Open circuit
Nominal pressure $p_{\text{nom max}}$: 350 bar
Peak pressure $p_{\max}$: 420 bar
Geometric displacement $V_{\max}$: 250 cm³/U
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Variable displacement axial piston pumps adjust the geometric output volume from maximum to zero. As a result they vary the flow rate that is provided to the consumers.

The axial piston pump type V30D is designed for open circuits in industrial hydraulics and operate according to the swash plate principle. They are available with the option of a thru-shaft for operating additional hydraulic pumps in series.

The sturdy pump is particularly suitable for continuous operation in challenging applications. The range of pump controllers allows the axial piston pump to be used in a wide variety of applications.

**Features and benefits:**

- Low-noise emissions
- Long lifetime even under demanding application conditions
- Broad selection of controllers
- Full torque available at the second pump in tandem pump applications

**Intended applications:**

- Hydraulic presses
- Marine applications
- Industrial plants
- Power pack assembly
- Mining and tunnel boring machines
Available versions, main data

2.1 Basic version

Circuit symbol:

Order coding example:

<table>
<thead>
<tr>
<th>Coding</th>
<th>Geometric displacement (cm³/rev)</th>
<th>Nominal pressure $p_{nom}$ (bar)</th>
<th>Peak pressure $p_{max}$ (bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>045</td>
<td>45</td>
<td>350</td>
<td>420</td>
</tr>
<tr>
<td>075</td>
<td>75</td>
<td>350</td>
<td>420</td>
</tr>
<tr>
<td>095</td>
<td>96</td>
<td>350</td>
<td>420</td>
</tr>
<tr>
<td>115</td>
<td>115</td>
<td>250¹</td>
<td>300¹</td>
</tr>
<tr>
<td>140</td>
<td>142</td>
<td>350</td>
<td>420</td>
</tr>
<tr>
<td>160</td>
<td>164</td>
<td>250¹</td>
<td>300¹</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>350</td>
<td>420</td>
</tr>
</tbody>
</table>

¹ Higher pressures are possible with reduced geometric displacement.
### Table 2 Rotation directions

<table>
<thead>
<tr>
<th>Coding</th>
<th>Description</th>
<th>Description of rotation direction both sides (only V30D-075, V30D-095, V30D-115, V30D-140, V30D-160, V30D-250)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Anti-clockwise</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>Clockwise</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Rotation direction both sides (only V30D-075, V30D-095, V30D-115, V30D-140, V30D-160, V30D-250)</td>
<td></td>
</tr>
</tbody>
</table>

When looking at the shaft journal.

### Table 3 Shaft versions

<table>
<thead>
<tr>
<th>Coding</th>
<th>Description</th>
<th>Designation/standard</th>
<th>Size</th>
<th>Max. drive torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Spline shaft (DIN 5480)</td>
<td>W35x2x16x9g DIN 5480</td>
<td>V30D-045</td>
<td>550</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W40x2x18x9g DIN 5480</td>
<td>V30D-075/115</td>
<td>910</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W50x2x24x9g DIN 5480</td>
<td>V30D-140/160</td>
<td>1,700</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W60x2x28x9g DIN 5480</td>
<td>V30D-250</td>
<td>3,100</td>
</tr>
<tr>
<td>K</td>
<td>Parallel key shaft (DIN 6885)</td>
<td>Ø 35 - AS10x8x56 DIN 6885</td>
<td>V30D-045</td>
<td>280</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ø 40 - AS12x8x70 DIN 6885</td>
<td>V30D-075</td>
<td>460</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ø 40 - AS12x8x80 DIN 6885</td>
<td>V30D-095/115</td>
<td>650</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ø 50 - AS14x9x80 DIN 6885</td>
<td>V30D-140/160</td>
<td>850</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ø 60 - AS18x11x100 DIN 6885</td>
<td>V30D-250</td>
<td>1,550</td>
</tr>
<tr>
<td>S</td>
<td>Spline shaft (SAE J744 or DIN ISO 3019-1)</td>
<td>SAE-C J744 14T 12/24 DP 32-4 DIN ISO 3019-1</td>
<td>V30D-045</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SAE-D J744 13T 8/16 DP 44-4 DIN ISO 3019-1</td>
<td>V30D-095/115/140/160/250</td>
<td>1,200</td>
</tr>
</tbody>
</table>

### Table 4 Flange versions (input side)

<table>
<thead>
<tr>
<th>Coding</th>
<th>Description</th>
<th>Designation</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Flange (DIN ISO 3019-2)</td>
<td>125 B4 HW DIN ISO 3019-2</td>
<td>V30D-045</td>
</tr>
<tr>
<td></td>
<td></td>
<td>140 B4 HW DIN ISO 3019-2</td>
<td>V30D-075</td>
</tr>
<tr>
<td></td>
<td></td>
<td>160 B4 HW DIN ISO 3019-2</td>
<td>V30D-095/115</td>
</tr>
<tr>
<td></td>
<td></td>
<td>180 B4 HW DIN ISO 3019-2</td>
<td>V30D-140/160/250</td>
</tr>
<tr>
<td>F</td>
<td>Flange (SAE J744 or DIN ISO 3019-1)</td>
<td>SAE-C 4-hole J744 127-4 DIN ISO 3019-1</td>
<td>V30D-045/075</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SAE-D 4-hole J744 152-4 DIN ISO 3019-1</td>
<td>V30D-095/115/140/160/250</td>
</tr>
</tbody>
</table>
### Table 5 Seals

<table>
<thead>
<tr>
<th>Coding</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>NBR</td>
</tr>
<tr>
<td>V</td>
<td>FKM</td>
</tr>
<tr>
<td>E</td>
<td>EPDM</td>
</tr>
<tr>
<td>C</td>
<td>NBR, suitable for HFC, for restrictions, see “Assembly, operation and maintenance recommendations”</td>
</tr>
</tbody>
</table>

### Table 6 Housing version

<table>
<thead>
<tr>
<th>Coding</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Without thru-shaft, suction port 45°</td>
</tr>
<tr>
<td>2</td>
<td>With thru-shaft, suction port 45°</td>
</tr>
<tr>
<td>3</td>
<td>Without thru-shaft, suction port 90° (only V30D-140, V30D-160)</td>
</tr>
<tr>
<td>4</td>
<td>With thru-shaft, suction port 90° (only V30D-140, V30D-160)</td>
</tr>
</tbody>
</table>

### Table 7 Swash plate angle indicator

<table>
<thead>
<tr>
<th>Coding</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Without display</td>
</tr>
<tr>
<td>1</td>
<td>With display</td>
</tr>
<tr>
<td>2</td>
<td>With pivoting angle pick-up (Hall sensor)</td>
</tr>
</tbody>
</table>
## Table 8 Controllers

<table>
<thead>
<tr>
<th>Coding</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS</td>
<td>Load sensing controller</td>
</tr>
<tr>
<td>LSN</td>
<td>Load sensing controller with integrated pressure limitation</td>
</tr>
<tr>
<td>LSP</td>
<td>Load sensing controller with remote-control port for external pressure limitation</td>
</tr>
<tr>
<td>LSD</td>
<td>Load sensing controller without integrated pressure limitation for parallel operation of multiple pumps</td>
</tr>
<tr>
<td>Q</td>
<td>Flow controller for setting a constant flow rate independently of the speed.</td>
</tr>
<tr>
<td>Qb</td>
<td>Flow controller for setting a constant flow rate independently of the speed, for applications with high demands on accuracy</td>
</tr>
<tr>
<td>V</td>
<td>Electric proportional delivery flow controller with increasing characteristic curve</td>
</tr>
<tr>
<td>VH</td>
<td>Hydraulic delivery flow controller with increasing characteristic curve</td>
</tr>
</tbody>
</table>

