Variable displacement pump with axial tapered piston rotary group of bent axis design, for open circuit hydraulic drives.
This pump is suitable for both mobile and industrial applications.
Comprehensive program of control devices available. The robust taper roller drive shaft bearings are designed to give long service life.
Output flow is proportional to drive speed and pump displacement is steplessly variable between maximum and zero ($V_{g\text{ max}}$ to $V_{g\text{ min}} = 0$).
### Ordering Code / Standard Program

**Fluid**
- Mineral oil (no code)

**Axial piston unit**
- Variable displacement, bent axis design

**Mode of operation**
- Pump in open circuit

**Sizes**

<table>
<thead>
<tr>
<th>Displacement Vₘₐₓ in cm³</th>
<th>55</th>
<th>80</th>
<th>107</th>
<th>160</th>
<th>250</th>
<th>355</th>
<th>500</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sizes 250, 355, 500, 1000</td>
<td>see RE 92203</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Control and adjustment devices**

<table>
<thead>
<tr>
<th></th>
<th>55</th>
<th>80</th>
<th>107</th>
<th>160</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant power control</td>
<td>LR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRH1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRH2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRH5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRH6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRDH1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRDH2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRDH5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRDH6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LRDU</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Pressure cut-off integral (fixed setting)**

- **H1**: Hydr. stroke limiter Δp = 25 bar, neg. control
- **H2**: Hydr. stroke limiter Δp = 25 bar, pos. control
- **H5**: Hydr. stroke limiter Δp = 10 bar, neg. control
- **H6**: Hydr. stroke limiter Δp = 10 bar, pos. control
- **U**: Electrical stroke limiter

**Remote constant pressure control**

<table>
<thead>
<tr>
<th></th>
<th>DR</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DRG</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Hydraulic control, pilot pressure dependent**

<table>
<thead>
<tr>
<th></th>
<th>HD1</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HD2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HD1G</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HD2G</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remote pressure cut-off**

- **1**: Pilot pressure increase Δp = 10 bar
- **2**: Pilot pressure increase Δp = 25 bar

**Electrical control with proportional solenoid**

<table>
<thead>
<tr>
<th></th>
<th>EP</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EPG</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) The constant power control with remote pressure cut-off LRG is also available with hydr. or electrical stroke limiter (e.g. LRGH1).

---

= Preferred program
Variable displacement pump A7VO

Axial piston unit

Mode of operation

Sizes

Control and adjustment devices

Series

Index

Direction of rotation

<table>
<thead>
<tr>
<th>55</th>
<th>80</th>
<th>107</th>
<th>160</th>
</tr>
</thead>
<tbody>
<tr>
<td>clockwise</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>counter-clockwise</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Seals

NBR - nitril caoutchouc / shaft seal FPM

|  | ● | ● | ● | ● | N |

FPM - flour caoutchouc

|  | ● | ● | ● | ● | V |

Shaft end

splined DIN 5480

|  | ● | ● | ● | ● | Z |

Mounting flange

ISO 4-hole

|  | ● | ● | ● | ● | B |

Service line connections

Pressure port SAE at rear (metric mounting threads)

|  | ● | ● | ● | ● | 01 |

Suction port SAE at rear (metric mounting threads)

When ordering with pressure cut-off/pressure control please state the setting values in clear text. The minimum and maximum displacement is set to limiting values $V_{g_{\text{max}}}$ and $V_{g_{\text{min}}} = 0$. If other setting values are desired please state in clear text. Setting screws are factory fitted with protective tamper proof caps to prevent subsequent resetting.

