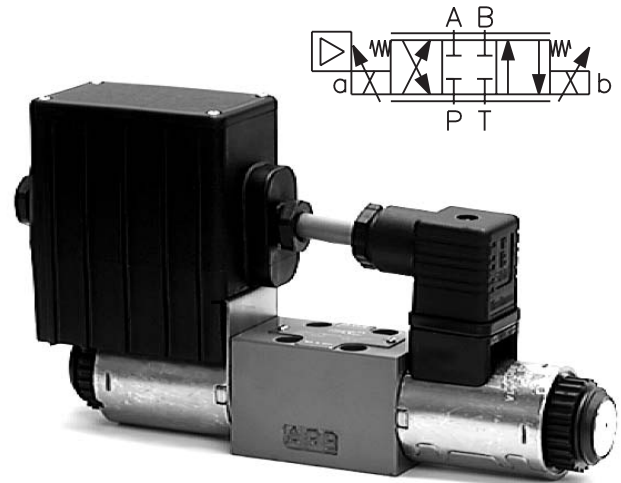


- Compact design with integrated electronics
- High reliability
- Simple replacement of the exciting coils including electronics without opening the hydraulic circuits
- Continuous flow control in both directions
- Installation dimensions to DIN 24 340 / ISO 4401 / CETOP RP121-H



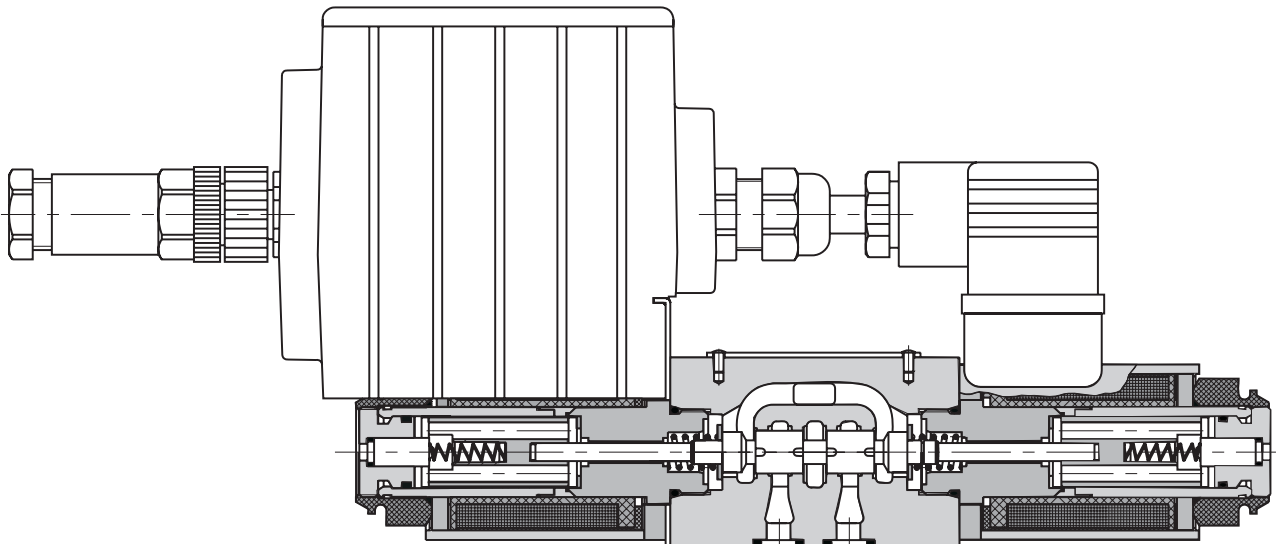
Functional Description

The proportional directional valve consists of a cast-iron housing, a special control spool, two centering springs with supporting washers and one or two proportional solenoids. 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 apposite 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 M12 x 1. The solenoid coils, including the control box, can be turned in the range of $\pm 90^\circ$. The electric control unit supplies the solenoid with current, which varies with the control signal. The solenoid shifts the control spool to the required position, proportional to the control current.

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 $\geq 1 \text{ k}\Omega$.

The electronic control card enables voltage or current control to be used, according to the positions of the switches SW1 to SW3 (see table on page 6).

The basic surface treatment of the valve housing is phosphate coated and the operating solenoids are zinc coated.



Ordering Code

PRM2-04 / -

Proportional Directional Control Valve

Seals

without designation
V

NBR
FPM (Viton)

Nominal size

Electronics

without designation without electronics

EK

connection by connector
M12 x 1 (4-pin connector)
(supplied with counterpart)

Nominal supply voltage

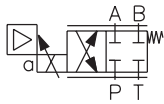
12
24

12 V DC
24 V DC

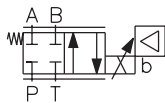
Nominal flow rate at Δp = 10 bar

4
8
12

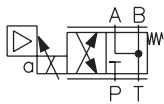
4 L/min
8 L/min
12 L/min



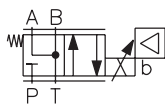
2Z51



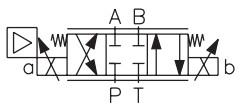
2Z11



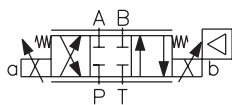
2Y51



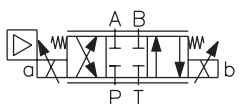
2Y11



3Z11

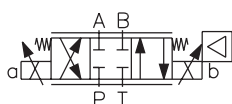


3Z11B



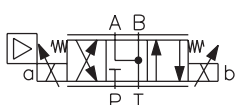
$$\frac{q_A}{q_B} = \frac{1}{2}^*$$

3Z12

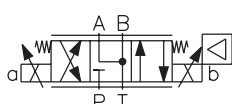


$$\frac{q_A}{q_B} = \frac{1}{2}^*$$

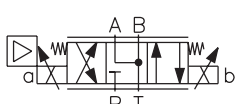
3Z12B



3Y11

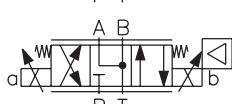


3Y11B



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

3Y12



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

3Y12B

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

Technical Data

Nominal size	mm	04
Maximum operating pressure at ports P, A, B	bar	320
Maximum operating pressure at port T	bar	210
Hydraulic fluid	Hydraulic oils of power classes (HL, HLP) to DIN 51524	
Fluid temperature range (NBR / Viton)	°C	-30 ... +80 / -20 ... +80
Ambient temperature, max.	°C	+50
Viscosity range	mm ² /s	20 ... 400
Maximum degree of fluid contamination	Class 21/18/15 according to ISO 4406 (1999).	
Nominal flow rate Q_n at $\Delta p = 10$ bar ($v = 32 \text{ mm}^2 \cdot \text{s}^{-1}$)	L/min	4, 8, 12
Hysteresis	%	≤ 6
Weight PRM2-042 PRM2-043	kg	0.9 1.25
Mounting position	any, preferably horizontal	
Enclosure type EN 60 529	IP65	

Technical Data of the Proportional Solenoid

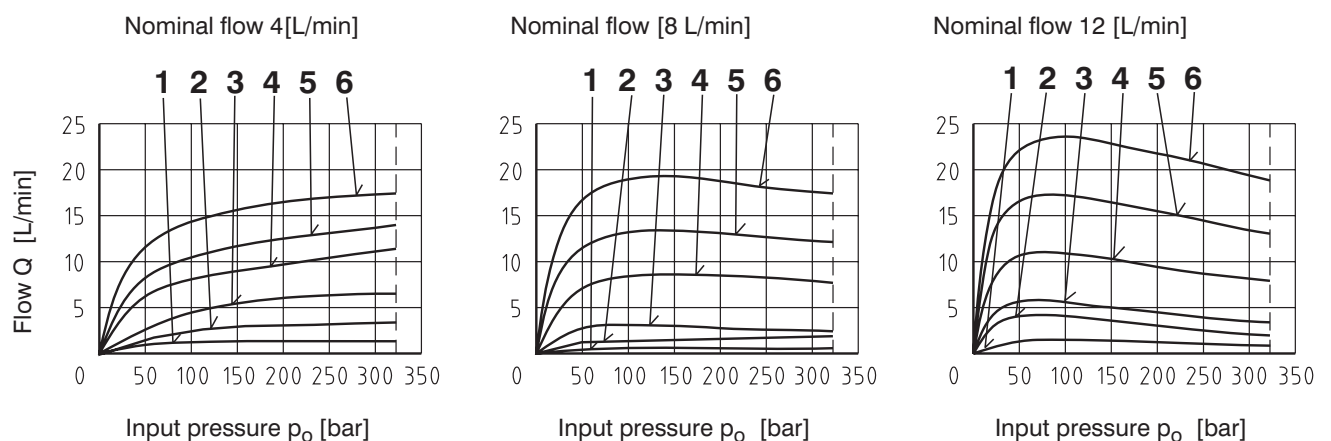
Nominal supply voltage	V	12 DC	24 DC
Limit current	A	1.7	0.8
Mean resistance value at 20°C	Ω	5	21

Technical Data of the Electronics

Nominal supply voltage U_{cc}	V	12 DC	24 DC
Supply voltage range	V	11.2... 14.7	20 ... 30 DC
Stabilized voltage for control	V	5 DC ($R > 1 \text{ k}\Omega$)	10 DC ($R \geq 1 \text{ k}\Omega$)
Control signal	see table of switches configuration (page 6)		
Maximum output current	A	2.4 for $R < 4\Omega$	1.5 for $R < 10\Omega$
Ramp adjustment range	s	0.05 ... 3	
Dither frequency	Hz	90/60	
Dither amplitude	%	0 ... 30	

Limit Power

Measured at $v = 32 \text{ mm}^2/\text{s}$ $P \rightarrow A / B \rightarrow T$ or $P \rightarrow B / A \rightarrow T$

