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

Type DRS and ZDRS

RE 29173
Edition: 2015-10
Replaces: 2014-10

H7121

- 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

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	**no code**
	Sandwich plate	**Z**
02	Pressure reducing valve with DC motor actuation	**DRS**
03	Size 6	**6**

Pressure reduction

04	In channel A (subplate mounting)	**no code**
	In channel P① (sandwich plate valve)	**VP**
05	Component series 10 ... 19 (10 ... 19: unchanged installation and connection dimensions)	**1X**

Pressure rating

06	50 bar	**50**
	100 bar	**100**
	210 bar	**210**
07	**Without** pressure transducer on device	**A**
	With pressure transducer on device (only version “100”)	**S**
08	**Without** check valve	**M**

Supply voltage of the control electronics

09	Direct voltage 24 V	**G24**

Electrical connection

10	**Without** mating connector; connector type GO51FAVM	**K32** [1]

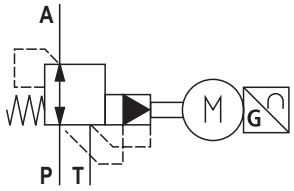
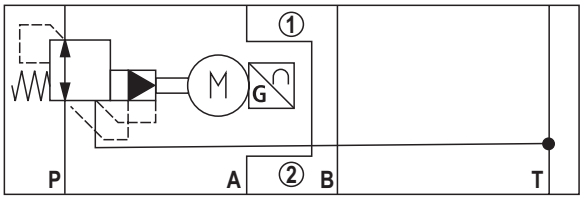
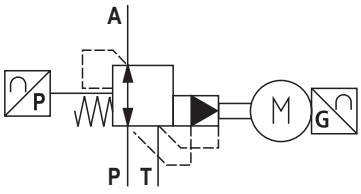
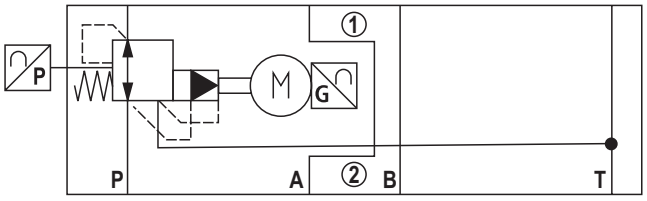
Seal material

11	NBR seals	**M**
	FKM seals	**V**
	Observe compatibility of seals with hydraulic fluid used! (Other seals on request)	
12	**With** position feedback	**G**
13	Further details in the plain text	*****

[1] 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
Version “A”(without pressure transducer) 	**Version “A”**(without pressure transducer) 
Version “S” (with pressure transducer) 	**Version “S”** (with pressure transducer) 

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).

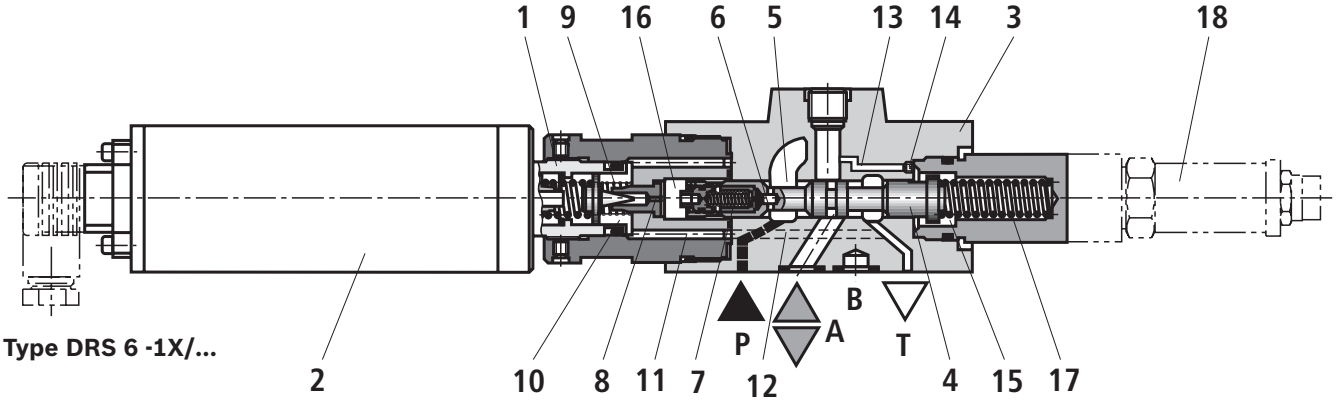
Pressure limitation does not work if contaminated.