● = available

Preferred types, when ordering please state type and ident-number

<table>
<thead>
<tr>
<th>Type</th>
<th>Ident-Number</th>
<th>Type</th>
<th>Ident-Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>A7VO55LRH1/63R-NZB01</td>
<td>9610373</td>
<td>A7VO107LRH1/63R-NZB01</td>
<td>9610393</td>
</tr>
<tr>
<td>A7VO55LRD/63R-NZB01</td>
<td>9610555</td>
<td>A7VO107LRD/63R-NZB01</td>
<td>9610559</td>
</tr>
<tr>
<td>A7VO55DR/63R-NZB01</td>
<td>9610374</td>
<td>A7VO107DR/63R-NZB01</td>
<td>9610394</td>
</tr>
<tr>
<td>A7VO55EP/63R-NZB01</td>
<td>9610376</td>
<td>A7VO107EP/63R-NZB01</td>
<td>9610396</td>
</tr>
<tr>
<td>A7VO80LRH1/63R-NZB01</td>
<td>9610383</td>
<td>A7VO160LRH1/63R-NZB01</td>
<td>9610403</td>
</tr>
<tr>
<td>A7VO80LRD/63R-NZB01</td>
<td>9610557</td>
<td>A7VO160LRD/63R-NZB01</td>
<td>9610561</td>
</tr>
<tr>
<td>A7VO80DR/63R-NZB01</td>
<td>9610384</td>
<td>A7VO160DR/63R-NZB01</td>
<td>9610404</td>
</tr>
<tr>
<td>A7VO80EP/63R-NZB01</td>
<td>9610386</td>
<td>A7VO160EP/63R-NZB01</td>
<td>9610406</td>
</tr>
</tbody>
</table>
Hydraulic fluid
We request that before starting a project detailed information about the choice of hydraulic fluids and application conditions are taken from our catalogue sheets RE 90220 (mineral oil), RE 90221 (environmentally acceptable hydraulic fluids) and RE 90223 (fire resistant fluids, HF).

When using HF fluids or environmentally acceptable hydraulic fluids respectively possible limitations for the technical data have been taken into consideration. If necessary please contact our technical department (please indicate type of the hydraulic fluid used in your application when ordering).

Operating viscosity range
We recommend that the operating viscosity (at operating temperature, for both efficiency and life of the unit, be chosen within the optimum range of:

$$\nu_{opt} = \text{opt. operating viscosity } 16...36 \text{ mm}^2/\text{s}$$

referred to tank temperature at open circuit.

Viscosity limits
The limiting values for viscosity are as follows:

$$\nu_{min} = 5 \text{ mm}^2/\text{s}$$

short term at a max. permissible temp. of $$t_{max} = 115\degree C$$.

Please note that the max. fluid temperature of 115°C is also not exceeded in certain areas (for instance bearing area).

$$\nu_{max} = 1600 \text{ mm}^2/\text{s}$$

short term on cold start, $$t_{min} = -40\degree C$$.

At temperatures of -25°C up to -40°C special measures may be required for certain installation positions. Please contact us for further information.

Example: At an ambient temperature of $$X\degree C$$, the operating temperature in the tank is 60°C. In the optimum viscosity range $$\nu_{opt}$$ (shaded area), this corresponds to viscosity grades VG 46 or VG 68, VG 68 should be selected.

Important: The leakage fluid temperature is influenced by pressure and speed and is typically higher than the tank temperature. However, maximum temperature at any point in the system must be less than 115°C.

If the above conditions cannot be met due to extreme operating conditions, or with a high ambient temperature, we recommend that port U be used for bearing flushing.

Flushing flow

<table>
<thead>
<tr>
<th>Size</th>
<th>55</th>
<th>80</th>
<th>107</th>
<th>160</th>
</tr>
</thead>
<tbody>
<tr>
<td>$$q_{V,S}$$ L/min</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>12</td>
</tr>
</tbody>
</table>

Temperature of flushing fluid $$\leq$$ tank temperature

Filtration of fluid
The finer the filtration the better the achieved purity grade of the pressure fluid and the longer the life of the axial piston unit.

To ensure the functioning of the axial piston unit a minimum purity grade of:

9 to NAS 1638
6 to SAE
18/15 to ISO/DIS 4406 is necessary.

At very high temperatures of the hydraulic fluid (90°C to max. 115°C) at least cleanliness class 5 to SAE
8 to NAS 1638
5 to SAE
17/14 to ISO/DIS 4406 is necessary.

If above mentioned grades cannot be maintained please consult us.

Direction of flow

Clockwise rotation  Counter-clockwise rotation

| S to B | S to A |

Installation position
Optional. The pump housing must be filled with fluid prior to commissioning, and must remain full whenever it is operating. For pump installation positions above the tank special measures are necessary.

For extensive information on installation position, please consult our data sheet RE 90270 before completing your design work.

Operating pressure range – inlet side
Absolute pressure at port S (suction inlet)

$$p_{abs,min}$$ 0,8 bar

Max. pressure $$p_{abs,max}$$ is dependent upon shaft speed (see page 5).

Operating pressure range – outlet side
Max. pressure at ports A or B

<table>
<thead>
<tr>
<th>Drive shaft</th>
<th>Nominal pressure $$p_n$$</th>
<th>Peak pressure $$p_{max}$$</th>
</tr>
</thead>
<tbody>
<tr>
<td>no radial loading (coupling)</td>
<td>350 bar</td>
<td>400 bar</td>
</tr>
</tbody>
</table>

with radial loading (pinion or belt drive) 315 bar

(315 bar) 1

(400 bar) 1

1) with smallest permissible pinion or pulley diameter (see page 5).
Technical Data

Case drain fluid
The leakage oil chamber is connected to the suction chamber. A case drain line is therefore not necessary (both ports R are plugged).

