

Pressure relief valve, pilot-operated

Type DB; DBW



- ▶ Size 52
- ▶ Component series 3X
- ▶ Maximum operating pressure 315 bar
- ▶ Maximum flow 2,000 l/min



Features

- ▶ For flange connection
- ▶ For subplate mounting
- ▶ 3 adjustment types for pressure adjustment, optionally:
 - Sleeve with hexagon and protective cap
 - Rotary knob
 - Lockable rotary knob
- ▶ Solenoid-actuated unloading via a built-on directional spool valve
- ▶ Pilot oil return, internal or external
- ▶ Remote control port, optional
- ▶ Main spool insert optionally as seat or spool version
- ▶ CE conformity according to the Low-Voltage Directive 2014/35/EU for electrical voltages > 50 VAC or > 75 VDC

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Type-examination tested safety valve type DB(W)...E, Component series 3X, according to the 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
DB		52				-	3X	/		U				K4			*

01	Pressure relief valve	DB
02	Without directional valve	no code ◊
	With attached directional valve	W ◊

03	Size 52	52
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04		normally closed	A ¹⁾
		normally open	B ¹⁾ ◊

Type of connection

05	Subplate mounting	P ◊
	Flange connection	F ◊

Adjustment type for pressure adjustment

06	Rotary knob	1
	Sleeve with hexagon and protective cap	2 ◊
	Lockable rotary knob	3 ²⁾

Main spool

07	Seat version	-
08	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	3X

Pressure rating

09	Set pressure up to 100 bar	100
	Set pressure up to 315 bar	315 ◊

Pilot oil supply and pilot oil return (see also Symbols on page 4)

10	Internal pilot oil supply and pilot oil return	- ◊
	External pilot oil supply, internal pilot oil return	X
	Internal pilot oil supply, external pilot oil return	Y
	External pilot oil supply and pilot oil return	XY

11	Valve for minimum cracking pressure 3 bar	U
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12	Without directional valve	no code ◊
	With directional spool valve (data sheet 23178)	6E ¹⁾ ◊

13	Direct voltage 24 V	G24 ¹⁾ ◊
	AC voltage 230 V 50/60 Hz	W230 ¹⁾

14	With concealed manual override	N9 ¹⁾ ◊
	With manual override	N ¹⁾
	Without manual override	no code

Electrical connection

15	Without mating connector; connector DIN EN 175301-803	K4 ^{1; 3)}
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Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
DB		52				-	3X	/		U				K4			*


Seal material (observe compatibility of seals with hydraulic fluid used, see page 7)

