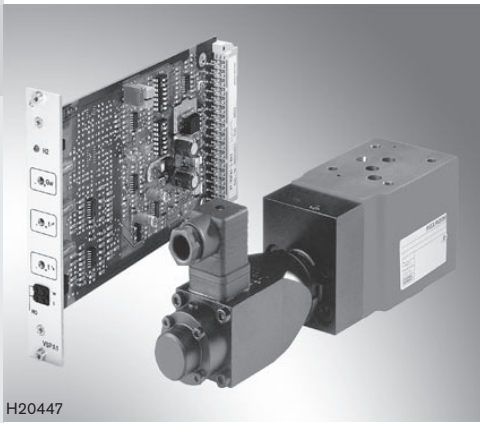
Proportional pressure reducing valve, pilot operated

RE 29179/02.07 1/12
Replaces: 07.05

Type ZDRE; ZDREE


H20447

Size 10
Component series 1X
Maximum operating pressure 315 bar
Maximum flow 80 l/min

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Features

- Pilot operated valve for reducing a system pressure
- Actuation by proportional solenoid
- Sandwich plate design
- Position of ports to DIN 24340 form A and ISO 4401
  - Subplates to data sheet RE 45054 (separate order)
  - Sandwich plate with lateral pilot oil ports X, Y (separate order, see page 3)
- 4 pressure stages
- Valve and control electronics from a single source
- External control for type ZDRE:
  - Analogue amplifier VT-VSPA1(K)-1 in Euro-card format (separate order), see page 7
  - Digital amplifier VT-VSPD-1 in Euro-card format (separate order), see page 7
  - Analogue amplifier VT 11131 of modular design (separate order), see page 7
- Integrated electronics (OBE) for type ZDREE:
  - Low manufacturing tolerance of the command value/pressure characteristic curve
  - Ramp times can be adjusted separately for pressure build-up and pressure reduction

Ordering code

Z	DRE		10	VP	–1X/		M	G24			*

Sandwich plate **= Z**

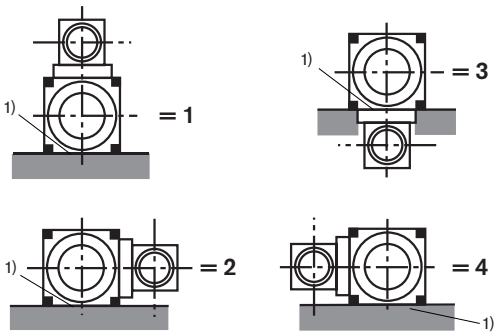
Proportional pressure reducing valve **= DRE**

For external electronics **= No code**
With integrated electronics **= E**

Size 10 **= 10**

Pressure reduction in channel P1 **= VP**

Position of cable socket



1) Valve mounting faces (seal ring recesses in housing)

Component series 10 to 19 **= 1X**
(10 to 19: unchanged installation and connection dimensions)

Pressure stage

Up to 50 bar	**= 50**
Up to 100 bar	**= 100**
Up to 200 bar	**= 200**
Up to 315 bar	**= 315**

M = Without check valve

Y = Pilot oil supply for directional valve from P2
Pilot oil drain for directional valve and ZDRE external

XY = Pilot oil supply for directional valve external
Pilot oil drain for directional valve and ZDRE external

L = Pilot oil supply for directional valve from P2
Pilot oil drain for directional valve internal and for ZDRE external

XL = Pilot oil supply from P2 to X plugged
(direct operated directional valve needs **no** pilot oil)
Pilot oil drain from directional valve plugged
(direct operated directional valve needs **no** pilot oil drain), for ZDRE external

Note: When using direct operated directional valves, verify that the seal ring recesses for X and Y are not provided on the mounting faces of the directional valve housing.
If required, use sandwich plate HSZ 10 B... on page 3 (separate order).

Supply voltage of control electronics

G24 = 24 V DC

Electrical connection for ZDRE:

K4 = **Without** cable socket, with component plug to DIN EN 175301-803
Cable socket – separate order, see page 7

for ZDREE:

K31 = **Without** cable socket, with component plug to DIN EN 175201-804
Cable socket – separate order, see page 7

Seal material

M = NBR seals, suitable for mineral oil (HL, HLP) to DIN 51524

V = FKM seals suitable for phosphate ester (HFD-R)

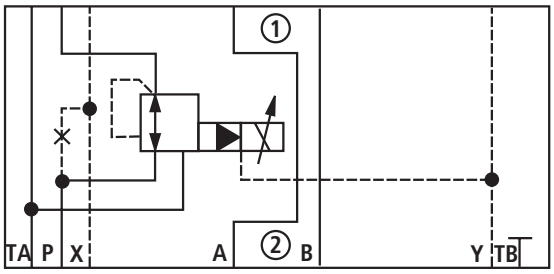
Further details in clear text

Standard types

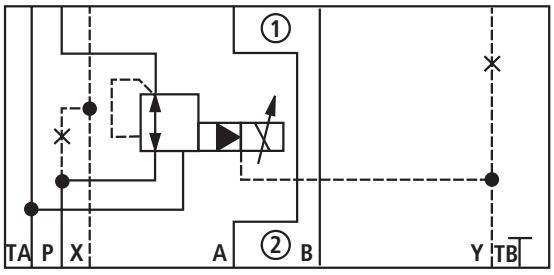
Type	Material no.
ZDREE 10 VP2-1X/50XLMG24K31M	R900954705
ZDREE 10 VP2-1X/100XLMG24K31M	R900921799
ZDREE 10 VP2-1X/200XLMG24K31M	R900948587
ZDREE 10 VP2-1X/315XLMG24K31M	R900935341