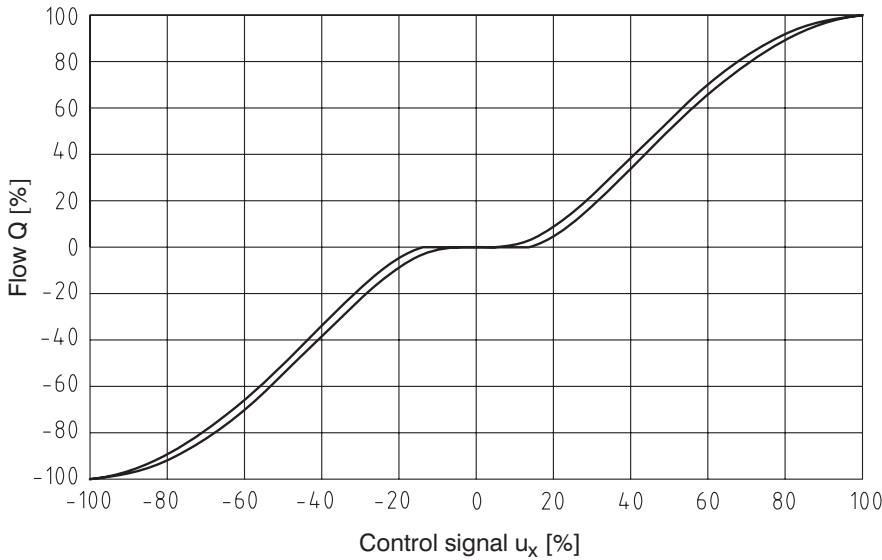


Solenoid current:

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

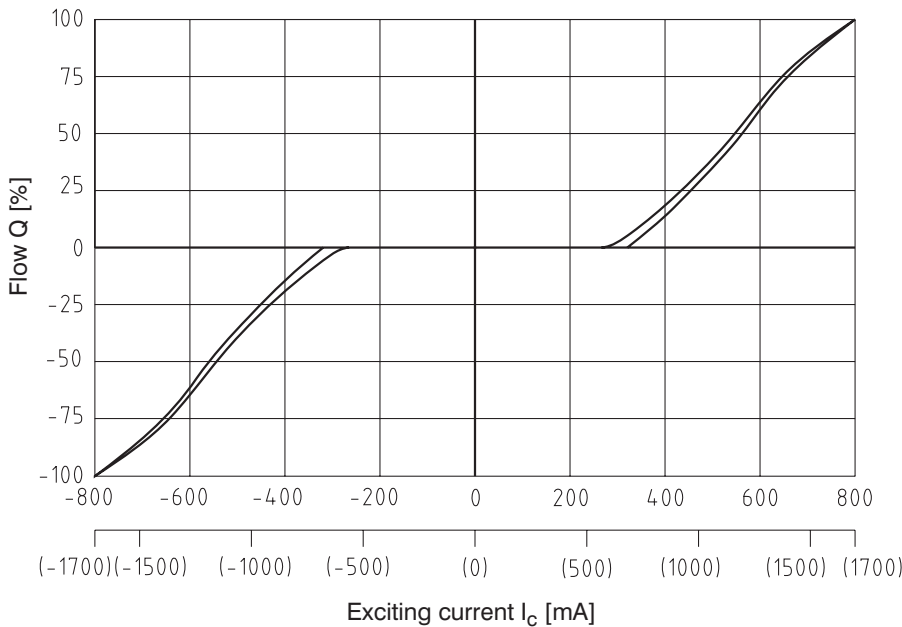
Flow Characteristic with Integrated Electronics

Measured at $\Delta p = 10 \text{ bar}$, $v = 32 \text{ mm}^2/\text{s}$



Flow Characteristic without Integrated Electronics

Measured at $\Delta p = 10 \text{ bar}$, $v = 32 \text{ mm}^2/\text{s}$,

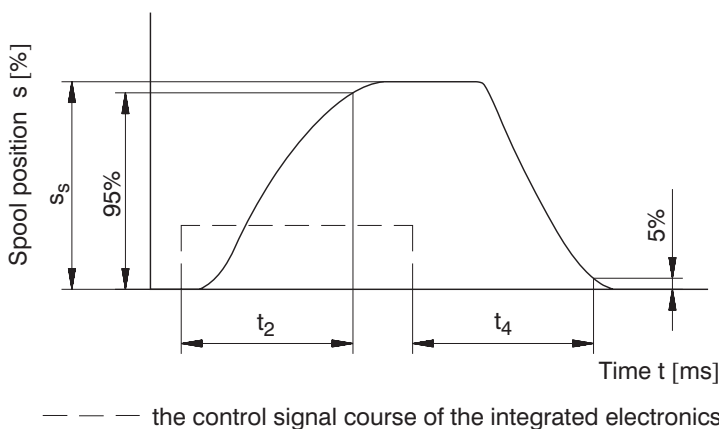


Values in parenthesis are valid for the supply voltage 12 V.

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 $\Delta p = 10 \text{ bar}$, $v = 32 \text{ mm}^2/\text{s}$; $Q = 80\% Q_n$

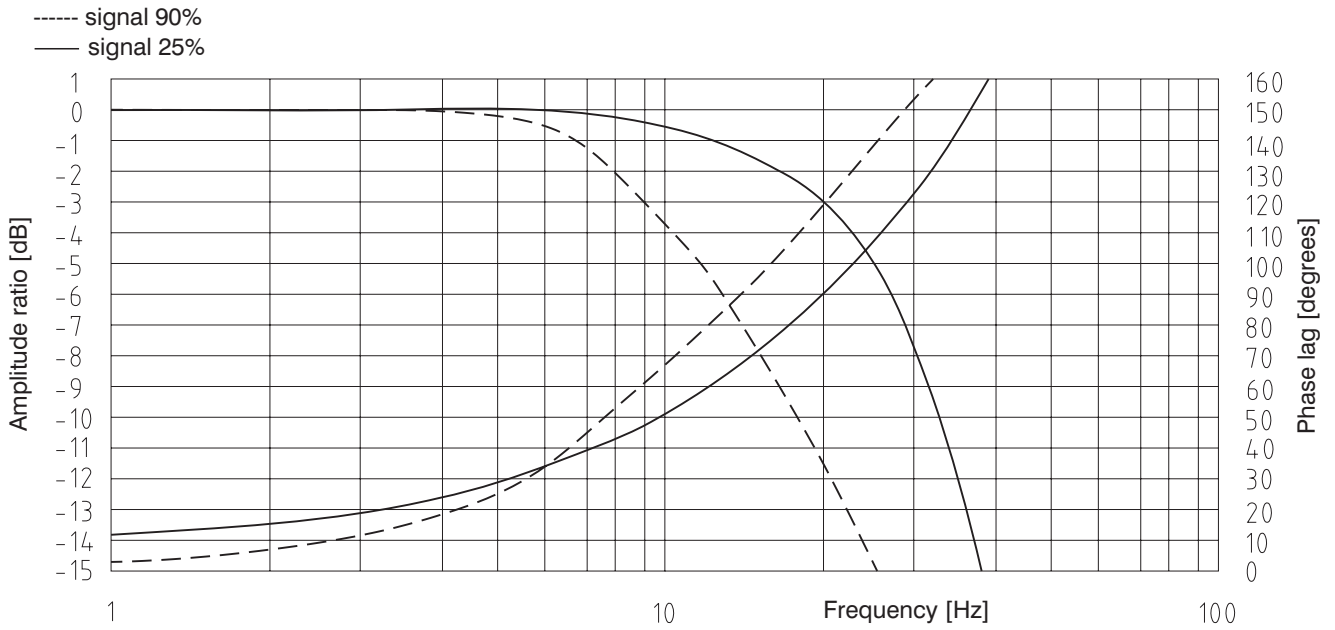


Steady spool position s_s [%]	t_2 [ms]	t_4 [ms]
100	75	70
75	70	55
50	50	40
25	35	25

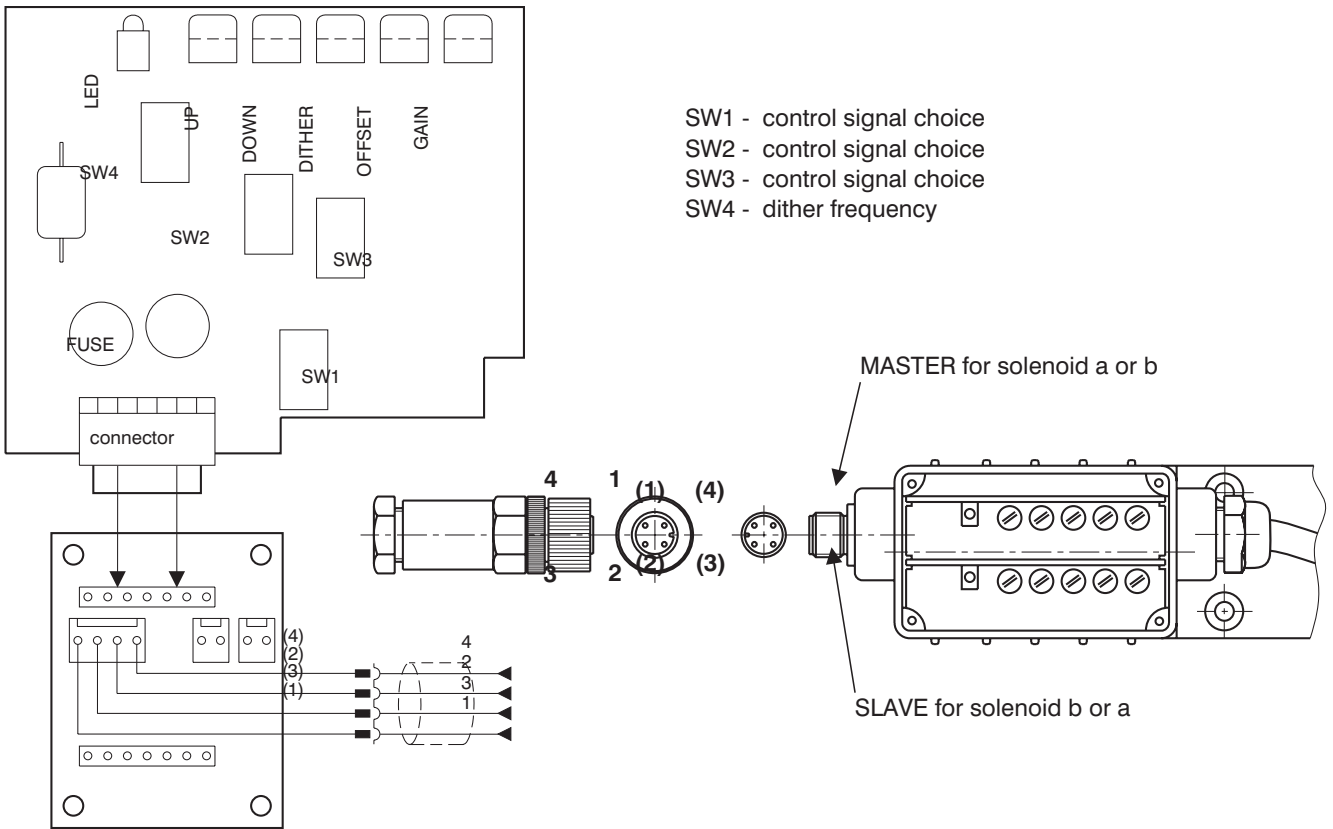
The values in table have only an informative character.

