

Pressure relief valves, pilot-operated

Type DB...W65; DBW...W65; DB 20 K



- Sizes 10 and 25
- Component series 1X; 4X
- Maximum operating pressure 350 bar
- Maximum flow 400 l/min



Features

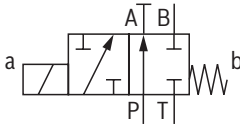
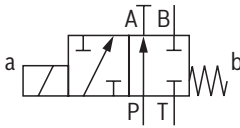
- For subplate mounting
- Porting pattern according to ISO 6264
- For threaded connection
- As screw-in cartridge valve
- Solenoid-actuated unloading via a built-on directional spool valve
- CE conformity according to the Low-Voltage Directive 2014/35/EU for electrical voltages > 50 VAC or > 75 VDC
- UKCA conformity according to the "Electrical Equipment (Safety) Regulations SI 2016/1101" for electrical voltages > 50 VAC or > 75 VDC
- Solenoid coil as approved component with UR marking according to UL 906, edition 1982, optional

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Type-examination tested safety valves type DB 20 K...E, according to Pressure Equipment Directive 2014/68/EU	
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Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
DB						-	/												*

01	Pressure relief valve	DB	
02	Without directional valve	no code	◇
	With attached directional valve	W¹⁾	◇
03	- Size 10		
	Subplate mounting "-"	10	
	Threaded connection "G" (G1 1/2)	10	◇
	- Size 25		
	Subplate mounting "-"	20	
	Threaded connection "G" (G3/4)	15	◇
	Threaded connection "G" (G1)	20	◇
	Screw-in cartridge valve "K"	20	◇
04	 normally closed	A²⁾	◇
	 normally open	B²⁾	◇

Type of connection

05	Subplate mounting	-	
	Threaded connection	G	◇
	Screw-in cartridge valve	K	◇

Adjustment type

06	Rotary knob	1	
	Bushing with hexagon and protective cap	2	◇
	Lockable rotary knob with scale	3³⁾	
	Rotary knob with scale	7	
07	Component series 10 ... 19 (10 ... 19: unchanged installation and connection dimensions); (version "K" only)	1X	◇
	Component series 40 ... 49 (40 ... 49: unchanged installation and connection dimensions); (version "-" and "G" only)	4X	◇

- 1) Only with version "G".
- 2) Ordering code only necessary with version "W".
- 3) H-key with material no. **R900008158** is included in the scope of delivery.
- 4) Dash "-" only necessary with version "W" and without specification of "U".
- 5) Mating connectors, separate order, see data sheet 08006.

Notice:

- When ordering spare parts for the screw-in cartridge valve, **always** order type DB 20 K.-1X/.XY.
- Type-examination tested safety valves are **only** available as type DB 20 K.-1X/.Y...E.

Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
DB						-	/												*

Pressure rating

08	Set pressure up to 50 bar	50	
	Set pressure up to 100 bar	100	◇
	Set pressure up to 200 bar	200	◇
	Set pressure up to 315 bar	315	
	Set pressure up to 350 bar (version "DB" only)	350	◇

Pilot oil flow (see also symbols on page 4)

09	Internal pilot oil supply, internal pilot oil return	- 4)	◇
	External pilot oil supply, internal pilot oil return	X	
	Internal pilot oil supply, external pilot oil return	Y	
	External pilot oil supply, external pilot oil return	XY	
10	Standard version	no code	◇
	Valve for minimum cracking pressure (not suitable for mutual relief)	U	
11	Without directional valve	no code	◇
	With directional spool valve (data sheet 23178)	6E 2)	◇
12	Direct voltage 24 V	G24 2)	
	For further voltages, see data sheet 23178		
13	With concealed manual override (standard)	N9 2)	◇
	With manual override	N 2)	
	Without manual override	no code	

Corrosion resistance

14	None	no code	◇
	High corrosion protection (720 h salt spray test according to EN ISO 9227); (only version "K" and "2"; without protective cap)	J5	

Electrical connection

15	Connector, 3-pole (2 + PE) according to EN 175301-803	K4 2)	◇
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Seal material (observe compatibility of seals with hydraulic fluid used, see page 7)