- 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.



Type DRS 6 -1X/...

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).

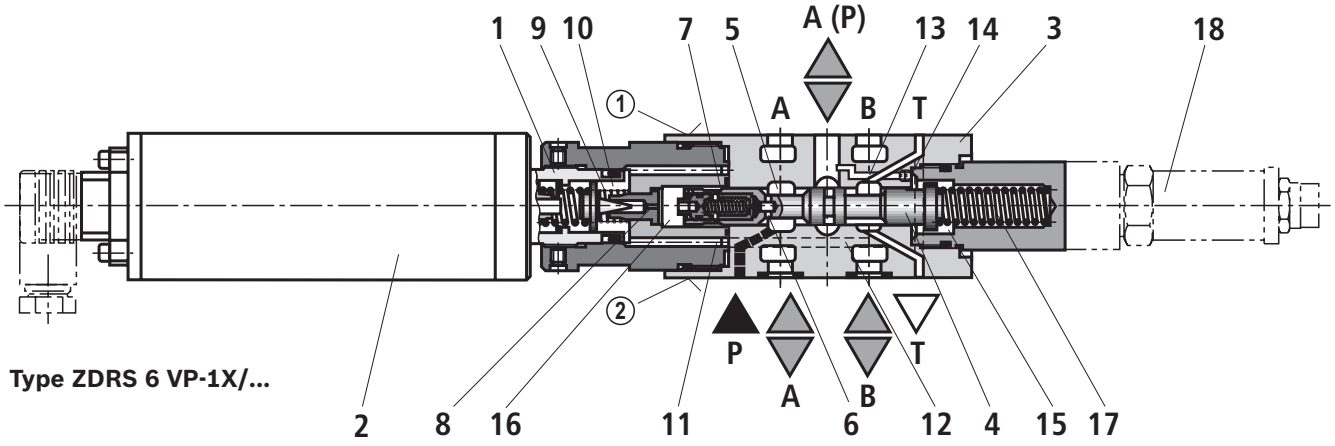
Pressure limitation does not work if contaminated.

- 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!)

General			
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

Hydraulic			
Maximum operating pressure	▶ Port P, P②	bar	250
	▶ Port P①, A, B	bar	210
	▶ Port T	bar	separately to tank[1] 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 [2]
Hydraulic fluid temperature range		°C	-20 ... +80
Viscosity range		mm^2/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 [3]
Step response $T_u + T_g$ [4]	▶ 0 % → 100 %, 100 % → 0 %	ms	< 500

1) Pressures > 10 can destroy the motor.

2) 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.

3) 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.

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

Notice:
The technical data were determined at a viscosity of 46 mm^2/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

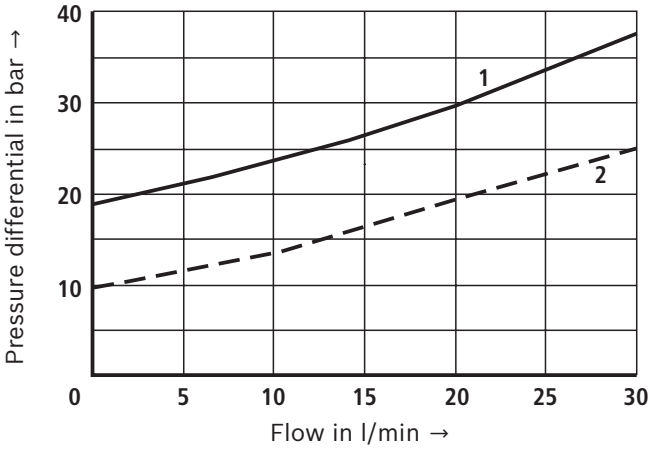
☞ **Notices:**
The valves must not be used for **safety-related machine functions** as only the electrical area is secured, not the hydraulic one. This means that if the hydraulic pressure in P falls to 0 bar, the actuator pressure (A) or secondary pressure (P①) is also 0.

When establishing the electrical connection, the protective earthing conductor (PE ⏚) has to be connected correctly.

