Features:
- Pilot operated valve used for the reduction of a system pressure
- Actuated by proportional solenoids
- Sandwich plate design
- Porting pattern to DIN 24 340 form A, ISO 4401 and CETOP-RP121H; NFPA/ANSI D 05 for subplates see data sheet RA 45 054 (must be ordered separately)
- 4 pressure ratings
- Valve and electronics from one source
- For control: electrical amplifier type VT-VSPA1-1 to data sheet RE 30 111 (must be ordered separately)
- Model ZDREE 10 VP with integrated electronics:
  - low variation between valves
  - independent ramp times for the increasing and decreasing pressure ramp times

Contents overview

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<td>10</td>
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Symbols (1 = valve side; 2 = sub-plate side)
Functional description, section (① = valve side; ② = sub-plate side)

Type ZDRE 10 VP

Valve types ZDRE 10 VP... are 3-way, sandwich plate, pilot operated pressure reducing valves, i.e. with pressure limitation of the actuator pressure. They are used for the reduction of system pressure. They basically consist of the pilot valve (1) with proportional solenoid (2), main valve (3) and control spool (4). The pressure in port P1 is set via the proportional solenoid dependent on the command value (2).  

At rest, i.e. without any pressure in port P2 the control spool (4) opens the connection from port P2 to P1. The pressure in port P1 applies pressure to the spool area (6) via the control drilling (5). The pilot oil for the pilot valve is taken from port P1 and flows via the control drilling (5), orifice (7) into spring chamber (8). From there it flows via the valve seat (9), drilling (10) and the Y-line back into the tank.

The pressure required in port P1 is set at the amplifier. The proportional solenoid pushes the valve poppet (11) onto the valve seat (9) and closes the connection between the spring chamber (8) and drilling (10). Thus both chambers (6) and (8) are pressure-balanced and the compression spring (12) pushes the spool (4) to the right towards the opening direction of P2 to P1. As soon as the working pressure P1 has risen to the value set at the pilot valve, the valve poppet opens (11) and limits the pressure in the spring chamber (8). The control spool (4) stops the flow P2 to P1 and opens at the control land (13) the connection P1 to tank, until the pressure has dropped to the set value.

Type ZDREE 10 VP (with integrated electronics)  

Function and design of these valves, with the exception of the integrated electronics, are the same as the type ZDRE 10 VP. The control electronics which are fitted into the housing (14) receive the supply voltage and command values via the plug-in connector (15). The pressure command value characteristic curves are factory pre-set with a low scatter. Via two potentiometers the ramp times for the increase and decrease in pressures can be independently adjusted. For further details regarding the integrated electronics, see pages 5 and 7.

* Plug-in connector must be ordered separately!
Pilot oil supply to the directional valve

⚠️ **Attention!**

- With direct operated directional valves the sealing arrangements for the X and Y connections are missing. Therefore, to ensure that oil does not escape, the pilot oil supply from P2 to X and the pilot oil drain between the directional valve and the ZDRE(E) 10 have to be plugged (version XL).

- When using pilot operated proportional directional control valves in conjunction with the ZDRE(E) 10, the proportional valve has to be the version with "external pilot supply".

---

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

With versions Y and L the port X in the sub-plate has to be plugged.
## Ordering details

<table>
<thead>
<tr>
<th>Z</th>
<th>DRE</th>
<th>10</th>
<th>VP</th>
<th>1X</th>
<th>M</th>
<th>G24</th>
<th>N</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandwich plate</td>
<td>= Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportional pressure reducing valve</td>
<td>= DRE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External control electronics</td>
<td>= No code</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With integrated control electronics</td>
<td>= E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal size 10</td>
<td>= 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pilot operated, pressure reduction in port P1</td>
<td>= VP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Plug-in connector position

1. Valve interface side
   - (R-ring counterbores in the housing)

   Series 10 to 19 = 1X
   
   (10 to 19: unchanged installation and connection dimensions)

### Pressure rating:

- up to 725 PSI (50 bar) = 50
- up to 1450 PSI (100 bar) = 100
- up to 2900 PSI (200 bar) = 200
- up to 4600 PSI (315 bar) = 315

### Electrical connections for ZDRE 10 VP:

- with unit plug to DIN 43 650-AM2
- without plug-in connector

### Supply voltage for the control electronics

- G24 = 24 V DC

### Note:

- When using direct operated directional valves it has to be taken into account that the R-ring counterbores for ports X and Y are missing from the housing of the directional valve interface.

