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RE 25710/2022-03-01
Replaces: 2021-08

rexroth
A Bosch Company

Pressure relief valve, direct operated Type DBD

K4942-1

- Size 4
- Component series 1X
- Maximum operating pressure 500 bar
- Maximum flow 20 l/min

CE

Features

- Screw-in cartridge valve
- 8 pressure ratings
- 2 adjustment types, optionally:
  - Grub screw with internal hexagon
  - Hand wheel

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Type-examination tested safety valves type DBD...K according to Pressure Equipment Directive 2014/68/EU (in the following shortly PED)

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Ordering code

01	02	03	04	05		06	07	08	09
DBD		**4**	**K**	**1X**	**/**		**V**		*****

01	Pressure relief valve, direct operated	**DBD**

Adjustment type for pressure adjustment

02	Grub screw with internal hexagon	**S**
	Hand wheel	**H**

03	Size 4	**4**

Type of connection

04	As screw-in cartridge valve (cartridge)	**K**

05	Component series 10 ... 19 (10 ... 19: unchanged installation and connection dimensions)	**1X**

Pressure rating

06	Set pressure up to 25 bar	**25**
	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	**350**
	Set pressure up to 420 bar	**420**
	Set pressure up to 500 bar	**500**

Seal material (observe compatibility of seals with hydraulic fluid used, see page 4)

07	FKM seals	**V**

Equipment Directive

08	**Without** type-examination procedure	**no code**
	Type-examination tested safety valve according to PED 2014/68/EU (see ordering code on page 8)	**E**

09	Further details in the plain text	

Notice
Preferred types and standard units are contained in the EPS (standard price list).

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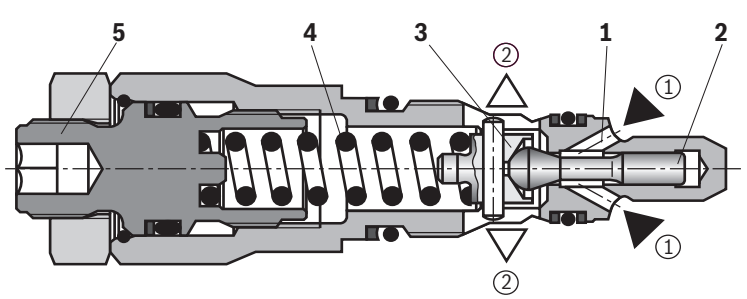
Function, section, symbol

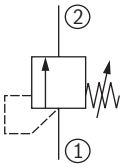
Pressure valves of type DBD are direct operated pressure relief valves to be installed in block designs. They are used for limiting a system pressure.
The system pressure can be set via the adjustment type (**5**).

In the initial position the valve is closed. Via control line (**1**) and poppet (**2**), the pressure in the main port ① acts on the spring plate (**3**). If the pressure in the main port ① rises above the value set at the compression spring (**4**), the poppet (**2**) opens and the hydraulic fluid flows into the main port ②.

▼ **Cross-section DBD**



Type DBDS 4 K1X/.V



① = Main port 1 (**P**)
② = Main port 2 (**T**)

1 Control line
2 Poppet
3 Spring plate
4 Compression spring
5 Adjustment type

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Technical data

General			
Weight		kg	approx. 0.3
Installation position			Any
Ambient temperature range		°C	–20 ... +80

Hydraulic			
Maximum operating pressure	– Input	bar	500
	– Output	bar	315 (50 bar at set pressure 500 bar)
Maximum set pressure		bar	25; 50; 100; 200; 315; 350; 420; 500
Maximum flow		l/min	20
Hydraulic fluid			see table below
Hydraulic fluid temperature range		°C	–20 ... +80
Viscosity range		mm²/s	10 ... 800
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			Level 20/18/15 [1]

Hydraulic fluid

Hydraulic fluid		Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils		HL, HLP	FKM	DIN 51524	90220
Environmentally acceptable	Insoluble in water	HEES	FKM	ISO 15380	90221
	Soluble in water	HEPG	FKM	ISO 15380	90221

Notice

- Further information and details on using other hydraulic fluids are available in the above data sheets or on request.
- Restrictions are possible with the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K above the maximum solenoid surface temperature.
- **Environmentally acceptable:** If environmentally acceptable hydraulic fluids are used that are also zinc-solving, there may be an accumulation of zinc.