## Table 9 Solenoid voltage and design

<table>
<thead>
<tr>
<th>Coding</th>
<th>Electrical connection</th>
<th>Nominal voltage</th>
<th>Protection class (IEC 60529)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V/12</td>
<td>DIN EN 175 301-803 A</td>
<td>12 V DC</td>
<td>IP 65</td>
</tr>
<tr>
<td>V/24</td>
<td>DIN EN 175 301-803 A</td>
<td>24 V DC</td>
<td>IP 65</td>
</tr>
</tbody>
</table>
### Table 10 Stroke limitation

<table>
<thead>
<tr>
<th>Coding</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No designation</td>
<td>No stroke limitation</td>
</tr>
<tr>
<td>1</td>
<td>Prepared for power controller</td>
</tr>
<tr>
<td>2</td>
<td>With adjustable stroke limitation (not possible in combination with pump controller type V, VH)</td>
</tr>
<tr>
<td>2/...</td>
<td>Stroke limitation fixed with specification of the set geometric displacement $V_3$ (cm$^3$/rev.)</td>
</tr>
</tbody>
</table>

**Order coding example**

V30D-075 RDGN-2-0-02/LSN-350 - C 426

### Table 11 Flange version (output side)

<table>
<thead>
<tr>
<th>Coding V30D</th>
<th>Flange</th>
<th>Shaft</th>
</tr>
</thead>
<tbody>
<tr>
<td>045 C 411 C 421 C 431 C 441 C 451/C 461 C 471 SAE-A 2-hole J744 82-2 DIN ISO 3019-1</td>
<td>SAE-A J744 (16-4 DIN ISO 3019-1) 9T 16/32 DP</td>
<td></td>
</tr>
<tr>
<td>075 C 412 C 422 C 432 C 442 C 452/C 462 C 472 SAE-A 2-hole J744 82-2 DIN ISO 3019-1</td>
<td>SAE-A J744 (16-4 DIN ISO 3019-1) 1) 9T 16/32 DP</td>
<td></td>
</tr>
<tr>
<td>095 C 413 C 423 C 433 C 443 C 453/C 463 C 473 SAE-A 2-hole J744 82-2 DIN ISO 3019-1</td>
<td>19-4 DIN ISO 3019-1 11T 16/32 DP</td>
<td></td>
</tr>
<tr>
<td>C 418 C 428 C 438 C 448 C 458/C 468 C 478 SAE-C 4-hole J744 127-4 DIN ISO 3019-1</td>
<td>SAE-C J744 (32-4 DIN ISO 3019-1) 14T 12/24 DP</td>
<td></td>
</tr>
<tr>
<td>-- -- C 440 C 450 C 460/C 470 C 480 SAE-D 4-hole J744 152-4 DIN ISO 3019-1</td>
<td>SAE-D J744 (44-4 DIN ISO 3019-1) 13T 8/16 DP</td>
<td></td>
</tr>
<tr>
<td>C 500 C 501 C 503 C 506 C 510/C 515 C 521 125 B4 HW DIN ISO 3019-2</td>
<td>W35x2x16x9gDIN 5480</td>
<td></td>
</tr>
<tr>
<td>-- C 502 C 504 C 507 C 511/C 516 C 522 140 B4 HW DIN ISO 3019-2</td>
<td>W40x2x18x9gDIN 5480</td>
<td></td>
</tr>
<tr>
<td>-- -- C 505 C 509 C 512/C 517 C 523 160 B4 HW DIN ISO 3019-2</td>
<td>W40x2x18x9gDIN 5480</td>
<td></td>
</tr>
<tr>
<td>-- -- -- -- C 514/C 520 C 525 180 B4 HW DIN ISO 3019-2</td>
<td>W50x2x24x9gDIN 5480</td>
<td></td>
</tr>
<tr>
<td>-- -- -- -- C 527 180 B4 HW DIN ISO 3019-2</td>
<td>W60x2x28x9gDIN 5480</td>
<td></td>
</tr>
</tbody>
</table>

1) ANSI B 92.1, FLAT ROOT SIDE FIT spline width deviating from the standard, $s = 2.357 - 0.03$

**NOTE**

Pay attention to the maximum permissible drive torque, as the flange or shaft may be damaged otherwise.

**NOTE**

An additional support is to be provided for pump combinations.
2.2 Controller

V30D-045/075/140/160

1. Basic pump
2. Controller type N, P, Pb, LS, Q, Qb
3. Controller type LSN, LSP
4. Controller type V
5. Controller type VH
6. Cover for version without N, P, Pb, LS, LSN, LSP, O, Qb
7. Cover for version without V or VH, without stroke limitation
8. Cover for version without V or VH, with stroke limitation
9. Controller type L, Lf1
10. Controller type LSD
11. Controller type PD5
12. Cover for version without L, Lf1, LSD, PD5
V30D-095/115

1 Basic pump
2.1 Controller type N, P, Pb, LS, Q, Qb
2.2 Controller type LSN, LSP
2.3 Cover for version without N, P, Pb, LS, LSN, LSP, O, Qb
3.1 Controller type V
3.2 Controller type VH
3.3 Cover for version without V or VH, without stroke limitation
3.4 Cover for version without V or VH, with stroke limitation
4.1 Controller type L, LF1
4.2 Controller type LSD
4.3 Controller type PD5
4.4 Cover for version without L, LF1, LSD, PD5
1 Basic pump
1.1 Control head without L, LF1, LSD, PD5 (series)
1.2 Control head for L, LF1, LSD, PD5
2.1 Controller type N, P, Pb, LS, Q, Qb
2.2 Controller type LSN, LSP
2.3 Cover for version without N, P, Pb, LS, LSN, LSP, Q, Qb
3.1 Controller type V
3.2 Controller type VH
3.3 Cover for version without V or VH, without stroke limitation
3.4 Cover for version without V or VH, with stroke limitation
4.1 Controller type L, LF1
4.2 Controller type LSD
4.3 Controller type PD5
4.4 Cover for version without L, LF1, LSD, PD5
2.2.1 Controller LS, LSN, LSP, LSD

The LS(N,P,D) controller is a delivery flow controller that generates a variable flow rate independently of the speed. It adapts the geometric displacement of the pump to the required flow rate of the consumer and regulates a constant difference between load pressure and pump pressure.

- **LS**: Without pressure limitation
- **LSN**: With integrated pressure limitation
- **LSP**: With remote-control port for external pressure limitation
- **LSD**: Without pressure limitation for parallel operation of several pumps

The LSD controller is used if several pumps supply the same consumer. It regulates the same geometric displacement on all pumps.