### Attention!

- The unintended use of the manual override can lead to uncontrolled machine movements!
### Technical data (for applications outside these parameters, please consult us!)

#### General

<table>
<thead>
<tr>
<th>Installation</th>
<th>ZDRE 10 VP</th>
<th>°F (°C)</th>
<th>–4 to 122 (–20 to +50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>ZDREE 10 VP</td>
<td>°F (°C)</td>
<td>32 to 122 (0 to +50)</td>
</tr>
<tr>
<td>Weight</td>
<td>ZDRE 10 VP</td>
<td>lb (kg)</td>
<td>11.9 (5.4)</td>
</tr>
<tr>
<td></td>
<td>ZDREE 10 VP</td>
<td>lb (kg)</td>
<td>12.1 (5.5)</td>
</tr>
</tbody>
</table>

#### Hydraulic (measured at \( v = 41 \) mm²/s and \( t = 50 \) °C)

<table>
<thead>
<tr>
<th>Max. working pressure</th>
<th>ports P; A; B; X; T; Y or L</th>
<th>PSI (bar)</th>
<th>separate pipe and without pressure to tank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5100 (350)</td>
<td></td>
</tr>
<tr>
<td>Max. settable pressure</td>
<td>pressure rating 50</td>
<td>PSI (bar)</td>
<td>725 (50)</td>
</tr>
<tr>
<td>in port P1</td>
<td>pressure rating 100</td>
<td>PSI (bar)</td>
<td>1450 (100)</td>
</tr>
<tr>
<td></td>
<td>pressure rating 200</td>
<td>PSI (bar)</td>
<td>2900 (200)</td>
</tr>
<tr>
<td></td>
<td>pressure rating 315</td>
<td>PSI (bar)</td>
<td>4600 (315)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flow (max. permissible)</th>
<th>GPM (L/min)</th>
<th>21.1 (80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot oil supply flow</td>
<td>GPM (L/min)</td>
<td>0.16 to 0.24 (0.6 to 0.9)</td>
</tr>
<tr>
<td>Pressure fluid</td>
<td>mineral oil (HL, HLP) to DIN 51 524, phosphate ester (HFD-R)</td>
<td></td>
</tr>
<tr>
<td>Pressure fluid - temperature range</td>
<td>°F (°C)</td>
<td>–4 to +158 (–20 to +70)</td>
</tr>
<tr>
<td>Viscosity range</td>
<td>mm²/s</td>
<td>15 to 380</td>
</tr>
</tbody>
</table>

#### Electrical

<table>
<thead>
<tr>
<th>Insulation of the valve to DIN 40 050</th>
<th>exceeds NEMA Class B (IP65)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>DC</td>
</tr>
<tr>
<td>Signal type</td>
<td>analog</td>
</tr>
<tr>
<td>Min. control current</td>
<td>mA</td>
</tr>
<tr>
<td>Max. control current</td>
<td>ZDRE 10 VP</td>
</tr>
<tr>
<td></td>
<td>ZDREE 10 VP</td>
</tr>
<tr>
<td>Coil resistance</td>
<td>cold value at 20°C</td>
</tr>
<tr>
<td></td>
<td>max. warm value</td>
</tr>
<tr>
<td>Duty cycle</td>
<td>continuous</td>
</tr>
<tr>
<td>Electrical connection 1) separate order: see pages 4 and 6</td>
<td>ZDRE 10 VP</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ZDREE 10 VP</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Control electronics</td>
<td>VT-VSPA1-1 to data sheet RA 30 111</td>
</tr>
</tbody>
</table>

#### Passed vibration test

<table>
<thead>
<tr>
<th>Vibration test no.</th>
<th>to DIN IEC 68-2-6 (sinusoidal)</th>
<th>5 - 2000 Hz; max. 10 g</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>to DIN IEC 68-2-36 (random)</td>
<td>20 - 2000 Hz; max. 0.05 g² / Hz</td>
</tr>
<tr>
<td></td>
<td>to IEC 68-2-27</td>
<td>half sinusoidal 15 g / 11 ms</td>
</tr>
<tr>
<td></td>
<td>DIN EN 60 068, part 27</td>
<td>3 x positive; 3 x negative per axis</td>
</tr>
</tbody>
</table>