Case drain pressure
Shaft seal ring FPM (fluor-caoutchouc)
The lower the speed and the case drain pressure the higher the life expectation of the shaft seal ring.
The values shown in the diagram are permissible limiting values at intermittent pressurisation of the drive shaft seal ring and shall not be exceeded.
In case of excess of the limit values or at stationary pressure loads in the range of the max. admissible leakage pressure a reduction of the life experience of the seal ring will result.
For a short period (t < 5 min.) pressure loads up to 5 bar independent from rotational speeds are permissible respectively at lower speeds up to 6 bar.
Special operation conditions may require limitations of these values.

Pump drive
Radial and axial loading on the drive shaft
The values shown are maximum values and are not permitted for continuous operation.

<table>
<thead>
<tr>
<th>Size</th>
<th>55</th>
<th>80</th>
<th>107</th>
<th>160</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17,5</td>
<td>20</td>
<td>22,5</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>F_q max</td>
<td>N</td>
<td>9280</td>
<td>11657</td>
<td>13580</td>
</tr>
<tr>
<td>F_q/bar</td>
<td>N/bar</td>
<td>23,2</td>
<td>29,1</td>
<td>34,0</td>
</tr>
<tr>
<td>± F_ax max</td>
<td>N</td>
<td>500</td>
<td>710</td>
<td>900</td>
</tr>
<tr>
<td>± F_ax zul./bar</td>
<td>N/bar</td>
<td>7,5</td>
<td>9,6</td>
<td>11,3</td>
</tr>
</tbody>
</table>

Code explanation
\[ a = \text{distance of } F_q \text{ from shaft shoulder} \]
\[ F_q = \text{max. occurring radial force} \]
\[ F_q/bar = \frac{\text{radial force}}{\text{bar working pressure}} \]
\[ \text{at gear drive (DIN 867) with smallest PCD of pinion } D_{k.min} \text{ and } V_{g.max} = \frac{2,5 \times \text{dia. of drive shaft}}{(D_{h.min} = 2,5 \times \text{dia. of drive shaft})} \]
\[ = \text{preload required/ bar working pressure} \]
\[ = \text{to transmit torque at V-belt drive (DIN 7753) with smallest pulley diameter } D_{k.min} \text{ and } V_{g.max} = \frac{5 \times \text{dia. of drive shaft}}{(D_{k.min} = 5 \times \text{dia. of drive shaft})} \]
\[ \pm F_{ax, max} = \text{max. permissible axial force when stationary or when axial piston unit is running at zero pressure} \]
\[ \pm F_{ax, zul.}/\text{bar} = \text{permissible axial bar working pressure} \]
\[ \text{The direction of the max. permissible axial force must be noted:} \]
\[ - F_{ax, max} = \text{increases bearing life} \]
\[ + F_{ax, max} = \text{reduces bearing life} \]
\[ \text{(avoid if possible)} \]

Optimal force direction of F_q
By means of appropriate force directions of F_q the bearing load caused by inside rotary group forces can be reduced.
An optimal life expectation of the bearing can be reached.

Technical Data

Case drain fluid
The leakage oil chamber is connected to the suction chamber. A case drain line is therefore not necessary (both ports R are plugged).

Case drain pressure
Shaft seal ring FPM (fluor-caoutchouc)
The lower the speed and the case drain pressure the higher the life expectation of the shaft seal ring.
The values shown in the diagram are permissible limiting values at intermittent pressurisation of the drive shaft seal ring and shall not be exceeded.
In case of excess of the limit values or at stationary pressure loads in the range of the max. admissible leakage pressure a reduction of the life experience of the seal ring will result.
For a short period (t < 5 min.) pressure loads up to 5 bar independent from rotational speeds are permissible respectively at lower speeds up to 6 bar.
Special operation conditions may require limitations of these values.

Pump drive
Radial and axial loading on the drive shaft
The values shown are maximum values and are not permitted for continuous operation.

