

# Proportional pressure reducing valve, pilot operated, with DC motor operation

## Type DRS and ZDRS

**RE 29173**

Edition: 2015-10

Replaces: 2014-10



- ▶ Size 6
- ▶ Component series 1X
- ▶ Maximum operating pressure 210 bar
- ▶ Maximum flow 30 l/min

### Features

- ▶ Pressure reduction at ports A or P① with pressure limitation
- ▶ For subplate mounting
- ▶ Porting pattern according to ISO 4401-03-02-0-05
- ▶ As a sandwich plate valve
- ▶ Self-locking DC motor → on failure of the supply voltage or error message from the control electronics, the pressure setting is retained
- ▶ Position feedback
- ▶ Built-in pressure monitoring, optional

### Contents

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**Ordering codes**

|    |     |    |    |    |    |    |    |     |     |    |    |    |
|----|-----|----|----|----|----|----|----|-----|-----|----|----|----|
| 01 | 02  | 03 | 04 | 05 | 06 | 07 | 08 | 09  | 10  | 11 | 12 | 13 |
|    | DRS | 6  | -  | 1X | /  |    | M  | G24 | K32 |    | G  | *  |

|    |                   |                |
|----|-------------------|----------------|
| 01 | Subplate mounting | <b>no code</b> |
|    | Sandwich plate    | <b>Z</b>       |

|    |                                                 |            |
|----|-------------------------------------------------|------------|
| 02 | Pressure reducing valve with DC motor actuation | <b>DRS</b> |
|----|-------------------------------------------------|------------|

|    |        |          |
|----|--------|----------|
| 03 | Size 6 | <b>6</b> |
|----|--------|----------|

**Pressure reduction**

|    |                                      |                |
|----|--------------------------------------|----------------|
| 04 | In channel A (subplate mounting)     | <b>no code</b> |
|    | In channel P① (sandwich plate valve) | <b>VP</b>      |

|    |                                                                                          |           |
|----|------------------------------------------------------------------------------------------|-----------|
| 05 | Component series 10 ... 19 (10 ... 19: unchanged installation and connection dimensions) | <b>1X</b> |
|----|------------------------------------------------------------------------------------------|-----------|

**Pressure rating**

|    |         |            |
|----|---------|------------|
| 06 | 50 bar  | <b>50</b>  |
|    | 100 bar | <b>100</b> |
|    | 210 bar | <b>210</b> |

|    |                                                                |          |
|----|----------------------------------------------------------------|----------|
| 07 | <b>Without</b> pressure transducer on device                   | <b>A</b> |
|    | <b>With</b> pressure transducer on device (only version "100") | <b>S</b> |

|    |                            |          |
|----|----------------------------|----------|
| 08 | <b>Without</b> check valve | <b>M</b> |
|----|----------------------------|----------|

**Supply voltage of the control electronics**

|    |                     |            |
|----|---------------------|------------|
| 09 | Direct voltage 24 V | <b>G24</b> |
|----|---------------------|------------|

**Electrical connection**

|    |                                                          |                          |
|----|----------------------------------------------------------|--------------------------|
| 10 | <b>Without</b> mating connector; connector type GO51FAVM | <b>K32</b> <sup>1)</sup> |
|----|----------------------------------------------------------|--------------------------|

**Seal material**

|    |                                                                                    |          |
|----|------------------------------------------------------------------------------------|----------|
| 11 | NBR seals                                                                          | <b>M</b> |
|    | FKM seals                                                                          | <b>V</b> |
|    | Observe compatibility of seals with hydraulic fluid used! (Other seals on request) |          |

|    |                               |          |
|----|-------------------------------|----------|
| 12 | <b>With</b> position feedback | <b>G</b> |
|----|-------------------------------|----------|

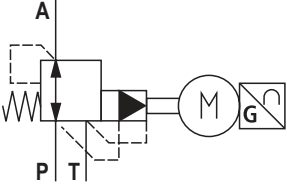
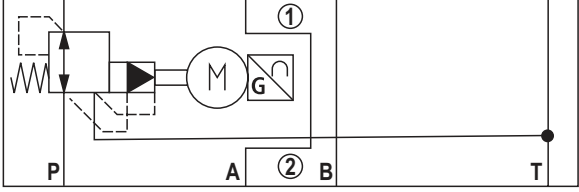
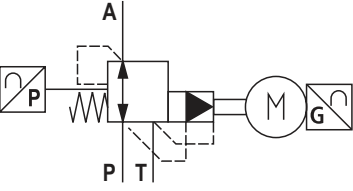
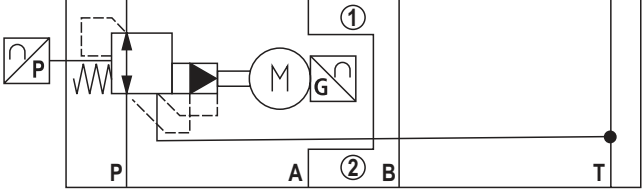
|    |                                   |          |
|----|-----------------------------------|----------|
| 13 | Further details in the plain text | <b>*</b> |
|----|-----------------------------------|----------|

<sup>1)</sup> For mating connectors, separate order, see page 14.



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

**Symbols** (① = component side, ② = plate side)

| Type DRS                                                                                                                                 | Type ZDRS                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Version “A”(without pressure transducer)</b></p>  | <p><b>Version “A”(without pressure transducer)</b></p>  |
| <p><b>Version “S” (with pressure transducer)</b></p>    | <p><b>Version “S” (with pressure transducer)</b></p>    |

**Function, section: Type DRS**

Valves of type DRS are pilot operated 3-way pressure reducing valves with pressure limitation of the actuator. They are used for reducing a system pressure.