16	NBR seals	no code \diamond
	FKM seals	V

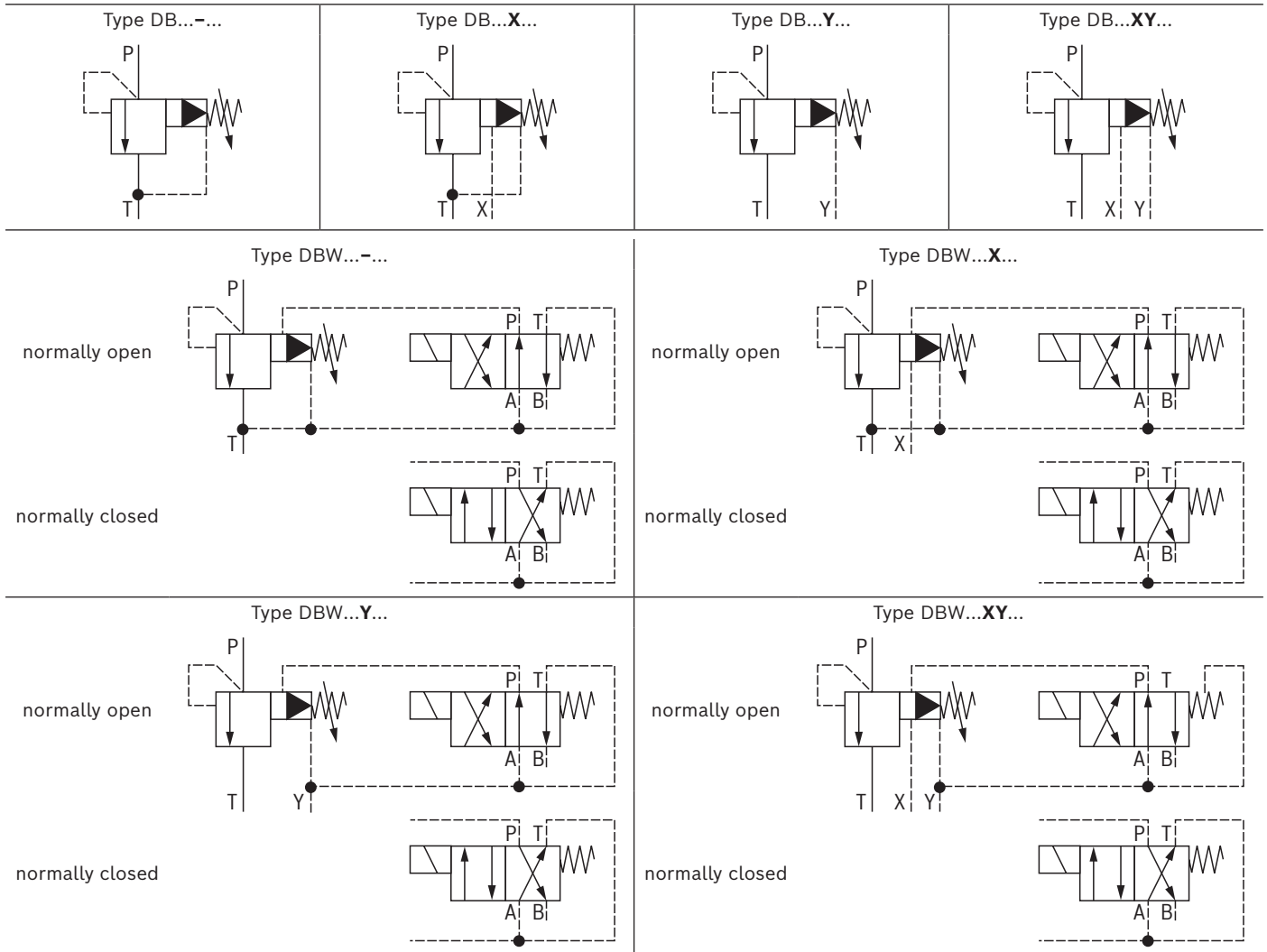
Equipment Directive

17	Without type-examination procedure	no code \diamond
	Type-examination tested safety valves according to Pressure Equipment Directive 2014/68/EU ⁴⁾	E
18	For further details, see the plain text	

- 1) Ordering code only necessary with version with mounted directional valve ("DBW").
- 2) H-key with material no. **R900008158** is included in the scope of delivery.
- 3) Mating connectors, separate order, see page 16.
- 4) See ordering code on page 11.

 **Notice:** \diamond = Preferred type

Symbols



Function, section, symbol

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

The pressure relief valves basically consist of the pilot control valve (1) with pressure adjustment element (2), main valve (3) with main spool insert (4) and directional valve (5), optional.

Pressure relief valve type DB

The pressure applied by the system acts on the main spool (4). At the same time, pressure is applied to the spring-loaded side of the main spool (4) and to the pilot control valve (1) via the control lines (6) which are equipped with nozzles. If the system pressure exceeds the value set at the spring (7), the poppet (10) of the pilot control valve opens. The hydraulic fluid on the spring-loaded side of main spool (4) now flows via the spring chamber of the pilot control valve (1) to the tank, either internally via port T, or externally, via port Y. Due to the combination of jets in the control lines, a pressure drop results at the main spool, the connection from P to T

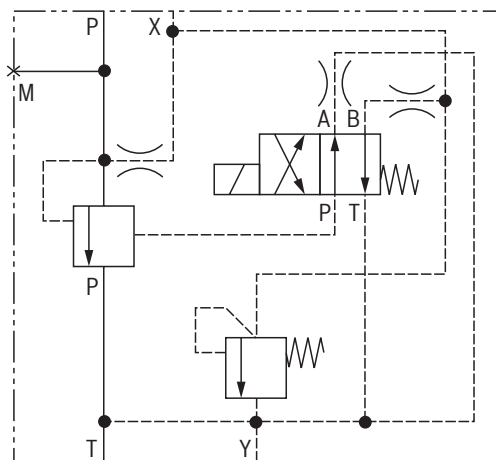
is thus released. The hydraulic fluid flows from channel P to channel T maintaining the set operating pressure. The pressure relief valve can be unloaded by means of remote control or switched to another pressure value via port X (8).

