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Pressure relief valve, pilot operated

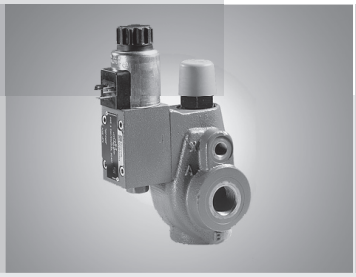
RA 25818/08.03 **1**/12
Replaces: 08.99

Model DB(W)...W65

Nominal sizes 10 and 25
Series 1X; 4X
Maximum operating pressure
350 bar (5000 PSI)
Max. flow
400 l/min (105 GPM)



Model
DB 20 K1-4X/...XY



Model
DBW 20 AG2-4X/... 6E...W65



Model
DB 10 -1-4X/..W65

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Features

- Mounts on standard ISO 4401-**06**, or **08**, NFPA/ANSI **R 06** or **R 08** interface
- For subplates see catalog sheet RE 45 065 (separate order)
- For threaded connections
- As a cartridge valve
- Four adjustment elements:
  - Rotary knob
  - Sleeve with hexagon and protective cap
  - Lockable rotary knob with scale
  - Rotary knob with scale
- Five pressure stages
- Solenoid operated unloading via a built-on directional valve (only with threaded connections)

- For further information regarding the pilot valve see:
  High performance directional valve to RE 23 178

Note:

Design tested pressure relief valves to pressure component directive 97/23/EG (abbreviated to DGRL in any further text) type DB 20 K../..E, series 1X, for ordering details see page 3.

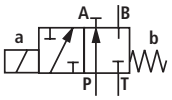
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Ordering details

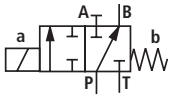
DB [ ] [ ] [ ] [ ] **–** / [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] *****

Pressure relief valve = **DB**
Without directional valve = **No code**
With built-on directional valve = **W** [1]

NS	Ordering details		
	Subplate mounting "–"	Threaded connection "G"	Cartridge valve "K"
10	= **10**	= **10** (G 1/2)	
25		= **15** (G 3/4)	
	= **20**	= **20** (G 1)	= **20**



Normally closed = **A** [2]



Normally open = **B** [2]

For subplate mounting = **–**
For threaded connections = **G**
As a cartridge valve (cartridge) = **K**

Adjustment element
Rotary knob = **1**
Sleeve with hexagon and protective cap = **2**
Lockable rotary knob with scale = **3** [3]
Rotary knob with scale = **7**

Series 10 to 19 (only version "K") = **1X**
(10 to 19: unchanged installation and connection dimensions)
Series 40 to 49 = **4X**
(40 to 49: unchanged installation and connection dimensions)

Settable pressure up to 50 bar (725 PSI) = **50**
Settable pressure up to 100 bar (1450 PSI) = **100**
Settable pressure up to 200 bar (2900 PSI) = **200**
Settable pressure up to 315 bar (4600 PSI) = **315**
Settable pressure up to 350 bar (5100 PSI) (only version DB) = **350**

Pilot oil supply and pilot oil drain
Internal pilot oil supply and pilot oil drain = **–** [5]
External pilot oil supply, internal pilot oil drain = **X**
Internal pilot oil supply, external pilot oil drain = **Y**
External pilot oil supply and pilot oil drain = **XY**
Also see symbols on page 4

No code = Lowest circulation pressure
U [4] = See characteristic curves on page 7

No code = Without directional valve
6E [2] = With directional valve NS 6

G24 [2] = 24 V DC
W230 [2] = 230 V AC 50/60 Hz

No code [2] = Without hand override
N [2] = With hand override
N9 [2] = With protected hand override

Electrical connection [2]
K4 [6] = **Without** plug-in connector
Individual connection with component plug DIN EN 175 301-803

No code = NBR seals
V = FKM seals
(other seals on request)

⚠ **Attention!**
The compatibility of the seals and pressure fluid has to be taken into account!

W65 = Vertical cartridge (ordering details are not required for cartridge valve "K")

Design tested:
No code = Without
E = Safety valve with design testing to DGRL 97/23/EG

No Code = BSP Thread Port
12 = SAE threaded ext. connections

Further details in clear text

[1] Only for valve with threaded connections

[2] Only version DBW..G..

[3] H-key to Material No. **R900008158** is included within the scope of supply

[4] Version "U" is **not** suitable for a cross-relief function!

[5] Hyphen „**–**" **only** required for DBW..G .. without stating details regarding X, Y, XY, and U.

[6] Plug-in connectors must be ordered separately (see page 6).

Attention!
When ordering spare cartridges for subplate mounting or threaded connection housings NS 10 and 25 **always** order type DB 20 K.-1X/..XY!
Design tested safety valves are **only** available for type DB 20 K.-1X/..YE!

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Ordering details for design tested pressure relief valves type DB..K../..E, series 1X

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

NS	Designation	Component identification	Max. permissible flow q_{Vmax} in L/min (GPM)	Set response over pressure p in bar (PSI)
25	DB 20 K [1] –1X/ [2] Y [3] E	TÜV.SV. [ ] –1001.14,4.F.G.p	70 (18.4) 100 (26.4) 150 (39.6) 200 (52.8) 300 (79)	30 to 60 (435 to 870) 61 to 110 (884 to 1595) 111 to 210 (1609 to 3045) 211 to 315 (3060 to 4568) 316 to 350 (4583 to 5076)

[1]
☐ Adjustment element hand wheel (sealed pressure adjuster, unloading or adjustments in the lower settable range is possible!) **= 1**
Adjustment element with sealed protective cap (no adjustment or unloading is possible) **= 2**

[2]
☐ The pressure details contained within the type code are to be entered by the customer e.g. **= 150**
Pressure adjustments ≥ 30 bar (435 PSI) and in 5 bar (72 PSI) steps are possible.

