

6 Proportional Valves

Content

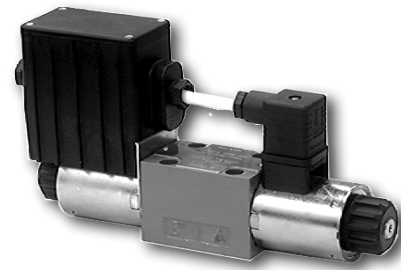
Symbol Example	Flow l/min (GPM)	Pressure bar (PSI)	Type Code	Cartridge Size 04; D02	Size 06; D03	Size 10; D05	Line Mounted	Page	Data Sheet
Proportional Directional Control Valves									
	20 (5)	320 (4600)	PRM2-04	X				332	HA 5105
	20 (5)	320 (4600)	PRM7-04	X				342	HA 5120
	40 (11)	350 (5100)	PRM2-06		X			348	HA 5104
	40 (11)	350 (5100)	PRM7-06		X			358	HA 5119
	80 (21)	350 (5100)	PRM6-10			X		364	HA 5115
	80 (21)	350 (5100)	PRM7-10			X		374	HA 5116
	140 (37)	350 (5100)	PRM8-06		X			380	HA 5178
Proportional Pressure Control Valves, Relief, Direct Acting									
	2 (0.4)	350 (5100)	SR1P2-A2	X	(X)		(X)	382	HA 5122
	2 (0.4)	350 (5100)	SRN1P1-A2	X	(X)		(X)	384	HA 5137
Proportional Pressure Control Valves, Relief, Pilot Operated									
	60 (16)	350 (5100)	SR4P2-B2	X	(X)		(X)	386	HA 5117
	60 (16)	350 (5100)	SRN4P1-B2	X			(X)	388	HA 5138
Proportional Pressure Control Valves, Reducing - Relieving, Direct Acting									
	20 (5)	50 (700)	PP2P1-W3	X			(X)	390	HA 5125
	30 (8)	50 (700)	PP2P3-W3	X			(X)	392	HA 5147
	20 (5)	50 (700)	PVRM1-063/S	X				394	HA 5108
	40 (11)	50 (700)	PVRM3/10	X				396	HA 5118
Proportional Pressure Control Valves, Reducing - Relieving, Pilot Operated									
	40 (11)	30 (11)	SP4P1-B4	X			(X)	398	HA 5124
	60 (16)	350 (5100)	SP4P2-B3	X	(X)		(X)	400	HA 5123
	60 (16)	350 (5100)	SPN4P1-B3	X	(X)		(X)	402	HA 5139
2 Way Pressure Compensators									
	16 (4)	320 (4600)	TV2-042/M		X			404	HA 5167
	35 (9)	350 (5100)	TV2-062/M		X			406	HA 5166
	80 (21)	350 (5100)	TV2-102/S	X			(X)	408	HA 5179
	80 (21)	350 (5100)	TV2-102/M			X		410	HA 5169

Symbol Example	Flow l/min (GPM)	Pressure bar (PSI)	Type Code	Cartridge Size 04; D02	Size 06; D03	Size 10; D05	Line Mounted	Page	Data Sheet
3 Way Pressure Compensators									
	40 (11)	350 (5100)	TV2-063/S	X				412	HA 5158
	20 (5)	320 (4600)	TV2-043/M		X			414	HA 5188
	35 (9)	350 (5100)	TV2-063/M			X		416	HA 5168
	80 (21)	350 (5100)	TV2-103/S	X			(X)	418	HA 5180
	80 (21)	350 (5100)	TV2-103/M			X		420	HA 5170
Electronic Controllers for Proportional Valves									
Type Code								Page	Data Sheet
EL3	Analoque amplifier							422	HA 9145
EL4	Amplifier with process, position feedback							428	HA 9140
EL6	Plug in amplifier, open loop							432	HA 9150

Proportional Directional Control Valve, with Analogue Control Electronics

PRM2-04

Size 04 (D02) • Q_{max} 20 l/min (5 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- Direct acting, proportional control valve without or with integrated analogue electronic (OBE) with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02) standards
- Used for directional and speed control of hydraulic actuators
- The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- The valve can be controlled directly by a current control supply unit or by means of the electronic control units to exploit valve performance to the full
- Converter analogue card allow a fine control of the positioning of the valve spool, reducing hysteresis and response time and optimizing the performance of the valve
- Three chamber housing design for production cost saving
- For versions without OBE wide range of solenoid electrical terminal versions available
- Wide range of interchangeable spools and manual overrides available
- The coil is fastened to the core tube with a retaining nut and can be rotated by 360° to suit the available space
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

PRM2-04* Versions without on board electronics

The valve can be controlled directly by a current control supply unit or by means of the external electronic card directly mounted to the electrical terminal (see catalogue of EL3E card 9145 and EL6 card 9150). This control card, depending on the number of the controlled solenoids, can be mounted onto either solenoid.

PRM2-04*EK Versions with on board electronics

A control box, which comprises one or two electronic control cards, depending on the number of the controlled solenoids, can be mounted onto either solenoid. With the model with two solenoids, the solenoid mounted opposite the control box is connected with the box by means of a DIN connector, a two-cored cable and a bushing. The connection of the control box with the supply source and with the control signal is realized by means of a 4-pin connector, type M12x1. The electric control unit supplies the solenoid with current, which varies with the control signal.

The electronic control unit provides the following adjustment possibilities:

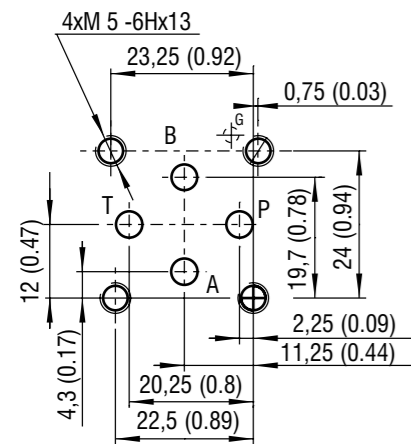
Offset, gain, rise and drop-out time of the ramp generator, frequency (2 frequencies) and amplitude of the dither signal generator. The correct function of the control unit is signaled by LED-diodes. Stabilized voltage +10V (+5V for 12V voltage) is also available for the user.

By the use of this voltage, a voltage control signal can be made by means of a potentiometer ≥ 1kW .

The electronic control card enables voltage or current control to be used, according to the positions of the switches SW1 to SW3.

Technical Data

ISO 4401-02-01-0-05



Nominal Size	04 (D02)	
Max. operating pressure at port P, A, B	bar (PSI)	320 (4580)
Max. operating pressure at port T	bar (PSI)	210 (3050)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)
Hysteresis	%	≤ 6
Nominal flow rate Q _n at Δp=10 bar (145 PSI)	l/min (GPM)	4 (1.1) 8 (2.1) 12 (3.2)
Protection degree (for version PRM*EK)		IP65
Mass - valve with 1 solenoid	kg (lbs)	0.9 (1.98)
- valve with 2 solenoids		1.25 (2.76)
Technical Data of the Proportional Solenoid		
Nominal supply voltage	V	12 DC 24 DC
Limit current	A	1.7 0.8
Mean resistance value at 20 °C (68 °F)	Ω	5 21
Technical data of the electronics		
Supply voltage range	V	11.2... 14.7 20... 30
Stabilized voltage for control	V	5 DC (R > 1 kΩ) 10 DC (R > 1 kΩ)
Control signal		see table of switches configuration (page 4,5 and 6)
Maximum output current	A	2.4 for R < 4 Ω 1.5 for R < 10 Ω
Ramp adjustment range	s	0.05... 3
Dither frequency	Hz	90 / 60
Dither amplitude	%	0... 30
	Data Sheet	Type
General information	GI_0060	products and operating conditions
Coil types / Connectors	C_8007 / K_8008	C19B* / K*
Mounting interface	SMT_0019	Size 04
Spare parts	SP_8010	
Subplates	SP_0002	DP*-04

Ordering Code

PRM2-04 / - - - - -

Proportional directional control valve, with analogue control electronics

Valve size

Spool symbols
see table „Spool Symbols“

Nominal flow rate at Δp = 10 bar (145 PSI)

4 l/min (1.05 GPM)	4
8 l/min (2.1 GPM)	8
12 l/min (3.2 GPM)	12

Rated supply voltage of solenoids (at the coil terminal)

12 V DC	12
24 V DC	24

Electronics on board / Position at solenoid
connection by connector M12 x 1 (4-pin connector, supplied with counterpart)

on board electronics (solenoid „a“) EK

on board electronics (solenoid „b“)* EKB

Surface treatment

No designation	standard
A	zinc-coated (ZnCr-3), ISO 9227 (240 h)
B	zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation	NBR
V	FPM (Viton)

Manual override

No designation	standard
N2	protected with rubber boot

Connector
only for version without on board electronic „EK“

E1	EN 175301-803-A
E2	E1 with quenching diode
E3	AMP Junior Timer - axial direction
E4	E3 with quenching diode
E3A	AMP Junior Timer - axial direction (2 pins; male)
E4A	E3A with quenching diode
E8	loose conductors (two insulated wires)
E9	E8 with quenching diode
E12A	deutsch DT04-2P - axial direction (2 pins; male)
E13A	E12A with quenching diode

*For valve versions with one solenoid the designation „B“ with OBE is not shown.

- Valves without integrated control electronics with E1, E2 coils (with connector according to EN 175301-803, form A) are delivered in the standard version with connector sockets.
- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- Mounting bolts M5 x 35 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 5 Nm (3.7 lbf.ft).
- Besides the shown, commonly used valve versions other specialmodels are available.
- Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

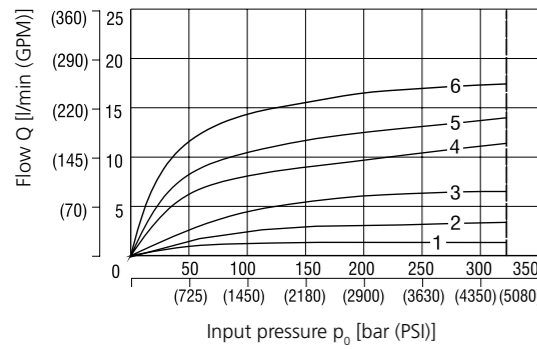
Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	$\frac{q_A}{q_B} = \frac{1}{2}$
2Y51		3Y11	
2Y11		3Y12	$\frac{q_A}{q_B} = \frac{1}{2}$

*Model for cylinders with asymmetric piston area ratio 1:2

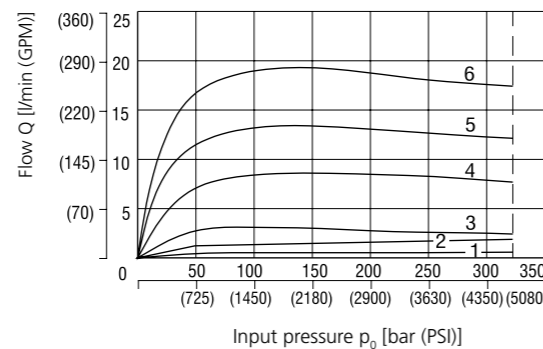
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Operating limits: Flow direction $P \rightarrow A / B \rightarrow T$ or $P \rightarrow B / A \rightarrow T$

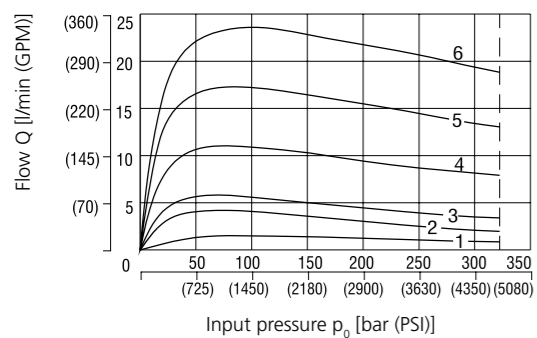
Nominal flow 4 l/min (1.1 GPM)



Nominal flow 8 l/min (2.1 GPM)

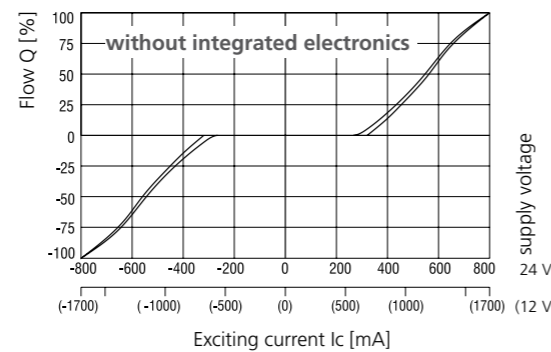
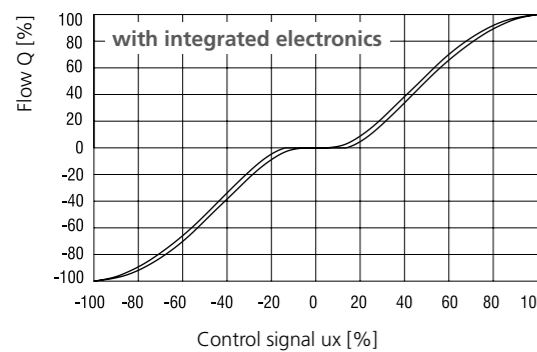


Nominal flow 12 l/min (3.2 GPM)



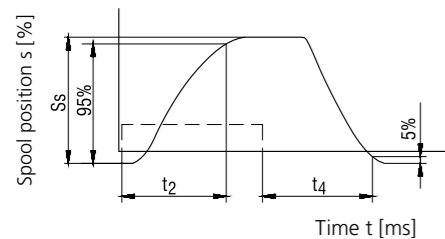
Solenoid current:
1 = 50 %
2 = 60 %
3 = 70 %
4 = 80 %
5 = 90 %
6 = 100 %

Regulated flow related to control signal $\Delta p = 10 \text{ bar}$ (145 PSI)



The coil current which initializes the flow through the proportional directional valve can differ due to the production tolerances about in a range of $\pm 6\%$ of the limit current.

Transient Characteristic measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS), $\Delta p = 10 \text{ bar}$ (145 PSI)

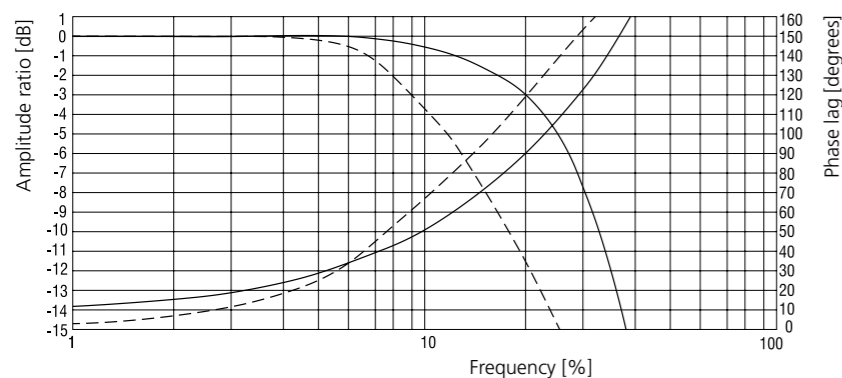


Steady Spool Position S_s [%]	t_2 [ms]	t_4 [ms]
100	85	100
75	70	85
50	55	75
25	45	55

The values in table have only an informative character. The times of the transient characteristics at pressure or flow control will be in a particular hydraulic circuit always longer.

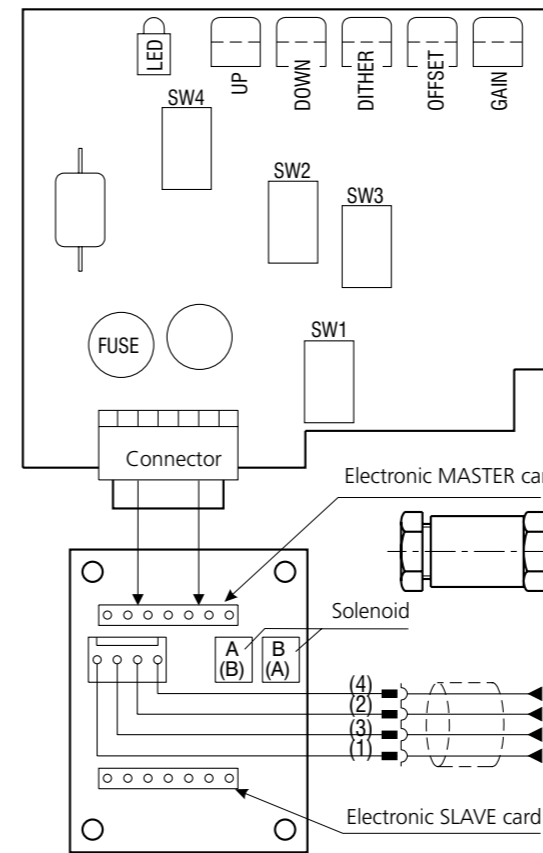
--- the control signal course of the integrated electronics

Frequency Response



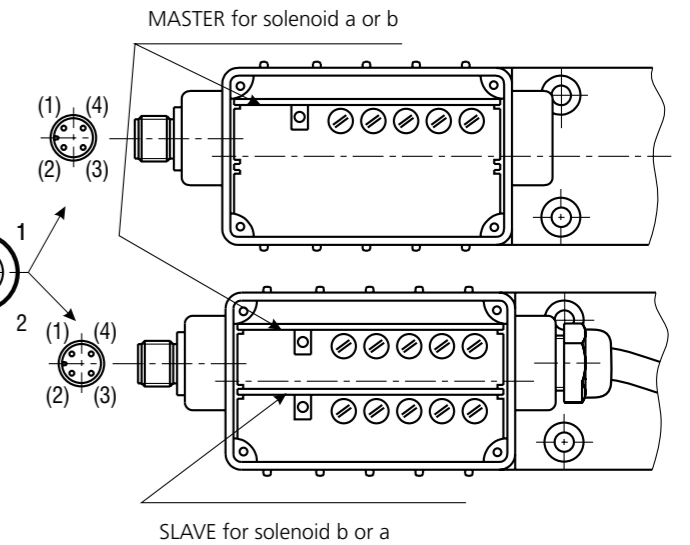
----- signal 90 %
————— signal 25 %

Component Arrangement on the Electronic Card



PIN	Description	Wire Colours	Connection Connector - Electronics
1	+24 V (Ucc) (+12 V)	(1)	brown
2	control	(2)	white
3	0 V	(3)	blue
4	+10 V (+5 V)	(4)	black

SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency



Attention: The control signal must have the same ground potential as the supply source.

Table of the Switch Configuration for the Control Signal Choices

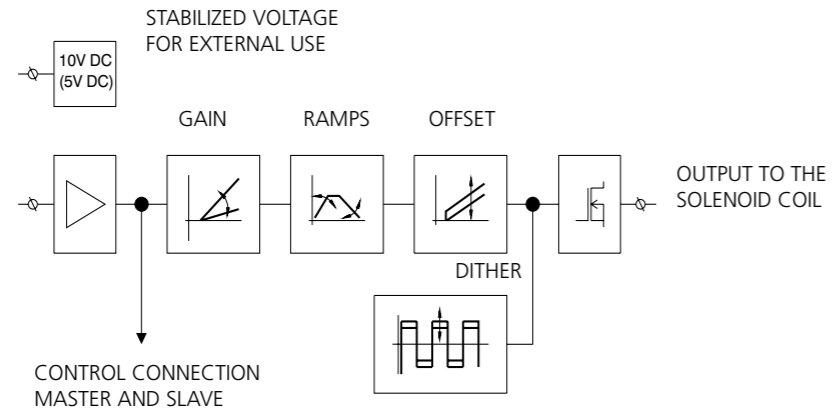
		PRM2-042				PRM2-043	
		0 ... 5 V	0 ... 10 V (0...5 V)*	0 ... 20 mA	4 ... 20 mA	$U_{cc}/2 \pm 10 \text{ V} (\pm 5 \text{ V})^*$	$\pm 10 \text{ V} (\pm 5 \text{ V})^*$
MASTER M	SW1						
	SW2						
	SW3						
	SW4	90 Hz			60 Hz		
SLAVE S	SW1						
	SW2						
	SW3						
	SW4					90 Hz	60 Hz

Designation of the basic manufacture setting.

The ramp functions are adjusted on their minimum values, the dither is set to the optimal value with respect to hysteresis. Offset and gain are adjusted according to the characteristic on page 3 and 4. The manufacturer does not recommend these adjusted values to be changed.

* Input signal level for the 12 V electronic unit.

Block Diagram

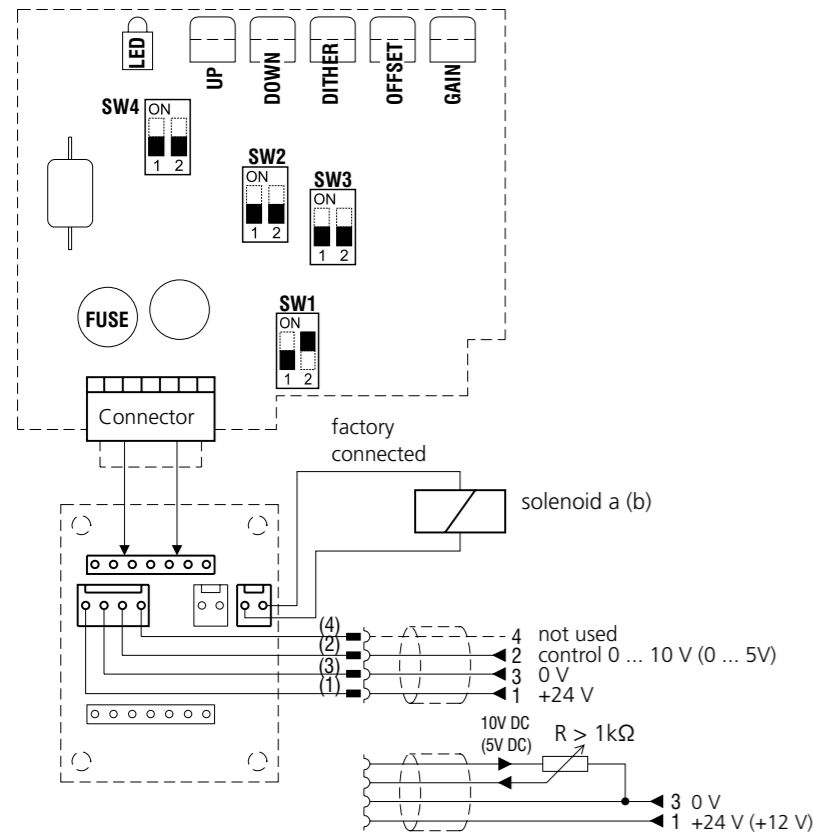


Setting of Control Electronics

Valve PRM2-042*EK (with one solenoid)

Control with external voltage source 0...10 V, 0 ... 5 V (Factory setting) or with external potentiometer R>1 kΩ

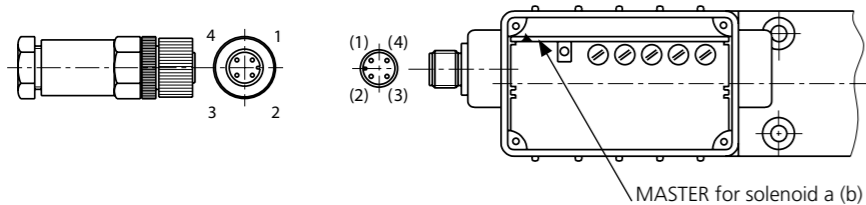
Master card for solenoid a (b)



Factory set values:
 Control signal: 0 - 10 V (0 - 5 V)
 Dither: frequency 90 Hz
 amplitude - optimum
 Ramps: 0.05 s
 Offset, gain: according to the characteristics on page 3



The control signal must have the same ground potential as the supply source.



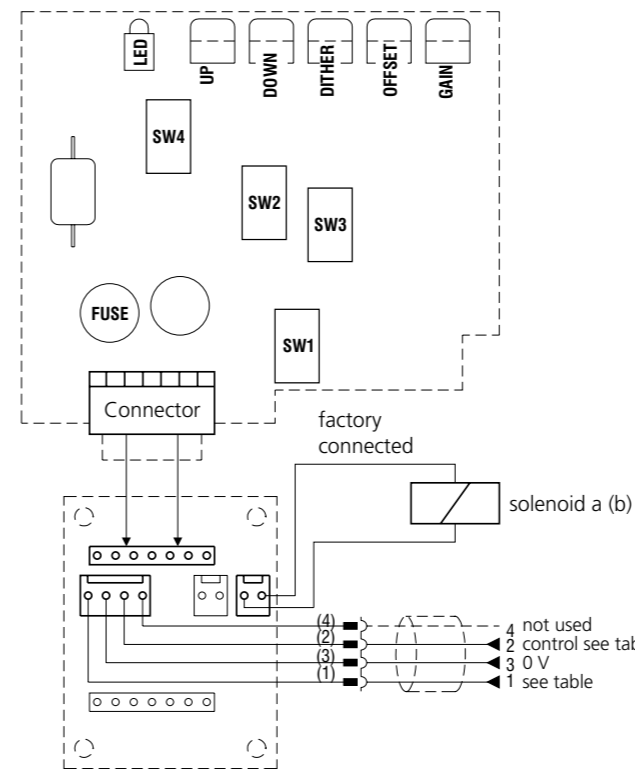
Wire colours (connection connector - electronics)
 (1) - brown
 (2) - white
 (3) - blue
 (4) - black

Setting of Control Electronics

Valve PRM2-042*EK (with one solenoid)

Control with external source 0 ... 5 V, 0 ... 20 mA, 4 ... 20 mA

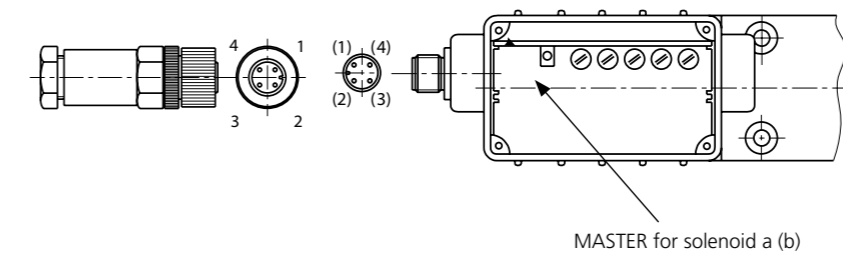
Master card for solenoid a (b)



Control with external source		0 ...5 V	0 ...20 mA	4 ...20 mA
SW1				
SW2				
SW3				
SW4				
PIN 1 (1)	+24 V	+24 V (+12 V)	+24 V (+12 V)	
PIN 2 (2)	0 ...5 V	0 ...20 mA	4 ...20 mA	

For the other than factory setting modification the following steps are required:

1. Unscrew the electronics cover
2. Carefully remove the master card
3. Flip the switch SW1 (2 or 3) in position shown in the table
4. Put in the master card and fix the electronics cover
5. Connect the voltage +24 V (+12 V) from an external supply source to terminals 1 and 3 of the connector
6. Bring the control voltage (current) from an external source to terminals 2 and 3 of the connector



Wire colours (connection connector - electronics)
 (1) - brown
 (2) - white
 (3) - blue
 (4) - black



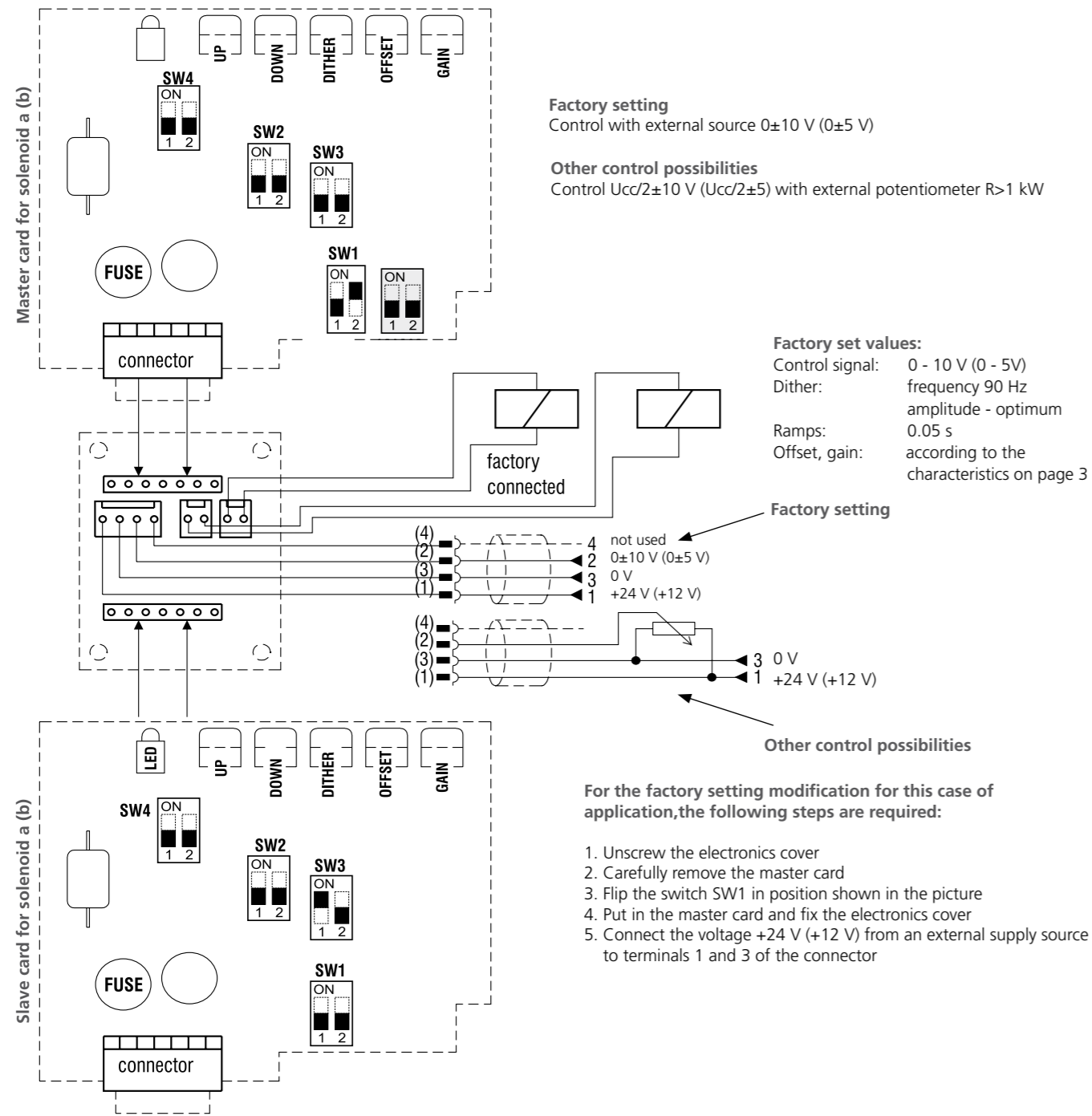
The control signal must have the same ground potential as the supply source.



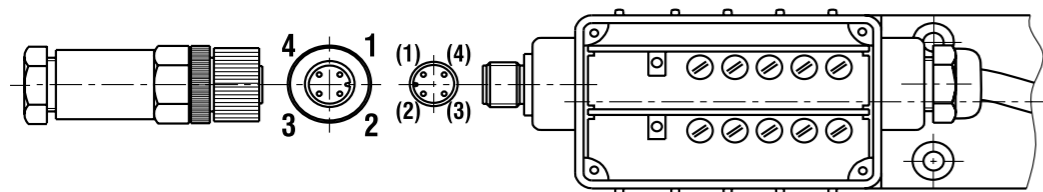
Designation of the basic factory setting.
 The ramp functions are adjusted on their minimum values.
 The dither is set to the optimal value with respect to hysteresis.
 Offset and gain are adjusted according to the characteristic on page 1 and 2.
 The manufacturer does not recommend these adjusted values to be changed.

Setting of Control Electronics

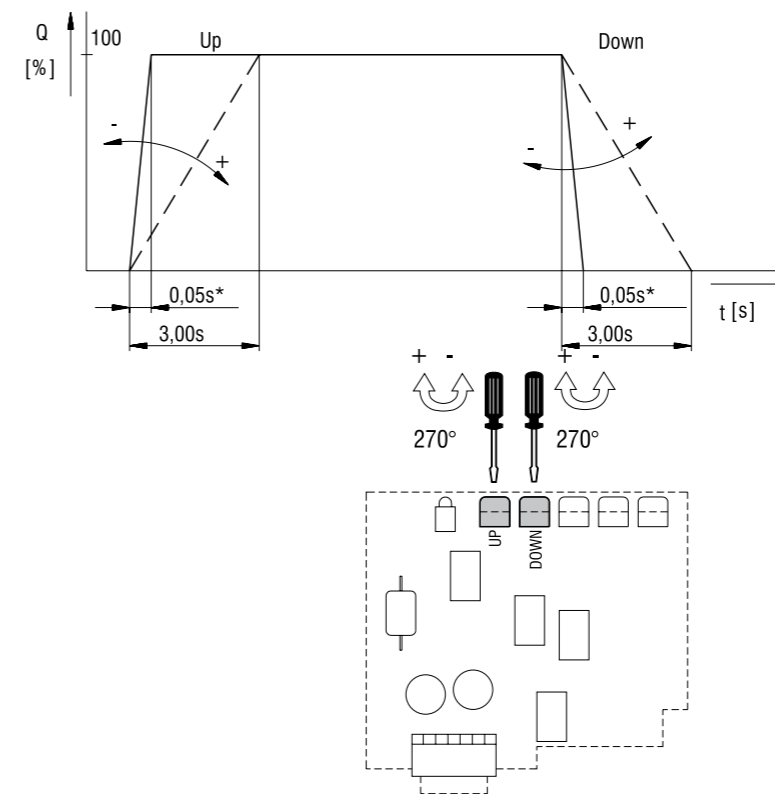
Valve PRM2-043*EK (with two solenoids), factory setting, other control possibilities



The control signal must have the same ground potential as the supply source.



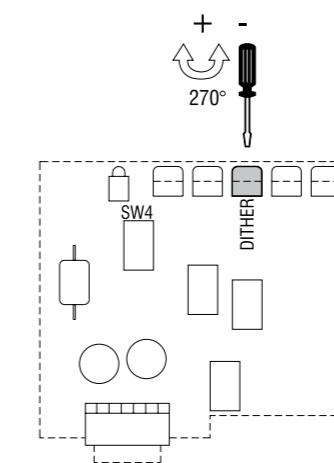
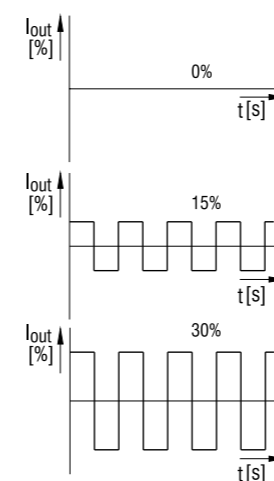
Ramp Adjustment (Up, Down)



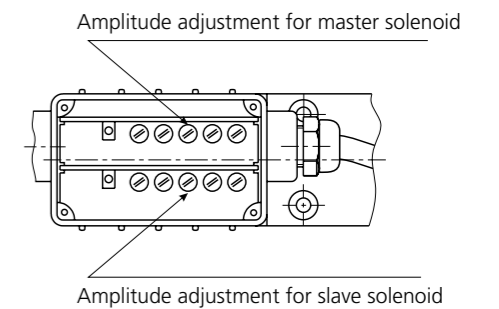
The factory setting of the ramp functions is to the minimum values.

Dither Adjustment

Amplitude - potentiometer (dither) (0 - 30 %)

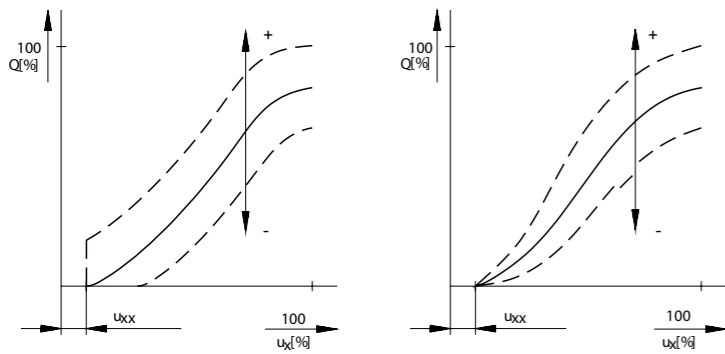


Frequency - switch SW4



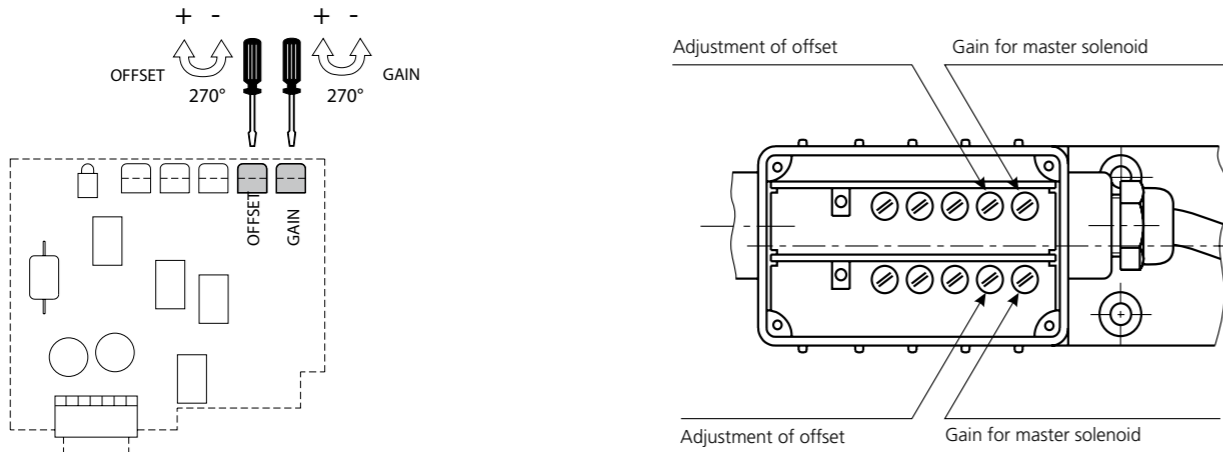
The dither is adjusted with regard to the minimum hysteresis.

Offset, Gain Parameters Adjustment



i The factory setting of the offset and gain parameters is specific for the solenoids used. The manufacturer does not recommend this setting to be changed.

Nominal Supply Voltage of Electronics (V)	Area Insensible to Control Signal u_{xx} (%)
12	1 ... 3
24	0,5 ... 2



Solenoid Coil in millimeters (inches)

E1, E2 Protection Degree IP65	E3, E4 Protection Degree IP67	E3A, E4A Protection Degree IP65	E8, E9 Protection Degree IP65	E12A, E13A Protection Degree IP67 / 69K
<p>Note: A = Standard 300 mm, (11.8 in) other lengths on demand</p>				

The indicated IP protection level is only achieved if the connector is properly mounted.

Manual Override in millimeters (inches)

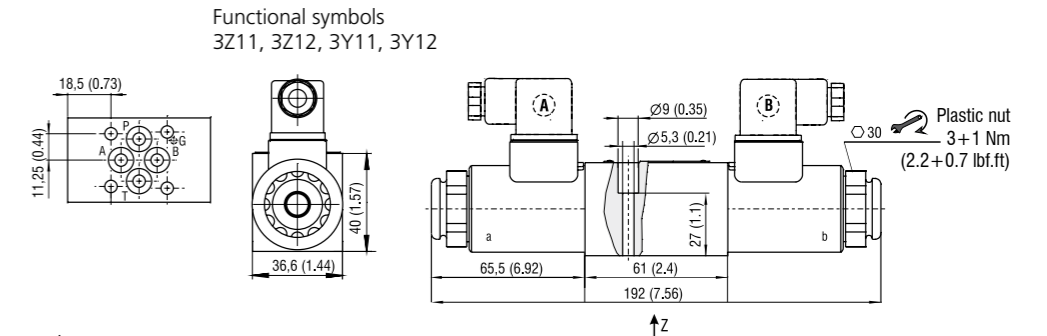
No Designation - Standard	Designation N2 - Rubber Boot Protected

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Dimensions in millimeters (inches)

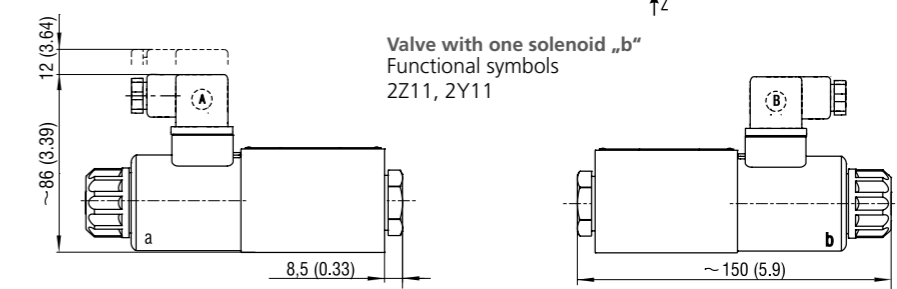
PRM2-043.../...E1

Valve with two solenoids
Example with electrical terminal
EN 175301-803-A (E1, E2)



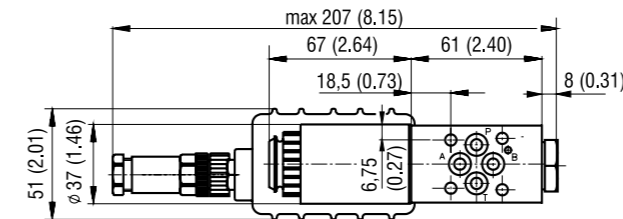
PRM2-042.../...E1

Valve with one solenoid „a“
Functional symbols
2Z51, 2Y51



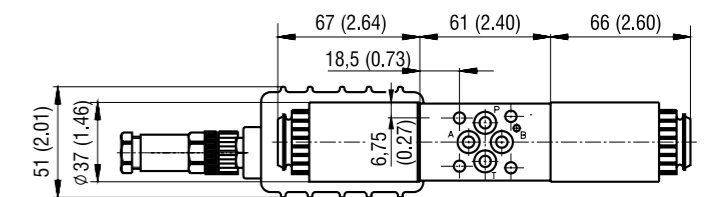
PRM2-043x/xEK*

Valve with one solenoid
OBE on side „a“ version EK



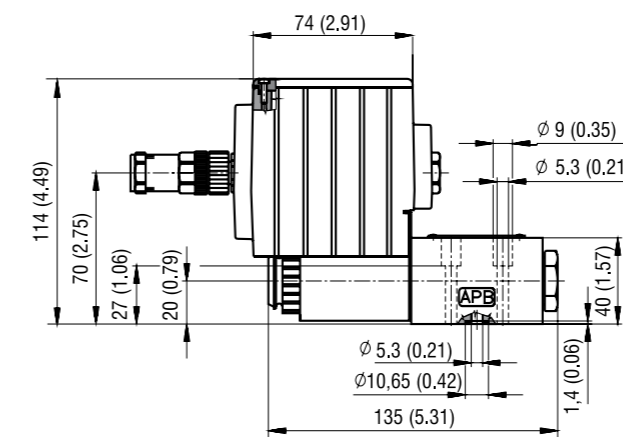
PRM2-043x/xEK*

Valve with two solenoids
OBE on side „a“ version EK



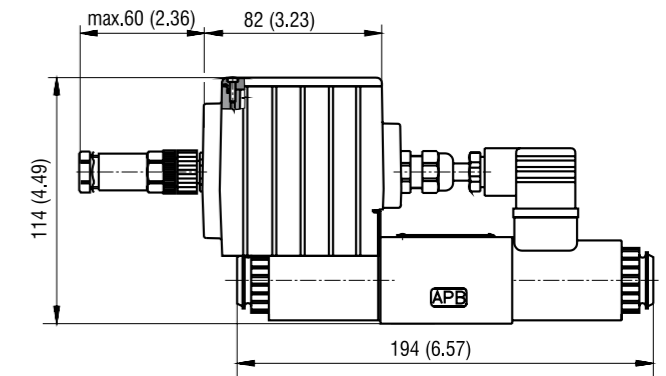
Valve with one solenoid „a“

Spool symbols 2Z51, 2Y51
OBE on side „a“ version EK



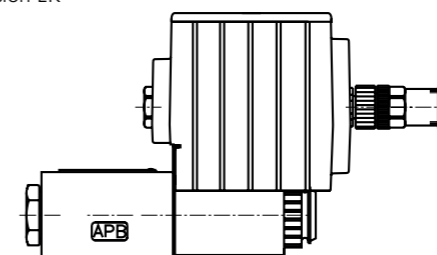
Valve with two solenoids

Spool symbols 3Z11, 3Z12, 3Y11, 3Y12
OBE on side „a“ version EK



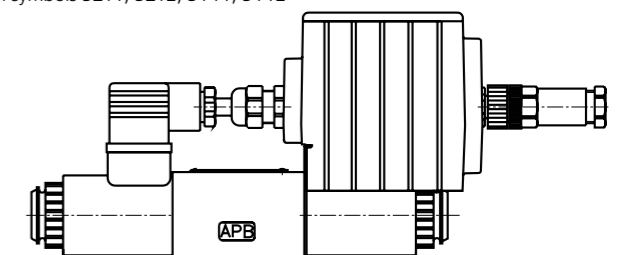
Valve with one solenoid „b“

Spool symbols 2Z11, 2Y11
OBE on side „b“ version EK



Valve with two solenoids

OBE on side „b“ version EKB
Spool symbols 3Z11, 3Z12, 3Y11, 3Y12



Proportional Directional Control Valve, with Digital Control Electronics, Feedback and OBE

PRM7-04

Size 02 (D04) • Q_{max} 20 l/min (5.3 GPM) • p_{max} 320 bar (4600 PSI)

Technical Features

- › Direct acting, proportional control valve with integrated digital electronic (OBE) proportional control, spool and process feedback
- › Control valve with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 02) standards
- › The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- › Digital converter card allows fine control of the valve spool position, reducing hysteresis and response time and optimizing the performance of the valve
- › Various models with or without onboard digital converter card or position sensor feedback available
- › Used for directional and speed control of hydraulic actuators
- › Wide range of interchangeable spools available
- › For versions without OBE wide range of solenoid electrical terminal versions available
- › The driver directly manages digital settings. It's possible to customize the settings for special applications using the optional kit.
- › In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h protection acc. to ISO 9227
- › Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

The proportional directional valve PRM7 consists of a cast iron housing, a special control spool, two centering springs with supporting washers, one or two proportional solenoids, a position sensor or, if desired, of a control box with digital electronics. The measurement system of the position sensor consists of a differential transformer with sensor core and its electronic evaluation unit.

Models without integrated electronic unit OBE

The electrical connection of the solenoids is realized by a variety of connectors. The position sensor output is connected by the G4W1F connector plug. Both connectors are supplied.

In this case the proportional valve can be used as follows:
S01, S02 with the internal feedback from the spool position sensor.

Models with the integrated electronic unit OBE

The model comprises an electronic control box that is mounted together with the position sensor on either of the solenoids. The connection of the position sensor to the control box is provided by a cable. For models with two solenoids, the solenoid mounted opposite the control box is connected to the control box by a EN 175301-803 connector.

The connection of the supply voltage, control signal, program input and external output of the position sensor is implemented in a 5-pin connector (ELKA 5012). The connection of the external feedback is provided by a 5-pin connector, which also has three supply voltages +24 V, +10 V and -5 V for an external sensor available.

The solenoid coils, including the control box, can be turned in the range of ± 90°. The digital control unit enables the proportional valve to be controlled on the basis of data required from two feedback circuits. In this case the proportional valve can be used as follows:

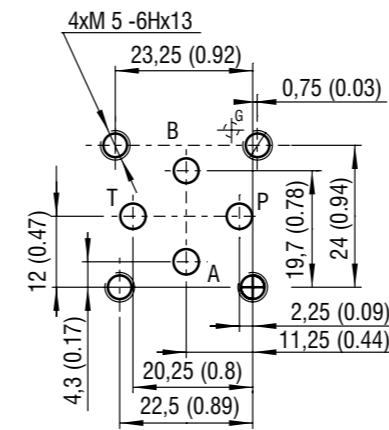
- E01** Proportional directional valve
- E02*S01** Only with the internal feedback from the spool position sensor.
- E03** Only with the external feedback (pressure sensor, position sensor, etc.).
- E04*S01** With internal and external feedback.

The digital control unit utilizes pulse-with-modulation (PWM) and supplies the solenoids with current proportional to the control signal. The supply current is additionally modulated with a dither frequency. Individual functional parameters are adjusted through software by a special programmer, or by computer through the RS 232 interface. The cable kit must be ordered separately, as detailed on page 4. The correct function of the digital control unit is signaled by a green LED. The incorrect function (failure) is indicated by a red LED. As a standard, the proportional valve is delivered with factory setting.