The times of the transient characteristics at pressure or flow control will be in a particular hydraulic circuit always longer.

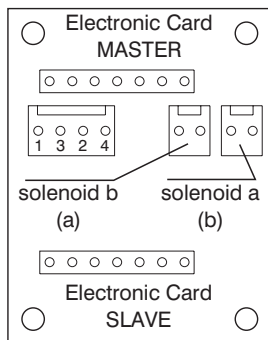
Frequency Reponse



Component Arrangement on the Electronic Card



Description basic subplatte



PIN	Description
1	+24 V (U_{CC}) (+12 V)
2	control
3	0 V
4	+10 V (+5 V)

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	$U_{cc}/2$ $\pm 10 V (\pm 5 V)^*$	$\pm 10 V$ $(\pm 5 V)^*$
MASTER M	SW1						
	SW2						
	SW3						
	SW4	90 Hz		60 Hz			
SLAVE S	SW1	X					
	SW2						
	SW3						
	SW4					90 Hz	

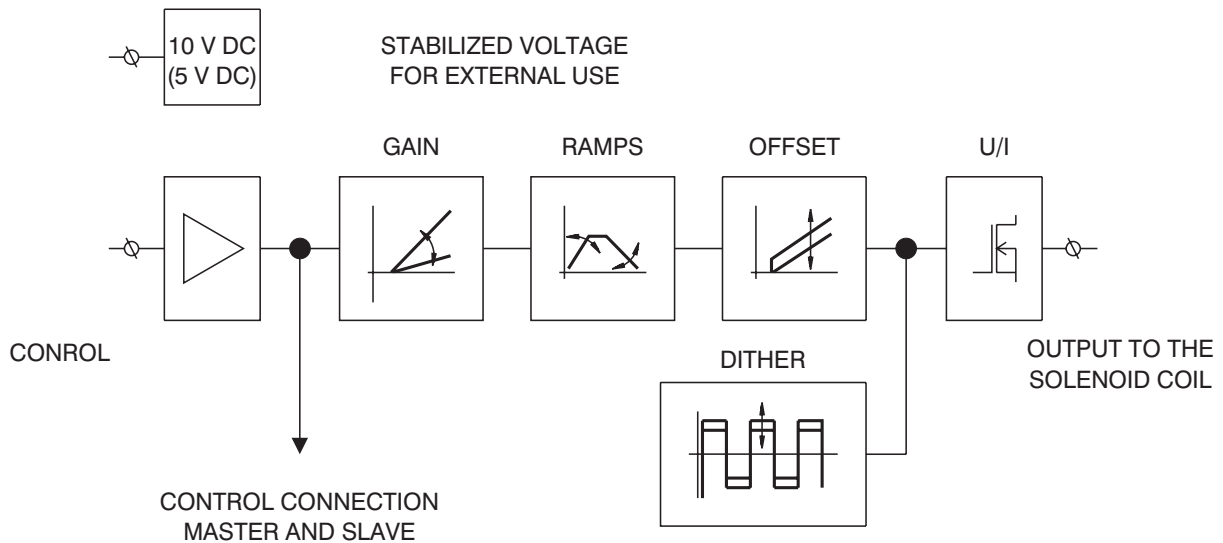
Designation of the basic manufacture setting.



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



Valve PRM2-042 (with one solenoid)

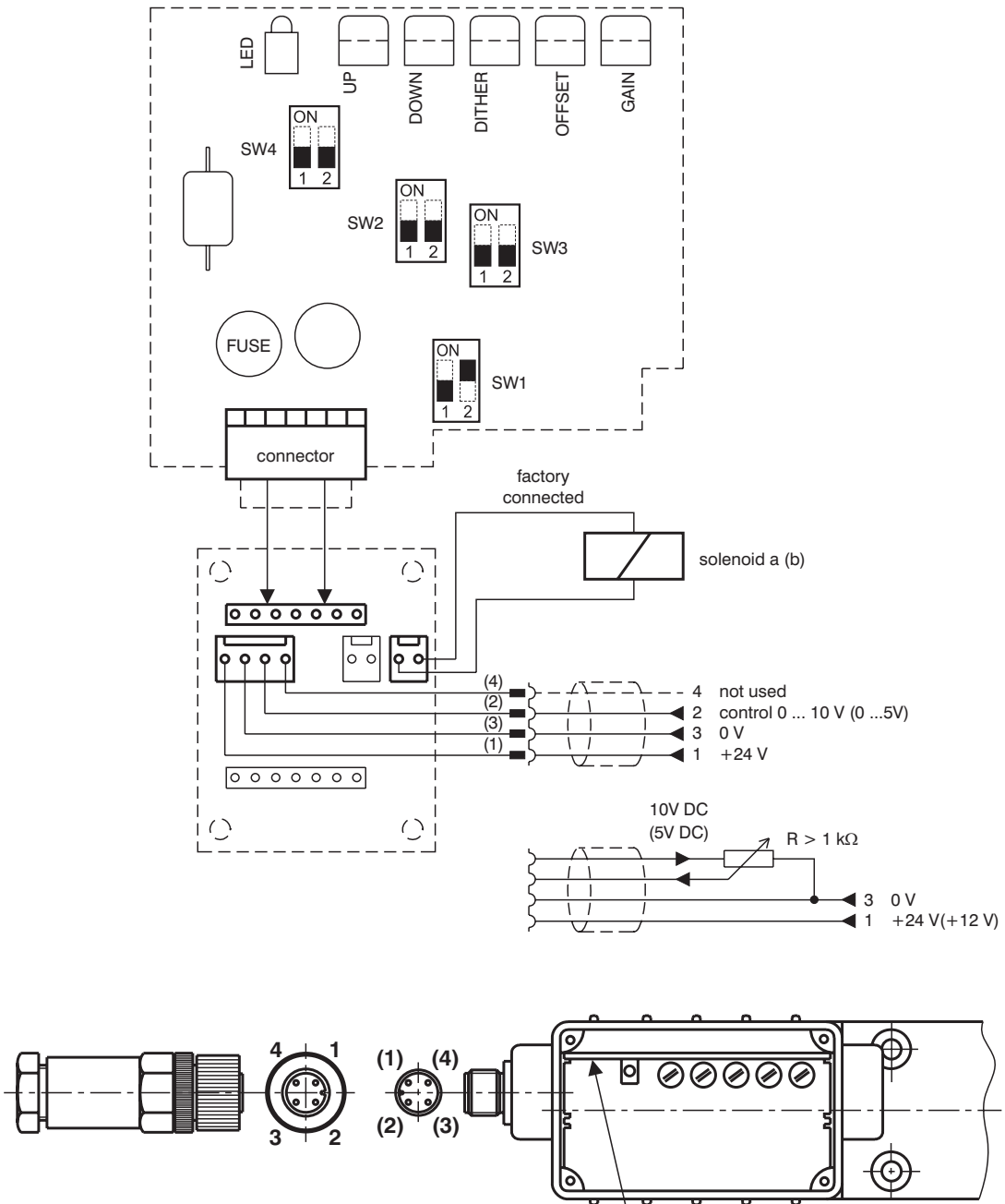
1 Factory setting

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

Notice:

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

Master card for solenoid a (b)



Wire colours (connection connector - electronics):

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

Factory set values:

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

Dither: frequency 90Hz
amplitude - optimum

Ramps: 0.05 s

Offset, Gain: according to the characteristics on page 3, 4

Valve PRM2-042 (with one solenoid)

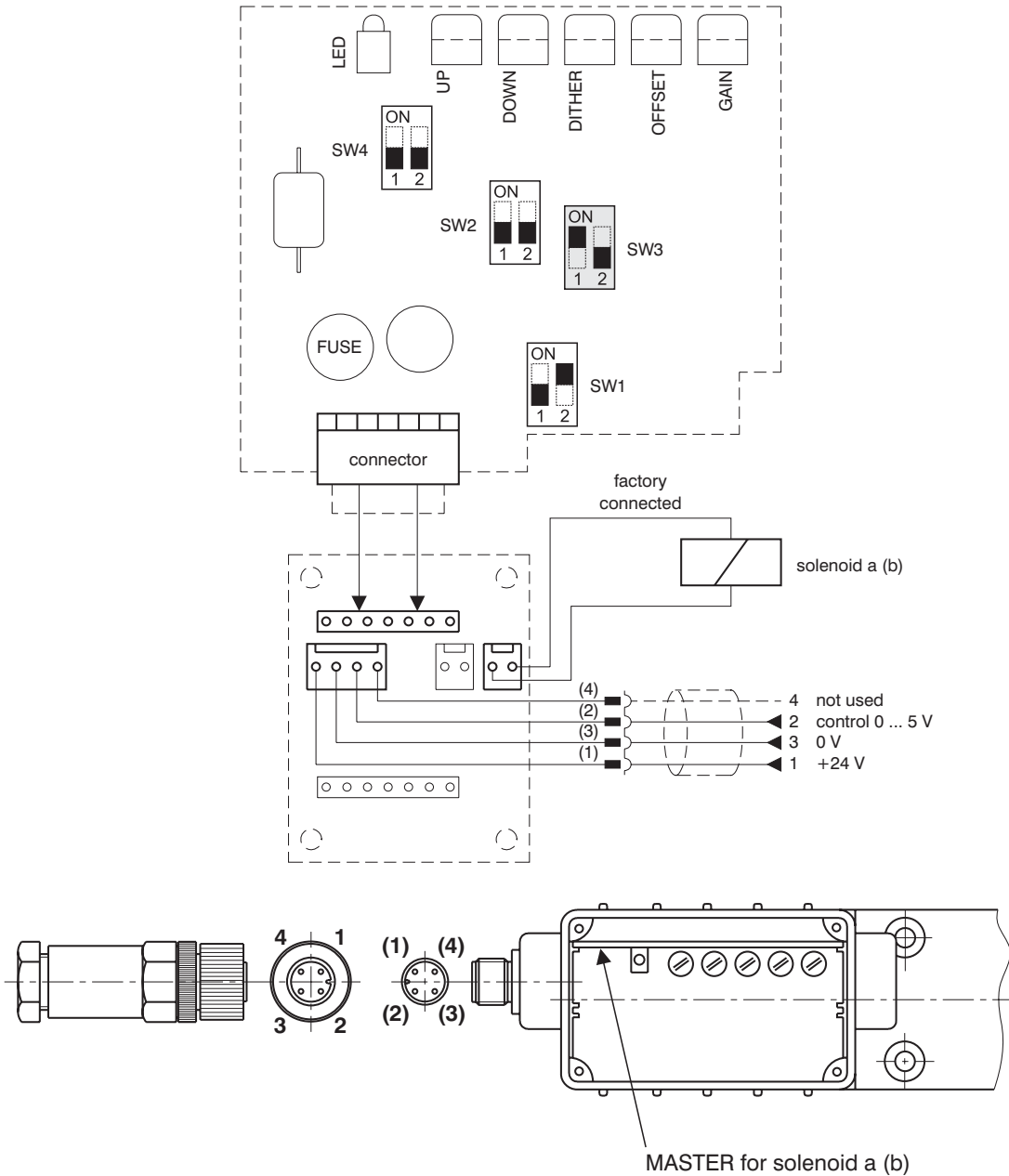
2 Other control possibilities

2.1 Control with external source 0 ... 5 V

Notice:

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

Master card for solenoid a (b)



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 SW3 in position shown in the picture
4. Put in the Master card and fix the electronics cover
5. Connect the voltage +24 V from an external supply source to terminals 1 and 3 of the connector
6. Connect the control voltage 0 ... 5 V from an external source to terminals 2 and 3 of the connector

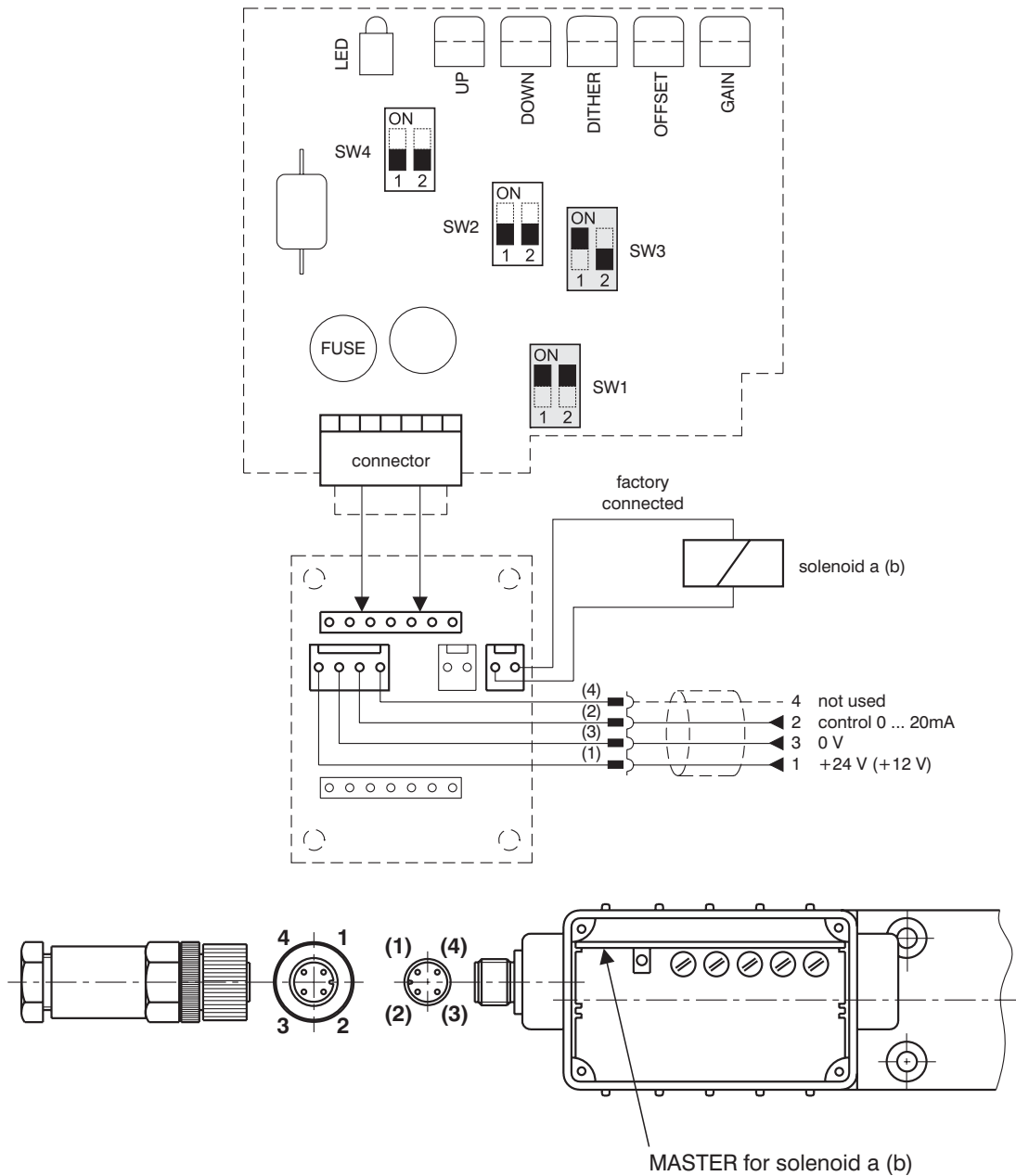
Valve PRM2-042 (with one solenoid)

2.2 Control with external source 0 ... 20 mA

Notice:

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

Master card for solenoid a (b)



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 and SW3 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
6. Bring the control current 0 ... 20 mA from an external source to terminals 2 and 3 of the connector

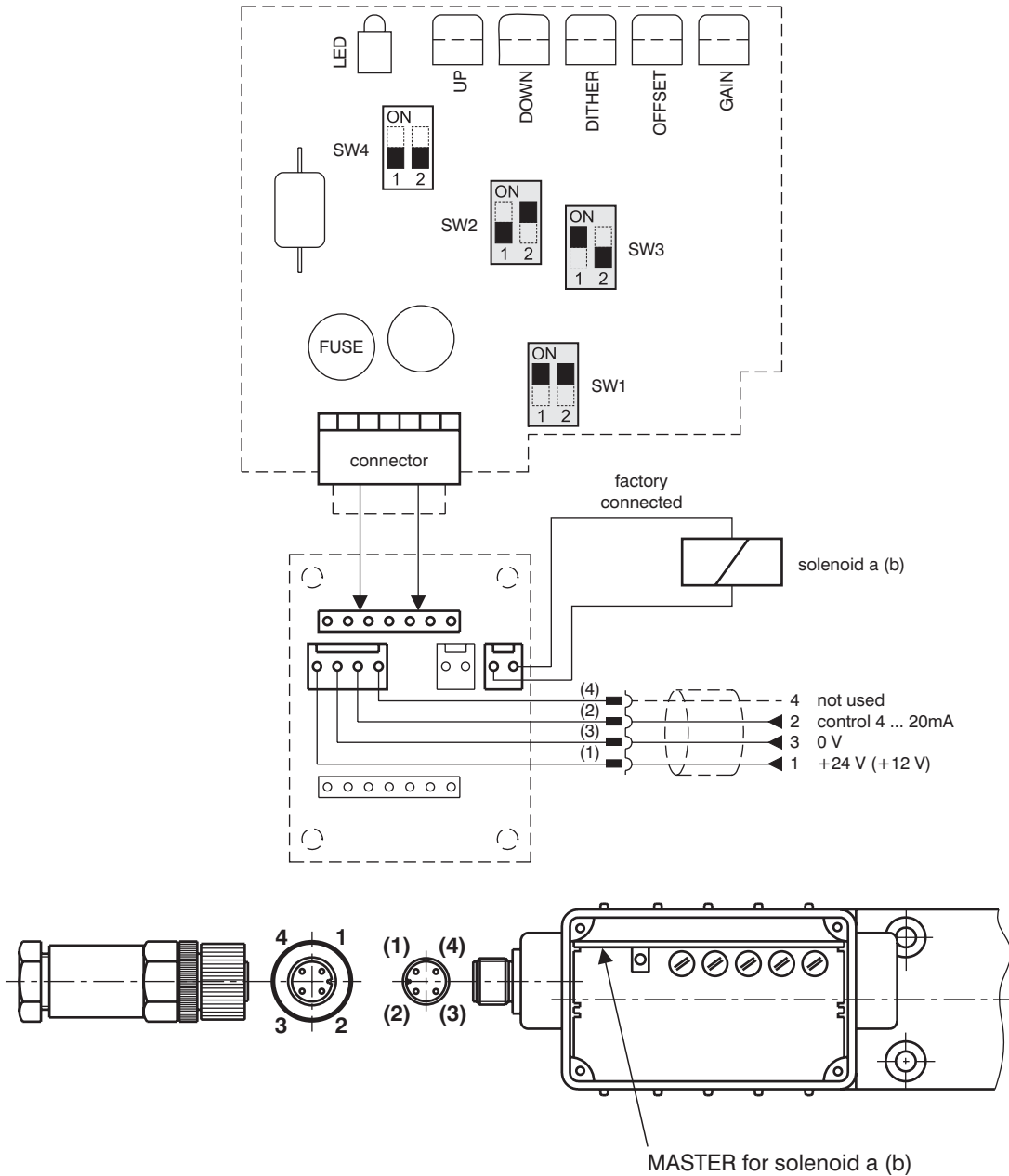
Valve PRM2-042 (with one solenoid)

2.3 Control with external source 4 ... 20 mA

Notice:

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

Master card for solenoid a (b)



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, SW2 and SW3 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
6. Bring the control current 4 ... 20 mA from an external source to terminals 2 and 3 of the connector

Valve PRM2-043 (with two solenoids)

