

Proportional flow control, normally closed & normally open, poppet
Up to 104 L/min (27.3 USgpm) • 210 bar (3000 psi)

Normally closed

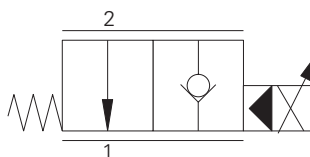


Operation

In the de-energized position, this valve blocks flow from port 2 to port 1 and free flow is allowed from port 1 to port 2.

In the energized position, flow from port 1 to port 2 is restricted while free flow is allowed from port 2 to port 1. The valve flow is proportional to the current applied to the coil.

Normally open



Operation

In the de-energized position, this valve allows free flow from port 2 to port 1 and restricts flow from port 1 to port 2.

In the energized position, flow is blocked from port 2 to port 1, and free flow is allowed from port 1 to port 2. The valve flow is proportional to the current applied to the coil.

Performance data

Ratings and specifications

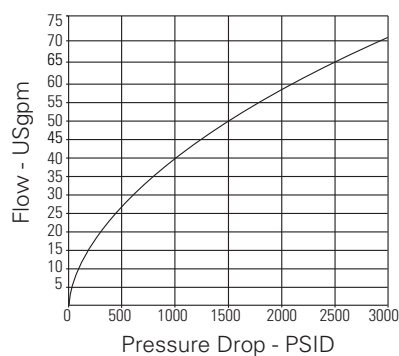
Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

Typical application pressure	210 bar (3000 psi)
Cartridge endurance rating	1 million cycles
Rated flow	@ 500 psid, 27.3 gpm min, 28.9 gpm nom
Leakage (fully closed)	5 drops/min max @ 3000 psi
Nominal supply voltage	12/24 VDC
Current to open & fully close valve	800-900 mA (12V coil), 400-450 mA (24V coil)
Temperature range	-30° to 90°C (-22° to 194°F)
Maximum oil temperature	120°C (248°F)
Maximum internal oil temperature	200°C (392°F)
Cavity	C-12-2
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc.
Filtration	Cleanliness code 18/16/13
Housing material (standard)	Aluminum
Hysteresis	1 USgpm with dither
Weight cartridge only normally close	0.23 kg (0.48 lbs)
Weight cartridge only normally open	0.24 kg (0.23 lbs)
Seal kit	02-165889 (Buna-N), 02-165888 (Viton®)

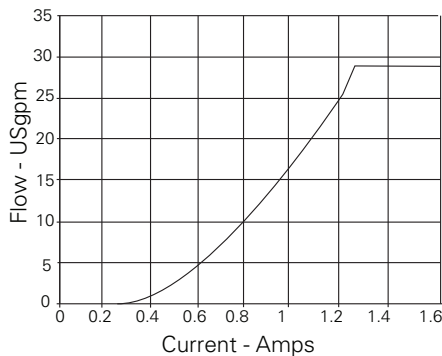
Viton is a registered trademark of E.I. DuPont

Pressure drop curves

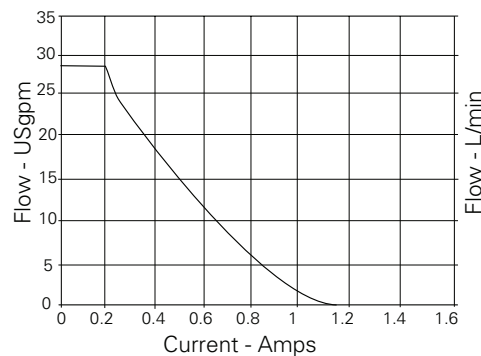
Pressure Drop At Max Poppet Opening
for close & open



Flow vs. Current at 500 PSID
for closed



Flow vs. Current at 500 PSID
for open

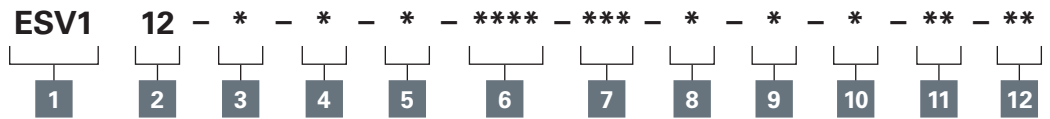


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ESV1-12-C / O - Proportional valve

Proportional flow control, normally closed, poppet
Up to 104 L/min (27.3 USgpm) • 210 bar (3000 psi)

Model code



1 Function

ESV1 - Proportional flow control

2 Size

12 - 12 size

3 Seal material

Blank - Buna-N
V - Viton

4 Style

C - Normally closed
O - Normally open

5 Housing material

Blank - Cartridge only
A - Aluminum

6 Port size

Code	Port size	Housing number
Aluminium single		
3	Cartridge only	
4G	1/2" BSPP	02-161118
4GU	1/2" BSPP	02-161116
6G	3/4" BSPP	02-161117
6GU	3/4" BSPP	02-161115
10T	SAE 10	02-160640
10TU	SAE 10	02-160641
12T	SAE 12	02-160644
12TU	SAE 12	02-160645

See section J for housing details.

7 Coil voltage

0 - No coil
12D - 12VDC
24D - 24VDC

8 Type of power

Blank - No coil
B - DC/with diode
D - DC w/o diode

9 Connector type

Blank - No coil
G - ISO 4400 DIN 43650
W - Flying lead
N - Deutsch (DC only)
Y - Amp JR (DC only)
D - Metripack 150 male (DC only)
J - Metripack 280 male (DC only)
E - Weather-Pack female
F - Weather-Pack male
For coil part numbers and dimensions see section C.

10 Coil series

Blank - No coil
J - J Series, 23 W
For coil part numbers and dimensions see section C.

11 Coil special features

Blank - No coil
00 - No special feature

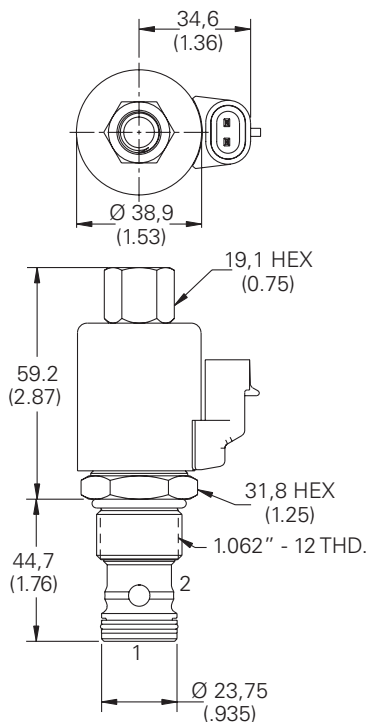
12 Valve special features

Blank - None

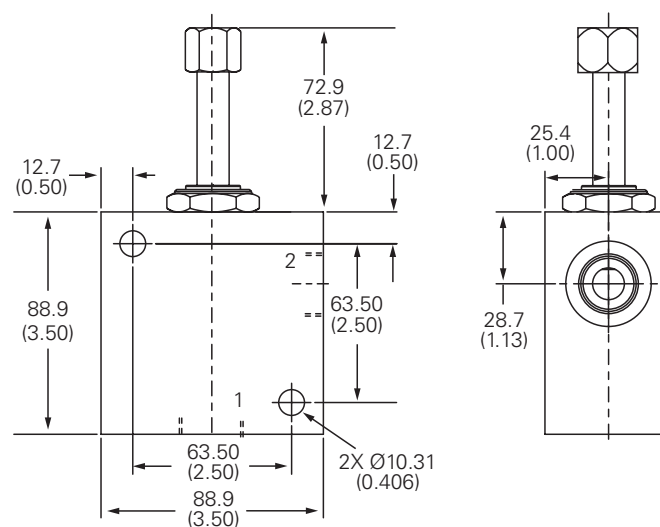
Dimensions

mm (inch)

Cartridge only



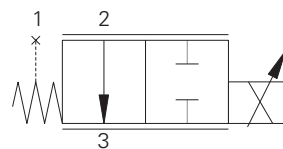
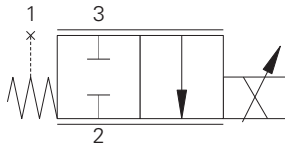
Installation drawing



Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EFV1-10-C / O - Proportional valve

Proportional flow, Normally open & Normally close, poppet
Up to 38 L/min (10 USgpm) • 210 bar (3000 psi)



Operation

The valve is controlled by current supplied to the coil. At zero current, the valve is fully closed from port 3 to port 2. At 1500 mA (12V coil) the valve is considered fully open. This is the maximum intended current level for use in applications. Port 1 is used for pressure balancing the spool and armature and must be blocked in all cases. The maximum intended pressure drop is 300 PSID. At pressure drops above 300 PSID, almost no increase in flow is obtained. The intended flow direction is from port 3 to port 2.

Operation of the valve with flow from port 2 to port 3 will produce flow vs current and flow vs pressure drop curves that are significantly different from those obtained with flow from port 3 to port 2. Since the spool and armature are pressure balanced, the operating pressure does not affect the operating characteristics of the valve. The operating point of the valve is determined only by current, pressure drop and temperature.

Operation

The valve is controlled by current supplied to the coil. At zero current, the valve is fully open from port 2 to port 3. At 1500 to 1600 mA (12V coil) the valve is fully closed. Port 1 is used for pressure balancing the spool and armature and must be blocked in all cases. The maximum intended pressure drop is 300 PSID, almost no increase in flow is obtained. The intended flow direction is from port 2 to port 3.

Operation of the valve with flow from port 3 to port 2 will produce flow vs current and flow vs pressure drop curves that are significantly different from those obtained with flow from port 2 to port 3. Since the spool and armature are pressure balanced, the operating pressure does not affect the operating characteristics of the valve. The operating point of the valve is determined only by current, pressure drop and temperature.

Performance data

Ratings and specifications

Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

Typical application pressure	210 bar (3000 psi)
Cartridge endurance rating	1million cycles
Rated flow	Flow rating "A" 15.1 L/min (4 USgpm) Flow rating "B" 30.2 L/min (8 USgpm) Flow rating "C" 37.9 L/min (10 USgpm)
Internal leakage	197 cm ³ /min (12in ³ /min) @ 3000 PSID
Nominal supply voltage	12/24 V
Current to fully close & open valve	1500-1600 mA (12V coil), 750-800 mA (24V coil)
Recommended PWM frequency	200-400 Hz
Coil resistance	4.7v V/12V, 19.0V/24V
Mass	Cartridge only 0,37 kg (0.82 lb), cartridge with coil and end nut 0,73 kg (1.62 lb)
Temperature range	-30° to 90°C (-22° to 194°F)
Maximum oil temperature	120°C (248°F)
Maximum internal coil temperature	200°C (392°F)
Cavity	C-10-3
Fluids	All general purpose hydraulics fluids such as: MIL-H-5606, SAE 10, SAE 20, DTE 24, etc.
Filtration	Cleanliness code 18/16/13
Housing material (standard)	Aluminum or steel
Hysteresis	1 USgpm with 400Hz PWM driver
Seal kit	9900225-000 (Buna-N), 9900226-000 (Viton®)

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Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EFV1-10-C / O - Proportional valve

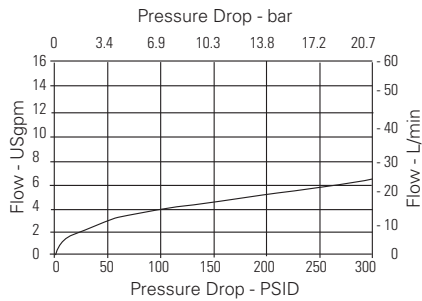
Proportional flow, Normally open & Normally close, poppet
Up to 38 L/min (10 USgpm) • 210 bar (3000 psi)

B

Normally close

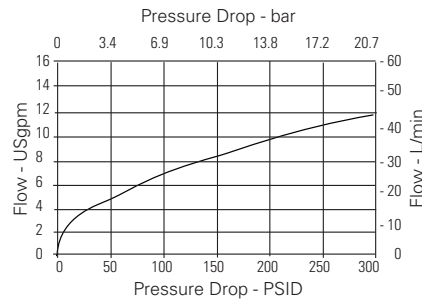
Max Flow vs. Pressure drop

Flow rating "A" at zero current



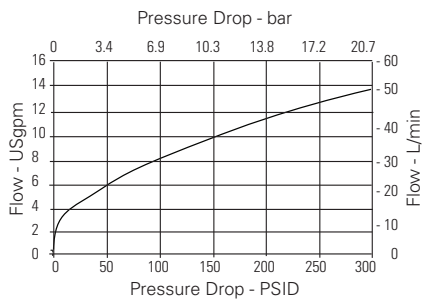
Max Flow vs. Pressure drop

Flow rating "B" at zero current

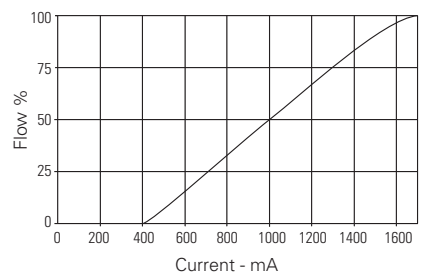


Max Flow vs. Pressure drop

Flow rating "C" at zero current



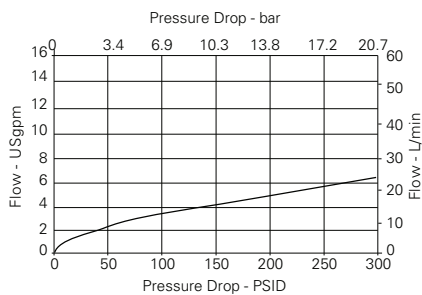
Flow vs. Current



Normally open

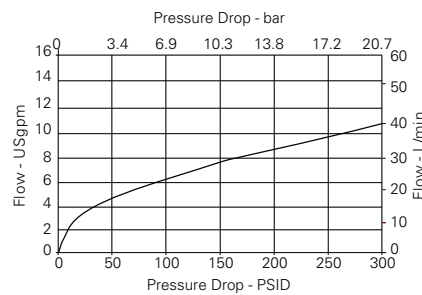
Max. flow vs Pressure drop

Flow rating "A" (Valve fully open)



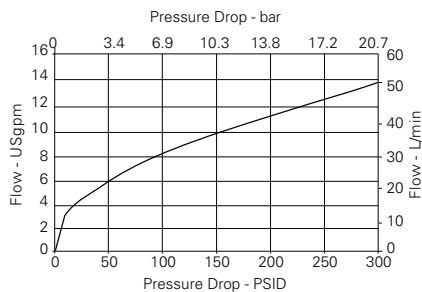
Max. flow vs Pressure drop

Flow rating "B" (Valve fully open)

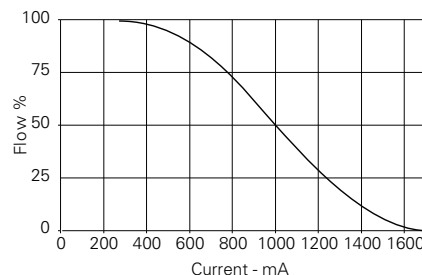


Max. flow vs Pressure drop

Flow rating "C" (Valve fully open)



Flow vs. Current



Note: To determine operating characteristics for the flow rating selected, at a specific differential pressure, first determine maximum flow from upper curve at the differential pressure value. This will be the "100%" flow on the lower curve.

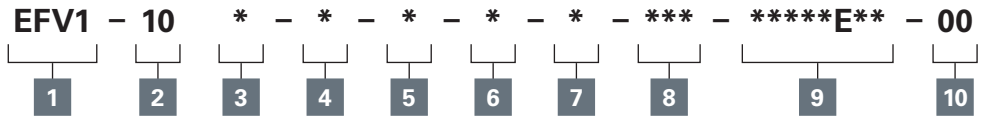
These drawings are critical request certified drawings. We reserve the right to change specifications without notice.

Parameters: 400 Hz PWM

EFV1-10-C / O - Proportional valve

Proportional flow, Normally open & Normally close, poppet
Up to 38 L/min (10 USgpm) • 210 bar (3000 psi)

Model Code



1 Function

EFV1 - Electro proportional flow control valve

2 Size

10 - 10 size

3 Seal material

N - Buna-N
V - Viton®

4 Logic

C - Normally closed
O - Normally open

5 Flow rating

A - 4 USgpm @ 160 PSID
B - 8 USgpm @ 160 PSID
C - 10 USgpm @ 160 PSID

6 Manual override option

0 - No core tube special features
S - Screw-in

7 Valve housing material

Blank - Cartridge only
A - Aluminum
S - Steel

9 Coil series

E - E series coils

*These model digits will not be stamped on the valve.

For coil part numbers and dimensions see section C.

8 Port size

Code	Port size	Housing number	
		Aluminium single	Steel single
0	Cartridge only		
3B	3/8" BSPP	02-173358*	
6T	SAE 6	566162*	02-175124
8T	SAE 8		02-175125
2G	1/4" BSPP	876705	02-175127
3G	3/8" BSPP	876714	02-175128
6H	SAE 6	876704	
8H	SAE 8	876711	

Note: Both the manifold and port plug are required. See section J for housing details.
*Aluminum – Light duty.

10 Special features

00 - None

Only required when valve has special features, omitted if "00".

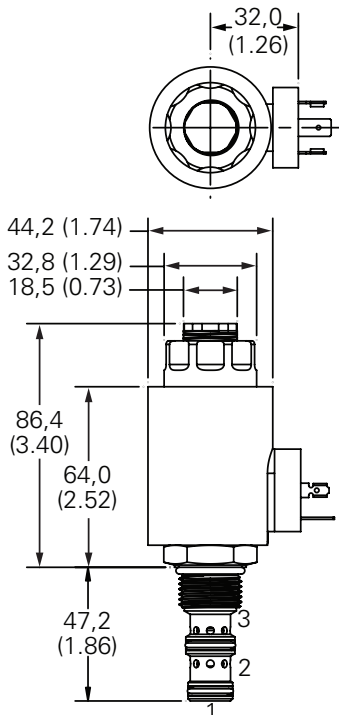
Dimensions

mm (inch)

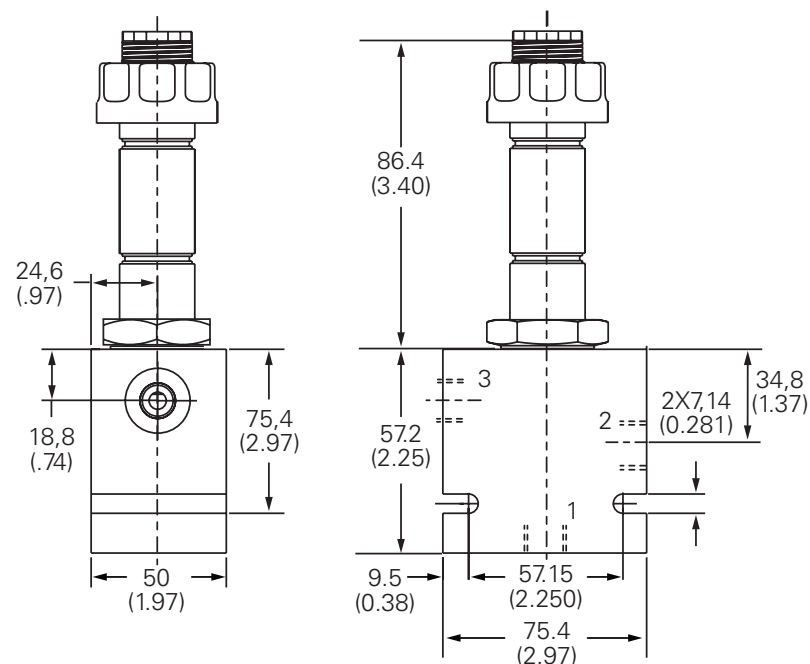
Note: S type manual override shown. DIN 43650 connector shown.

Note: Port 1 is unused and must be plugged.

Cartridge only



Installation drawing (Aluminum)

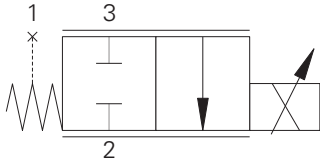


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EFV1-12-C / O - Proportional valve

Proportional flow, normally closed spool
Up to 104 L/min (27.5 USgpm) • 210 bar (3000 psi)

Normally closed

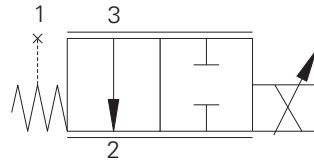


Operation

The valve is controlled by current supplied to the coil. At zero current, the valve is fully closed from port 3 to port 2. At 1500 mA (12V coil) the valve is considered fully open. This is the maximum intended current level for use in applications. Port 1 is used for pressure balancing the spool and armature and must be blocked in all cases. The maximum intended pressure drop is 300 PSID. At pressure drops above 300 PSID, almost no increase in flow is obtained. The intended flow direction is from port 3 to port 2.

Operation of the valve with flow from port 2 to port 3 will produce flow vs current and flow vs pressure drop curves that are significantly different from those obtained with flow from port 3 to port 2. Since the spool and armature are pressure balanced, the operating pressure does not affect the operating characteristics of the valve. The operating point of the valve is determined only by current, pressure drop and temperature.

Normally open



Operation

The valve is controlled by current supplied to the coil. At zero current, the valve is fully open from port 2 to port 3. At 1500 to 1600 mA (12V coil) the valve is fully closed. Port 1 is used for pressure balancing the spool and armature and must be blocked in all cases. The maximum intended pressure drop is 300 PSID. At pressure drops above 300 PSID, almost no increase in flow is obtained. The intended flow direction is from port 2 to port 3.

Operation of the valve with flow from port 3 to port 2 will produce flow vs current and flow vs pressure drop curves that are significantly different from those obtained with flow from port 2 to port 3. Since the spool and armature are pressure balanced, the operating pressure does not affect the operating characteristics of the valve. The operating point of the valve is determined only by current, pressure drop and temperature.

