

DATA SHEET - OPERATION MANUAL

APPLICATION

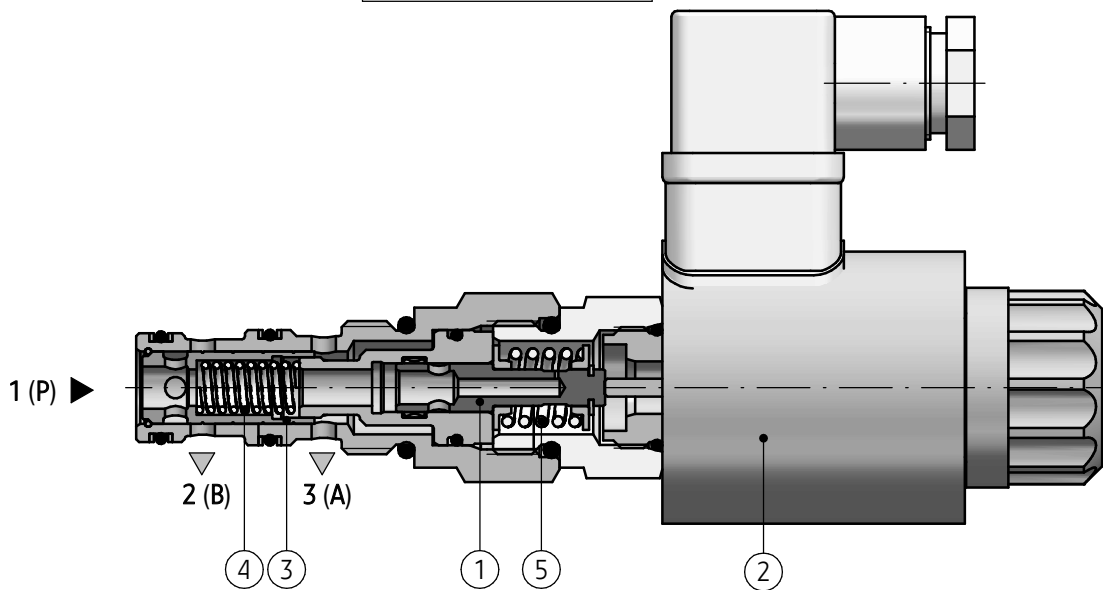
3-way proportional flow control valve, electrically operated type **WDUD6...** is used to adjust the fluid flow rate irrespective of pressure on the supply (pump) in a hydraulic system. It allows to control the velocity of the actuator movement – mostly of the piston rod or hydraulic motor. The inlet fluid (port **1**) is divided into two fluid streams: main fluid stream directed to port **3** and the remaining (residual) fluid stream directed via port **2** to the drain or to the supply of the other actuator.

The flow control valve type **WDUD6...** is designed for mounting in connections in hydraulic manifold blocks in any desired working position.



DESCRIPTION OF OPERATION

WDUD6 - 02/20 M1-12 Z4



The 3-way flow control valve is used to divide the inlet fluid (port **1**) into main fluid directed to port **3** and into remaining (residual) fluid (port **2**).

The 3-way flow control valve type **WDUD6...** is composed of two valves working together: differential valve and throttle valve (proportionally and electrically operated).

The differential valve is used as a control valve and consists of a spool (**3**) and a spring (**4**). The throttle valve is used for measurement and is electrically, proportionally operated.

It consists of the throttle (**1**) made as a spool with suitable holes (well-matched to the range of flow rate) and a proportional solenoid (**2**) working with the spring (**5**).

Depending on the supply voltage for the coil, the position of force balance between the solenoid plunger and the pushed spring (**5**) is fixed. The position of balance determines the position of throttle setting.

DESCRIPTION OF OPERATION

Hydraulic fluid passing through the valve from port 1 to port 3 causes the pressure drop at the throttle (1) that depends on the setting and the current flow rate via the throttle (1). The pressure difference before and behind the throttle (1) affects the spool (3). After the initial spring tension (4) is overcome, the pressure difference affects opening the port 1 to port 2, and thus the remaining (residual) fluid can flow. At the same time, the spool (3) with its control edge - from the opposite -

causes that the hydraulic fluid flowing to the port 3 is throttled. The spool (3) is held in the equilibrium position when the pressure drop at the measurement throttle (1) corresponds to the initial spring tension (spring pre-tension) (4). Therefore, the rate of fluid flow passing through the port 3 is constant irrespective of the pressure on the supply (port 1) and depends only on the position of throttle (1).

