Rexroth
Bosch Group

Safety valves, directly operated

RE 25010-XC-B2/06.09
Replaces: **09.08**

Type DBDH...1X/...XC...E

Nominal size (NG) 4...30
Unit series 1X

Safety valves
for potentially explosive atmospheres

Part II Technical Data Sheet

Information on safety:

Range of application as type-tested valve in accordance with the Pressure Equipment Directive 97/23/EG

Information on explosion protection:

Range of application in accordance with the Explosion Protection Directive and type of protection

- Ranges of application as per Directive 94/9/EG: **IM2, II2G, II2D**
- Type of protection of valve: c (EN 13463-5:2004-03)

What you need to know about these Operating Instructions

These Operating Instructions apply to the explosion-proof version of Rexroth valves, and consist of the following three parts:

Part I General Information RE 07010-X-B1
Part II Technical Data Sheet RE 25010-XC-B2
Part III Product-specific Instructions RE 25010-XC-B3

RE 25010-XC-B0

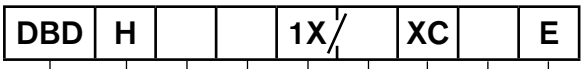
You can find further information on the correct handling of Rexroth hydraulic products in our publication "General Product Information on Hydraulic Products", RE 07008.

Overview of Contents

Features

- As ATEX units in accordance with Directive 94/9/EG for ranges of application: **IM2, II2G, II2D**
- As type-tested safety valves in accordance with Pressure Equipment Directive 97/23/EG
- As screw-in valve (cartridge)
- For threaded connection
- For sub plate mounting
- Adjustment with hand wheel

Ordering data and scope of delivery



Pressure relief valve, directly operated

Setting element for pressure adjustment

Hand wheel **= H**

Nominal size (NG) = 4, = 6, = 10, = 20, = 30

Version

Screw-in valve (cartridge) **= K**
Threaded connection [1] **= G**
Sub plate mounting [1] **= P**

Unit series 10 to 19 **= 1X**
(10 to 19: installation and connection dimensions unchanged)

Set response pressure (bar) [2] **= 30 bis 630**

E = Type-tested safety valve as per Pressure Equipment Directive 97/23/EG

Seal material

V = FKM-seals [3]
No code = NBR-seals [4]

Note:
Take compatibility of seals and pressure fluid into account!

XC = Explosion protection „Constructional Safety“, see information on explosion protection, page 5, for details

[1] Not possible with size NG4
[2] Operating limits, page 5
[3] All pressure stages possible
[4] Pressure stages < 315 bar possible

Included in scope of delivery:

Valve operating instructions with Declaration of Conformity in Part III

Note:

Not all combinations of the above type codes are available.

Component identification mark

Type-tested safety valves have a component code, which is composed of elements that are always the same, the meaning of which is described to **example** below:

TÜV . SV . 03 - 390 . 4,5 . F . 30 . 500

- Set response pressure in bar
- Maximum permitted flow rate in l/min without back pressure in the flow line
- Valve for pressure fluid
- Narrowest flow diameter before the valve seat in mm
- Number of component code assigned by the testing authority
- Last two digits indicating the year in which the validity of the component code was last extended
- Safety valve
- Designation of the named authority that conducted type testing

Function, sectional diagram, symbol

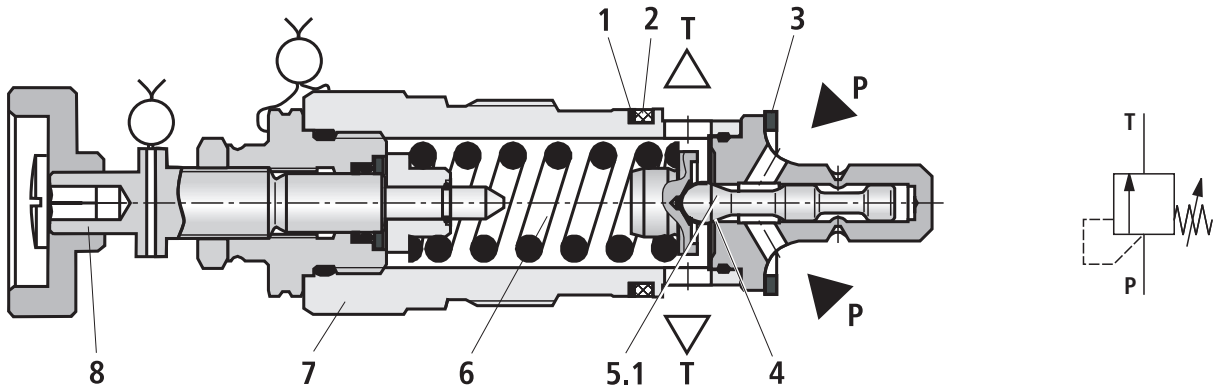
Valves of the type DBDH…1X/…XC…E are type-tested, directly operated pressure relief valves which conform to the Pressure Equipment Directive 97/23/EG. They are employed for reducing system pressure and are intended for use as safety valves.
When the preset response pressure is exceeded in the P duct, the valves react and connect the P and T ducts internally. The valves are available in different versions: as screw-in valve “K” for screwing into blocks, as a valve with threaded connection “G”, or as a valve for subplate mounting “P” (“G” and “P” are not possible with size NG4).
The screw-in valve itself, which is used in all versions, basically consists of the sleeve (7), spring (6), cone (5.1, response pressure up to 400 bar) or ball (5.2, response pressure 405 bar and over), valve seat (4) and setting element (8).
The spring presses the cone (5.1) or the ball (5.2) against the valve seat (4). The response pressure is factory-set to a fixed value using the setting element, then the valve is sealed.

The P duct is connected to the system. The pressure predominating in the system acts on the cone or the ball. If the pressure in the P duct rises above the value set by the pretension of the spring, the cone or the ball lifts up from the valve seat against the spring force, and connects the P and T ducts. The pressure fluid flows out of the P duct into the T duct. Design measures limit the maximum possible lift of the cone.

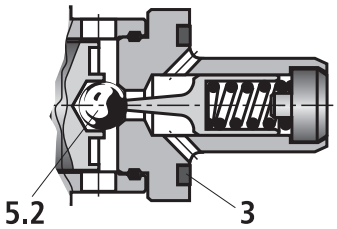
The valves are available with graduated response pressures (in 5 bar increments). The valve spring can be relieved of tension using the hand wheel, and the response pressure can be reduced from the factory setting without having to remove the seal. To do this, please refer to Part III of the Operating Instructions, RE 25010-XC-B3, section 5.3.