<table>
<thead>
<tr>
<th>Size</th>
<th>55</th>
<th>80</th>
<th>107</th>
<th>160</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17,5</td>
<td>20</td>
<td>22,5</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>F_q max</td>
<td>N</td>
<td>9280</td>
<td>11657</td>
<td>13580</td>
</tr>
<tr>
<td>F_q/bar</td>
<td>N/bar</td>
<td>23,2</td>
<td>29,1</td>
<td>34,0</td>
</tr>
<tr>
<td>± F_ax max</td>
<td>N</td>
<td>500</td>
<td>710</td>
<td>900</td>
</tr>
<tr>
<td>± F_ax zul./bar</td>
<td>N/bar</td>
<td>7,5</td>
<td>9,6</td>
<td>11,3</td>
</tr>
</tbody>
</table>

Code explanation
\[ a = \text{distance of } F_q \text{ from shaft shoulder} \]
\[ F_q = \text{max. occurring radial force} \]
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\[ \pm F_{ax, max} = \text{max. permissible axial force when stationary or when axial piston unit is running at zero pressure} \]
\[ \pm F_{ax, zul.}/\text{bar} = \text{permissible axial bar working pressure} \]
\[ \text{The direction of the max. permissible axial force must be noted:} \]
\[ - F_{ax, max} = \text{increases bearing life} \]
\[ + F_{ax, max} = \text{reduces bearing life} \]
\[ \text{(avoid if possible)} \]

Optimal force direction of F_q
By means of appropriate force directions of F_q the bearing load caused by inside rotary group forces can be reduced.
An optimal life expectation of the bearing can be reached.
Table of values (theoretical values, without considering mech-hyd. and volumetric efficiency; values rounded)

<table>
<thead>
<tr>
<th>Size</th>
<th>55</th>
<th>80</th>
<th>107</th>
<th>160</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>$V_g$</td>
<td>cm³</td>
<td>54.8</td>
<td>80</td>
</tr>
<tr>
<td>$V_{g\ min}$</td>
<td>cm³</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Max. speed ¹)</td>
<td>at $V_{g\ max}$</td>
<td>$n_{max \ 1}$</td>
<td>rpm</td>
<td>2500</td>
</tr>
<tr>
<td>at $V_{g} &lt; V_{g\ max}$ (see diagram)</td>
<td>$n_{max \ 2}$</td>
<td>rpm</td>
<td>3400</td>
<td>3000</td>
</tr>
<tr>
<td>Max. perm. speed (speed limit) with increased inlet pressure $p_{abs}$ at suction inlet S (see diagram)</td>
<td>$n_{max \ zul}$</td>
<td>rpm</td>
<td>3750</td>
<td>3350</td>
</tr>
<tr>
<td>Max. perm. flow ²)</td>
<td>at $n_{max \ 1}$ ($V_{g\ max}$)</td>
<td>$q_{V\ max \ 1}$</td>
<td>L/min</td>
<td>133</td>
</tr>
<tr>
<td>Max. power ($\Delta p = 350$ bar)</td>
<td>at $q_{V\ max \ 1}$</td>
<td>$P_{max \ 1}$</td>
<td>kW</td>
<td>80</td>
</tr>
<tr>
<td>Torque constants</td>
<td>at $V_{g\ max}$</td>
<td>$T_\eta$</td>
<td>Nm/Bar</td>
<td>0.87</td>
</tr>
<tr>
<td>Perm. torque at $V_{g\ max}$</td>
<td>at continuous operation ($\Delta p = 350$ bar)</td>
<td>$T_n$</td>
<td>Nm</td>
<td>305</td>
</tr>
<tr>
<td>Perm. torque at $V_{g\ max}$</td>
<td>max. perm., short-term ($\Delta p = 400$ bar)</td>
<td>$T_{max}$</td>
<td>Nm</td>
<td>348</td>
</tr>
<tr>
<td>Moment of inertia about the drive axis</td>
<td>$J$</td>
<td>kgm²</td>
<td>0.0042</td>
<td>0.0080</td>
</tr>
<tr>
<td>Weight (approx.)</td>
<td>$m$</td>
<td>kg</td>
<td>25</td>
<td>40</td>
</tr>
</tbody>
</table>

¹) The values shown are valid for an absolute pressure ($p_{abs}$) of 1 bar at the suction inlet S and when operated on mineral oil.
²) By increasing the inlet pressure ($p_{abs} > 1$ bar) the speed may be increased to the max. permissible speed (speed limit), see diagram.