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

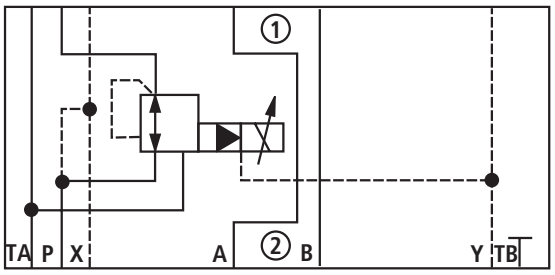
Type ZDRE



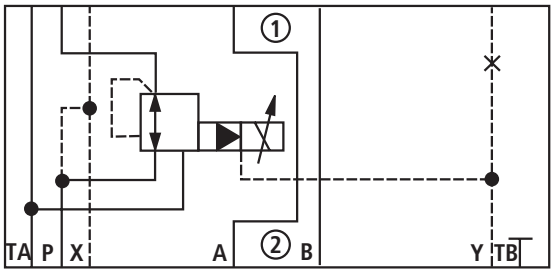
Type ZDRE 10…1X/…**XY**



Type ZDRE 10…1X/…**XL**

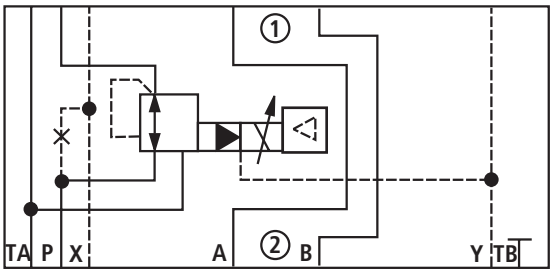


Type ZDRE 10…1X/…**Y**

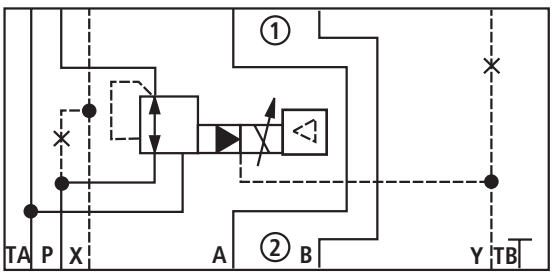


Type ZDRE 10…1X/…**L**

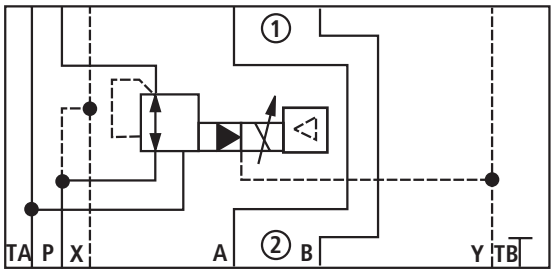
Type ZDREE



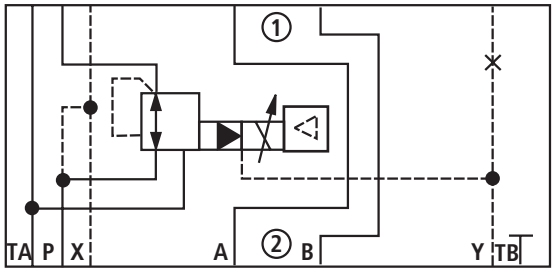
Type ZDREE 10…1X/…**XY**



Type ZDREE 10…1X/…**XL**



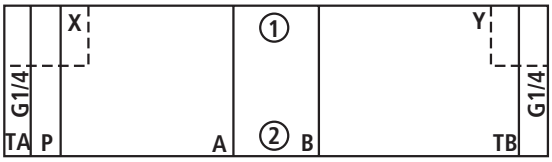
Type ZDREE 10…1X/…**Y**



Type ZDREE 10…1X/…**L**

Sandwich plate with X and Y port (separate order)

Type **HSZ 10 B097-3X/M01**
Material no.: **R900320785**
Plate dimensions (length x width x height): 100 x 70 x 30 mm
Weight: 2.5 kg
Size of ports X and Y: G 1/4
Dimension drawing no.: R900262648



Function, section (① = component side, ② = plate side)

Type ZDRE

Valves of type ZDRE... are pilot operated 3-way pressure reducing valves of sandwich plate design, i.e. with pressure limitation of the actuator pressure.

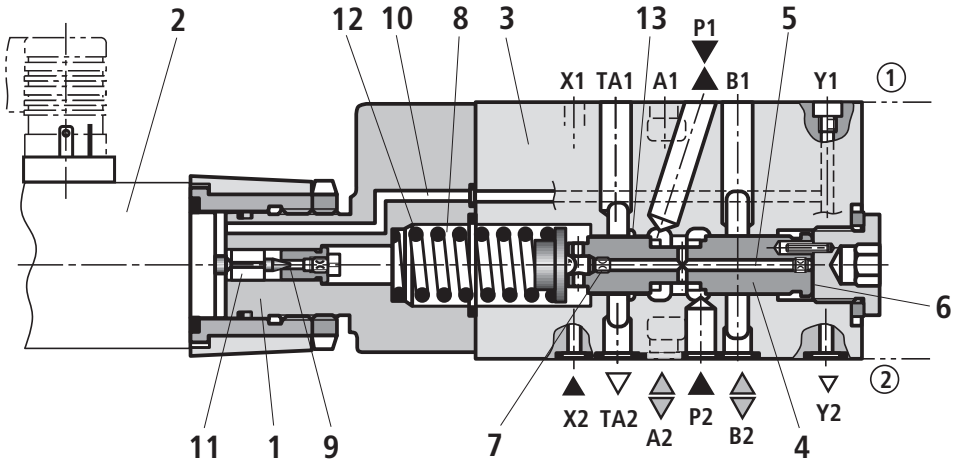
They are used to reduce a system pressure.

