

**RE 25 802/03.03**

Replaces: 05.02

Material No. R900772641b

**Pressure relief valve,  
pilot operated,  
Types DB; DBW**

Nominal sizes 10 to 32

Series 5X

Maximum operating pressure 350 bar

Maximum flow 650 L/min

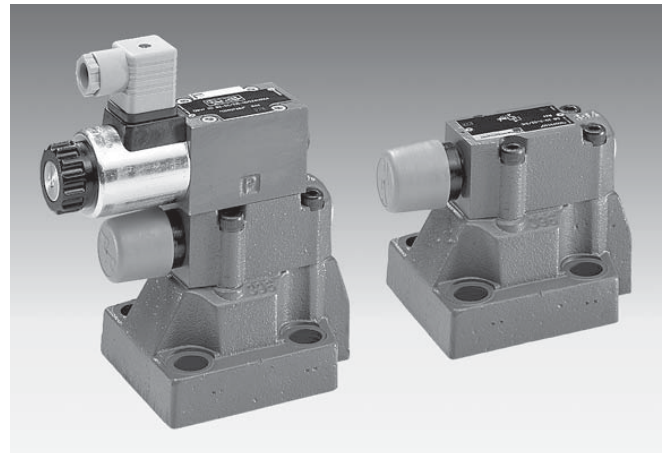
**Overview of contents**

Contents	Page
Features	1
Ordering details	2, 3
Preferred types	3
Plug-in connectors	4
Ordering details for design tested pressure relief valves	4 ... 7
Function, section	7, 8
Symbols	7
Technical data	9, 10
General guidelines	10
Characteristic curves	11, 12
Unit dimensions	12 ... 16

**Note:**

**Design tested pressure relief valves to pressure component directive 97/23/EG (abbreviated to „DGRL“ in any further text)**

**Type DB(W)...E, series 5X, for ordering details see page 4.**



H6088/98 + H6089/98

Type DBW 20 B2-5X/315-6EG24N9K4 with plug-in connector (separate order) and type DB 20 -2-5X/315...

**Features**

- For subplate mounting:
  - Porting pattern to DIN 24 340 form E,
  - ISO 6264-AR-06-2-A (NS 10)
  - ISO 6264-AS-08-2-A (NS 25)
  - ISO 6264-AT-10-2-A (NS 32)
  - and CETOP-RP 121 H,
  - subplates to catalogue sheet RE 45 064 (separate order)
- For threaded connections
- For installation into manifolds
- 4 adjustment elements:
  - Rotary knob
  - Sleeve with hexagon and protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale
- 5 pressure stages
- Solenoid operated unloading via a built-on directional spool valve or directional poppet valve
- High performance solenoid
- Explosion-proof solenoid (on request)
- Switching shock damping, optional (only type DBW)
- Further information:
  - Pilot operated valves
    - High performance directional valves RE 23 178 and RE 22 058
  - Subplates RE 45 064



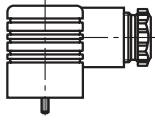
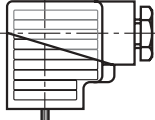
© 2003  
by Bosch Rexroth AG, Industrial Hydraulics, D-97813 Lohr am Main

All rights reserved. No part of this document may be reproduced or stored, processed, duplicated or circulated using electronic systems, in any form or by means, without the prior written authorisation of Bosch Rexroth AG. In the event of contravention of the above provisions, the contravening party is obliged to pay compensation.





**Plug-in connectors** to DIN EN 175 301-803 and ISO 4400 for component plug "K4"

For further plug-in connectors, see RE 08 006					
		<b>Material No.</b>			
<b>Valve side</b>	<b>Colour</b>	Without circuitry	With indicator light 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Z-diode protective circuit 24 V
a	Grey	<b>R900074683</b>	–	–	–
a/b	Black	–	<b>R900057292</b>	<b>R900313933</b>	<b>R900310995</b>

**Ordering details for design tested pressure relief valves type DB(W)..../E, series 5X**

Design tested to directive 97/23/EG (pressure component directive)

NS	Designation	Component identification	Max. permissible flow $q_{Vmax}$ in L/min with pilot oil drain		Set response over pressure $p$ in bar
			external „Y“	internal „–“	
10	DB 10 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> –5X/ <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> E	TÜV.SV. <input type="checkbox"/> –851.12.F.G.p	170	130	30 to 60
	DBW 10 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> –5X/ <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> * <input type="checkbox"/> E	TÜV.SV. <input type="checkbox"/> –851.12.F.G.p	230	200	61 to 110
25	DB 20 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> –5X/ <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> E	TÜV.SV. <input type="checkbox"/> –852.22.F.G.p	230	200	111 to 210
	DBW 20 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> –5X/ <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> * <input type="checkbox"/> E	TÜV.SV. <input type="checkbox"/> –852.22.F.G.p	230	200	211 to 350
32	DB 30 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> N5X/ <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> E	TÜV.SV. <input type="checkbox"/> –853.22.F.G.p	250	180	30 to 60
	DBW 30 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> N5X/ <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> * <input type="checkbox"/> E	TÜV.SV. <input type="checkbox"/> –853.22.F.G.p	270	210	61 to 110
			420	320	111 to 210
			450	400	211 to 350
			600	225	30 to 60
			600	340	61 to 110
			650	540	111 to 210
			700	580	211 to 350

- 1  Directional valve, normally closed = **A**
- Directional valve, normally open = **B**
- 2  For subplate mounting for threaded connections = **No code**
- 3  Adjustment element hand wheel (sealed pressure adjuster, unloading or adjustments in the lower settable range is possible) = **G**
- Adjustment element with sealed protective cap (no adjustment or unloading is possible) = **1**
- 4  The pressure details contained within the type code are to be entered by the customer, e.g. = **2**
- 5  Pressure adjustments  $\geq 30$  bar and in 5 bar steps are possible = **10**
- Internal pilot oil supply and pilot oil drain = – <sup>1)2)</sup>
- Recommended: Internal pilot oil supply, external pilot oil drain = **Y** <sup>2)</sup>
- \*  Electrical data ordering details (see page 3) e.g. = **EG24N9K4**
- NBR seals = **No code**
- FKM seals = **V**
- Details are completed by the factory

**Important notes:**

- Before ordering a design tested pressure relief valve, checks have to be carried out to ensure that at the required **response pressure  $p$**  the maximum permissible **flow  $q_{Vmax}$**  of the safety valve is greater than the maximum possible flow from the system! The appropriate regulations must be taken into account.
- The return lines (ports T and Y) from safety valves must vent in a safe manner. Fluid must **not** be able to gather in a venting system.
- The removal of the seal from a safety valve invalidates the DGRL approval!
- The requirements of the pressure component directive 97/23/EG and the AD2000 information sheet A2 must be taken into account !

