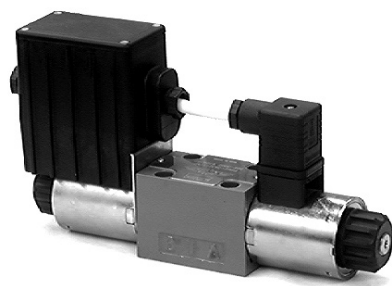


# Proportional Directional Control Valve, with Analog Control Electronics

## 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:

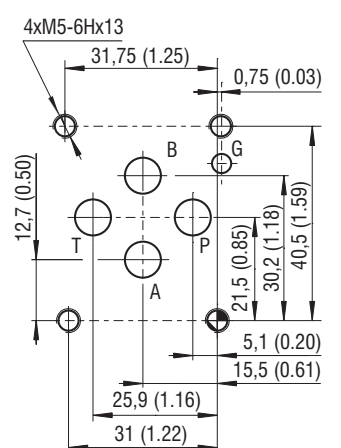
Offset, gain, rise and drop-out time of the ramp generator, frequency (2 frequencies) and amplitude of the dither signal generator.

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  $\geq 1k\Omega$  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.

### ISO 4401-03-02-0-05

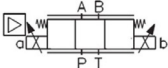
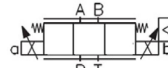


Ports P, A, B, T - max  $\varnothing 7.5$  mm (0.29 in)

### Technical Data

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 <sub>n</sub> 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	kg (lbs)	1.9 (4.2)			
- valve with 1 solenoid - 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		V		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	C22B* / K*			
Mounting interface / Tolerances	SMT_0019	Size 06			
Spare parts	SP_8010				
Subplates	SP_0002	DP*-06			


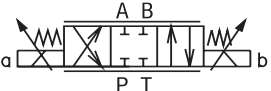
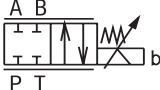
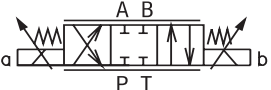


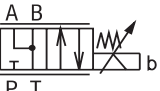

## Ordering Code

<b>PRM2-06</b> <input type="text"/> / <input type="text"/> - <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> - <input type="text"/>	
<b>Proportional directional control valve, with analog control electronics</b>	<b>Surface treatment</b> No designation standard <b>A</b> zinc-coated (ZnCr-3), ISO 9227 (240 h) <b>B</b> zinc-coated (ZnNi), ISO 9227 (520 h)
<b>Valve size</b>	<b>Seals</b> No designation NBR <b>V</b> FPM (Viton)
<b>Spool symbols</b> see table „Spool Symbols“	<b>Manual Override</b> No designation standard <b>N1</b> protected with cap nut <b>N2</b> protected with rubber boot
<b>Nominal flow rate at Δp = 10 bar (145 PSI)</b> 5 l/min (1.3 GPM) <b>5</b> 8 l/min (2.1 GPM) <b>8</b> 15 l/min (4.0 GPM) <b>15</b> 30 l/min (7.9 GPM) <b>30</b>	<b>Connector</b> only for version without on board electronic „EK“ with terminal for the connector, EN 175301-803-A <b>E1</b> E1 with quenching diode <b>E2</b> with AMP-Junior-Timer-connector - Axial direction <b>E3A</b> E3A with quenching diode <b>E4A</b> loose conductors (two insulated wires) <b>E8</b> E8 with quenching diode <b>E9</b> with Deutsch DT04-2P <b>E12A</b> E12A with quenching diode <b>E13A</b>
<b>Rated supply voltage of solenoids (at the coil terminal)</b> 12 V DC <b>12</b> 24 V DC <b>24</b>	
<b>Electronics on board / Position at solenoid</b> connection by connector M12 x 1 (4-pin connector, supplied with counterpart) on board electronics (solenoid „a“)  <b>EK</b> on board electronics (solenoid „b“)  <b>EKB</b>	

\*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

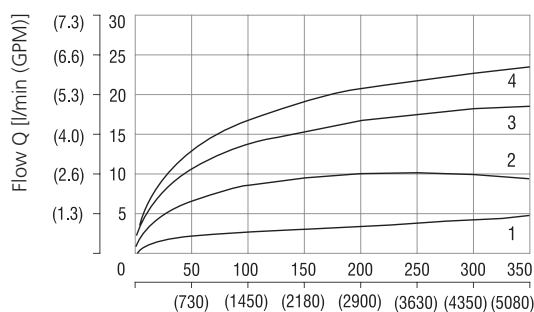
Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	 $\frac{q_A}{q_B} = \frac{1}{2}^*$
2Y51		3Y11	
2Y11		3Y12	 $\frac{q_A}{q_B} = \frac{1}{2}^*$