**Set-up**

The valves consist of three main assemblies:

- ▶ Pilot control valve (1)
- ▶ DC motor (2) with position feedback
- ▶ Main valve (3) with main spool (4)
- ▶ With or without pressure transducer, optional (18)

**Function**

- ▶ Setting of the pressure to be reduced in channel A based on the command value via the DC motor (2).
- ▶ If port P is depressurized, spring (17) holds the main spool (4) in the starting position → connection from port A to T open, port P to A blocked.
- ▶ Pressure connection from port P to the ring channel (5). Pilot oil flows through bore (6) via the flow controller (7) into the pilot control chamber (16), via the nozzle (8), the throttle gap (9) into the chamber (10) and through the bores (11, 12) to port T

**Pressure reduction**

- ▶ Build-up of the pilot pressure in the pilot control chamber (16) as function of the command value.
- ▶ Movement of the main spool (4) to the right, hydraulic fluid flows from P to A
- ▶ Actuator pressure pending in port A to the spring chamber (15) via channel (13) and nozzle (14).
- ▶ Increase in the pressure in port A to the command pressure set leads to the movement of the main spool (4) to the left into the control position. The pressure in port A is almost identical with the set pressure at pilot control valve (1).

**Pressure limitation** does not work if contaminated.

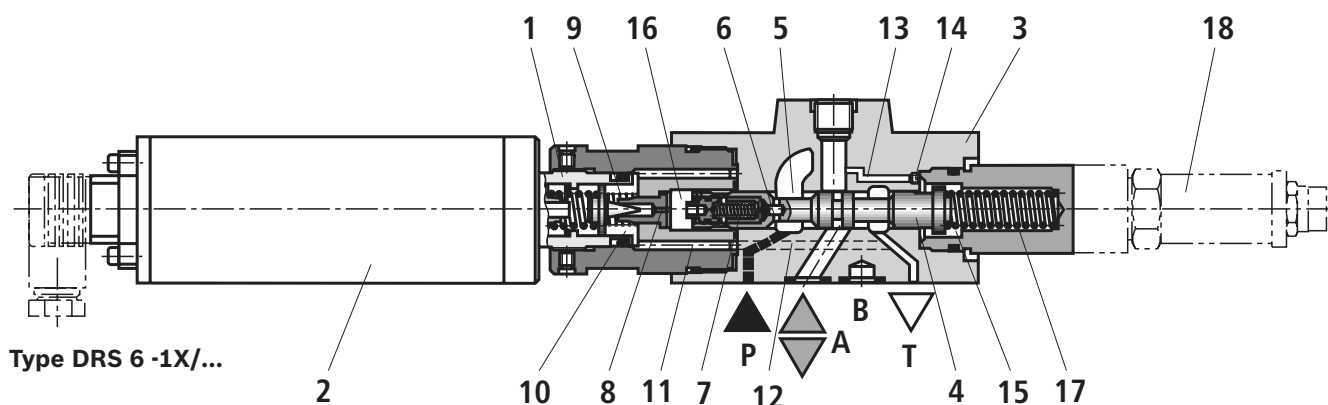
- ▶ If the pressure in port A exceeds the command pressure set, the main spool (4) is moved further to the left.
- ▶ This closes the connection from P to A, opens the connection from P to T and limits the pressure pending in port A in accordance with the command value set.

**Pressure monitoring**

For valves with built-in pressure transducers, this is connected to the electronics system and used for recording and monitoring the pressure set. Another alternative is a valve without a built-in pressure transducer, but with a pressure measurement sandwich plate. (For example applications, see data sheet 62003)

**Notice:**

If the voltage supply to the control electronics is switched off or fails, the DC motor stays in its current position and therefore the last pressure set is also retained if the hydraulic supply is in place.



## Function, section: Type ZDRS

Valves of type ZDRS are pilot operated 3-way pressure reducing valves with pressure limitation of the actuator. They are used for reducing a system pressure.

### Set-up

The valves consist of three main assemblies:

- ▶ Pilot control valve (1)
- ▶ DC motor (2) with position feedback
- ▶ Main valve (3) with main spool (4)
- ▶ With or without pressure transducer, optional (18)

### Function

- ▶ Setting of the pressure to be reduced in channel A based on the command value via the DC motor (2).
- ▶ If port P is depressurized, spring (17) holds the main spool (4) in the starting position → connection from port A to T is open, port P to A blocked
- ▶ Pressure connection from port P to the ring channel (5). Pilot oil flows through bore (6) via the flow controller (7) into the pilot control chamber (16), via the nozzle (8) and the throttle gap (9) into the chamber (10) and through the bores (11, 12) to port T

### Pressure reduction

- ▶ Build-up of the pilot pressure in the pilot control chamber (16) as function of the command value.
- ▶ Movement of the main spool (4) to the right, hydraulic fluid flows from P to A
- ▶ Actuator pressure pending in port A to the spring chamber (15) via channel (13) and nozzle (14).
- ▶ Increase in the pressure in port A to the command pressure set leads to the movement of the main spool (4) to the left into the control position. The pressure in port A is almost identical with the set pressure at pilot control valve (1).