**Coding LS**

1. Delivery flow controller: Regulates a constant difference between load pressure and pump pressure
2. Pressure limitation: Limits the pump pressure to a maximum value
3. Bypass throttle
4. External pressure-limiting valve (not included in scope of delivery)
Characteristic curve **LS, LSN, LSP**

- \( p_B \): operating pressure (bar); \( Q \): delivery flow (%)

1. Approx. 3 bar

**Coding LS**

- 1. Differential pressure \( \Delta p \) (stand-by pressure)
- 2. Bypass throttle

**Coding LSN, LSP**

- 1. Differential pressure \( \Delta p \) (stand-by pressure)
- 2. Maximum pressure \( p_{\text{max}} \) (pressure limitation)
- 3. Bypass throttle LS
- 4. Bypass throttle N
- 5. For coding LSN with tapped plug closed
## Pressure adjustment

<table>
<thead>
<tr>
<th>Pressure adjustment</th>
<th>Pressure range (bar)</th>
<th>$\Delta p$ (bar)/revolution</th>
<th>Factory-set pressure setting (bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum pressure $p_{\text{max}}$ (N250)$^1$</td>
<td>50 ... 200</td>
<td>Approx. 50</td>
<td>200</td>
</tr>
<tr>
<td>Maximum pressure $p_{\text{max}}$ (N400)$^1$</td>
<td>100 ... 350</td>
<td>Approx. 100</td>
<td>300</td>
</tr>
<tr>
<td>Differential pressure $\Delta p$ (P)</td>
<td></td>
<td>Approx. 15</td>
<td>15</td>
</tr>
<tr>
<td>Differential pressure $\Delta p$ (LS)</td>
<td></td>
<td>Approx. 15</td>
<td>30</td>
</tr>
</tbody>
</table>

$^1$ Depending on the pressure setting, either a weak spring (N250) or a strong spring (N400) is installed.

### CAUTION
Risk of injury on overloading components due to incorrect pressure settings!
Risk of minor injury.
- Always monitor the pressure gauge when setting and changing the pressure.

### NOTE
Loosen the lock nut sufficiently before setting so that the sealing ring is not damaged.
2.2.2 Controller Q, Qb

The Q(b) controller is a delivery flow controller that generates a constant flow rate independently of the speed. It regulates a constant differential pressure via an orifice in the P gallery. The differential pressure can be set between 15 and tbd bar; the orifice is available in different graduations (see table).

- **Q**: Standard version
- **Qb**: Version with external feedback of the pump pressure to compensate for a pressure loss in the P line. For use in hydrostatic applications with high demands on the speed consistency, e.g. generator drives.

### Coding Q

1. Delivery flow controller: Regulates a constant differential pressure before and after the orifice
2. Orifice: Selection based on the table (not included in the scope of supply)
3. Bypass throttle

### Coding Qb

<table>
<thead>
<tr>
<th>Orifice (mm)</th>
<th>Flow rate at 20 bar differential pressure (lpm)</th>
<th>Orifice (mm)</th>
<th>Flow rate at 20 bar differential pressure (lpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Approx. 23</td>
<td>7</td>
<td>Approx. 127</td>
</tr>
<tr>
<td>3.5</td>
<td>Approx. 32</td>
<td>7.5</td>
<td>Approx. 146</td>
</tr>
<tr>
<td>4</td>
<td>Approx. 42</td>
<td>8</td>
<td>Approx. 166</td>
</tr>
<tr>
<td>4.5</td>
<td>Approx. 53</td>
<td>8.5</td>
<td>Approx. 188</td>
</tr>
<tr>
<td>5</td>
<td>Approx. 65</td>
<td>9</td>
<td>Approx. 210</td>
</tr>
<tr>
<td>5.5</td>
<td>Approx. 79</td>
<td>9.5</td>
<td>Approx. 234</td>
</tr>
<tr>
<td>6</td>
<td>Approx. 94</td>
<td>10</td>
<td>Approx. 260</td>
</tr>
<tr>
<td>6.5</td>
<td>Approx. 110</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Coding $Q, Q_b$

Determination of the flow rate

$$Q = 55 \cdot d^2 \sqrt{\Delta p}$$

$Q$ = Flow rate (lpm)
$d$ = Orifice diameter (mm)
$\Delta p$ = Pressure difference (bar)

NOTE
Loosen the lock nut sufficiently before setting so that the sealing ring is not damaged.
2.2.3 Controller V, VH

The V and VH controllers are proportional flow controllers that generate a variable, speed-dependent flow rate. They adjust the geometric displacement of the pump based on an electrical or hydraulic input signal. The resulting flow rate depends on the geometric displacement and the rotation speed.

The required pilot pressure for adjusting the pivoting angle is tapped internally. When used in open centre systems with operating pressures of < 25 bar, an external auxiliary pump or a pre-load valve must be provided to ensure reliable adjustment.

- **V**: Electric flow controller with increasing characteristic curve.
- **VH**: Hydraulic delivery flow controller with increasing characteristic curve.

**Coding V**

![Diagram of Coding V]

**Coding VH**

![Diagram of Coding VH]

1 External auxiliary pump, pressure-limiting valve and check valve (not included in scope of delivery)

**Coding V**

![Graph of Coding V]

I current (mA); \( V_g \) geometric displacement (%)

1 Hysteresis approx. 2 %

**Coding VH**

![Graph of Coding VH]

\( p_o \) pilot pressure (bar); \( V_g \) geometric displacement (%)

1 Hysteresis approx. 4 %

**NOTE**

Q = 0 lpm possible through the use of an auxiliary pump.

At \( V_g = 0 \) cm³/rev, additional rinsing via the drain port is required to ensure sufficient lubrication of the pump.

Recommended flow rate: 2 lpm (V30D-045/075), 3 lpm (V30D-095/115), 4 lpm (V30D-140/160) or 5 lpm (V30D-250)
Response time

\[ \Delta T = \text{Delay} \]
\[ T_1 = \text{On-stroke time 0 to max.} \]
\[ T_2 = \text{On-stroke time max. to 0} \]

Acting time \( T_1 \) (ms)

Acting time \( T_2 \) (ms)

Coding VH

1 Stroke limitation control valve
Coding V
2.2.4 Controller N, P, Pb and PD5

The N, P, Pb and PD5 controllers are pressure controllers. As soon as the pump pressure exceeds the set value, they reduce the pivoting angle of the pump and regulate a constant pressure level.

Depending on the controller type, the pressure setting takes place either via a setting screw directly on the controller or via an external pilot valve.

- **N**: The pressure setting takes place via a setting screw directly on the controller.
- **P**: The pressure setting takes place via an external pilot valve connected to the controller via a control port.
- **Pb**: The pressure setting takes place via an external pilot valve connected to the controller via a control port. The pressure in the P line is recorded outside the pump.
  It is really only useful for extremely vibration-prone systems (e.g. accumulator systems).
- **PD5**: Parallel pressure controller. The PD5 controller is used if several pumps supply the same consumer. It regulates the same geometric displacement on all pumps. The pressure setting takes place via an external pilot valve connected to the controllers via a control ports.

The pressure controllers can either be used in constant pressure systems or as low-loss pressure limitation in combination with a flow controller (e.g. type V or VH).