16	NBR seals	no code	◇
	FKM seals	V	
	Low-temperature version (version "K" only)	MT	

Screw-in cartridge valve installation position

17	Vertical (version "-" and "G" only)	W65	◇
	Any (version "K" only)	no code	◇

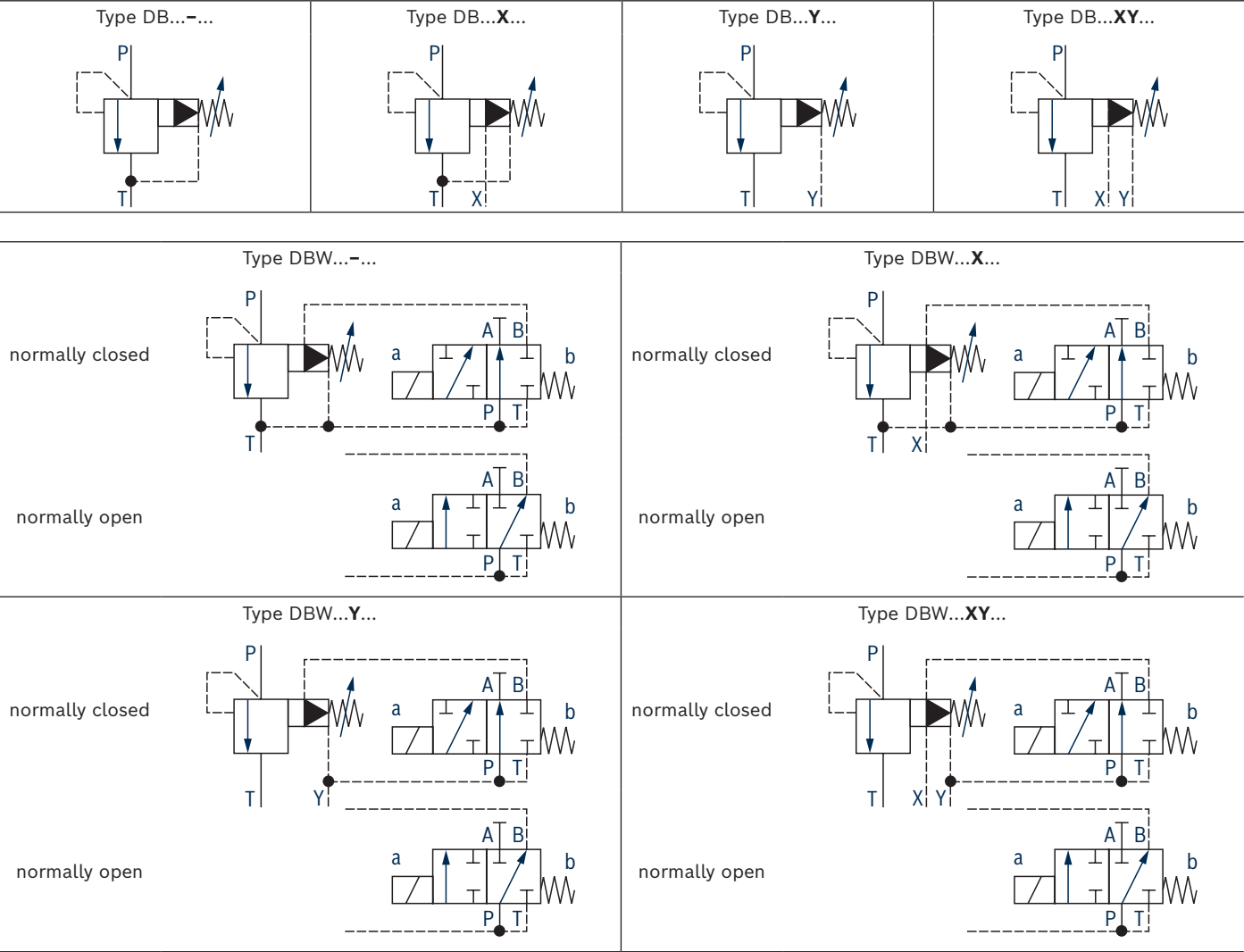
Type-examination procedure

18	Without type-examination procedure	no code	◇
	Safety valve according to Pressure Equipment Directive 2014/68/EU (version "K" only)	E	
19	Standard version	no code	◇
	Solenoid coil is an approved component with UR-marking according to UL 906	=UR	
20	Further details in the plain text		



Notice: ◇ = Preferred type

Symbols



Function, section

Valves of type DB and DBW are pilot-operated pressure relief valves. They are used for limitation (DB) or limitation and solenoid-actuated unloading (DBW) of the operating pressure.

The valves basically consist of housing (1) and pilot control valve (2) with adjustment type.

Pressure relief valve type DB

The pressure applied to channel P acts on the main spool (3). Via the nozzle bores (4 and 5), the pressure is at the same time applied to poppet (6). If the pressure in channel P exceeds the value set at spring (7), poppet (6) opens against spring (7). Via the nozzle bores (4 and 5), the hydraulic fluid from channel P now flows into the spring chamber (8). From here, it is led into the tank internally (version "-"), via the control line (9 and 10), or externally (version "Y") via the control line (9 and 11).

Due to the state of equilibrium at the main spool (3), hydraulic fluid flows from channel P to channel T, maintaining the set operating pressure.

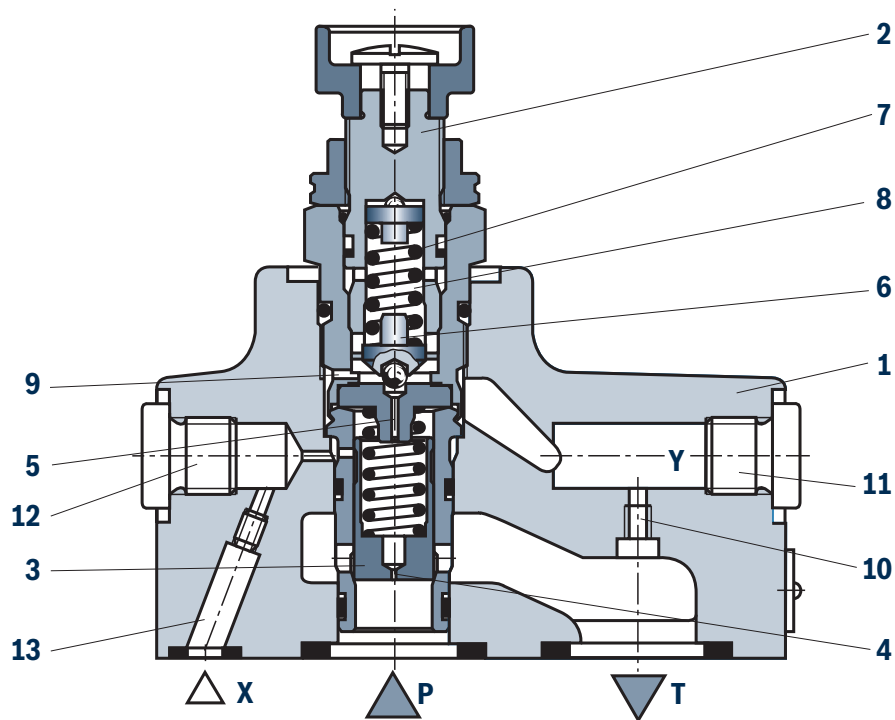
A pressure gauge connection (12) allows for the control of the operating pressure.

The pressure relief valve can be unloaded or switched to another pressure (second pressure rating) via port X (13).

Pressure relief valve type DBW (only threaded connection)

The function of this valve is basically the same as that of valve type DB.

The main spool (3) is unloaded by controlling a built-on directional valve.



Technical data

(For applications outside these values, please consult us!)

General				
Size		NG	10	25
Type of connection			Subplate mounting; threaded connection; screw-in cartridge valve	
Porting pattern			ISO 6264-06-09-*97	ISO 6264-08-13-*97
Weight	▶ Subplate mounting "-"	kg	1.6	2.3
	▶ Threaded connection "G"	– Type DB	kg	2.95
		– Type DBW	kg	4.25
	▶ Screw-in cartridge valve "K"	kg	–	0.35
Installation position			Any	
Ambient temperature range	▶ Type DB			
	– Standard version	°C	–20 ... +80 (NBR seals) –15 ... +80 (FKM seals)	
	– Low-temperature version	°C	–40 ... +100	
	▶ Type DBW			
	– Standard version	°C	–20 ... +50 (NBR seals) –15 ... +50 (FKM seals)	
Conformity	▶ CE according to Low-Voltage Directive 2014/35/EU ¹⁾ , tested according to	EN 60204-1 (classified as component)		
	▶ UKCA according to "Electrical Equipment (Safety) Regulations SI 2016/1101" ¹⁾ , tested according to	EN 60204-1 (classified as component)		

Hydraulic				
Maximum operating pressure	► Port P, X	bar	350	
	► Port T	bar	315	
	► Port Y – Type DB	bar	250	
	► Port Y, T – Type DBW	bar	210 (version "6EG") 180 (version "6EG...=UR") 160 (version "6EW" and "6EW...=UR")	
Hydraulic fluid			See table on page 7	
Hydraulic fluid temperature range (at the valve working ports)	► Standard version	°C	–20 ... +80 (NBR seals) –15 ... +80 (FKM seals)	
	► Low-temperature version	°C	–40 ... +100	
Viscosity range		mm²/s	10 ... 800	
Maximum admissible degree of contamination of the hydraulic fluid; cleanliness class according to ISO 4406 (c)			Class 20/18/15 2)	
Maximum flow	► Subplate mounting "–"	l/min	200	400
	► Threaded connection "G"	l/min	150	200 (G3/4); 300 (G1)
Minimum set pressure		bar	Flow-dependent, see characteristic curves page 9 and 10	
Maximum set pressure		bar	50; 100; 200; 315; 350 (only type DB)	

¹⁾ Type DBAW with nominal voltages >50 VAC or >75 VDC.²⁾ The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.**Notice:**

Technical data for directional spool valve see data sheet 23178.

