Features

- Variable displacement axial piston pump of swashplate design for hydrostatic drives in open circuit hydraulic system
- Designed primarily for use in mobile applications
- The pump operates under self-priming conditions, with tank pressurization, or with an optional built-in charge pump (impeller)
- A comprehensive range of control options is available matching any application requirement
- Power control option is externally adjustable, even when the pump is running
- The through drive is suitable for adding gear pumps and axial piston pumps up to the same, i.e. 100% through drive
- The output flow is proportional to the drive speed and infinitely variable between maximum and zero

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Ordering Code / Standard Program

**Axial piston unit**
Swashplate design, variable displacement

**Charge pump (impeller)**

<table>
<thead>
<tr>
<th>Without charge pump (no code)</th>
<th>40</th>
<th>60</th>
<th>75</th>
<th>95</th>
<th>130</th>
<th>145</th>
<th>190</th>
<th>260</th>
</tr>
</thead>
<tbody>
<tr>
<td>With charge pump</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Operation**
Pump, open circuit

<table>
<thead>
<tr>
<th>Size</th>
<th>Displacement Vg max (cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40</td>
</tr>
</tbody>
</table>

**Control device**

<table>
<thead>
<tr>
<th>Control device</th>
<th>Power control</th>
<th>Pressure control</th>
<th>Hydraulic control</th>
<th>Electrical control</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>LR</td>
<td>DR</td>
<td>HD</td>
<td>EP</td>
</tr>
<tr>
<td>With override</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Cross-sensing</td>
<td></td>
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<tr>
<td>Negative</td>
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<tr>
<td>LR</td>
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<tr>
<td>C</td>
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<tr>
<td>High pressure</td>
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<tr>
<td>Related</td>
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<tr>
<td>Negative</td>
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<td>LR3</td>
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</tr>
<tr>
<td>Positive</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>LG1</td>
<td></td>
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<tr>
<td>LG2</td>
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<tr>
<td>Electrical</td>
<td></td>
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</tr>
<tr>
<td>12V</td>
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<tr>
<td>Negative</td>
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</tr>
<tr>
<td>LE1</td>
<td></td>
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</tr>
<tr>
<td>24V</td>
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<tr>
<td>Negative</td>
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<tr>
<td>LE2</td>
<td></td>
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<td></td>
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<tr>
<td>With pressure cut-off</td>
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<tr>
<td>D</td>
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</tr>
<tr>
<td>Hydraulic 2-stage</td>
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</tr>
<tr>
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<td></td>
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<tr>
<td>Hydraulic remote controlled G</td>
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<tr>
<td>With load sensing</td>
<td></td>
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<tr>
<td>Electr. prop. override, 24V</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>S2</td>
<td></td>
<td></td>
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<tr>
<td>Hydr. prop. override</td>
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<tr>
<td>S5</td>
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</tr>
<tr>
<td>With stroke limiter</td>
<td></td>
<td></td>
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<tr>
<td>Negative characteristic</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Δp = 25 bar</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>H1</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Δp = 10 bar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive characteristic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Δp = 25 bar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Δp = 10 bar</td>
<td></td>
<td></td>
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<tr>
<td>H6</td>
<td></td>
<td></td>
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<tr>
<td>U = 12 V</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>H1</td>
<td></td>
<td></td>
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<tr>
<td>U = 24 V</td>
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<tr>
<td>H2</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Series</td>
<td></td>
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<td>1</td>
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</tbody>
</table>

**Direction of rotation**

<table>
<thead>
<tr>
<th>viewed on shaft end</th>
<th>clockwise</th>
<th>anti-clockwise</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td></td>
<td>L</td>
</tr>
</tbody>
</table>

In case of controls with several additional functions, observe the order of the columns, only one option per column is possible (e.g. LRDCH2).

The following combinations are not available for the power control:

- LRDS2, LRDS5, L...GS, L...GS2, L...GS5, L...EC
- and the combination L...DG in connection with the stroke limiters H1, H2, H5, H6, U1 and U2.

● = available
○ = available on request
- = not available
= preferred program
### Seals

- **NBR (nitrile-caoutchouc)**, shaft seal in FKM (fluor-caoutchouc)  

<table>
<thead>
<tr>
<th>Seals</th>
<th>40</th>
<th>60</th>
<th>75</th>
<th>95</th>
<th>130</th>
<th>145</th>
<th>190</th>
<th>260</th>
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</thead>
<tbody>
<tr>
<td>NBR</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>NBR</td>
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<td>●</td>
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<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

### Shaft end

#### (perm. input torques see page 7)

- **Splined shaft DIN 5480 for single and combi pump**  
- **Cylindrical shaft with key DIN 6885**  
- **Splined shaft ANSI B92.1a–1976 for single pump**  
- **for combination pump**

<table>
<thead>
<tr>
<th>Shaft end</th>
<th>40</th>
<th>60</th>
<th>75</th>
<th>95</th>
<th>130</th>
<th>145</th>
<th>190</th>
<th>260</th>
</tr>
</thead>
<tbody>
<tr>
<td>Splined shaft DIN 5480</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Cylindrical shaft</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Splined shaft ANSI B92.1a–1976</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Splined shaft ANSI B92.1a–1976</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

### Mounting flange

- **SAE J744 – 2-hole**  
- **SAE J744 – 4-hole**  
- **SAE J617 ²) (SAE 3)**

<table>
<thead>
<tr>
<th>Mounting flange</th>
<th>40</th>
<th>60</th>
<th>75</th>
<th>95</th>
<th>130</th>
<th>145</th>
<th>190</th>
<th>260</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE J744 – 2-hole</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>SAE J744 – 4-hole</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>SAE J617 ²) (SAE 3)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

### Service line ports

- **SAE pressure and suction port on (opposite) sides**  
- **With metric fastening threads**

<table>
<thead>
<tr>
<th>Service line ports</th>
<th>40</th>
<th>60</th>
<th>75</th>
<th>95</th>
<th>130</th>
<th>145</th>
<th>190</th>
<th>260</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE pressure and suction port</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>With metric fastening threads</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

### Through drive

- **Flange SAE J744 ³)**  
- **Splined shaft coupler**

<table>
<thead>
<tr>
<th>Through drive</th>
<th>40</th>
<th>60</th>
<th>75</th>
<th>95</th>
<th>130</th>
<th>145</th>
<th>190</th>
<th>260</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flange SAE J744 ³)**</td>
<td>5/8in</td>
<td>9T 16/32DP (A)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Splined shaft coupler</td>
<td>3/4in</td>
<td>11T 16/32DP (A-B)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>W35 2x30x16x9g</td>
<td>101-2 (B)</td>
<td>7/8in</td>
<td>13T 16/32DP (B)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>W35 2x30x16x9g</td>
<td>127-2 (C) ⁴)</td>
<td>1 1/4in</td>
<td>14T 12/24DP (C)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>W35 2x30x16x9g</td>
<td>152-4 (D)</td>
<td>1 1/4in</td>
<td>14T 12/24DP (C)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>W35 2x30x16x9g</td>
<td>165-4 (E)</td>
<td>1 3/4in</td>
<td>13T 8/16DP (D)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>W35 2x30x16x9g</td>
<td>165-4 (E)</td>
<td>1 3/4in</td>
<td>13T 8/16DP (D)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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</tbody>
</table>

### Swivel angle indicator

- **Swivel angle indicator (page 57)**

<table>
<thead>
<tr>
<th>Swivel angle indicator</th>
<th>40</th>
<th>60</th>
<th>75</th>
<th>95</th>
<th>130</th>
<th>145</th>
<th>190</th>
<th>260</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without (no code)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>With optical swivel angle indicator</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>With electrical swivel angle sensor</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<td>●</td>
</tr>
</tbody>
</table>

### Male connectors for solenoids ⁵) (page 58)

- **DEUTSCH DT04-2P-EP04 (2-pole), moulded on the solenoid coil**
- **Hirschmann according to DIN EN 175 301-803-A (not for new projects)**

<table>
<thead>
<tr>
<th>Male connectors for solenoids ⁵)</th>
<th>40</th>
<th>60</th>
<th>75</th>
<th>95</th>
<th>130</th>
<th>145</th>
<th>190</th>
<th>260</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEUTSCH DT04-2P-EP04 (2-pole)</td>
<td>●</td>
<td>●</td>
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<td>●</td>
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<tr>
<td>Hirschmann according to DIN EN 175 301-803-A (not for new projects)</td>
<td>●</td>
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<td>●</td>
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<td>●</td>
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<td>●</td>
</tr>
</tbody>
</table>

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¹) S-shaft suitable for combination pump!  
²) To fit the flywheel housing of the combustion engine  
³) 2 holes; 4 holes  
⁴) Size 190 and 260 with 2 + 4-hole flange  
⁵) Male connector without bidirectional suppressor diode  
⁶) no code = standard version, S = special version, K = combination with mounting part or mounting pump
Technical Data

Hydraulic fluid

For detailed information on the choice of hydraulic fluids and application conditions, please see our catalog pages RE 90220 (mineral oil), RE 90221 (environmentally acceptable hydraulic fluids) and RE 90223 (HF-hydraulic fluids) prior to configuration.

The variable displacement pump A11VO is unsuitable for operation with HFA, HFB and HFC. When using HF- or environmentally acceptable (Eco-evaluated) hydraulic fluids possible restrictions in the technical data may have to be taken in consideration. If required please consult with our technical support department. The hydraulic fluid type used should be stated on the order.

Operating viscosity range

We recommend you to choose the operating viscosity (at operating temperature) in the optimum range for efficiency and useful life of

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

related to the tank temperature (open circuit).

Limit viscosity range

The following values apply for borderline conditions:

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

temporary (t < 3 min)

at max. perm. temperature of \( t_{\text{max}} = +115^\circ\text{C} \).

Note that the max. hydraulic fluid temperature of 115°C may not be exceeded even locally (e.g. in the bearing area).

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

temporary (t < 3 min)

at cold start (p ≤ 30 bar, n ≤ 1000 min\(^{-1}\), \( t_{\text{min}} = -40^\circ\text{C} \)).

Only for starting up without load. The optimum operating viscosity must be reached within about 15 minutes.

Special measures are necessary in the temperature range from -40°C to -25°C, please ask.

For detailed information about use at low temperatures, see RE 90300-03-B.

Selection diagram

Explanation of selection of the hydraulic fluid

Knowledge of the operating temperature in the tank (open circuit) depending on the ambient temperature is a prerequisite for the correct choice of hydraulic fluid.

The hydraulic fluid should be selected so that the operating viscosity is in the optimum range \( (\nu_{\text{opt}}) \) in the operating temperature range, see selection diagram, shaded area.

We recommend you to choose the respective higher viscosity class.

Example: At an ambient temperature of \( X^\circ\text{C} \) an operating temperature of 60°C is set in the circuit. In the optimum operating viscosity range \( (\nu_{\text{opt}}; \text{shaded area}) \) this corresponds to the viscosity classes VG 46 or VG 68; to be selected: VG 68.

Note: The leakage oil temperature, influenced by pressure and speed, is always above the tank temperature. The temperature may not be higher than 115°C at any point in the machine.

If the above conditions cannot be satisfied in the case of extreme operating parameters or high ambient temperatures, please ask.

Filtration

The finer the filtration the better the cleanliness class of hydraulic fluid reached, the longer the life of the axial piston unit.

