# 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 **PAR1-10** 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 **PAR1-16** 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 **EPRV1-16** 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 **PPAR1-10** 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 | PAR1 | PPAR1 | EPPV |
|---|---|---|---|---|---|---|
| EPV10 | ESV1-8-C / 0 | EFV1-10-C / 0 | IRV1-10 | PAR1-10 | PPAR1-10 | EPPV5 |
| EPV16 | ESV1-10-C / 0 | EFV1-12-C / 0 | IRV2-10 | PAR1-16 | | EPPV6 |
| | ESV1-12-C / 0 | EFV2-12-C / 0 | | | | |

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

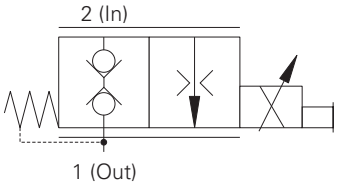
# Proportional valves

Valve locator/section contents

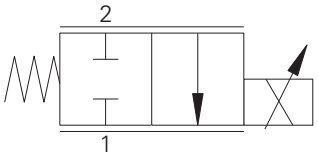
**Note:** Proportional valve solenoid coils and electronic valve drivers are covered in section C of this Catalog.



## Functional symbol

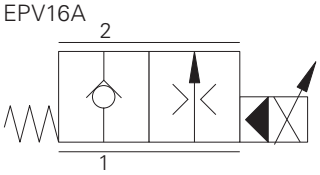



| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional bi-directional, NC, poppet* | | **L/min (USgpm)** | **bar (psi)** | |
| PFR21H | A879 | 18 (5) | 210 (3000) | B-7 |

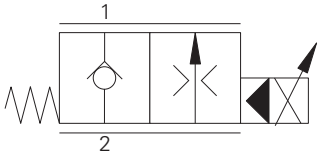



| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional bi-directional, NC, poppet uni-directional* | | **L/min (USgpm)** | **bar (psi)** | |
| EPV10 | C-10-2 | 0-30 (0-8) | 350 (5000) | B-9 |

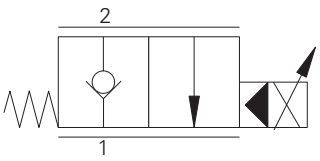
EPV16A



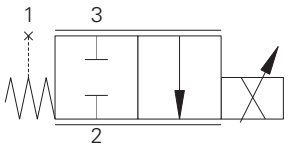

EPV16B



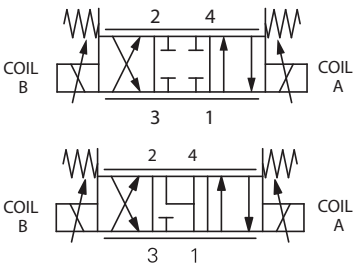

| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional flow control, NC, poppet* | | **L/min (USgpm)** | **bar (psi)** | |
| EPV16A | C-16-3SU (undercut) | 0-160 | 280 (4000) | B-12 |
| EPV16B | C-16-3SU (undercut) | 0-160 | 280 (4000) | B-12 |




| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional flow control, NC, poppet* | | **L/min (USgpm)** | **bar (psi)** | |
| 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 |
|---|---|---|---|---|
| *Proportional flow control, NC, spool* | | **L/min (USgpm)** | **bar (psi)** | |
| 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 |



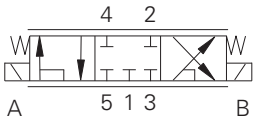

| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional flow control, NO, spool* | | **L/min (USgpm)** | **bar (psi)** | |
| ESV9-8-E | C-8-4 | 11.0 (2.9) | 210 (3,000) | B-31 |
| ESV9-8-F | C-8-4 | 11.0 (2.9) | 210 (3,000) | B-31 |
| ESV9-10 | C-10-5S | 22.0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

# Proportional valves

Valve locator/section contents

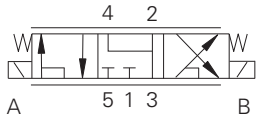
## Functional symbol

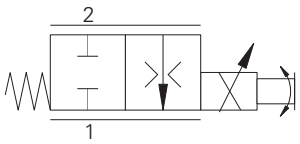
**E**



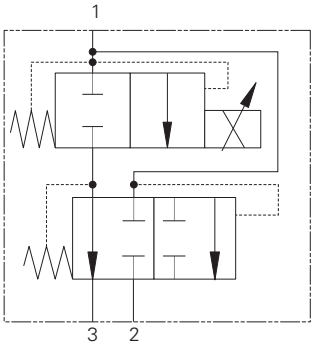

| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional flow Control, NC, spool* | | L/min (USgpm) | bar (psi) | |
| ESVL9-10-E | C-10-5S | 23 (6) | 250 (3600) | B-37 |
| ESVL9-10-F | C-10-5S | 23 (6) | 250 (3600) | B-37 |

**F**

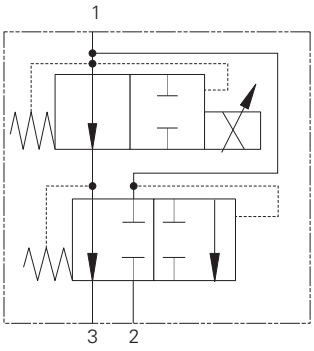


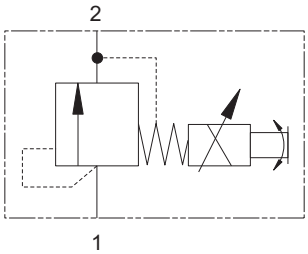

| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional bi-directional, NC, poppet* | | L/min (USgpm) | bar (psi) | |
| PFR24A | A6701 | 18 (5) | 210 (3000) | B-40 |




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

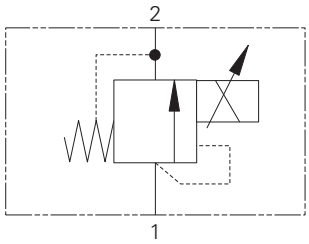



| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional flow control, NO, spool* | | L/min (USgpm) | bar (psi) | |
| EFV2-12-O | C-12-3 | <114 (<30) | 210 (3000) | B-42 |

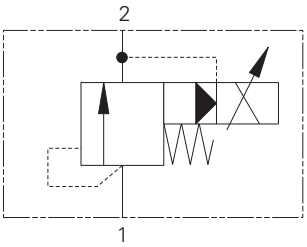



| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional relief, NO, POPPET* | | L/min (USgpm) | bar (psi) | |
| PDR21A | A879 | 1.5 (.3) | 350 (5000) | B-46 |

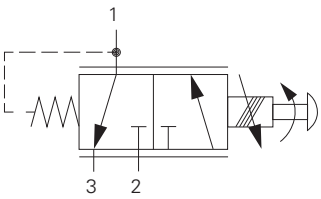
**Functional symbol**



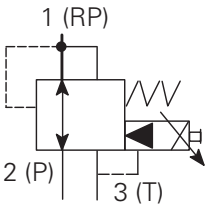

| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional inverse relief, poppet* | | **L/min (USgpm)** | **bar (psi)** | |
| IRV1-10 | C-10-2 | 1 (.25) | 210 (3000) | B-48 |
| IRV2-10 | C-10-2 | 57 (15) | 240 (3500) | B-50 |



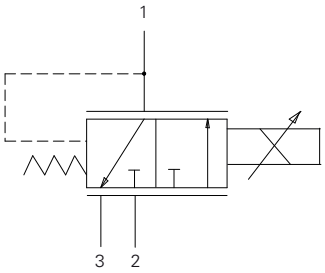

| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional relief, spool* | | **L/min (USgpm)** | **bar (psi)** | |
| PAR1-10 | C-10-2 | <60 (15) | 240 (3500) | B-52 |
| PAR1-16 | C-16-2 | <132 (35) | 210 (3000) | B-54 |



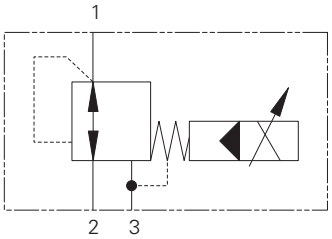

| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional reducing/relief, spool* | | **L/min (USgpm)** | **bar (psi)** | |
| PPD22A | A879 | 20 (5) | 210 (3000) | B-56 |
| EPRV2-8 | C-8-3 | 7.6 (2) | 35 (500) | B-58 |




| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional reducing/relief, spool* | | **L/min (USgpm)** | **bar (psi)** | |
| PPAR1-10 | C-10-3 | 30 (8) | 207 (3000) | B-60 |




| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional reducing/relief, spool* | | **L/min (USgpm)** | **bar (psi)** | |
| EPPV5 | TC06025 | 8 (2.1) | 50 (725) | B-62 |
| EPPV6 | TC06023 | 8 (2.1) | 50 (725) | B-65 |




| Model | Cavity | Flow rating | Typical pressure | Page |
|---|---|---|---|---|
| *Proportional reducing/relief, spool* | | **L/min (USgpm)** | **bar (psi)** | |
| EPRV1-10 | C-10-3 | 8 (2) | 35 (500) | B-68 |
| EPRV1-16 | C-16-3 | 7.6 (2) | 35 (500) | B-70 |

# 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.

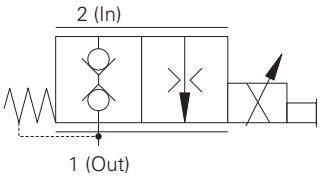
**⚠ Warning**

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) |
| PAR1-10 | 47-54 Nm (35-40 ft lbs) | - | 5-8 Nm(4-6 ft lbs) |
| PAR1-16 | 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) |
| PPAR1-10 | 47-54 Nm (35-40 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) |
| 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 USgmp) • 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.

B

## Performance data

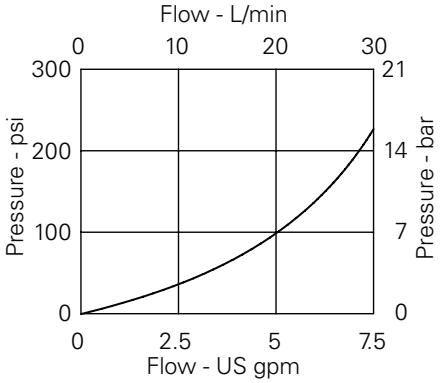
**Ratings and specifications**

| | |
|---|---|
| *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%,<br>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®) |

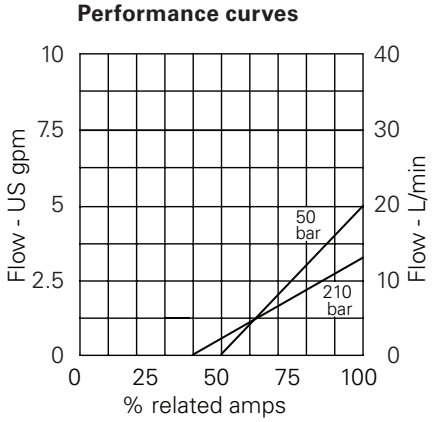
Viton is a registered trademark of E.I. DuPont

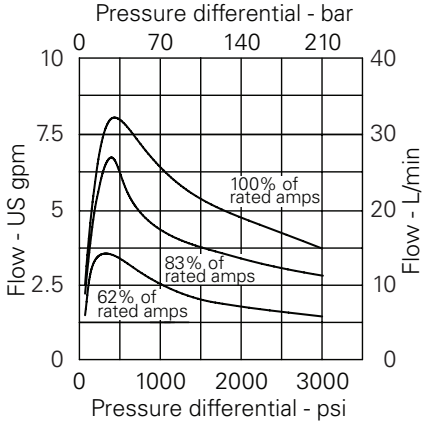
### Pressure drop

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**

**PFR21H – N – 6 – H – 24 – 3W**

1 2 3 4 5 6

### 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.

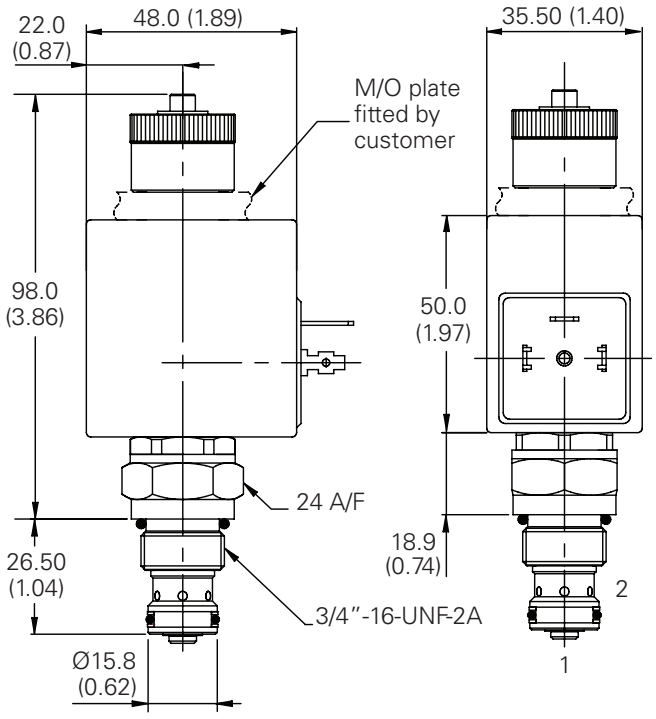
### 5 Voltage
**12** - 12 VDC
**24** - 24 VDC

### 6 Port size

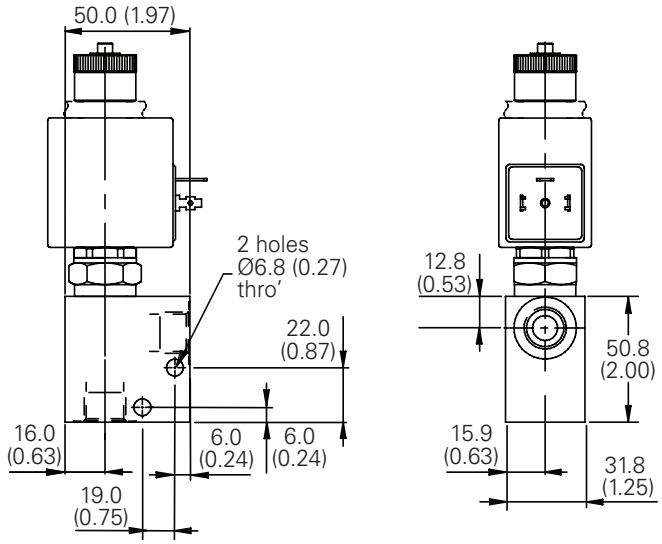
| Code | Port size | Housing number |
|---|---|---|
| Blank | Cartridge only | |
| **2W** | 1/4" BSP | A12592 |
| **3W** | 3/8" BSP | A7450 |
| **6T** | 3/8" SAE | A19355 |

## Dimensions
mm (inch)

### Cartridge only



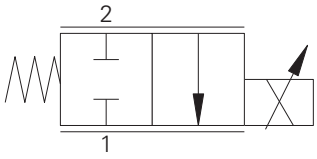

### Installation drawing




*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.

B

## Performance data

**Ratings and specifications**

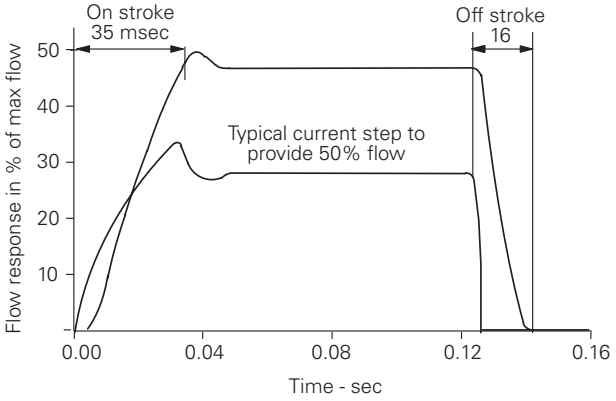
| | |
|---|---|
| *Performance data is typical with fluid at 21,8 cSt (105 SSU) and 49°C (120°F)* | |
| Typical application pressure (at port 2) | 350 bar (5000 psi) |
| Rated flow | 0 - 30 L/min (0 - 8 USgpm) |
| Operating ambient temperature | -30° to 90°C (-22° to 194°F) |
| Cavity | C-10-2 |
| Weight cartridge only | 0,78 kg (1.72 lbs) |
| Filtration | 70 - 210 bar (1000 - 3000 psi) Cleanliness code 17/15/12<br>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)<br>Adj from 150 - 300 mA (24 VDC) |
| Coil current @ max flow | 0.7 amps max @ 24 VDC<br>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<br>24V-25.0Ω |
| Power consumption @ rated current and 20°C coil temperature | 12V-12.8 watts<br>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 USgmp) • 350 bar (5000 psi)

## Step response data

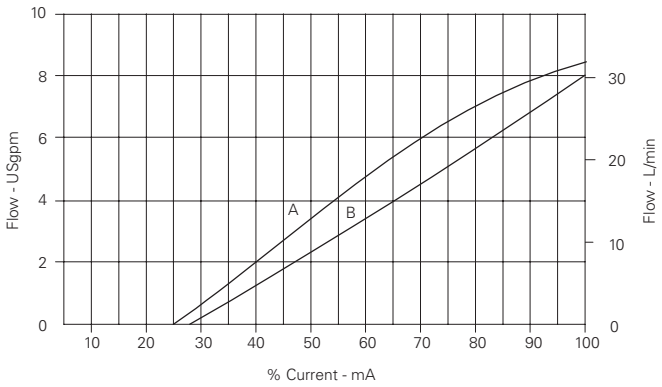



## Flow vs current

With 10 bar differential between inlet and outlet

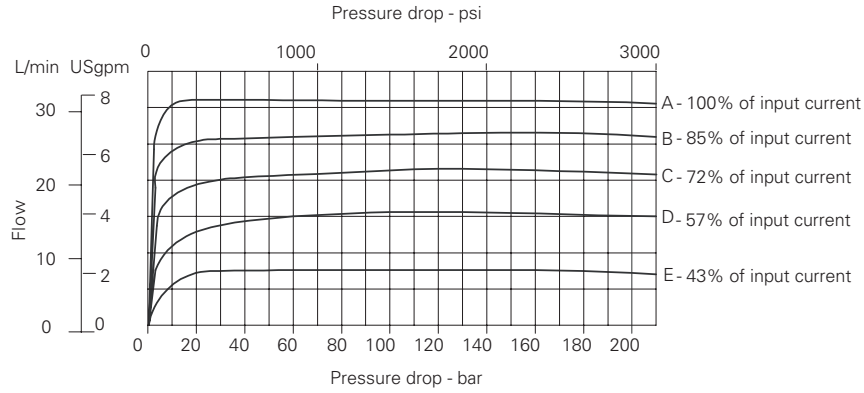
**A -** 210 bar (3000 psi) pressure drop from Port 2 to Port 1

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




## Flow vs pressure drop

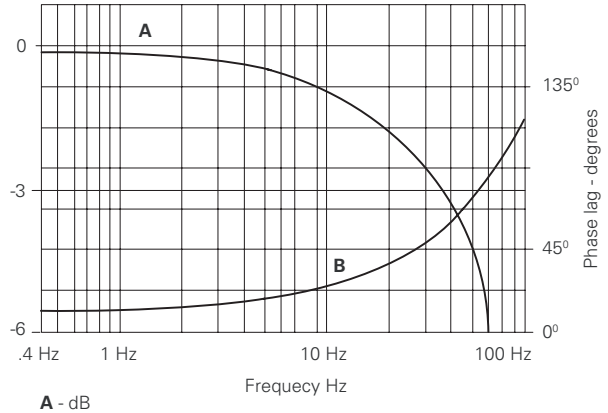
Per % of input current




## Typical flow response

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

ΔP = 10 bar (145 psi)




**A** - dB
**B** - Phase Lag

*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)



**Model code**

EPV 10 – * – ** – ** – *** – * – * – 10 – (S**)

1 2 3 4 5 6 7 8 9 10

## 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.

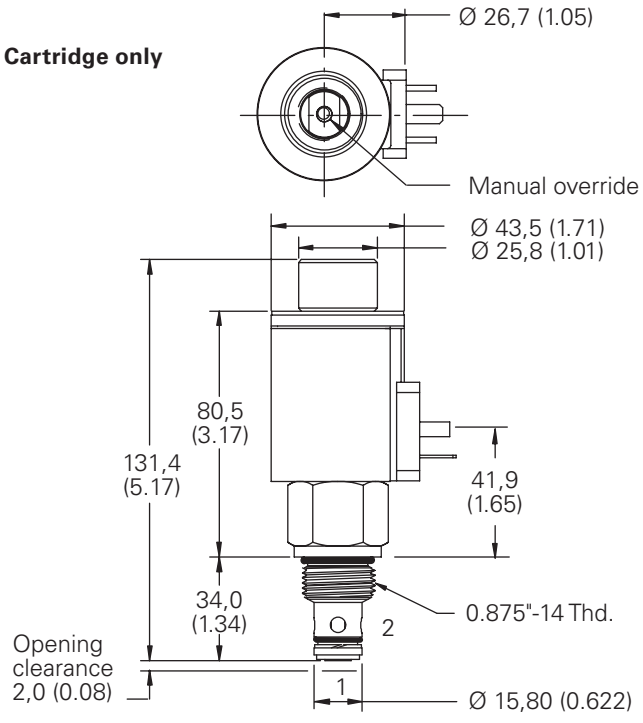
## 10 Special features

**Blank** - None

## Dimensions

mm (inch)

**Cartridge only**




**⚠ Warning**

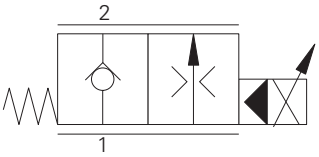
The cavity should be machined to the 14,29 (0.562) maximum diameter and 36,00 (1.417) maximum depth. See section M.