Example illustration with symbol:

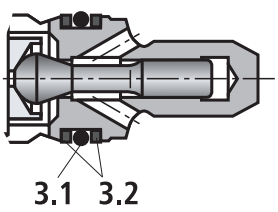
Screw-in valve **DBDH 10 K1X/…XC…E**
Response pressure 30 … 400 bar



Response pressure 405 … 630 bar (ball poppet valve NG10)



Screw-in valve type Typ **DBDH 4 K1X/…XC…E**
Response pressure 60 … 500 bar



P	P duct
T	T duct
1, 2	O-rings on valve body
3	Axial or radial sealing of single seal
3.1, 3.2	Sealing elements of axial or radial seal of multiple seal
4	Valve seat
5.1	Valve cone
5.2	Valve ball
6	Spring
7	Sleeve
8	Hand wheel setting element

Technical data

General

Installation position		Optional
Ambient temperature range	°C	–20 … +80 (FKM-seals) –30 … +80 (NBR-seals)
Storage temperature range	°C	–20 … +80 (FKM-seals) –30 … +80 (NBR-seals)
Dimensions, weight		See “Unit dimensions” from page 12
Surface protection for versions “G” and “P”		Paint, layer thickness max. 100 µm
Degree of protection to EN 60529:1991+A1:2000		IP 65

Hydraulic

(measured at a viscosity of $\nu = 32$ mm²/s and a pressure fluid temperature of 40° C)

Set response pressure	bar	See last number of component identification mark
Maximum back pressure in flow line	bar	See page 8 ... 11 “Characteristic curves … with back pressure in the flow line”
Maximum flow rate	l/min	See penultimate number of component identification mark and page 6 onwards, “Characteristic curves for maximum permitted flow rate”
Pressure fluid		Mineral oil (HL, HLP) to DIN 51524, other pressure fluids available on request Ignition temperature > 180 °C
Pressure fluid temperature range When used as a safety valve	°C	–15 … +60 [1]
Viscosity range When used as a safety valve	mm²/s	12 … 230 [1]
Maximum permitted degree of contamination of pressure fluid purity class to ISO 4406 (c)		Class 20/18/15

Operating limits

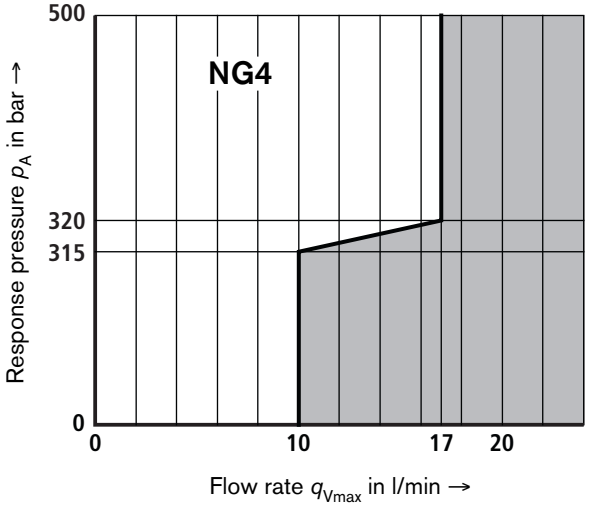
NG	Response pressure p_A in bar	Max. flow rate q_{Vmax} in l/min
4	60 … 315	10
	320 … 500	17
6, 10, 20, 30	See characteristic curves and last number of component identification mark	See characteristic curves and last number of component identification mark

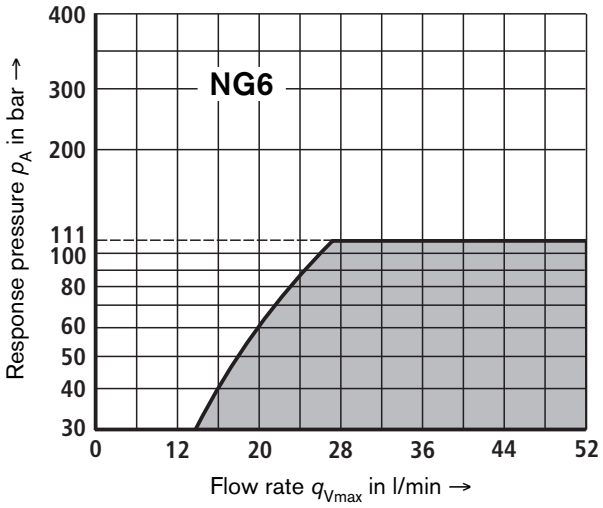
Information on explosion protection

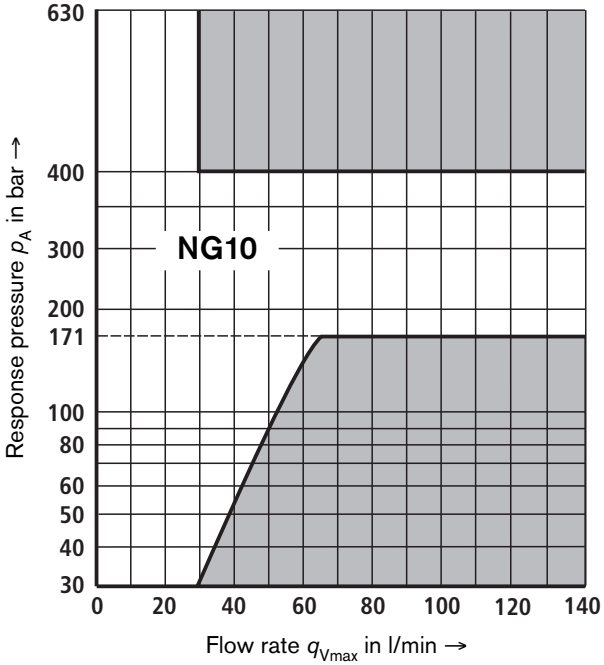
Range of application as per Directive 94/9/EG		IM2, II2G	IM2, II2D
Type of protection of valve		c (EN 13463-5:2004-03)	c (EN 13463-5:2004-03)
Maximum surface temperature Temperature class	°C	125 T4	114 –
Degree of protection		–	IP 65
Special conditions for safe use		The screw-in valve (cartridge) must not be painted!	

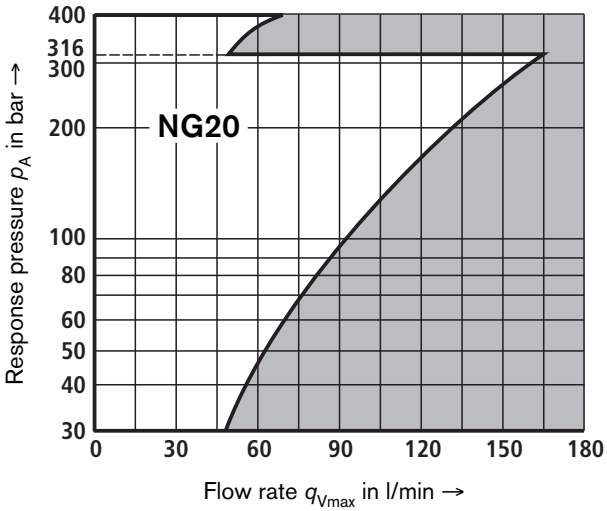
[1] If the valve is not employed as a safety valve in accordance with Pressure Equipment Directive 97/23/EG, the temperature of the pressure fluid must not exceed +80 °C, the viscosity must not exceed 800 mm²/s.

