

# Pressure relief valve, pilot operated

RA 25818/08.03  
Replaces: 08.99

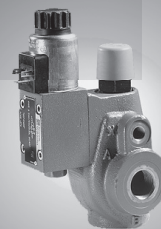
1/12

## 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.

## Ordering details

DB					-	/											*
----	--	--	--	--	---	---	--	--	--	--	--	--	--	--	--	--	---

Pressure relief valve = DB

Without directional valve = No code

With built-on directional valve = W<sup>1)</sup>Further details  
in clear text

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

## Design tested:

No code = Without

E = Safety valve  
with  
design testing  
to DGRL 97/23/EGW65 = Vertical cartridge  
(ordering details  
are not required for  
cartridge valve "K")

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!Electrical connection<sup>2)</sup>K4<sup>6)</sup> = Without plug-in connector  
Individual connection with  
component plug DIN EN 175 301-803No code<sup>2)</sup> = Without hand overrideN<sup>2)</sup> = With hand overrideN9<sup>2)</sup> = With protected hand overrideG24<sup>2)</sup> = 24 V DCW230<sup>2)</sup> = 230 V AC 50/60 Hz

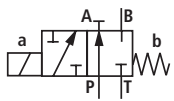
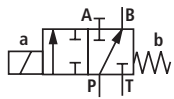
No code = } Without directional valve

6E<sup>2)</sup> = } With directional valve NS 6

No code = Lowest circulation pressure

U<sup>4)</sup> = See characteristic curves on page 7

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

Normally closed = A<sup>2)</sup>Normally open = B<sup>2)</sup>

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<sup>3)</sup>

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 = -<sup>5)</sup>

External pilot oil supply, internal pilot oil drain Also see = X

Internal pilot oil supply, external pilot oil drain symbols = Y

External pilot oil supply and pilot oil drain on page 4 = XY

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 supply4) 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!

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

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

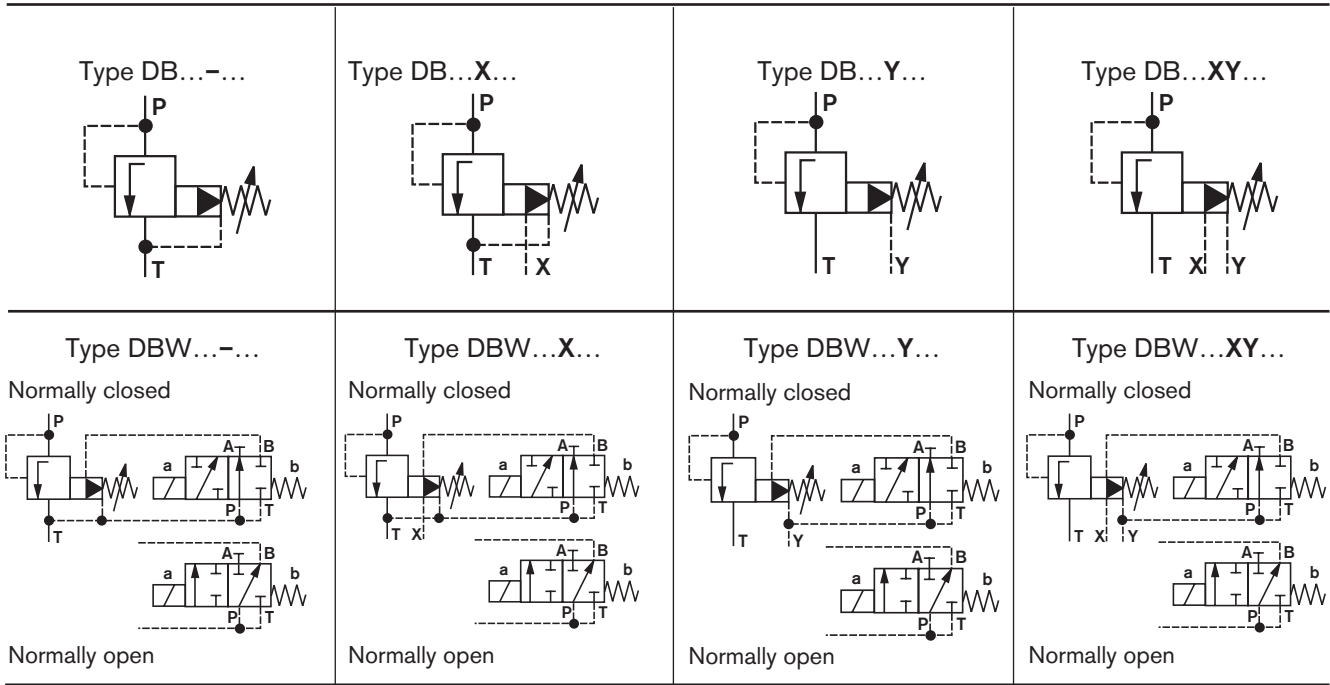
NS	Designation	Component identification	Max. permissible flow $q_{Vmax}$ in L/min (GPM)	Set response over pressure $p$ in bar (PSI)
25	DB 20 K <input type="checkbox"/> <sup>1</sup> -1X/ <input type="checkbox"/> <sup>2</sup> Y <input type="checkbox"/> <sup>3</sup> E	TÜV.SV. <input type="checkbox"/> -1001.14,4.F.G.p	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)