For a model including an external feedback contact the manufacturer.

Technical Data

ISO 4401-02-01-0-05



Ports P, A, B, T - max Ø4.5 mm (0.18 in)

Valve Size	04 (D02)	
Max. operating pressure at ports P, A, B	bar (PSI)	320 (4600)
Max. operating pressure at port T	bar (PSI)	210 (3050)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature max.	°C (°F)	-30 ... +50 (-22 ... +122)
Nominal flow at Δp = 10 bar (145 PSI)	l/min (GPM)	4 (1.1) 8 (2.1) 12 (3.2)
Hysteresis	%	< 6
Hysteresis - closed position loop	%	< 0.5
Protection degree EN 60529	IP65	
Mass	kg (lbs)	1.5 (3.30) 1.8 (3.96)
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Coil types / Connectors	C_8007 / K_8008	C19B* / K*
Mounting surface	SMT_0019	Size 04
Spare parts	SP_8010	
Subplates	SP_0002	DP*-04

Ordering Code

PRM7-04 [] / [] - [] [] [] [] - []

Proportional directional control valve, with digital control electronics, feedback and OBE

Valve size

Spool symbols
see the table „Spool symbols“

Nominal flow rate at Δp = 10 bar (145 PSI)

flow 4 l/min (1.1 GPM)	4
flow 8 l/min (2.1 GPM)	8
flow 12 l/min (3.2 GPM)	12

Nominal solenoid supply voltage

12V DC	12
24V DC	24

Surface treatment

No designation	Standard
A	240 h salt spray test (ISO 9227)
B	520 h salt spray test (ISO 9227)

Seals

No designation	NBR
V	FPM (Viton)

Installation side of OBE and position transducer

No designation	OBE with spool position transducer at side of port A
----------------	--

Model

S01	position sensor with voltage outlet
S02	position sensor with current outlet
E01	proportional directional valve without feedback
E02S01	proportional directional valve with position feedback
E03	proportional directional valve with external feedback
E04S01	proportional directional valve with position and external feedback

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- Mounting bolts M5x35 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 5 Nm (3.7 lbf.ft).
- Besides the shown, commonly used valve versions other special models are available.
- Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	$\frac{q_A}{q_B} = \frac{1}{2}$
2Y51		3Y11	
2Y11		3Y12	$\frac{q_A}{q_B} = \frac{1}{2}$

*Model for cylinders with asymmetric piston area ratio 1:2

Technical Data of Position Sensor - Voltage Outlet

Operating pressure	bar (PSI)	to 320 (4640), static
Electrical connection * only for S01 model		electrical connector G4W1F Hirschmann*
Contact assignment		1 - Power supply 2 - Command signal 3 - GND 4 - not used
Enclosure protection type according to EN 60529		IP65
Measured distance	mm (in)	8 (0.315)
Operating voltage	V	9.6 ... 30 DC
Linearity error	%	< 1
Current consumption at load current of 2 mA	mA	< 15
Output voltage	V	0 ... 5
Output signal range used:		
0 position	V	2.5
1 solenoid - stroke 1.8 mm (0.07 in)		1.375 ... 2.5
2 solenoids - stroke ±1.8 mm (0.07 in)		1.375 ... 3.625
Max. load current	mA	2
Noise voltage		
- at load current 0	mV _{p-p}	< 20
- at load current of 2 mA		< 15
Additional output signal error at:		
- temperature change between 0 ... 80°C (32... 176 °F)		typical 0.2% / 10K
- between 0... -25 °C (32 ... -13 °F)		max. 0.5 % / 10K
- Load change from 0 to 2 mA		max. 0.5 % / 10K
Input voltage change		
from 9.6 V to 14.4 V	%	< 0.1
from 14.4 V to 30 V		< 0.25
Long-term drift (30 days)	%	< 0.25
Cut-off frequency		
3dB fall in amplitude	Hz	> 600
Frequency 90°		> 600

Technical Data of Position Sensor - Current Outlet

Linearity	%	< 1
Operating pressure	bar (PSI)	to 320 (4640), static
Electrical connection * only for S02 model		electrical connector G4W1F Hirschmann*
Contact assignment		1 - Power supply 2 - Command signal 3 - GND 4 - not used
Enclosure protection type according to EN 60529		IP 65
Operatin voltage	V	20 ... 30 DC
Current	mA	< 35
Output signal range	mA	4 ... 20
Output signal range used:		
0 position	mA	12
1 solenoid - stroke 1.8mm (0.07 in)		8.4 ... 12
2 solenoids - stroke ±1.8 mm (0.07 in)		8.4 ... 15.6
Additional output signal error:		
- at temperature change from +10... 55°C (50... 131°F)		0.2% / 10K
- at impedance change from 50%		≤ 0.1%
- at input voltage change in the range of operating voltage		≤ 0.05%
Impedance	Ω	≤ 500
Output signal ripple	mA R.M.S.	≤ 0.02
Limit frequency at 3 dB amplitude decrease	Hz	≥ 800

Technical Data of Proportional Solenoid

Type of coil	V	12 DC	24 DC
Limiting current	A	1.7	0.8
Resistance at 20° C (68 °F)	Ω	4.9	21

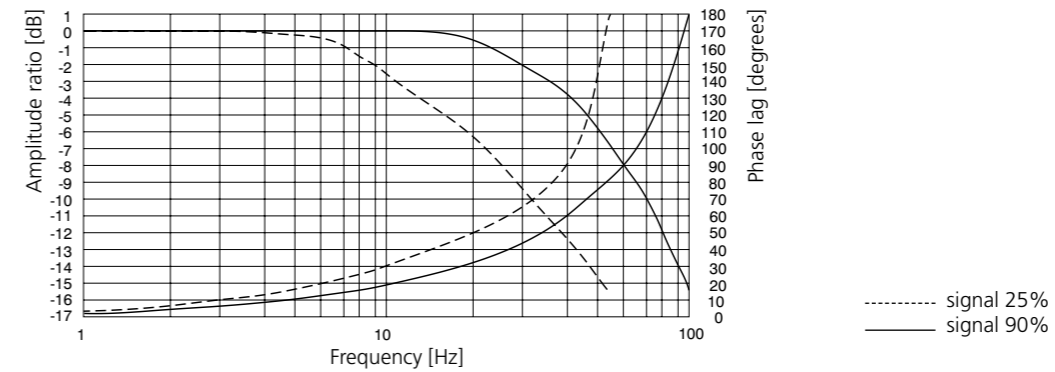
Electronics Data

Supply voltage with polarity inversion protection	V	11.2 ... 28 VDC (residual ripple < 10%)
Input: command signal / according to customer setting		±10 V, 0...10 V, ±10 mA, 4...20 mA, 0...20 mA, 12 mA ±8 mA
Input: spool position sensor signal		0...5V
Input: external feedback signal		0...10 V, 4...20 mA, 0...20 mA
Resolution of the A/D converter		12 bit
Output: solenoids		two PWM output stages up to max. 3.5 A
PWM frequency	kHz	18
Adjustment of parameters	μS	170
EMC		
Interference resistance		61000 - 6 - 2 : 2005
Radiation resistance		55011 : 1998 class A
Parameter setting		Serial port RS 232 (zero modem). 19200 bauds, 8 data bits, 1 stop bit, no parity. Special software PRM7 Conf.

Accessories

Order number	Content
23093400	Connecting cable to PC - length 2 m (6.56 ft), CD-ROM with program PRM7 Conf and user manual
23093500	Connecting cable to PC - length 5 m (16.40 ft), CD-ROM with program PRM7 Conf and user manual
24523400	Connecting cable to PC - length 2 m (6.56 ft)
24523500	Connecting cable to PC - length 5 m (6.56 ft)

Frequency Response closed position loop, for E02S01 model

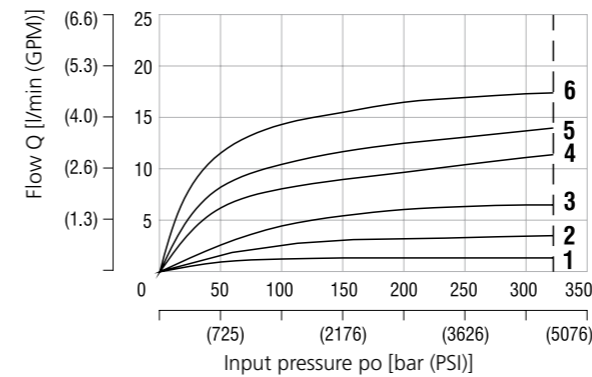


Characteristics measured at v = 32 mm²/s (156 SUS)

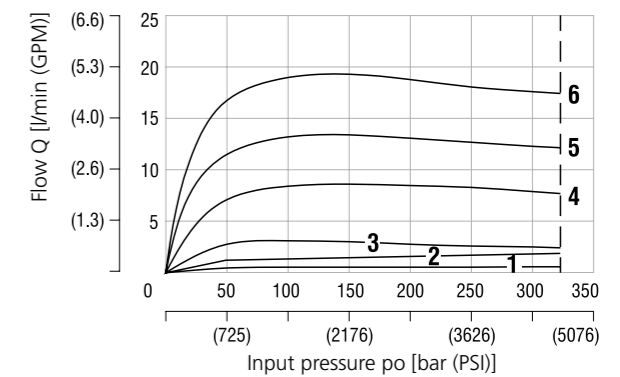
Operating limits: Flow direction P → A / B → T or P → B / A → T

Operating limits only for **E01 model only**

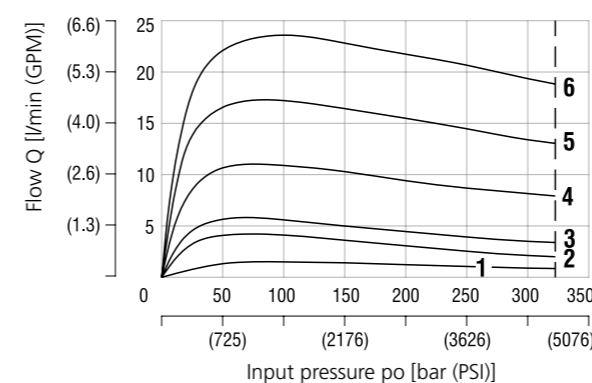
Nominal flow 4 l/min (1.1 GPM)



Nominal flow 8 l/min (2.1 GPM)



Nominal flow 12 l/min (3.2 GPM)

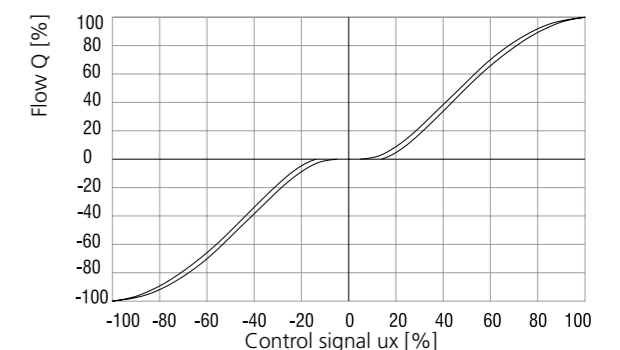


Solenoid current:

- 1 = 50 %
- 2 = 60 %
- 3 = 70 %
- 4 = 80 %
- 5 = 90 %
- 6 = 100 %

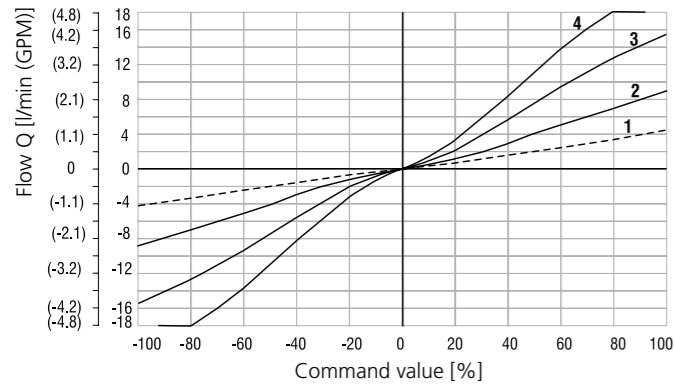
Regulated flow related to control signal

Flow characteristics (**E01 model only**) Δp=10 bar (145 PSI)

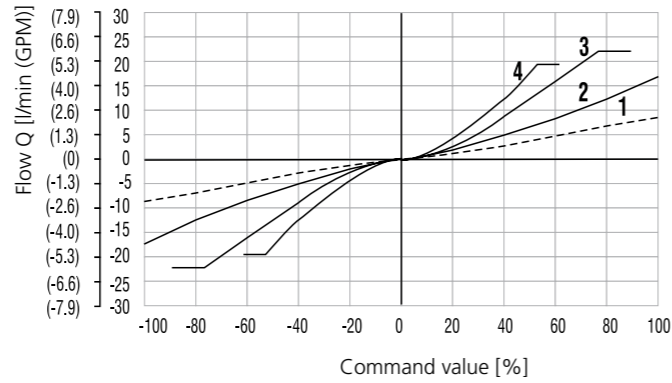


Flow Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

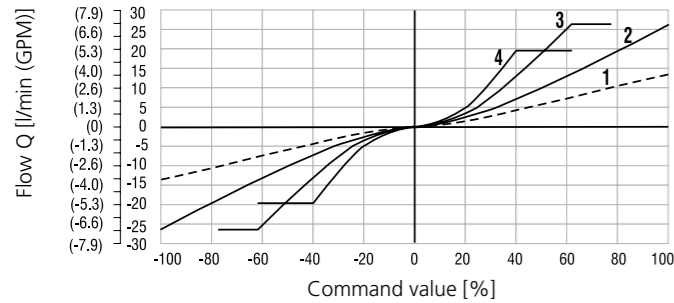
Flow characteristics (E02S01 model only)
 $Q_n = 4 \text{ l/min}$ (1.1 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



$Q_n = 8 \text{ l/min}$ (2.1 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



$Q_n = 12 \text{ l/min}$ (3.2 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



Δp = Valve pressure differential (inlet pressure p_v minus load pressure and return pressure p_r)

Δp_n = Valve pressure differential for nominal flow Q_n

1	$\Delta p_n = 10 \text{ bar}$ (145 PSI)
2	$\Delta p = 50 \text{ bar}$ (725 PSI)
3	$\Delta p = 160 \text{ bar}$ (2321 PSI)
4	$\Delta p = 320 \text{ bar}$ (4641 PSI)

Factory Settings

Item	Model	
	E01	E02S01
Control signal	0 ... 10 V	$\pm 10 \text{ V}$
Signal external feedback	-	-
Output position sensor spool	-	0 ... 5 V

Connectors

K1

PIN	Technical data
1	* Power supply input
2	* Ground (power supply)
3	Control signal
4	Ground (signal)
5	Power reference signal
6	Control signal of position sensor spool
7	* Protective earth lead (PE)

*Recommended min. lead cross section 0,75 mm²

K2

PIN	Technical data
1	TxD
2	RxD
3	Ground (signal)
4	Not used

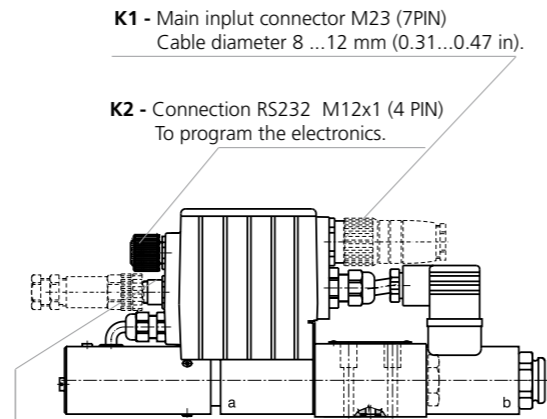
K3

PIN	Technical data
1	Power supply output
2	Signal of external feedback
3	Ground
4	Not used
5	Not used

K1 - Main input connector M23 (7PIN)
Cable diameter 8 ... 12 mm (0.31...0.47 in).

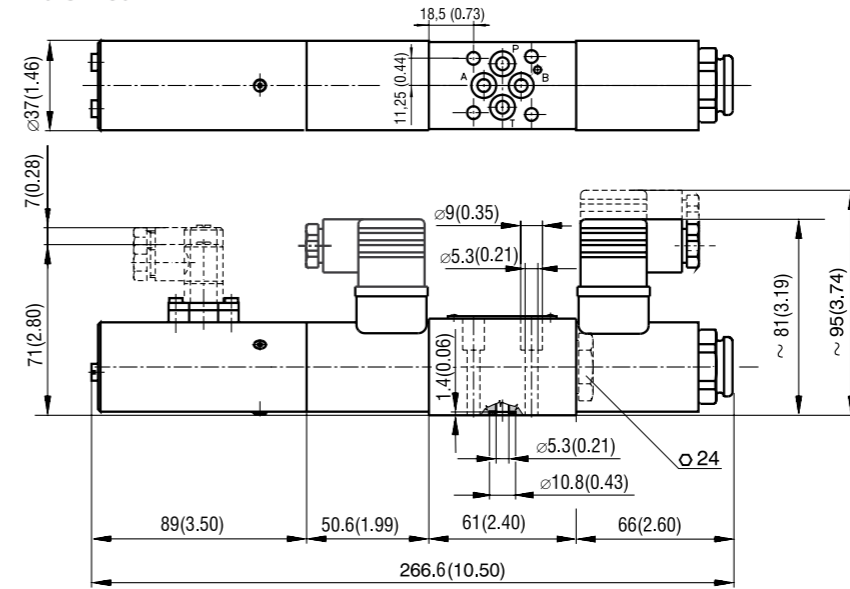
K2 - Connection RS232 M12x1 (4 PIN)
To program the electronics.

K3 - Conektor M12x1 (5PIN)
External feedback signal (for configurations E03 and E04S01 only).

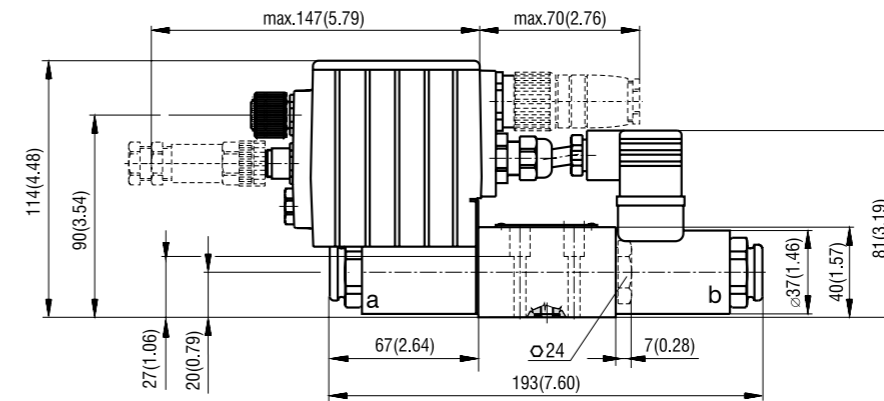


Dimensions in millimeters (inches)

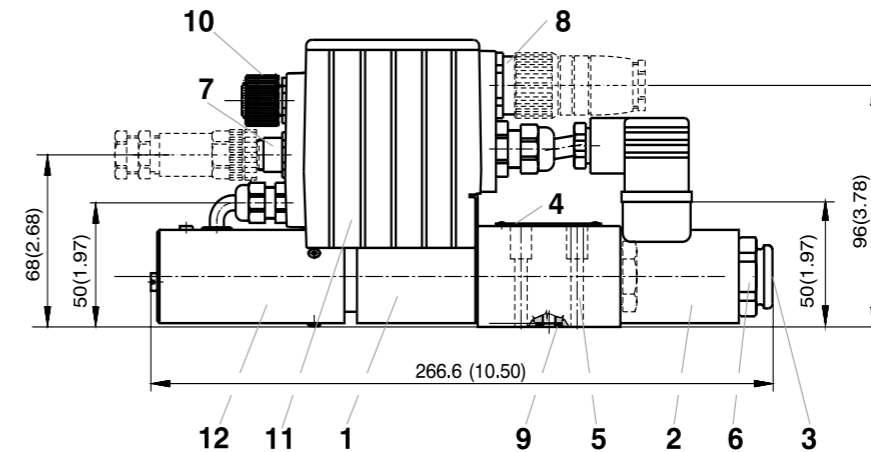
PRM7-043 ... S01
PRM7-043 ... S02



PRM7-043 ... E01 - without connector plug for spool position feedback
PRM7-043 ... E03



PRM7-043 ... E02S01 - without connector plug for spool position feedback
PRM7-043 ... E04S01

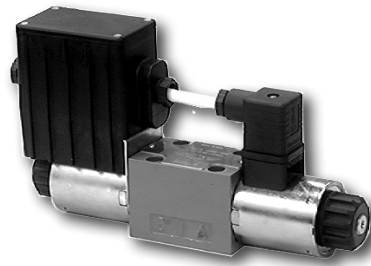


- 1 Solenoid a
- 2 Solenoid b
- 3 Manual override
- 4 Name plate
- 5 4 mounting holes
- 6 Solenoid fixing nut
- 7 Connector M12x1 for connection of external feedback
- 8 Main supply connector M23
- 9 Square ring 7.65 x 1.68 (4 pcs.), supplied in delivery packet
- 10 Cover of connector M12x1 for programming
- 11 Plastic box with integrated electronics
- 12 Position sensor

Proportional Directional Control Valve, with Analog Control Electronics

PRM2-06

Size 06 (D03) • Q_{max} 40 l/min (11 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Direct acting, proportional control valve without or with integrated analog electronic (OBE) with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 03) standards
- Used for directional and speed control of hydraulic actuators
- The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- The valve can be controlled directly by a current control supply unit or by means of the electronic control units to exploit valve performance to the fullest
- Analog converter card allows fine control of the valve spool position, reducing hysteresis and response time and optimizing the valve performance
- Five chambers housing design with reduced hydraulic power dependence on fluid viscosity
- For versions without OBE a wide range of solenoid electrical terminal versions available
- Wide range of interchangeable spools and manual overrides available
- The coil is fastened to the core tube with a retaining nut and can be rotated by 360° to suit the available space
- In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

PRM2-06* Versions without on board electronics

The valve can be controlled directly by a current control supply unit or by the external electronic card directly mounted to the electrical terminal (see catalog of EL3E card 9145 and EL6 card 9150). This control card, depending on the number of the controlled solenoids, can be mounted onto either solenoid.

PRM2-06*EK Versions with on board electronics

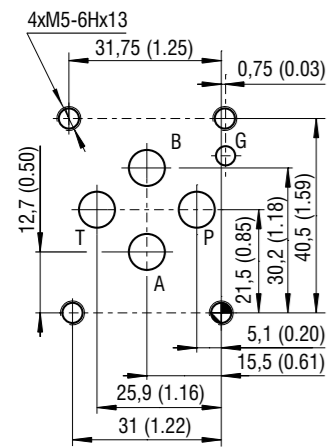
A control box, which comprises one or two electronic control cards, depending on the number of controlled solenoids, can be mounted onto either solenoid. For models with two solenoids, the solenoid mounted opposite the control box is connected to the box by a DIN connector, a two-lead cable and a bushing. The connection of the control box with the supply source and with the control signal is implemented by a 4-pin connector of type M12x1. The electric control unit supplies the solenoid with current, which varies with the control signal.

The electronic control unit provides the following adjustment possibilities:

Offset, gain, rise and drop-out time of the ramp generator, frequency (2 frequencies) and amplitude of the dither signal generator. The correct function of the control unit is signaled by LEDs. Stabilized voltage +10 V (+5 V for 12 V voltage) is also available to the user. Using this voltage and a potentiometer ≥ 1kΩ a voltage control signal can be generated. The electronic control card enables voltage or current control to be used, depending on the position of the switches SW1 to SW3.

Technical Data

ISO 4401-03-02-0-05



Ports P, A, B, T - max Ø7.5 mm (0.29 in)

Nominal Size	06 (D03)	
Max. operating pressure at port P, A, B	bar (PSI)	350 (5080)
Max. operating pressure at port T	bar (PSI)	210 (3050)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)
Hysteresis	%	≤ 6
Nominal flow rate Q _n at Δp=10 bar (145 PSI)	l/min (GPM)	5 (1.13) 8 (2.1) 15 (4.0) 30 (7.9)
Protection degree (for version PRM*EK)		IP65
Mass - valve with 1 solenoid	kg (lbs)	1.9 (4.2)
- valve with 2 solenoids		2.4 (5.3)
Technical Data of the Proportional Solenoid		
Nominal supply voltage	V	12 DC 24 DC
Limit current	A	2.5 1.0
- with electronic		1.6 -
Mean resistance value at 20 °C (68 °F)	Ω	2.3 13.4
- with electronic		5.2 -
Technical Data of the Electronics		
Supply voltage range	V	Ucc 12V DC Ucc 24V DC
Stabilized voltage for control	V	11.2... 14.7 20... 30
Control signal		5 DC (R > 1 kΩ) 10 DC (R > 1 kΩ)
Maximum output current	A	see table of switches configuration (page 4, 5 and 6)
Ramp adjustment range	s	2.4 for R < 4 Ω 1.5 for R < 10 Ω
Dither frequency	Hz	0.05... 3
Dither amplitude	%	90 / 60
		0... 30
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Coil types / Connectors	C_8007 / K_8008	C22B* / K*
Mounting interface / Tolerances	SMT_0019	Size 06
Spare parts	SP_8010	
Subplates	SP_0002	DP*-06

Ordering Code

PRM2-06 / - - - - -

Proportional directional control valve, with analog control electronics

Valve size

Spool symbols see table „Spool Symbols“

Nominal flow rate at Δp = 10 bar (145 PSI)

5 l/min (1.3 GPM)	5
8 l/min (2.1 GPM)	8
15 l/min (4.0 GPM)	15
30 l/min (7.9 GPM)	30

Rated supply voltage of solenoids (at the coil terminal)

12 V DC	12
24 V DC	24

Electronics on board / Position at solenoid connection by connector M12 x 1 (4-pin connector, supplied with counterpart)

on board electronics (solenoid „a“) EK

on board electronics (solenoid „b“)* EKB

Surface treatment

No designation	standard
A	zinc-coated (ZnCr-3), ISO 9227 (240 h)
B	zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation	NBR
V	FPM (Viton)

Manual Override

No designation	standard
N1	protected with cap nut
N2	protected with rubber boot

Connector

E1	only for version without on board electronic „EK“ with terminal for the connector, EN 175301-803-A
E2	E1 with quenching diode
E3A	with AMP-Junior-Timer-connector - Axial direction
E4A	E3A with quenching diode
E8	loose conductors (two insulated wires)
E9	E8 with quenching diode
E12A	with Deutsch DT04-2P
E13A	E12A with quenching diode

*For valve versions with one solenoid the designation „B“ with OBE is not shown.

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 8.9 Nm (6.56 ft-lbf)
- Besides the shown, commonly used valve versions other special models are available.
- Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

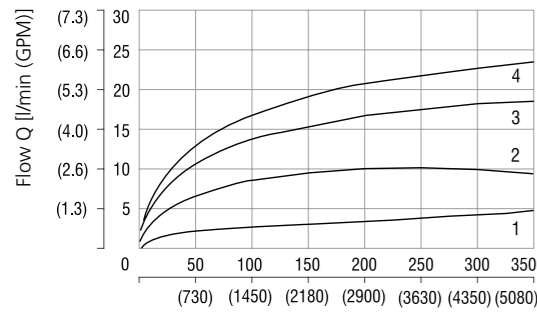
Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	$\frac{q_A}{q_B} = \frac{1}{2}$
2Y51		3Y11	
2Y11		3Y12	$\frac{q_A}{q_B} = \frac{1}{2}$

*Model for cylinders with asymmetric piston area ratio 1:2

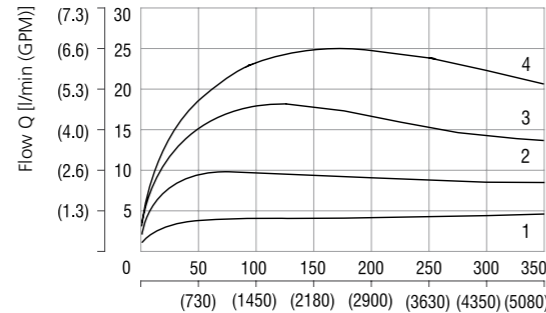
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Operating limits: Flow direction $P \rightarrow A/B \rightarrow T$ or $P \rightarrow B/A \rightarrow T$

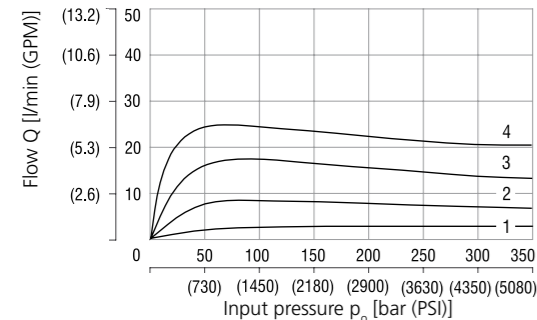
Nominal flow 5 l/min (1.3 GPM)



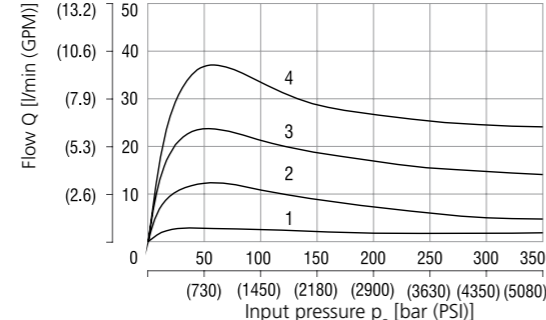
Nominal flow 8 l/min (2.1 GPM)



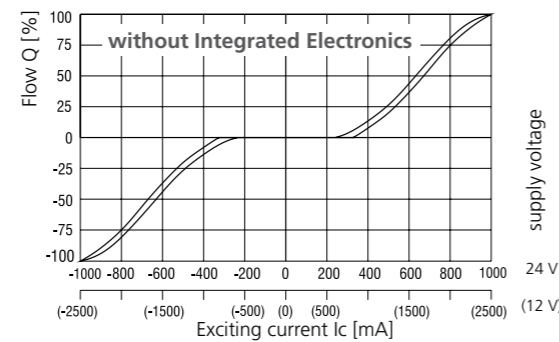
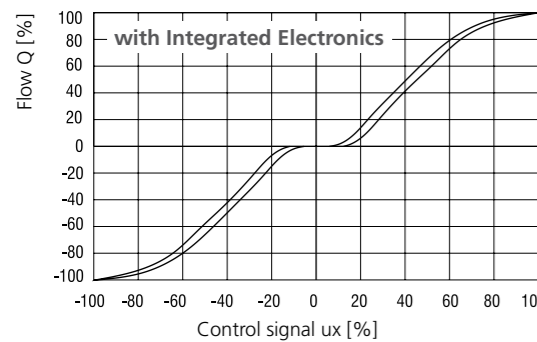
Nominal flow 15 l/min (4.0 GPM)



Nominal flow 30 l/min (7.9 GPM)



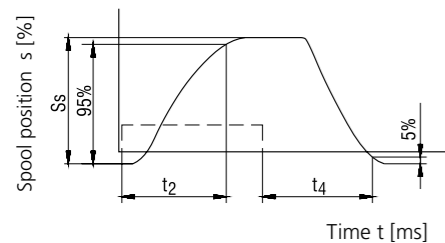
Regulated flow related to control signal
 $\Delta p = 10 \text{ bar}$ (145 PSI)



Solenoid current:
1 = 50 %
2 = 60 %
3 = 70 %
4 = 80 %
5 = 90 %
6 = 100 %

The coil current which initializes the flow through the proportional directional valve can differ due to the production tolerances about in a range of $\pm 6\%$ of the limit current.

Transient Characteristic measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS), $\Delta p = 10 \text{ bar}$ (145 PSI)

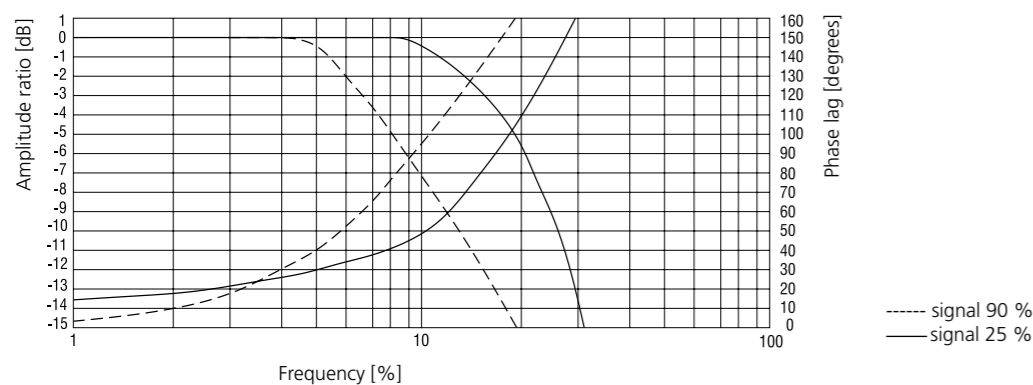


Steady Spool Position S_s [%]	t_2 [ms]	t_4 [ms]
100	85	100
75	70	85
50	55	75
25	45	55

The values in table have only an informative character. The times of the transient characteristics at pressure or flow control will be in a particular hydraulic circuit always longer.

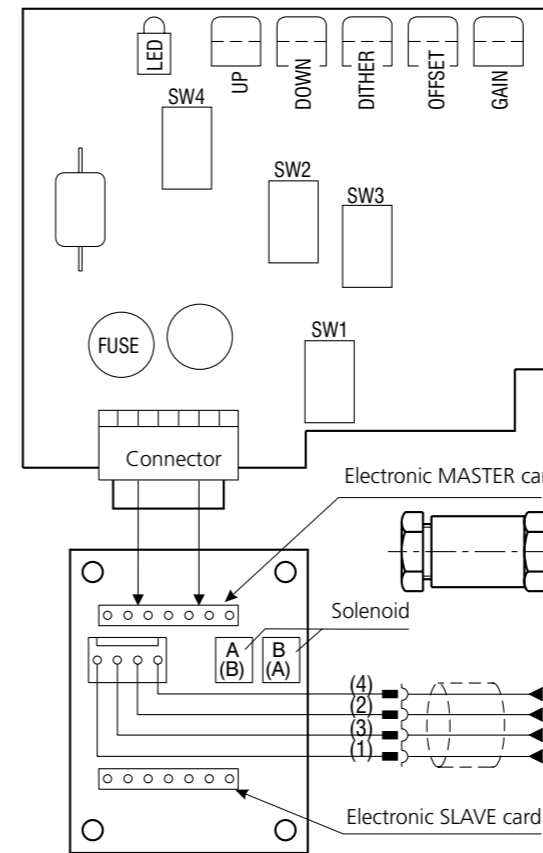
---- the control signal course of the integrated electronics

Frequency Response



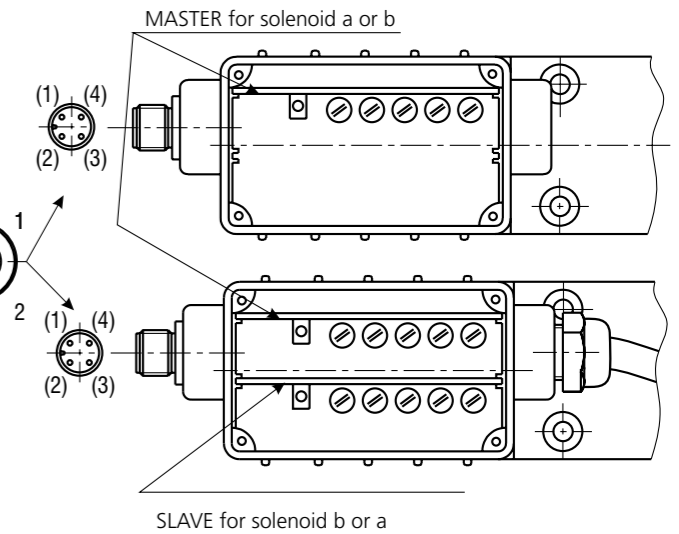
----- signal 90 %
————— signal 25 %

Component Arrangement on the Electronic Card



PIN	Description	Wire Colors, Connection	Connector - Electronics
1	+24 V (Ucc) (+12 V)	(1)	brown
2	control	(2)	white
3	0 V	(3)	blue
4	+10 V (+5 V)	(4)	black

SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency



Attention: The control signal must have the same ground potential as the supply.

Table of the Switch Configuration for the Control Signal Choices

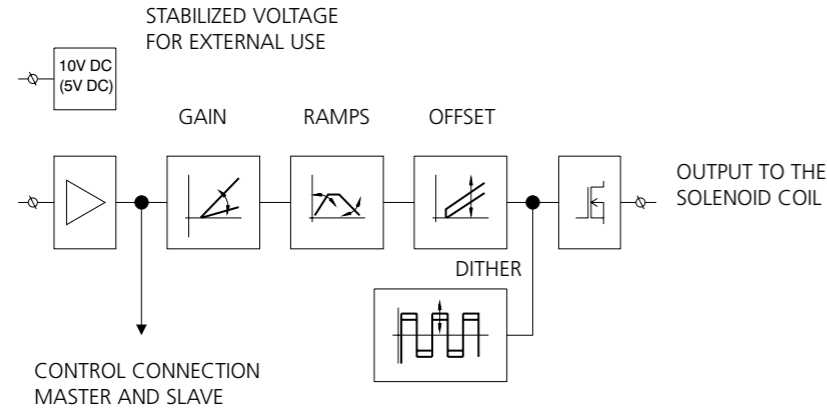
		PRM2-062				PRM2-063	
		0 ... 5 V	0 ... 10 V (0...5 V)*	0 ... 20 mA	4 ... 20 mA	$U_{cc}/2 \pm 10 \text{ V} (\pm 5 \text{ V})^*$	$\pm 10 \text{ V} (\pm 5 \text{ V})^*$
MASTER M	SW1						
	SW2						
	SW3						
	SW4	90 Hz			60 Hz		
SLAVE S	SW1						
	SW2						
	SW3						
	SW4					90 Hz	60 Hz

Designation of the basic manufacture setting.

The ramp functions are adjusted to their minimum values, the dither is set to the optimal value with respect to hysteresis. Offset and gain are adjusted according to the characteristic on page 3 and 4. The manufacturer does not recommend to change these adjusted values.

* Input signal level for the 12 V electronic unit.

Block Diagram

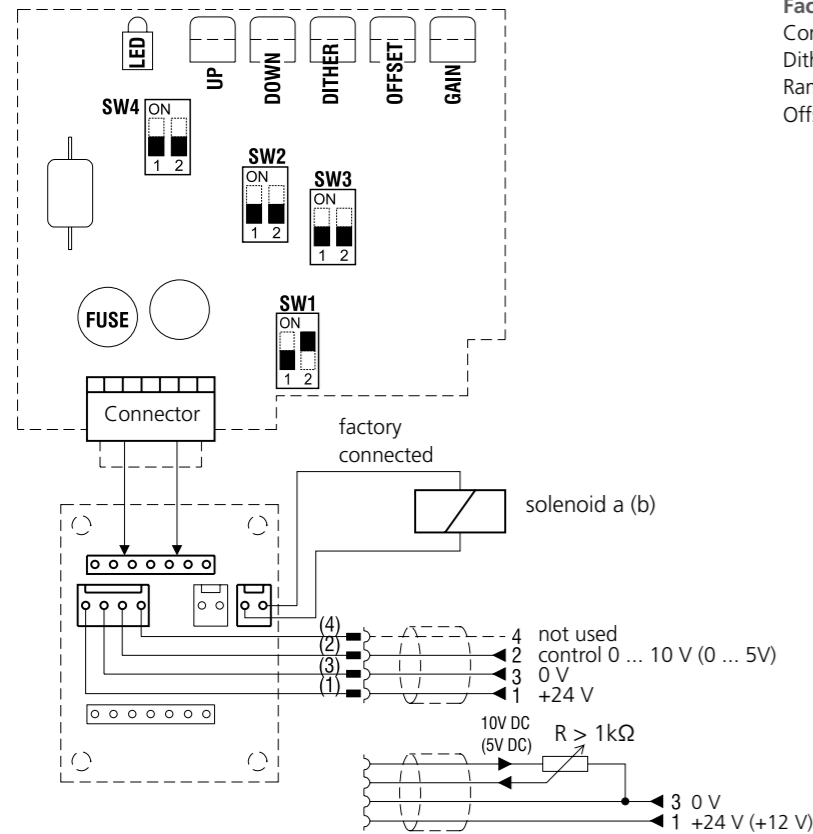


Setting of Control Electronics

Valve PRM2-062*EK (with one solenoid)

Control with external voltage source 0...10 V, 0 ... 5 V (factory setting) or with external potentiometer R>1 kΩ

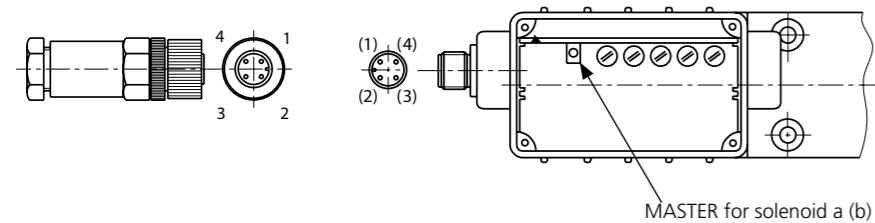
Master card for solenoid a (b)



Factory set values:
Control signal: 0 - 10 V (0 - 5 V)
Dither: frequency 90 Hz amplitude - optimum
Ramps: 0.05 s
Offset, gain: according to the characteristics on page 3



The control signal must have the same ground potential as the supply source.



Wire colors (connection connector - electronics)
(1) - brown
(2) - white
(3) - blue
(4) - black

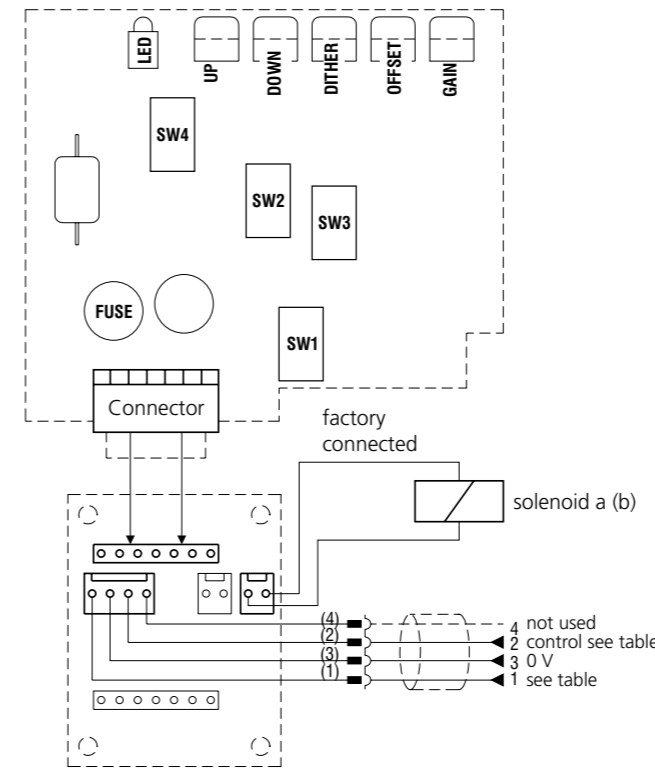
MASTER for solenoid a (b)

Setting of Control Electronics

Valve PRM2-062*EK (with one solenoid)

Control with external source 0 ... 5 V, 0 ... 20 mA, 4 ... 20 mA

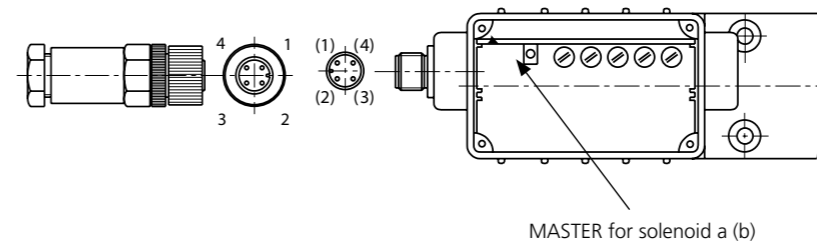
Master card for solenoid a (b)



		Control with external source		
		0 ...5 V	0 ...20 mA	4 ...20 mA
SW1				
SW2				
SW3				
SW4				
PIN 1 (1)		+24 V	+24 V (+12 V)	+24 V (+12 V)
PIN 2 (2)		0 ...5 V	0 ...20 mA	4 ...20 mA

Follow the subsequent steps to modify the factory settings:

1. Unscrew the electronics cover
2. Carefully remove the master card
3. Flip the switch SW1 (2 or 3) in position shown in the table
4. Put in the master card and fix the electronics cover
5. Connect the voltage +24 V (+12 V) from an external supply source to terminals 1 and 3 of the connector
6. Bring the control voltage (current) from an external source to terminals 2 and 3 of the connector



Wire colors (connection connector - electronics)
(1) - brown
(2) - white
(3) - blue
(4) - black

MASTER for solenoid a (b)



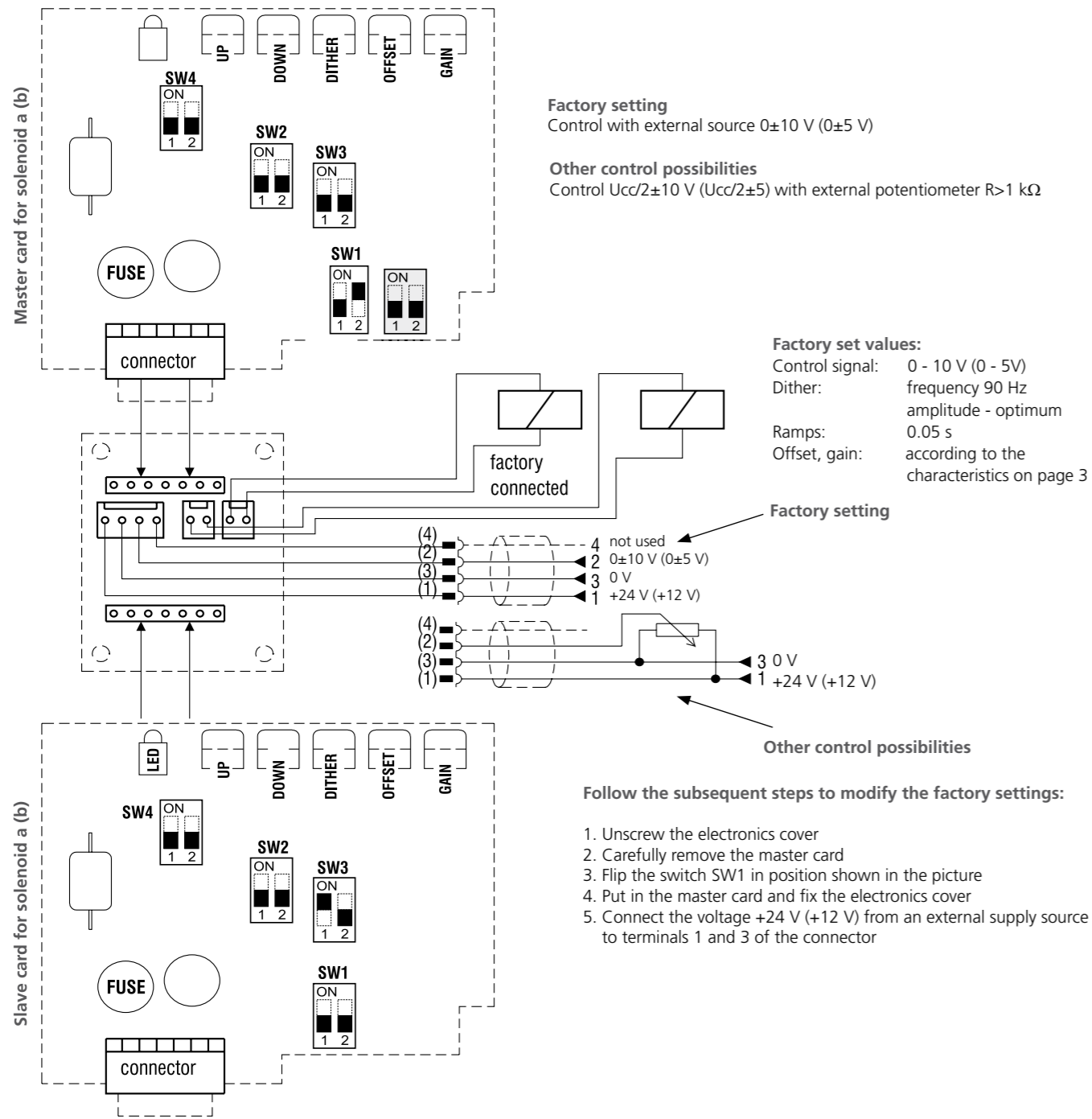
The control signal must have the same ground potential as the supply source.