Calculation of Size

Flow: $q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$ in L/min

Drive torque: $T = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}} = \frac{1.59 \cdot V_g \cdot \Delta p}{100 \cdot \eta_{mh}}$ in Nm

Drive power: $P = \frac{2 \cdot \pi \cdot T \cdot n}{60 \cdot 9549} = \frac{T \cdot n}{600 \cdot \eta_t}$ in kW

Calculation of inlet pressure $p_{abs}$ at suction inlet S or of the reduction in pump displacement for an increase in speed

Example:
Given: Size 80
Drive speed 2560 rpm
Required: Required pressure $p_{abs}$ at suction inlet S
Solution: Speed ratio $n_{max \ 1} = \frac{2560}{2240} = 1.14$

This gives an inlet pressure $p_{abs} = 1.3$ bar at max. swivel angle ($V_{g\ max}$).
If, for example, free inlet flow can only be obtained with $p_{abs} = 1$ bar, then pump displacement must be reduced to $0.88 \cdot V_{g\ max}$

Note:
- max. perm. speed $n_{max \ zul}$ (speed limit).
- min. and max. perm. pressure at port S.
- perm. values of the shaft seal ring.
**LR Constant Power Control**

The constant power control controls the output volume of the pump in relation to the working pressure so that, at a constant drive speed, the preset drive power is not exceeded.

\[ p_b \cdot V_g = \text{constant} \]

\( p_b \) = working pressure, \( V_g \) = pump displacement

Optimum power usage is obtained by accurately following the power hyperbola. Working pressure applies a force on a piston within the control piston on to a rocker arm. An externally adjustable spring force is applied to the other side of the rocker arm to determine the power setting.

Should the working pressure exceed the set spring force, the pilot control valve is operated via the rocker arm, allowing the pump to swivel towards zero output. This in turn reduces the effective moment on the arm of the rocker, thus allowing the working pressure to rise in the same ratio by which the output flow is reduced (\( p_b \cdot V_g = \text{constant} \)).

In unoperated (zero pressure) condition, the pump is swivelled to its starting position (\( V_g \max \)) by means of a control spring. The start of control is adjustable from 50 bar to 220 bar.

The output power (performance curve) is influenced by the efficiency of the pump.

**When ordering, state in clear text:**
- Input power \( P \) in HP or kW
- Input speed \( n \) in rpm
- Max. output flow \( q_{V \max} \) in L/min

After all technical details have been clarified, a power diagram can be produced by computer.

**Circuit diagram**

*Constant power control LR*

---

**Variation: Remote pressure cut-off (G)**

A sequence valve with subplate takes over the function of the pressure cut-off. The valve is mounted separate from the pump, and the simple piping length should not exceed 5 m. High pressure is supplied from the pump to the valve via port \( A_1 \), and the valve control oil is fed back to the pump via port \( X_3 \), causing the pump to swivel back towards \( V_{g \min} \). Port \( T \) of the sequence valve and \( T_1 \), the pilot drain from the pump must be connected back to tank (cooler).

Setting range from 50 bar to 315 bar

Any pressure relief valve included in the circuit to limit the max. pressure must be set to a cracking pressure at least 20 bar above the pressure control setting.

The sequence valve and subplate must be ordered separately.

Sequence valve: DZ5DP2-1X/315 YMSO21 (Id.-Nr. 154 869)

Subplate: G 115/1 (Id.-Nr. 153 138)

**When ordering, state in clear text:**

Setting of the pressure cut-off

---

**Circuit diagram**

*Constant power control with remote pressure cut-off, LRG*
**LRD** Constant Power Control...

**Variation: Integral pressure cut-off (fixed setting), (D)**

The pressure cut-off is in effect a constant pressure control which swivels the pump back to $V_{g\text{ min}}$ when the preset working pressure is reached. This function overrides the constant power control, i.e., the constant power control is effective below the preset working pressure. The valve is integrated into the control housing and is set in the factory to a fixed pressure, within the range 200 bar to max. 350 bar. Note, however, that the max. permissible setting between start of control and pressure cut-off is start of control x 5.

Example:
Start of control (constant power control): 50 bar
Max. setting of pressure cut-off: 50 bar + 5 = 250 bar
When $T_1$ is plugged and $T_{\text{tank}} \leq 50\degree C$ the maximum duration of operation is $\leq 2$ min.

Any pressure relief valve included in the circuit to limit the max. pressure must be set to a cracking pressure at least 20 bar above the pressure control setting.

**When ordering, state in clear text:**
Setting of the pressure cut-off

![Circuit diagram](image)

**Unit dimensions LRD**
General dimensions and connections see pages 17...20

**Prior to finalising your design, please obtain a certified drawing.**

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**Circuit diagram**
*Constant power control with integral pressure cut-off (fixed setting) LRD*
LR.U Constant Power Control...