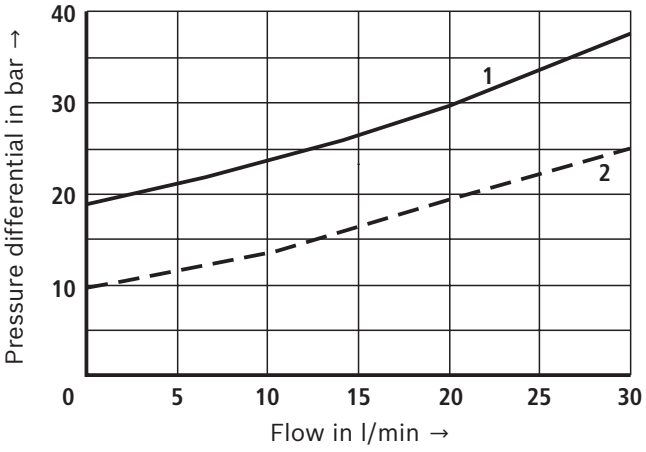
Characteristic curves
(measured with HLP46, ϑ_{oil}= 40 ±5 °C)

Δp-q_V characteristic curves

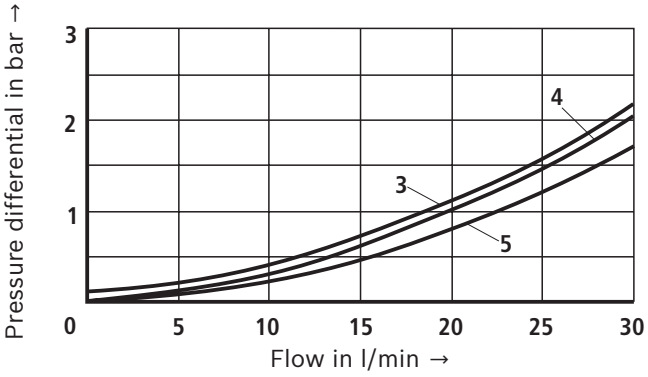
Type DRS (P → A)



Type ZDRS (P② → P①)



Type ZDRS



☞ **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).

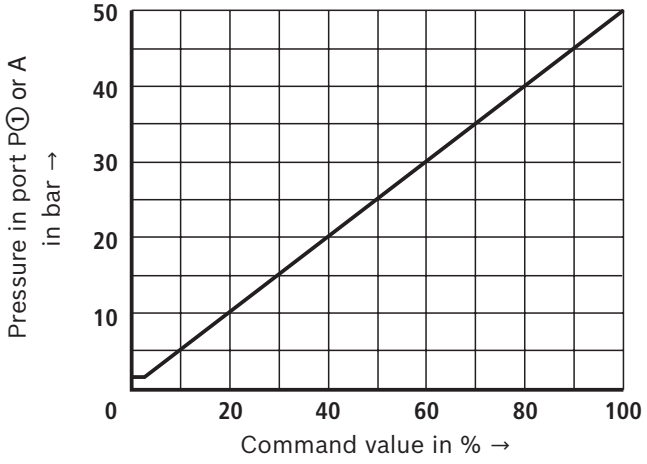
1 100/210 bar
2 50 bar
3 A① →A②
4 B① →B②
5 T① →T②

Characteristic curves

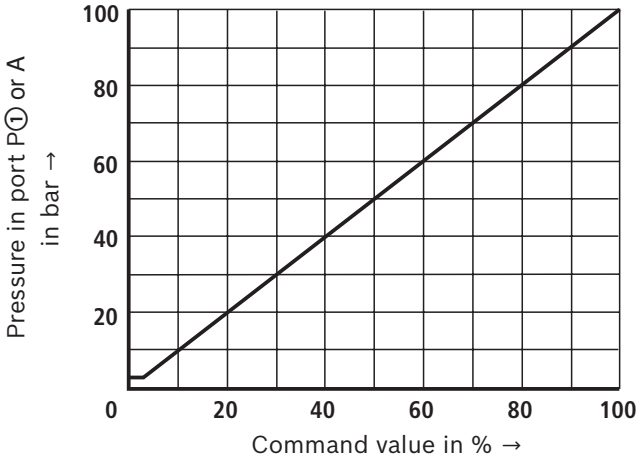
(measured with HLP46, ϑ_{oil}= 40 ±5 °C)