To ensure functional reliability of the axial piston unit at least cleanliness class

\[ 20/18/15 \] in accordance with ISO 4406 is necessary for the hydraulic fluid.

At very high hydraulic fluid temperatures (90°C to max. 115°C) at least cleanliness class

\[ 19/17/14 \] in accordance with ISO 4406 is required.

If the above classes cannot be observed, please consult with product support.
Technical Data

Operating pressure range

Inlet
Absolute pressure at port S (suction port)

Version without charge pump

\[ p_{\text{abs min}} = 0.8 \text{ bar} \]
\[ p_{\text{abs max}} = 30 \text{ bar} \]

If the pressure is > 5 bar, please ask.

Version with charge pump

\[ p_{\text{abs min}} = 0.6 \text{ bar} \]
\[ p_{\text{abs max}} = 2 \text{ bar} \]

Maximum permissible speed (speed limit)

Permissible speed by increasing the inlet pressure \( p_{\text{abs}} \) at the suction port S or at \( V_g \leq V_g \text{ max} \)

```
\[
\text{Speed } n/\text{max, perm.} = 1.0
\]
```

Outlet

Pressure at port A or B

Nominal pressure \( p_{\text{n}} \)

\[ p_{\text{n}} = 350 \text{ bar} \]

Peak pressure \( p_{\text{max}} \)

\[ p_{\text{max}} = 400 \text{ bar} \]

Minimum operating pressure

A minimum operating pressure \( p_{\text{B min}} \) is required in the pump service line depending on the speed, the swivel angle and the displacement (see diagram).

Case drain pressure

The case drain pressure at the ports \( T_1 \) and \( T_2 \) may be a maximum 1.2 bar higher than the inlet pressure at the port S but not higher than

\[ p_{\text{t, abs max}} = 2 \text{ bar} \]

An unrestricted, full size case drain line directly to tank is required.

Temperature range of the shaft seal

The FKM shaft seal ring is permissible for housing temperatures of -25°C to +115°C.

Note:

For applications below -25°C, an NBR shaft seal is necessary as a special version (permissible temperature range: -40°C to +90°C). State NBR shaft seal in clear text in the order.

Flushing the housing

If a variable displacement pump with control device EP, HD, DR or stroke limiter (H., U.) is operated over a long period \((t > 10 \text{ min})\) with flow zero or operating pressure < 15 bar, flushing of the housing via ports "T1", "T2" or "R" is necessary.

```
<table>
<thead>
<tr>
<th>size</th>
<th>40</th>
<th>60</th>
<th>75</th>
<th>95</th>
<th>130</th>
<th>145</th>
<th>190</th>
<th>260</th>
</tr>
</thead>
<tbody>
<tr>
<td>( q_{\text{v flush}} ) (L/min)</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>
```

The housing flushing is unnecessary in versions with charge pump (A11VLO), since a part of the charge flow is directed to the housing. Higher case drain flow beyond volumetric rotary group losses and control flow may be noticed.

Charge pump (impeller)

The charge pump is a circulating pump with which the A11VLO (size 130...260) is filled and therefore can be operated at higher speeds. This also simplifies cold starting at low temperatures and high viscosity of the hydraulic fluid. Tank charging is therefore unnecessary in most cases. A tank pressurization of a max. 2 bar is permissible with charge pump.
## Technical Data

### Value table

( theoretical values, without efficiencies and tolerances; values rounded)

<table>
<thead>
<tr>
<th>Size</th>
<th>A11VO (with charge pump)</th>
<th>40</th>
<th>60</th>
<th>75</th>
<th>95</th>
<th>130</th>
<th>145</th>
<th>190</th>
<th>260</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>$V_{g_{\text{max}}}$ cm$^3$</td>
<td>42</td>
<td>58.5</td>
<td>74</td>
<td>93.5</td>
<td>130</td>
<td>145</td>
<td>193</td>
<td>260</td>
</tr>
<tr>
<td></td>
<td>$V_{g_{\text{min}}}$ cm$^3$</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Speed</td>
<td>maximum at $V_g_{\text{max}}$ 1)</td>
<td>$n_{\text{max}}$ min$^{-1}$</td>
<td>3000</td>
<td>2700</td>
<td>2550</td>
<td>2350</td>
<td>2100</td>
<td>2200</td>
<td>2100</td>
</tr>
<tr>
<td></td>
<td>maximum at $V_g \leq V_g_{\text{max}}$ 3)</td>
<td>$n_{\text{max1}}$ min$^{-1}$</td>
<td>3500</td>
<td>3250</td>
<td>3000</td>
<td>2780</td>
<td>2500</td>
<td>2500</td>
<td>2300</td>
</tr>
<tr>
<td>Flow 4)</td>
<td>at $n_{\text{max}}$ and $V_g_{\text{max}}$</td>
<td>$q_v_{\text{max}}$ L/min</td>
<td>126</td>
<td>158</td>
<td>189</td>
<td>220</td>
<td>273</td>
<td>319</td>
<td>405</td>
</tr>
<tr>
<td>Power at $q_v_{\text{max}}$ and $\Delta p = 350$ bar</td>
<td>$P_{\text{max}}$ kW</td>
<td>74</td>
<td>92</td>
<td>110</td>
<td>128</td>
<td>159</td>
<td>186</td>
<td>236</td>
<td>273</td>
</tr>
<tr>
<td>Torque at $V_g_{\text{max}}$ and $\Delta p = 350$ bar</td>
<td>$T_{\text{max}}$ Nm</td>
<td>234</td>
<td>326</td>
<td>412</td>
<td>521</td>
<td>724</td>
<td>808</td>
<td>1075</td>
<td>1448</td>
</tr>
<tr>
<td>Mass moment of inertia around drive axis</td>
<td>$J$ kgm$^2$</td>
<td>0.0048</td>
<td>0.0082</td>
<td>0.0115</td>
<td>0.0173</td>
<td>0.0318</td>
<td>0.0341</td>
<td>0.0341</td>
<td>0.0341</td>
</tr>
<tr>
<td>Rotational vibration 4)</td>
<td>Angular acceleration, max. $\alpha$ rad/s$^2$</td>
<td>22000</td>
<td>17500</td>
<td>15000</td>
<td>13000</td>
<td>10500</td>
<td>9000</td>
<td>6800</td>
<td>4800</td>
</tr>
<tr>
<td></td>
<td>Speed variation, max. $\Delta n$ min$^{-1}$</td>
<td>85</td>
<td>73</td>
<td>68</td>
<td>63</td>
<td>57</td>
<td>49</td>
<td>37</td>
<td>28</td>
</tr>
<tr>
<td>Frequency limit</td>
<td>$f_{\text{limit}}$ Hz</td>
<td>788</td>
<td>731</td>
<td>675</td>
<td>626</td>
<td>563</td>
<td>563</td>
<td>563</td>
<td>518</td>
</tr>
<tr>
<td>Rotary stiffness</td>
<td>Shaft end Z Nm/rad</td>
<td>88894</td>
<td>102440</td>
<td>145836</td>
<td>199601</td>
<td>302495</td>
<td>302495</td>
<td>302495</td>
<td>302495</td>
</tr>
<tr>
<td></td>
<td>Shaft end P Nm/rad</td>
<td>87467</td>
<td>107888</td>
<td>143104</td>
<td>196435</td>
<td>312403</td>
<td>312403</td>
<td>383292</td>
<td>653835</td>
</tr>
<tr>
<td></td>
<td>Shaft end S Nm/rad</td>
<td>58347</td>
<td>86308</td>
<td>101921</td>
<td>173704</td>
<td>236861</td>
<td>236861</td>
<td>236861</td>
<td>236861</td>
</tr>
<tr>
<td></td>
<td>Shaft end T Nm/rad</td>
<td>74476</td>
<td>102440</td>
<td>122563</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>301928</td>
<td>567115</td>
</tr>
<tr>
<td>Filling volume</td>
<td>L</td>
<td>1.1</td>
<td>1.35</td>
<td>1.85</td>
<td>2.1</td>
<td>2.9</td>
<td>2.9</td>
<td>3.8</td>
<td>4.6</td>
</tr>
<tr>
<td>Weight (approx.)</td>
<td>m</td>
<td>32</td>
<td>40</td>
<td>45</td>
<td>53</td>
<td>66</td>
<td>76</td>
<td>95</td>
<td>125</td>
</tr>
</tbody>
</table>

1) The values apply at absolute pressure ($p_{\text{abs}}$) 1 bar at the suction port S and mineral hydraulic fluid.
2) The values apply at absolute pressure ($p_{\text{abs}}$) of at least 0.8 bar at the suction port S and mineral hydraulic fluid.
3) The values apply at $V_g \leq V_g_{\text{max}}$ or in case of an increase in the inlet pressure $p_{\text{abs}}$ at the suction port S (see diagram page 5)
4) The permissible angular acceleration or speed variation only applies for single pumps, not for combi pumps.

The load on connection parts (e.g. through drive) must be taken into account additionally.

At $f < f_{\text{limit}}$ the $\Delta n$ specified in the table is permissible.

At $f > f_{\text{limit}}$ the permissible angular acceleration $\alpha$ specified in the table limits the value of the speed variation:

$\Delta n_{\text{perm}} = 3.04 \cdot \frac{\alpha}{f}$

### Determining the nominal value

**Flow**

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

$V_g = $ Displacement per revolution cm$^3$

$\Delta p = $ Differential pressure bar

**Torque**

$T = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}}$ Nm

$n = $ Speed rpm

$\eta_v = $ volumetric efficiency

$\eta_{mh} = $ mechanical-hydraulic efficiency

**Power**

$P = \frac{2 \pi \cdot T \cdot n}{60000} = \frac{q_v \cdot \Delta p}{600 \cdot \eta_t}$ kW

$\eta_t = $ overall efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)
Technical Data

Permissible radial and axial loading on the drive shaft

<table>
<thead>
<tr>
<th>Size</th>
<th>40</th>
<th>60</th>
<th>75</th>
<th>95</th>
<th>130</th>
<th>145</th>
<th>190</th>
<th>260</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radial force, max. at distance (from shaft collar) $F_{q_{\text{max}}}$ N</td>
<td>3600</td>
<td>5000</td>
<td>6300</td>
<td>8000</td>
<td>11000</td>
<td>11000</td>
<td>16925</td>
<td>22000</td>
</tr>
<tr>
<td>a mm</td>
<td>17.5</td>
<td>17.5</td>
<td>20</td>
<td>20</td>
<td>25.5</td>
<td>22.5</td>
<td>26</td>
<td>29</td>
</tr>
<tr>
<td>$F_{q_{\text{max}}}$ N</td>
<td>2891</td>
<td>4046</td>
<td>4950</td>
<td>6334</td>
<td>8594</td>
<td>8594</td>
<td>13225</td>
<td>16809</td>
</tr>
<tr>
<td>b mm</td>
<td>30</td>
<td>30</td>
<td>35</td>
<td>35</td>
<td>40</td>
<td>40</td>
<td>46</td>
<td>50</td>
</tr>
<tr>
<td>$F_{q_{\text{max}}}$ N</td>
<td>2416</td>
<td>3398</td>
<td>4077</td>
<td>5242</td>
<td>7051</td>
<td>7051</td>
<td>10850</td>
<td>13600</td>
</tr>
<tr>
<td>c mm</td>
<td>42.5</td>
<td>42.5</td>
<td>50</td>
<td>50</td>
<td>57.5</td>
<td>57.5</td>
<td>66</td>
<td>71</td>
</tr>
<tr>
<td>Axial force, max. $F_{ax_{\text{max}}}$ N</td>
<td>1500</td>
<td>2200</td>
<td>2750</td>
<td>3500</td>
<td>4800</td>
<td>4800</td>
<td>6000</td>
<td>4150</td>
</tr>
</tbody>
</table>