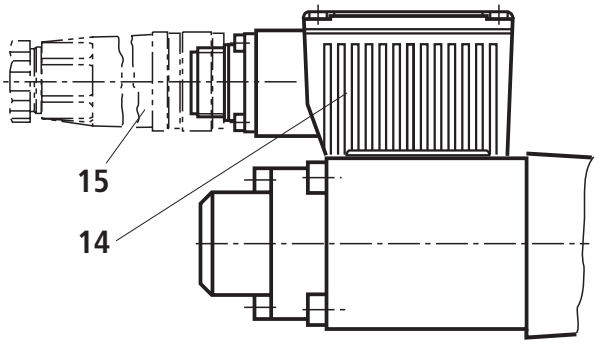
These valves basically consist of pilot part (1) with proportional solenoid (2), main valve (3) and pilot piston (4). The pressure in channel P1 is adjusted in dependence upon the command value via the proportional solenoid (2).

At rest, i.e. without pressure in channel P2, pilot piston (4) opens the connection from channel P2 to P1.

The pressure in channel P1 acts via bore (5) on piston area (6). The pilot oil for the pilot valve is taken from channel P1 and flows via bore (5) and orifice (7) into spring chamber (8). From there, it flows via valve seat (9), bore (10) and the Y-channel back to the tank.

The pressure required in channel P1 is selected on the associated amplifier. The proportional solenoid presses valve poppet (11) against valve seat (9) and closes the connection between spring chamber (8) and bore (10). Thus, both chambers (6) and (8) are pressure-compensated, and compression spring (12) shifts piston (4) to the right towards the opening direction P2 to P1. As soon as actuator pressure P1 has increased to the value set on the pilot valve, valve poppet (11) opens and limits the pressure in spring chamber (8). Pilot piston (4) now moves to the left to the control position. When actuator pressure P1 exceeds the value set on the pilot valve, the pilot piston is moved further to the left and blocks the flow from P2 to P1 and opens the connection P1 to the tank at control land (13) until this pressure has dropped again to the set value.





Type ZDREE – with integrated electronics (OBE)

In terms of function and structure, these valves correspond to those of type ZDRE, except for the integrated electronics. The electronics (OBE) that is accommodated in housing (14) receives its supply and command value voltage from cable socket (15).

The command value/pressure characteristic curve is adjusted in the factory with narrow tolerances.

The ramp time for pressure build-up and pressure reduction can be adjusted independently of one another by means of two potentiometers.

For further details regarding the integrated electronics (OBE), see pages 7 and 8.

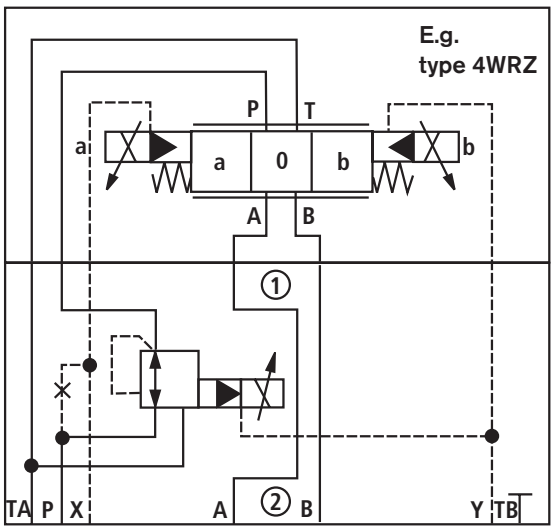
Pilot oil supply to the directional valve fitted above

☞ ⚠ **Caution!**

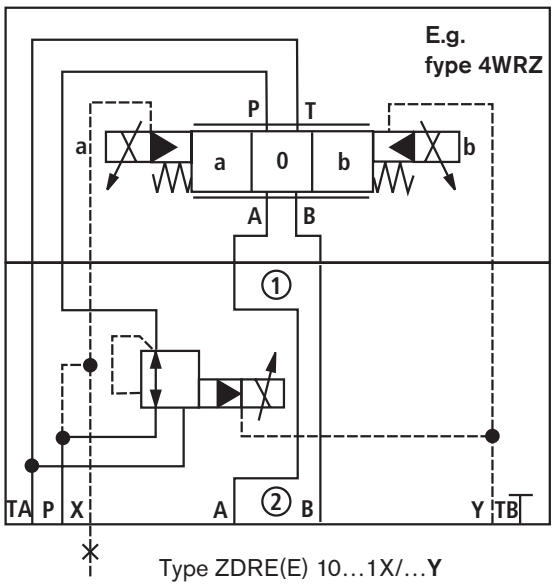
- With **direct operated** directional valves, the sealing arrangements for the X and Y ports are missing on the mounting face of the housing. In order to prevent hydraulic fluid from draining, the pilot oil supply from P2 to X and the pilot oil drain between the directional valve and the ZDRE(E) must be plugged (version XL).
- As a result of leakage due to the spool clearance from “P” to “B”, pressure may build up in channel “B”!
- In the case of a **pilot operated** proportional directional valve in conjunction with the ZDRE(E), the proportional directional valve has to be the version with **"external pilot oil supply"**.

With versions XY and XL the connection between P2 and X is closed.

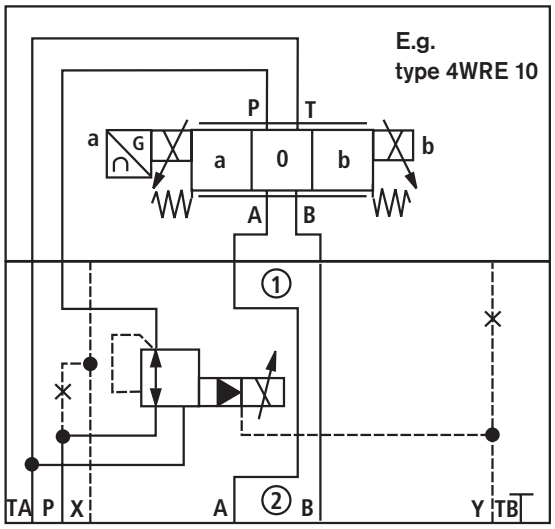
With versions Y and L , plug port X on the subplate.