1) Hyphen „–“ **only** required for the version with built-on directional valve (DBW)

2) External pilot oil supply „X“ is not possible !

# Safety guidelines for design tested safety valves DB.(W) 10/20/30-5X/...(Y) E in accordance to the pressure components directive DGRL 97/23/EG

In accordance to DGRL 97/23/EG the system pressure must not increase, due to the flow, by more than 10% of the set response pressure (see component identification).

**Application notes must be taken into account!**

The response value stated within the component identification is set in the manufacturing plant with a flow of 2 L/min.

The maximum permissible flow stated within the component identification (= numerical value in the place of „G“ within the component identification, see page 4) must not be exceeded.

Is valid for:

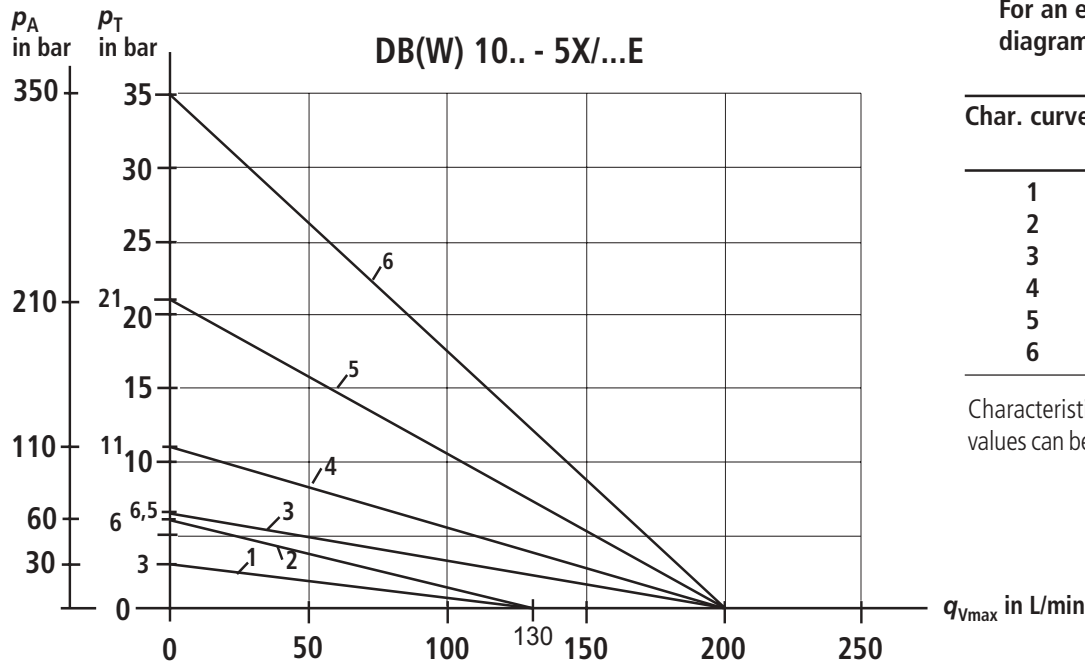
- Pilot oil return "external" (= Y in the order code) **without back pressure** in the **pilot oil return line Y**, the permissible back pressure in the return line (port T) < 15 bar

- Pilot oil return "internal" (= **no code** in the order code). The maximum permissible flow is only permissible **without back pressure** in the **return line** (port T).

With internal pilot oil return, the system pressure increases with an increase in flow by the value of the back pressure in the return line (port T) (Take the AD2000 - A2 information sheet, point 6.3 into account!)

To ensure that the system pressure does not increase, due to the flow, by more than 10% of the set response pressure, the permissible flow must be reduced in relation to the back pressure in the return line (port T) (see the following diagram).

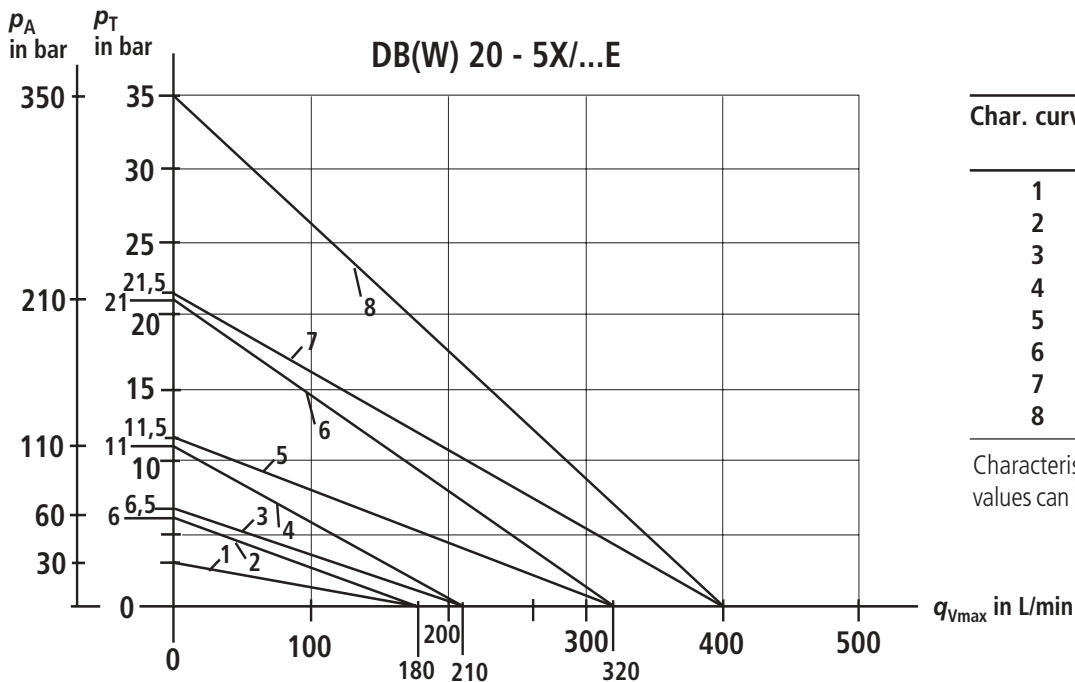
## The relationship of the maximum permissible flow $q_{Vmax}$ and the back pressure $p_T$ in the return line with internal pilot oil return



