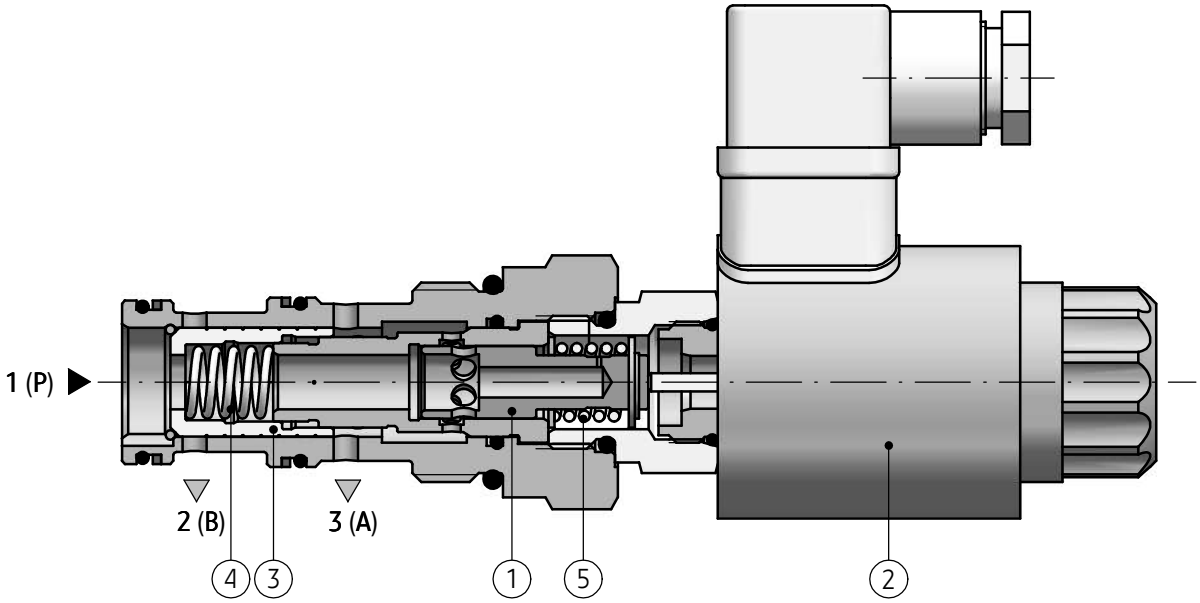
PONAR wadowice	3-way proportional flow control cartridge valve type WDUD10			WK 420 270
	NS 10	up to 21 MPa	up to 90 dm^3/min	09.2010

APPLICATION

3-way proportional flow control valve, electrically operated type **WDUD10...** 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 **WDUD10...** is designed for mounting in connections in hydraulic manifold blocks in any desired working position.

DESCRIPTION OF OPERATION

WDUD10-02/90 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 **WDUD10...** 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

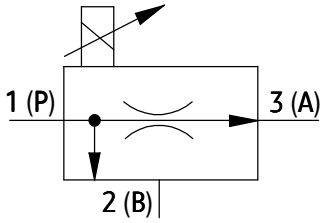
Hydraulic fluid	mineral oil		
Required filtration	**up to 16 µm**		
Recommended filtration	up to 10 µm		
Nominal fluid viscosity	37 mm ^{2}/s at temperature 55 °C		
Viscosity range	2,8 up to 380 mm ^{2}/s		
Fluid temperature range (in a tank)	recommended	40 °C do 55 °C	
	max	-20 °C do +70 °C	
Ambient temperature range	- 20 °C do +50 °C		
Maximum operating pressure	**21 MPa**		
Minimum operating pressure	1,8 MPa		
Maximum flow rate	**version**	**flow rate in port 1 (P)**	**flow rate in port 3 (A)**
	WDUD10.../**25**...	**60 dm^3/min**	**25 dm^3/min**
	WDUD10.../**50**...	**90 dm^3/min**	**50 dm^3/min**
	WDUD10.../**90**...	**150 dm^3/min**	**90 dm^3/min**
Hysteresis	range of flow rate		
	25 dm^3/min	50 dm^3/min	90 dm^3/min
	10 %	**8 %**	**6 %**
Maximum supply current of the solenoid	**1,5 A**		
Coil resistance	5,4 Ω at temperature 20 °C		
Electronic regulators/amplifiers	type **20RE10 E** according to data sheet **WK 420 820** (at regulated supply voltage **12V DC**)		
	type **VPC** according to data sheet **WK 499 735** (at regulated supply voltage **12V DC**)		
	typ **30RE20 D** according to data sheet **WK 420 830**		
Weight	1,1 kg		