[3]
☐ NBR seals **= No code**
FKM seals **= V**

▪ Details are completed by the factory

Safety guidelines for design tested safety valves type DB..K../..E, series 1X to the pressure component directive DGRL 97/23/EG

- 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} (= numerical value in the place of the "G" within the component identification) of the safety valve is greater than the maximum possible flow from the system. The appropriate regulations must be taken into account!
- **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).

  – The maximum permissible flow stated within the component identification **must not be exceeded**.

  – The return lines from safety valves must vent in a safe manner. Fluid must **not** be able to gather in a venting system (see the AD2000 -A2 information sheet).

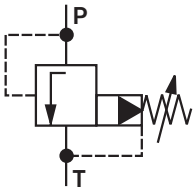
Application notes must be taken into account!

- The response value stated within the component identification is set in the manufacturing plant with a flow of 2 L/min (0.52 GPM).
- The maximum permissible flow stated within the component identification 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) < 10 bar (< 145 PSI)
- The removal of the seal from a safety valve invalidates the DGRL approval
- Cavities (see page 11): Drilling "XY" **without** port X
- The requirements of the pressure component directive and the AD2000-A2 information sheet must be taken into account!

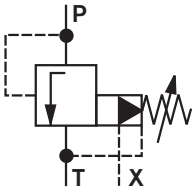
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Symbols

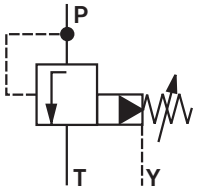
Type DB…–…



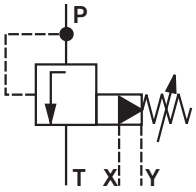
Type DB…**X**…



Type DB…**Y**…

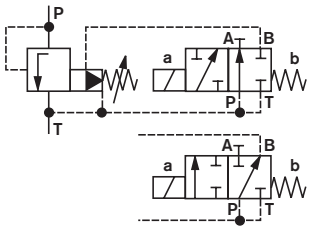


Type DB…**XY**…



Type DBW…–…

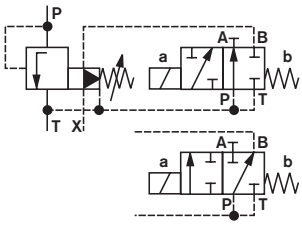
Normally closed



Normally open

Type DBW…**X**…

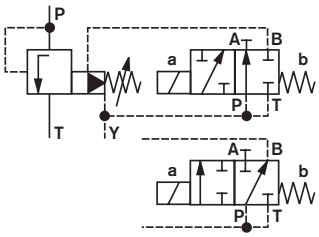
Normally closed



Normally open

Type DBW…**Y**…

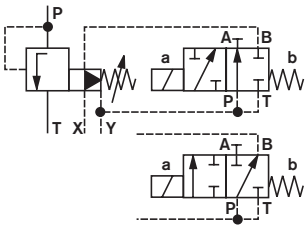
Normally closed



Normally open

Type DBW…**XY**…

Normally closed



Normally open

Functional description, cross-section

Types DB and DBW valves are pilot operated pressure relief valves of cartridge design. They are used for limiting (DB) or limiting and solenoid operated unloading (DBW only with threaded connections) of an operating pressure.

The valves basically consists of the housing (1) and a pressure control valve cartridge (2).

The pressure present in port P acts on the spool (3). At the same time pressure is applied to poppet (6) via orifice drillings (4 and 5). When the pressure port P exceeds the force set on the spring (7), the poppet (6) opens against the spring (7).

Pressure fluid can now flow from port P via the orifice drillings (4 und 5) into the spring chamber (8). From here the fluid is led internally, with type DB..-4X/.. , via control passages (9 and 10) or externally, with type DB..-4X/..Y.. , via control passages (9 and 11) to the tank.

Due to the balanced condition at the poppet (3) pressure fluid flows from port P to port T, while maintaining the set operating pressure.

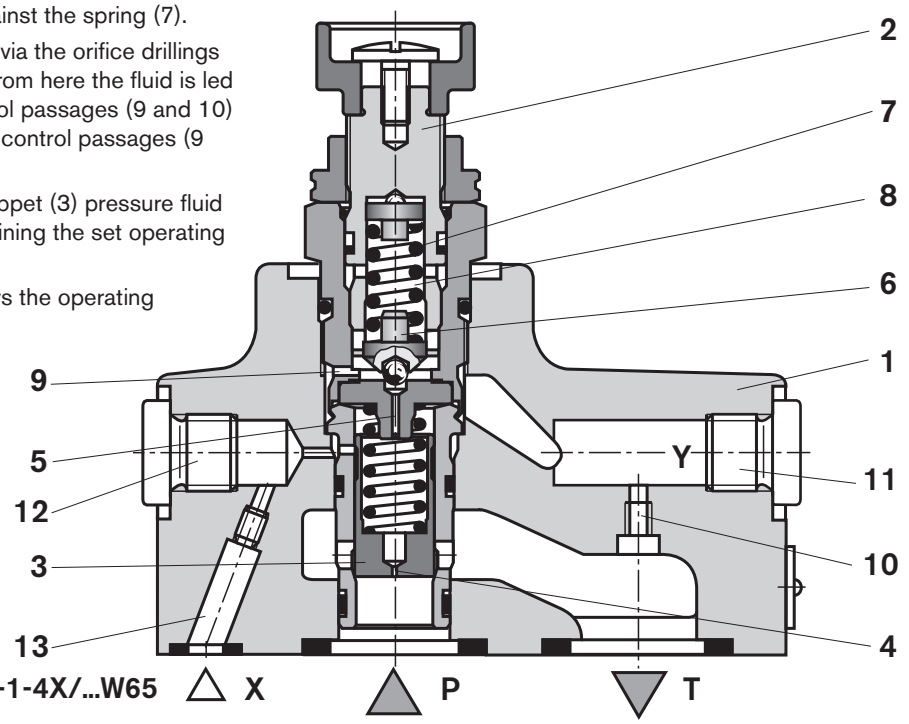
A pressure gauge connection (12) allows the operating pressure to be monitored.