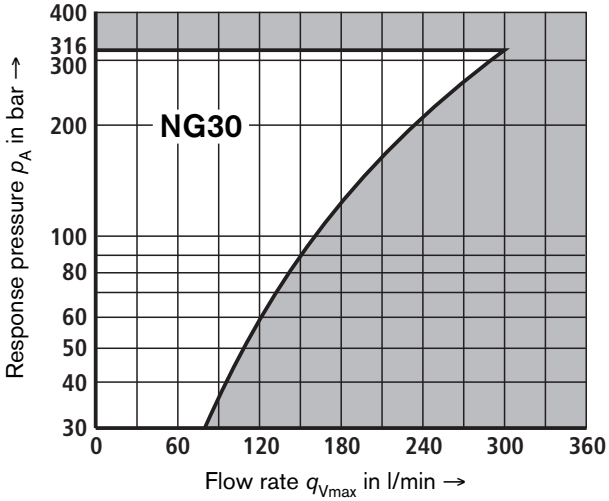
Characteristic curves for maximum permitted flow rate











Note:

Value pairs that are **located in the gray areas** of the characteristic curves **cannot** be achieved with the valve!

The characteristic curves presented here apply solely to a back pressure of 0 bar in the flow line.

Important information for operation in accordance with the Pressure Equipment Directive 97/23/EG

– Before you order a type-tested safety valve, please note that at the desired response pressure p, the maximum permitted flow rate q_{Vmax} of the safety valve is greater than the maximum possible flow rate of the system/accumulator which the valve is intended to protect.
With this in mind, please note the appropriate regulations.
– In accordance with Pressure Equipment Directive 97/23/EG, the system pressure may not increase due to the flow rate by more than 10 % of the set response pressure (see component code). The maximum permitted flow rate q_{Vmax} specified in the component code must not be exceeded. Flow lines from safety valves must exit safely. It must not be possible for fluid to collect in the flow system (see AD2000, code of practice A2).

Essential notes for use!

– The response pressure specified in the component code is factory-set at a flow rate of 2 l/min.
– The maximum permitted flow rate specified in the component code applies to applications without back pressure in the flow line (port T).
– If the seal on the safety valve is removed, the valve no longer conforms to the Pressure Equipment Directive!
– The requirements of the Pressure Equipment Directive and the AD2000 code of practice A2 must be observed!
– We strongly recommend that type-tested safety valves are secured by means of wiring and sealing to the housing/block (bore hole available in setting element), to prevent their unauthorized removal from the screw-in housing/block.

Note

The rising flow rate causes the system pressure to increase by the amount of the back pressure in the flow line (port T). Note AD2000 code of practice A2, item 6.3.
In order to ensure that this rise in system pressure due to the flow rate does not exceed 10 % of the set response pressure, the permitted flow rate must be reduced as a function of the back pressure in the flow line (port T) (see pages 8 to 11).

Characteristic curves NG4 with back pressure in the flow line

As far as possible, the valve should basically be operated with no back pressure in the flow line. If there is back pressure in the flow line, the maximum possible flow rate is reduced. There is a relationship between the maximum permitted back pressure p_T in the flow line and the flow rate q_V, which can be seen in the characteristic curves below.

The curves for intermediate response pressure values that are not shown below must be calculated by means of interpolation.

When the flow rate is around zero, the maximum permitted back pressure p_T is 10 % of the respective response pressure. As the flow rate increases, the maximum permitted back pressure p_T decreases.

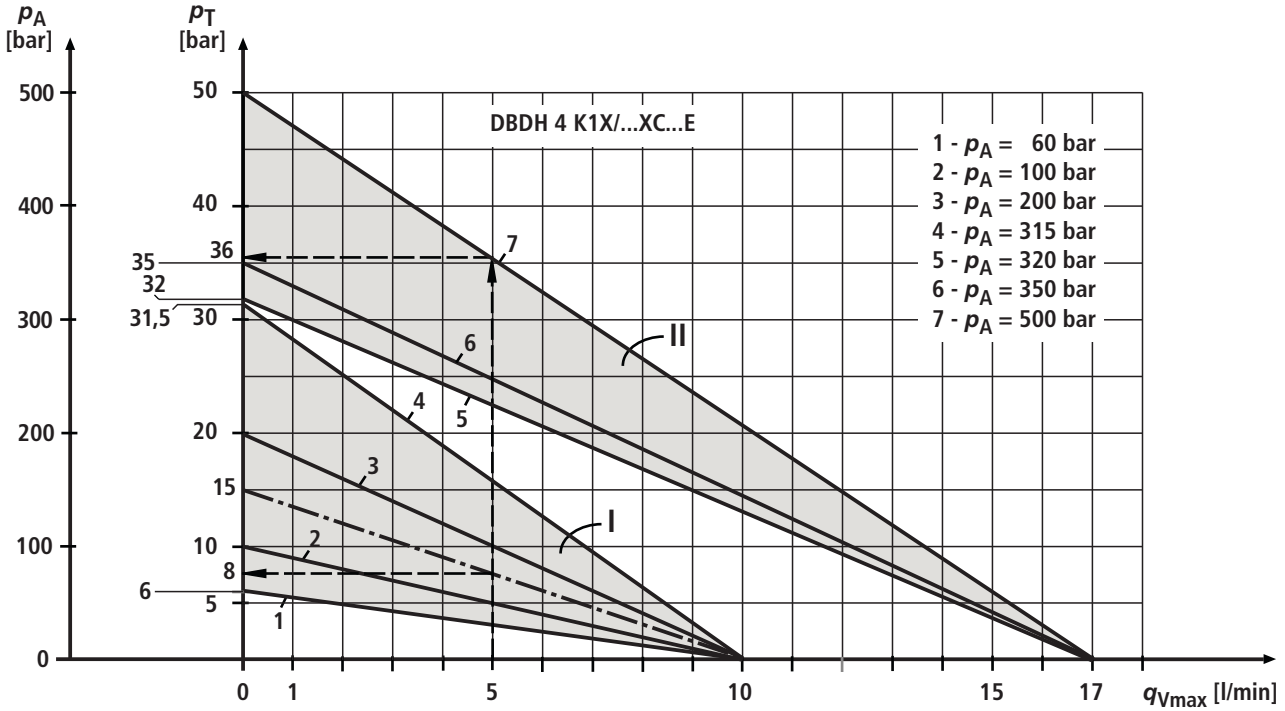


Diagram for determining the maximum permitted back pressure p_T in the flow line at port T of the valve as a function of the flow rate q_{Vmax} for DBDH **4**K1X/...XC...E valves with different response pressures p_A.

p_A Response pressure in bar

p_T Maximum permitted back pressure in the flow line (port T) in bar

q_{Vmax} Max. maximum flow rate in l/min

I Interpolation area **I**, for DBDH **4**K1X/...XC...E valves with response pressure p_A = 60 ... 315 bar and maximum flow rate q_{Vmax} = 10 l/min

II Interpolation area **II**, for DBDH **4**K1X/...XC...E E valves with response pressure p_A = 320 ... 500 bar and maximum flow rate q_{Vmax} =17 l/min

Interpolation of intermediate values from the diagram

1. Enter the 1/10 value of the response pressure p_A on the p_T axis.
2. From the above point, draw a straight line to where the q_{Vmax} axis crosses zero, keeping inside the interpolation area (here, 10 l/min for interpolation area **I** or 17 l/min for interpolation area **II**).
3. On the q_{Vmax} axis, enter the system flow rate that is not to be exceeded.
4. For this value, ascertain the maximum permitted back pressure on the basis of the line on the p_T axis that you have just drawn.