---

1)
Electrical connections

For type ZDRE 10 VP (without integrated electronics)

Connection to unit plug

Connection to plug-in connector

Plug-in connector to DIN 43 650-AF2
Pg11 (Z4) part no. RR00 008 909
1/2" NPT (Z45) part no. RR00 011 039

For type ZDREE 10 VP (with integrated electronics)

Plug-in connector to E DIN 43 563-BF6-3/Pg11
(must be ordered separately under part no. RR00 021 267)

For PIN allocation see block diagram on page 7
Integrated electronics for types ZDREE

Functional description

The control of the integrated electronics is via the differential amplifier connections D and E.

The ramp generator produces from a command value jump (0 to 10 V or 10 to 0 V) a delayed increase or decrease in solenoid current. At potentiometer R14 the rate of increase in time and at R13 the rate of decrease in time of the solenoid current can be set. Only via the full command value range is the maximum ramp time of 5 secs. possible. With smaller command value changes the ramp time is shortened.

Via the characteristic curve generator, the command value solenoid voltage characteristic curve is so adjusted to the valve, that nonlinearities in the hydraulics are compensated for so that a linear command value and pressure characteristic curve is obtained.

The current regulator controls the solenoid current unrelated to the solenoid coil resistance.

At potentiometer R30, the increase rate of the command value current characteristic curve and, thereby also the increase rate of the command value - pressure characteristic curve can be changed. The potentiometer R43 is used to adjust the biasing current. This setting should not be changed. If required, the zero point of the command value/pressure characteristic curve is adjustable at the valve seat.

The power stage of the electronics for the control of the proportional solenoids is generated by a chopper amplifier. It is pulse width modulated with a pulse frequency of 300 Hz.

At the two measurement sockets MP1 and MP2 the solenoid currents can be measured. A voltage drop of 0.352 V at the measurement resistor relates to a solenoid voltage of 1.6 A.

Block circuit diagram for the integrated electronics / PIN allocation

Power supply

Power supply voltage

\[ V_{\text{eff}} = 22 \text{ to } 33 \text{ V} \]

Residual ripple at power supply: < 5 %

Supply current: \[ i_{\text{eff}} = \text{max. } 1.4 \text{ A} \]

Power supply cable: recommended 5 core, 18 AWG or 16 AWG

- (0.75 or 1 mm²) with shield
- outside diameter 0.26 to 0.44 in (6.5 to 11.2 mm)
- screening at 0 V power supply
- max. permissible length 330 ft (100 m)

The minimum power supply voltage at the power supply is dependent on the length of the supply cable (see diagram).

For lengths >160 ft (50 m) a capacitor with a value of 2200 µF must be fitted near to the valve.
### Characteristic curves (measured at $v = 41 \text{ mm}^2/\text{s}$ and $t = 50 ^\circ \text{C}$)

#### Minimum pressure drop vs flow curves

- **A1 → A2; B1 → B2**

#### Pressure in port P1 in relationship to the command value

- **Pressure rating 50 bar**
- **Pressure rating 100 bar**
- **Pressure rating 200 bar**
- **Pressure rating 315 bar**
Characteristic curves (measured at $v = 41 \text{ mm}^2/\text{s}$ and $t = 50 \degree \text{C}$)

Pressure-Flow - Characteristic curve

**Pressure rating 50 bar**

- Pressure in port P1 in PSI (bar)
  - 1015 (70)
  - 870 (60)
  - 725 (50)
  - 580 (40)
  - 435 (30)
  - 290 (20)
  - 145 (10)

- Volume flow $Q$ in GPM (L/min)
  - (80) (60) (40) (20) (10)

**Pressure rating 100 bar**

- Pressure in port P1 in PSI (bar)
  - 1740 (120)
  - 1450 (100)
  - 1160 (80)
  - 870 (60)
  - 580 (40)
  - 290 (20)
  - 145 (10)

- Volume flow $Q$ in GPM (L/min)
  - (80) (60) (40) (20) (10)