The pressure relief valve can be unloaded or switched over to another pressure value (second pressure stage) via port “X” (13).

Pressure relief valve type DBW (only threaded connections)

In principle, the function of this valve corresponds to that of the valve type DB.

Unloading of the main poppet is achieved by controlling the built-on directional valve.



Type DB 20-1-4X/...W65

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

General

Installation			Optional	
Ambient temperature range	Type DB.. °C (°F)		–30 to +80 (–22 to 176) (NBR seals)	
			–15 to +80 (5 to 176)(FKM seals)	
	Type DBW..G..°C (°F)		–30 to +50 (–22 to 122) (NBR seals)	
			–15 to +50 (5 to 122) (FKM seals)	
The minimum housing material strength			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		NS	10	25
	Subplate mounting	kg (lbs)	1.6 (3.5)	2.3 (5.06)
	Threaded connections	Type DB.. kg (lbs)	2.95 (6.5)	2.95 (6.5)
		Type DBW.. kg (lbs)	4.25 (9.4)	4.25 (9.3)
	Cartridge valve (cartridge)	kg (lbs)	–	0.35 (0.8)
Directional valve technical data			See catalogue sheet RE 23 178	

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Max. operating pressure,	Ports P, X	bar (PSI)	350 (5075)	
	Port T	bar (PSI)	315 (4570)	
Max. back pressure: Port **Y**		Type DB..bar (PSI)	250 (3635)	
Port **Y** (DBW..G../..Y) or port T (DBW..G../..)		bar (PSI)	210 (3000) for a DC solenoid	
			160 (2320) for an AC solenoid	
Settable pressure		Min. bar (PSI)	Dependent on $q_{v,}$ see characteristic curves on page 5	
		Max. bar (PSI)	Up to 50, Up to 100, Up to 200, Up to 315; (Up to 350 only version DB) (725; 1150; 2900; 4570; (DB - 5075))	
Maximum flow		NS	10	25
	Subplate mounting	L/min (GPM)	200 (52.8)	400 (105.6)
	Threaded connections	L/min (GPM)	150 (39.6)	200 (52.8) (G 3/4); 300 (79) (G 1)
Pressure fluid			Mineral oil (HL, HLP) to DIN 51 524 [1]; Fast bio-degradable pressure fluids to VDMA 24 568 (also see RE 90 221); HETG (rape seed oil) [1]; HEPG (polyglycole) [2]; HEES (synthetic ester) [2]; other seals on request	
Pressure fluid temperature range		°C (°F)	–30 to +80 (–22 to 176) (NBR seals)	
			–15 to +80 (5 to 176) (FKM seals)	
Viscosity range		mm^2/s (SUS)	10 to 800 (46 to 3708)	
ISO code cleanliness class			Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 class 20/18/15 [3]	

[1] Suitable for NBR **and** FKM seals

[2] **Only** suitable for FKM seals

[3] The cleanliness class stated for the components must be adhered to 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.

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Deviating technical data for design tested pressure relief valves [1)]

Hydraulic

Maximum back pressure	Port Y	bar (PSI)	0 (0)
	Port T	bar (PSI)	10 (145)
Maximum flow			See tables on page 3
Pressure fluid			Mineral oil (HL, HLP) to DIN 51 524 and DIN 51 525
Pressure fluid temperature range		°C (°F)	–20 to +60 (–4 to 140) (for NBR seals)
			–15 to +60 (5 to 140) (for FKM seals)
Viscosity range		mm^2/s (SUS)	12 to 230

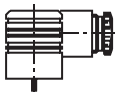
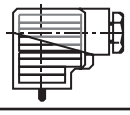
[1)] For applications outside these parameters, please consult us!

General guidelines

- The unloading function (directional valve function with DBW) must **not** be used for safety functions !
- With type DBW..**B**..4X/... the lowest settable pressure is set (circulation pressure) if the current fails or if there is a cable break.
  With type DBW..**A**..4X/... the pressure relief function is activated if the current falls or if there is a cable break.
- Any hydraulic back pressure in port T with an internal pilot oil drain (type DB/DBW../.. or port Y with an external pilot oil drain (type DB/DBW../..Y.) are added 1:1 to the response pressure set at the pilot control of the valve.

Example: The valve pressure setting resulting from the spring loading(Pos. 7 on page 4) in the pilot control valve/ adjustment unit p_{spring} **= 200 bar (2900 PSI)** Hydraulic back pressure in port T with internal pilot oil drain $p_{hydraulic}$ **= 50 bar (725 PSI)** => Response pressure = p_{spring} + $p_{hydraulic}$ **= 250 bar (3626 PSI)**