Example 1 with available curve

System/accumulator flow rate that is not to be exceeded: q_{Vmax} = 5 l/min
Safety valve set to: p_A = 500 bar.
From the diagram (see arrows, curve 7), read the maximum permitted back pressure p_T of approx. 36 bar.

Example 2 with interpolated curve

System/accumulator flow rate that is not to be exceeded: q_{Vmax} = 5 l/min
Safety valve set to: p_A = 150 bar.
Value to be entered on the p_T axis: 1/10 x 150 bar = 15 bar.
From the diagram (see arrows, dotted curve), read the maximum permitted back pressure p_T of approx. 8 bar.

Characteristic curves NG6 with back pressure in the flow line

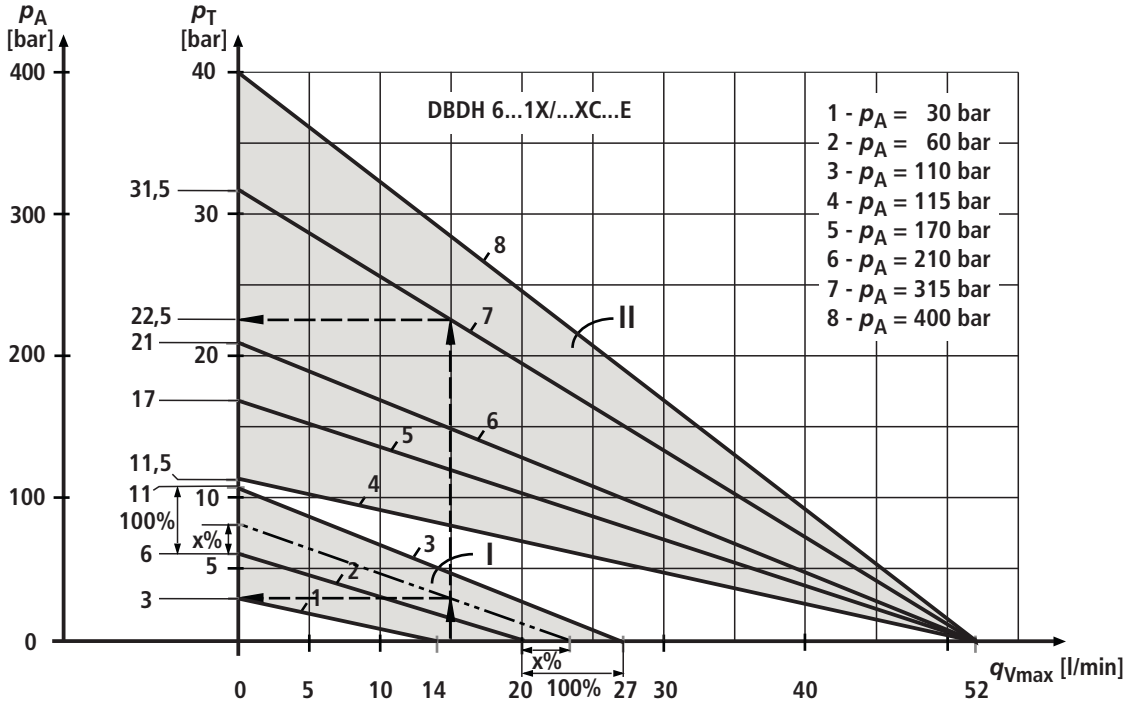


Diagram for determining the maximum permitted back pressure p_T in the flow line at port T of the valve as a function of the flow rate q_{Vmax} for DBDH **6**…1X/…XC…E valves with different response pressures p_A.

p_A Response pressure in bar

p_T Maximum permitted back pressure in the flow line (port T) in bar

q_{Vmax} Max. maximum flow rate in l/min

I Interpolation area **I**, for DBDH **6**…1X/…XC…E valves with response pressure p_A = 30 ... 110 bar and maximum flow rate q_{Vmax} = 14 … 27 l/min

II Interpolation area **II**, for DBDH **6**…1X/…XC…E valves with response pressure p_A = 115 ... 400 bar and maximum flow rate q_{Vmax} = 52 l/min

Interpolation of intermediate values in the diagram

1. Enter the 1/10 value of the response pressure p_A on the p_T axis.
2. Determine the neighboring, lower and higher curve from this point. The point entered on p_T divides the section between the lower and higher curve on the p_T axis with a certain percentage
3. On the q_{Vmax} axis, divide the section between neighboring, lower and higher curves, using the same percentage as the section on the p_T axis. Draw a straight line from the point where the q_{Vmax} axis crosses zero, which you have just determined, and the previously entered value on the p_T axis.
4. On the q_{Vmax} axis, enter the system flow rate that is not to be exceeded.
5. For this value, ascertain the maximum permitted back pressure on the basis of the line on the p_T axis that you have just drawn.

Determining the permitted back pressure

Example 1 with available curve

System/accumulator flow rate that is not to be exceeded: q_{Vmax} = 15 l/min
Safety valve set to: p_A = 315 bar.
From the diagram (see arrows, curve 7), read the maximum permitted back pressure p_T of approx. 22.5 bar.

Example 2 with interpolated curve

System/accumulator flow rate that is not to be exceeded: q_{Vmax} = 15 l/min
Safety valve set to: p_A = 80 bar.
Value to be entered on the axis designated as p_T: 1/10 x 80 bar = 8 bar.
From the diagram (see arrows, dotted curve), read the maximum permitted back pressure p_T of approx. 3 bar.