TECHNICAL DATA

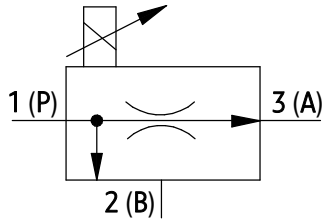
Hydraulic fluid	mineral oil		
Required fluid cleanliness class	ISO 4406 class 20/18/15		
Nominal fluid viscosity	37 mm ² /s at temperature 55 °C		
Viscosity range	2,8 up to 380 mm ² /s		
Fluid temperature range (in a tank)	recommended	40 °C up to 55 °C	
	max	-20 °C up to +70 °C	
Ambient temperature range	- 20 °C up to +50 °C		
Maximum operating pressure	25 MPa		
Minimum operating pressure	1,8 MPa		
Maximum flow rate	version (flow range)	flow rate	
		port 1 (P)	port 3 (A)
	WDUD6.../...15...	40 dm ³ /min	15 dm ³ /min
	WDUD6.../...20...	40 dm ³ /min	20 dm ³ /min
WDUD6.../...25...	40 dm ³ /min	25 dm ³ /min	
Hysteresis	version (flow range)	WDUD6.../...15...	10 %
		WDUD6.../...20...	8,8 %
		WDUD6.../...25...	7,5 %
Maximum supply current of the solenoid	1,5 A		0,8 A
Resistance of cold solenoid coils (20 °C)	5,4 Ω		19,5 Ω
Electronic regulators/amplifiers (must be ordered separately)	type 21RE10 D in accordance with data sheet WK 421 810		-
	type 20RE10 E in accordance with data sheet WK 420 820 type 20RC10 E in accordance with data sheet WK 427 790 (when powered by a stabilized voltage 12 to 24V DC, set the maximum current I _{max})		
Weight	0,8 kg		

INSTALLATION AND OPERATION REQUIREMENTS

- Only fully functional and operational valve, properly connected to electrical installation must be used.
- During the period of operation must be kept fluid viscosity acc. to requirements defined in this Data Sheet - Operation Manual
- In order to ensure failure free and safe operation the following must be checked:
 - condition of the electrical connection
 - proper working of the valve
 - cleanliness of the hydraulic fluid
- Due to heating of electromagnet solenoid coils to high temp., the valve shall be placed in such way to eliminate the risk of accidental contact with the valve during operation or to apply suitable covers acc. to PN-EN ISO 13732-1 and PN-EN 4413
- In order to ensure tightness of the valve block, one should take care of dimension of sealing rings, tightening torques and valve operation parameters given in this Data Sheet - Operation Manual
- A person that operates the valve must be thoroughly familiar with this Data Sheet - Operation Manual.

DIAGRAMS

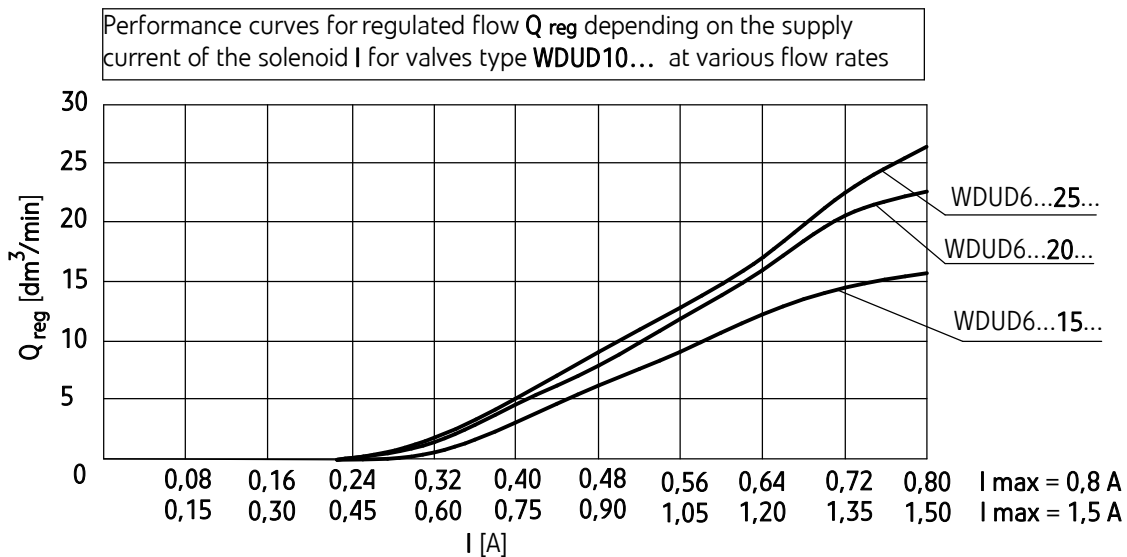
Hydraulic diagram of proportional flow control valve type **WDUD6...**