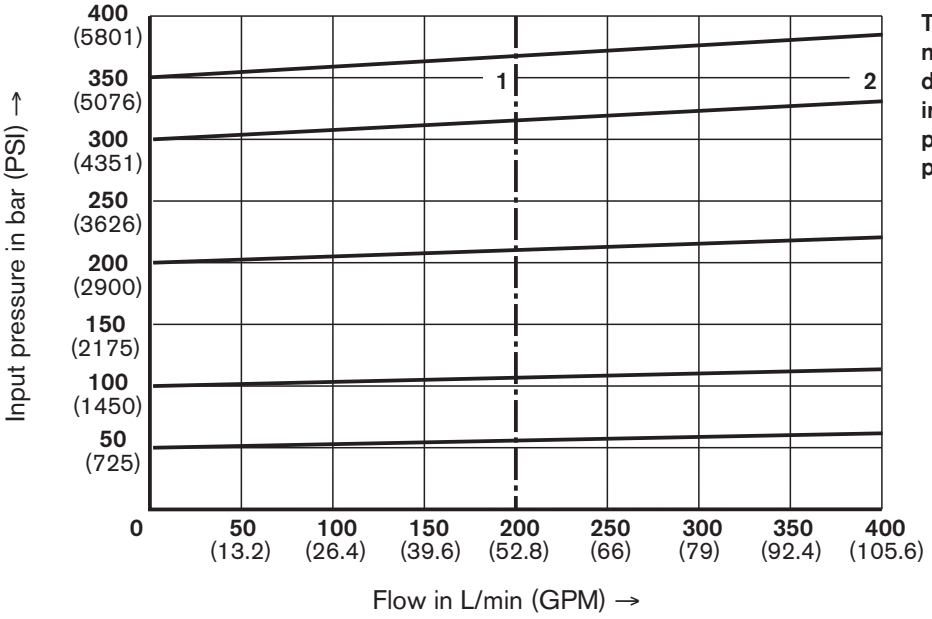
Ordering details: plug-in connectors to DIN EN 175 301-803 and ISO 4400 for component plug "K4"

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

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Characteristic curves – measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C (104 °F ±41 °F)

Input pressure in relation to the flow



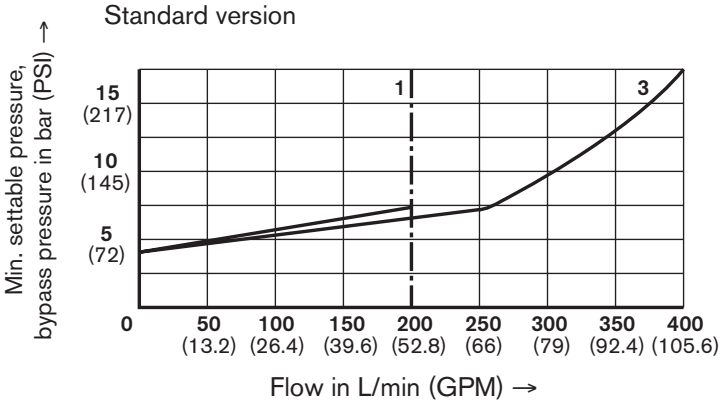
These characteristic curves were measured with external pilot oil drain at zero pressure. With an internal pilot oil drain, the input pressure increases by the output pressure present in port T.

1 NS 10
2 NS 25

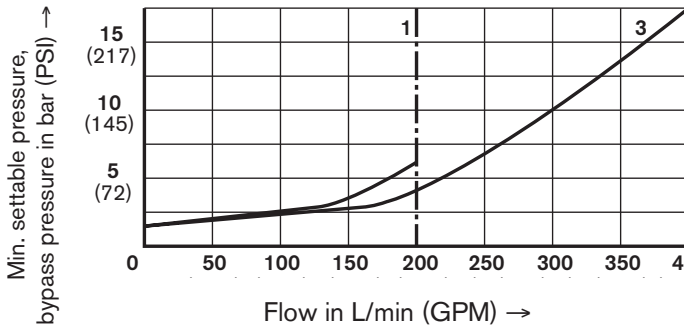
Minimum settable pressure and bypass pressure in relation to the flow [1)]

Subplate mounting

Standard version

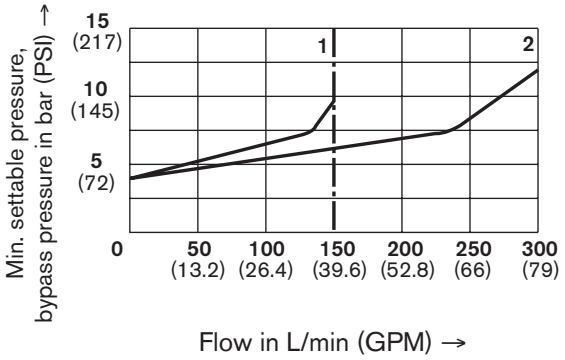


Version "U"

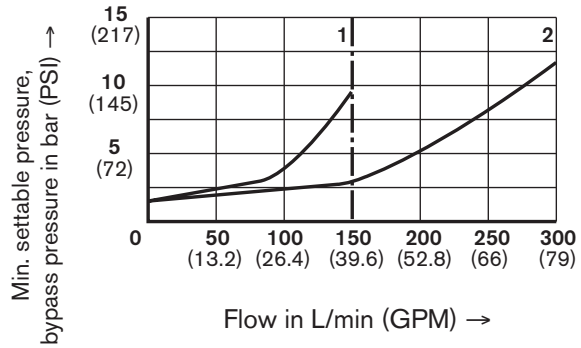


Threaded connections and cartridge valve

Standard version



Version "U"