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

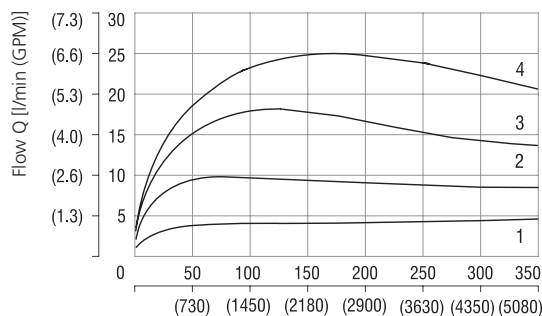
## Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

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

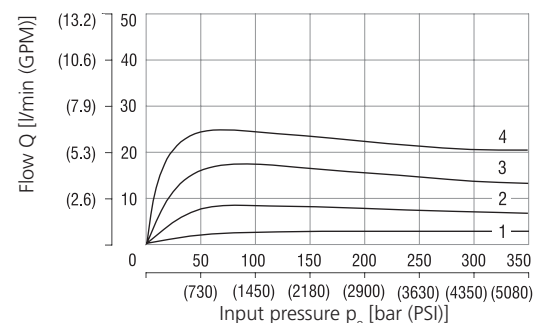
Nominal flow 5 l/min (1.3 GPM)



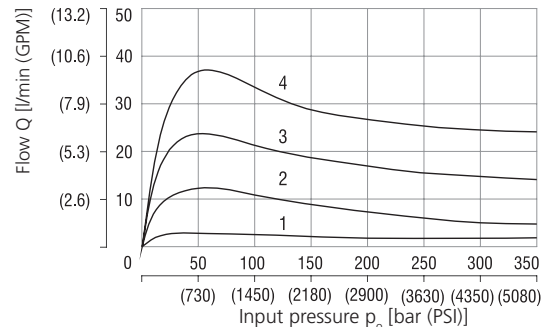
Nominal flow 8 l/min (2.1 GPM)



Nominal flow 15 l/min (4.0 GPM)



Nominal flow 30 l/min (7.9 GPM)

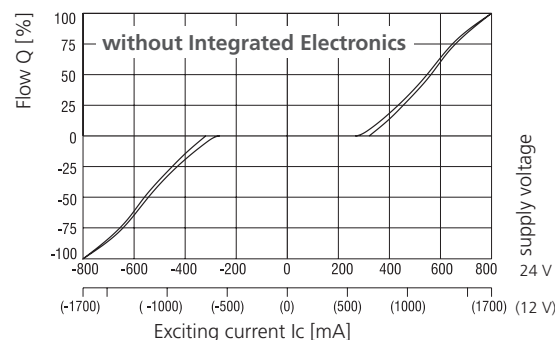
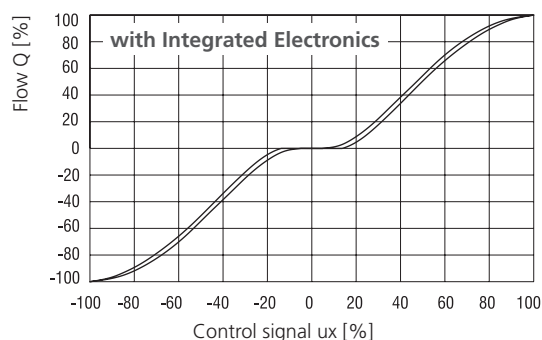


**Solenoid current:**

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

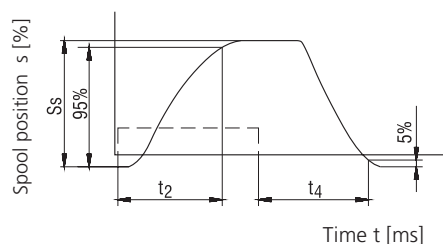
### Regulated flow related to control signal

$\Delta p = 10 \text{ bar}$  (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)

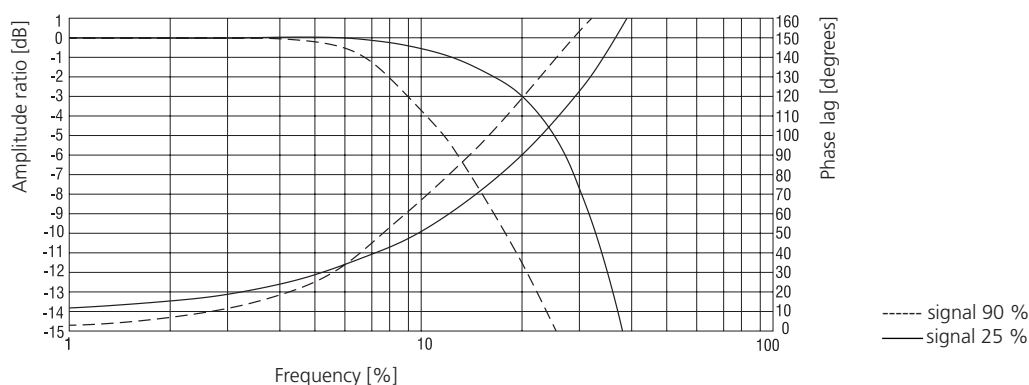


Steady Spool Position $S_s$ [%]	$t_2$ [ms]	$t_4$ [ms]
100	85	100
75	70	85
50	55	75
25	45	55