*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)**

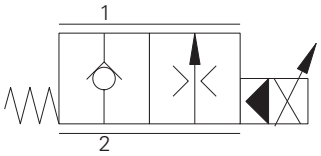
EPV16A




## 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 ontrolled 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)<br>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)<br>Phosphate esters (non-alkyl) with Viton® |
| Filtration | 70-210 bar (1000-3000 psi) Cleanliness code 17/15/12<br>210+ bar (3000+ psi) Cleanliness code 15/13/11 |
| Housing material (standard) | Aluminum or steel |
| Typical hysterisis | less than 4% of rated current @ 10 bar<br>pressure drop-pulse width modulated (PWM) |
| Weight cartridge only | 1 kg (2.2 lbs) |
| Seal kit | 02-154069 (Buna-N) |

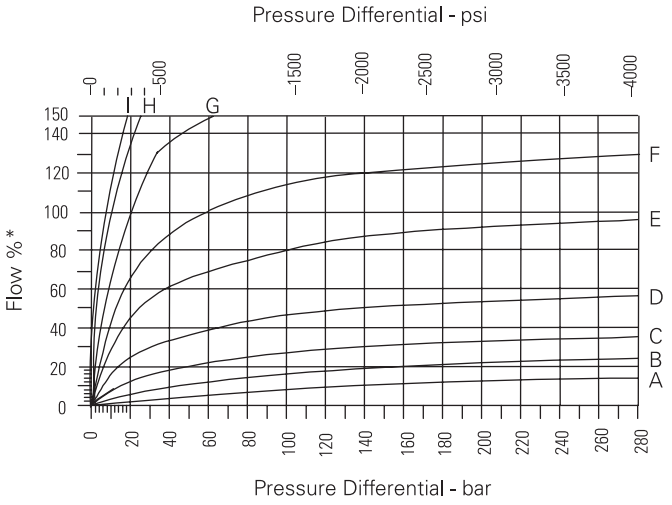
Viton is a registered trademark of E.I. DuPont

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

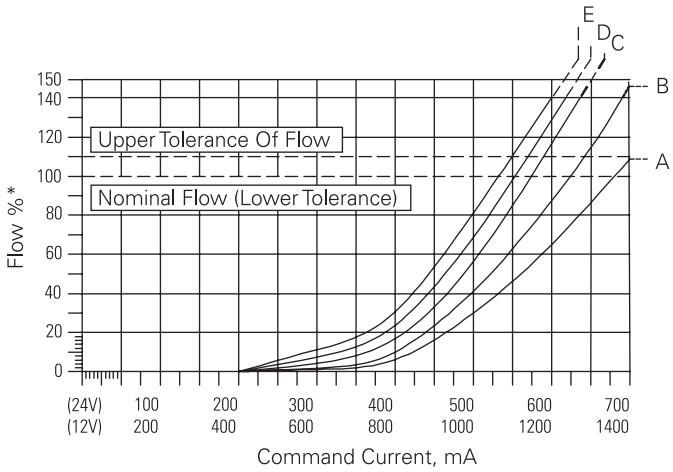
# EPV16 - Proportional valve

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

## Pressure drop curves




* Flow interims of % for each poppet size



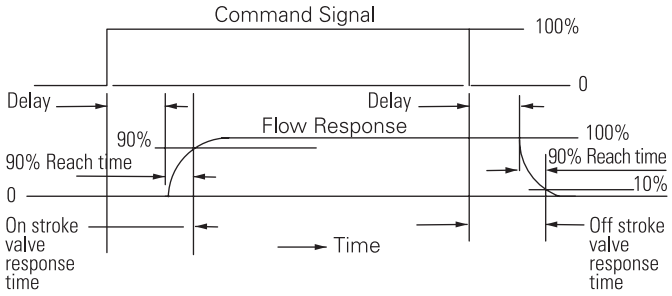

* Flow interims of % for each poppet size

**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 |

**Pressure differential**

| | 10 bar | 150 psi |
|---|---|---|
| A- | | |
| 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)

**Model code**

| EPV | 16 | – | * | – | ** | – | * | – | *** | – | ** | – | *** | – | * | – | * | – | 13 | – | (S**) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 |

## 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 | | Steel | |
| | | EPV16-A | EPV16-B | 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.

## 11 Design number

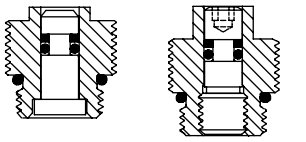
**13** - Design no.

## 12 Special features

**Blank** - None

## Manual override option

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



## ⚠ 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.

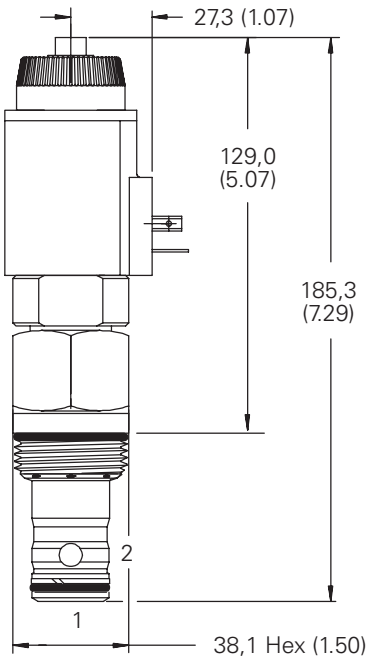
*Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.*

## Dimensions

mm (inch)

**Cartridge only - EPV16A**

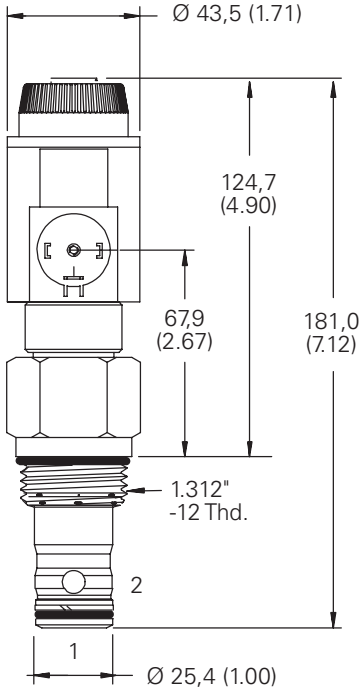
Nose-in, side out




With manual actuator

**EPV16B**

Side-in, nose out




No manual actuator

EPV16A:

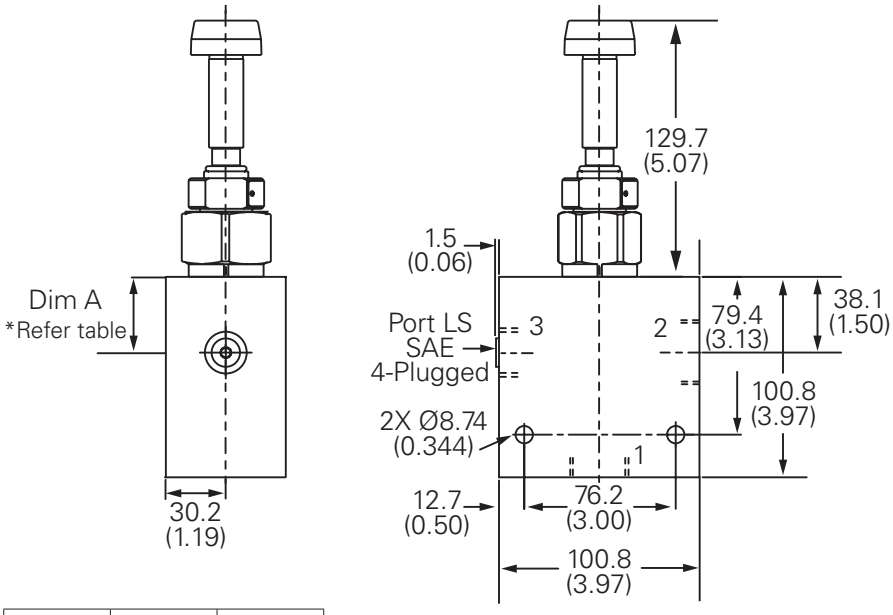
Port 3 is to be plugged. A separate external port

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.*

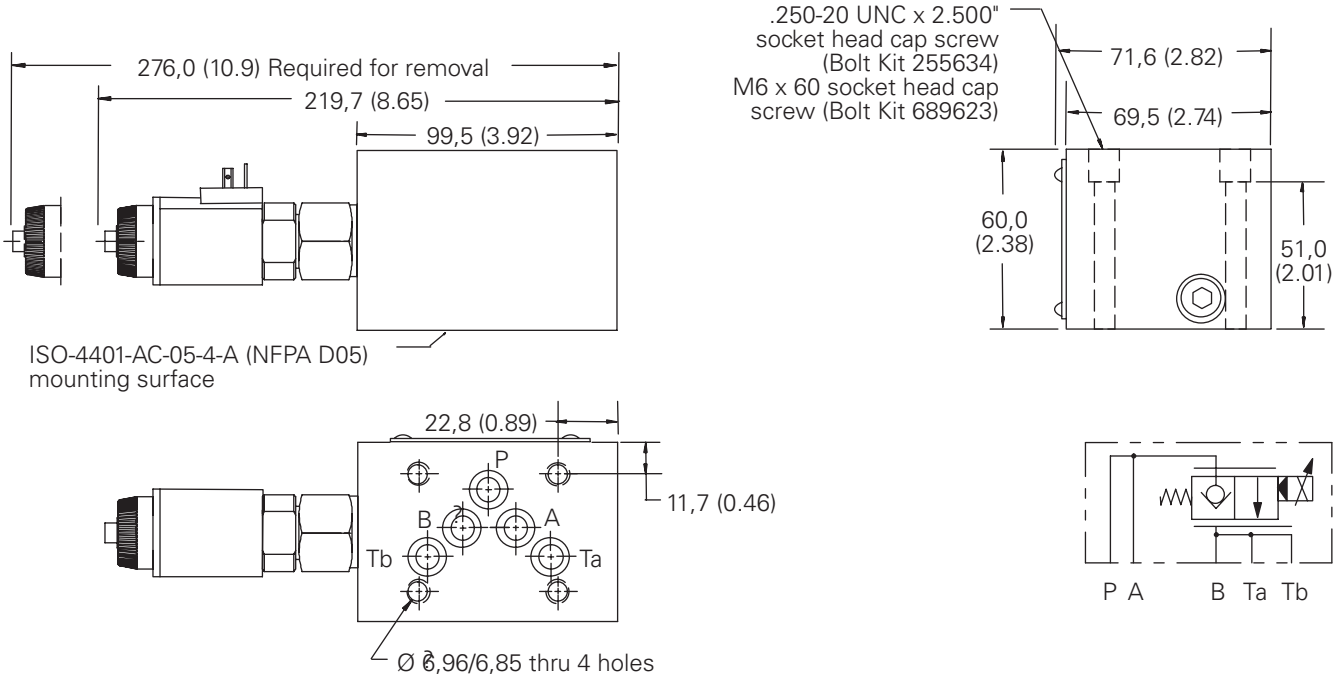
# EPV16 - Proportional valve

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

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

CETOP 5 Interface

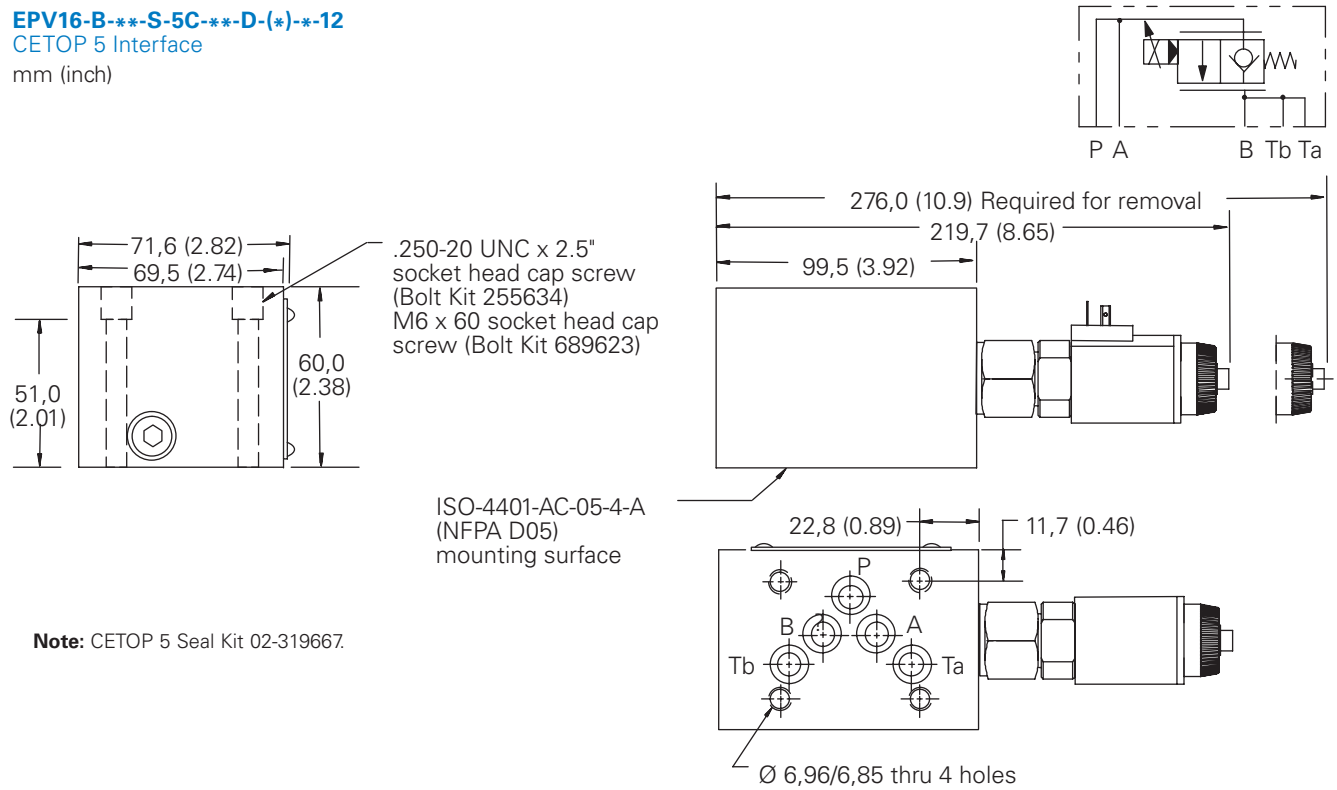
mm (inch)




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

CETOP 5 Interface

mm (inch)




**Note:** CETOP 5 Seal Kit 02-319667.

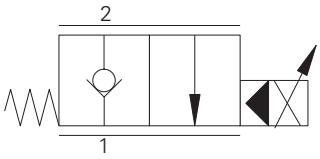
*Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.*

# 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

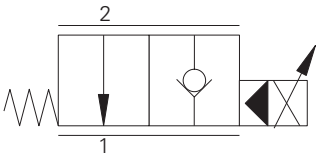



## Operation

In the de-energized position, this valve blocks flow from port 2 to port 1and 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<br>Current to fully close valve for normally open | 1350-1450 mA (12V coil), 075-725 mA (24V coil)<br>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 |
| Hysterisis | 1 Usgpm with dither |
| Weight cartridge only | 0.11 kg (0.24 lbs) |
| Seal kit | 02-165875 (Buna-N), 02-165877 (Viton®) |

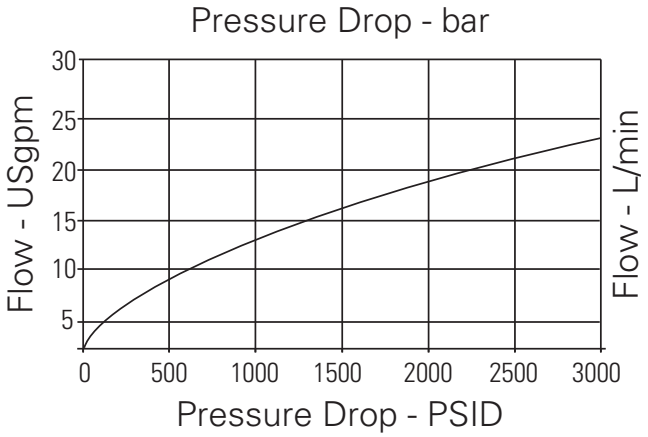
Viton is a registered trademark of E.I. DuPont

# ESV1-8-C / O - Proportional valve

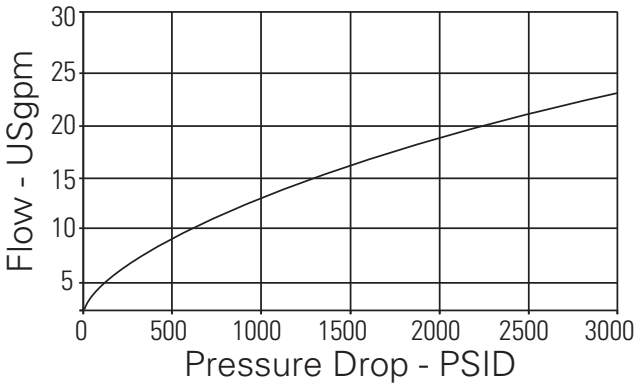
Proportional flow control, normally closed & normally open, poppet
Up to 32 L/min (8.4 USgpm) • 210 bar (3000 psi)

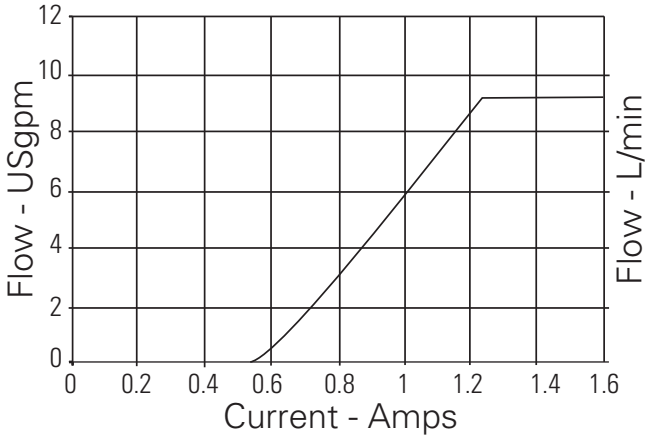
**Pressure drop curves**

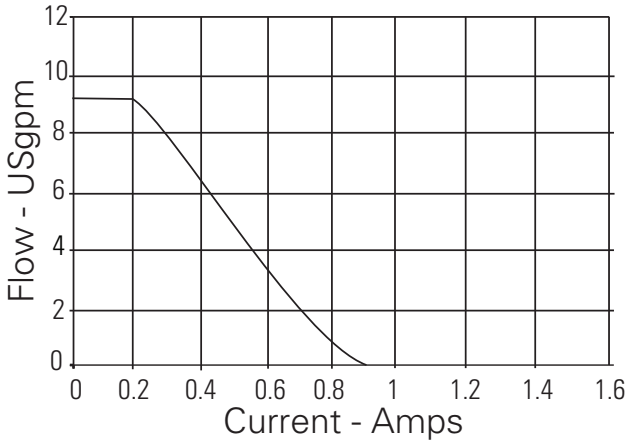
**Normally closed**




**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**

| ESV1 | 8 | – | * | – | * | – | * | – | * | – | ** | – | ** | – | * | – | * | – | * | – | ** | – | ** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | | 13 |

**1 Function**
**ESV1** - Proportional flow control

**2 Size**
**8** - 8 size

**3 Seal material**
**N** - Buna-N
**V** - Viton

**4 Style**
**C** - Normally close
**O** - Normally open

**5 Manual override option**
**Blank** - No manual override
**M** - Knob type
**MO** - Option available only in normally close

**6 Housing material**
**Blank** - Cartridge only
**A** - Aluminum

**7 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.

**8 Coil voltage**
**0** - No coil
**12D** - 12VDC
**24D** - 24VDC

**9 Type of power**
**Blank** - No coil
**B** - DC/with diode
**D** - DC w/o diode

**10 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.

**11 Coil series**
**Blank** - No coil
**S** - S Series, 20 W
For coil part numbers and dimensions see section C.

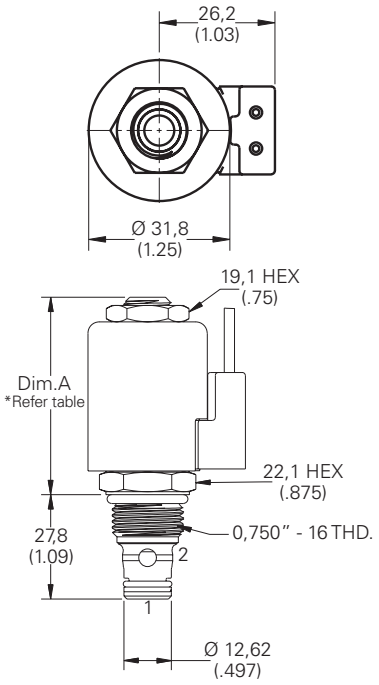
**12 Coil special features**
**Blank** - No coil
**00** - No special feature

**13 Valve special features**
**Blank** - None

## Dimensions

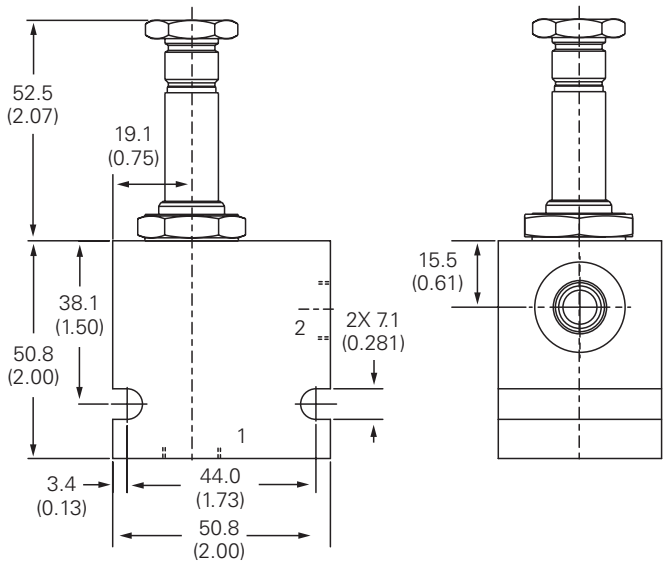
mm (inch)

### Cartridge only




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

### Installation drawing

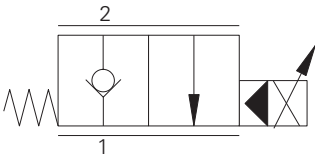



*Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.*

# 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

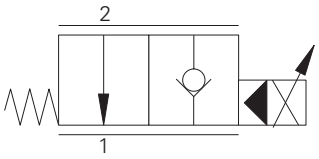



## Operation

In the de-energized position, this valve blocks flow from port 2 to port 1and 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<br>Without manual override<br>With "M" type manual override | <br>@ 500 psid, 70 L/min (18.5 gpm) min, 74 L/min (19.4 gpm) nom<br>@ 500 psid, 37.9 L/min (10 gpm) min (locked position) |
| Leakage (fully closed) | 5 drops/min max @ 3000 psi |
| Nominal supply voltage | 12/24 VDC |
| Current to open valve for normally closed<br>Current to fully close valve for normally open | 900-1000 mA (12V coil), 450-500 mA (24V coil)<br>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 |
| Hysterisis | 1 USgpm with dither |
| Weight cartridge only | 0.13 kg (0.28 lbs) |
| Seal kit | 0565803 (Buna-N), 0566086 (Viton®) |

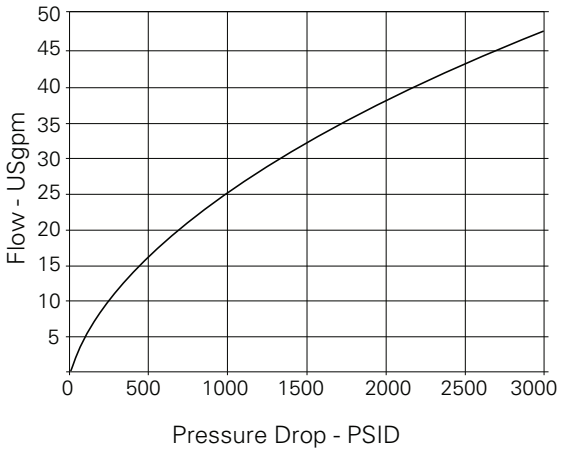
Viton is a registered trademark of E.I. DuPont

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

**Pressure drop curves**

**Normally closed**

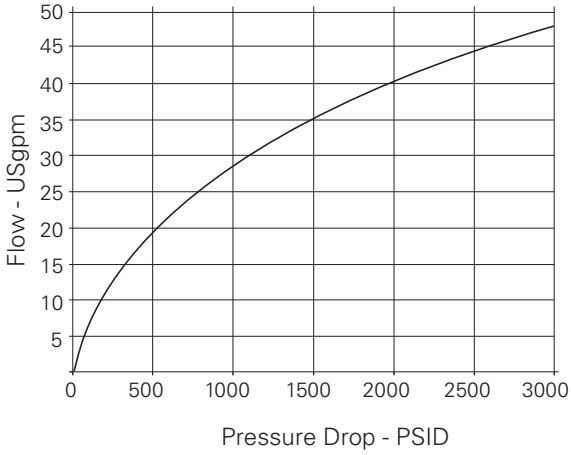
**Pressure Drop At Max Poppet Opening**



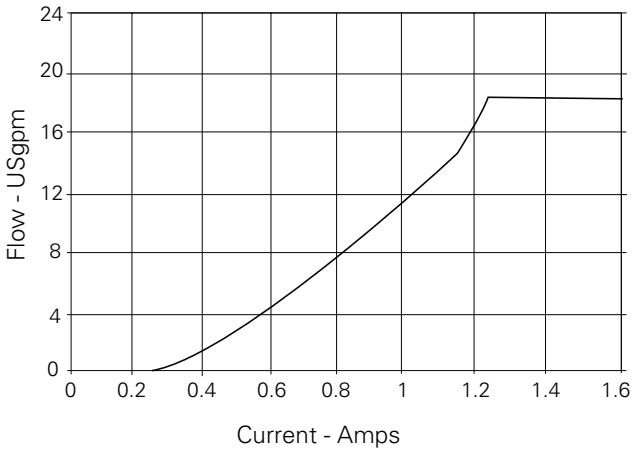

**Pressure drop curves**

**Normally open**

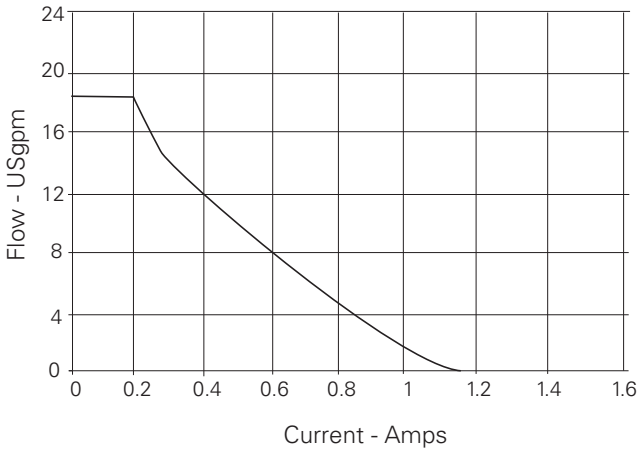
**Pressure Drop At Max Poppet Opening**




**Flow vs. Current at 500 PSID**




**Flow vs. Current at 500 PSID**



# 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**

| ESV1 | 10 | – | * | – | * | – | * | – | * | – | ** | – | ** | – | * | – | * | – | * | – | ** | – | ** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | | 13 |

## 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 Manual override option
**Blank** - No manual override
**M** - Knob type
**MO** - Option available only in normally close

## 6 Housing material
**Blank** - Cartridge only
**A** - Aluminum

## 7 Port size

| Code | Port size | Housing number |
|---|---|---|
| | | Aluminium |
| **0** | Cartridge only | |
| **3B** | 3/8" BSPP | 02-175462 |
| **6T** | SAE 6 | 566151 |
| **2G** | 1/4" BSPP | 876702 |
| **3G** | 3/8" BSPP | 876703 |
| **6H** | SAE 6 | 876700 |
| **8H** | SAE 8 | 876701 |

See section J for housing details.