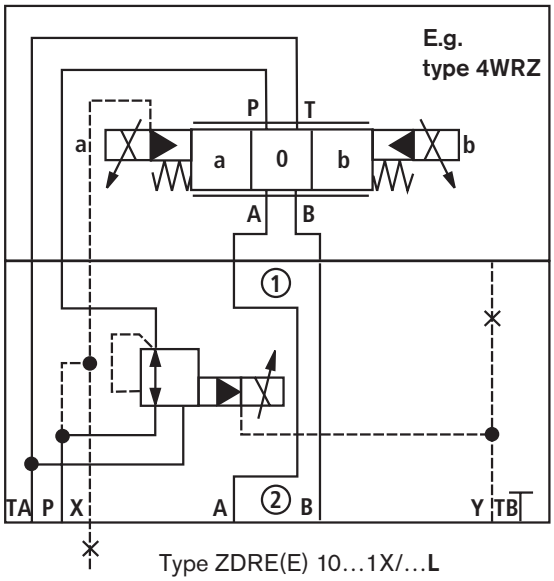
Type ZDRE(E) 10…1X/…**XY**



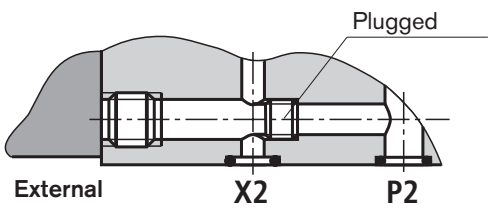
Type ZDRE(E) 10…1X/…**Y**

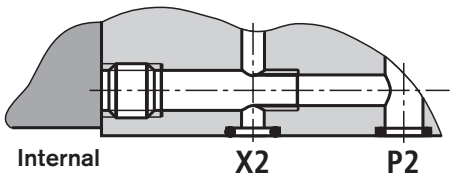


Type ZDRE(E) 10…1X/…**XL**



Type ZDRE(E) 10…1X/…**L**





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

General

Weight	– ZDRE	kg	5.4
	– ZDREE	kg	5.5
Installation orientation			Preferred orientation of the proportional solenoid is downwards or horizontal
Storage temperature range		°C	– 20 to + 80
Ambient temperature range	– ZDRE	°C	– 20 to + 70
	– ZDREE	°C	– 20 to + 50

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

Max. operating pressure	– Port P1	bar	315
	– Ports P2; A; B; X	bar	350
	– Port T	bar	250
	– Port Y or L		Line separately and at zero pressure to tank
Max. set pressure in channel P1	– Pressure stage 50 bar	bar	50
	– Pressure stage 100 bar	bar	100
	– Pressure stage 200 bar	bar	200
	– Pressure stage 315 bar	bar	315
Min. set pressure channel P1 at zero command value		bar	See $p_{E\,min}$-q_v characteristic curve on page 10
Max. permissible flow		l/min	80
Pilot oil flow		l/min	0.6 to 0.9
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524, phosphate ester (HFD-R)
Hydraulic fluid temperature range		°C	– 20 to + 80
Viscosity range		mm^2/s	15 to 380
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [1]
Hysteresis		%	± 2 of p_{max}
Repeatability		%	< ± 2 of p_{max}
Linearity		%	± 3.5 of p_{max}
Manufacturing tolerance	– ZDRE	%	± 2 of max. set pressure referred to the hysteresis characteristic curve (increasing pressure)
	– ZDREE	%	± 1.5
Step response $T_u + T_g$	10 → 90%	ms	~ 150 Measured with a static hydraulic fluid column of 5 litres in port P1
	90 → 10%	ms	~ 120

Electrical

Supply voltage		V	24 DC
Type of signal			Analogue
Min. control current		mA	100
Max. control current	– ZDRE	mA	1600
	– ZDREE	mA	1440 to 1760
Solenoid coil resistance	– Cold value at 20 °C	Ω	5.4
	– Max. hot value	Ω	7.8
Duty cycle		%	100
Electrical connection	– ZDRE		With component plug to DIN EN 175301-803
			Cable socket to DIN EN 175301-803 [2]
	– ZDREE		With component plug to DIN EN 175201-804
			Cable socket to DIN EN 175201-804 [2]
Type of protection of the valve to EN 60529			IP 65 with cable socket mounted and locked

For explanation of footnotes [1] and [2], see page 7

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

Control electronics

– For ZDREE		Integrated in the valve (see page 8)
– For ZDRE		
• Amplifier in Euro-card format	analogue	VT-VSPA1(K)-1 to data sheet RE 30111
(separate order)	digital	VT-VSPD-1 to data sheet RE 30123
• Amplifier of modular design (separate order)	analog	VT 11131 to data sheet RE 29865

[1] The cleanliness classes specified for components must be adhered to hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components .

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

[2] Separate order, see below

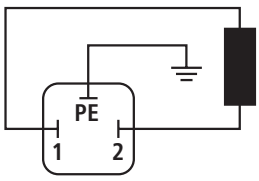
☞ **Note:** For details regarding **environment simulation testing** in the fields of EMC (electromagnetic compatibility), climate and mechanical stress, see RE 29179-U (declaration on environmental compatibility).