**Coding N**

**Coding P**

**Coding Pb**

**Coding PD5**

1. Bypass throttle
2. External pressure-limiting valve (not included in scope of delivery)
Characteristic curve N, P, Pb

Characteristic curve PD5

1. Approx. 3 bar

Coding N, P, Pb

1. Pressure setting p
2. Bypass throttle
3. Y-port: For coding N and P with tapped plug closed
4. X port: For coding N with tapped plug closed
Coding PD5

1 Pressure setting p
2 X port

### Pressure adjustment

<table>
<thead>
<tr>
<th>Pressure range (bar)</th>
<th>Δp (bar)/revolution</th>
<th>Factory-set pressure setting (bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N 250 ¹) 50 to 200</td>
<td>Approx. 50</td>
<td>200</td>
</tr>
<tr>
<td>N 400 ¹) 100 to 350</td>
<td>Approx. 100</td>
<td>300</td>
</tr>
<tr>
<td>P, Pb, PD5</td>
<td>Approx. 15</td>
<td>15</td>
</tr>
</tbody>
</table>

¹) Depending on the pressure setting, either a weak spring (N250) or a strong spring (N400) is installed.

**CAUTION**
Risk of injury on overloading components due to incorrect pressure settings!
Risk of minor injury.
- Always monitor the pressure gauge when setting and changing the pressure.

**NOTE**
Loosen the lock nut sufficiently before setting so that the sealing ring is not damaged.
2.2.5 Controller L, Lf and Lf1

The L, Lf and Lf1 controllers are power controllers. As soon as the product of geometric displacement and pressure exceeds the set value, the controller reduces the pivoting angle of the pump to protect the drive shaft, motor or gearbox from overload \((p_B \times V_g = \text{constant})\).

The setting is made either as a torque limitation (Nm) or power limitation (kW) at the corresponding rotation speed (rpm).

**Drive torque**

\[
M = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{\text{ph}}} \quad \text{(Nm)}
\]

**Drive power**

\[
P = \frac{2 \pi \cdot M \cdot \eta_v \cdot n}{60000} = \frac{Q \cdot \Delta p}{600 \cdot \eta_T} \quad \text{(kW)}
\]

- **L**: Power controller with fixed setting value
- **Lf**: Hydraulically adjustable power controller with increasing characteristic curve
- **Lf1**: Hydraulically adjustable power controller with decreasing characteristic curve

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(M)</td>
<td>Torque (Nm)</td>
</tr>
<tr>
<td>(V_g)</td>
<td>Geometric output volume (\text{cm}^3/\text{rev})</td>
</tr>
<tr>
<td>(\Delta p)</td>
<td>Differential pressure</td>
</tr>
<tr>
<td>(p_B)</td>
<td>Operating pressure</td>
</tr>
<tr>
<td>(P)</td>
<td>Power (kW)</td>
</tr>
<tr>
<td>(Q)</td>
<td>Flow rate (lpm)</td>
</tr>
<tr>
<td>(n)</td>
<td>Rotation speed (rpm)</td>
</tr>
<tr>
<td>(\eta_v)</td>
<td>Volumetric efficiency</td>
</tr>
<tr>
<td>(\eta_{\text{mh}})</td>
<td>Mechanical-hydraulic efficiency</td>
</tr>
<tr>
<td>(\eta_T)</td>
<td>Overall efficiency (\eta_T = \eta_v \cdot \eta_{\text{mh}})</td>
</tr>
</tbody>
</table>

**Coding**

- **L**
- **Lf**
- **Lf1**

1. External pressure reducing valve (not included in scope of delivery)
2. External auxiliary pump (not included in scope of delivery)
Coding L, Lf, Lf1

Smallest recommended nominal torque setting (only valid for versions without additional controllers)

<table>
<thead>
<tr>
<th>Coding</th>
<th>Nm</th>
<th>Corresponds to kW/ rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>045</td>
<td>40</td>
<td>6/1500</td>
</tr>
<tr>
<td>075</td>
<td>70</td>
<td>11/1500</td>
</tr>
<tr>
<td>095/115</td>
<td>99</td>
<td>15/1500</td>
</tr>
<tr>
<td>140/160</td>
<td>146</td>
<td>22/1500</td>
</tr>
<tr>
<td>250</td>
<td>271</td>
<td>41/1500</td>
</tr>
</tbody>
</table>

Coding Lf1

Rough reference values for the remote setting of the Lf1 controller

Coding L

1 Torque setting
1. Differential pressure $\Delta p$ (stand-by pressure)
2. $p_r$ port

**Coding L, Lf, Lf1**

![Diagram showing dimensions and torque values](image)

$x$ dimension (mm); $M$ torque (Nm)

**NOTE**

Loosen the lock nut sufficiently before setting so that the sealing ring is not damaged.
### Parameters

#### 3.1 General

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designation</td>
<td>Variable displacement axial piston pump</td>
</tr>
<tr>
<td>Design</td>
<td>Axial piston pump according to the swash plate principle</td>
</tr>
<tr>
<td>Mounting</td>
<td>Mounting flange according to DIN ISO 3019-1 or DIN ISO 3019-2</td>
</tr>
<tr>
<td>User interface</td>
<td>Primed</td>
</tr>
<tr>
<td>Drive/output torque</td>
<td>See &quot;Max. permissible drive/output torque&quot;</td>
</tr>
<tr>
<td>Installation position</td>
<td>Any (for installation information see 5 &quot;Assembly, operation and maintenance recommendations&quot;)</td>
</tr>
<tr>
<td>Rotation direction</td>
<td>Right, left or on both sides</td>
</tr>
<tr>
<td>Connections</td>
<td>- Suction port</td>
</tr>
<tr>
<td></td>
<td>- Pressure connection</td>
</tr>
<tr>
<td></td>
<td>- Drain port</td>
</tr>
<tr>
<td></td>
<td>- Pressure gauge connection</td>
</tr>
<tr>
<td>Hydraulic fluid</td>
<td>- Hydraulic oil according to Part 1 to 3; ISO VG 10 to 68 according to DIN 51519</td>
</tr>
<tr>
<td></td>
<td>- Viscosity range: min. 10; max. 1000 mm²/s</td>
</tr>
<tr>
<td></td>
<td>- optimal operation between 16 and 60 mm²/s</td>
</tr>
<tr>
<td></td>
<td>- Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C</td>
</tr>
<tr>
<td>Cleanliness level</td>
<td>ISO 4406 20/18/15</td>
</tr>
<tr>
<td>Temperatures</td>
<td>- Surrounding area: -40°C to +60°C (observe viscosity range)</td>
</tr>
<tr>
<td></td>
<td>- Oil: - 25°C to +80°C (observe viscosity range)</td>
</tr>
<tr>
<td></td>
<td>- Start temperature: Down to -40°C permissible (note start viscosities), if the application limits are observed, See &quot;Operating instructions&quot;</td>
</tr>
<tr>
<td></td>
<td>- Biologically degradable hydraulic fluids: Not above +70°C</td>
</tr>
</tbody>
</table>

### Pressure and delivery flow

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating pressure</td>
<td>See Chapter 2, &quot;Available versions, main data&quot;</td>
</tr>
<tr>
<td>Geometric displacement</td>
<td>See Chapter 2, &quot;Available versions, main data&quot;</td>
</tr>
</tbody>
</table>
## Weight

<table>
<thead>
<tr>
<th>Type V30D</th>
<th>Without controller (kg)</th>
<th>With controller (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>045</td>
<td>40</td>
<td>46</td>
</tr>
<tr>
<td>075</td>
<td>60</td>
<td>66</td>
</tr>
<tr>
<td>095</td>
<td>70</td>
<td>76</td>
</tr>
<tr>
<td>115</td>
<td>70</td>
<td>76</td>
</tr>
<tr>
<td>140</td>
<td>85</td>
<td>91</td>
</tr>
<tr>
<td>160</td>
<td>85</td>
<td>91</td>
</tr>
<tr>
<td>250</td>
<td>130</td>
<td>136</td>
</tr>
</tbody>
</table>