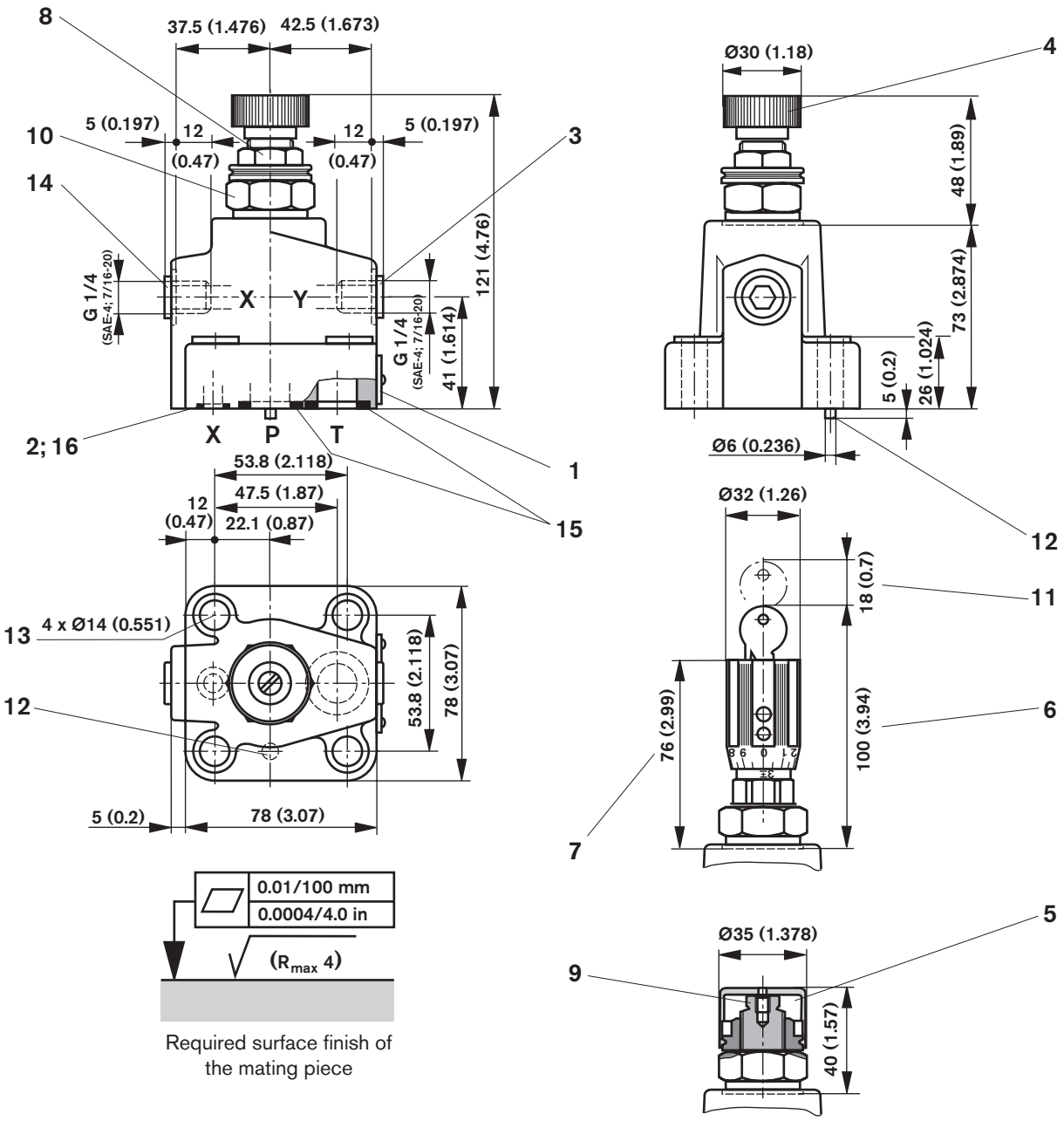


1 NS 10
2 NS 15 / NS 20
3 NS 20

[1)] The characteristic curves are valid for an output pressure = zero over the entire flow range!

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Unit dimensions: subplate mounting – dimensions in millimeters (inches) **NS 10**



Required surface finish of the mating piece

1 Name plate
2 Port X for remote control (optional)
3 Port Y for external pilot oil drian
4 Adjustment element “1”
5 Adjustment element “2”
6 Adjustment element “3”
7 Adjustment element “7”
8 Locknut 22A/F
9 Hexagon 10A/F
10 Hexagon 30A/F
Tightening torque
M_A= 50 Nm (36lb-ft)
11 Space required to remove the key
12 Locating pin
13 Valve fixing holes
14 Pressure gauge connection
15 Identical seal rings for ports P and T
16 Seal ring for port X