Pressure in port P① or A depending on the command value

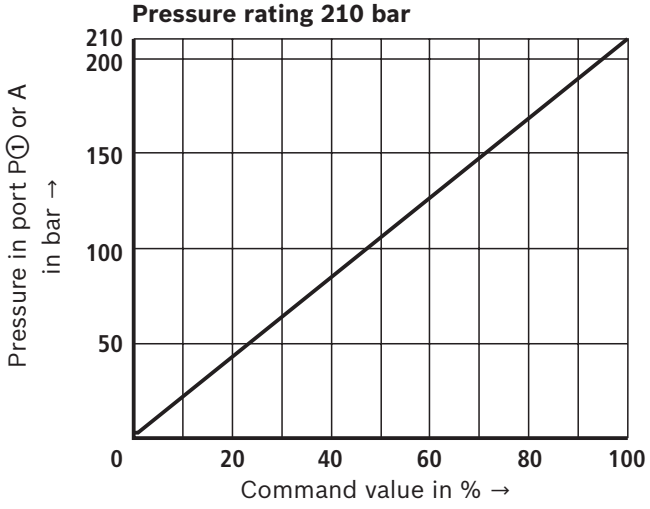
Pressure rating 50 bar



Pressure rating 100 bar



Pressure rating 210 bar

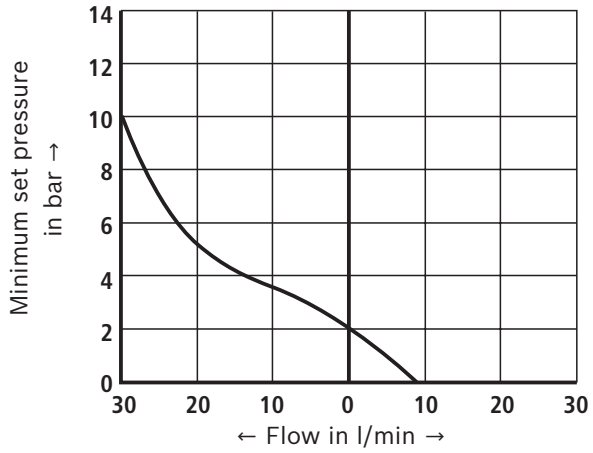


Characteristic curves

(measured with HLP46, ϑ_{oil}= 40 ±5 °C)

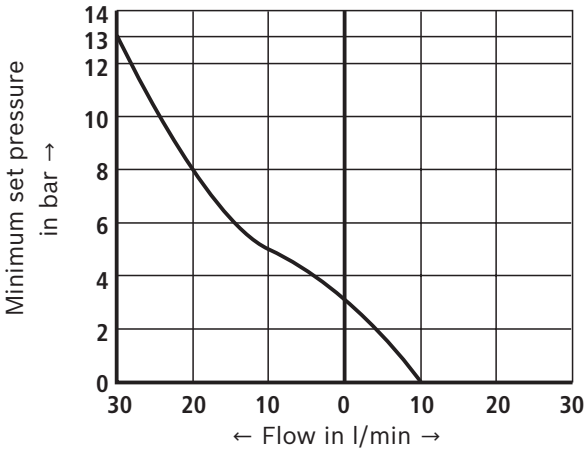
Minimum set pressure in port P① or A with command value 0 V **(without counter pressure in channel T or T①)**

Pressure rating 50 bar



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

Pressure rating 100 bar and 210 bar



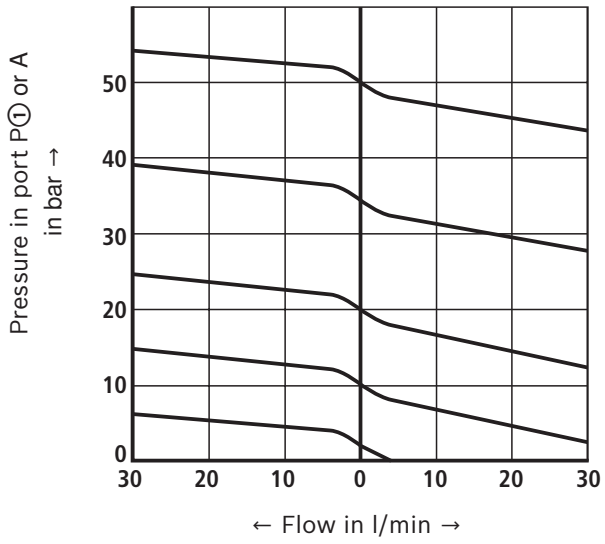
Type DRS	A → T	P → A
Type ZDRS	P① → T②	P② → P①

