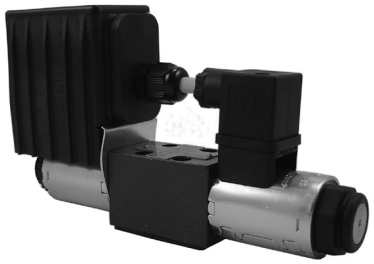
PRM2-04

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

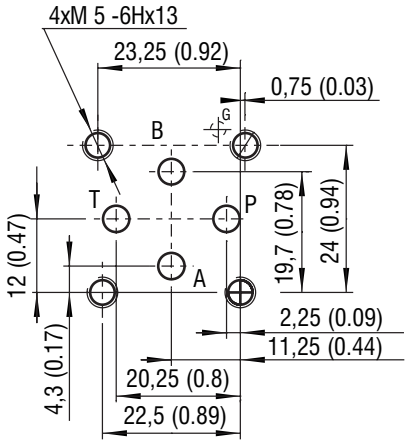
The valve can be controlled directly by a current control supply unit or by means of the external electronic card directly mounted to the electrical terminal (see catalogue of EL3E card 9145 and EL6 card 9150). This control card, depending on the number of the controlled solenoids, can be mounted onto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

ISO 4401-02-01-0-05



Ports P, A, B, T - max ∅ 4.5 mm (0.18 in)

Technical Data

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 - valve with 2 solenoids	kg (lbs)	0,9 (1.98) 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		Ucc 12V DC	Ucc 24V DC
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 / Tolerances	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

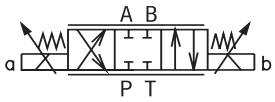
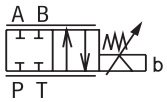
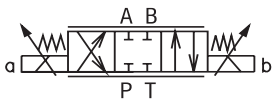
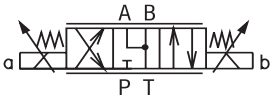
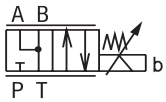
Connector
only for version without on board electronic „EK“

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.

- 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

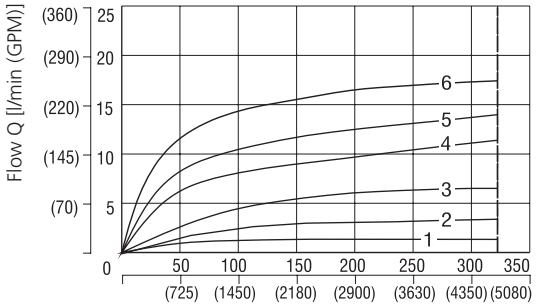
Type	Symbol	Type	Symbol
2Z51		**3Z11**	
2Z11		**3Z12**	 $\frac{q_A}{q_B} = \frac{1}{2}^*$
2Y51		**3Y11**	
2Y11		**3Y12**	 $\frac{q_A}{q_B} = \frac{1}{2}^*$

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

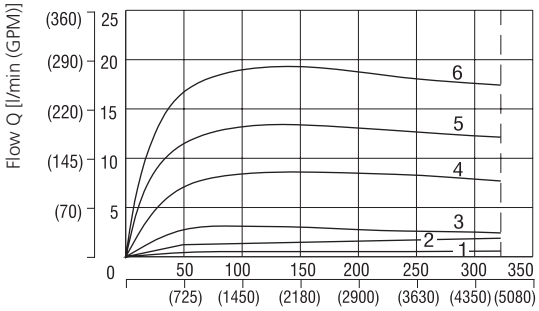
Characteristics measured at ν = 32 mm²/s (156 SUS)

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

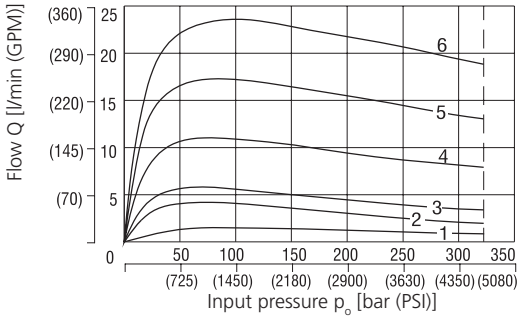
Nominal flow 4 l/min (1.1 GPM)



Nominal flow 8 l/min (2.1 GPM)