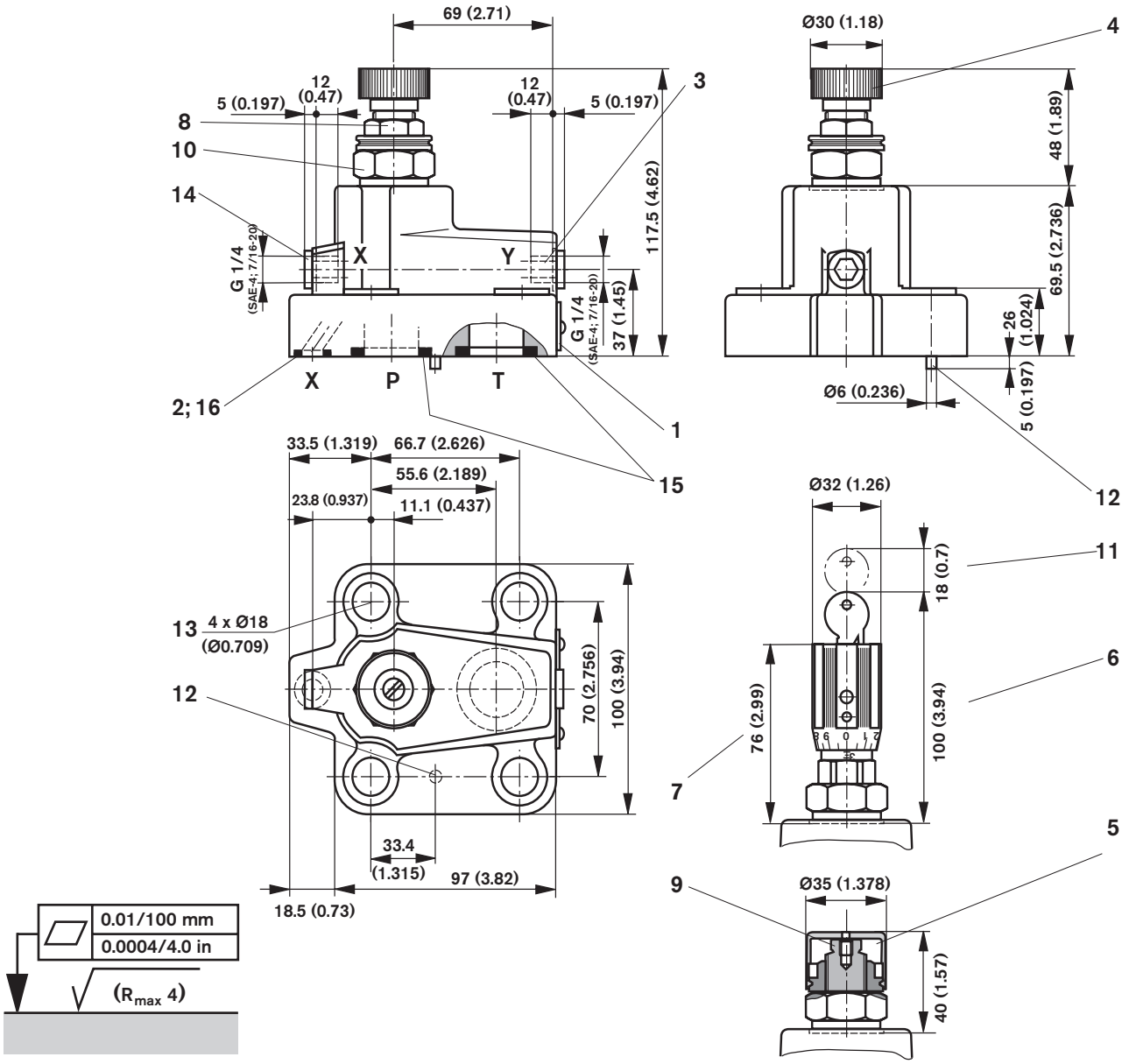
Subplates to catalogue sheet RE 45 064 and valve fixing screws must be ordered separately.

Subplates: G 545/01, G 3/8 [1)]
G545/12 (SAE-6; 9/16-18)
G 546/01, G 1/2 [1)]
G546/12 (SAE-8; 3/4-16)
G 565/01, G 3/4 [1)]
G565/12 (SAE-12; 11/16-12)

Valve fixing screws
M12 x 50 DIN 912-10.9,
(1/2-13 UNC x 2”)
M_A = 130 Nm (95 lb-ft)

[1)] It is **not** permissible to use the stated subplates with design tested valves!

Unit dimensions: subplate mounting – dimensions in mm (inches) **NS 25**



Required surface finish of the mating piece

1 Name plate
2 Port X for remote control (optional)
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 Locknut 22A/F
9 Hexagon 10A/F
10 Hexagon 30A/F
Tightening torque M_A= 50 Nm (36 lb-ft)
11 Space required to remove the key
12 Locating pin
13 Valve fixing screws
14 Pressure gauge connection
15 Identical seal rings for ports P and T
16 Seal ring for port X

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

Subplates G 408/01, G 3/4 [1)]
G408/12 (SAE-12; 11/16-12)
G 409/01, G 1 [1)]
G409/12 (SAE-16; 15/16-20)

Valve fixing screws

M16 x 50 DIN 912-10.9,
(5/8-11 UNC x 2”)

M_A = 310 Nm (228 lb-ft)