Technical data

(For applications outside these values, please consult us!)

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	► Insoluble in water	HETG	ISO 15380	90221
		HEES		
	► Soluble in water	HEPG	ISO 15380	
Flame-resistant	► Water-free	HFDU (glycol base)	ISO 12922	90222
		HFDU (ester base)		
		HFDR		
	► Containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	ISO 12922	90223



Important information on hydraulic fluids:

- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.
- **Bio-degradable and flame-resistant – containing water:**
If components with galvanic zinc coating (e.g. version "J3" or "J5") or parts containing zinc are used, small amounts of dissolved zinc may get into the hydraulic system and cause accelerated aging of the hydraulic fluid. Zinc soap may form as a chemical reaction product, which may clog filters, nozzles and solenoid valves – particularly in connection with local heat input.

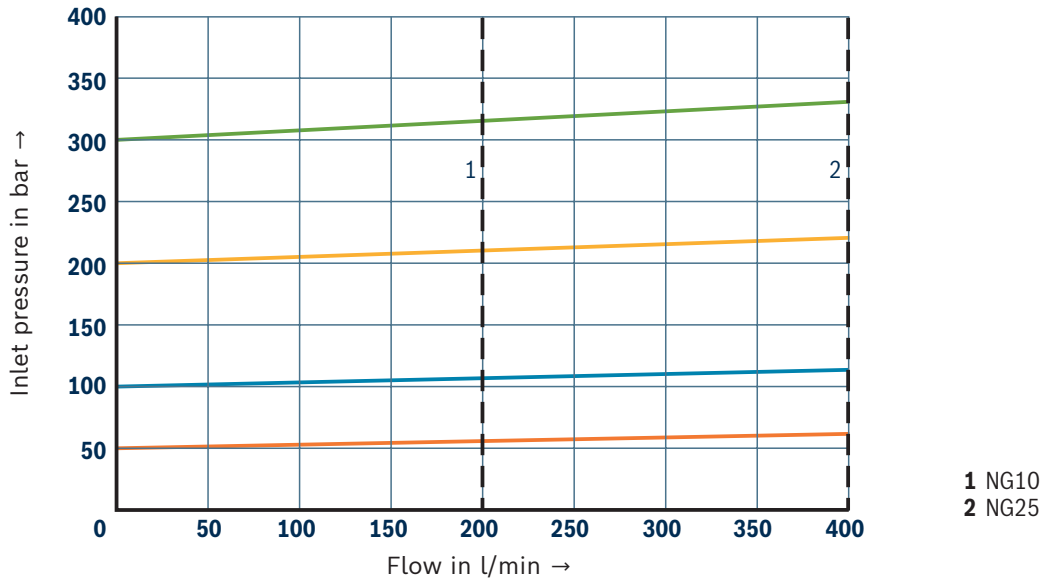
► Flame-resistant – containing water:

- Due to an increased cavitation tendency with the use of HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to use with HLP mineral oil. In order to reduce the cavitation effect, it is recommended – if possible, specific to the installation – to back up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.
- Dependent on the hydraulic fluid used, the maximum ambient and hydraulic fluid temperature must not exceed 50 °C. In order to reduce the heat input into the component, a maximum duty cycle of 50% in continuous operation has to be set for on/off valves (measuring time 300 s). If this is not possible for functional reasons, an energy-reducing control of these components is recommended, e.g. via a PWM plug-in amplifier.

Characteristic curves

(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

Inlet pressure dependent on the flow

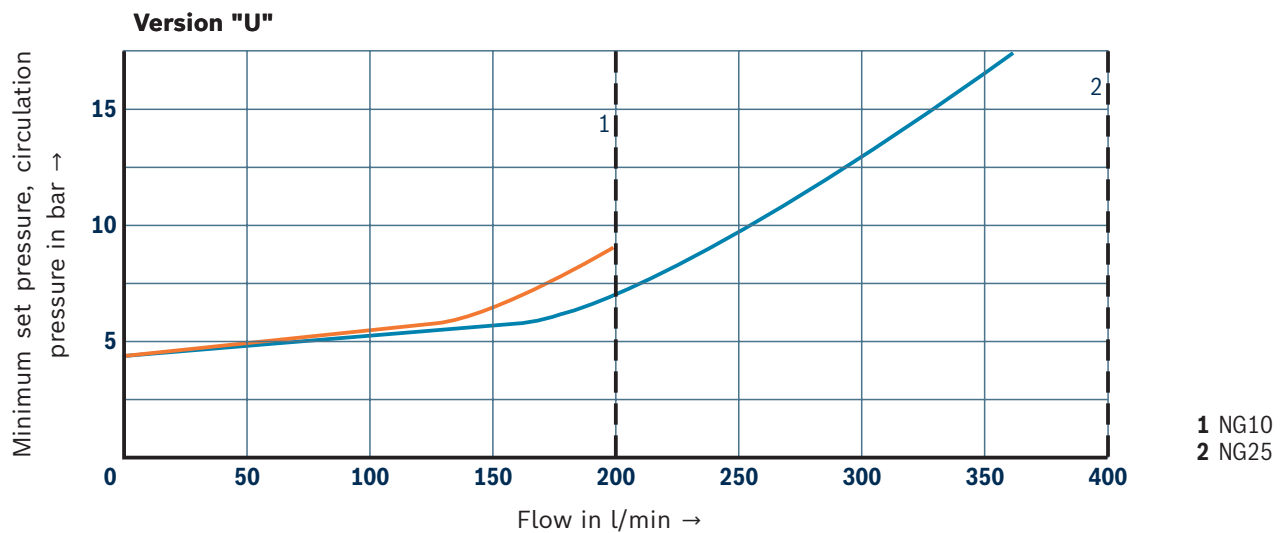
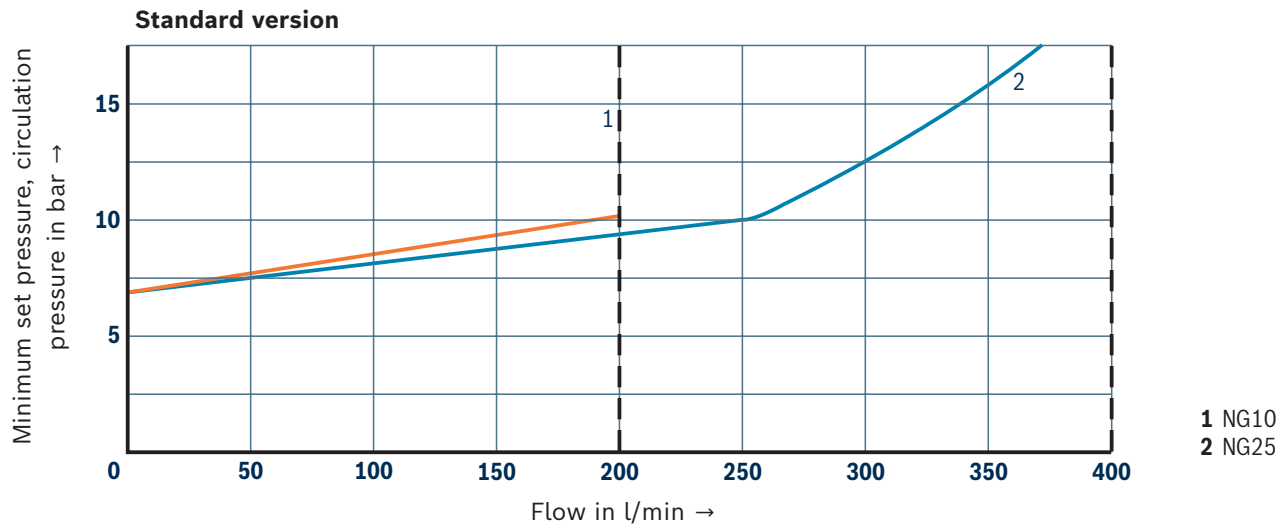