Performance data

Ratings and specifications

Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

Typical application pressure	210 bar (3000 psi)
Cartridge endurance rating	1million cycles
Rated flow for normally closed	Flow rating "A" 55 L/min (14.3 USgpm) Flow rating "B" 77 L/min (20.6 USgpm)
Rated flow for normally open	Flow rating "A" 95 L/min (25 USgpm) Flow rating "B" 104 L/min (27.5 USgpm)
Internal leakage	77-483 cm ³ /min (5-30 in ³ /min) @ 210 bar (3000 PSID)
Nominal supply voltage	12/24 V
Current to fully close & open valve	1500-1600 mA (12V coil), 750-800 mA (24V coil)
Recommended dither frequency	200-400 Hz
Coil resistance	4.7v V/12V, 19.0V/24V
Mass	Cartridge only 0,37 kg (0.82 lb), cartridge with coil and end nut 0,73 kg (1.62 lb)
Temperature range	-30° to 90°C (-22° to 194°F)
Maximum oil temperature	120°C (248°F)
Maximum internal coil temperature	200°C (392°F)
Cavity	C-12-3
Fluids	All general purpose hydraulics fluids such as: MIL-H-5606, SAE 10, SAE 20, DTE 24, etc.
Filtration	Cleanliness code 18/16/13
Housing material (standard)	Aluminum or steel
Hysteresis	1 USgpm with 400Hz PWM driver
Seal kit	9900171-000 (Buna-N), 9900172-000 (Viton®)

Viton is a registered trademark of E.I. DuPont

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

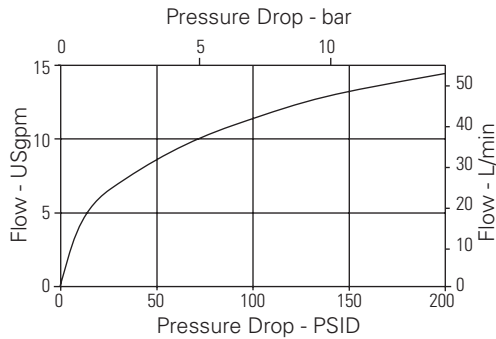
EFV1-12-C / O - Proportional valve

Proportional flow, Normally open & Normally close spool
Up to 77 L/min (20.6 USgpm) • 210 bar (3000 psi)

Normally closed

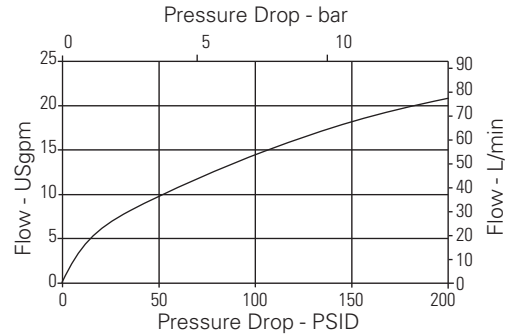
Max flow vs. Pressure drop

Flow rating "A" at zero current

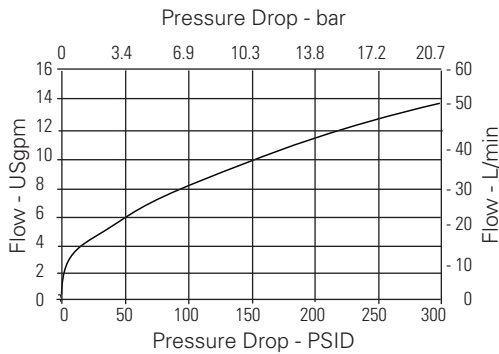


Max flow vs. Pressure drop

Flow rating "B" at zero current



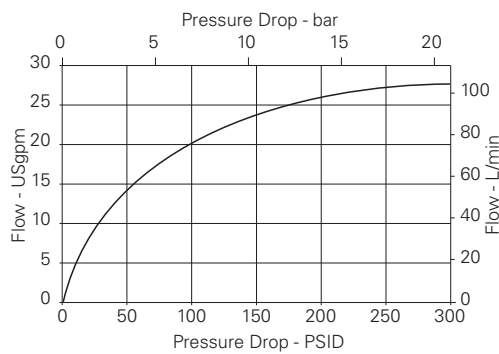
Flow vs. Current



Normally open

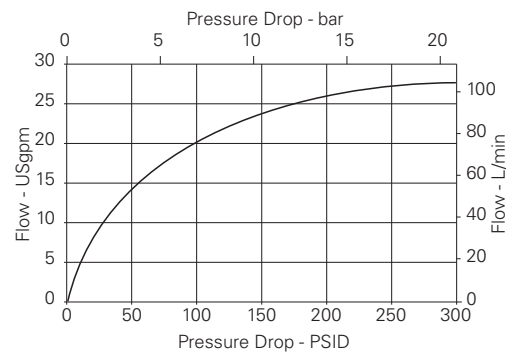
Max. flow vs Pressure drop

Flow rating "B" (Zero Current)

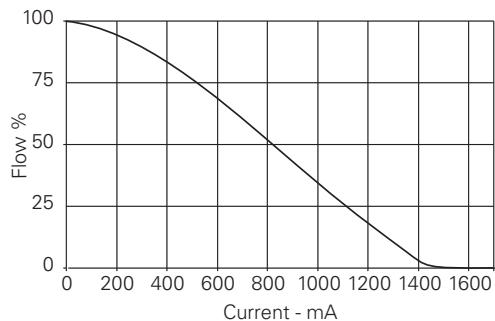


Max. flow vs Pressure drop

Flow rating "A" (Zero Current)



Flow vs Current



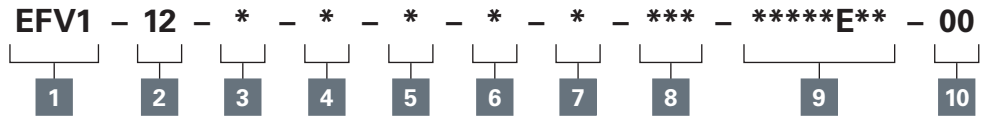
Note: To determine operating characteristics for the flow rating selected, at a specific differential pressure, first determine maximum flow from upper curve at the differential pressure value. This will be the "100%" flow on the lower curve.

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EFV1-12-C / O - Proportional valve

Proportional flow, Normally open & Normally close spool
Up to 77 L/min (20.6 USgpm) • 210 bar (3000 psi)

Model code



1 Function

EFV1 - Electro proportional flow control valve

2 Size

12 - 12 size

3 Seal material

N - Buna-N
V - Viton®

4 Logic

C - Normally closed
O - Normally open

5 Flow rating

Normally Closed

A - 14.3 USgpm @ 300 PSID
B - 20.6 USgpm @ 300 PSID

Normally Open

A - 25.0 USgpm @ 300 PSID
B - 27.5 USgpm @ 300 PSID

6 Manual override option

0 - No core tube special features
S - Screw-in

7 Valve housing material

Blank - Cartridge only
A - Aluminum
S - Steel

8 Port size

Code	Port size	Housing number	
		Aluminium single	Steel single
0	Cartridge only		
4G	1/2" BSPP	02-161817	02-169815
6G	3/4" BSPP	02-161816	02-169814
10T	SAE 10	02-160642	02-161070
12T	SAE 12	02-160646	02-169816

Note: Both the manifold and port plug are required. See section J for housing details.

9 Coil series

E - E series coils
*These model digits will not be stamped on the valve. For coil part numbers and dimensions see section C.

10 Special features

00 - None
Only required when valve has special features, omitted if "00".

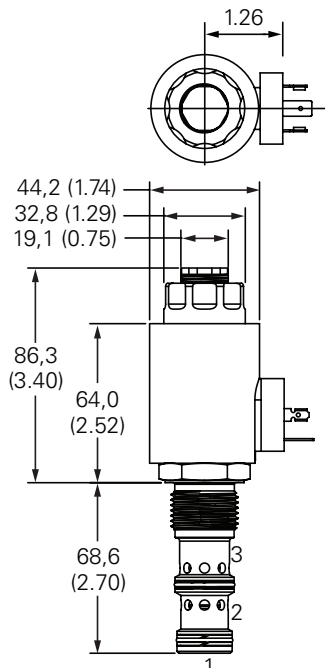
Dimensions

mm (inch)

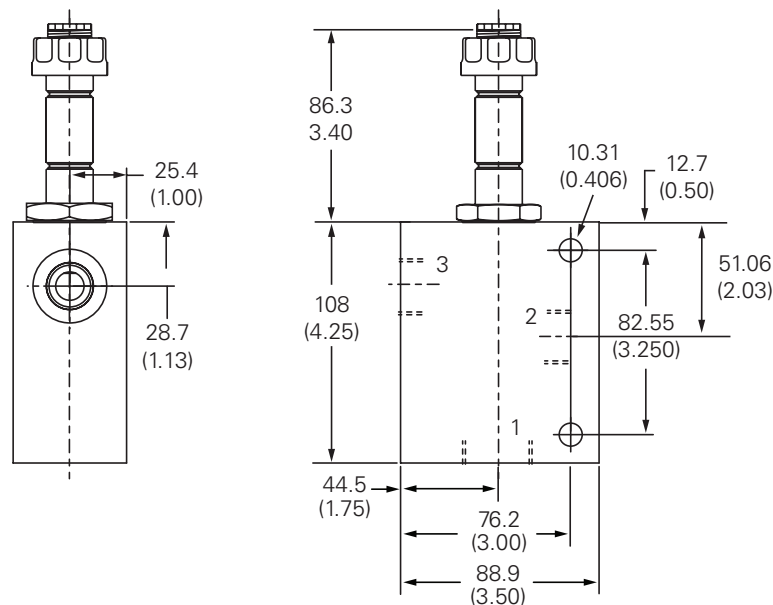
Port 1 is unused and must be plugged.

Note: EFV1-12 with DIN-43650 connector shown.

Cartridge only



Installation drawing (Aluminum)

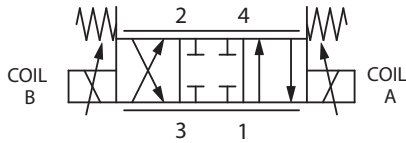


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ESV9-8 - Proportional solenoid valve

4-way, 3-position, proportional solenoid valve
Up to 11 L/min (2.9 USgpm) • Up to 250 bar (3600 psi)

ESV9-8-E



Operation

In the de-energized (center) position, all ports are blocked. When solenoid A is energized, flow is directed from port 3 to port 2 and from port 4 to port 1. Port 1 is not intended to be used as an inlet.

When solenoid B is energized, flow is directed from port 3 to port 4 and from port 2 to port 1. Port 1 is not intended to be used as an inlet.

Performance data

Ratings and specifications

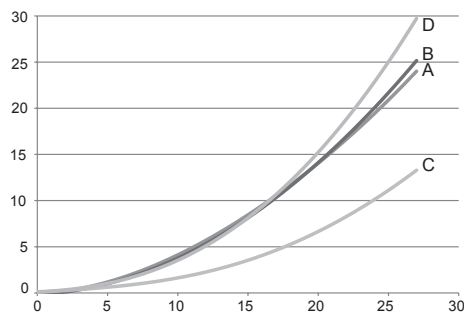
Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

Typical application pressure	
Operating Pressure Port 1 (T)	210 bar (3,000 psi)
Operating Pressure Port 2,3 and 4 (A, P and B)	250 bar (3,600 psi)
Rated burst pressure	750 bar (10,600 psi) per NFPA/T2-6-1 R2-2000
Rated flow	11.0 L/min (2.9 USgpm)
Temperature range	-40° to 120°C (-40° to 248°F)
Coil power	23 W*
Maximum hysteresis	7.0%
Step response	70 ms to 90% flow
Cavity	C-8-4
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20 etc.
Filtration	Cleanliness code 18/16/13
Standard housing material	Steel
Weight including coils	0.5 kg (1.1 lbs)
Seal kit	02-160757 (Buna-N), 02-160758 (Viton®)
Internal leakage	165 cm ³ /min (10 in ³ /min) max. @ 210 bar (3000 psi)

Viton is a registered trademark of E.I. DuPont.

*AC coils must be used with a rectifying connector.

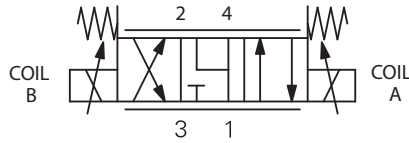
Pressure drop



A - Port 3 to port 2
B - Port 3 to port 4

C - Port 4 to port 1
D - Port 2 to port 1

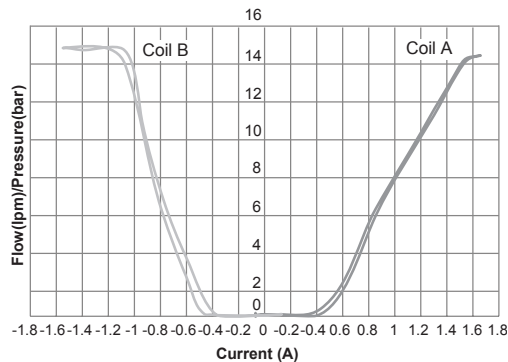
ESV9-8-F



Operation

In the de-energized (center) position, port 1, port 2, and port 4 are open to each other while port 3 is blocked. When solenoid A is energized, flow is directed from port 3 to port 2 and from port 4 to port 1. When solenoid B is energized, flow is directed from port 3 to port 4 and from port 2 to port 1.

Flow vs. Current at 10 bar ΔP

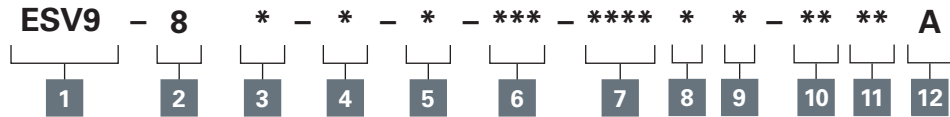


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ESV9-8 - Proportional solenoid valve

4-way, 3-position, screw-in cartridge, proportional solenoid valve
 Up to 11 L/min (2.9 USgpm) • Up to 250 bar (3600 psi)

Model code



B

1 Function

ESV9 - Proportional solenoid valve

2 Size

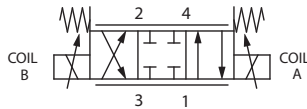
8 - 8 size

3 Seal material

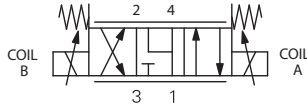
Blank - Buna-N
V - Viton®

4 Spool center condition

E



F



5 Manual override option

0 - No manual override

M - Manual override, push pull type

For valve dimensions with manual override, see pages B34.

6 Housing material and ports

Code	Port size	Housing number	
		Aluminium	Steel
0	Cartridge only		
A2G	1/4" BSPP	02-160747	
A3G	3/8" BSPP	02-160748	
A6H	SAE 6	02-160749	
A8H	SAE 8	02-160750	
S2G	1/4" BSPP		02-160753
S3G	3/8" BSPP		02-160754
S6T	SAE 6		02-160751
S8T	SAE 8		02-160752

See section J for housing details.

7 Coil voltage and type

000 - No coil
012D - 12V DC without diode
024D - 24V DC without diode
012B - 12V DC with diode
024B - 24V DC with diode

8 Connection type

Blank - No coil
G - ISO 4400 DIN 43650
W - Flying lead
N - Deutsch (DC only)
Y - Amp JR (DC only)
D - Metripack 150 male (DC only)
J - Metripack 280 male (DC only)
F - Weather-Pack (Packard) male on wire leads
 For coil part numbers and dimensions see section C.

9 Coil series

Blank - No coil
P - P Series
 ToughCoils™ 23 W

10 Coil special feature

00 - None

11 Valve special features¹

00 - None
 (Only required if valve has special features omitted if "00".)

12 Design code

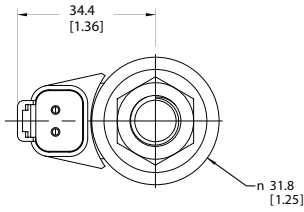
A - Design code 00

¹These model digits are not stamped on the valve.

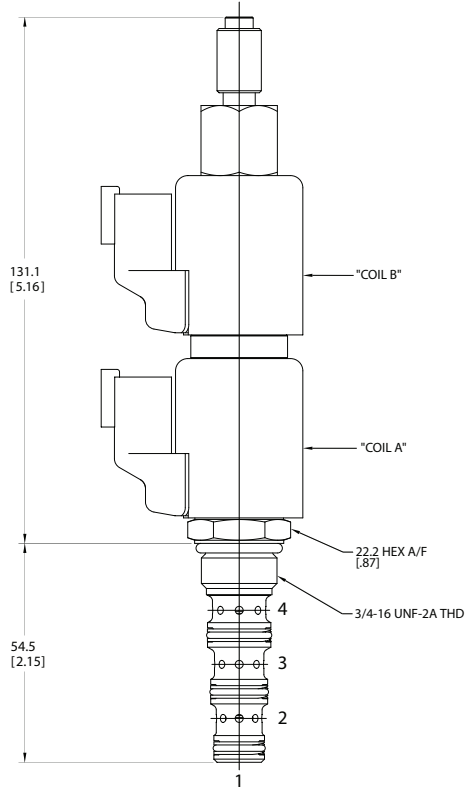
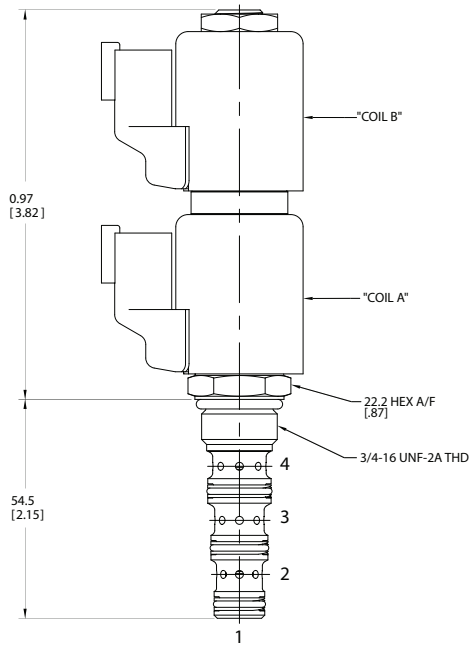
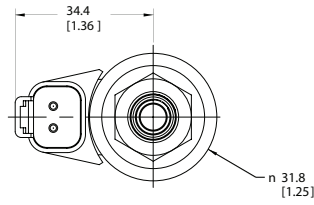
ESV9-8 - Proportional solenoid valve

4-way, 3-position, proportional solenoid valve
Up to 11 L/min (2.9 USgpm) • 250 bar (3000 psi)

ESV9-8 without MO



ESV9-8 with MO



Dimensions

mm (inch)

Spare parts

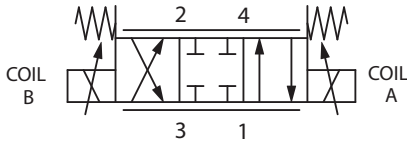
Coil Nut for MO	565559
Coil Nut without MO	565558
Coil Spacer	02-186730

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ESV9-10 - Proportional Solenoid Valve

4-way, 3-position, screw-in cartridge,
Up to 22 L/min (5.8 USgpm) • Up to 250 bar (3600 psi)

ESV9-10-E

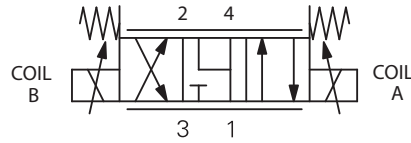


Operation

In the de-energized (center) position, all ports are blocked. When solenoid A is energized, flow is directed from port 3 to port 2 and from port 4 to port 1. Port 1 is not intended to be used as an inlet.

When solenoid B is energized, flow is directed from port 3 to port 4 and from port 2 to port 1. Port 1 is not intended to be used as an inlet.

ESV9-10-F



Operation

In the de-energized (center) position, port 1, port 2, and port 4 are open to each other while port 3 is blocked. When solenoid A is energized, flow is directed from port 3 to port 2 and from port 4 to port 1.

When solenoid B is energized, flow is directed from port 3 to port 4 and from port 2 to port 1.

Performance data

Ratings and specifications

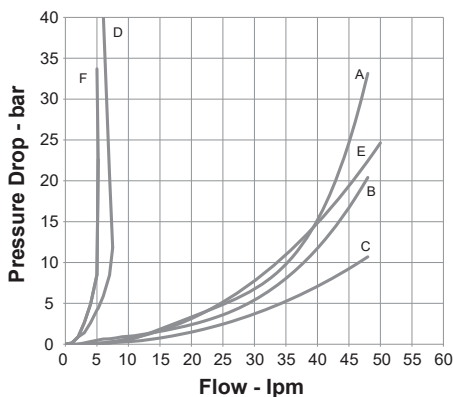
Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

Typical application pressure	
Operating Pressure Port 1 (T)	210 bar (3,000 psi)
Operating Pressure Port 2,3 and 4 (A, P and B)	250 bar (3,600 psi)
Rated burst pressure	750 bar (10,600 psi) per NFPA/T2-6-1 R2-2000
Rated flow	22.0 L/min (5.8 USgpm)
Temperature range	-40° to 120°C (-40° to 248°F)
Coil power	23 W*
Maximum hysteresis	7.0%
Step response	90 ms to 90% flow
Cavity	C-10-4
Weight including coils	1.1 kg (2.3 lbs)
Internal leakage for Spool E	165 cm ³ /min (10 in ³ /min) max. @ 210 bar (3000 psi)
Internal leakage for Spool F	250 cm ³ /min (15 in ³ /min) max. @ 210 bar (3000 psi)
Seal kit	SK2-10-4(Buna-N), SK2-10V-4(Viton®)

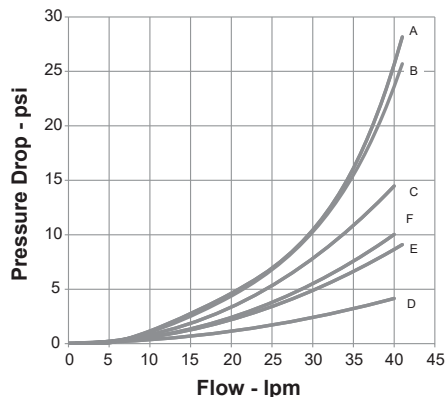
Viton is a registered trademark of E.I. DuPont

*AC coils must be used with a rectifying connector Endurance tested to 1 million cycles at full rated flow and pressure. 28 W is with Large ToughCoils™. ESV9-10 using EN490 coils the power required is 22 W.