Elctrical connection, cable sockets (nominal dimensions in mm)

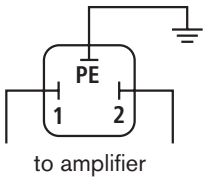
For type ZDRE – for external control electronics

Cable socket to DIN EN 175301-803
Separate order stating material no. **R901017011**

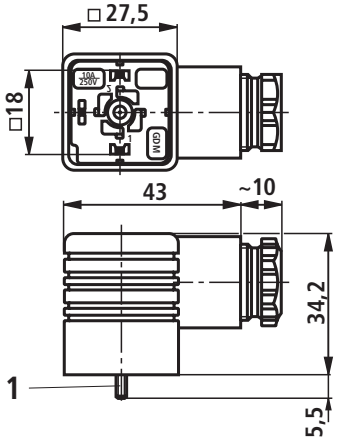
Connection to component plug



Connection to cable socket



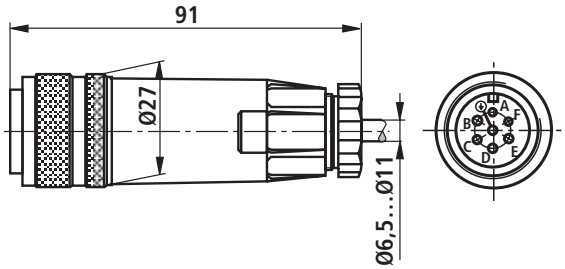
to amplifier



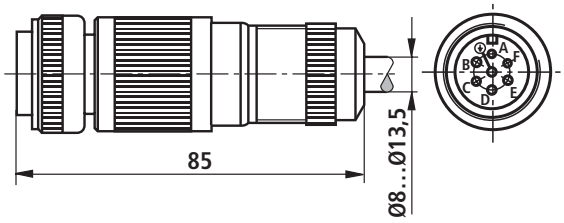
1 Fixing screw M3,
tightening torque $M_T = 0.5$ Nm

For type ZDREE – with integrated electronics (OBE)

Cable socket to DIN EN 175201-804
Separate order stating material no. **R900021267**
(plastic version)



Cable socket to DIN EN 175201-804
Separate order stating material no. **R900223890**
(metal version)



For pin assignment, see Block circuit diagram on page 8.

Integrated electronics (OBE) of type ZDREE

Function

The integrated electronics is controlled via the two differential amplifier connections D and E.

The ramp generator generates from a command value step-change (0 to 10 V or 10 to 0 V) a delayed increase or drop of the solenoid current. Potentiometer R14 can be used to adjust the rise time, potentiometer R13 to adjust the drop time of the solenoid current.

The maximum ramp time of 5 s is only possible over the full command value range. In the case of minor changes in the command value, the ramp time shortens accordingly.

The command value/solenoid current characteristic curve is adjusted to the valve by means of the characteristic curve generator so that non-linearities in the hydraulic system are compensated for and a linear command value/pressure characteristic curve is obtained.

The current regulator regulates the solenoid current independently of the solenoid coil resistance.

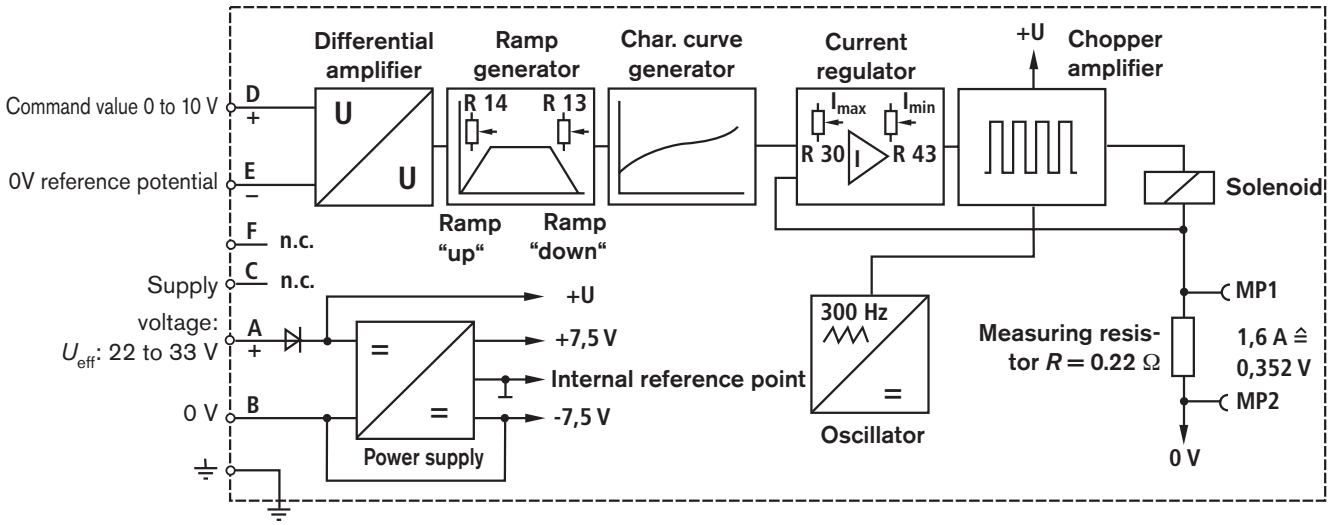
Potentiometer R30 can be used to change the gradient of the command value/current characteristic curve and hence the gradient of the command value/pressure characteristic curve of the proportional pressure control valve.

Potentiometer R43 serves for adjusting the biasing current. This setting should not be changed. If required, adjust the zero point of the command value/pressure characteristic curve on the valve seat.

A chopper amplifier forms the power stage of the electronics for controlling the proportional valve. It is pulse-width-modulated with a clock frequency of 300 Hz.

The solenoid current can be measured at both measuring sockets MP1 and MP2. A voltage drop of 0.352 V at the measuring resistor corresponds to a solenoid current of 1.6 A.