**Pressure limitation** does not work if contaminated.

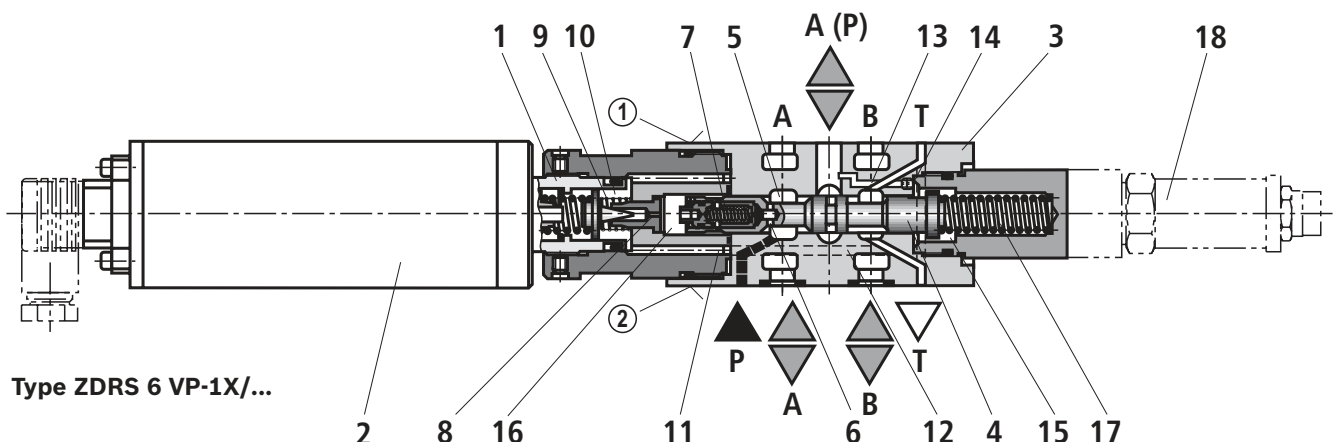
- ▶ If the pressure in port A (P①) exceeds the command pressure set, the main spool (4) is moved further to the left.
- ▶ This closes the connection from P to A (P①), opens the connection from P① to T and limits the pressure pending in port A (P①) in accordance with the command value set.

### Pressure monitoring

For valves with built-in pressure transducers, this is connected to the electronics system and used to record and monitor the pressure set in channel P①. Another alternative is a valve without a built-in pressure transducer, but with a pressure measurement sandwich plate. (For example applications, see data sheet 62003)

#### **Notice:**

If the voltage supply to the control electronics is switched off or fails, the DC motor stays in its current position and therefore the last pressure set is also retained if the hydraulic supply is in place.



Type ZDRS 6 VP-1X/...

**Technical data**

(For applications outside these parameters, please consult us!)

| <b>General</b>                                                                                                  |                           |                              |                                                                                   |
|-----------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------|-----------------------------------------------------------------------------------|
| Installation position                                                                                           |                           | Any (preferably horizontal)  |                                                                                   |
| Weight                                                                                                          | ► Type DRS                | kg                           | 1.6                                                                               |
|                                                                                                                 | ► Type ZDRS               | kg                           | 1.5                                                                               |
| Storage temperature range                                                                                       |                           | °C                           | -20 ... +80                                                                       |
| Ambient temperature range                                                                                       |                           | °C                           | -20 ... +60                                                                       |
| <b>Hydraulic</b>                                                                                                |                           |                              |                                                                                   |
| Maximum operating pressure                                                                                      | ► Port P, P②              | bar                          | 250                                                                               |
|                                                                                                                 | ► Port P①, A, B           | bar                          | 210                                                                               |
|                                                                                                                 | ► Port T                  | bar                          | separately to tank <sup>1)</sup> at zero pressure (volume flow 30 l/min possible) |
| Maximum set pressure in channel P① and A                                                                        | ► Pressure rating 50 bar  | bar                          | 50                                                                                |
|                                                                                                                 | ► Pressure rating 100 bar | bar                          | 100                                                                               |
|                                                                                                                 | ► Pressure rating 210 bar | bar                          | 210                                                                               |
| Minimum pressure in channel P or P②                                                                             |                           | bar                          | Set pressure in channel A or channel P① plus 20 bar                               |
| Minimum set pressure with command value 0 in channel A or P①                                                    |                           | bar                          | see characteristic curves page 10 (maximum 3 bar)                                 |
| Maximum flow                                                                                                    |                           | l/min                        | 30                                                                                |
| Pilot flow                                                                                                      |                           | l/min                        | 0.65                                                                              |
| Hydraulic fluid                                                                                                 |                           | see table on page 7          |                                                                                   |
| Maximum permissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c) |                           | Class 20/18/15 <sup>2)</sup> |                                                                                   |
| Hydraulic fluid temperature range                                                                               |                           | °C                           | -20 ... +80                                                                       |
| Viscosity range                                                                                                 |                           | mm <sup>2</sup> /s           | 15 ... 280                                                                        |
| Hysteresis                                                                                                      |                           | %                            | < 2 of the maximum pressure which can be set                                      |
| Repetition accuracy                                                                                             |                           | %                            | < ± 1 of the maximum pressure which can be set                                    |
| Linearity                                                                                                       |                           | %                            | < 2 of the maximum pressure which can be set                                      |
| Response sensitivity                                                                                            |                           | %                            | < 0.5 of the maximum pressure which can be set                                    |
| Valve manufacturing tolerance of the command value pressure characteristic curve,                               |                           | %                            | < ± 6 of the maximum pressure which can be set <sup>3)</sup>                      |
| Step response $T_u + T_g$ <sup>4)</sup>                                                                         |                           | ms                           | < 500                                                                             |
|                                                                                                                 |                           |                              | ► 0 % → 100 %, 100 % → 0 %                                                        |

<sup>1)</sup> Pressures > 10 can destroy the motor.

<sup>2)</sup> The cleanliness classes stated for the components need to be maintained in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of the filters see [www.boschrexroth.com/filter](http://www.boschrexroth.com/filter).

<sup>3)</sup> By adjusting the zero point and the range in the electronics system, type VT-MRMA1-1-1X/V0/0, the manufacturing tolerance of the complete unit (valve + electronics) can be reduced.

<sup>4)</sup>  $T_u + T_g$  measured with standing hydraulic fluid column < 5 liters

**Notice:**

The technical data were determined at a viscosity of 46 mm<sup>2</sup>/s (HLP46; 40 °C).