Notice

For applications outside these values, please consult us!

1) Cleanliness levels specified for the components must be maintained in the hydraulic systems. Effective filtration prevents malfunctions and simultaneously extends the service life of the components.

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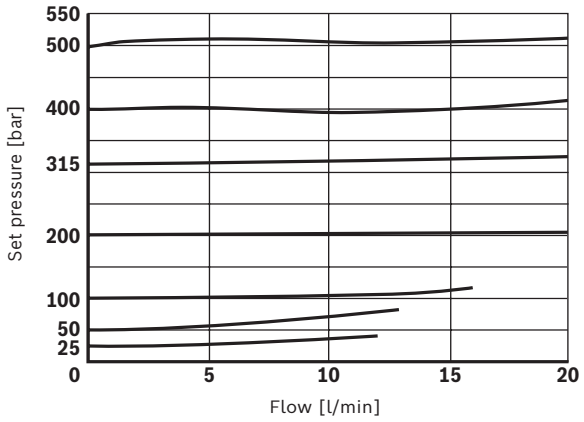
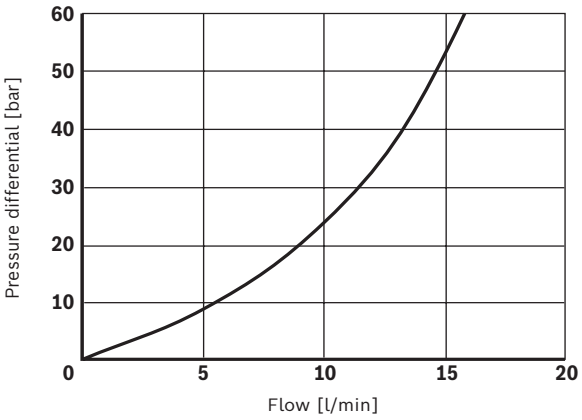
Characteristic curves

▼ p_E-q_V **characteristic curve**



▼ Δp-q_V **characteristic curve**



Notice

- Characteristic curves measured with HLP46, ϑ_{oil} = 40±5 °C.
- The characteristic curves apply to output pressure = zero in the entire flow range and were measured without housing resistance.

General information

Hydraulic counter pressures in the main port ② (**T**) add 1:1 to the response pressure of the valve set at the adjustment.

Example:

- Pressure adjustment of the valve due to spring preload (item 4 on page 3) p_{spring} **= 200 bar**
- Hydraulic counter pressure in the main port ② (**T**): $p_{hydraulic}$ **= 50 bar**