Block circuit diagram / pin assignment of integrated electronics



Supply voltage

Power supply unit with rectifier

Single-phase rectification or three-phase current bridge:
U_{eff} = 22 to 33 V

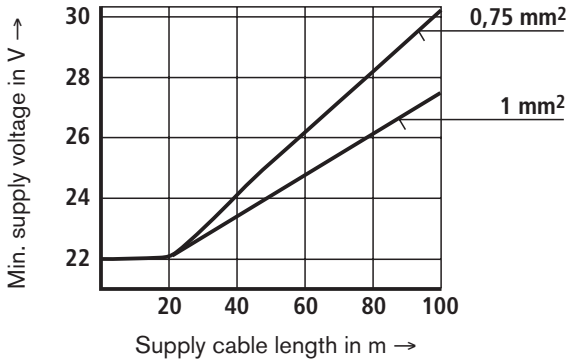
Residual ripple content on the power supply unit : < 5 %

Output current: I_{eff} = max. 1.4 A

Supply cable:
- Recommended: 5-wire, 0.75 or 1 mm² with protective conductor and shield
- Outer diameter 6.5 to 11 mm
- Shield to 0 V supply voltage
- Max. permissible length 100 m

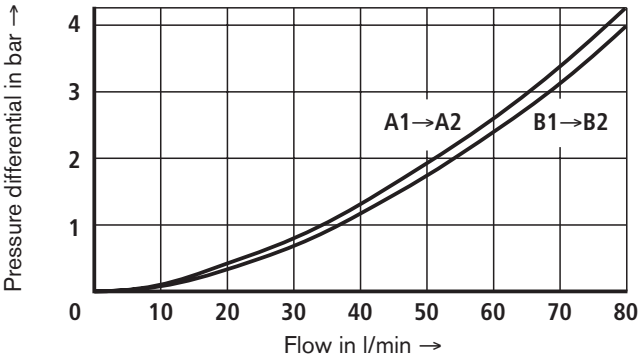
The minimum supply voltage of the power supply unit depends on the length of the supply cable (see diagram).

In the case of lengths > 50 m, a capacitor of 2200 µ must be provided in the supply cable in the vicinity of valve.

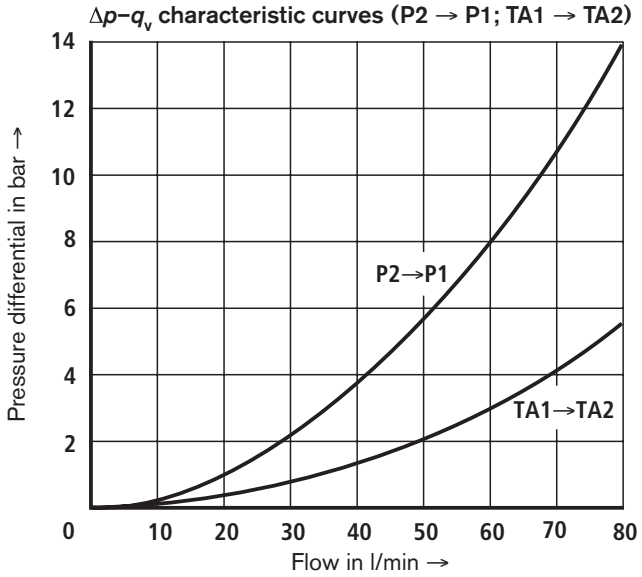


Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Δp–q_v characteristic curves (A1 → A2; B1 → B2)

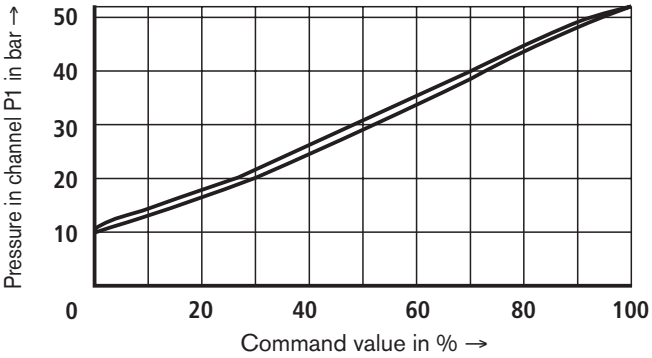


Δp–q_v characteristic curves (P2 → P1; TA1 → TA2)