## Technical data

(For applications outside these parameters, please consult us!)

| Hydraulic fluid |                      | Classification                                      | Suitable sealing materials | Standards | Data sheet |
|-----------------|----------------------|-----------------------------------------------------|----------------------------|-----------|------------|
| Mineral oils    |                      | HL, HLP                                             | NBR, FKM                   | DIN 51524 | 90220      |
| Bio-degradable  | ► Insoluble in water | HEES                                                | FKM                        | ISO 15380 | 90221      |
|                 | ► soluble in water   | HEPG                                                | FKM                        | ISO 15380 |            |
| Flame-resistant | ► water-free         | HFDU                                                | FKM                        | ISO 12922 | 90222      |
|                 | ► containing water   | HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620) | NBR                        | ISO 12922 | 90223      |



### Important Information on hydraulic fluids:

- For more information and data on the use of other hydraulic fluids, please refer to the above data sheets or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.

### ► Flame-resistant – containing water:

- Maximum pressure differential 210 bar, otherwise, increased cavitation.
- Pressure pre-loading at the tank port >20 % of the pressure differential, otherwise increased cavitation
- Life cycle as compared to operation with mineral oil HL, HLP 30 to 100 %

- **Bio-degradable and flame resistant:** When using these hydraulic fluids that are simultaneously zinc-solvent, zinc may accumulate (700 mg zinc per pole tube).

| Electrical: Valve                                   |    |                                                                                                 |
|-----------------------------------------------------|----|-------------------------------------------------------------------------------------------------|
| Nominal voltage                                     | V  | 18                                                                                              |
| Rated current                                       | A  | 0.5 ± 20%                                                                                       |
| Maximum continuous current                          | A  | 0.5                                                                                             |
| Connection resistance                               | Ω  | 9.9                                                                                             |
| Winding temperature                                 | °C | approx. 20                                                                                      |
|                                                     | K  | 100                                                                                             |
| Protection class of the valve according to EN 60529 |    | IP 65 (with mating connector mounted and locked)                                                |
| Electrical: Control electronics                     |    |                                                                                                 |
| Control electronics                                 |    | Amplifier type VT-MSPA1-11-1X/V0/0 in modular design (separate order) based on data sheet 30214 |



### Notices:

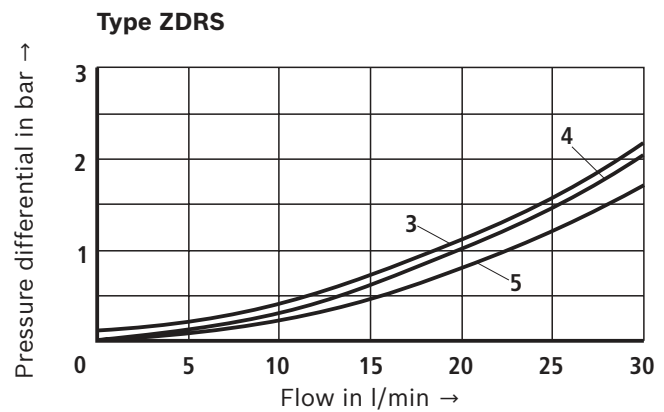
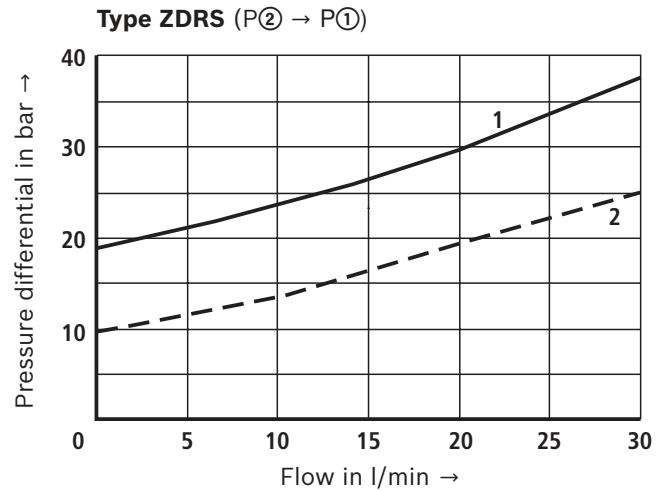
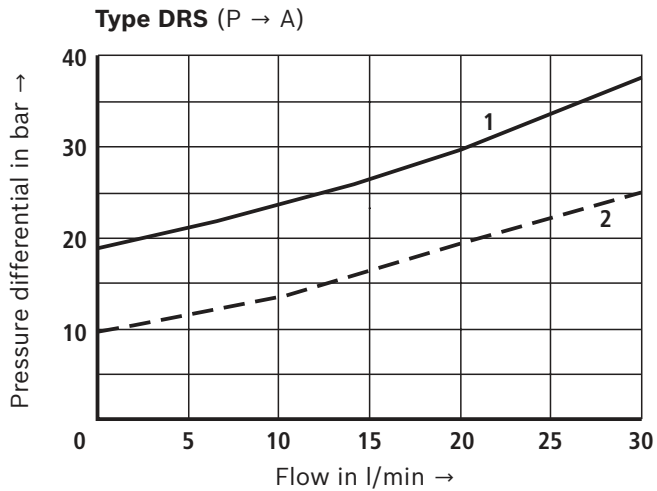
The valves must not be used for **safety-related machine functions** as only the electrical area is secured, not the hydraulic one. This means that if the hydraulic pressure in P falls to 0 bar, the actuator pressure (A) or secondary pressure (P①) is also 0.

**When establishing the electrical connection, the protective earthing conductor (PE  $\perp$ ) has to be connected correctly.**

## Characteristic curves

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

### $\Delta p$ - $q_v$ characteristic curves



#### Notice:

The pressure differential shown corresponds to the minimum pressure available in port P (P②) minus the maximum pressure to be controlled in port A (P①).