- <sup>1</sup>
- 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
- <sup>2</sup>
- The pressure details contained within the type code are to be entered by the customer e.g. = 150  
Pressure adjustments  $\geq 30$  bar (435 PSI) and in 5 bar ( 72 PSI) steps are possible.
- <sup>3</sup>
- 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!

**Symbols**



**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.

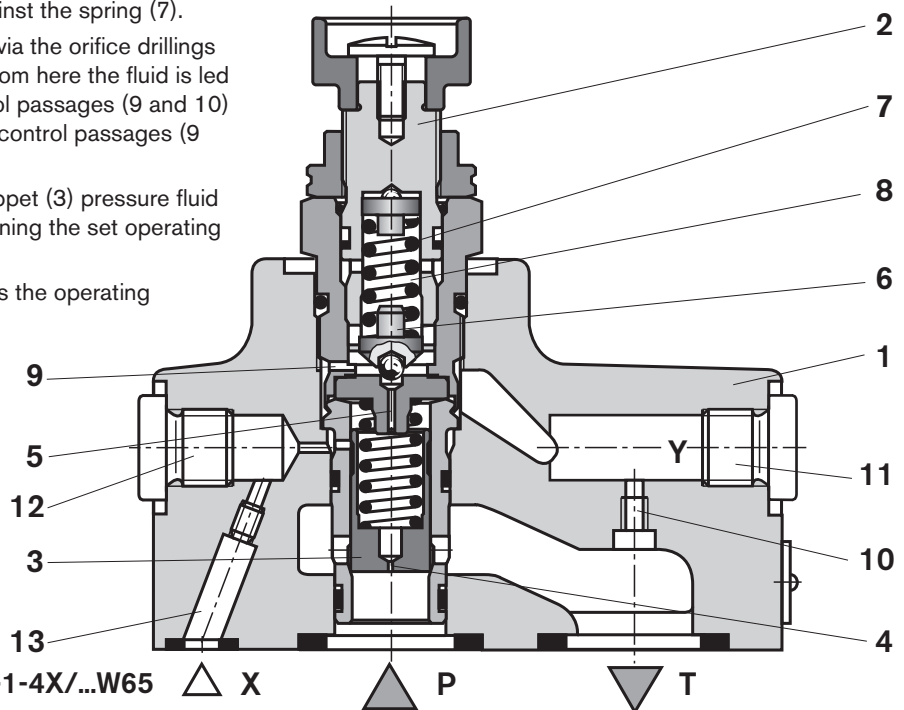
A pressure gauge connection (12) allows the operating pressure to be monitored.

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.



**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,  $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ )

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 <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 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 <sup>2</sup> /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 <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 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.

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

### 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 <sup>2</sup> /s (SUS)	12 to 230	

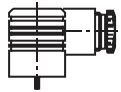
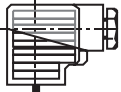
<sup>1)</sup> For applications outside these parameters, please consult us!