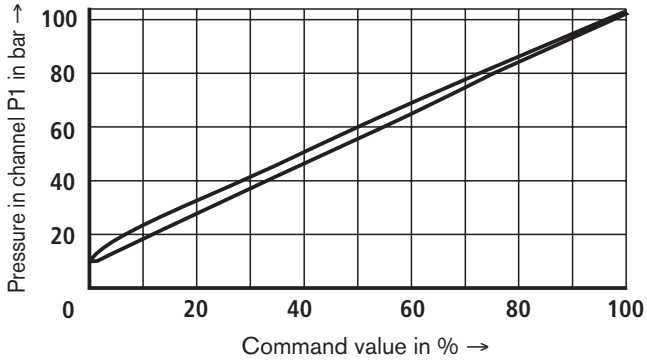


Pressure in channel P1 in dependence upon the command value

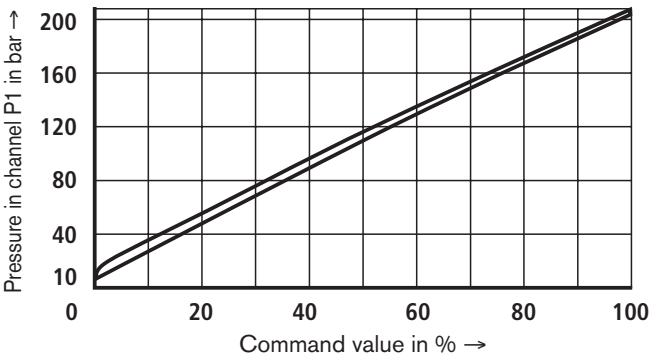
Pressure stage 50 bar



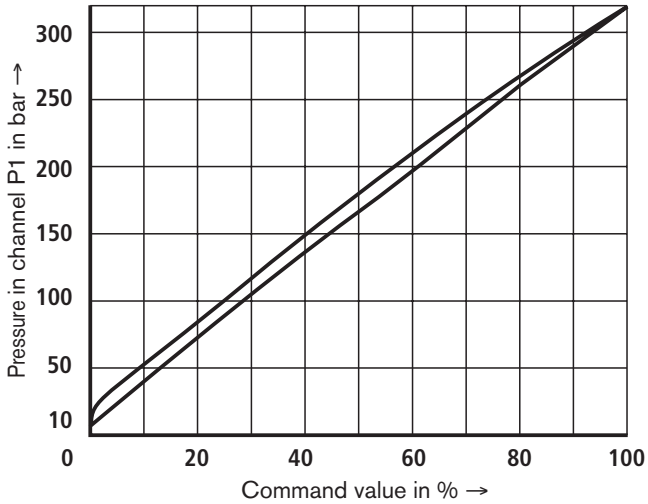
Pressure stage 100 bar



Pressure stage 200 bar



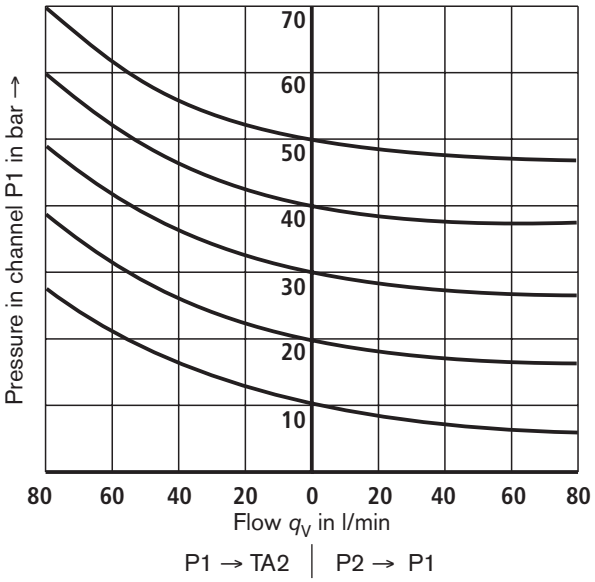
Pressure stage 315 bar



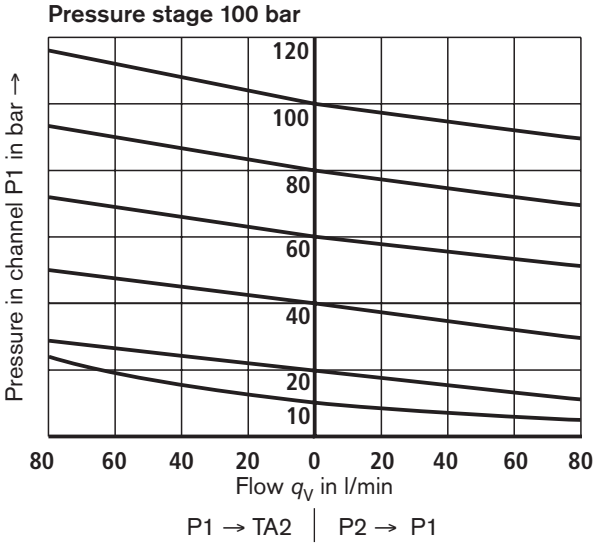
Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Pressure/flow characteristic curves