## Additional parameters

<table>
<thead>
<tr>
<th>Nominal size</th>
<th>Designation</th>
<th>045</th>
<th>075</th>
<th>095</th>
<th>115</th>
<th>140</th>
<th>160</th>
<th>250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. swash plate angle</td>
<td>°</td>
<td>17°</td>
<td>17.5°</td>
<td>17°</td>
<td>20°</td>
<td>17.5°</td>
<td>20°</td>
<td>17.5°</td>
</tr>
<tr>
<td>Absolute inlet pressure required in open circuit</td>
<td>bar</td>
<td>0.8</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>Max. permissible housing pressure (static/dynamic)</td>
<td>bar</td>
<td>1 / 2</td>
<td>1 / 2</td>
<td>1 / 2</td>
<td>1 / 2</td>
<td>1 / 2</td>
<td>1 / 2</td>
<td>1 / 2</td>
</tr>
<tr>
<td>Max. permissible inlet pressure</td>
<td>bar</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Max. rotation speed during suction operation and max. swash plate angle at 1 bar abs. inlet pressure</td>
<td>rpm</td>
<td>2,600</td>
<td>2,400</td>
<td>2,200</td>
<td>2,000</td>
<td>2,200</td>
<td>1,900</td>
<td>1,800</td>
</tr>
<tr>
<td>Max. rotation speed with zero stroke and 1 bar abs. inlet pressure</td>
<td>rpm</td>
<td>3,600</td>
<td>3,200</td>
<td>2,900</td>
<td>2,800</td>
<td>2,600</td>
<td>2,500</td>
<td>2,000</td>
</tr>
<tr>
<td>Min. rotation speed in continuous operation</td>
<td>rpm</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Required drive torque at 100 bar</td>
<td>kW</td>
<td>30</td>
<td>50</td>
<td>64</td>
<td>77</td>
<td>95</td>
<td>109</td>
<td>174</td>
</tr>
<tr>
<td>Drive power at 250 bar and 1450 rpm</td>
<td>kW</td>
<td>30</td>
<td>50</td>
<td>64</td>
<td>77</td>
<td>95</td>
<td>109</td>
<td>174</td>
</tr>
<tr>
<td>Inertia torque</td>
<td>kg m²</td>
<td>0.0056</td>
<td>0.0124</td>
<td>0.0216</td>
<td>0.0216</td>
<td>0.03</td>
<td>0.03</td>
<td>0.0825</td>
</tr>
<tr>
<td>Lifetime L₁₀ of the shaft bearing at 250 bar, 1450 rpm and max. swash plate angle</td>
<td>h</td>
<td>31,000</td>
<td>20,000</td>
<td>17,000</td>
<td>10,000</td>
<td>17,000</td>
<td>10,000</td>
<td>23,000</td>
</tr>
<tr>
<td>Noise level at 250 bar, 1450 rpm and max. swash plate angle (measured in acoustic measurement chamber according to DIN ISO 4412-1, measuring distance 1 m)</td>
<td>dB(A)</td>
<td>72</td>
<td>74</td>
<td>75</td>
<td>75</td>
<td>76</td>
<td>76</td>
<td>77</td>
</tr>
</tbody>
</table>

## Max. permissible drive/output torque

<table>
<thead>
<tr>
<th>Nominal size</th>
<th>Designation</th>
<th>045</th>
<th>075</th>
<th>095/115</th>
<th>140/160</th>
<th>250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spline shaft D</td>
<td>Drive/output</td>
<td>550 Nm/275 Nm</td>
<td>910 Nm/455 Nm</td>
<td>1200 Nm/600 Nm</td>
<td>1700 Nm/850 Nm</td>
<td>3100 Nm/1550 Nm</td>
</tr>
<tr>
<td>Parallel key K</td>
<td>Drive</td>
<td>280 Nm</td>
<td>460 Nm</td>
<td>650 Nm</td>
<td>850 Nm</td>
<td>1550 Nm</td>
</tr>
<tr>
<td>Spline shaft S</td>
<td>Drive/output</td>
<td>500 Nm/272 Nm</td>
<td>500 Nm/445 Nm</td>
<td>1200 Nm/600 Nm</td>
<td>1200 Nm/850 Nm</td>
<td>1200 Nm/1000 Nm</td>
</tr>
</tbody>
</table>
3.2 Characteristics

Delivery flow and power (basic pump)

The diagrams show delivery flow and drive power over pressure without a controller at 1450 rpm.

V30D-045

1. Delivery flow/pressure
2. Drive power/pressure (max. swash plate angle)
3. Drive power/pressure (zero stroke)

V30D-075

1. Delivery flow/pressure
2. Drive power/pressure (max. swash plate angle)
3. Drive power/pressure (zero stroke)

V30D-095 (115)

1. Delivery flow/pressure (V30D-115)
2. Delivery flow/pressure (V30D-095)
3. Drive power/pressure (V30D-095, max. swash plate angle)
4. Drive power/pressure (V30D-095/115, zero stroke)
5. Drive power/pressure (V30D-115, max. swash plate angle)

V30D-140 (160)

1. Delivery flow/pressure (V30D-160)
2. Delivery flow/pressure (V30D-140)
3. Drive power/pressure (V30D-140, max. swash plate angle)
4. Drive power/pressure (V30D-140/160, zero stroke)
5. Drive power/pressure (V30D-160, max. swash plate angle)
V30D-250

1. Delivery flow/pressure
2. Drive power/pressure (max. swash plate angle)
3. Drive power/pressure (zero stroke)

**Inlet pressure and self-suction speed**

The diagrams show the inlet pressure/rotation speed at the max. swash plate angle and an oil viscosity of 75 mm²/s.

1. 0 bar relative = 1 bar absolute
### Acting times

#### Acting times T1 (LSN controller)

The diagram illustrates the on-stroke time based on the pressure for the LSN controller, i.e. the time required to swing out the pump and to adjust the geometric displacement from the minimum to the maximum.

![Diagram of T1 acting times](image1)

- **p**: pressure (bar); acting time **T1** (ms)

#### Acting times T2 (LSN controller)

The diagram illustrates the on-stroke time based on the pressure for the LSN controller, i.e. the time required to swing in the pump and to adjust the geometric displacement from the maximum to the minimum.