**Pressure rating 200 bar**

- Pressure in port P1 in PSI (bar)
  - 3190 (220)
  - 2900 (200)
  - 2320 (160)
  - 1740 (120)
  - 1160 (80)
  - 580 (40)

- Volume flow $Q$ in GPM (L/min)
  - (80) (60) (40) (20) (10)

**Pressure rating 315 bar**

- Pressure in port P1 in PSI (bar)
  - 5076 (350)
  - 4351 (300)
  - 3626 (250)
  - 2900 (200)
  - 2175 (150)
  - 1450 (100)
  - 725 (50)

- Volume flow $Q$ in GPM (L/min)
  - (80) (60) (40) (20) (10)

**Minimum settable pressure in P1**

- Pressure in port P1 in PSI (bar)
  - 435 (30)
  - 290 (20)
  - 145 (10)

- Volume flow $Q$ in GPM (L/min)
  - (80) (60) (40) (20) (10)
Subplates to data sheet RE 45 054 and valve fixing screws must be ordered separately.

**Subplates:**
- G 534/05 (3/4" NPT) without connection X and Y
- G 535/05 (3/4" NPT) with connection X and Y
- G 536/05 (1" NPT) with connection X and Y

**Valve fixing screws:**
- 4) 1/4-20 UNC or M6 DIN 912-10.9 (grade 8 or better);
  - $M_k = 11.4 \, \text{lb-ft (15.5 Nm)}$
- 1 Proportional solenoid
  - Please note the position of solenoid plug (also see ordering details)
- 2 Name plate
- 3 Valve housing
- 4 Manual override "N"

⚠️ **Attention!**

The unintended use of the manual override can lead to uncontrolled machine movements!

---

**Unit dimensions:** dimensions in inches (millimeters)

<table>
<thead>
<tr>
<th>Component</th>
<th>Dimension (in)</th>
<th>Dimension (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port B2</td>
<td>0.591 (15)</td>
<td>0.591 (15)</td>
</tr>
<tr>
<td>Port P2</td>
<td>0.591 (15)</td>
<td>0.591 (15)</td>
</tr>
<tr>
<td>Port TA</td>
<td>13.56 (344.5)</td>
<td>13.56 (344.5)</td>
</tr>
<tr>
<td>Port TB</td>
<td>10.90 (277.5)</td>
<td>10.90 (277.5)</td>
</tr>
<tr>
<td>Port X2</td>
<td>4.232 (107.5)</td>
<td>4.232 (107.5)</td>
</tr>
<tr>
<td>Port Y2</td>
<td>0.280 (6.6)</td>
<td>0.280 (6.6)</td>
</tr>
<tr>
<td>Port X</td>
<td>0.16 (4)</td>
<td>0.16 (4)</td>
</tr>
<tr>
<td>Port Y</td>
<td>2.756 (70)</td>
<td>2.756 (70)</td>
</tr>
<tr>
<td>Port A2</td>
<td>3.661 (93)</td>
<td>3.661 (93)</td>
</tr>
<tr>
<td>Port B2</td>
<td>0.984 (25)</td>
<td>0.984 (25)</td>
</tr>
<tr>
<td>Port P2</td>
<td>2.362 (60)</td>
<td>2.362 (60)</td>
</tr>
<tr>
<td>Port TA</td>
<td>0.703 (17.85)</td>
<td>0.703 (17.85)</td>
</tr>
<tr>
<td>Port TB1</td>
<td>0.703 (17.85)</td>
<td>0.703 (17.85)</td>
</tr>
<tr>
<td>Port X2</td>
<td>1.811 (46)</td>
<td>1.811 (46)</td>
</tr>
<tr>
<td>Port Y2</td>
<td>1.811 (46)</td>
<td>1.811 (46)</td>
</tr>
</tbody>
</table>

**Rings:**
- R-ring 13 x 1.6 x 2 (O-ring 12 x 2)
- R-ring 11.18 x 1.6 x 1.78 (O-ring 10.82 x 1.78)

**Ports:**
- A2, B2, P2, TA2, TB2
- X2, Y2

**Ports and Rings:**
- Ports A2, B2, P2, TA2, TB2
- Ports X2, Y2

---

**Attention!**

The unintended use of the manual override can lead to uncontrolled machine movements!