Characteristic curves

(measured with HLP46, ϑ_{oil}= 40 ±5 °C)

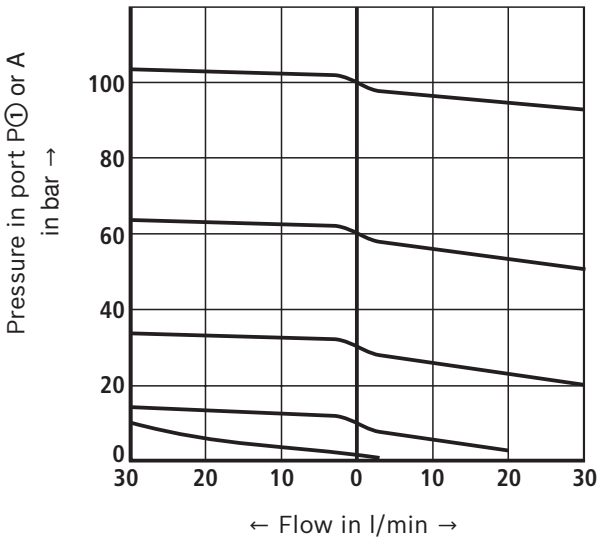
Pressure in port P① or A depending on the flow

Pressure rating 50 bar



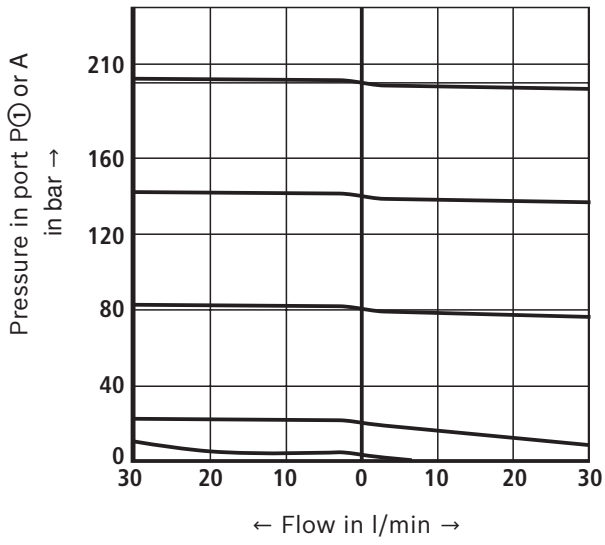
Type DRS	A → T	P → A
Type ZDRS	P① → T②	P② → P①