Permissible input and through drive torques

<table>
<thead>
<tr>
<th>Size</th>
<th>40</th>
<th>60</th>
<th>75</th>
<th>95</th>
<th>130</th>
<th>145</th>
<th>190</th>
<th>260</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque (at $V_{g_{\text{max}}}$ and $\Delta p = 350$ bar $^1$)) $T_{\text{max}}$ Nm</td>
<td>234</td>
<td>326</td>
<td>412</td>
<td>521</td>
<td>724</td>
<td>808</td>
<td>1075</td>
<td>1448</td>
</tr>
<tr>
<td>Input torque, max. $^2$) at shaft end $P$ $T_{E_{\text{perm.}}} \text{Nm}$</td>
<td>468</td>
<td>648</td>
<td>824</td>
<td>1044</td>
<td>1448</td>
<td>1448</td>
<td>2226</td>
<td>2787</td>
</tr>
<tr>
<td>Keyed per DIN 6885 Ø32 Ø35 Ø40 Ø45 Ø50 Ø50 Ø55 Ø60</td>
<td>912</td>
<td>912</td>
<td>1460</td>
<td>2190</td>
<td>3140</td>
<td>3140</td>
<td>3140</td>
<td>5780</td>
</tr>
<tr>
<td>DIN 5480 W35 W35 W40 W45 W50 W50 W50 W60</td>
<td>314</td>
<td>602</td>
<td>602</td>
<td>1640</td>
<td>1640</td>
<td>1640</td>
<td>1640</td>
<td>1640</td>
</tr>
<tr>
<td>ANSI B92.1a-1976 (SAE J744) 1 in 1 1/4 in 1 1/4 in 1 3/4 in 1 3/4 in 1 3/4 in 1 3/4 in</td>
<td>314</td>
<td>602</td>
<td>970</td>
<td>970</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>2670</td>
</tr>
<tr>
<td>ANSI B92.1a-1976 (SAE J744) 1 1/4 in 1 3/8 in 1 3/8 in –     –     –     –</td>
<td>602</td>
<td>970</td>
<td>970</td>
<td>2 in</td>
<td>2 in</td>
<td>2 in</td>
<td>2 in</td>
<td>4070</td>
</tr>
<tr>
<td>Through drive torque, max. $^3$) $T_{D_{\text{perm.}}} \text{Nm}$</td>
<td>314</td>
<td>521</td>
<td>660</td>
<td>822</td>
<td>1110</td>
<td>1110</td>
<td>1760</td>
<td>2065</td>
</tr>
</tbody>
</table>

$^1$ Efficiency not taken into account

$^2$ For side load-free drive shafts

$^3$ Observe max. input torque for shaft S!

Distribution of torques
LR Power Control

The power control regulates the displacement of the pump depending on the operating pressure so that a given drive power is not exceeded at constant drive speed.

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

\[
\rho_B = \text{operating pressure}
\]

\[
V_g = \text{displacement}
\]

The precise control with a hyperbolic control characteristic, provides an optimum utilization of available power.

The operating pressure acts on a rocker via a piston. An externally adjustable spring force counteracts this, it determines the power setting.

If the operating pressure exceeds the set spring force, the control valve is actuated by the rocker, the pump swivels back (direction \(V_g\) min). The lever length at the rocker is shortened and the operating pressure can increase at the same rate as the displacement decreases without the drive powers being exceeded (\(p_B \cdot V_g = \text{constant}\)).

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

State in clear text in the order:
- drive power \(P\) in kW
- drive speed \(n\) in rpm
- max. flow \(q_{V_{\text{max}}}\) in l/min

After clarifying the details a power diagram can be created by our computer.
LR Power Control

LRC Override with cross-sensing
Cross sensing control is a summation power control system, whereby the total power, of both the A11VO and of a same size A11VO power controlled pump mounted onto the through drive, are kept constant.

If a pump is operating at pressures below the start of the control curve setting, then the surplus power not required, in a critical case up to 100%, becomes available to the other pump. Total power is thus divided between two systems as demand requires.

Any power being limited by means of pressure cut-off or other override functions is not taken into account.

Half side cross-sensing function
When using the LRC control on the 1st pump (A11VO) and a power-controlled pump without cross-sensing attached to the through drive, the power required for the 2nd pump is deducted from the setting of the 1st pump. The 2nd pump has priority in the total power setting.

The size and start of control of the power control of the 2nd pump must be specified for rating the control of the 1st pump.

LR3 High pressure related override
The high pressure related power override is a total power control in which the power control setting is piloted by the load pressure of an attached fixed displacement pump (port Z).

As a result the A11VO can be set to 100% of the total drive power. The power setting of the A11VO is reduced proportional to the load-dependent rise in operating pressure of the fixed displacement pump. The fixed displacement pump has priority in the total power setting.

The measuring area of the power reduction pilot piston is designed as a function of the size of the fixed displacement pump.

Size 40-145: LRC

Size 190-260: LRC

Size 40-145: LR3

Size 190-260: LR3
LR Power Control

LG1/2 Pilot pressure related override

This power control works by overriding the control setting with an external pilot pressure signal. This pilot pressure acts on the adjustment spring of the power regulator via port Z.

The mechanically adjusted basic setting can be hydraulically adjusted by means of different pilot pressure settings, enabling different power mode settings.

If the pilot pressure signal is then adjusted by means of an external power limiting control, the total hydraulic power consumption of all users can be adapted to the available drive power from the engine.

The pilot pressure used for power control is generated by an external control element that is not a component part of the A11VO (e.g. see also data sheet RE 95310, Electronic Load Limiting Control, LLC).

LG1 Negative power override

Power control with negative override, LG1: the force resulting from the pilot pressure is acting against the mechanical adjustment spring of the power control.

Increasing the pilot pressure reduces the power setting.

LG2 Positive power override

Power control with positive override, LG2: the force resulting from the pilot pressure is additive the mechanical adjustment spring of the power control.

An increase in pilot pressure increases the power output.
LR Power Control

LE1/2 Electrical override (negative)

Contrary to hydraulic power control override, the basic power setting is reduced by an electrical pilot current applied to a proportional solenoid. The resulting force is acting against the mechanical power control adjustment spring.

Increase in current = decrease in power

If the pilot current signal is adjusted by a load limiting control (e.g. LLC control RE 95310) the power consumption of all mechanical and hydraulic actuators is decreasing the A11VO power setting to match the remaining available power from the engine.

A 12V (LE1) or 24V (LE2) supply is required for the control of the proportion solenoid.

Technical data of solenoids

<table>
<thead>
<tr>
<th></th>
<th>LE1</th>
<th>LE2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>12 V DC (± 20 %)</td>
<td>24 V DC (± 20 %)</td>
</tr>
<tr>
<td>Control current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start of control</td>
<td>400 mA</td>
<td>200 mA</td>
</tr>
<tr>
<td>End of control</td>
<td>1200 mA</td>
<td>600 mA</td>
</tr>
<tr>
<td>Limiting current</td>
<td>1.54 A</td>
<td>0.77 A</td>
</tr>
<tr>
<td>Nominal resistance (at 20°C)</td>
<td>5.5 Ω</td>
<td>22.7 Ω</td>
</tr>
<tr>
<td>Dither frequency</td>
<td>100 Hz</td>
<td>100 Hz</td>
</tr>
<tr>
<td>Duty cycle</td>
<td>100 %</td>
<td>100%</td>
</tr>
<tr>
<td>Type of protection</td>
<td>dependent on connector version, see page 58</td>
<td></td>
</tr>
</tbody>
</table>

Overview of power overrides

Effect of power overrides at rising pressure or current
LR Power Control

**LRD  Power control with pressure cut-off**
Pressure cut-off is a pressure control that adjusts the pump displacement back towards $V_{g\min}$ when a preset pressure value is reached.

This function overrides the power control, i.e. below the preset pressure value, the power function is effective.

The pressure cut-off function is integrated into the pump control module and is preset to a specified value at the factory.

Setting range from 50 to 350 bar

Characteristic: LRD

![LRD Diagram]

**LRE  Power control with pressure cut-off, 2-stage**
By connecting an external pilot pressure to port Y, the basic value of the pressure cut-off can be increased by 50 +20 bar and a 2nd pressure setting implemented.

This value is usually above the primary pressure relief valve setting and therefore disables the pressure cut-off function.

The pressure signal at port Y must be between 20 and 50 bar.

Characteristic: LRE

![LRE Diagram]

**LRG  Power control with pressure cut-off, hydraulically remote controlled**
See page 20 for description and characteristic (pressure control remote controlled, DRG)
LR Power Control

LRDS Power control with pressure cut-off and load sensing

The load-sensing control is a flow control option that operates as a function of the load pressure to regulate the pump displacement to match the actuator flow requirement.

The flow depends here on the cross section of the external sensing orifice (1) fitted between the pump outlet and the actuator. The flow is independent of the load pressure below the power curve and the pressure cut-off setting and within the control range of the pump.

The sensing orifice is usually a separately arranged load sensing directional valve (control block). The position of the directional valve piston determines the opening cross section of the sensing orifice and thus the flow of the pump.

The load-sensing control compares pressure before and after the sensing orifice and maintains the pressure drop across the orifice - and therefore the pump flow - constant as a function of the orifice size.

If the differential pressure $\Delta p$ increases, the pump is swivelled back towards $V_g\text{ min}$ and, if the $\Delta p$ decreases the pump is swivelling out towards $V_g\text{ max}$ until the pressure drop across the sensing orifice in the valve is restored.

$\Delta p_{\text{orifice}} = p_{\text{pump}} - p_{\text{actuator}}$

The setting range for $\Delta p$ is between 18 bar and 25 bar.

The stand-by pressure in zero stroke operation (sensing orifice plugged) is slightly above the $\Delta p$ setting.

In a standard LS system the pressure cut-off is integrated in the pump control. In a LUDV (flow sharing) system the pressure cut-off is integrated in the LUDV control block.

(1) The sensing orifice (control block) is not included in the pump supply.

Characteristic: LRDS
LR Power Control

**LRS2 Power control with load sensing, electrically override**

This control option adds a proportional solenoid to override the mechanically set load-sensing pressure. The pressure differential change is proportional to the solenoid current.

Increasing current = smaller ∆p-setting

See following characteristic for details (example).

This permits a change in flow with the same sensing orifice size, to improve control resolution of the control block.

Please consult us when applying.

For solenoid specification, see page 11 (LE2)

*Characteristic: LRS2*

![Characteristic: LRS2](image)

**LRS5 Power control with load sensing, hydraulically override**

This control option adds an external proportional pilot pressure signal (to port Z) to override the mechanically set load-sensing pressure.

Increasing pilot pressure = smaller ∆p-setting

See following characteristic for details (example).

This permits a change in flow with the same sensing orifice size, to improve control resolution of the control block.