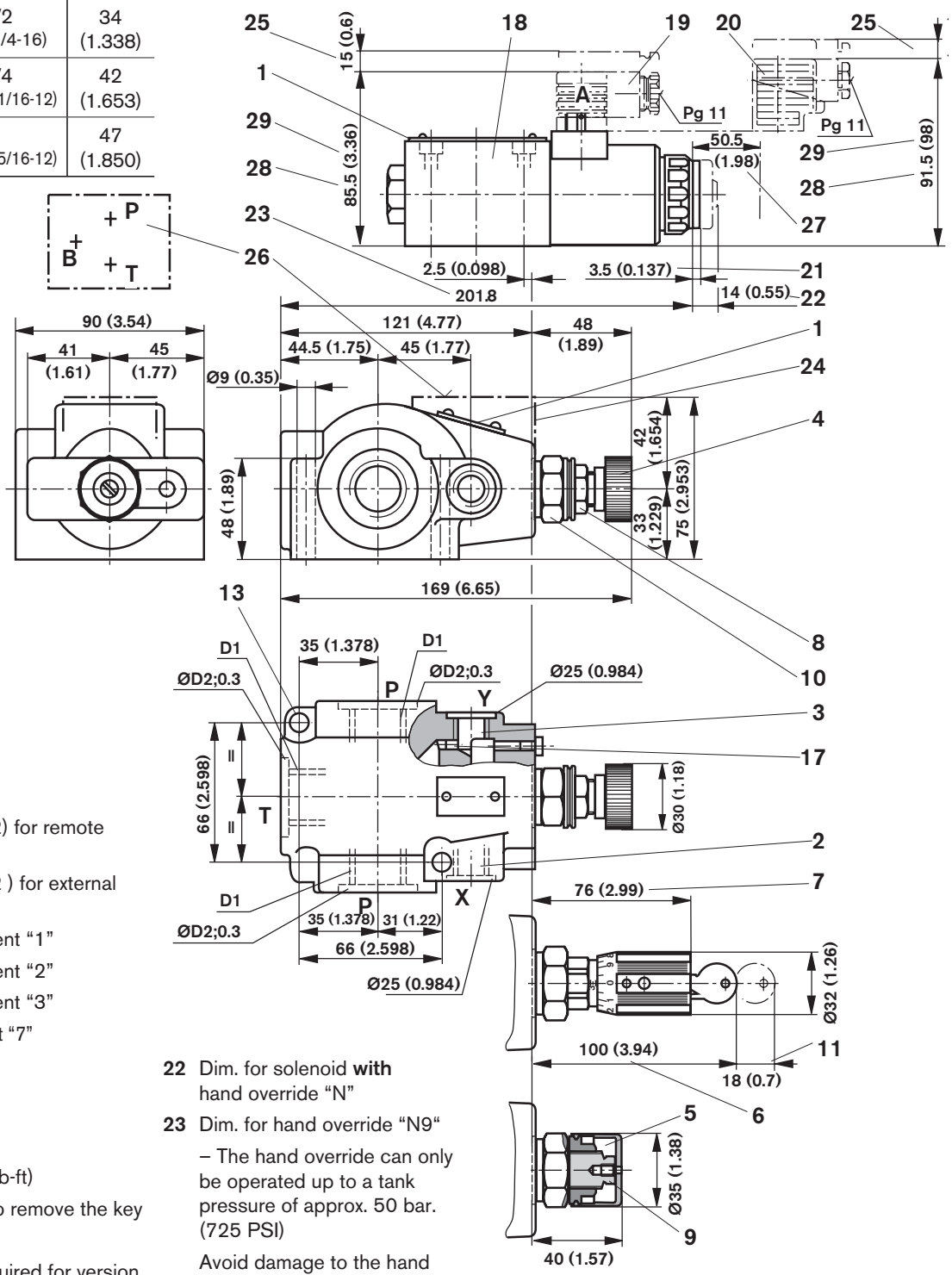
[1)] It is **not** permissible to use the stated subplates with design tested valves!

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Unit dimensions: threaded connections – dimensions in millimeters (inches)

Valve type	D1	Ø D2
DB.10.G	G 1/2 (SAE-8; 3/4-16)	34 (1.338)
DB.15.G	G 3/4 (SAE-12; 1-1/16-12)	42 (1.653)
DB.20.G	G 1 (SAE-16; 1-5/16-12)	47 (1.850)



1 Name plate

2 Port X (G 1/4; 12) for remote control

3 Port Y (G 1/4; 12) for external pilot oil drain

4 Adjustment element “1”

5 Adjustment element “2”

6 Adjustment element “3”

7 Adjustment element “7”

8 Locknut 22A/F

9 Hexagon 10A/F

10 Hexagon 30A/F tightening torque $M_A = 50$ Nm (36lb-ft)

11 Space required to remove the key

13 Valve fixing holes

17 Set scres not required for version with internal pilot oil drain

18 Directional valve NS 6 (for dimensions see catalogue sheet RE 23 178)

19 Plug-in connector **without** circuitry [1)]

20 Plug-in connector **with** circuitry [1)]

21 Dim. for solenoid **without** hand override “N”

22 Dim. for solenoid **with** hand override “N”

23 Dim. for hand override “N9“

– The hand override can only be operated up to a tank pressure of approx. 50 bar. (725 PSI)

Avoid damage to the hand override pin bore!