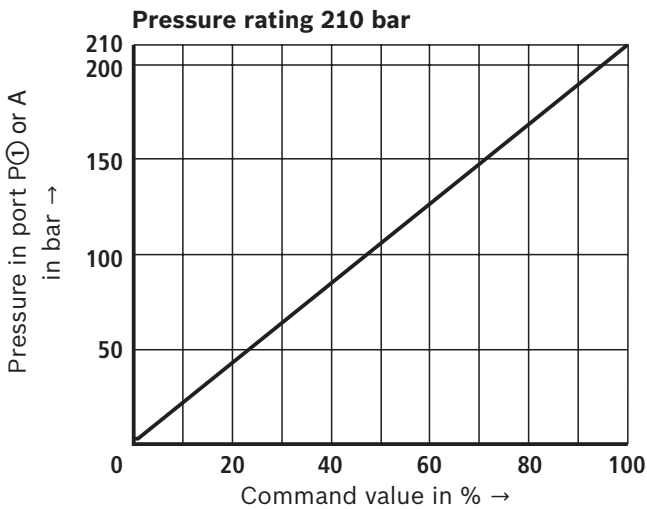
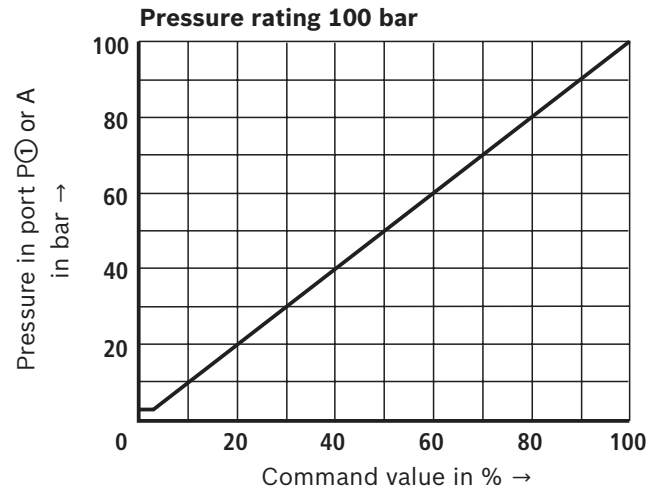
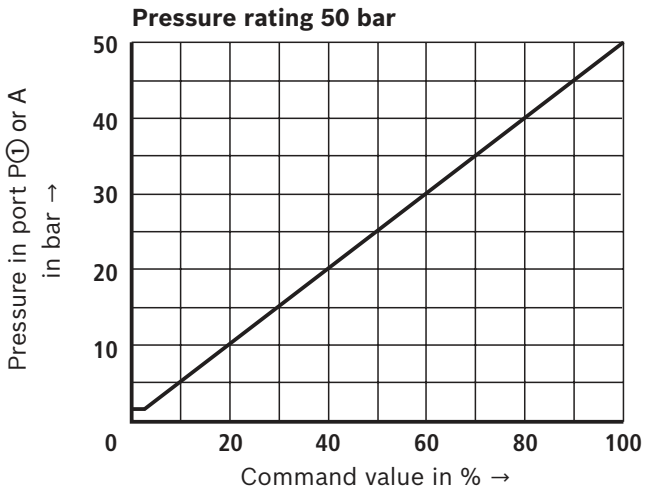
- 1 100/210 bar
- 2 50 bar
- 3 A① → A②
- 4 B① → B②
- 5 T① → T②



## Characteristic curves

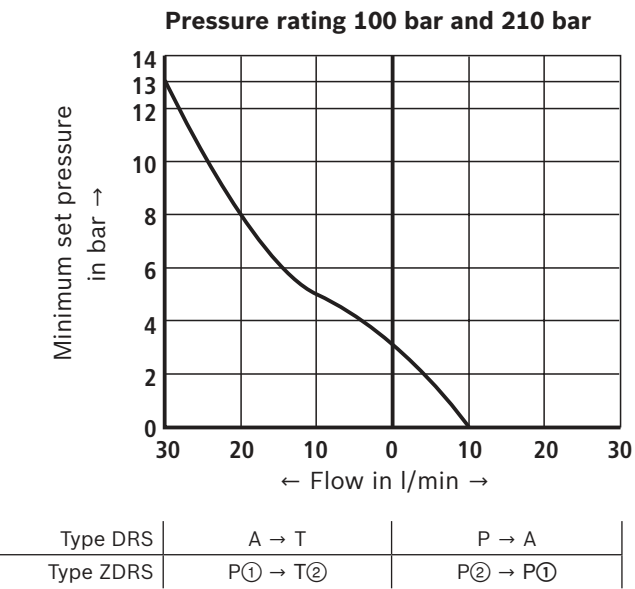
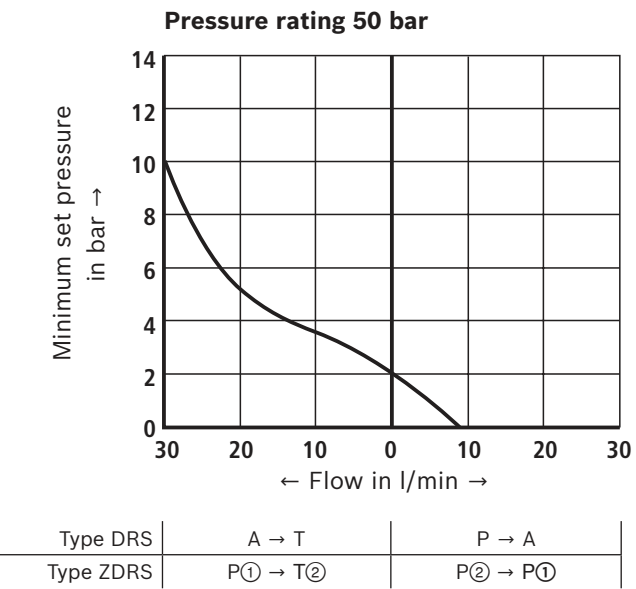
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$ )