Please consult us when applying.

*Characteristic: LRS5*

![Characteristic: LRS5](image)
LR Power Control

LR... Power control with stroke limiter

The stroke limiter can be used to vary or limit the displacement of the pump continuously over the whole control range. The displacement is set in LRH with the pilot pressure $P_{St}$ (max. 40 bar) applied to port Y or in LRU by the control current applied to the proportional solenoid. A DC current of 12V (U1) or 24V (U2) is required to control the proportional solenoid.

The power control overrides the stroke limiter control, i.e. below the hyperbolic power characteristic, the displacement is controlled, by the control current or pilot pressure. When exceeding the power characteristic with a set flow or load pressure, the power control overrides and reduces the displacement following the hyperbolic characteristic.

LRH1/5 Hydraulic stroke limiter
(negative characteristic)

Control from $V_{g_{max}}$ to $V_{g_{min}}$

With increasing pilot pressure the pump swivels to a smaller displacement.

Start of control (at $V_{g_{max}}$), settable _______ from 4 – 10 bar

Please state start of control value, when ordering.

Starting position without control signal (pilot pressure): $V_{g_{max}}$

Characteristic: H1

Increase in pilot pressure ($V_{g_{max}} - V_{g_{min}}$) _______ $\Delta p = 25$ bar

Characteristic: H5

Increase in pilot pressure ($V_{g_{max}} - V_{g_{min}}$) _______ $\Delta p = 10$ bar

Note:
If no external control pressure is connected at G, the shuttle valve must be removed.

To permit operation of the pump displacement control from its starting position $V_{g_{max}}$ to $V_{g_{min}}$, a minimum control pressure of 30 bar is required for the electrical stroke limiter LRU1/2 and the hydraulic stroke limiter.

The required control oil is taken either from the load pressure, or from the externally applied control pressure at the G port.

To ensure functioning of the stroke limiter at low operating pressure as well, the port G must be supplied with external control pressure of approx. 30 bar.
LR Power Control

LRH2/6 Hydraulic stroke limiter  
(positive characteristic)

Control from $V_g_{\text{min}}$ to $V_g_{\text{max}}$

With increasing pilot pressure the pump swivels to a higher displacement.

Start of control (at $V_g_{\text{min}}$), settable from 4 – 10 bar

Please state start of control value, when ordering.

Starting position without control signal (pilot pressure):

- at operating pressure and external control pressure
  $< 30$ bar: $V_g_{\text{max}}$
- at operating pressure or external control pressure
  $> 30$ bar: $V_g_{\text{min}}$

Characteristic: $H2$

Increase in pilot pressure ($V_g_{\text{min}} - V_g_{\text{max}}$) $\Delta p = 25$ bar

Characteristic: $H6$

Increase in pilot pressure ($V_g_{\text{min}} - V_g_{\text{max}}$) $\Delta p = 10$ bar
LRU1/2 Electrical stroke limiter
(positive characteristic)

Control from $V_g\text{ min}$ to $V_g\text{ max}$

With increasing control current the pump swivels to a higher displacement.

Technical data of solenoids

<table>
<thead>
<tr>
<th></th>
<th>LRU1</th>
<th>LRU2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>12 V DC (± 20 %)</td>
<td>24 V DC (± 20 %)</td>
</tr>
</tbody>
</table>

Control current

<table>
<thead>
<tr>
<th></th>
<th>LRU1</th>
<th>LRU2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start of control at $V_g\text{ min}$</td>
<td>400 mA</td>
<td>200 mA</td>
</tr>
<tr>
<td>End of control at $V_g\text{ max}$</td>
<td>1200 mA</td>
<td>600 mA</td>
</tr>
<tr>
<td>Limiting current</td>
<td>1.54 A</td>
<td>0.77 A</td>
</tr>
<tr>
<td>Nominal resistance (at 20 °C)</td>
<td>5.5 Ω</td>
<td>22.7 Ω</td>
</tr>
<tr>
<td>Dither frequency</td>
<td>100 Hz</td>
<td>100 Hz</td>
</tr>
<tr>
<td>Duty cycle</td>
<td>100 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Type of protection</td>
<td>dependent on connector version, see page 58</td>
<td></td>
</tr>
</tbody>
</table>

Starting position without control signal (control current):

- at operating pressure and external control pressure
  - < 30 bar: $V_g\text{ max}$
  - > 30 bar: $V_g\text{ min}$

The following electronic control devices are available for controlling the proportional solenoid:

- Proportional amplifier PV (see RE 95023)
- Electronic control unit RC (see RE 95200)

Characteristic: LRU1/2
**DR Pressure Control**

**DR Pressure control**

The pressure control keeps the pressure in a hydraulic system constant within its control range even under varying flow conditions. The variable displacement pump only moves as much hydraulic fluid as is required by the actuators. If the operating pressure exceeds the setpoint set at the integral pressure control valve, the pump displacement is automatically swivelled back until the pressure deviation is corrected.

In zero pressure non-running condition, the pump is swivelled to its starting position ($V_{g\ max}$) by means of the control spring.

Setting range from 50 to 350 bar.

*Characteristic: DR*

---

**Graph:**

- **Operating pressure $p_b$** in bar
- **Flow $q_v$** in L/min

---

**Diagram:**

- **Size 40-145: DR**
- **Size 190-260: DR**
DR Pressure Control

DRS Pressure control with load sensing

The load-sensing control is a flow control option that operates as a function of the load pressure to regulate the pump displacement to match the actuator flow requirement.

The flow depends here on the cross section of the external sensing orifice (1) fitted between the pump outlet and the actuator. The flow is independent of the load pressure below the pressure cut-off setting and within the control range of the pump.

The sensing orifice is usually a separately arranged load sensing directional valve (control block). The position of the directional valve piston determines the opening cross section of the sensing orifice and thus the flow of the pump.

The load-sensing control compares pressure before and after the sensing orifice and maintains the pressure drop across the orifice - and therefore the pump flow - constant as a function of the orifice size.

If the differential pressure $\Delta p$ increases, the pump is swivelled back towards $V_g$ min and, if the $\Delta p$ decreases the pump is swivelling out towards $V_g$ max until the pressure drop across the sensing orifice in the valve is restored.

$\Delta p_{\text{orifice}} = p_{\text{pump}} - p_{\text{actuator}}$

The setting range for $\Delta p$ is between 14 bar and 25 bar.

The standard differential pressure setting is 18 bar. (Please state in clear text when ordering).

The stand-by pressure in zero stroke operation (sensing orifice plugged) is slightly above the $\Delta p$ setting.

(1) The sensing orifice (control block) is not included in the pump supply.

Characteristic: DRS
DR Pressure Control

DRG Pressure control, remote controlled

The remote control pressure cut-off regulator permits the adjustment of the pressure setting by a remotely installed pressure relief valve (1). Pilot flow for this valve is provided by a fixed orifice in the control module. The pressure drop across this relief valve is additive to the spring bias of the control spool.

Setting range from 50 to 350 bar.

In addition the pump can be unloaded into a standby pressure condition by an externally installed 2/2-way directional valve (2).

Both functions can be used individually or in combination (see circuit diagram).

The external valves are not included in the pump supply.

As a separate pressure relief valve (1) we recommend:
- DBDH 6 (manual control), see RE 25402

Characteristic: DRG

Note: The remote controlled pressure cut-off is also possible in combination with LR, HD and EP.
**DR Pressure Control**

**DRL Pressure control for parallel operation**

The pressure control DRL is suitable for pressure control of several axial piston pumps A11VO in parallel operation pumping into a common pressure header.

The parallel pressure control has a pressure rise characteristic of approx. 15 bar from \( q_v \text{max} \) to \( q_v \text{min} \). The pump regulates therefore to a pressure dependent displacement position. This results in stable control behavior, without the need of "staging" the individual pump compensators.

With the externally installed pressure relief valve (1) the nominal pressure setting of all pumps connected to the system is adjusted to the same value.

Setting range from 50 to 350 bar.

Each pump can be individually unloaded from the system by an separately installed 3/2- way directional valve (2).

The check valves (3) in the service line (port A) or control line (port X) must be provided generally.

The external valves are not included in the pump supply.

As a separate pressure relief valve (1) we recommend:

DBDH 6 (manual control) see RE 25402

The size of the remote relief valve depends on the number of pumps installed in parallel, and has to be able to handle the sum of the pilot flows provided by each pump control.

*Characteristic: DRL*

![Diagram of DRL pressure control system](image-url)

Size 40-145: DRL

- [Diagram of DRL system for size 40-145](image-url)

Size 190-260: DRL

- [Diagram of DRL system for size 190-260](image-url)
HD Hydraulic Control, Pilot Pressure Related

With the pilot pressure related control the pump displacement is adjusted in proportion to the pilot pressure applied to port Y.

Maximum permissible pilot pressure \( p_{St\,max} = 40 \text{ bar} \)

Control from \( V_g\,\text{min} \) to \( V_g\,\text{max} \).

With increasing pilot pressure the pump swivels to a higher displacement.

Start of control (at \( V_g\,\text{min} \)), settable from 4 - 10 bar

State start of control in clear text in the order.

Starting position without control signal (pilot pressure):
- at operating pressure and external control pressure < 30 bar: \( V_g\,\text{max} \)
- at operating pressure or external control pressure > 30 bar: \( V_g\,\text{min} \)

A control pressure of 30 bar is required to swivel the pump from its starting position \( V_g\,\text{max} \) to \( V_g\,\text{min} \).

The required control pressure is taken either from the load pressure, or from the externally applied control pressure at the G port.

To ensure the control even at low operating pressure < 30 bar the port G must be supplied with an external control pressure of approx. 30 bar.

Note:
If no external control pressure is required at G port, the parts of the shuttle valve are to be removed from the pump and G port must be plugged.

Characteristic: HD1

Increase in pilot pressure \( V_g\,\text{min} \) to \( V_g\,\text{max} \) \( \Delta p = 10 \text{ bar} \)

Characteristic: HD2

Increase in pilot pressure \( V_g\,\text{min} \) to \( V_g\,\text{max} \) \( \Delta p = 25 \text{ bar} \)
HD Hydraulic Control, Pilot Pressure Related

**HD.D Hydraulic control with pressure cut-off**

The pressure cut-off corresponds to a pressure control which adjusts the pump displacement back to $V_{g\text{ min}}$, when the pressure setting is reached.

This function overrides the HD control, i.e., the pilot pressure related displacement control is functional below the pressure setting.

The valve for the pressure cut-off is integrated in the control housing and is set to a fixed specified pressure value at the factory.

Setting range from 50 to 350 bar

**Characteristic: Pressure cut-off D**

- Operating pressure $p_B$ in bar
- Flow $q_v$ in L/min
- Setting range

---

Size 40-145: HD.D

Size 190-260: HD.D
EP  Electrical Control With Proportional Solenoid

With the electrical control with proportional solenoid, the pump displacement is adjusted proportionally to the solenoid current, resulting in a magnetic control force, acting directly onto the control spool that pilots the pump control piston.

A 12V DC (EP1) or 24V DC (EP2) supply is required to operate the proportional solenoid.

Control from $V_{g_{\text{min}}}$ to $V_{g_{\text{max}}}$

With increasing control current the pump swivels to a higher displacement.