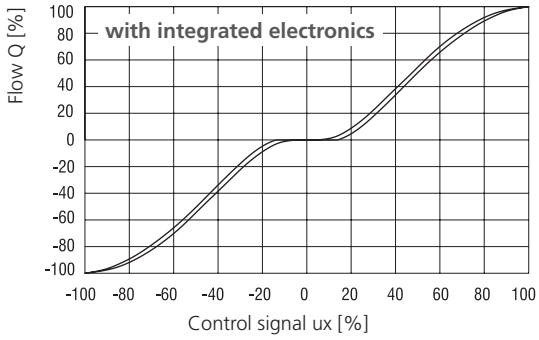


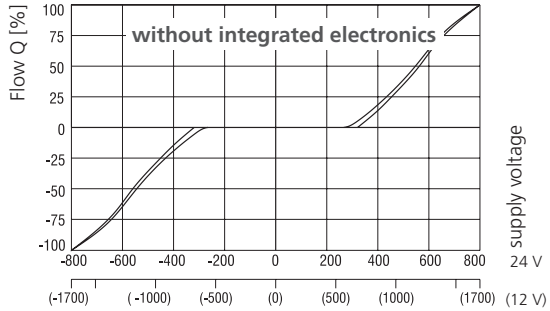
Nominal flow 12 l/min (3.2 GPM)



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

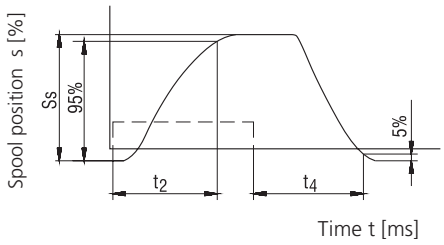
Regulated flow related to control signal
Δp=10 bar (145 PSI)





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

Transient Characteristic measured at ν = 32 mm²/s (156 SUS), Δp=10 bar (145 PSI)

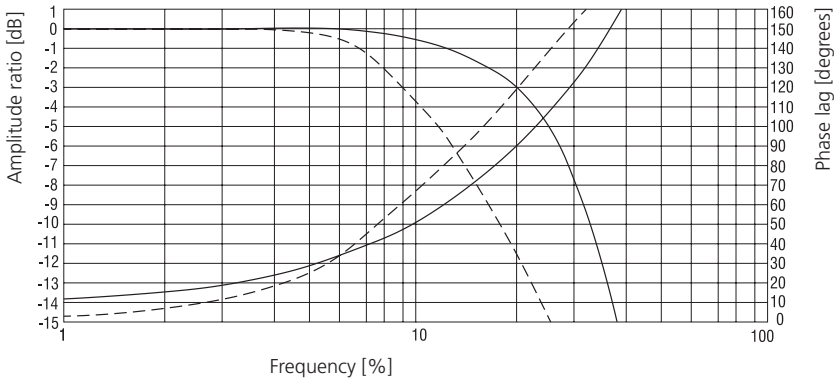


Steady Spool Position S_s [%]	t_2 [ms]	t_4 [ms]
100	85	100
75	70	85
50	55	75
25	45	55

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

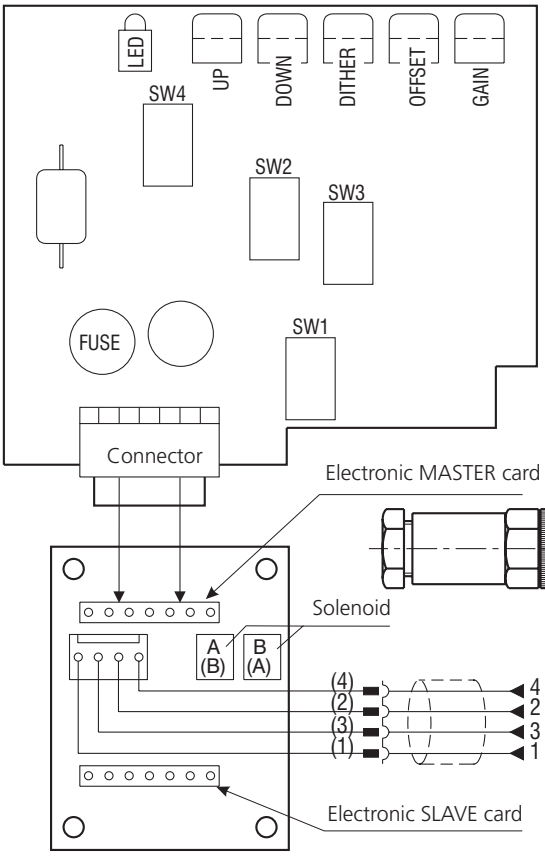
The values in table have only an informative character. The times of the transient characteristics at pressure or flow control will be in a particular hydraulic circuit always longer.