## 8 Coil voltage
**0** - No coil
**12D** - 12VDC
**24D** - 24VDC

## 9 Type of power
**Blank** - No coil
**B** - DC/with diode
**D** - DC w/o diode

## 10 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.

## 11 Coil series
**Blank** - No coil
**J** - J Series, 23 W

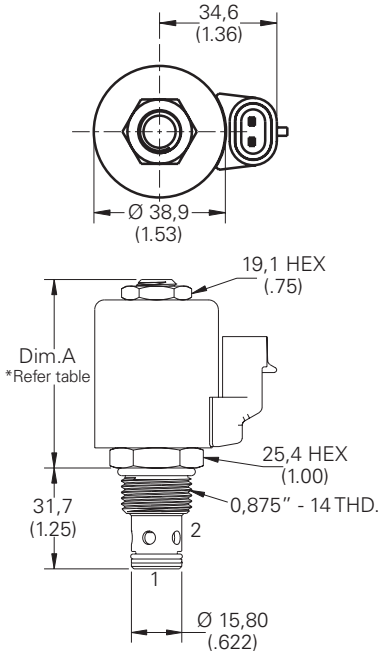
For coil part numbers and dimensions see section C.

## 12 Coil special features
**Blank** - No coil
**00** - No special feature

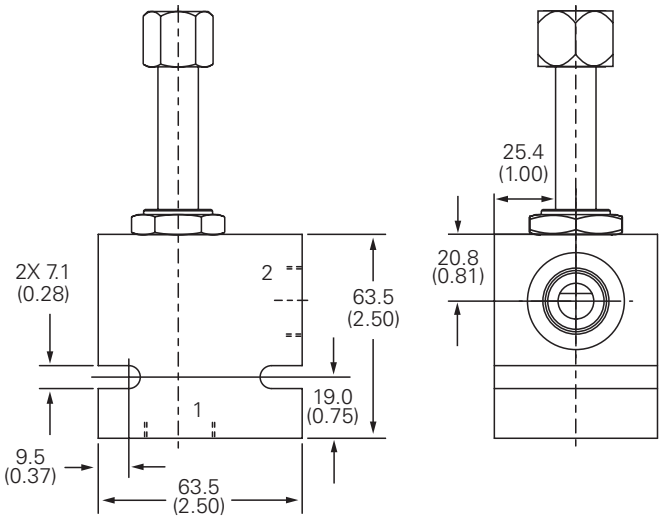
## 13 Valve special features
**Blank** - None

**Dimensions**
mm (inch)

**Cartridge only**




**Installation drawing**




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

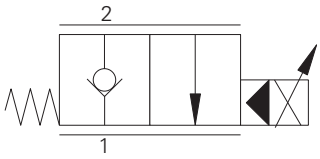
*Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.*

# 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

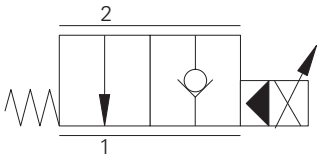



## Operation

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

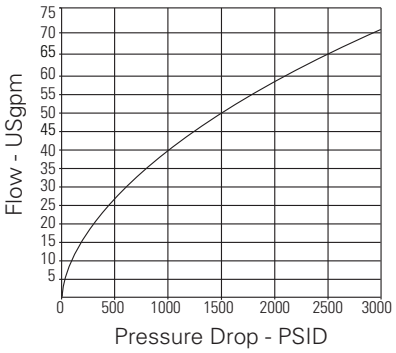
**Ratings and specifications**

| *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 |
| Hysterisis | 1 USgpm with dither |
| Weight cartridge only normally close<br>Weight cartridge only normally open | 0.23 kg (0.48 lbs)<br>0.24 kg (0.23 lbs) |
| Seal kit | 02-165889 (Buna-N), 02-165888 (Viton®) |

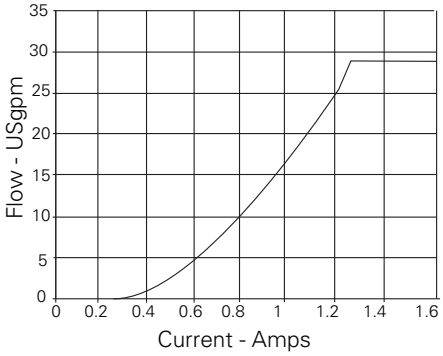
Viton is a registered trademark of E.I. DuPont

## Pressure drop curves

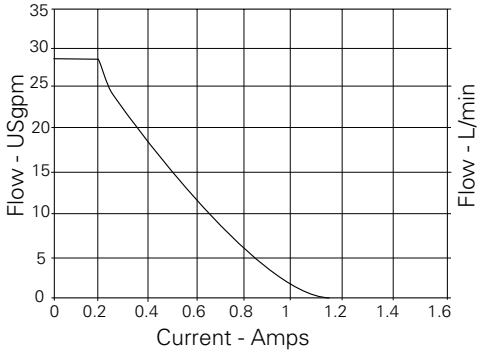
**Pressure Drop At Max Poppet Opening for close & open**




**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**

| ESV1 | 12 | – | * | – | * | – | * | – | **** | – | *** | – | * | – | * | – | * | – | ** | – | ** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 |

## 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

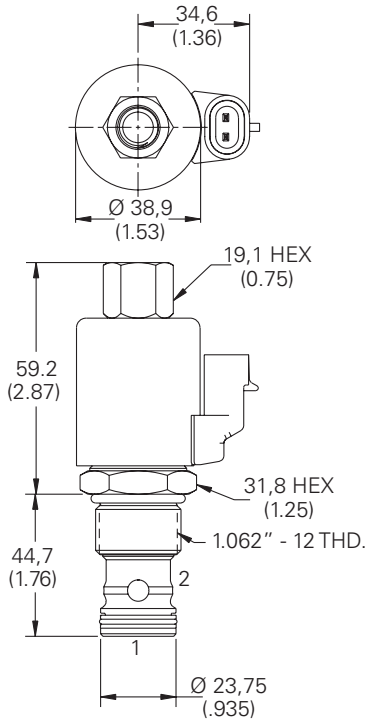
## 12 Valve special features

**Blank** - None

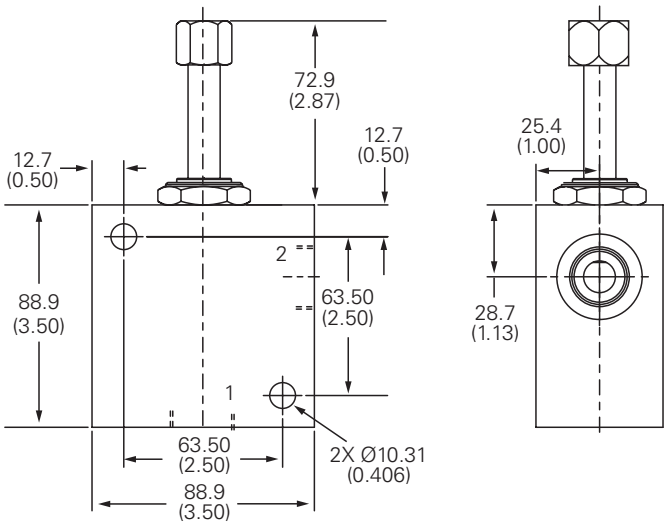
**Dimensions**

mm (inch)

**Cartridge only**




**Installation drawing**

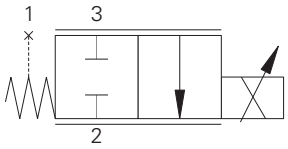



*Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.*

# EFV1-10-C / O - Proportional valve

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

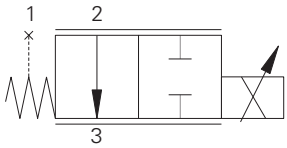





## Operation

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. 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 | Flow rating "A" 15.1 L/min (4 USgpm)<br>Flow rating "B" 30.2 L/min (8 USgpm)<br>Flow rating "C" 37.9 L/min (10 USgpm) |
| Internal leakage | 197 $cm^3$/min (12$in^3$/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 |
| Hysterisis | 1 USgpm with 400Hz PWM driver |
| Seal kit | 9900225-000 (Buna-N), 9900226-000 (Viton®) |

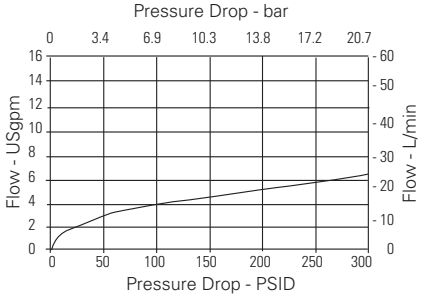
Viton is a registered trademark of E.I. DuPont

# EFV1-10-C / O - Proportional valve

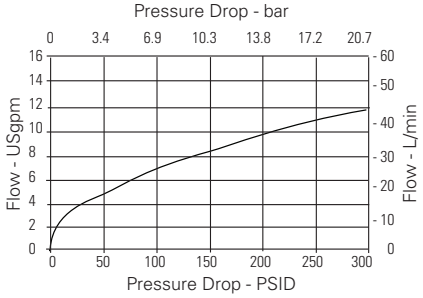
Proportional flow, Normally open & Normally close, poppet
Up to 38 L/min (10 USgpm) • 210 bar (3000 psi)

## Normally close

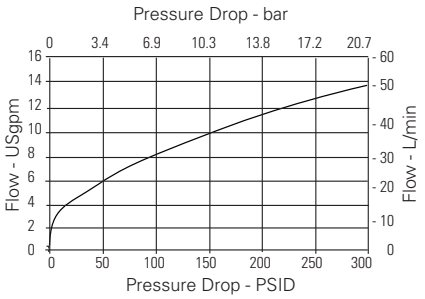
### Max Flow vs. Pressure drop
Flow rating "A" at zero current



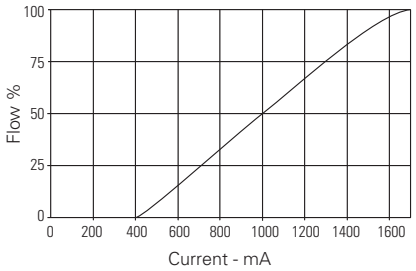

### Max Flow vs. Pressure drop
Flow rating "B" at zero current




### Max Flow vs. Pressure drop
Flow rating "C" at zero current

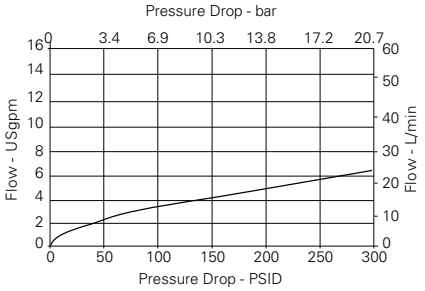



### Flow vs. Current

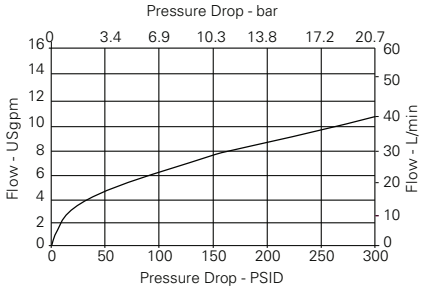



## Normally open

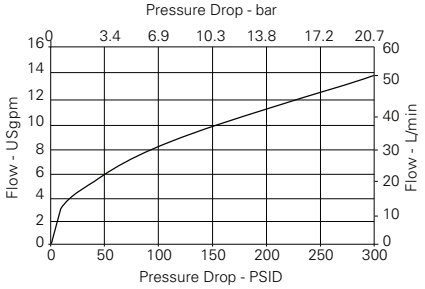
### Max. flow vs Pressure drop
Flow rating "A" (Valve fully open)



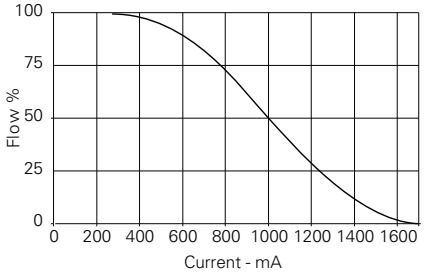

### Max. flow vs Pressure drop
Flow rating "B" (Valve fully open)




### 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.

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**

**EFV1 – 10 * – * – * – * – * – * – *** – *****E** – 00**

1 2 3 4 5 6 7 8 9 10

## 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

## 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.

## 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

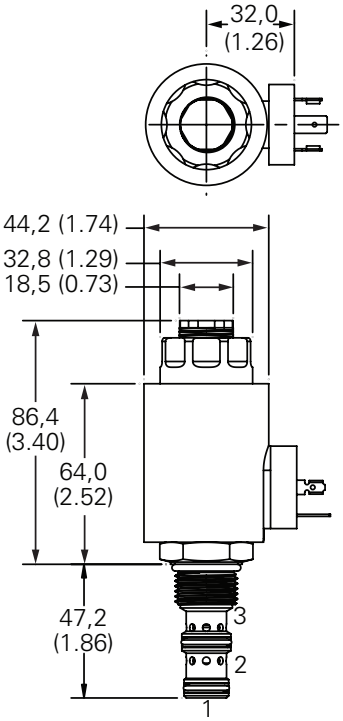
Only required when valve has special features, omitted if "00".

## Dimensions
mm (inch)

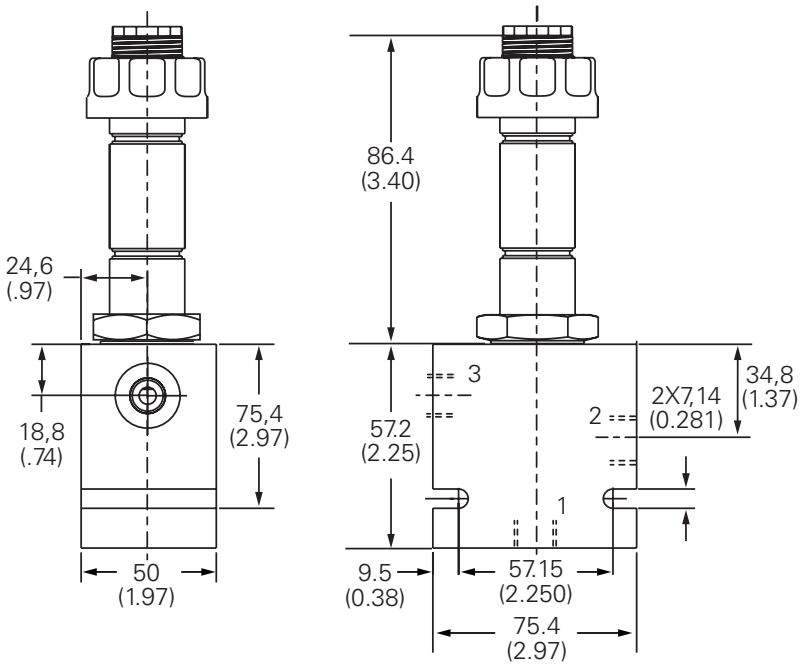
**Note:** S type manual override shown. DIN 43650 connector shown.

**Note:** Port 1 is unused and must be plugged.

**Cartridge only**




**Installation drawing (Aluminum)**

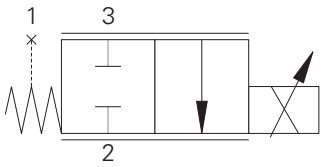



*Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.*

# 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

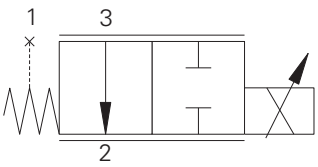



## Operation

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**

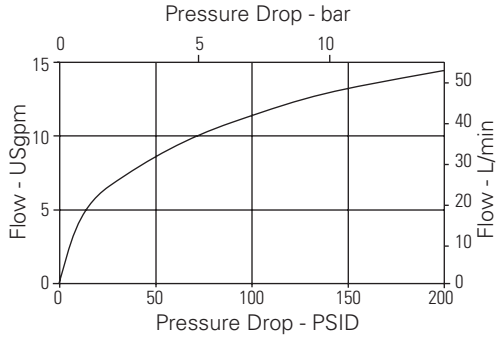
| | |
|---|---|
| *Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)* | |
| Typical application pressure | 210 bar (3000 psi) |
| Cartridge endurance rating | 1million cycles |
| Rated flow for normally closed<br>Rated flow for normally open | Flow rating "A" 55 L/min (14.3 USgpm)<br>Flow rating "B" 77 L/min (20.6 USgpm)<br>Flow rating "A" 95 L/min (25 USgpm)<br>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 |
| Hysterisis | 1 USgpm with 400Hz PWM driver |
| Seal kit | 9900171-000 (Buna-N), 9900172-000 (Viton®) |

Viton is a registered trademark of E.I. DuPont

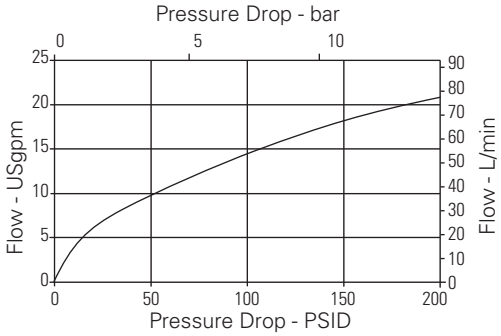
*Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.*

## Normally closed

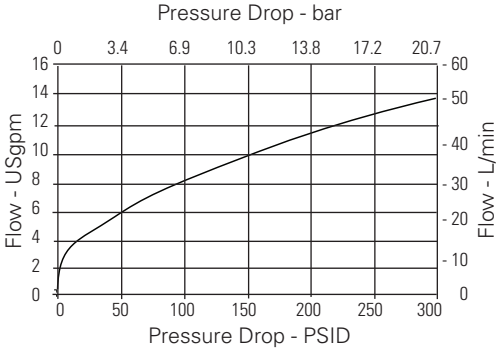
### Max flow vs. Pressure drop
Flow rating "A" at zero current




### Max flow vs. Pressure drop
Flow rating "B" at zero current

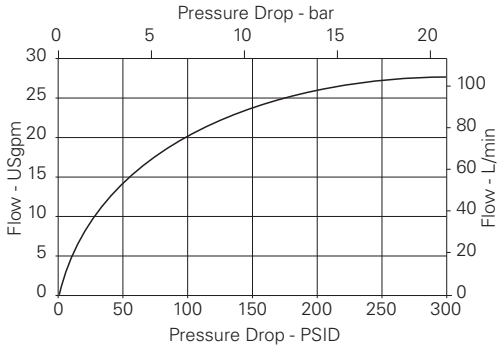



### Flow vs. Current

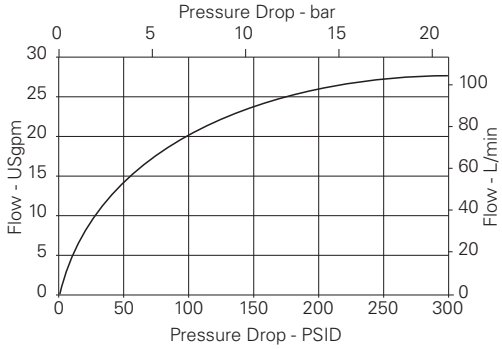



## Normally open

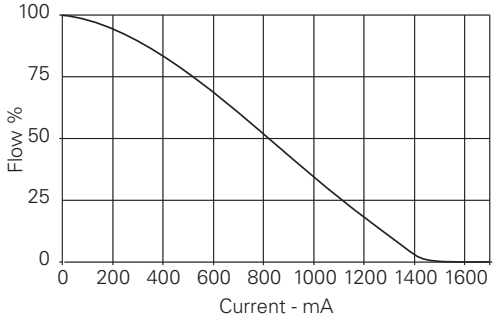
### Max. flow vs Pressure drop
Flow rating "B" (Zero Current)




### 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**

**EFV1 – 12 – * – * – * – * – * – *** – *****E** – 00**

1 2 3 4 5 6 7 8 9 10

## 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

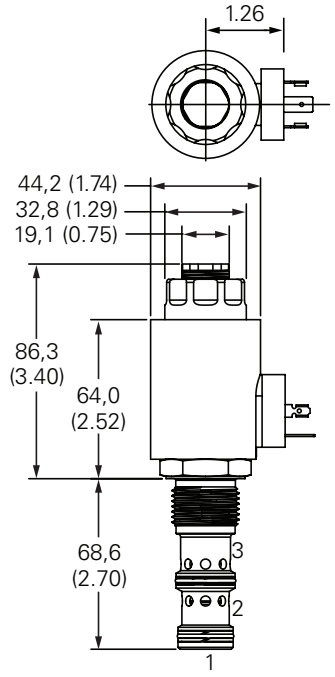
Only required when valve has special features, omitted if "00".