Characteristic curves NG10 with back pressure in the flow line

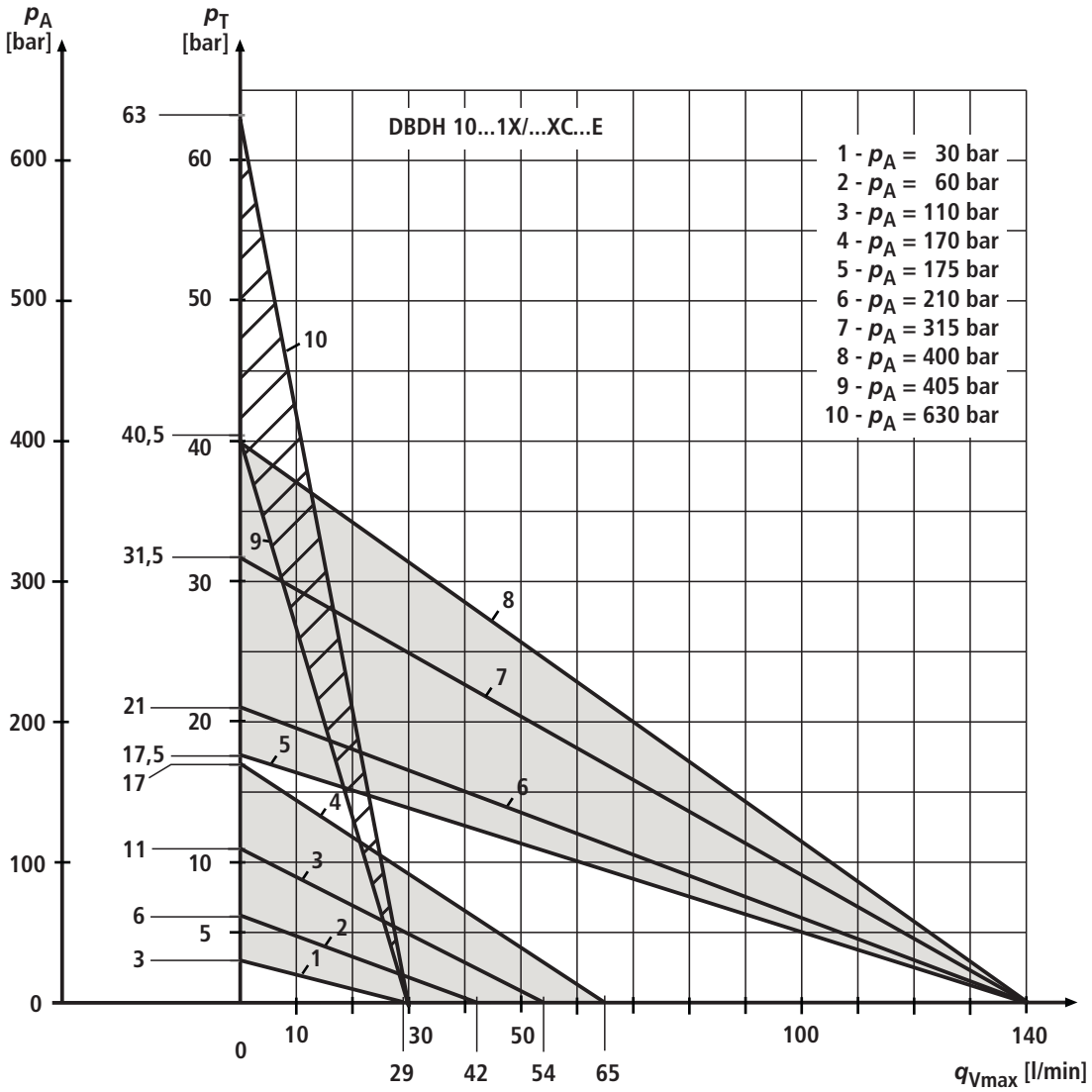


Diagram for determining the maximum permitted back pressure p_T in the flow line at port T of the valve as a function of the flow rate q_{Vmax} for DBDH **10**…1X/…XC…E valves with different response pressures p_A.

ntermediate values can be ascertained with the aid of interpolation. Please refer to the explanations on the previous pages for the interpolation process.