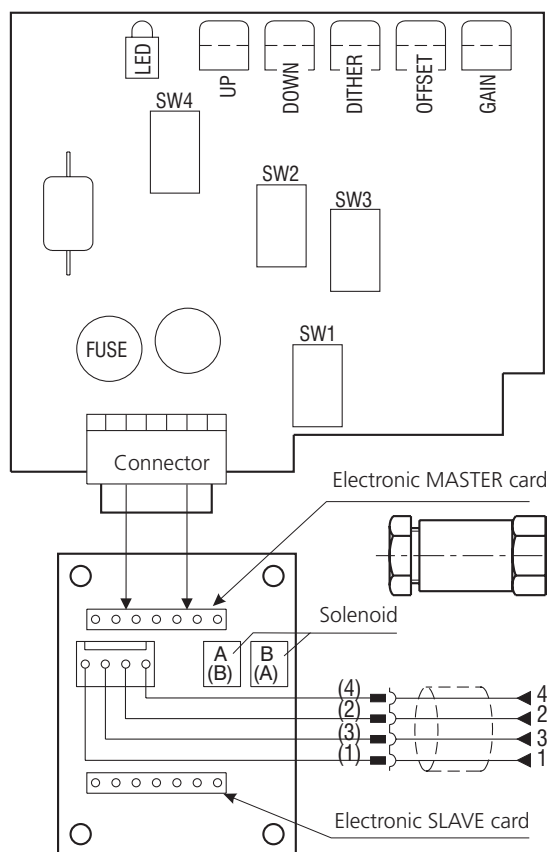
The values in table have only an informative character. The times of the transient characteristics at pressure or flow control will be in a particular hydraulic circuit always longer.

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

### Frequency Response

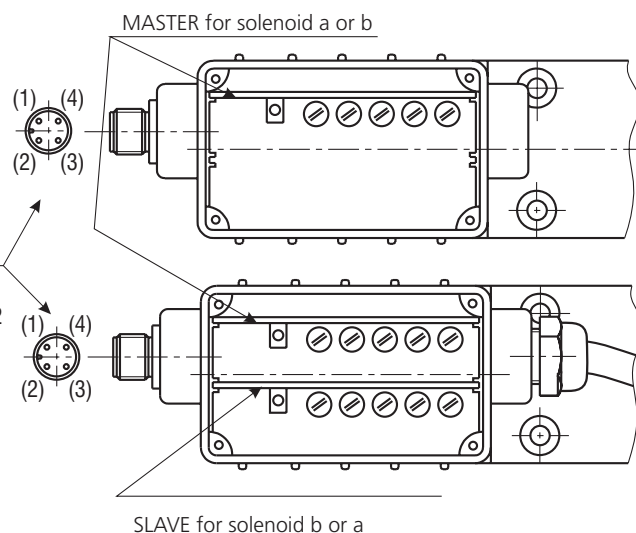


## Component Arrangement on the Electronic Card



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

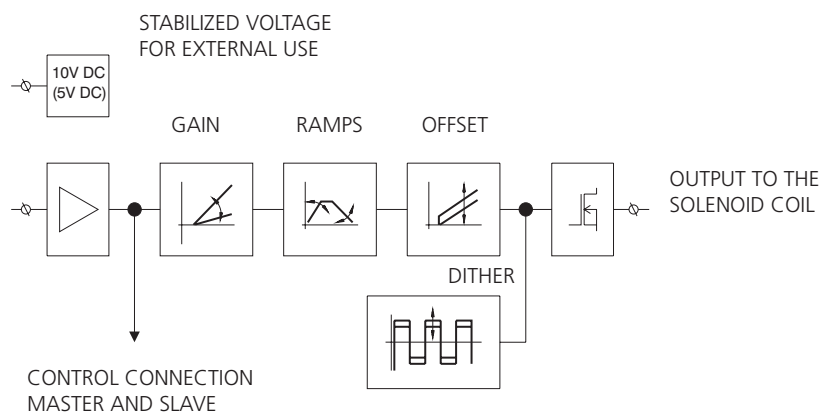
		PRM2-062				PRM2-063	
		0 ... 5 V	0 ... 10 V (0...5 V)*	0 ... 20 mA	4 ... 20 mA	Ucc/2 ± 10 V (± 5 V)*	± 10 V (± 5 V)*
MASTER M	SW1						
	SW2						
	SW3						
	SW4	90 Hz			60 Hz		
SLAVE S	SW1						
	SW2						
	SW3						
	SW4					90 Hz	60 Hz