## Dimensions
mm (inch)

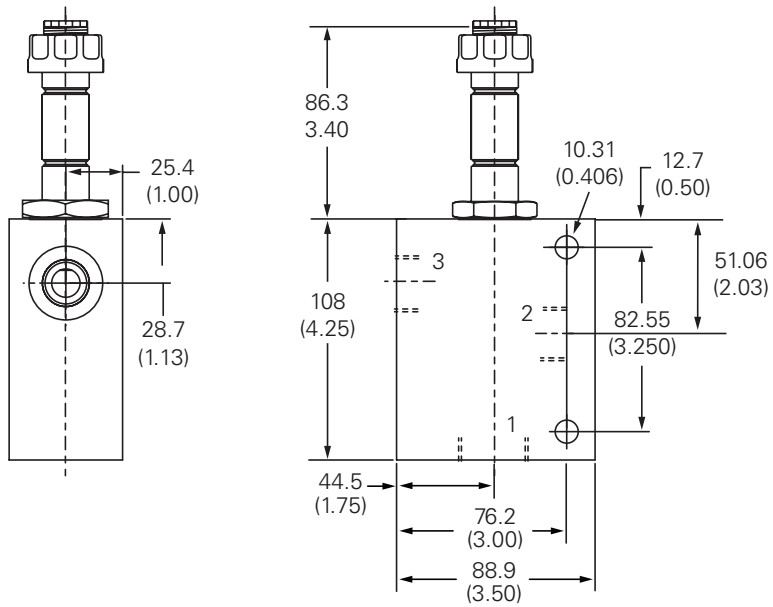
Port 1 is unused and must be plugged.

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

**Cartridge only**




**Installation drawing (Aluminum)**



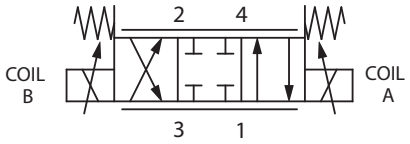

*Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.*

# ESV9-8 - Proportional solenoid valve

4-way, 3-position, proportional solenoid valve
Up to 11 L/min (2.9 USgpm) • 210 bar (3000 psi)



### ESV9-8-E

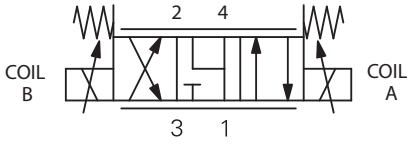



### Operation

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.

### 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.

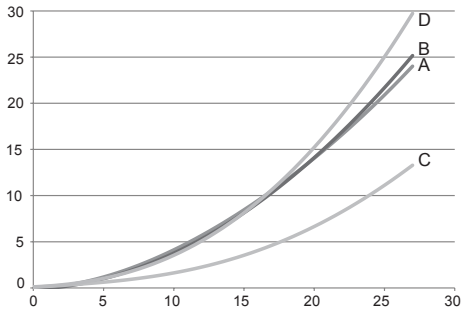
## Performance data

**Ratings and specifications**

| *Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)* | |
|---|---|
| Typical application pressure<br>Operating Pressure Port 1 (T)<br>Operating Pressure Port 2,3 and 4 (A, P and B) | <br>210 bar (3,000 psi)<br>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) |

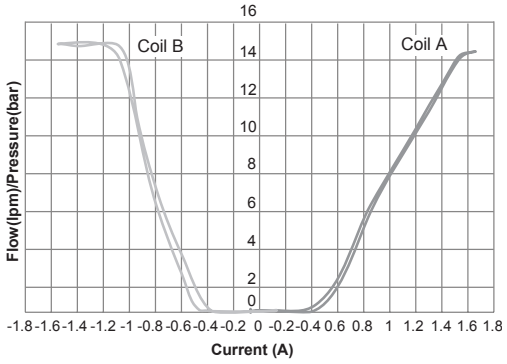
Viton is a registered trademark of E.I. DuPont.
*AC coils must be used with a rectifying connector.

### 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

### 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, proportional solenoid valve
Up to 11 L/min (2.9 USgpm) • 210 bar (3000 psi)

**Model code**

| ESV9 | – | 8 | * | – | * | – | * | – | *** | – | **** | * | * | – | ** | ** | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 2 | 3 | | 4 | | 5 | | 6 | | 7 | 8 | 9 | | 10 | 11 | 12 |

## 1 Function

**ESV9** - Proportional solenoid valve

## 2 Size

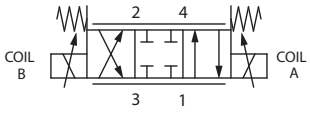
**8** - 8 size

## 3 Seal material

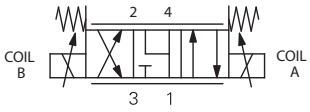
**Blank** - Buna-N
**V** - Viton®

## 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 features[1]

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

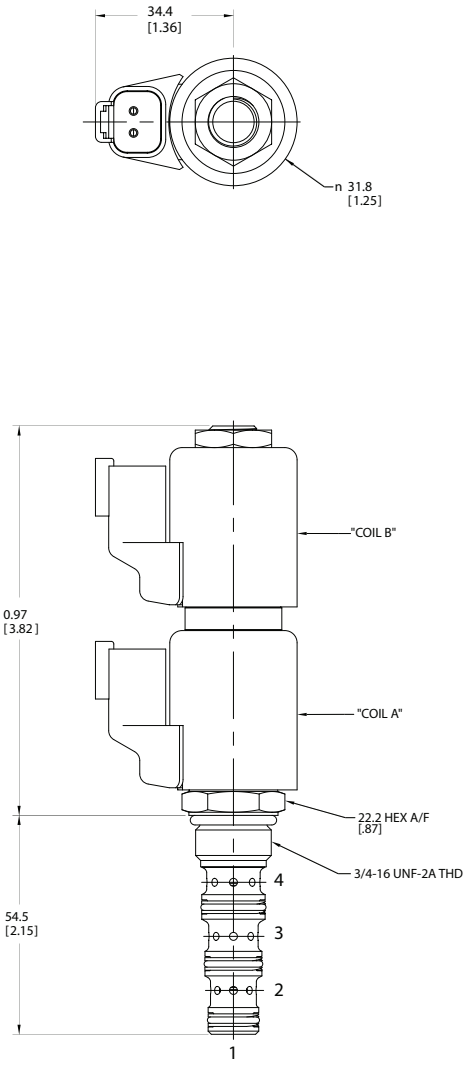
## 12 Design code

**A** - Design code 00

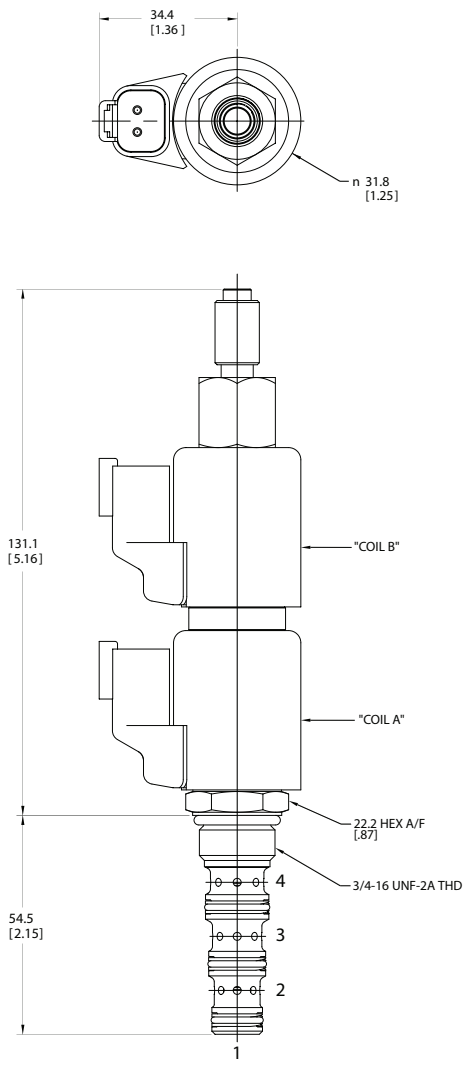
[1]These model digits are not stamped on the valve.

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

## ESV9-8 without MO




## ESV9-8 with MO




## Dimensions

mm (inch)

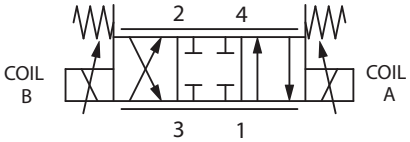
| Spare parts | |
|---|---|
| Coil Nut for MO | 565559 |
| Coil Nut without MO | 565558 |
| Coil Spacer | 02-186730 |

*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, proportional solenoid valve
Up to 22 L/min (5.8 USgpm) • 250 bar (3600 psi)

### ESV9-10-E

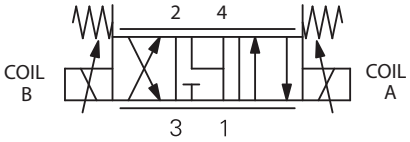



### Operation

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.

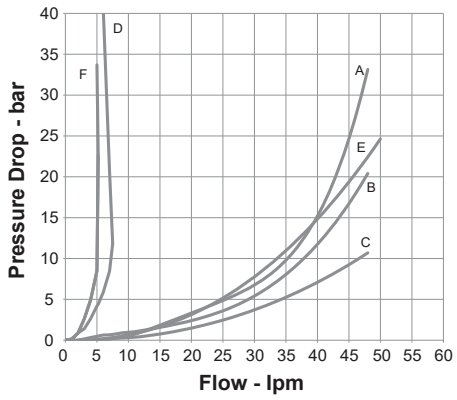
## Performance data

**Ratings and specifications**

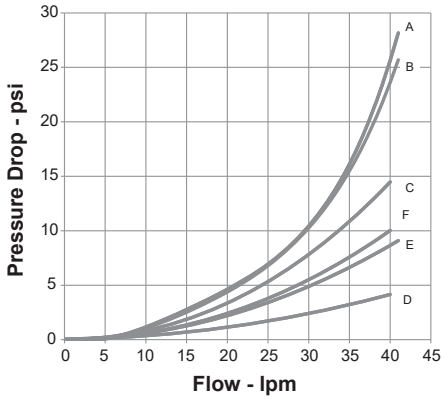
| *Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)* | |
|---|---|
| Typical application pressure<br>Operating Pressure Port 1 (T)<br>Operating Pressure Port 2,3 and 4 (A, P and B) | <br>210 bar (3,000 psi)<br>250 bar (3,600 psi) |
| Rated burst pressure | 750 bar (10,600 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 cm3/min (10 in3/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.

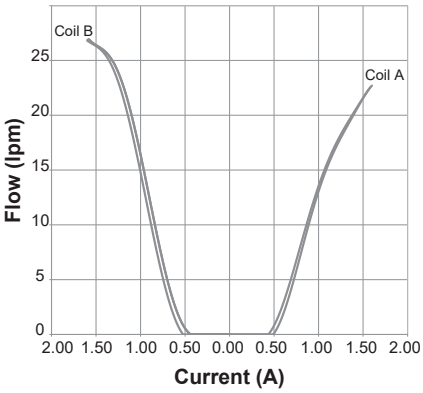
### Pressure Drop for spool F




### 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, screw-in cartridge, proportional solenoid valve
Up to 22 L/min (5.8 USgpm) • 250 bar (3600 psi)

**Model code**

| ESV9 | – | 10 | * | – | * | * | – | *** | – | **** | * | * | – | ** | ** | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 2 | 3 | | 4 | 5 | | 6 | | 7 | 8 | 9 | | 10 | 11 | 12 |

## 1 Function

**ESV9** - Proportional solenoid valve

## 2 Size

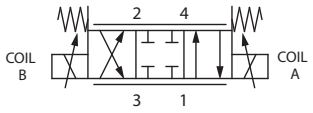
**10** - 10 size

## 3 Seal material

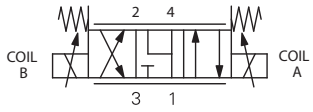
**Blank** - Buna-N
**V** - Viton®

## 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 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 features[1]

**00** - None

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

## 12 Design code

**A** - Design code 00

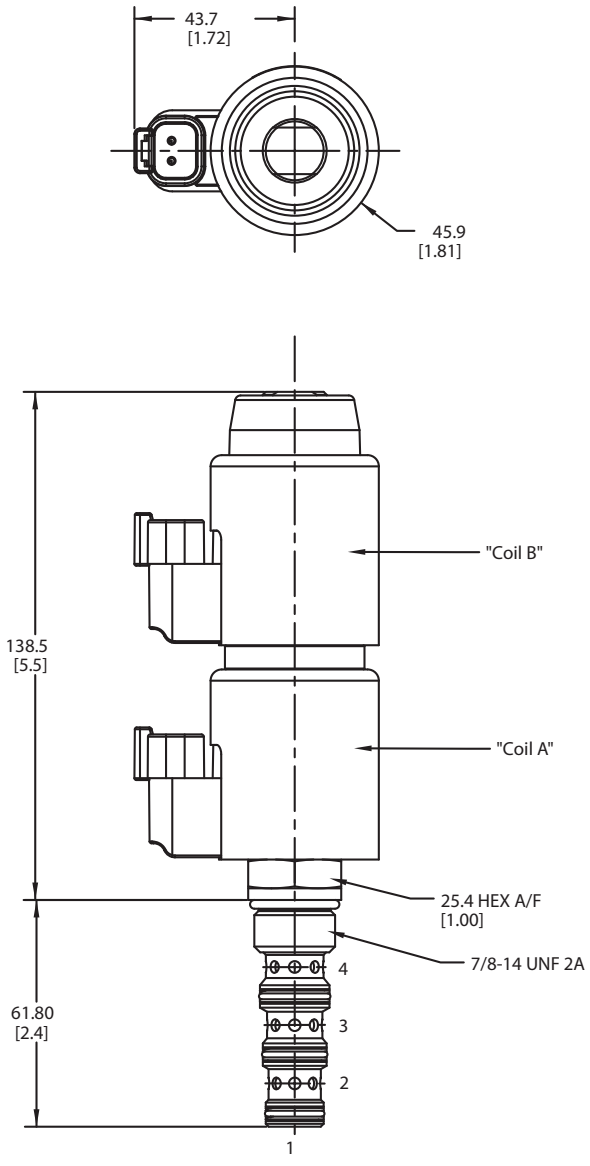
[1]These model digits are not stamped on the valve.

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

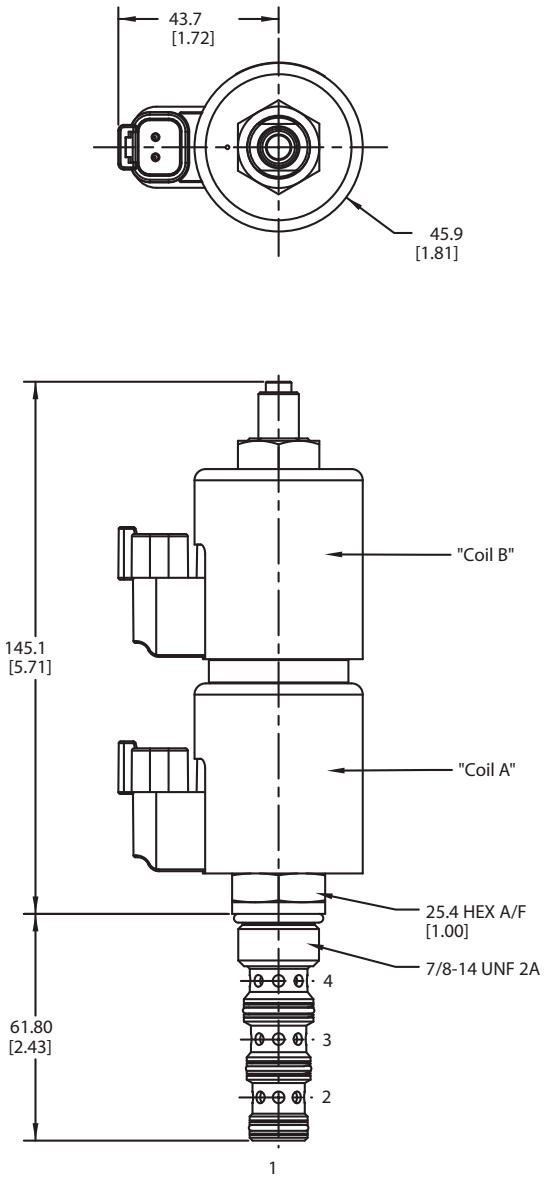
# ESV9-10 - Proportional Solenoid Valve

4-way, 3-position, screw-in cartridge, proportional solenoid valve
Up to 22 L/min (5.8 USgpm) • 250 bar (3600 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.*

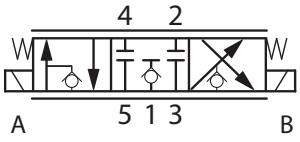
# ESVL9-10 - Proportional solenoid valve

5 Port, 3-position, screw-in cartridge, proportional solenoid valve
Up to 23 L/min (6 USgpm) • Up to 250 bar (3600 psi)

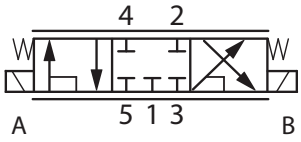


## ESVL9-10-E

### With Load Sense check valve

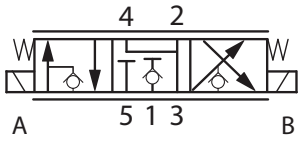



### Without Load Sense check valve

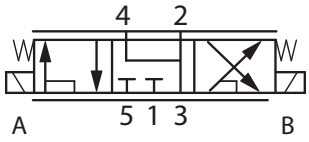



## ESVL9-10-F

### 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.

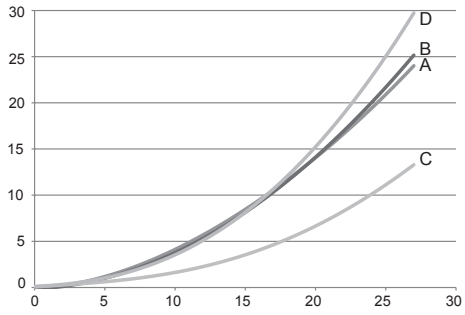
## Performance data

**Ratings and specifications**

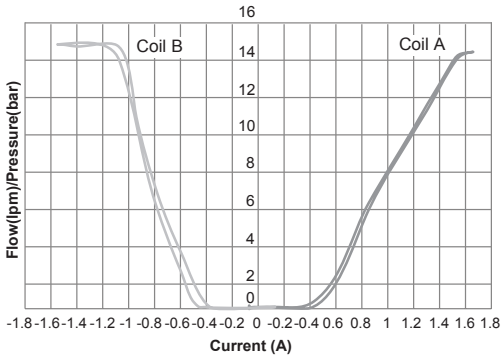
| *Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)* | |
|---|---|
| Typical application pressure for all ports | 250 bar (3,600 psi) |
| Rated burst pressure | 750 bar (10,600 psi) per NFPA/T2-6-1 R2-2000 |
| Max. flow | 23 L/min (6 USgpm) |
| Temperature range | -40° to 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




## Flow vs. Current at 10 bar ΔP




**A** - Port 5 to port 4
**B** - Port 5 to port 2
**C** - Port 2 to port 3
**D** - Port 4 to port 3

*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 (6 USgpm) • Up to 250 bar (3600 psi)

**Model code**

**ESVL9 – 10 * – * * – *** – **** * * – ** * A**

1 2 3 4 5 6 7 8 9 10 11 12

## 1 Function

**ESVL9** - Proportional solenoid valve

## 2 Size

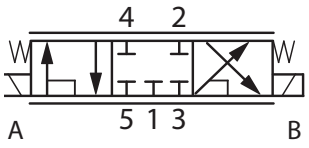
**10** - 10 size

## 3 Seal material

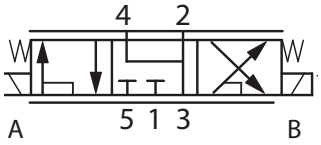
**Blank** - Buna-N
**V** - Viton®

## 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 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

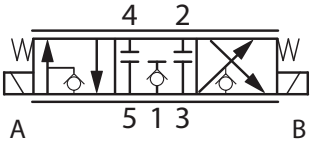
## 10 Coil special feature

**00** - None

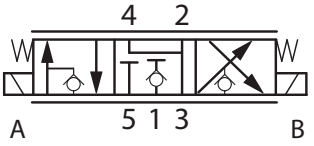
## 11 Valve special features[1]

**0** - None
**C** - With valve check

**E**




**F**




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

## 12 Design code

**A** - Design code 00

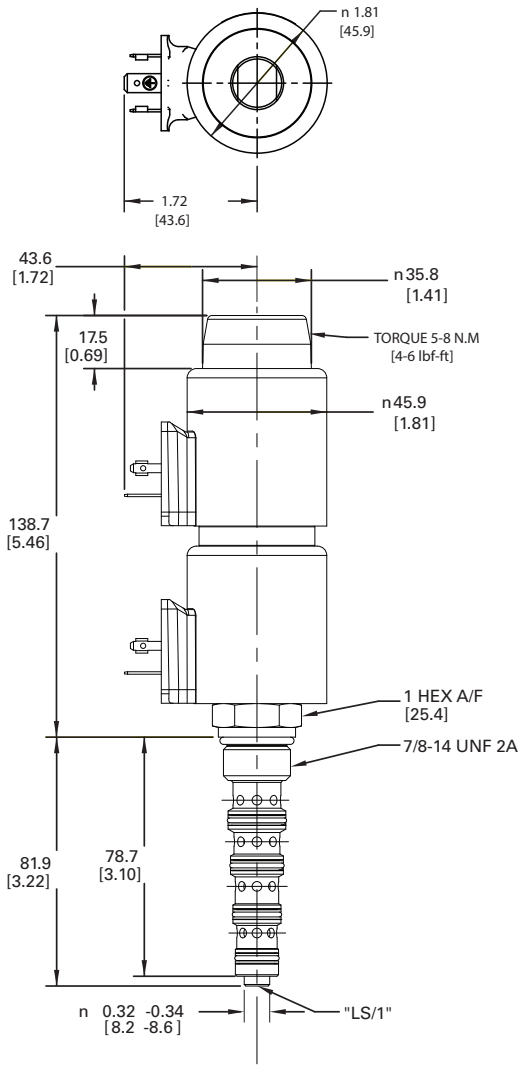
[1]These model digits are not stamped on the valve.

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

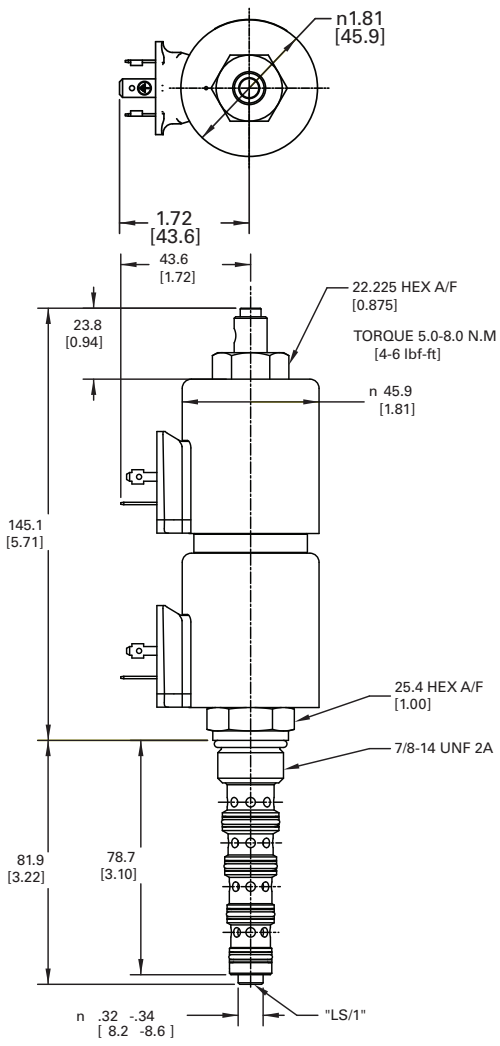
# ESVL9-10 - Proportional solenoid valve

5 Port, 3-position, screw-in cartridge, proportional solenoid valve
Up to 23 L/min (6 USgpm) • Up to 250 bar (3600 psi)

## ESVL9-10 without MO




## ESVL9-10 with MO




## Dimensions

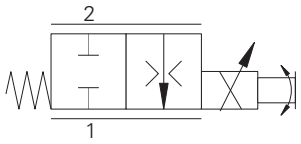
mm (inch)

| 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.