Notice:

- The characteristic curves were measured with an **external, depressurized pilot oil return**.
- With internal pilot oil returns, the inlet pressure increases by the output pressure present in port T.
- Typical characteristic curves which are subject to tolerance variations.

Characteristic curves: Subplate mounting
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

Minimum set pressure and circulation pressure dependent on the flow

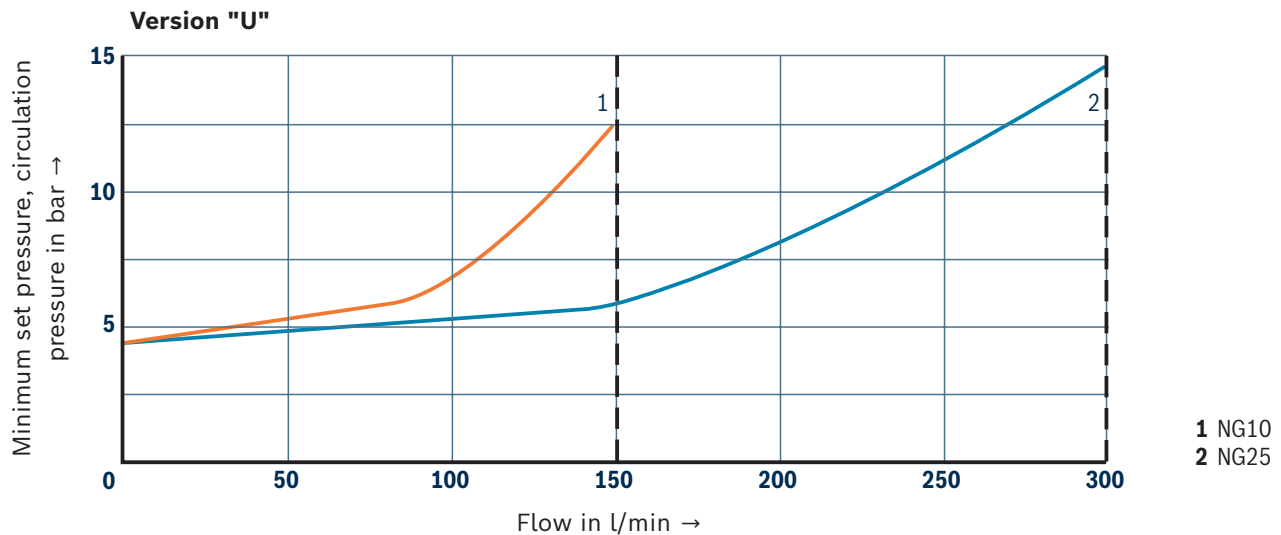
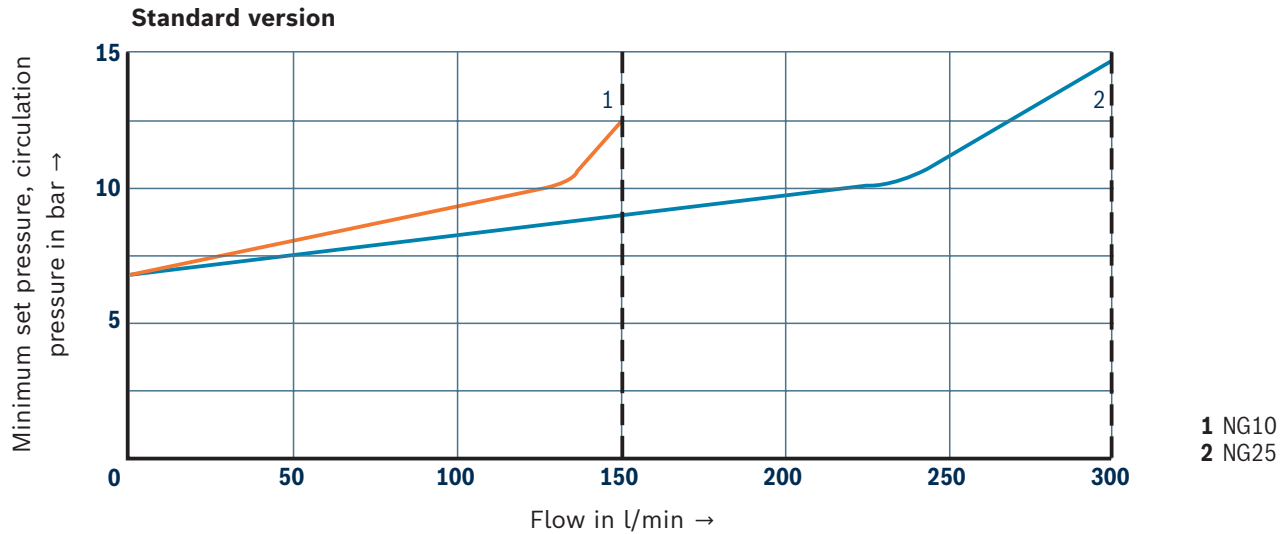


Notice:

- ▶ The characteristic curves were measured with an **external, depressurized pilot oil return**.
- ▶ With internal pilot oil returns, the inlet pressure increases by the output pressure present in port T.
- ▶ The characteristic curves apply for output pressure $p_T = 0 \text{ bar}$ in the entire flow range.
- ▶ Typical characteristic curves which are subject to tolerance variations.