Frequency Response



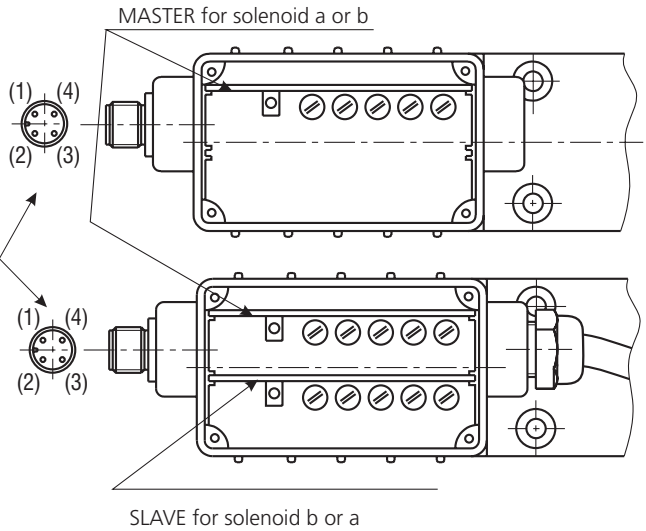
------ signal 90 %
—— signal 25 %

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



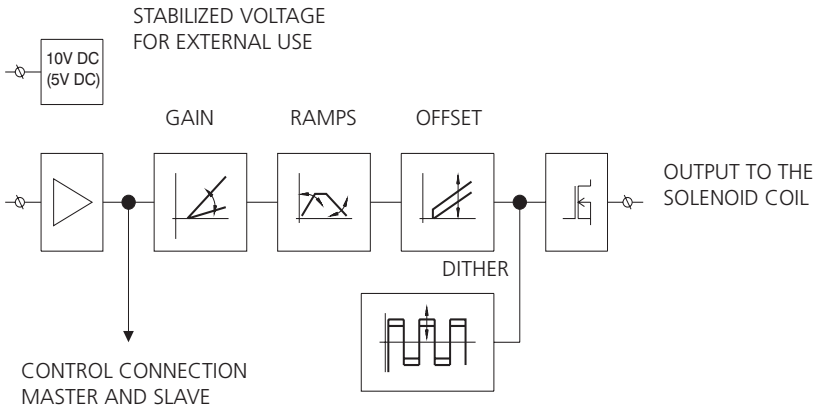
Attention: The control signal must have the same ground potential as the supply source.

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	Ucc/2 ± 10 V (± 5 V)*	± 10 V (± 5 V)*
MASTER M	SW1	ON 1 2	ON 1 2	ON 1 2	ON 1 2	ON 1 2	ON 1 2
	SW2	ON 1 2	ON 1 2	ON 1 2	ON 1 2	ON 1 2	ON 1 2
	SW3	ON 1 2	ON 1 2	ON 1 2	ON 1 2	ON 1 2	ON 1 2
	SW4	90 Hz	ON 1 2		60 Hz	ON 1 2	
SLAVE S	SW1					ON 1 2	ON 1 2
	SW2					ON 1 2	ON 1 2
	SW3					ON 1 2	ON 1 2
	SW4					90 Hz ON 1 2	60 Hz ON 1 2

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 characterisitic 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