→ Response pressure = p_{spring} + $p_{hydraulic}$ **= 250 bar**

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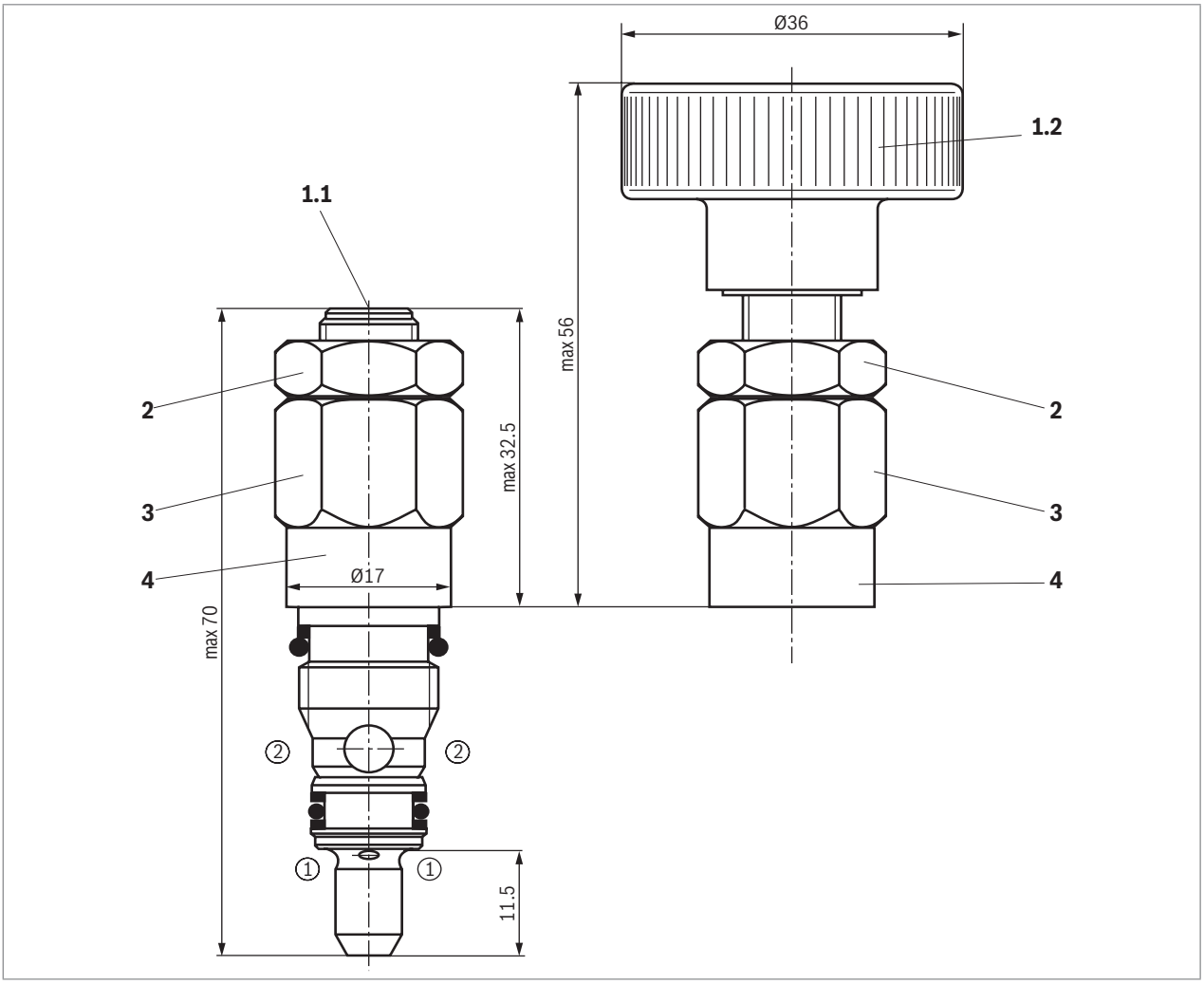
Dimensions

▼ **DBD**



1.1 Adjustment type “S”, internal hexagon SW5
1.2 Adjustment type “H”, hand wheel
2 Lock nut SW17, tightening torque M_A = 10+5 Nm
3 Sechskant SW17, tightening torque when screwing in M_A = 23±2 Nm
4 Embossed type designation

① = Main port 1 (**P**)
② = Main port 2 (**T**)