p_A Response pressure in bar

p_T Maximum permitted back pressure in the flow line (port T) in bar

q_{Vmax} Max. maximum flow rate in l/min

Interpolation areas

Characteristic curves NG20 and NG30 with back pressure in the flow line

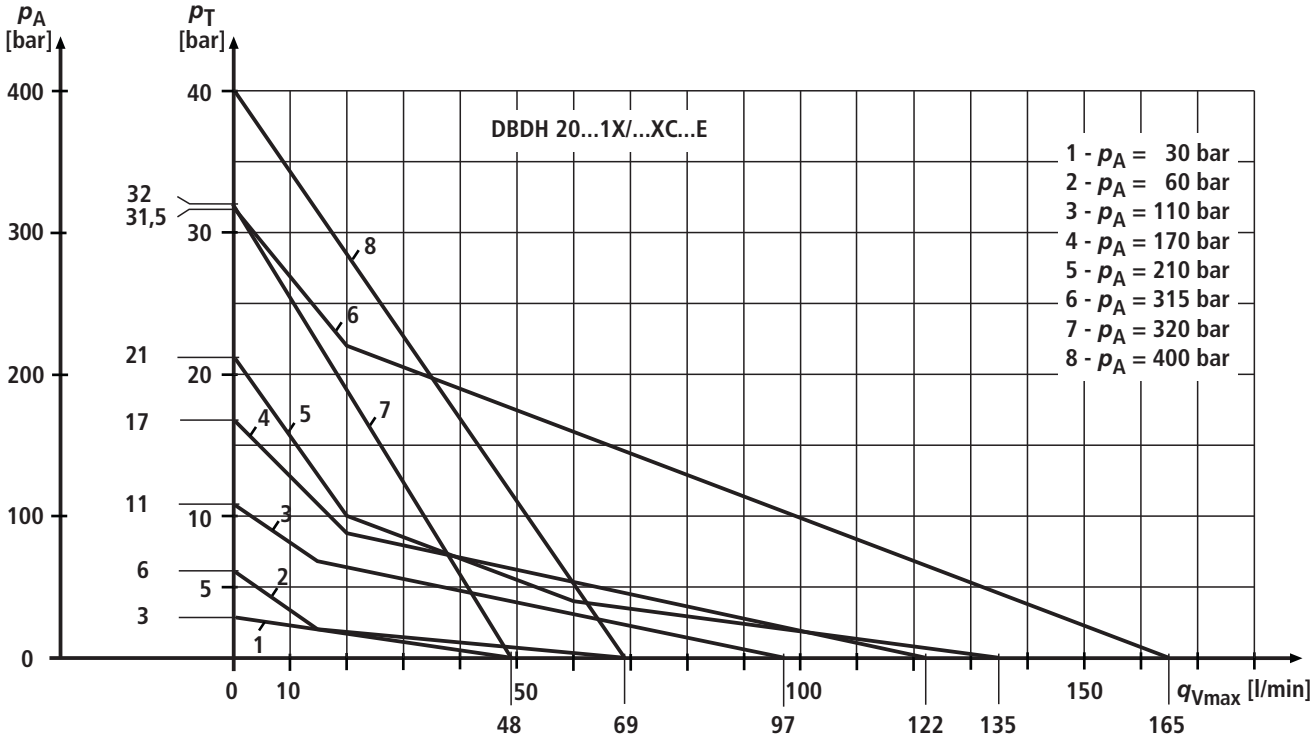
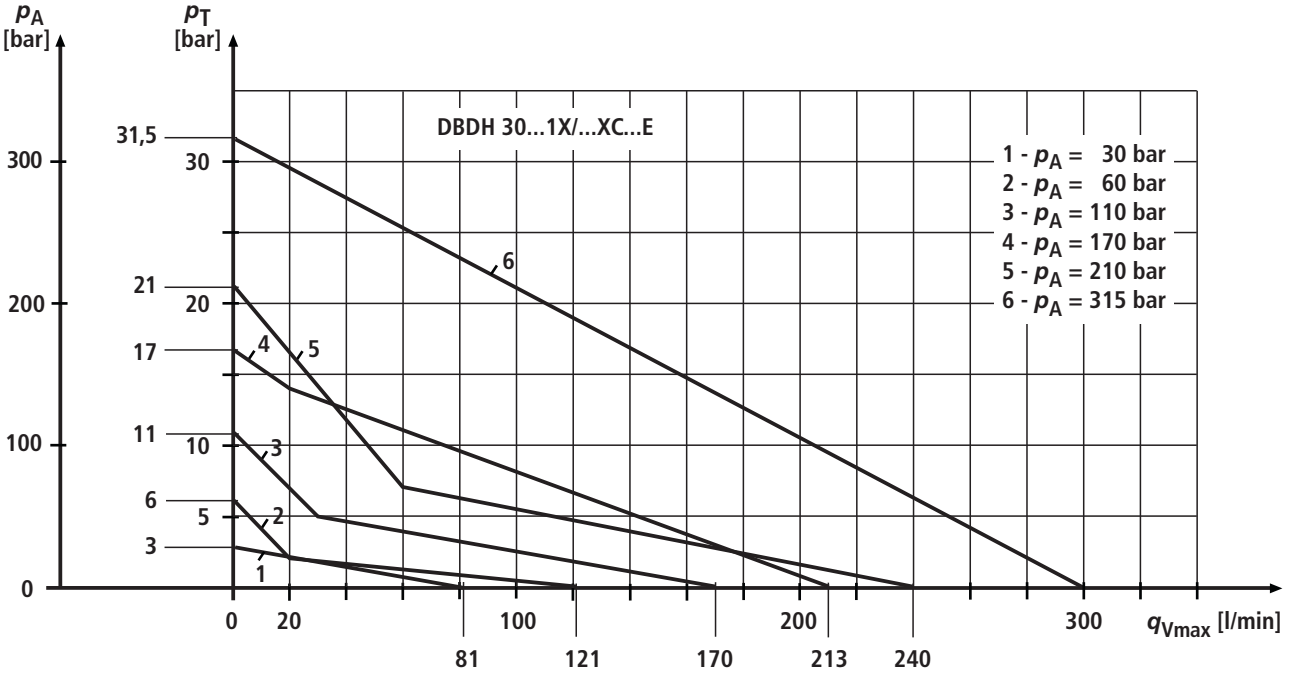
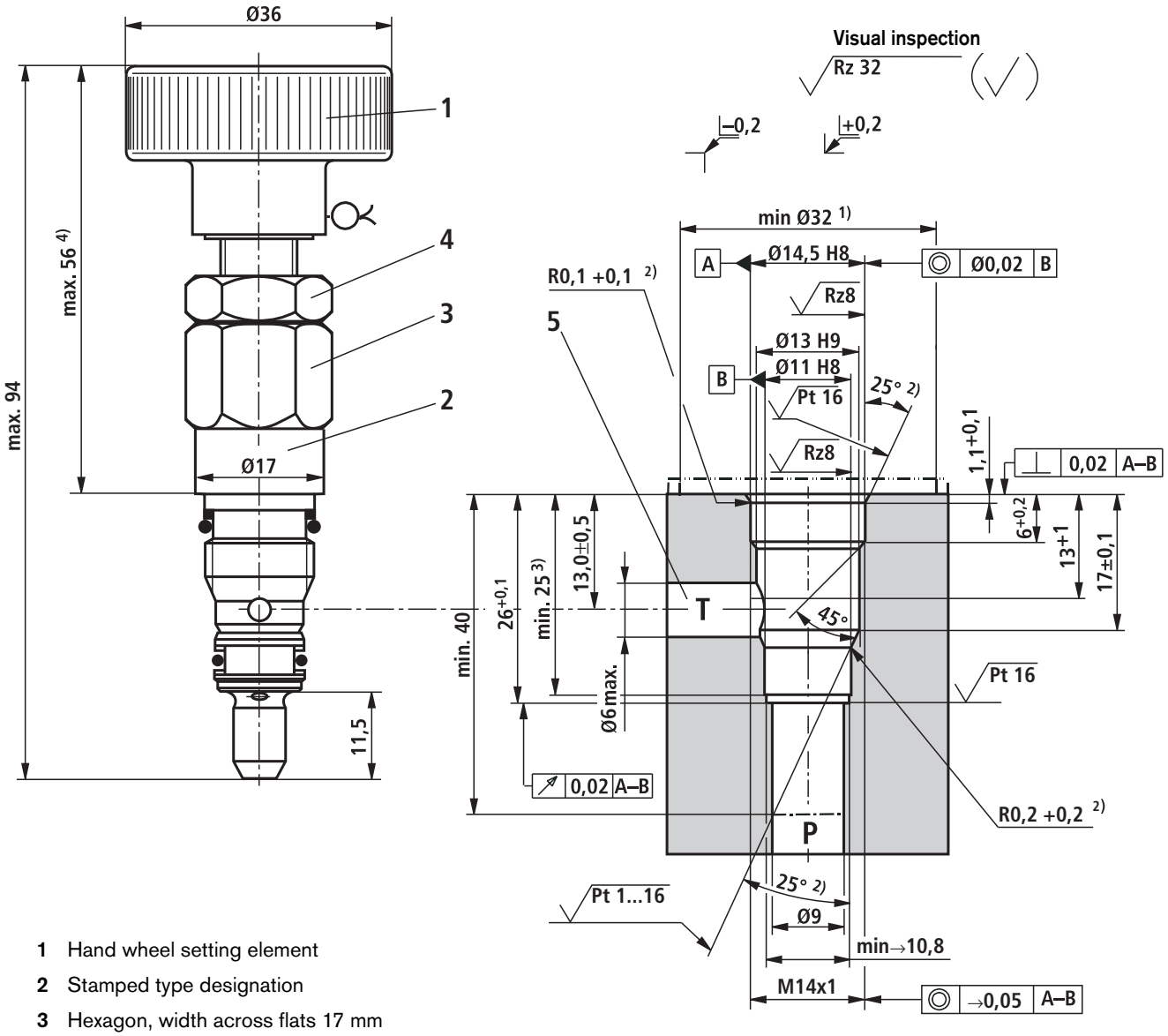


Diagram for determining the maximum permitted back pressure p_T in the flow line at port T of the valve as a function of the flow rate q_{Vmax} for DBDH **20**…1X/…XC…E valves (diagram above) and DBDH **30**…1X/…XC…E valves (diagram below) with different response pressures p_A.

Intermediate values can be ascertained with the aid of interpolation. Please refer to the explanations on the previous pages for the interpolation process.



Unit dimensions: Screw-in valve NG4 (in mm)