For an explanation of the diagram see page 6

Char. curves	Response pressure $p_A$ in bar
1	30
2	60
3	65
4	110
5	210
6	350

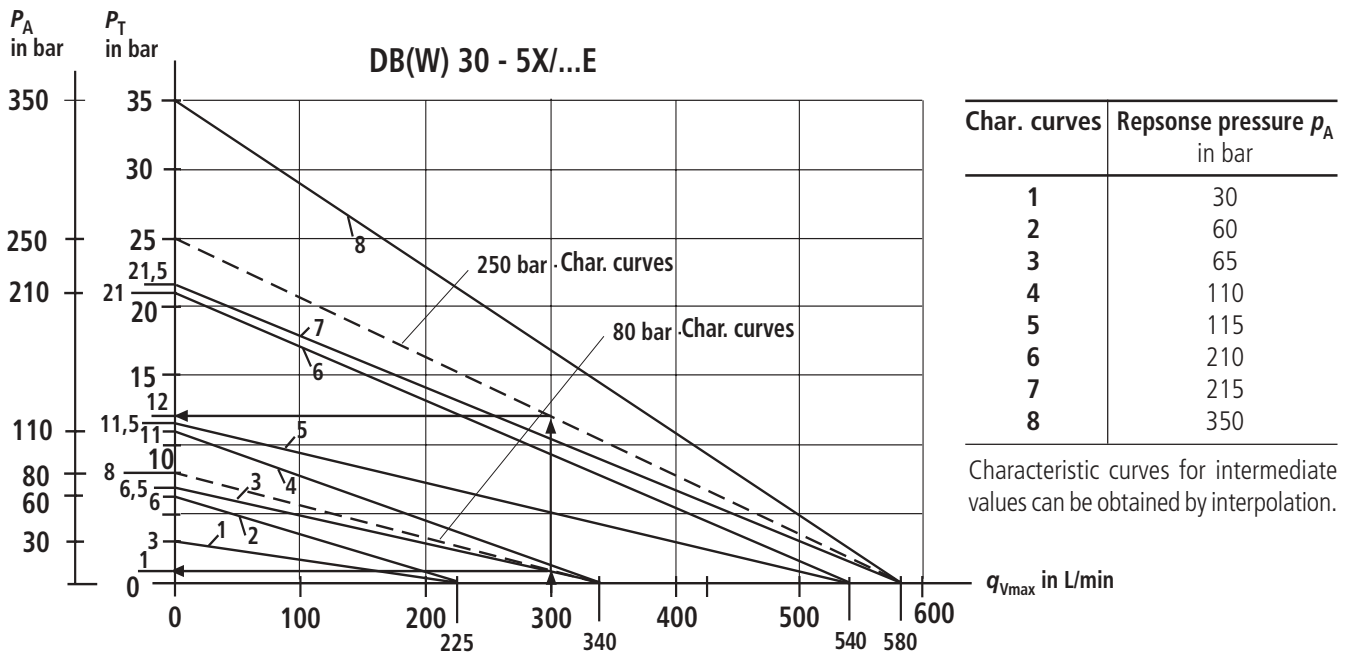
Characteristic curves for intermediate values can be obtained by interpolation.



Char. curves	Response pressure $p_A$ in bar
1	30
2	60
3	65
4	110
5	115
6	210
7	215
8	350

Characteristic curves for intermediate values can be obtained by interpolation.

The relationship of the maximum permissible flow  $q_{Vmax}$  and the back pressure  $p_T$  in the return line with internal pilot oil return



$p_A$  = Response pressure in bar

$p_T$  = Maximum permissible back pressure in the return line (port T)

(The sum of all of the possible back pressures; also see the AD2000 - A2 information sheet)

$p_{Tmax} = 10\% \times p_A$  (at  $q_v = 0$ ) to DGRL 97/23/EG

$q_{Vmax}$  = Maximum permissible flow in L/min

### An explanation of the diagram using a type DB(W) 30...5X/...E as an example

#### Example 1

Given: The flow for which safety has to be provided from the system/accumulator  $q_{Vmax} = 300$  L/min  
 Safety valve set response pressure  $p_A = 250$  bar

Required:  $p_T$

Solution: See the arrows within the diagram above (300L/min, 250bar)  $p_T \approx 12$ bar

#### Example 2

Given: The flow for which safety has to be provided from the system/accumulator  $q_{Vmax} = 300$  L/min  
 Safety valve set response pressure  $p_A = 80$  bar

Required:  $p_T$

Solution: See the arrows within the diagram above (300L/min, 80bar)  $p_T \approx 1$ bar

## Function, section: type DB...

### General

Types DB and DBW pressure valves are pilot operated pressure relief valves.

They are used for the limitation (DB) or limitation and solenoid operated unloading (DBW) of the operating pressure.

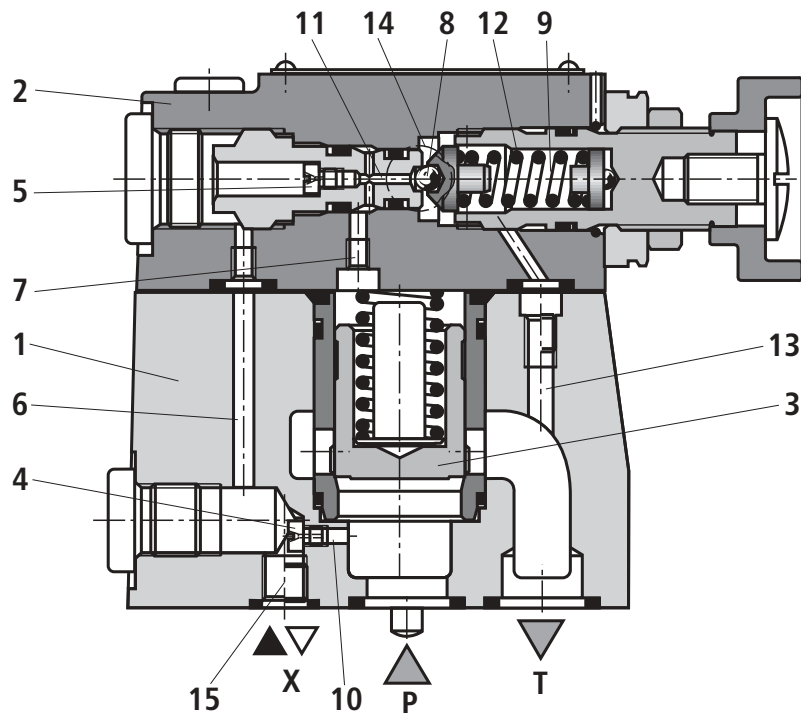
The pressure relief valves (DB) mainly consists of the main valve (1) with main spool assembly (3) and pilot control valve (2) with pressure adjustment element.