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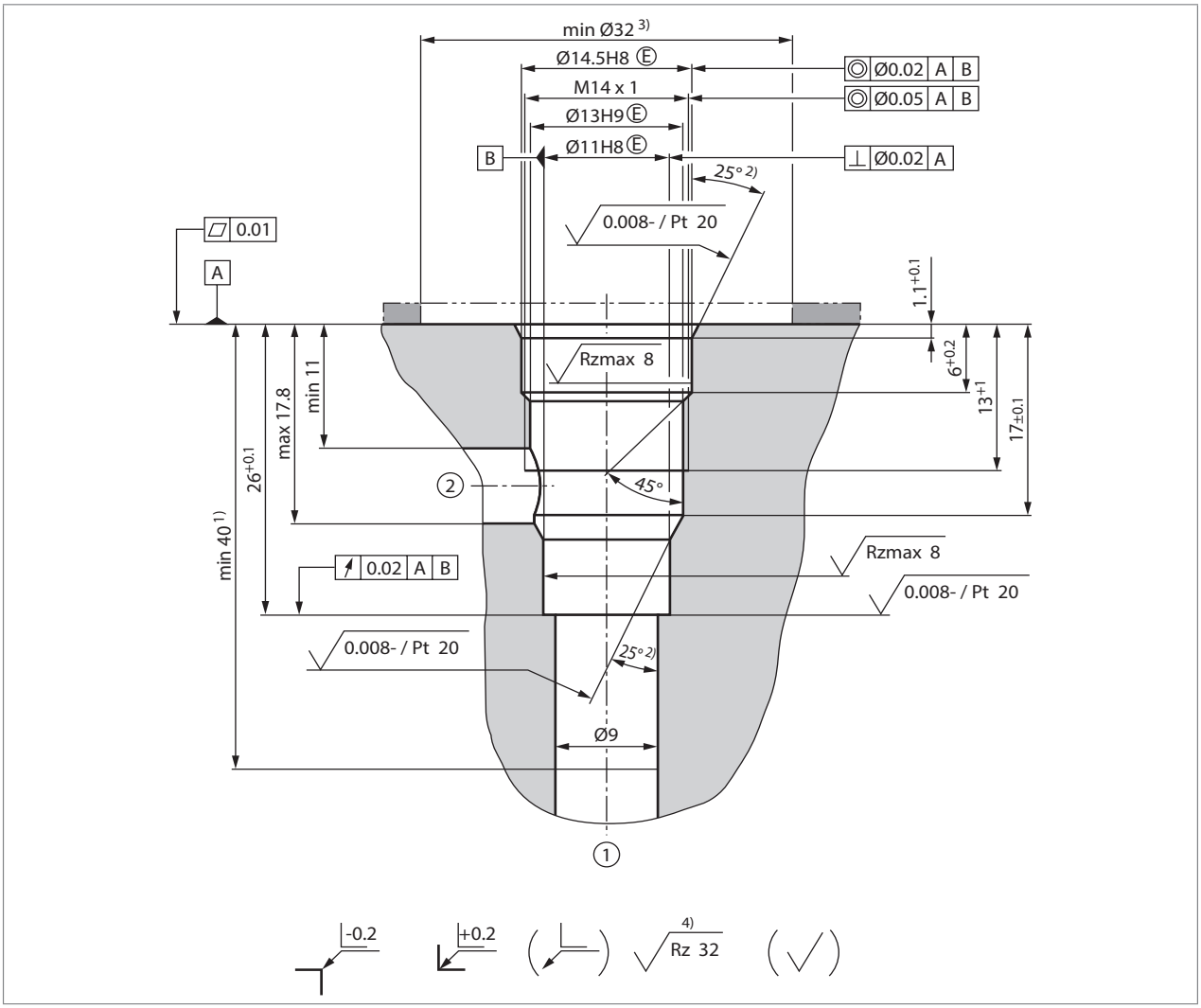
Mounting cavity

▼ **R/DBD . 4K; 2 main ports; thread M14×1**



1) Depth for moving parts
2) All seal ring insertion faces are rounded and free of burrs
3) With countersink
4) Visual inspection

① = Main port 1 (**P**)
② = Main port 2 (**T**), can optionally be arranged at the circumference

Tolerance for all angles ±0.5°

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Type-examination tested safety valves

The functionality of these valves corresponds to that of the standard series (see page 3). Valves of type DBD..1X/..E are, however, type-examination tested pressure relief valves according to the Pressure Equipment Directive 2014/68/EU and intended for use as safety valves.
At the factory, the response pressure is set to a fixed maximum value using the adjustment type. Afterwards, the safety valve is sealed.

The safety valves are available with graded response pressures (in 5 bar steps). With valve versions equipped with rotary knob or hand wheel, the valve spring can be unloaded by the user and a response pressure lower than the factory setting can be set without the need for removing the lead seal.

Ordering code: Type-examination tested safety valves type DBD [1)]

Designation	Component marking	Maximum flow $q_{V\,max}$ [l/min]	Pre-set response overpressure p [bar]
DBDS 4 K1X/ ☐ E	TÜV.SV.- ■ -1038.4.F.G.p	10	60 ... 315
DBDH 4 K1X/ ☐ E		17	320 ... 500

☐ Pressure in the type designation is to be entered by the customer, pressure adjustment ≥ 60 bar and possible in 5-bar steps.
■ Value entered at the factory.

Deviating technical data: Type-examination tested safety valves type DBD [1)]

General		
Ambient temperature range	°C	–10 ... +60
Conformity		CE according to Pressure Equipment Directive 2014/68/EU

Hydraulic		
Set response pressure	bar	See last figure of the component marking above
Maximum counter pressure in the discharge line	bar	See characteristic curves on page 9 and 10
Maximum flow	l/min	The last but one figure of the component marking attached at the safety valve is always binding, see above. For valve types which have a variable maximum flow depending on the response pressure, the discharge coefficient is specified at this place (see also page 10)
Hydraulic fluid		Hydraulic fluids according to DIN 51524: Hydraulic oils HL and HLP are suitable for safety valves with FKM seals.
Hydraulic fluid temperature range (= TS)	°C	–10 ... +60
Viscosity range	mm²/s	12 ... 230

Notice
For applications outside these values, please consult us!