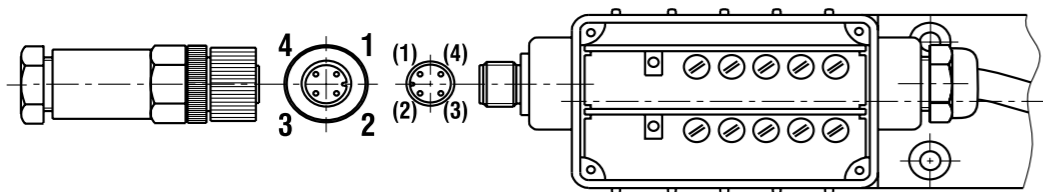
Designation of the basic factory setting.
The ramp functions are adjusted on their minimum values.
The dither is set to the optimal value with respect to hysteresis.
Offset and gain are adjusted according to the characteristic on page 1 and 2.
The manufacturer does not recommend to change these adjusted values.

Setting of control electronics

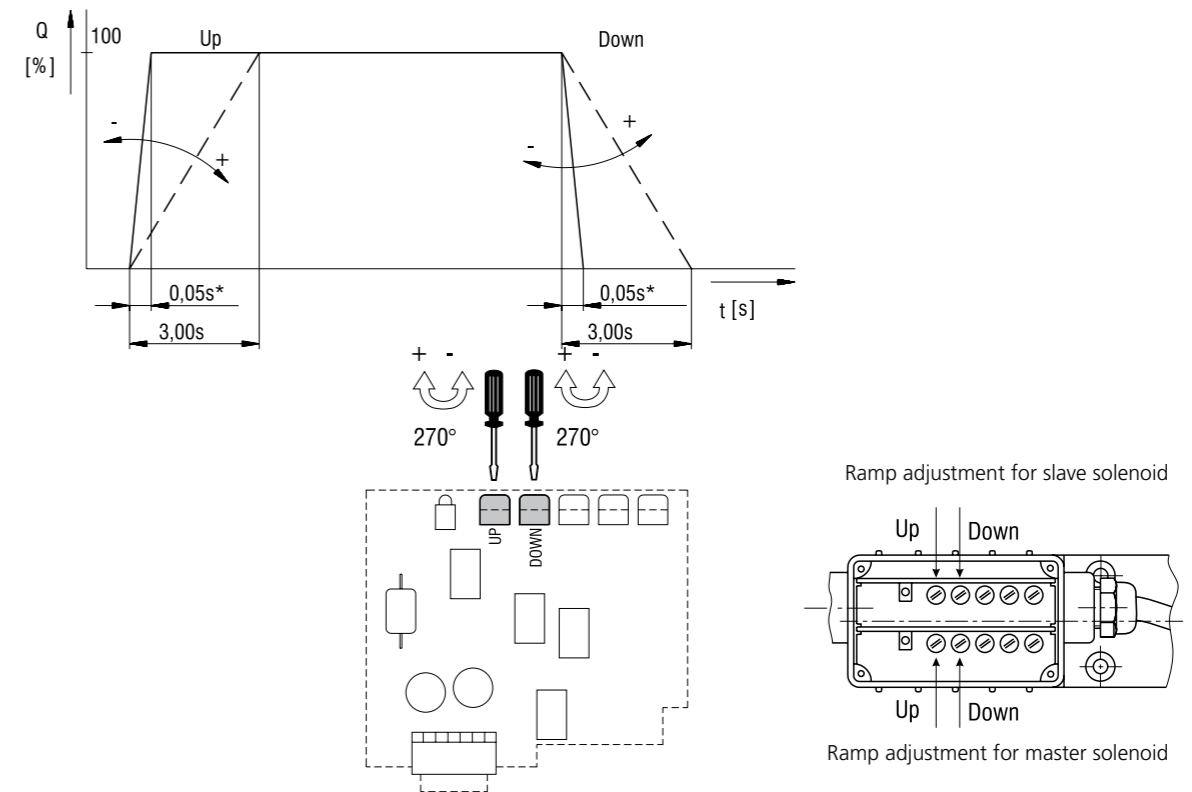
Valve PRM2-063*EK (with two solenoids), factory setting, other control possibilities



The control signal must have the same ground potential as the supply source.



Ramp Adjustment (Up, Down)



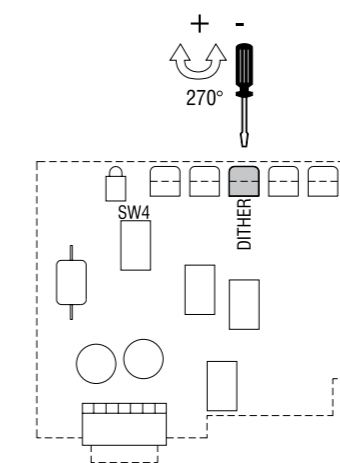
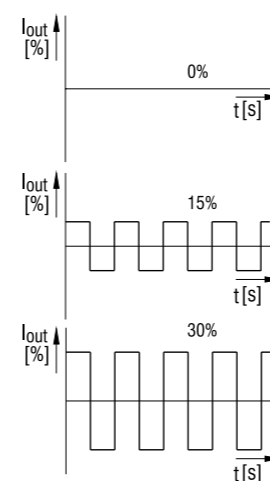
* The value has only an informative character with respect to the particular type of the proportional directional valve (see page 3).



The factory setting of the ramp is at the minimum value.

Dither Adjustment

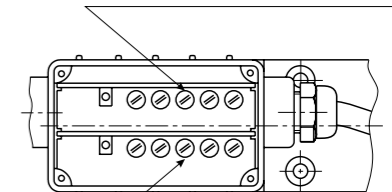
Amplitude - potentiometer (dither) (0 - 30 %)



Frequency - switch SW4



Amplitude adjustment for master solenoid

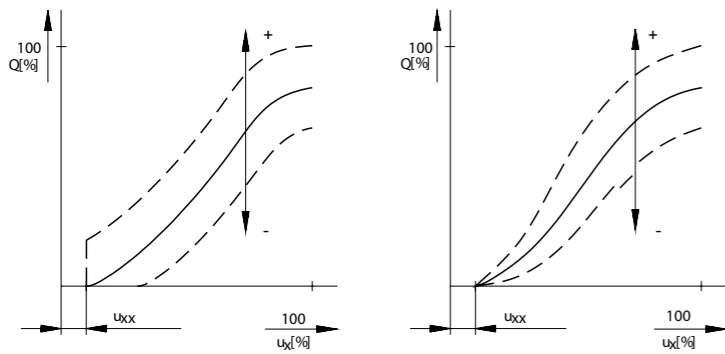


Amplitude adjustment for slave solenoid



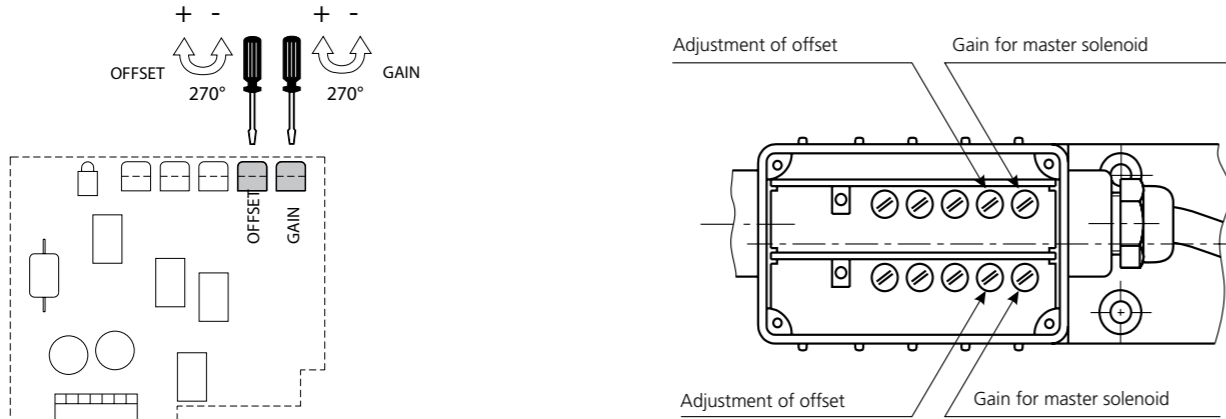
The dither is adjusted to minimize hysteresis.

Offset, Gain Parameters Adjustment



i The factory setting of the offset and gain parameters is specific for the solenoids used. The manufacturer does not recommend to change these settings.

Nominal Electronics Supply Voltage (V)	Area Insensitive to Control Signal uxx (%)
12	1 ... 3
24	0.5 ... 2



Solenoid Coil in millimeters (inches)

E1, E2 Protection Degree IP65	E3A, E4A Protection Degree IP67	E8, E9 Protection Degree IP65	E12A, E13A Protection Degree IP67 / 69K

The indicated IP protection level is only achieved if the connector is properly mounted.

Manual Override in millimeters (inches)

No Designation - Standard	Designation N1 - Cap Nut Covered	Designation N2 - Rubber Boot Protected

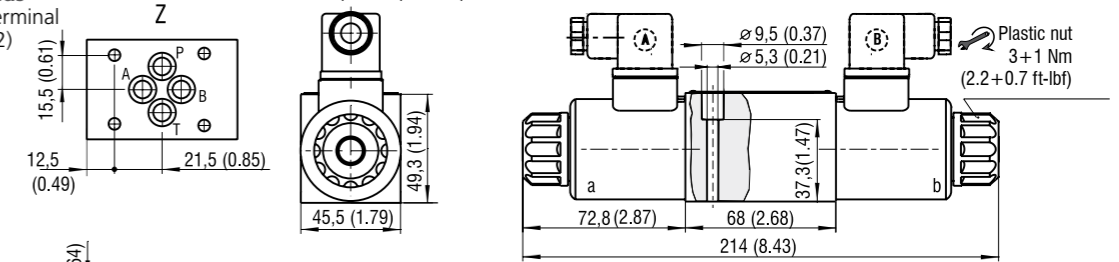
In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Dimensions in millimeters (inches)

PRM2-063.../...E1

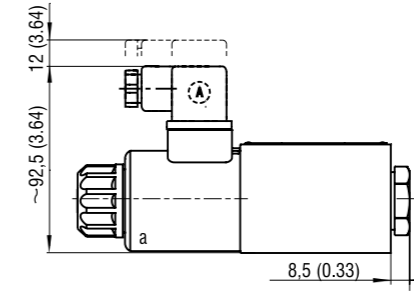
Valve with two solenoids
Example with electrical terminal EN 175301-803-A (E1, E2)

Functional symbols
3Z11, 3Z12, 3Y11, 3Y12

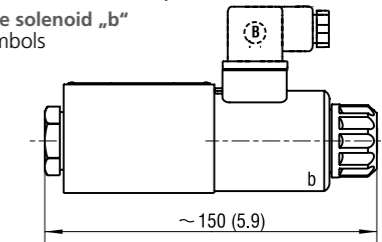


PRM2-062.../...E1

Valve with one solenoid „a“
Functional symbols
2Z51, 2Y51

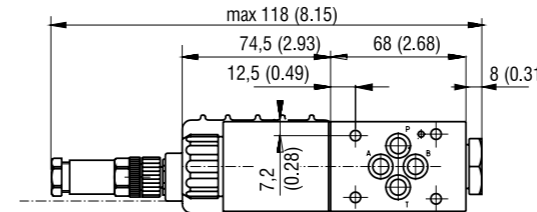


Valve with one solenoid „b“
Functional symbols
2Z11, 2Y11



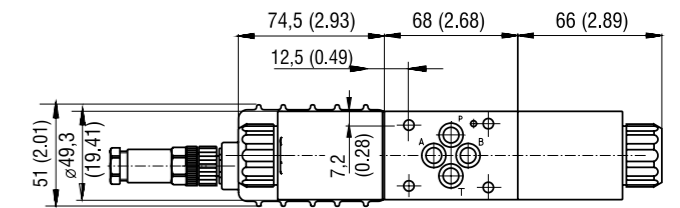
PRM2-063x/xEK*

Valve with one solenoid
OBE on side „a“ version EK



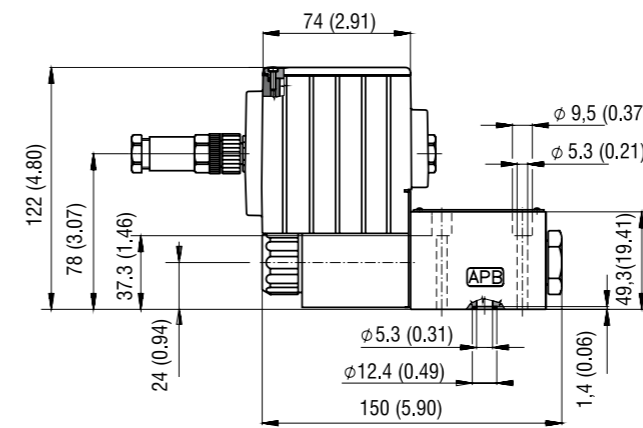
PRM2-063x/xEK*

Valve with two solenoids
OBE on side „a“ version EK



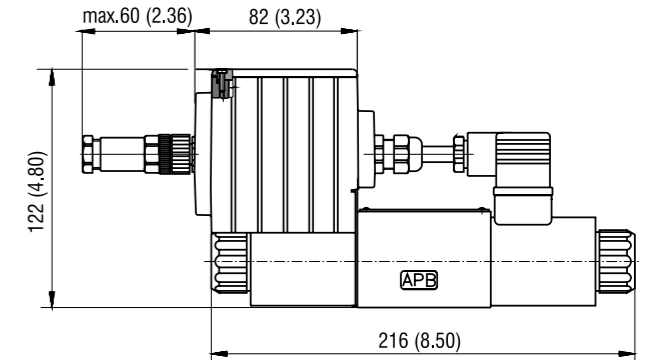
Valve with one solenoid „a“

Spool symbols 2Z51, 2Y51
OBE on side „a“ version EK



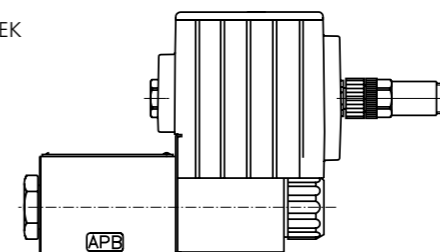
Valve with two solenoids

Spool symbols 3Z11, 3Z12, 3Y11, 3Y12
OBE on side „a“ version EK



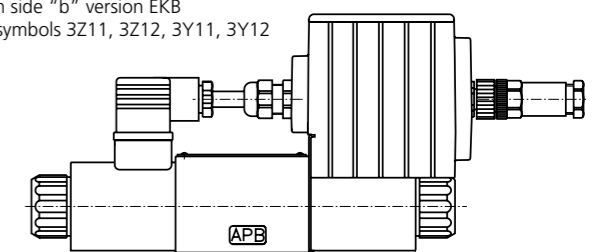
Valve with one solenoid „b“

Spool symbols 2Z11, 2Y11
OBE on side „b“ version EK



Valve with two solenoids

OBE on side „b“ version EKB
Spool symbols 3Z11, 3Z12, 3Y11, 3Y12



Proportional Directional Control Valve, with Digital Control Electronics, Feedback and OBE

PRM7-06

Size 06 (D03) • Q_{max} 40 l/min (11 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features

- Direct acting, proportional control valve with integrated digital electronic (OBE) proportional control, spool and process feedback
- Control valve with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 03) standards
- The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- Digital converter card allows fine control of the valve spool position, reducing hysteresis and response time and optimizing the performance of the valve
- Various models with or without onboard digital converter card or position sensor feedback available
- Used for directional and speed control of hydraulic actuators
- Wide range of interchangeable spools available
- For versions without OBE wide range of solenoid electrical terminal versions available
- The driver directly manages digital settings. It's possible to customize the settings for special applications using the optional kit.
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

The proportional directional valve PRM7 consists of a cast iron housing, a special control spool, two centering springs with supporting washers, one or two proportional solenoids, a position sensor or, if need be, of a control box with digital electronics. The measuring system of the position sensor consists of a differential transformer with core and from the evaluating electronic unit realized in hybrid technique.

Models without integrated electronic unit OBE

The electrical connection of the solenoids is realized by a variety of connectors. The position sensor output is connected by the G4W1F connector plug. Both connectors are supplied.

In this case the proportional valve can be used as follows:

S01, S02 with the internal feedback from the spool position sensor.

Models with the integrated electronic unit OBE

The model comprises an electronic control box that is mounted together with the position sensor on either of the solenoids. The connection of the position sensor to the control box is provided by a cable. For models with two solenoids, the solenoid mounted opposite the control box is connected to the control box by a EN 175301-803 connector.

The connection of the supply voltage, control signal, program input and external output of the position sensor is implemented in a 5-pin connector (ELKA 5012). The connection of the external feedback is provided by a 5-pin connector, which also has three supply voltages +24 V, +10 V and -5 V for an external sensor available.

The solenoid coils, including the control box, can be turned in the range of ± 90°. The digital control unit enables the proportional valve to be controlled on the basis of data required from two feedback circuits. In this case the proportional valve can be used as follows:

- E01** Proportional directional valve
- E02*501** Only with the internal feedback from the spool position sensor.
- E03** Only with the external feedback (pressure sensor, position sensor, etc.).
- E04*501** With internal and external feedback.

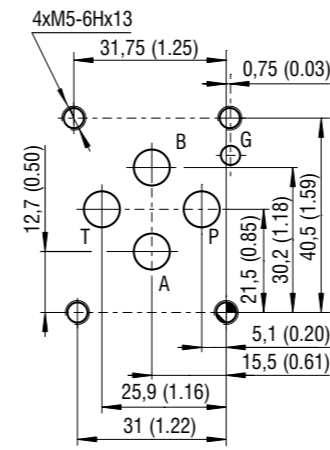
The digital control unit utilizes pulse-width-modulation (PWM) and supplies the solenoids with current proportional to the control signal.

The supply current is additionally modulated with a dither frequency. Individual functional parameters are adjusted through software by a special programmer, or by computer through the RS 232 interface. The cable kit must be ordered separately, as detailed on page 4. The correct function of the digital control unit is signaled by a green LED. The incorrect function (failure) is indicated by a red LED. As a standard, the proportional valve is delivered with factory setting.

For a model including an external feedback contact the manufacturer.

Technical Data

ISO 4401-03-02-0-05



Ports P, A, B, T - max Ø7.5 mm (0.29 in)

Valve Size		06 (D03)
Max. operating pressure at ports P, A, B	bar (PSI)	350 (5100)
Max. operating pressure at port T	bar (PSI)	210 (3050)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature max.	°C (°F)	-30 ... +50 (-22 ... +122)
Nominal flow Q _n at Δp=10 bar (145 PSI)	l/min (GPM)	5 (1.3), 8 (2.1), 15 (4.0), 30 (7.9)
Hysteresis	%	< 6
Hysteresis - closed position loop	%	< 0.5
Protection degree EN 60529		IP65
Mass - valve with 1 solenoid	kg (lbs)	2.3 (5.1)
- valve with 2 solenoids		2.8 (6.2)
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Coil types / Connectors	C_8007 / K_8008	C22A* / K*
Mounting surface	SMT_0019	Size 06
Spare parts	SP_8010	
Subplates	SP_0002	DP*-06

Ordering Code

PRM7-06 [] / [] - [] [] [] [] - []

Proportional directional control valve, with digital control electronics, feedback and OBE

Valve size

Spool symbols
see the table „Spool symbols“

Nominal flow rate at Δp = 10 bar (145 PSI)

flow 5 l/min (1.3 GPM)	5
flow 8 l/min (2.1 GPM)	8
flow 15 l/min (4.0 GPM)	15
flow 30 l/min (7.9 GPM)	30

Nominal solenoid supply voltage

12V DC	12
24V DC	24

Surface treatment

No designation	Standard
A	240 h salt spray test (ISO 9227)
B	520 h salt spray test (ISO 9227)

Seals

No designation	NBR
V	FPM (Viton)

Installation side of OBE and position transducer

No designation	OBE with spool position transducer at side of port A
----------------	--

Model

S01	position sensor with voltage outlet
S02	position sensor with current outlet
E01	proportional directional valve without feedback
E02S01	proportional directional valve with position feedback
E03	proportional directional valve with external feedback
E04S01	proportional directional valve with position and external feedback

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 8.9 Nm (6.56 ft-lbf)
- Besides the shown, commonly used valve versions other special models are available.
- Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	
2Y51		3Y11	
2Y11		3Y12	

*Model for cylinders with asymmetric piston area ratio 1:2

Technical Data of Position Sensor - Voltage Outlet

Operating pressure	bar (PSI)	to 350 (5100), static
Electrical connection * only for S01 model		electrical connector G4W1F Hirschmann*
Contact assignment		1 - Power supply 2 - Command signal 3 - GND 4 - not used
Enclosure protection type according to EN 60529		IP65
Measured distance	mm (in)	8 (0.315)
Operating voltage	V	9.6 ... 30 DC
Linearity error	%	< 1
Current consumption at load current of 2 mA	mA	< 15
Output voltage	V	0 ... 5
Output signal range used:		
0 position	V	2.5
1 solenoid - stroke 2.8 mm (0.11 in)		0.75 ... 2.5
2 solenoids - stroke ± 2.8 mm (0.11 in)		0.75 ... 4.025
Max. load current	mA	2
Noise voltage		
- at load current 0	mV _{pp}	< 20
- at load current of 2 mA		< 15
Additional output signal error at:		
- temperature change between 0 ... 80°C (32... 176 °F)		typical 0.2% / 10K
- between 0 ... -25 °C (32 ... -13 °F)		max. 0.5 % / 10K
- Load change from 0 to 2 mA		max. 0.5 % / 10K 0.1 %
Input voltage change		
from 9.6 V to 14.4 V	%	< 0.1
from 14.4 V to 30 V		< 0.25
Long-term drift (30 days)	%	< 0.25
Cut-off frequency	Hz	> 600
3dB fall in amplitude		> 600
Frequency 90°		

Technical Data of Position Sensor - Current Outlet

Linearity	%	< 1
Operating pressure	bar (PSI)	to 350 (5100), static
Electrical connection * only for S01 and S02 model		electrical connector G4W1F Hirschmann*
Contact assignment		1 - Power supply 2 - Command signal 3 - GND 4 - not used
Enclosure protection type according to EN 60529		IP65
Operating voltage	V	20 ... 30 DC
Current	mA	< 35
Output signal range	mA	4 ... 20
Output signal range used:		
0 position	mA	12
1 solenoid - stroke 2.8 mm (0.11 in)		4.4 ... 12
2 solenoids - stroke ± 2.8 mm (0.11 in)		4.4 ... 19.6
Additional output signal error:		
- at temperature change from +10 ... 55°C (50... 131°F)		0.2% / 10K
- at impedance change from 50%		≤ 0.1%
- at input voltage change in the range of operating voltage		≤ 0.05%
Impedance	Ω	≤ 500
Output signal ripple	mA R.M.S.	≤ 0.02
Limit frequency at 3 dB amplitude decrease	Hz	≥ 800

Technical Data of Proportional Solenoid

Type of coil	V	12 DC	24 DC
Limiting current	A	2.4	1.0
Resistance at 20 °C (68 °F)	Ω	2.3	13.4

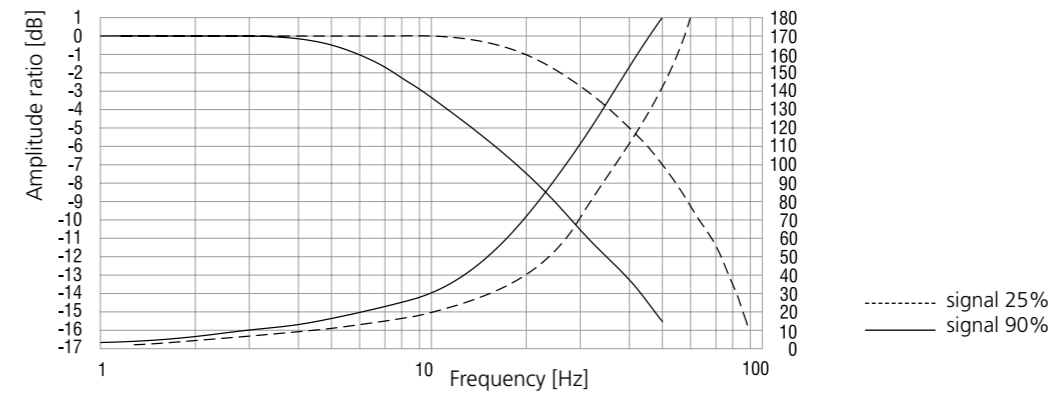
Electronics Data

Supply voltage with polarity inversion protection	V	11.2 ... 28 VDC (residual ripple < 10%)
Input: command signal / according to customer setting		±10 V, 0...10 V, ±10 mA, 4...20 mA, 0...20 mA, 12 mA±8 mA
Input: spool position sensor signal		0...5 V
Input: external feedback signal		0...10V, 4...20 mA, 0...20 mA
Resolution of the A/D converter		12 bit
Output: solenoids		two PWM output stages up to max. 3.5 A
PWM frequency	kHz	18
Adjustment of parameters	μS	170
EMC	Interference resistance	61000 - 6 - 2 : 2005
	Radiation resistance	55011 : 1998 class A
Parameter setting	Serial port RS 232 (zero modem). 19200 bauds, 8 data bits, 1 stop bit, no parity. Special software PRM7 Conf.	

Accessories

Order number	Content
23093400	Connecting cable to PC - length 2 m (6.56 ft), CD-ROM with program PRM7 Conf and user manual
23093500	Connecting cable to PC - length 5 m (16.40 ft), CD-ROM with program PRM7 Conf and user manual
24523400	Connecting cable to PC - length size 2 m (6.56 ft)
24523500	Connecting cable to PC - length size 5 m (6.56 ft)

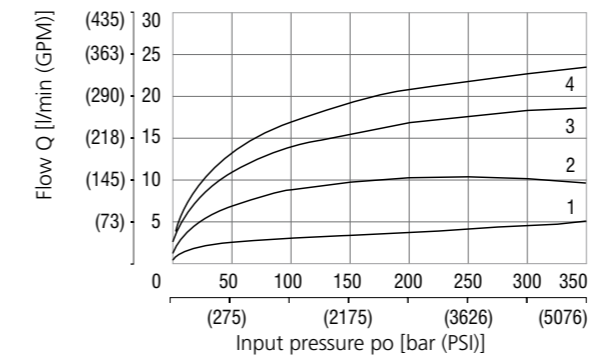
Frequency Response closed position loop, for E02S01 model



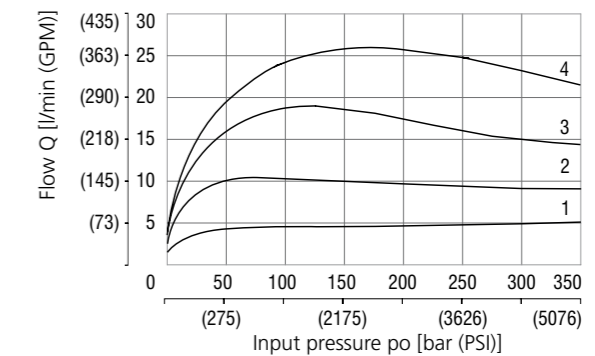
Characteristics measured at v = 32 mm³/s (156 SUS)

Operating limits: Flow direction P → A / B → T or P → B / A → T
Operating limits (E01 model only)

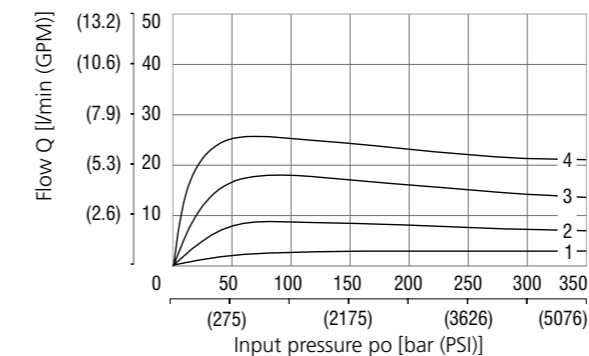
Nominal flow 5 l/min (1.3 GPM)



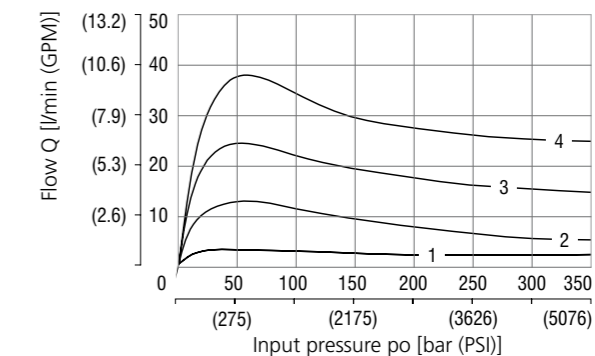
Nominal flow 8 l/min (2.1 GPM)



Nominal flow 15 l/min (4.0 GPM)



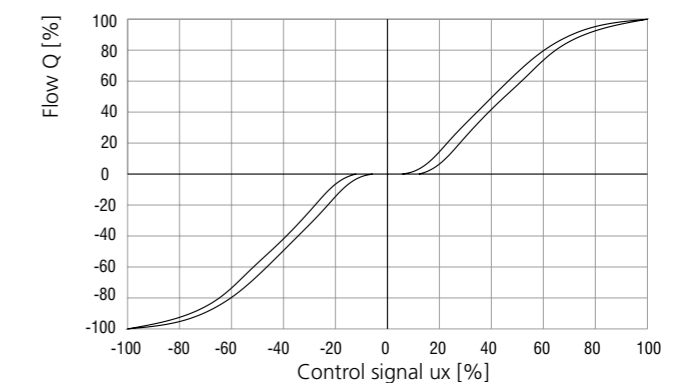
Nominal flow 30 l/min (7.9 GPM)



Solenoid current:
1 = 50 %
2 = 60 %
3 = 70 %
4 = 80 %
5 = 90 %
6 = 100 %

Regulated flow related to control signal

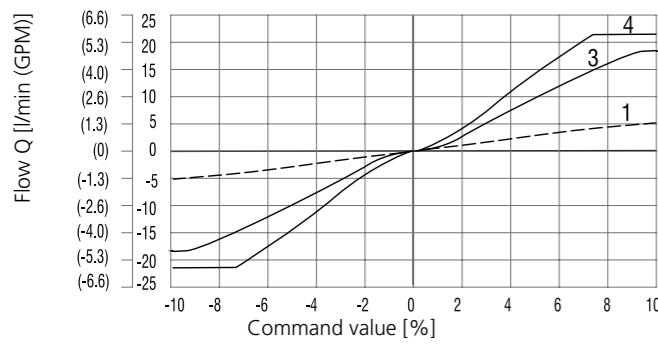
Flow characteristics (E01 model only) Δp=10 bar (145 PSI)



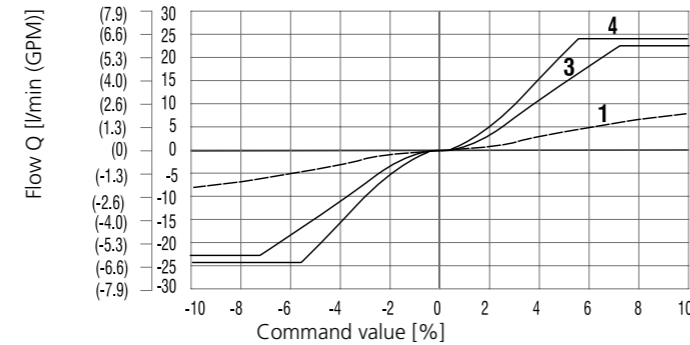
Flow Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Flow characteristics (E02S01 model only)

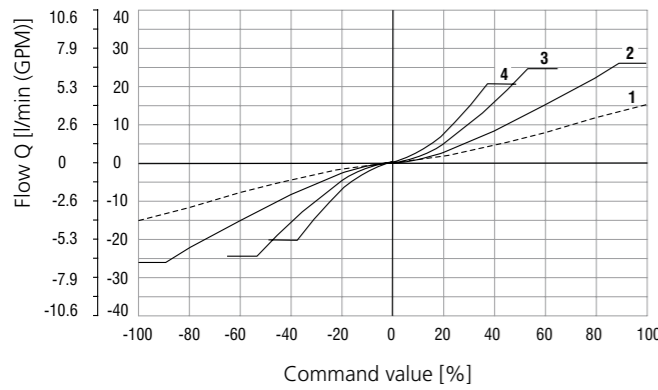
$Q_n = 5 \text{ l/min}$ (1.3 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



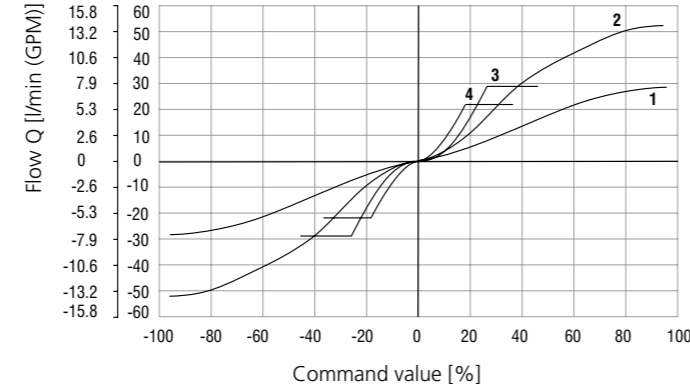
$Q_n = 8 \text{ l/min}$ (2.1 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



$Q_n = 15 \text{ l/min}$ (4.0 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



$Q_n = 30 \text{ l/min}$ (7.9 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



Δp = Valve pressure differential (inlet pressure p_v minus load pressure and return pressure p_r)
 Δp_n = Valve pressure differential for nominal flow Q_n

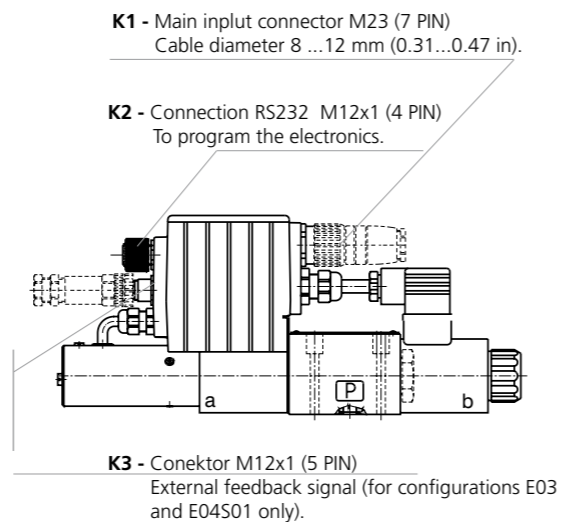
1	$\Delta p_n = 10 \text{ bar}$ (145 PSI)	3	$\Delta p = 160 \text{ bar}$ (2321 PSI)
2	$\Delta p = 50 \text{ bar}$ (725 PSI)	4	$\Delta p = 320 \text{ bar}$ (4641 PSI)

Factory Settings

Item	Model							
	E01		E02S01		E03		E04S01	
	1 Magnet	2 Magnets	1 Magnet	2 Magnets	1 Magnet	2 Magnets	1 Magnet	2 Magnets
Control signal	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$
Signal external feedback	-	-	-	-	0 ... 10 V	-	-	-
Output position sensor spool	-	-	0 ... 5 V	-	-	-	0 ... 5 V	-

Connectors

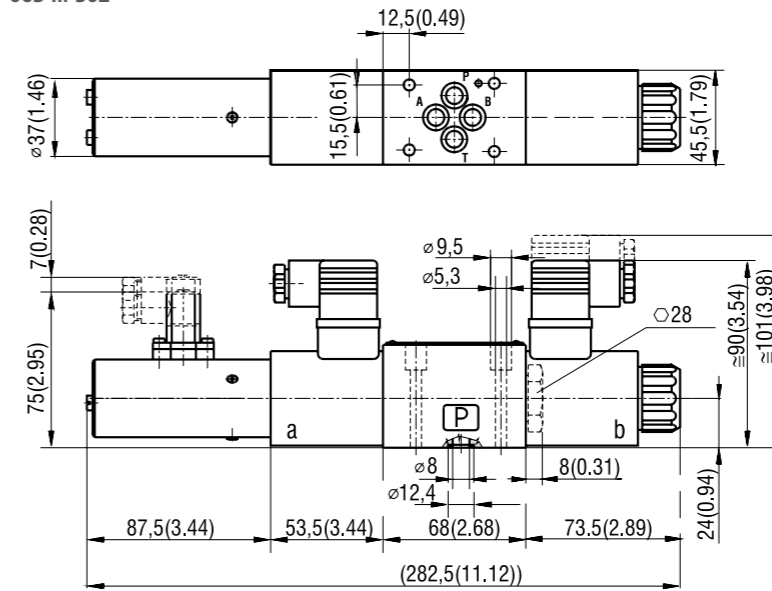
K1	Connector K1 - type M23 (male)	
	PIN	Technical data
	1	* Power supply input
	2	* Ground (power supply)
	3	Control signal
	4	Ground (signal)
	5	Power reference signal
	6	Control signal of position sensor spool
	7	* Protective earth lead (PE)
*Recommended min. lead cross section 0.75 mm ²		
K2	Connector K2 - type M12x1 (male)	
	PIN	Technical data
	1	TxD
	2	RxD
	3	Ground (signal)
	4	Not used
K3	Connector K3 - type M12x1 (female)	
	PIN	Technical data
	1	Power supply output
	2	Signal of external feedback
	3	Ground
	4	Not used
	5	Not used



Dimensions in millimeters (inches)

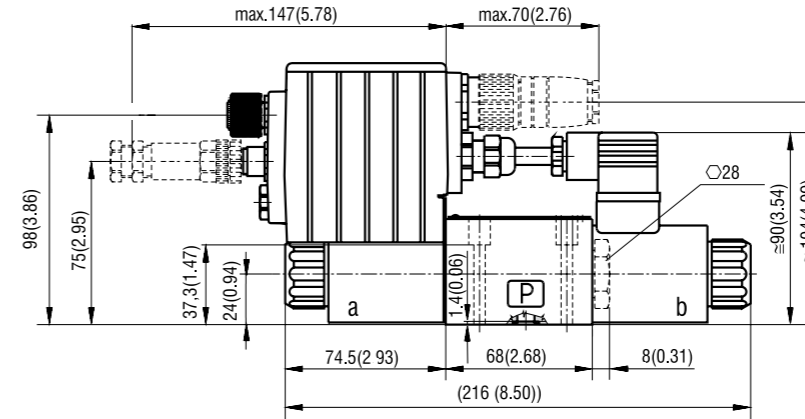
PRM7-063 ... S01

PRM7-063 ... S02



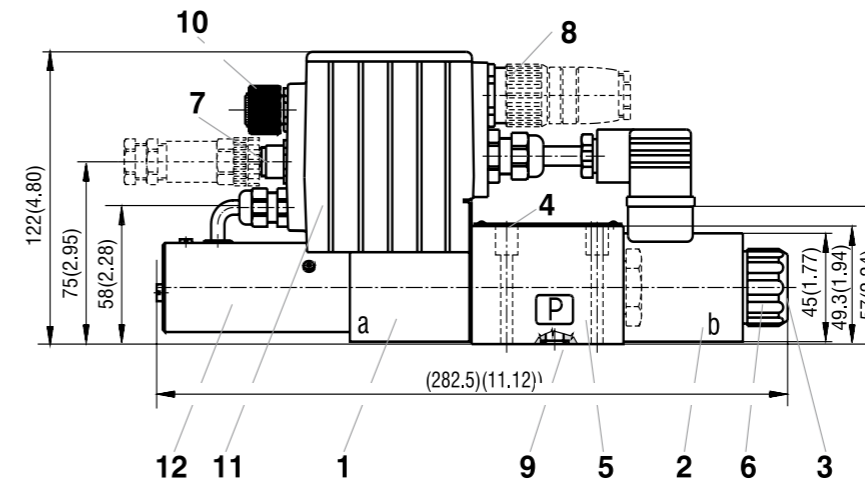
PRM7-063 ... E01 - without connector plug for spool position feedback

PRM7-063 ... E03



PRM7-063 ... E02S01 - without connector plug for spool position feedback

PRM7-063 ... E04S01

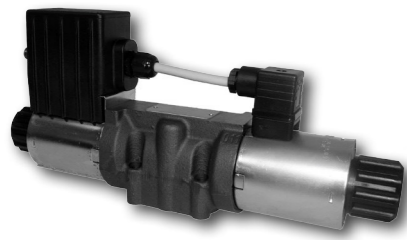


- 1 Solenoid a
- 2 Solenoid b
- 3 Manual override
- 4 Name plate
- 5 4 mounting holes
- 6 Solenoid fixing nut
- 7 Connector M12x1 for connection of external feedback
- 8 Main supply connector M23
- 9 Square ring 7.65 x 1.68 (4 pcs.), supplied in delivery packet
- 10 Cover of connector M12x1 for programming
- 11 Plastic box with integrated electronics
- 12 Position sensor

Proportional Directional Control Valve, with Analog Control Electronics

PRM6-10

Size 10 (D05) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Direct acting, proportional control valve without or with integrated analog electronic (OBE) with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 05) standards
- Used for directional and speed control of hydraulic actuators
- The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- The valve can be controlled directly by a current control supply unit or by means of the electronic control units to exploit valve performance to the fullest
- Analog converter card allows fine control of the valve spool position, reducing hysteresis and response time and optimizing the valve performance
- Five chambers housing design with reduced hydraulic power dependence on fluid viscosity
- For versions without OBE a wide range of solenoid electrical terminal versions available
- Wide range of interchangeable spools and manual overrides available
- The coil is fastened to the core tube with a retaining nut and can be rotated by 360° to suit the available space
- In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

PRM6-10* Versions without on board electronics

The valve can be controlled directly by a current control supply unit or by the external electronic card directly mounted to the electrical terminal (see catalog of EL3E card 9145 and EL6 card 9150). This control card, depending on the number of the controlled solenoids, can be mounted onto either solenoid.

PRM6-10*EK Versions with on board electronics

A control box, which comprises one or two electronic control cards, depending on the number of controlled solenoids, can be mounted onto either solenoid. For models with two solenoids, the solenoid mounted opposite the control box is connected to the box by a DIN connector, a two-lead cable and a bushing.

The connection of the control box with the supply source and with the control signal is implemented by a 4-pin connector of type M12x1. The electric control unit supplies the solenoid with current, which varies with the control signal.

The electronic control unit provides the following adjustment possibilities:

Offset, gain, rise and drop-out time of the ramp generator, frequency (2 frequencies) and amplitude of the dither signal generator.

The correct function of the control unit is signaled by LEDs.

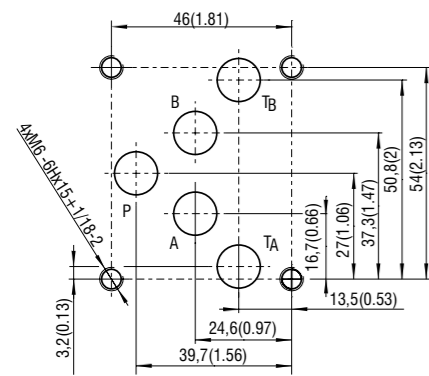
Stabilized voltage +10 V (+5 V for 12 V voltage) is also available to the user.

Using this voltage and a potentiometer $\geq 1k\Omega$ a voltage control signal can be generated.

The electronic control card enables voltage or current control to be used, depending on the position of the switches SW1 to SW3.

Technical Data

ISO 4401-05-04-0-05



Ports P, A, B, T - max. $\varnothing 11.2$ mm (0.44 in)

Valve Size	10 (D05)	
Maximal flow at pressure 320 bar (4640 PSI)	l/min (GPM)	80 (21)
Max. operating pressure at ports P, A, B	bar (PSI)	350 (5080)
Maximum operating pressure at port T	bar (PSI)	210 (3050)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature max.	°C (°F)	-30 ... +50 (-22 ... +122)
Nominal flow rate Q _n at $\Delta p=10$ bar (145 PSI)	l/min (GPM)	30 (7.9) / 60 (15.9) / 80 (21.13)
Hysteresis	%	< 6
Mass - valve with 1 solenoid	kg (lbs)	4.3 (9.48)
- valve with 2 solenoids		5.8 (12.78)
Protection degree (for version PRM*EK)		IP65
Technical Data of the Proportional Solenoid		
Nominal supply voltage	V	12 DC 24 DC
Limit current	A	1.9 1.1
Mean resistance value at 20 °C (68 °F)	Ω	4.7 13.9
Technical Data of the Electronics		
Supply voltage range	V DC	U _{cc} 12V DC U _{cc} 24V DC
Stabilized voltage for control	V DC	5 (R > 1k Ω) 5 (R \geq 1k Ω)
Maximum output current	A	2.4 (R < 4 Ω) 1.5 (R < 10 Ω)
Ramp adjustment range	s	0.05...3
Dither frequency	Hz	90 / 60
Dither amplitude	%	0...30
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Coil types / Connectors	C_8007 / K_8008	C31* / K*
Mounting interface	SMT_0019	Size 10
Spare parts	SP_8010	
Subplates	SP_0002	DP*-10

Ordering Code



Proportional directional control valve

Valve size

Spool symbols
see table „Spool Symbols“

Nominal flow rate at $\Delta p = 10$ bar (145 PSI)

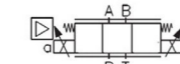
30 l/min (7.9 GPM)	30
60 l/min (15.85 GPM)	60
80 l/min (21 GPM)	80

Rated supply voltage of solenoids (at the coil terminal)

12 V DC	12
24 V DC	24

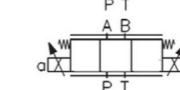
Electronics on board / Position at solenoid
connection by connector M12 x 1
(4-pin connector, supplied with counterpart)

on board electronics (solenoid „a“)



EK

on board electronics (solenoid „b“)*



EKB

No designation	Surface treatment
A	standard
B	zinc-coated (ZnCr-3), ISO 9227 (240 h)
	zinc-coated (ZnNi), ISO 9227 (520 h)

No designation	Seals
V	NBR
	FPM (Viton)

No designation	Manual Override
N1	standard
N2	protected with retaining nut
	protected with rubber boot

No designation	Connector
E1	only for version without on board electronic „EK“
E2	EN 175301-803-A
E3	E1 with quenching diode
E4	AMP Junior Timer - radial directions (2 pins; male)
E8	E3 with quenching diode
E9	loose conductors (two insulated wires)
E12A	E8 with quenching diode
E13A	deutsch DT04-2P - axial direction
	E12A with quenching diode

*For valve versions with one solenoid the designation „B“ with OBE is not shown.

- Valves without integrated control electronics with E1, E2 coils (with connector according to EN 175301-803, form A) are delivered in the standard version with connector sockets.

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.

- Mounting bolts M6 x 40 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 14 Nm (10.3 lbf.ft).

- Besides the shown, commonly used valve versions other special models are available.

- Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

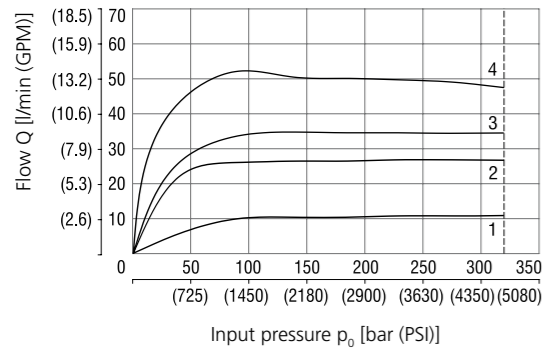
Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	
2Y51		3Y11	
2Y11		3Y12	

*Model for cylinders with asymmetric piston area ratio 1:2

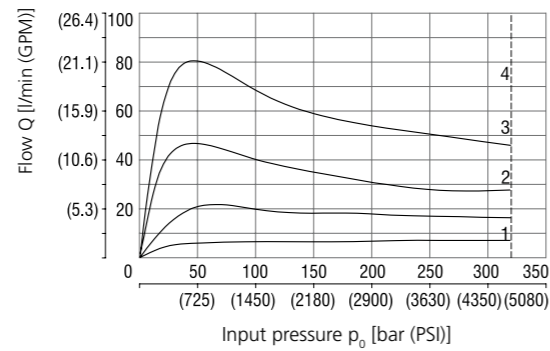
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Operating limits: Flow direction $P \rightarrow A/B \rightarrow T$ or $P \rightarrow B/A \rightarrow T$

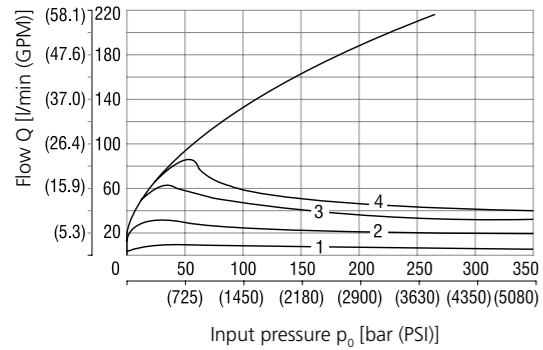
Nominal flow 30 l/min (7.95 GPM)



Nominal flow 60 l/min (15.85 GPM)

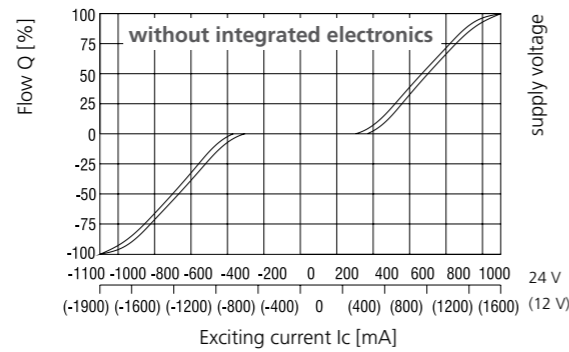
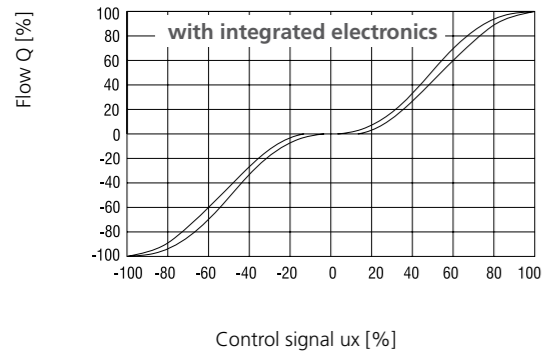


Nominal flow 80 l/min (21.13 GPM)



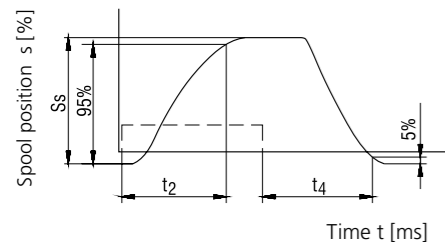
Solenoid current:
1 = 40 %
2 = 60 %
3 = 80 %
4 = 100 %

Regulated flow related to control signal $\Delta p=10 \text{ bar}$ (145 PSI)



The coil current which initializes the flow through the proportional directional valve can differ due to the production tolerances about in a range of $\pm 6\%$ of the limit current.

Transient Characteristic measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS), $\Delta p=10 \text{ bar}$ (145 PSI)

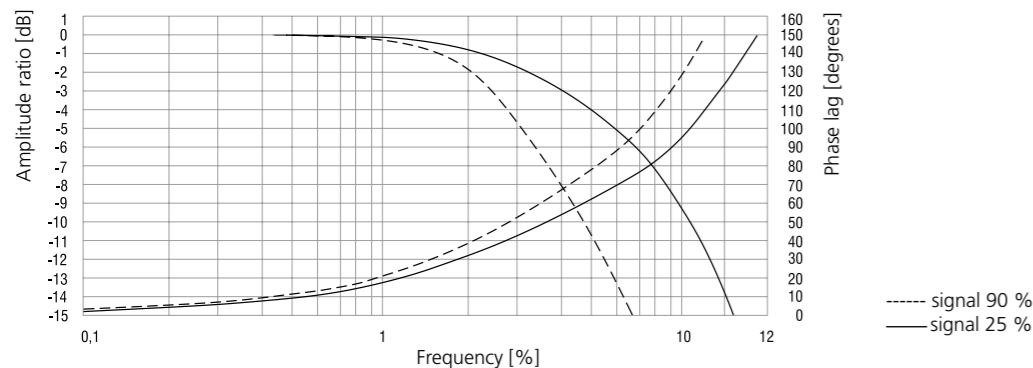


Steady Spool Position S_s [%]	t_2 [ms]	t_4 [ms]
100	85	100
75	70	85
50	55	75
25	45	55

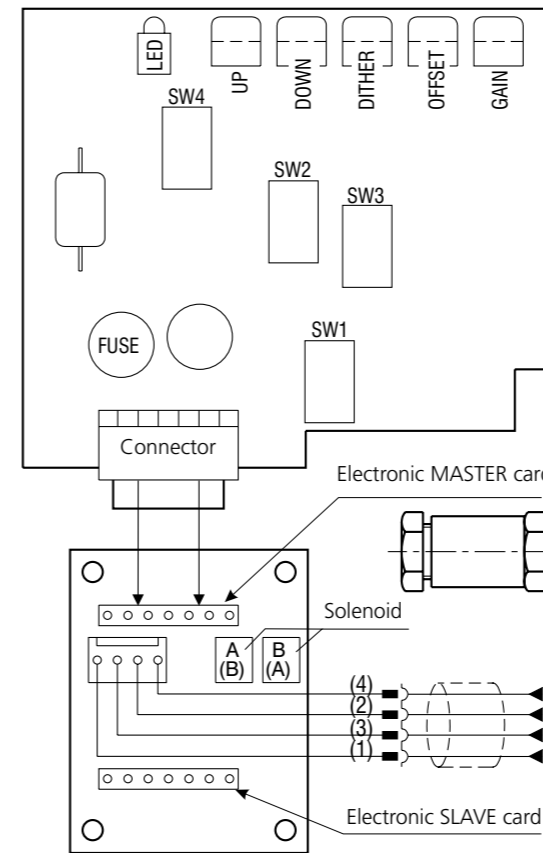
The values in table have only an informative character. The times of the transient characteristics at pressure or flow control will be in a particular hydraulic circuit always longer.

---- the control signal course of the integrated electronics

Frequency Response

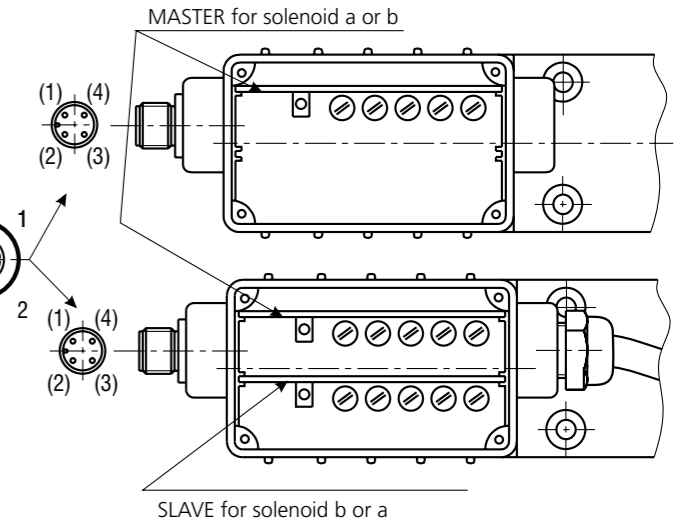


Component Arrangement on the Electronic Card



PIN	Description	Wire Colors	Connection Connector - Electronics
1	+24 V (Ucc) (+12 V)	(1)	brown
2	control	(2)	white
3	0 V	(3)	blue
4	+10 V (+5 V)	(4)	black

SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency



Attention: The control signal must have the same ground potential as the supply source.

Table of the Switch Configuration for the Control Signal Choices

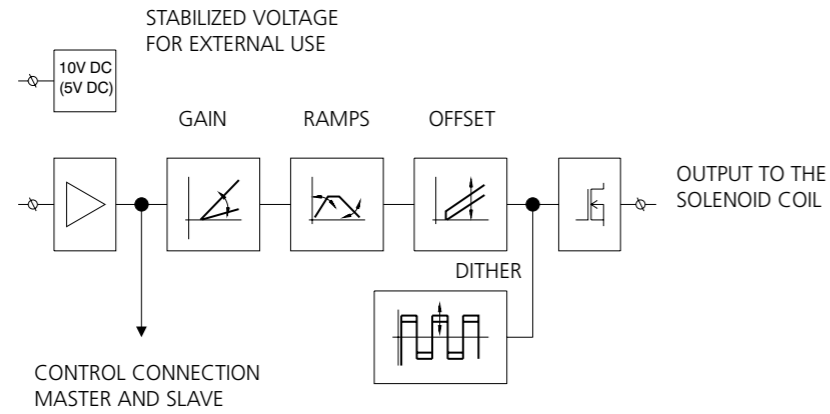
		PRM2-062				PRM2-063	
		0 ... 5 V	0 ... 10 V (0...5 V)*	0 ... 20 mA	4 ... 20 mA	$U_{cc}/2 \pm 10 \text{ V} (\pm 5 \text{ V})^*$	$\pm 10 \text{ V} (\pm 5 \text{ V})^*$
MASTER M	SW1						
	SW2						
	SW3						
	SW4	90 Hz			60 Hz		
SLAVE S	SW1						
	SW2						
	SW3						
	SW4					90 Hz	60 Hz

Designation of the basic manufacture setting.

The ramp functions are adjusted on their minimum values, the dither is set to the optimal value with respect to hysteresis. Offset and gain are adjusted according to the characteristic on page 3 and 4. The manufacturer does not recommend to change these adjusted values.

* Input signal level for the 12 V electronic unit.

Block Diagram

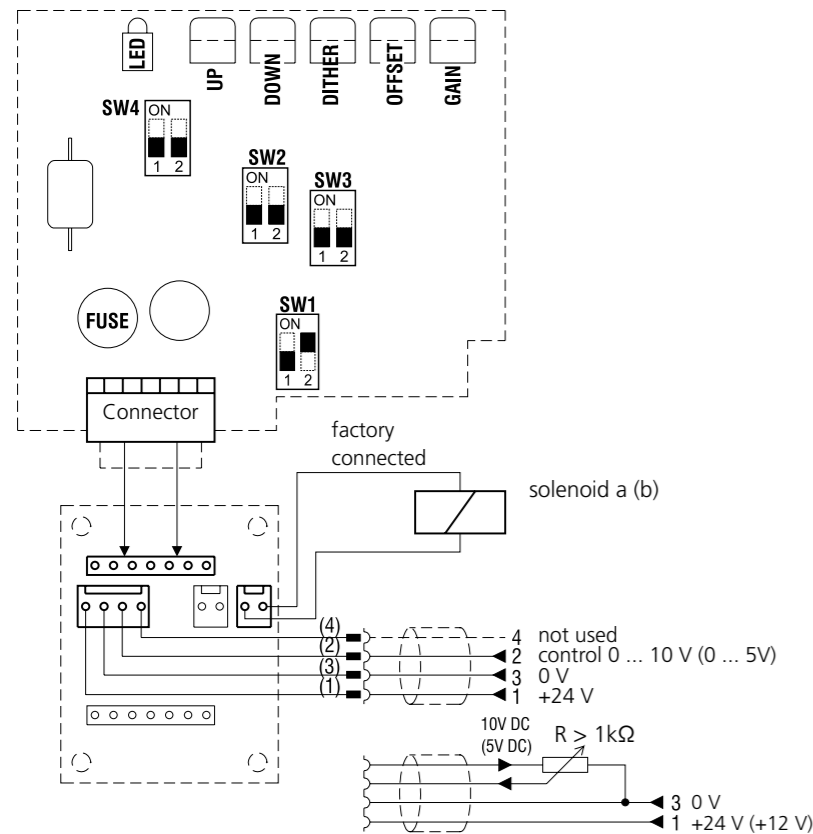


Setting of Control Electronics

Valve PRM2-102*EK (with one solenoid)

Control with external voltage source 0...10 V, 0 ... 5 V (factory setting) or with external potentiometer R>1 kΩ

Master card for solenoid a (b)

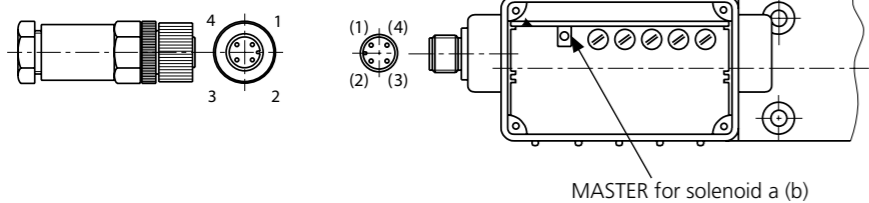


Factory set values:

- Control signal: 0 - 10 V (0 - 5 V)
- Dither: frequency 90 Hz, amplitude - optimum
- Ramps: 0.05 s
- Offset, gain: according to the characteristics on page 3



The control signal must have the same ground potential as the supply source.



Wire colors (connection connector - electronics)

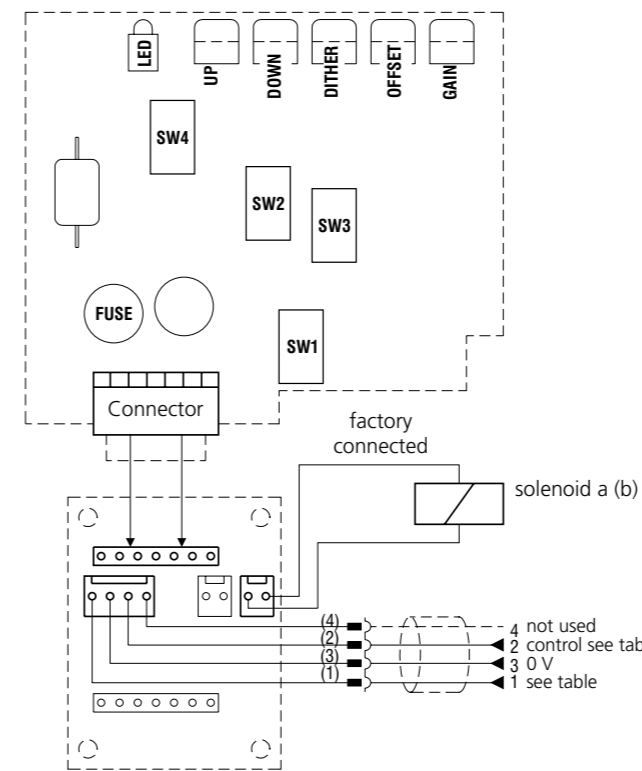
- (1) - brown
- (2) - white
- (3) - blue
- (4) - black

Setting of Control Electronics

Valve PRM2-102*EK (with one solenoid)

Control with external source 0 ... 5 V, 0 ... 20 mA, 4 ... 20 mA

Master card for solenoid a (b)



Control with external source			
	0 ...5 V	0 ...20 mA	4 ...20 mA
SW1			
SW2			
SW3			
SW4			
PIN 1 (1)	+24 V	+24 V (+12 V)	+24 V (+12 V)
PIN 2 (2)	0 ...5 V	0 ...20 mA	4 ...20 mA

Follow the subsequent steps to modify the factory settings:

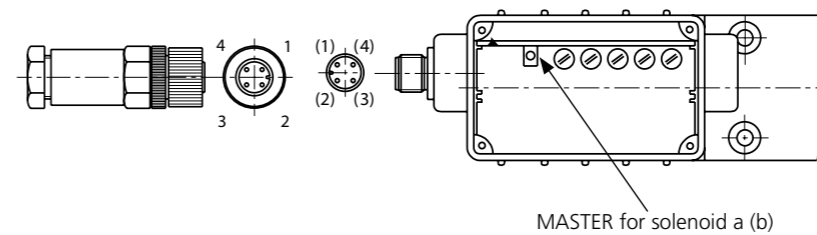
1. Unscrew the electronics cover
2. Carefully remove the master card
3. Flip the switch SW1 (2 or 3) in position shown in the table
4. Put in the master card and fix the electronics cover
5. Connect the voltage +24 V (+12 V) from an external supply source to terminals 1 and 3 of the connector
6. Bring the control voltage (current) from an external source to terminals 2 and 3 of the connector



The control signal must have the same ground potential as the supply source.



Designation of the basic factory setting. The ramp functions are adjusted on their minimum values. The dither is set to the optimal value with respect to hysteresis. Offset and gain are adjusted according to the characteristic on page 3. The manufacturer does not recommend to change these adjusted values.

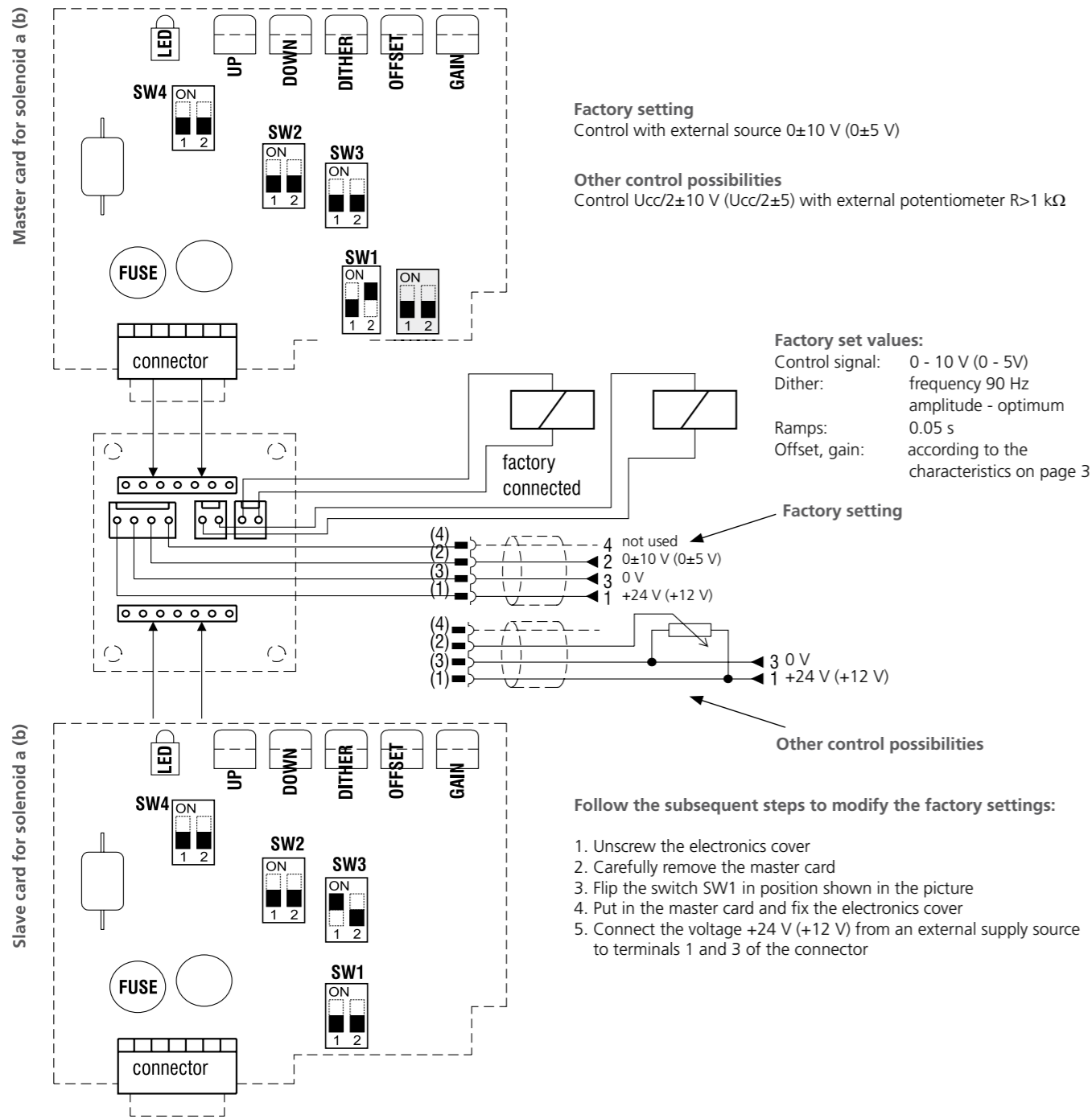


Wire colors (connection connector - electronics)

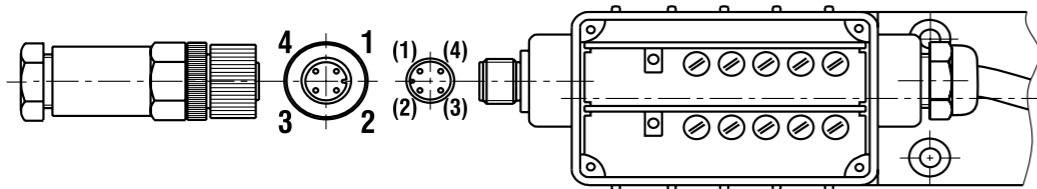
- (1) - brown
- (2) - white
- (3) - blue
- (4) - black

Setting of Control Electronics

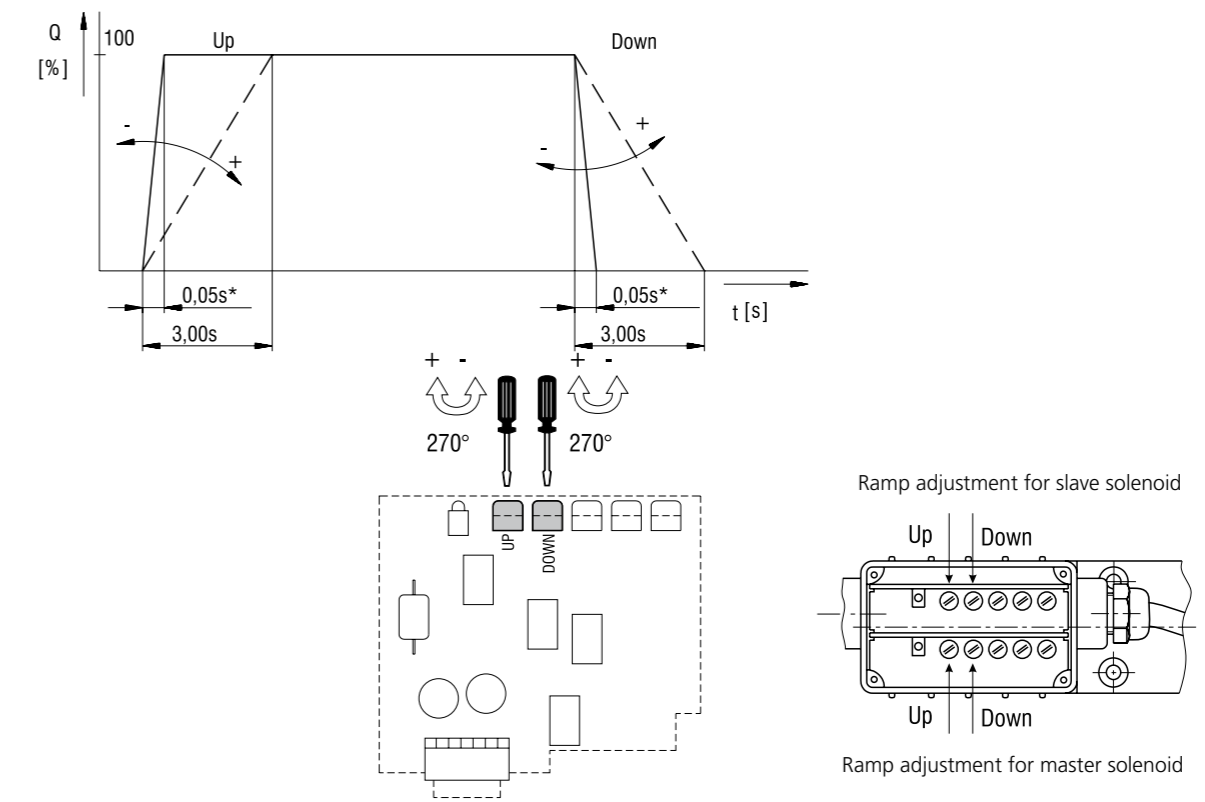
Valve PRM2-103*EK (with two solenoids), factory setting, other control possibilities



The control signal must have the same ground potential as the supply source.



Ramp Adjustment (Up, Down)



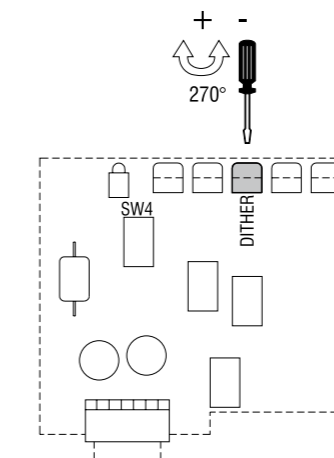
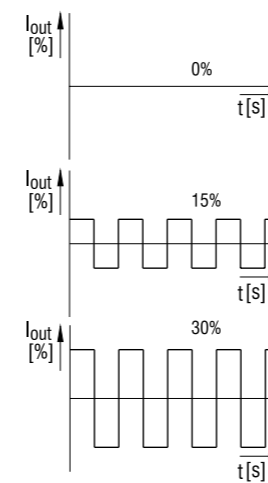
* The value has only an informative character with respect to the particular type of the proportional directional valve (see page 3).



The factory setting of the ramp is at the minimum value.

Dither Adjustment

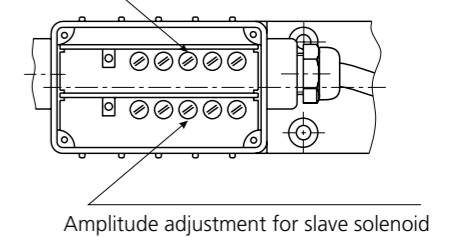
Amplitude - potentiometer (dither) (0 - 30 %)



Frequency - switch SW4

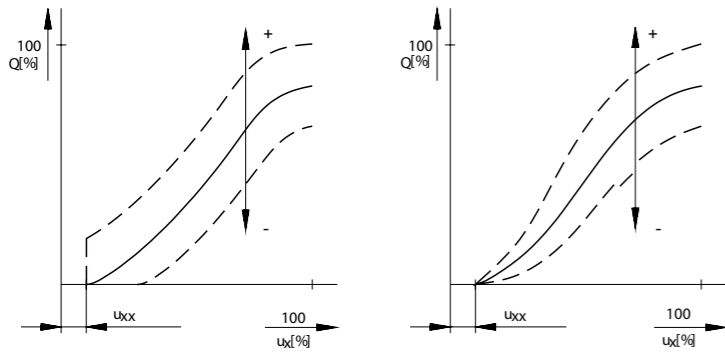


Amplitude adjustment for master solenoid



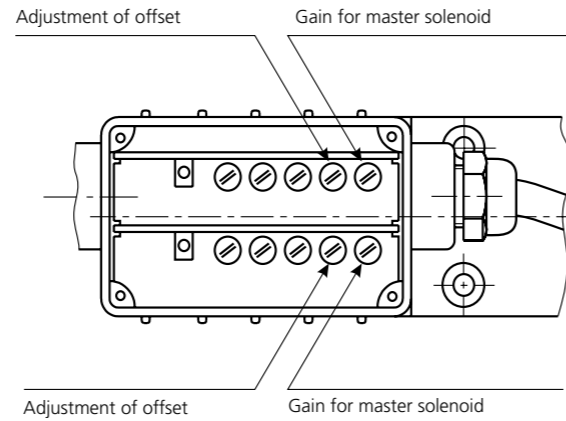
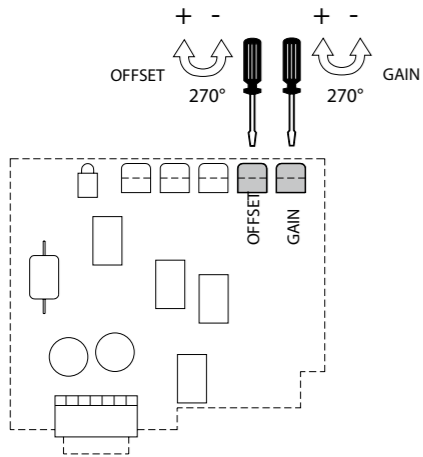
The dither is adjusted to minimize hysteresis.

Offset, Gain Parameters Adjustment



i The factory setting of the offset and gain parameters is specific for the solenoids used. The manufacturer does not recommend to change these settings.

Nominal Electronics Supply Voltage (V)	Area Insensitive to Control Signal uxx (%)
12	1 ... 3
24	0.5 ... 2



Solenoid Coil in millimeters (inches)

E1, E2 Protection Degree IP65	E3A, E4A Protection Degree IP67	E8, E9 Protection Degree IP65	E12A, E13A Protection Degree IP67 / 69K

The indicated IP protection level is only achieved if the connector is properly mounted.

Manual Override in millimeters (inches)

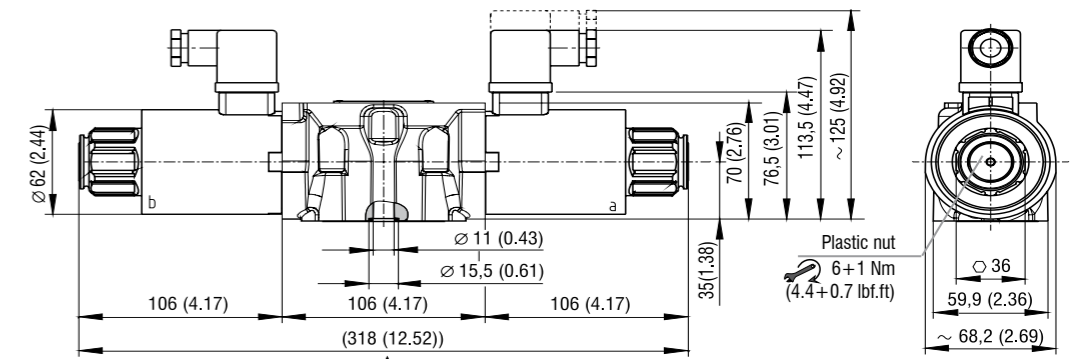
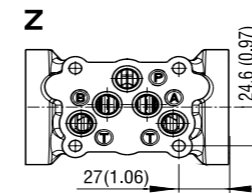
No Designation - Standard	Designation N1 - Cap Nut Covered	Designation N2 - Rubber Boot Protected

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Dimensions in millimeters (inches)

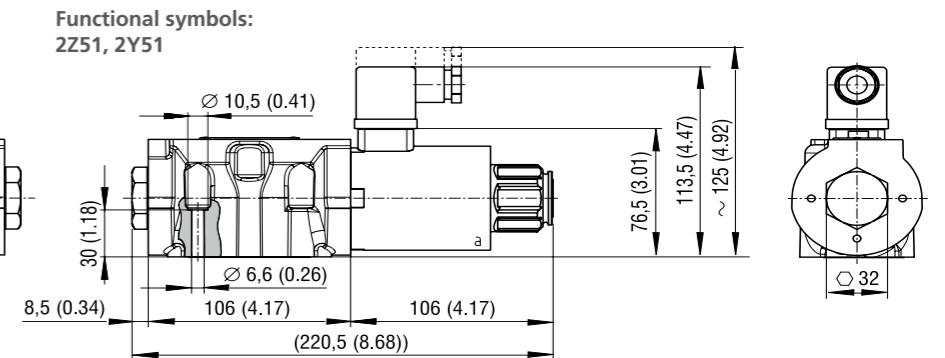
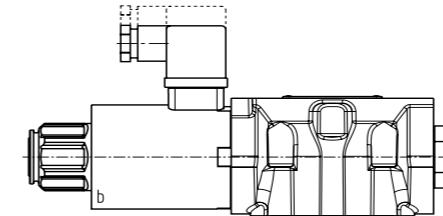
PRM6-103x/x-xxx-x

Functional symbols:
3Z11, 3Z12, 3Y11, 3Y12



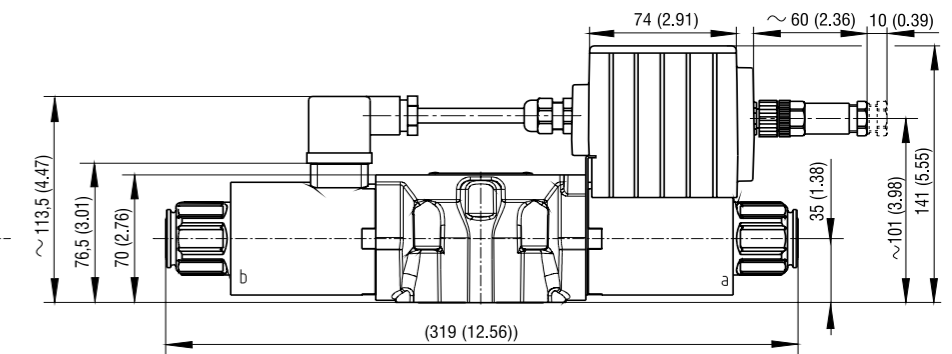
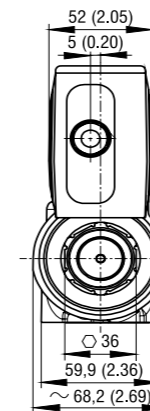
PRM6-102x/x-xxx-x

Functional symbols:
2Z11, 2Y11



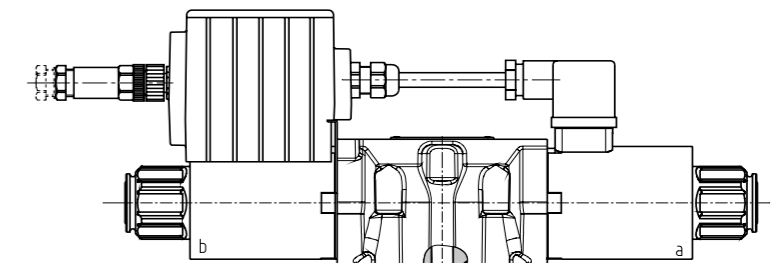
PRM6-103x/x-xxEKx-x

Functional symbols:
3Z11, 3Z12, 3Y11, 3Y12



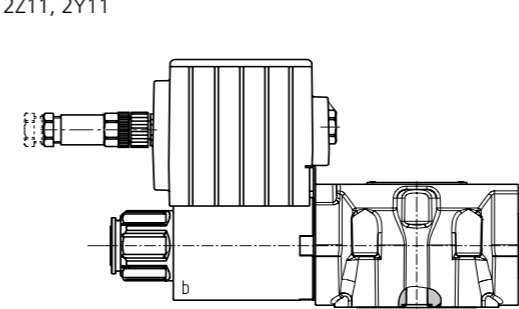
PRM6-103xB/x-xxEKx-x

Functional symbols:
3Z11B, 3Z12B, 3Y11B, 3Y12B

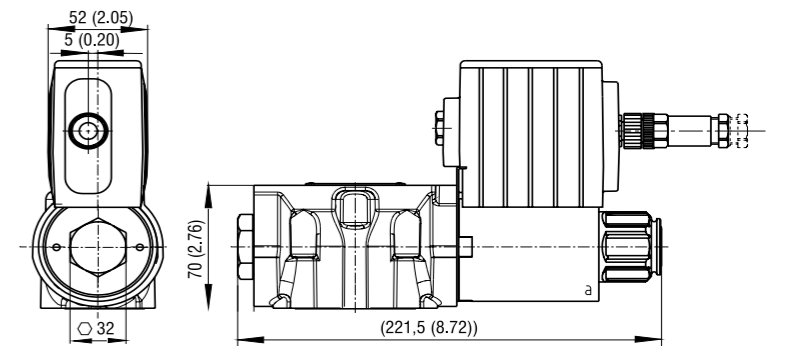


PRM6-102x/x-xxEKx-x

Functional symbols:
2Z11, 2Y11



Functional symbols: 2Z51, 2Y51

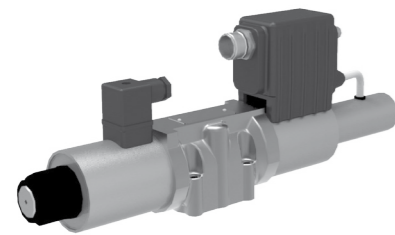


Proportional Directional Control Valve, With Digital Control Electronics, Feedback and OBE

PRM7-10

Size 10 (D05) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features



- Direct acting proportional control valve with integrated digital electronic (OBE) proportional control, spool and process feedback
- Control valve with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 05) standards
- Valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- Digital converter card allows fine control of the valve spool position, reducing hysteresis and response time and optimizing the performance of the valve
- Various models with or without onboard digital converter card or position sensor feedback available
- Used for directional and speed control of hydraulic actuators
- Wide range of interchangeable spools available
- For versions without OBE, a wide range of solenoid electrical terminal versions available
- The driver directly manages the digital settings. It's possible to customize the settings for special applications using an optional kit.
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

The proportional directional valve PRM7 consists of a cast iron housing, a special control spool, two centering springs with supporting washers, one or two proportional solenoids, a position sensor or, if desired, of a control box with digital electronics. The measurement system of the position sensor consists of a differential transformer with sensor core and its electronic evaluation unit.

Models without integrated electronic unit OBE

The electrical connection of the solenoids is realized by a variety of connectors. The position sensor output is connected by the G4W1F connector plug. Both connectors are supplied.

In this case the proportional valve can be used as follows:

S01, S02 with the internal feedback from the spool position sensor.

Models with integrated electronic unit OBE

The model comprises an electronic control box that is mounted together with the position sensor on either of the solenoids. The connection of the position sensor to the control box is provided by a cable. For models with two solenoids, the solenoid mounted opposite the control box is connected to the control box by a EN 175301-803 connector.

The connection of the supply voltage, control signal, program input and external output of the position sensor is implemented in a 5-pin connector (ELKA 5012). The connection of the external feedback is provided by a 5-pin connector, which also has three supply voltages +24 V, +10 V and -5 V for an external sensor available.

The solenoid coils, including the control box, can be turned in the range of ± 90°. The digital control unit enables the proportional valve to be controlled on the basis of data required from two feedback circuits. In this case the proportional valve can be used as follows:

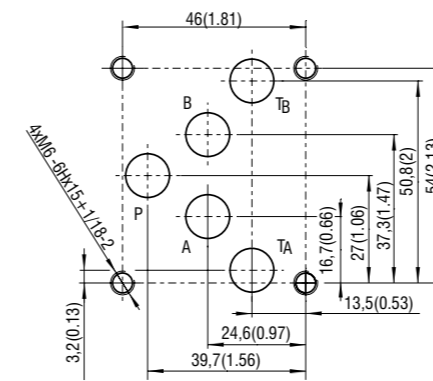
- E01** Proportional directional valve
- E02*S01** Only with the internal feedback from the spool position sensor.
- E03** Only with the external feedback (pressure sensor, position sensor, etc.).
- E04*S01** With internal and external feedback.

The digital control unit utilizes pulse-width-modulation (PWM) and supplies the solenoids with current proportional to the control signal. The supply current is additionally modulated with a dither frequency. Individual functional parameters are adjusted through software by a special programmer, or by computer through the RS 232 interface. The cable kit must be ordered separately, as detailed on page 4. The correct function of the digital control unit is signaled by a green LED. The incorrect function (failure) is indicated by a red LED. As a standard, the proportional valve is delivered with factory setting.

For a model including an external feedback contact the manufacturer.

Technical Data

ISO 4401-05-04-0-05



Ports P, A, B, T - max Ø11.2 mm (0.44 in)

Valve size	10 (D05)	
Max. operating pressure at ports P, A, B	bar (PSI)	350 (5100)
Max. operating pressure at port T	bar (PSI)	210 (3046)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature max.	°C (°F)	-30 ... +50 (-22... +122)
Nominal flow rate Q _n at Δp=10 bar (145 PSI)	l/min (GPM)	30 (7.9) / 60 (15.9) / 80 (21.1)
Hysteresis	%	< 6
Hysteresis - closed position loop	%	< 0.5
Protection degree EN 60529	IP65	
Mass - valve with 1 solenoid	kg (lbs)	4.4 (9.70)
- valve with 2 solenoids	kg (lbs)	5.9 (13.01)
Data Sheet	Type	
General information	GI_0060	Products and operating conditions
Coil types / Connectors	C_8007 / K_8008	
Mounting surface	SMT_0019	Size 10
Spare parts	SP_8010	
Subplates	SP_0002	
		DP*-10

Ordering Code

PRM7-10 / [] - [] [] [] [] - []

Proportional directional control valve, with digital control electronics, feedback and OBE

Valve size

Spool symbols see the table „Spool Symbols“

Nominal flow rate at Δp = 10 bar (145 PSI)

flow 30 l/min (7.9 GPM)	30
flow 60 l/min (15.6 GPM)	60
flow 80 l/min (21.1 GPM)	80

Nominal solenoid supply voltage

12V DC	12
24V DC	24

Surface treatment

No designation	Standard
A	240 h salt spray test (ISO 9227)
B	520 h salt spray test (ISO 9227)

Seals

No designation	NBR
V	FPM (Viton)

Installation side of OBE and position transducer

No designation	OBE with spool position transducer at side of port A
----------------	--

Model

S01	position sensor with voltage outlet
S02	position sensor with current outlet
E01	proportional directional valve without feedback
E02S01	proportional directional valve with position feedback
E03	proportional directional valve with external feedback
E04S01	proportional directional valve with position and external feedback

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- Mounting bolts M6 x 40 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 14 Nm (10.3 ft-lbs).
- Besides the shown, commonly used valve versions other special models are available.
- Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	
2Y51		3Y11	
2Y11		3Y12	

$q_A = \frac{1}{2} q_B$

*Model for cylinders with asymmetric piston area ratio 1:2

Technical Data of Position Sensor - Voltage Outlet

Operating pressure	bar (PSI)	to 350 (5080), static
Electrical connection		electrical connector G4W1F Hirschmann
Contact assignment		1 - Power supply 2 - Command signal 3 - GND 4 - not used
Enclosure protection type according to EN 60529		IP65
Measured distance	mm (in)	8 (0.315)
Operating voltage	V	9.6 ... 30 DC
Linearity error	%	< 1
Current consumption at load current of 2 mA	mA	< 15
Output voltage	V	0 ... 5
Output signal range used:		
0 position	V	2.5
1 solenoid - stroke 1.8 mm (0.07 in)		0.125 ... 2.5
2 solenoids - stroke ±1.8 mm (0.07 in)		0.125 ... 4.875
Max. load current	mA	2
Noise voltage		
- at load current 0	mV _{p-p}	< 20
- at load current of 2 mA		< 15
Additional output signal error at:		
- temperature change between 0 ... 80° C (32... 176 °F)		typical 0.2% / 10K
- between 0... -25 °C (32 ... -13 °F)		max. 0.5 % / 10K
- Load change from 0 to 2 mA		max. 0.5 % / 10K
Input voltage change		
from 9.6 V to 14.4 V	%	< 0.1
from 14.4 V to 30 V		< 0.25
Long-term drift (30 days)	%	< 0.25
Cut-off frequency		
3dB fall in amplitude	Hz	> 600
Frequency 90°		> 600

Technical Data of Position Sensor - Current Outlet

Linearity	%	< 1
Operating pressure	bar (PSI)	to 350 (5076), static
Electrical connection * only for S01 and S02 model.		electrical connector G4W1F Hirschmann*
Contact assignment		1 - Power supply 2 - Command signal 3 - GND 4 - not used
Enclosure protection type according to EN 60529		IP65
Operating voltage	V	20 ... 30 DC
Current	mA	< 35
Output signal range	mA	4 ... 20
Output signal range used:		
0 position	mA	12
1 solenoid - stroke 1.8 mm (0.07 in)		4.4 ... 12
2 solenoids - stroke ±1.8 mm (0.07 in)		4.4 ... 19.6
Additional output signal error:		
- at temperature change from +10... 55° C (50... 131° F)		0.2% / 10K
- at impedance change beyond 50%		≤ 0.1%
- at input voltage change in the range of operating voltage		≤ 0.05%
Impedance	Ω	≤ 500
Output signal ripple	mA R.M.S.	≤ 0.02
Limit frequency at 3 dB amplitude decrease	Hz	≥ 800

Technical Data of Proportional Solenoid

Type of coil	V	12 DC	24 DC
Limiting current	A	1.9	1.1
Resistance at 20° C (68 °F)	Ω	4.7	13.9

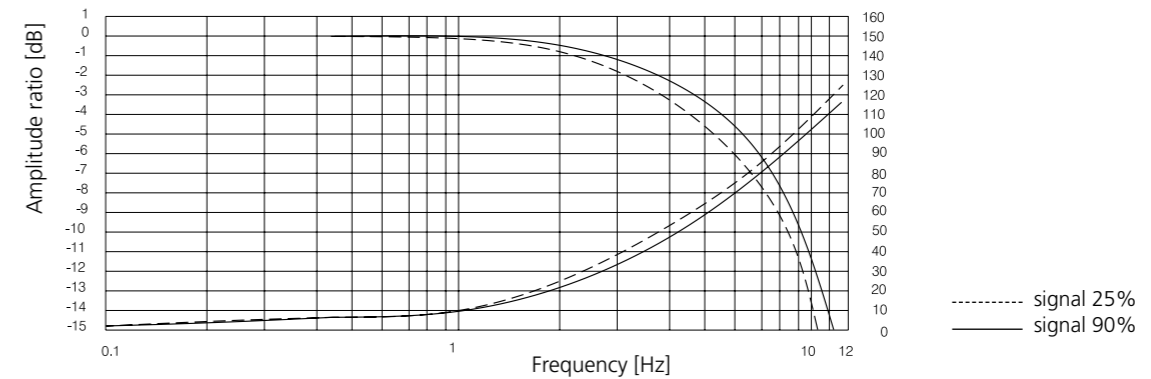
Electronics Data

Supply voltage with polarity inversion protection	V	11.2 ... 28 VDC (residual ripple < 10%)
Input: command signal / according to customer setting		±10 V, 0...10 V, ±10 mA, 4...20 mA, 0...20 mA, 12 mA±8 mA
Input: spool position sensor signal		0...5 V
Input: external feedback signal		0...10 V, 4...20 mA, 0...20 mA
Resolution of the A/D converter		12 bit
Output: solenoids		two PWM output stages up to max. 3.5 A
PWM frequency	kHz	18
Adjustment of parameters	μs	170
EMC		
Interference resistance		61000 - 6 - 2 : 2005
Radiation resistance		55011 : 1998 class A
Parameter setting		Serial port RS 232 (zero modem). 19200 bauds, 8 data bits, 1 stop bit, no parity. Special software PRM7 Conf.