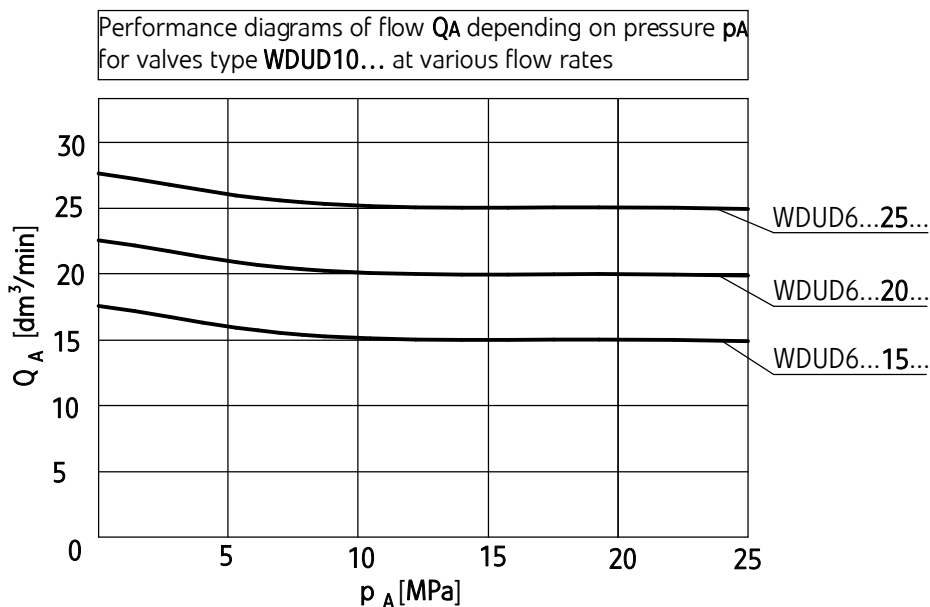
PERFORMANCE CURVES

measured at viscosity $\nu = 41 \text{ mm}^2/\text{s}$ and temperature $t = 50^\circ\text{C}$