Starting position without control signal (control current):
- at operating pressure and external control pressure < 30 bar: $V_{g_{\text{max}}}$
- at operating pressure or external control pressure > 30 bar: $V_{g_{\text{min}}}$

A control pressure of 30 bar is required to swivel the pump from its starting position $V_{g_{\text{max}}}$ to $V_{g_{\text{min}}}$.

The required control pressure is taken either from the load pressure, or from the externally applied control pressure at the G port.

To ensure the control even at low operating pressure < 30 bar the port G must be supplied with a external control pressure of approx. 30 bar.

Note:
If no external control pressure is required at G port, the parts of the shuttle valve are to be removed from the pump and G port must be plugged.

Note:
Install pump with EP control in the oil tank only when using mineral hydraulic oils and an oil temperature in the tank of max. 80°C.

The following electronic control devices are available for controlling the proportional solenoid:
- Proportional amplifier PV (see RE 95023)
- Electronic control unit RC (see RE 95200)

### Technical data of solenoids

<table>
<thead>
<tr>
<th></th>
<th>EP1</th>
<th>EP2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>12 V DC (±20 %)</td>
<td>24 V DC (±20 %)</td>
</tr>
<tr>
<td>Control current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start of control at $V_{g_{0}}$</td>
<td>400 mA</td>
<td>200 mA</td>
</tr>
<tr>
<td>End of control at $V_{g_{\text{max}}}$</td>
<td>1200 mA</td>
<td>600 mA</td>
</tr>
<tr>
<td>Limiting current</td>
<td>1.54 A</td>
<td>0.77 A</td>
</tr>
<tr>
<td>Nominal resistance (at 20°C)</td>
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<td>22.7 Ω</td>
</tr>
<tr>
<td>Dither frequency</td>
<td>100 Hz</td>
<td>100 Hz</td>
</tr>
<tr>
<td>Duty cycle</td>
<td>100 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Type of protection</td>
<td>dependent on connector version, see page 58</td>
<td></td>
</tr>
</tbody>
</table>
EP Electrical Control With Proportional Solenoid

EP.D Electrical control with pressure cut-off

The pressure cut-off corresponds to a pressure control which adjusts the pump displacement back to \( V_g_{\text{min}} \), when the pressure setting is reached.

This function overrides the EP control, i.e. the control current related displacement control is functional below the pressure setting.

The valve for the pressure cut-off is integrated in the control housing and is set to a fixed specified pressure value at the factory.

Setting range from 50 to 350 bar

Characteristic: Pressure cut-off \( D \)
Unit Dimensions, Size 40

LRDCS:
Power control LR with pressure cut-off D, cross sensing control C and load sensing control S

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 40

Shaft ends

<table>
<thead>
<tr>
<th>Z</th>
<th>Splined shaft DIN 5480 W35x2x30x16x9g</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Cyl. shaft with key DIN 6885 – AS10x8x56</td>
</tr>
<tr>
<td>S</td>
<td>Splined shaft 1 in 15T 16/32DP ²) (SAE J744 – 25-4 (B-B))</td>
</tr>
<tr>
<td>T</td>
<td>Splined shaft 1 1/4 in 14T 12/24DP ²) (SAE J744 – 32-4 (C))</td>
</tr>
</tbody>
</table>

Ports

<table>
<thead>
<tr>
<th>A</th>
<th>Service ports (high pressure series)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Suction port (standard series)</td>
</tr>
<tr>
<td>T₁, T₂</td>
<td>Bleeding, tank</td>
</tr>
<tr>
<td>R</td>
<td>Bleeding, oil drain</td>
</tr>
<tr>
<td>M₁</td>
<td>Measuring position, positioning chamber</td>
</tr>
<tr>
<td>M</td>
<td>Measuring position, service port</td>
</tr>
<tr>
<td>X</td>
<td>Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off (G)</td>
</tr>
<tr>
<td>Y</td>
<td>Pilot pressure port in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD</td>
</tr>
<tr>
<td>Z</td>
<td>Pilot pressure port in version with cross sensing (C) and power override (LR3, LG1)</td>
</tr>
<tr>
<td>G</td>
<td>Port for control pressure (controller) in version with stroke limiter (H... U2), HD and EP with screw union GE10 - PLM (otherwise port G plugged)</td>
</tr>
</tbody>
</table>

Tightening torque, max.

<table>
<thead>
<tr>
<th>Port</th>
<th>SAE J518</th>
<th>DIN 13</th>
<th>ISO</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3/4 in</td>
<td>M10x1.5; 17 deep</td>
<td>50 Nm</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>2 in</td>
<td>M12x1.75; 20 deep</td>
<td>210 Nm</td>
<td></td>
</tr>
<tr>
<td>T₁, T₂</td>
<td>DIN 3852</td>
<td>M22x1.5; 14 deep</td>
<td>210 Nm</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>DIN 3852</td>
<td>M22x1.5; 14 deep</td>
<td>50 Nm</td>
<td></td>
</tr>
<tr>
<td>M₁</td>
<td>DIN 3852</td>
<td>M12x1.5; 12 deep</td>
<td>50 Nm</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>DIN 3852</td>
<td>M12x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>DIN 3852</td>
<td>M14x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>DIN 3852</td>
<td>M14x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>DIN 3852</td>
<td>M14x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>DIN 3852</td>
<td>M14x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
</tr>
</tbody>
</table>

1) Centering bore in accordance with DIN 332
2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5
Unit Dimensions, Size 40

**LRDH1/LRDH5:**
Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)

**LRDH2/LRDH6:**
Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)

**LRDU1/LRDU2:**
Power control with pressure cut-off and electrical stroke limiter (positive characteristic)

**LR3DS:**
Power control with high pressure related override, pressure cut-off and load sensing control

**LG1E:**
Power control with pilot pressure related override (negative) and 2-stage pressure cut-off

**LG2E:**
Power control with pilot pressure related override (positive) and 2-stage pressure cut-off

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 40

**HD1D/HD2D:**
Hydraulic control, pilot pressure related with pressure cut-off

**EP1D/EP2D:**
Electrical control with proportional solenoid and pressure cut-off

**DRS/DRG:**
Pressure control with load sensing control
Pressure control remote controlled

**DRL:**
Pressure control for parallel operation

**LE1S/LE2S:**
Power control with electrical override (negative) and load sensing control

**LE2S2/LE1S5/LE2S5:**
Power control with electrical override (negative) and load sensing control, override

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 60

LRDCS:
Power control LR with pressure cut-off D, cross sensing control C and load sensing control S

Before finalizing your design, please request a certified drawing.

*) Center of gravity
**Unit Dimensions, Size 60**

**Shaft ends**

- **Z** splined shaft DIN 5480
  - W35x2x301x16x9g

- **P** cyl. shaft with key
  - DIN 6885 – AS10x8x56

- **S** splined shaft
  - 1 1/4 in 14T 12/24DP ²)
  - (SAE J744 – 32-4 (C))

- **T** splined shaft
  - 1 3/8 in 21T 16/32DP ²)

**Ports**

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
<th>SAE</th>
<th>Metric</th>
<th>Fastening Thread</th>
<th>Depth</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Service ports (high pressure series)</td>
<td>J518</td>
<td>3/4 in</td>
<td>M10x1.5; 17 deep</td>
<td>–</td>
<td>see safety instructions</td>
</tr>
<tr>
<td>S</td>
<td>Suction port (standard series)</td>
<td>J518</td>
<td>2</td>
<td>M12x1.75; 20 deep</td>
<td>see safety instructions</td>
<td>-</td>
</tr>
<tr>
<td>T₁, T₂</td>
<td>Bleeding, tank</td>
<td>3852</td>
<td>M22x1.5; 14 deep</td>
<td>210 Nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>Bleeding, oil drain</td>
<td>3852</td>
<td>M22x1.5; 14 deep</td>
<td>210 Nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M₁</td>
<td>Measuring position, positioning chamber</td>
<td>3852</td>
<td>M12x1.5; 12 deep</td>
<td>50 Nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Measuring position, service port</td>
<td>3852</td>
<td>M12x1.5; 12 deep</td>
<td>50 Nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off (G)</td>
<td>3852</td>
<td>M14x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>Pilot pressure port in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD</td>
<td>3852</td>
<td>M14x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>Pilot pressure port in version with cross sensing (C) and power override (LR3, LG1)</td>
<td>3852</td>
<td>M14x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Port for control pressure (controller) in version with stroke limiter (H... U2), HD and EP with screw union GE10 - PLM (otherwise port G plugged)</td>
<td>3852</td>
<td>M14x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹) Centering bore in accordance with DIN 332
²) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5
Unit Dimensions, Size 60

**LRDH1/LRDH5:**
Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)

**LRDH2/LRDH6:**
Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)

**LRDU1/LRDU2:**
Power control with pressure cut-off and electrical stroke limiter (positive characteristic)

**LR3DS:**
Power control with high pressure related override, pressure cut-off and load sensing control

**LG1E:**
Power control with pilot pressure related override (negative) and 2-stage pressure cut-off

**LG2E:**
Power control with pilot pressure related override (positive) and 2-stage pressure cut-off

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 60

**HD1/D/HD2D:**
Hydraulic control, pilot pressure related with pressure cut-off

**EP1D/EP2D:**
Electrical control with proportional solenoid and pressure cut-off

**DRS/DRG:**
Pressure control with load sensing control
Pressure control remote controlled

**DRL:**
Pressure control for parallel operation

**LE1S/LE2S:**
Power control with electrical override (negative) and load sensing control

**LE2S2/LE1S5/LE2S5:**
Power control with electrical override (negative) and load sensing control, override

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 75

LRDCS:
Power control LR with pressure cut-off D, cross sensing control C and load sensing control S

Before finalizing your design, please request a certified drawing.
**Unit Dimensions, Size 75**

**Shaft ends**

| **Z** | splined shaft DIN 5480  
|       | W40x2x30x18xg  

**Ports**

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
<th>Connection</th>
<th>Fastening thread</th>
<th>Note</th>
</tr>
</thead>
</table>
| A    | Service ports (high pressure series)  
|      | Fastening thread | SAE J518 | M12x1.75; 17 deep | see safety instructions |
| S    | Suction port | SAE J518 | M12x1.75; 17 deep | see safety instructions |
| T1, T2 | Bleeding, tank | DIN 3852 | M22x1.5; 14 deep | 210 Nm |
| R    | Bleeding, oil drain | DIN 3852 | M22x1.5; 14 deep | 210 Nm |
| M1   | Measuring position, positioning chamber | DIN 3852 | M12x1.5; 12 deep | 50 Nm |
| M    | Measuring position, service port | DIN 3852 | M12x1.5; 12 deep | 50 Nm |
| X    | Pilot pressure port  
|      | in version with load sensing (S)  
|      | and remote controlled pressure cut-off (G) | DIN 3852 | M14x1.5; 12 deep | 80 Nm |
| Y    | Pilot pressure port  
|      | in version with stroke limiter (H...),  
|      | 2-stage pressure cut-off (E) and HD | DIN 3852 | M14x1.5; 12 deep | 80 Nm |
| Z    | Pilot pressure port  
|      | in version with cross sensing (C) and  
|      | power override (LR3, LG1) | DIN 3852 | M14x1.5; 12 deep | 80 Nm |
| G    | Port for control pressure (controller)  
|      | in version with stroke limiter (H... U2),  
|      | HD and EP with screw union GE10 - PLM  
|      | (otherwise port G plugged) | DIN 3852 | M14x1.5; 12 deep | 80 Nm |

1) Centering bore in accordance with DIN 332  
2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5
Unit Dimensions, Size 75

**LRDH1/LRDH5:**
Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)

**LRDH2/LRDH6:**
Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)

**LRDU1/LRDU2:**
Power control with cut-off and electrical stroke limiter (positive characteristic)

**LR3DS:**
Power control with high pressure related override, pressure cut-off and load sensing control

**LG1E:**
Power control with pilot pressure related override (negative) and 2-stage pressure cut-off

**LG2E:**
Power control with pilot pressure related override (positive) and 2-stage pressure cut-off

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 75

**HD1D/HD2D:**
Hydraulic control, pilot pressure related with pressure cut-off

**EP1D/EP2D:**
Electrical control with proportional solenoid and pressure cut-off

**DRS/DRG:**
Pressure control with load sensing control
Pressure control remote controlled

**DRL:**
Pressure control for parallel operation

**LE1S/LE2S:**
Power control with electrical override (negative) and load sensing control

**LE2S2/LE1S5/LE2S5:**
Power control with electrical override (negative) and load sensing control, override

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 95

LRDCS:
Power control LR with pressure cut-off D, cross sensing control C and load sensing control S

Before finalizing your design, please request a certified drawing.