Characteristic curves: Threaded connection
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ } ^\circ\text{C}$)

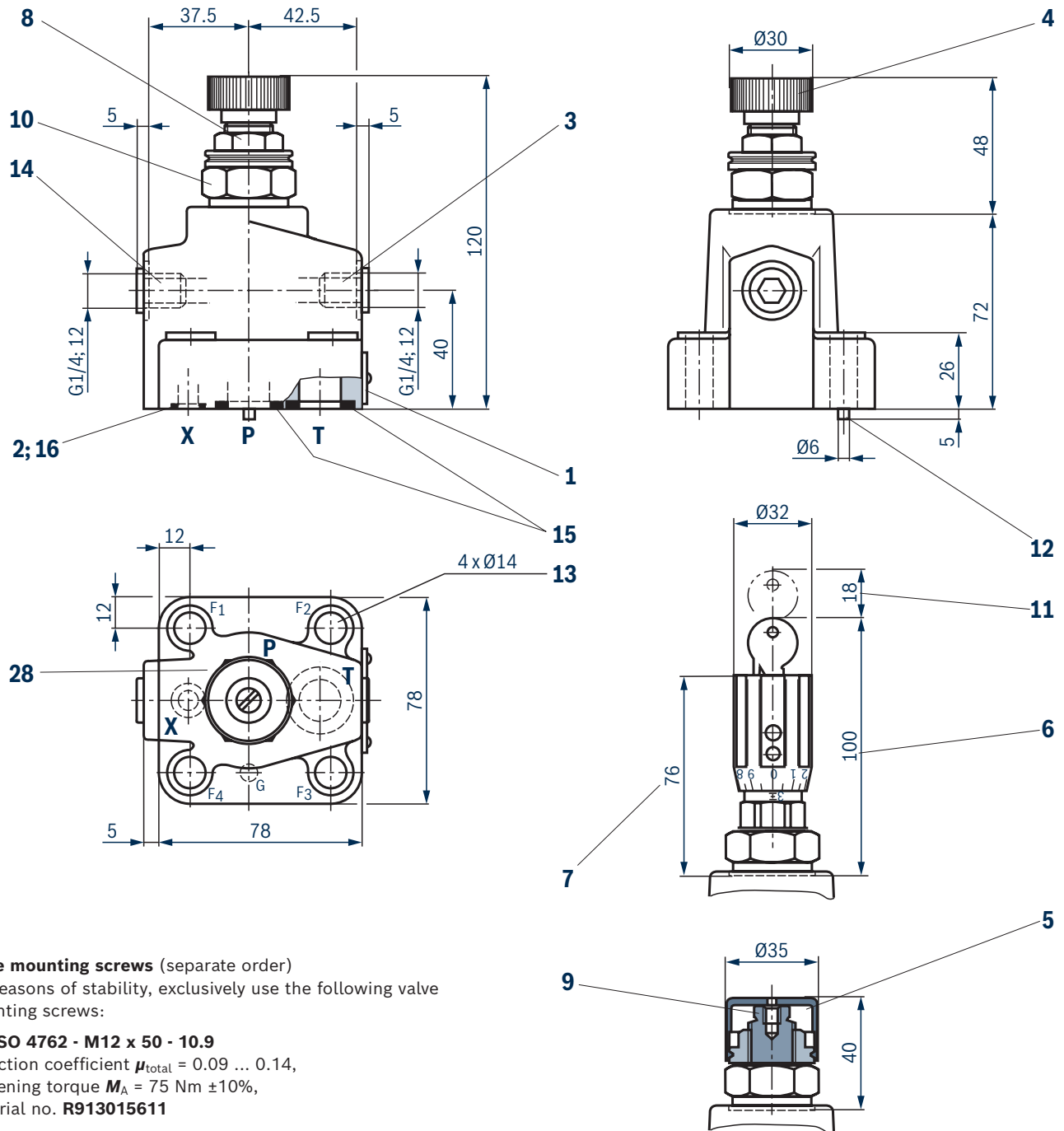
Minimum set pressure and circulation pressure dependent on the flow



Notice:

- ▶ The characteristic curves were measured with an **external, depressurized pilot oil return**.
- ▶ With internal pilot oil returns, the inlet pressure increases by the output pressure present in port T.
- ▶ The characteristic curves apply for output pressure $p_T = 0 \text{ bar}$ in the entire flow range.
- ▶ Typical characteristic curves which are subject to tolerance variations.

Dimensions: Subplate mounting – size 10 (Dimensions in mm)



Valve mounting screws (separate order)

For reasons of stability, exclusively use the following valve mounting screws:

4 x ISO 4762 - M12 x 50 - 10.9

at friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$,
tightening torque $M_A = 75 \text{ Nm} \pm 10\%$,
material no. **R913015611**

Notice:

The tightening torques are guidelines when using screws with the specified friction coefficients and when using a manual torque wrench (tolerance $\pm 10\%$).

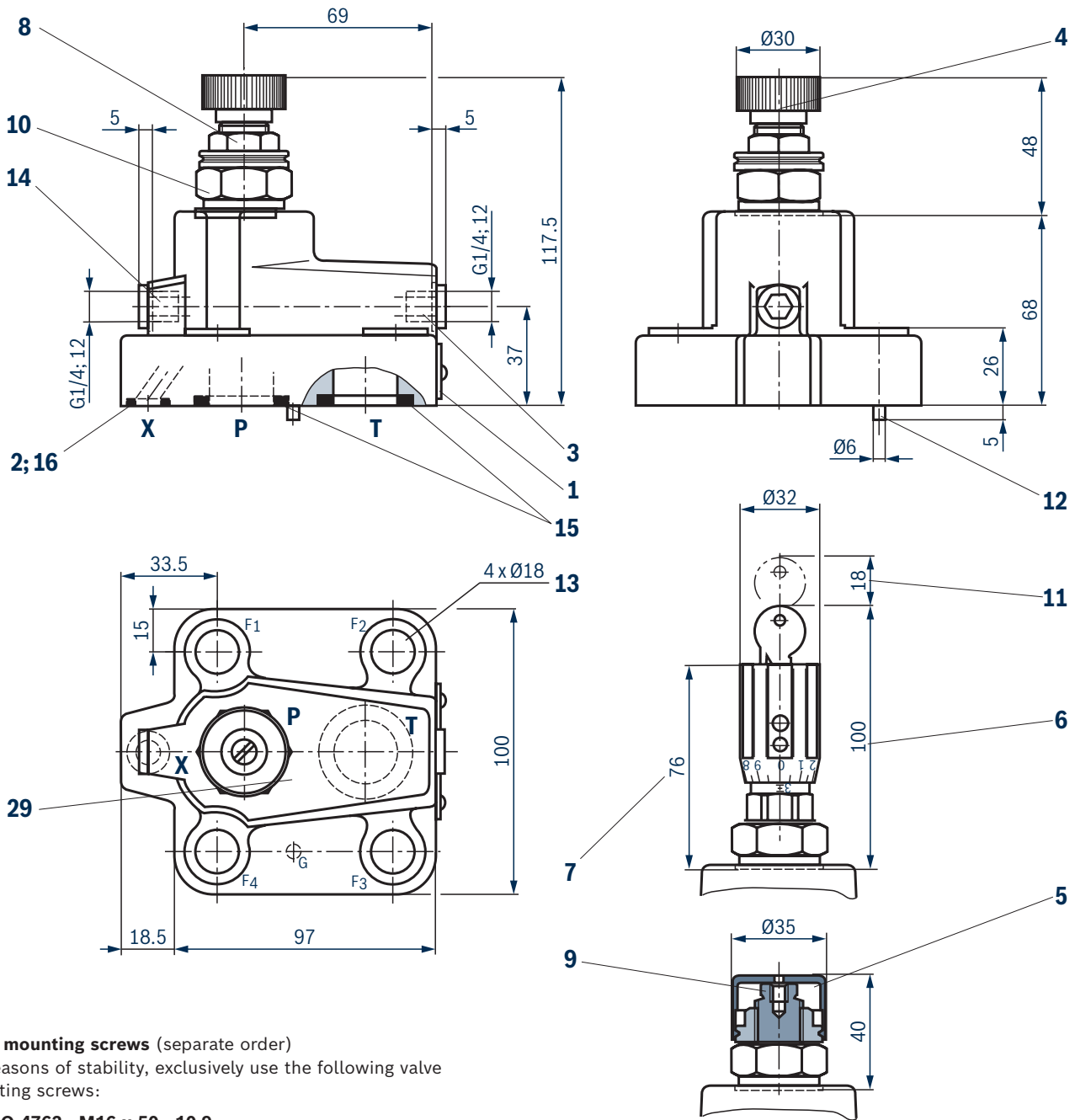
Item explanations see page 17.