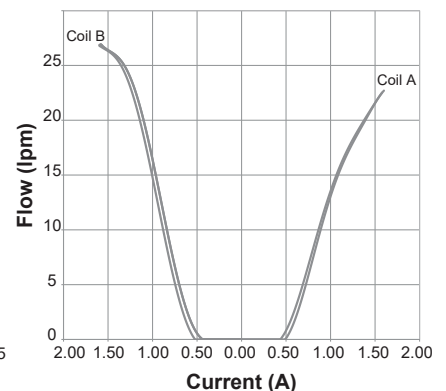
Pressure Drop for spool F



Pressure Drop for spool E



Flow vs. Current at 10 bar ΔP for spool E & F



A - Port 3 to port 2
B - Port 3 to port 4

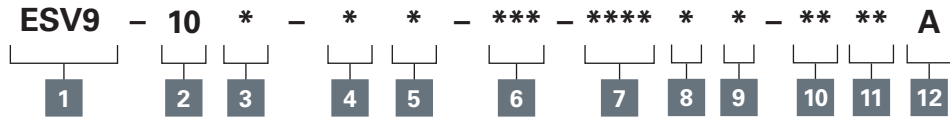
C - Port 4 to port 1
D - Port 2 to port 1

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ESV9-10 - Proportional solenoid valve

4-way, 3-position, proportional solenoid valve
Up to 22 L/min (5.8 USgpm) • Up to 250 bar (3600 psi)

Model code



1 Function

ESV9 - Proportional solenoid valve

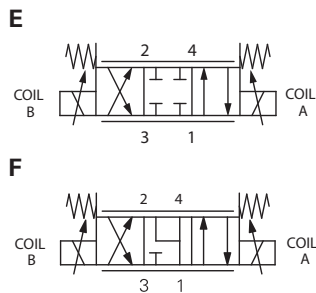
2 Size

10 - 10 size

3 Seal material

Blank - Buna-N
V - Viton®

4 Spool center condition



5 Manual override option

0 - No manual override
M - Manual override, push pull type
For valve dimensions with manual override, see pages B873.

6 Housing material and ports

Code	Port size	Housing number	
		Aluminium	Steel
0	Cartridge only		
A2G	1/4" BSPP	02-185804	
A3G	3/8" BSPP	02-185805	
A6H	SAE 6	02-185802	
A8H	SAE 8	02-185803	
S2G	1/4" BSPP		02-175139
S3G	3/8" BSPP		02-175140
S6T	SAE 6		02-175137
S8T	SAE 8		02-175138

See section J for housing details.

7 Coil voltage and type

000 - No coil
012D - 12V DC without diode
024D - 24V DC without diode
012B - 12V DC with diode
024B - 24V DC with diode

8 Connection type

Blank - No coil
N - Deutsch male, DT04-2P, integrated
G - DIN 43650
Y - Amp Jr (DC Only) Mating Connector: AMP 963040-3 or equivalent
D0 - MetriPackR 150 Male, Integrated (DC Only) Mating Connector: Delphi 12052641

See Section C for coil details.

9 Coil series

Blank - No coil
L - L Series Large ToughCoils™ 28 W

10 Coil special feature

00 - None

11 Valve special features¹

00 - None

(Only required if valve has special features omitted if "00".)

12 Design code

A - Design code 00

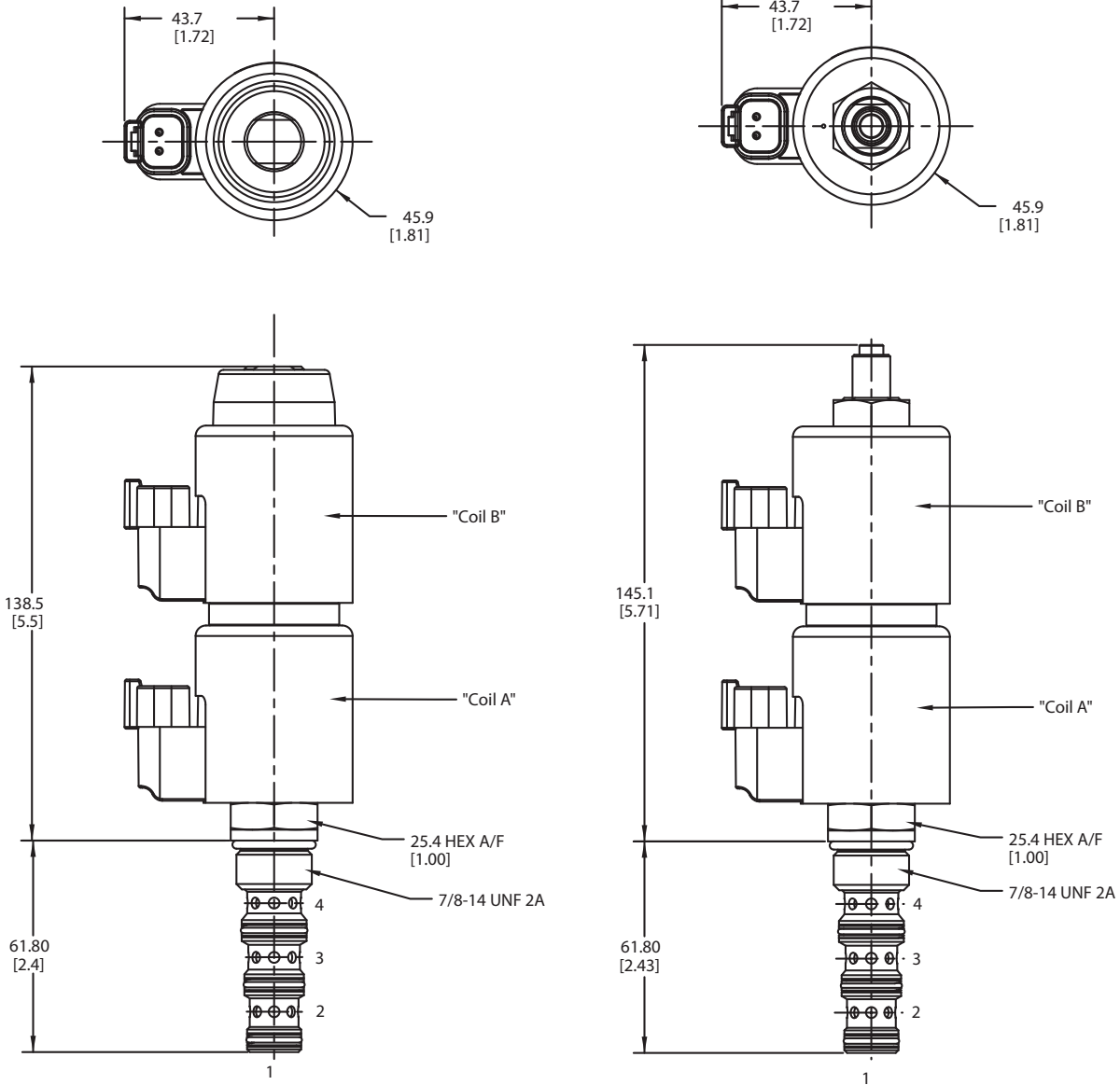
¹These model digits are not stamped on the valve.

ESV9-10 - Proportional Solenoid Valve

4-way, 3-position, screw-in cartridge, proportional solenoid valve
 Up to 22 L/min (5.8 USgpm) • 250 bar (3000 psi)

ESV9-10 without MO

ESV9-10 with MO



Dimensions

mm (inch)

Spare parts

Coil Nut for MO	6038813-001
Coil Nut without MO	02-148332
Coil Spacer	6038409-001

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

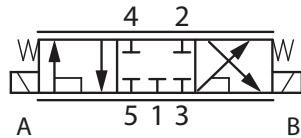
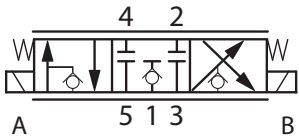
ESVL9-10 - Proportional solenoid valve

5 Port, 3-position, screw-in cartridge, proportional solenoid valve
Up to 23 L/min (USgpm) • Up to 250 bar (3600 psi)

ESVL9-10-E

With Load Sense check valve

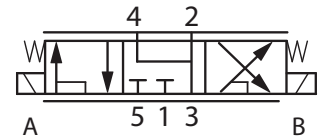
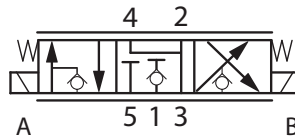
Without Load Sense check valve



ESVL9-10-F

With Load Sense check valve

Without Load Sense check valve



Operation

In the de-energized (center) position, all ports are blocked. When solenoid A is energized, flow is directed from port 5 to port 4 and from port 2 to port 3. Port 1 is connected to system load sense line.

When solenoid B is energized, flow is directed from port 5 to port 2 and from port 4 to port 3. Port 1 is connected to system load sense line.

Operation

In the de-energized (center) position, port 3, port 2, and port 4 are open to each other while port 5 is blocked. When solenoid A is energized, flow is directed from port 5 to port 4 and from port 2 to port 3. When solenoid B is energized, flow is directed from port 5 to port 2 and from port 4 to port 3.

Port 1 is connected to system load sense line.

Performance data

Ratings and specifications

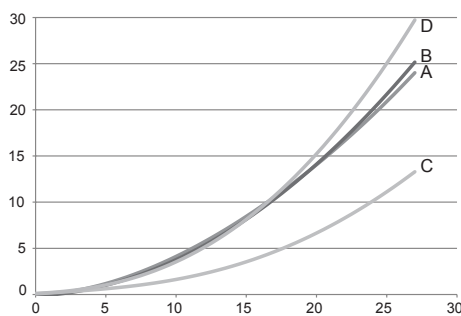
Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

Typical application pressure for all ports	250 bar (3,600 psi)
Rated burst pressure	750 bar (10,600 psi) per NFPA/T2-6-1 R2-2000
Max. flow	23 L/min (2.9 USgpm)
Temperature range	-40° to 120°C (-40° to 248°F)
Coil power	28 W*
Recommended PWM and Dither frequency	100 Hz
Cavity	C-10-5S
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20 etc.
Filtration	Cleanliness code 18/16/13
Standard housing material	Steel
Weight including coils with check valve	1.25 KG
Seal kit	9901261-000(Buna-N), 9901262-000(Viton®)
Internal leakage	250 cm ³ /min (10 in ³ /min) max. @ 210 bar (3000 psi)

Viton is a registered trademark of E.I. DuPont.

*AC coils must be used with a rectifying connector.

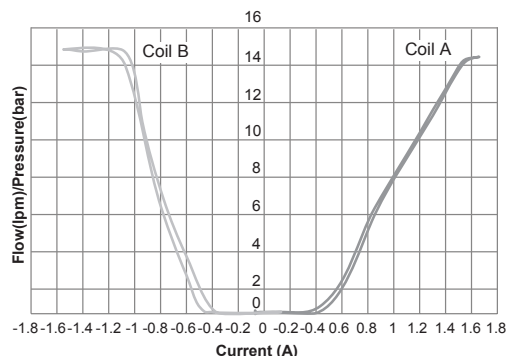
Pressure drop



A - Port 5 to port 4
B - Port 5 to port 2

C - Port 2 to port 3
D - Port 4 to port 3

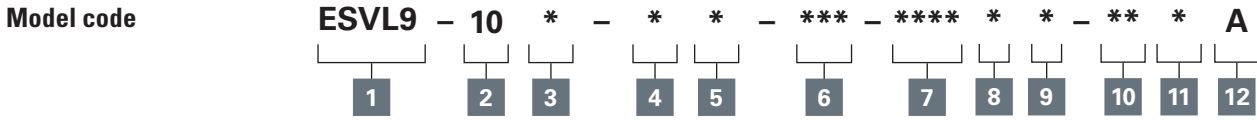
Flow vs. Current at 10 bar ΔP



Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ESVL9-10 - Proportional solenoid valve

5 Port, 3-position, screw-in cartridge, proportional solenoid valve
 Up to 23 L/min (USgpm) • Up to 250 bar (3600 psi)

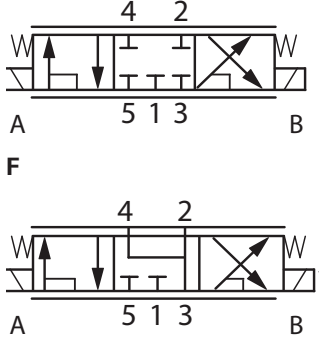


1 Function
ESVL9 - Proportional solenoid valve

2 Size
10 - 10 size

3 Seal material
Blank - Buna-N
V - Viton®

4 Spool center condition
E



5 Manual override option
0 - No manual override
M - Manual override, push pull type
 For valve dimensions with manual override, see pages B873.

6 Housing material and ports

Code	Port size	Housing number	
		Aluminium	Steel
0	Cartridge only		
S3G	3/8" BSPP		6042921-001

See section J for housing details.

7 Coil voltage and type
000 - No coil
012D - 12V DC without diode
024D - 24V DC without diode
012B - 12V DC with diode
024B - 24V DC with diode

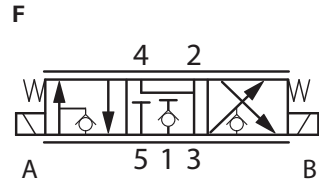
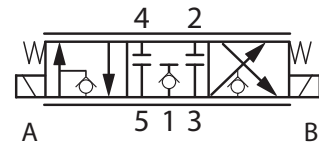
8 Connection type
Blank - No coil
G - DIN 43650-A Integrated
N - Deutsch male, DT04-2P, Integrated
D - Metric - Pack 150 male, Integrated
Y - AMP Junior, Integrated

See Section C for coil details.

9 Coil series
Blank - No coil
L - L Series Large ToughCoils™ 28 W

10 Coil special feature
00 - None

11 Valve special features¹
0 - None
C - With valve check
E



(Only required if valve has special features omitted if "00".)

12 Design code
A - Design code 00

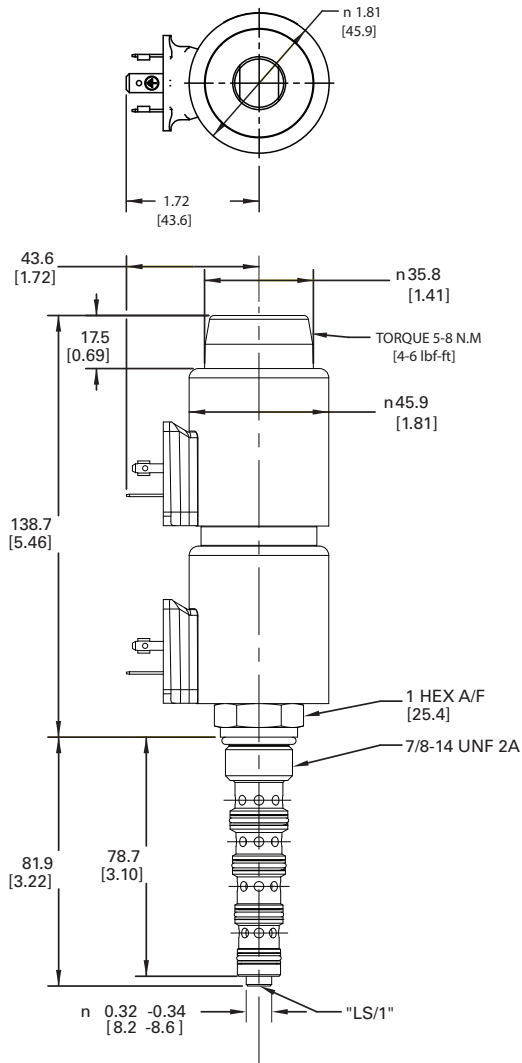
¹These model digits are not stamped on the valve.

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

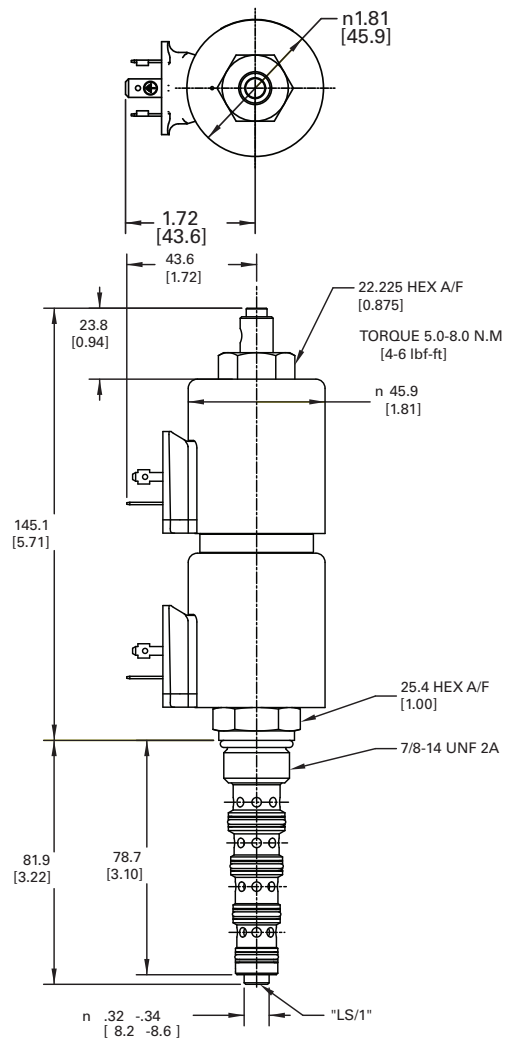
ESVL9-10 - Proportional solenoid valve

5 Port, 3-position, screw-in cartridge, proportional solenoid valve
Up to 23 L/min (USgpm) • Up to 250 bar (3600 psi)

ESVL9-10 without MO



ESVL9-10 with MO



Dimensions

mm (inch)

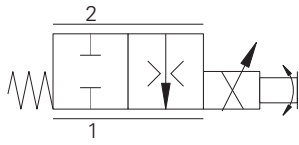
Spare parts

Coil Nut for MO	6038813-001
Coil Nut without MO	02-148332
Coil Spacer	6038409-001

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

PFR24A - Proportional valve

Bi-directional, normally closed poppet
18 L/min at 75% • 210 bar (3000 psi)



Operation

In the de-energized condition the valve is closed. As current is applied to the coil the valve opens proportionally allowing flow from port 2 to port 1.

Performance data

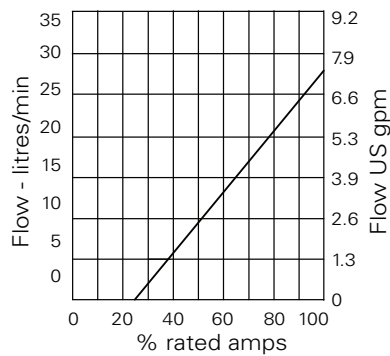
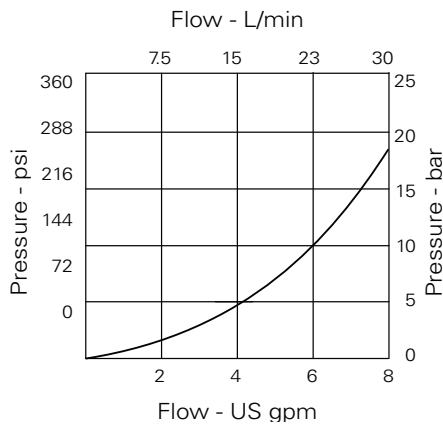
Ratings and specifications

Performance data is typical with fluid at 32 cSt (150 SUS)

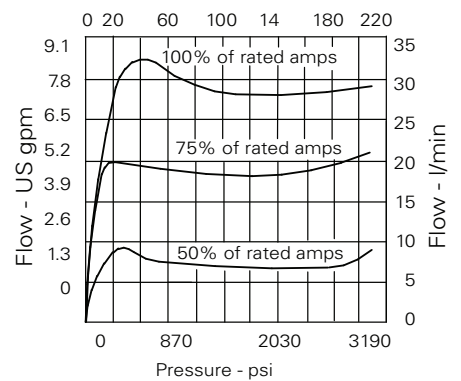
Max inlet pressure	210 bar (3000 psi)
Rated flow	28 L/min @ 100%, 23 L/min @ 85%, 18 L/min @ 75%
Hysteresis	8% maximum without PWM, 4% maximum with PWM
Frequency	200 Hz to 400 Hz - 200 recommended
Dead band	25-35% of rated current
Response time	300 ms
Internal leakage	Up to 200 ml/min, 210 bar differential
Temperature range	-30° to 120°C (-22° to 248°F)
Cavity	A6701 (see section M)
Torque cartridge into cavity	30 Nm (22 lbs ft)
Mounting position	Unrestricted
Fluids	All general purpose hydraulics fluids such as: MIL-H-5606, SAE 10, SAE 20, etc
Filtration	BS5540/4 Class 16/13 (25 micron or better)
Housing material	Aluminium
Nominal viscosity range	15 to 250 cSt
Coil Weight	0.3 kg (0.6 lbs)
Weight	0.2 kg (0.44 lbs)
Seal kit	SK1138 (Nitrile) SK1138V (Viton®)

Viton is a registered trademark of E.I. DuPont

Pressure drop curves



Pressure differential - bar

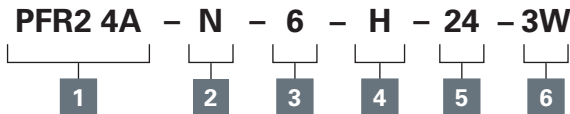


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

PFR24A - Proportional Valve

Proportional bi-directional, normally closed poppet
18 L/min at 75% • 210 bar (3000 psi)

Model code



1 Function
PFR2 4A - Cartridge only

2 Seal material
N - Nitrile
V - Viton®

3 Manual override
6 - Screw

4 Coil termination
H - DIN43650
F - Flying Lead
DM - Deutsch moulded

Other terminations available on request.

5 Voltage
12 - 12 VDC
24 - 24 VDC

6 Port size

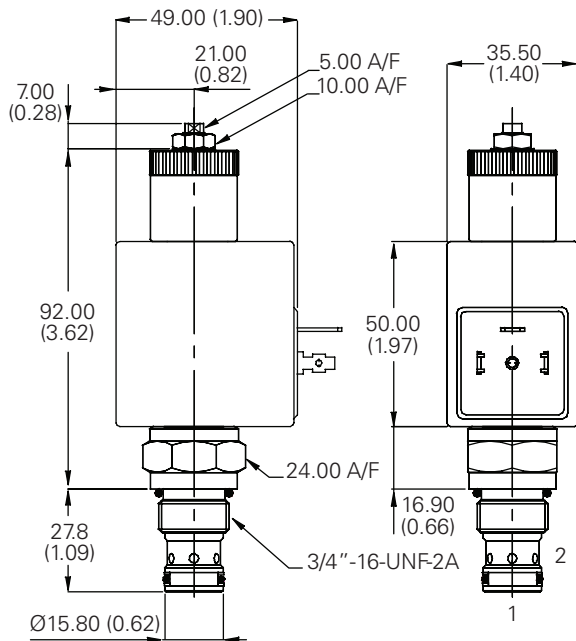
Code	Port size	Housing number
		Aluminium
0		Cartridge only
2W	1/4" BSP	A12592
3W	3/8" BSP	A7450
6T	3/8" SAE	A19355

See section J for housing details.