APPLICATION AND MOUNTING REQUIREMENTS

1. Due to heating solenoid coils to high temperature, the electronic regulator should be placed in order to eliminate the possibility of accidental touch with the coil during application. Another solution is to provide protection covers in accordance with the requirements of the European standards: EN ISO 13732-1 and EN 982.
2. The plug-in-connector of the solenoid should adjoin accurately the connection and it must be secured by screwing mounting bolt tightly. It is necessary to provide tightness and appropriate clamp for the cable in the plug-in- connector gland.
3. To assure the tightness of the regulator connection to a system, tightening torque of the regulator to the connection should be 60 up to 65 Nm. It is necessary to keep the dimensions of connection, sealing rings and performance characteristics of the valve included in the data sheet.

SCHEMES

Graphical symbol of proportional flow control valve type **WDUD10...**

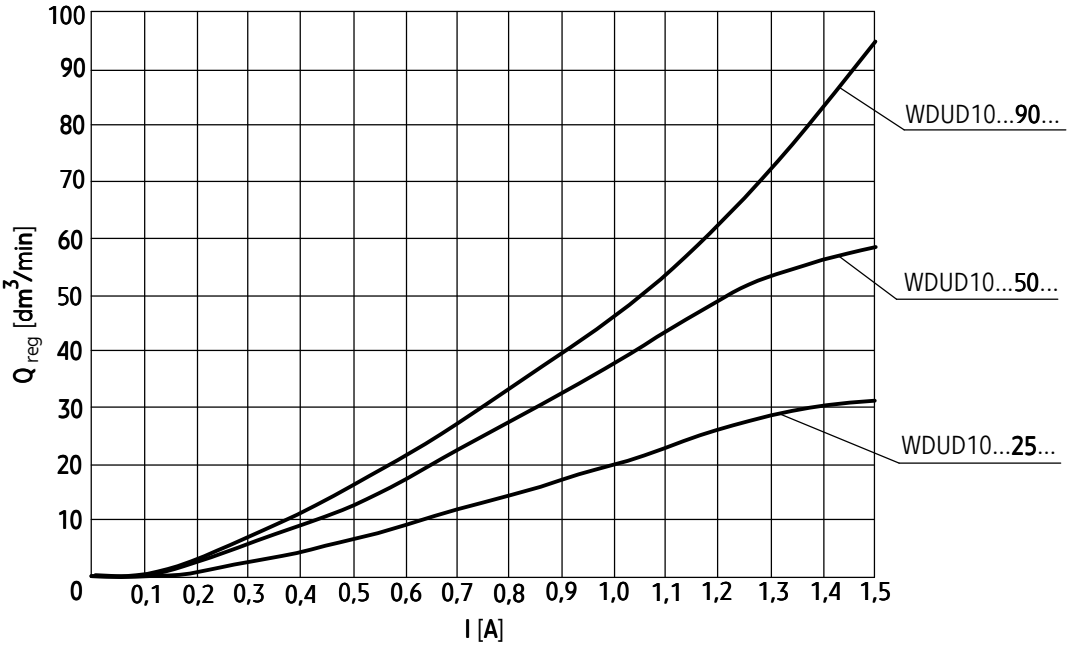


PERFORMANCE CURVES

measured at viscosity ν = 41 mm^2/s and temperature t = 50°C

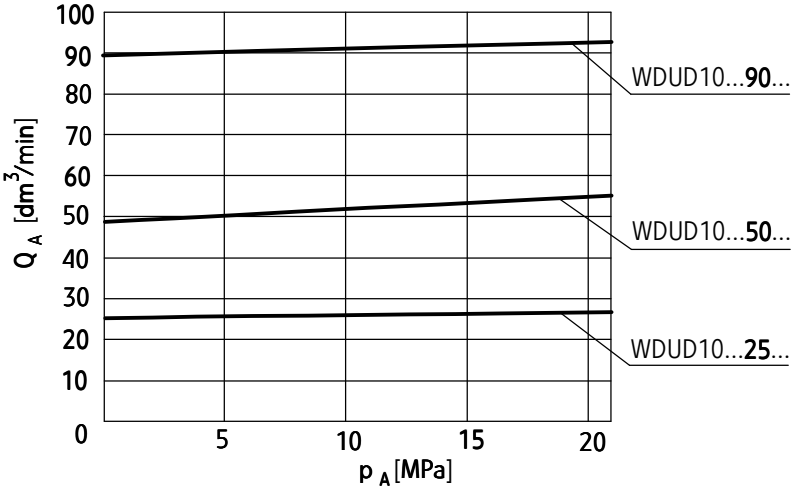
Performance curves for flow rate depending on the supply current of the solenoid