![Diagram of T2 acting times](image2)

- **p**: pressure (bar); acting time **T2** (ms)

#### Acting times Tu, T1 and T2

- **S**: positioning travel of actuator
- **T**: delay < 3 ms
- **T1**: on-stroke time
- **T2**: destroke time
- **p**: pressure

LS line approx. 10% of the volume of the P line
### 3.3 Electric parameters V30D

#### Controller coding V

<table>
<thead>
<tr>
<th>Parameter</th>
<th>12 VDC</th>
<th>24 VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resistance $R_{so}$</td>
<td>4.6 $\Omega$</td>
<td>21.7 $\Omega$</td>
</tr>
<tr>
<td>Current, cold $I_{so}$</td>
<td>2.6 A</td>
<td>1.2 A</td>
</tr>
<tr>
<td>Limit current $I_{G}$</td>
<td>1.8 A</td>
<td>0.81 A</td>
</tr>
<tr>
<td>Limit power $P_{G}$</td>
<td>21.5 W</td>
<td>21.5 W</td>
</tr>
<tr>
<td>Actuated time</td>
<td>S1 (100 %)</td>
<td>S1 (100 %)</td>
</tr>
<tr>
<td>Dither frequency</td>
<td>50 - 150 Hz</td>
<td>50 - 150 Hz</td>
</tr>
<tr>
<td>Dither amplitude $A_{dA}^%$</td>
<td>$\frac{I_{Spitze-Spitze}}{I_{G}} \cdot 100$</td>
<td>$\frac{I_{Spitze-Spitze}}{I_{G}} \cdot 100$</td>
</tr>
</tbody>
</table>

#### Electrical connection

**Coding V**

![Coding V diagram](image)

### 3.4 Pivoting angle pick-up

#### Pivoting angle pick-up

![Pivoting angle pick-up diagram](image)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage $U_B$</td>
<td>10 to 30 V DC</td>
</tr>
<tr>
<td>Output signal $U_A$</td>
<td>0.5 to 4.5 V</td>
</tr>
<tr>
<td>Tested for automotive field</td>
<td>DIN 40839</td>
</tr>
<tr>
<td>Test pulse</td>
<td>1, 2, 3 a/b</td>
</tr>
<tr>
<td>Electrical connection</td>
<td>3-PIN AMP Superseal 1.5 plug</td>
</tr>
</tbody>
</table>
4 Dimensions

All dimensions in mm, subject to change.

4.1 Basic pump

4.1.1 Type V30D-045

Rotating direction **clockwise** (viewed from shaft journal)

Rotating direction **anti-clockwise** (viewed from shaft journal)

1. Shaft version
2. Flange version
3. Controller for L, Lf1, LSD, PD5
4. Controller V, VH
5. Controller N, P, Pb, LS, Q, Qb, LSN, LSP

**Pressure port**

**Suction port**

**Ports D1, D2, E, M, St (DIN EN ISO 228-1)**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D1, D2</td>
<td>Drain port G 1/2 (BSPP)</td>
</tr>
<tr>
<td>E</td>
<td>Bleeding and flushing port G 1/4 (BSPP)</td>
</tr>
<tr>
<td>M</td>
<td>Measurement fitting G 1/4 (BSPP)</td>
</tr>
<tr>
<td>St</td>
<td>Control oil connection G 1/4 (BSPP)</td>
</tr>
</tbody>
</table>
### Shaft versions

#### Spline shaft
- Coding **D**
  - (W35x2x16x9g DIN 5480)
- Coding **S**
  - (SAE-C J744 14T 12/24 DP)

#### Parallel key shaft
- Coding **K**
  - (Ø35 - AS10x8x56 DIN 6885)

### Flange versions

#### Coding **G**
- (125 B4 HW DIN ISO 3019-2)

#### Coding **F**
- (SAE-C 4-hole J744)
  - (127-4 DIN ISO 3019-1)
Housing version -2 (with thru-shaft)

Flange version (output side)

Coding **C411, C412, C413**  
(SAE-A 2-hole)  

Coding **C414, C416**  
(SAE-B 2-hole)  

Coding **C415**  
(SAE-B 4-hole)

Coding **C418**  
(SAE-C 4-hole)
4.1.2 Type V30D-075

Rotating direction **clockwise** (viewed from shaft journal)

Rotating direction **anti-clockwise** (viewed from shaft journal)

1. Shaft version
2. Flange version
3. Controller for L, Lf1, LSD, PD5
4. Controller V, VH
5. Controller N, P, Pb, LS, Q, Qb, LSN, LSP

**Pressure port**

**Suction port**

**Ports D1, D2, E, M, St (DIN EN ISO 228-1)**

- D1, D2: Drain port G 1/2 (BSPP)
- E: Bleeding and flushing port G 1/4 (BSPP)
- M: Measurement fitting G 1/4 (BSPP)
- St: Control oil connection G 1/4 (BSPP)
Shaft versions

**Spline shaft**
- Coding **D**
  (W40x2x18x9g DIN 5480)

**Spline shaft**
- Coding **S**
  (SAE-C J744 14T 12/24 DP)

**Parallel key shaft**
- Coding **K**
  (Ø40 - A12x8x70 DIN 6885)

Flange versions

**Coding G**
(140 B4 HW DIN ISO 3019-2)

**Coding F**
(SAE-C 4-hole J744)
(152-4 DIN ISO 3019-1)
Housing version -2 (radial ports, with thru-shaft)

Flange version (output side)

Coding C421, C422, C423 (SAE-A 2-hole)

Coding C424, C426 (SAE-B 2-hole and SAE-B 4-hole)

Coding C425 (SAE-B 4-hole)

Coding C427, C429 (SAE-C 4-hole and SAE-C 2-hole)

Coding C428 (SAE-D 4-hole)
4.1.3 Type V30D-095/115

Rotating direction **clockwise** (viewed from shaft journal)

Rotating direction **anti-clockwise** (viewed from shaft journal)

1. Shaft version
2. Flange version
3. Controller for L, Lf1, LSD, PD5
4. Controller V, VH
5. Controller N, P, Pb, LS, Q, Qb, LSN, LSP

**Pressure port**

- D1, D2
- E
- M
- St (DIN EN ISO 228-1)

**Suction port**

- ports D1, D2, E, M, St (DIN EN ISO 228-1)

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1, D2</td>
<td>Drain port G 3/4 (BSPP)</td>
</tr>
<tr>
<td>E</td>
<td>Bleeding and flushing port G 1/4 (BSPP)</td>
</tr>
<tr>
<td>M</td>
<td>Measurement fitting G 1/4 (BSPP)</td>
</tr>
<tr>
<td>St</td>
<td>Control oil connection G 1/4 (BSPP)</td>
</tr>
</tbody>
</table>
Shaft versions

Spline shaft
Coding D
(W40x2x18x9g DIN 5480)

Spline shaft
Coding S
(SAE-D J744 13T 8/16 DP)

Parallel key shaft
Coding K
(Ø40 - A12x8x80 DIN 6885)

Flange versions

Coding G
(160 B4 HW DIN ISO 3019-2)

Coding F
(SAE-D 4-hole J 744)
(152-4 DIN ISO 3019-1)
Housing version -2 (radial ports, with thru-shaft)

Flange version (output side)

Coding C431 (C441), C432 (C442), C433 (C443) (SAE-A 2-hole)

Coding C434 (C444), C436 (C446) (SAE-B 2-hole and SAE-B 4-hole)

Coding C435 (C445) (SAE-B 4-hole)

Coding C437 (C447), C439 (C449) (SAE-C 4-hole and SAE-C 2-hole)

Coding C438 (C448) (SAE-D 4-hole)

Coding C440 (C450) (SAE-D 4-hole)
4.1.4 Type V30D-140/160

Rotating direction **clockwise** (viewed from shaft journal)

Rotating direction **anti-clockwise** (viewed from shaft journal)

1. Shaft version
2. Flange version
3. Controller for L, Lf1, LSD, PD5
4. Controller V, VH
5. Controller N, P, Pb, LS, Q, Qb, LSN, LSP

**Pressure port**

**Suction port**

<table>
<thead>
<tr>
<th>Ports D1, D2, E, M, St (DIN EN ISO 228-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1, D2</td>
</tr>
<tr>
<td>E</td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td>St</td>
</tr>
</tbody>
</table>
Shaft versions