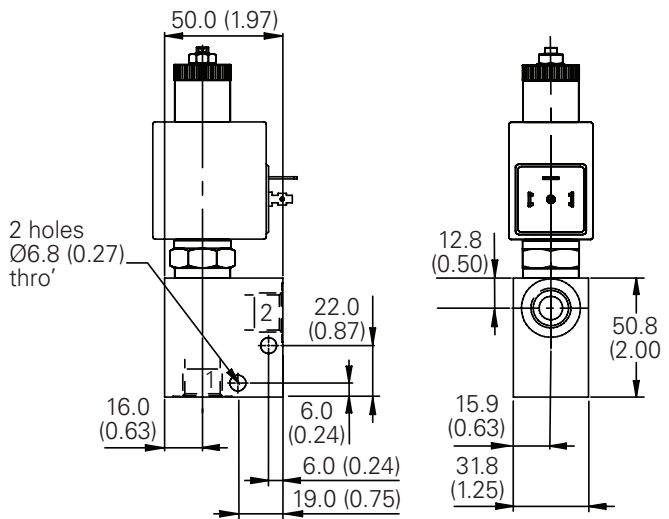
Dimensions

mm (inch)

Cartridge only



Installation drawing

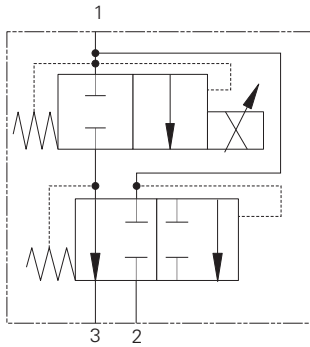


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EFV2-12-C / O - Proportional valve

Proportional flow, Normally open & Normally close spool
Up to 114 L/min (30 USgpm) • 210 bar (3000 psi)

EFV2-12-C

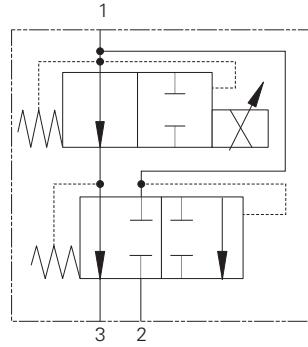


Operation

Current supplied to the coil controls the valve. At zero current, the valve is fully closed from port 1 to port 3. At 1500 to 1600 mA (12V coil) the valve is fully open.

The valve will regulate flow out of port 3 regardless of downstream system pressure. As current is increased to the solenoid the flow out of port 3 will increase.

EFV2-12-O



Operation

Current supplied to the coil controls the valve. At zero current, the valve is fully open from port 1 to port 3. At 1600 mA (12V coil) the valve is fully closed.

The valve will regulate flow out of port 3 regardless of downstream system pressure. As current is increased to the solenoid the flow out of port 3 will decrease.

Performance data for closed spool

Ratings and specifications

Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

Typical application pressure	210 bar (3000 psi)
Cartridge endurance rating	1 million cycles
Cartridge fatigue pressure (infinite life)	210 bar (3000 psi) NFPA rated
Rated flow for closed spool	"A" Spool-max regulated flow (by-pass mode): 57 L/min (15 USgpm) max regulated flow (2 port mode): 53 L/min (14 USgpm) max input flow (input flow): 114 L/min (30 USgpm) "B" Spool-max regulated flow (by-pass mode): 38 L/min (10 USgpm) max regulated flow (2 port mode): 31 L/min (8 USgpm) max input flow (input flow): 114 L/min (30 USgpm) Note: Max regulated flow may decrease slightly during compensation.
Rated flow for normally open spool	"A" Spool-max regulated flow (by-pass mode): 53 L/min (14 USgpm) max regulated flow (2 port mode): 42 L/min (11 USgpm) max input flow (input flow): 114 L/min (30 USgpm) "B" Spool-max regulated flow (by-pass mode): 38 L/min (10 USgpm) max regulated flow (2 port mode): 31 L/min (8 USgpm) max input flow (input flow): 114 L/min (30 USgpm) Note: Max regulated flow may decrease slightly during compensation.
Internal leakage Normally closed	240 cm ³ /min (15 in ³ /min) @ 3000 PSID
Internal leakage Normally open	77-483 cm ³ /min (5-30 in ³ /min) @ 3000 PSID
Nominal supply voltage	12/24 V
Current to fully open valve	Normally closed 1600 ± 200 mA (12V coil), 800 ± 100 mA (24V coil) Normally open 350 ± 100 mA (12V coil), 800 ± 100 mA (24V coil)
Current to fully close valve	Normally closed 350 ± 100 mA (12V coil), 175 ± 50 mA (24V coil) Normally open 1600 ± 200 mA (12V coil), 800 ± 100 mA (24V coil)
Recommended PWM frequency	200-400 Hz
Coil resistance	4.7v V/12V, 19.0 V/24V
Mass	Cartridge only 0,37 kg (0.82 lb), cartridge with coil and end nut 0,73 kg (1.62 lb)
Temperature range	-30° to 90°C (-22° to 194°F)
Maximum oil temperature	120°C (248°F)
Maximum internal coil temperature	200°C (392°F)
Cavity	C-12-3
Fluids	All general purpose hydraulics fluids such as: MIL-H-5606, SAE 10, SAE 20, DTE 24, etc.
Filtration	Cleanliness code 18/16/13
Housing material (standard)	Aluminum or steel
Hysteresis	1.5 USgpm with 400Hz PWM driver
Seal kit	9900171-000 (Buna-N), 9900172-000 (Viton®)

Viton is a registered trademark of E.I. DuPont

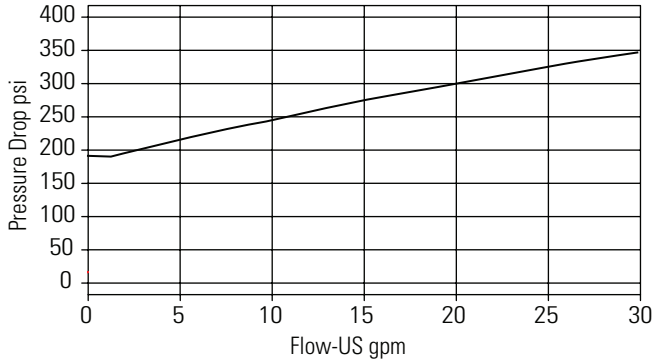
Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EFV2-12-C - Proportional valve

Up to 114 L/min (30 USgpm) • 210 bar (3000 psi)
Performance Curves

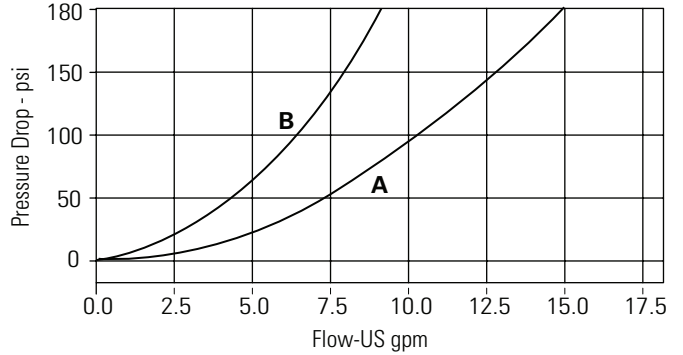
Flow vs Pressure drop

Excess flow P1 to P2 (P3 to Atm)
Full current (1700 mA on a 12V Coil)



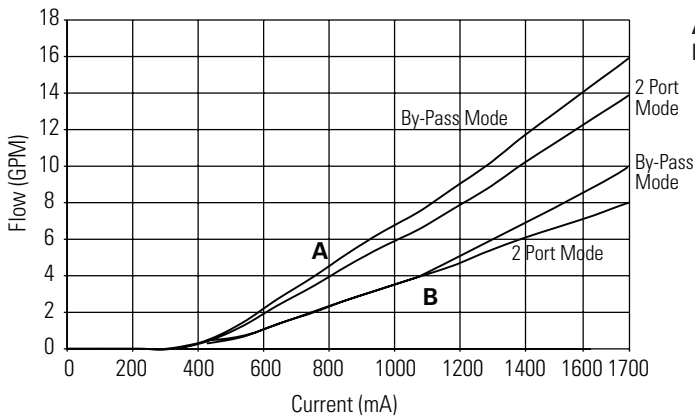
Flow vs Pressure drop

Regulated flow P1 to P3 (P2 to Atm)
Full current (1700 mA on a 12V Coil)



A - A spool pressure drop
B - B spool pressure drop

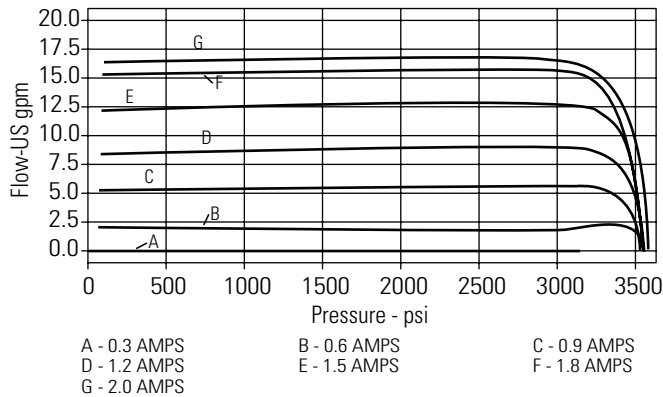
Flow vs Current



A - A spool
B - B spool

Regulated flow vs Pressure

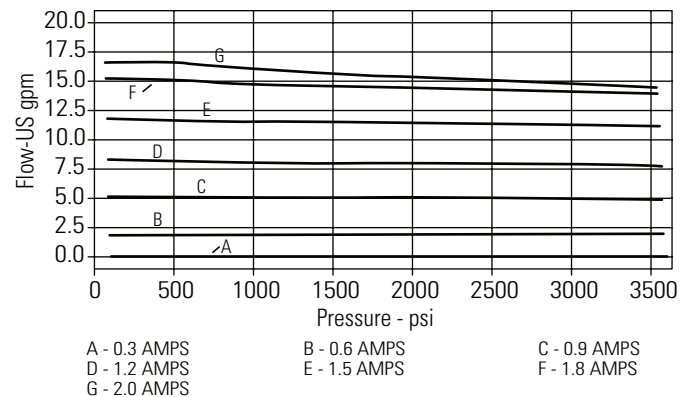
Regular to Bypass



A - 0.3 AMPS B - 0.6 AMPS C - 0.9 AMPS
D - 1.2 AMPS E - 1.5 AMPS F - 1.8 AMPS
G - 2.0 AMPS

Regulated flow vs Pressure

Bypass to Regular



A - 0.3 AMPS B - 0.6 AMPS C - 0.9 AMPS
D - 1.2 AMPS E - 1.5 AMPS F - 1.8 AMPS
G - 2.0 AMPS

Note: Pressure Compensation curves are shown for "B" spool valves.

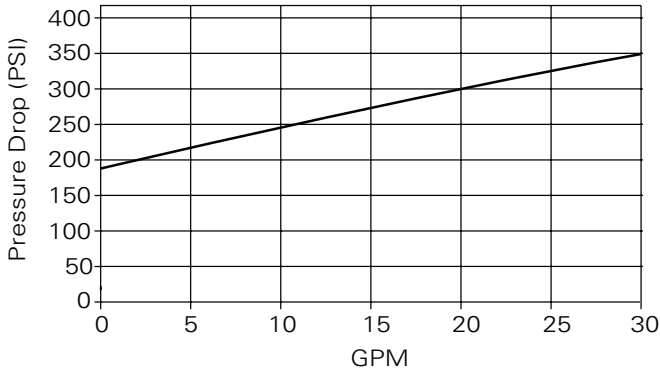
Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

B

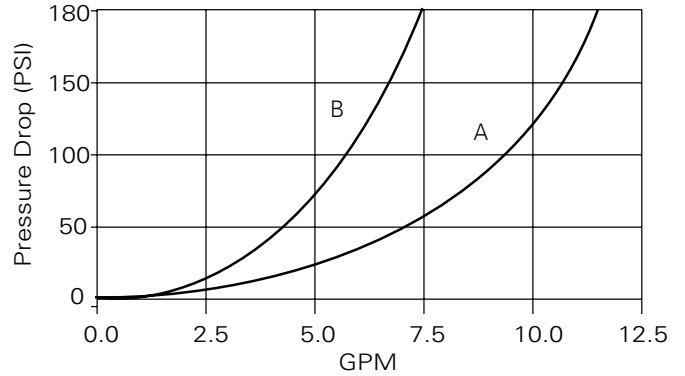
EFV2-12-O - Proportional valve

Up to 114 L/min (30 USgpm) • 210 bar (3000 psi)
Performance Curves

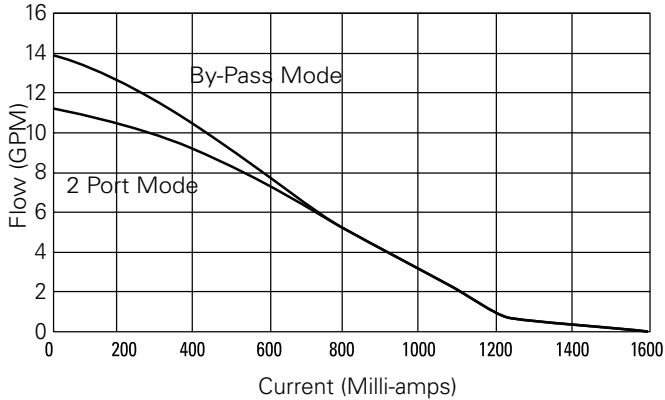
Pressure drop port 1 to port 2



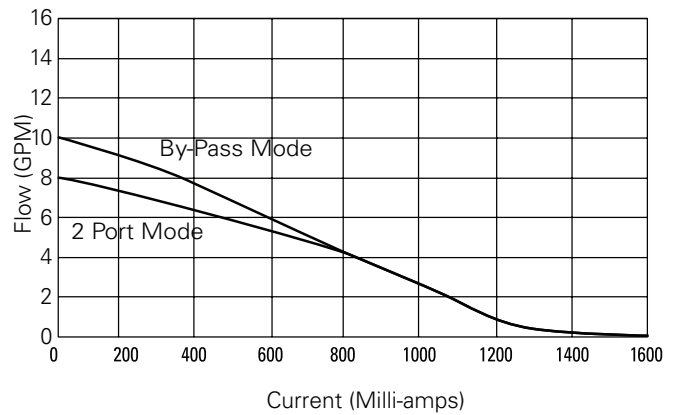
Pressure drop port 1 to port 3



Flow vs Current - A Spool



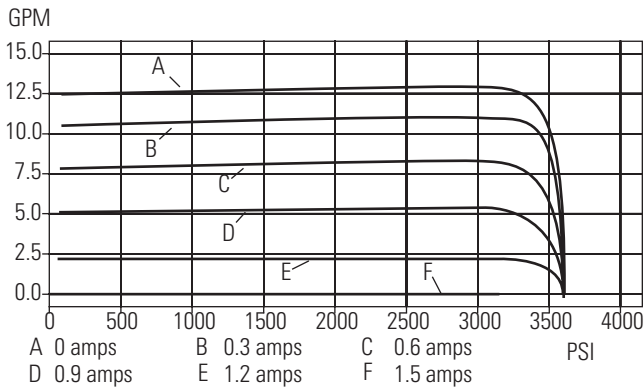
Flow vs Current - B Spool



Parameters: 400 Hz PWM

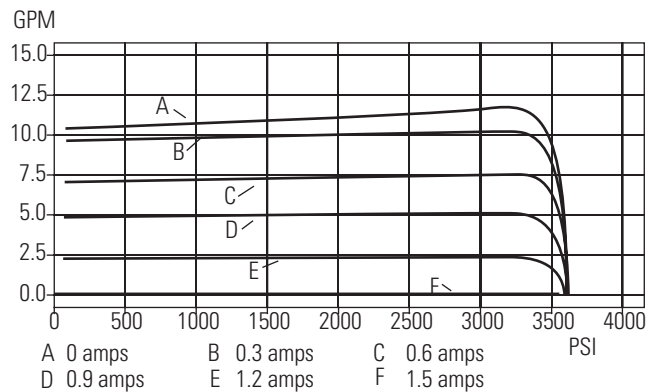
Regulated flow vs Pressure

Port 3 Pressure > Port 2 Pressure



Regulated flow vs Pressure

Port 2 Pressure > Port 3 Pressure



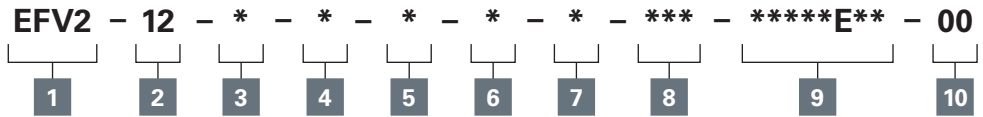
Note: Pressure Compensation curves are shown for "B" spool valves.

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EFV2-12-C / O - Proportional valve

Proportional flow, Normally open & Normally close spool
Up to 114 L/min (30 USgpm) • 210 bar (3000 psi)

Model code



1 Function

EFV2 - Electro proportional flow control valve

2 Size

12 - 12 size

3 Seal material

N - Buna-N
V - Viton®

4 Logic

C - Normally closed
O - Normally Open

5 Flow rating

A - 15 USgpm @ 180 PSID
B - 10 USgpm @ 180 PSID

See specifications

6 Manual override option

0 - No Manual Override
S - Screw-in

7 Valve housing material

0 - Cartridge only
A - Aluminum
S - Steel

9 Coil series

E - E series coils

*These model digits will not be stamped on the valve. For coil part numbers and dimensions see section C.

8 Port Size

Code	Port size	Housing number	
		Aluminium single	Steel single
0	Cartridge only		
04G	1/2" BSPP	02-161817	02-169815
06G	3/4" BSPP	02-161816	02-169814
10T	SAE 10	02-160642	02-161070
12T	SAE 12	02-160646	02-169816

Note: Both the manifold and port plug are required. See section J for housing details.

10 Special features

00 - None

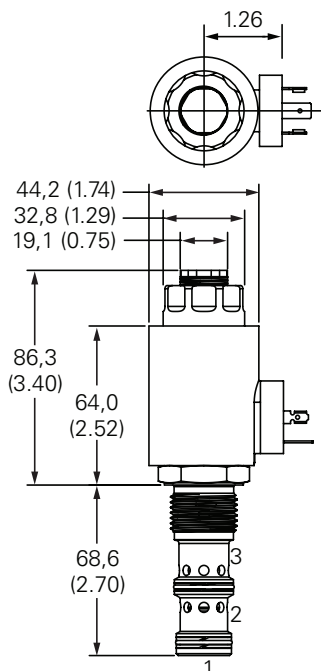
Only required when valve has special features, omitted if "00".

Dimensions

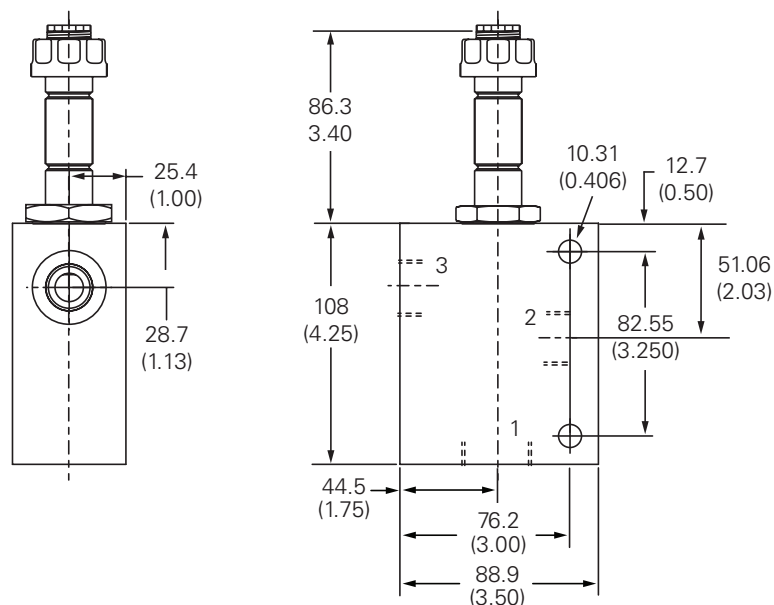
mm (inch)

Note: EFV2-12 with DIN-43650 connector shown.

Cartridge only



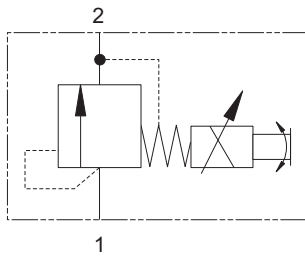
Installation drawing (Aluminum)



Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

PDR21A - Proportional valve

Proportional relief
 1.5 L/min (.3 USgpm) • 350 bar (5000 psi)



Operation

The poppet is held on the seat by a light spring. The force is increased by the application of magnetic force due to the increase in current. This increases the pressure required to lift the poppet of the seat thus controlling the pressure.