Pressure relief valves type DBW

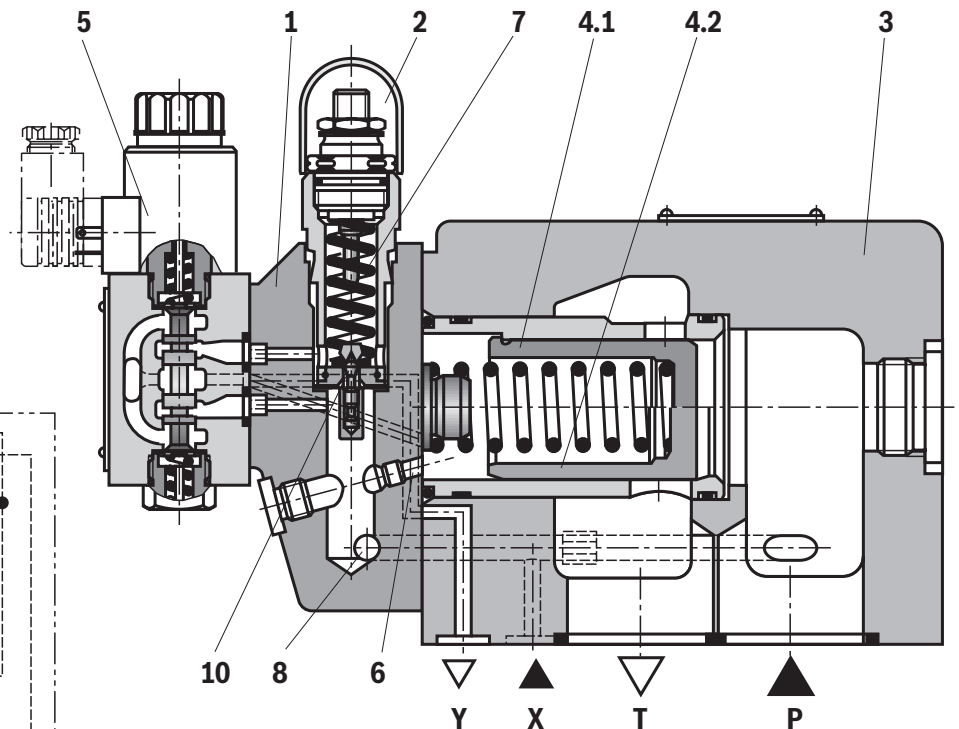
The function of this valve is basically the same as that of valve type DB. The unloading of the main spool (4) is, however, achieved by controlling the mounted directional valve (5).

To reduce the tank pressure peaks when switching to depressurized circulation by operating the directional valve, the main spool in spool version (4.1) can be used.

Principle:



With version "DBW ...Y...", the connection T-Y is closed.



Type DBW 52 BP2.3X/...XYU6EG24N9K4

- 4.1 Spool version
- 4.2 Seat version


Technical data

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

General			
Weight	▶ DB ...	kg	approx. 27
	▶ DBW ...	kg	approx. 28.5
Installation position			any
Ambient temperature range	▶ DB ...	°C	-30 ... +80 (NBR seals) -15 ... +80 (FKM seals)
	▶ DBW ...	°C	-20 ... +50 (NBR seals) -15 ... +50 (FKM seals)
Conformity	▶ CE according to Low-Voltage Directive 2014/35/EU tested according to		EN 60204-1:2006-01 and DIN VDE 0580, classified as component

Hydraulic			
Maximum operating pressure	▶ Port P, T, X	bar	315
Maximum counter pressure	▶ Port Y	- DB ...	bar 315
		- DBW ...Y	bar 210 with DC solenoid
	▶ Port T	- DBW ...	bar 160 with AC solenoid
Minimum set pressure		bar	flow-dependent (see characteristic curves page 6)
Maximum set pressure		bar	100; 315
Maximum flow		l/min	2000
Hydraulic fluid			see table page 7
Hydraulic fluid temperature range		°C	-20 ... +80 (NBR seals) -15 ... +80 (FKM seals)
Viscosity range		mm ² /s	10 ... 380
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			Class 20/18/15 ¹⁾

¹⁾ 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 life cycle of the components.

 **Notice:**

- ▶ Technical data for directional spool valve see data sheet 23178.
- ▶ Technical data for connection flange see data sheet 45501.
- ▶ Deviating technical data for type-examination tested safety valves can be found on page 12.

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 notices 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.