<table>
<thead>
<tr>
<th>Shaft version</th>
<th>Coding</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spline shaft</td>
<td>D</td>
<td>(W50x2x24x9g DIN 5480)</td>
</tr>
<tr>
<td>Spline shaft</td>
<td>S</td>
<td>(SAE-D J 744 13T 8/16 DP)</td>
</tr>
<tr>
<td>Parallel key shaft</td>
<td>K</td>
<td>(Ø50 - AS14x9x80 DIN 6885)</td>
</tr>
</tbody>
</table>

Flange versions

<table>
<thead>
<tr>
<th>Flange version</th>
<th>Coding</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coding G</td>
<td>G</td>
<td>(180 B4 HW DIN ISO 3019-2)</td>
</tr>
<tr>
<td>Coding F</td>
<td>F</td>
<td>(SAE-D 4-hole J 744) (152-4 DIN ISO 3019-1)</td>
</tr>
</tbody>
</table>
Housing version -2 (radial ports, with thru-shaft)

Flange version (output side)

Coding C451 (C461), C452 (C462), C453 (C463) (SAE-A 2-hole)

Coding C454 (C464), C456 (C466) (SAE-B 2-hole and SAE-B 4-hole)

Coding C455 (C465) (SAE-B 4-hole)

Coding C457 (C467), C459 (C469) (SAE-C 4-hole and SAE-C 2-hole)

Coding C458 (C468) (SAE-D 4-hole)

Coding C460 (C470) (SAE-D 4-hole)
4.1.5 Type V30D-250

Rotating direction **clockwise** (viewed from shaft journal)

Rotating direction **anti-clockwise** (viewed from shaft journal)

1. Shaft version
2. Flange version
3. Controller for L, LF1, LSD, PD5
4. Controller V, VH
5. Controller N, P, Pb, LS, Q, qb, LSN, LSP

Pressure port

- Ports D1, D2, E, St (DIN EN ISO 228-1)
  - D1, D2: Drain port M33x2
  - E: Bleeding and flushing port G 1/4 (BSPP)
  - St: Control oil connection pipe connection Ø8
Shaft versions

### Spline shaft
- Coding **D**
  
  (W60x2x28x9g DIN 5480)

### Spline shaft
- Coding **S**
  
  (SAE-D J 744 13T 8/16 DP)

### Parallel key shaft
- Coding **K**
  
  (Ø60 - AS18x11x100 DIN 6885)

Flange versions

### Coding **G**

(160 B4 INSTR DIN ISO 3019-2)

### Coding **F**

(SAE-D 4-hole J 744)

(152-4 DIN ISO 3019-1)
Housing version -2 (radial ports, with thru-shaft)

Flange version (output side)

Coding C471, C472, C473  
(SAE-A 2-hole)

Coding C474, C476  
(SAE-B 2-hole and SAE-B 4-hole)

Coding C475  
(SAE-B 4-hole)

Coding C477, C479  
(SAE-C 4-hole and SAE-C 2-hole)

Coding C478  
(SAE-D 4-hole)

Coding C480  
(SAE-D 4-hole)
### 4.2 Swash plate angle indicator

<table>
<thead>
<tr>
<th>swash plate angle indicator</th>
<th>swash plate angle pick-up</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Swash plate angle indicator" /></td>
<td><img src="image2" alt="Swash plate angle pick-up" /></td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3-PIN AMP Superseal</td>
</tr>
</tbody>
</table>
4.3 Controller

Coding LS

Coding LSN, LSP

Coding Q, Qb
Assembly, operation and maintenance recommendations

5.1 Intended use

This product is intended exclusively for hydraulic applications (fluid technology).
The user must observe the safety measures and warnings in this documentation.

Essential requirements for the product to function correctly and safely:

– All information in this documentation must be observed. This applies in particular to all safety measures and warnings.
– The product must only be assembled and put into operation by qualified personnel.
– The product must only be operated within the specified technical parameters. The technical parameters are described in detail in this documentation.
– The operating and maintenance manual of the components, assemblies and the specific complete system must also always be observed.

If the product can no longer be operated safely:
1. Remove the product from operation and mark it accordingly.
   ✓ It is then not permitted to continue using or operating the product.

5.2 Assembly information

The product must only be installed in the complete system with standard and compliant connection components (screw fittings, hoses, pipes, fixtures etc.).
The product must be shut down correctly prior to dismounting (in particular in combination with hydraulic accumulators).

⚠️ DANGER
Risk to life caused by sudden movement of the hydraulic drives when dismantled incorrectly!
Risk of serious injury or death.
- Depressurise the hydraulic system.
- Perform safety measures in preparation for maintenance.
5.2.1 General information

The V30D variable displacement axial piston pump is designed for use in an open circuit. It can be mounted using a mounting flange in accordance with ISO 3019-1 or DIN ISO 3019-2.

During assembly, note the following principles:

Only trained persons are allowed to mount or remove the pump. Always ensure absolute cleanliness to prevent contamination from affecting the pump.

- Remove all plastic plugs before operation.
- Avoid installation above the tank (see installation positions in Chapter 5.2.3, "Installation positions").
- For electric reference values Suction intakes must be adhered to.
- Before initial use, fill the pump with hydraulic fluid and bleed. Automatic pump filling via the suction line by opening the drain ports is not possible.
- Never drain the pump.
- Always supply the pump with hydraulic fluid from the start. Even just a short period with insufficient hydraulic fluid can damage the pump. Such damage is not immediately visible once the pump is put into operation.
- Hydraulic fluid which flows back into the tank must not be sucked back in immediately (install baffles!).
- Before first use, run the pump for approx. 10 minutes at max. 50 bar after initial start-up.
- Do not use the entire pressure range of the pump until it has been thoroughly bled and flushed.
- From the start, always keep the temperature within the specified range (see Chapter 3, "Parameters"). Never exceed the maximum temperature.
- Always comply with the cleanliness level of the hydraulic fluid. In addition, always filter the hydraulic fluid appropriately (see Chapter 3, "Parameters").
- Self-installed filters in the suction line must be approved beforehand by HAWE Hydraulik.
- A system pressure-limiting valve must be installed in the pressure line so that the maximum system pressure is not exceeded.
5.2.2 Connections

The nominal width of the connecting lines depends on the specified operating conditions, the viscosity of the hydraulic fluid, the start-up and operating temperatures and the rotation speed of the pump. In principle we recommend the use of hose lines due to the superior damping characteristics.

**Bleeding and flushing port**

V30D pumps are fitted with two G1/4 (BSPP) bleeding and flushing ports. These are used to bleed and flush the front shaft bearing in the case of vertical installation.

**Pressure connection**

The pressure connection takes place via SAE ports, see Chapter 4, "Dimensions". Metric attachment threads are used in deviation from the standard.

Observe the tightening torque specified by the fitting manufacturer.

**Suction port**

The suction port can be established via SAE ports for the pump; see Chapter 4, "Dimensions". Metric attachment threads are used in deviation from the standard.

If possible, route the suction line to the tank on a rising gradient. This allows trapped air to escape. Observe the specifications in Installation positions Chapter 5.2.3, "Installation positions". The absolute suction pressure must not fall below 0.85 bar. A hose line should generally be used in preference to a rigid pipe.

**Drain port**

The V30D pumps have 2 drain ports G 1/2 (BSPP), G 3/4 (BSPP) or M33.