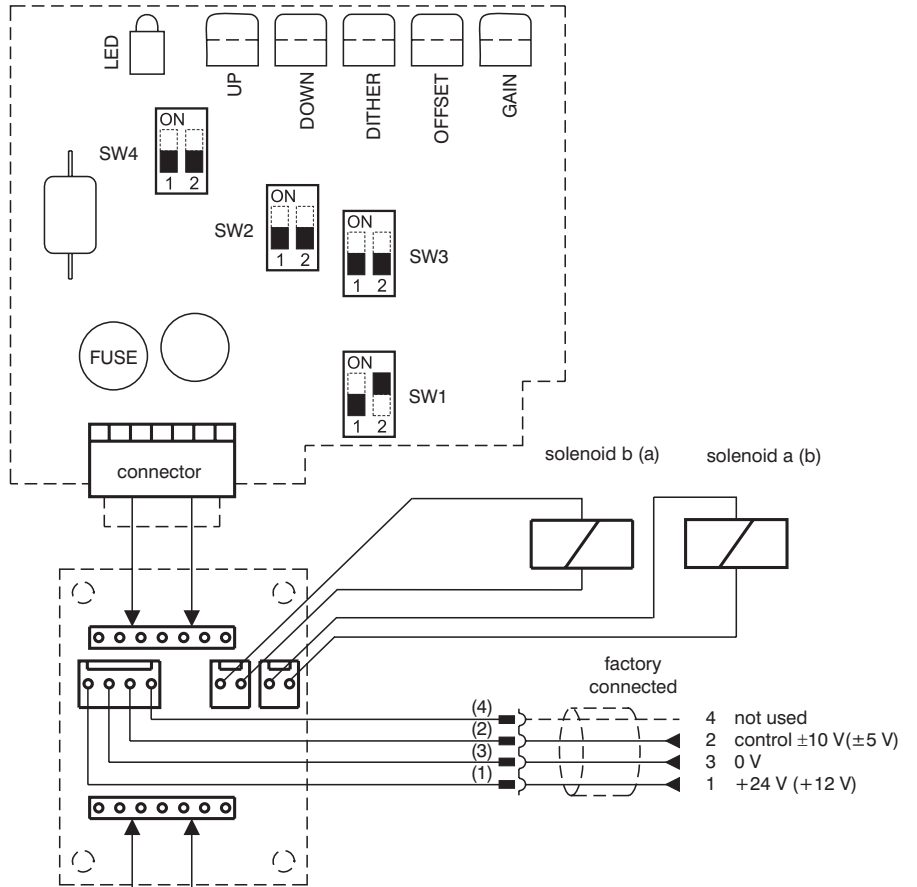
3 Factory setting

3.1 Control with external source $0 \pm 10 \text{ V}$ ($0 \pm 5 \text{ V}$)

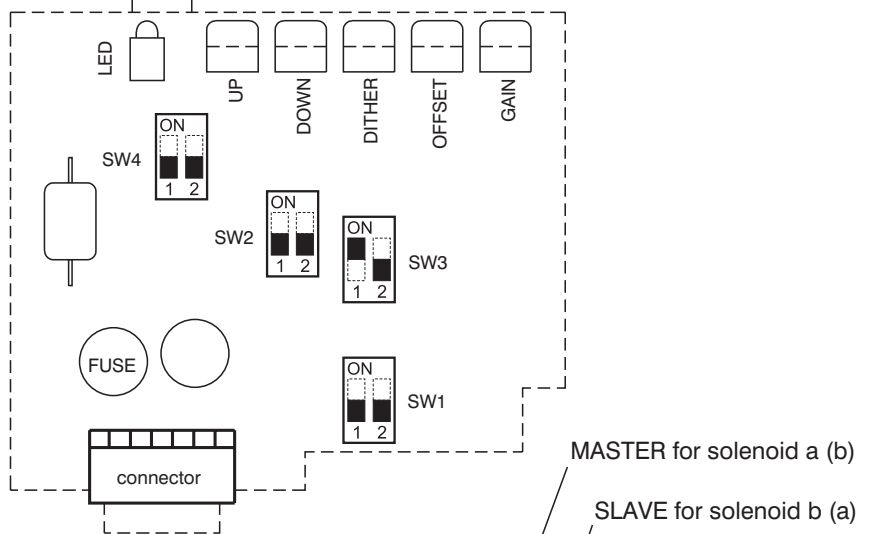
Notice:

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

Master card for solenoid a (b)



Slave card for solenoid b (a)



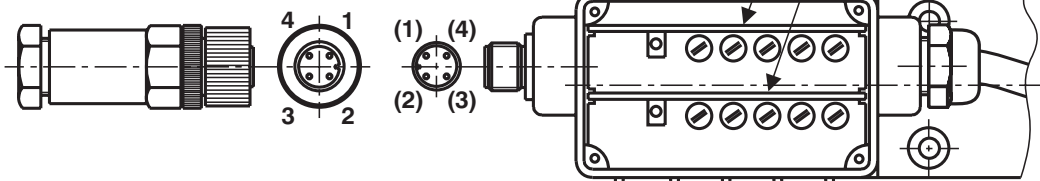
Factory set values:

Control signal: $0 \pm 10 \text{ V}$ ($0 \pm 5 \text{ V}$)

Dither: frequency 90 Hz
amplitude - optimum

Ramps: 0.05 s

Offset, Gain: according to the characteristics on page 3, 4

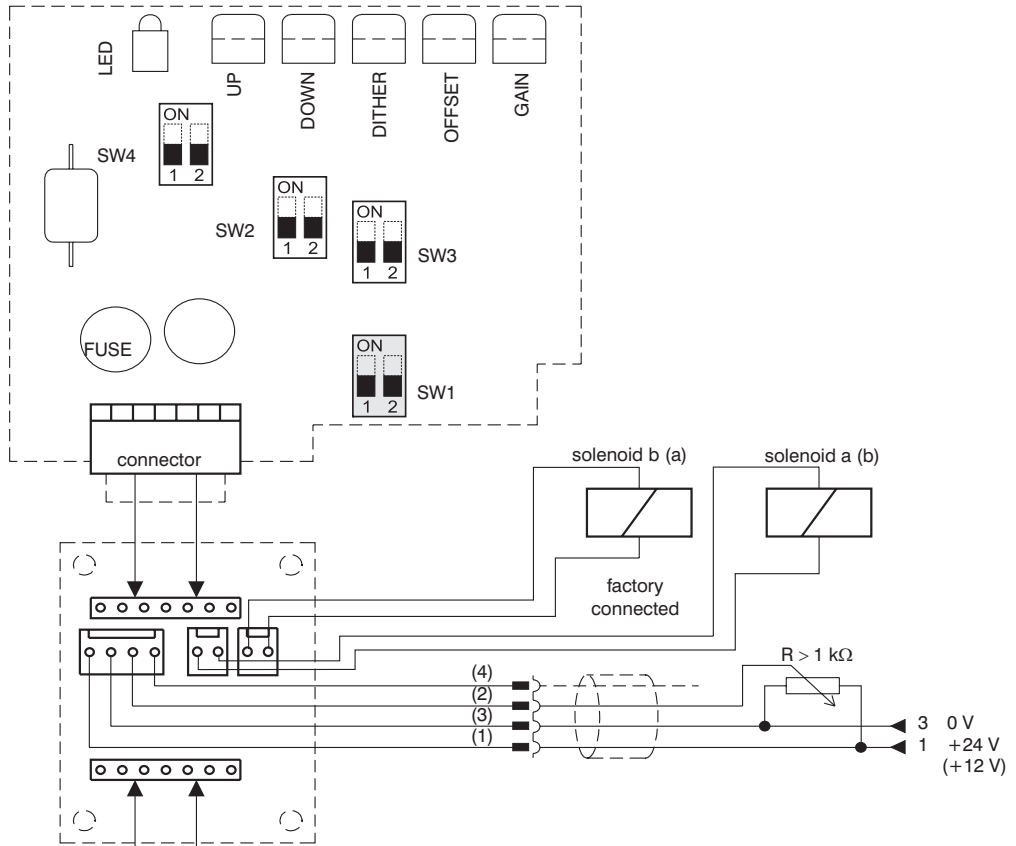


Valve PRM2-043 (with two solenoids)

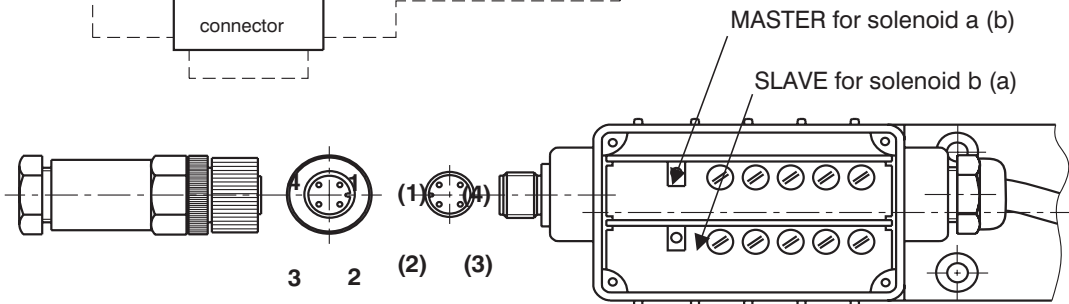
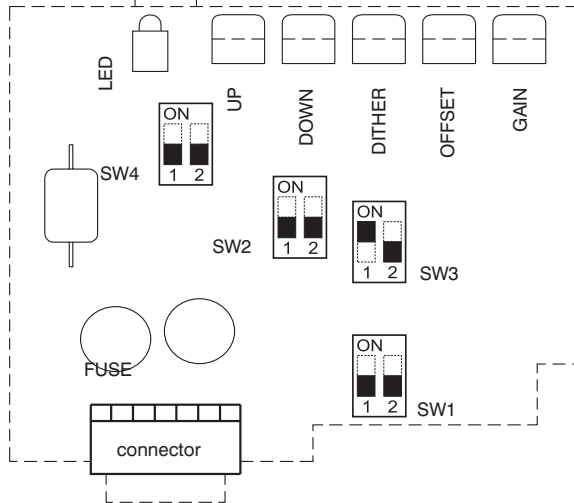
3.2 Other control possibilities

Control $U_{cc}/2 \pm 10 V (U_{cc}/2 \pm 5V)$ external potentiometer $R > 1 k\Omega$

Master card for solenoid a (b)



Slave card for solenoid b (a)

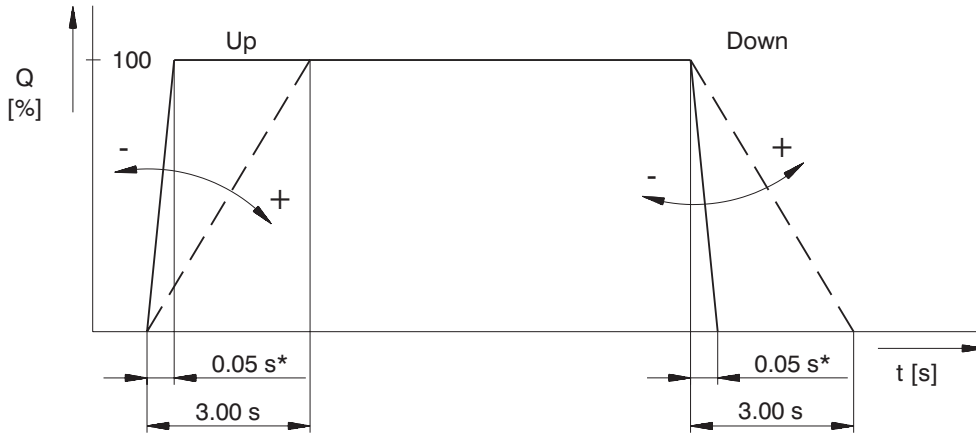


For the factory setting modification for this case of application, the following steps are required:

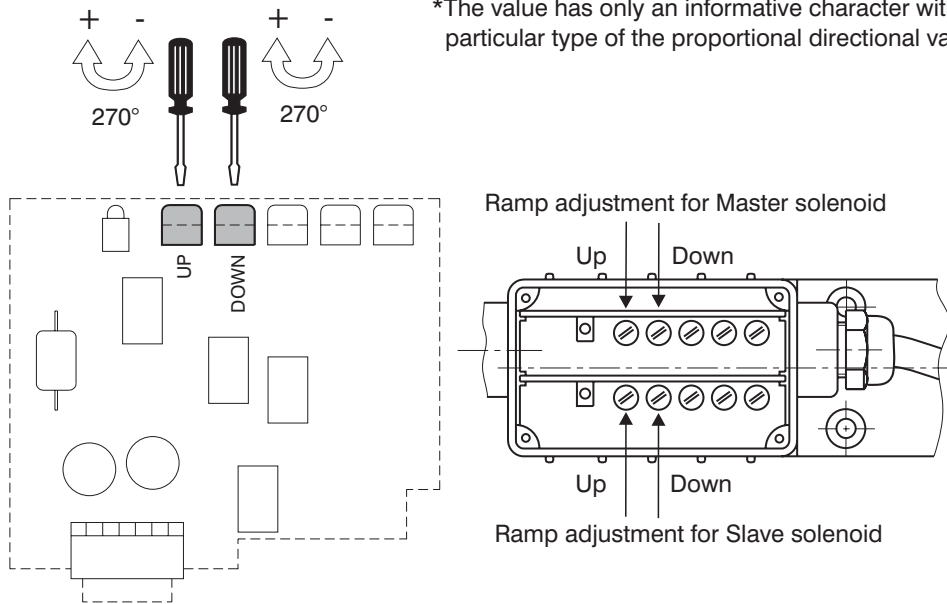
1. Unscrew the electronics cover
2. Carefully remove the Master card
3. Flip the switch SW1 in position shown in the picture
4. Put in the Master card and fix the electronics cover
5. Connect the voltage +24 V (+12 V) from an external supply source to terminals 1 and 3 of the connector

Ramp Adjustment (Up, Down)

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



*The value has only an informative character with respect to the particular type of the proportional directional valve (see page 4)

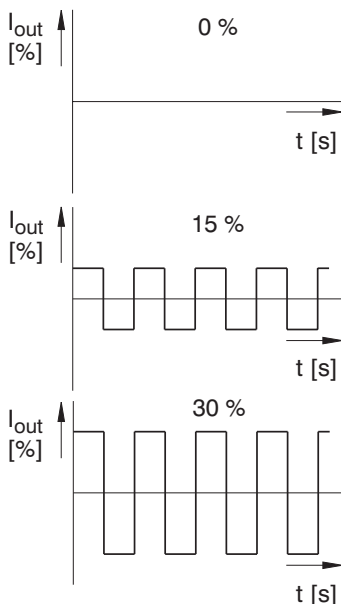


Dither Adjustment

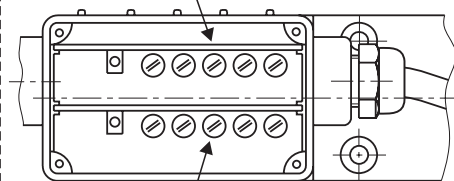
Notice: The dither is adjusted with regard to the minimum hysteresis.

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

Frequency - switch SW4



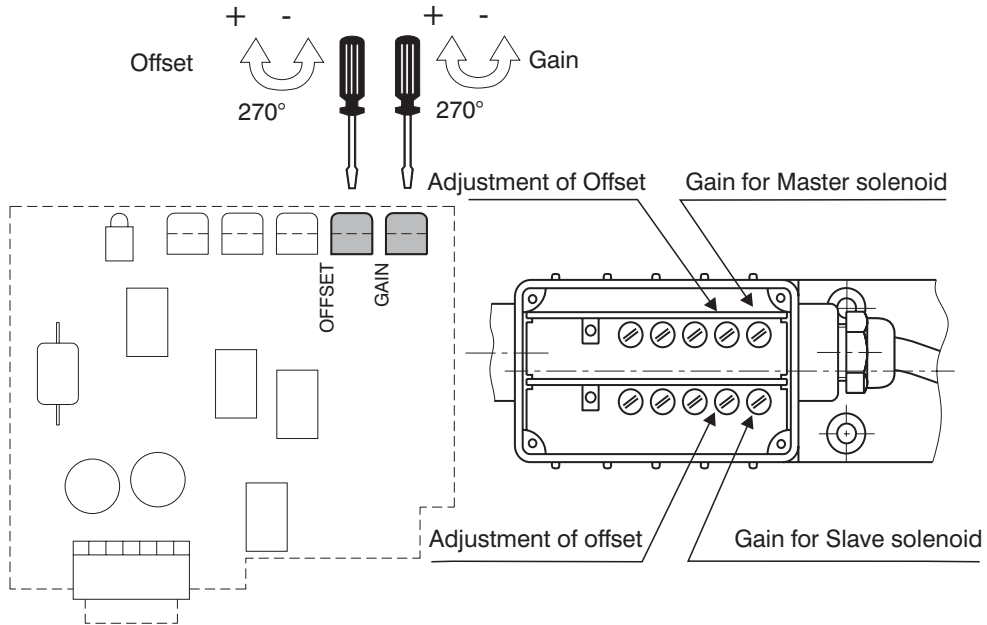
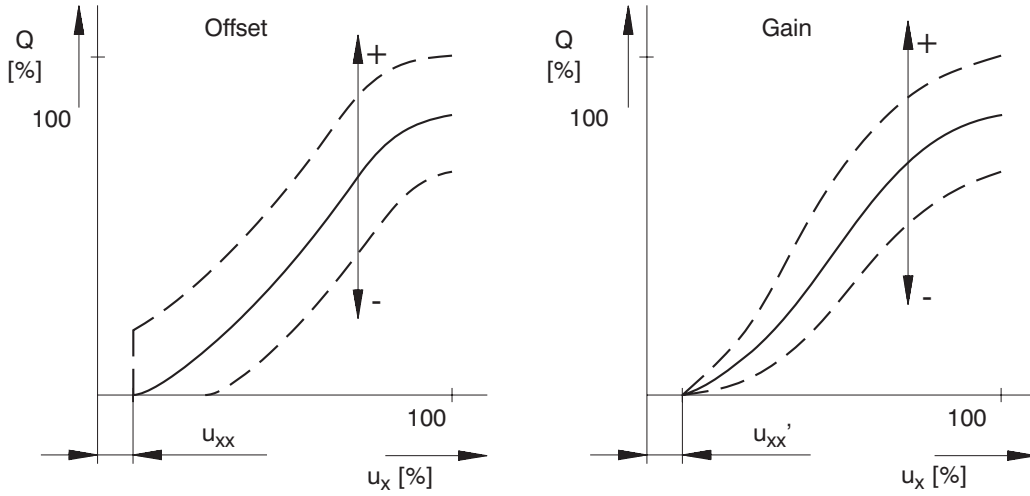
Amplitude adjustment for Master solenoid



Amplitude adjustment for Slave solenoid

Adjustment of Offset, Gain Parameters

Notice: 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.

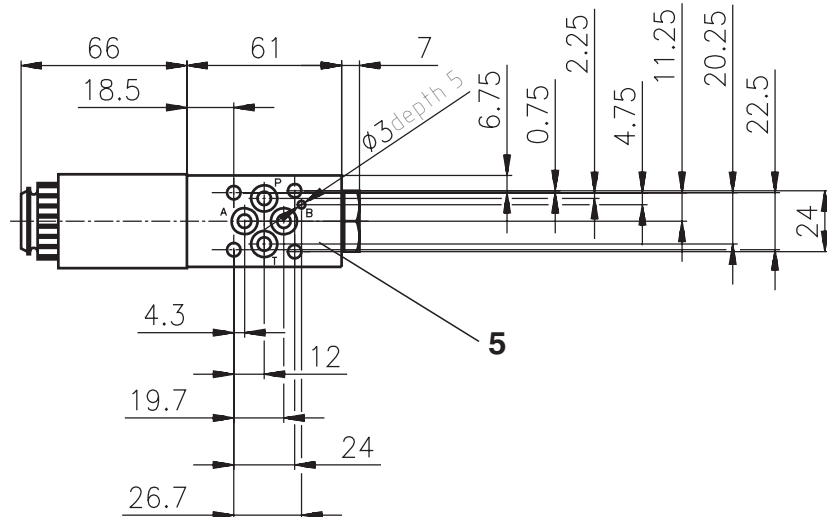


Nominal supply voltage of electronics [V]	Area insensible to control signal u_{xx} [%]
12	1 ... 3
24	0.5 ... 2

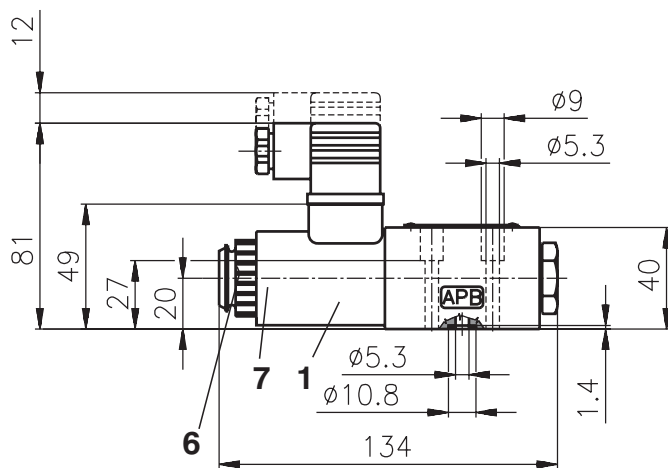
Valve Dimensions

Dimensions in millimetres

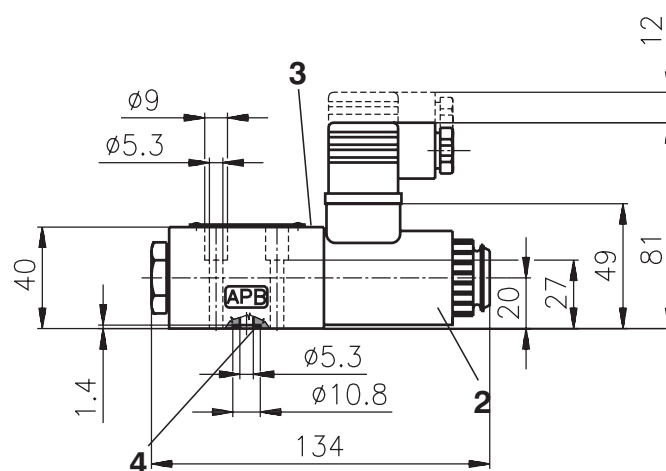
PRM2-042..../-....