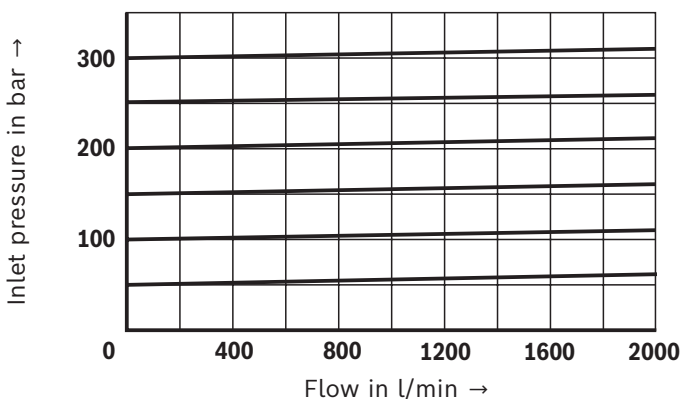
▶ Flame-resistant – containing water:

- Due to the increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended – if possible specific to the installation – backing 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 due to the function, an energy-reducing control of these components is recommended, e.g. via a PWM plug-in amplifier.

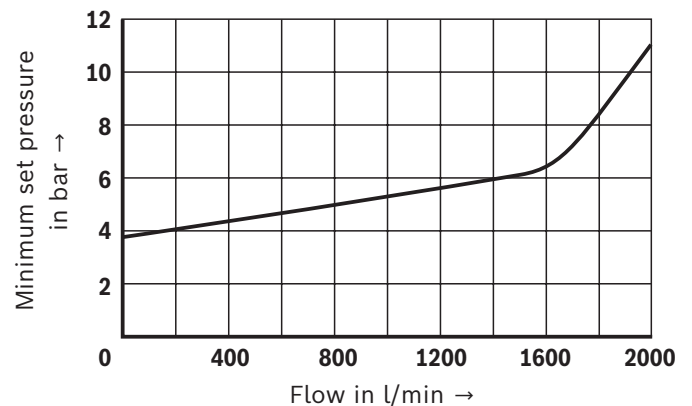
Characteristic curves

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

Inlet pressure dependent on the flow



Minimum set pressure dependent on the flow ¹⁾

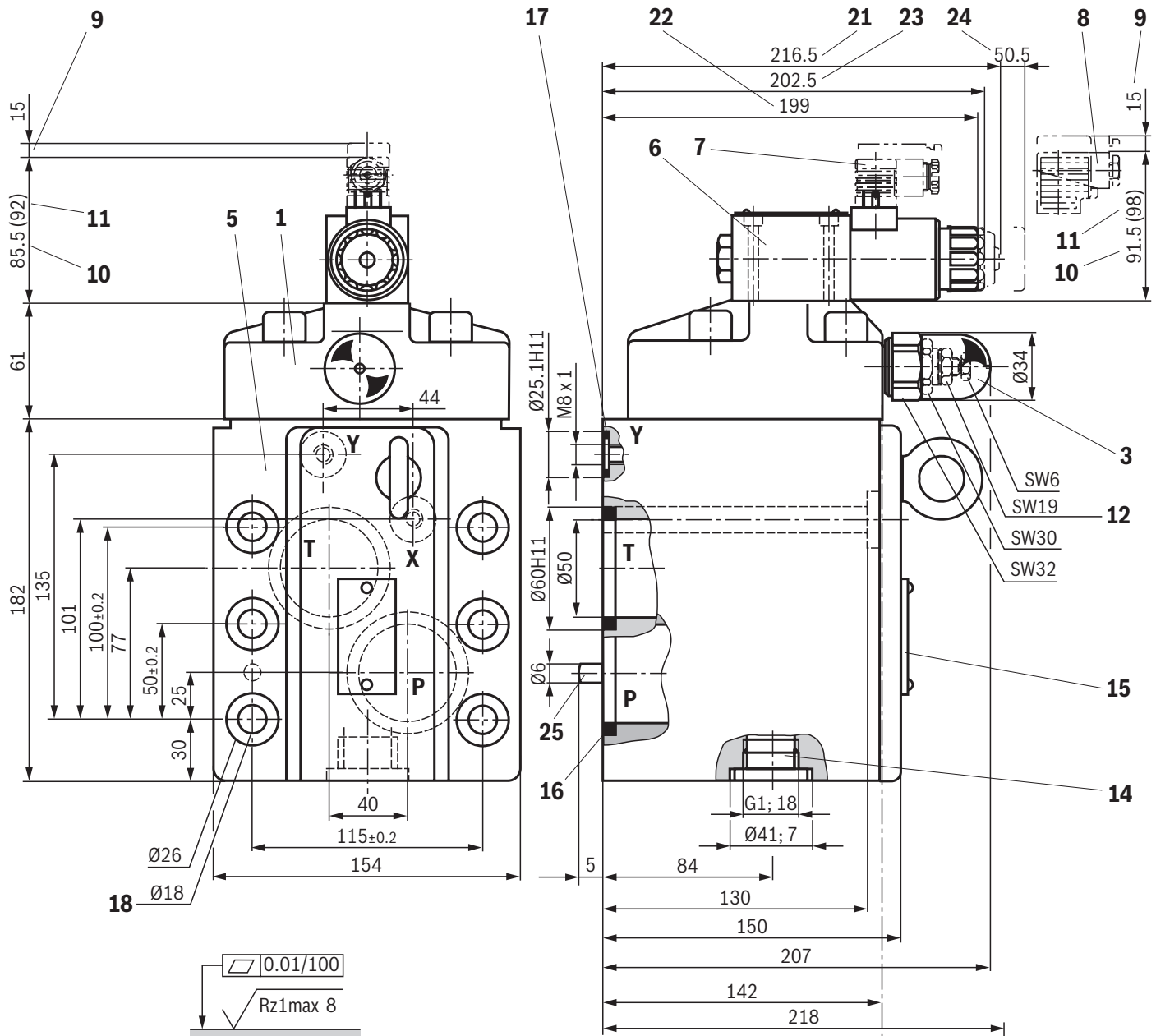


Notice:

The characteristic curves were measured with **external, depressurized pilot oil return**.
With internal pilot oil return, the inlet pressure increases by the output pressure present in port T.

¹⁾ The characteristic curves apply for output pressure $p_T = 0 \text{ bar}$ in the entire flow range

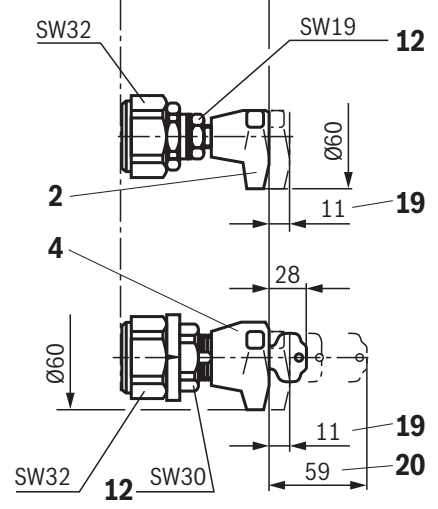
Dimensions: Subplate mounting
(dimensions in mm)



Required surface quality of the valve contact surface for installation of the valve without subplate.

Notice:
Please use the existing mounting bores to fix the valve so that the reaction forces can be absorbed in a risk-free manner.

Item explanations can be found on page 10.
Deviating dimensions for version "E" see page 12.



Dimensions

- 1 Pilot control valve
- 2 Adjustment type "1"