Details:
- Dimensions according to SAE J617-No. 3, for connection to the flywheel housing of the combustion engine
- Center of gravity

[Diagrams and measurements shown]
Unit Dimensions, Size 95

Shaft ends

- **Z** splined shaft DIN 5480
  - W45x2x30x21x9g
  - Ø101 x 50 x 42 x 12 x 36 x 60 mm

- **P** cyl. shaft with key
  - DIN 6885 – AS14x9x80
  - Ø45 x 82 x 12 x 36 x 55 x 75 mm

- **S** splined shaft
  - 1 3/4 in 13T 8/16DP
  - (SAE J744 – 44-4 (D))
  - Ø101 x 55 x 12 x 36 x 67 x 75 mm

Ports

- **A** Service ports (high pressure series)
  - Fastening thread
  - SAE J518
  - DIN 13
  - M12x1.75; 17 deep

- **S** Suction port (standard series)
  - Fastening thread
  - SAE J518
  - DIN 13
  - M16x2; 24 deep

- **T₁, T₂** Bleeding, tank
  - DIN 3852
  - M26x1.5; 16 deep
  - 230 Nm

- **R** Bleeding, oil drain
  - DIN 3852
  - M26x1.5; 16 deep
  - 230 Nm

- **M₁** Measuring position, positioning chamber
  - DIN 3852
  - M12x1.5; 12 deep
  - 50 Nm

- **M** Measuring position, service port
  - DIN 3852
  - M12x1.5; 12 deep
  - 50 Nm

- **X** Pilot pressure port
  - in version with load sensing (S)
  - and remote controlled pressure cut-off (G)
  - DIN 3852
  - M14x1.5; 12 deep
  - 80 Nm

- **Y** Pilot pressure port
  - in version with stroke limiter (H...),
  - 2-stage pressure cut-off (E) and HD
  - DIN 3852
  - M14x1.5; 12 deep
  - 80 Nm

- **Z** Pilot pressure port
  - in version with cross sensing (C) and
  - power override (LR3, LG1)
  - DIN 3852
  - M14x1.5; 12 deep
  - 80 Nm

- **G** Port for control pressure (controller)
  - in version with stroke limiter (H... U2),
  - HD and EP with screw union GE10 - PLM
  - (otherwise port G plugged)
  - DIN 3852
  - M14x1.5; 12 deep
  - 80 Nm

1) Centering bore in accordance with DIN 332
2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 95

**LRDH1/LRDH5:**
Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)

**LRDH2/LRDH6:**
Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)

**LRDU1/LRDU2:**
Power control with pressure cut-off and electrical stroke limiter (positive characteristic)

**LR3DS:**
Power control with high pressure related override, pressure cut-off and load sensing control

**LG1E:**
Power control with pilot pressure related override (negative) and 2-stage pressure cut-off

**LG2E:**
Power control with pilot pressure related override (positive) and 2-stage pressure cut-off

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 95

**HD1D/HD2D:**
Hydraulic control, pilot pressure related with pressure cut-off

**EP1D/EP2D:**
Electrical control with proportional solenoid and pressure cut-off

**DRS/DRG:**
Pressure control with load sensing control
Pressure control remote controlled

**DRL:**
Pressure control for parallel operation

**LE1S/LE2S:**
Power control with electrical override (negative) and load sensing control

**LE2S2/LE1S5/LE2S5:**
Power control with electrical override (negative) and load sensing control, override

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 130/145

LRDCS:
Power control LR with pressure cut-off D, cross sensing control C and load sensing control S

View Y
clockwise rotation
(anti-clockwise rotation)

without charge pump

Flange SAE J744
152-4 (D)

Flange SAE 3 (G)
305 (A11VO) / 353 (A11VLO)

with charge pump

Detail W

Detail V

*) Center of gravity

1) Dimensions according to SAE J617-No. 3, for connection to the flywheel housing of the combustion engine
2) The housing or length dimension with flange SAE 3 is 5 mm shorter than the standard housing.
Unit Dimensions, Size 130/145

Shaft ends

Z splined shaft DIN 5480
W50x2x30x24x9g

P cyl. shaft with key DIN 6885 – AS14x9x80

S splined shaft
1 3/4 in 13T 8/16DP ²)
(SAE J744 – 44-4 (D))

Ports

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
<th>Fastening thread</th>
<th>Size</th>
<th>Deep</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Service ports (high pressure series)</td>
<td>SAE J518</td>
<td>1 in</td>
<td>17 deep</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Fastening thread</td>
<td>DIN 13</td>
<td>M12x1.75</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>A₁</td>
<td>Service ports (high pressure series) with charge pump</td>
<td>SAE J518</td>
<td>1 1/4 in</td>
<td>19 deep</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Fastening thread</td>
<td>DIN 13</td>
<td>M14x2</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>S, S₁</td>
<td>Suction port (standard series)</td>
<td>SAE J518</td>
<td>3 in</td>
<td>24 deep</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Fastening thread</td>
<td>DIN 13</td>
<td>M16x2</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>T₁, T₂</td>
<td>Bleeding, tank</td>
<td>DIN 3852</td>
<td>M26x1.5</td>
<td>16 deep</td>
<td>230 Nm</td>
</tr>
<tr>
<td>R</td>
<td>Bleeding, oil drain</td>
<td>DIN 3852</td>
<td>M26x1.5</td>
<td>16 deep</td>
<td>230 Nm</td>
</tr>
<tr>
<td>M₁</td>
<td>Measuring position, positioning chamber</td>
<td>DIN 3852</td>
<td>M12x1.5</td>
<td>12 deep</td>
<td>50 Nm</td>
</tr>
<tr>
<td>M</td>
<td>Measuring position, service port</td>
<td>DIN 3852</td>
<td>M12x1.5</td>
<td>12 deep</td>
<td>50 Nm</td>
</tr>
<tr>
<td>X</td>
<td>Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off (G)</td>
<td>DIN 3852</td>
<td>M14x1.5</td>
<td>12 deep</td>
<td>80 Nm</td>
</tr>
<tr>
<td>Y</td>
<td>Pilot pressure port in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD</td>
<td>DIN 3852</td>
<td>M14x1.5</td>
<td>12 deep</td>
<td>80 Nm</td>
</tr>
<tr>
<td>Z</td>
<td>Pilot pressure port in version with cross sensing (C) and power override (LR3, LG1)</td>
<td>DIN 3852</td>
<td>M14x1.5</td>
<td>12 deep</td>
<td>80 Nm</td>
</tr>
<tr>
<td>G</td>
<td>Port for control pressure (controller) in version with stroke limiter (H., U2), HD and EP with screw union GE10 - PLM (otherwise port G plugged)</td>
<td>DIN 3852</td>
<td>M14x1.5</td>
<td>12 deep</td>
<td>80 Nm</td>
</tr>
</tbody>
</table>

¹) Centering bore in accordance with DIN 332
²) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 130/145

**LRDH1/LRDH5:**
Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)

**LRDH2/LRDH6:**
Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)

**LRDU1/LRDU2:**
Power control with pressure cut-off and electrical stroke limiter (positive characteristic)

**LR3DS:**
Power control with high pressure related override, pressure cut-off and load sensing control

**LG1E:**
Power control with pilot pressure related override (negative) and 2-stage pressure cut-off

**LG2E:**
Power control with pilot pressure related override (positive) and 2-stage pressure cut-off

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 130/145

HD1D/HD2D:
Hydraulic control, pilot pressure related with pressure cut-off

EP1D/EP2D:
Electrical control with proportional solenoid and pressure cut-off

DRS/DRG:
Pressure control with load sensing control
Pressure control remote controlled

DRL:
Pressure control for parallel operation

LE1S/LE2S:
Power control with electrical override (negative) and load sensing control

LE2S2/LE1S5/LE2S5:
Power control with electrical override (negative) and load sensing control, override

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 190

LRDCS:
Power control LR with pressure cut-off D, cross sensing control C and load sensing control S

Before finalizing your design, please request a certified drawing.

1) Dimensions according to SAE J617-No. 3, for connection to the flywheel housing of the combustion engine
2) The housing or length dimension with flange SAE 3 is 5 mm shorter than the standard housing.
3) Center of gravity
Unit Dimensions, Size 190

Shaft ends

**Z** splined shaft DIN 5480
W50x2x30x24x9g

**P** cyl. shaft with key DIN 6885 – AS16x10x100

**S** splined shaft
1 3/4 in 13T 8/16DP 2
(SAE J744 – 44-4 (D))

**T** splined shaft
2 in 15T 8/16DP 2
(SAE J744 – 50-4 (F))

**Ports**

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
<th>Thread</th>
<th>Size</th>
<th>Depth</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, A1</td>
<td>Service ports (high pressure series) Fastening thread</td>
<td>SAE J518</td>
<td>1 1/2 in</td>
<td>M16x2; 21 deep</td>
<td>see safety instructions</td>
</tr>
<tr>
<td>S, S1</td>
<td>Suction port (standard series) Fastening thread</td>
<td>SAE J518</td>
<td>3 1/2 in</td>
<td>M16x2; 24 deep</td>
<td>see safety instructions</td>
</tr>
<tr>
<td>T1, T2</td>
<td>Bleeding, tank</td>
<td>DIN 3852</td>
<td>M33x2; 18 deep</td>
<td>540 Nm</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>Bleeding, oil drain</td>
<td>DIN 3852</td>
<td>M33x2; 18 deep</td>
<td>540 Nm</td>
<td></td>
</tr>
<tr>
<td>M1</td>
<td>Measuring position, positioning chamber</td>
<td>DIN 3852</td>
<td>M12x1.5; 12 deep</td>
<td>50 Nm</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Measuring position, service port</td>
<td>DIN 3852</td>
<td>M12x1.5; 12 deep</td>
<td>50 Nm</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off (G)</td>
<td>DIN 3852</td>
<td>M14x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>Pilot pressure port in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD</td>
<td>DIN 3852</td>
<td>M14x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>Pilot pressure port in version with cross sensing (C) and power override (LR3, LG1)</td>
<td>DIN 3852</td>
<td>M14x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Port for control pressure (controller) in version with stroke limiter (H... U2), HD and EP with screw union GE10 - PLM (otherwise port G plugged)</td>
<td>DIN 3852</td>
<td>M14x1.5; 12 deep</td>
<td>80 Nm</td>
<td></td>
</tr>
</tbody>
</table>

1) Centering bore in accordance with DIN 332
2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 190

LRDH1/LRDH5:
Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)

LRDH2/LRDH6:
Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)

LRDU1/LRDU2:
Power control with pressure cut-off and electrical stroke limiter (positive characteristic)

LR3DS:
Power control with high pressure related override, pressure cut-off and load sensing control

LG1EH:
Power control with pilot pressure related override (neg.), 2-stage pressure cut-off and hydr. stroke limiter

LG2EH:
Power control with pilot pressure related override (pos.), 2-stage pressure cut-off and hydr. stroke limiter

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 190

**HD1D/HD2D:**
Hydraulic control, pilot pressure related with pressure cut-off

**EP1D/EP2D:**
Electrical control with proportional solenoid and pressure cut-off

**DRS/DRG:**
Pressure control with load sensing control
Pressure control remote controlled

**DRL:**
Pressure control for parallel operation

**LE1S/LE2S:**
Power control with electrical override (negative) and load sensing control

**LE2S2/LE1S5/LE2S5:**
Power control with electrical override (negative) and load sensing control, override

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 260

LRDCS:
Power control LR with pressure cut-off D, cross sensing control C and load sensing control S

Before finalizing your design, please request a certified drawing.