Performance curves for regulated flow Q_{reg} depending on the supply current of the solenoid **I** for valves type **WDUD10...** at various flow rates



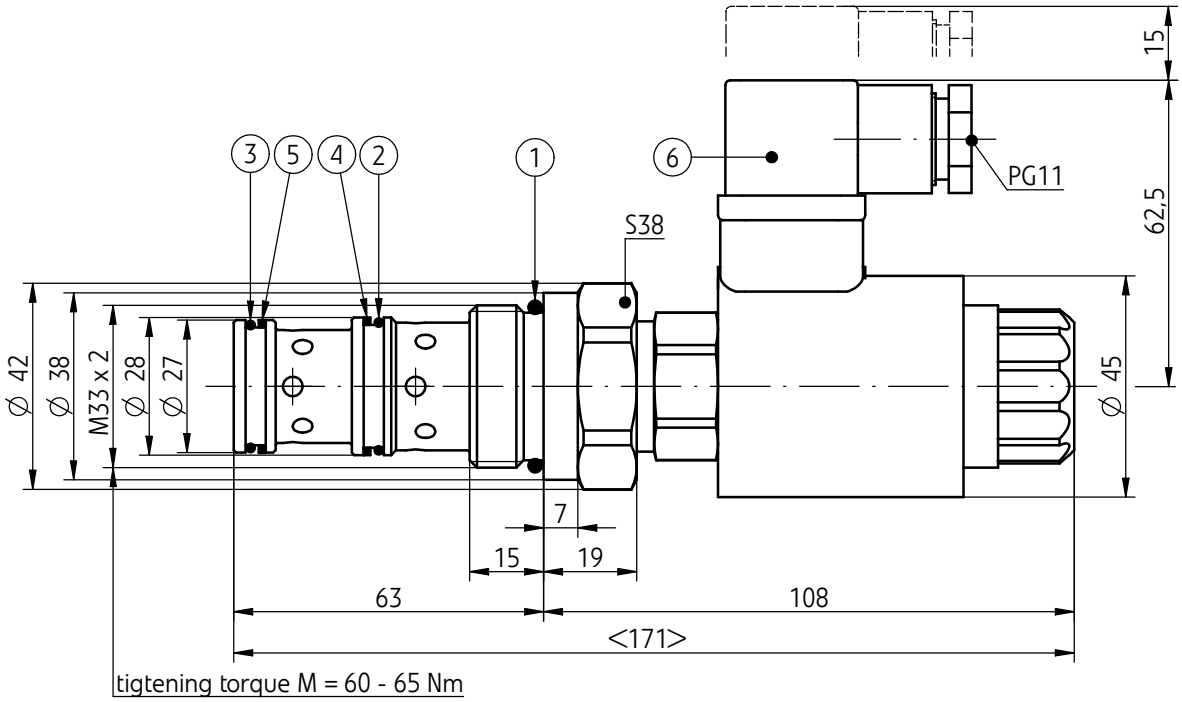
Performance diagrams of stable flow rate

Performance diagrams of flow Q_A depending on pressure p_A for valves type **WDUD10...** at various flow rates