### Pressure relief valve type DB

The pressure present in port P acts on the main spool (3). At the same time pressure is applied via the control lines (6) and (7), which are fitted with orifices (4) and (5), onto the spring loaded side of the main spool (3) and at the ball (8) in the pilot control valve (2). If the pressure in port P exceeds the value set at the spring (9), then the ball (8) opens against the spring (9).

The signal for this comes internally via the control lines (10) and (6) from port P. The pressure fluid on the spring loaded side of the main spool (3) now flows via the control line (7), orifice bore (11) and ball (8) into the spring chamber (12). In type DB...5X/... it flows internally via the control line (13), or in type DB...5X/...Y... externally via the control line (14) to tank. Due to the orifices (4) and (5) a pressure drop occurs at the main spool (3), and the connection from port P to port T is opened. Now the pressure fluid flows from port P to port T whilst maintaining the set operating pressure.

The pressure relief valve may be unloaded or switched over to a different pressure (second pressure stage) via port "X" (15).



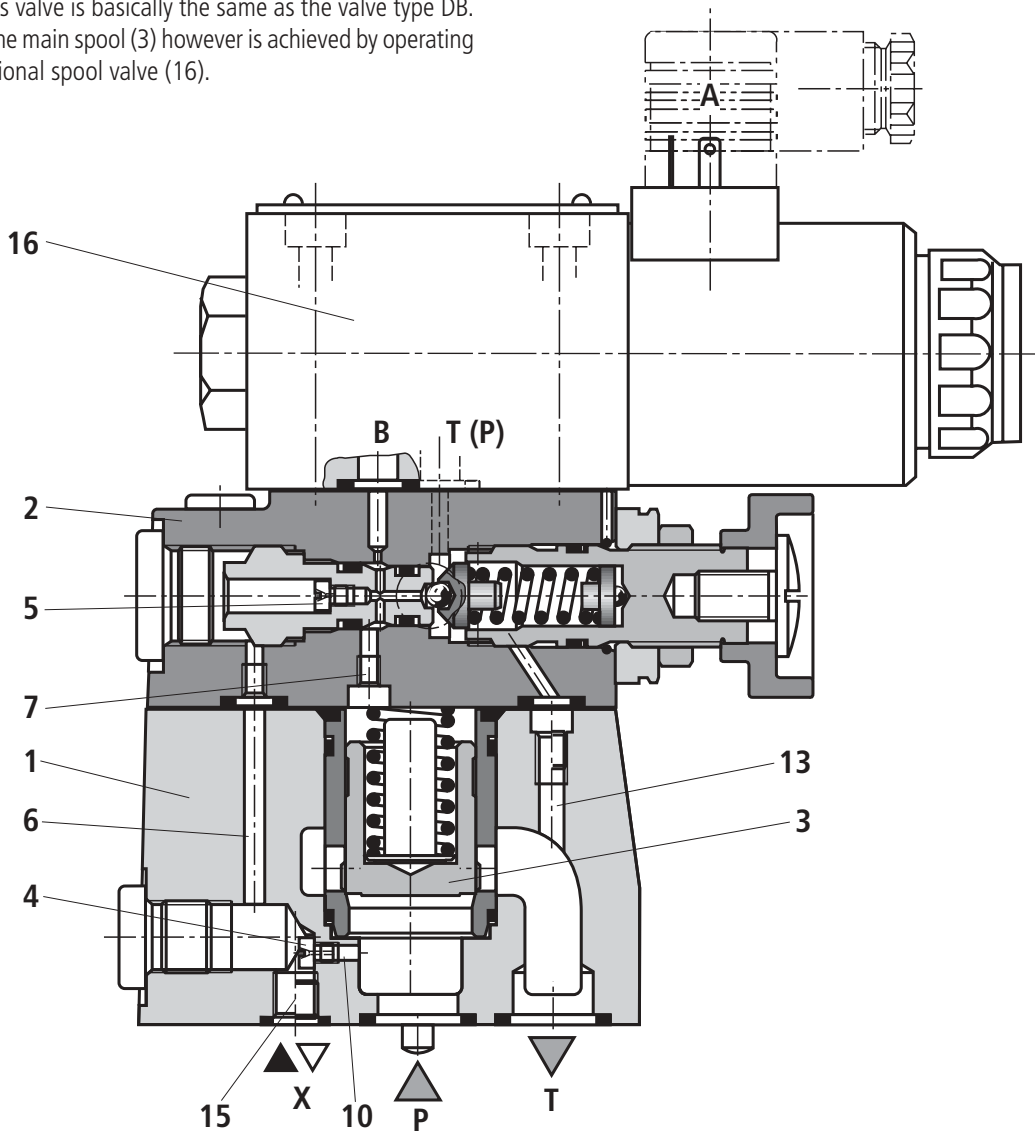
### Symbols

<p>Type DB...-...</p>	<p>Type DB...X...</p>	<p>Type DB...Y...</p>	<p>Type DB...XY...</p>
<p>Type DBW...-...</p> <p>Normally closed</p> <p>Normally open</p>	<p>Type DBW...X...</p> <p>Normally closed</p> <p>Normally open</p>	<p>Type DBW...Y...</p> <p>Normally closed</p> <p>Normally open</p>	<p>Type DBW...XY...</p> <p>Normally closed</p> <p>Normally open</p>

**Function, section: type DBW...**

**Pressure relief valve type DBW**

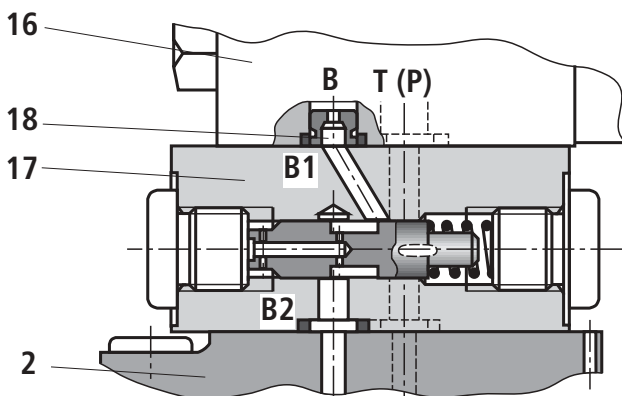
The function of this valve is basically the same as the valve type DB. The unloading of the main spool (3) however is achieved by operating the built-on directional spool valve (16).