B

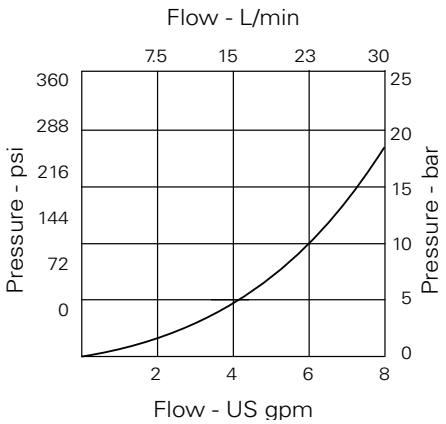
## Performance data

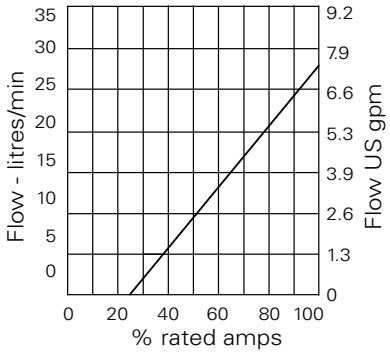
**Ratings and specifications**

| | |
|---|---|
| *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% |
| Hystersis | 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®) |

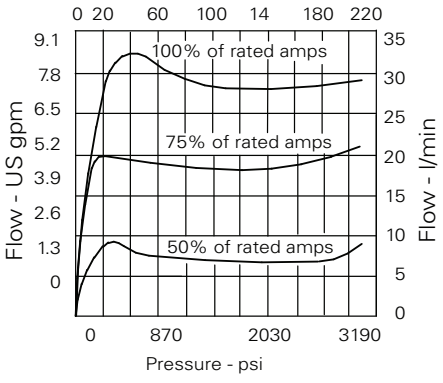
Viton is a registered trademark of E.I. DuPont

### 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**

**PFR2 4A – N – 6 – H – 24 – 3W**

1 2 3 4 5 6

### 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

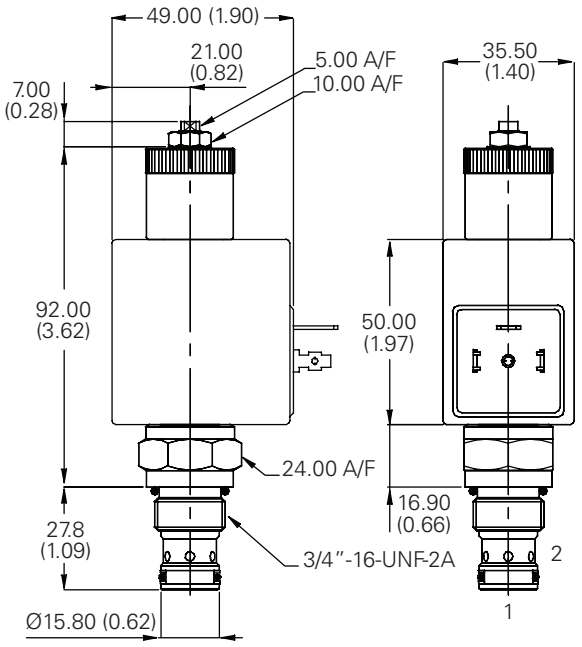
| Code | Port size | Housing number |
|---|---|---|
| | | **Aluminium** |
| **0** | | Cartridge only |
| **2W** | 1/4" BSP | A12592 |
| **3W** | 3/8" BSP | A7450 |
| **6T** | 3/8" SAE | A19355 |

See section J for housing details.

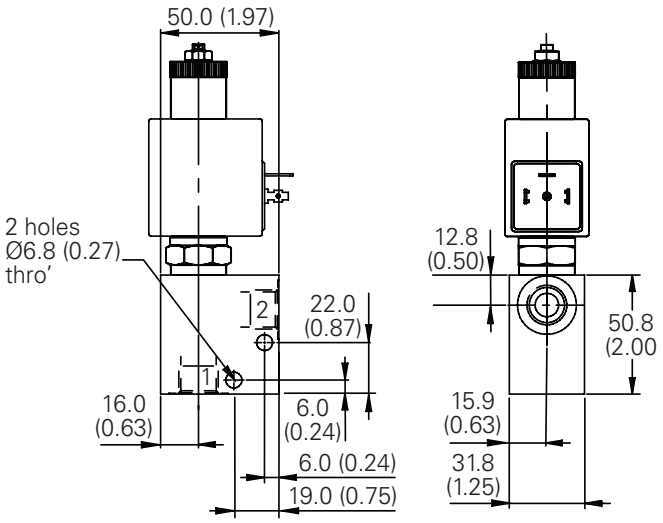
## Dimensions

mm (inch)

### Cartridge only




### Installation drawing

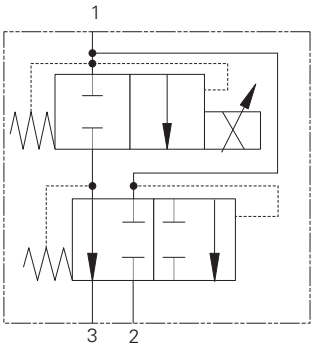



*Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.*

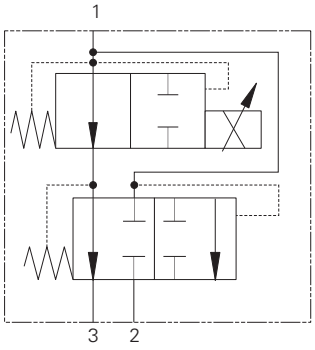
# EFV2-12-C / O - Proportional valve

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

### EFV2-12-C




### EFV2-12-O




### 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.

### 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.

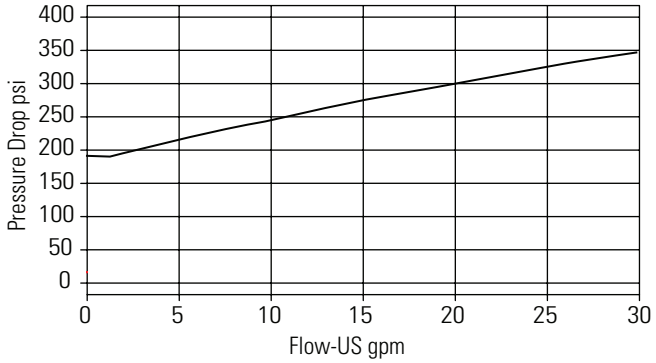
The valve will regulate flow out of port 3 regardless of downstream system pressure. As current is increased to the solenoid the flow out of port 3 will decrease.

### Performance data for closed spool

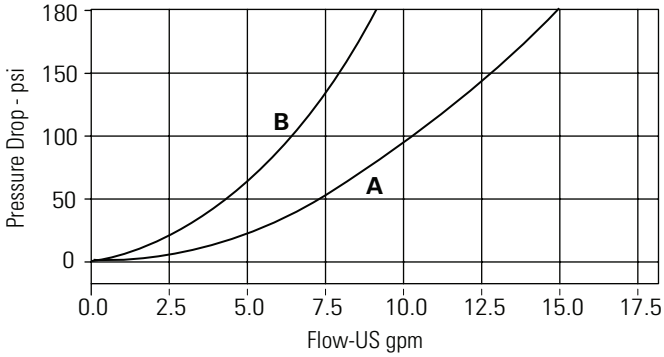
| Ratings and specifications | |
|---|---|
| *Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)* | |
| Typical application pressure | 210 bar (3000 psi) |
| Cartridge endurance rating | 1million cycles |
| Cartridge fatigue pressure (infinite life) | 210 bar (3000 psi) NFPA rated |
| Rated flow for closed spool | "A" Spool-max regulated flow (by-pass mode): 57 L/min (15 USgpm)<br>max regulated flow (2 port mode): 53 L/min (14 USgpm)<br>max input flow (input flow): 114 L/min (30 USgpm)<br>"B" Spool-max regulated flow (by-pass mode): 38 L/min (10 USgpm)<br>max regulated flow (2 port mode): 31 L/min (8 USgpm)<br>max input flow (input flow): 114 L/min (30 USgpm)<br>**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)<br>max regulated flow (2 port mode): 42 L/min (11 USgpm)<br>max input flow (input flow): 114 L/min (30 USgpm)<br>"B" Spool-max regulated flow (by-pass mode): 38 L/min (10 USgpm)<br>max regulated flow (2 port mode): 31 L/min (8 USgpm)<br>max input flow (input flow): 114 L/min (30 USgpm)<br>**Note:** Max regulated flow may decrease slightly during compensation. |
| Internal leakage Normally closed<br>Internal leakage Normally open | 240 cm3/min (15 in3/min) @ 3000 PSID<br>77-483 cm3/min (5-30 in3/min) @ 3000 PSID |
| Nominal supply voltage | 12/24 V |
| Current to fully open valve<br><br><br>Current to fully close valve | Normally closed 1600 6 200 mA (12V coil), 800 6 100 mA (24V coil)<br>Normally open 350 6 100 mA (12V coil), 800 6 100 mA (24V coil)<br>Normally closed 350 6 100 mA (12V coil), 175 6 50 mA (24V coil)<br>Normally open 1600 6 200 mA (12V coil), 800 6 100 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 |
| Hysterisis | 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.*

**Flow vs Pressure drop**
Excess flow P1 to P2 (P3 to Atm)
Full current (1700 mA on a 12V Coil)

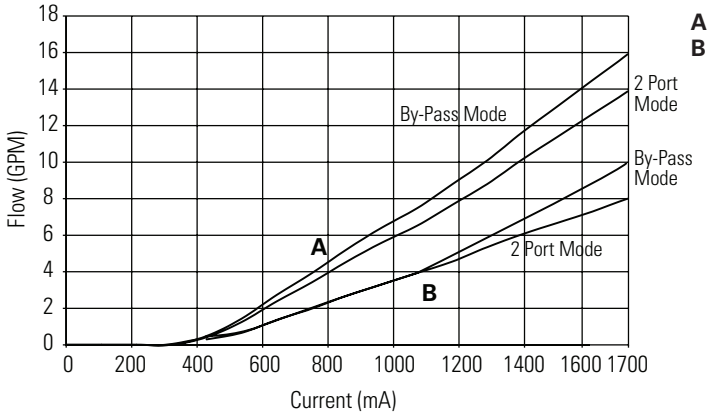



**Flow vs Pressure drop**
Regulated flow P1 to P3 (P2 to Atm)
Full current (1700 mA on a 12V Coil)



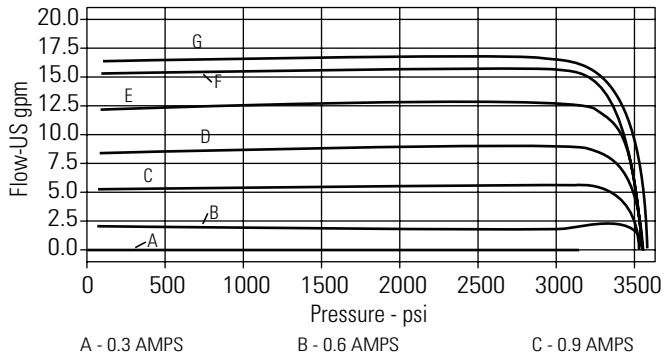

**A** - A spool pressure drop
**B** - B spool pressure drop

**Flow vs Current**




**A** - A spool
**B** - B spool

**Regulated flow vs Pressure**
Regular to Bypass

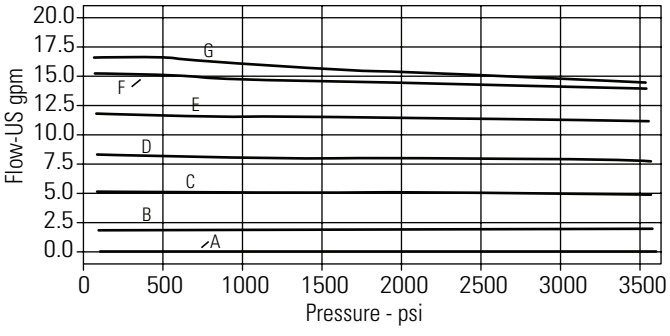



A - 0.3 AMPS
D - 1.2 AMPS
G - 2.0 AMPS

B - 0.6 AMPS
E - 1.5 AMPS

C - 0.9 AMPS
F - 1.8 AMPS

**Regulated flow vs Pressure**
Bypass to Regular




A - 0.3 AMPS
D - 1.2 AMPS
G - 2.0 AMPS

B - 0.6 AMPS
E - 1.5 AMPS

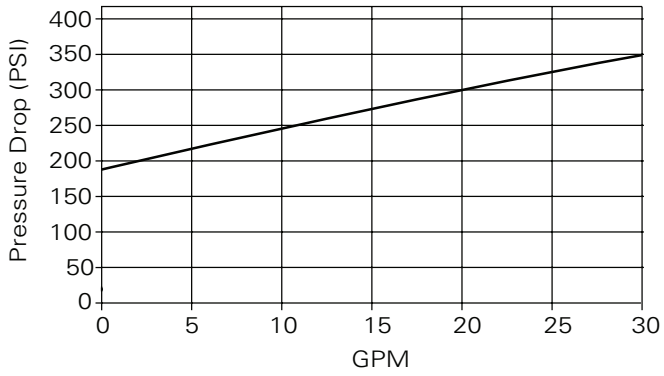
C - 0.9 AMPS
F - 1.8 AMPS

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

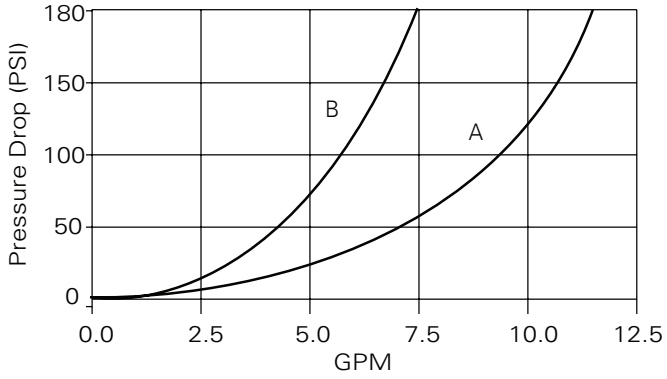
# EFV2-12-O - Proportional valve

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

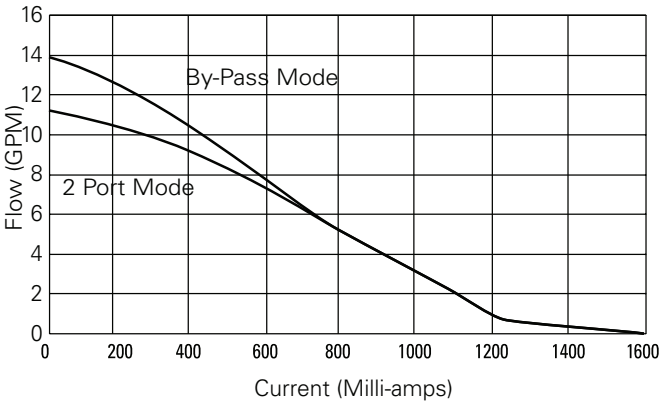
### Pressure drop port 1 to port 2



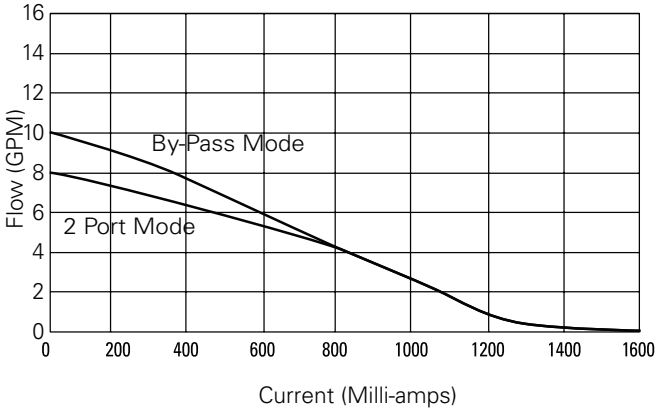

### Pressure drop port 1 to port 3




### Flow vs Current - A Spool



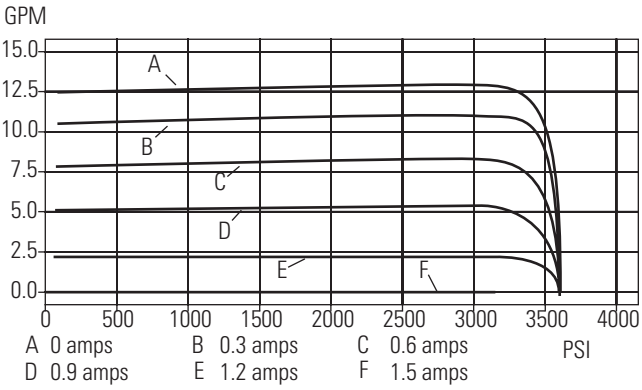

### Flow vs Current - B Spool




Parameters: 400 Hz PWM

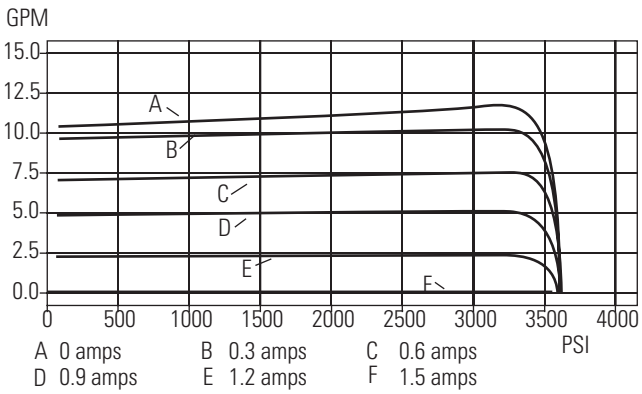
### Regulated flow vs Pressure

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**

**EFV2 – 12 – * – * – * – * – * – * – *** – *****E** – 00**

1 2 3 4 5 6 7 8 9 10

**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

**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.

**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

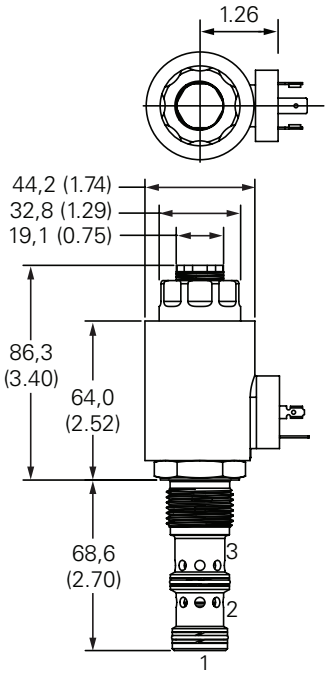
Only required when valve has special features, omitted if "00".

## Dimensions

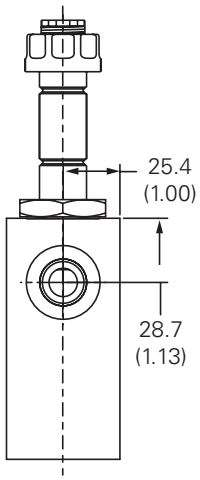
mm (inch)

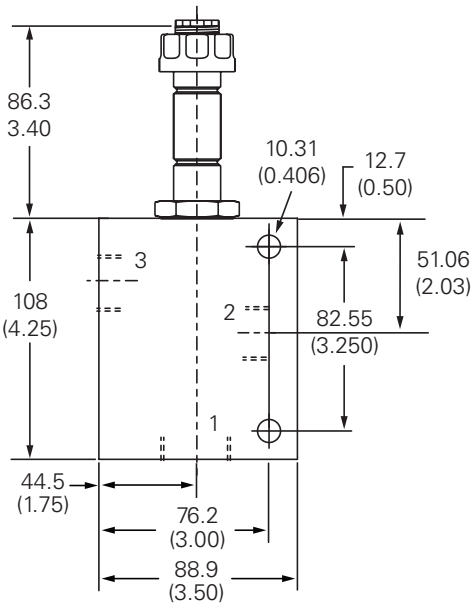
**Note:** EFV2-12 with DIN-43650 connector shown.

**Cartridge only**




**Installation drawing (Aluminum)**

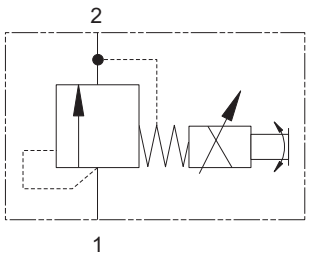



*Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.*

# 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.

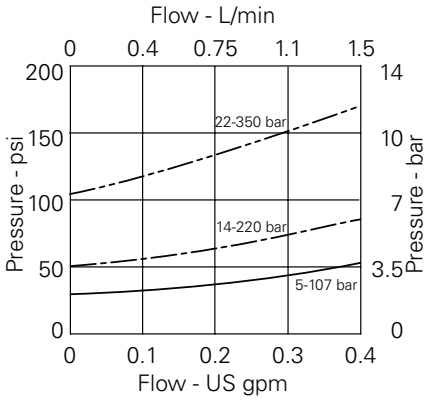
## Performance data

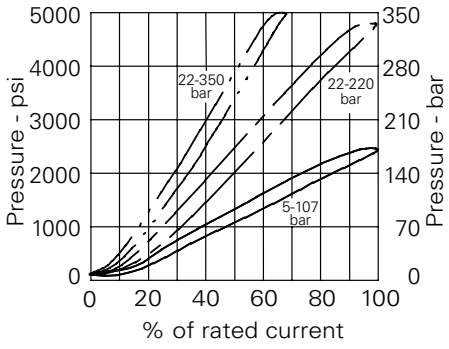
**Ratings and specifications**

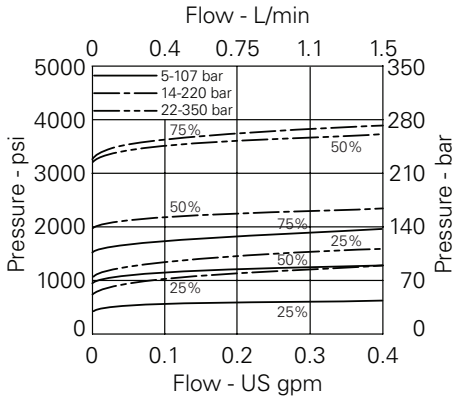
| *Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)* | |
|---|---|
| Max inlet pressure | 350 bar (5000 psi) |
| Pressure range | 10 = 5-107 bar (72-1550 psi), 20 = 14-220 bar (200-3200 psi), 35 = 22-350 bar (320-5000 psi) |
| Max press port 2 | 100 bar (1450 psi) |
| Max flow | 1.5 L/min (.3 US GPM) |
| Hystersis | <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**

**PDR21A – N – 20 – 6 – H – 24 – 3W**

1 2 3 4 5 6 7

**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.

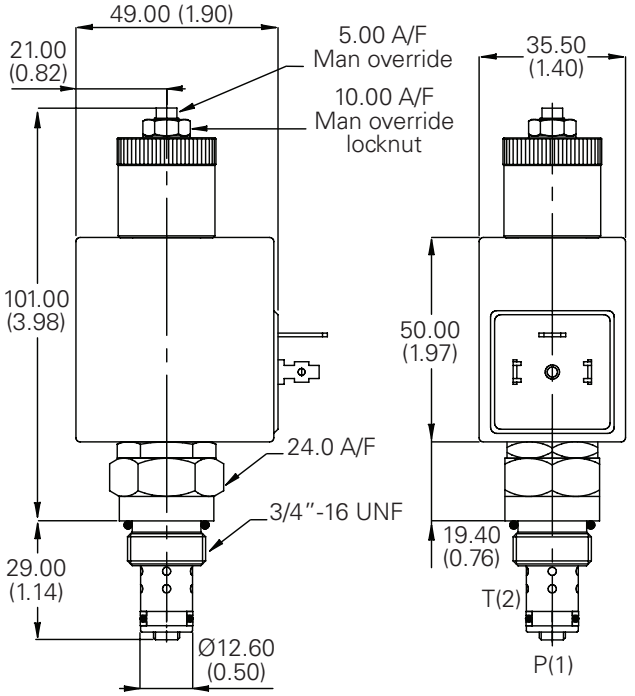
**6 Voltage**
**12** - 12 VDC
**24** - 24 VDC

**7 Port size**

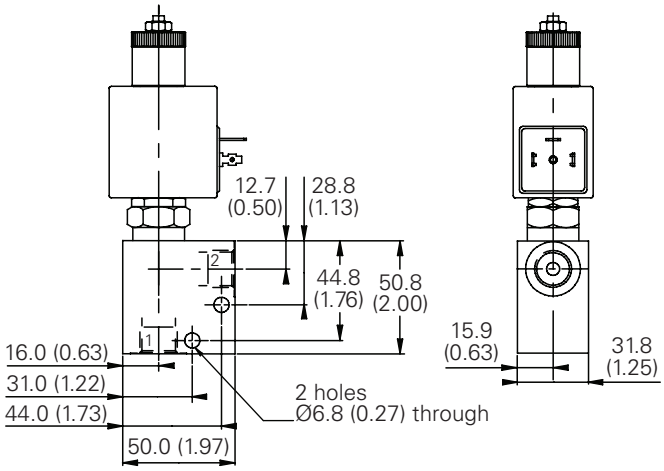
| Code | Port size | Housing number | |
|---|---|---|---|
| | | Aluminum | Steel |
| 0 | Cartridge only | | |
| 2W | 1/4" BSP | A1485 | A14128 |
| 3W | 3/8" BSP | A1043 | A14175 |
| 4T | 1/4" SAE | A14842 | - |
| 6T | 3/8" SAE | A15676 | A14843 |

**Dimensions**
mm (inch)

**Cartridge only**



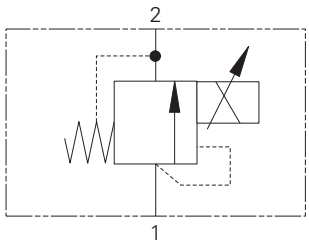

**Installation drawing**




*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).