Accessories

Order number	Content
23093400	Connecting cable to PC - length 2 m (6.56 ft), CD-ROM with program PRM7 Conf and user manual
23093500	Connecting cable to PC - length 5 m (16.40 ft), CD-ROM with program PRM7 Conf and user manual
24523400	Connecting cable to PC - length 2 m (6.56 ft)
24523500	Connecting cable to PC - length 5 m (6.56 ft)

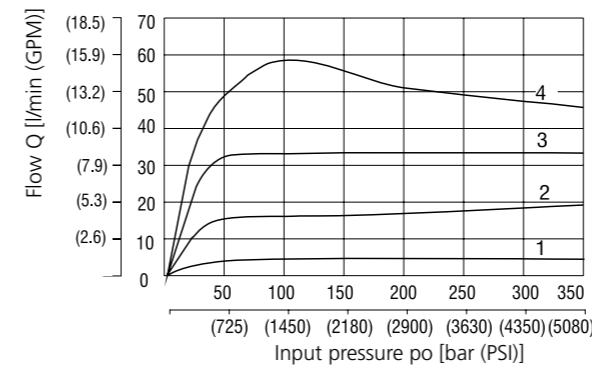
Frequency Response closed position loop, for E02S01 model



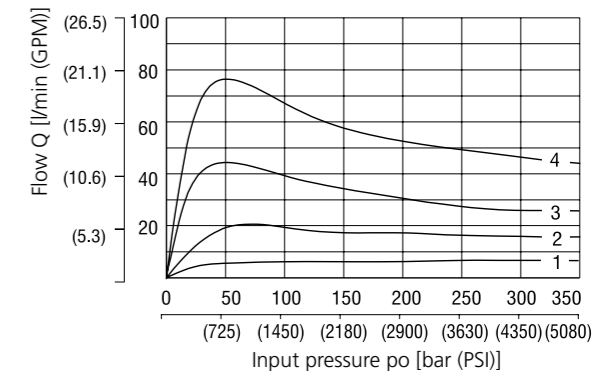
Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits: Flow direction P → A / B → T or P → B / A → T
Operating limits (E01 model only)

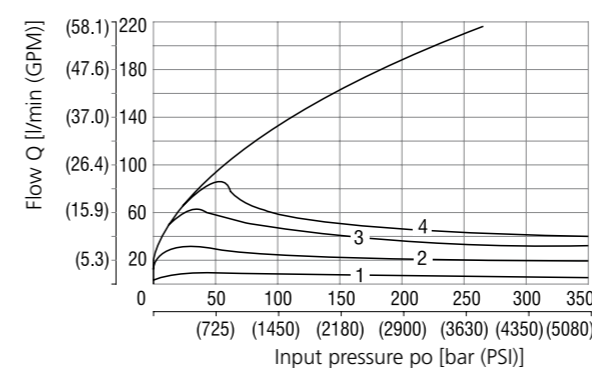
Nominal flow 30 l/min (7.9 GPM)



Nominal flow 60 l/min (15.9 GPM)



Nominal flow 80 l/min (21.1 GPM)

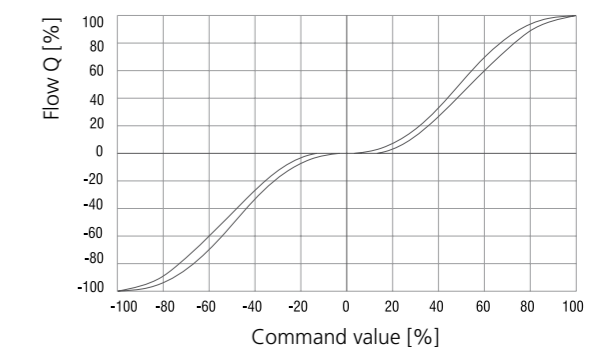


Solenoid current:

- 1 = 50 %
- 2 = 60 %
- 3 = 70 %
- 4 = 80 %
- 5 = 90 %
- 6 = 100 %

Regulated flow related to control signal

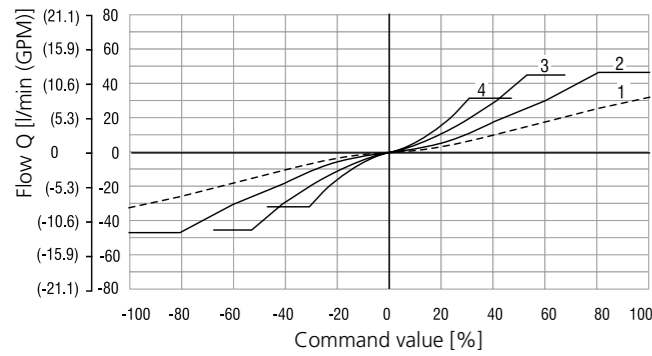
Flow characteristics (E01 model only) Δp=10 bar (145 PSI)



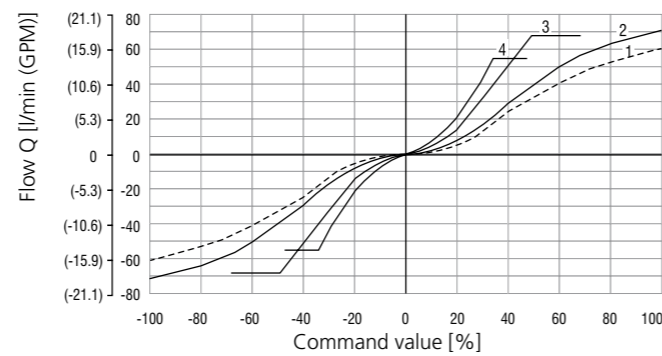
Flow Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Flow characteristics (E02S01 model only)

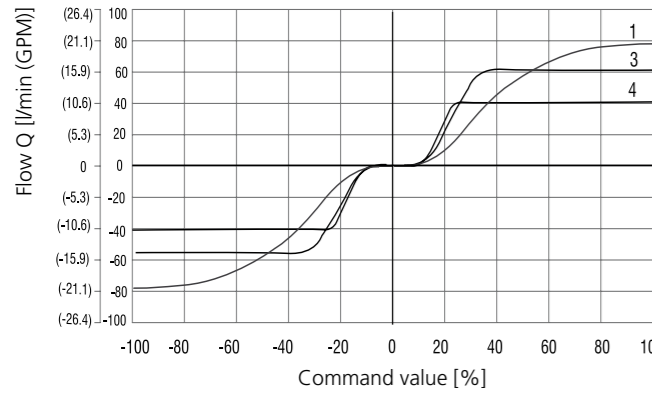
$Q_n = 30 \text{ l/min}$ (7.9 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



$Q_n = 60 \text{ l/min}$ (15.9 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



$Q_n = 80 \text{ l/min}$ (21.1 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



Δp = Valve pressure differential (inlet pressure p_v minus load pressure and return pressure p_r)

Δp_n = Valve pressure differential for nominal flow Q_n

1	$\Delta p_n = 10 \text{ bar}$ (145 PSI)
2	$\Delta p = 50 \text{ bar}$ (725 PSI)
3	$\Delta p = 160 \text{ bar}$ (2321 PSI)
4	$\Delta p = 320 \text{ bar}$ (4641 PSI)

Factory Settings

Item	Model		E02S01	E03	E04S01	
	E01					
	1 Magnet	2 Magnets	1 Magnet	2 Magnets	1 Magnet	2 Magnets
Control signal	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$
Signal external feedback	-	-	-	0 ... 10 V	-	-
Output position sensor spool	-	-	0 ... 5 V	-	0 ... 5 V	-

Connectors

K1

PIN	Technical data
1	* Power supply input
2	* Ground (power supply)
3	Control signal
4	Ground (signal)
5	Power reference signal
6	Control signal of position sensor spool
7	* Protective earth lead (PE)

*Recommended min. lead cross section 0.75 mm^2

K2

PIN	Technical data
1	TxD
2	RxD
3	Ground (signal)
4	Not used

K3

PIN	Technical data
1	Power supply output
2	Signal of external feedback
3	Ground
4	Not used
5	Not used

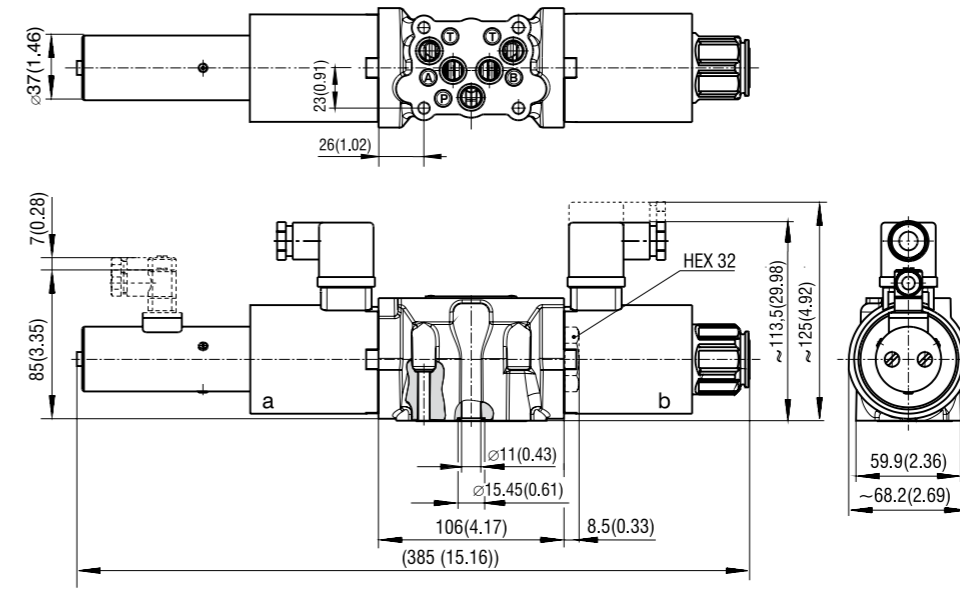
K1 - Main input connector M23 (7 PIN)
Cable diameter 8 ... 12 mm (0.31...0.47 in)

K2 - Connection RS232 M12x1 (4 PIN)
To program the electronics

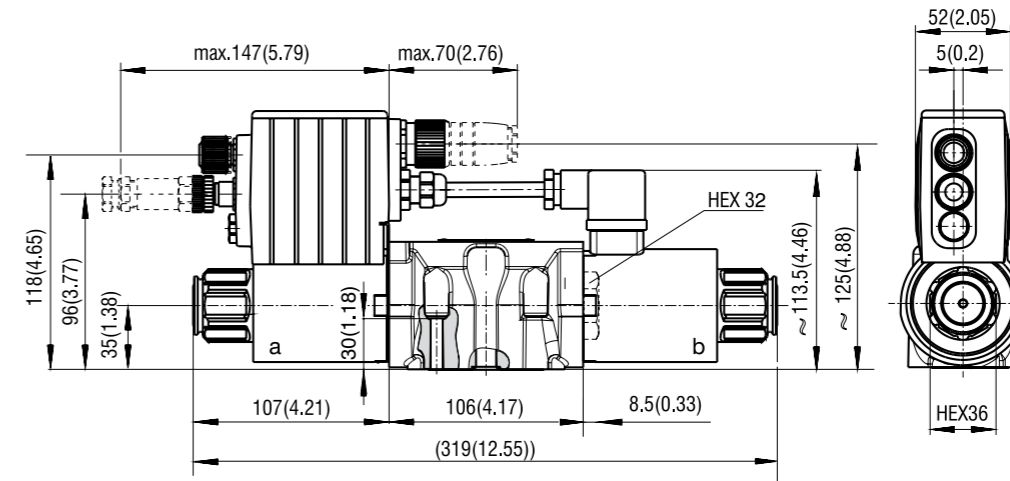
K3 - Connector M12x1 (5 PIN)
External feedback signal (for configurations E03 and E04S01 only)

Dimensions in millimeters (inches)

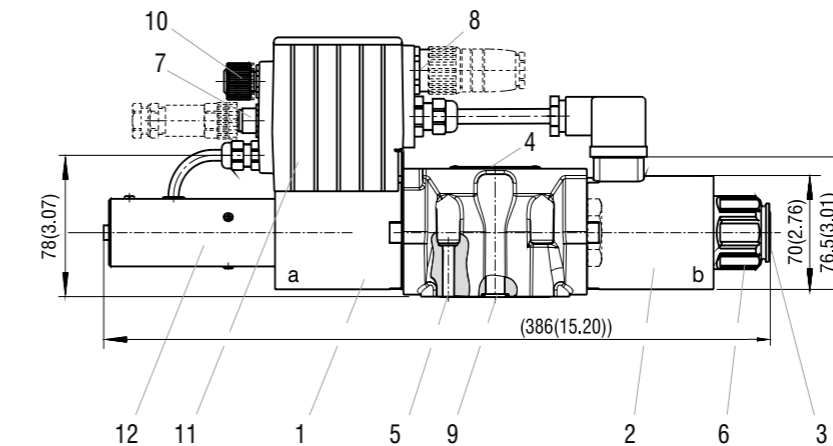
PRM7-102, 103 ... S01
PRM7-102, 103 ... S02



PRM7-102, 103 ... E01 - without connector plug for spool position feedback
PRM7-102, 103 ... E03



PRM7-1023 ... E02S01 - without connector plug for spool position feedback
PRM7-103 ... E04S01



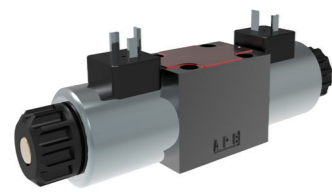
- Solenoid a
- Solenoid b
- Manual override
- Name plate
- 4 mounting holes
- Solenoid fixing nut
- Connector M12x1 for connection of external feedback
- Main supply connector M23
- Square ring 7.65 x 1.68 (4 pcs.), supplied in delivery packet
- Cover of connector M12x1 for programming
- Plastic box with integrated electronics
- Position sensor

Proportional Directional Control Valve, Pilot Operated

PRM8-06

Size 06 (D03) • Q_{max} 140 l/min (37 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features



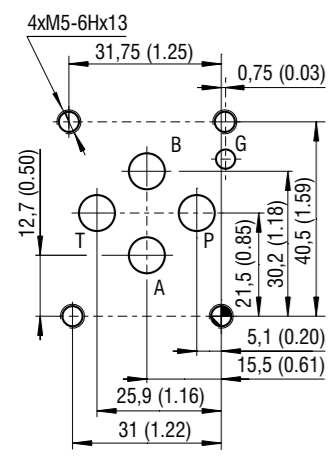
- › Pilot operated proportional control valve with exceptional hydraulic power limits
- › Subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 03) standards
- › The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- › The valve can be controlled directly by a current control supply unit or by an electronic control unit to exploit the valve performance to the fullest
- › Analog converter card EL6 allows fine position control of the valve spool, reducing hysteresis and response time and optimizing the performance of the valve
- › Five chamber housing design with reduced hydraulic power dependence on fluid viscosity
- › Wide range of electrical terminal versions for the solenoids available
- › Wide range of interchangeable spools and manual overrides available
- › The coil is fastened to the core tube with a retaining nut and can be rotated by 360° to suit the available space
- › In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- › Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

The pilot operated main spool valve follows the control spool position, which is given by the control current to the solenoid. The solenoids are supplied from an external source, which should be provided with a current feedback. In order to achieve optimum operating parameters the external electronics should be able to generate a dither signal. The proportional valve can be used within the whole range of input pressure where the required continuity of the flow rate characteristics and minimum hysteresis is achieved. The selected concept increases the achieved output parameters of the proportional valve in comparison to direct controlled proportional valve. The valve can be controlled directly by a current control supply unit or by means of the external electronic card directly mounted to the electrical terminal (see Catalogue of EL3E card 9145 and EL6 card 9150). This control card, depending on the number of the controlled solenoids, can be mounted onto either solenoid.

ISO 4401-03-02-0-05

Technical Data

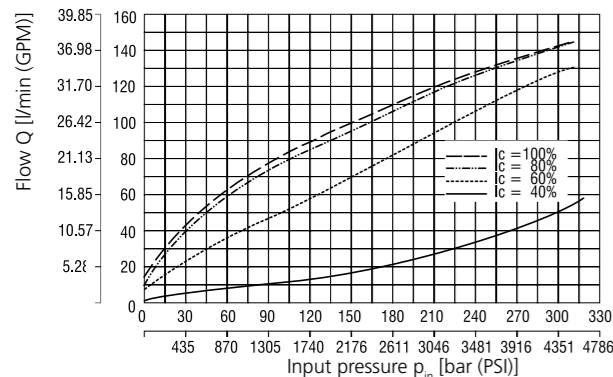


Valve size	06 (D03)	
Max. operating pressure at ports P, A, B	bar (PSI)	350 (5080)
Maximal flow at pressure 320 bar (4640 PSI)	l/min (GPM)	140 (37)
Maximum operating pressure at port T	bar (PSI)	210 (3050)
Fluid temperature range (NBR / FPM)	°C (°F)	-30 .. +80 (-22 ... +176) / -20 .. +80 (-4 .. +176)
Ambient temperature max.	°C (°F)	-30 ... +50 (-22 ... +122)
Nominal flow rate Q _n at Δp=10 bar (145 PSI)	l/min (GPM)	25 (6.6)
Hysteresis	%	< 6
Service life	cycles	10 ⁶
Mass	kg (lbs)	2.4 (5.3)
Technical data of the proportional solenoid		
Nominal supply voltage	V	12 DC 24 DC
Limit current	A	2.5 1.0
Mean resistance value at 20 °C (68 °F)	W	2.3 13.4
General information		
Nominal supply voltage	Data Sheet Type	
Limit current	GI_0060 Products and operating conditions	
Mean resistance value at 20 °C (68 °F)	C_8007 C22B* / K*	
	SMT_0019 Size 06	
	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

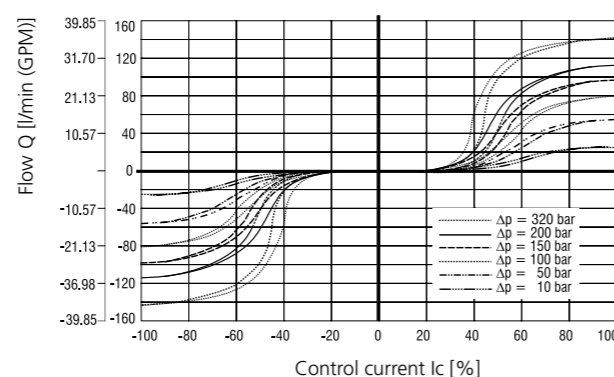
Operating limits:

Flow direction P → A / B → T or P → B / A → T



Regulated flow related to control signal

Δp=10 bar (145 PSI)



The coil current initializing the flow through the proportional directional valve can differ due to the production tolerances in a range of ± 6% of the limit current.

Ordering Code

PRM8-06 / [] - [] [] [] [] - []	
Proportional directional control valve	No designation A zinc-coated (ZnCr-3), ISO 9227 (240 h) B zinc-coated (ZnNi), ISO 9227 (520 h)
Valve size	Surface treatment standard
Spool symbols	No designation V
3Z11	Seals NBR FPM (Viton)
3Y11	Manual override standard N1 protected with retaining nut N2 protected with rubber boot
Nominal flow rate at Δp = 10 bar (145 PSI)	Connector E1 with terminal for the connector, EN 175301-803-A E2 E1 with quenching diode E3A with quenching diode E4A E3A with quenching diode E8 loose conductors (two insulated wires) E9 E8 with quenching diode E12A with Deutsch DT04-2P E13A E12A with quenching diode
25 l/min (6.6 GPM)	25
Rated supply voltage of solenoids (at the coil terminal)	12 V DC 12 24 V DC 24

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- The solenoid operated valves are delivered without connectors. For available connectors see data sheet K_8008.
- Electronics for controlling proportional valves can be ordered separately, see catalog HA 9150.
- Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 8.9 Nm (6.56 ft-lbf)
- Besides the shown widely used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Solenoid Coil in millimeters (inches)

E1, E2 Protection degree IP65	E3A, E4A Protection degree IP67	E8, E9 Protection degree IP65	E12A, E13A Protection degree IP67 / 69K
Note: A = Standard 300 mm, (11.8 in) other lengths on demand			

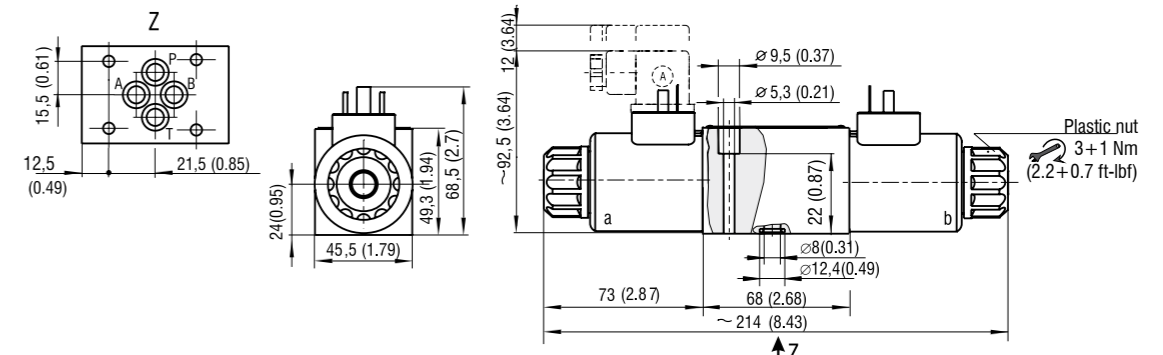
The indicated IP protection level is only achieved if the connector is properly mounted.

Manual Override in millimeters (inches)

No Designation - Standard	Designation N1 - Cap Nut Covered	Designation N2 - Rubber Boot Protected
73 (2.87)	79,5 (3.13)	85 (3.35)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Dimensions in millimeters (inches)

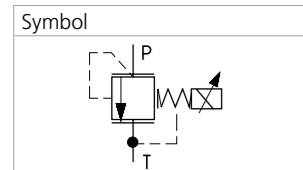
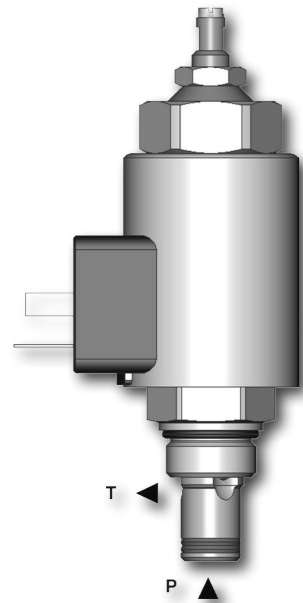


i Proper function of the valve is guaranteed only if the supply pressure in the "P" channel is present and exceeds always the pressure in the "T" channel.

Proportional Pressure Control Valve, Relieving, Direct-Acting

SR1P2-A2

3/4-16 UNF • Q_{max} 1.5 l/min (0.40 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- › Increasing pressure output proportional with increasing DC current input
- › Low hysteresis, accurate pressure control
- › Wide pressure range up to 350 bar
- › Solenoid electrical terminal option acc. to EN 175301-803-A, AMP Junior Timer, or Deutsch DT04-2P
- › 12 or 24 V DC coils
- › Usable as pilot stage for SR4P2-B2 and SP4P2-B3 proportional valves
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct operated proportional poppet pressure relief valve in the form of a screw-in cartridge. The valve is designed for continuous regulation of system pressure. It is used mostly as a pilot stage. To set the minimum cracking pressure use the adjusting screw (s=5) which incorporates also the air bleed screw. Back pressure on port T becomes additive to the pressure setting of the valve. Air bleeding is necessary for the correct function of the valve. Installation: When possible, the valve should be mounted below the reservoir oil level. This will keep oil in the actuator at all times, preventing instability caused by air enclosures. If this is not possible, mount the valve for best results vertically downward with proper air bleeding.

Technical Data

Valve size / Cartridge cavity	3/4-16 UNF-2A / A2	
Max. operating pressure (port P)	bar (PSI)	350 (5080)
Max. operating pressure (port T)	bar (PSI)	100 (1450)
Max. flow	l/min (GPM)	1.5 (0.40)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Ambient temperature range	°C (°F)	-20 ... +80 (-4 ... 176)
Hysteresis	%	< 5
Solenoid data		
Supply voltage	V	12 DC 24 DC
Max. current	A	1 0.6
Rated resistance at 20 °C (68 °F)	Ω	6.5 ± 5 % 20.6 ± 5 %
Duty cycle	%	100
Optimal PWM frequency	Hz	200
Quenching diode		BZW06-19B BZW06-33B
Enclosure type acc.to EN 60529**		IP65 / IP67 / IP69K
Mass with solenoid	kg (lbs)	0.44 (0.97)
	Data Sheet	Type
General information		
Coil types	GI_0060	Products and operating conditions
	C_8007	C19B*
Valve bodies	In-line mounted SB_0018	SB-A2*
	Sandwich mounted SB-04(06)_0028	SB-*A2*
Cavity details / Form tools	SMT_0019	SMT-A2*
Spare Parts	SP_8010	

**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

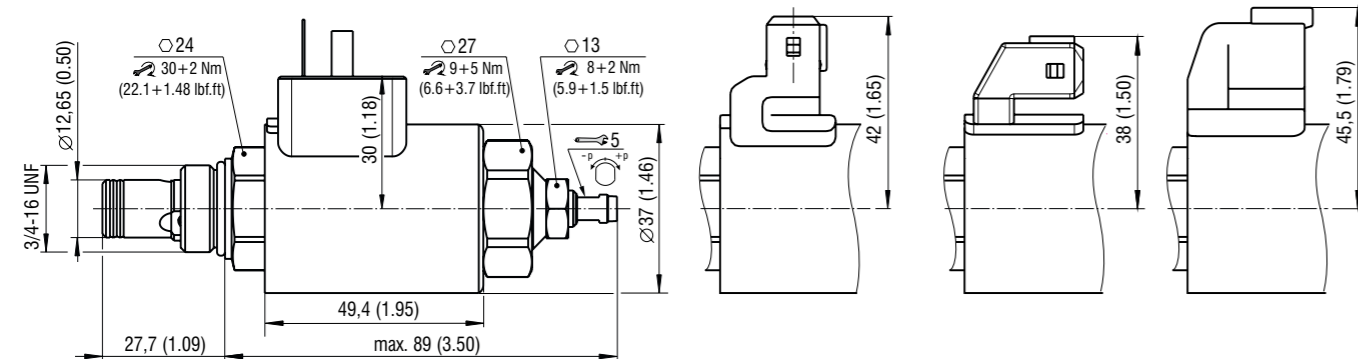
Connector type

E1, E2 - IP65
EN 175301-803-A

E3, E4 - IP67
AMP Junior Timer
- radial

E3A, E4A - IP67
AMP Junior Timer
- axial

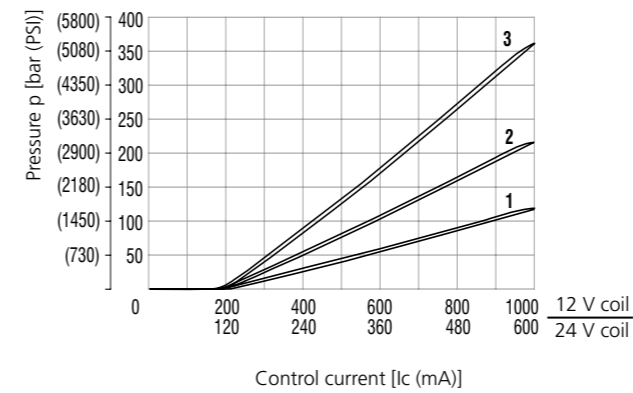
E12A, E13A
- IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm²/s (156 SUS)

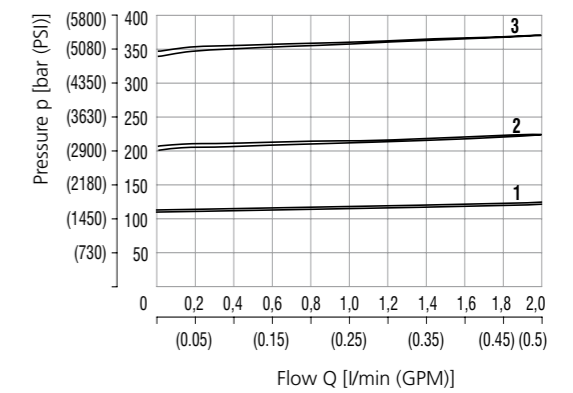
Relief pressure related to control signal

Q=0.2 l/min (0.05 GPM), pressure in port T=0 bar, PWM 160Hz



Pressure range	12	21	35
	1	2	3

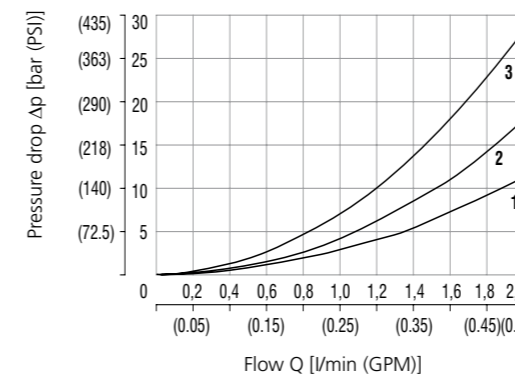
Relief pressure related to flow rate



Pressure range	12	21	35
	1	2	3

Pressure drop related to flow rate

0% of control current, P-T direction

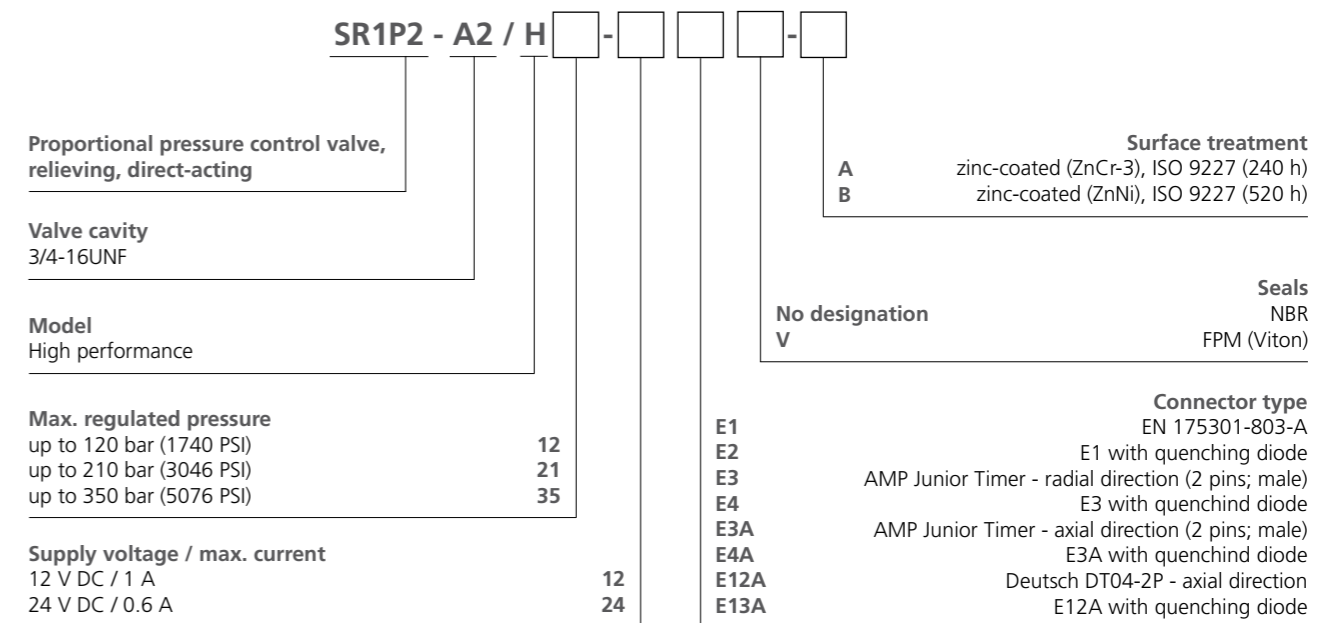


Pressure range	12	21	35
	1	2	3



Attention:
The proportional pressure relief valve is not mechanically protected and it does not perform the relief valve function.

Ordering Code

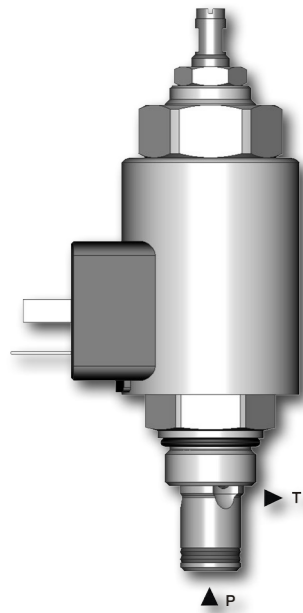


For other solenoid terminals see data sheet No. 8007

Proportional Pressure Control Valve, Relieving, Direct-Acting, Inverted

SRN1P1-A2

3/4-16 UNF • Q_{max} 1.5 l/min (0.40 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- › Decreasing pressure output proportional with increasing DC current input
- › Low hysteresis, accurate pressure control
- › Wide pressure range up to 350 bar
- › Mechanical adjustment of minimum cracking pressure
- › Solenoid electrical terminal option acc. to EN 175301-803-A, AMP Junior Timer or Deutsch DT04-2P
- › 12 or 24 V DC coils
- › Usable as pilot stage of SRN4P1-B2 and SPN4P1-B3 proportional valves
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct operated proportional poppet pressure relief valve in the form of a screw-in cartridge. The valve is designed for continuous regulation of system pressure. It is used mostly as a pilot stage. To set the minimum cracking pressure use the adjusting screw (s=5) which incorporates also the air bleed screw. Back pressure on port T becomes additive to the pressure setting of the valve. Air bleeding is necessary for the correct function of the valve. Installation: When possible, the valve should be mounted below the reservoir oil level. This will keep oil in the actuator at all times, preventing instability caused by air enclosures. If this is not possible, mount the valve for best results vertically downward with proper air bleeding.

Technical Data

Valve size / Cartridge cavity		3/4-16 UNF-2A / A2	
Max. operating pressure (port P)	bar (PSI)	350 (5080)	
Max. operating pressure (port T)	bar (PSI)	100 (1450)	
Max. flow	l/min (GPM)	1.5 (0.40)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)	
Ambient temperature range	°C (°F)	-20 ... +80 (-4 ... 176)	
Hysteresis	%	< 5	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1	0,6
Rated resistance at 20 °C (68 °F)	Ω	6.5 ± 5 %	20.6 ± 5 %
Duty cycle	%	100	
Optimal PWM frequency	Hz	160 - 200	
Quenching diode		BZW06-19B	BZW06-33B
Enclosure type acc.to EN 60529**		IP65 / IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.44 (0.97)	
	Data Sheet	Type	
General information		GI_0060	
Coil types		C_8007	
Valve bodies	In-line mounted	SB_0018	SB-A2*
	Sandwich mounted	SB-04(06)_0028	SB-*A2*
Cavity details / Form tools		SMT_0019	
Spare Parts		SP_8010	

**The indicated IP protection level is reached only with a properly mounted connector.

Dimensions in millimeters (inches)

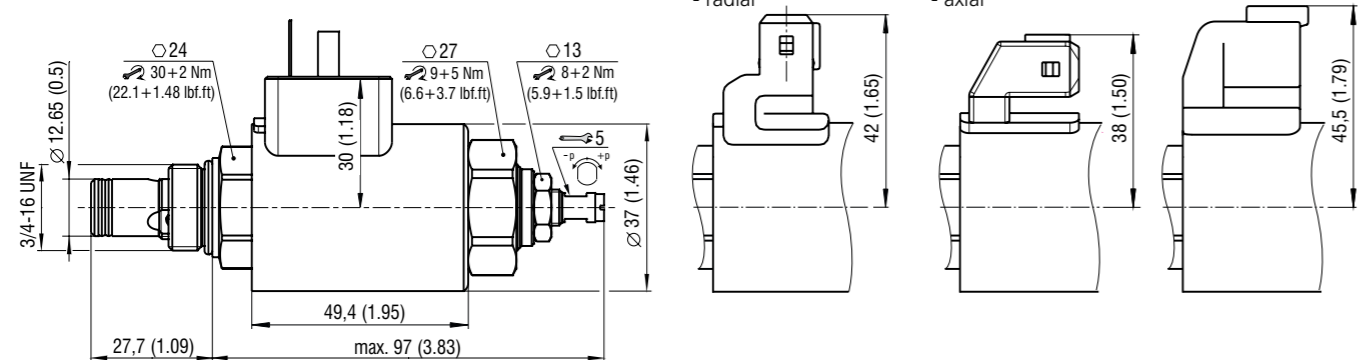
Connector type

E1, E2 - IP65
EN 175301-803-A

E3, E4 - IP67
AMP Junior Timer
- radial

E3A, E4A - IP67
AMP Junior Timer
- axial

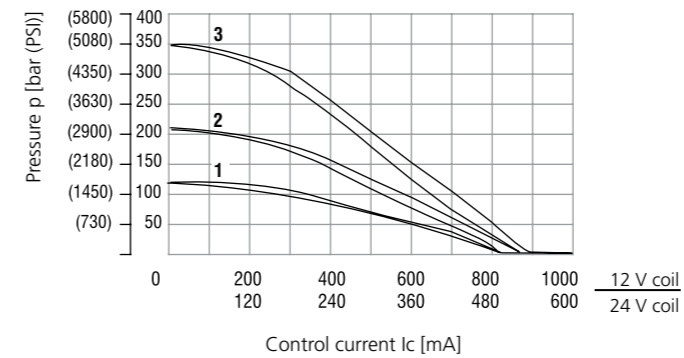
E12A, E13A - IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to control signal

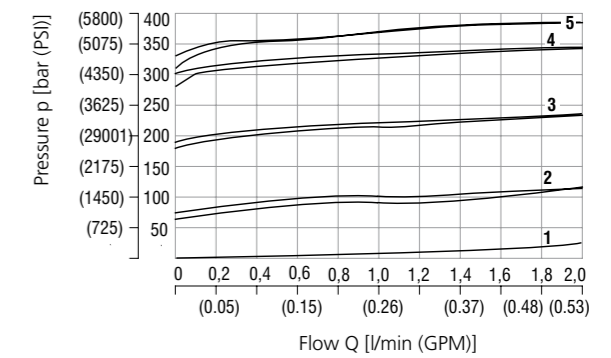
Q=0.2 l/min (0.05 GPM), pressure in port T=0 bar, PWM 160Hz



Pressure range	12	21	35
	1	2	3

Relief pressure related to flow rate

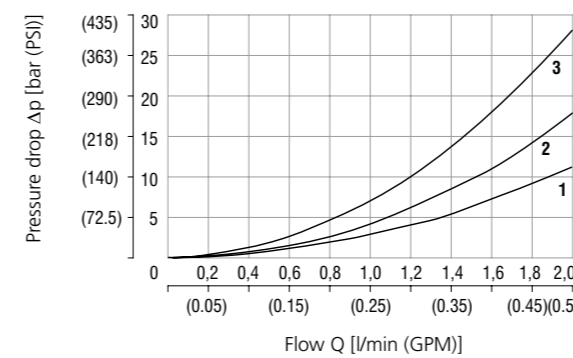
Pressure range 35, various control currents



Control current	1	2	3	4	5
	100 % I _{max}	75 % I _{max}	50 % I _{max}	25 % I _{max}	0 % I _{max}

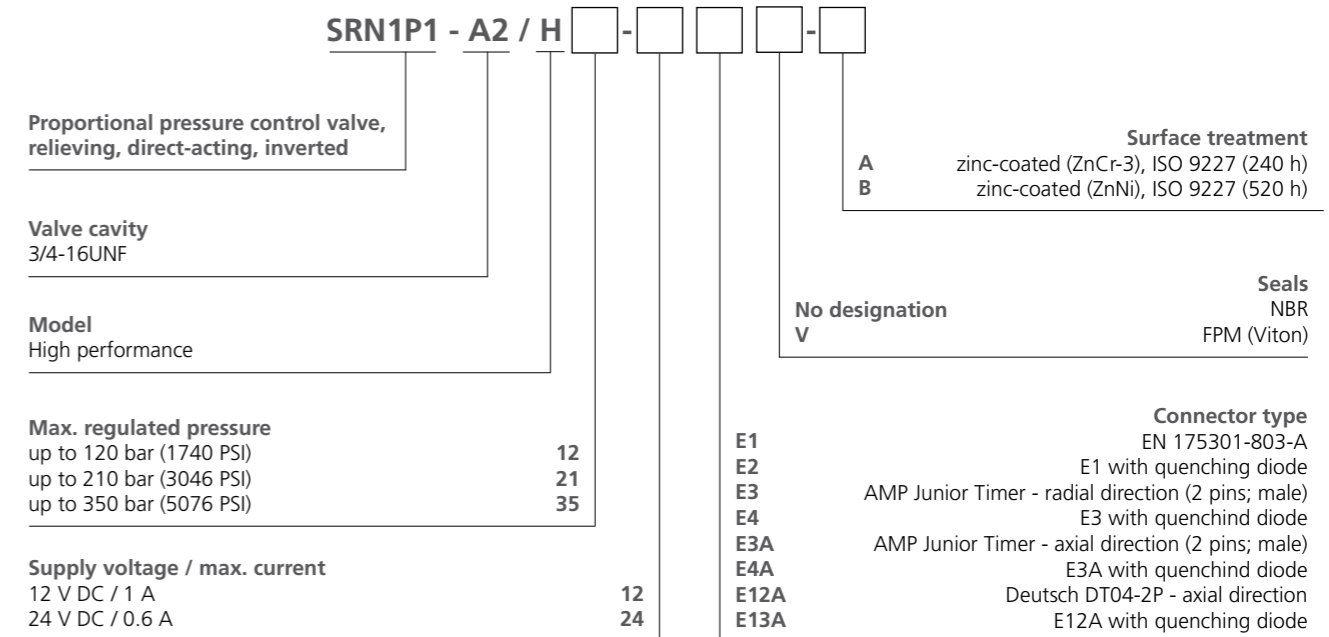
Pressure drop related to flow rate

100% of control current, P-T direction



Pressure range	12	21	35
	1	2	3

Ordering Code

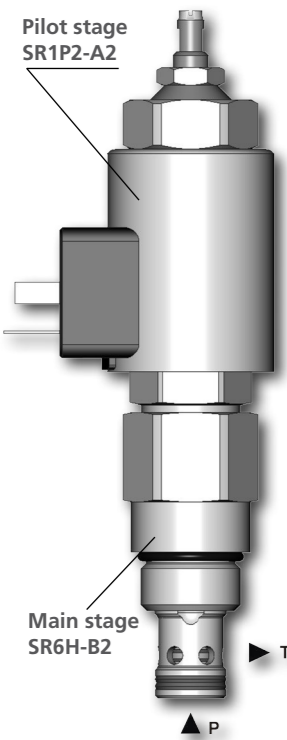


For other solenoid terminals see data sheet No. 8007

Proportional Pressure Control Valve, Relieving, Pilot Operated

SR4P2-B2

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- › Increasing pressure output proportional with increasing DC current input
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 350 bar
- › High flow capacity
- › Solenoid electrical terminal option acc. to EN 175301-803-A, AMP Junior Timer, or Deutsch DT04-2P
- › 12 or 24 V DC coils
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot operated proportional pressure relief spool valve in the form of a screw-in cartridge. The valve is designed for continuous regulation of system pressure. The complete valve consists of a pilot stage SR1P2-A2 and a main stage with connection 7/8-14 UNF. To set the minimum cracking pressure use the adjusting screw (s=5) which incorporates also the air bleed screw. Back pressure on port T becomes additive to the pressure setting of the valve. Air bleeding is necessary for the correct function of the valve. Installation: When possible, the valve should be mounted below the reservoir oil level. This will keep oil in the actuator at all times, preventing instability caused by air enclosures. If this is not possible, mount the valve for best results vertically downward with proper air bleeding.

Technical Data

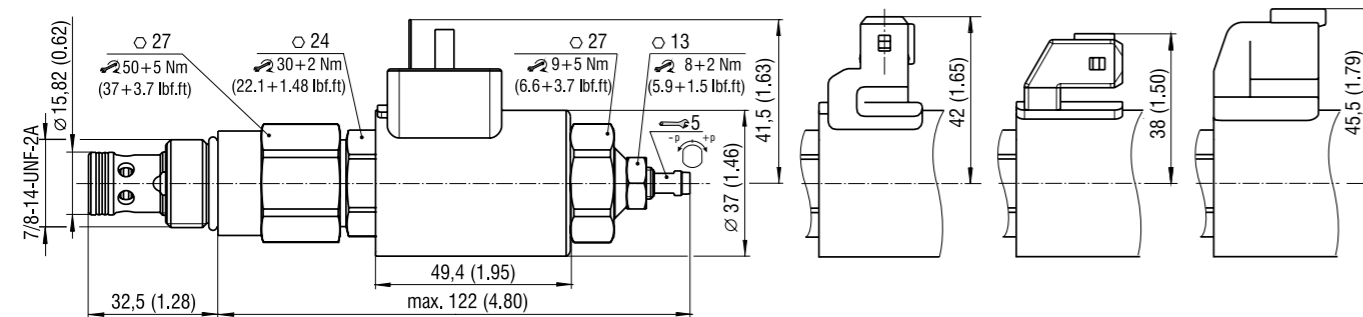
Valve size / Cartridge cavity		7/8-14 UNF-2A / B2	
Max. operating pressure (port P)	bar (PSI)	350 (5080)	
Max. operating pressure (port T)	bar (PSI)	100 (1450)	
Max. flow	l/min (GPM)	60 (15.9)	
Fluid temperature range (FPM)	°C (°F)	-20...+120 (-4...+248)	
Ambient temperature range	°C (°F)	-20...+80 (-4...+176)	
Min. setting pressure	bar (PSI)	7 bar (101.5 PSI) for 5 l/min (1.32 GPM)	
Hysteresis	%	< 5	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1	0.6
Rated resistance at 20 °C (68 °F)	Ω	6.5±5 %	20.6±5 %
Duty cycle	%	100	
Optimal PWM frequency	Hz	250	
Quenching diode		BZW06-19B	BZW06-33B
Enclosure type acc. to EN 60529**		(acc.to terminal type) IP65 / IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.58 (1.28)	
	Data Sheet	Type	
General information			
Coil types	GI_0060	Products and operating conditions	
Valve bodies	C_8007	C19B*	
Valve bodies	In-line mounted SB_0018	SB-B2*	
Cavity details / Form tools	SMT_0019	SMT-B2*	
Spare parts	SP_8010		

**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

Connector type

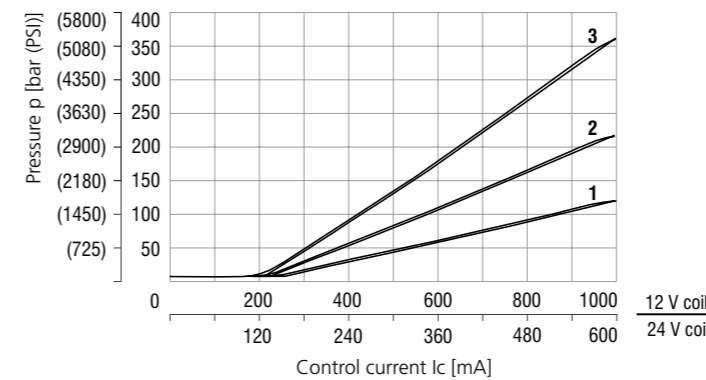
- E1, E2 - IP65
EN 175301-803-A
- E3, E4 - IP67
AMP Junior
Timer - radial
- E3A, E4A - IP67
AMP Junior
Timer - axial
- E12A, E13A - IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm²/s (156 SUS)

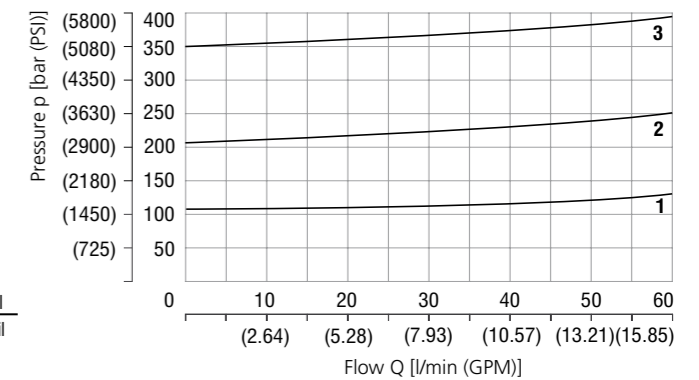
Relief pressure related to control signal

Q=5 l/min (1.32 GPM), pressure in port T=0 bar, PWM 160Hz



Pressure range	12	21	35
	1	2	3

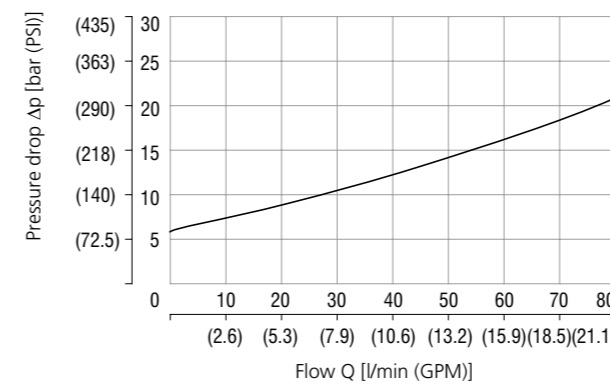
Relief pressure related to flow rate



Pressure range	12	21	35
	1	2	3

Pressure drop related to flow rate

0% of control current, P-T direction



Attention:
The proportional pressure relief valve is not mechanically protected and it does not perform the relief valve function.

Ordering Code

SR4P2 - B2 / H [] - [] - [] - []

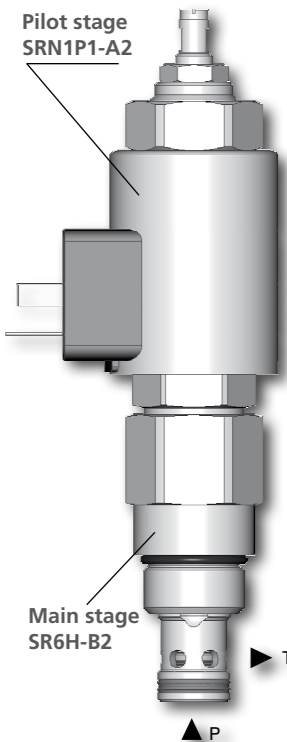
- Proportional pressure control valve, relieving, pilot operated**
- Valve cavity**
7/8-14 UNF-2A
- Model**
High performance
- Max. regulated pressure**
up to 120 bar (1740 PSI) 12
up to 210 bar (3046 PSI) 21
up to 350 bar (5076 PSI) 35
- Supply voltage / max. current**
12 V DC / 1.0 A 12
24 V DC / 0.6 A 24
- Main stage ordering key:** SR6H-B2/HV
- Surface treatment**
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
No designation V NBR
FPM (Viton)
- Connector type**
EN 175301-803-A
E1 with quenching diode
E2 with quenching diode
E3 AMP Junior Timer - radial direction (2 pins; male)
E3 with quenching diode
E4 AMP Junior Timer - axial direction (2 pins; male)
E4 with quenching diode
E3A AMP Junior Timer - radial direction (2 pins; male)
E3A with quenching diode
E4A AMP Junior Timer - axial direction (2 pins; male)
E4A with quenching diode
E12A Deutsch DT04-2P - axial direction
E12A with quenching diode
E13A

For other solenoid terminals see data sheet No. 8007

Proportional Pressure Control Valve, Relieving, Pilot Operated, Inverted

SRN4P1-B2

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Decreasing pressure output proportional with increasing DC current input
- Low hysteresis, accurate pressure control and low pressure drop
- Wide pressure range up to 350 bar
- Mechanical adjustment of minimum cracking pressure
- High flow capacity
- Solenoid electrical terminal option acc. to EN 175301-803-A, AMP Junior Timer, or Deutsch DT04-2P
- 12 or 24 V DC coils
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot operated proportional pressure relief spool valve in the form of a screw-in cartridge. The valve is designed for continuous regulation of system pressure. The complete valve consists of pilot stage SRN1P1-A2 and main stage with connection 7/8-14 UNF. To set the minimum cracking pressure use the adjusting screw (s=5) which incorporates also the air bleed screw. Back pressure on port T becomes additive to the pressure setting of the valve. Air bleeding is necessary for the correct function of the valve. Installation: When possible, the valve should be mounted below the reservoir oil level. This will keep oil in the actuator at all times, preventing instability caused by air enclosures. If this is not possible, mount the valve for best results vertically downward with proper air bleeding.