The nominal width of the leakage line must not be less than 16 mm. The cross-section is determined by the max. permissible housing pressure.

Integrate the leakage line in the system in such a way as to prevent direct connection with the suction line of the pump.

All drain ports can be used simultaneously.

A separate leakage line from the controller to the tank is not required. Observe the specifications in Chapter 5.2.3, "Installation positions".

The top drain port can be used to fill the housing.

**LS port with version LS, LSN, LSP, Q and Qb**

The LS line is connected to the controller via a G 1/4 (BSPP) threaded connection.

The nominal width of the line depends on the installation position of the pump and should be 10% of the pressure line capacity. A hose line should generally be used in preference to a rigid pipe connection.

- When the proportional directional spool valve is in a neutral position, the LS line must be fully relieved.
For operation with HFC (35 - 50 % water content) the following restrictions apply

- The tank is above the pump
- The temperature does not exceed 50°C
- The fluid velocity in the suction line is below 1 m/s
- Pump pressure maximum 200 bar
- The two shaft bearings of the pump are each flushed with a separate supply of cool oil, per bearing with 2 lpm (V30D-045/075), 3 lpm (V30D-095/115), 4 lpm (V30D-140/160) and 5 lpm (V30D-250)

For operation with liquids with a water content ≤ 20 % the following restrictions apply

- The tank is above the pump
- The tank temperature does not exceed 70°C
- The fluid velocity in the suction line is below 1 m/s
- Pump pressure maximum 300 bar
- Possible without bearing flushing

5.2.3 Installation positions

The V30D variable displacement axial piston pump can be mounted in any installation position.

A support is required for tandem pumps or multiple hydraulic pumps mounted in series (see Chapter 5.2.1, “General information”). The following points must be observed:

**Horizontal installation: (pump below the min. fill level)**

- For horizontal installation, use the uppermost drain port

**Vertical installation: (pump below the min. fill level)**

- Assemble the pump so that the pump mounting flange is facing upwards.
- For vertical installation, use the uppermost drain port.
- Also connect the G 1/8” (BSPP) bleeding port on the pump flange (see Chapter 4, “Dimensions”).
- Take appropriate measures to ensure continuous bleeding of this line (line routing/bleeding).

For installation with the pump flange facing downwards, please contact HAWE Hydraulik.
5.2.4 Tank installation

**Tank installation (pump below the min. fill level)**

The pump can be operated either with or without a suction intake. It is recommended to use a short suction intake (see D 7960 N, 6.1.1 Suction intakes).

**Additional notes regarding installation above the fill level**

Special measures are required if the pump is installed above the fill level. The pump must not run dry via the pressure, intake, drain, bleed or control lines. This applies in particular to long periods of downtime.

- The leakage line must be installed in the tank in such a way that it ends below the oil level.
- Facilitate bleeding of connecting lines via separate bleed openings.
- Adjust the bleeding sequence to the specific installation.
- If necessary, a gear pump should be provided in order to draw air from the suction line.

For specialist advice on designing axial piston pumps, the following contact form is available: [Checklist for designing variable displacement axial piston pumps: B 7960 checklist](#).

For further information on installation, operation and maintenance, see the relevant assembly instructions: B 7960, B 5488.
5.3 Operating instructions

Restrictions in operation during cold start phase and warm-up phase

<table>
<thead>
<tr>
<th>Phase</th>
<th>Temperature</th>
<th>Viscosity (mm²/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold start phase</td>
<td>-25 .... -40°C</td>
<td>&lt; 1000</td>
</tr>
<tr>
<td>Warm-up phase</td>
<td>-25 .... 80 °C</td>
<td>500 ... 1000</td>
</tr>
<tr>
<td>Normal operation</td>
<td>-25 .... 80 °C</td>
<td>10 ... 500</td>
</tr>
</tbody>
</table>

NOTE
Optimum range: 16 - 35 mm²/s

Cold start phase:
- \( p_B = 20 \text{ – } 30 \text{ bar} \)
- \( n \leq 1000 \text{ rpm} \)

Warm-up phase:
- \( p_B = 20 \text{ – } 200 \text{ bar} \)
- \( n \leq 1500 \text{ rpm} \)

Normal operation:
No further restrictions. Service conditions according to Chapter 3 Parameters.

NOTE
Read the documentation carefully before usage.
The documentation must be accessible to the operating and maintenance staff at all times.
Keep documentation up to date after every addition or update.

CAUTION
Risk of injury on overloading components due to incorrect pressure settings!
Risk of minor injury.
- Always monitor the pressure gauge when setting and changing the pressure.

Purity and filtering of the hydraulic fluid

Fine contamination can significantly impair the function of the hydraulic component. Contamination can cause irreparable damage.

Examples of fine contamination include:
- Metal chips
- Rubber particles from hoses and seals
- Dirt due to assembly and maintenance
- Mechanical debris
- Chemical ageing of the hydraulic fluid

NOTE
Fresh hydraulic fluid from the drum does not always have the necessary degree of purity.
When pouring in hydraulic fluid, filter it.
Adhere to the cleanliness level of the hydraulic fluid in order to maintain faultless operation. (also see cleanliness level in Chapter 3, "Parameters")

Additionally applicable document: D 5488/1 Oil recommendations
### 6.1 Planning information

#### Determination of nominal sizes

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Formula</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery flow</td>
<td>( Q = \frac{V_g \cdot n \cdot \eta_V}{1000} \text{ (l/min)} )</td>
<td>Flow rate (lpm)</td>
</tr>
<tr>
<td>Drive torque</td>
<td>( M = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}} \text{ (Nm)} )</td>
<td>Torque (Nm)</td>
</tr>
<tr>
<td>Drive power</td>
<td>( P = \frac{2\pi \cdot M \cdot n}{60000} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t} \text{ (kW)} )</td>
<td>Power (kW)</td>
</tr>
</tbody>
</table>

- \( V_g \) = Geom. output volume (cm\(^3\)/rev.)
- \( \Delta p \) = Differential pressure
- \( n \) = Rotation speed (rpm)
- \( \eta_V \) = Volumetric efficiency
- \( \eta_{mh} \) = Mechanical-hydraulic efficiency
- \( \eta_t \) = Overall efficiency (\( \eta_t = \eta_V \cdot \eta_{mh} \))
Further information

Additional versions

- General operating manual for the assembly, initial operation and maintenance of hydraulic components and systems: B 5488
- Variable displacement axial piston pump type V30E: D 7960 E
- Variable displacement axial piston pump type V60N: D 7960 N
- Fixed displacement axial piston pump type K60N: D 7960 K
- Fixed displacement axial piston pump type K61N: D 7961 K
- Axial piston motors type M60N: D 7960 M
- Proportional directional spool valve, type PSL and PSV size 2: D 7700-2
- Proportional directional spool valve, type PSL, PSM and PSV size 3: D 7700-3
- Proportional directional spool valve, type PSL, PSM and PSV size 5: D 7700-5
- Proportional directional spool valve type PSLF, PSVF and SLF size 3: D 7700-3F
- Proportional directional spool valve type PSLF, PSVF and SLF size 5: D 7700-5F
- Proportional directional spool valve banks type PSLF and PSVF size 7: D 7700-7F
- Load-holding valve type LHT: D 7918
- Load-holding valve type LHDV: D 7770
- Proportional amplifier type EV1M3: D 7831/2
- Proportional amplifier type EV1D: D 7831 D