- 3 Adjustment type "2"
- 4 Adjustment type "3"
- 5 Main valve
- 6 Directional spool valve NG6, see data sheet 23178
- 7 Mating connector **without** circuitry for connector "K4"
(separate order, see page 16 and data sheet 08006)
- 8 Mating connector **with** circuitry for connector "K4"
(separate order, see page 16 and data sheet 08006)
- 9 Space required for removing the mating connector
- 10 Dimension for valve with DC solenoid
- 11 Dimension () for valve with AC solenoid
- 12 Lock nut, tightening torque $M_A = 10^{+5}$ Nm
- 13 Connection flanges (T and P), see data sheet 45501
- 14 Pressure gauge connection, tightening torque
 $M_A = 225$ Nm $\pm 10\%$
- 15 Name plate
- 16 Identical seal rings for ports P and T
- 17 Identical seal rings for ports X and Y
- 18 Valve mounting bores
- 19 Maximum dimension with unloaded valve
- 20 Space required to remove the key
- 21 Dimension for valve with manual override "N"
- 22 Dimension for valve with concealed manual override "N9"
- 23 Dimension for valve without manual override
- 24 Space required to remove the coil
- 25 Locking pin

Valve mounting screws (separate order)

- ▶ Subplate mounting
6 hexagon socket head cap screws ISO 4762 - M16 x 150 - 10.9
(friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$)
Tightening torque $M_A = 229$ Nm $\pm 10\%$
Material no. **R913000154**
- ▶ Flange connection
2 hexagon socket head cap screws ISO 4762 - M12 - 10.9