Pressure rating 100 bar



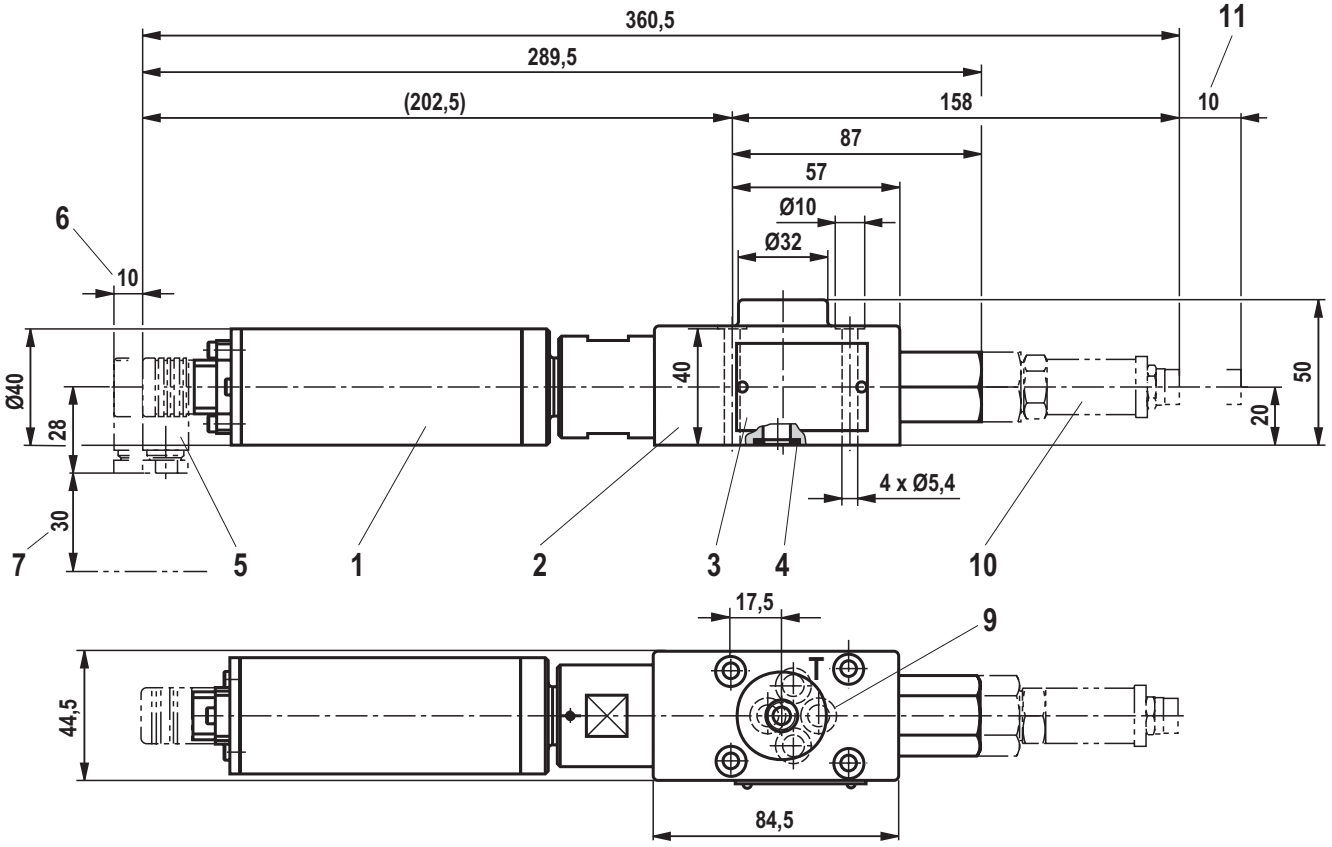
Type DRS	A → T	P → A
Type ZDRS	P① → T②	P② → P①

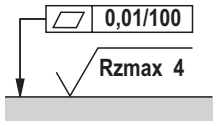
Pressure rating 210 bar



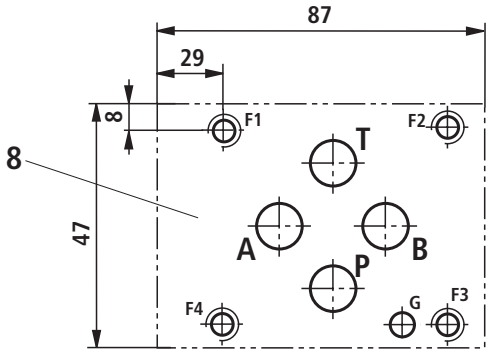
Type DRS	A → T	P → A
Type ZDRS	P① → T②	P② → P①

Dimensions: Type DRS
(dimensions in mm)