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

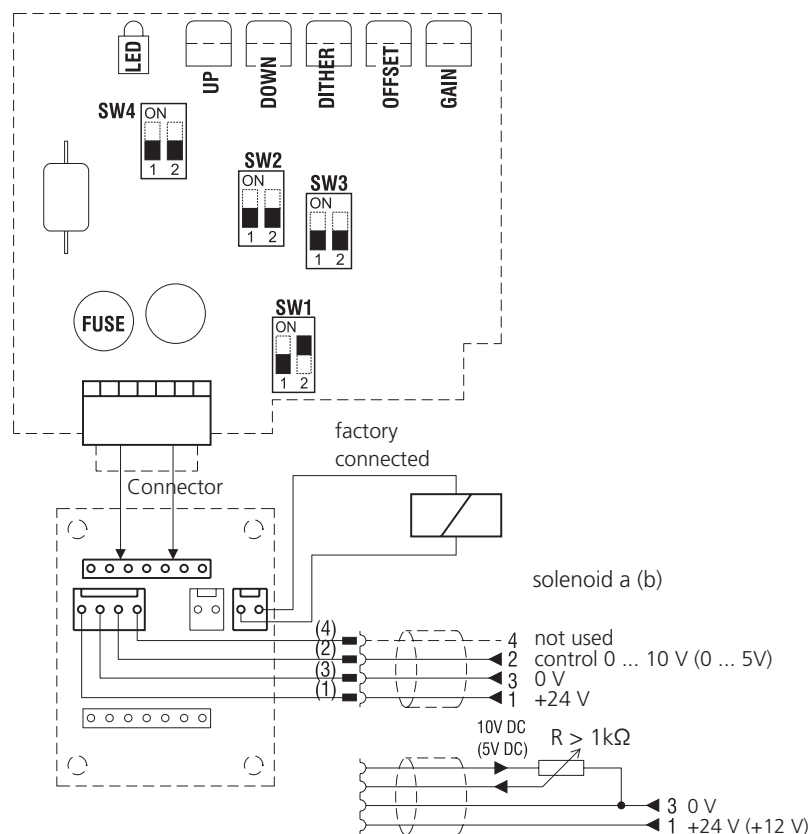


## Setting of Control Electronics

### Valve PRM2-062\*EK (with one solenoid)

Control with external voltage source 0...10 V, 0 ... 5 V (factory setting) or with external potentiometer  $R > 1 \text{ k}\Omega$

### Master card for solenoid a (b)



### Factory set values:

Control signal: 0 - 10 V (0 - 5 V)

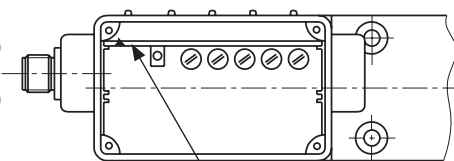
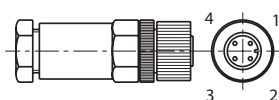
Dither: frequency 90 Hz  
amplitude - optimum