Performance curves for flow rate depending on the supply current of the solenoid

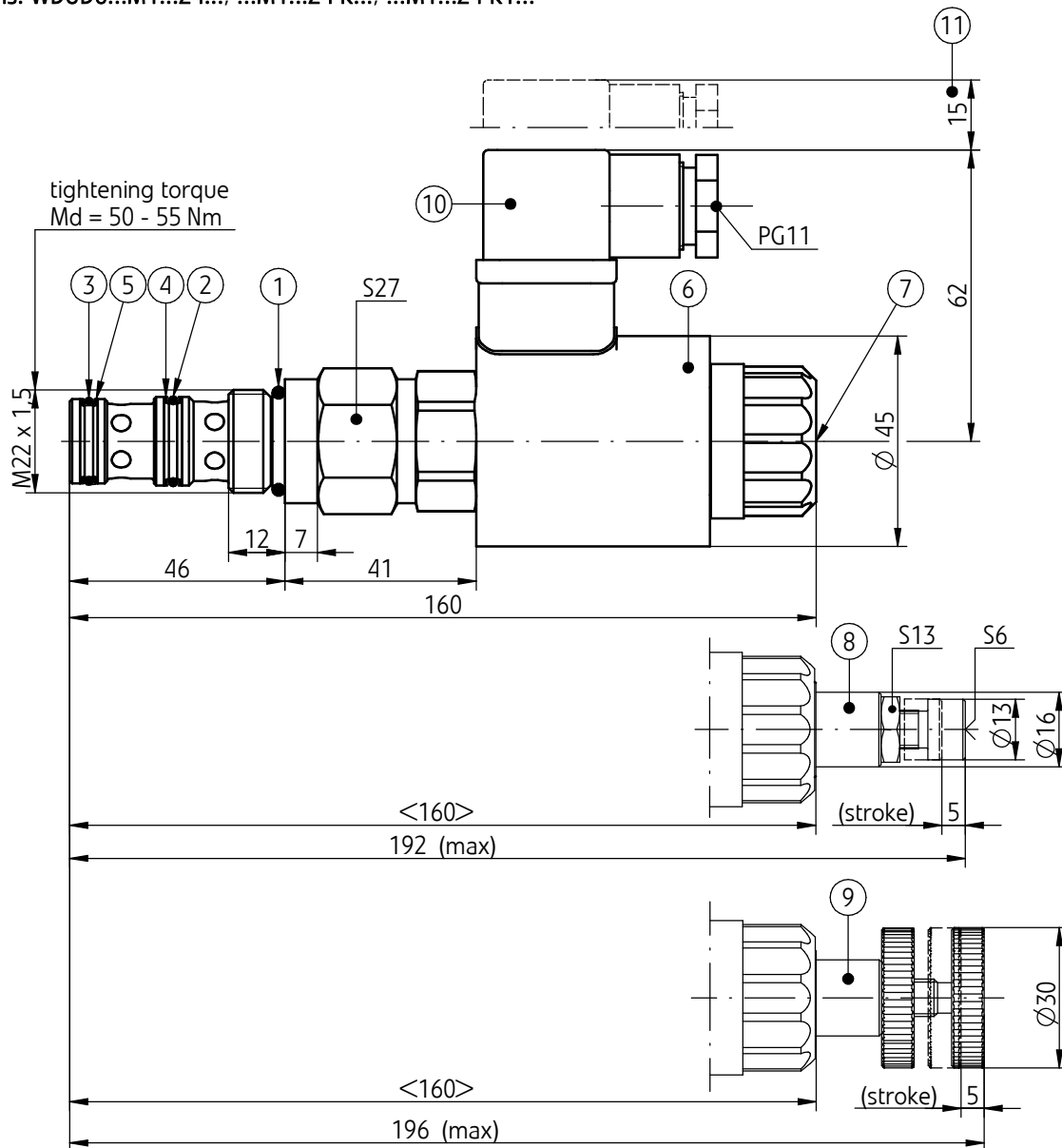


Performance diagrams of stable flow rate



OVERALL AND CONNECTION DIMENSIONS

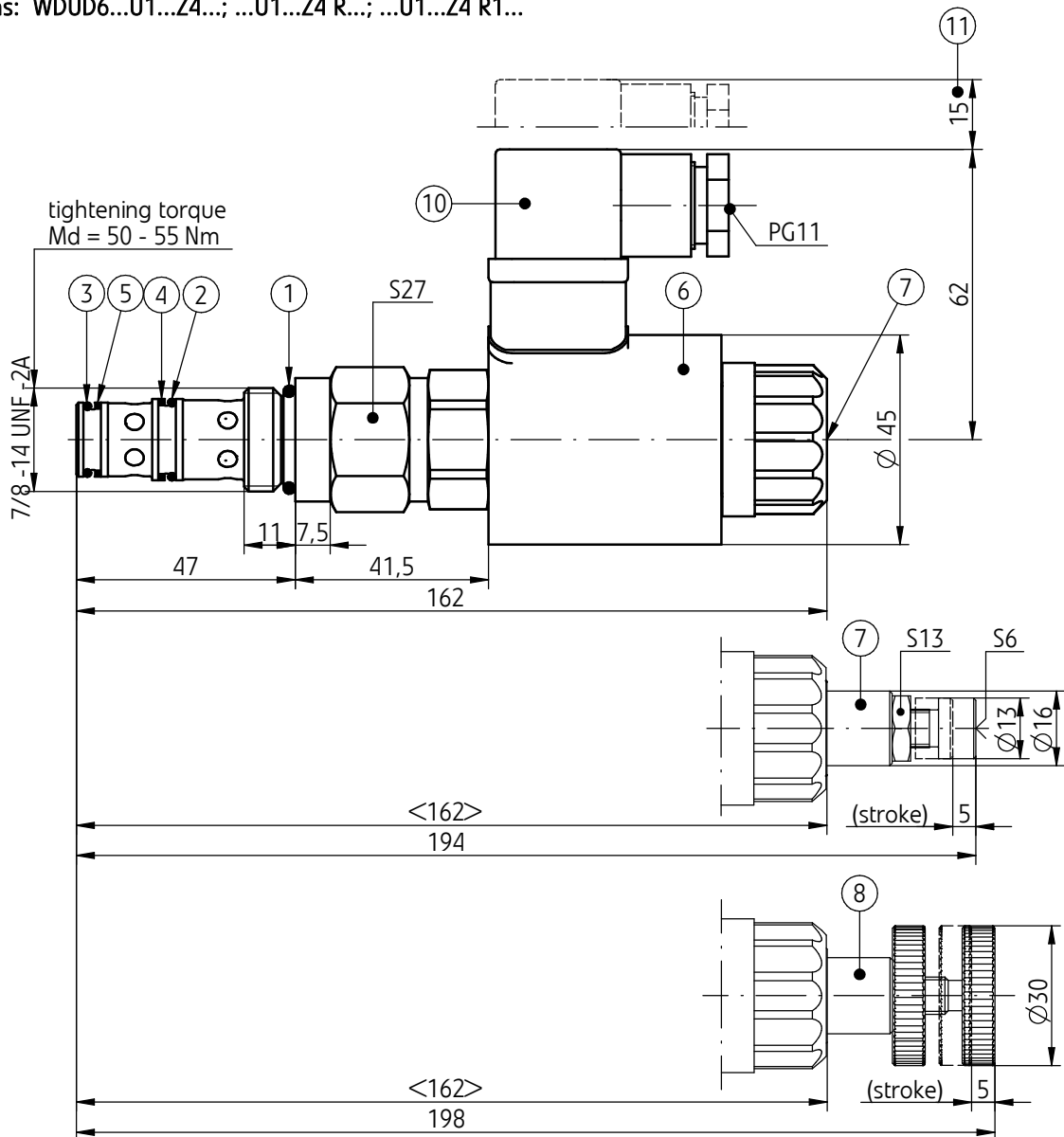
versions: WDUD6...M1...Z4...; ...M1...Z4 R...; ...M1...Z4 R1...



- 1 - Sealing **o-ring** 18 x 2,65 - 1 pcs/set
 - 2 - Sealing **o-ring** 15,6 x 1,78 - 1 pcs/set
 - 3 - Sealing **o-ring** 15 x 1,8 - 1 pcs/set
 - 4 - Retaining ring 19 x 16,2 x 0,7 - 2 pcs/set
 - 5 - Retaining ring 18 x 15,2 x 0,7 - 2 pcs/set
 - 6 - Solenoid **without mechanical adjustment**
(version WDUD6...M1...Z4...)
 - 7 - Manual override
 - 8 - Solenoid **with mechanical adjustment** - set screw with
hexagon socket S6 (version WDUD6...M1...Z4 R...)
 - 9 - Solenoid **with mechanical adjustment** - hand knob
(version WDUD6...M1...Z4 R1...)
 - 10 - Plug-in-connector type **ISO 4400** * (DIN 43650 - A)
 - 11 - Space required to remove plug-in connector - pos. 10
- NOTE:**
(*) - additional option of electrical connection in accordance with page 10

OVERALL AND CONNECTION DIMENSIONS

versions: WDUD6...U1...Z4...; ...U1...Z4 R...; ...U1...Z4 R1...