Connection flanges (separate order), see data sheet 45501

Ordering code: Type-examination tested safety valves, version "DB(W)...E" ¹⁾

Designation	Component marking	Maximum flow q_{Vmax} in l/min with pilot oil return		Set response overpressure p in bar
		external "Y"	internal "-"	
DB 52 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 3X/ <input type="checkbox"/> <input type="checkbox"/> U <input type="checkbox"/> E	TÜV.SV. <input type="checkbox"/> - 734.46.F.G.p	1000	500	50 ... 110
DBW 52 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 3X/ <input type="checkbox"/> <input type="checkbox"/> U6 <input type="checkbox"/> <input type="checkbox"/> E	TÜV.SV. <input type="checkbox"/> - 734.46.F.G.p	1500 2000	1000 1500	111 ... 210 211 ... 315

<input type="checkbox"/> 1	Directional valve, normally closed	A
	Directional valve, normally open	B
<input type="checkbox"/> 2	Subplate mounting	P
	Flange connection	F

Adjustment type for pressure adjustment

<input type="checkbox"/> 3	Rotary knob (pressure adjustment sealed, unloading or setting of a lower response pressure possible)	1
	With sealed protective cap (no adjustment/unloading possible)	2

Main spool

<input type="checkbox"/> 4	Seat version	-
	Spool version	L

Pressure

<input type="checkbox"/> 5	To be entered by the customer, e.g. pressure adjustment ≥ 50 bar and in 5 bar steps possible	e.g. 150
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Pilot oil supply and pilot oil return

<input type="checkbox"/> 6	Internal pilot oil supply and pilot oil return	- 2; 3)
	Pilot oil supply internal, pilot oil return external (recommendation)	Y 3)

Electrical specifications

<input type="checkbox"/> 7	See page 2	e.g. EG24N9K4
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Seal material

<input type="checkbox"/> 8	NBR seals	no code
	FKM seals	V

<input type="checkbox"/>	Value entered at the factory	
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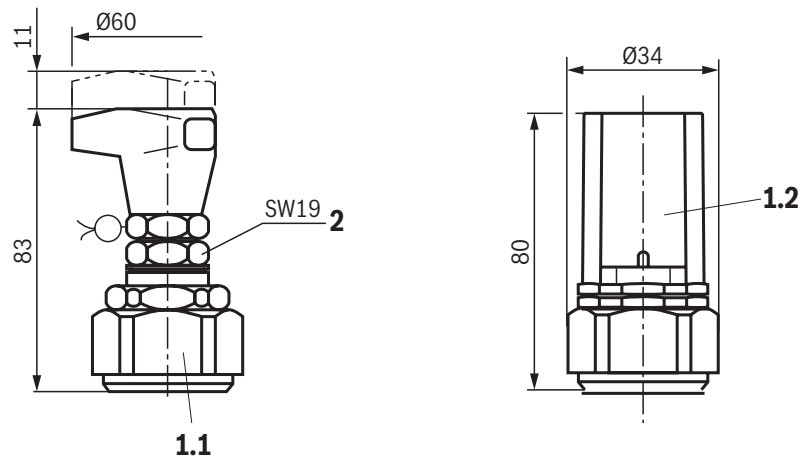
- 1) Component series 3X, according to the Pressure Equipment Directive 2014/68/EU
- 2) Dash "-" **only** necessary with version with attached directional valve (DBW)
- 3) External pilot oil supply "X" not possible!

Deviating technical data: Type-examination tested safety valves, version "DB(W)...E" **1)**

General						
Conformity			CE according to Pressure Equipment Directive 2014/68/EU			
Hydraulic						
Version		"DB../.."	"DB../..Y"	"DBW../.."	"DBW../..Y"	
Maximum counter pressure	▶ Port Y	bar	–	0	–	0
	▶ Port T	bar	2)	$p_T < 15$	2)	$p_T < 15$
Maximum flow		see table page 11 as well as characteristic curves page 14 ... 15				
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524				
Hydraulic fluid temperature range (= TS)		°C	–10 ... +60			
Viscosity range		mm ² /s	12 ... 230			

1) Component series 3X, according to Pressure Equipment Directive 2014/68/EU (For applications outside these parameters, please consult us!)