Notice:

The dimensions are nominal dimensions which are subject to tolerances.

Required surface quality of the valve contact surface

Dimensions: Subplate mounting – size 25 (Dimensions in mm)



Valve mounting screws (separate order)

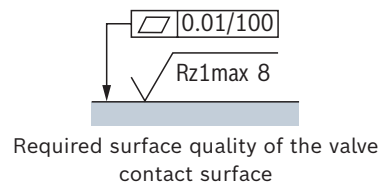
For reasons of stability, exclusively use the following valve mounting screws:

4 x ISO 4762 - M16 x 50 - 10.9

at friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$,
tightening torque $M_A = 185 \text{ Nm} \pm 10\%$,
material no. **R913015664**

Notice:

The tightening torques are guidelines when using screws with the specified friction coefficients and when using a manual torque wrench (tolerance $\pm 10\%$).

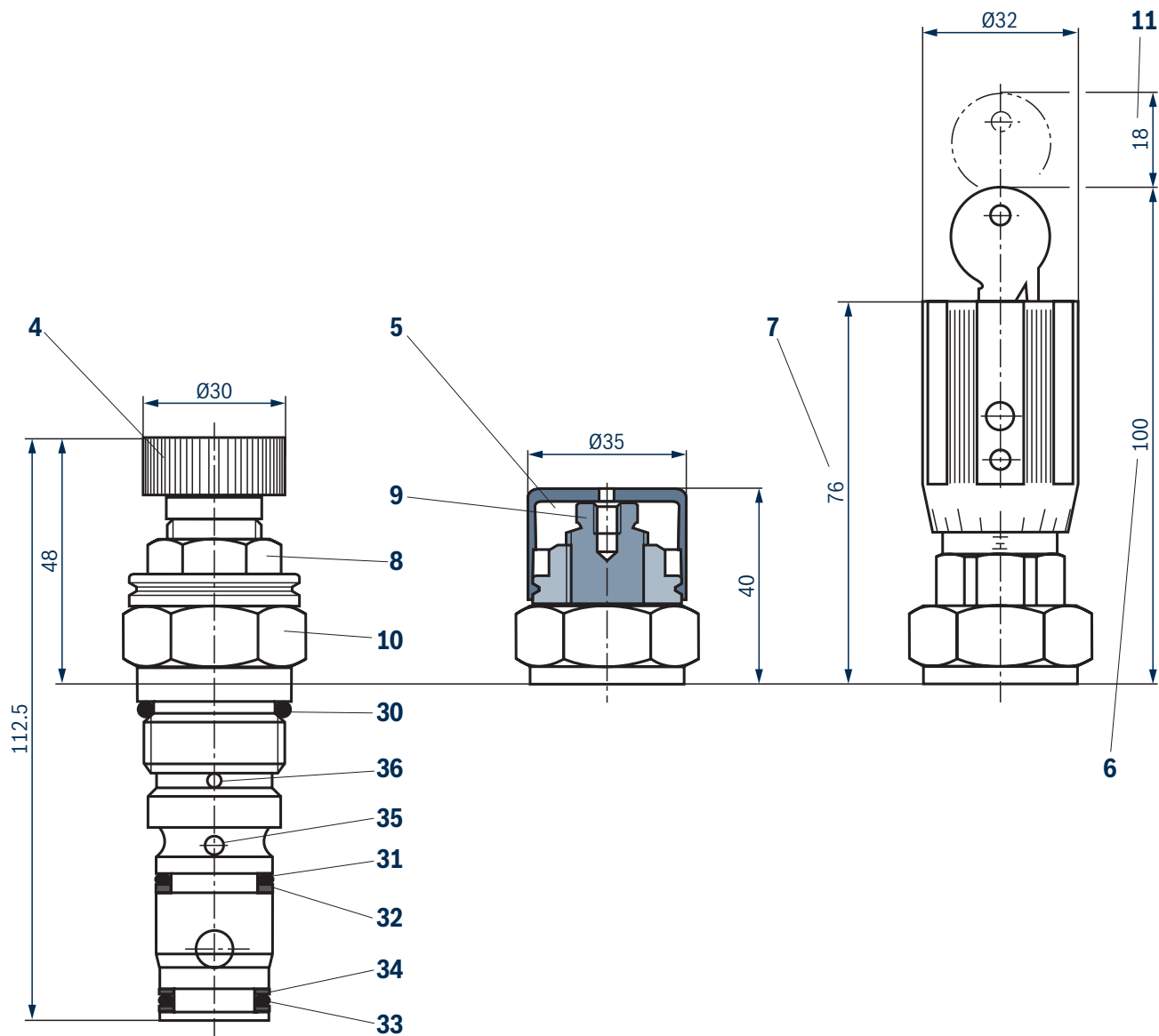


Item explanations see page 17.