Variation: Electrical stroke limiter (U)
The electrical stroke limiter allows the maximum displacement to be infinitely varied or limited as required.
The displacement is set by means of the pilot current generated by the proportional solenoid.
A 24V DC supply and a current of between 200 and 600 mA are required for the control of the proportional solenoid.
The electrical stroke limiter is overridden by the constant power control, i.e. below the power curve (power hyperbola), displacement is adjusted in relation to the pilot current. If the set flow or the working pressure is such that the power curve is exceeded, the constant power control overrides the stroke limiter and reduces displacement until the power hyperbola is restored.

As the pilot current increases, the pump swivels to a lower displacement.
In unoperated (zero pressure) condition, the pump is swivelled to its starting position \( V_{g\ max} \) by means of a control spring.
Start of control \( (V_{g\ max}) \) 200 mA
End of control \( (V_{g\ min}) \) 600 mA
Control from \( V_{g\ max} \) to \( V_{g\ min} \)

Circuit diagram: Constant power control with pressure cut-off and electrical stroke limiter, LRDU

Connections
\( Y_3 \) Remote control pressure M14x1.5 (plugged)

<table>
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<tr>
<th>Size</th>
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LR.H. Constant Power Control...

Variation: Hydraulic stroke limiter (H...)
The hydraulic stroke limiter allows the maximum displacement to be infinitely varied or limited as required.
Control range \( V_{g,\text{max}} \) to \( V_{g,\text{min}} \).
The displacement is set by means of the pilot pressure applied at port \( X_1 \).
The hydraulic stroke limiter is overridden by the constant power control, i.e. below the power curve (power hyperbola), displacement is adjusted in relation to pilot pressure. If the set flow or the working pressure is such that the power curve is exceeded, the constant power control overrides the stroke limiter and reduces displacement until the power hyperbola is restored.

H1/H5 → Function: \( V_{g,\text{max}} \) to \( V_{g,\text{min}} \) (negative control)
As pilot pressure increases the pump swivels towards lower displacement.
In unoperated (zero pressure) condition, the pump is swivelled to its starting position (\( V_{g,\text{max}} \)) by means of a control spring.
Start of control, (at \( V_{g,\text{max}} \)), adjustable from 4 bar to 15 bar.
When ordering, please state required start of control in clear text.

H1 → pilot pressure increase \( (V_{g,\text{max}} - V_{g,\text{min}}) \). \( \Delta p = 25 \) bar

H5 → pilot pressure increase \( (V_{g,\text{max}} - V_{g,\text{min}}) \). \( \Delta p = 10 \) bar

A pressure of 40 bar is necessary to operate the control. The required control oil is taken from the high pressure circuit. If necessary, a boost pressure of \( \geq 40 \) bar should be applied at port \( Y_3 \).
If the H-function is used for two-point switching control only \( (V_{g,\text{max}} - V_{g,\text{min}}) \), pilot pressure at port \( X_1 \) must not exceed 40 bar.
H2/H6 → Function: \( V_{g_{\text{min}}} \) to \( V_{g_{\text{max}}} \) (positive control)
As pilot pressure increases the pump swivels towards higher displacement.
In unoperated (zero pressure) condition, the pump is swivelled to its starting position (\( V_{g_{\text{max}}} \)) by means of a control spring.
If the working pressures is \( \geq 40 \) bar, the pump swivels from \( V_{g_{\text{max}}} \) to \( V_{g_{\text{min}}} \) (pilot pressure \( \leq \) start of control).
Start of control, (at \( V_{g_{\text{min}}} \)), adjustable from 4 bar to 15 bar
When ordering, please state required start of control in clear text.

**H2** → pilot pressure increase \( (V_{g_{\text{min}}} - V_{g_{\text{max}}}) \) \( \Delta p = 25 \) bar

**H6** → pilot pressure increase \( (V_{g_{\text{min}}} - V_{g_{\text{max}}}) \) \( \Delta p = 10 \) bar

A pressure of 40 bar is necessary to operate the control. The required control oil is taken from the high pressure circuit.
If necessary, a boost pressure of \( \geq 40 \) bar should be applied at port \( Y_3 \).
If the H-function is used for two-point switching control only \( (V_{g_{\text{min}}} - V_{g_{\text{max}}}) \), pilot pressure at port \( X_1 \) must not exceed 40 bar.

Circuit diagram:
Constant power control with pressure cut-off and hydraulic stroke limiter (positive control), LRDH2, LRDH6

Unit dimensions LRDH2, LRDH6
General dimensions and connections see pages 17...20

Connections see LRDH1/H5 page 10

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**DR  Constant Pressure Control**

The constant pressure control maintains the pressure in a hydraulic system constant within its control range in spite of changing pump flow requirements. The variable pump supplies only the volume of fluid required by the consumer. Should working pressure exceed the set pressure, the pump is automatically swivelled back to a smaller angle and the deviation in control corrected.