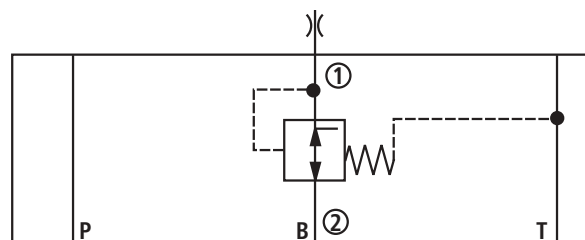
**Pressure relief valve with switching shock damping (sandwich plate), type DBW.../..S6...R12**

With a switching shock damping valve (17) the opening of the connection from B2 to B1 is delayed. Pressure peaks and acoustic unloading shocks in the return line are thereby avoided. It is fitted between the pilot control valve (2) and the directional valve (16).

The degree of damping (unloading shock) is determined by the size of the orifice (18). The Ø 1.2 mm orifice is recommended (ordering detail..R12..).



Shown: Directional valve open





## Technical data (for applications outside these parameters, please consult us!)

### General

Installation			Optional
Ambient temperature range	DB..	°C	– 30 to + 80 (NBR seals)
			– 15 to + 80 (FKM seals)
	DBW...	°C	– 30 to + 50 (NBR seals)
			– 15 to + 50 (FKM seals)

The minimum housing material strength (for subplate mounting and DBC../DBWC.. valves):

Housing materials are to be so selected that adequate safety is ensured for all conceivable operating pressures, e.g.: with reference to the compressive strength, thread strength and tightening torques

Weight	Subplate mounting	DB...	kg	DB. 10	DB. 15	DB. 20	DB. 25	DB. 30
				2.6	–	3.5	–	4.4
		DBW...	kg	4.05	–	4.95	–	5.85
		DBC...	kg	1.2				
		DBWC...	kg	2.65				
		DBC10 or 30...	kg	1.5				
		DBWC10 or 30...	kg	2.95				
	Threaded connections	DB..G...	kg	5.3	5.2	5.1	5.0	4.8
				6.75	6.65	6.55	6.45	6.25
Technical data	Directional spool valve		See catalogue sheet RE 23 178					
	Directional poppet valve		See catalogue sheet RE 22 058					

### Hydraulic

Maximum operating pressure	P	bar	350					
at ports	T	bar	315					
Max. back pressure:	Port <b>Y</b>	DB..	bar	315				
Port <b>Y</b> (DBW../..Y..) or port <b>T</b> (DBW../..)			bar	210 For DC solenoids				
			bar	160 for AC solenoids				
Settable pressure	Minimum	bar	Flow dependent (see characteristic curves on page 11)					
	Maximum	bar	50; 100; 200; 315; 350					
Maximum flow	Subplate mounting	L/min	DB. 10	DB. 15	DB. 20	DB. 25	DB. 30	
			250	–	500	–	650	
			Threaded connections	L/min	250	500	500	500
Pressure fluid	Mineral oil (HL, HLP) to DIN 51 524 <sup>1)</sup> ; Fast bio-degradable pressure fluids to VDMA 24 568 (also see RE 90 221); HETG (rape seed oil) <sup>1)</sup> ; HEPG (polyglycole) <sup>2)</sup> ; HEES (synthetic ester) <sup>2)</sup> ; other pressure fluids on request							
Pressure fluid temperature range			°C	– 30 to + 80 for NBR seals				
			°C	– 15 to + 80 for FKM seals				
Viscosity range			mm <sup>2</sup> /s	10 to 800				
ISO code cleanliness class	Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 (C) class 20/18/15 <sup>3)</sup>							

<sup>1)</sup> Suitable for NBR **and** FKM seals

<sup>2)</sup> **Only** suitable for FKM seals

<sup>3)</sup> The cleanliness class stated for the components must be adhered too in hydraulic systems.

Effective filtration prevents faults from occurring and at the same time increases the component service life.

For the selection of filters see catalogue sheets RE 50 070, RE 50 076 and RE 50 081.

## Deviating technical data for design tested pressure relief valves <sup>1)</sup>

### Hydraulic

Maximum flow	See tables on page 4 and characteristic curves on pages 5 and 6					
Pressure fluid	Mineral oil (HL, HLP) to DIN 51 524 and DIN 51 525					
Pressure fluid temperature range	°C	– 20 to + 60 (for NBR seals)				
	°C	– 15 to + 60 (for FKM seals)				
Viscosity range	mm <sup>2</sup> /s	12 to 230				
Maximum back pressure		DB../..	DB../..Y	DBW../..	DBW../..Y	
	Port Y	bar	–	0	–	0
	Port T	bar	<sup>2)</sup>	$p_T < 15$	<sup>2)</sup>	$p_T < 15$

<sup>1)</sup> For applications outside these parameters, please consult us!

<sup>2)</sup> See characteristic curves and explanations regarding the permissible back pressures, see pages 5 and 6

### General guidelines

- The unloading function (directional valve function with the type DBW) must not be used for safety functions!
- For type DBW..**B**..5X/... the lowest settable pressure is set if the current fails or if there is a cable break (circulation pressure).  
For type DBW..**A**..5X/... the pressure relief function is activated if the current fails or if there is a cable break.
- Hydraulic back pressures in port T with an internal pilot oil drain or in port Y with an external pilot oil drain are added 1:1 to the response pressure set at the pilot control of the valve.

Example:

Valve pressure setting via the spring loading  
(Pos. 12 on page 7) in the  
pilot control valve/adjustment unit  $p_{\text{spring}} = 200 \text{ bar}$