Notice:

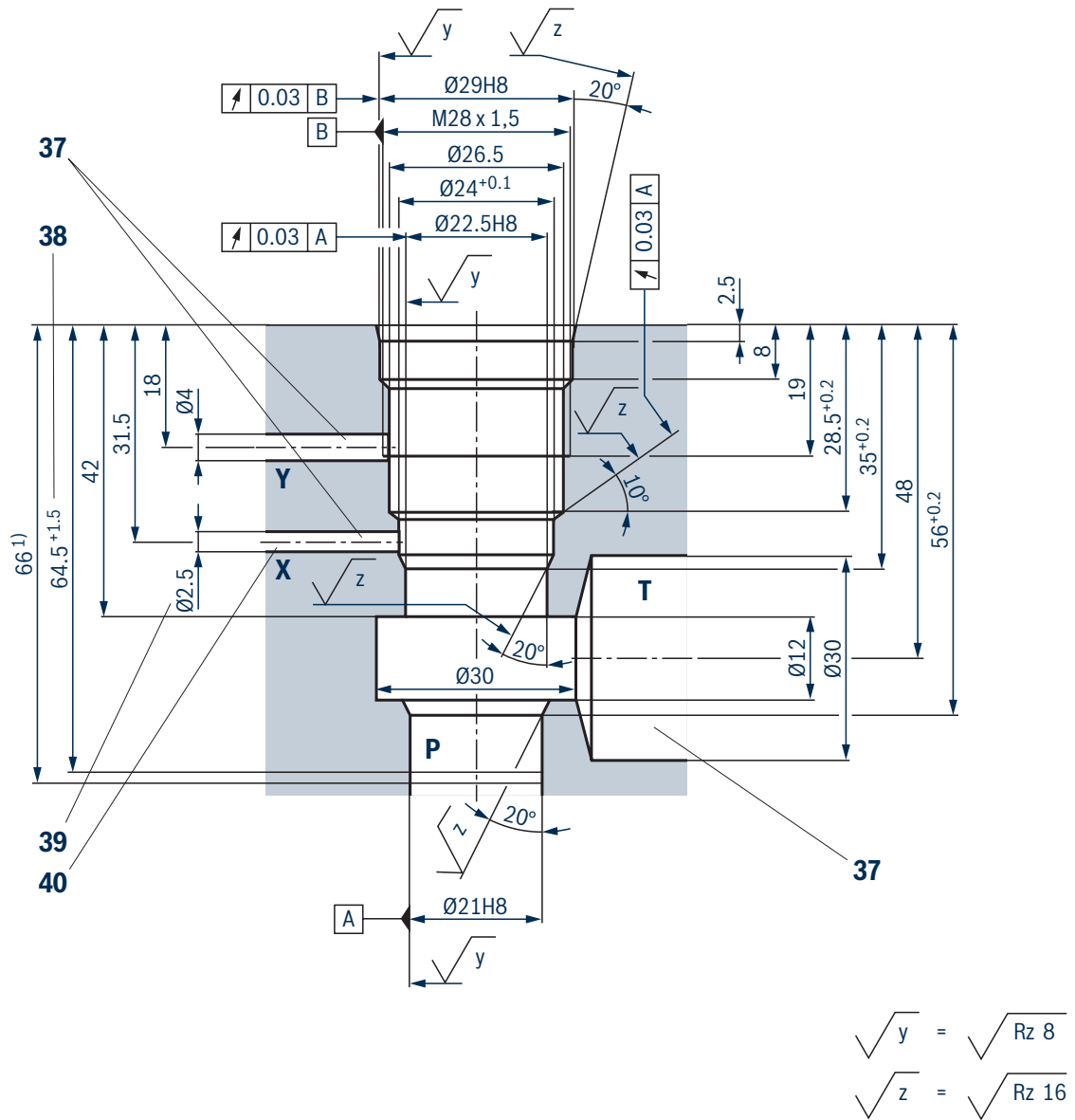
The dimensions are nominal dimensions which are subject to tolerances.

Dimensions: Screw-in cartridge valve
(Dimensions in mm)



Item explanations see page 17.

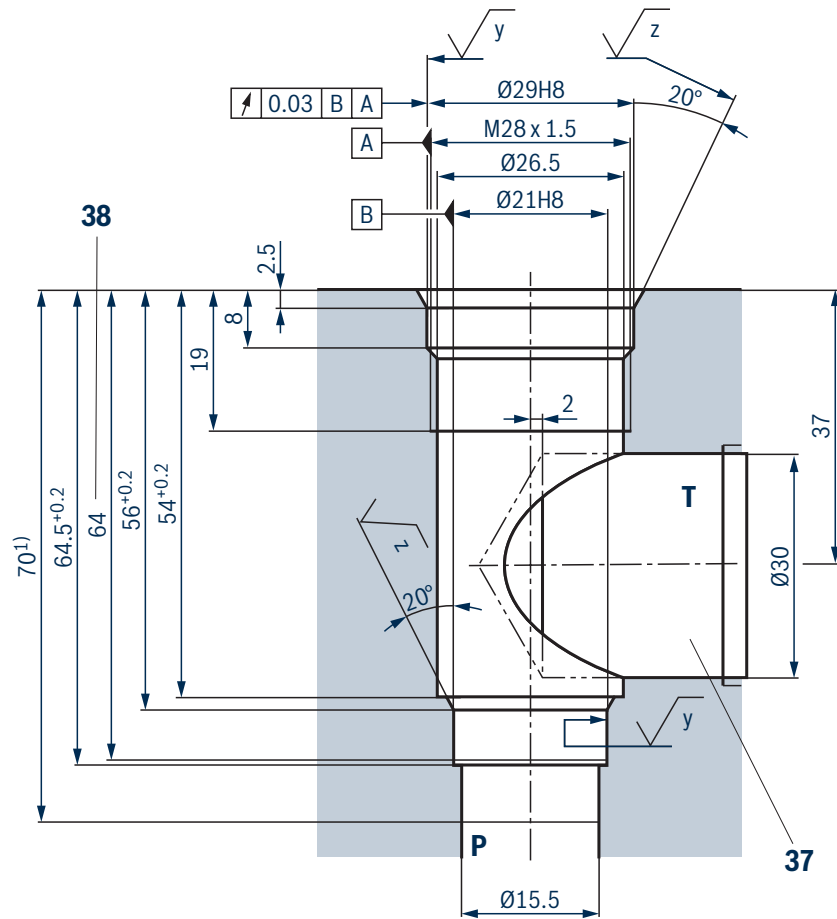
Mounting cavity: Version "XY" and
type-examination tested safety valves version "Y...E"
(Dimensions in mm)



¹⁾ Installation depth

Item explanations see page 17.

Mounting cavity: Version "Y"
(Dimensions in mm)



1) Installation depth

Item explanations see page 17.