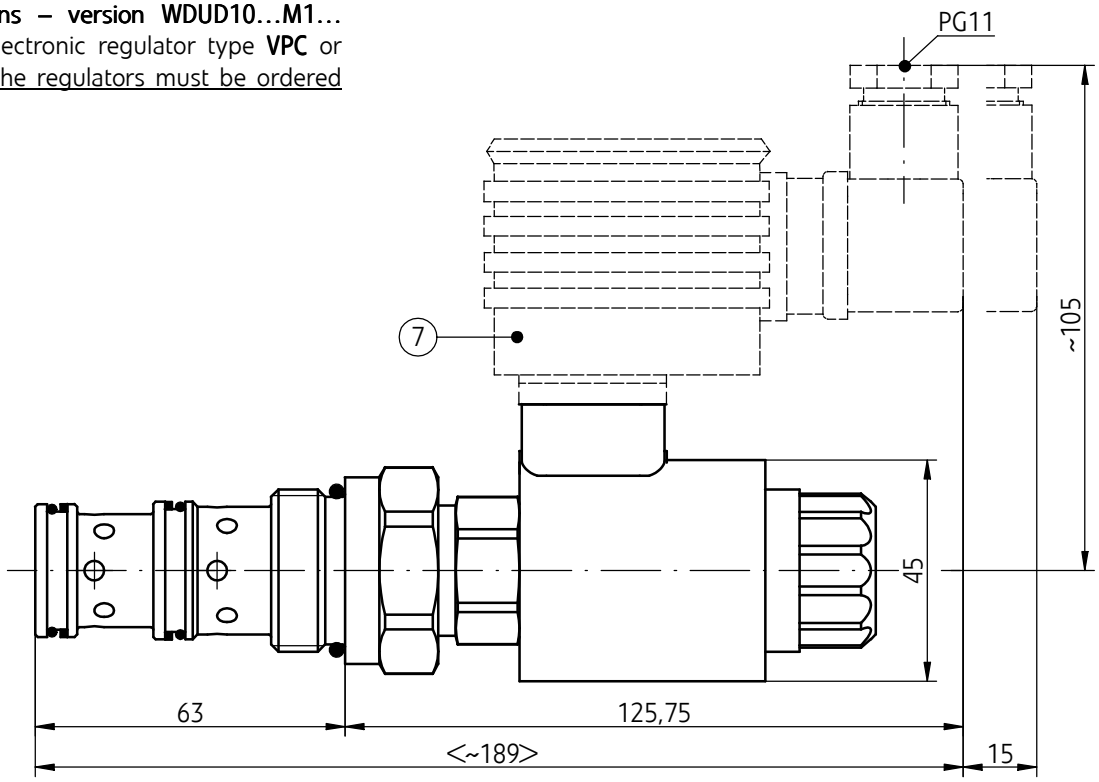


OVERALL AND CONNECTION DIMENSIONS

version WDUD10...M1...



overall dimensions – version WDUD10...M1...
equipped with electronic regulator type **VPC** or type **20RE10E** - the regulators must be ordered separately



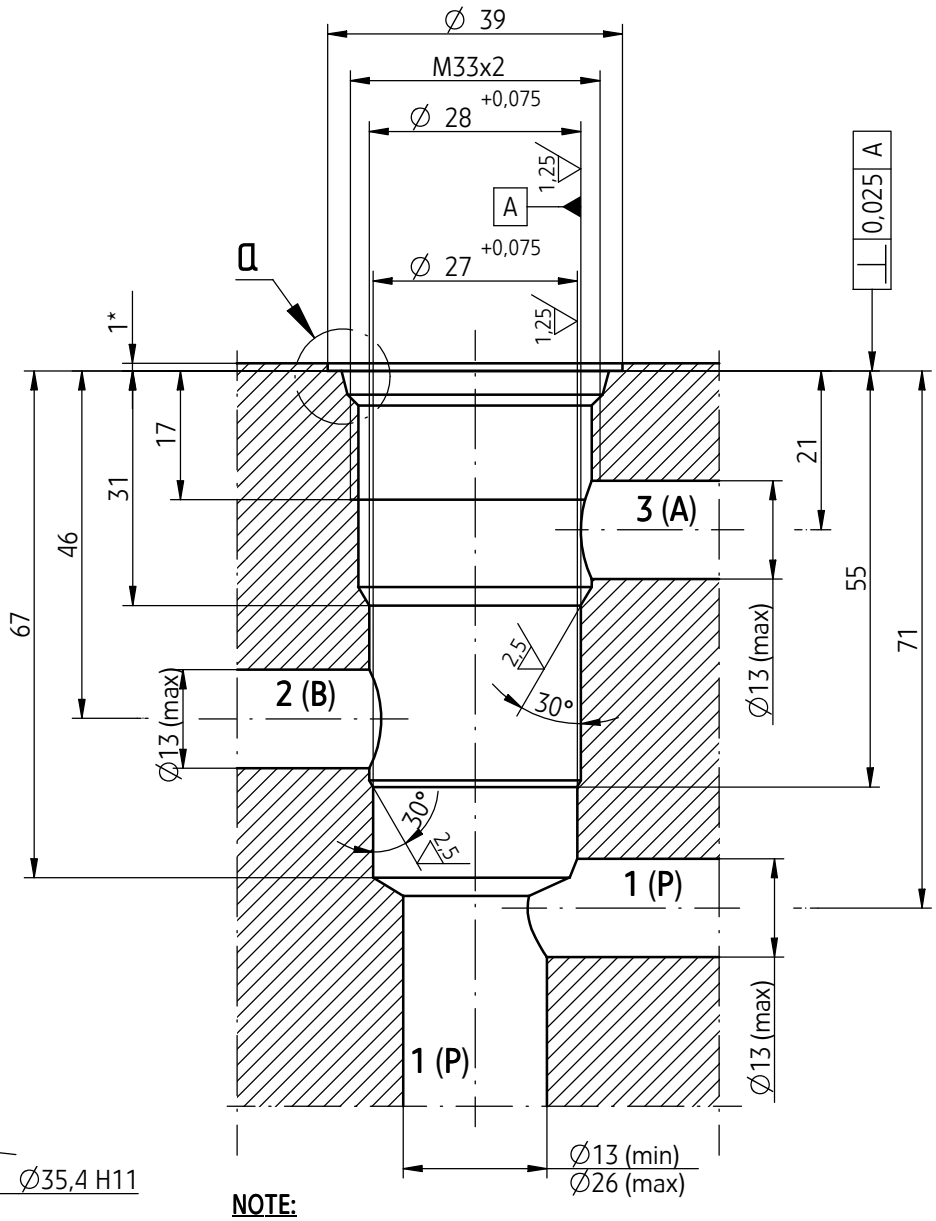
1 - **O-ring 29,2 x 3**
2 - **O-ring 24 x 2**
3 - **O-ring 23 x 2**
4 - Retaining ring **28 x 25 x 1,4**
5 - Retaining ring **27 x 24 x 1,4**
6 - Plug-in-connector type **DIN 43650-A/ISO 4400**
7 - Electronic regulator for solenoid
(with plug-in-connector type **DIN 43650-A/ISO 4400**)