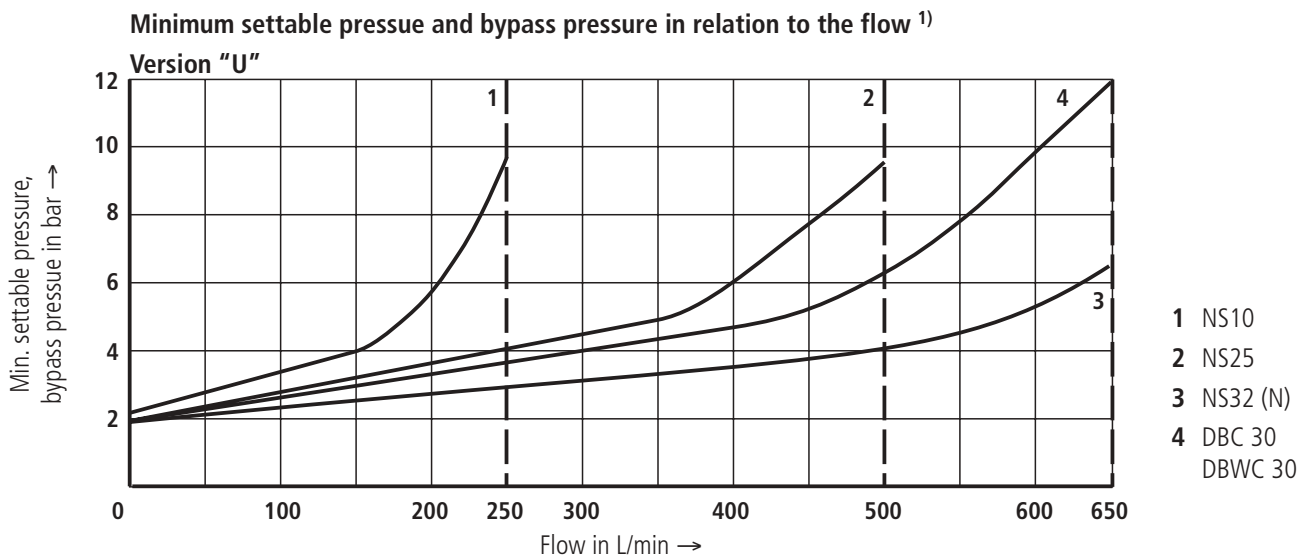
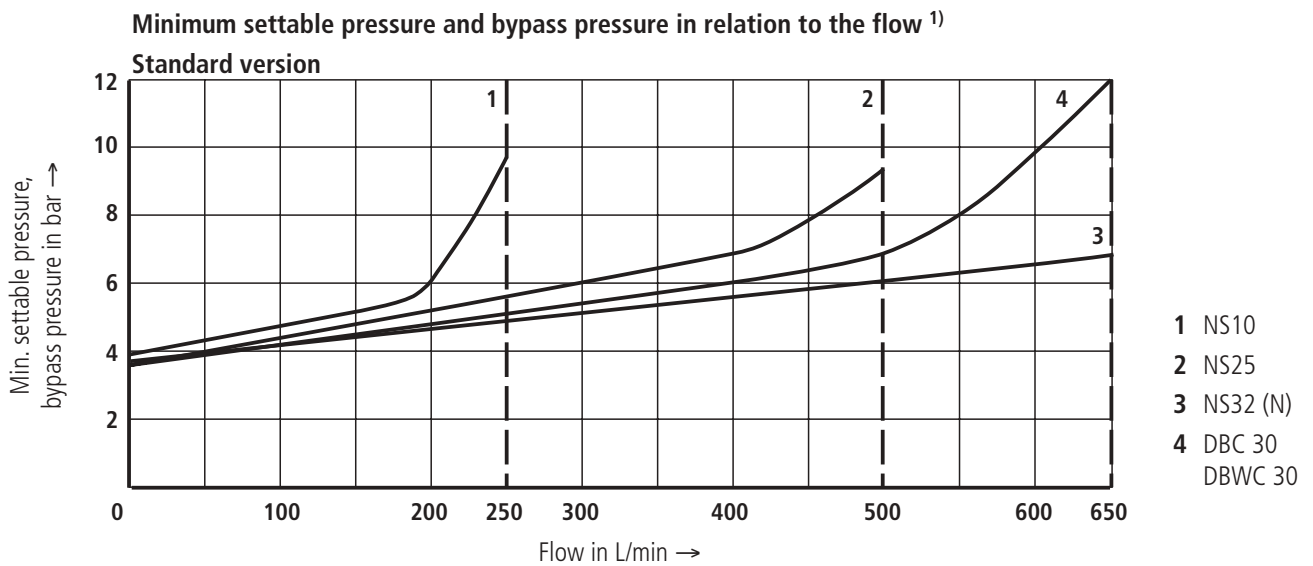
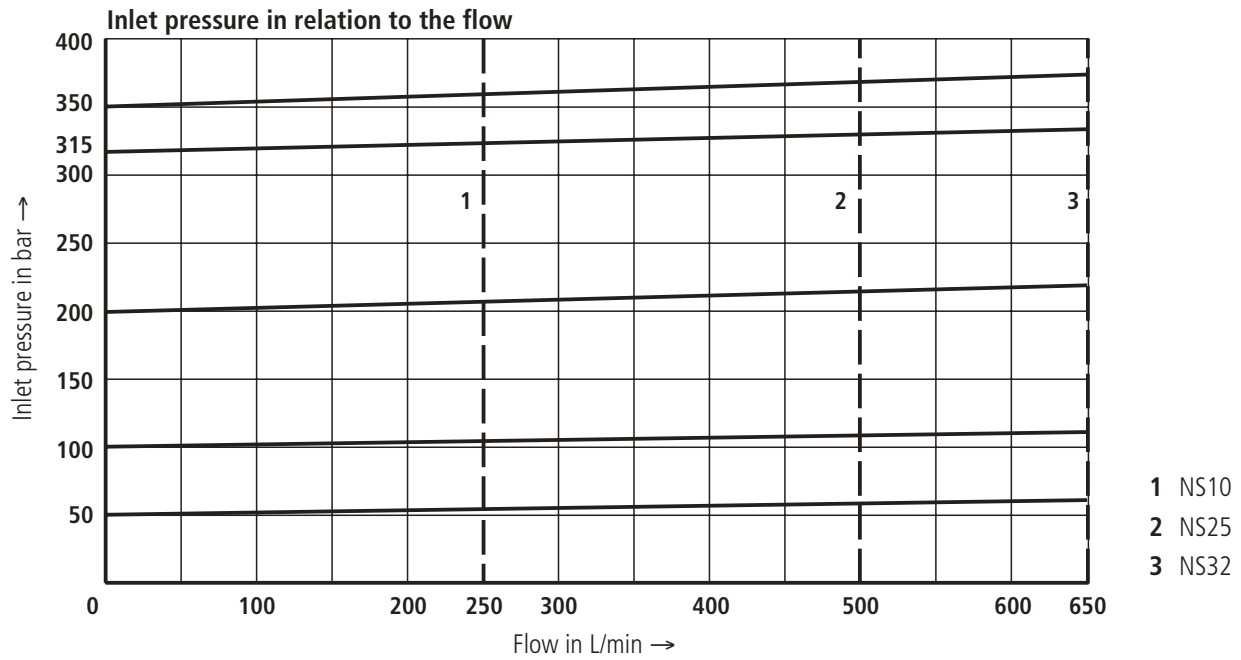
Hydraulic back pressure in port T with an  
internal pilot oil drain  $p_{\text{hydraulic}} = 50 \text{ bar}$

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

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

The characteristic curves were measured with **external, pilot oil drain, at zero pressure.**