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

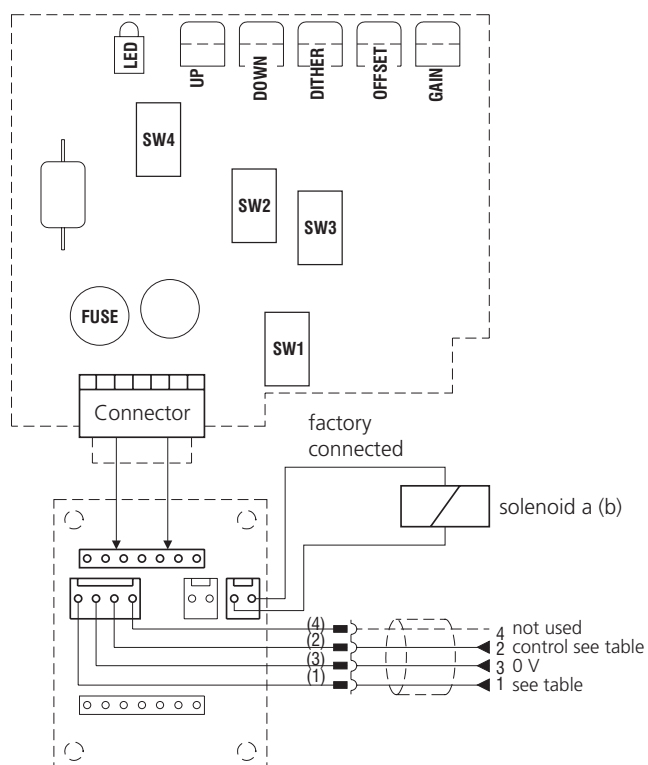
(4) - black

## Setting of Control Electronics

### Valve PRM2-062\*EK (with one solenoid)

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

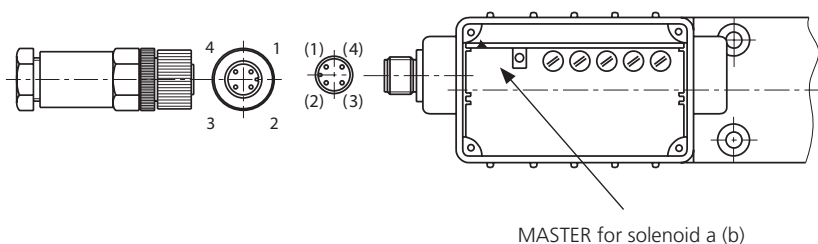
#### Master card for solenoid a (b)



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



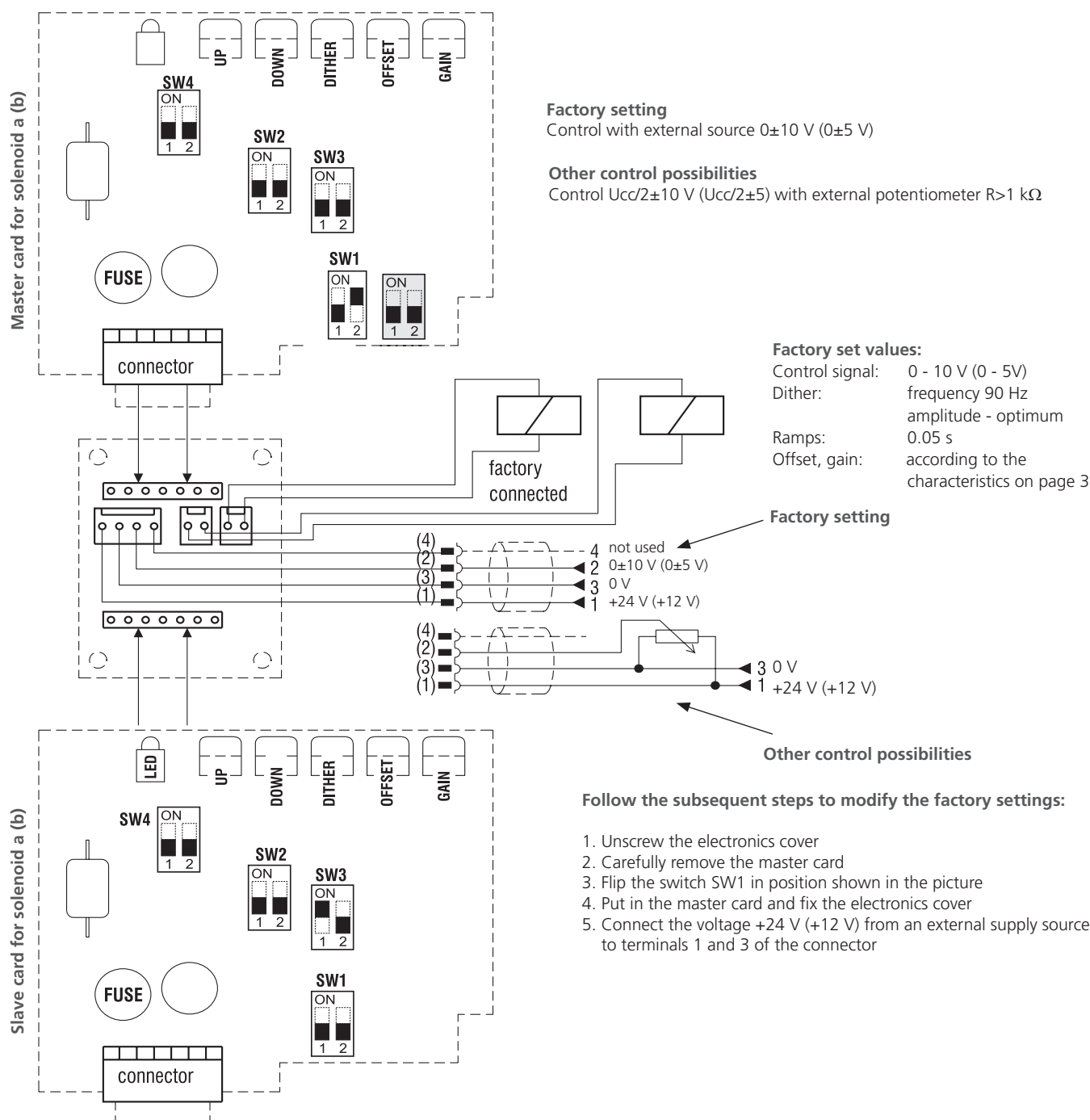
The control signal must have the same ground potential as the supply source.