Performance data

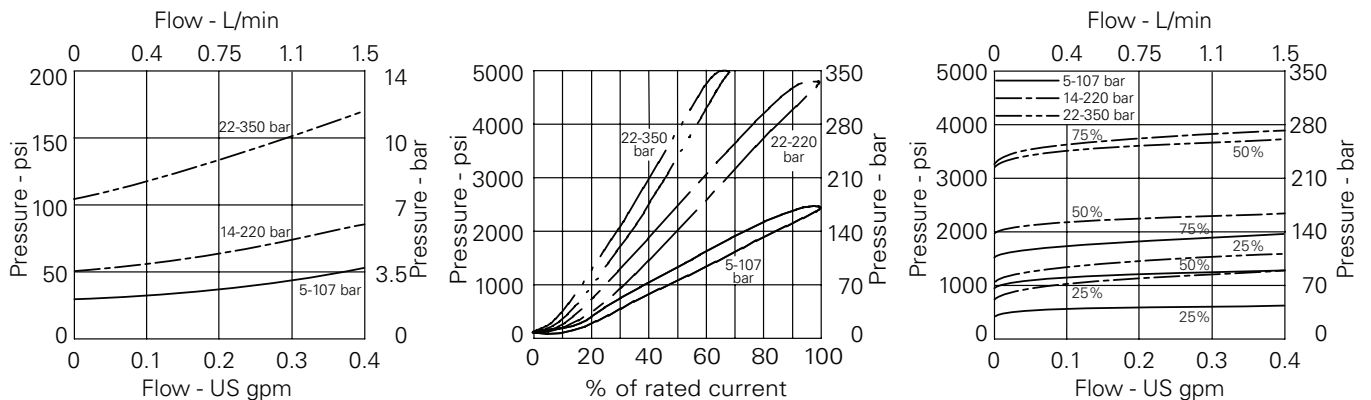
Ratings and specifications

Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49°C (120°F)

Max inlet pressure	350 bar (5000 psi)
Pressure range	10 = 5-107 bar (72-1550 psi), 20 = 14-220 bar (200-3200 psi), 35 = 22-350 bar (320-5000 psi)
Max press port 2	100 bar (1450 psi)
Max flow	1.5 L/min (.3 US GPM)
Hysteresis	<12.5% without PWM
Dead band	10% approx
Response time	10 = 2-193 ms, 20 = 3-395 ms, 35 = 2-358 ms
Internal leakage	<5 ml/min
Temperature range	-30° to 120°C (-22° to 248°F)
Cavity	A879 (see Section M)
Torque cartridge into cavity	40 Nm (29.5 lbs ft)
Mounting position	For best results mount below reservoir oil level. If this is not feasible mount horizontally
Seal material	Standard nitrile with PTFE back up rings
Filtration	BS5540/4 Class 18/13 (25 micron or better)
Housing materials	Aluminium
Nominal viscosity range	15 to 250 cSt
Coil Model Code	C16-*.*/19
Coil Weight	0.3 kg (0.6 lbs)
Weight	0.25 kg (0.55 lbs)
Voltage available	12/24 VDC
Seal kit	SK1119 (Nitrile) SK1119V (Viton®)

Viton is a registered trademark of E.I. DuPont

Performance curves

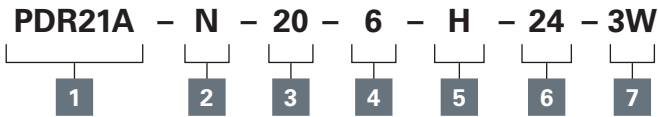


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

PDR21A - Proportional valve

Proportional relief
1.5 L/min (.3 USgpm) • 350 bar (5000 psi)

Model code



1 Function

PDR21A - Normally open

2 Seal material

N - Nitrile
V - Viton

3 Pressure range

10 - 5 to 120 bar
20 - 10 to 240 bar

4 Manual override

6 - Screw

5 Coil termination

H - DIN43650
F - Flying Lead
DM - Deutsch moulded
Other terminations available on request.

6 Voltage

12 - 12 VDC
24 - 24 VDC

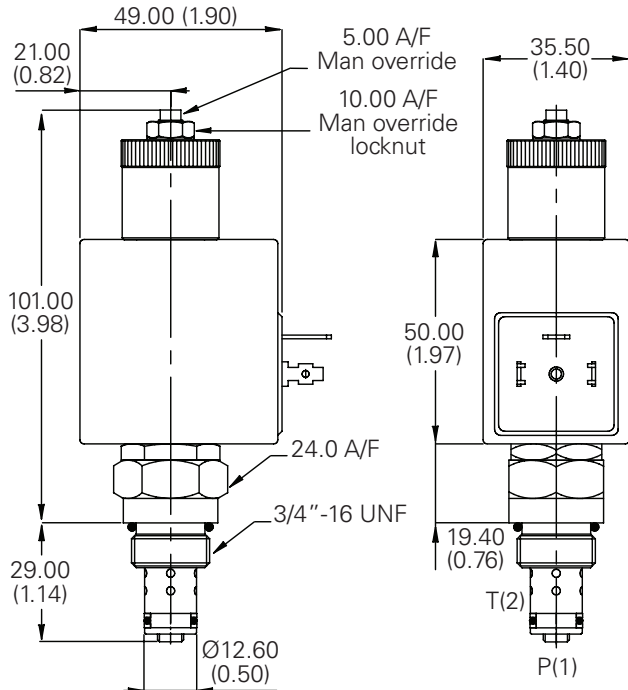
7 Port size

Code	Port size	Housing number	
		Aluminum	Steel
0	Cartridge only		
2W	1/4" BSP	A1485	A14128
3W	3/8" BSP	A1043	A14175
4T	1/4" SAE	A14842	-
6T	3/8" SAE	A15676	A14843

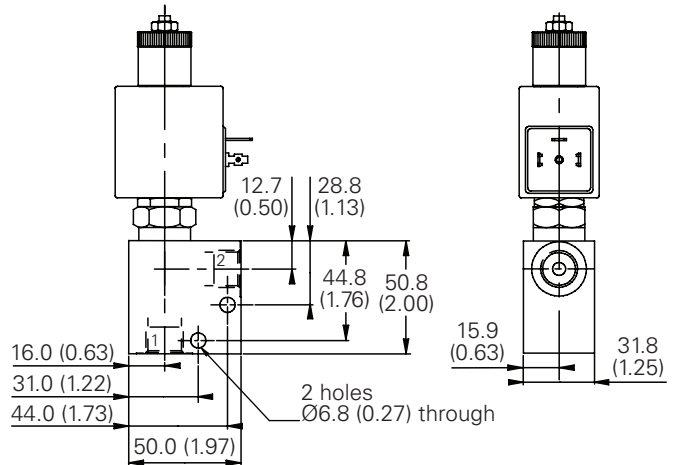
Dimensions

mm (inch)

Cartridge only



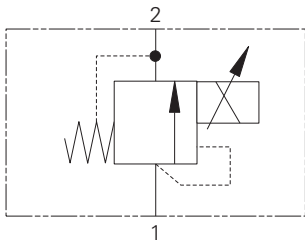
Installation drawing



Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

IRV1-10 - Proportional valve

Proportional inverse relief, poppet
 1 L/min (.25 USgpm) • 210 bar (3000 psi)



Operation

The IRV1-10 proportional relief is spring biased closed to the highest setting. Increasing current to the coil will proportionally decrease the pressure setting.

When the pressure at port 1 (inlet) is enough to overcome the spring force, the poppet lifts and allows flow from port 1 to port 2 (outlet).

Performance data

Ratings and specifications

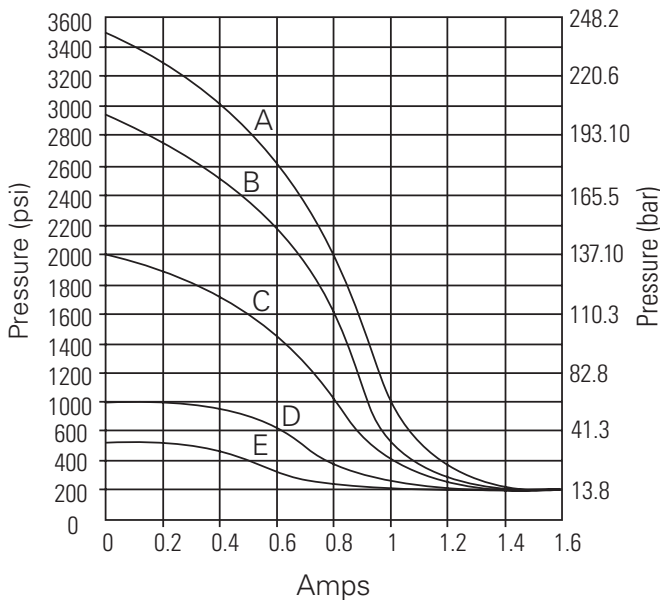
Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

Typical application pressure	210 bar (3000 psi)
Cartridge endurance rating	1 million cycles
Maximum pressure setting range	35-210 bar (3000 psi)
Rated flow	1 L/min, (0.25 USgpm)
Nominal supply voltage	12/24 V
Temperature range	-30° to 90°C (-22° to 194°F)
Maximum oil temperature	120°C (248°F)
Maximum internal oil temperature	200°C (392°F)
Cavity	C-10-2
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc.
Filtration	Cleanliness code 18/16/13
Housing materials	Aluminium
Hysteresis	100 psi with dither
Weight cartridge only	0,13 kg (0.3 lbs)
Seal kit	565803 (Buna-N), 566086 (Viton®)

Viton is a registered trademark of E.I. DuPont
 Endurance tested to 1 million cycles at full rated flow and pressure.

Pressure drop

Metering Performance



Pressure Differential

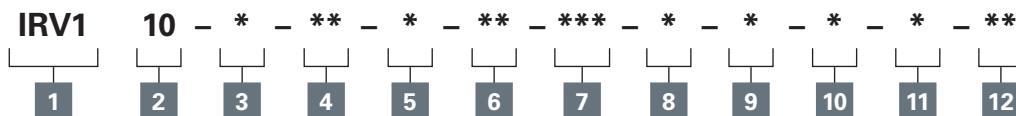
- A - 3500 psi B - 3000 psi
- C - 2000 psi D - 1000 psi
- E - 500 psi

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

IRV1-10 - Proportional valve

Proportional inverse relief, poppet
1 L/min (.25 USgpm) • 210 bar (3000 psi)

Model code



1 Function

IRV1 - Inverse proportional relief

2 Size

10 - 10 size

3 Seal material

Blank - Buna-N
V - Viton®

4 Factory set pressure

User requested in **100 psi** increments. Max pressure setting range 500 - 3000 psi

Example

15 - 1500 psi
30 - 3000 psi

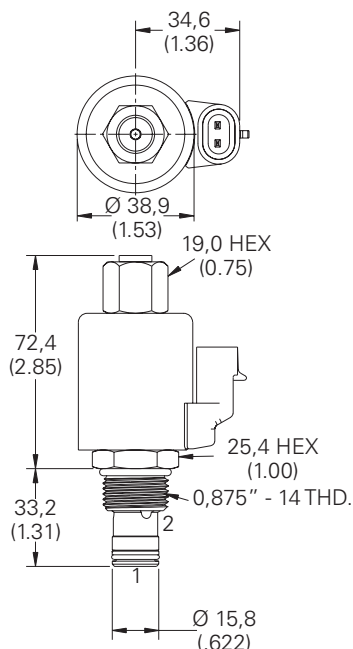
5 Housing material

Blank - Cartridge only
A - Aluminum

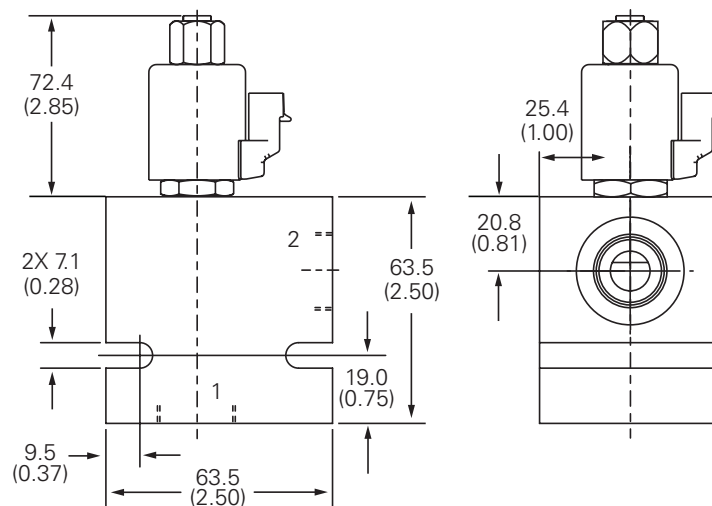
Dimensions

mm (inch)

Cartridge only



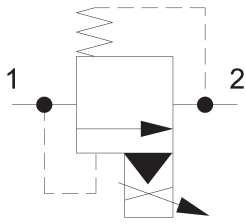
Installation drawing



Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

IRV2-10 - Proportional valve

Proportional inverse relief, Spool
 57 L/min (15 USgpm) • 240 bar (3500 psi)



Operation

The IRV2-10 proportional relief is spring biased closed to highest setting. Increasing current to the coil will proportionally decrease the pressure setting.

This valve remains closed between port 1 and 2 until the predetermined pressure setting has been reached at port 1, overcoming the spring force and opening the spool to allow flow from port 1 to 2.

Performance data

Ratings and specifications

Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

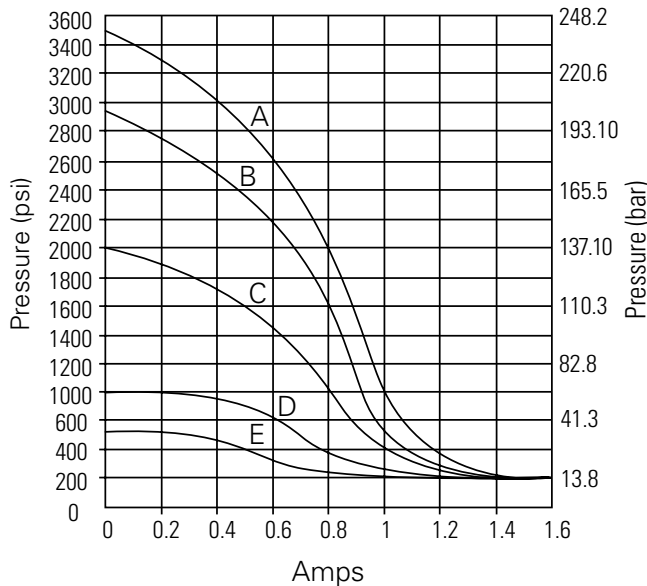
Typical application pressure (all ports)	240 bar (3500 psi)
Maximum pressure setting range	35 bar to 240 bar (500 to 3500 psi)
Rated Flow	57 lpm (15 US gpm)
Nominal supply voltage	12/24 V
Cavity	C-10-2
Internal leakage, port 1 to port 2	114 cm ³ /min. (7 in ³ /min) @ 210 bar
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE10, SAE20 etc
Filtration	Cleanliness code 18/16/13
Housing materials	Aluminium
Temperature range	-40° to 120° C (-40° to 248° F)
Hysterisis	100 psi with dither
Weight cartridge only	0.13 kg (0.3 lbs)
Seal Kit	565803 (Buna-N), 56086 (Viton®)

Viton is a registered trademark of E.I. DuPont.

Endurance tested to 1 million cycles at full rated flow and pressure.

Pressure drop

Metering Performance



Pressure Differential

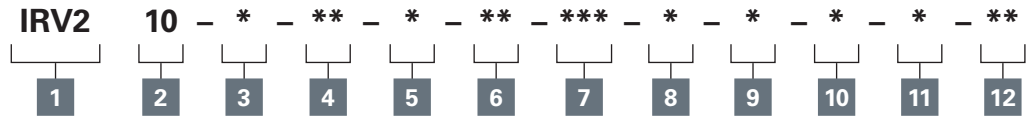
- A - 3500 psi B - 3000 psi
- C - 2000 psi D - 1000 psi
- E - 500 psi

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

IRV2-10 - Proportional valve

Proportional inverse relief, Spool
57 L/min (15 USgpm) • 240 bar (3500 psi)

Model code



1 Function

IRV2 - Inverse proportional relief

2 Size

10 - 10 size

3 Seal material

Blank - Buna-N
V - Viton®

4 Factory set pressure

User requested in **100 psi** increments. Max pressure setting range 500 - 3000 psi

Example

15 - 1500 psi
30 - 3000 psi

5 Housing material

Blank - Cartridge only
A - Aluminum

6 Port size

Code	Port size	Housing number	
		Aluminum Single	Aluminum Single
		Light duty	Fatigue rated
0	Cartridge only		
6T	SAE 6	566150	
8T	SAE 8	566151	
2G	1/4" BSPP		5986433-001
3G	3/8" BSPP		876703
6H	SAE 6		876700
8H	SAE 8		876701

See section J for housing details.

7 Coil voltage

00 - No coil
010 - 10VDC
012 - 12VDC
024 - 24VDC

8 Type of power

Blank - No coil
D - DC w/o diode
B - DC with diode

9 Connector type

Blank - No coil
G - ISO 4400 DIN 43650
W - Flying lead
N - Deutsch (DC only)
Y - Amp JR (DC only)
D - Metripack 150 male (DC only)
J - Metripack 280 male (DC only)
E - Weather-Pack female
F - Weather-Pack male
For coil part numbers and dimensions see section C.

10 Coil series

Blank - No coil
J - J Series, 23 W
For coil part numbers and dimensions see section C.

11 Coil special features

Blank - No coil
00 - No special feature

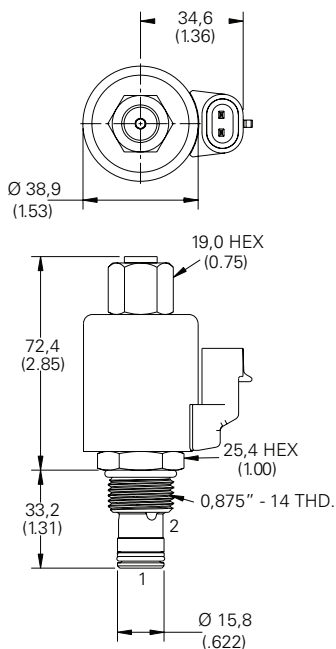
12 Valve special features

Blank - No special feature

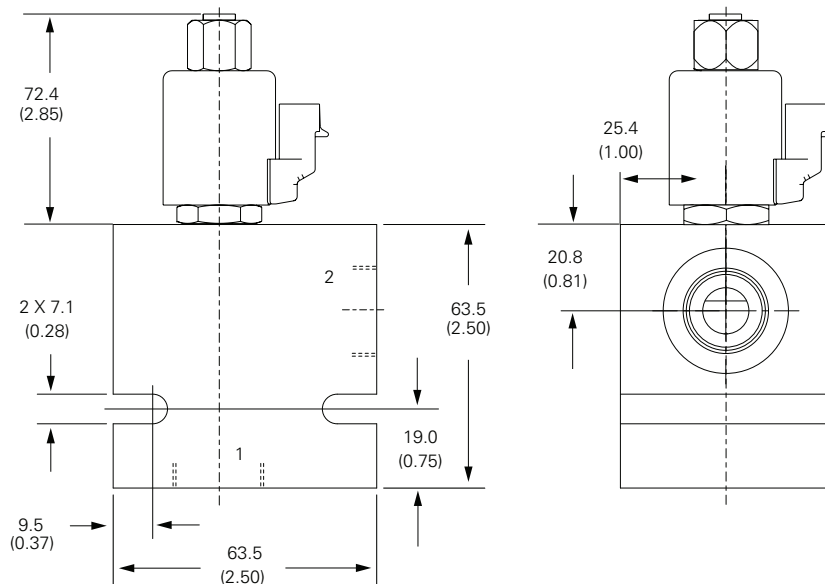
Dimensions

mm (inch)

Cartridge only



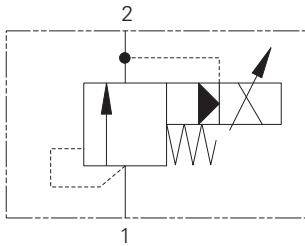
Installation drawing



Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ERV1-10 - Proportional valve

Proportional relief, spool
 3.8 - 6.0 L/min (1 - 15 USgpm) • 240 bar (3500 psi)



Operation

This valve remains closed between port 1 and 2 until the predetermined pressure setting has been reached at port 1, overcoming the electrical force and opening the spool to allow flow from port 1 to port 2.

Performance data

Ratings and specifications

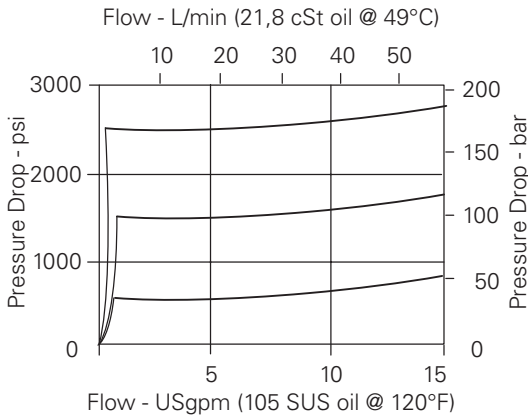
Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49°C (120°F)

Typical application pressure (all ports)	2-240 bar (30-3500 psi)
Rated flow	3.8-60,0 L/min (1-15 USgpm)
Temperature range	-40° to 120°C (-40° to 248°F)
Cavity	C-10-2
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20 etc.
Filtration	Cleanliness code 18/16/13
Housing materials	Aluminium
Weight including coil	0,44 kg (0.98 lbs)
Seal kit	565803 (Buna-N), 889627 (Viton®)

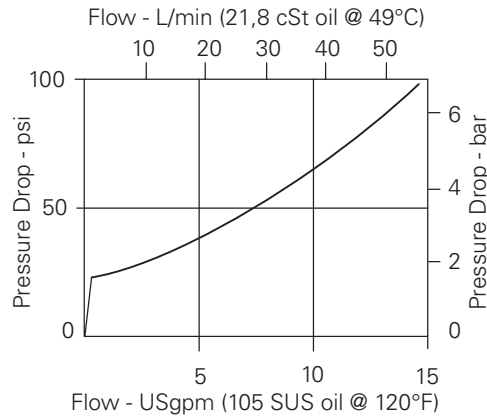
Viton is a registered trademark of E.I. DuPont

Pressure drop curves

Pressure override, energized

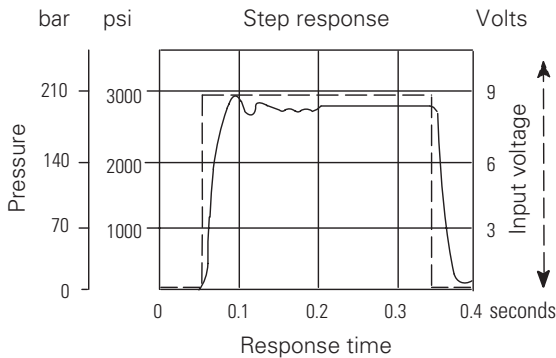


Pressure override, de-energized

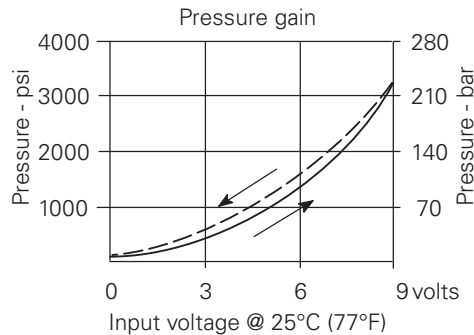


Performance curves

Cartridges only



Zero outlet pressure

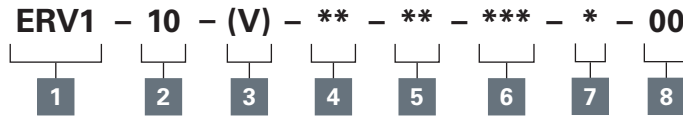


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ERV1-10 - Proportional valve

Proportional relief, spool
3.8 L/min (60 USgpm) • 240 bar (3500 psi)

Model code



1 Function

ERV1 - Proportional relief valve

2 Size

10 - 10 size

3 Seal material

Blank - Buna-N

V - Viton®

4 Maximum pressure

Customer to specify settings in increments of 7 bar (100 psi) and coded in hundreds of psi within the 35-210 bar range (500-3000 psi) range.