In unoperated (zero pressure) condition, the pump is swivelled to its starting position (\(V_g_{\text{max}}\)) by means of a control spring.

**Setting range from 50 bar to 350 bar**

**When ordering, state in clear text:**
Setting of the constant pressure control

Any pressure relief valve included in the circuit to limit the max. pressure must be set to a cracking pressure at least 20 bar above the pressure control setting.

**Zero stroke operation**

The standard pump unit is designed for intermittent constant pressure operation. Short-term operation at zero stroke (< 10 min.; ~50 % duty) is permissible up to a working pressure \(p_{\text{max}} = 315\) bar at a tank temperature of \(\leq 50^\circ\text{C}\).

For long-term periods of zero stroke operation, port U should be used for bearing flushing.

**Circuit diagram:**

*Constant pressure control DR (integral valve), fixed setting*

**Flushing flow**

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<td>(q_{V,SP}) in L/min</td>
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<td>8</td>
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**Temperature of flushing fluid \(\leq\) tank temperature**

**Unit dimensions DR**

General dimensions and connections see pages 17...20.

**View Y**

- Counter-clockwise rotation
- Clockwise rotation

**Size**

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**Variation: Remote constant pressure control (G)**

A sequence valve with subplate takes over the pressure control function. The valve is mounted separate from the pump, and the simple piping length should not exceed 5 m. High pressure is supplied from the pump to the valve via port A₁, and the valve control oil is fed back to the pump via port X₃, causing the pump to swivel back towards \( V_{g\text{ min}} \). Port T of the sequence valve and T₁, the pilot drain from the pump must be connected back to tank (cooler).

Setting range from 50 bar to 315 bar.

Any pressure relief valve included in the circuit to limit the max. pressure must be set to a cracking pressure at least 20 bar above the pressure control setting.

The sequence valve and subplate must be ordered separately.

Sequence valve: DZ5DP2-1X/315YMSO21 (Id.-Nr. 154 869)

Subplate: G 115/1 (Id.-Nr. 153 138)

**When ordering, state in clear text:**

Setting of the constant pressure control

---

**Unit dimensions DRG**

see control device DR,

general dimensions and connections see pages 17...20

Ports A₁ and X₃ are open

---

**Circuit diagram:**

*Remote constant pressure control DRG*
HD Hydraulic Control, Pilot Pressure Related

The pilot pressure related hydraulic control allows stepless setting of the pump displacement in relation to pilot pressure. Control is proportional to the pilot pressure applied to port X₁. Start position in zero pressure condition at V₉ₐₐₜₙ. Control from V₉ₐₐₜₙ to V₉ₐₐₛₓₙ.

HD1
Pilot pressure increase (V₉ₐₐₜₙ – V₉ₐₐₛₓₙ) Δp = 10 bar
Start of control (at V₉ₐₐₜₙ), adjustable from 4 – 15 bar
When ordering, please state required start of control in clear text.

Circuit diagram:
Hydraulic control, pilot pressure related, HD1, HD2

Unit dimensions HD1, HD2
general dimensions and connections see pages 17...20

A pressure of 40 bar is necessary to operate the control. The required control oil is taken from the high pressure circuit. If the working pressure equals or exceeds 40 bar and minimum displacement (V₉ₐₐₛₓₙ) is greater than zero, then no external control pressure is required. In other cases, an external control pressure with min. 40 bar should be connected at port Y₃.
If the HD control is only required as a 2-point switching control (V₉ₐₐₜₙ – V₉ₐₐₛₓₙ), the pilot pressure at port X₁ must not exceed 40 bar.

Connections
Y₃ External control pressure M14x1,5 (plugged) X₁ Pilot pressure M14x1,5

Size A1 A2 A3 A4 A5 A6 A7
55 256 221 192 170 190 186 12
80 287 240 209 187 212 207 14
107 306 252 221 199 225 220 18
160 348 278 248 225 253 249 19

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**Variation: Remote pressure cut-off (G)**

A sequence valve with subplate takes over the function of the pressure cut-off. The valve is mounted separate from the pump, and the simple piping length should not exceed 5 m. High pressure is supplied from the pump to the valve via port A. The control oil of the pump is directed to the valve via the port X and led into the tank at port A located on the subplate of the sequence valve. In this case the pump is regulated to $V_g \text{min}$ in case of access of the set-point pressure value.