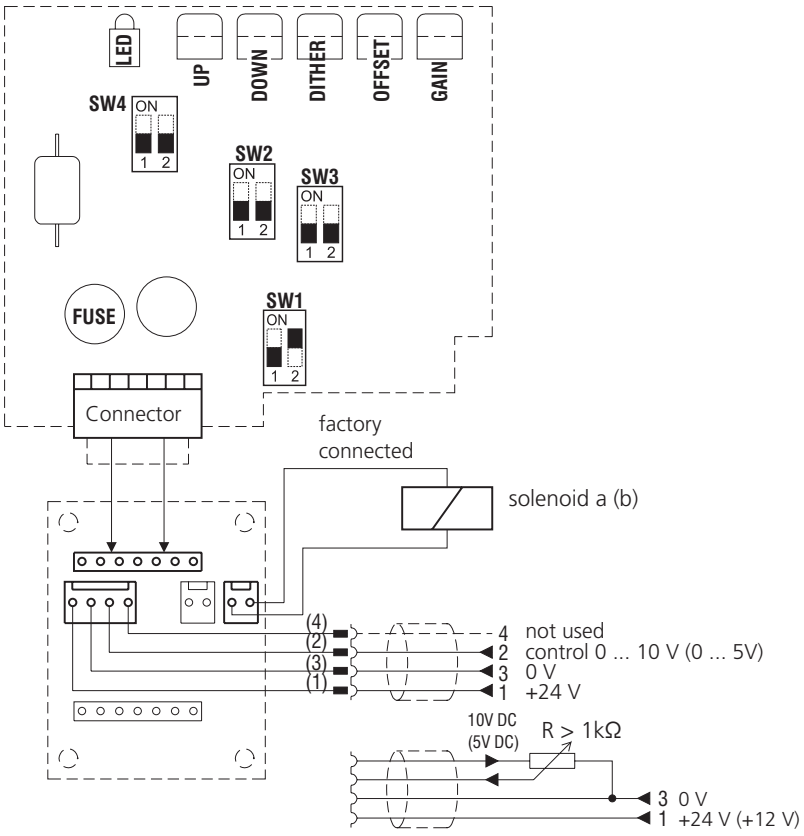


Setting of Control Electronics

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

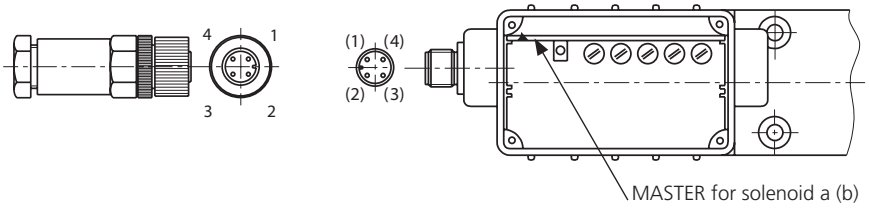
Master card for solenoid a (b)



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.

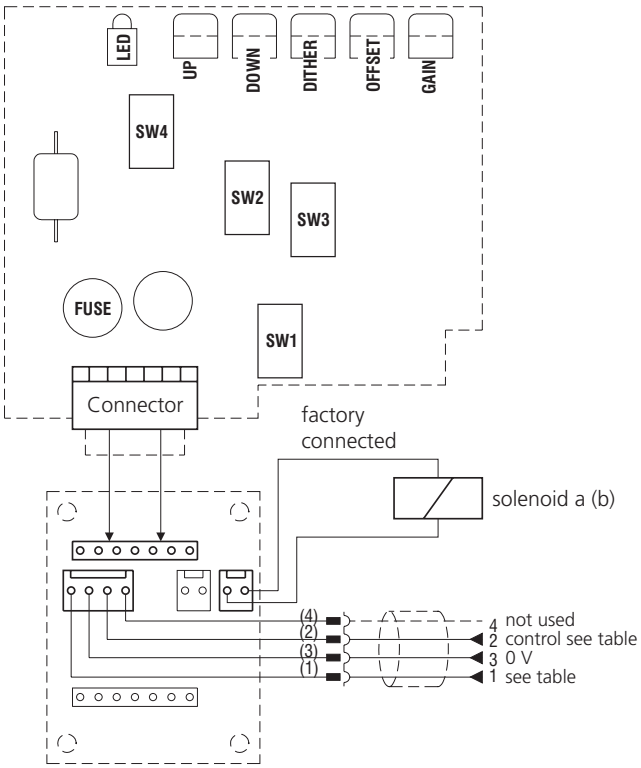


Wire colours
(connection connector - electronics)
(1) - brown
(2) - white
(3) - blue
(4) - black

Valve PRM2-042*EK (with one solenoid)