Example: 5-35,0 (500 psi)

5 Port size

Code	Port size	Housing number
Aluminum single		
0	Cartridge only	
6T	SAE 6	566151*
2G	1/4" BSPP	876702*
3G	3/8" BSPP	876703
6H	SAE 6	876700
8H	SAE 8	876701

*Light duty housing.
See section J for housing details.

6 Voltage rating

00 - No coil
12D - 12VDC
24D - 24VDC
12B - 12VDC/w diode*
24B - 24VDC/w diode*

*Optional arc suppression diode.

Note: This valve uses the standard J series coils, see section C for coil part numbers and specifications.

7 Connector types

Blank - No coil

G - ISO 4400 DIN 43650

W - Flying lead

N - Deutsch (DC only)

Y - Amp JR (DC only)

D - Metripack 150 male (DC only)

J - Metripack 280 male (DC only)

E - Weather-Pack female

F - Weather-Pack male

For coil part numbers and dimensions see section C.

8 Special features

00 - None

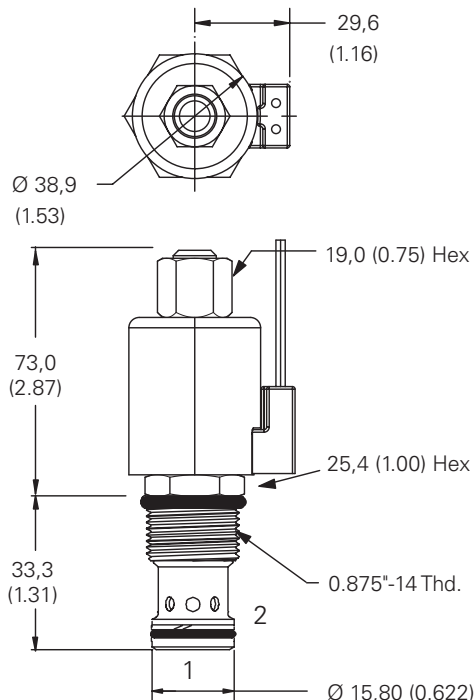
Only required if valve has special features, omitted if "00."

Dimensions

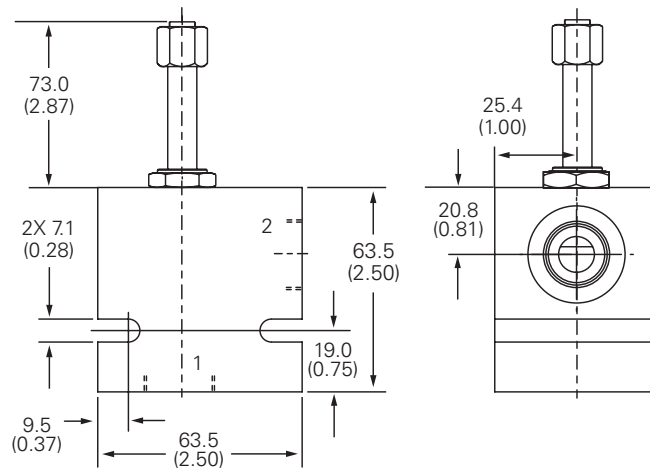
mm (inch)

Cartridge only

Valve is shown with "W" coil.



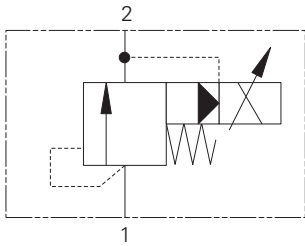
Installation drawing



Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ERV1-16 - Proportional valve

Proportional relief, spool
Up to 132 L/min (35 USgpm) • 210 bar (3000 psi)



Operation

This valve remains closed between port 1 and 2 until the predetermined pressure setting has been reached at port 1, overcoming the electrical force and opening the spool to allow flow from port 1 to port 2.

Performance data

Ratings and specifications

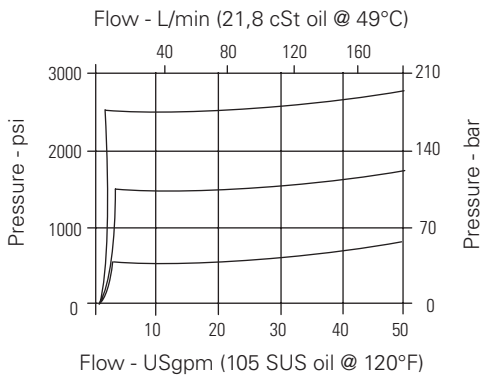
Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49°C (120°F)

Typical application pressure (all ports)	3,5-210 bar (50-3000 psi)
Rated flow	7,6-132,0 L/min (2-35 USgpm)
Temperature range	-40° to 120°C (-40° to 248°F)
Cavity	C-16-2
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20 etc.
Filtration	Cleanliness code 18/16/13
Housing materials	Aluminium
Weight including coil	0,44 kg (0.98 lbs)
Seal kit	565810 (Buna-N), 889609 (Viton®)

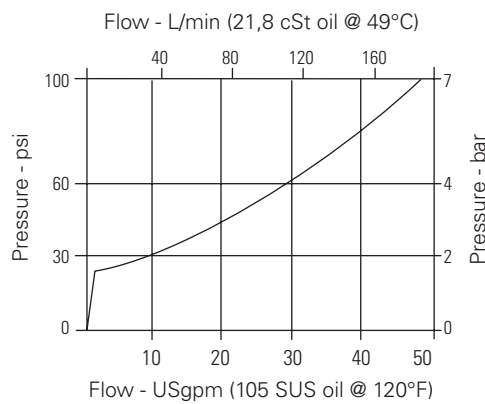
Viton is a registered trademark of E.I. DuPont

Pressure drop curves

Pressure override, energized

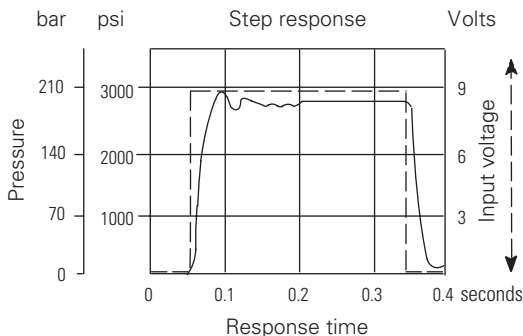


Pressure override, de-energized

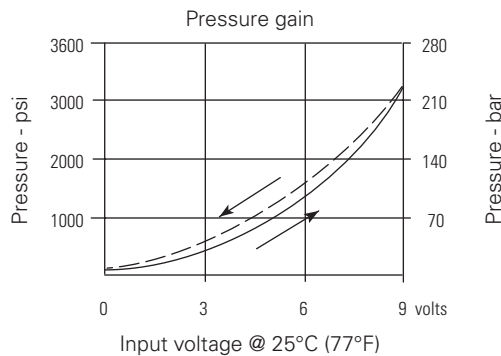


Performance curves

Cartridges only



Zero outlet pressure



Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

ERV1-16 - Proportional valve

Proportional relief, spool
Up to 132 L/min (35 USgpm) • 210 bar (3000 psi)

Model code



1 Function

ERV1 - Proportional relief valve

2 Size

16 - 16 size

3 Seal material

Blank - Buna-N
V - Viton®

4 Maximum pressure

Customer to specify settings in increments of 7 bar (100 psi) and coded in hundreds of psi within the 35-210 bar range (500-3000 psi) range.
Example: 5-35,0 (500 psi)

5 Port size

Code	Port size	Housing number
Aluminum single		
0	Cartridge only	
12T	SAE 12	566149*
4G	1/2" BSPP	876716*
6G	3/4" BSPP	876718
10H	SAE 10	876717
12H	SAE 12	566113

*Light duty housing.
See section J for housing details.

6 Voltage rating

00 - No coil
12D - 12VDC
24D - 24VDC
12B - 12VDC/w diode*
24B - 24VDC/w diode*

*Optional arc suppression diode.
Note: This valve uses the standard J series coils, see section C for coil part numbers and specifications.

7 Connector types

Blank - No coil
G - ISO 4400 DIN 43650
W - Flying lead
N - Deutsch (DC only)
Y - Amp JR (DC only)
D - Metripack 150 male (DC only)
J - Metripack 280 male (DC only)
E - Weather-Pack female
F - Weather-Pack male
For coil part numbers and dimensions see section C.

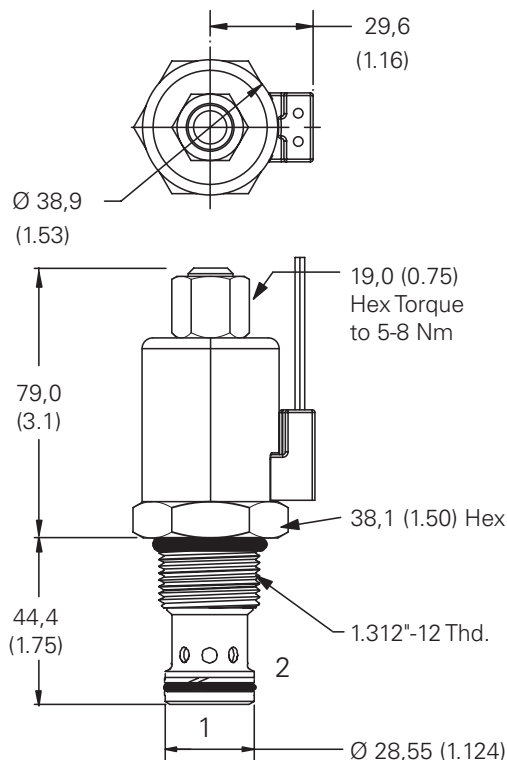
8 Special features

00 - None
Only required if valve has special features, omitted if "00."

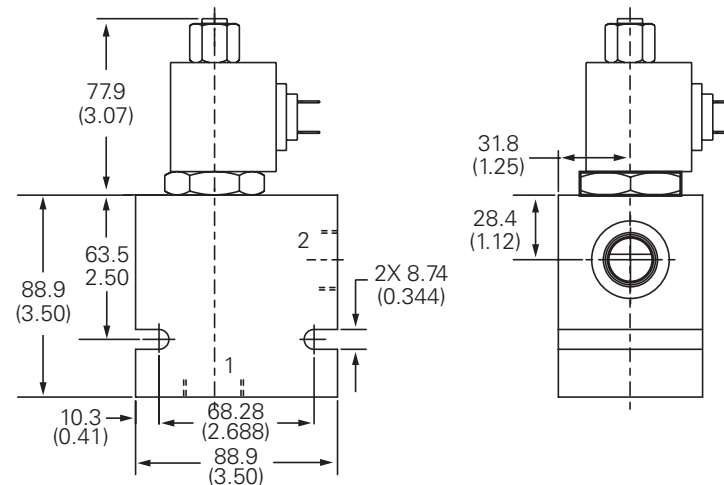
Dimensions

mm (inch)

Cartridge only



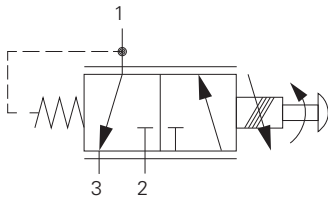
Installation drawing



Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

PPD22A - Proportional valve

Proportional reducing/relief, spool
 20 L/min (5.4 USgpm) • 210 bar (3000 psi)



Operation

In the de-energized position, pressure inlet port 2 is open to reduced pressure port 1, return port 3 is closed. As electrical current is increased, the setting of the valve increases allowing pressure at port 1 to increase. If the pressure at port 1 exceeds the setting of the valve, the spool will shift further and relieve to port 3.

Performance data

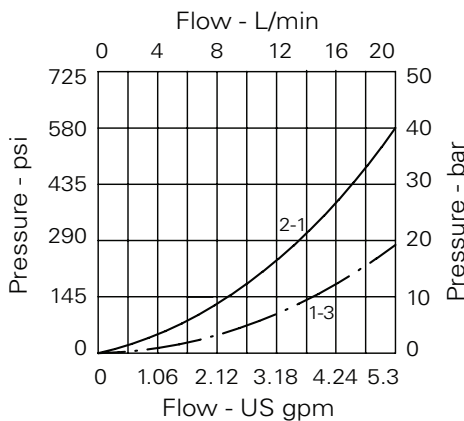
Ratings and specifications

Performance data is typical with fluid at 32 cST (150 SUS)

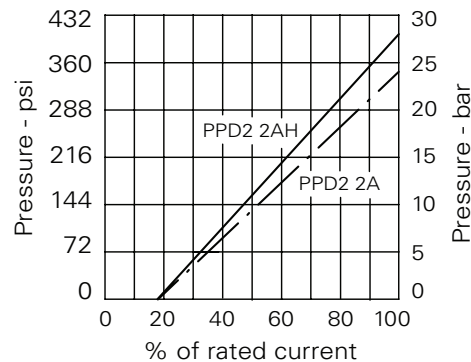
Max inlet pressure	210 bar (3000 psi)
Max regulated pressure	19 watt coil 24 bar, 29 watt coil 28 bar
Max flow	18.6 L/min (5 USgpm) 19 watt coil 20 L/min (5.4 USgpm) 29 watt coil
Hysteresis	16% max without PWM
Frequency	200 Hz
Dead band	19% approx
Response time	10 = 2-193 ms, 20 = 3-395 ms, 35 = 2-358 ms
Internal leakage	Up to 50 mL/min at 210 bar differential
Temperature range	-30° to 120°C (-22° to 248°F)
Cavity	A3531 (see Section M)
Torque cartridge into cavity	30 Nm (22 lbs ft)
Mounting position	Unrestricted
Fluids	All general purpose hydraulics fluids such as: MIL-H-5606, SAE 10, SAE 20, etc
Filtration	BS5540/4 Class 18/13 (25 micron or better)
Nominal viscosity range	15 to 250 cSt
Coil weight	0.3 kg (0.6 lbs)
Weight cartridge only	0.25 kg (0.55 lbs)
Seal kit	SK1119 (Nitrile) SK1119V (Viton®)

Viton is a registered trademark of E.I. DuPont

Pressure Drop



Performance curve

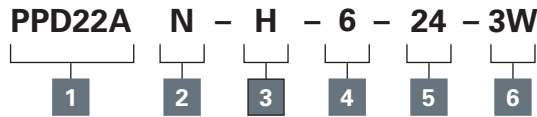


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

PPD22A - Proportional valve

Proportional Reducing/Relief, Spool
20 L/min (5.4 USgpm) • 210 bar (3000 psi)

Model code



1 Function

PPD22A - Standard
PPD22H - Heavy duty

2 Seal material

N - Nitrile
V - Viton®

3 Coil termination

H - DIN43650
F - Flying Lead
DM - Deutsch moulded
Other terminations available on request.

4 Manual override

6 - Screw Type Manual Override

5 Voltage

12 - 12 VDC
24 - 24 VDC

6 Port size

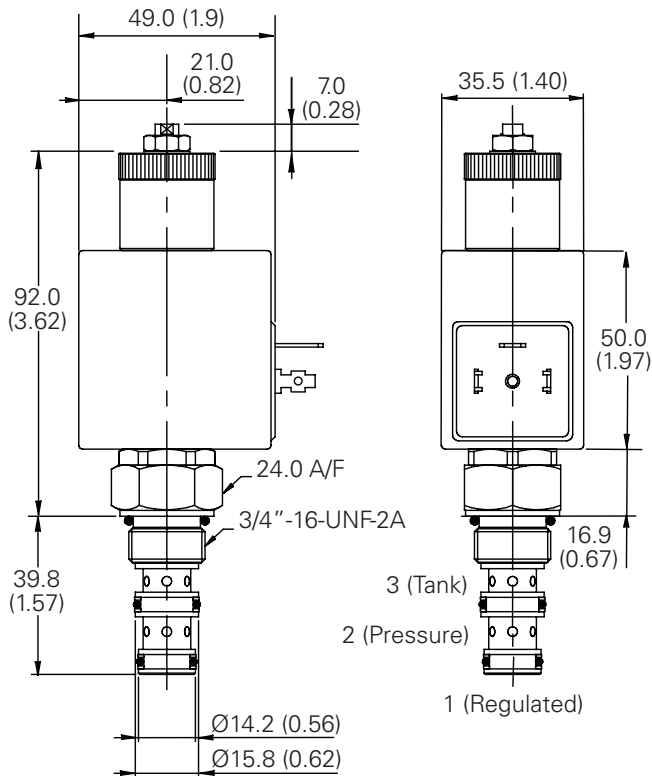
Code	Port size	Housing number
Aluminum single		
0	Cartridge only	
2W	1/4" BSP	A7724
3W	3/8" BSP	A6684
6T	3/8" SAE	B6516

See section J for housing details.

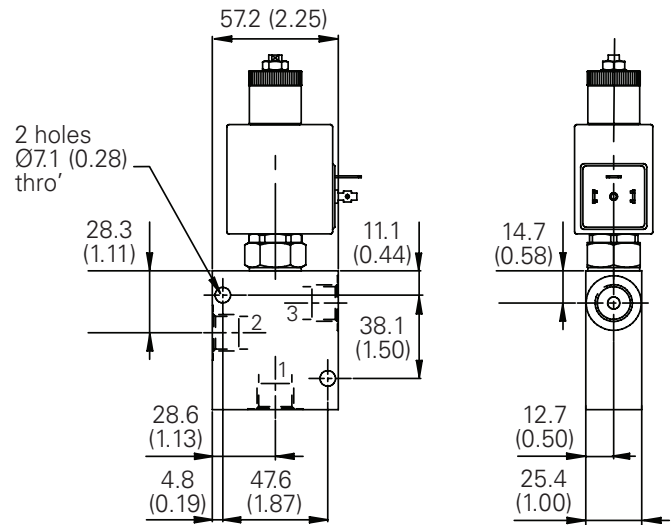
Dimensions

mm (inch)

Cartridge only



Installation drawing

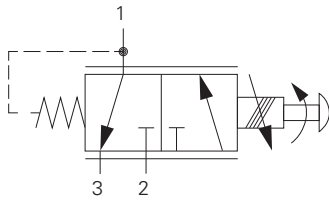


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPRV2-8 - Proportional valve

Proportional reducing/relief, spool
7.6 L/min (2 USgpm) • 35 bar (500 psi)

B



Operation

In the de-energized position, pressure inlet port 2 is closed and reduced pressure port 1 is open to return port 3. As electrical current is increased, port 2 opens to port 1 and port 3 closes, proportionally increasing pressure at port 1.

If the pressure at port 1 exceeds the setting of the valve, the spool will shift further and relieve to port 3.

Performance data

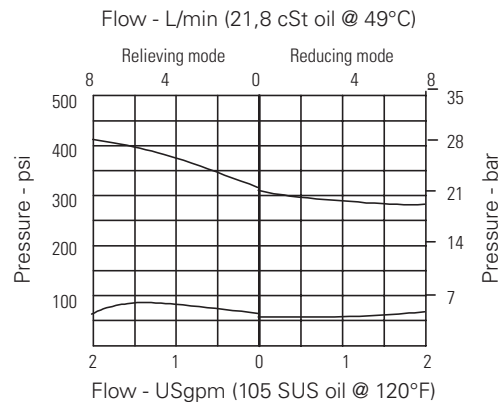
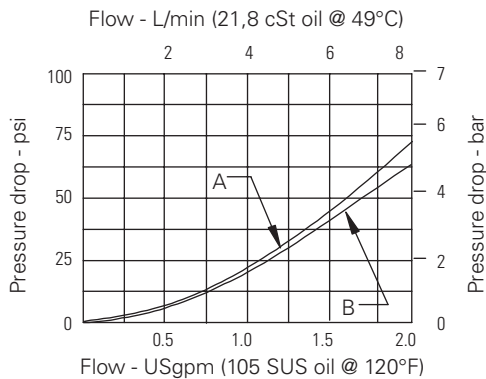
Ratings and specifications

Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49°C (120°F)

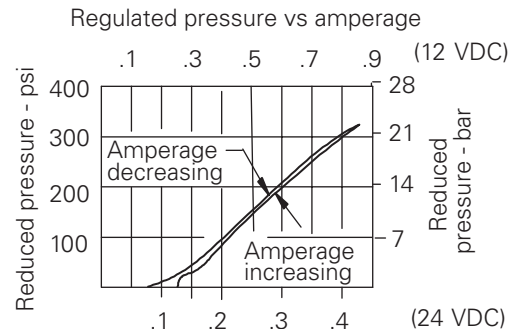
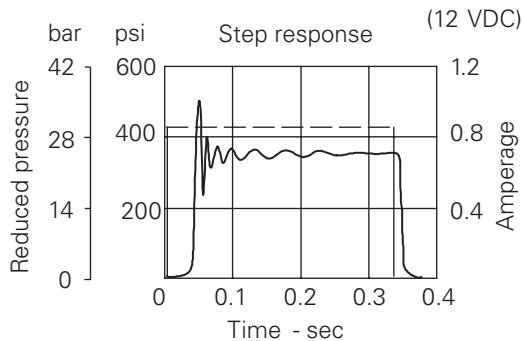
Maximum inlet pressure	35 bar (500 psi)
Reduced pressure range	0-22 bar (0-320 psi)
Maximum operating flow	7,6 L/min (2 USgpm)
Temperature range	-40° to 120°C (-40° to 248°F)
Cavity	C-8-3
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20 etc.
Filtration	Cleanliness code 18/16/13
Recommended PWM frequency	150 Hz
Hysteresis @ 150 Hz PWM	5%
Weight including coil	0,29 kg (0.64 lbs)
Seal kit	02-179451 (Buna-N), 02-179452 (Viton®)

Viton is a registered trademark of E.I. DuPont

Pressure drop curves



Performance curves

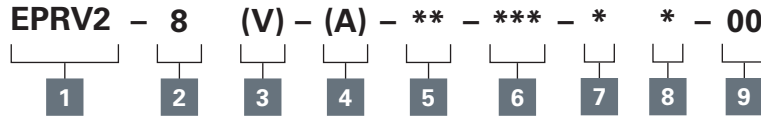


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPRV2-8 - Proportional valve

Proportional reducing/relief, spool
7.6 L/min (2 USgpm) • 35 bar (500 psi)

Model code



1 Function

EPRV2 - Proportional reducing/relieving valve

2 Size

8 - 8 size

3 Seal material

Blank - Buna-N
V - Viton®

4 Valve housing material

Omit for cartridge only
A - Aluminum

5 Port size

Code	Port size	Housing number
Aluminum single		
0	Cartridge only	
4T	SAE 4	02-160741
6T	SAE 6	02-160742
2G	1/4" BSPP	02-160739
3G	3/8" BSPP	02-160740

See section J for housing details.