Pressure in port P① or A depending on the command value



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

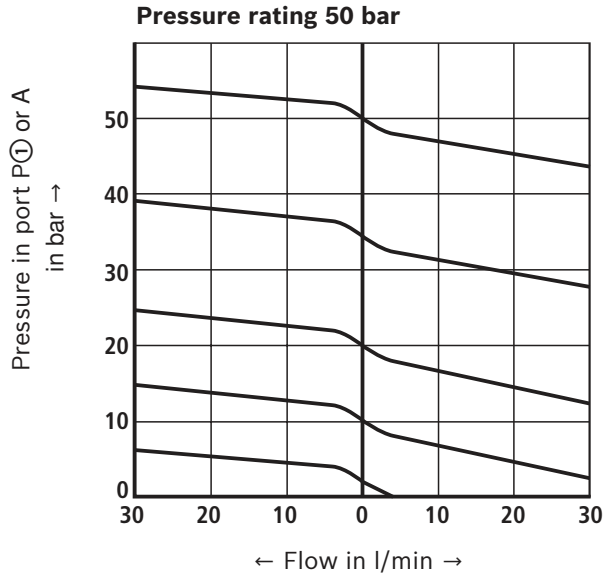
**Minimum set pressure in port P① or A with command value 0 V (without counter pressure in channel T or T①)**



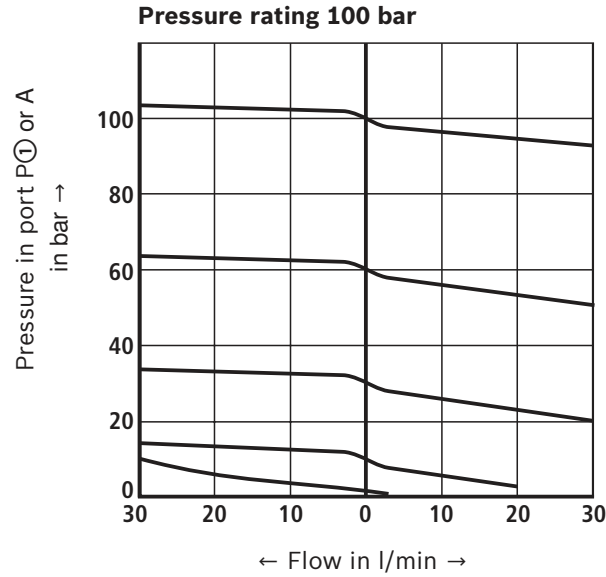
### Characteristic curves

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

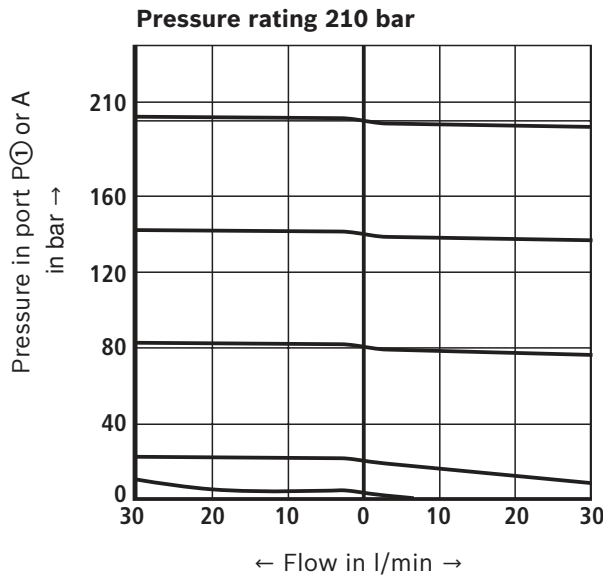
Pressure in port P① or A depending on the flow



|           |         |         |
|-----------|---------|---------|
| Type DRS  | A → T   | P → A   |
| Type ZDRS | P① → T② | P② → P① |