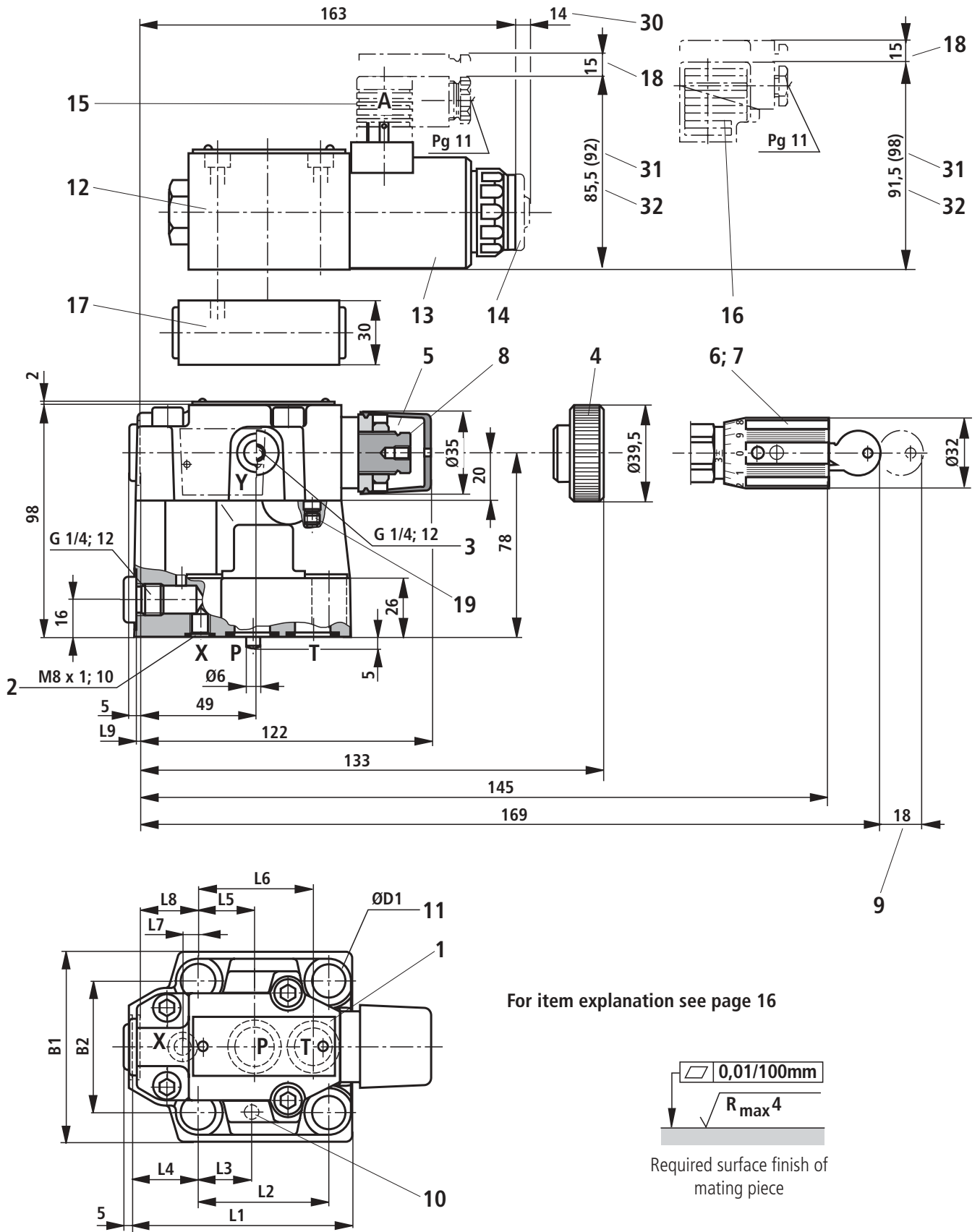
With an internal pilot oil drain the inlet pressure increases by the outlet pressure present at port T.



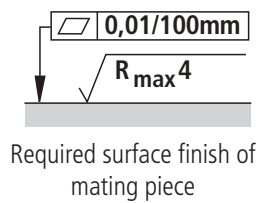
<sup>1)</sup> The characteristic curves are valid for outlet pressure  $p_T = 0$  over the entire flow range!