- 1 - Sealing o-ring 18 x 2,65 - 1 pcs/set
- 2 - Sealing o-ring 14 x 1,78 - 1 pcs/set
- 3 - Sealing o-ring 12,42 x 1,78 - 1 pcs/set
- 4 - Retaining ring 17,5 x 14,6 x 1,4 - 1 pcs/set
- 5 - Retaining ring 15,9 x 13 x 1,4 - 1 pcs/set
- 6 - Solenoid **without mechanical adjustment**
(version WDUD6...U1...Z4...)
- 7 - Manual override
- 8 - Solenoid **with mechanical adjustment** - set screw with
hexagon socket S6 (version WDUD6...U1...Z4 R...)
- 9 - Solenoid **with mechanical adjustment** - hand knob
(version WDUD6...U1...Z4 R1...)
- 10 - Plug-in-connector type **ISO 4400** * (DIN 43650 - A)
- 11 - Space required to remove plug-in connector - pos. 10

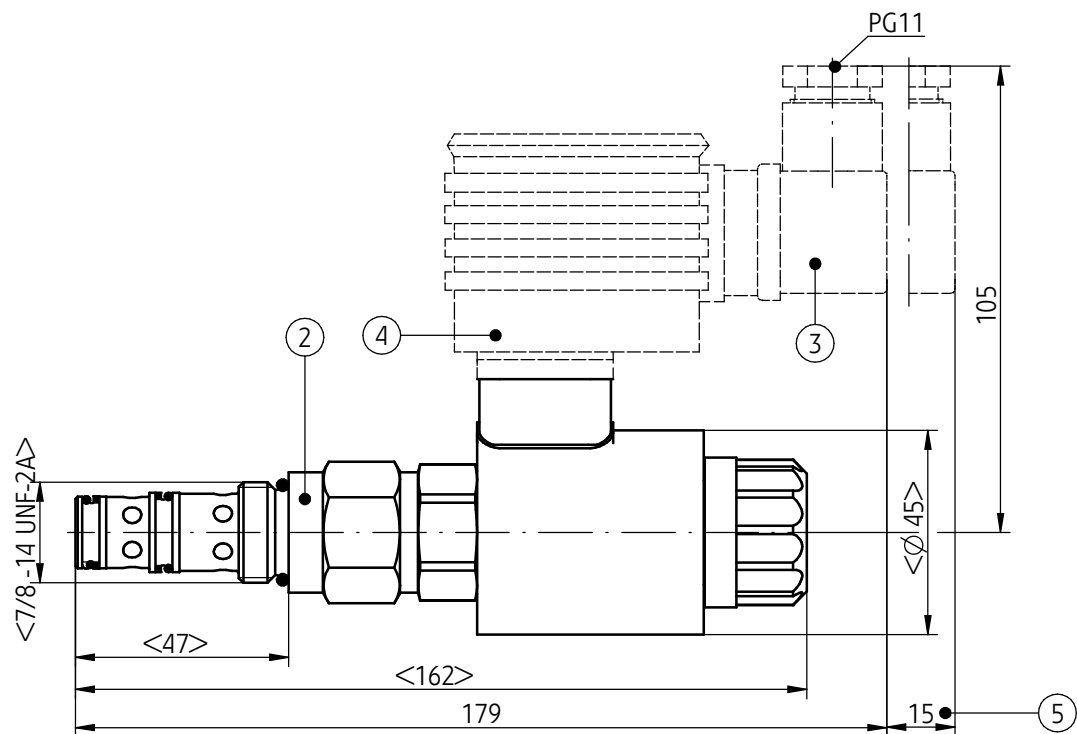
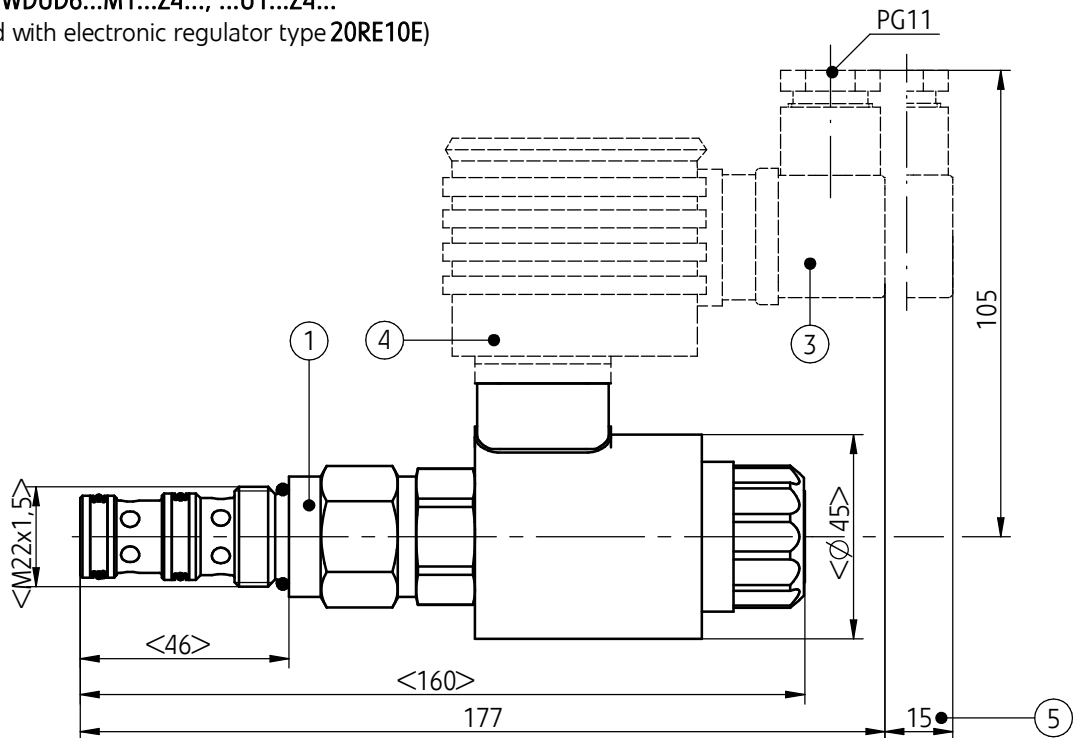
NOTE:

(*) - additional option of electrical connection in accordance with page 10

OVERALL AND CONNECTION DIMENSIONS

versions: WDUD6...M1...Z4...; ...U1...Z4...

(equipped with electronic regulator type 20RE10E)



NOTE:

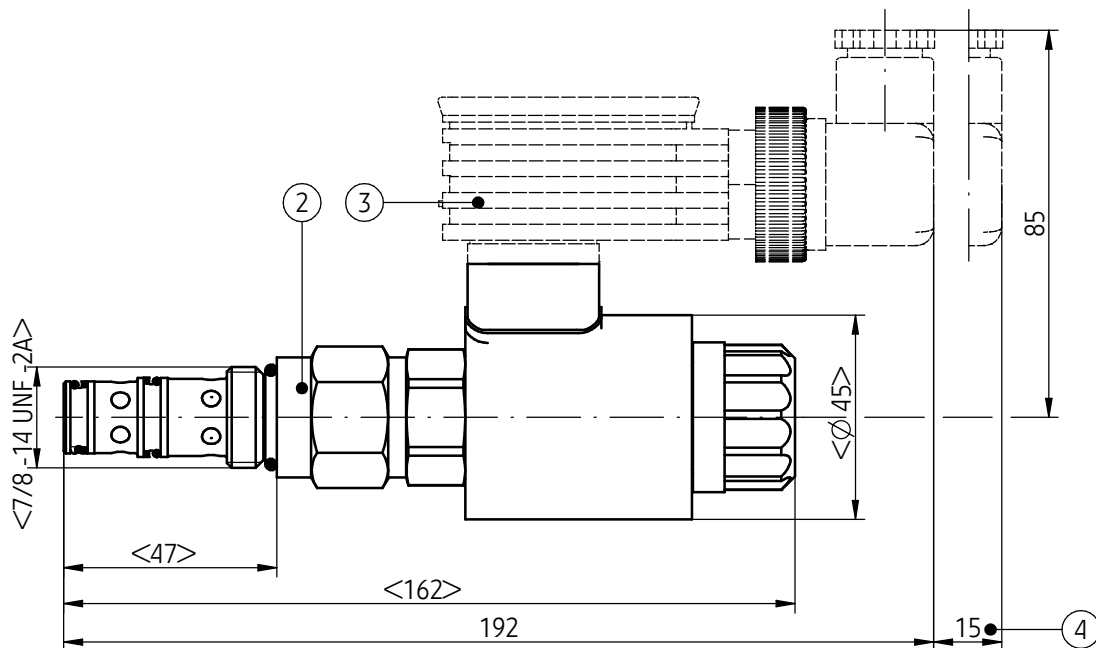
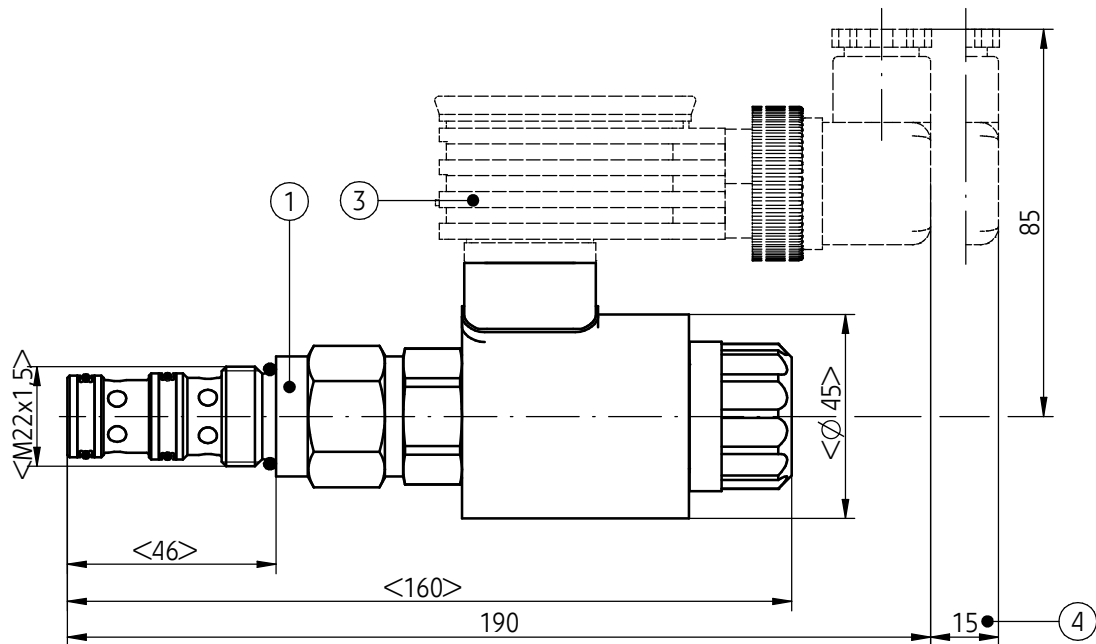
Dimensions for other versions of control valves - pos. 1 and 2 without mechanical adjustment of solenoid and dimensions of versions with mechanical adjustment of solenoid (not shown in the drawing) acc. to page 4 and 6