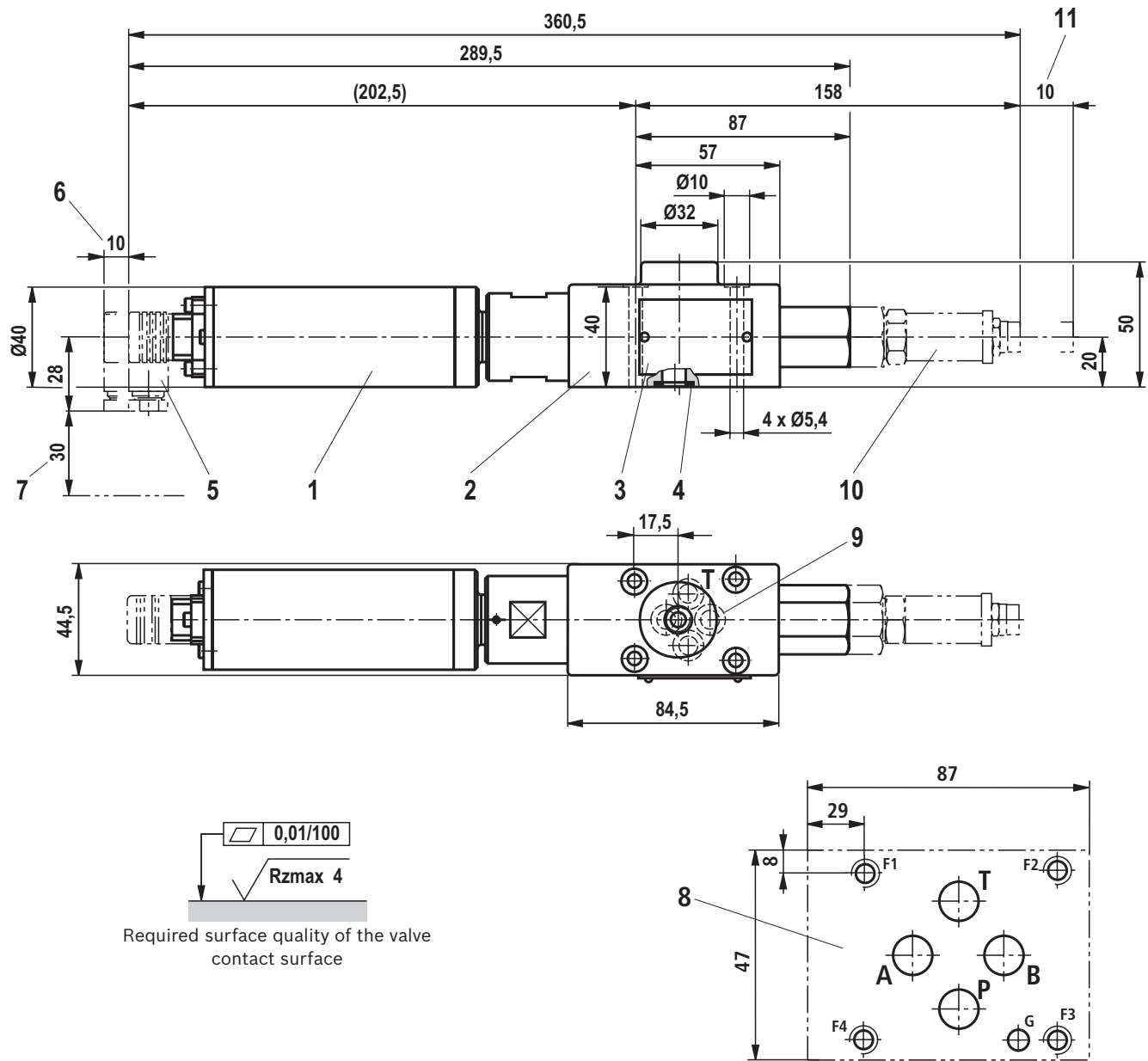


|           |         |         |
|-----------|---------|---------|
| Type DRS  | A → T   | P → A   |
| Type ZDRS | P① → T② | P② → P① |



|           |         |         |
|-----------|---------|---------|
| Type DRS  | A → T   | P → A   |
| Type ZDRS | P① → T② | P② → P① |

**Dimensions:** Type DRS  
(dimensions in mm)



- 1 DC motor
- 2 valve housing
- 3 Name plate
- 4 Identical seal rings for ports A, P, T and blind counterbore B
- 5 Mating connector, separate order, see page 14.
- 6 Space required to remove the mating connector
- 7 Space required for connecting cable
- Note:** The mating connector can be fitted offset by 4 x 90°.
- 8 Porting pattern according to ISO 4401-03-02-0-05 (Deviating from the standard, without locating pin)
- 9 Blind bore hole (port B)
- 10 Pressure transducer for version "S"
- 11 Space required to remove the mating connector

**For valve mounting screws and subplates, see page 14.**



Dimensions

Valve mounting screws (separate order)

| Type | Quantity | Hex socket head cap screws                                                                                                                                                          | Material number                            |
|------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| DRS  | 4        | ISO 4762 - M5 x 50 - 10.9-flZn-240h-L<br>(friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ );<br>tightening torque $M_A = 7 \text{ Nm} \pm 10 \%$                        | R913000064                                 |
|      | or       |                                                                                                                                                                                     |                                            |
|      | 4        | 4 hexagon socket head cap screws ISO 4762 - M5 x 50 - 10.9<br>(friction coefficient $\mu_{\text{total}} = 0.12 \dots 0.17$ );<br>tightening torque $M_A = 8.1 \text{ Nm} \pm 10 \%$ | Not included in the Rexroth delivery range |
| ZDRS | 4        | ISO 4762 - M5 - 10.9-flZn-240h-L<br>(friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ );<br>tightening torque $M_A = 7 \text{ Nm} \pm 10 \%$ ,                           | See notes                                  |
|      | or       |                                                                                                                                                                                     |                                            |
|      | 4        | ISO 4762 - M5 - 10.9<br>(friction coefficient $\mu_{\text{total}} = 0.12 \dots 0.17$ );<br>tightening torque $M_A = 8.1 \text{ Nm} \pm 10 \%$                                       | Not included in the Rexroth delivery range |

**Notices:**

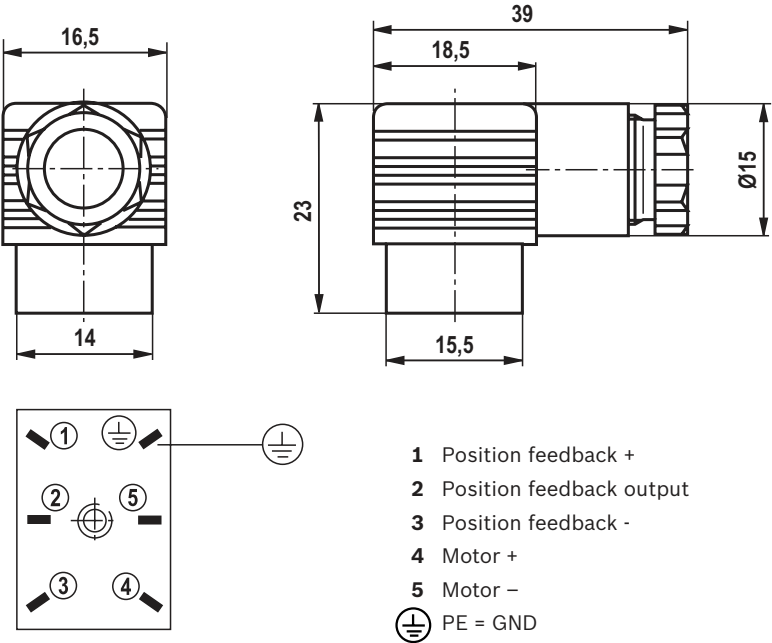
- ▶ The tightening torque of the hexagon socket head cap screws refers to the maximum operating pressure.
- ▶ Type ZDRS: Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Subplates(separate order)

| Size | Data sheet | Material number |
|------|------------|-----------------|
| 6    | 45052      | –               |