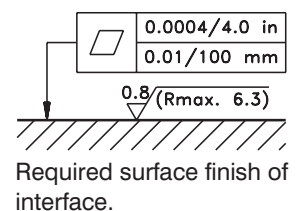
Functional symbols
2Z51, 2Y51



Functional symbols
2Z11, 2Y11



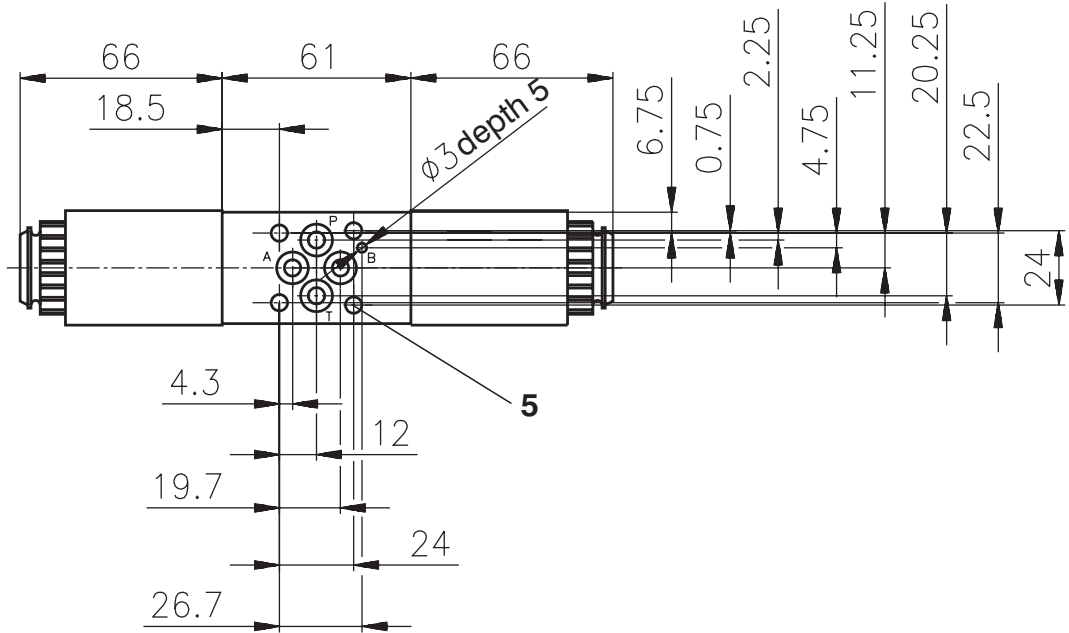
- 1 Solenoid a
- 2 Solenoid b
- 3 Name plate
- 4 Square ring 7.65 x 1.68 (4 pcs.)
supplied in delivery packet
- 5 4 mounting holes
- 6 Manual override
- 7 Solenoid fixing nut (Nut torque 3 Nm)



Valve Dimensions

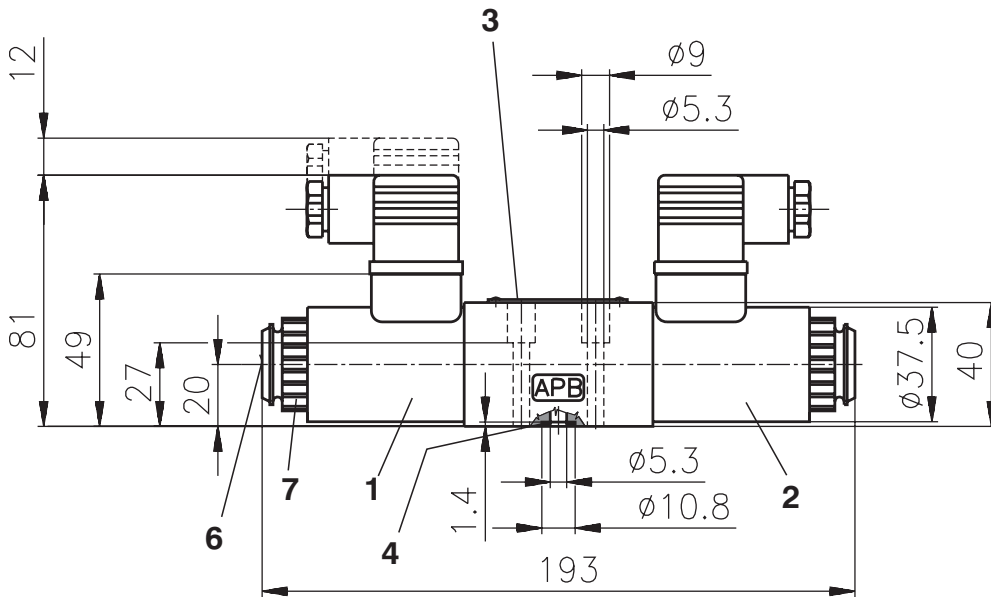
Dimensions in millimetres

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

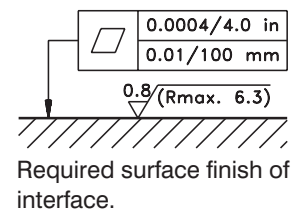


Functional symbols

3Z11, 3Z12, 3Y11, 3Y12



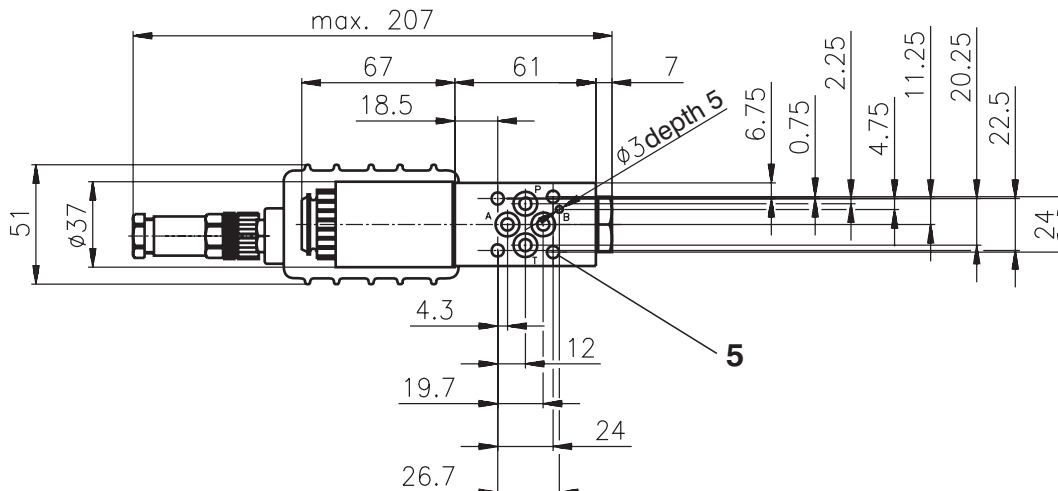
- 1 Solenoid a
- 2 Solenoid b
- 3 Name plate
- 4 Square ring 7.65 x 1.68 (4 pcs.)
supplied in delivery packet
- 5 4 mounting holes
- 6 Manual override
- 7 Solenoid fixing nut (Nut torque 3 Nm)



Valve Dimensions

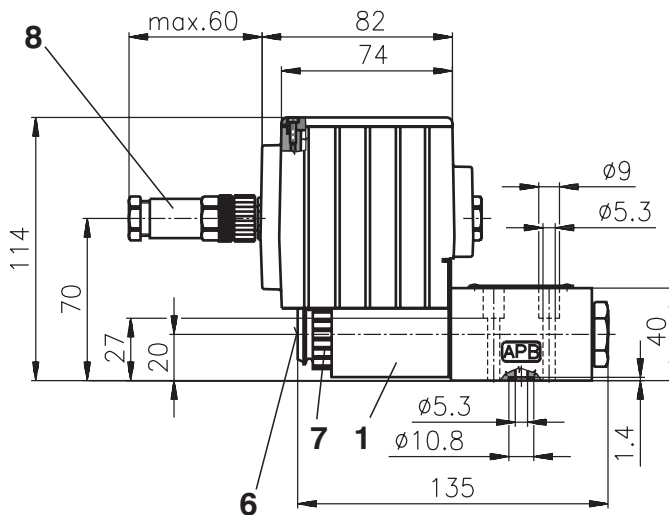
Dimensions in millimetres

PRM2-042..../-...EK.