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

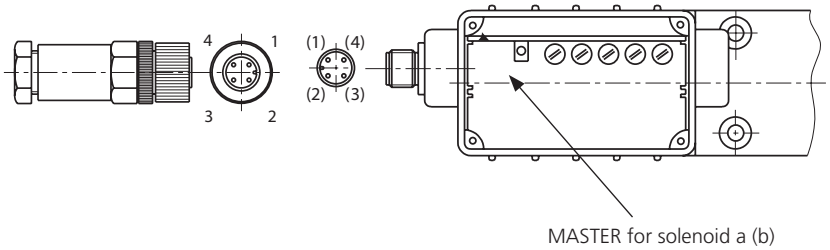
Master card for solenoid a (b)



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

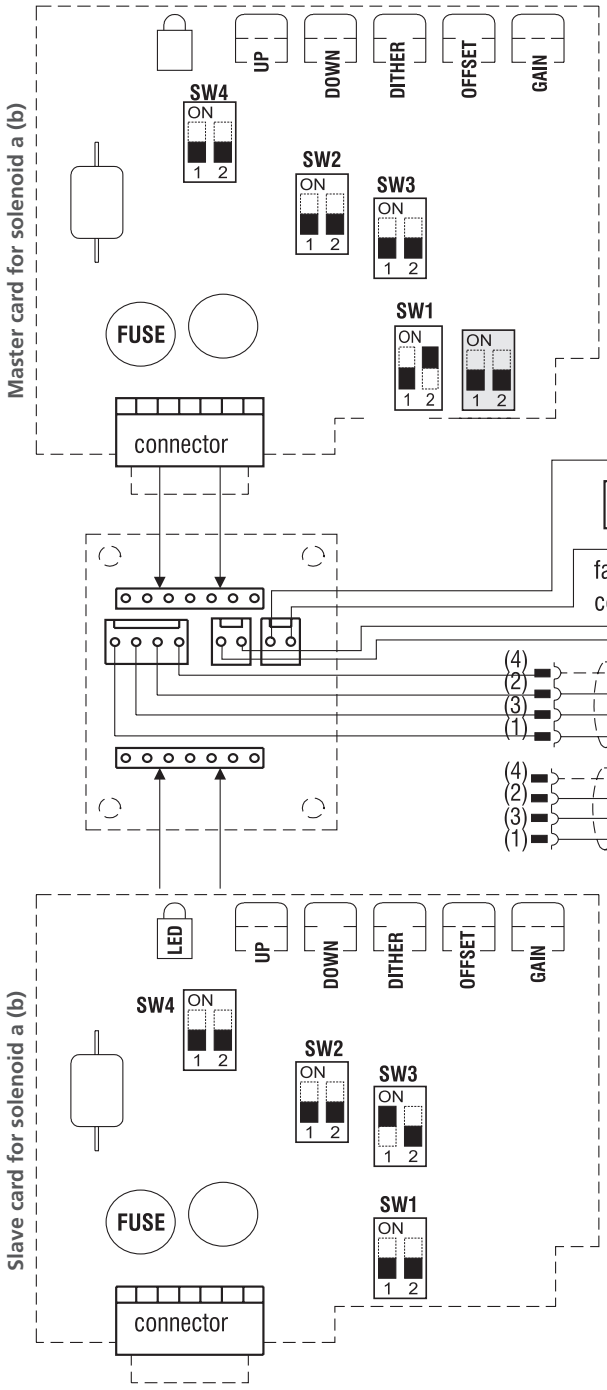


Wire colours
(connection connector - electronics)
(1) - brown
(2) - white
(3) - blue
(4) - black

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

Designation of the basic factory setting.
The ramp funcions 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.

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



Factory setting
Control with external source 0±10 V (0±5 V)

Other control possibilities
Control Ucc/2±10 V (Ucc/2±5) with external potentiometer R>1 kW

Factory set values:

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

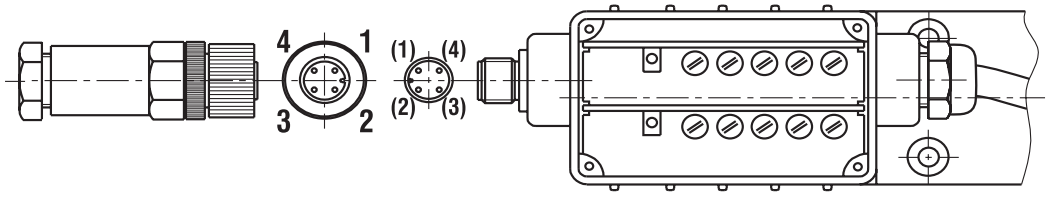
Factory setting

Other control possibilities

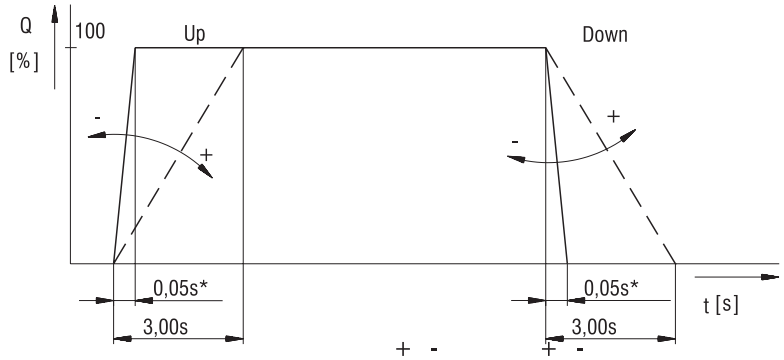
For the factory setting modification for this case of application,the following steps are required:

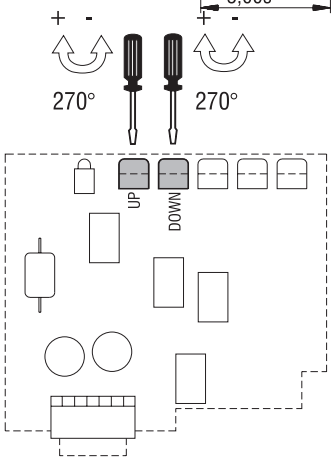
1. Unscrew the electronics cover
2. Carefully remove the master card
3. Flip the switch SW1 in position shown in the picture
4. Put in the master card and fix the electronics cover
5. Connect the voltage +24 V (+12 V) from an external supply source to terminals 1 and 3 of the connector

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

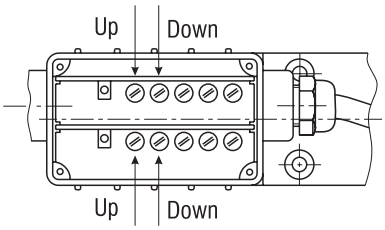


Ramp Adjustment (Up, Down)





Ramp adjustment for slave solenoid



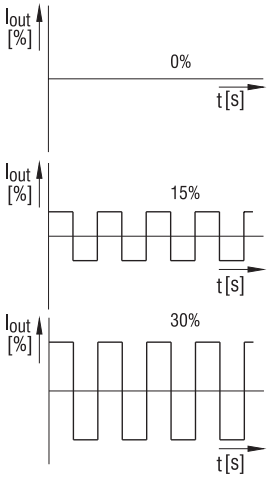
Ramp adjustment for master solenoid

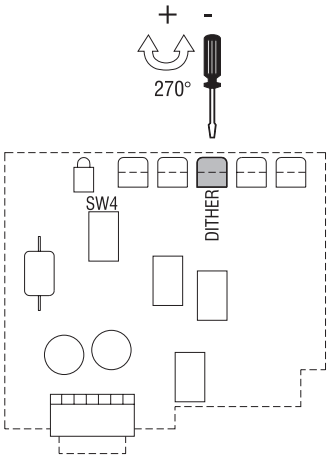
* The value has only an informative character with respect to the particular type of the proportional directional valve (see page 3).

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

Dither Adjustment

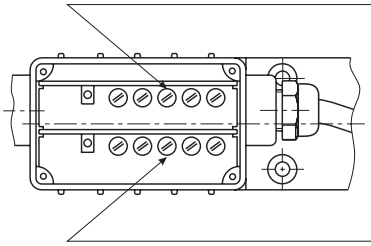
Amplitude - potentiometer (dither) (0 - 30 %)





Frequency - switch SW4

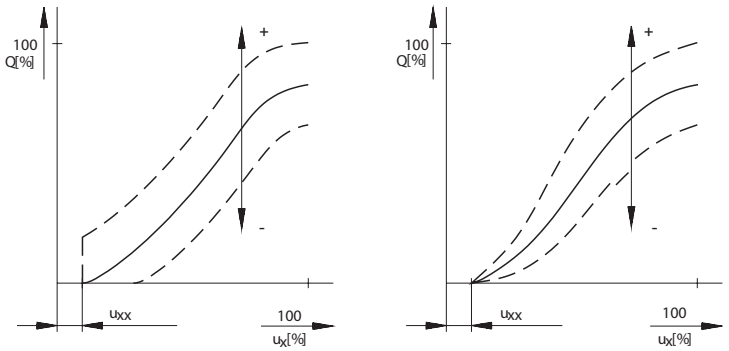
Amplitude adjustment for master solenoid