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

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Safety instructions: Type-examination tested safety valves type DBD [1)]

- Before ordering a type-examination tested safety valve, it must be observed that for the desired **response pressure** p, the maximum admissible **flow** q_{Vmax} 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 8).
- The maximum admissible flow q_{Vmax} stated in the component marking must not be exceeded.
- Discharge lines 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).

Application notes must always be observed!

- In the plant, the response pressure specified in the component marking is set with a flow of 1 l/min.
- The maximum flow stated in the component marking applies for applications without counter pressure in the discharge line (port **T**).
- By removing the lead seal at the safety valve, the approval according to the Pressure Equipment Directive becomes void!
- Basically, the requirements of the Pressure Equipment Directive and of data sheet AD 2000 A 2 have to be observed.
- It is recommended to secure type-examination tested safety valves against inadmissible disassembly by means of wiring and sealing with the housing/block (bore available in the adjustment type).

Notice
The system pressure increases by the counter pressure in the discharge line (port **T**) due to the increasing flow. (Observe the data sheet AD 2000 A 2, point 6.3)
To ensure that this increase in system pressure caused by the flow does not exceed the value of 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 on page 9 and 10).

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.

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

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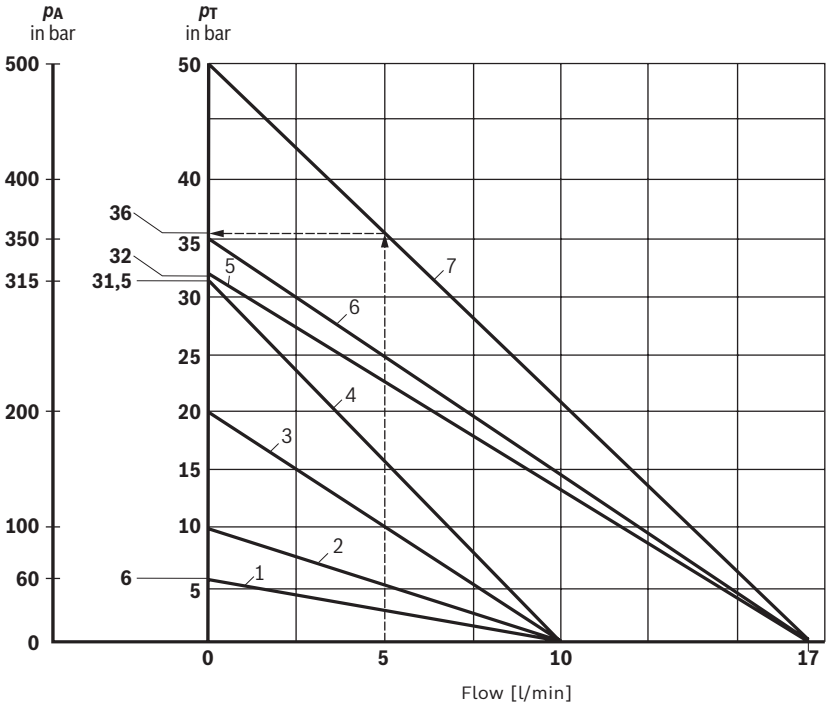
Characteristic curves: Counter pressure in the discharge line

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 DBD.**4**...1X/...E with different response pressures p_A.



Characteristic curves	Response pressure p_A [bar]
1	60
2	100
3	200
4	315
5	320
6	350
7	500

Characteristic curves for intermediate values can be generated by interpolation. Further explanations can be found on page 9.

p_A Response pressure in bar

p_T Maximum counter pressure in the discharge line (port **T**) in bar

q_{Vmax} Maximum flow in l/min

Determination of the maximum counter pressure

Example (with already existing characteristic curve):
Flow of the system / accumulator to be secured:
q_{Vmax} = 5 l/min
Safety valve set to: p_A = 500 bar.
Read off the maximum counter pressure p_T of approx. 36 bar from the diagram (see arrows, characteristic curve 7).

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Related documentation

▶ Safety equipment against excessive pressure – safety valves	Data sheet AD 2000 A 2
▶ 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
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012, 90294
▶ Hydraulic valves for industrial applications	Operating instructions 07600-B

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