2) See characteristic curves and explanatory notes for maximum admissible counter pressures on page 14 ... 15

Deviating dimensions: Type-examination tested safety valves, version "DB(W)...E" **1)**
(dimensions in mm)

- 1.1** Adjustment type "1" – rotary knob
1.2 Adjustment type "2", hexagon with safety cap
2 Lock nut, tightening torque $M_A = 10^{+5}$ Nm

Safety instructions: Type-examination tested safety valves, version "DB(W)...E" ¹⁾

- ▶ Before ordering a type-examination tested safety valve, it must be observed that for the desired **response overpressure p** , the maximum admissible **flow $q_{V \max}$** of the safety valve must be larger than the maximum possible flow of the system/accumulator to be secured.
- ▶ According to the 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 page 11).
- ▶ Discharge lines (ports T and Y) of safety valves must end in a risk-free manner. An accumulation of fluids in the discharge system must **not** be possible (see data sheet AD2000 A2).
- ▶ If a lead seal at the safety valve is removed, the approval according to the PED becomes void.
- ▶ The requirements of the Pressure Equipment Directives **2014/68/EU** and of data sheet AD2000 A2 must be generally observed!

**Application notes must always be observed**

- ▶ In the plant, the response pressure specified in the component marking is set with a flow of 12 l/min (version "Y" with 9 l/min).
- ▶ The maximum admissible flow stated in the component marking (= numerical value instead of the character "G" in the component marking, see page 11) must not be exceeded.

It applies to:

- Pilot oil return **external ("Y") without counter pressure** in the **discharge line Y**; admissible counter pressure in the discharge line (port T) < 15 bar
- Pilot oil return **internal ("no code")**. The maximum flow is only admissible **without counter pressure** in the **discharge line** (port T).

With internal pilot oil return, the system pressure increases by the counter pressure in the discharge line (port T) with increasing flow (observe AD2000 - data sheet A2 - item 6.3).

To ensure that this increase in system pressure caused by the flow does not exceed 10% of the set response pressure, the admissible flow has to be reduced dependent on the counter pressure in the discharge line (port T) see diagrams page 14 ... 15).

**Notice:**

Possible unloading via the directional valve must not be applied for safety-relevant functions. If unloading is required for safety-relevant functions, an additional safety valve must be installed.

¹⁾ Component series 3X, according to the Pressure Equipment Directive 2014/68/EU

Characteristic curves: Counter pressure in the discharge line

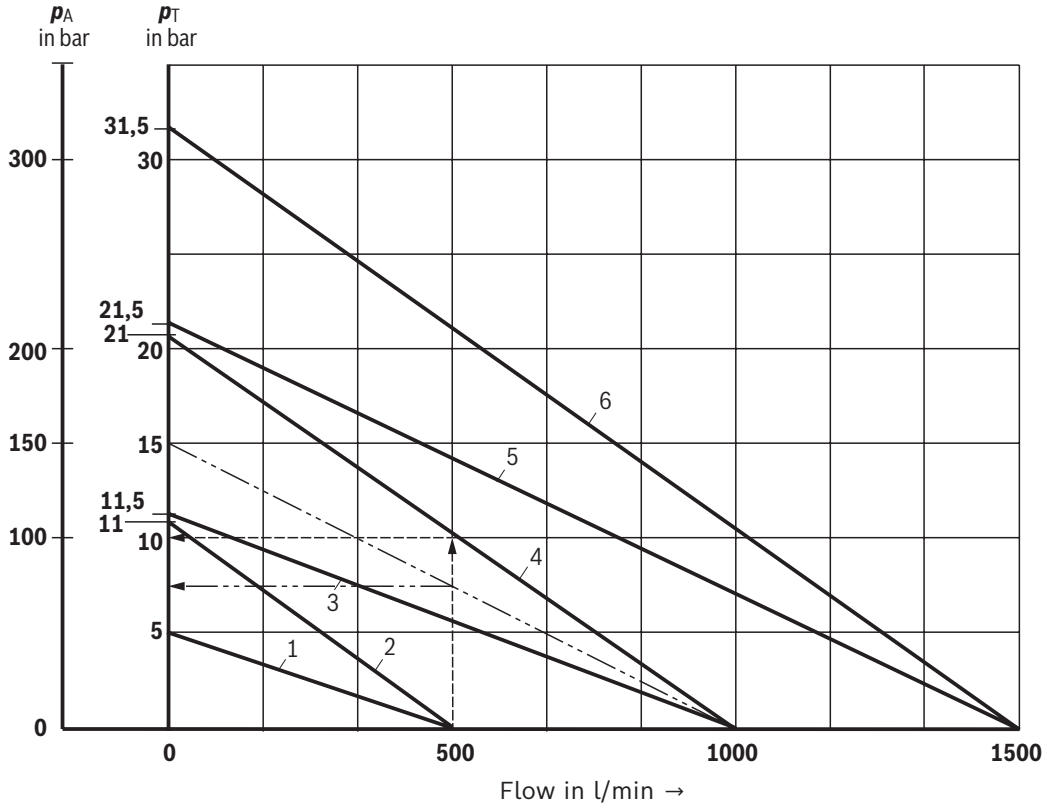
In principle, the valve should be operated without counter pressure in the discharge line, if possible. In case of counter pressure in the discharge line, the maximum possible flow is reduced. There is a relationship between maximum counter pressure p_T in the discharge line and flow q_V , which can be seen from the following characteristic curve. Characteristic curves for intermediate values of the response pressure which are not listed must be determined by means of interpolation. When the flow approaches zero, the maximum counter pressure p_T is in each case 10% of the response pressure. With increasing flow, the maximum counter pressure p_T decreases.