Dimensions

- | | |
|---|--|
| <ul style="list-style-type: none"> 1 Name plate 2 Port X for remote control, optional 3 Port Y for external pilot oil return 4 Adjustment type "1" 5 Adjustment type "2" 6 Adjustment type "3" 7 Adjustment type "7" 8 Lock nut, wrench size SW22, tightening torque $M_A = 10^{+5}$ Nm 9 Hexagon, SW10 10 Hexagon, wrench size 30, tightening torque $M_A = 50$ Nm 11 Space required to remove the key 12 Locating pin 13 Valve mounting bores 14 Pressure gauge connection 15 Identical seal rings for ports P and T 16 Seal ring for port X 17 Grub screw is omitted with internal pilot oil return 18 Directional spool valve NG6, see data sheet 23178 19 Mating connector without circuitry
(separate order, see data sheet 08006) 20 Mating connector with circuitry
(separate order, see data sheet 08006) 21 Dimensions for valve without manual override 22 Dimensions for valve with manual override "N" | <ul style="list-style-type: none"> 23 Dimensions for valve with concealed manual override "N9" 24 Housing for version "W" 25 Space required for removing the mating connector 26 Valve contact surface; port A is not bored 27 Space required to remove the solenoid coil 28 Porting pattern according to ISO 6264-06-09-* -97 29 Porting pattern according to ISO 6264-08-13-* -97 30 Seal ring 31 Seal ring (omitted with version "Y") 32 Support ring (omitted with version "Y") 33 Seal ring 34 2 support rings 35 Bore for port X not available with version "Y" 36 Bore for port Y available with version "XY" and "Y" 37 Bore X, Y and T optionally at the circumference for version "XY"
Bore T optionally at the circumference for version "Y"
(no separate bore Y required; pilot oil return via bore T) 38 Depth of fit 39 Bore $\varnothing 2.5$ is only to be bored if necessary 40 Port X does not have to be bored for type-examination tested safety valves version "Y...E" as it does not have any function. |
|---|--|

Ordering codes: Type-examination tested safety valves, version "DB 20 K...E", component series 1X according to Pressure Equipment Directive 2014/68/EU

NG	Type designation	Component marking
25	DB 20 K 1 2 3 -1X/ Y E	TÜV.SV: -1001.14,4.F.G.p

Adjustment type

1	Hand wheel (pressure adjustment sealed, unloading or setting of a lower response pressure possible)	1
	With sealed protective cap (no adjustment/unloading possible)	2

Pressure

2	To be entered by the customer, e.g. pressure adjustment ≥ 30 bar and possible in 5 bar steps.	e.g. 150
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Seal material

3	NBR seals	no code
	FKM seals	V

	Information is entered at the factory	
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Deviating technical data: Type-examination tested safety valves, version "DB 20 K...E", according to Pressure Equipment Directive 2014/68/EU

General	
Conformity	CE according to Pressure Equipment Directive 2014/68/EU

Hydraulic				
Maximum counter pressure	► Port Y		bar	0
	► Port T	– Version "no code"	bar	0
		– Version "Y"	bar	10
Hydraulic fluid			See table on page 19	
Hydraulic fluid temperature range (= TS)			°C	–10 ... +80
Viscosity range			mm²/s	12 ... 230
Maximum flow			l/min	See table below
Set response pressure			bar	See table below

Size	Maximum flow $q_{V\text{ max}}$ in l/min		Set response pressure p_A in bar
	HL, HLP	HFDU, HFC	
25	70	60	30 ... 60
	100	90	61 ... 110
	150	135	111 ... 210
	200	180	211 ... 315
	300	270	316 ... 350

Deviating technical data: Type-examination tested safety valves, version "DB(W)...E" according to Pressure Equipment Directive 2014/68/EU

Hydraulic fluid	Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils	HL, HLP	FKM	DIN 51524	90220
Flame-resistant ▶ Water-free	HFDU (glycol base)	FKM	ISO 12922	90222
	HFDU (ester base)	FKM		
	HFDR	FKM		
	▶ Containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	ISO 12922	90223



Important information on hydraulic fluids:

- ▶ The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.

▶ Flame-resistant – containing water:

- Due to an increased cavitation tendency with the use of HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to use with HLP mineral oil.
- Dependent on the hydraulic fluid used, the maximum ambient and hydraulic fluid temperature must not exceed 50 °C.

Safety instructions: Type-examination tested safety valves, version "DB 20 K...E", according to Pressure Equipment Directive 2014/68/E

- ▶ Before ordering a type-examination tested safety valve, it must be ensured that at the desired **response pressure** p_A , the maximum admissible **flow** $q_{V \max}$ (= numerical value at the position of letter "G" in the component marking) of the safety valve is higher than the maximum possible flow of the system/accumulator to be secured. The applicable regulations must be observed here.
- ▶ According to **Pressure Equipment Directive 2014/68/EU**, the increase in the system pressure due to the flow must not exceed 10% of the set response pressure (see component marking).
- ▶ The maximum flow $q_{V \max}$ stated in the component marking must not be exceeded.
- ▶ Discharge lines of safety valves must end in a risk-free manner. The accumulation of fluids in the discharge lines must **not** be possible (AD2000 - data sheet A2).



Application notes must always be observed

- ▶ In the plant, the response pressure specified in the component marking is set at a flow of 2 l/min.
- ▶ The maximum admissible flow specified in the component marking applies to:
 - External pilot oil return **"Y"** without counter pressure in the pilot oil return line: Admissible counter pressure in the discharge line (port T) <10 bar
- ▶ By removing a lead seal at the safety valve, the approval according to the Pressure Equipment Directive becomes void
- ▶ Mounting cavities (see page 15 and 16)
- ▶ Basically, the requirements of the Pressure Equipment Directives and of AD 2000 data sheet A 2 have to be observed.

Project planning information

- ▶ The unloading function (directional valve function with version "W") must not be used for safety functions.
- ▶ With version "B", the lowest adjustable pressure (circulation pressure) is set in case of power failure or cable break. With version "A", the pressure limiting function is set in case of power failure or cable break.
- ▶ Hydraulic counter pressures in port T with internal pilot oil return and/or port Y with external pilot oil return add 1:1 to the response pressure of the valve set at the pilot control.

Example:

Pressure adjustment of the valve by spring preload (item 7 on page 5) in the pilot control valve/
adjustment type $p_{\text{spring}} = 200 \text{ bar}$

Hydraulic counter pressure in port T with internal pilot oil return $p_{\text{hydraulic}} = 50 \text{ bar}$

=> Response pressure = $p_{\text{spring}} + p_{\text{hydraulic}} = 250 \text{ bar}$

Further information

- ▶ Subplates
- ▶ Hydraulic fluids on mineral oil basis
- ▶ Environmentally compatible hydraulic fluids
- ▶ Reliability characteristics $MTTF_D$ regarding the functional safety according to ISO 13849
- ▶ Mating connectors and cable sets for valves and sensors
- ▶ Pressure relief valve, pilot-operated
- ▶ Hydraulic valves for industrial applications
- ▶ Information on available spare parts

Data sheet 45100

Data sheet 90220

Data sheet 90221

Data sheet 90294

Data sheet 08006

Operating instructions 25818-B

Operating instructions 07600-B

www.boschrexroth.com/spc

Bosch Rexroth AG
Industrial Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52/40 30 20
my.support@boschrexroth.com
www.boschrexroth.com

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