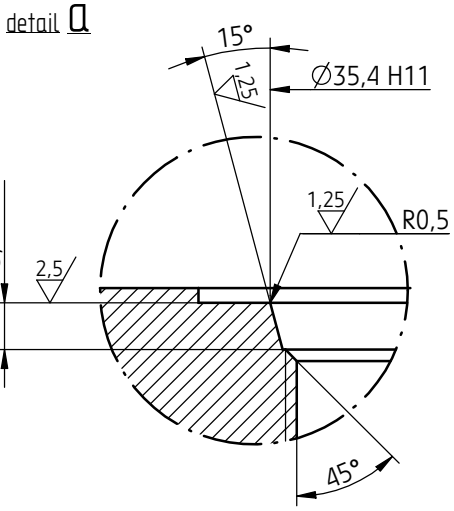
OVERALL AND CONNECTION DIMENSIONS

version WDUD10...M1...
cavity M33 x 2 (size **M-10-3**)

tightening torque **M = 60 - 65 Nm**

⌀ϕ 0,025 - applied to all diameters of main hole and bevels



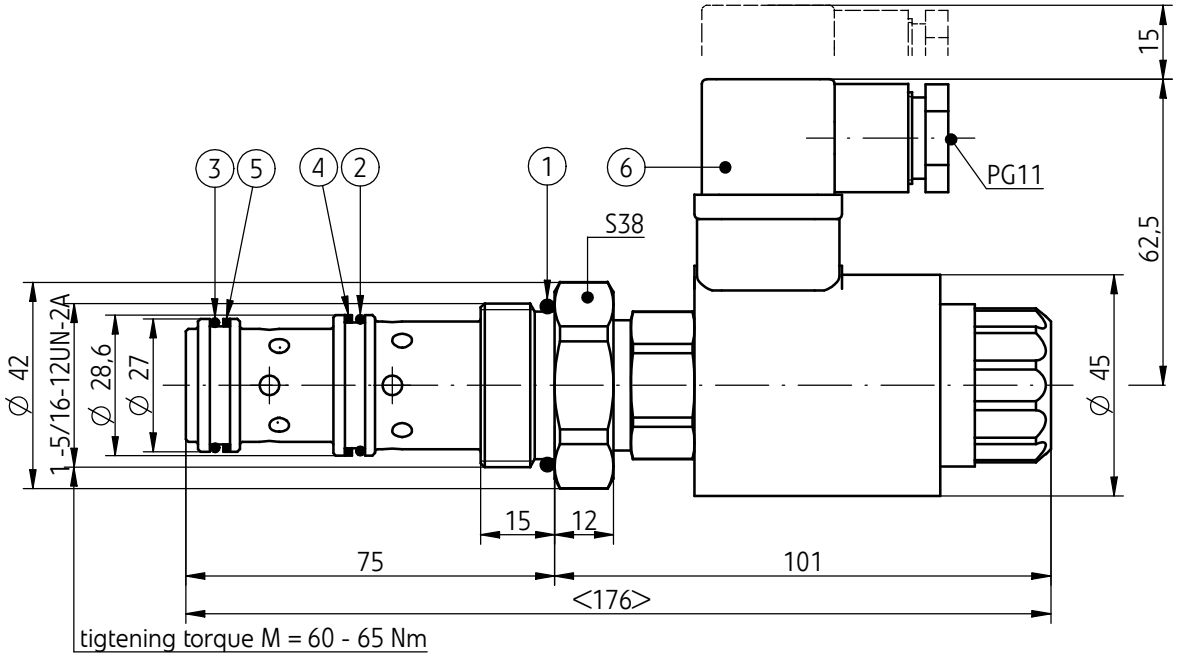
detail 

NOTE:

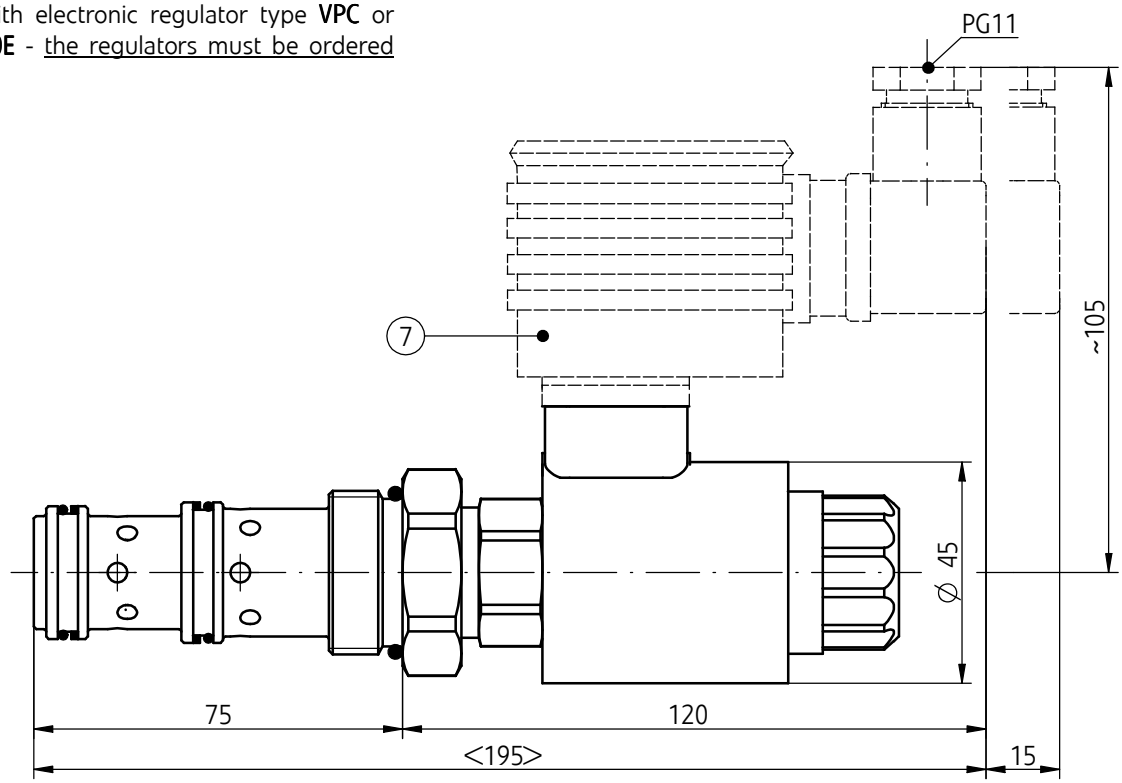
(*) - Max depth hole according to overall dimensions of the valve.

OVERALL AND CONNECTION DIMENSIONS

version WDUD10...U1...



overall dimensions – version WDUD10...U1...
equipped with electronic regulator type **VPC** or type **20RE10E** - the regulators must be ordered separately



1 - **O-ring 29,2 x 3**
2 - **O-ring 24 x 2**
3 - **O-ring 23 x 2**
4 - Retaining ring **28,6 x 25,6 x 1,4**
5 - Retaining ring **27 x 24 x 1,4**
6 - Plug-in-connector type **DIN 43650-A/ISO 4400**
7 - Electronic regulator for solenoid
(with plug-in-connector type **DIN 43650-A/ISO 4400**)