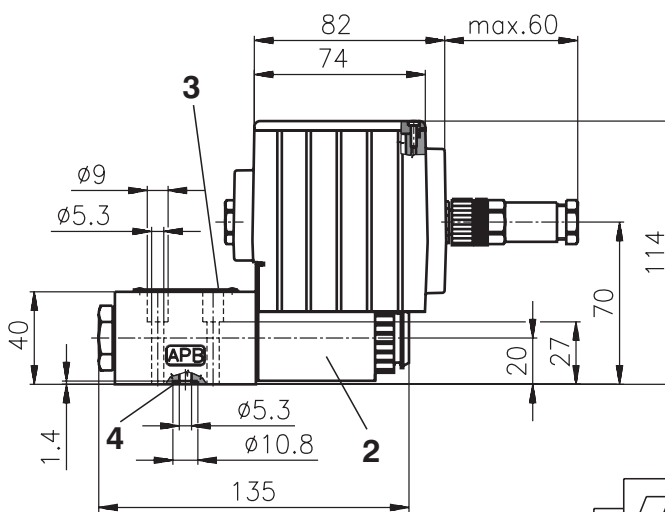
Functional symbols

2Z51, 2Y51

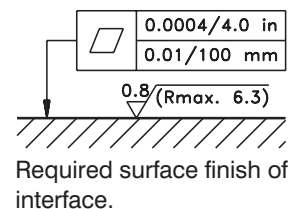


Functional symbols

2Z11, 2Y11



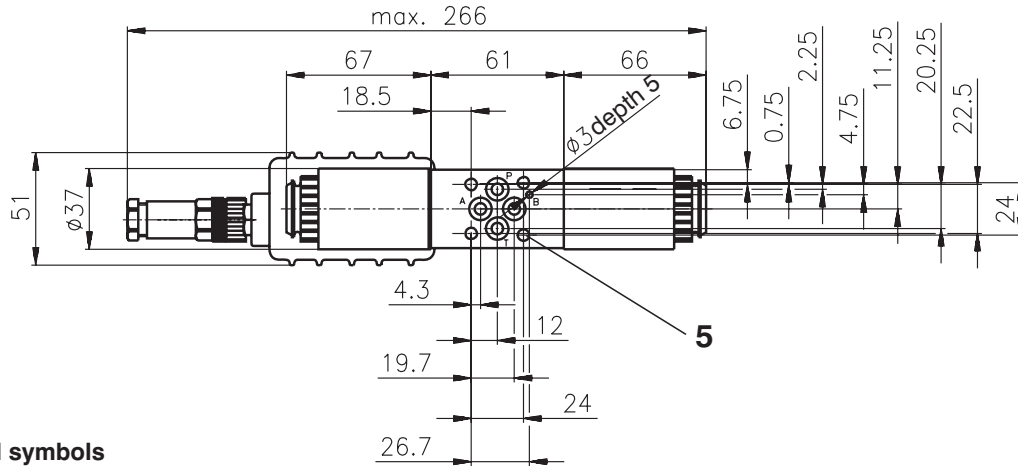
- 1 Solenoid a
- 2 Solenoid b
- 3 Name plate
- 4 Square ring 7.65 x 1.68 (4 pcs.)
supplied in delivery packet
- 5 4 mounting holes
- 6 Manual override
- 7 Solenoid fixing nut (Nut torque 3 Nm)
- 8 4-pin connector M12 x 1 for external supply voltage



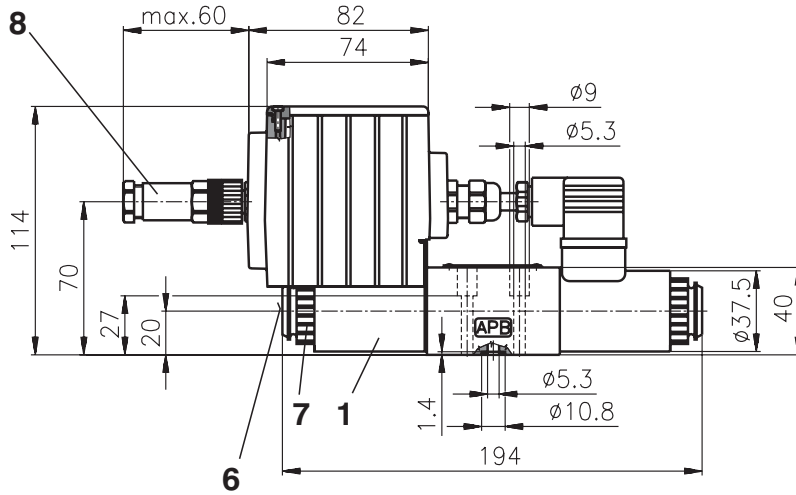
Valve Dimensions

Dimensions in millimetres

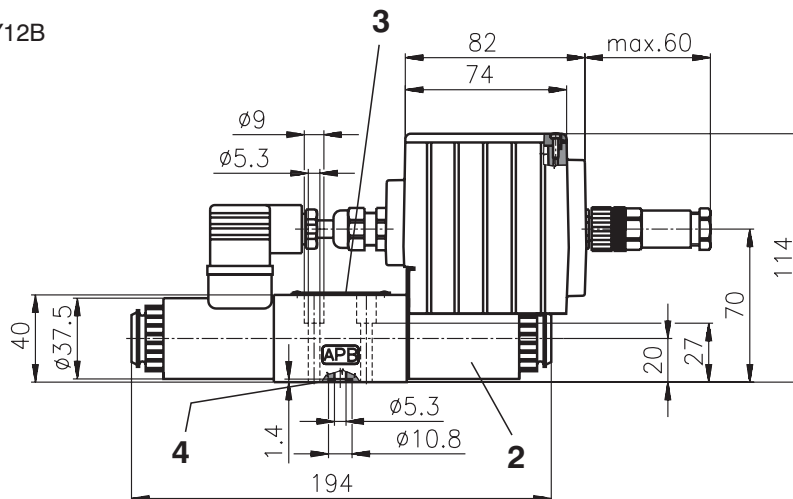
PRM2-043..../-...EK.



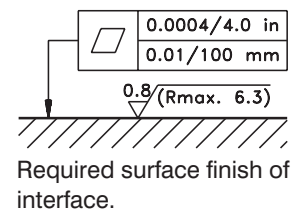
Functional symbols
3Z11, 3Z12, 3Y11, 3Y12



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

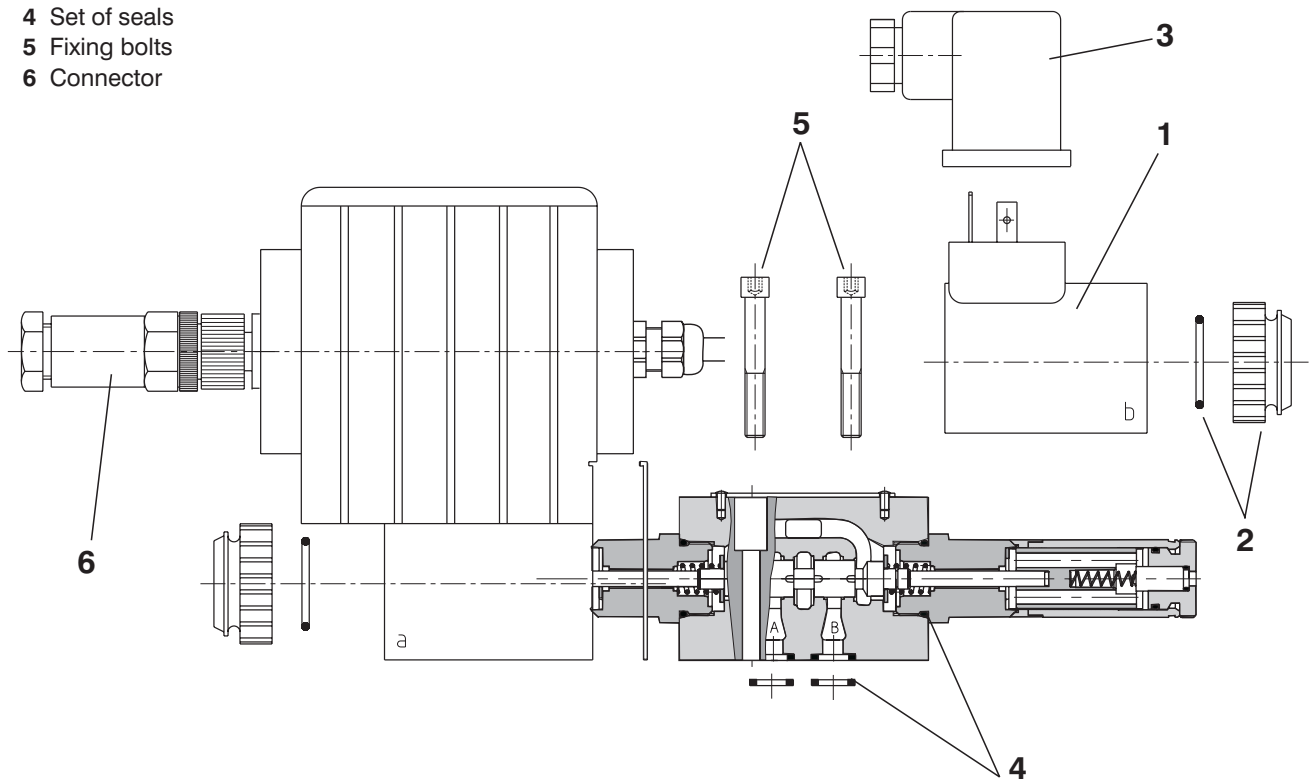


- 1 Solenoid a
- 2 Solenoid b
- 3 Name plate
- 4 Square ring 7.65 x 1.68 (4 pcs.)
supplied in delivery packet
- 5 4 mounting holes
- 6 Manual override
- 7 Solenoid fixing nut (Nut torque 3 Nm)
- 8 4- pin connector M12 x 1 for external supply voltage



Spare Parts

- 1 Solenoid coil
- 2 Nut + sealing ring
- 3 Connector plug EN 175301-803
- 4 Set of seals
- 5 Fixing bolts
- 6 Connector



1. Solenoid coil

Nominal supply voltage [V]	Ordering number
12	16186100
24	16186200

2. Solenoid fixing nut + sealing ring

Model of the nut	Sealing ring	Ordering number
Standard nut	18 x 1,5	15874500

3. Connector plug to EN 175301-803

Type designation	Type	Maximum input voltage	Connector plug A gray	Connector plug B black
			Ordering number	
K5	without rectifier - M16x1.5, (bushing bore \varnothing 4-6 mm)	230 V DC	16202600	16202500

4. Set of seals

Type	Dimensions, number		Ordering number
Standard - NBR 70	7.65 x 1.68 (4 pcs)	16 x 2 (2 pcs)	15873800
Viton	7.65 x 1.68 (4 pcs)	16 x 2 (2 pcs)	15874400

5. Fixing bolts - set

Dimensions, number	Tightening torque	Ordering number
M5 x 35 DIN 912-10.9 (4 pcs)	5 Nm	15874600

6. Connector

Ordering number
M12 x 1 (4-pin connector) 358358904012

Caution!

- The packing foil is recyclable.
- The protective plate can be returned to manufacturer.
- Mounting bolts M5 x 35 DIN 912-10.9 or studs must be ordered separately.
Tightening torque of the bolts is 5 Nm.
- The technical information regarding the product presented in this catalogue is for descriptive purposes only. It should not be construed in any case as a guaranteed representation of the product properties in the sense of law.

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