Amplitude adjustment for slave solenoid

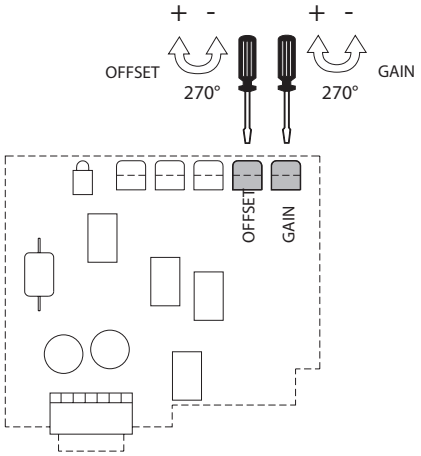
The dither is adjusted with regard to the minimum hysteresis.

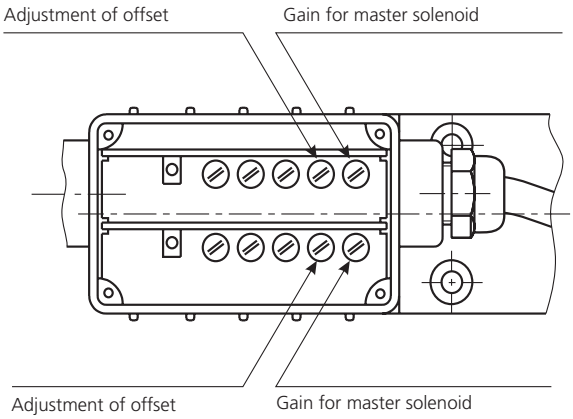
Offset, Gain Parameters Adjustment



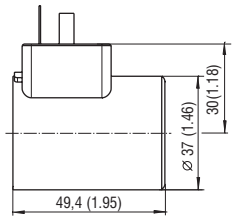
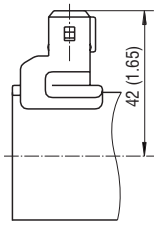
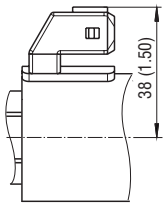
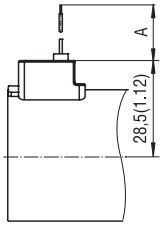
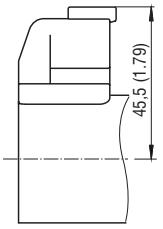
The factory setting of the offset and gain parameters is specific for the solenoids used. The manufacturer does not recommend this setting to be changed.

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



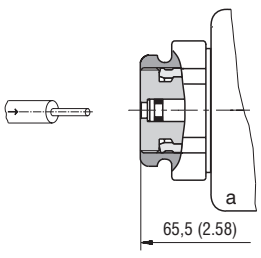
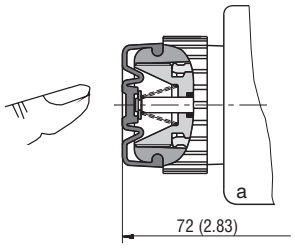


Solenoid Coil in millimeters (inches)

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
			 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)

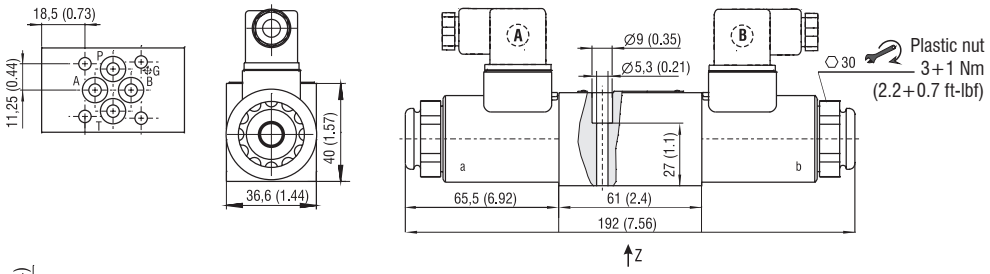
No Designation - Standard	Designation N2 - Rubber Boot Protected
	

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.