6 Voltage rating

00 - No coil
12D - 12VDC
24D - 24VDC
12B - 12VDC/w diode*
24B - 24VDC/w diode*

*Optional arc suppression diode.

Note: This valve uses the standard S series coils, see section C for coil part numbers and specifications.

7 Connector types

Blank - No coil
G - ISO 4400 DIN 43650
W - Flying lead
N - Deutsch (DC only)
Y - Amp JR (DC only)
D - Metripack 150 male (DC only)
J - Metripack 280 male (DC only)
E - Weather-Pack (Packard) female on wire leads
F - Weather-Pack (Packard) male on wire leads
For coil part numbers and dimensions see section C.

8 Coil

S - S series coils

9 Special features

00 - None

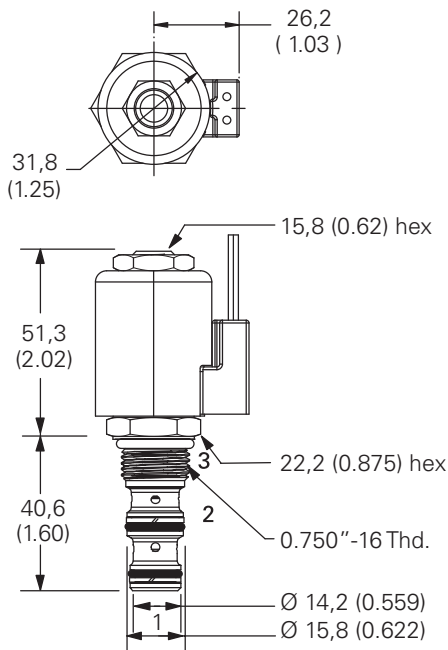
Only required if valve has special features, omitted if "00."

Dimensions

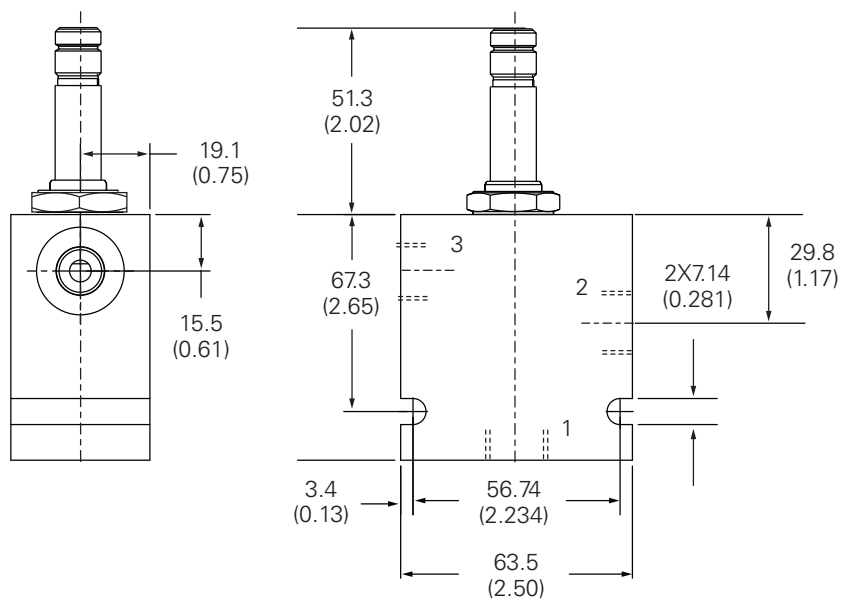
mm (inch)

Cartridge only

Valve is shown with "N" coil.



Installation drawing

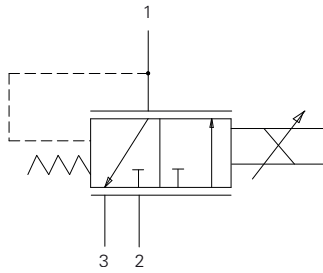


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPPV5 - Proportional Valve

Proportional pressure reducing valve
8.0 L/min (2.1 USgpm) • 50 bar (725 psi)

B



Operation

In the de-energized position, pressure inlet port 2 is closed and reduced pressure port 1 is open to return port 3. As electrical current is increased, port 2 opens to port 1 and port 3 closes, proportionally increasing pressure at port 1.

If the pressure at port 1 exceeds the setting of the valve, the spool will shift further and relieve to port 3.

Performance data

Ratings and Specifications

Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

Maximum inlet pressure, A(1) and P(2)	50 bar (725 psi)
Maximum inlet pressure, Tank (3)	30 bar (425 psi)
Reduced pressure range	In accordance with control pressure range in model code
Maximum operating flow	8.0 L/min (2 USgpm)
Temperature range	-40° to 105°C (-40° to 221°F)
Cavity	TC06025
Fluids	Mineral oil according to DIN 51524
Filtration	Cleanliness code 20/18/15
Recommended PWM frequency	100 Hz
Hysteresis @100 Hz PWM	<0.7 bar (pA = 20) <1.0 bar (pA = 25) <1.5 bar (pA = 35)
Resistance	4.72 ohms +/-5% for 12V 20.8 ohms +/-5% for 24V
Current	1500 mA for 12V 750 mA for 24V
Protection class	Up to IP6K6 / IPX9K

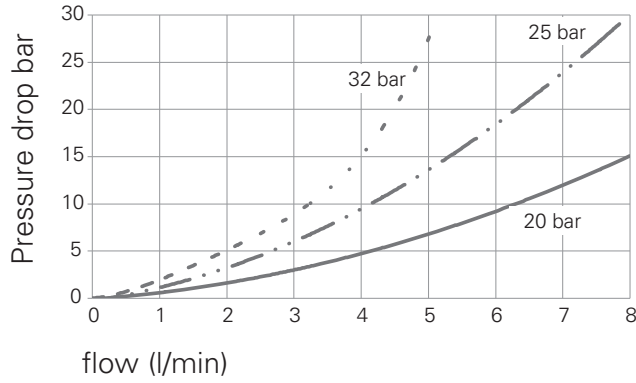
Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPPV5 - Proportional Valve

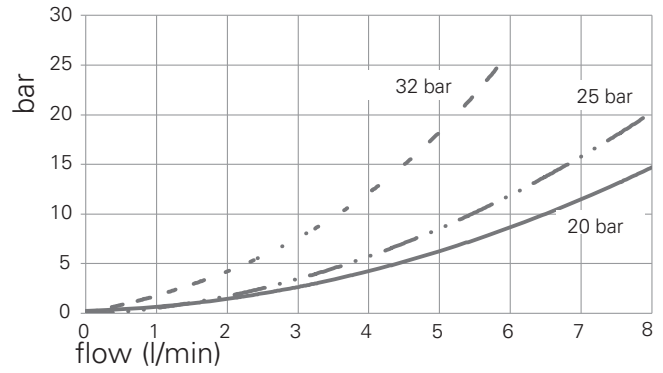
Proportional pressure reducing valve
8.0 L/min (2.1 USgpm) • 50 bar (725 psi)

Pressure drop curves

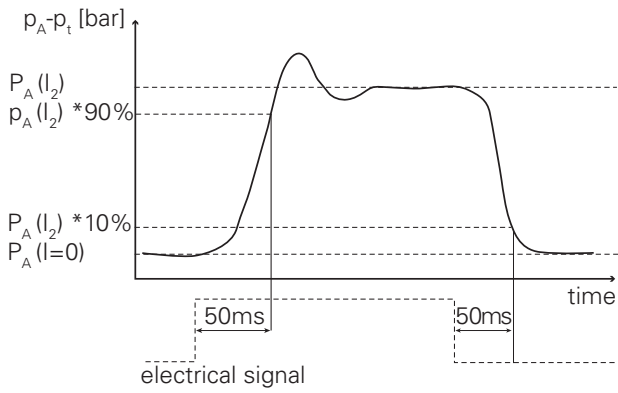
Port A to T



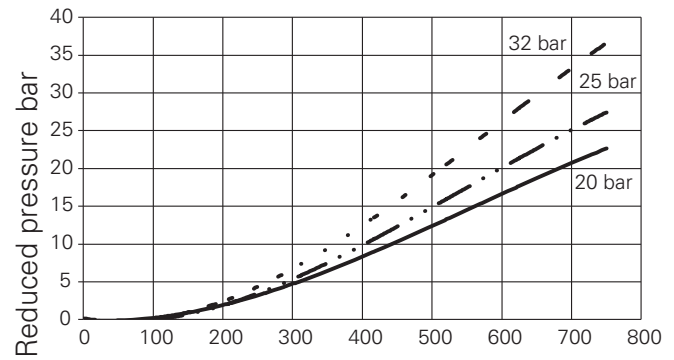
Port P to A



Performance curves



Regulated pressure vs. amperage

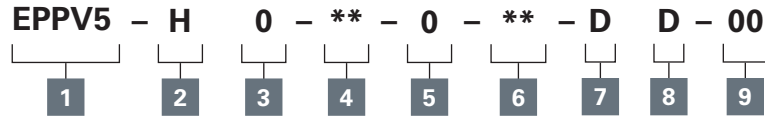


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPPV5 - Proportional Valve

Proportional pressure reducing valve/relief, spool
8.0 L/min (2.1 USgpm) • 50 bar (725 psi)

Model code



1 Function

EPPV5 - Proportional pressure reducing valve

2 Seal material

H - Buna-HBNR

3 Manual override Option

0 - Manual override not available

4 Control pressure

20 - 20 bar (290 psi)
25 - 25 bar (360 psi)
32 - 32 bar (460 psi)

5 Port size

Code	Port size
0	Cartridge only

6 Voltage Rating

12 - 12V
24 - 24V

7 Voltage type

D - DC

8 Connector type

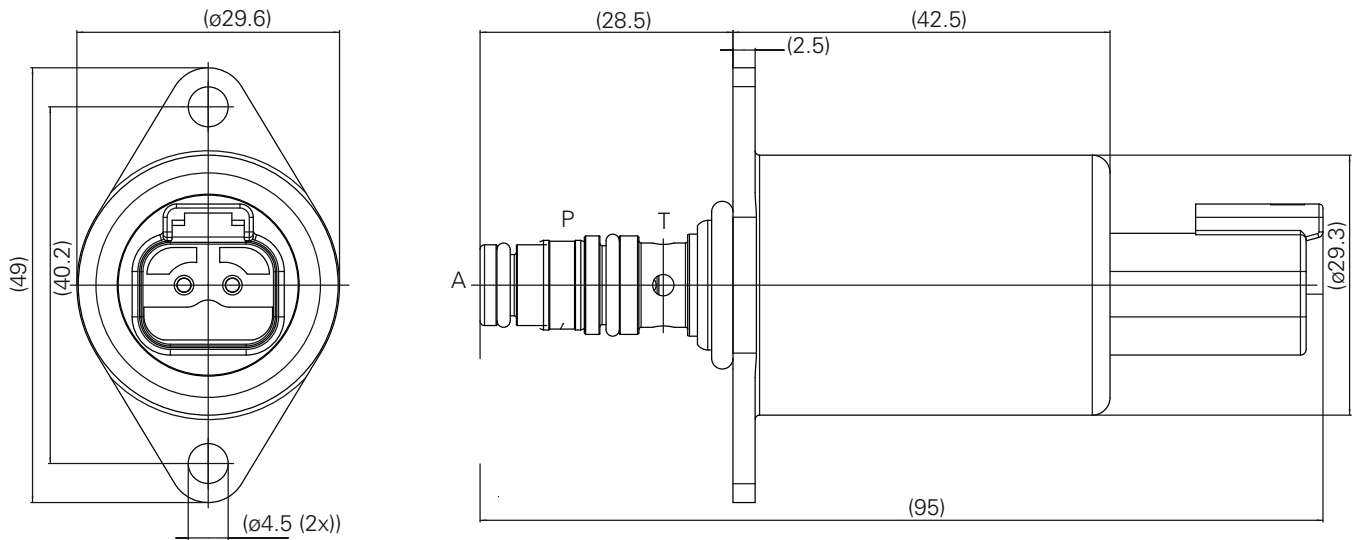
N - Deutsch DT04-2P

9 Special features

00 - None

Cartridge only

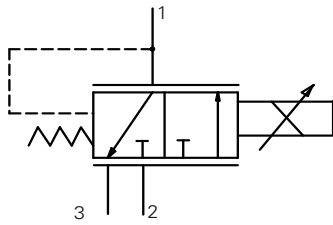
Dimensions (mm)



Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPPV6 - Proportional Valve

Proportional pressure reducing valve
8.0 L/min (2.1 USgpm) • 50 bar (725 psi)



Operation

In the de-energized position, pressure inlet port 2 is closed and reduced pressure port 1 is open to return port 3. As electrical current is increased, port 2 opens to port 1 and port 3 closes, proportionally increasing pressure at port 1.

If the pressure at port 1 exceeds the setting of the valve, the spool will shift further and relieve to port 3.

Performance data

Ratings and Specifications

Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)

Maximum inlet pressure, A(1) and P(2)	50 bar (725 psi)
Maximum inlet pressure, Tank (3)	30 bar (425 psi)
Reduced pressure range	In accordance with control pressure range in model code
Maximum operating flow	8.0 L/min (2.1 USgpm)
Temperature range	-40° to 105°C (-40° to 221°F)
Cavity	TC06023
Fluids	Mineral oil according to DIN 51524
Filtration	Cleanliness code 20/18/15
Recommended PWM frequency	100 Hz
Hysteresis @100 Hz PWM	<0.7 bar (pA = 20) <1.0 bar (pA = 25) <1.5 bar (pA = 35)
Resistance	5.3 ohms +/-5% for 12V 21.2 ohms +/-5% for 24V
Current	1500 mA for 12V 750 mA for 24V
Protection class	Up to IP6K6 / IPX9K

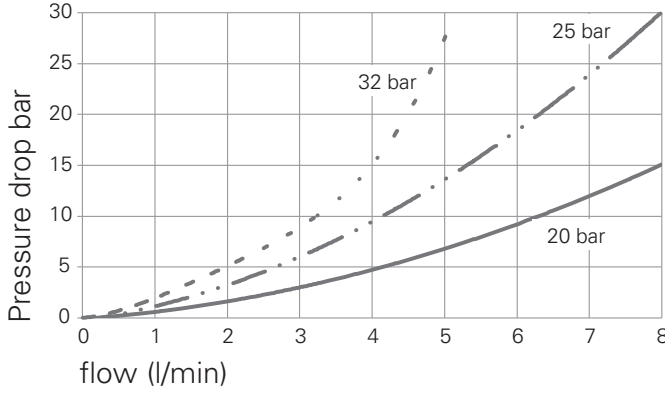
Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPPV6 - Proportional Valve

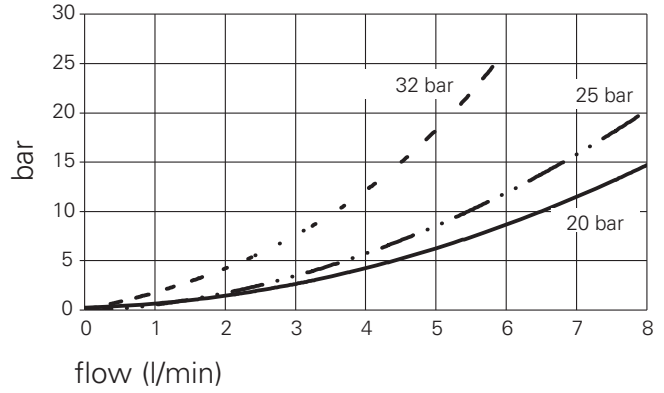
Proportional pressure reducing valve
8.0 L/min (2.1 USgpm) • 50 bar (725 psi)

Pressure drop curves

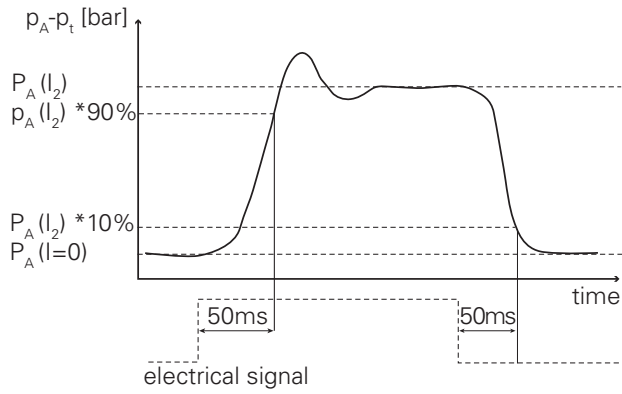
Port A to T



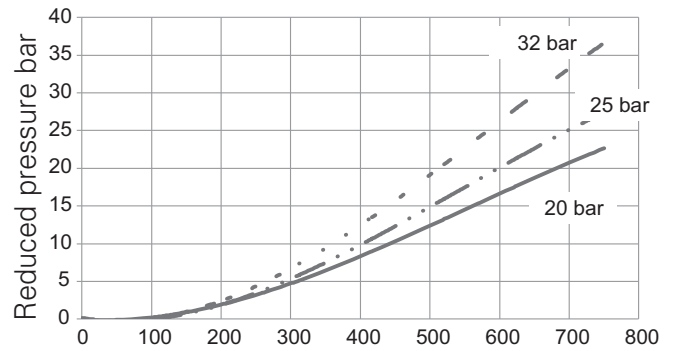
Port P to A



Performance curves



Regulated pressure vs. amperage

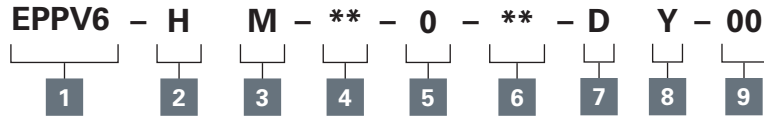


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPPV6 - Proportional Valve

Proportional pressure reducing valve/relief, spool
8.0 L/min (2.1 USgpm) • 50 bar (725 psi)

Model code



1 Function

EPPV6 - Proportional pressure reducing valve

4 Control pressure

20 - 20 bar (290 psi)
32 - 32 bar (460 psi)

6 Voltage rating

12 - 12V
24 - 24V

8 Connector type

Y - AMP Jr Power Timer

2 Seal material

Blank - NBR Buna

5 Port size

Code	Port size
0	Cartridge only

7 Voltage type

D - DC

9 Special features

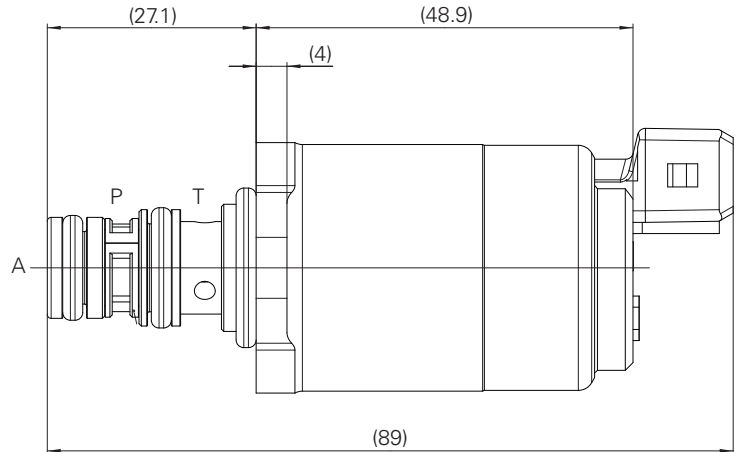
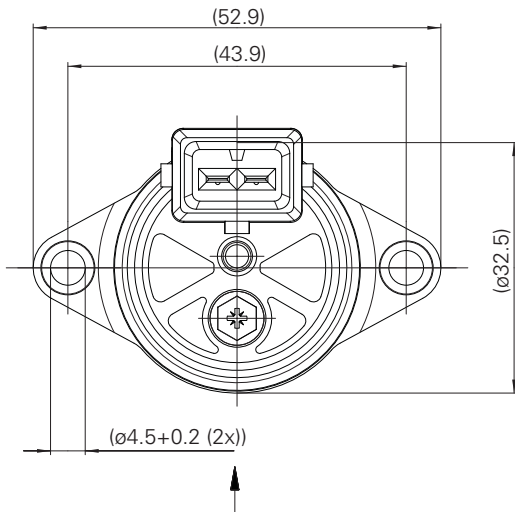
00 - None

3 Manual override option

M - with manual override

Cartridge only

Dimensions (mm)

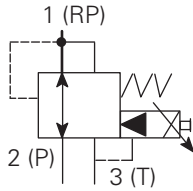


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPRV1-10 - Proportional valve

Proportional reducing/relief, spool
76 L/min (2 USgpm) • 35 bar (500 psi)

Functional symbol



Operation

This valve remains open from port 2 to port 1 (port 3 must be vented). Once the predetermined pressure is reached at port 1, the spool shifts to restrict the inlet flow at port 2, which regulates the pressure at port 1.

If the pressure at port 1 exceeds the setting of the valve, the spool will shift farther and relieve to port 3.