- 1 - Flow control valve **without mechanical adjustment of solenoid** - version WDUD6...M1...Z4...
- 2 - Flow control valve **without mechanical adjustment of solenoid** - version WDUD6...U1...Z4...
- 3 - Plug-in-connector type ISO 4400 (DIN 43650 - A)
- 4 - Electronic regulator of solenoid type 20RE10E in accordance with data sheet WK 420 820 - must be ordered separately
- 5 - Space required to remove plug-in connector

OVERALL AND CONNECTION DIMENSIONS

versions: WDUD6...M1...Z4...; ...U1...Z4...

(equipped with digital electronic regulator type 20RC10E)



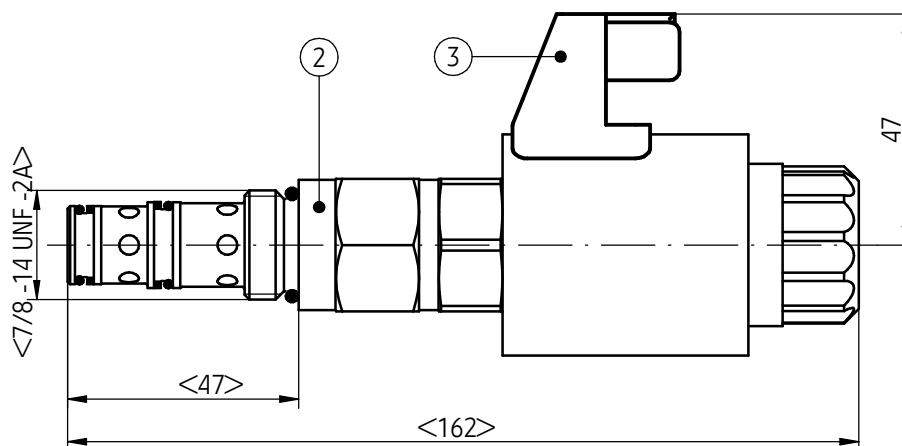
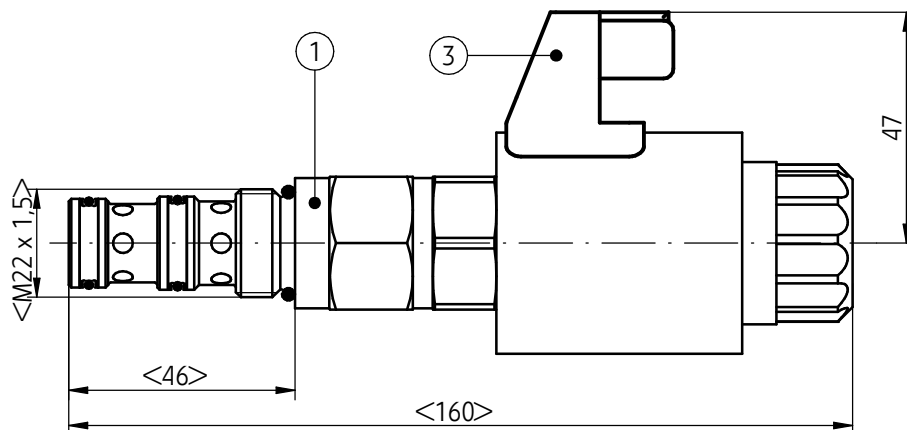
NOTE:

Dimensions for other versions of control valves - pos. 1 and 2 without mechanical adjustment of solenoid and dimensions of versions with mechanical adjustment of solenoid (not shown in the drawing) acc. to page 4 and 6

- 1 - Flow control valve **without** mechanical adjustment of solenoid - version WDUD6...M1...Z4...
- 2 - Flow control valve **without** mechanical adjustment of solenoid - version WDUD6...U1...Z4...
- 3 - Digital electronic regulator of solenoid type 20RC10E with plug-in-connector type ISO 4400 (DIN 43650 - A) in accordance with data sheet WK 427 790 - must be ordered separately
- 4 - Space required to remove plug-in connector

OVERALL AND CONNECTION DIMENSIONS

versions: WDUD6...M1...J...; ...U1...J...
(conector type AMP Junior Timer)



NOTE:

Dimensions for other versions of control valves - pos. 1 and 2 without mechanical adjustment of solenoid and dimensions of versions with mechanical adjustment of solenoid (not shown in the drawing) as in versions: WDUD6...M1...Z4...; ...U1...Z4... acc. to page 4 and 6

- 1 - Flow control valve **without mechanical adjustment of solenoid** - version WDUD6...M1...J...
- 2 - Flow control valve **without mechanical adjustment of solenoid** - version WDUD6...U1...J...
- 3 - Solenoid with plug-in-conector type **AMP Junior Timer - male 2-poles** (plug-in connectors not shown in the drawing, must be ordered separately in accordance with data sheet **WK 499 963**)
- 4 - Space required to remove plug-in connector