PRM2-043..../..-...E1

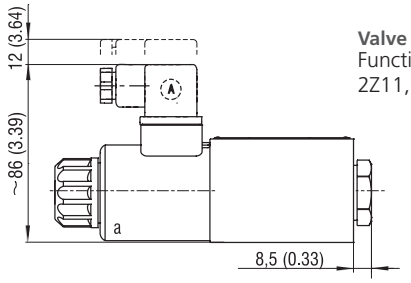
Valve with two solenoids
Example with electrical terminal
EN 175301-803-A (E1, E2)

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

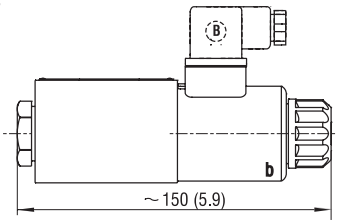


PRM2-042.../..-...E1

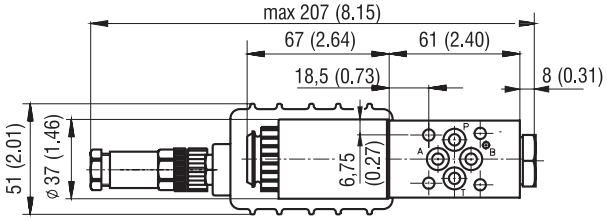
Valve with one solenoid „a“
Functional symbols
2Z51, 2Y51



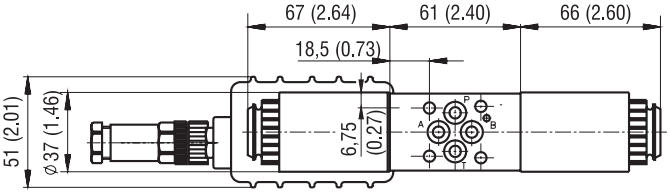
Valve with one solenoid „b“
Functional symbols
2Z11, 2Y11



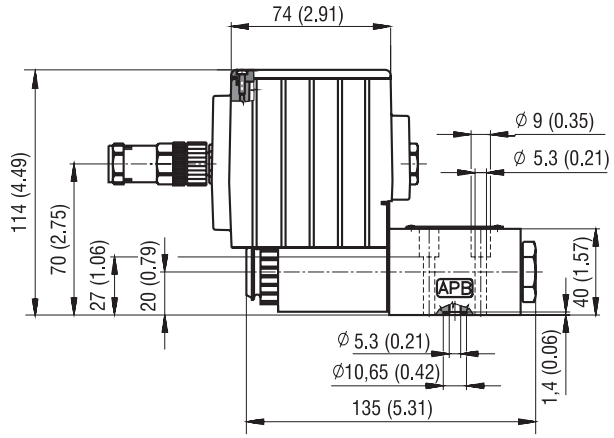
PRM2-043x/xEK*
Valve with one solenoid
OBE on side “a” version EK



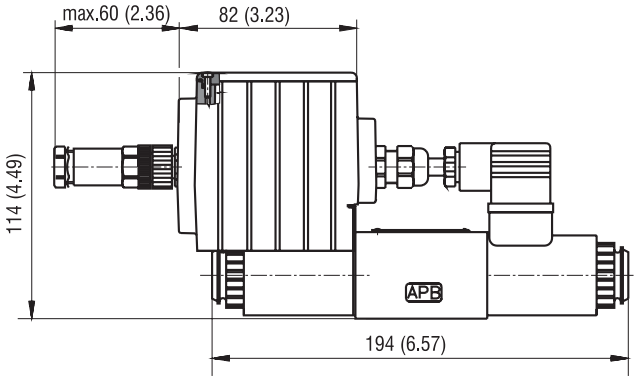
PRM2-043x/xEK*
Valve with two solenoids
OBE on side “a” version EK



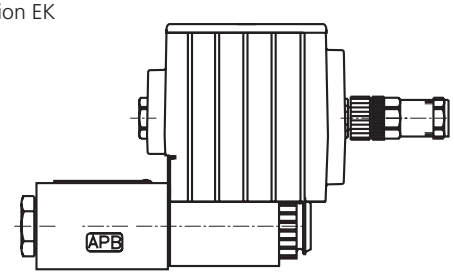
Valve with one solenoid „a“
Spool symbols 2Z51, 2Y51
OBE on side “a” version EK



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