### 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.

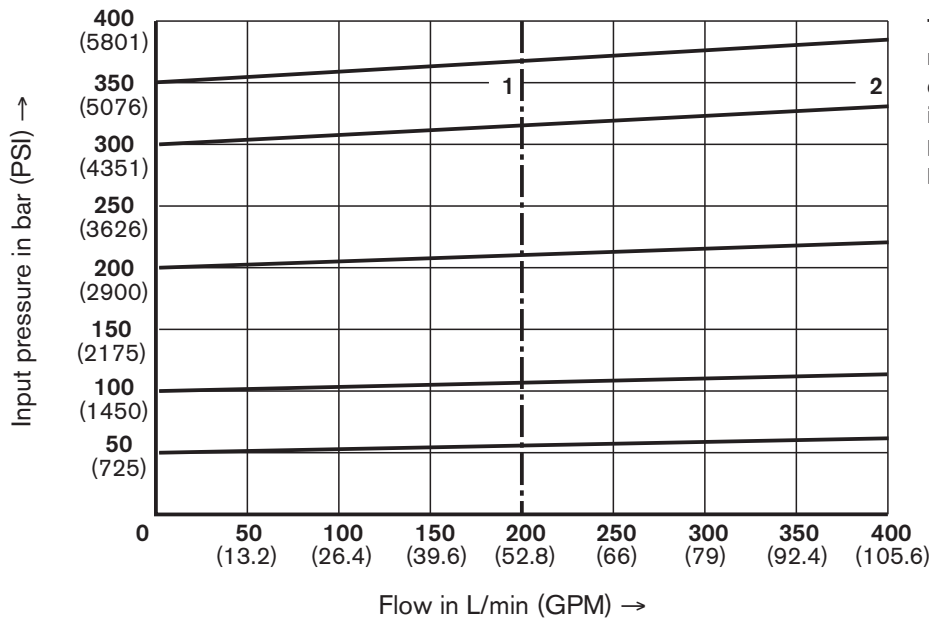
Example: The valve pressure setting resulting from the spring loading (Pos. 7 on page 4) in the pilot control valve/ adjustment unit  $p_{\text{spring}} = 200 \text{ bar (2900 PSI)}$  Hydraulic back pressure in port T with internal pilot oil drain  $p_{\text{hydraulic}} = 50 \text{ bar (725 PSI)}$  =>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

### 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					
		<b>Material No.</b>			
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	<b>R900074683</b>	-	-	-
a/b	Black	-	<b>R900057292</b>	<b>R900313933</b>	<b>R900310995</b>

**Characteristic curves** – measured with HLP 46,  $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$  (104 °F  $\pm$  41 °F)

**Input pressure in relation to the flow**

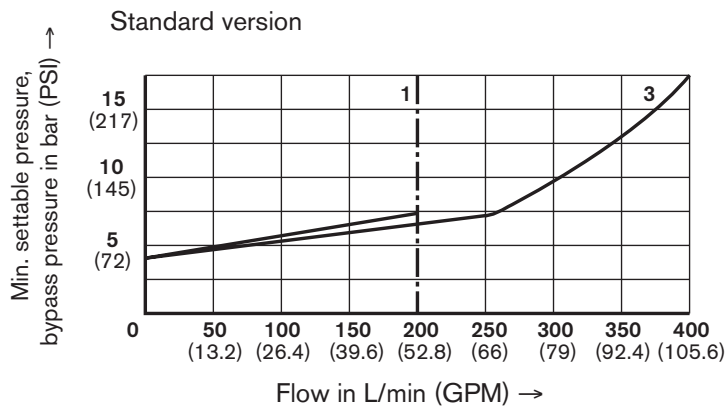


These characteristic curves were measured with external pilot oil drain at zero pressure. With an internal pilot oil drain, the input pressure increases by the output pressure present in port T.