Note: Port A of the sequence valve must be connected back to tank (cooler).

Setting range from 50 bar to 315 bar.

Any pressure relief valve included in the circuit to limit the max. pressure must be set to a cracking pressure at least 20 bar above the pressure control setting.

The sequence valve and subplate must be ordered separately.

Sequence valve: DZ5DP2-1X/315XSO20 (Id.-Nr. 154 768)

Subplate: G 115/1 (Id.-Nr. 153 138)

**When ordering, state in clear text:**
Setting of the pressure cut-off

**Unit dimensions HD1G/HD2G**

See control device HD1/HD2, general dimensions and connections see pages 17...20

Ports A, and X are open

**Circuit diagram:**

*Hydraulic control, pilot pressure related with remote pressure cut-off, HD1G, HD2G*
**EP Electrical Control with Proportional Solenoid**

The electrical control with proportional solenoid allows stepless and programmable setting of the pump displacement. Control is proportional to solenoid force (current strength). The control force at the control piston is generated by a proportional solenoid. For control of the proportional solenoid, a 24 V DC supply with current levels between 200 and 600 mA is required.

Start of control (at $V_{g \text{ min}}$) 200 mA
End of control (at $V_{g \text{ max}}$) 600 mA

Insulation class IP 54
Start position in zero pressure condition at $V_{g \text{ min}}$.
Control from $V_{g \text{ min}}$ to $V_{g \text{ max}}$.
A pressure of 40 bar is necessary to operate the control. The required control oil is taken from the high pressure circuit.
If the working pressure equals or exceeds 40 bar and minimum displacement ($V_{g \text{ min}}$) is greater than zero, then no external control pressure is required.
In other cases, an external control pressure with min. 40 bar should be connected at port $Y_3$.

**Unit dimensions EP**

General dimensions and connections see pages 17...20

**Circuit diagram:**

*Electrical control with proportional solenoid, EP*

Suitable control for the proportional solenoid are proportional amplifier PV (catalogue sheet RE 95023) and chopper amplifier CV (catalogue sheet RE 95029).
By using an electronic control card control of swivel time is also possible.

Note: Pumps with EP control may only be mounted within an oil tank when using mineral hydraulic oils and with oil temperatures in the tank of max. 80°C.

**Circuit diagram EPG**

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Unit Dimensions, Size 55
Constant power control LR
Variation:
Constant power control with remote pressure cut-off LRG
(ports A1, X3, T1 open)

Shaft end
Z  Splined shaft
W 30x2x30x14x9g
DIN 5480

Connections
A, B Service line ports
(metric mounting threads) 420 bar (6000 psi)
High pressure series
S  Suction port
(metric mounting threads) 210 bar (3000 psi)
Standard series
U  Bearing flushing port
M18x1,5 (plugged)
R  Bleed port
M18x1,5 (plugged)
A1  High pressure port
M14x1,5 (plugged)
T1  Pilot oil drain
M12x1,5 (plugged)
X3  Port for override
M14x1,5 (plugged)
Unit Dimensions, Size 80
Constant power control LR

Variation:
Constant power control with remote pressure cut-off LRG
(ports A₁, X₃, T₁ open)

Connections
- A₁, B Service line ports (metric mounting threads) SAE 1"
- S Suction port (metric mounting threads) 420 bar (6000 psi)
- A High pressure port 170 bar (2500 psi)
- T₁ Pilot oil drain Standard series
- X₃ Port for override M18x1.5 (plugged)

Shaft end
- Z Splined shaft DIN 5480
- W 35x2x30x16x9g
- M12; 17 deep

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Unit Dimensions, Size 107
Constant power control LR

Variation:
Constant power control with remote pressure cut-off LRG
(ports A₁, X₃, T₁ open)

Shaft end
Z Splined shaft
W 40x2x30x18x9g
DIN 5480

Connections
A, B Service line ports
(metric mounting threads) SAE 1"
420 bar (6000 psi)

S Suction port
(metric mounting threads) SAE 2 1/2"
170 bar (2500 psi)

U Bearing flushing port
M18x1,5 (plugged)

R Bleed port
M18x1,5 (plugged)

A₁ High pressure port
M16x1,5 (plugged)

T₁ Pilot oil drain
M12x1,5 (plugged)

X₃ Port for override
M16x1,5 (plugged)

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Unit Dimensions, Size 160
Constant power control LR

Variation:
Constant power control with remote pressure cut-off LRG
(ports A₁, X₃, T₁ open)

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