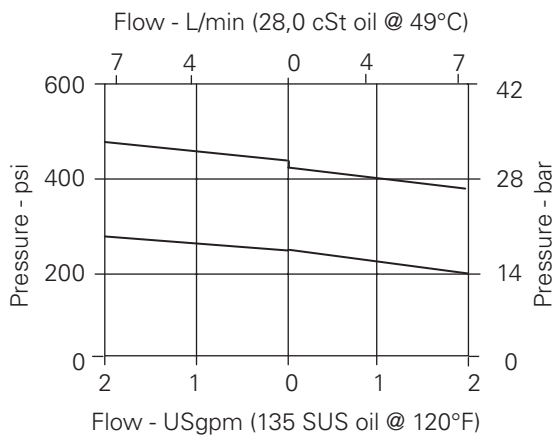
Ratings and specifications

Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49°C (120°F)

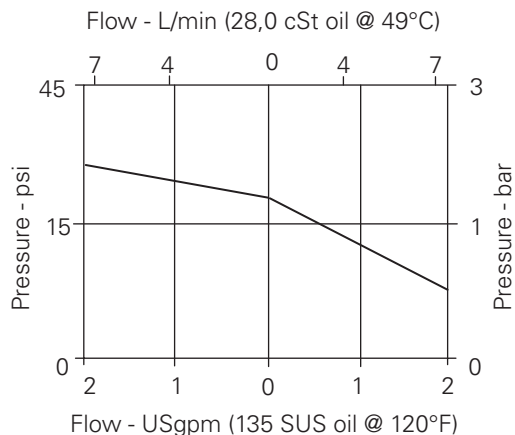
Typical application pressure (all ports)	3,5 - 35 bar (50 - 500 psi)
Cartridge fatigue pressure (infinite life)	35 bar (500 psi)
Rated flow	0 - 7,6 L/min (0 - 2.0 USgpm)
Cavity	C-10-3
Temperature range	-40° to 120°C (-40° to 248°F)
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc.
Filtration	Cleanliness code 18/16/13
Weight cartridge and coil	0,44 kg (0.98 lbs)
Seal kits	565804 (Buna-N) 889599 (Viton®) Viton is a registered trademark of E.I. DuPont

Pressure override characteristics

Pressure override, energized

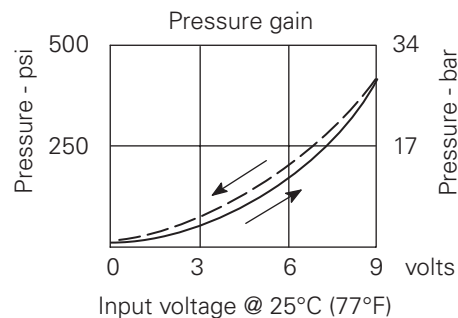
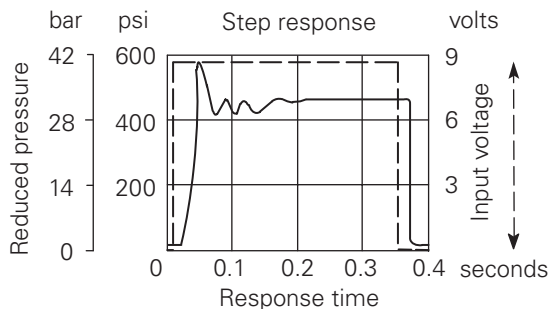


Pressure override, de-energized



Performance characteristics

Cartridges only Zero outlet pressure

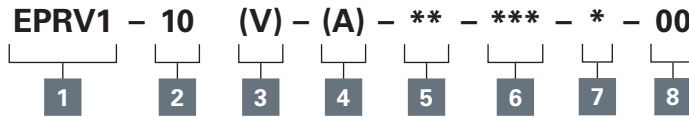


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPRV1-10 - Proportional valve

Proportional reducing/relief, spool
7.6 L/min (2 USgpm) • 35 bar (500 psi)

Model code



1 Function

EPRV1 - Proportional reducing/relieving valve

2 Size

10 - 10 size

3 Seal material

Blank - Buna-N
V - Viton*

4 Maximum pressure (factory set)

Customer to specify settings in increments of 7 bar (100 psi) and coded in hundreds of psi within the 14-35 bar range (200-500 psi) range.

Example: **5** - 35,0 (500 psi)

5 Port size

0 - Cartridge only

Code	Port size	Housing number
3B	3/8" BSPP	02-173358*
6T	SAE 6	566162*
2G	1/4" BSPP	876702
3G	3/8" BSPP	876714
6H	SAE 6	876704
8H	SAE 8	876711

*Light duty housing.
See section J for housings.

6 Voltage rating

00 - No coil
12D - 12VDC
24D - 24VDC
12B - 12VDC/w diode*
24B - 24VDC/w diode*

*Optional arc suppression diode.
Note: This valve uses the standard J series coils, see section C for coil part numbers and specifications.

7 Connector types

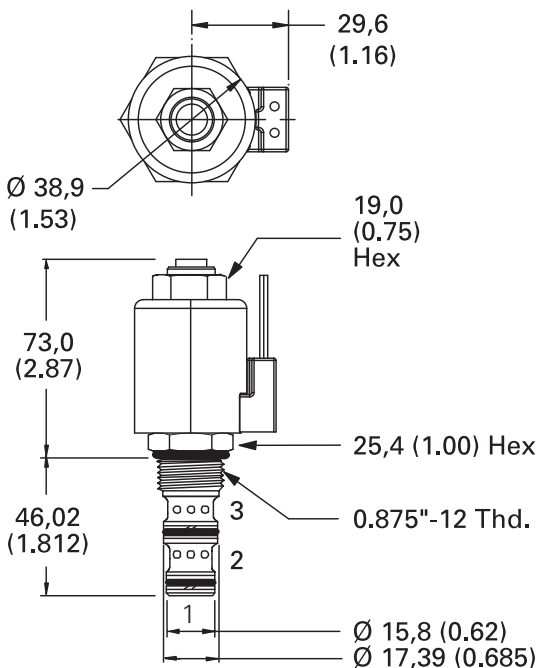
Blank - No coil
G - ISO 4400 DIN 43650
W - Flying lead
N - Deutsch (DC only)
Y - Amp JR (DC only)
D - Metripack 150 male (DC only)
J - Metripack 280 male (DC only)
E - Weather-Pack female
F - Weather-Pack male
For coil part numbers and dimensions see section C.

8 Special features

00 - None
(Only required if valve has special features, omitted if "00.")

Dimensions

mm (inch)



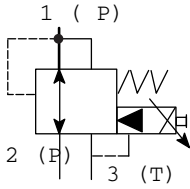
Valve is shown with "W" coil.

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPRV3-10- Proportional valve

Proportional reducing/relief, spool
 30 L/min (8 USgpm) • 207 bar (3000 psi)

Functional symbol



Operation

This valve remains open from port 2 to port 1 (port 3 must be vented). Once the predetermined pressure is reached at port 1, the spool shifts to restrict the inlet flow at port 2, which regulates the pressure at port 1. If the pressure at port 1 exceeds the setting the valve, the spool will shift farther and relieve to port 3.

Ratings and specifications

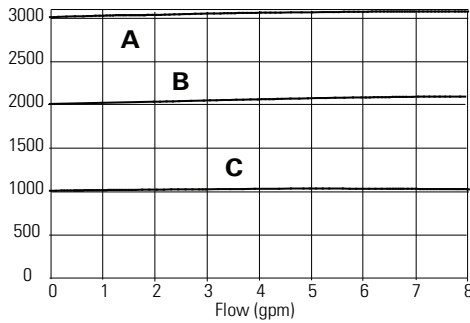
Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49°C (120°F)

Typical application pressure (all ports)	3,5 - 207 bar (50 - 3000 psi)
Maximum Inlet Pressure	240 bar (3500 psi)
Cartridge fatigue pressure (infinite life)	207 bar (3000 psi)
Rated flow	30 L/min (8 USgpm)
Cavity	C-10-3
Temperature range	-40° to 120°C (-40° to 248°F)
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc.
Filtration	Cleanliness code 18/16/13
Weight cartridge and coil	0,44 kg (0.98 lbs)
Seal kits	565804 (Buna-N) 889599 (Viton®)

Viton is a registered trademark of E.I. DuPont

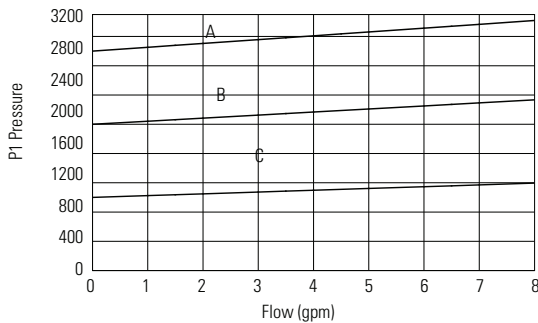
Pressure override characteristics

Pressure override, energized



A – EPRV3-10X-30-0-00
 B – EPRV3-10X-20-0-00
 C – EPRV3-10X-10-0-00

Pressure override, de-energized

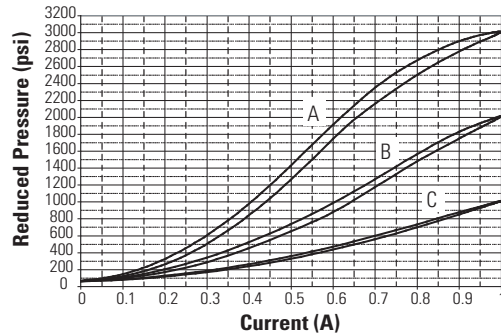


A – EPRV3-10X-30-0-00
 B – EPRV3-10X-20-0-00
 C – EPRV3-10X-10-0-00

Performance characteristics

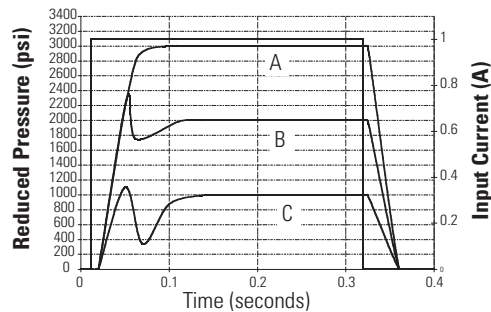
Cartridges only
 Zero outlet pressure

Pressure vs. Current



A – EPRV3-10X-30-0-00
 B – EPRV3-10X-20-0-00
 C – EPRV3-10X-10-0-00

Step Response Curve



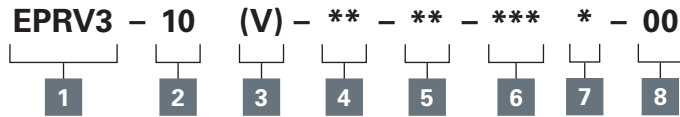
A – EPRV3-10X-30-0-00
 B – EPRV3-10X-20-0-00
 C – EPRV3-10X-10-0-00

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPRV3-10- Proportional valve

Proportional reducing/relief, spool
30 L/min (8 USgpm) • 207 bar (3000 psi)

Model code



1 Function

EPRV3 - Proportional reducing/relieving valve

2 Size

10 - 10 size

3 Seals

Blank - Buna-N
V - Viton*

4 Maximum pressure (factory set)

Customer to specify settings in increments of 7 bar (100 psi) and coded in hundreds of psi within the 35-207 bar range (500-3000 psi) range.
Example: **5** - 35,0 (500 psi)

5 Port size

0 - Cartridge only

Code	Port size	Housing number
A3B	3/8" BSPP	02-173358*
A6T	SAE 6	566162*
A2G	1/4" BSPP	876702
A3G	3/8" BSPP	876714
A6H	SAE 6	876704
A8H	SAE 8	876711

*Light duty housing.
See section J for housings.

6 Voltage rating

00 - No coil
012D - 12VDC
024D - 24VDC
012B - 12VDC/w diode*
024B - 24VDC/w diode*

*Optional arc suppression diode.
Note: This valve uses the standard J series coils, see section C for coil part numbers and specifications.

7 Connector types

Blank - No coil
G - ISO 4400 DIN 43650
W - Flying lead
N - Deutsch (DC only)
Y - Amp JR (DC only)
D - Metripack 150 male (DC only)
J - Metripack 280 male (DC only)
E - Weather-Pack female
F - Weather-Pack male
For coil part numbers and dimensions see section C.

8 Coil series

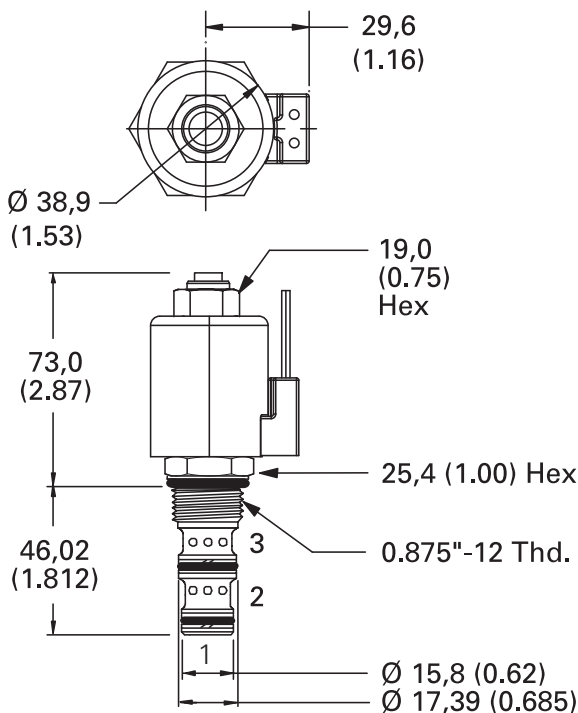
Blank - No coil
J - J series coil

9 Coil special features

00 - None
(Only required when valve has special features, omitted if "00.")

Dimensions

mm (inch)

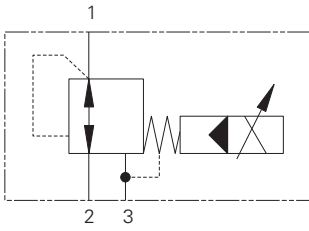


Valve is shown with "W" coil.

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPRV1-16 - Proportional valve

Proportional reducing/relief, spool
 38 L/min (10 USgpm) • 35 bar (500 psi)



Operation

This valve remains open from port 2 to port 1 (port 3 must be vented). Once the predetermined pressure is reached at port 1, the spool shifts to restrict the inlet flow at port 2, which regulates the pressure at port 1.

If the pressure at port 1 exceeds the setting of the valve, the spool will shift farther and relieve to port 3.

Performance data

Ratings and specifications

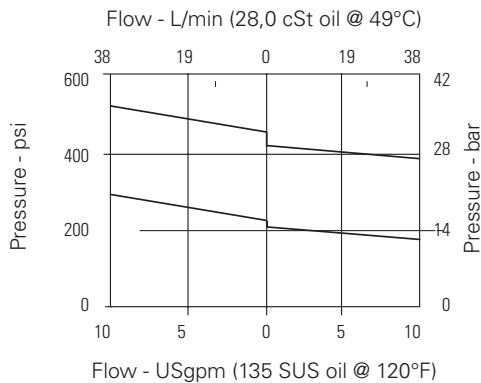
Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49°C (120°F)

Typical application pressure (all ports)	3,5-35 bar (0-500 psi)
Rated flow	0-38,0 L/min (0-10 USgpm)
Temperature range	-40° to 120°C (-40° to 248°F)
Cavity	C-16-3
Fluids	All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20 etc.
Filtration	Cleanliness code 18/16/13
Weight including coil	0,9 kg (2.00 lbs)
Seal kit	565811 (Buna-N), 889599 (Viton®)

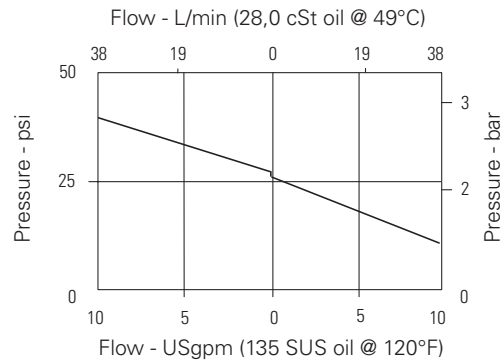
Viton is a registered trademark of E.I. DuPont.

Pressure drop curves

Pressure override, energized

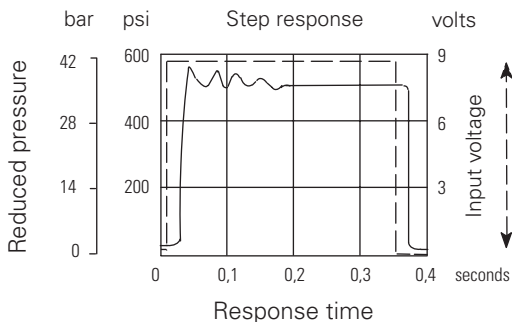


Pressure override, de-energized

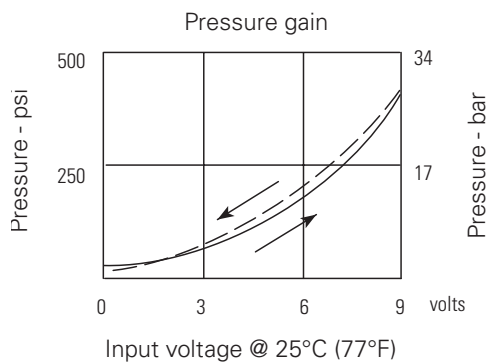


Performance curves

Cartridges only



Zero outlet pressure

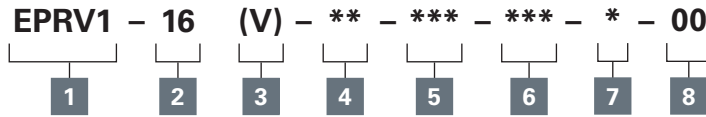


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

EPRV1-16 - Proportional valve

Proportional reducing/relief, spool
38 L/min (10 USgpm) • 35 bar (500 psi)

Model code



1 Function

EPRV1 - Proportional reducing/relieving valve

2 Size

16 - 16 size

3 Seal material

Blank - Buna-N
V - Viton*

4 Maximum pressure

Customer to specify settings in increments of 7 bar (100 psi) and coded in hundreds of psi within the 14-35 bar range (200-500 psi) range.
Example: 5-35,0 (500 psi)

5 Port size

Code	Port size	Housing number
Aluminum single		
0	Cartridge only	
6B	3/4" BSPP	02-175465*
12T	SAE 12	566162*
6G	3/4" BSPP	876722
10H	SAE 10	876721
12H	SAE 12	876723

*Light duty housing.
See section J for housing details.

6 Voltage rating

00 - No coil
12D - 12VDC
24D - 24VDC
36D - 36VDC
12B - 12VDC/w diode*
24B - 24VDC/w diode*

*Optional arc suppression diode.

7 Connector types

Blank - No coil
G - ISO 4400 DIN 43650
W - Flying lead
N - Deutsch (DC only)
Y - Amp JR (DC only)
D - Metripack 150 male (DC only)
J - Metripack 280 male (DC only)
E - Weather-Pack female
F - Weather-Pack male
For coil part numbers and dimensions see section C.

8 Special features

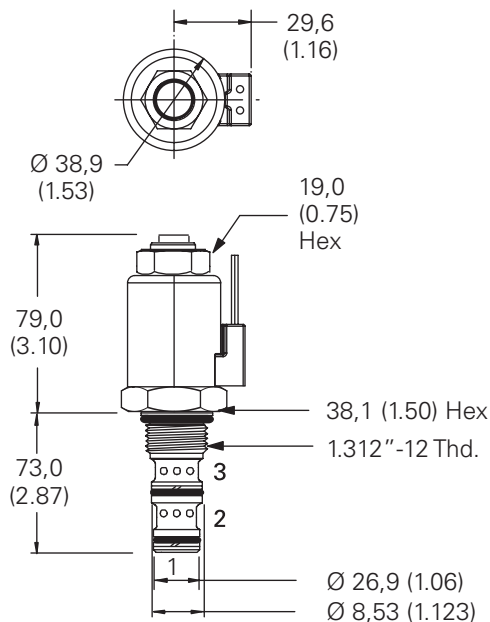
00 - None
Only required if valve has special features, omitted if "00."

Dimensions

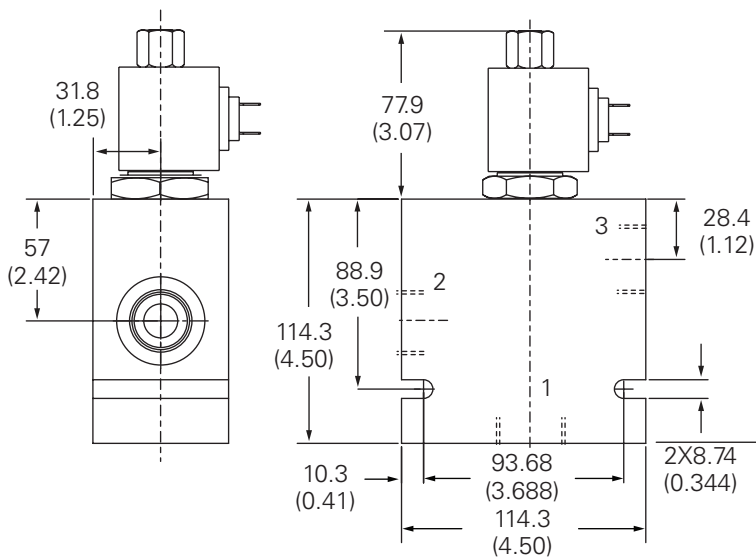
mm (inch)

Cartridge only

Valve is shown with "W" coil.



Installation drawing



For hydropower, it's...

Durability.

Complete plant control systems for gate operation, turbine governors and balance of plant... including total hydraulic control systems, entire power distribution and control systems, coolant, lubrication and filtration systems. All with the most respected brand name products in the industry, manufactured and warranted by Eaton under a single purchase order.

For wind energy, it's...

Reliability.

Eaton's integrated systems help harvest the inexhaustible green power of wind. In constant use under the harshest conditions, wind turbines demand extreme reliability and durability from every component. Eaton is a world leading manufacturer of those critical hydraulic, electrical and filtration products.

For everyone, it's...

Sustainability.

Eaton seeks out and tests the latest environmentally acceptable and biodegradable hydraulic fluids...from all over the world. By leading the way for our customers and their industries, we are working to sustain and safeguard the environment, everywhere our products are at work.

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