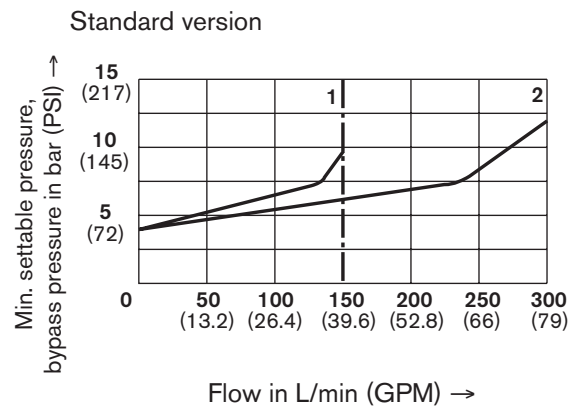
- 1 NS 10
- 2 NS 25

**Minimum settable pressure and bypass pressure in relation to the flow <sup>1)</sup>**

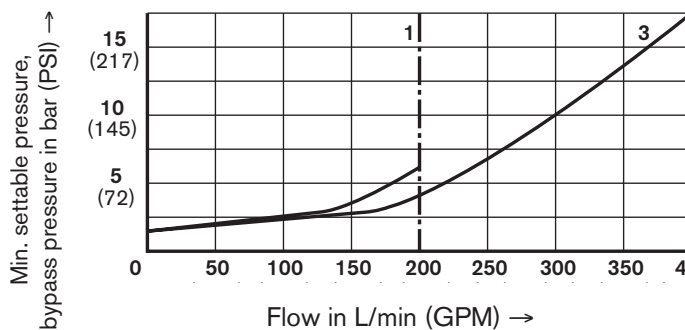
**Subplate mounting**



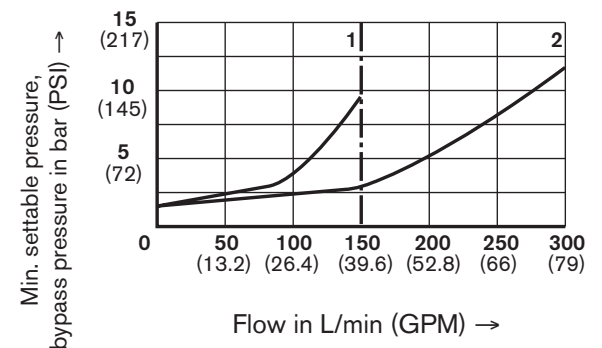
**Threaded connections and cartridge valve**



**Version "U"**



**Version "U"**



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

<sup>1)</sup> The characteristic curves are valid for an output pressure = zero over the entire flow range!