Technical Data

Valve size / Cartridge cavity	7/8-14 UNF-2A / B2	
Max. operating pressure (port P)	bar (PSI)	350 (5080)
Max. operating pressure (port T)	bar (PSI)	100 (1450)
Max. flow	l/min (GPM)	60 (15.9)
Fluid temperature range (FPM)	°C (°F)	-20...+120 (-4...+248)
Ambient temperature range	°C (°F)	-20...+80 (-4...+176)
Min. setting pressure	bar (PSI)	7 bar (101.5 PSI) for 5 l/min (1.32 GPM)
Hysteresis	%	< 5
Solenoid data		
Supply voltage	V	12 DC 24 DC
Max. current	A	1 0.6
Rated resistance at 20 °C (68 °F)	Ω	6.5±5 % 20.6±5 %
Duty cycle	%	100
Optimal PWM frequency	Hz	250
Quenching diode		BZW06-19B BZW06-33B
Enclosure type acc. to EN 60529**		(acc.to terminal type) IP65 / IP67 / IP69K
Mass with solenoid	kg (lbs)	0.58 (1.28)
Data Sheet	Type	
General information	GI_0060	Products and operating conditions
Coil types	C_8007	C19B*
Valve bodies	In-line mounted	SB_0018 SB-B2*
Cavity details / Form tools	SMT_0019	SMT-B2*
Spare parts	SP_8010	

**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

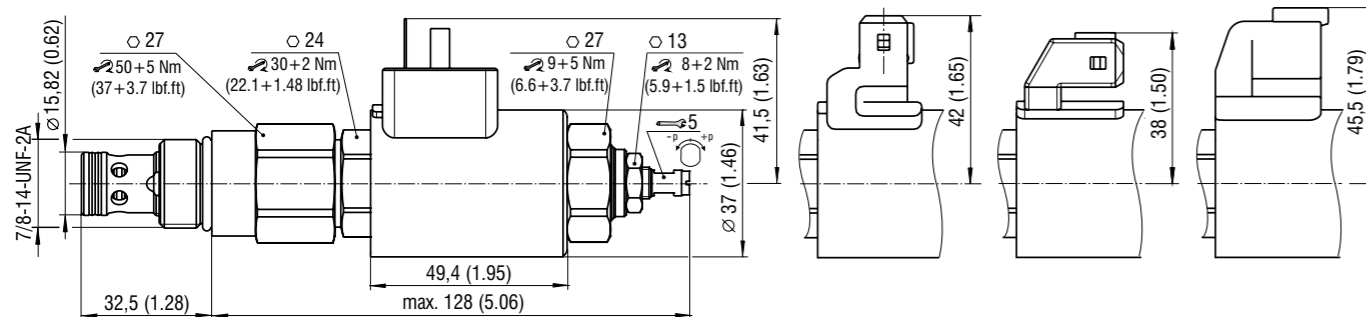
Connector type

E1, E2 - IP65
EN 175301-803-A

E3, E4 - IP67
AMP Junior Timer
- radial

E3A, E4A - IP67
AMP Junior Timer
- axial

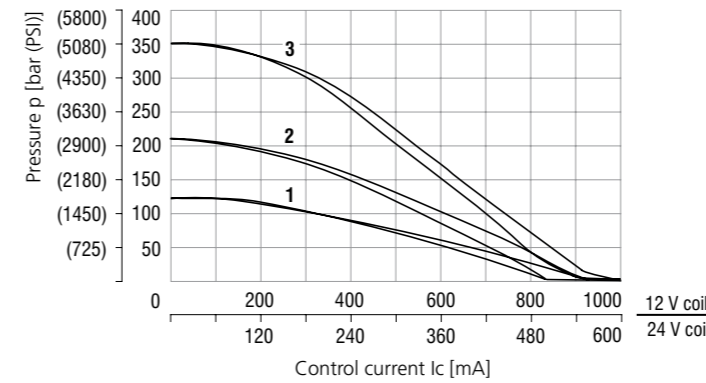
E12A, E13A
- IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to control signal

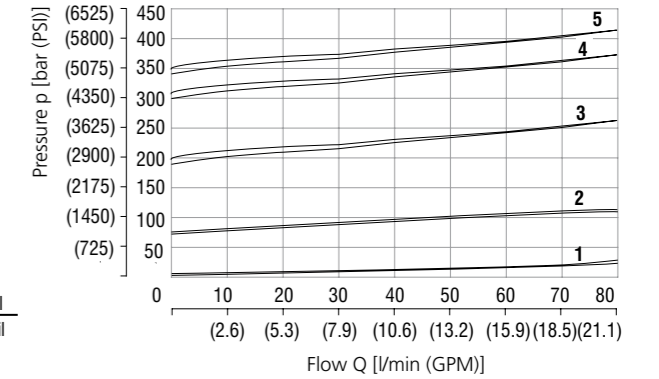
Q=5 l/min (1.32 GPM), pressure in port T=0 bar, PWM 160 Hz



Pressure range	12	21	35
	1	2	3

Relief pressure related to flow rate

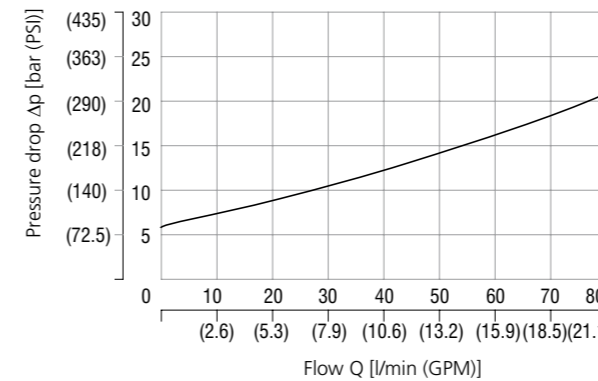
Pressure range 35, various control currents



Control current	1	2	3	4	5
	100 % I _{max}	75 % I _{max}	25 % I _{max}	25 % I _{max}	0 % I _{max}

Pressure drop related to flow rate

100 % of control current, P-T direction



Ordering Code

SRN4P1 - B2 / H [] - [] - [] - []

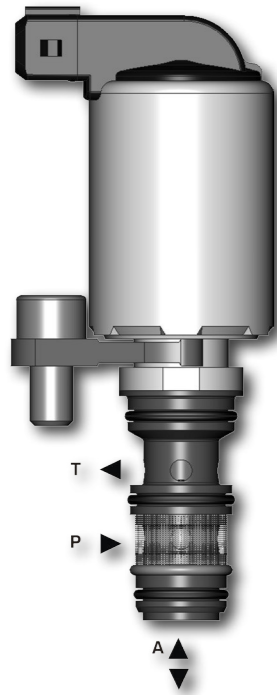
- Proportional pressure control valve, relieving, pilot operated, inverted**
- Valve cavity**
7/8-14 UNF-2A
- Model**
High performance
- Max. regulated pressure**
up to 120 bar (1740 PSI) 12
up to 210 bar (3046 PSI) 21
up to 350 bar (5076 PSI) 35
- Supply voltage / max. current**
12 V DC / 1.0 A 12
24 V DC / 0.6 A 24
- Main stage ordering key:** SR6H-B2/HV
- Surface treatment**
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
NBR
V FPM (Viton)
- Connector type**
E1 EN 175301-803-A
E2 E1 with quenching diode
E3 AMP Junior Timer - radial direction (2 pins; male)
E4 E3 with quenching diode
E3A AMP Junior Timer - axial direction (2 pins; male)
E4A E3A with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode

For other solenoid terminals see data sheet No. 8007

Proportional Pressure Control Valve, Reducing - Relieving, Direct-Acting, Slip-In Style

PP2P1-W3

Size D20 • Q_{max} 20 l/min (5 GPM) • p_{max} 50 bar (700 PSI)



Technical Features

- Excellent stability throughout flow range with rapid response to proportional current input change
- Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- Precise pressure control vs current and excellent repeatability
- Integrated relief function for protection against pressure peaks
- Solenoid electrical terminal AMP Junior Timer or Deutsch DT04-2P
- 12 or 24 V DC coils
- Compact design with reduced solenoid dimensions for production cost savings
- High flow capacity and low coil power consumption
- Optional mesh screen
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct-operated, spool-type hydraulic pressure reducing valve in the form of a slip-in cartridge. Reduced pressure output is proportional to DC current input. This valve is intended for use as a pressure limiting device. Note: Consult factory for special OEM versions of this product.

Model Code	no mesh screen	with mesh screen
Symbol		

Technical Data

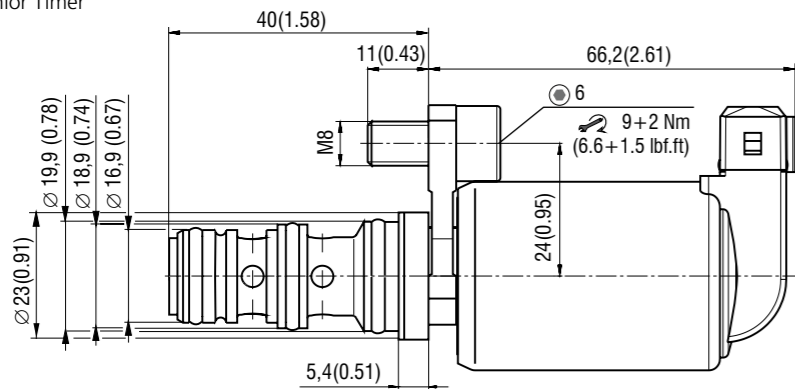
Valve size / Cartridge cavity		D20 / W3		
Max. operating pressure (port P)	bar (PSI)	50 (730)		
Max. regulated pressure (port A)	bar (PSI)	20 (290)	25 (363)	32 (460)
Max. flow rate P-A	l/min (GPM)	20 (5.3)	20 (5.3)	16 (4.2)
Fluid temperature range	°C (°F)	-30 ...90 (-22 ...194), +100 (212) short-time		
Ambient temperature range	°C (°F)	-30 ...90 (-22 ...194), +100 (212) short-time		
Response time at 100% signal	ms	< 50		
Solenoid data				
Supply voltage	V	12 DC		24 DC
Max. current	A	1		1
Rated resistance at 20 °C (68 °F)	Ω	7.2±6.5 %		11.2±6.5 %
Duty cycle	%	100		
Optimal PWM frequency	Hz	signal100		
Quenching diode		BZW06-28B		BZW06-33B
Enclosure type acc. to EN 60529**		(acc.to terminal type) IP 67 / IP 69K		
Mass	kg (lbs)	0.4 (0.88)		
	Data Sheet	Type		
General information				
Valve bodies	In-line mounted	SB_0018		SB-W3-*
Cavity details		SMT_0019		SB-W3-*
Spare parts		SP_8010		

**The indicated IP protection level is only reached with a properly mounted connector.

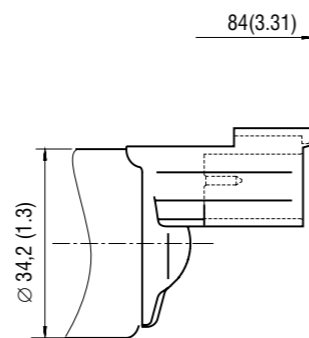
Dimensions in millimeters (inches)

Connector type

E3, E4 - IP67
AMP Junior Timer



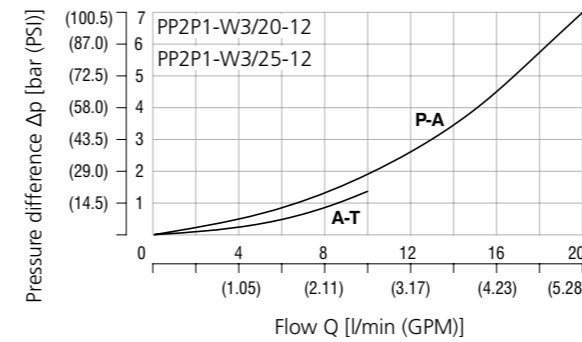
E12A, E13A - IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm²/s (156 SUS)

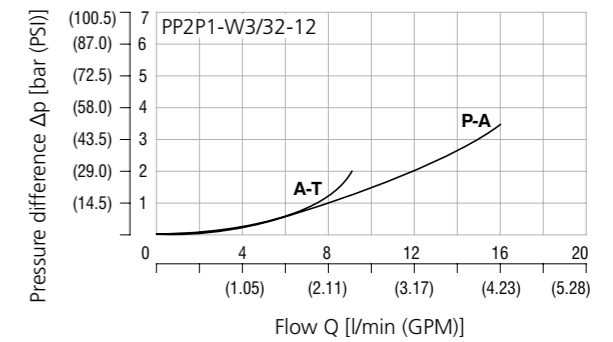
Pressure drop related to flow rate

A-T, Valve coil de-energized (reducing function)
P-A, Valve coil energized (relieving function)



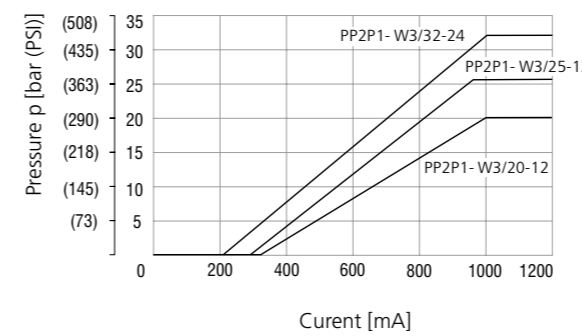
Pressure drop related to flow rate

A-T, Valve coil de-energized (reducing function)
P-A, Valve coil energized (relieving function)



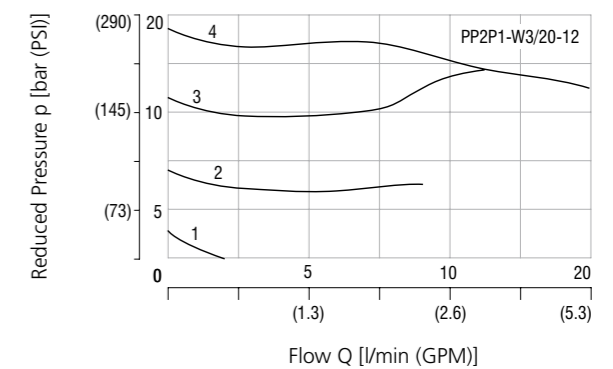
Reduced pressure related to control signal

Port A, range 0 - 20 bar (290 PSI)
Port A, range 0 - 32 bar (464 PSI)
Port P, Inlet pressure 50 bar (730 PSI)
Q = 0 lpm (GPM)



Reducing pressure related to flow rate

Reducing Function P - A



Control signal	
1	40 %
2	60 %
3	80 %
4	100 %

Ordering Code

PP2P1 - W3/ [] - [] [] [] - [] []

Proportional pressure control valve, reducing - relieving, direct-acting, slip-in style

Valve cavity
D20 mm (0.79 in)

Max. regulated pressure
20 bar (290 PSI) 20
25 bar (363 PSI) 25
32 bar (464 PSI) 32

Supply voltage / max. current
12 V DC / 1 A 12
24 V DC / 1 A 24

Mesh screen
No designation without mesh screen
SP-125 port P, 125 microns

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR
V FPM (Viton)

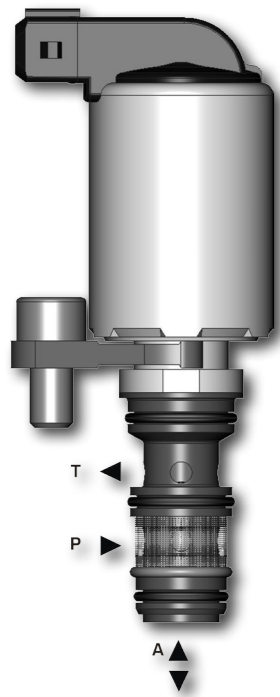
Connector
E3 AMP Junior Timer - radial direction (2 pins; male)
E4 E3 with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode

Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Proportional Pressure Control Valve, Reducing - Relieving, Direct-Acting, Slip-In Style

PP2P3-W3

Size D20 • Q_{max} 30 l/min (8 GPM) • p_{max} 50 bar (700 PSI)



Technical Features

- Valve is primary used in clutch control application typically in mobile transmissions
- Excellent stability throughout flow range with rapid response to proportional current input change
- Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- Precise pressure control vs current and excellent repeatability
- Integrated relief function for protection against pressure peaks
- Solenoid electrical terminal AMP Junior Timer or Deutsch DT04-2P
- 12 or 24 V DC coils
- Compact design with reduced solenoid dimensions for production cost savings
- High flow capacity and low coil power consumption
- Optional mesh screen
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct-operated, spool-type hydraulic pressure reducing valve in the form of a slip-in cartridge. Reduced pressure output is proportional to DC current input. This valve is intended for use as a pressure limiting device. Note: Consult factory for special OEM versions of this product.

Model Code	no mesh screen	with mesh screen
Symbol		

Technical Data

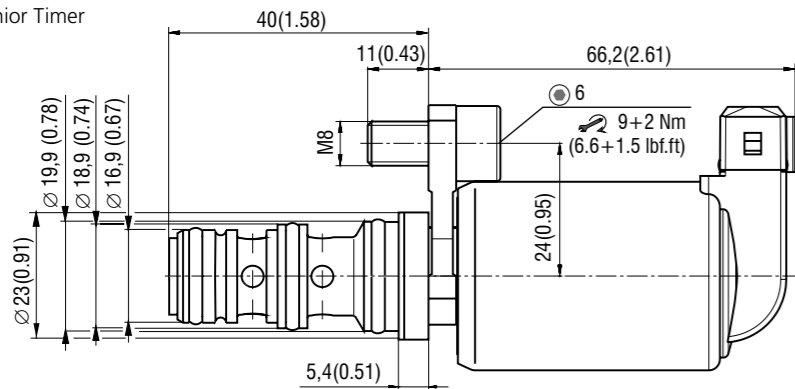
Valve size / Cartridge cavity		D20 / W3	
Max. operating pressure (port P)	bar (PSI)	50 (730)	
Max. reducing pressure (port A)	bar (PSI)	20 (290)	25 (363)
Max. flow rate P-A	l/min (GPM)	30 (7.9)	
Fluid temperature range	°C (°F)	-30 ... 90 (-22 ... 194), +100 (212) short-time	
Ambient temperature range	°C (°F)	-30 ... 90 (-22 ... 194), +100 (212) short-time	
Response time at 100% signal	ms	< 50	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1	1
Rated resistance at 20 °C (68 °F)	Ω	7.2±6.5%	11.2±6.5%
Duty cycle	%	100	
Optimal PWM frequency	Hz	100	
Quenching diode		BZW06-28B	BZW06-33B
Enclosure type acc. to EN 60529**		(acc.to terminal type) IP 67 / IP 69K	
Mass	kg (lbs)	0.4 (0.88)	
	Data Sheet	Type	
General information			
Valve bodies	In-line mounted	SB_0018	SB-W3-*
Cavity details		SMT_0019	SB-W3-*
Spare parts		SP_8010	

**The indicated IP protection level is only reached with a properly mounted connector.

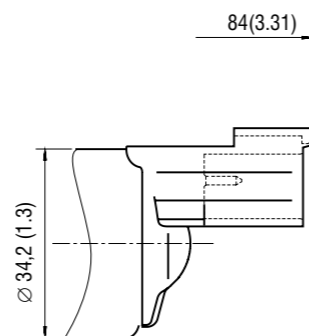
Dimensions in millimeters (inches)

Connector type

E3, E4 - IP67
AMP Junior Timer



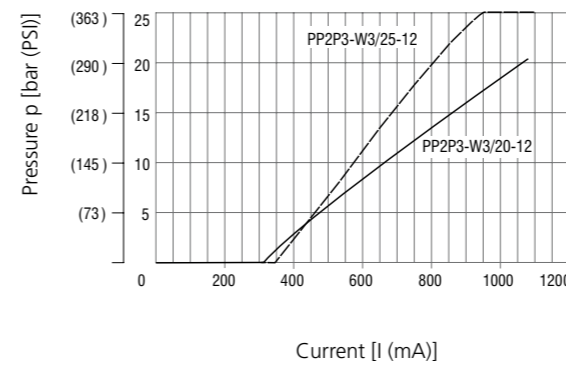
E12A, E13A - IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm²/s (156 SUS)

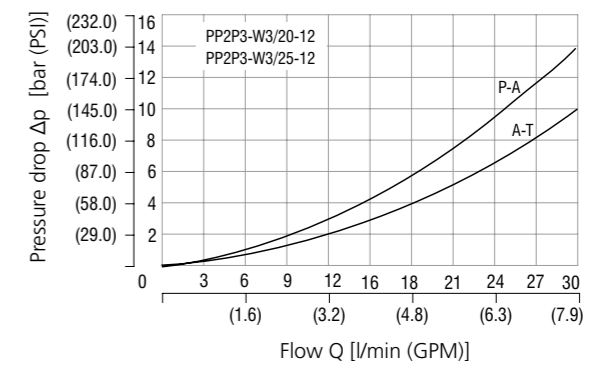
Reduced pressure related to control signal

Port A, range 0 - 20 bar (290 PSI)
Port A, range 0 - 25 bar (363 PSI)
Port P, Inlet pressure 50 bar (730 PSI)
Q = 0 lpm (GPM)

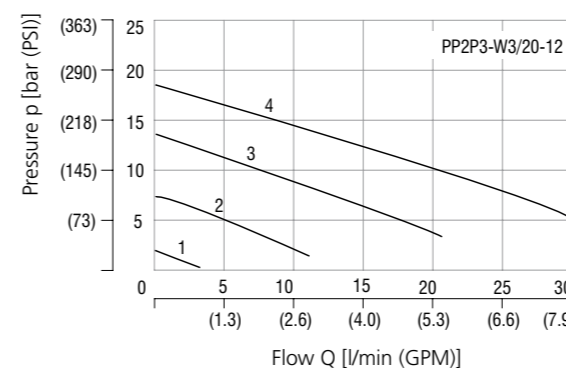


Pressure drop related to flow rate

A-T, Valve coil de-energized (relieving function)
P-A, Valve coil energized (reducing function)

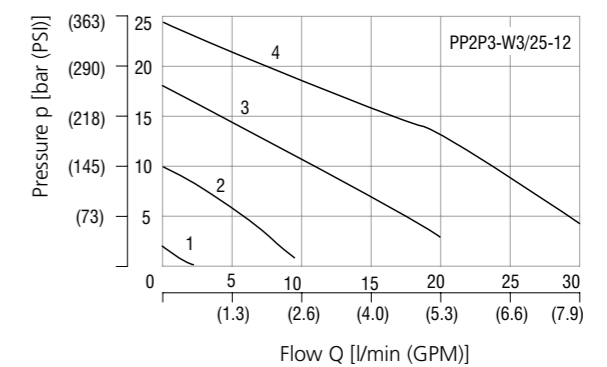


Reducing pressure related to flow rate



Reducing pressure related to flow rate

Reducing Function P - A



Control signal	
1	40 %
2	60 %
3	80 %
4	100 %

Ordering Code

PP2P3 - W3/ - -

- Proportional pressure control valve, reducing - relieving, direct-acting, slip-in style**
- Valve cavity**
D20 mm (0.79 in)
- Max. reducing pressure**
20 bar (290 PSI) 20
25 bar (363 PSI) 25
- Supply voltage / max. current**
12 V DC / 1 A 12
24 V DC / 1 A 24
- Mesh screen**
No designation without mesh screen
SP-125 port P, 125 microns
- Surface treatment**
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
No designation NBR
V FPM (Viton)
- Connector**
E3 AMP Junior Timer - radial direction (2 pins; male)
E4 E3 with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode

Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Proportional Pressure Control Valve, Reducing - Relieving, Direct-Acting

PVRM1-063/S

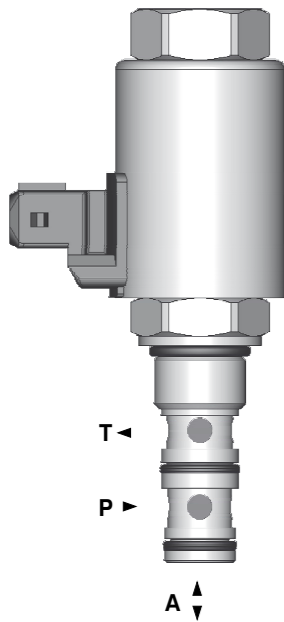
M20x1.5 • Qmax 20 l/min (5 GPM) • pmax 50 bar (700 PSI)

Technical Features

- › Excellent stability throughout flow range with rapid response to proportional current input change
- › Low hysteresis, accurate pressure control and low pressure drop
- › Precise pressure control vs current and excellent repeatability
- › Integrated relief function for protection against pressure peaks
- › Solenoid electrical terminal acc. to EN 175301-803-A, AMP Junior Timer, or Deutsch DT04-2P
- › 12 or 24 V DC coils
- › Optional mesh screen
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct-operated, spool-type hydraulic pressure reducing-relieving valve in the form of a screw-in cartridge. Reduced pressure output is proportional to DC current input. This valve is intended for use as a pressure limiting device. Note: Consult factory for special OEM versions of this product.



Model Code	no mesh screen	with mesh screen
Symbol		

Technical Data

Valve size / Cartridge cavity		M20x1.5 / QE3	
Max. operating pressure (port P)	bar (PSI)	50 (730)	
Max. reduced pressure (port A)	bar (PSI)	20 (290)	32 (464)
Max. flow rate P-A	l/min (GPM)	20 (5.3)	
Fluid temperature range	°C (°F)	-30 ...90 (-22 ...194), +100 (212) short-time	
Ambient temperature range	°C (°F)	-30 ...90 (-22 ...194), +100 (212) short-time	
Response time at 100% signal	ms	< 50	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1	0,75
Rated resistance at 20 °C (68 °F)	Ω	7.1 ± 6.5%	20.6 ± 6.5%
Duty cycle	%	100	
Optimal PWM frequency	Hz	100	
Quenching diode		BZW06-28B	BZW06-33B
Enclosure type acc. to EN 60529**	DIN / AMP / Deutsch DT04-2P	IP65 / IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.4 (0.88)	

	Data sheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT-QE3*
Spare parts	SP_8010	

**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

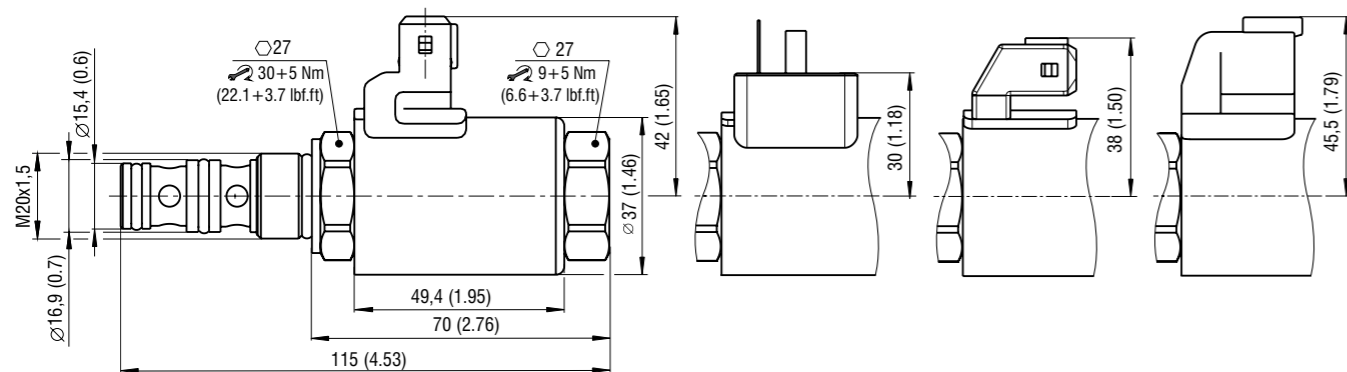
Connector type

E3, E4 - IP67
AMP Junior Timer - radial

E1, E2 - IP65
EN 175301-803-A

E3A, E4A - IP67
AMP Junior
Timer - axial

E12A, E13A - IP67/ IP69K
Deutsch DT04-2P

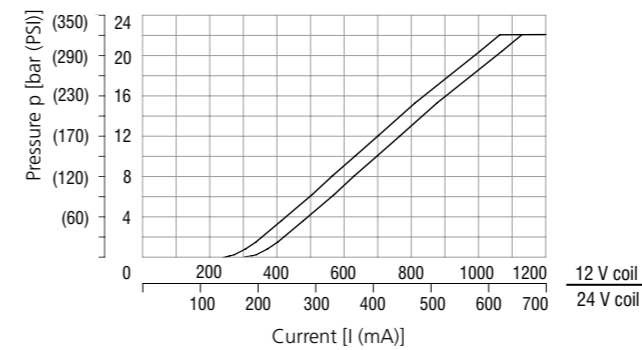


Characteristics measured at v = 32 mm²/s (156 SUS)

Reduced pressure related to control signal

Port A, range 0 - 20 bar (290 PSI), Q = 0 lpm (GPM)
Port P, inlet pressure 50 bar (730 PSI)

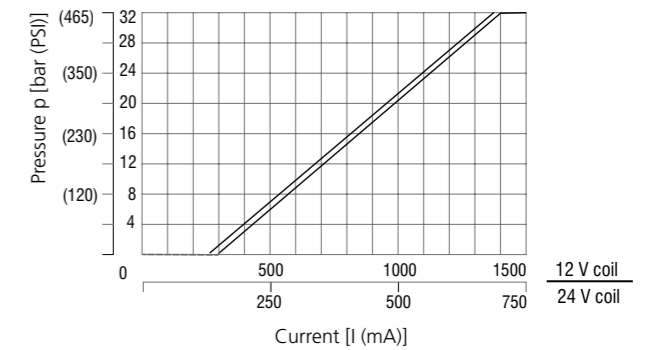
PVRM1-063/S*20



Reduced pressure related to control signal

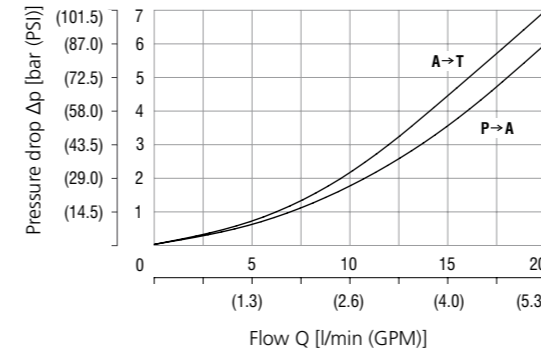
Port A, range 0 - 32 bar (464 PSI), Q = 0 lpm (GPM)
Port P, inlet pressure 50 bar (730 PSI)

PVRM1-063/S*32



Pressure drop related to flow rate

A-T, Valve coil de-energized (relieving function)
P-A, Valve coil energized (reducing function)



Ordering Code

PVRM1 - 063 / S - [] - [] - [] - [] - []

- Proportional pressure control valve, reducing - relieving, direct-acting**
- Valve cavity**
M20x1.5 / QE3
- Model**
screw-in cartridge
- Max. reduced pressure**
20 bar (290 PSI) → 20
32 bar (464 PSI) → 32
- Supply voltage / max. current**
12 V DC / max. 1 A → 12
24 V DC / max. 0.75 A → 24
- Mesh screen**
No designation SP-125 → without mesh screen port P, 125 microns
- Surface treatment**
A → zinc-coated (ZnCr-3), ISO 9227 (240 h)
B → zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
No designation V → NBR, FPM (Viton)
- Connector**
E1 → EN 175301-803-A
E2 → E1 with quenching diode
E3 → AMP Junior Timer - radial direction (2 pins; male)
E4 → E3 with quenching diode
E3A → AMP Junior Timer - axial direction (2 pins; male)
E4A → E3A with quenching diode
E12A → Deutsch DT04-2P - axial direction
E13A → E12A with quenching diode

Proportional Pressure Control Valve, Reducing - Relieving, Direct-Acting

PVRM3-10

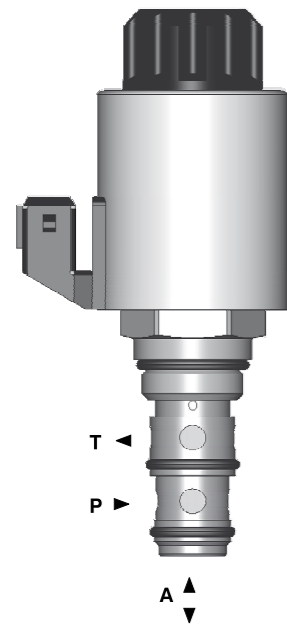
M24x1.5 • Q_{max} 40 l/min (11 GPM) • p_{max} 90 bar (1300 PSI)

Technical Features

- Excellent stability throughout flow range with rapid response to proportional current input change
- Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- Precise pressure control vs current and excellent repeatability
- Integrated relief function for protection against pressure peaks
- Solenoid electrical terminal AMP Junior Timer, or Deutsch D04-2P
- 12 or 24 V DC coils
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct-operated, spool-type hydraulic pressure reducing-relieving valve in the form of a screw-in cartridge. Reduced pressure output is proportional to DC current input. This valve is intended for use as a pressure limiting device. Note: Consult factory for special OEM versions of this product.



Model Code	no mesh screen
Symbol	

Technical Data

Valve size / Cartridge cavity	M24x1.5 / QJ3				
	Max. operating pressure (port P)	bar (PSI)	50 (730)	90 (1305)	
Max. reduced pressure (port A)	bar (PSI)	18 (260)	20 (290)	30 (435)	80 (1160)
Max. flow rate P-A	l/min (GPM)	40 (11)			
Fluid temperature range	°C (°F)	-30 ... +90 (-22 ... +194), +100 (212) short-time			
Ambient temperature range	°C (°F)	-30 ... +90 (-22 ... +194), +100 (212) short-time			
Response time at 100% signal	ms	< 50			
Solenoid data					
Supply voltage	V	12 DC	24 DC		
Max. current	A	1.5	1		
Rated resistance at 20 °C (68 °F)	Ω	5 ± 6.5%	13.4 ± 6.5%		
Duty cycle	%	100			
Optimal PWM frequency	Hz	150			
Quenching diode		BZW06-28B	BZW06-33B		
Enclosure type acc. to EN 60529**	AMP / Deutsch DT04-2P	(acc.to terminal type) IP67 / IP69K			
Mass with solenoid	kg (lbs)	0.4 (0.88)			

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT-QJ3*
Spare parts	SP_8010	

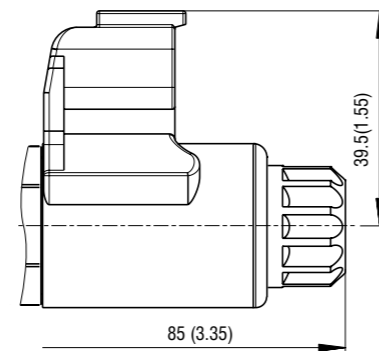
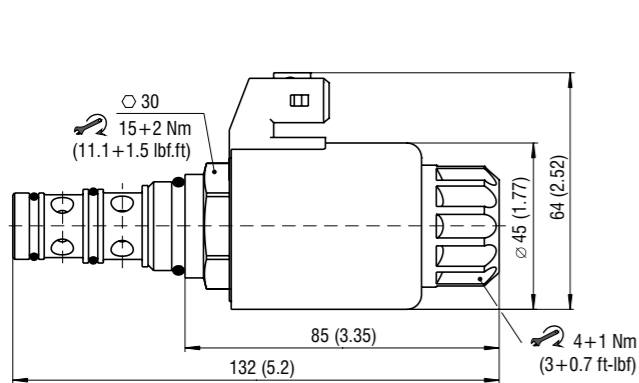
**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

Connector type

AMP Junior Timer E3A, E4A - IP67

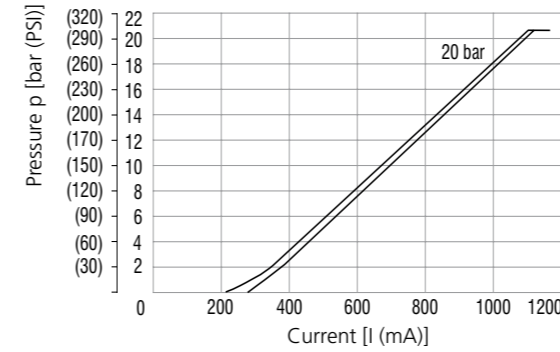
Deutsch DT04-2P - E12A, E13A - IP69K



Characteristics measured at v = 32 mm²/s (156 SUS)

Reduced pressure related to control signal

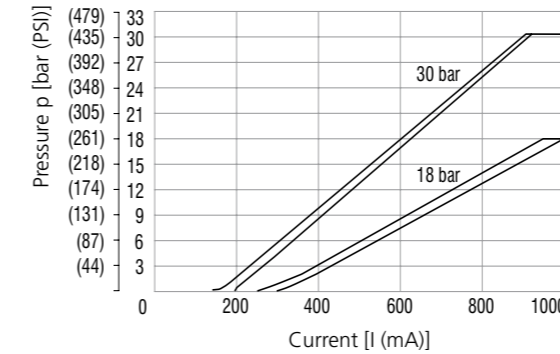
Port A, range 0 - 20 bar (290 PSI), Q = 0 lpm (GPM)
Port P, inlet pressure 50 bar (730 PSI)



Reduced pressure related to control signal

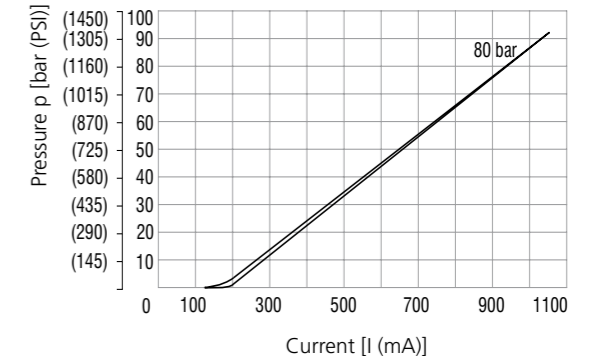
Port A, range 0 - 18 bar (260 PSI), Q = 0 lpm (GPM)
Port P, inlet pressure 50 bar (730 PSI)

Port A, range 0 - 30 bar (435 PSI), Q = 0 lpm (GPM)
Port P, inlet pressure 50 bar (730 PSI)



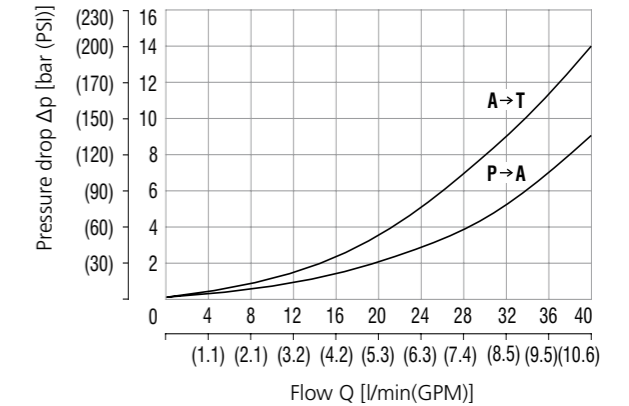
Reduced pressure related to control signal

Port A, range 0 - 80 bar (1160 PSI), Q = 0 lpm (GPM)
Port P, inlet pressure 90 bar (1305 PSI)



Pressure drop related to flow rate

A-T, Valve coil de-energized (relieving function)
P-A, Valve coil energized (reducing function)



Ordering Code

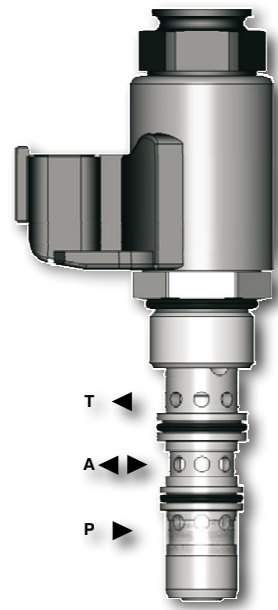
PVRM3 - 10 / S - [] - [] - [] - []

- Proportional pressure control valve, reducing - relieving, direct-acting**
- Valve cavity**
M24x1.5 / QJ3
- Model**
screw-in cartridge
- Max. reduced pressure**
18 bar (260 PSI) → 18
20 bar (290 PSI) → 20
30 bar (435 PSI) → 30
80 bar (1160 PSI) → 80
- Supply voltage / max. current**
12 V DC / 1.5 A → 12
24 V DC / 1 A → 24
- Surface treatment**
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
No designation → NBR
V → FPM (Viton)
- Connector type**
E3A AMP Junior Timer - axial direction (2 pins; male)
E4A E3A with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode

Proportional Pressure Control Valve, Reducing - Relieving, Pilot Operated, Screw-In Style

SP4P1-B4

7/8-14 UNF • Q_{max} 40 l/min (11 GPM) • p_{max} 30 bar (435 PSI)



Technical Features

- › Excellent stability throughout flow range with rapid response to proportional current input change
- › Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- › Precise pressure control vs current and excellent repeatability
- › Integrated relief function for protection against pressure peaks
- › Solenoid electrical terminal: AMP Junior Timer or Deutsch DT04-2P
- › 12 or 24 V DC coils
- › Compact design with reduced solenoid dimensions for production cost saving
- › High flow capacity and low coil power consumption
- › Optional mesh screen
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot-operated, spool-type hydraulic pressure reducing valve in the form of a screw-in cartridge. Reduced pressure output is proportional to DC current input. This valve is intended for use as a pressure limiting device. Note: Consult factory for special OEM versions of this product.

Model Code	no mesh screen	with mesh screen
Symbol		

Technical Data

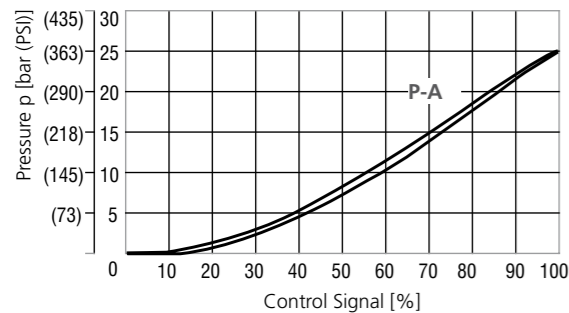
Valve size / Cartridge cavity		7/8-14 UNF-2A / B4	
Max. operating pressure (port P)	bar (PSI)	30 (435)	
Max. reducing pressure (port A)	bar (PSI)	25 (363)	
Max. flow rate P-A	l/min (GPM)	40 (11)	
Fluid temperature range	°C (°F)	-30 ...90 (-22 ...194), +100 (212) short time	
Ambient temperature range	°C (°F)	-30 ...90 (-22 ...194), +100 (212) short time	
Response time at 100 % signal	ms	< 50	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	0.7	0.35
Rated resistance at 20 °C (68 °F)	Ω	7.82±5 %	29.5±4.5 %
Duty cycle	%	100	
Optimal PWM frequency	Hz	200	
Quenching diode		BZW06-28B	BZW06-33B
Enclosure type acc.to EN 60529**		(acc.to terminal type) IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.3 (0.66)	
Data Sheet		Type	
General information		GI_0060	
Coil types		C_8007	
Valve bodies	In-line mounted	SB_0018	
	Sandwich mounted	SB-04(06)_0028	
Cavity details / Form tools		SMT_0019	
Spare parts		SP_8010	

**The indicated IP protection level is only reached with a properly mounted connector.

Characteristics measured at v = 32 mm²/s (156 SUS)

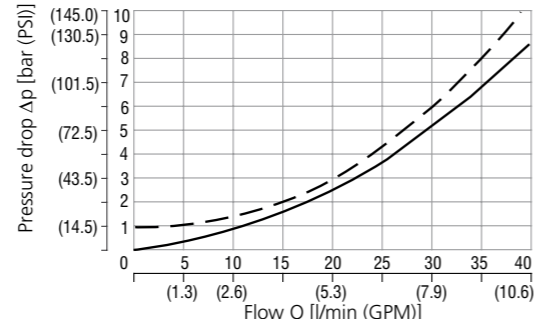
Reduced pressure related to control signal

Port A of range 0 - 25 bar (363 PSI), Q = 0 lpm (GPM)
Port P inlet pressure 30 bar (435 PSI)
measured without mesh screen



Pressure drop related to flow rate

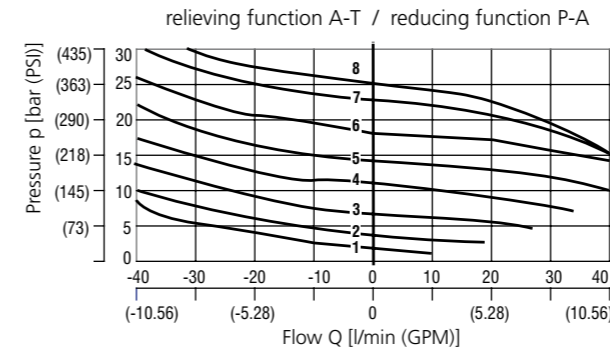
— A-T Valve coil de-energized (relieving function)
— P-A Valve coil energized (reducing function)
measured without mesh screen



Characteristics measured at v = 32 mm²/s (156 SUS)

Reducing - relieving pressure related to flow rate

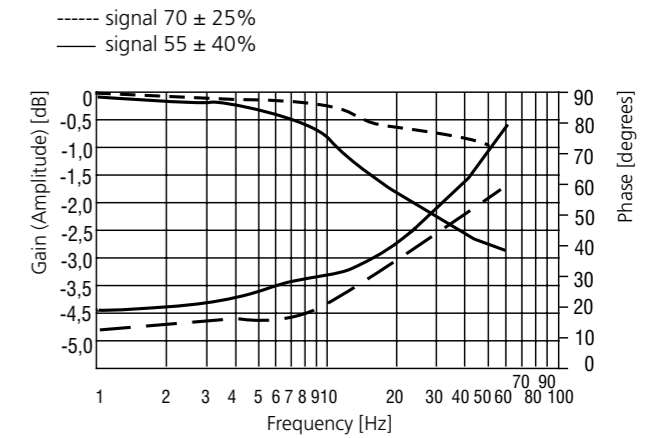
Reducing pressure range 0 - 25 bar (0 - 363 PSI), input 30 bar (435 PSI)
various control currents
measured without mesh screen



1	2	3	4	5	6	7	8
24%	35%	47%	59%	70%	82%	94%	100%

Frequency response characteristics

Inlet pressure at port P - 30 bar (435 PSI), flow = 0 lpm (GPM)

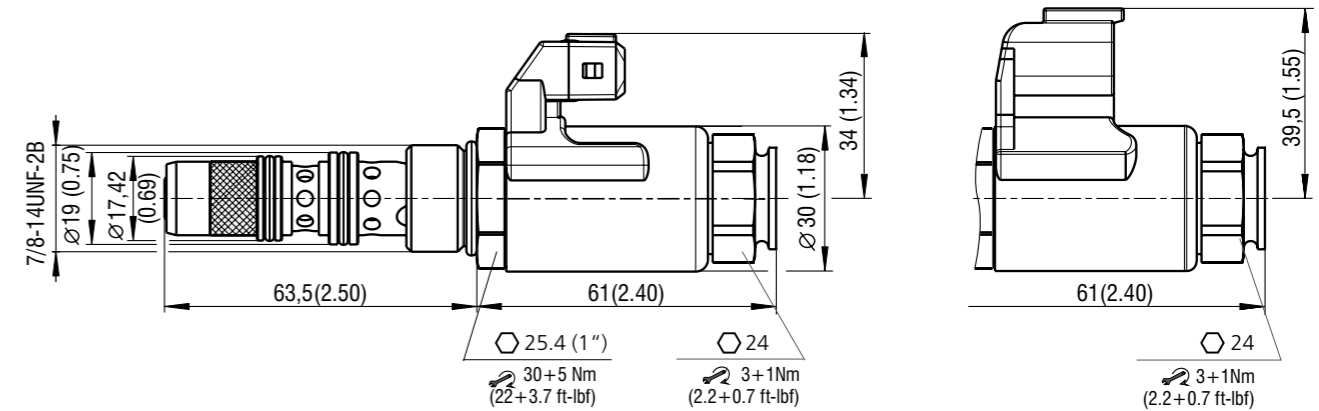


Dimensions in millimeters (inches)

Connector type

E3A, E4A - IP67
AMP Junior Timer

E12A, E13A - IP67 / IP69K
Deutsch DT04-2P



Ordering Code

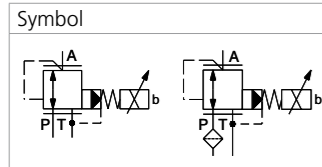
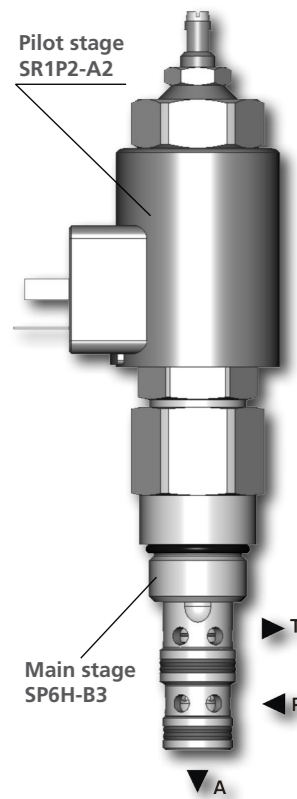
SP4P1-B4 / [] - [] [] [] [] [] []

- Proportional pressure control valve, reducing - relieving, pilot operated, screw-in style**
- Valve cavity**
7/8-14 UNF
- Max. reducing pressure**
20 bar (290 PSI) → 20
25 bar (363 PSI) → 25
- Supply voltage / max. current**
12 V DC / 0.7 A → 12
24 V DC / 0.35 A → 24
- Mesh screen**
No designation → SP-300
Mesh screen without mesh screen port P, 300 microns
- Surface treatment**
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
No designation → V
NBR
FPM (Viton)
- Connector type**
AMP Junior Timer - axial direction (2 pins; male)
E3A with quenching diode
Deutsch DT04-2P - axial direction
E12A with quenching diode

Proportional Pressure Control Valve, Reducing - Relieving, Pilot Operated

SP4P2-B3

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Increasing pressure output proportional with increasing DC current input
- Low hysteresis, accurate pressure control and low pressure drop
- Wide pressure range up to 350 bar
- The valve manual override allows the setting of a relief pressure when power supply is lost
- High flow capacity
- Solenoid electrical terminal acc. to EN 175301-803-A, AMP Junior Timer, or Deutsch DT04-2P
- 12 or 24 V DC coils
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot-operated proportional pressure reducing valve in the form of a screw-in cartridge. The valve is designed for continuous regulation of pressure in the consumer port. The complete valve consists of a pilot stage valve SR1P2-A2 and a main stage with connection 7/8-14 UNF. Due to its 3-way design the valve is capable to relief the secondary pressure to the tank port. To set the minimum cracking pressure use the adjusting screw (s=5) which incorporates also an air bleed screw. Back pressure on port T becomes additive to the pressure setting of the valve. Air bleeding is necessary for the correct function of the valve.