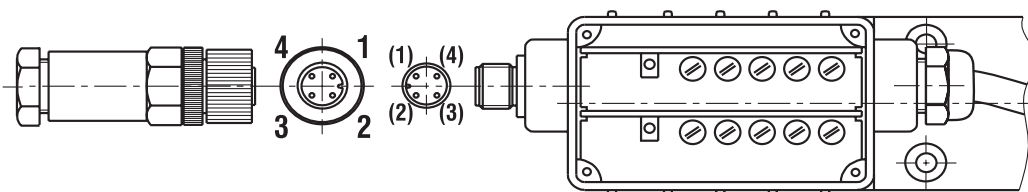
Designation of the basic factory setting.  
 The ramp functions are adjusted on their minimum values.  
 The dither is set to the optimal value with respect to hysteresis.  
 Offset and gain are adjusted according to the characteristic on page 1 and 2.  
 The manufacturer does not recommend to change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

## Setting of control electronics

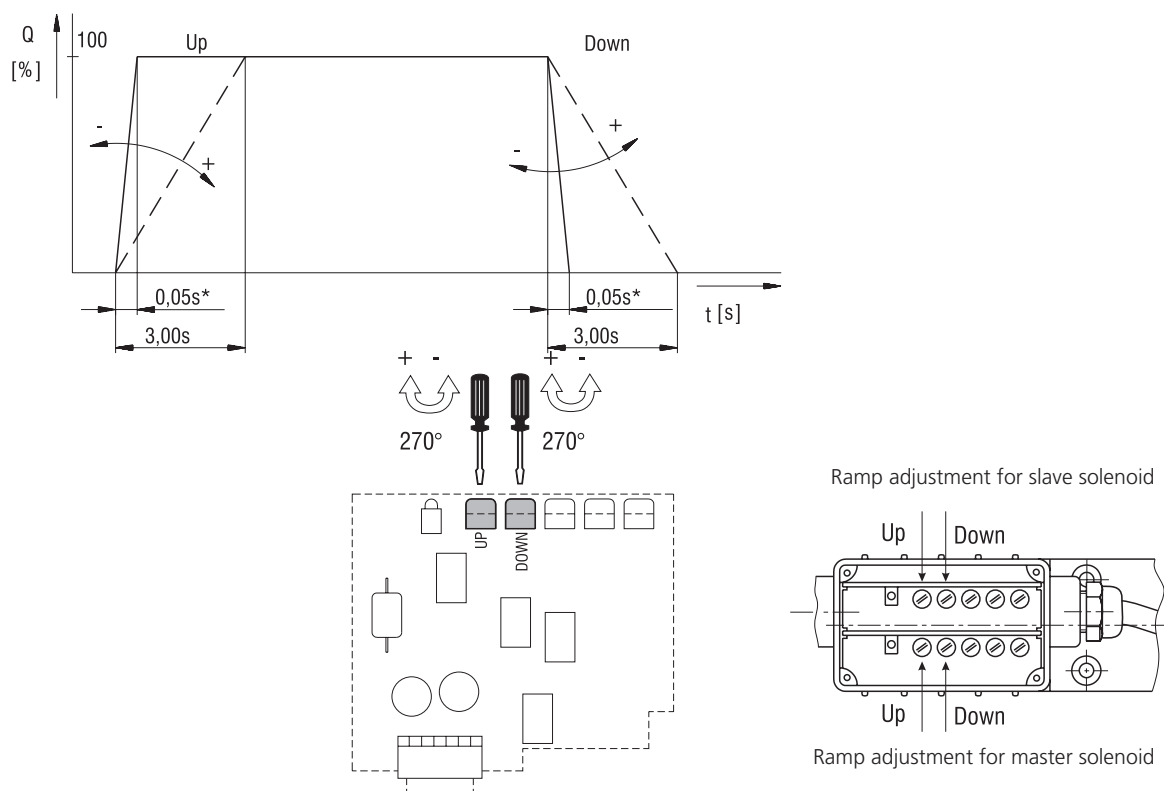
Valve PRM2-063\*EK (with two solenoids), factory setting, other control possibilities