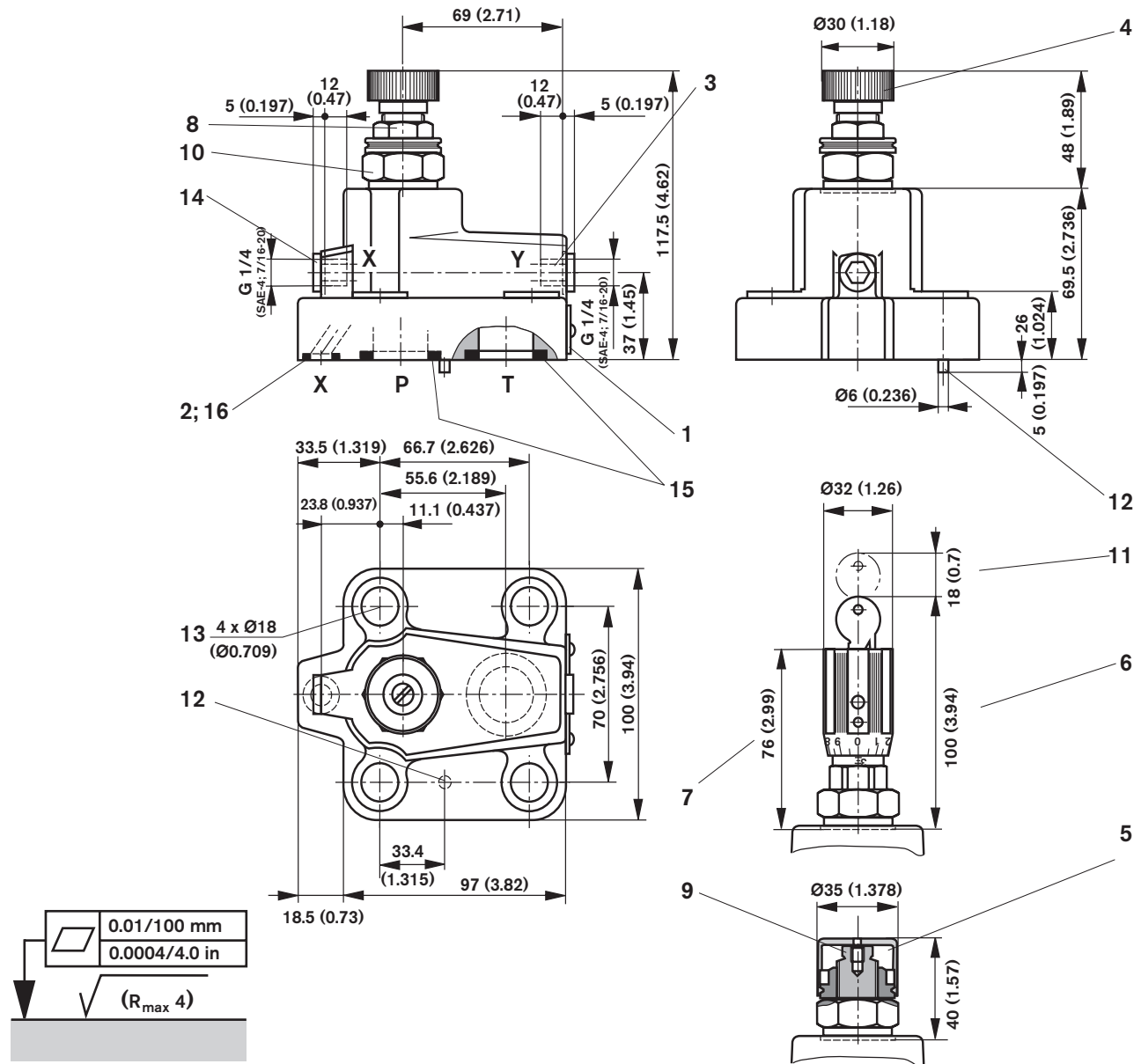






Unit dimensions: subplate mounting – dimensions in mm (inches)

NS 25



Required surface finish of the mating piece

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

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

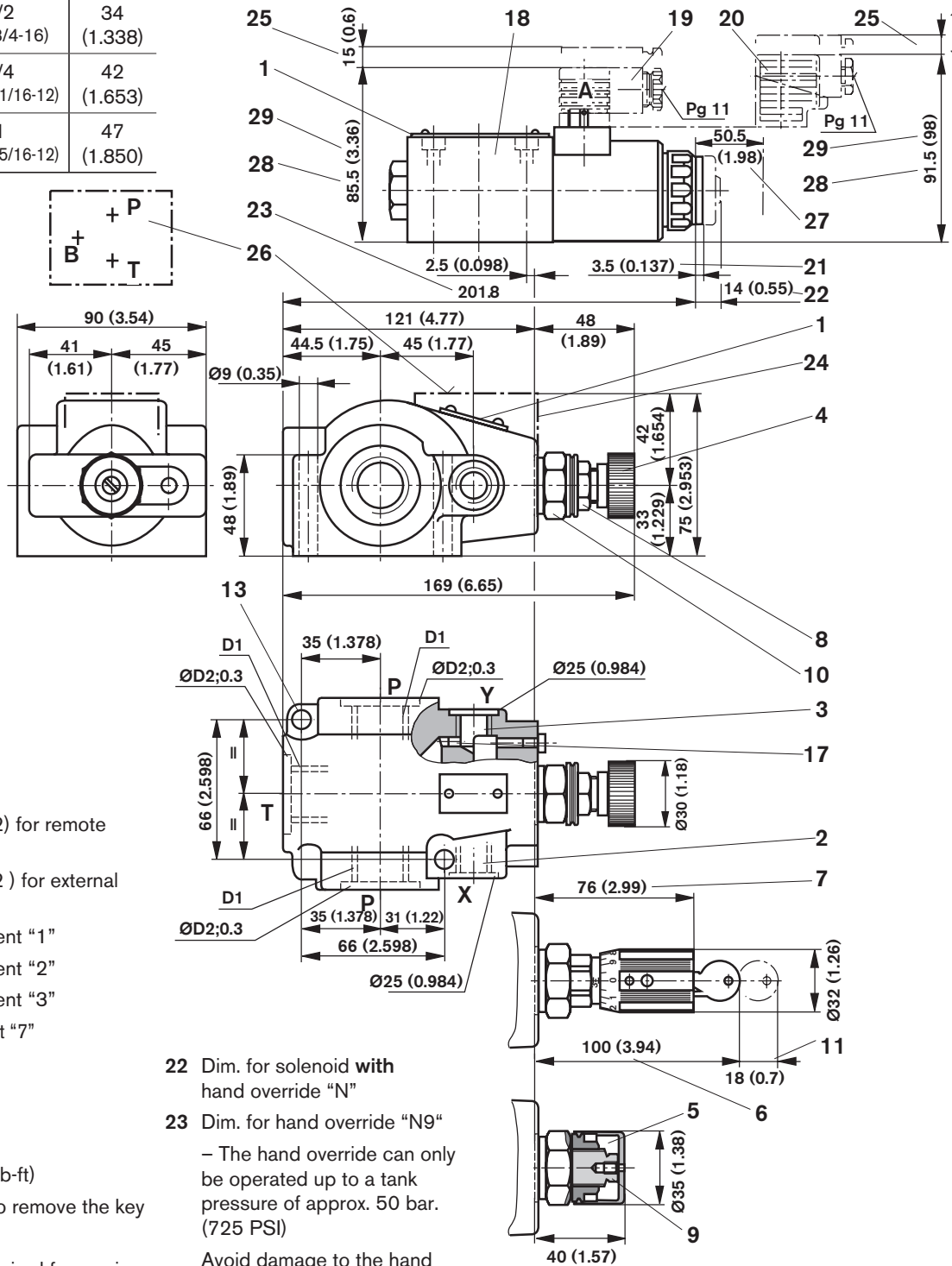
**Subplates** G 408/01, G 3/4 <sup>1)</sup>  
G408/12 (SAE-12; 11/16-12)  
G 409/01, G 1 <sup>1)</sup>  
G409/12 (SAE-16; 15/16-20)