HOW TO ORDER

WDUD	6	+	/		+					*
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Nominal size (NS)

NS6 = **6**

Series number

(00 - 09) - connection and installation dimensions
unchanged = 0X

series 02 = **02**

Flow range

up to 15 dm³/min = **15**

up to 20 dm³/min = **20**

up to 25 dm³/min = **25**

Type of connection

cavity M22 x 1,5 = **M1**

cavity 7/8 -14 UNF -2B = U1

Solenoid coil

coil for max current I_{max} = 1,5 A = **12**

coil for max current I_{max} = 0,8 A = **24**

Electrical connection

plug-in-connector type ISO 4400 without LED (DIN 43650 - A) = **Z4**

without plug-in-connector, connection type AMP Junior Timer = J

Solenoid adjustment

electrical = **no designation**

electrical with mechanical adjustment - set screw with hexagon socket = R

electrical with mechanical adjustment - hand knob = R1

Sealing

NBR (for fluids on mineral oil base) = **no designation**

FKM (for fluids on phosphate ester base) = V

Further requirements in clear text
(to be agreed with the manufacturer)

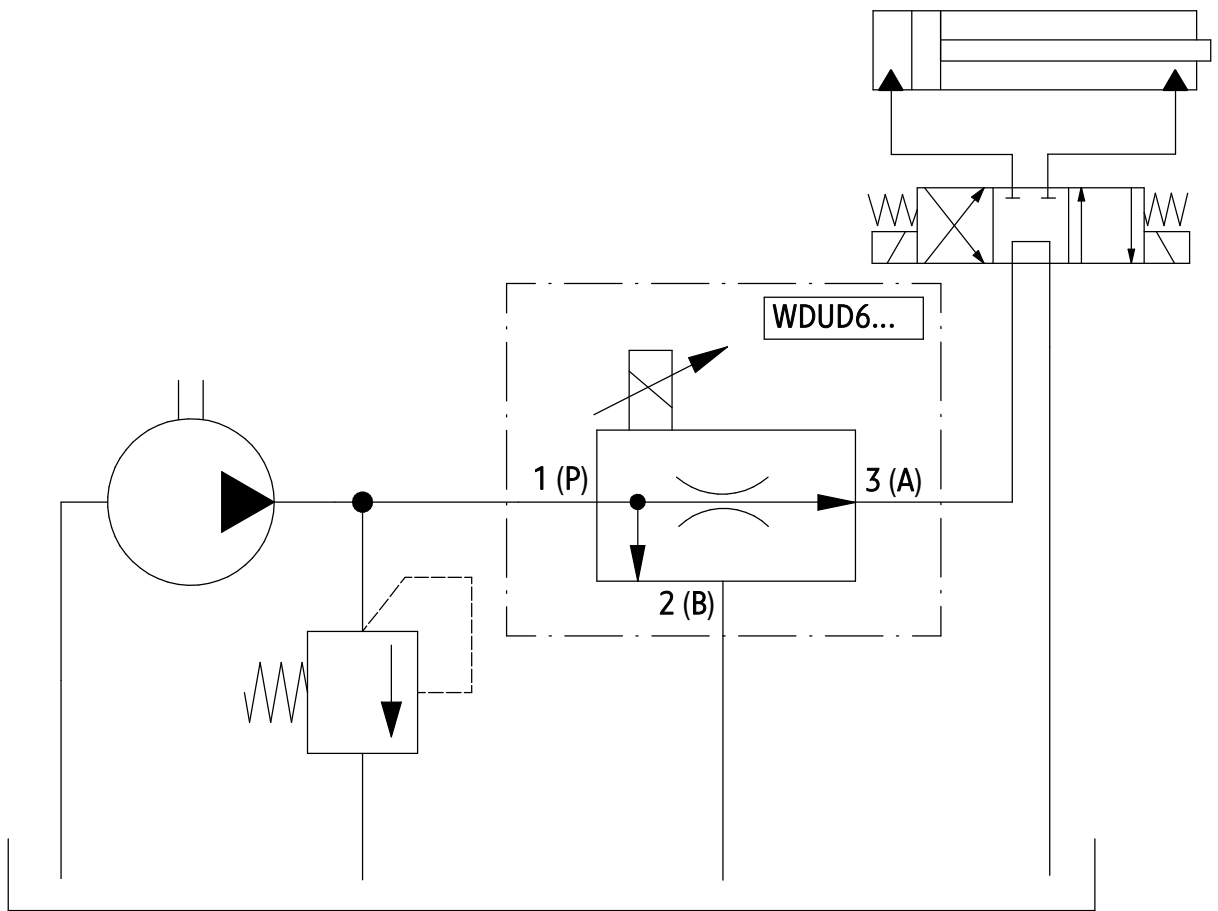
NOTES:

Proportional flow control valve should be ordered according to above coding.

The symbols in bold are the preferred versions available in short delivery time.

Coding example: WDUD6 - 02/20 M1 - 12 Z4

**EXAMPLE OF APPLICATION
IN HYDRAULIC SYSTEM**



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