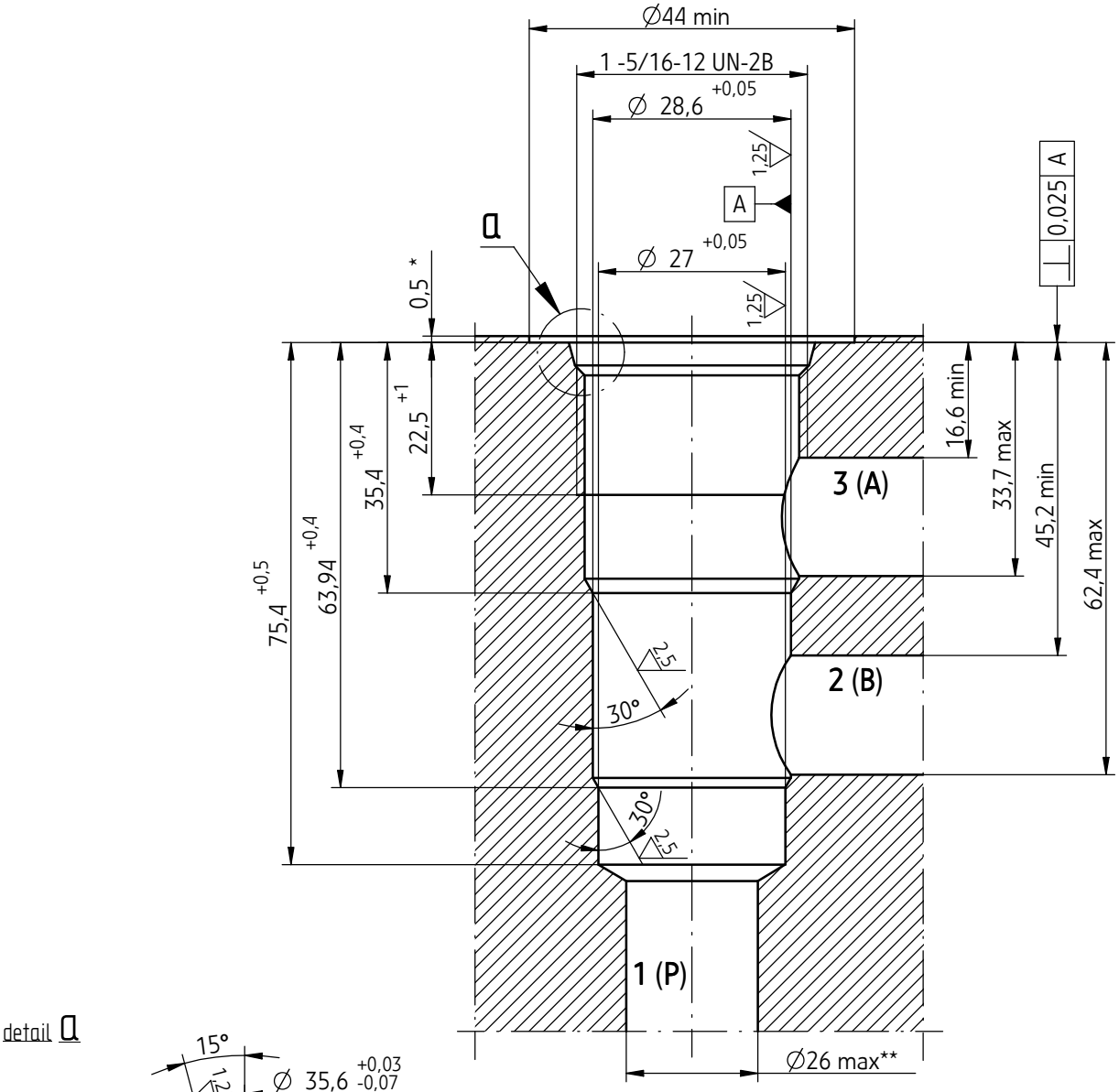
OVERALL AND CONNECTION DIMENSIONS

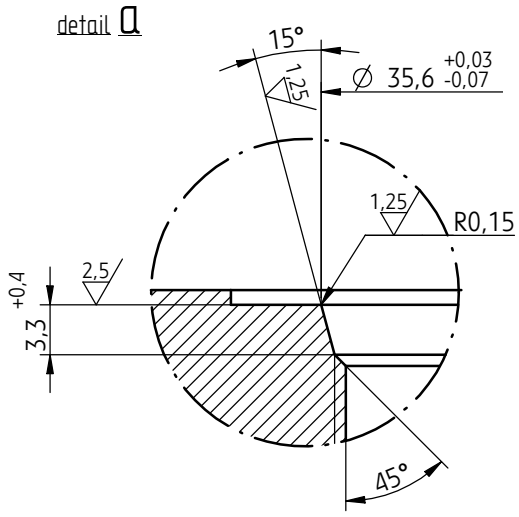
version WDUD10...U1...

cavity 1- 5/16 -12 UN -2B (size **U-10-3**)

tightening torque **M = 60 - 65 Nm**

⌀ϕ 0,025 - applied to all diameters of main hole and bevels





NOTES:

(*) - Max depth hole according to overall dimensions of the valve.

(**) - Diameter of ports: **1** (**P**), **2** (**B**), **3** (**A**) located in the given range of limit dimensions - **min ϕ13**.