**Valve fixing screws**  
M16 x 50 DIN 912-10.9,  
(5/8-11 UNC x 2")  
 $M_A = 310 \text{ Nm}$  (228 lb-ft)

<sup>1)</sup> It is **not** permissible to use the stated subplates with design tested valves!

**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)

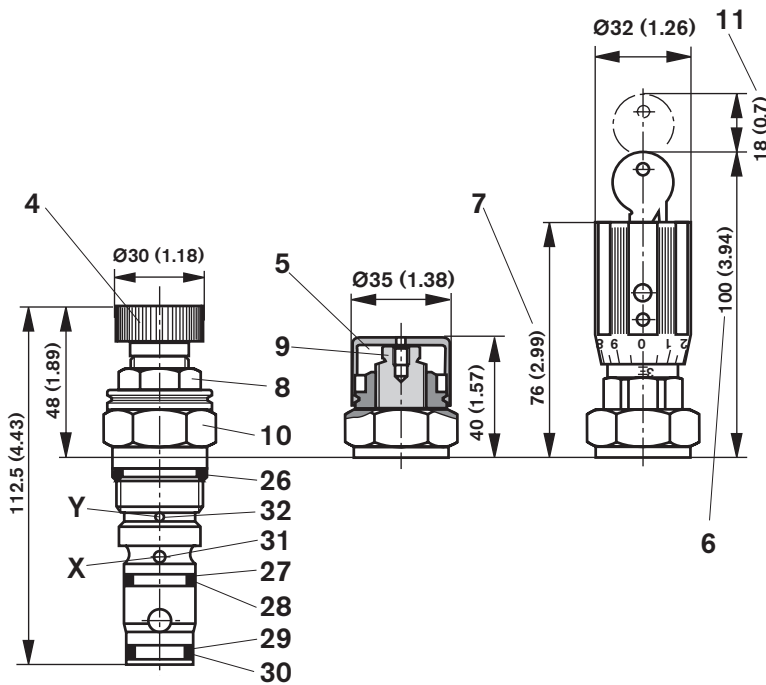


- 1 Name plate
- 2 Port X (G 1/4; 12) for remote control
- 3 Port Y (G 1/4; 12) for external pilot oil drain
- 4 Adjustment element "1"
- 5 Adjustment element "2"
- 6 Adjustment element "3"
- 7 Adjustment element "7"
- 8 Locknut 22A/F
- 9 Hexagon 10A/F
- 10 Hexagon 30A/F tightening torque  $M_A = 50 \text{ Nm (36lb-ft)}$
- 11 Space required to remove the key
- 13 Valve fixing holes
- 17 Set screws 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 <sup>1)</sup>
- 20 Plug-in connector **with** circuitry <sup>1)</sup>
- 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)
- 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