Installation: When possible, the valve should be mounted below the reservoir oil level. This will maintain oil in the actuator, preventing instability caused by air in the system. If this is not possible, mount the valve for best results vertically downward coil and ensure proper air bleeding.

Technical Data

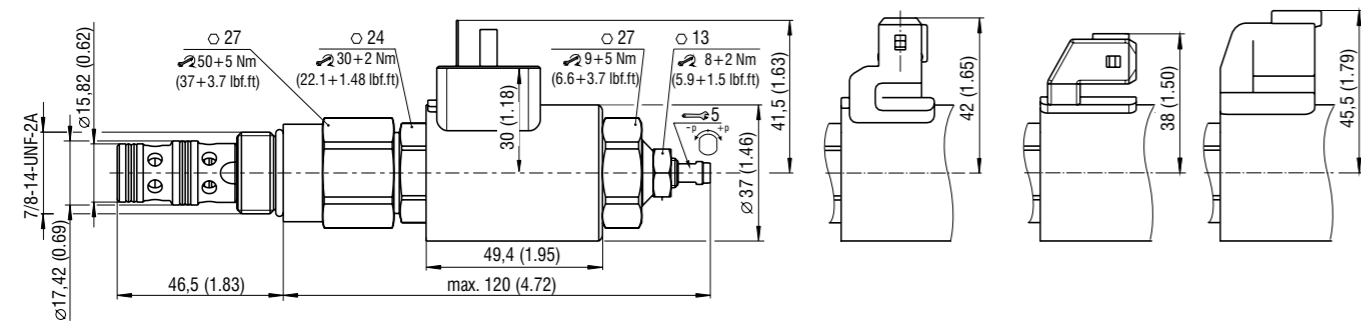
Valve size / Cartridge cavity		7/8-14 UNF-2A / B3	
Max. operating pressure (port P)	bar (PSI)	350 (5080)	
Max. reduced pressure (port A)	bar (PSI)	100 (1450)	
Max. flow rate P-A	l/min (GPM)	60 (15.9)	
Fluid temperature range (FPM)	°C (°F)	-20 ... 120 (-4 ... 248)	
Ambient temperature range	°C (°F)	-20 ... 80 (-4 ... 176)	
Min. setting pressure	bar (PSI)	6 (87) for 0 l/min (0 GPM)	
Hysteresis	%	< 5	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1	0.6
Rated resistance at 20 °C (68 °F)	Ω	6.5±5 %	20.6±5 %
Duty cycle	%	100	
Optimal PWM frequency	Hz	250	
Quenching diode		BZW06-19B	BZW06-33B
Enclosure type acc. to EN 60529**		(acc. to terminal type) IP65 / IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.6 (1.32)	
Data Sheet	Type		
General information			
GI_0060	Products and operating conditions		
Coil types	C_8007	C19B*	
Valve bodies	In-line mounted SB_0018	SB-B3*	
Cavity details / Form tools	SMT_0019	SMT-B3*	
Spare parts	SP_8010		

**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

Connector type

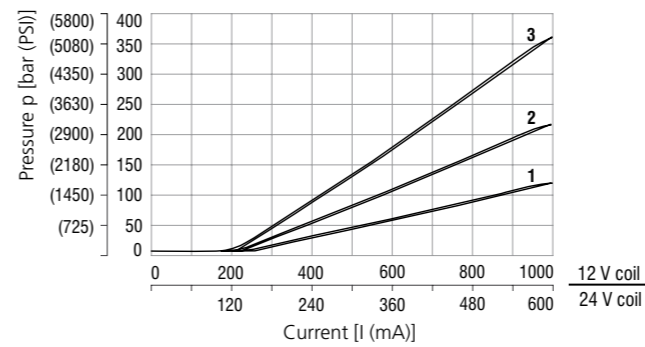
- | | | | |
|-----------------|------------------------------|-----------------------------|---------------------------|
| E1, E2 - IP65 | E3, E4 - IP67 | E3A, E4A - IP67 | E12A, E13A - IP67 / IP69K |
| EN 175301-803-A | AMP Junior
Timer - radial | AMP Junior
Timer - axial | Deutsch DT04-2P |



Characteristics measured at v = 32 mm²/s (156 SUS)

Reduced pressure related to control signal

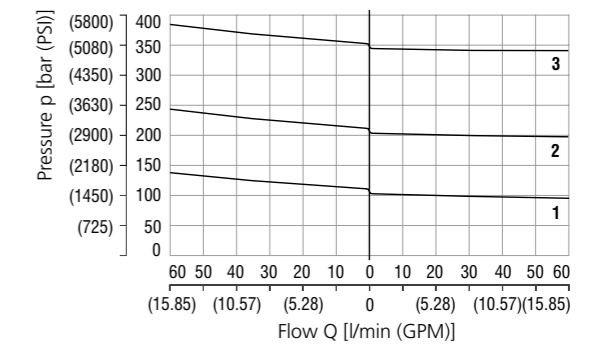
Q = 0 l/min (0 GPM), pressure in port T = 0 bar, PWM 160 Hz



Pressure range	12	21	35
	1	2	3

Reducing - relieving pressure related to flow rate

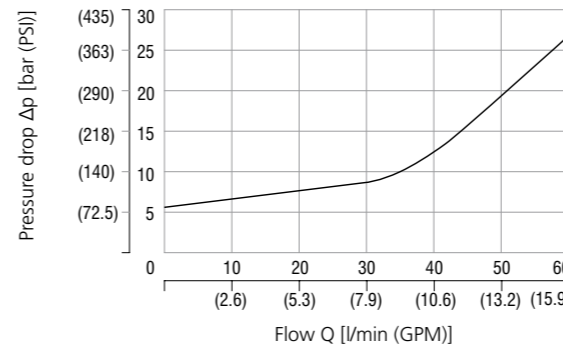
relieving function A-T / reducing function P-A



Pressure range	12	21	35
	1	2	3

Pressure drop related to flow rate

0% of control current, A-T direction



Ordering Code

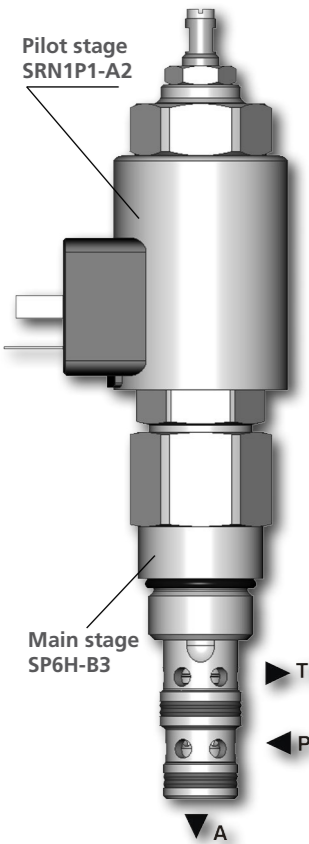
SP4P2 - B3 / H [] - [] - [] - []

- Proportional pressure control valve, reducing - relieving, pilot operated**
- Valve cavity**
7/8-14 UNF
- Model**
High performance
- Max. reduced pressure**
up to 120 bar (1740 PSI) **12**
up to 210 bar (3046 PSI) **21**
up to 350 bar (5076 PSI) **35**
- Supply voltage / max. current**
12 V DC / 1.0 A **12**
24 V DC / 0.6 A **24**
- Main stage ordering key:** SP6H-B3/HV
- Surface treatment**
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
V NBR
FPM (Viton)
- Connector**
EN 175301-803-A
E1 with quenching diode
E2 AMP Junior Timer - radial direction (2 pins; male)
E3 with quenching diode
E3A AMP Junior Timer - axial direction (2 pins; male)
E4 with quenching diode
E4A E3A with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode
- For other solenoid terminals see data sheet No. 8007

Proportional Pressure Control Valve, Reducing - Relieving, Pilot Operated, Inverted

SPN4P1-B3

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Decreasing pressure output proportional with increasing DC current input
- Low hysteresis, accurate pressure control and low pressure drop
- Wide pressure range up to 350 bar
- Mechanical adjustment of minimum cracking pressure
- High flow capacity
- Solenoid electrical terminal acc. to EN 175301-803-A, AMP Junior Timer, Deutsch DT04-2P
- 12 or 24 V DC coils
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot-operated proportional pressure reducing valve in the form of a screw-in cartridge. The valve is designed for continuous regulation of pressure in the consumer port. The complete valve consists of a pilot stage valve SRN1P1-A2 and a main stage with connection 7/8-14 UNF. Due to its 3-way design the valve is capable to relief the secondary pressure to the tank port. To set the minimum cracking pressure use the adjusting screw (s=5) which incorporates also an air bleed screw. Back pressure on port T becomes additive to the pressure setting of the valve. Air bleeding is necessary for the correct function of the valve.

Installation: When possible, the valve should be mounted below the reservoir oil level. This will maintain oil in the actuator, preventing instability caused by air in the system. If this is not possible, mount the valve for best results vertically downward coil and ensure proper air bleeding.

Technical Data

Valve size / Cartridge cavity	7/8-14 UNF-2A / B3	
Max. operating pressure (port P)	bar (PSI)	350 (5080)
Max. operating pressure (port T)	bar (PSI)	100 (1450)
Max. flow	l/min (GPM)	60 (15.9)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Ambient temperature range	°C (°F)	-20 ... +80 (-4 ... 176)
Min. setting pressure	bar (PSI)	6 (87) for 0 l/min (0 GPM)
Hysteresis	%	< 5
Solenoid data		
Supply voltage	V	12 DC 24 DC
Max. current	A	1 0.6
Rated resistance at 20 °C (68 °F)	Ω	6.5±5 % 20.6±5 %
Duty cycle	%	100
Optimal PWM frequency	Hz	250
Quenching diode		BZW06-19B BZW06-33B
Enclosure type acc. to EN 60529**		(acc. to terminal type) IP65 / IP67 / IP69K
Mass with solenoid	kg (lbs)	0.6 (1.32)
Data Sheet		
General information	GI_0060	Type Products and operating conditions
Coil types	C_8007	C19B*
Valve bodies	In-line mounted SB_0018	SB-B3*
Cavity details / Form tools	SMT_0019	SMT-B3*
Spare Parts	SP_8010	

**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

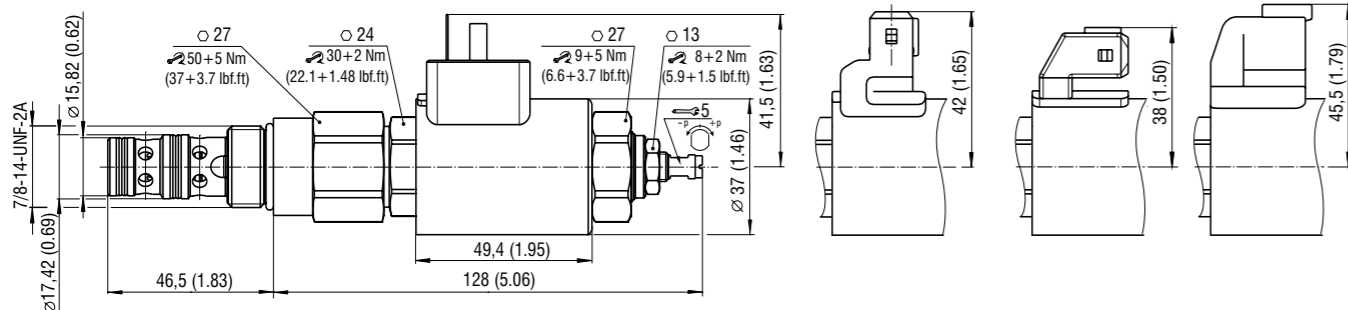
Connector type

E1, E2 - IP65
EN 175301-803-A

E3, E4 - IP67
AMP Junior Timer
- radial

E3A, E4A - IP67
AMP Junior Timer
- axial

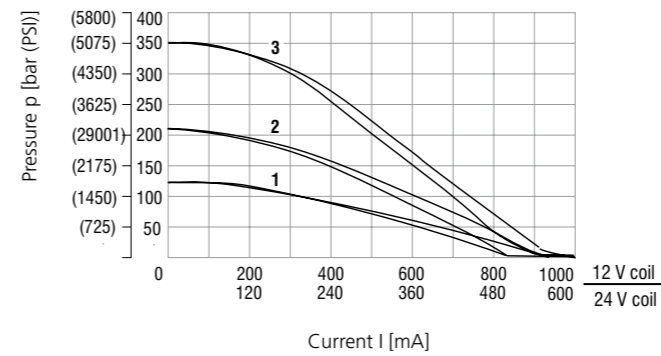
E12A, E13A
- IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm²/s (156 SUS)

Reduced pressure related to control signal

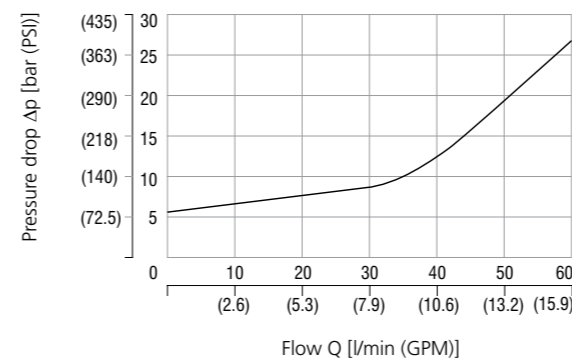
Q = 0 l/min (0 GPM), pressure in port T = 0 bar, PWM 160 Hz



Pressure range	12	21	35
	1	2	3

Pressure drop related to flow rate

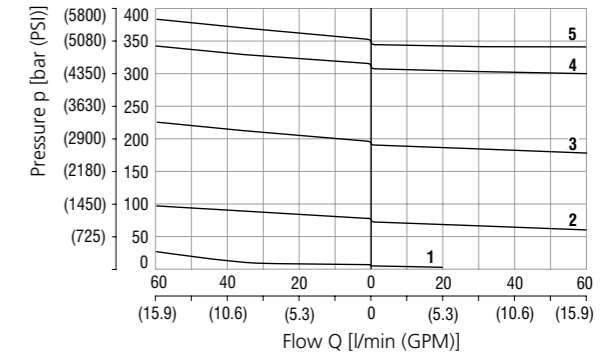
100% of control current, A-T direction



Reducing - relieving pressure related to flow rate

Pressure range 35, Input 400 bar, various control currents

relieving function A-T / reducing function P-A



Control current	1	2	3	4	5
	100%Imax	75%Imax	50%Imax	25%Imax	0%Imax

Ordering Code

SPN4P1 - B3 / H [] - [] - [] - []

Proportional pressure control valve,
reducing - relieving, pilot operated,
inverted

Valve cavity
7/8-14 UNF

Model
High performance

Max. reduced pressure
up to 120 bar (1740 PSI)
up to 210 bar (3046 PSI)
up to 350 bar (5076 PSI)

Supply voltage / max. current
12 V DC / 1.0 A
24 V DC / 0.6 A

Main stage ordering key: SP6H-B3/HV

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation
V NBR
FPM (Viton)

Connector
E1 EN 175301-803-A
E2 E1 with quenching diode
E3 AMP Junior Timer - radial direction (2 pins; male)
E4 E3 with quenching diode
E3A AMP Junior Timer - axial direction (2 pins; male)
E4A E3A with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode

For other solenoid terminals see data sheet No. 8007

2-Way Pressure Compensator, Spool-Type, Direct-Acting, Modular

TV2-042/M

Size 04 (D02) • Q_{max} 16 l/min (4 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- 2-Way pressure compensator, spool-type, direct-acting with subplate interface acc. to ISO 4401, DIN 24340 (CETOP 02)
- Modular design for vertical stacking assemblies with built-in load sensing shuttle valve
- Meter-in and meter-out flow control models with integrated by-pass check valves
- The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of pressure variations
- Excellent stability throughout the flow range, rapid response to dynamic pressure changes
- Quiet and modulate response to load changes
- Hardened precision parts
- High flow capacity
- In the standard version, the valve housing is phosphated and steel parts are zinc-coated

Functional Description

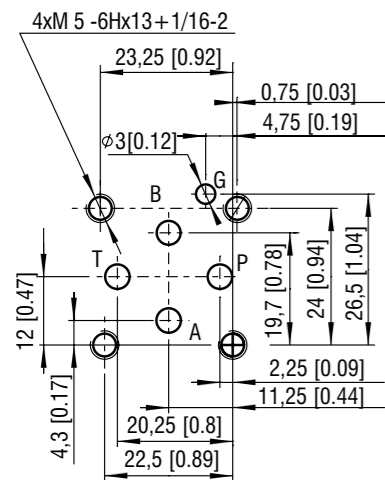
A normally open, direct-acting, spring loaded 2-way pressure compensator in the form of a sandwich plate. **2-Way compensators for meter-in applications (models A,B,C)**
The 2-way meter-in pressure compensators will maintain a constant pressure difference across the metering edge of the proportional directional valve. In this case, the pressure variations due to load changes as well as pump pressure changes are compensated. Any increase in pump pressure does not affect the flow. The meter-in compensators may only be used with positive load direction. They are designated for load compensation in inlet port P.
2-Way compensators for meter-out applications (models D,E,F)
In systems with changing load directions or negative load, the use of meter-out pressure compensators is required. With respect to the application, a valve with a pressure compensator installed in one or in both actuator ports are available. The pressure compensator is always mounted between the actuator and the proportional directional valve. The valve will maintain the pressure difference between A and T or B and T constant. The flow rate and the flow direction are adjusted by the proportional directional valve. To enable free reverse flow, two by-pass check valves are incorporated into the valve body.

Technical Data

Valve size		04 (D02)
Max. operating pressure	bar (PSI)	320 (4640)
Max. flow	l/min (GPM)	16 (4.2)
Control pressure differential	bar (PSI)	10 (145)
Fluid temperature range (NBR)	°C (°F)	-30 +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 +120 (-4 ... +248)
Mass (all models)	kg (lbs)	0.6 (1.32)

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 04
Spare parts	SP_8010	

ISO 4401-02-01-0-05

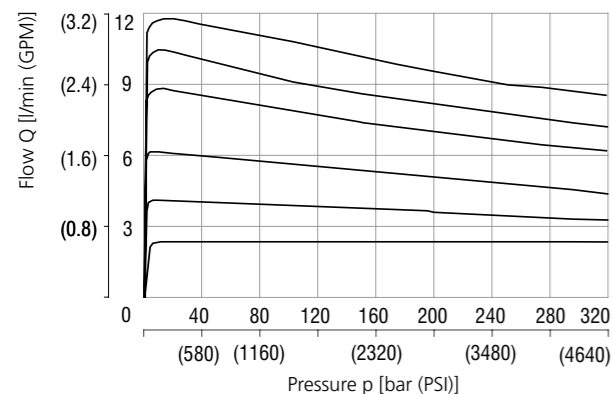


Ports P, A, B, T - max. Ø4.5 mm (0.18 in)

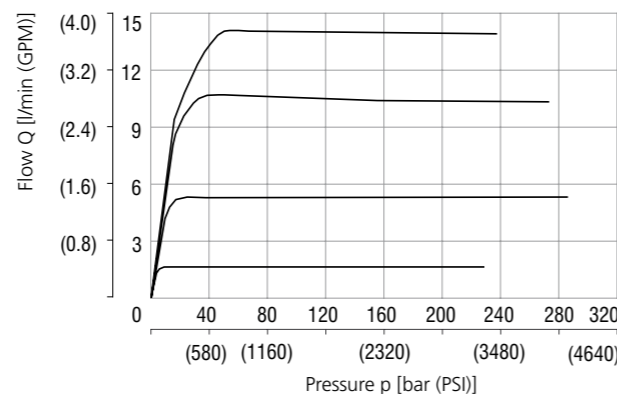
Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

TV2-042/MC Meter-in compensator



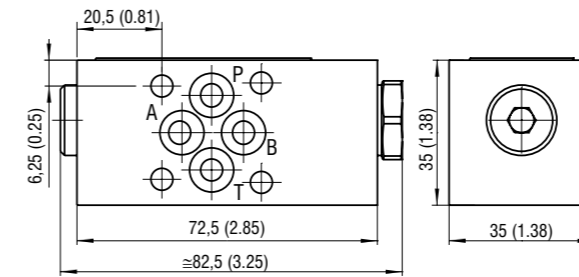
TV2-042/MD Meter-out compensator



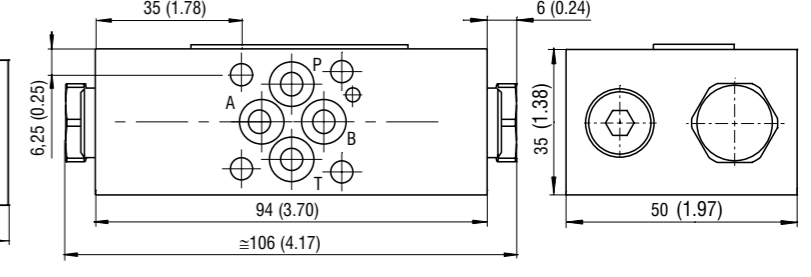
The characteristic of the pressure compensator corresponds to the flow rate of a PRM2-043Z11/12 proportional directional valve. If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

Dimensions in millimeters (inches)

TV2-042/MA (B, C) Meter-in compensator

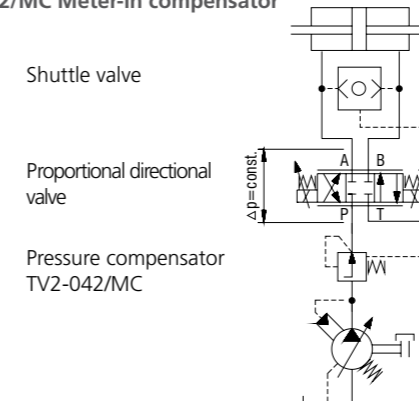


TV2-042/MD (E, F) Meter-out compensator

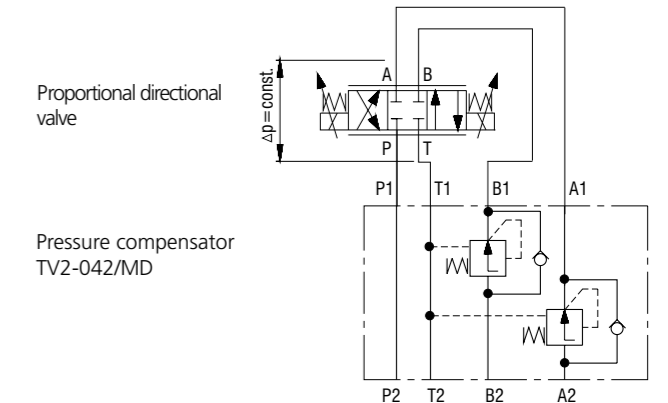


Application Example

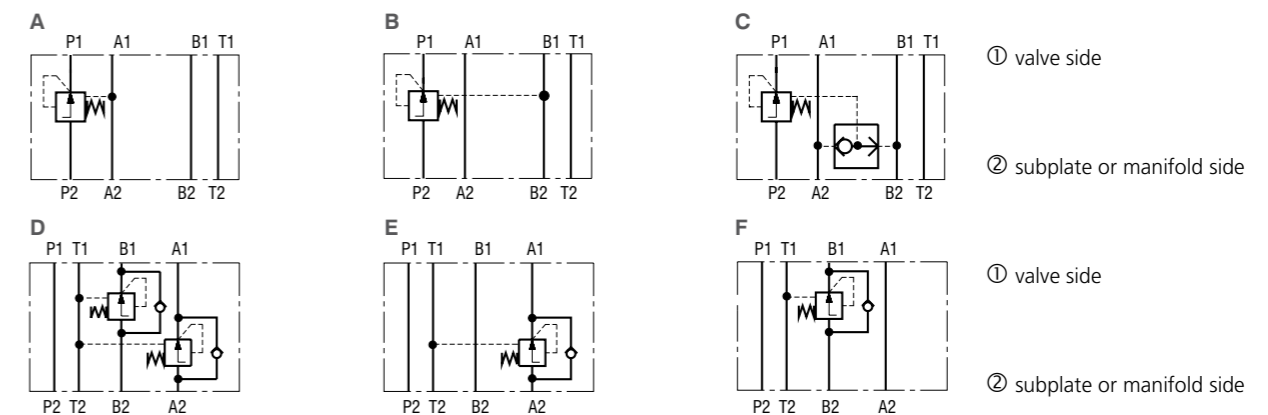
TV2-042/MC Meter-in compensator



TV2-042/MD Meter-out compensator



Functional Symbols



Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

TV2-042/M **1** **C** **-**

2-Way pressure compensator, spool-type, direct-acting, modular

Nominal size
ISO 4401-02-01-0-05,
DIN 24340 (CETOP 02), NG04

2-way pressure compensator

Sandwich plate

Model
Meter-in compensator in port A
Meter-in compensator in port B
Meter-in compensator in port A and B
Meter-out compensator in port A and B
Meter-out compensator in port A
Meter-out compensator in port B

Surface treatment
No designation housing phosphated, steel parts
zinc-coated (ZnCr-3), ISO 9227 (240 h)
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR
V FPM (Viton)

Adjustment option
fixed setting, not adjustable

Control pressure differential
10 bar (145 PSI)

2-Way Pressure Compensator, Spool-Type, Direct-Acting, Modular

TV2-062/M

Size 06 (D03) • Q_{max} 35 l/min (9 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- 2-Way pressure compensator, spool-type, direct-acting with subplate interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- Modular design for vertical stacking assemblies with built-in load sensing shuttle valve
- Meter-in and meter-out flow control models with integrated by-pass check valves
- The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of the pressure variations
- Excellent stability throughout the flow range, rapid response to dynamic pressure changes
- Quiet and modulate response to load changes
- Hardened precision parts
- Load sensing port from mounting pattern side option
- High flow capacity
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

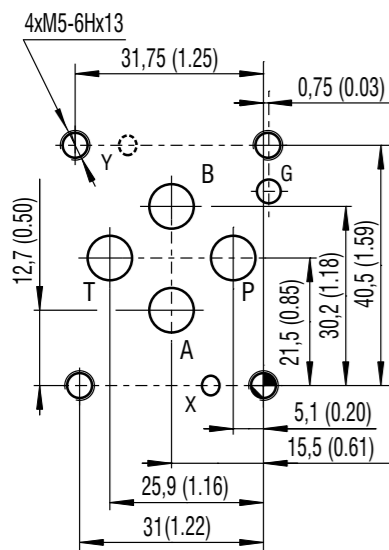
A normally open, direct-acting, spring loaded 2-way pressure compensator in the form of a sandwich plate. **2-Way compensators for meter-in applications (models A,B,C, CX)**
The 2-way meter-in pressure compensators will maintain a constant pressure difference across the metering edge of the proportional directional valve. In this case, the pressure variations due to load changes, as well as pump pressure changes are compensated. Any increase in pump pressure does not affect the flow. The meter-in compensators may only be used with positive load direction. They are designated for load compensation in inlet port P.
2-Way compensators for meter-out applications (models D,E,F)
In systems with changing load directions or negative load, the use of meter-out pressure compensators is required. With respect to the application, a valve with a pressure compensator installed in one or in both actuator ports are available. The pressure compensator is always mounted between the actuator and the proportional directional valve. The valve will maintain the pressure difference between A and T or B and T constant. The flow rate and the flow direction are adjusted by the proportional directional valve. To enable free reverse flow, two by-pass check valves are incorporated into the valve body.

Technical Data

Valve size		06 (D03)
Max. operating pressure	bar (PSI)	350 (5080)
Max. flow	l/min (GPM)	35 (9.2)
Control pressure differential	bar (PSI)	10 (145)
Fluid temperature range (NBR)	°C (°F)	-30 +100 (-22 +212)
Fluid temperature range (FPM)	°C (°F)	-20 +120 (-4 +248)
Mass (all models)	kg (lbs)	1.0 (2.20)

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 06
Spare parts	SP_8010	

ISO 4401-03-02-0-05

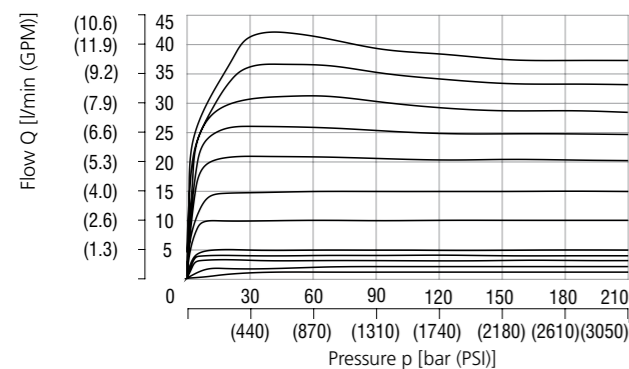


Ports P, A, B, T max. Ø7.5 mm (0.29)

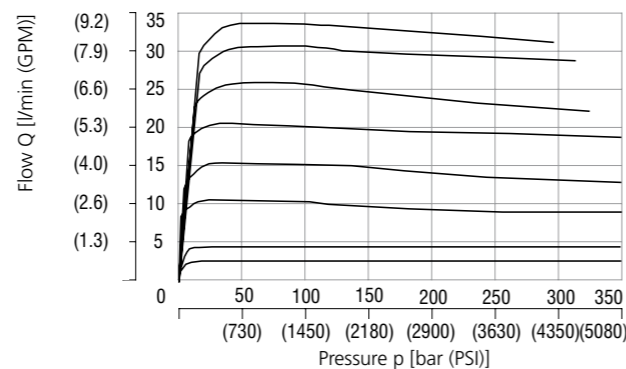
Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

TV2-062/MC Meter-in compensator



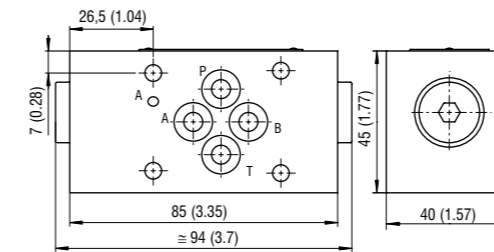
TV2-062/MD Meter-out compensator



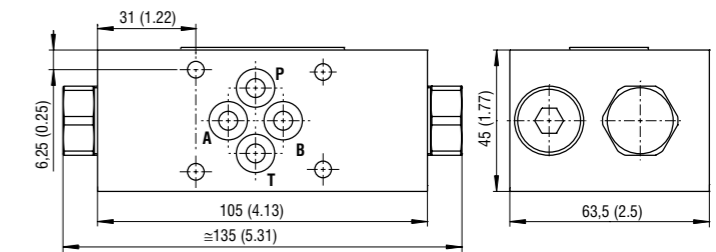
The characteristic of the pressure compensator corresponds to the flow rate of a PRM2-063Z11/30 proportional directional valve. If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

Dimensions in millimeters (inches)

TV2-062/MA (B, C, CX) Meter-in compensator

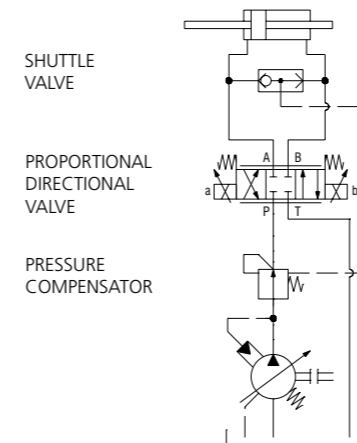


TV2-062/MD (E, F) Meter-out compensator

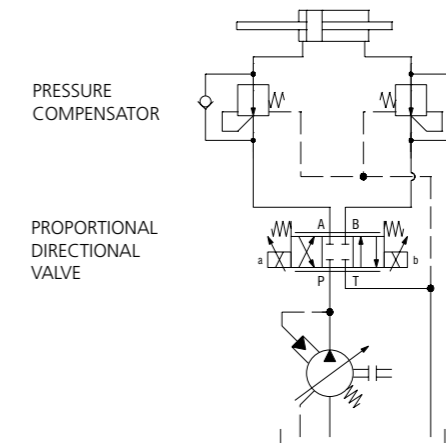


Application Example

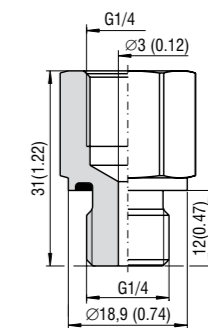
Meter-in compensator



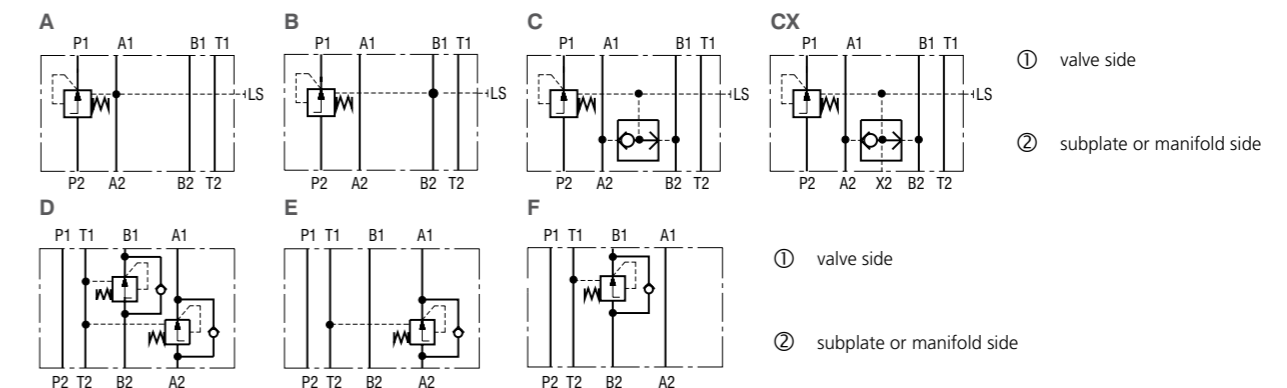
Meter-out compensator



Adapter G1/4/G1/4-ED
addition of equipment for external LS connection
Ordering number: 28004900



Functional Symbols



Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

TV2-062/M **1** **C** **-**

2-Way pressure compensator, spool-type, direct-acting, modular

Nominal size
ISO 4401-03-02-0-05, DIN 24340 (CETOP 03), NG 06

2-Way pressure compensator

Sandwich plate

Model
Meter-in compensator in port A: A
Meter-in compensator in port B: B
Meter-in compensator in port A and B: C
Meter-in compensator in port A and B with LS pattern port: CX
Meter-out compensator in port A and B: D
Meter-out compensator in port A: E
Meter-out compensator in port B: F

Surface treatment
No designation: housing phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A: zinc-coated (ZnCr-3), ISO 9227 (240 h)
B: zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation: NBR
V: FPM (Viton)

Adjustment option
fixed setting, not adjustable

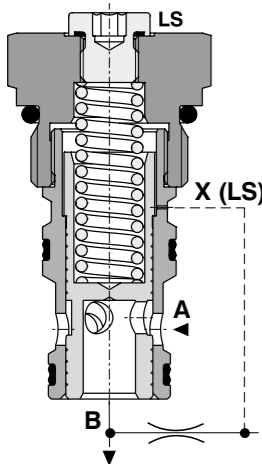
Control pressure differential
10 bar (145 PSI)

2-Way Pressure Compensator, Spool-Type, Direct-Acting

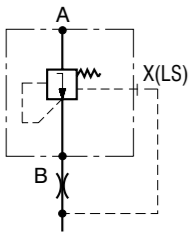
TV2-102/S

M27x2 • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)

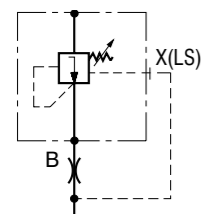
TV2-102/S*C



TV2-102/S*C



TV2-102/S*S(RP)



Technical Features

- The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of the pressure variations
- Excellent stability throughout the flow range, rapid response to dynamic pressure changes
- Spring setting of the variable adjustment compensator can be varied from 4 to 14 bar (58 to 203 PSI)
- Quiet and modulate response to load changes
- Integrated stroke limiter for reliable operation
- Adjustable by allen key or hand knob, or delivered with fix setting
- Hardened precision parts
- High flow capacity
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A normally open, direct-acting, spring loaded pressure compensator in the form of a screw-in cartridge. The outlet of the controlled directional or proportional flow valve can be connected back to the pressure compensator port X as a load sensing signal. Typically, 2-way pressure compensators are used in serial connection with a flow restrictor valve to control raising or lowering a variable load at the same velocity. The pressure compensator valve then keeps a nearly constant pressure difference between its pressure inlet and the pressure at the output port of the regulated flow valve. When the pressure differential exceeds the pre-set value, the pressure compensator closes and restricts the flow to the flow valve. If there is no flow demand from the consumer, the compensator remains open.

Technical Data

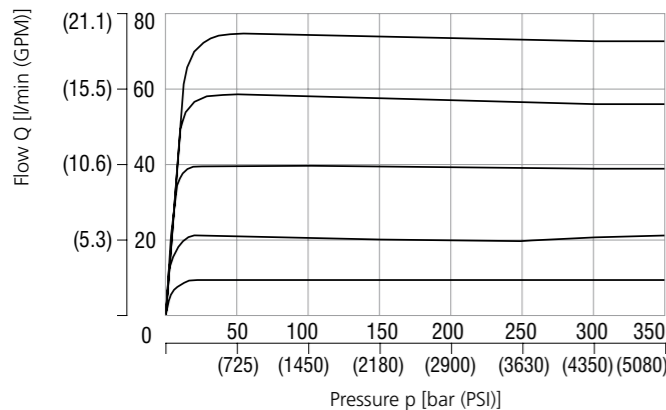
Valve size / Cartridge cavity	M27x2 / QM3	
Max. operating pressure	bar (PSI)	350 (5080)
Max. flow	l/min (GPM)	80 (21.1)
Control pressure differential	bar (PSI)	4... 14 (58...203)
Fluid temperature range (NBR)	°C (°F)	-30.... +100 (-22... +212)
Fluid temperature range (FPM)	°C (°F)	-20.... +120 (-4... +248)
Mass	kg (lbs)	0.15 (0.3)

		Data Sheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	Sandwich mounted	SB-04(06)_0028	SB-*QM3*
Cavity details		SMT_0019	SMT-QM3*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

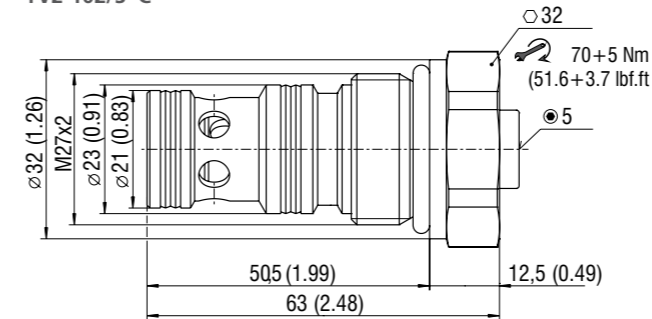
The characteristic of the pressure compensator corresponds to the flow rate of a PRM2-103Z11/60 proportional directional valve.



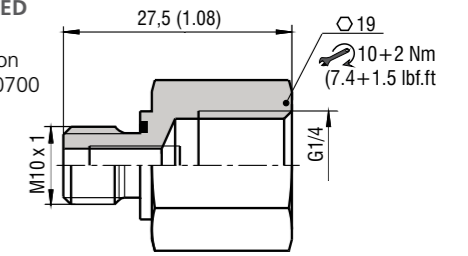
If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

Dimensions in millimeters (inches)

TV2-102/S*C

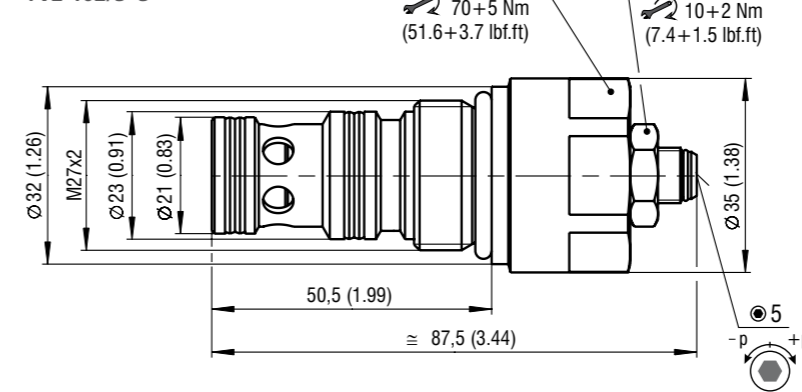


Adapter M10x1/G1/4-ED
addition of equipment
for external LS connection
Ordering number: 19860700

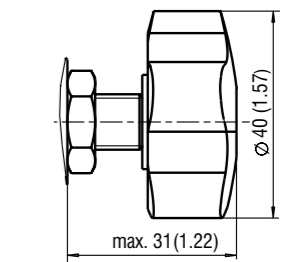


Applicable only for „TV*C“ versions. (Fixed setting, not adjustable)

TV2-102/S*S

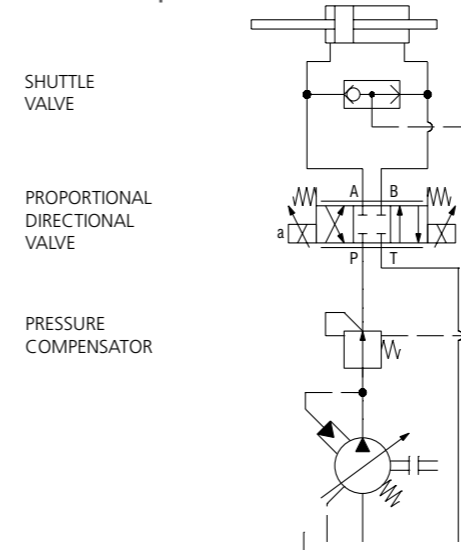


TV2-102/S*RP

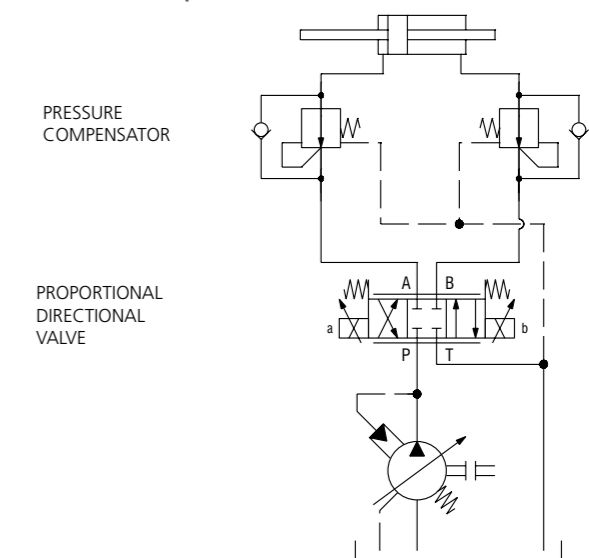


Application Example

Meter-in compensator



Meter-out compensator



Ordering Code

TV2-102/S [] [] [] [] [] [] []

2-Way pressure compensator, spool-type, direct-acting	[]
Nominal size M27x2 / QM3	[]
2-way pressure compensator	[]
Cartridge design	[]
Control pressure differential	[]
4 - 12 bar (58 - 174 PSI), 10 bar (145 PSI) "C" Model	1
10 - 14 bar (145 - 203 PSI), 14 bar (203 PSI) "C" Model	2
Surface treatment	[]
A zinc-coated (ZnCr-3), ISO 9227 (240 h)	[]
B zinc-coated (ZnNi), ISO 9227 (520 h)	[]
Seals	[]
NBR	[]
FPM (Viton)	[]
Adjustment option	[]
fixed setting, not adjustable	[]
allen key (hex. 5), without protective cap	[]
hand knob, plastic	[]
No designation V	[]

2-Way Pressure Compensator, Spool-Type, Direct-Acting, Modular

TV2-102/M

Size 10 (D05) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- > 2-Way pressure compensator, spool-type, direct-acting with subplate interface acc. to ISO 4401, DIN 24340 (CETOP 05)
- > Modular design for vertical stacking assemblies with built-in load sensing shuttle valve
- > Meter-in flow control models with load sensing from optional consumer ports
- > The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- > Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of the pressure variations
- > Excellent stability throughout the flow range, rapid response to dynamic pressure changes
- > Adjustable by allen key or hand knob, or delivered with fix setting
- > Quiet and modulate response to load changes
- > Hardened precision parts
- > High flow capacity
- > In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A normally open, direct-acting, spring loaded 2-way pressure compensator in the form of a sandwich plate. They consist of a body, a 2-way screw-in cartridge compensator TV2-102/S and a load shuttle valve.

2-Way compensators for meter-in applications (models A,B,C)
The 2-way meter-in pressure compensators will maintain a constant pressure difference across the metering edge of the proportional directional valve. In this case, the pressure variations due to load changes, as well as pump pressure changes are compensated. Any increase in pump pressure does not affect the flow. The meter-in compensators may only be used with positive load direction. They are designated for load compensation in inlet port P.