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



## Ramp Adjustment (Up, Down)



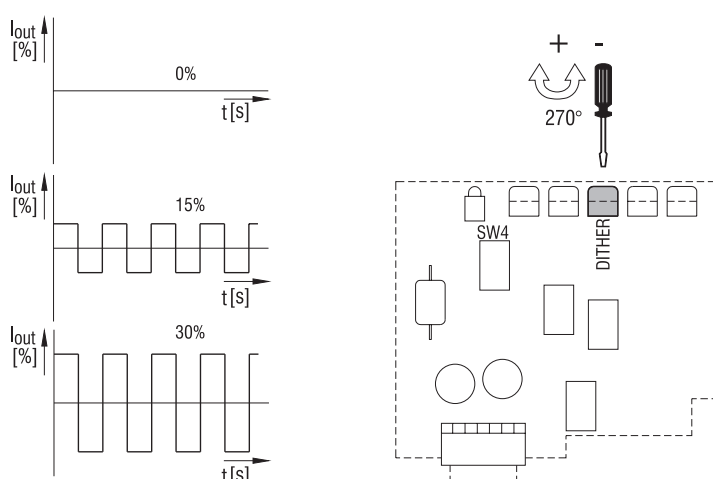
\* The value has only an informative character with respect to the particular type of the proportional directional valve (see page 3).



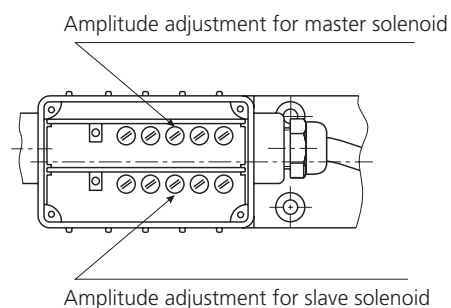
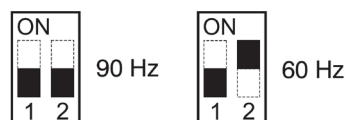
The factory setting of the ramp is at the minimum value.

## Dither Adjustment

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



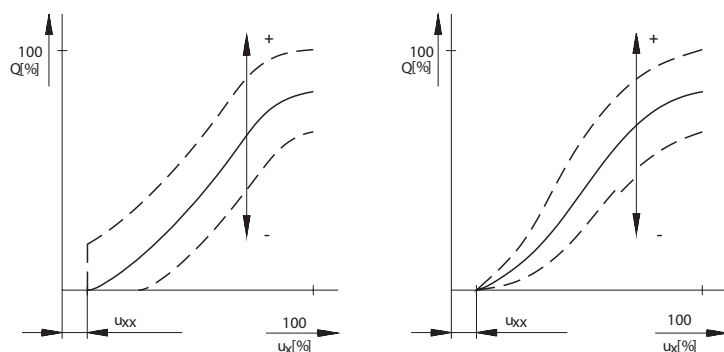
### Frequency - switch SW4



The dither is adjusted to minimize hysteresis.

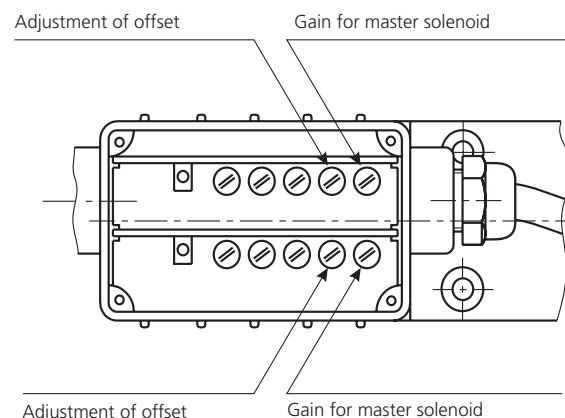
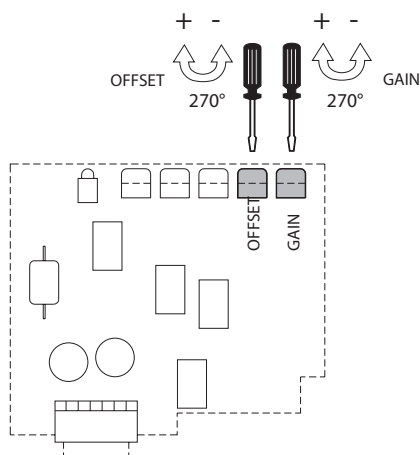


## Offset, Gain Parameters Adjustment



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

Nominal Electronics Supply Voltage (V)	Area Insensitive to Control Signal $u_{xx}$ (%)
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
		 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

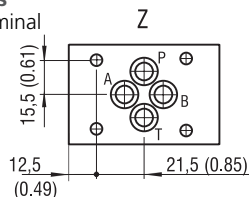
In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

# Dimensions in millimeters (inches)

## PRM2-063..../-...E1

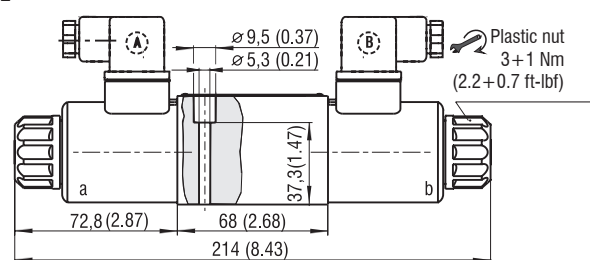
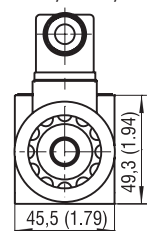
### Valve with two solenoids