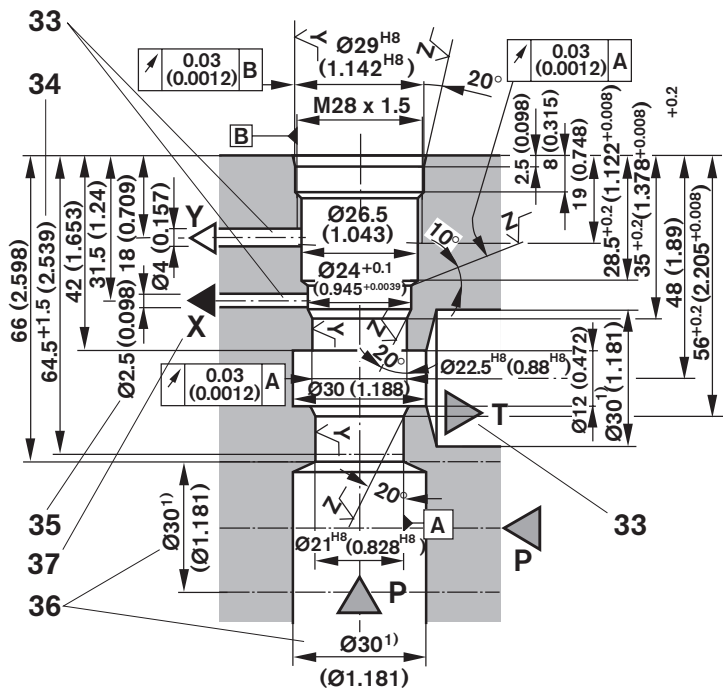
Unit dimensions: cartridge valve types DB 20 K...XY and Y – dimensions in mm (inches)



- 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  $M_A = 50 \text{ Nm}$  (36 lb-ft)
- 11 Space required to remove the key
- 26 Seal ring
- 27 Seal ring<sup>2)</sup>
- 28 Back-up ring<sup>2)</sup>
- 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

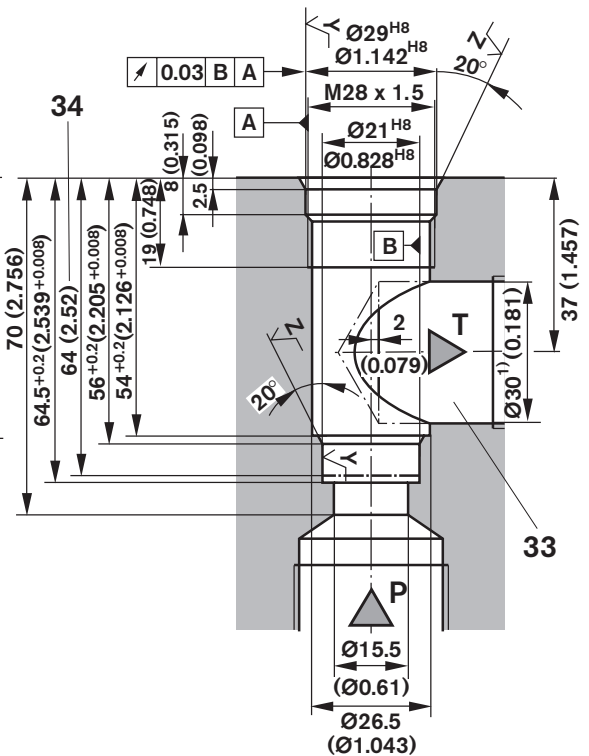
Version "XY" and design tested valves DB 20 K../..Y..E (without X port)



- 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  $\varnothing 2.5$  (0.098 in) only when required

Cartridge valve mounting cavity

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



- 36 Drilling P, optional
- 37 Port "X" for design tested valves type DB 20 K../..Y..E **must not** be drilled, is without function!

<sup>1)</sup> Maximum dimensions

<sup>2)</sup> Deleted with type DB 20 K.-1X/..Y..

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

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

## 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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