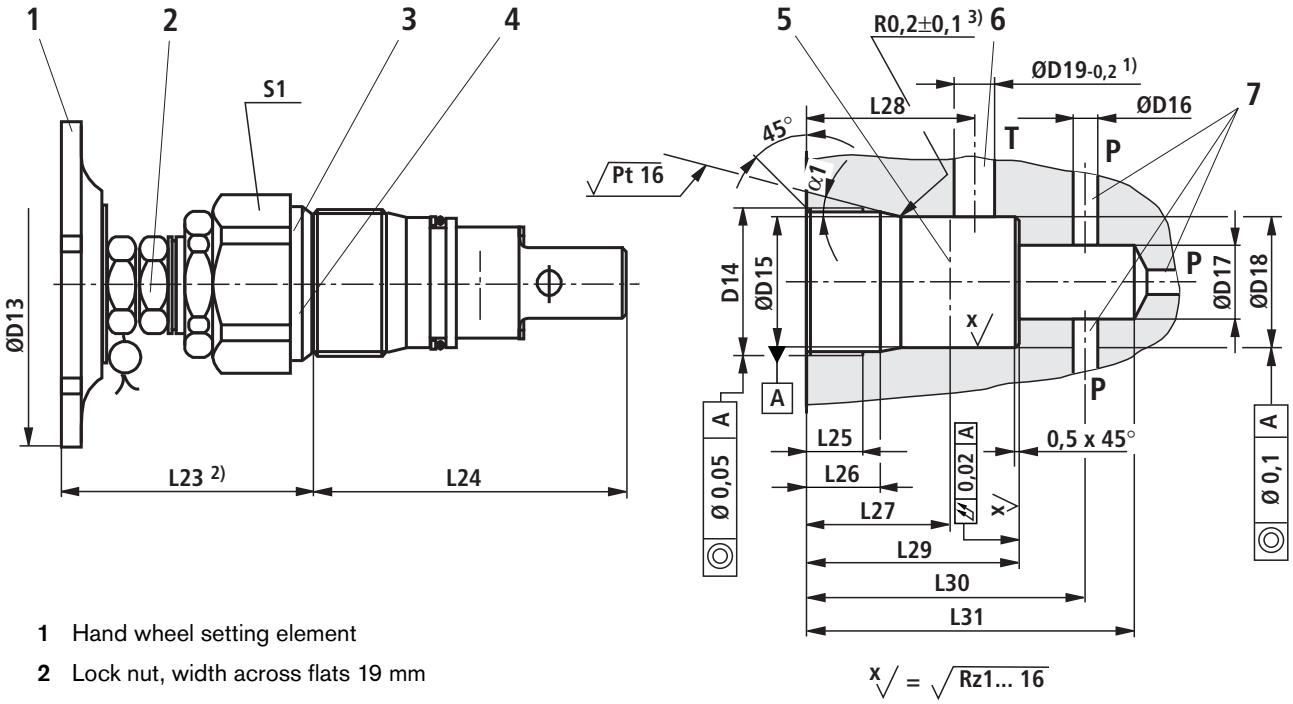


1 Hand wheel setting element
2 Stamped type designation
3 Hexagon, width across flats 17 mm
4 Lock nut, width across flats 17 mm
5 Port T, anywhere on the perimeter

Tolerancing: DIN 7167
General tolerances: ISO 2768-mk

[1] Minimum diameter in recess
[2] All edges of sealing ring insertion taper rounded and free from burrs
[3] Fitting depth
[4] Maximum dimension with response pressure at lowest setting

Unit dimensions: Screw-in valves NG6 to NG30 (in mm)



1 Hand wheel setting element
2 Lock nut, width across flats 19 mm
3 Stamped component code
4 Stamped type designation and response pressure
5 Fitting depth
6 Port T, anywhere on perimeter
7 Port P, anywhere on perimeter or on end face

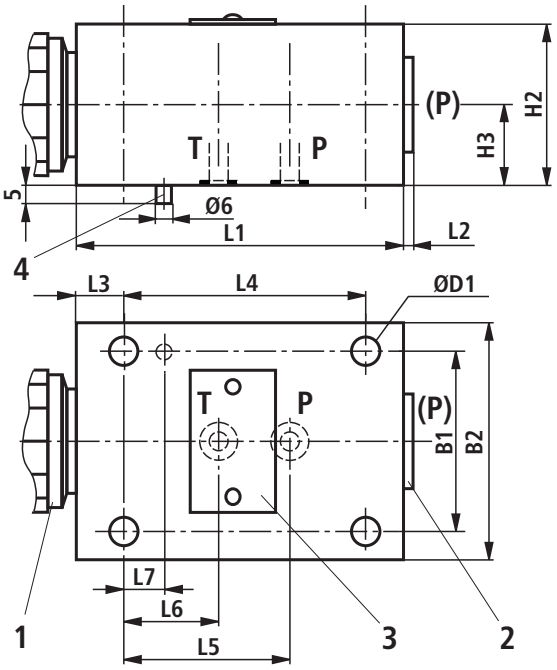
Tolerancing: DIN 7167
General tolerances: ISO 2768-mk

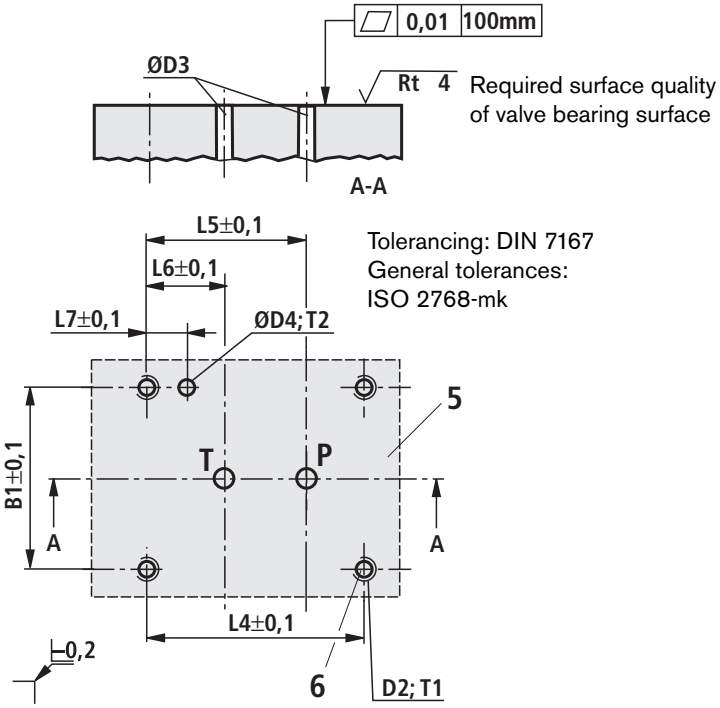
1) Maximum dimension
2) Maximum dimension with response pressure at lowest setting
3) Edge of sealing ring insertion taper rounded and free from burrs

Screw-in valve					
NG	**ØD13**	**L23**	**L24**	**S1**	**Weight**
6	40	81	64,5	32	ca. 0.4 kg
10	40	77	77	36	ca. 0.5 kg
20	40	71	106	46	ca. 1 kg
30	80	97	131	60	ca. 2.2 kg

Screw-in bore hole														
NG	**D14**	**ØD15**	**ØD16**	**ØD17**	**ØD18**	**ØD19**	**L25**	**L26**	**L27**	**L28**	**L29**	**L30**	**L31**	**α1**
6	M28 x 1.5	25^{H9}	6	15	$24.9^{+0.152}_{-0.2}$	12	15	19	30	36	45	56.5 ± 5.5	65	15°
10	M35 x 1.5	32^{H9}	10	18.5	$31.9^{+0.162}_{-0.2}$	15	18	23	35	41.5	52	67.5 ± 7.5	80	15°
20	M45 x 1.5	40^{H9}	20	24	$39.9^{+0.162}_{-0.2}$	22	21	27	45	55	70	91.5 ± 8.5	110	20°
30	M60 x 2	55^{H9}	30	38.75	$54.9^{+0.174}_{-0.2}$	34	23	29	45	63	84	113.5 ± 11.5	140	20°

Unit dimensions: Sub plate mounting, NG6 to NG30 (in mm)





1 Screw-in valve, example illustration [1)]

2 Connecting bore **(P)**, e.g. for pressure measurement, sealed when supplied with screw plug (see dimension table for **(P)**)
Not available for NG10 with pressure stages > 400 bar

3 Nameplate

4 Locating pin

5 Valve bearing surface

6 Four valve fastening bores

[1)] See page 13 for dimensions

In order to ensure a secure connection, use only the following valve fastening bolts (order separately)**:**

– **4 hexagon socket head cap screws ISO 4762...-flZn-240h-L**
(coefficient of friction μ_{total} = 0.09 to 0.14)

Valve fastening bolts to ISO 4762 [2)]

NG	Dimensions	Property class	Material number
6	M6 x 50	10.9	**R913000151**
10	M8 x 70	10.9	**R913000149**
20	M8 x 90	12.9	**R913000150**
30	M10 x 110	12.9	**R913000148**

[2)] Appropriate specified bolts to DIN 912 may also be used as an alternative.