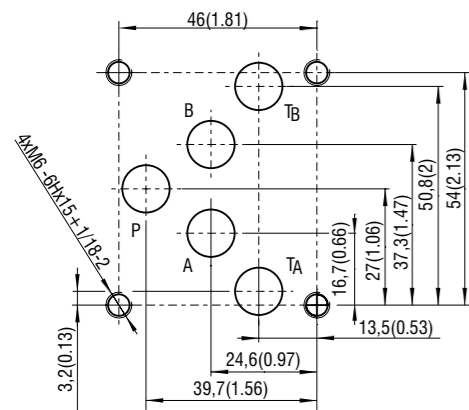
2-Way compensators for meter-out applications (models D,E,F)
In systems with changing load directions or negative load, the use of meter-out pressure compensators is required. With respect to the application, a valve with pressure compensator installed in one or in both actuator ports are available. The pressure compensator is always mounted between the actuator and the proportional directional valve. The valve will maintain the pressure difference between A and T or B and T constant. The flow rate and the flow direction are adjusted by the proportional directional valve. To enable free reverse flow, two by-pass check valves are incorporated into the valve body.

Technical Data

Valve size		10 (D05)
Max. operating pressure	bar (PSI)	350 (5100)
Max. flow	l/min (GPM)	80 (21.1)
Control pressure differential	bar (PSI)	4... 14 (58...203)
Fluid temperature range (NBR)	°C (°F)	-30... +100 (-22... +212)
Fluid temperature range (FPM)	°C (°F)	-20... +120 (-4... +248)
Mass (Models A, B, C / D, E, F)	kg (lbs)	3.7 (8.2) / 6.65 (14.7)

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 10
Spare parts	SP_8010	

ISO 4401-05-04-0-05

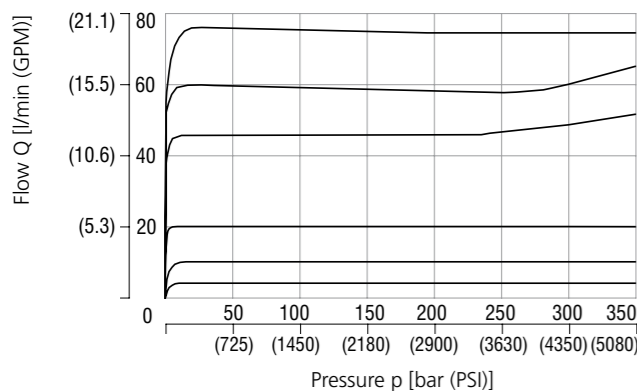


Ports P, A, B, T - max. Ø11.2 mm (0.44 in)

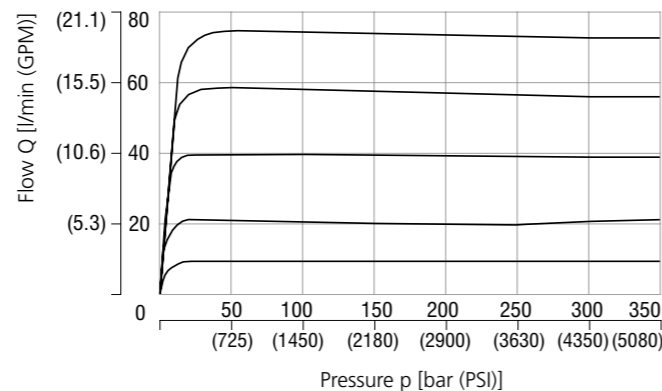
Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

TV2-102/MC Meter-in compensator



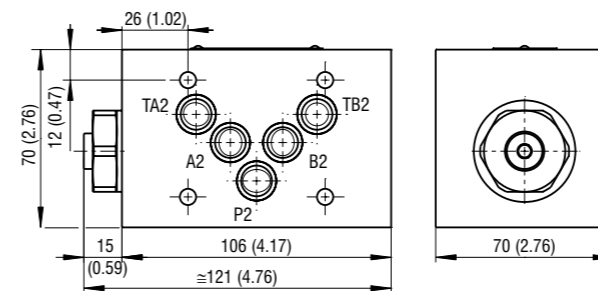
TV2-102/MD Meter-out compensator



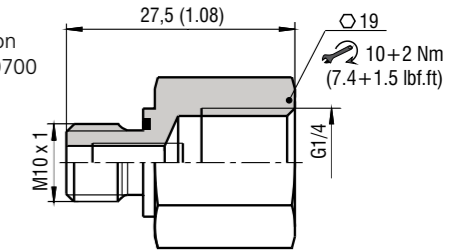
The characteristic of the pressure compensator corresponds to the flow rate of a PRM2-103Z11/60 proportional directional valve. If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

Dimensions in millimeters (inches)

TV2-102/MC**C* Meter-in compensator

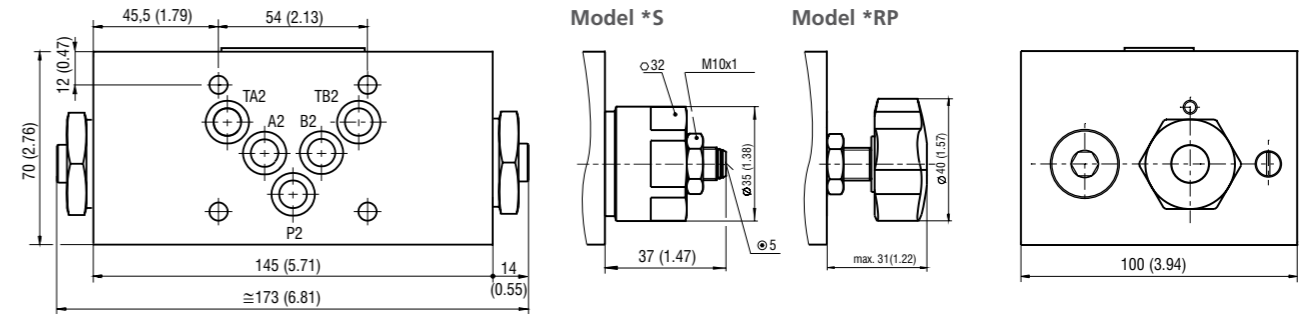


Adapter M10x1/G1/4-ED
addition of equipment for external LS connection
Ordering number: 19860700



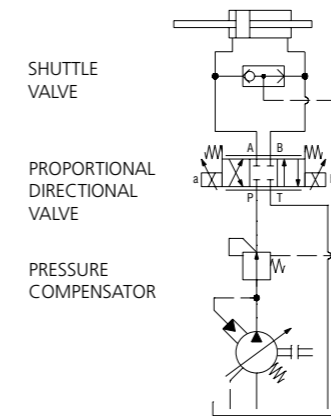
Applicable only for „TV**C*“ versions. (Fixed setting, not adjustable)

TV2-102/MD**C* Meter-out compensator

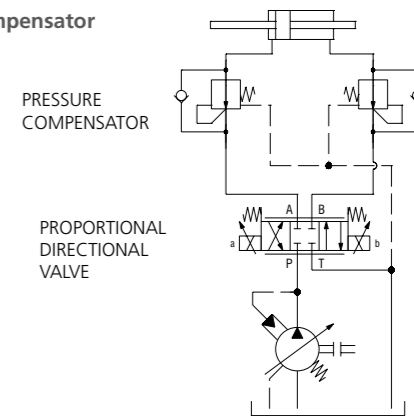


Application Example

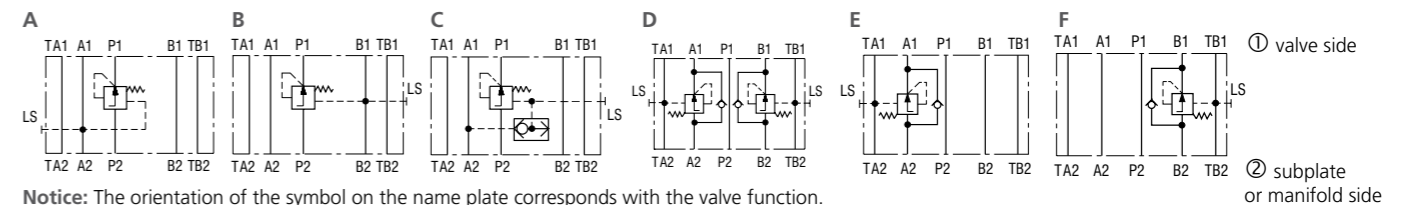
Meter-in compensator



Meter-out compensator



Functional Symbols



Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

2-Way pressure compensator, spool-type, direct-acting, modular	TV2-102/M								
Sandwich plate									
Model									
Meter-in compensator in channel A									A
Meter-in compensator in channel B									B
Meter-in compensator in channel A and B									C
Meter-out compensator in channel A and B									D
Meter-out compensator in channel A									E
Meter-out compensator in channel B									F
Control pressure differential									
4 - 12 bar (58 - 174 PSI), 10 bar (145 PSI) "C" Model									1
10 - 14 bar (145 - 203 PSI), 14 bar (203 PSI) "C" Model									2
Surface treatment									
No designation									housing phosphated, steel parts
A									zinc-coated (ZnCr-3), ISO 9227 (240 h)
B									zinc-coated (ZnNi), ISO 9227 (520 h)
Seals									
No designation									NBR
V									FPM (Viton)
Adjustment option									
No designation									fixed setting, non adjustable
S									allen key (hex. 5), without protective cap
RP									hand knob, plastic

3-Way Pressure Compensator, Spool-Type, Direct-Acting

TV2-063/S

M20x1.5 • Q_{max} 40 l/min (11 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features

- › The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- › Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of pressure variations
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Spring setting of the variable adjustment compensator can be varied from 5 to 40 bar (72.5 to 580 PSI)
- › Quiet and modulate response to load changes
- › Hardened precision parts
- › High flow capacity
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

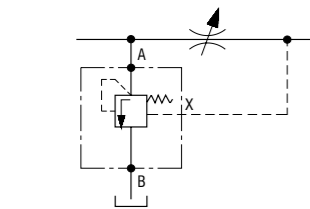
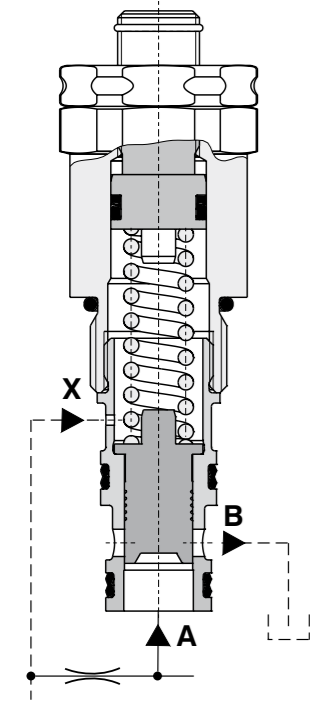
Functional Description

A normally closed, direct-acting, spring loaded pressure compensator valve in the form of a screw-in cartridge. From the outlet of the controlled directional or proportional flow valve a load sensing signal is taken to the spring chamber of the pressure compensator port X. Typically, 3-way pressure compensators are used as meter-in regulators in parallel with flow restrictor valves when raising or lowering variable loads at the same velocity is required. The pressure compensator valve then keeps the pressure difference between its pressure inlet and the pressure at the output port of the regulated flow valve nearly constant. When the pressure differential exceeds the pre-set value, the pressure compensator opens and releases excessive flow from the main circuit to port B. If there is no flow demand from the consumer, the compensator allows the oil to flow back to tank and therefore vents the whole system. This prevents the hydraulic system from overheating especially in load sensing circuits with a fixed displacement pump.

Technical Data

Valve size / Cartridge cavity		M20x1.5 / QE3
Max. operating pressure	bar (PSI)	350 (5080)
Max. flow	l/min (GPM)	40 (10.6)
Control pressure differential	bar (PSI)	5 ... 40 (72.5 ... 580)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	kg (lbs)	0.15 (0.3)

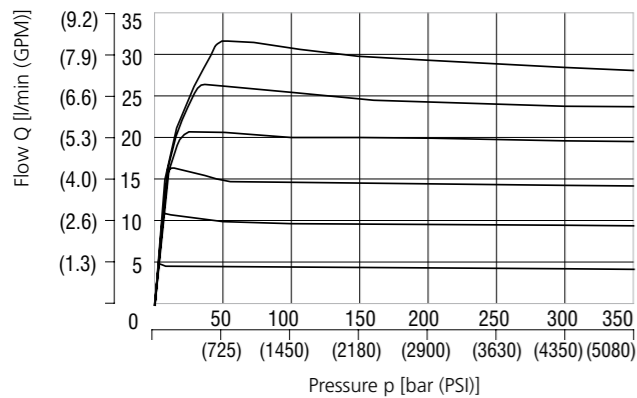
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	Sandwich mounted SB-04(06)_0028	SB-*QE3*
Cavity details	SMT_0019	SMT-QE3*
Spare parts	SP_8010	



Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

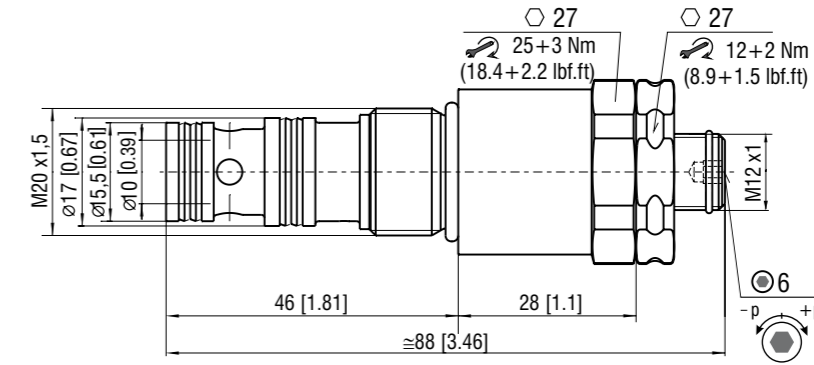
The characteristic of the pressure compensator corresponds with the flow rate of a PRM2-043Z11/12 and PRM2-063Z11/30 proportional directional valve.



If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

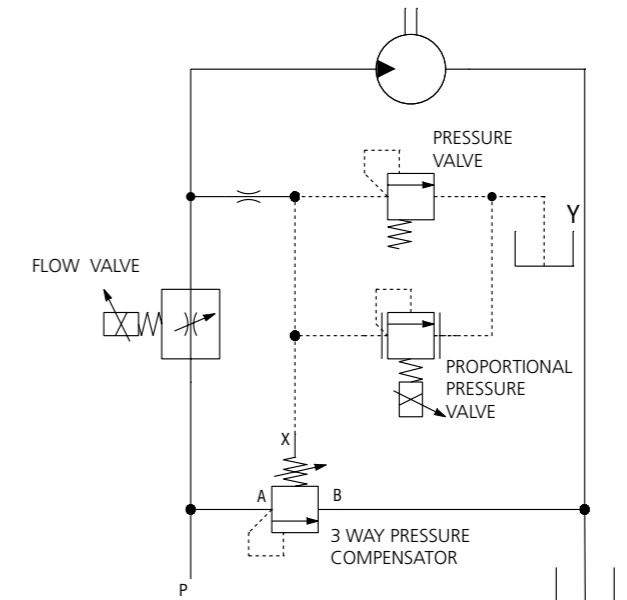
Dimensions in millimeters (inches)

TV2-063/S



Application Example

Meter-in compensator



Ordering Code

TV2-063/S [] [] [] - []

- 3-Way pressure compensator, spool-type, direct-acting**
- Nominal size**
M20x1.5 / QE3
- 3-Way pressure compensator**
- Cartridge design**
- Pressure range**
5 - 40 bar (72.5 - 580 PSI)
- Surface treatment**
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
NBR
FPM (Viton)
- Adjustment option**
allen key (hex. 6), without protective cap
- No designation**
V

3-Way Pressure Compensator, Spool-Type, Direct-Acting, Modular

TV2-043/M

Size 04 (D02) • Q_{max} 20 l/min (4 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- › 3-Way pressure compensator, spool-type, direct-acting with subplate interface acc. to ISO 4401, DIN 24340 (CETOP 02)
- › Modular design for vertical stacking assemblies with built-in load sensing shuttle valve
- › Meter-in flow control models with load sensing from optional consumer ports
- › The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- › Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of pressure variations
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Spring setting of the variable adjustment compensator can be varied from 5 to 40 bar (72.5 to 580 PSI)
- › Quiet and modulate response to load changes
- › Hardened precision parts
- › High flow capacity
- › Adjustable by allen key
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

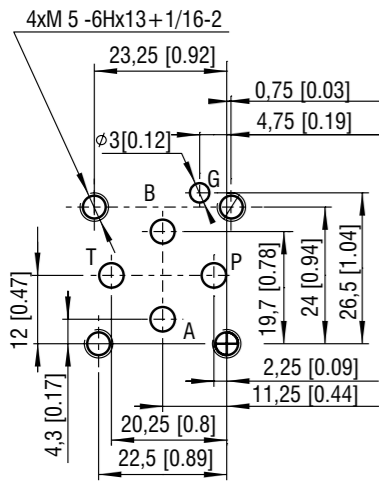
A normally closed, direct-acting, spring loaded 3-way pressure compensator valve in the form of sandwich plate. It consists of a body, a 3-way screw-in cartridge compensator TV2-043/S and a load shuttle valve. Ports A and B are always connected through the load shuttle valve with the spring chamber of the pressure compensator cartridge valve. Typically, 3-way pressure compensators are used as meter-in regulators in parallel with flow restrictor valves when raising or lowering variable loads at the same velocity is required. The pressure compensator valve then keeps the pressure difference between its pressure inlet and the pressure at the output port of the regulated flow valve nearly constant. When the pressure differential exceeds the pre-set value, the pressure compensator opens and releases excessive flow from the main circuit to port B. If there is no flow demand from the consumer, the compensator allows the oil to flow back to tank and therefore vents the whole system. This prevents the hydraulic system from overheating especially in load sensing circuits with a fixed displacement pump.

Technical Data

Valve size		04 (D02)
Max. operating pressure	bar (PSI)	320 (4640)
Max. flow	l/min (GPM)	20 (4.2)
Control pressure differential	bar (PSI)	5... 40 (72.5... 580)
Fluid temperature range (NBR)	°C (°F)	-30... +100 (-22... +212)
Fluid temperature range (FPM)	°C (°F)	-20... +120 (-4... +248)
Mass (All models)	kg (lbs)	0.6 (1.32)

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 04
Spare parts	SP_8010	

ISO 4401-02-01-0-05

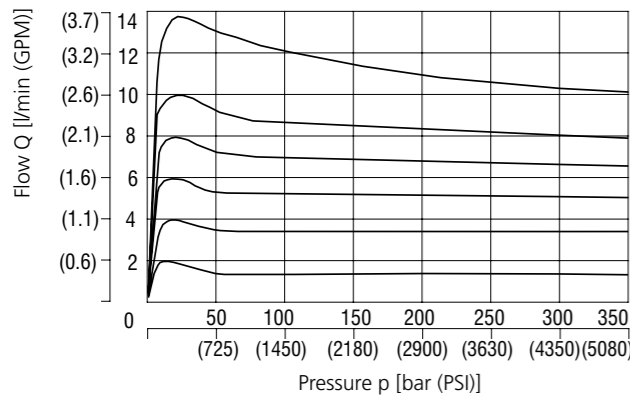


Ports P, A, B, T - max. Ø4.5 mm (0.18 in)

Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

TV2-043/MC Meter-in compensator

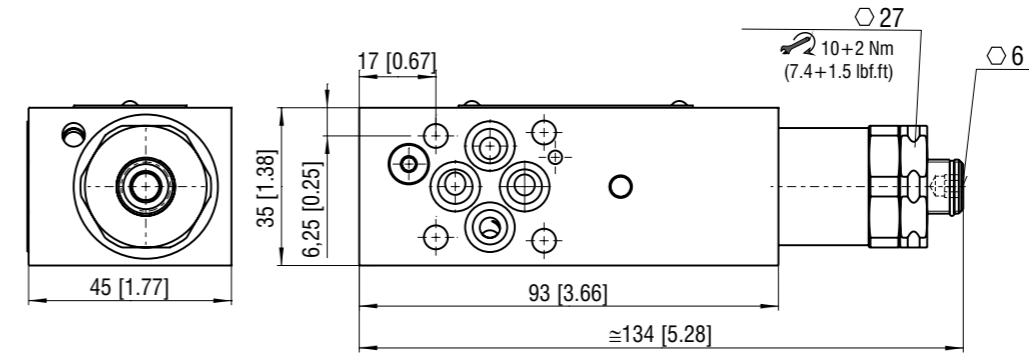


The characteristic of the pressure compensator corresponds to the flow rate of a PRM2-043Z11/12 proportional directional valve.

If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

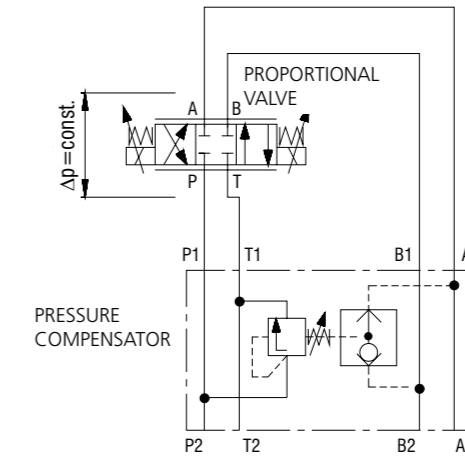
Dimensions in millimeters (inches)

TV2-043/MA (B, C) - Meter-in compensator

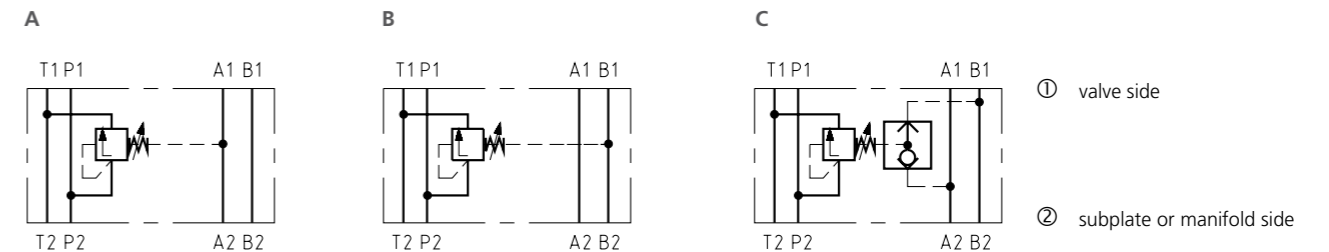


Application Example

Meter-in compensator



Functional Symbols



Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

TV2-043/M [] [] [] [] - []

3-Way pressure compensator, spool-type, direct-acting, modular

Nominal size
ISO 4401-02-01-0-05,
DIN 24340 (CETOP 02), NG 04

3-Way pressure compensator

Sandwich plate

Model
Meter-in compensator in port A A
Meter-in compensator in port B B
Meter-in compensator in port A and B C

Control pressure differential
5 - 40 bar (72.5 - 580 PSI) 4

Surface treatment
No designation housing phosphated, steel parts
zinc-coated (ZnCr-3), ISO 9227 (240 h)
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation
V NBR
FPM (Viton)

Adjustment option
allen head (hex.6), without protective cap S

3-Way Pressure Compensator, Spool-Type, Direct-Acting, Modular

TV2-063/M

Size 06 (D03) • Q_{max} 40 l/min (11 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- › 3-Way pressure compensator, spool-type, direct-acting with subplate interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- › Modular design for vertical stacking assemblies with built-in load sensing shuttle valve
- › Meter-in flow control models with load sensing from optional consumer ports
- › The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- › Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of pressure variations
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Spring setting of the variable adjustment compensator can be varied from 5 to 40 bar (72.5 to 580 PSI)
- › Quiet and modulate response to load changes
- › Hardened precision parts
- › High flow capacity
- › Adjustable by allen key
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

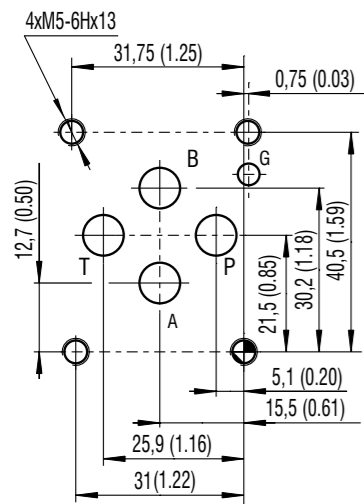
A normally closed, direct-acting, spring loaded 3-way pressure compensator valve in the form of a sandwich plate. It consists of a body, a 3-way screw-in cartridge compensator TV2-063/S and a load shuttle valve. Ports A and B are always connected through the load shuttle valve with the spring chamber of the pressure compensator cartridge valve. Typically, 3-way pressure compensators are used as meter-in regulators in parallel with flow restrictor valves when raising or lowering variable loads at the same velocity is required. The pressure compensator valve then keeps the pressure difference between its pressure inlet and the pressure at the output port of the regulated flow valve nearly constant. When the pressure differential exceeds the pre-set value, the pressure compensator opens and releases excessive flow from the main circuit to port B. If there is no flow demand from the consumer, the compensator allows the oil to flow back to tank and therefore vents the whole system. This prevents the hydraulic system from overheating especially in load sensing circuits with a fixed displacement pump.

Technical Data

Valve size		06 (D03)
Max. operating pressure	bar (PSI)	320 (4640)
Max. flow	l/min (GPM)	40 (10.6)
Control pressure differential	bar (PSI)	5 ... 40 (72.5 ... 580)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass (Model A, B, C)	kg (lbs)	1.0 (2.20)

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 06
Spare parts	SP_8010	

ISO 4401-03-02-0-05

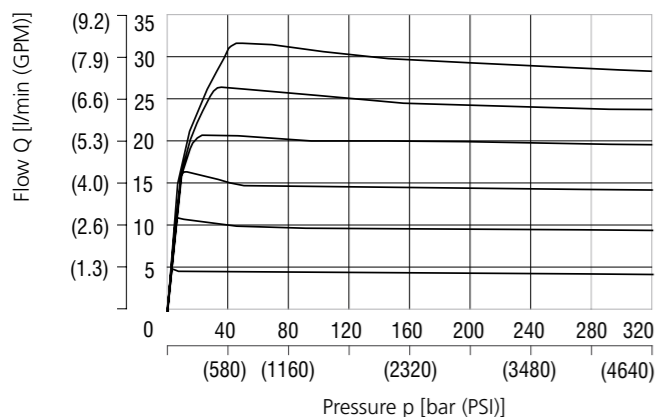


Ports P, A, B, T max. Ø 7.5 mm (0.29 in)

Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

TV2-063/MC Meter-in compensator

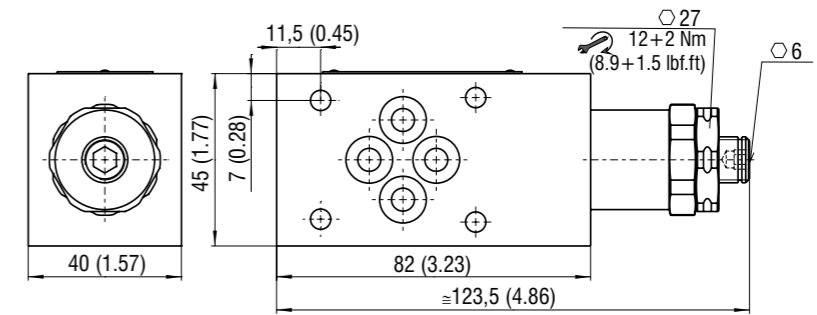


The characteristic of the pressure compensator corresponds to the flow rate of a PRM2-063Z1 1/30 proportional directional valve.

If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

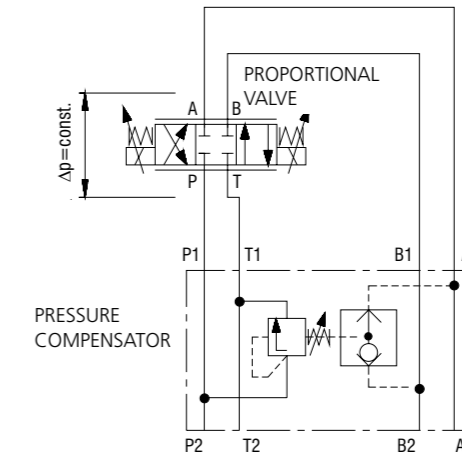
Dimensions in millimeters (inches)

TV2-063/MA (B, C) - Meter-in compensator

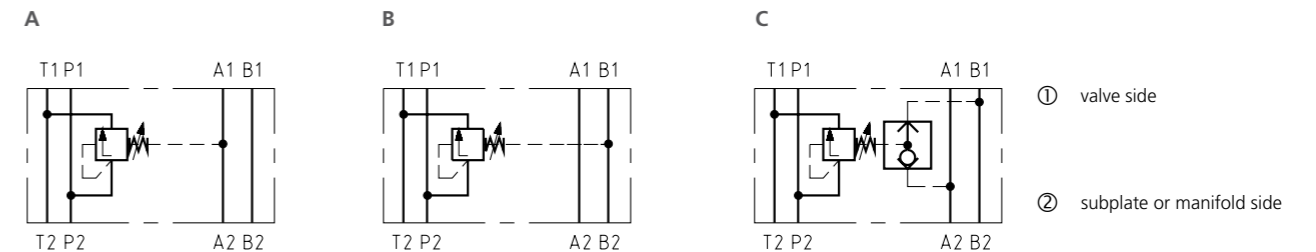


Application Example

Meter-in compensator

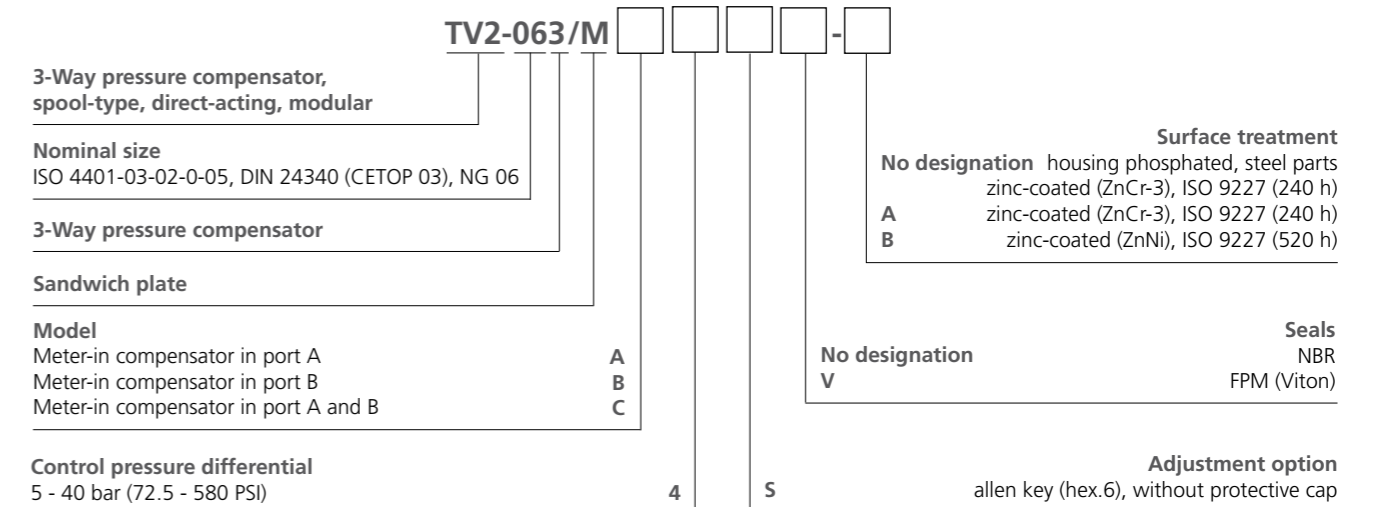


Functional Symbols



Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

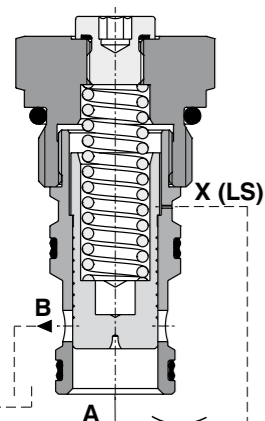


3-Way Pressure Compensator, Spool-Type, Direct-Acting

TV2-103/S

M27x2 • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)

TV2-103/S*C



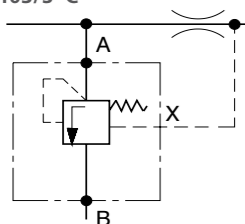
Technical Features

- ▶ The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- ▶ Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of pressure variations
- ▶ Excellent stability throughout flow range with rapid response to dynamic pressure changes
- ▶ Spring setting of the variable adjustment compensator can be varied from 4 to 14 bar (58 to 203 PSI)
- ▶ Quiet and modulate response to load changes
- ▶ Integrated stroke limiter for reliable operation
- ▶ Adjustable by allen key or hand knob, or delivered with fix setting
- ▶ Hardened precision parts
- ▶ High flow capacity
- ▶ In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

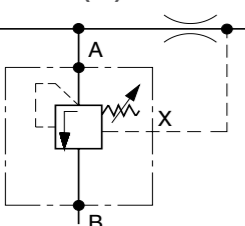
Functional Description

A normally closed, direct-acting, spring loaded pressure compensator valve in the form of a screw-in cartridge. From the outlet of the controlled directional or proportional flow valve a load sensing signal is taken to the spring chamber of the pressure compensator port X. Typically, 3-way pressure compensators are used as meter-in regulators in parallel with flow restrictor valves when raising or lowering variable loads at the same velocity is required. The pressure compensator valve then keeps the pressure difference between its pressure inlet and the pressure at the output port of the regulated flow valve nearly constant. When the pressure differential exceeds the pre-set value, the pressure compensator opens and releases excessive flow from the main circuit to port B. If there is no flow demand from the consumer, the compensator allows the oil to flow back to tank and therefore vents the whole system. This prevents the hydraulic system from overheating especially in load sensing circuits with a fixed displacement pump.

TV2-103/S*C



TV2-103/S*S (RP)



Technical Data

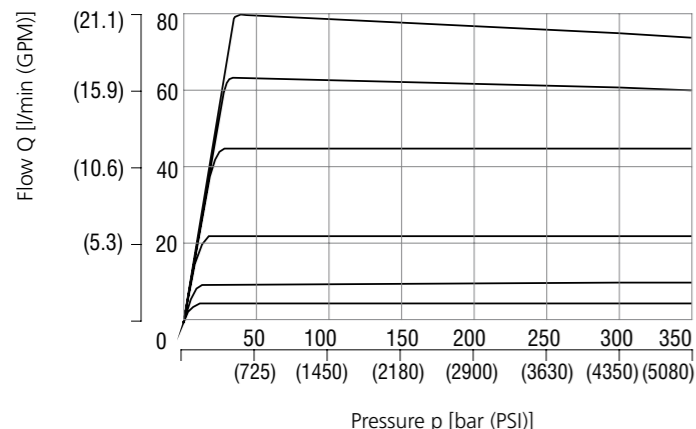
Valve size / Cartridge cavity		M27x2 / QM3
Max. operating pressure	bar (PSI)	350 (5080)
Max. flow	l/min (GPM)	80 (21.1)
Control pressure differential	bar (PSI)	4... 14 (58... 203)
Fluid temperature range (NBR)	°C (°F)	-30... +100 (-22... +212)
Fluid temperature range (FPM)	°C (°F)	-20... +120 (-4... +248)
Mass	kg (lbs)	0.15 (0.3)

		Data Sheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	Sandwich mounted	SB-04(06)_0028	SB-*QM3*
Cavity details		SMT_0019	SMT-QM3*
Spare parts		SP_8010	

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Regulated flow related to input pressure

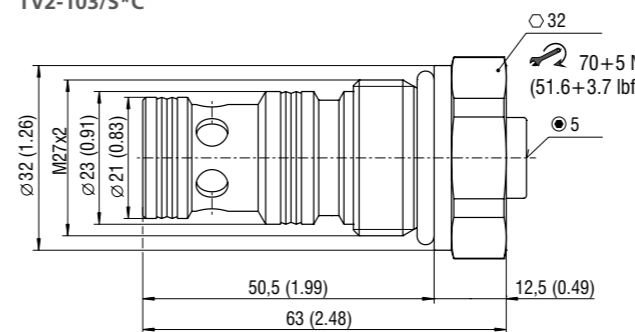
The characteristic of the pressure compensator corresponds with the flow rate of a PRM2-103Z11/60 proportional directional valve.



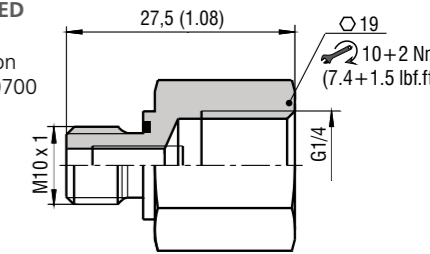
If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

Dimensions in millimeters (inches)

TV2-103/S*C

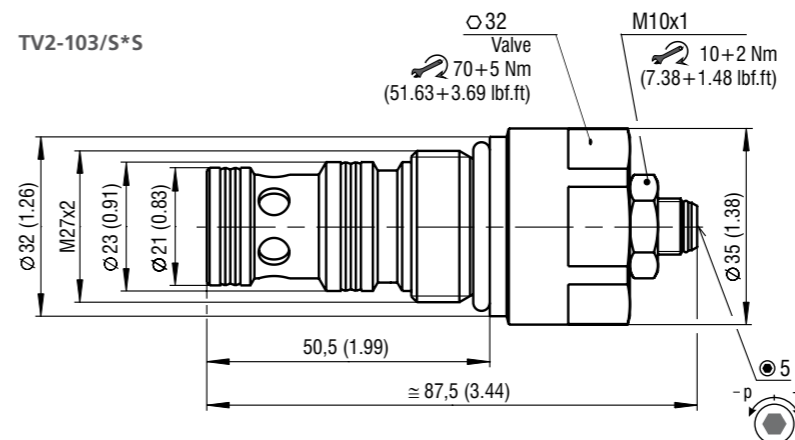


Adapter M10x1/G1/4-ED
addition of equipment
for external LS connection
Ordering number: 19860700

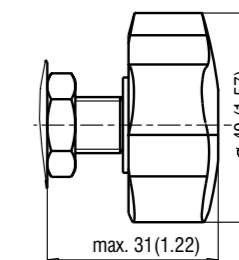


Applicable only for „TV*C“ versions. (Fixed setting, not adjustable)

TV2-103/S*S

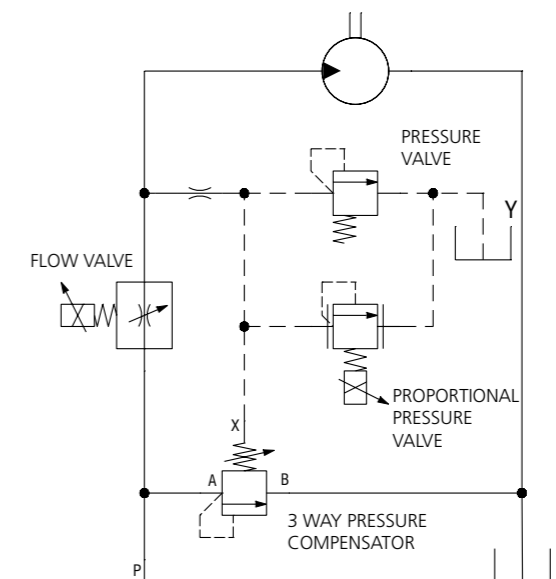


TV2-103/S*RP



Application Example

Meter-in compensator



Ordering Code

TV2-103/S					
3-Way pressure compensator, spool-type, direct-acting					
Nominal size M27x2 / QM3					
3-Way pressure compensator					
Cartridge design					
Pressure range					
4 - 12 bar (58 - 174 PSI), 10 bar (145 PSI) "C" Model	1				
10 - 14 bar (145 - 203 PSI), 14 bar (203 PSI) "C" Model	2				
				Surface treatment	
				A zinc-coated (ZnCr-3), ISO 9227 (240 h)	
				B zinc-coated (ZnNi), ISO 9227 (520 h)	
				Seals	
				NBR	
				V FPM (Viton)	
				Adjustment option	
				fixed setting, not adjustable	
				allen key (hex. 5), without protective cap	
				hand knob, plastic	

3-Way Pressure Compensator, Spool-Type, Direct-Acting, Modular

TV2-103/M

Size 10 (D05) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

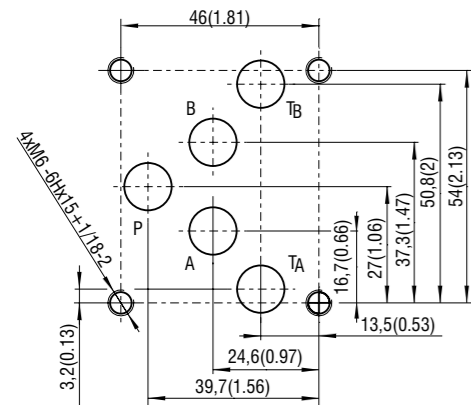
- > 3-Way pressure compensator, spool-type, direct-acting with subplate interface acc. to ISO 4401, DIN 24340 (CETOP 05)
- > Modular design for vertical stacking assemblies with built-in load sensing shuttle valve
- > Meter-in flow control models with load sensing from optional consumer ports
- > The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- > Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of pressure variations
- > Excellent stability throughout flow range with rapid response to dynamic pressure changes
- > Adjustable by allen key or hand knob, or delivered with fix setting
- > Quiet and modulate response to load changes
- > Hardened precision parts
- > High flow capacity
- > In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A normally closed, direct-acting, spring loaded 3-way pressure compensator valve in the form of a sandwich plate. It consists of a body, a 3-way screw-in cartridge compensator TV2-103/S and a load shuttle valve. Ports A and B are always connected through the load shuttle valve with the spring chamber of the pressure compensator cartridge valve.

Typically, 3-way pressure compensators are used as meter-in regulators in parallel with flow restrictor valves when raising or lowering variable loads at the same velocity is required. The pressure compensator valve than keeps the pressure difference between its pressure inlet and the pressure at the output port of the regulated flow valve nearly constant. When the pressure differential exceeds the pre-set value, the pressure compensator opens and releases excessive flow from the main circuit to port B. If there is no flow demand from the consumer, the compensator allows the oil to flow back to tank and therefore vents the whole system. This prevents the hydraulic system from overheating especially in load sensing circuits with a fixed displacement pump.

ISO 4401-05-04-0-05



Ports P, A, B, T - max. Ø11.2 mm (0.44 in)

Technical Data

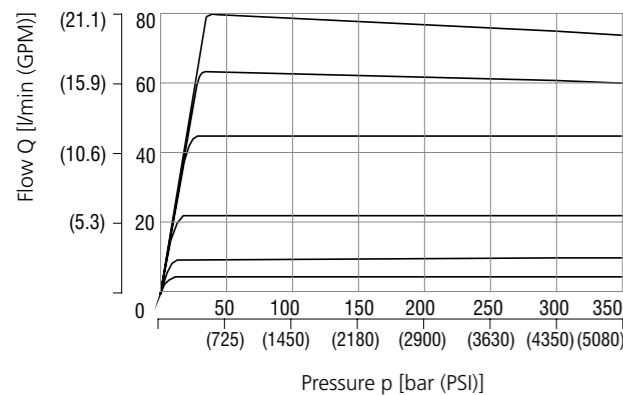
Valve size	10 (D05)	
Max. operating pressure	bar (PSI)	350 (5100)
Max. flow	l/min (GPM)	80 (21.1)
Control pressure differential	bar (PSI)	4... 14 (58...203)
Fluid temperature range (NBR)	°C (°F)	-30... +100 (-22... +212)
Fluid temperature range (FPM)	°C (°F)	-20... +120 (-4... +248)
Mass (all models)	kg (lbs)	1.0 (2.2)

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 10
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

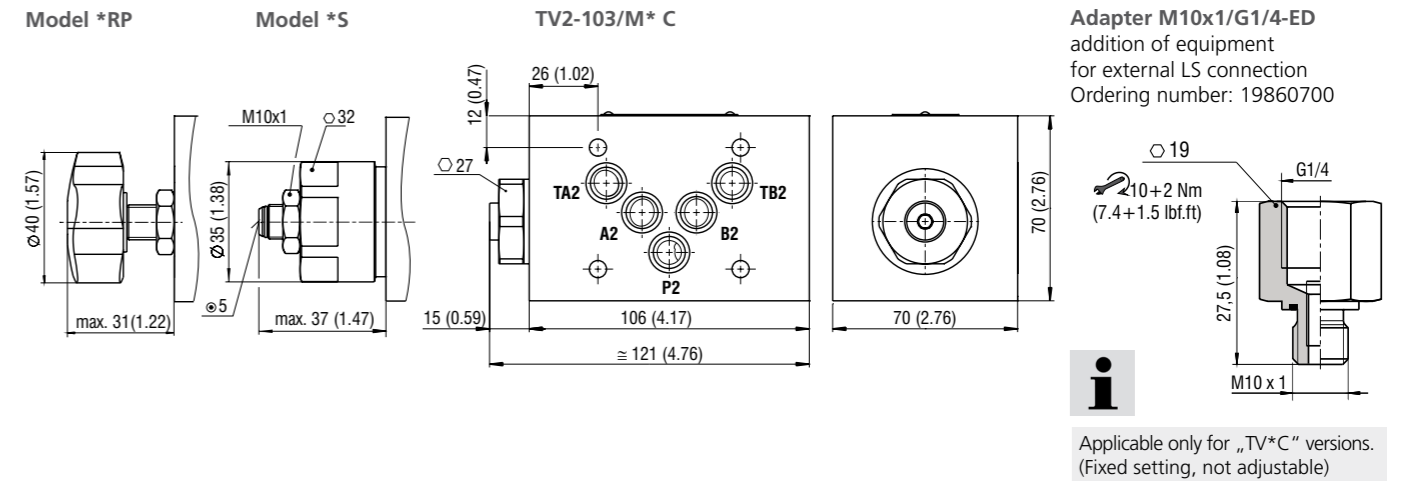
TV2-103/MC Meter-in compensator



The characteristic of the pressure compensator corresponds to the flow rate of a PRM2-103Z11/60 proportional directional valve.

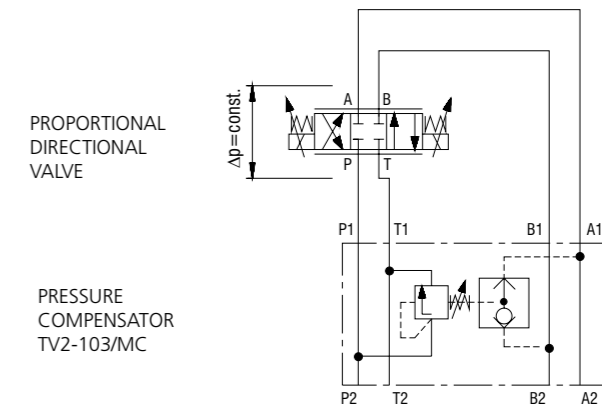
If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

Dimensions in millimeters (inches)

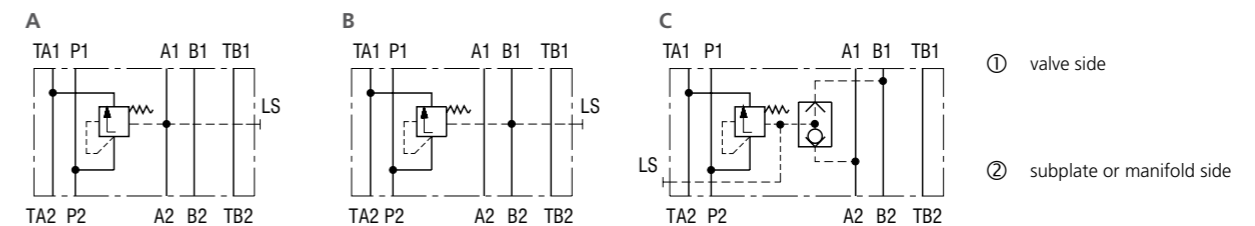


Application Example

Meter-in compensator



Functional Symbols



Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

TV2-103 / M						
3-Way pressure compensator, spool-type, direct-acting, modular						
Sandwich plate						
Model						
Meter-in compensator in channel A					A	
Meter-in compensator in channel B					B	
Meter-in compensator in channel A and B					C	
Control pressure differential						
4 - 12 bar (58 - 174 PSI), 10 bar (145 PSI) "C" Model					1	
10 - 14 bar (145 - 203 PSI), 14 bar (203 PSI) "C" Model					2	
Surface treatment						
No designation						housing phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A						zinc-coated (ZnCr-3), ISO 9227 (240 h)
B						zinc-coated (ZnNi), ISO 9227 (520 h)
Seals						
No designation						NBR
V						FPM (Viton)
Adjustment option						
No designation						fixed setting, not adjustable
C						allen key (hex. 5), without protective cap
S						hand knob, plastic
RP						