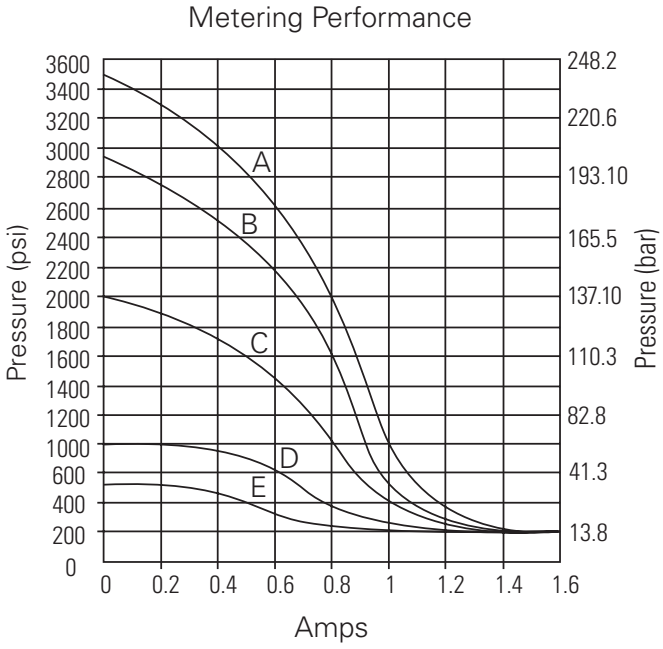
## Performance data

**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 |
| Hysterisis | 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




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**

| IRV1 | 10 | – | * | – | ** | – | * | – | ** | – | *** | – | * | – | * | – | * | – | * | – | ** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 |

## 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

## 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

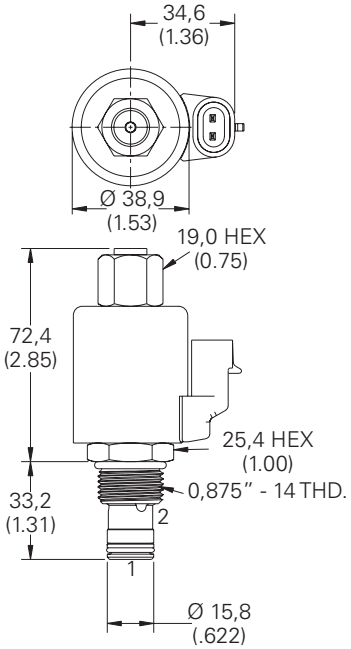
## 12 Valve special features

**Blank** - No special feature

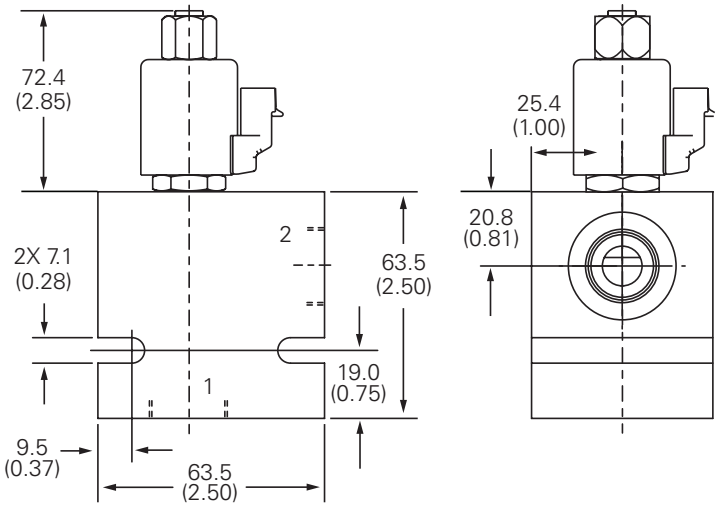
## Dimensions

mm (inch)

### Cartridge only



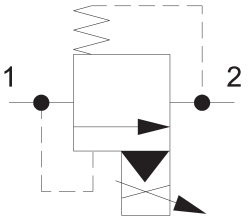

### Installation drawing




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

# 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.

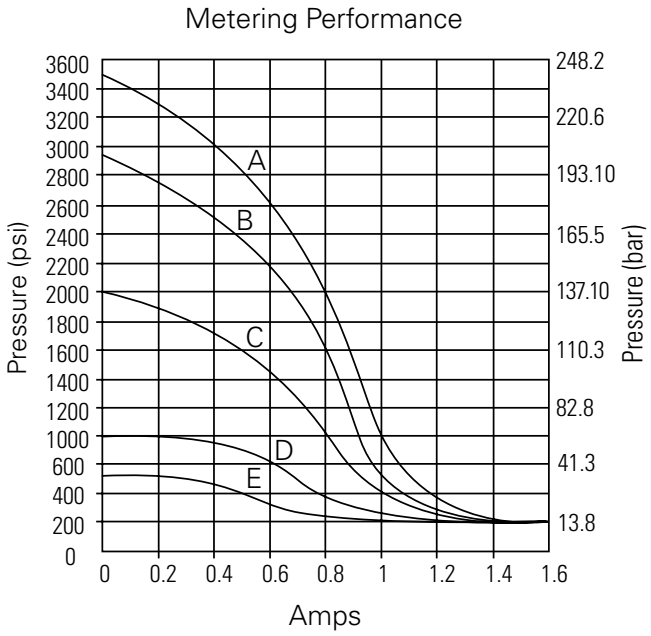
## Performance data

**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 ibs) |
| 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




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**

| IRV2 | 10 | – | * | – | ** | – | * | – | ** | – | *** | – | * | – | * | – | * | – | * | – | ** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 |

## 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

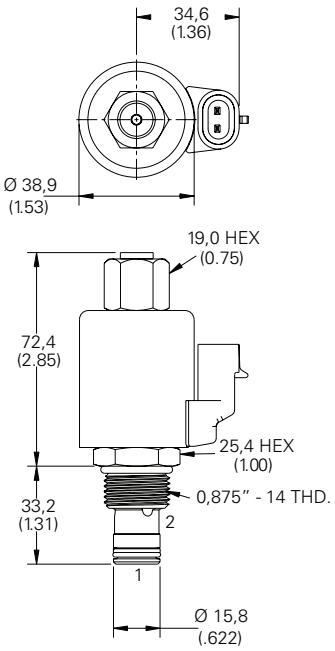
## 12 Valve special features

**Blank** - No special feature

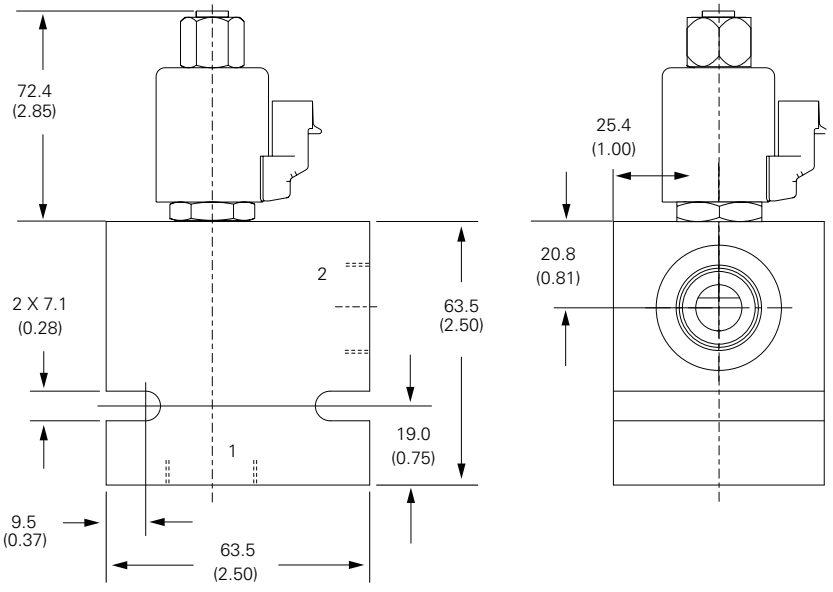
## Dimensions

mm (inch)

### Cartridge only



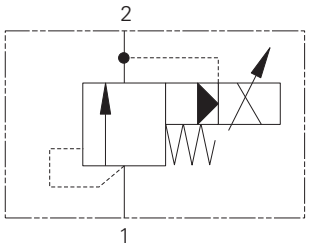

### Installation drawing




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

# PAR1-10 - Proportional valve

Proportional relief, spool
57 L/min (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

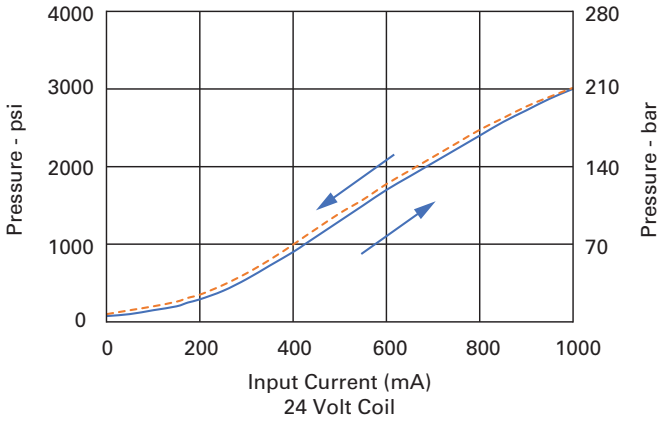
**Ratings and specifications**

| *Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)* | |
|---|---|
| Typical application pressure (all ports) | 240 bar (3500 psi) |
| Cartridge fatigue pressure (infinite life) | 240 bar (3500 psi) |
| Rated flow | 57 L/min (15 USgpm) |
| Temperature range | -20° to 120°C (-4° 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 material (standard) | Aluminum |
| Weight including coil | 0,44 kg (.98 lbs) |
| Seal kit | 565803 (Buna-N), 566086 (Viton®) |

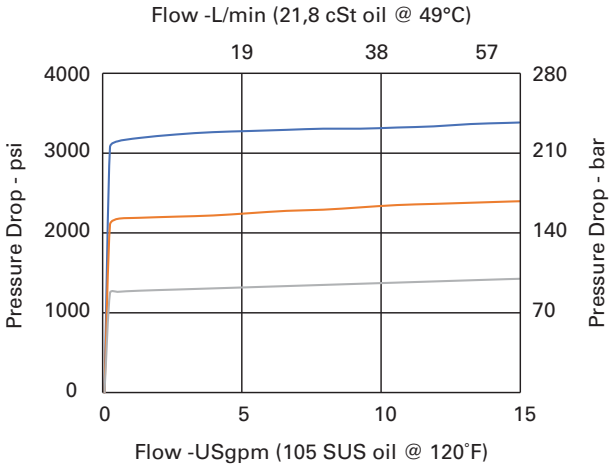
Viton is a registered trademark of E.I. DuPont

## Pressure drop curves

### Pressure gain




### Pressure override, energized




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

# PAR1-10 - Proportional valve

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

## Model code

**PAR1 – 10 – (V) – ** – *** – *** – * – * – * – ** – **

1 2 3 4 5 6 7 8 9 10 11

### 1 Function

**PAR1** - Proportional relief valve

### 2 Size

**10** - 10 size

### 3 Seal material

**Blank** - Buna-N
**V** - Viton®

### 4 Maximum pressure setting

In hundreds of psi in range 100-3000 psi
(EX.- 05 - 500 PSI)

### 5 Port size

| Code | Port size | Housing number |
|---|---|---|
| | | Aluminum single |
| **0** | Cartridge only | |
| **6T** | SAE 6 | 20057 |
| **2G** | 1/4" BSPP | 23037 |
| **3G** | 3/8" BSPP | 23038 |
| **6H** | SAE 6 | 23035 |
| **8H** | SAE 8 | 23036 |

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

### 6 Voltage rating

**00** - No coil
**012** - 12 V
**024** - 24 V

### 7 Type of power

**Blank** - No special feature
**D** - DC w/o DIODE
**B** - DC with DIODE

### 8 Connectors type

**Blank** - No coil
**G** - DIN 43650
**W** - Lead wires
**N** - Deutsch
**Y** - AMP JR.

### 9 Coil series

**Blank** - No coil
**J** - J series, 23W

### 10 Coil special feature

**Blank** - No coil
**00** - No special feature

### 11 Valve special feature

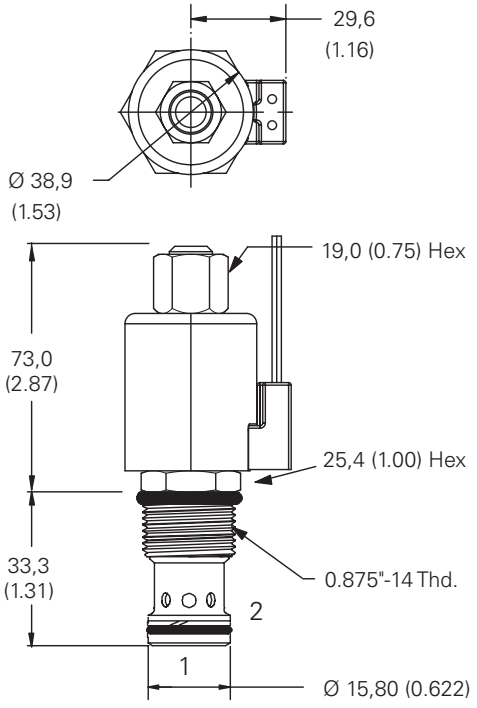
**Blank** - None

## Dimensions

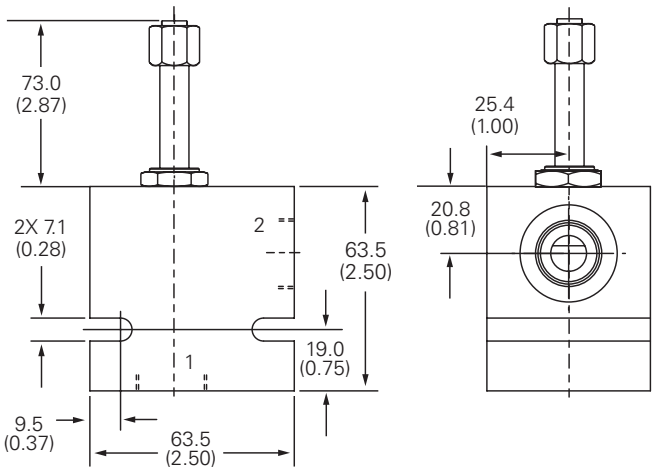
mm (inch)

### Cartridge only

Valve is shown with "W" coil.



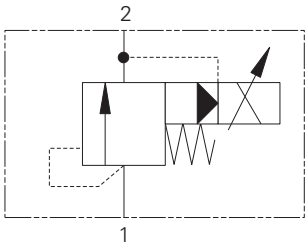

### Installation drawing




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

# PAR1-16 - 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

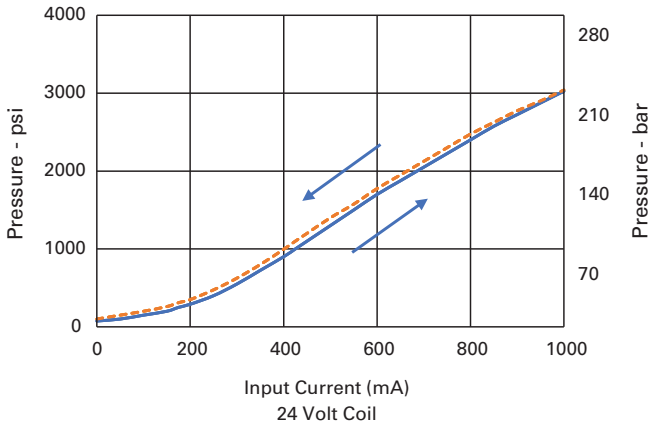
**Ratings and specifications**

| | |
|---|---|
| *Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)* | |
| Typical application pressure (all ports) | 210 bar (3000 psi) |
| Cartridge fatigue pressure (infinite life) | 210 bar (3000 psi) |
| Rated flow | 132,0 L/min (35 USgpm) |
| Temperature range | -20° to 120°C (-4° 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 material (standard) | Aluminum |
| Weight including coil | 0,44 kg (.98 lbs) |
| Seal kit | 565810 (Buna-N), 889609 (Viton®) |

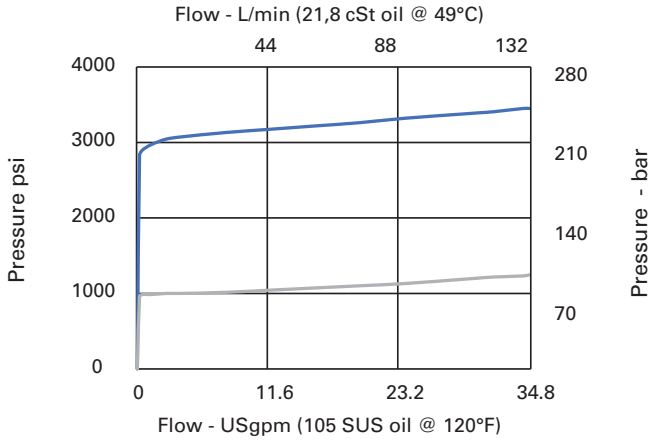
Viton is a registered trademark of E.I. DuPont

## Pressure drop curves

### Pressure gain




### Pressure override, energized




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

# PAR1-16 - Proportional valve

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

## Model code

PAR1 – 16 – (V) – ** – *** – *** – * – * – * – * – ** – **

1 2 3 4 5 6 7 8 9 10 11

### 1 Function

**PAR1** - Proportional relief valve

### 2 Size

**16** - 16 size

### 3 Seal material

**Blank** - Buna-N
**V** - Viton®

### 4 Maximum pressure setting

In hundreds of psi in range 100-3000 psi
(EX.- 05 - 500 PSI)

### 5 Port size

| Code | Port size | Housing number |
|---|---|---|
| | | Man/fold item 23 |
| **0** | N/A | NONE |
| **12T** | SAE 12 | 20460 |
| **4G** | 1/2" BSPP | 30694 |
| **6G** | 3/4" BSPP | 30696 |
| **10H** | SAE 10 | 30695 |
| **12H** | SAE 12 | 30697 |

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

### 6 Voltage rating

**00** - No coil
**012** - 12 V
**024** - 24 V

### 7 Type of power

**Blank** - No special feature
**D** - DC w/o DIODE
**B** - DC with DIODE

### 8 Connectors type

**Blank** - No coil
**G** - DIN 43650
**W** - Lead wires
**N** - Deutsch
**Y** - AMP JR.

### 9 Coil series

**Blank** - No coil
**J** - J series, 23W

### 10 Coil special feature

**Blank** - No coil
**00** - No special feature

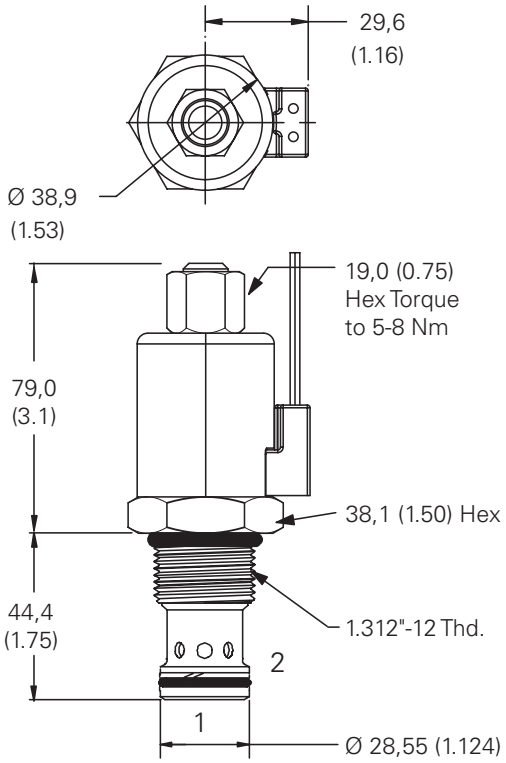
### 11 Valve special feature

**Blank** - None

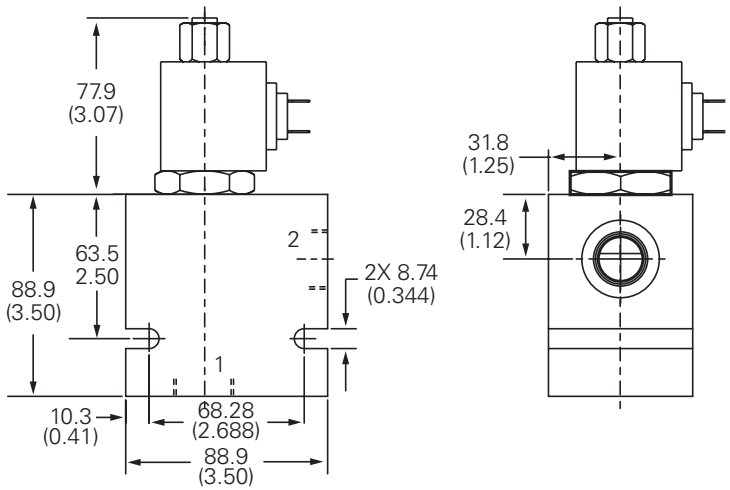
## Dimensions

mm (inch)