*) Center of gravity
Before finalizing your design, please request a certified drawing.

Unit Dimensions, Size 260

Shaft ends

Z splined shaft DIN 5480
W60x2x30x28x9g

P cyl. shaft with key
DIN 6885 – AS18x11x100

S splined shaft
1 3/4 in 13T 8/16DP ²
(SAE J744 – 44-4 (D))

T splined shaft
2 1/4 in 17T 8/16DP ²

Ports

A, A₁ Service ports (high pressure series)
Fastening thread

S Suction port (standard series)
Fastening thread

S₁ Suction port (standard series)
Fastening thread

T₁, T₂ Bleeding, tank

R Bleeding, oil drain

M₁ Measuring position, positioning chamber

M Measuring position, service port

X Pilot pressure port
in version with load sensing (S)
and remote controlled pressure cut-off (G)

Y Pilot pressure port
in version with stroke limiter (H...),
2-stage pressure cut-off (E) and HD

Z Pilot pressure port
in version with cross sensing (C) and
power override (LR3, LG1)

G Port for control pressure (controller)
in version with stroke limiter (H..., U2),
HD and EP with screw union GE10 - PLM
(otherwise port G plugged)

 Tightening torque, max.

<table>
<thead>
<tr>
<th>Port</th>
<th>Port for control pressure (controller)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, A₁</td>
<td>Service ports (high pressure series)</td>
</tr>
<tr>
<td>Fastening thread</td>
<td>M16x2; 21 deep</td>
</tr>
<tr>
<td>S</td>
<td>Suction port (standard series)</td>
</tr>
<tr>
<td>Fastening thread</td>
<td>M16x2; 21 deep</td>
</tr>
<tr>
<td>S₁</td>
<td>Suction port (standard series)</td>
</tr>
<tr>
<td>Fastening thread</td>
<td>M16x1; 21 deep</td>
</tr>
<tr>
<td>T₁, T₂</td>
<td>Bleeding, tank</td>
</tr>
<tr>
<td>R</td>
<td>Bleeding, oil drain</td>
</tr>
<tr>
<td>M₁</td>
<td>Measuring position, positioning chamber</td>
</tr>
<tr>
<td>M</td>
<td>Measuring position, service port</td>
</tr>
<tr>
<td>X</td>
<td>Pilot pressure port</td>
</tr>
<tr>
<td>in version with load sensing (S)</td>
<td></td>
</tr>
<tr>
<td>and remote controlled pressure cut-off (G)</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>Pilot pressure port</td>
</tr>
<tr>
<td>in version with stroke limiter (H...),</td>
<td></td>
</tr>
<tr>
<td>2-stage pressure cut-off (E) and HD</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>Pilot pressure port</td>
</tr>
<tr>
<td>in version with cross sensing (C) and</td>
<td></td>
</tr>
<tr>
<td>power override (LR3, LG1)</td>
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</tr>
<tr>
<td>G</td>
<td>Port for control pressure (controller)</td>
</tr>
<tr>
<td>in version with stroke limiter (H..., U2),</td>
<td></td>
</tr>
<tr>
<td>HD and EP with screw union GE10 - PLM</td>
<td></td>
</tr>
</tbody>
</table>

Tightening torque, max.

M33x2; 16 deep
M12x1.5; 12 deep
M14x1.5; 12 deep

– see safety instructions

1) Centering bore in accordance with DIN 332

2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5
Unit Dimensions, Size 260

LRDH1/LRDH5:
Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)

LRDH2/LRDH6:
Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)

LRDU1/LRDU2:
Power control with pressure cut-off and electrical stroke limiter (positive characteristic)

LR3DS:
Power control with high pressure related override, pressure cut-off and load sensing control

LG1EH:
Power control with pilot pressure related override (neg.), 2-stage pressure cut-off and hydr. stroke limiter

LG2EH:
Power control with pilot pressure related override (pos.), 2-stage pressure cut-off and hydr. stroke limiter

Before finalizing your design, please request a certified drawing.
Unit Dimensions, Size 260

HD1D/HD2D:
Hydraulic control, pilot pressure related with pressure cut-off

EP1D/EP2D:
Electrical control with proportional solenoid and pressure cut-off

DRS/DRG:
Pressure control with load sensing control
Pressure control remote controlled

DRL:
Pressure control for parallel operation

LE1S/LE2S:
Power control with electrical override (negative) and load sensing control

LE2S2/LE1S5/LE2S5:
Power control with electrical override (negative) and load sensing control, override

Before finalizing your design, please request a certified drawing.
Through Drive Dimensions

**Flange SAE J744 – 82-2 (A)**
- **Coupler** for splined shaft according to ANSI B92.1a-1976

![Flange SAE J744 – 82-2 (A)](image)

<table>
<thead>
<tr>
<th>Size</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
</tr>
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<tbody>
<tr>
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<td>240</td>
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<tr>
<td>60</td>
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<td>190</td>
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<td>260</td>
<td>385</td>
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<td>–</td>
</tr>
<tr>
<td>260*</td>
<td>273</td>
<td>427.3</td>
<td>–</td>
</tr>
</tbody>
</table>

*1) Version with charge pump

**Notes:**
- All through drive flanges can be turned 90°. Please state in clear text if required.
- Pressure angle 30°, flat root side fit, tolerance class 5
- O-ring seal is included in the supply
- Thread according to DIN 13, see safety instructions

---

**Flange SAE J744 – 101-2 (B)**
- **Coupler** for splined shaft according to ANSI B92.1a-1976

![Flange SAE J744 – 101-2 (B)](image)

<table>
<thead>
<tr>
<th>Size</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
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<td>240</td>
<td>8</td>
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<tr>
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<td>190*</td>
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<td>404</td>
<td>394</td>
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<tr>
<td>260</td>
<td>395</td>
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<td>–</td>
</tr>
<tr>
<td>260*</td>
<td>437.5</td>
<td>437.5</td>
<td>437.5</td>
</tr>
</tbody>
</table>

*1) Version with charge pump

**Note:** In size 190 and 260 the hole template is turned 45° counterclockwise.

**Flange SAE J744 – 127-2 (C)**
- **Coupler** for splined shaft according to ANSI B92.1a-1976

![Flange SAE J744 – 127-2 (C)](image)

<table>
<thead>
<tr>
<th>Size</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>272</td>
<td>265</td>
<td>13</td>
</tr>
<tr>
<td>75</td>
<td>290</td>
<td>283</td>
<td>13</td>
</tr>
<tr>
<td>95</td>
<td>318</td>
<td>318</td>
<td>318</td>
</tr>
<tr>
<td>130/145</td>
<td>330</td>
<td>330</td>
<td>330</td>
</tr>
<tr>
<td>130/145*</td>
<td>364</td>
<td>364</td>
<td>364</td>
</tr>
</tbody>
</table>

*1) Version with charge pump

---

**Notes:**
- Pressure angle 30°, flat root side fit, tolerance class 5
- O-ring seal is included in the supply
- Thread according to DIN 13, see safety instructions
### Through Drive Dimensions

**Flange SAE J744 – 127-2 + 4 (C)**  
**Coupler** for splined shaft according to ANSI B92.1a-1976  
**Coupler** for splined shaft according to DIN 5480

<table>
<thead>
<tr>
<th>Size</th>
<th>A1 1/4in 14T 12/24 DP 1)</th>
<th>(SAE J744 – 32-4 (C))</th>
<th>K07</th>
</tr>
</thead>
<tbody>
<tr>
<td>190</td>
<td>367.8</td>
<td>367.8</td>
<td>367.8</td>
</tr>
<tr>
<td>190*</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>260</td>
<td>391.5</td>
<td>391.5</td>
<td>391.5</td>
</tr>
<tr>
<td>260*</td>
<td>433.5</td>
<td>433.5</td>
<td>433.5</td>
</tr>
</tbody>
</table>

*) Version with charge pump

**Flange SAE J744 – 152-4 (D)**  
**Coupler** for splined shaft according to ANSI B92.1a-1976  
**Coupler** for splined shaft according to DIN 5480

<table>
<thead>
<tr>
<th>Size</th>
<th>A1 1/4in 14T 12/24 DP 1)</th>
<th>(SAE J744 – 32-4 (C))</th>
<th>K07</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>317</td>
<td>317</td>
<td>317</td>
</tr>
<tr>
<td>130/145</td>
<td>340</td>
<td>340</td>
<td>340</td>
</tr>
<tr>
<td>130/145*</td>
<td>374</td>
<td>374</td>
<td>374</td>
</tr>
<tr>
<td>190</td>
<td>392</td>
<td>392</td>
<td>392</td>
</tr>
<tr>
<td>190*</td>
<td>424</td>
<td>424</td>
<td>424</td>
</tr>
<tr>
<td>260</td>
<td>417</td>
<td>417</td>
<td>417</td>
</tr>
<tr>
<td>260*</td>
<td>459</td>
<td>459</td>
<td>459</td>
</tr>
</tbody>
</table>

*) Version with charge pump

**Flange SAE J744 – 101-2 (E)**  
**Coupler** for splined shaft according to ANSI B92.1a-1976  
**Coupler** for splined shaft according to DIN 5480

<table>
<thead>
<tr>
<th>Size</th>
<th>A1 13/4 in 13T 16/32 DP 1)</th>
<th>(SAE J744 – 32-4 (C))</th>
<th>K07</th>
</tr>
</thead>
<tbody>
<tr>
<td>190</td>
<td>376.8</td>
<td>376.8</td>
<td>376.8</td>
</tr>
<tr>
<td>190*</td>
<td>409</td>
<td>409</td>
<td>409</td>
</tr>
<tr>
<td>260</td>
<td>417</td>
<td>417</td>
<td>417</td>
</tr>
<tr>
<td>260*</td>
<td>459</td>
<td>442.5</td>
<td>442.5</td>
</tr>
</tbody>
</table>