**Unit dimensions:** for subplate mounting with directional spool valve (dimensions in mm)

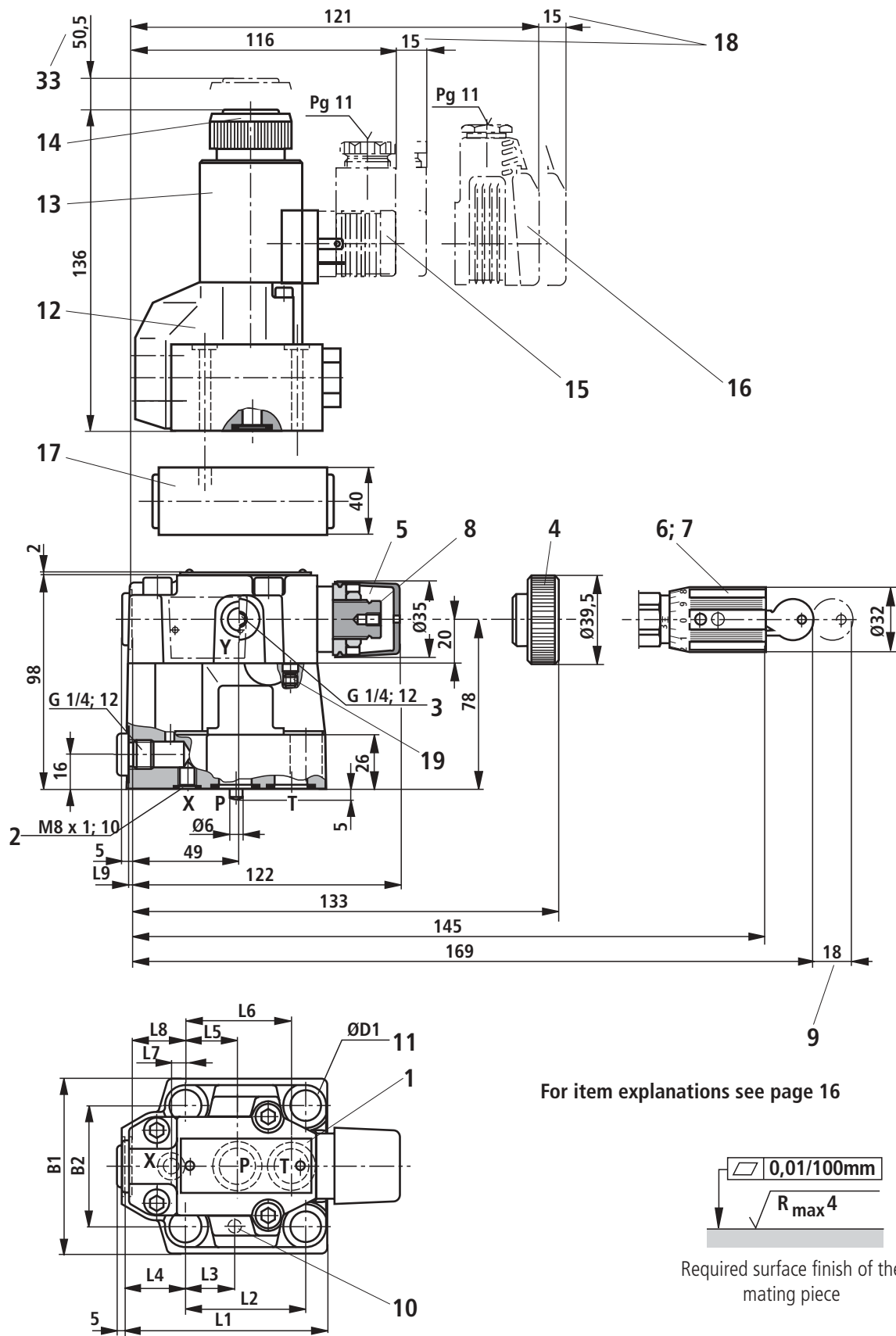


For item explanation see page 16



Type	L1	L2	L3	L4	L5	L6	L7	L8	L9	B1	B2	ØD1
DB. 10	91	53.8	22.1	27.5	22.1	47.5	0	25.5	2	78	53.8	14
DB. 20	116	66.7	33.4	33.3	11.1	55.6	23.8	22.8	10.5	100	70	18
DB. 30	147.5	88.9	44.5	41	12.7	76.2	31.8	20	21	115	82.6	20

**Unit dimensions:** for subplate mounting with directional poppet valve (dimensions in mm)



Type	L1	L2	L3	L4	L5	L6	L7	L8	L9	B1	B2	ØD1
DB. 10	91	53.8	22.1	27.5	22.1	47.5	0	25.5	2	78	53.8	14
DB. 20	116	66.7	33.4	33.3	11.1	55.6	23.8	22.8	10.5	100	70	18
DB. 30	147.5	88.9	44.5	41	12.7	76.2	31.8	20	21	115	82.6	20



## Item explanation

- 1 Name plate
- 2 Port X for external pilot oil supply
- 3 Port Y for external pilot oil drain
- 4 Adjustment element "1"
- 5 Adjustment element "2"
- 6 Adjustment element "3"
- 7 Adjustment element "7"
- 8 Hexagon 10A/F
- 9 Space required to remove the key
- 10 Locating pin
- 11 Valve fixing holes
- 12 Page 13: Directional spool valve NS 6  
(see catalogue sheet RE 23 178)  
Page 14: Directional poppet valve NS 6  
(see catalogue sheet RE 22 058)
- 13 Solenoid "a"
- 14 Hand override, optional
- 15 Plug-in connector without circuitry to DIN EN 175 301-803 <sup>1)</sup>
- 16 Plug-in connector with circuitry to DIN EN 175 301-803 <sup>1)</sup>
- 17 Switching shock damping valve, optional
- 18 Space required to remove the plug-in connector
- 19 Omitted with internal pilot oil drain
- 20 Seal ring
- 21 Main spool assembly
- 22 The Ø 32 bore may connect the Ø 45 bore at any position.  
However, care must be taken to ensure that the connection  
hole X and the fixing holes are not damaged.
- 23 Back-up ring and seal ring must be inserted into this bore  
before assembling the main spool.
- 24 Orifice must be ordered separately
- 25 Seal ring
- 26 Seal ring
- 27 Seal ring
- 28 Seal ring
- 29 Seal ring
- 30 Dim. for valve with hand override „N“
- 31 Dim. ( ) for valve with AC solenoid
- 32 Dim. for valve with DC solenoid
- 33 Space required to remove the solenoid coil

Subplates to catalogue sheet RE 45 064 and valve fixing screws must be ordered separately.

### Subplates for:

**Types DB/DBW 10** G 545/01 (G 3/8)<sup>2)</sup>  
G 546/01 (G 1/2)<sup>2)</sup>

**Types DB/DBW 20** G 408/01 (G 3/4)<sup>2)</sup>  
G 409/01 (G 1)<sup>2)</sup>

**Types DB/DBW 30** G 410/01 (G 1 1/4)<sup>2)</sup>  
G 411/01 (G 1 1/2)<sup>2)</sup>

**Types DBT/DBWT** G 51/01 (G 1/4)<sup>2)</sup>

### Valve fixing screws for:

**Types DB/DBW 10**  
4 off M12 x 50 DIN 912–10.9;  $M_A = 130 \text{ Nm}$

**Types DB/DBW 20**  
4 off M16 x 50 DIN 912–10.9;  $M_A = 310 \text{ Nm}$

**Types DB/DBW 30**  
4 off M18 x 50 DIN 912–10.9;  $M_A = 430 \text{ Nm}$

**Types DBC/DBWC,  
Types DBC 10/DBWC 10 and Types DBC 30/DBWC 30**  
4 off M8 x 40 DIN 912–10.9;  $M_A = 37 \text{ Nm}$

**Types DBT/DBWT**  
4 off M8 x 40 DIN 912–10.9;  $M_A = 37 \text{ Nm}$

<sup>1)</sup> Must be ordered separately, see page 4

### <sup>2)</sup> Attention!

It is **not permissible** to use the stated subplates with design tested pressure relief valve to the pressure component directive 97/23/EG.

### Bosch Rexroth AG Industrial Hydraulics

D-97813 Lohr am Main  
Zum Eisengießer 1 • D-97816 Lohr am Main  
Telefon 0 93 52 / 18-0  
Telefax 0 93 52 / 18-23 58 • Telex 6 89 418-0  
eMail documentation@boschrexroth.de  
Internet www.boschrexroth.de

### Bosch Rexroth Limited

Cromwell Road, St Neots  
Cambs, PE19 2ES  
Tel: 0 14 80/22 32 56  
Fax: 0 14 80/21 90 52  
E-mail: info@boschrexroth.co.uk

The data specified above only serves to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The details stated do not release you from the responsibility for carrying out your own assessment and verification. It must be remembered that our products are subject to a natural process of wear and ageing.