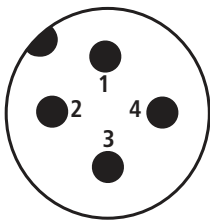
Electrical connection  
 (dimensions in mm)

**Mating connector** (separate order)  
 Material no. **R900021448**  
 (Plastic version)



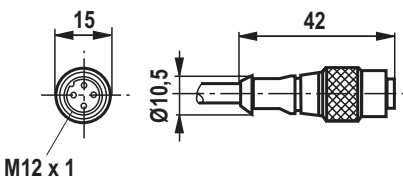
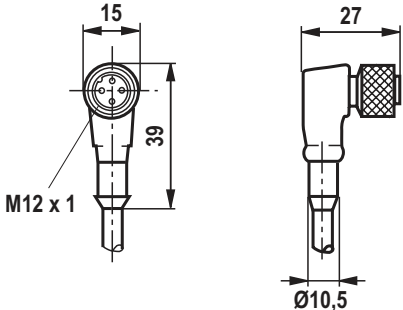
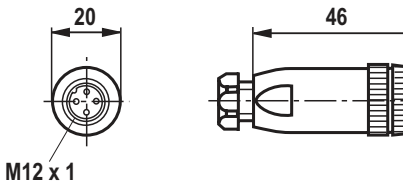
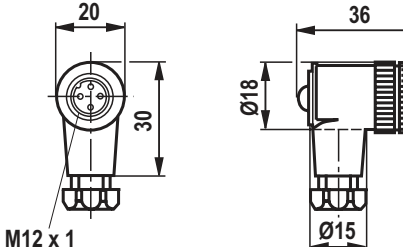
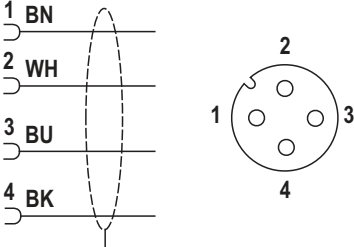
**Electrical connection**  
(dimensions in mm)

**Pressure transducer on device**, Version “S”  
(4-pole M12 connector, view of contact side)



| Voltage                           | Current (two-wire system)         |
|-----------------------------------|-----------------------------------|
| 1 → auxiliary energy + (+ $U_B$ ) | 1 → auxiliary energy + (+ $U_B$ ) |
| 2 → n.c.                          | 2 → n.c.                          |
| 3 → auxiliary energy – (0 V)      | 3 → auxiliary energy – (0 V)      |
| 4 → output signal                 | 4 → n.c.                          |

**Mating connectors for pressure transducer**

| Technical data                                                                      |                                  |                                                                                     |  | Designation                                       | Material no.      |
|-------------------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------|--|---------------------------------------------------|-------------------|
| Current carrying capacity                                                           | 4 A                              |    |  | 04 POL (with 2 m cable)                           | <b>R900773031</b> |
| Temperature range                                                                   | –25 ... 90 °C                    |                                                                                     |  | 04 POL (with 5 m cable)                           | <b>R900779498</b> |
| Protection class                                                                    | IP 67                            |                                                                                     |  |                                                   |                   |
| Contacts                                                                            | CuZn                             |                                                                                     |  |                                                   |                   |
| Contact surface                                                                     | gold-plated                      |  |  | 04 POL (with 2 m cable)                           | <b>R900779504</b> |
| Housing                                                                             | TPU                              |                                                                                     |  | 04 POL (with 5 m cable)                           | <b>R900779503</b> |
| Seal material                                                                       | FKM                              |                                                                                     |  |                                                   |                   |
| Fitting                                                                             | CuZn/Ni                          |                                                                                     |  |                                                   |                   |
| Wire cross-section                                                                  | 4 x 0.34 mm                      |  |  | 04 POL (without cable),<br>protection class IP 68 | <b>R900773042</b> |
| Jacket material                                                                     | PUR                              |                                                                                     |  |                                                   |                   |
| Screening                                                                           | on connector<br>side not applied |                                                                                     |  |                                                   |                   |
| Sleeve diameter                                                                     | Ø 5.0 mm                         |                                                                                     |  |                                                   |                   |
| Sleeve color                                                                        | black                            |  |  | 04 POL (without cable),<br>protection class IP 68 | <b>R900779509</b> |
| Bending radius for<br>dynamic use                                                   | min. 50 mm                       |                                                                                     |  |                                                   |                   |
|  |                                  |                                                                                     |  |                                                   |                   |

## More information

|                                                                                   |                                                                              |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| ▶ Subplates                                                                       | Data sheet 45052                                                             |
| ▶ Analog amplifier module type VT-MRMA1-1-1X/V0/0                                 | Data sheet 30214                                                             |
| ▶ Compact power supply units VT-NE30                                              | Data sheet 29929                                                             |
| ▶ Pressure transducer with integrated electronics, type HM 17                     | Data sheet 30269                                                             |
| ▶ Application example: Analog pressure adjustment system with pressure monitoring | Data sheet 62003                                                             |
| ▶ Mineral oil-based hydraulic fluids                                              | Data sheet 90220                                                             |
| ▶ Environmentally compatible hydraulic fluids                                     | Data sheet 90221                                                             |
| ▶ Flame-resistant, water-free hydraulic fluids                                    | Data sheet 90222                                                             |
| ▶ Hydraulic valves for industrial applications                                    | Data sheet 07600-B                                                           |
| ▶ General product information on hydraulic products                               | Data sheet 07008                                                             |
| ▶ Assembly, commissioning and maintenance of industrial valves                    | Data sheet 07300                                                             |
| ▶ Filter range                                                                    | <a href="http://www.boschrexroth.com/filter">www.boschrexroth.com/filter</a> |

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