HOW TO ORDER

WDUD	10	+	/		+				★

Nominal size (NS)
NS10 = **10**

Series number
(00-09) - connection and installation dimensions unchanged = 0X
series 02 = **02**

Flow range
up to 25 dm³/min = **25**
up to 50 dm³/min = **50**
up to 90 dm³/min = **90**

Type of connection
cavity M33 x 2 = **M1**
cavity 1 -5/16 -12 UN -2B = U1

Solenoid coil
coil for max current I max = **1,5 A** = **12**

Electrical connection
plug-in-connector DIN 43650-A/ISO 4400 without LED = **Z4**

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)

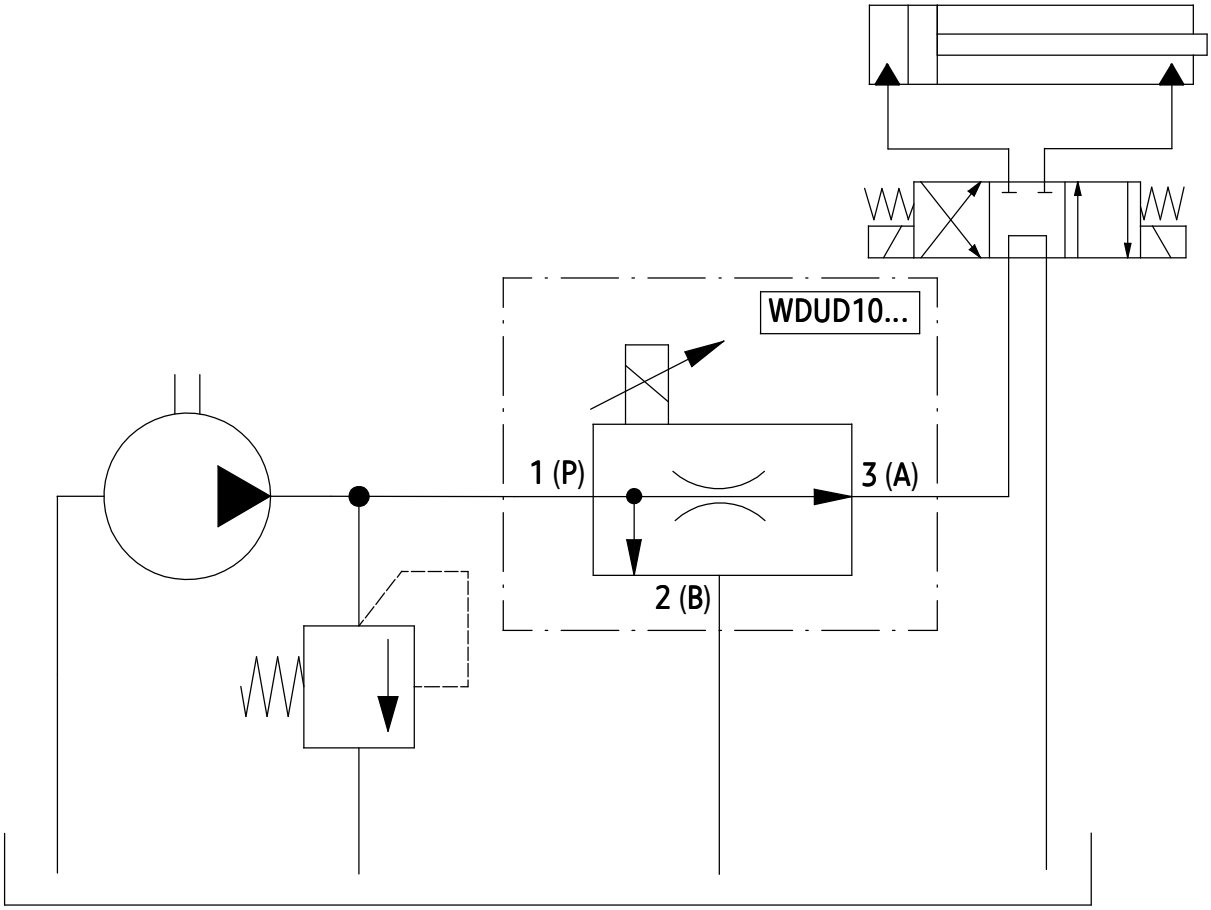
NOTES:

Flow control valve should be ordered according to the above coding.
The symbols in bold are preferred versions in short delivery time.
Coding example: WDUD10 - 02/90 M1 - 12 Z4

PLATES

The plates - available only for version **WDUD10.../...M1...**
should be ordered according to the following data sheets:
WK 217 558 - plate **3UL10/4**
(3 threaded connections **G 3/4**)
WK 217 559 - plate **3UL10/5**
(4 threaded connections **G 3/4**)
Above plates must be ordered separately.

EXAMPLE OF APPLICATION IN A HYDRAULIC SYSTEM



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