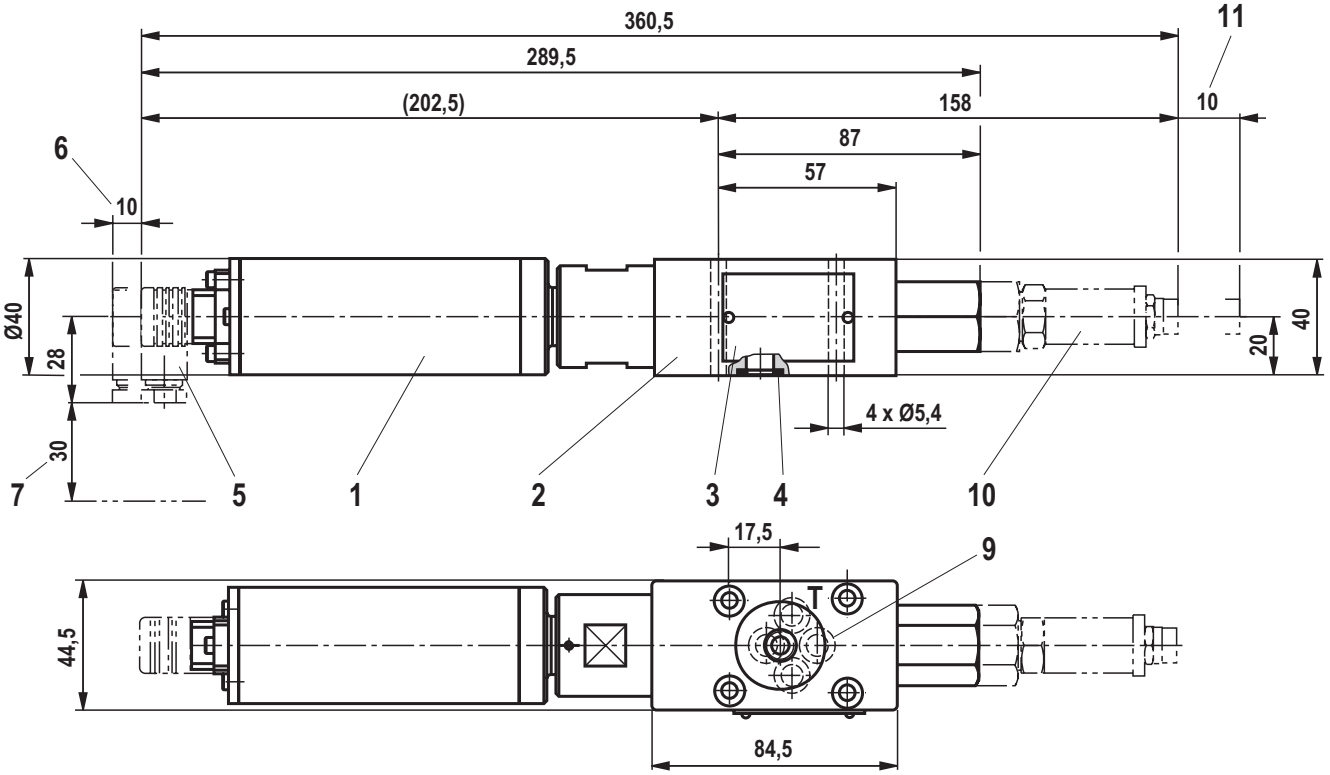
Required surface quality of the valve contact surface

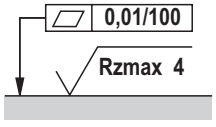


1 DC motor
2 valve housing
3 Name plate
4 Identical seal rings for ports A, P, T and blind counterbore B
5 Mating connector, separate order, see page 14.
6 Space required to remove the mating connector
7 Space required for connecting cable
Note: The mating connector can be fitted offset by 4 x 90°.
8 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

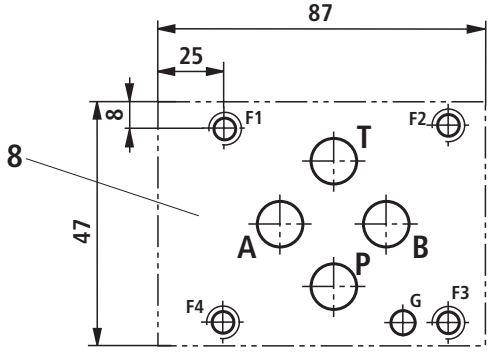
For valve mounting screws and **subplates,** see page 14.

Dimensions: Type ZDRS
(dimensions in mm)





Required surface quality
of the valve contact surface



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** (friction coefficient μ_{total} = 0.09 ... 0.14); tightening torque M_A = 7 Nm ±10 %	**R913000064**
	or		
	4	**4 hexagon socket head cap screws ISO 4762 - M5 x 50 - 10.9** (friction coefficient μ_{total} = 0.12 ... 0.17); tightening torque M_A = 8.1 Nm ±10 %	Not included in the Rexroth delivery range
ZDRS	4	**ISO 4762 - M5 - 10.9-flZn-240h-L** (friction coefficient μ_{total} = 0.09 ... 0.14); tightening torque M_A = 7 Nm ±10 %,	See notes
	or		
	4	**ISO 4762 - M5 - 10.9** (friction coefficient μ_{total} = 0.12 ... 0.17); tightening torque M_A = 8.1 Nm ±10 %	Not included in the Rexroth delivery range