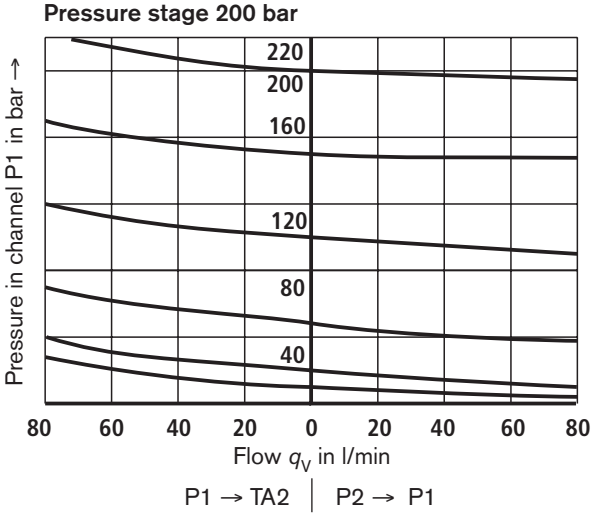
Pressure stage 50 bar



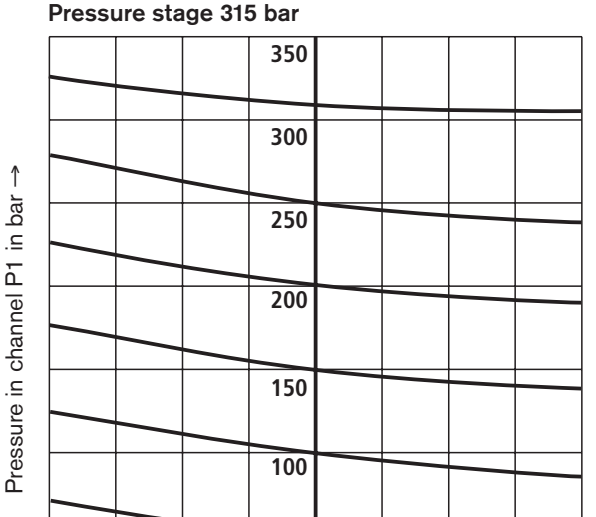
Pressure stage 100 bar



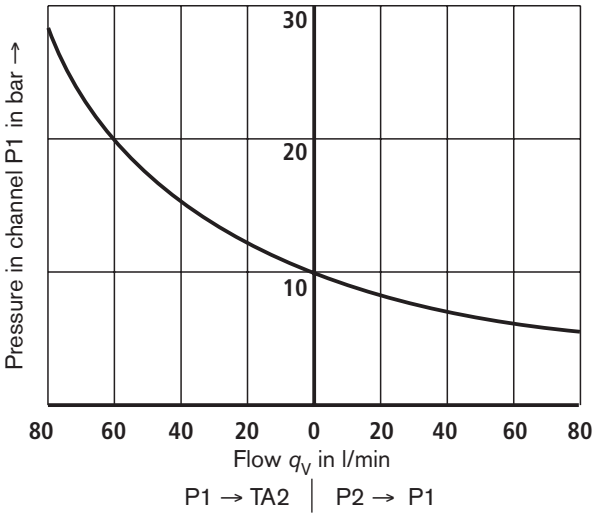
Pressure stage 200 bar



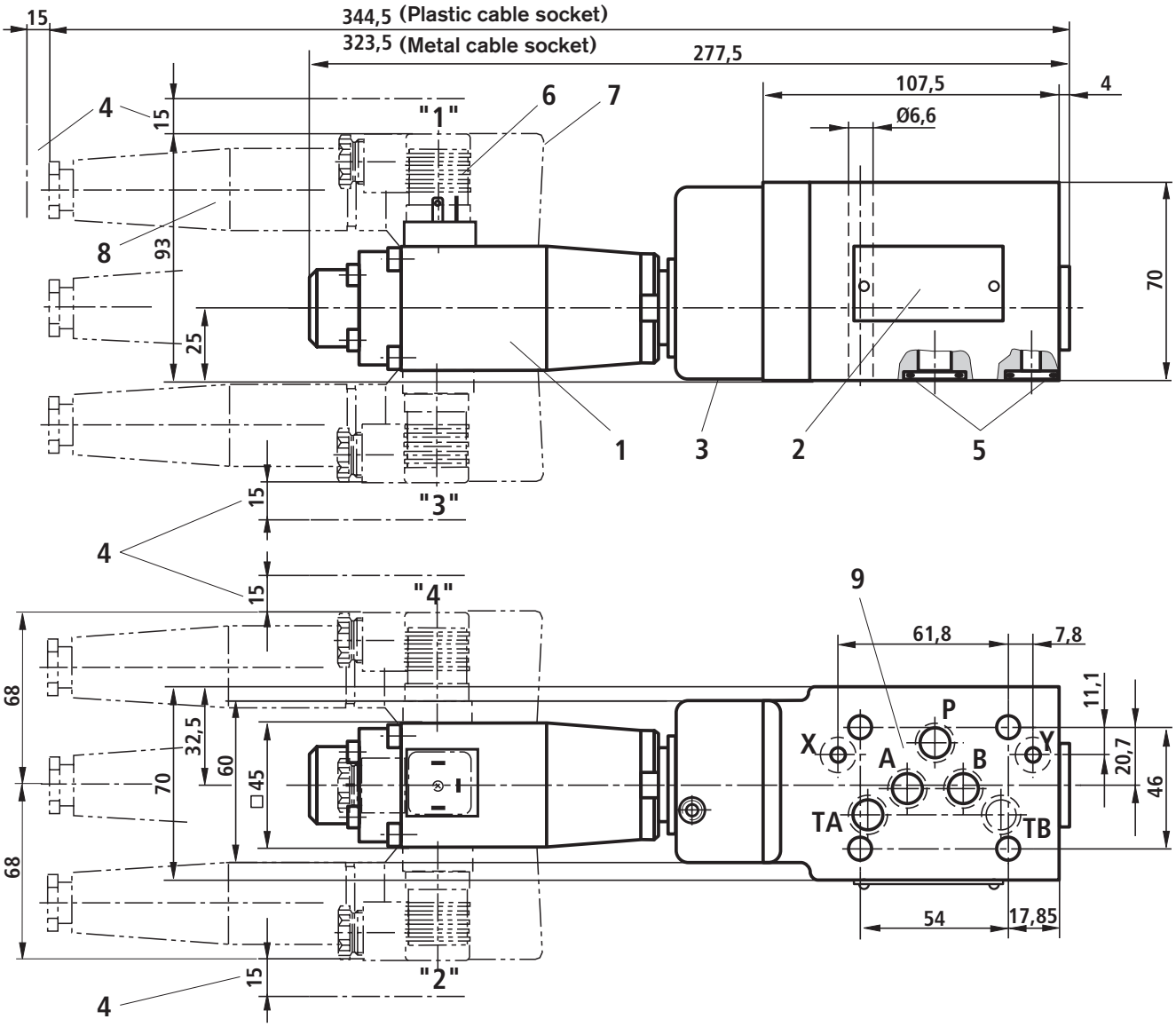
Pressure stage 315 bar

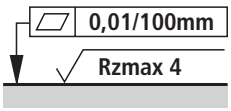


Minimum set pressure in P1



Unit dimensions (nominal dimensions in mm)





Required surface quality of mating part

1 Proportional solenoid
Observe position of cable socket!
(See also Ordering code)

2 Nameplate

3 Valve housing

4 Space required to remove cable socket

5 Identical seal rings for ports A2, B2, P2, TA2, TB2
Identical seal rings for ports X2, Y2

6 Cable socket for type ZDRE
(separate order, see page 7)

7 Integrated electronics (type ZDREE) with component plug

8 Cable socket for type ZDREE
(plastic or metal version)
(separate order, see page 7)

9 Position of ports to DIN 24340 Form A and ISO 4401 (X, Y as required)

Tolerances to: – General tolerances ISO 2768-mK

Subplates to data sheet RE 45054 and valve fixing screws must be ordered separately.

Subplates: G 535/01 (G 3/4) **with** port X and Y
G 536/01 (G 1) **with** port X and Y

Valve fixing screws (separate order)

4 socket head cap screws ISO 4762 - M6 - 10.9
(friction coefficient $\mu_{total} = 0.14$);
tightening torque $M_T = 15.5$ Nm
(please adjust in the case of changed surfaces)

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de