### Cartridge only



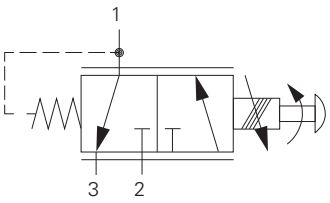

### Installation drawing




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

# 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.

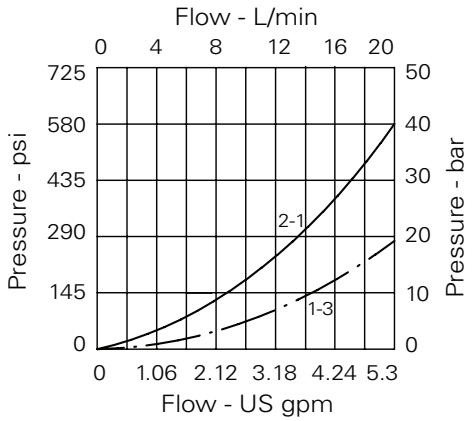
## Performance data

**Ratings and specifications**

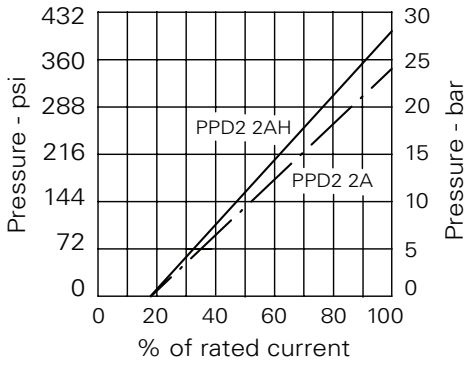
| | |
|---|---|
| *Performance data is typical with fluid at 32 cST (150 SUS)* | |
| Max inlet pressure | 210 bar (3000 psi) |
| Max regulated pressure | 19 watt coil 24 bar, 29 watt coil 28 bar |
| Max flow | 18.6 L/min (5 USgpm) 19 watt coil<br>20 L/min (5.4 USgpm) 29 watt coil |
| Hystersis | 16% 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**

**PPD22A N – H – 6 – 24 – 3W**

1 2 3 4 5 6

## 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

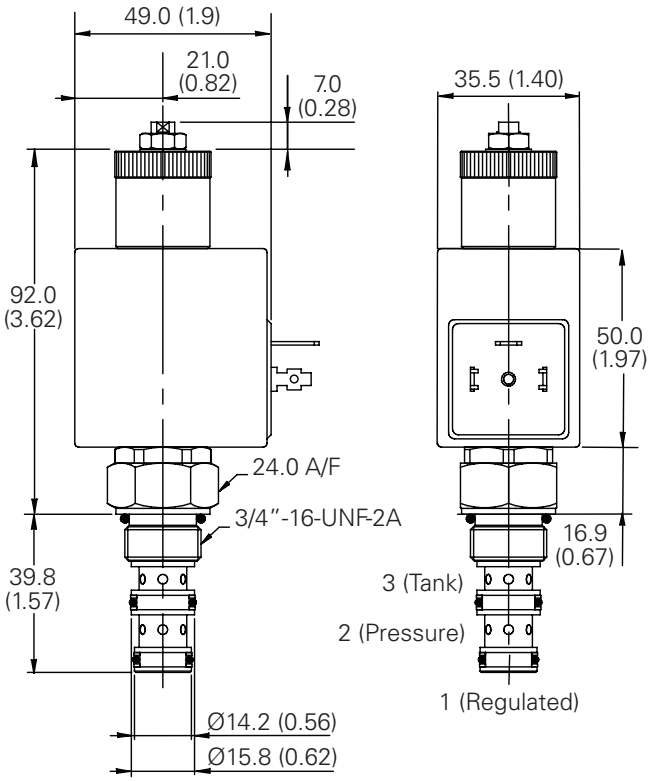
| Code | Port size | Housing number |
|---|---|---|
| | | Aluminum single |
| **0** | Cartridge only | |
| **2W** | 1/4" BSP | A7724 |
| **3W** | 3/8" BSP | A6684 |
| **6T** | 3/8" SAE | B6516 |

See section J for housing details.

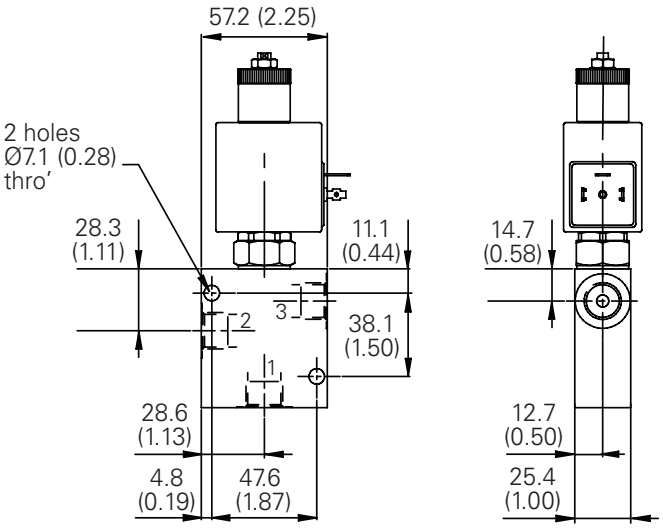
## Dimensions

mm (inch)

### Cartridge only



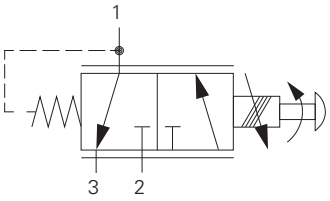

### Installation drawing




*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)




## 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.

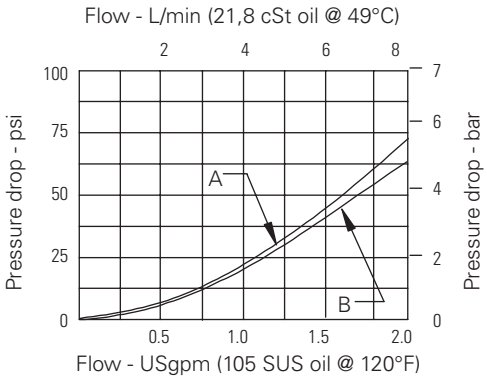
## Performance data

**Ratings and specifications**

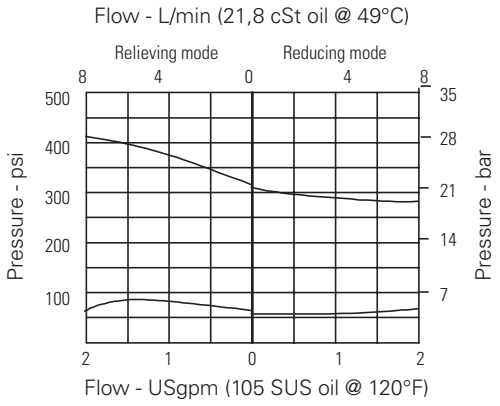
| | |
|---|---|
| *Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)* | |
| Maximum inlet pressure | 35 bar (500 psi) |
| Reduced pressure range | 0-22 bar (0-320 psi) |
| Maximum operating flow | 7,6 L/min (2 USgpm) |
| Temperature range | -40° to 120°C (-40° to 248°F) |
| 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 |
| Hysterisis @ 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

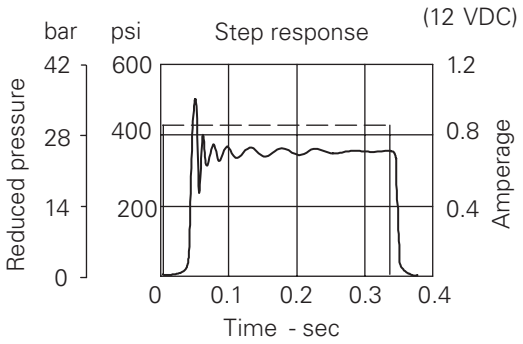
## Pressure drop curves

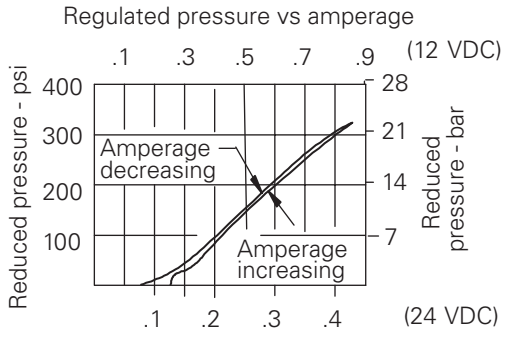



A - Port 1 to port 3  B - Port 2 to port 1




## 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**

**EPRV2 – 8 (V) – (A) – ** – *** – * * – 00**

1 2 3 4 5 6 7 8 9

## 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

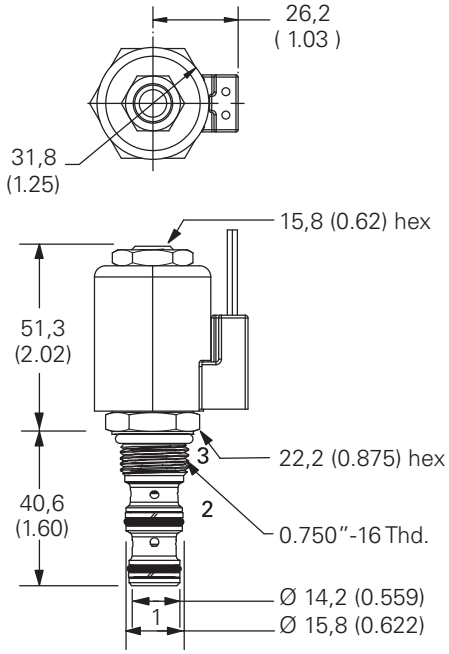
Only required if valve has special features, omitted if "00."

## Dimensions

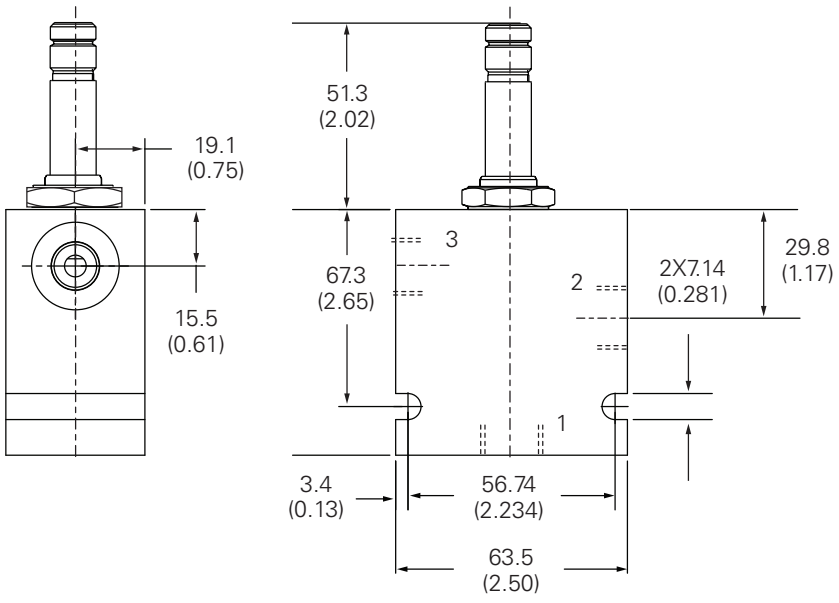
mm (inch)

### Cartridge only

Valve is shown with "N" coil.



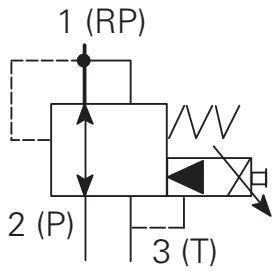

### Installation drawing




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

# PPAR1-10 - Proportional valve

Proportional reducing/relief, spool
30 L/min (8 USgpm) • 207 bar (3000 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 the valve, the spool will shift farther and relieve to port 3.

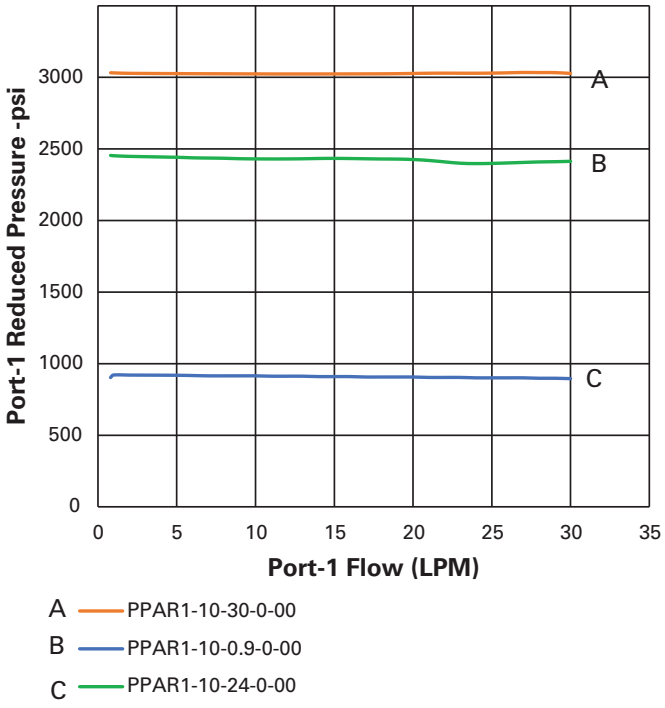
## Performance data

**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) | 207 bar (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 |
| Standard housing materials | Aluminum |
| Temperature range | -20° to 120°C (-4° 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)<br>889599 (Viton®)<br>Viton is a registered trademark of E.I. DuPont |

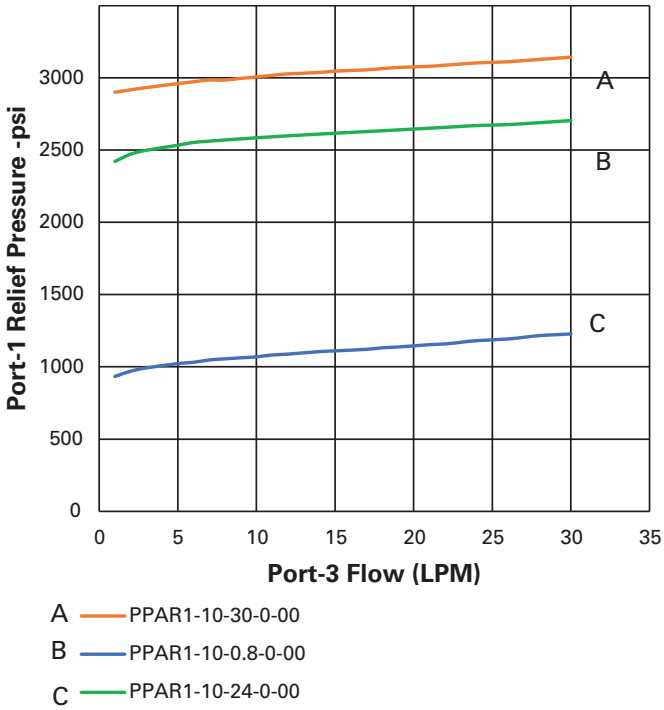
## Pressure override characteristics

**Pressure Over-ride, Reducing Mode, Energized**




A — PPAR1-10-30-0-00
B — PPAR1-10-0.9-0-00
C — PPAR1-10-24-0-00

**Pressure Over-ride, Relieving Mode, Energized**




A — PPAR1-10-30-0-00
B — PPAR1-10-0.8-0-00
C — PPAR1-10-24-0-00

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

# PPAR1-10 - Proportional valve

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

**Model code**

**PPAR1 – 10 (V) – ** – * – ** – *** – * – * – 00 – **

1 2 3 4 5 6 7 8 9 10 11

## 1 Function

**PPAR1-10** - 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 7-207 bar 100 range (100-3000 psi) range.

Example: 5 - 35,0 (500 psi)

## 5 Manual override option

**Blank** - No manual override
**S** - Manual override Screw Type

## 6 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.

## 7 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.

## 8 Connector types

**Blank** - No coil
**G** - DIN 43650
**Q** - Spade Terminals
**W** - Leadwire
**N** - Deutch
**Y** - Amp JR

## 9 Coil series

**Blank** - No coil
**J** - J series, 23W

## 10 Coil special features

**00** - None

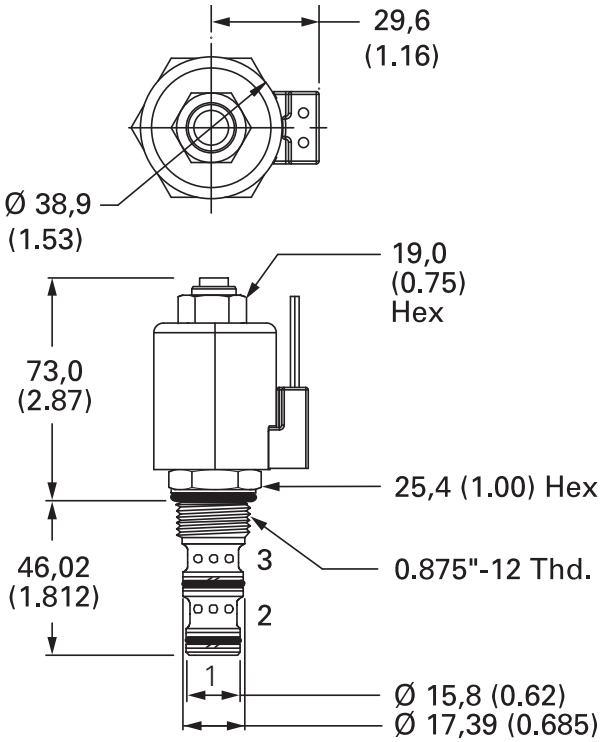
(Only required when valve has special features, omitted if "00.")

## 11 Valve special feature

**Blank** - None

## Dimensions

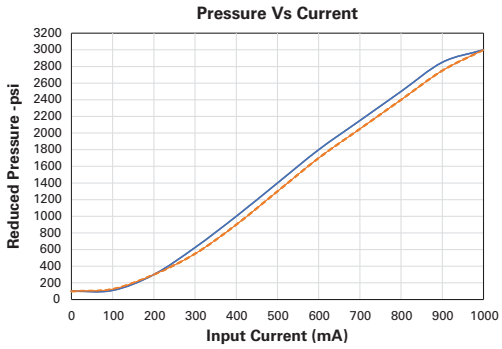
mm (inch)



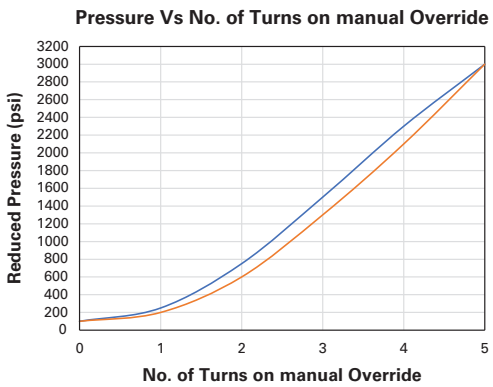

Valve is shown with "W" coil.

## Pressure gain curves

### W0 manual Override version



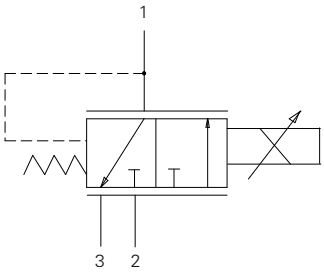

### With manual Override version




*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)




## 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

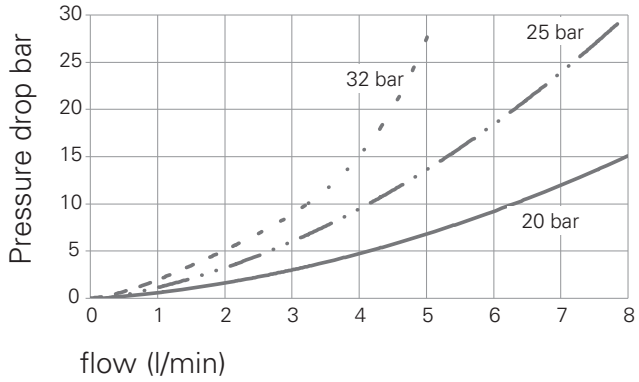
**Ratings and Specifications**

| *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)<br>Maximum inlet pressure, Tank (3) | 50 bar (725 psi)<br>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 |
| Hysterisis @100 Hz PWM | <0.7 bar (pA = 20)<br><1.0 bar (pA = 25)<br><1.5 bar (pA = 35) |
| Resistance | 4.72 ohms +/-5% for 12V<br>20.8 ohms +/-5% for 24V |
| Current | 1500 mA for 12V<br>750 mA for 24V |
| Protection class | Up to IP6K6 / IPX9K |

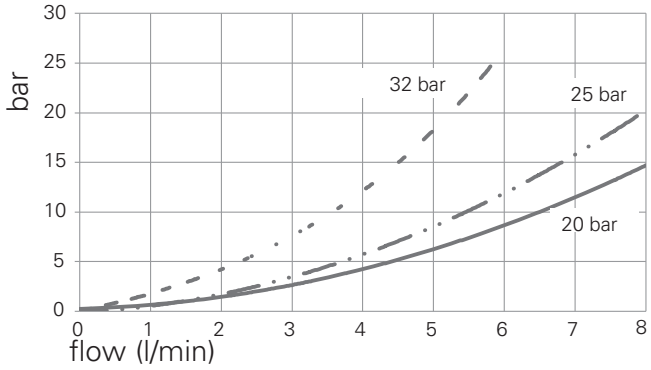
*Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.*