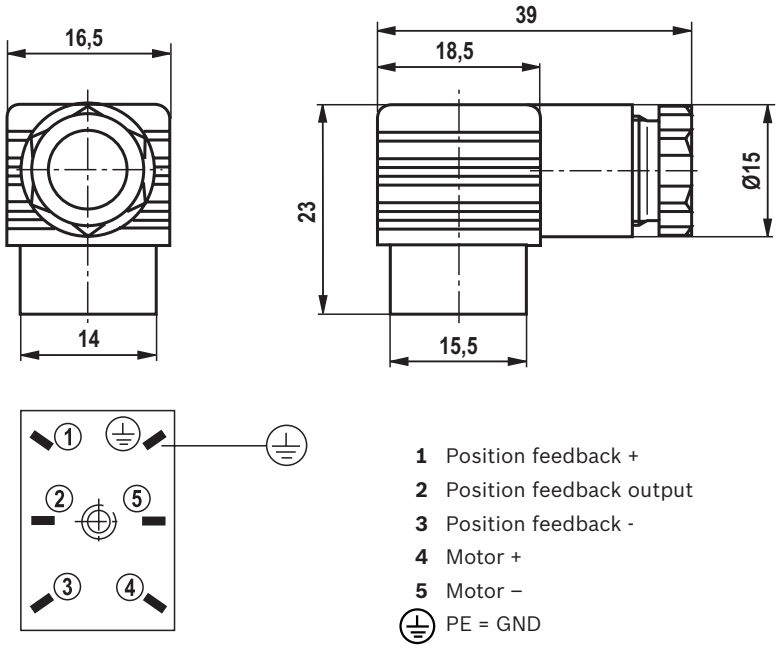
☞ **Notices:**
- The tightening torque of the hexagon socket head cap screws refers to the maximum operating pressure.
- Type ZDRS: Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Subplates(separate order)

Size	Data sheet	Material number
6	45052	–

Electrical connection
(dimensions in mm)

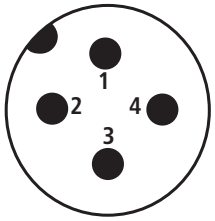
Mating connector (separate order)
Material no. **R900021448**
(Plastic version)



1 Position feedback +
2 Position feedback output
3 Position feedback -
4 Motor +
5 Motor –
PE = GND

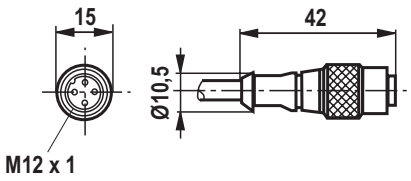
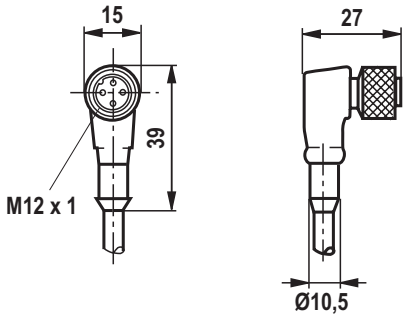
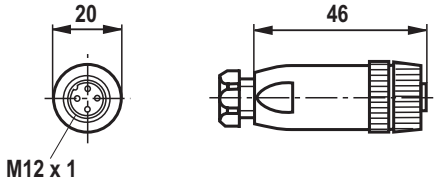
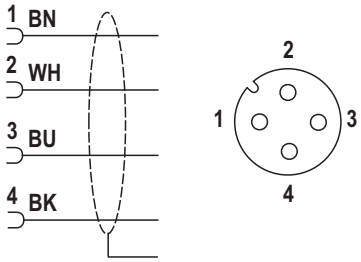
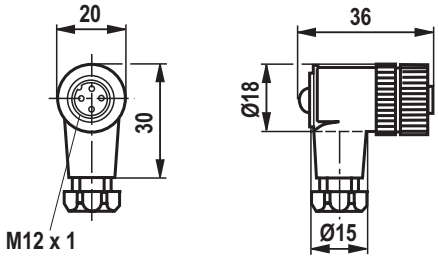
Electrical connection
(dimensions in mm)

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)	**R900773031**
Temperature range	–25 … 90 °C		04 POL (with 5 m cable)	**R900779498**
Protection class	IP 67			
Contacts	CuZn			
Contact surface	gold-plated		04 POL (with 2 m cable)	**R900779504**
Housing	TPU		04 POL (with 5 m cable)	**R900779503**
Seal material	FKM			
Fitting	CuZn/Ni			
Wire cross-section	4 x 0.34 mm			
Jacket material	PUR			
Screening	on connector side not applied		04 POL (without cable), protection class IP 68	**R900773042**
Sleeve diameter	Ø 5.0 mm			
Sleeve color	black			
Bending radius for dynamic use	min. 50 mm			
			04 POL (without cable), protection class IP 68	**R900779509**

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	www.boschrexroth.com/filter

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