Interpolation of intermediate values from the diagram

1. At the axis p_T , mark 1/10 of the value of p_A .
2. Determine the next lower and the next higher characteristic curve for this point. The point marked at p_T divides the section between lower and higher characteristic curve on the p_T axis with a certain percentage.
3. At the q_{Vmax} axis, divide the section between next lower and next higher characteristic curve in the same percentage as the section at the p_T axis. From the zero position flow on the q_{Vmax} axis determined in that way, draw a straight line to the value on the p_T axis marked before.
4. Mark the system flow to be secured at the q_{Vmax} axis.
5. Read off the maximum counter pressure for this value using the line at the p_T axis drawn before.

Characteristic curves: Counter pressure in the discharge line

Diagram for determining the maximum counter pressure p_T in the discharge line at port T of the valve dependent on the flow q_{Vmax} for valves DB(W) ...-3X/...E with different response pressures p_A .



Characteristic curves	Response pressure p_A in bar
1	50
2	110
3	115
4	210
5	215
6	315

Characteristic curves for intermediate values can be generated by interpolation. Further explanations can be found on page 14 and 15.

- p_A Response pressure in bar
- p_T Maximum counter pressure in the discharge line (port T) in bar
(sum of all possible counter pressures; also see AD2000 data sheet - A2)
 $p_{Tmax} = 10\% \times p_A$ (with $q_v = 0$ l/min) according to PED 2014/68/EU
- q_{Vmax} Maximum flow in l/min

Determination of the maximum counter pressure

Example 1 (with already existing characteristic curve):
Flow of the system / accumulator to be secured: $q_{Vmax} = 500$ l/min
Safety valve set to: $p_A = 210$ bar.
Read off the maximum counter pressure p_T of approx. 10 bar from the diagram (see arrows, dashed line "-----").

Example 2 (with interpolated characteristic curve):
Flow of the system / accumulator to be secured: $q_{Vmax} = 500$ l/min
Safety valve set to: $p_A = 150$ bar.
Value to be marked at the axis referred to as
 p_T : $1/10 \times 150$ bar = 15 bar.
Read off the maximum counter pressure p_T of approx. 7.5 bar from the diagram (see arrows, dashed/dotted line "- _ _ _ -").

Accessories (separate order)**Mating connectors and cable sets**

Pos. 1)	Designation	Version	Short designation	Material number	Data sheet
7, 8	Mating connector; for valves with "K4" connector, 2-pole + PE, design A	Without circuitry, M16 x 1.5, 12 ... 240 V, "a"	Z4	R901017010	08006
		Without circuitry, M16 x 1.5, 12 ... 240 V, "b"		R901017011	
		With indicator light, M16 x 1.5, 12 ... 240 V	Z5L	R901017022	
		With rectifier, M16 x 1.5, 80 ... 240 V	RZ5	R901017025	
		With indicator light and Z-diode-suppressor, M16 x 1.5, 24 V	Z5L1	R901017026	

1) See dimensions on page 8 and 9.

General information

- ▶ The unloading function (directional valve function with version "DBW") 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

- | | |
|--|--|
| ▶ Directional spool valve | Data sheet 23178 |
| ▶ Connection flanges | Data sheet 45501 |
| ▶ Hydraulic fluids on mineral oil basis | Data sheet 90220 |
| ▶ Environmentally compatible hydraulic fluids | Data sheet 90221 |
| ▶ Flame-resistant, water-free hydraulic fluids | Data sheet 90222 |
| ▶ Flame-resistant hydraulic fluids – containing water (HFAE, HFAS, HFB, HFC) | Data sheet 90223 |
| ▶ Hydraulic valves for industrial applications | Operating instructions 07600-B |
| ▶ General product information on hydraulic products | Data sheet 07008 |
| ▶ Assembly, commissioning and maintenance of industrial valves | Data sheet 07300 |
| ▶ Information on available spare parts | www.boschrexroth.com/spc |

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