## Pressure drop curves

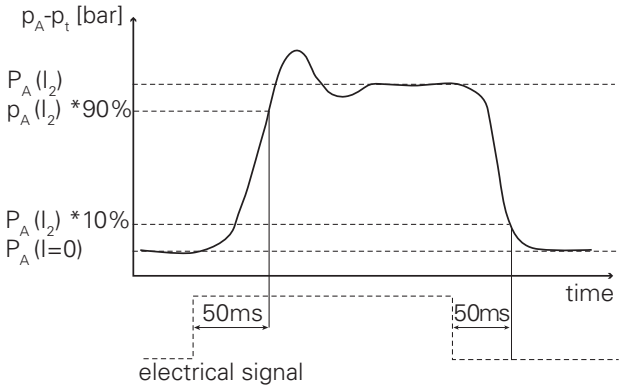
Port A to T



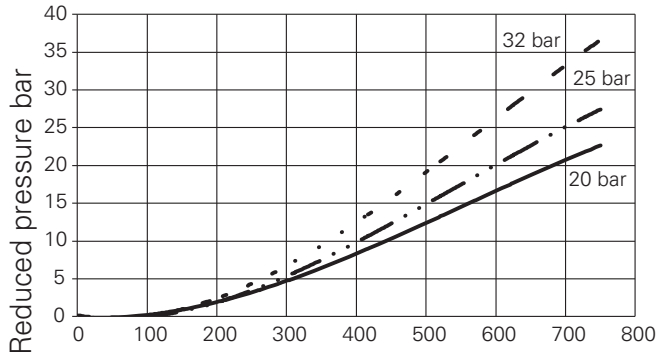

Port P to A




## 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**

**EPPV5 – H 0 – ** – 0 – ** – D D – 00**

1 2 3 4 5 6 7 8 9

**1 Function**
**EPPV5** - Proportional pressure reducing valve

**2 Seal material**
**H** - Buna-HBNR

**3 Manual override 0ption**
**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

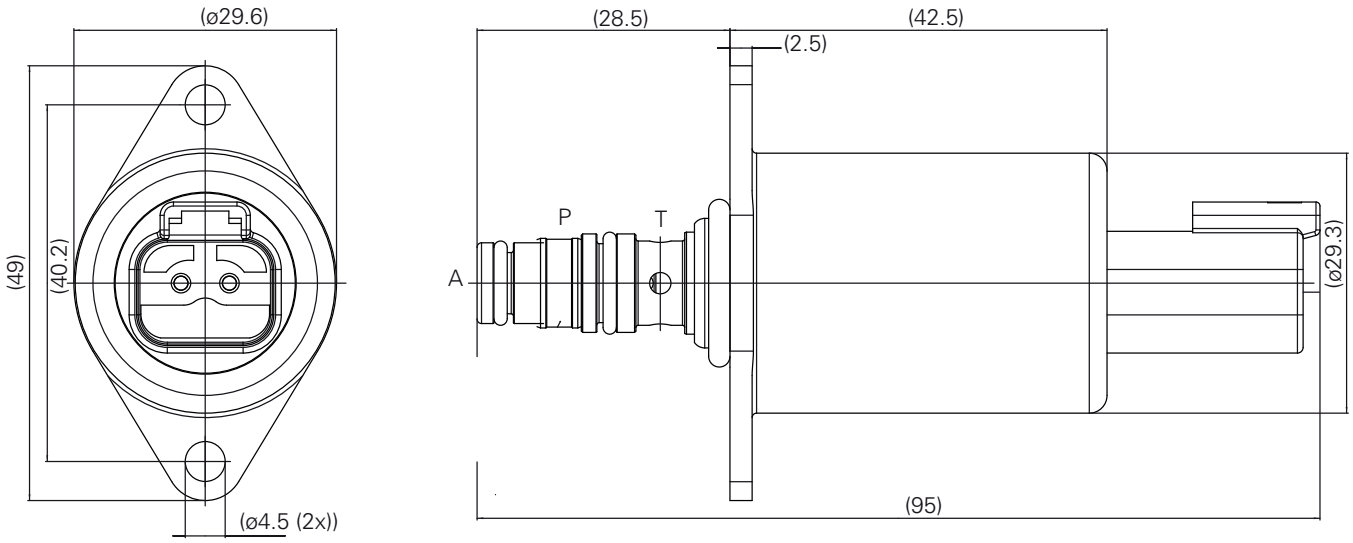
**7 Voltage type**
**D** - DC

**8 Connector type**
**N** - Deutsch DT04-2P

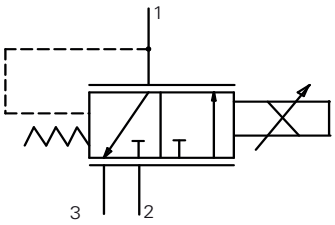
**9 Special features**
**00** - None

**Cartridge only**

Dimensions (mm)




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




## 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**

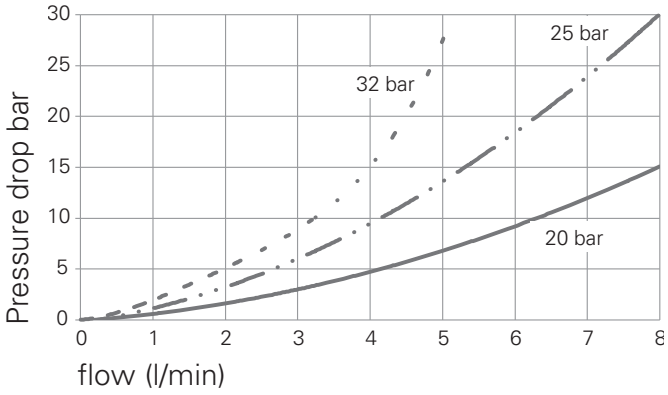
| *Performance data is typical with fluid at 21,8 cST (105 SUS) and 49°C (120°F)* | |
|---|---|
| Maximum inlet pressure, A(1) and P(2)<br>Maximum inlet pressure, Tank (3) | 50 bar (725 psi)<br>30 bar (425 psi) |
| Reduced pressure range | In accordance with control pressure range in model code |
| Maximum 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 |
| Hysterisis @100 Hz PWM | <0.7 bar (pA = 20)<br><1.0 bar (pA = 25)<br><1.5 bar (pA = 35) |
| Resistance | 5.3 ohms +/-5% for 12V<br>21.2 ohms +/-5% for 24V |
| Current | 1500 mA for 12V<br>750 mA for 24V |
| Protection class | Up to IP6K6 / IPX9K |

# EPPV6 - Proportional Valve

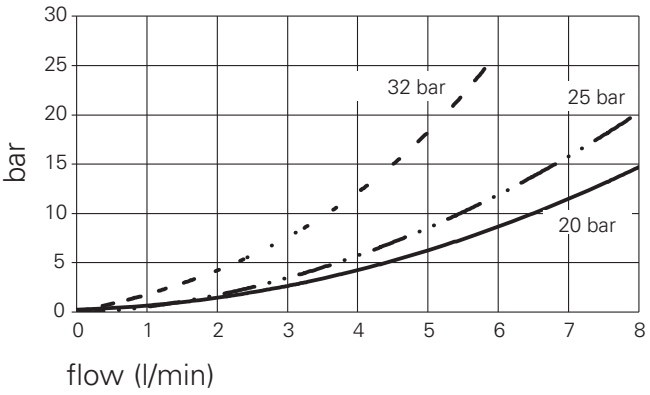
Proportional pressure reducing valve
8.0 L/min (2.1 USgpm) • 50 bar (725 psi)

## Pressure drop curves

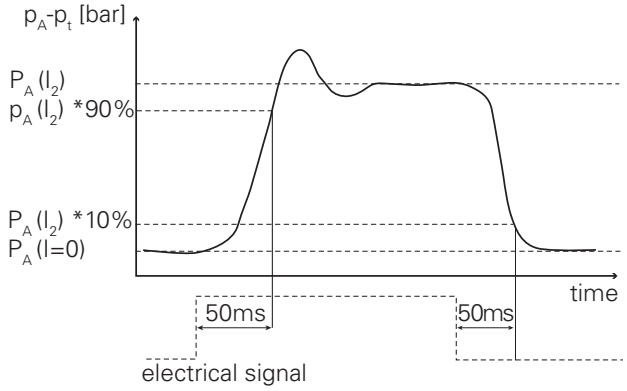
Port A to T



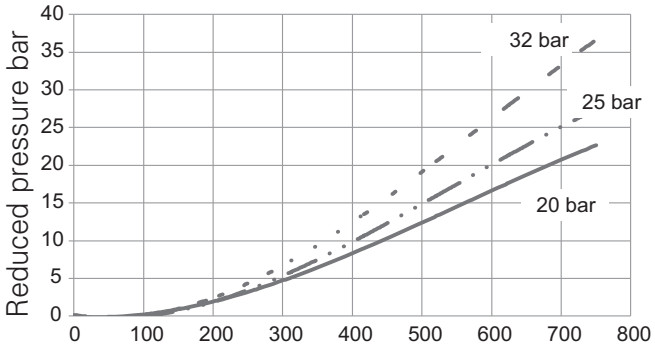

Port P to A




## 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**

**EPPV6 – H M – ** – 0 – ** – D Y – 00**

1 2 3 4 5 6 7 8 9

B

**1 Function**
**EPPV6** - Proportional pressure reducing valve

**2 Seal material**
**Blank** - NBR Buna

**3 Manual override option**
**M**- with manual override

**4 Control pressure**
**20** - 20 bar (290 psi)
**32**- 32 bar (460 psi)

**5 Port size**

| Code | Port size |
|---|---|
| **0** | Cartridge only |

**6 Voltage rating**
**12** - 12V
**24** - 24V

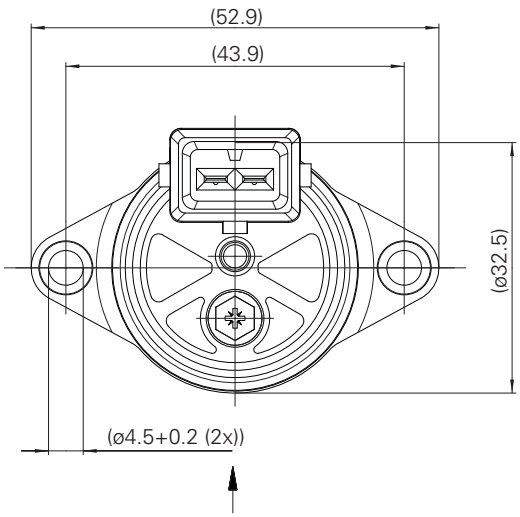
**7 Voltage type**
**D** - DC

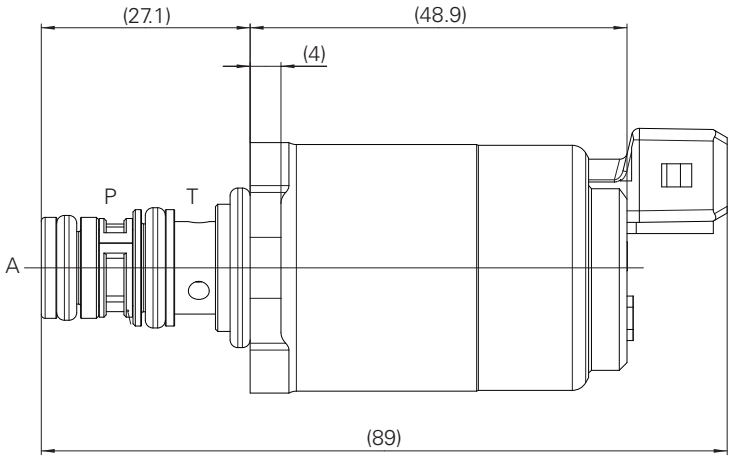
**8 Connector type**
**Y** - AMP Jr Power Timer

**9 Special features**
**00** - None

**Cartridge only**

Dimensions (mm)



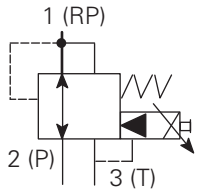




*Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.*

# EPRV1-10 - Proportional valve

Proportional reducing/relief, spool
7.6 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 predete mined pressure\is reached at port 1, the spool shifts to restrict the inlet flow at port 2, which regulates the pressure at port 1.

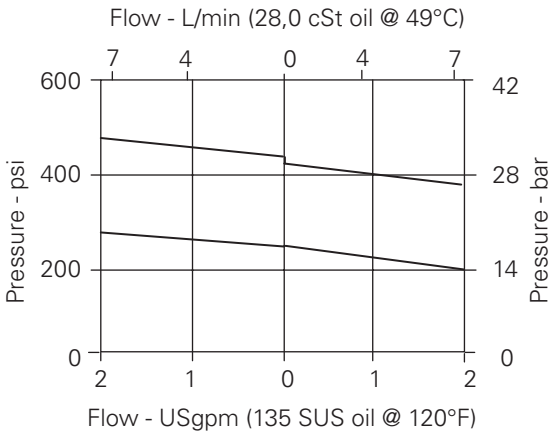
If the pressure at port 1 exceeds the setting of the valve, the spool will shift farther and relieve to port 3.

**Ratings and specifications**

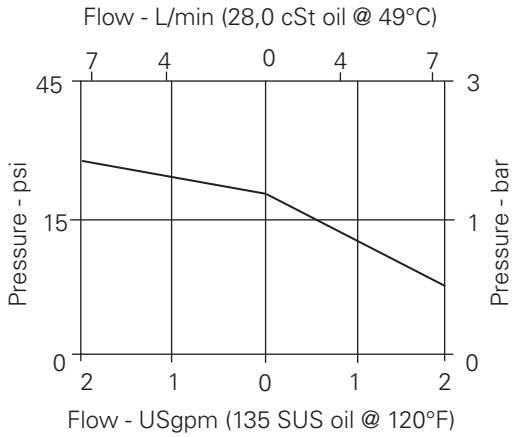
| *Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49°C (120°F)* | |
|---|---|
| Typical application pressure (all ports) | 3,5 - 35 bar (50 - 500 psi) |
| Cartridge fatigue pressure (infinite life) | 35 bar (500 psi) |
| Rated flow | 0 - 7,6 L/min (0 - 2.0 USgpm) |
| Cavity | C-10-3 |
| 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)<br>889599 (Viton®)<br>Viton is a registered trademark of E.I. DuPont |

## Pressure override characteristics

Pressure override, energized

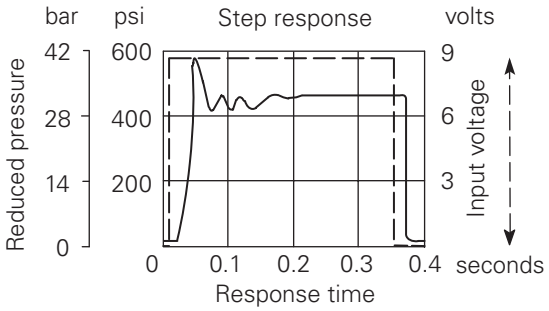


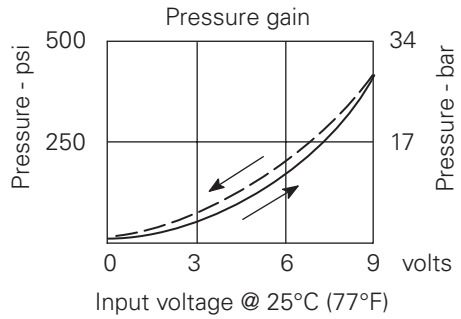

Pressure override, de-energized




## 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**

**EPRV1 – 10 (V) – (A) – ** – *** – * – 00**

1 2 3 4 5 6 7 8

## 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.

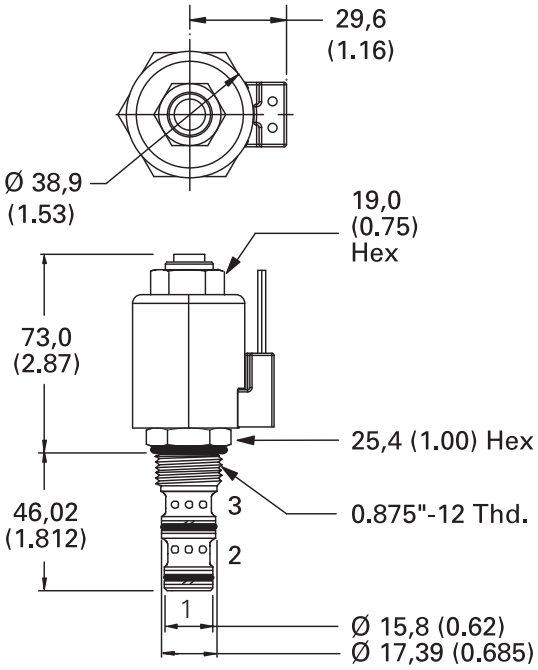
## 8 Special features

**00** - None

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

## Dimensions

mm (inch)

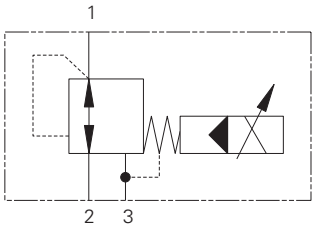



Valve is shown with "W" coil.

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

# 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

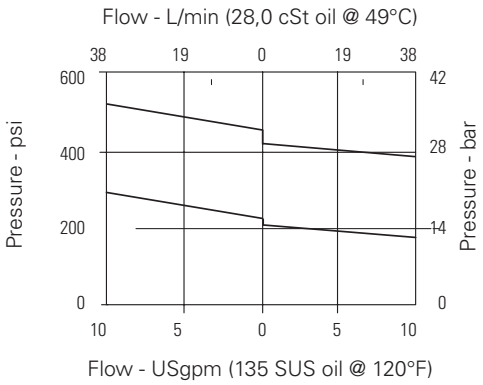
**Ratings and specifications**

| | |
|---|---|
| *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®) |

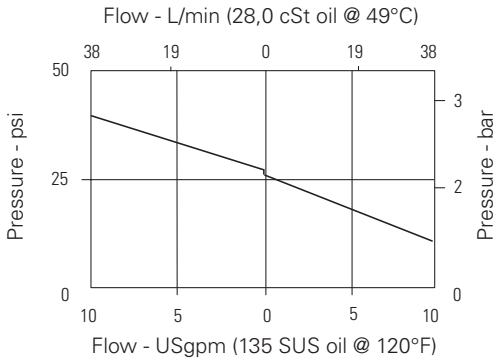
Viton is a registered trademark of E.I. DuPont.

## Pressure drop curves

### Pressure override, energized

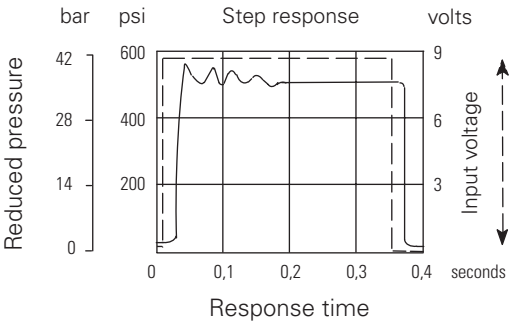



### Pressure override, de-energized

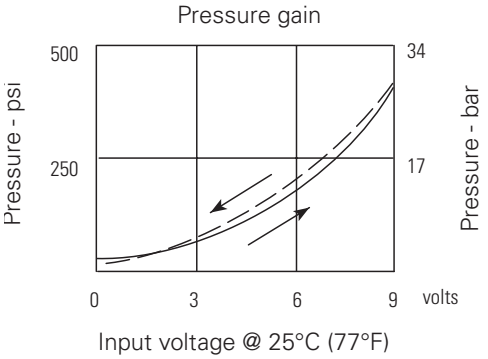



## Performance curves

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**

**EPRV1 – 16 (V) – ** – *** – *** – * – 00**

1 2 3 4 5 6 7 8

## 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

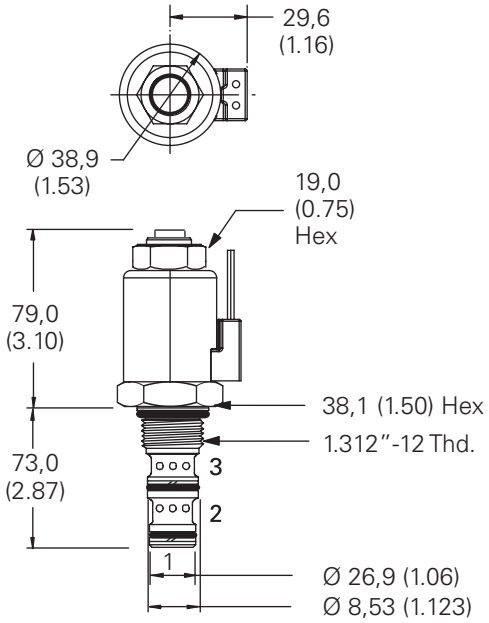
Only required if valve has special features, omitted if "00."

**Dimensions**

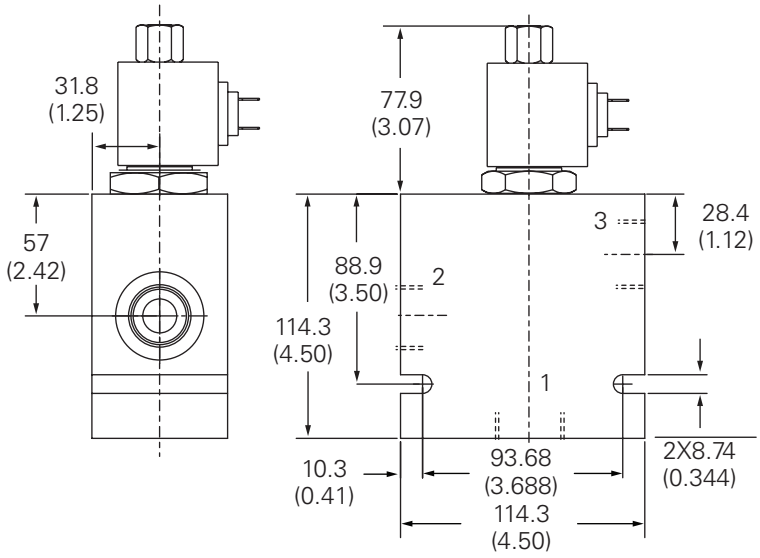
mm (inch)

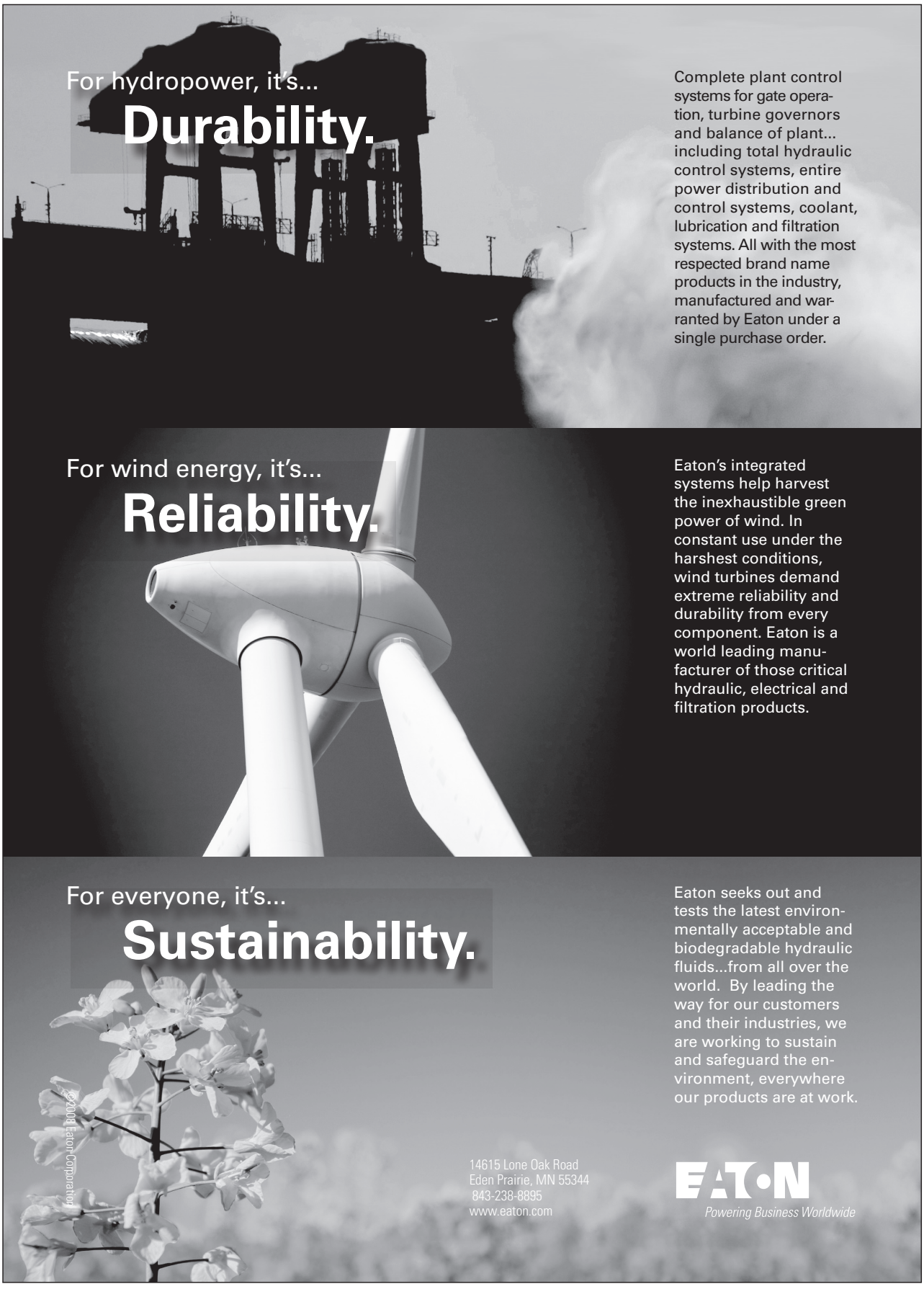
**Cartridge only**

Valve is shown with "W" coil.




**Installation drawing**






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