24 Housing for version with built-on directional valve (DBW..G..)

25 Space required to remove the plug-in connector

26 Valve mounting surface port A is not drilled

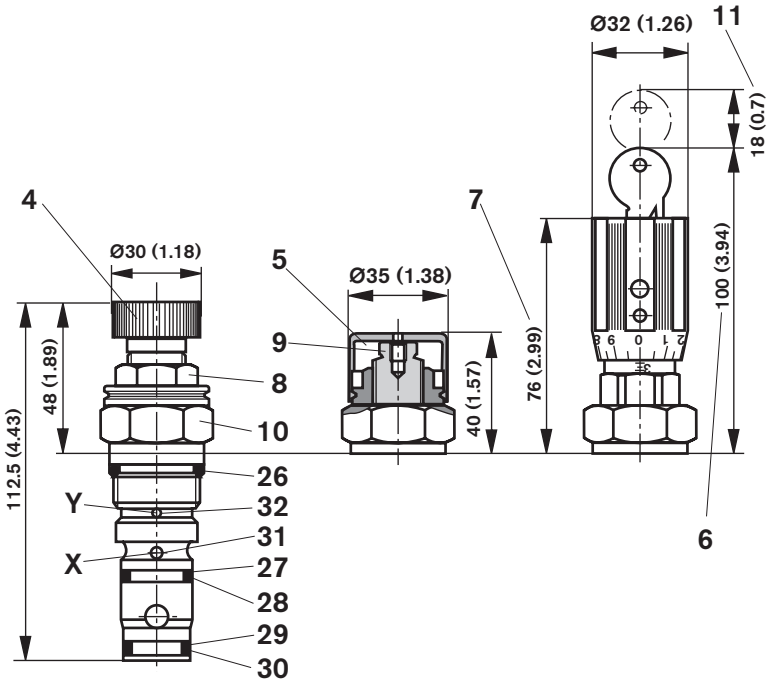
27 Space required to remove the coil

28 Dim. for valve with a DC voltage

29 Dim. ( ) for a valve with an AC voltage

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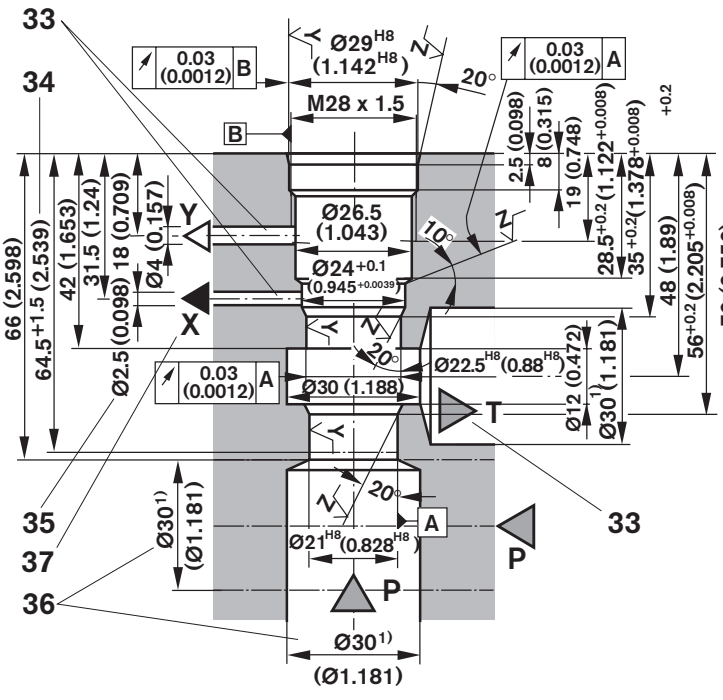
Unit dimensions: cartridge valve types DB 20 K...XY and Y – dimensions in mm (inches)



- **4** Adjustment element "1"
- **5** Adjustment element "2"
- **6** Adjustment element "3"
- **7** Adjustment element "7"
- **8** Locknut 22A/F
- **9** Hexagon 10A/F
- **10** Hexagon 30A/F tightening torque $M_A = 50$ Nm (36 lb-ft)
- **11** Space required to remove the key
- **26** Seal ring
- **27** Seal ring [2]
- **28** Back-up ring [2]
- **29** Seal ring
- **30** 2 back-up rings
- **31** Drilling for port "X" **not** provided for type DB 20 K..-1X/..**Y**..
- **32** Drilling for port "Y" provided for type DB 20 K.-1X/..**XY** and type DB 20 K.-1X/..**Y**

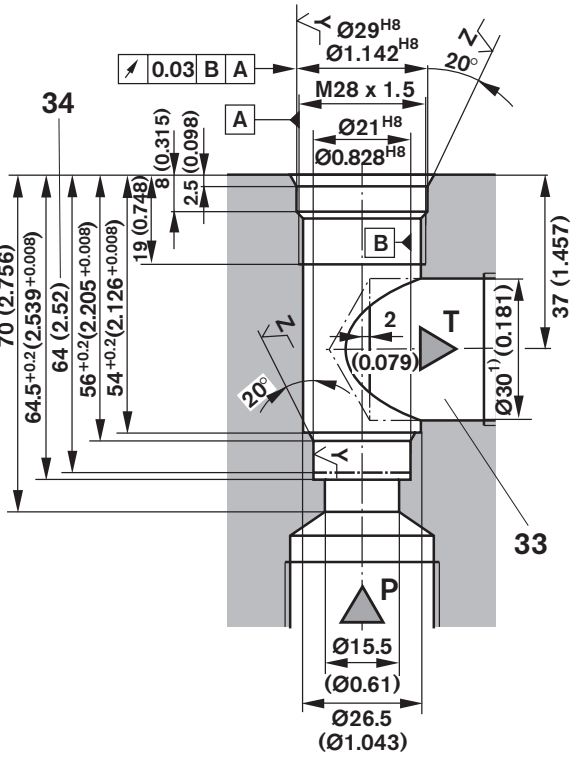
Cartridge valve mounting cavity

Version "XY" and design tested valves DB 20 K../..Y..E (without X port)



Cartridge valve mounting cavity

Version "Y"(internal pilot oil supply and pilot oil drain)



- **33** Drilling X, Y and T optional about the circumference with type DB 20 K.-1X/..**XY**..
  Drilling B optional about the circumference with type DB 20 K.-1X/..**Y**..
- **34** Depth of fit
- **35** Drilling Ø 2.5 (0.098 in) only when required
- **36** Drilling P, optional
- **37** Port "X" for design tested valves type DB 20 K../..**Y..E must not** be drilled, is without function!

[1] Maximum dimensions

[2] Deleted with type DB 20 K.-1X/..**Y**..

$\sqrt{Y} = \sqrt{R_z 8}$

$\sqrt{Z} = \sqrt{R_z 16}$

Standard types

Type	Material No.
DB 20 K2-1X/50XY	R900470296
DB 20 K2-1X/100XY	R900470297
DB 20 K2-1X/200XY	R900470298
DB 20 K2-1X/315XY	R900493939
DB 10 G2-4X/50W65	R900403149
DB 10 G2-4X/100W65	R900405532
DB 10 G2-4X/200W65	R900404262
DB 10 G2-4X/315W65	R900441994
DB 10-2-4X/50W65	R900517879
DB 10-2-4X/100W65	R900593404
DB 10-2-4X/200W65	R900368564
DB 10-2-4X/315W65	R900592765
DB 10-2-4X/350W65	R900597122
DB 20 G2-4X/50W65	R900479678
DB 20 G2-4X/100W65	R900407106
DB 20 G2-4X/200W65	R900401564
DB 20 G2-4X/315W65	R900423704
DB 20 G2-4X/350W65	R900402410
DB 20-2-4X/50W65	R900503495
DB 20-2-4X/200W65	R900503250
DB 20-2-4X/315W65	R900592968
DB 20-2-4X/315XW65	R900510838
DB 20-2-4X/350W65	R900593586

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