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



## Functional symbols

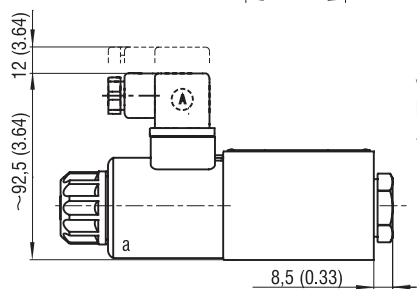
3Z11, 3Z12, 3Y11, 3Y12



## PRM2-062..../-...E1

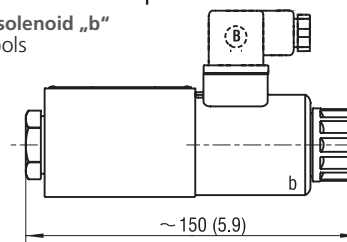
### Valve with one solenoid „a“

Functional symbols  
 2Z51, 2Y51



### Valve with one solenoid „b“

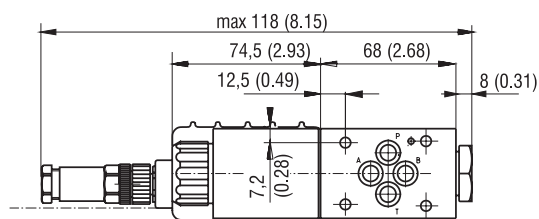
Functional symbols  
 2Z11, 2Y11



## PRM2-063x/xEK\*

### Valve with one solenoid

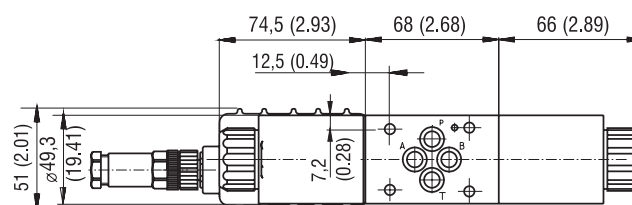
OBE on side „a“ version EK



## PRM2-063x/xEK\*

### Valve with two solenoids

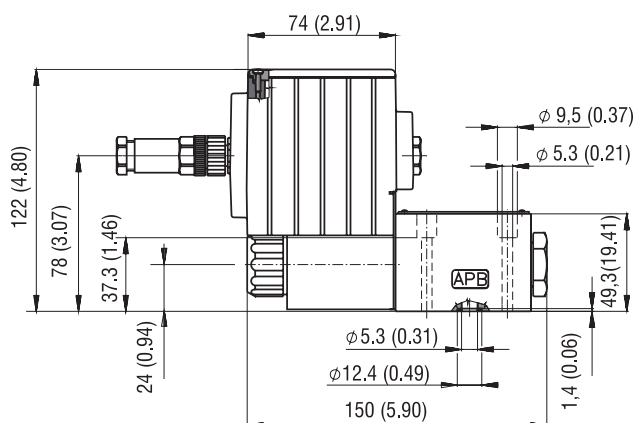
OBE on side „a“ version EK



## Valve with one solenoid „a“

Spool symbols 2Z51, 2Y51

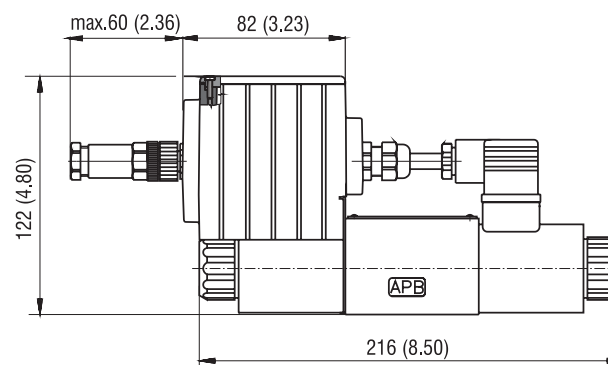
OBE on side „a“ version EK



## Valve with two solenoids

Spool symbols 3Z11, 3Z12, 3Y11, 3Y12

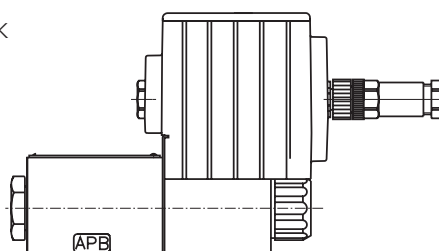
OBE on side „a“ version EK



## 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