*) Version with charge pump

---

**Note:** All through drive flanges can be turned 90°. Please state in clear text if required.

1) 30° pressure angle, flat root side fit, tolerance class 5  
2) O-ring seal is included in the supply  
3) Thread according to DIN 13, see safety instructions
Summary of Through Drive Assembly Possibilities for A11V(L)O

<table>
<thead>
<tr>
<th>Through drive – A11VO attachment – 2nd pump</th>
<th>Flange coupler for splined shaft code</th>
<th>A11VO Size (shaft)</th>
<th>A10V(S)O/31 Size (shaft)</th>
<th>A10V(S)O/52 Size (shaft)</th>
<th>A4FO Size (shaft)</th>
<th>A4VG Size (shaft)</th>
<th>A10VG Size (shaft)</th>
<th>external gear pump</th>
<th>thread drive available for Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>82-2 (A)</td>
<td>5/8in</td>
<td>K01</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>40...260</td>
</tr>
<tr>
<td></td>
<td>3/4in</td>
<td>K52</td>
<td>–</td>
<td>18 (S)</td>
<td>10 (S)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>40...260</td>
</tr>
<tr>
<td>101-2 (B)</td>
<td>7/8in</td>
<td>K02</td>
<td>–</td>
<td>28 (S,R)</td>
<td>45 (U,R)</td>
<td>16, 22, 28 (S)</td>
<td>18 (S)</td>
<td>–</td>
<td>40...260</td>
</tr>
<tr>
<td>1 in</td>
<td></td>
<td>K04</td>
<td>40 (S)</td>
<td>45 (S,R)</td>
<td>60 (U,W)</td>
<td>28 (S)</td>
<td>28, 45 (S)</td>
<td>–</td>
<td>40...260</td>
</tr>
<tr>
<td>W35</td>
<td>K79</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>40...260</td>
</tr>
<tr>
<td>127-2 (C)</td>
<td>1 1/4in</td>
<td>K07</td>
<td>60 (S)</td>
<td>71 (S,R)</td>
<td>100 (U)</td>
<td>40, 56, 71 (S)</td>
<td>63 (S)</td>
<td>–</td>
<td>60...260</td>
</tr>
<tr>
<td>1 1/2in</td>
<td>K24</td>
<td>–</td>
<td>100 (S)</td>
<td>85 (U)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>95...260</td>
<td></td>
</tr>
<tr>
<td>W30</td>
<td>K80</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>40, 56 (Z)</td>
<td>–</td>
<td>–</td>
<td>60...260</td>
<td></td>
</tr>
<tr>
<td>W35</td>
<td>K61</td>
<td>60 (Z)</td>
<td>–</td>
<td>–</td>
<td>40, 56 (A)</td>
<td>71 (Z)</td>
<td>–</td>
<td>60...260</td>
<td></td>
</tr>
<tr>
<td>152-4 (D)</td>
<td>1 1/4in</td>
<td>K86</td>
<td>75 (S)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>75...260</td>
<td></td>
</tr>
<tr>
<td>1 3/4in</td>
<td>K17</td>
<td>95, 130, 145 (S)</td>
<td>140 (S)</td>
<td>–</td>
<td>90, 125 (S)</td>
<td>–</td>
<td>–</td>
<td>130...260</td>
<td></td>
</tr>
<tr>
<td>W40</td>
<td>K81</td>
<td>75 (Z)</td>
<td>–</td>
<td>–</td>
<td>125 (Z)</td>
<td>–</td>
<td>–</td>
<td>75...260</td>
<td></td>
</tr>
<tr>
<td>W45</td>
<td>K82</td>
<td>95 (Z)</td>
<td>–</td>
<td>–</td>
<td>90, 125 (A)</td>
<td>–</td>
<td>–</td>
<td>95...260</td>
<td></td>
</tr>
<tr>
<td>W50</td>
<td>K83</td>
<td>130, 145 (Z)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>130...260</td>
<td></td>
</tr>
<tr>
<td>165-4 (E)</td>
<td>1 3/4in</td>
<td>K72</td>
<td>190, 260 (S)</td>
<td>–</td>
<td>–</td>
<td>180, 250 (S)</td>
<td>–</td>
<td>190...260</td>
<td></td>
</tr>
<tr>
<td>W50</td>
<td>K84</td>
<td>190 (Z)</td>
<td>–</td>
<td>–</td>
<td>180 (Z)</td>
<td>–</td>
<td>–</td>
<td>190...260</td>
<td></td>
</tr>
<tr>
<td>W60</td>
<td>K67</td>
<td>260 (Z)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>260</td>
<td></td>
</tr>
</tbody>
</table>

1) Rexroth recommends special versions of the gear pumps. Please ask.
2) Only A10VO with 4-hole mounting flange can be mounted to A11V(L)O 190 and 260.

Combination Pumps A11VO + A11VO

<table>
<thead>
<tr>
<th>A11VO (1st pump)</th>
<th>A11VO (2nd pump)</th>
</tr>
</thead>
<tbody>
<tr>
<td>size 40</td>
<td>size 60</td>
</tr>
<tr>
<td>size 75</td>
<td>size 95</td>
</tr>
<tr>
<td>size 130/145</td>
<td>size 130/145 2)</td>
</tr>
<tr>
<td>size 190</td>
<td>size 190 2)</td>
</tr>
<tr>
<td>size 260</td>
<td>size 260 2)</td>
</tr>
</tbody>
</table>

1) When using the S shaft (splined shaft DIN 5480) for the attached pump (2nd pump)
2) Version with charge pump

When ordering combination pumps, the type designations of the 1st and 2nd pumps must be connected by a "+".

Ordering code 1st pump + Ordering code 2nd pump

Ordering example:
A11VO130LRDS/10R-NZD12K61 + A11VO60LRDS/10R-NZC12N00

Note:
For permissible input torques and through drive torques see page 7, technical data.
Swivel Angle Indicator

Optical swivel angle indicator, V

With the optical swivel angle indicator, a mechanical pointer on the side of the pump housing displays the position of the swivel angle of the pump.

**Parameters**

- Supply voltage $U_b$: 10...30 V DC
- Current consumption: $< 15$ mA
- Output voltage $U_a$: 2.5 V ($V_{g\,\text{min}}$)...4.5 V ($V_{g\,\text{max}}$)
- Load resistance: $\geq 20$ kΩ
- Reverse polarity protection: Supply voltage to ground
- Protection against short circuit of the signal to ground
- EMC: DIN 40839
  - EN 55025, ISO/EN 14982,
  - ISO 11452, ISO 7637-1
  - Details on request
- Operating temperature range: $-40^\circ$ C...+$125^\circ$ C
- Vibration resistance
  - Sinusoidal vibration EN 60068-2-6: 4g / 22...500 Hz
  - Random vibration IEC 68-2-36: min. 0.02g$^2$ / Hz
- Shock resistance:
  - Continuous shocking IEC 68-2-29: 10g / 15 ms
- Type of protection DIN/EN 60529: IP67 and IP69K
- Housing material: synthetic material

**Electrical swivel angle sensor, R**

With the electrical swivel angle indicator the swivel position of the pump is measured by an electrical swivel angle sensor. It has a robust, sealed housing and integrated electronics designed for automotive applications.

As an output the Hall effect swivel angle sensor supplies a voltage signal proportional to the swivel angle (see technical parameters).

**Mating connector**

Female connector AMP Supeseal 1.5; 3-pin, Rexroth Mat. no. 2602132, consisting of:
- 1 female connector housing, 3-pins 282087-1
- 3 single wire seal, yellow 281934-2
- 3 female connector contacts 1.8 - 3.3 mm 283025-1

The mating connector is not included in the supply. It can be supplied by Rexroth on request.
Male Connector for Solenoids

DEUTSCH DT04-2P-EP04 (2-pole) moulded to the solenoid coil, without bidirectional suppressor diode P
Type of protection according to DIN/EN 60529: IP67 and IP69K

Hirschmann DIN EN 175 301-803-A/ISO 4400 (not for new projects) without bidirectional suppressor diode H
Type of protection according to DIN/EN 60529: IP65

Mating connector
Female connector DEUTSCH DT06-2S-EP04
Rexroth Mat. no. 02601804
consisting of:
- 1 housing DT06-2S-EP04
- 1 wedge W2S
- 2 female connectors 0462-201-16141
The mating connector is not included in the supply. It can be supplied by Rexroth on request.

The sealing ring in the screw cable gland (M16x1.5) is suitable for line diameters of 4.5 mm to 10 mm.
The mating connector is included in the supply of the pump.
Installation and Commissioning Instructions

**General**

The pump housing must be filled with hydraulic fluid during commissioning and before operation (filling of housing case). Commissioning must take place at low speed and without load until the system has been bled completely.

In long periods at standstill the housing can empty via the service lines, sufficient filling of the housing must be guaranteed when restarting.

The case drain for the pump housing cavity must be drained into the tank through the highest leakage oil port. The minimum suction pressure at port S of 0.8 bar absolute (without charge pump) or 0.6 bar (with charge pump) may not be dropped below of.

**Installation below tank**

Pumps under minimum oil level in the tank (standard).

- any installation position.
- installation position "shaft upwards":

  Make sure that the pump housing is completely filled during commissioning. An air cushion in the area of the bearings causes damage to the axial piston unit.

**Measures:**

- Fill the axial piston pump via the highest leakage oil port T1, T2, R prior to commissioning.
- Recommendation: fill suction lines.
- Operate the pump at low speed (starter speed) until the pump is completely filled.
- Minimum immersion depth of the suction or leakage oil line in the tank: 200 mm (related to the min. oil level in the tank).

**Installation above tank**

Pumps above minimum oil level in the tank.

The housing cavity may empty via the service lines during long periods of standstill (air gets in through the shaft seal), the bearing is not adequately lubricated when restarting.

The axial piston unit must be filled via the highest leakage oil port prior to restarting (bleed via port R). Emptying via the leakage oil line can be prevented with a check valve in the leak oil line (opening pressure 0.5 bar). Emptying via the service ports can be reduced with a special version of the control plate.

- installation position " shaft horizontal" and " shaft upwards".
- installation position " shaft upwards".
- The version A11VLO (with charge pump) is not designed for installation above the tank.

See installation below tank for further measures.

**Additional measures for installation above the tank:**

- max. permissible suction height \( h_{\text{max}} = 800 \text{ mm} \)
- min. permissible pressure at port S (min. suction pressure)
- For control options with pressure control, displacement limiters, HD and EP control, the minimum displacement setting must be \( V_g \geq 5\% \cdot V_{g_{\text{max}}} \)
- Recommendation: use suction line with "goose neck".
Safety Instructions

- The pump A11VO is designed for using in an open circuit.
- Configuration, assembly, commissioning of the pump must be performed by trained and qualified personnel.
- The operating and function ports are designed exclusively for connecting hydraulic lines.
- Tightening torques: The tightening torques specified in this data sheet are maximum values and may not be exceeded (maximum value for screw thread). Manufacturer specifications for the max. permissible tightening torques of the used fittings must be observed!

  For DIN 13 fastening screws we recommend checking the tightening torque individually according to VDI 2230 Edition 2003.

- There is a danger of burns from the pump and especially the solenoids during and shortly after operation.
- Observe the specified data and instructions.