Pressure relief valve

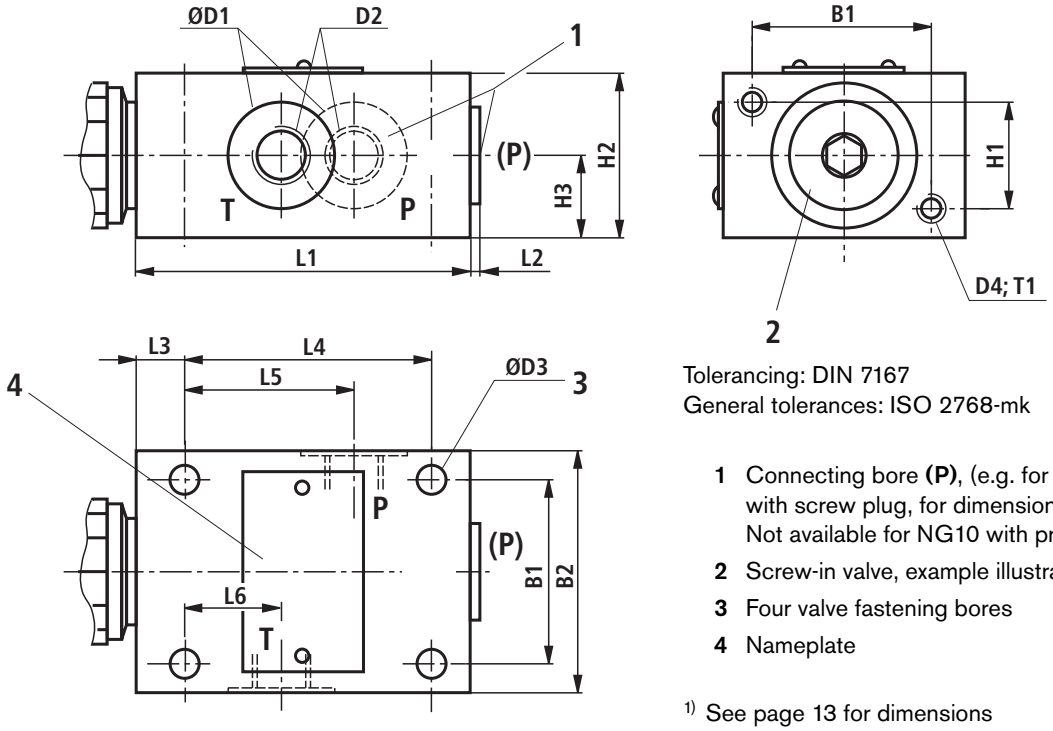
NG	B1	B2	ØD1	H2	H3	L1	L2	L3	L4	L5	L6	L7	(P)	Weight
6	45	60	6.6	40	20	80	4	15	55	40	20	15	G1/4	ca. 1.5 kg
10	60	80	9	60	30	100	4	20	70	45	21	15	G1/2	ca. 3.7 kg
20	70	100	9	70	35	135	5.5	20	100	65	34	15	G3/4	ca. 6.4 kg
30	100	130	11	90	45	180	5.5	25	130	85	35	15	G1 1/4	ca. 13.9 kg

NG	Maximum overall length with response pressure at lowest setting
6	165
10	181
20	212
30	283

Detail dimensions of mounting hole configurations

NG	B1	D2	ØD3	ØD4	L4	L5	L6	L7	T1	T2
6	45	M6	6	7.5	55	40	20	15	15	6.5
10	60	M8	10	7.5	70	45	21	15	15	6.5
20	70	M8	20	7.5	100	65	34	15	22	6.5
30	100	M10	30	7.5	130	88	35	15	22	6.5

Unit dimensions: Threaded connection, NG6 to NG30 (in mm)



Tolerancing: DIN 7167
General tolerances: ISO 2768-mk

1 Connecting bore **(P)**, (e.g. for pressure measurement), with screw plug, for dimensions see D2
Not available for NG10 with pressure stages > 400 bar

2 Screw-in valve, example illustration [1)]

3 Four valve fastening bores

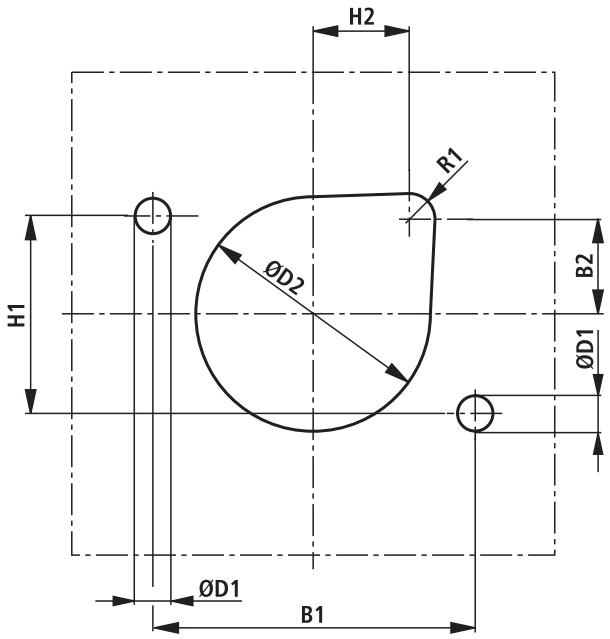
4 Nameplate

[1)] See page 13 for dimensions

Pressure relief valve																		
NG	**B1**	**B2**	**ØD1**	**D2**	**ØD3**	**D4**	**H1**	**H2**	**H3**	**L1**	**L2**	**L3**	**L4**	**L5**	**L6**	**T1**	**(P)**	**Weight**
6	45	60	25	G1/4	6.6	M6	25	40	20	80	4	15	55	40	20	10	G1/4	ca. 1.5 kg
10	60	80	34	G1/2	9	M8	40	60	30	100	4	20	70	48	21	15	G1/2	ca. 3.7 kg
20	70	100	47	G1	9	M8	50	70	35	135	5.5	20	100	65	34	18	G1	ca. 6.4 kg
30	100	130	65	G1 1/2	11	M10	60	90	45	180	5.5	25	130	85	35	20	G1 1/2	ca. 13.9 kg

NG	Maximum overall length with response pressure at lowest setting
6	165
10	181
20	212
30	283

Unit dimensions: Cut-out in sheet metal for valve mounting in version for subplate mounting (in mm)



NG	B1	B2	H1	H2	ØD1^{H13}	ØD2^{H13}	R1
6	45	12.5	25	22.5	7	40	8
10	60	20.5	40	20.5	9	44	8
20	70	24	50	24	9	55	8
30	100	29.5	60	29.5	11	73	8

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