Axial piston pump HSP-10VO in swashplate design is used in open loop circuits. Flow is proportional to drive speed and displacement. By adjusting the position of the swashplate it is possible to smoothly vary the output flow of the pump.

- Port connections to SAE or metric
- 2 case drain ports
- Operating pressure 3625 psi (250 bar)
- Good suction characteristics
- Low noise level
- High power/weight ratio Long service life
- Short control times
- Axial and radial loading of drive shaft possible
- Wide range of controls
- Through drive available
- SAE & ISO mounting flanges available
VARIABLE DISPLACEMENT PUMP HSP-10VO

SERIES 52

TECHNICAL DATA

1. Input Operating Pressure Range
   Absolute pressure at port S (A)
   Pabs min .................. 11.6 PSI or (0.8 Bar)
   Pabs max .................. 435 PSI or (30 Bar)

2. Output Operating Pressure Range
   Pressure at port B
   Nominal pressure .......... P_N 3625 PSI or (250 Bar)
   Peak pressure .............. Pmax 4500 PSI or (315 Bar)

3. Case Drain Pressure
   The maximum pump case drain pressure measured at ports L, L1 is 7 PSI (0.5 Bar) higher than
   the input pressure at ports S, but not exceeding more than 30 PSI (2 Bar) absolute.

4. Direction of Flow
   ("S" inlet port to "B" pressure port)

5. Table of values (theoretical values, without considering η_mh and η_v; values rounded)

<table>
<thead>
<tr>
<th>Size</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>V_{gmax} cm³</td>
<td>45</td>
</tr>
<tr>
<td>Max. Speed</td>
<td>at V_{gmax} n_{omax} rpm</td>
<td>2600</td>
</tr>
<tr>
<td>Max. flow</td>
<td>at n_{omax} Q_{omax} L/min</td>
<td>117</td>
</tr>
<tr>
<td>Max. power</td>
<td>at n_{omax} P_{omax} kW</td>
<td>49</td>
</tr>
<tr>
<td>Max. torque</td>
<td>at V_{gmax} T_{omax} Nm</td>
<td>179</td>
</tr>
<tr>
<td>Weight</td>
<td>m kg</td>
<td>18</td>
</tr>
</tbody>
</table>

Notes: Values shown are valid for an absolute pressure of 1 bar at suction port. If the flow is reduced or if the inlet pressure is increased
the speed may be increased.

HYDRAULIC FORMULA

1. Determination of Size
   Imperial          Metric
   Flow Q = \frac{V_g \cdot n \cdot \eta_v}{231} \quad \text{gpm} \quad V_g = \text{geometric displacement cu.in. or [cm³] per rev.}
   Torque T = \frac{V_g \cdot \Delta p}{24 \cdot \pi \cdot \eta_{mh}} \quad \text{lb-ft} \quad \Delta p = \text{differential pressure PSI or (Bar)}
   Power P = \frac{Q \cdot \Delta p}{1714 \cdot \eta_t} \quad \text{HP} \quad n = \text{speed [rpm]}
   \eta_v = \text{volumetric efficiency}
   \eta_{mh} = \text{mechanical-hydraulic efficiency}
   \eta_t = \text{total efficiency (η_t = η_v \cdot η_{mh})}
   Q = \text{Flow (gpm) or (L/min.)}
# VARIABLE DISPLACEMENT PUMP HSP10VO

## SERIES 52

### ORDERING CODE

<table>
<thead>
<tr>
<th>HSP-10V</th>
<th>0</th>
<th>45</th>
<th>DFR</th>
<th>52</th>
<th>R</th>
<th>P</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axial piston unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swash plate variable pump</td>
<td>HSP10VS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Modes of operation

- Pump, open circuit

### Size

<table>
<thead>
<tr>
<th>Displacement Vgmax (cm³)</th>
<th>45</th>
<th>60</th>
</tr>
</thead>
</table>

### Control devices

| Pressure control | ● | ● | DR |
| G - Remote control | ● | ● | DRG |
| Pressure and flow control, X channel plugged | ● | ● | DFR |
| | | | DFR1 |

### Series

- Series 52
  - Consult the factory for other series 50/53

### Direction of rotation

- Viewed on drive shaft
  - clockwise: R
  - counter-clockwise: L

### Seals

- Buna-N (NBR per DIN ISO 1629)
  - P
- FPM (fluorocarbon)
  - V

### Shaft end

<table>
<thead>
<tr>
<th>45</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE-splined shaft</td>
<td>●</td>
</tr>
<tr>
<td>SAE-splined shaft, smaller size (not for pumps with thru drive)</td>
<td>●</td>
</tr>
<tr>
<td>SAE-splined shaft, reinforced U-type shaft</td>
<td>–</td>
</tr>
<tr>
<td>SAE-keyed shaft</td>
<td>●</td>
</tr>
<tr>
<td>parallel with key DIN 6885</td>
<td>●</td>
</tr>
</tbody>
</table>

## VARIABLE DISPLACEMENT PUMP HSP10VO

### SERIES 52

### ORDERING CODE

<table>
<thead>
<tr>
<th>C</th>
<th>62</th>
<th>N00</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>45</td>
<td>60</td>
</tr>
</tbody>
</table>

Without through drive

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>N00</th>
</tr>
</thead>
</table>

Thru-drive pump with side ports only

<table>
<thead>
<tr>
<th>82-2 SAE A 16-4 SAE A</th>
<th></th>
<th>K01</th>
</tr>
</thead>
<tbody>
<tr>
<td>101-2 SAE B 22-4 SAE B</td>
<td></td>
<td>K02 &amp; K04</td>
</tr>
</tbody>
</table>

### Service ports

**Pressure port B and Suction port S**

<table>
<thead>
<tr>
<th>(Rear ports, UNC Mounting screws)</th>
<th>45</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Opposite side ports, UNC mounting screws)</td>
<td></td>
<td>61</td>
</tr>
</tbody>
</table>

| (Rear ports, metric mounting screws) |   | 62 |
| (Opposite side ports, metric mounting screws) | -- | 12 |
| (SAE-theaded rear) | -- | b4 |

### Mounting flange

<table>
<thead>
<tr>
<th>SAE 2 Bolt hole</th>
<th>45</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE 4 Bolt hole</td>
<td>--</td>
<td>64</td>
</tr>
</tbody>
</table>

● = available

Port pos. 61, 11 only for version without through drive

Port pos. 61, 11 only for version without through drive

Port pos. 61, 11 only for version without through drive
VARIABLE DISPLACEMENT PUMP HSP-10VO

SERIES 52

FLUID

1. **Hydraulic Fluid**
   The HSP-10V open loop pump in the standard design should be used with a good quality, petroleum based anti-wear hydraulic fluid.

2. **Operating Viscosity Range**
   In order to obtain optimum efficiency we recommend that the operating viscosity be selected from within the range.

   At operating temperature
   Optimum viscosity ($\nu_{\text{opt}}$) 80...170 SUS (16 / 36 mm²/s)

**Limits of viscosity range**
   The following values are valid for extreme operating conditions:

   - $\nu_{\text{min}} = 60$ SUS (10 mm²/s) for short periods at max. leakage oil temperature of 93°C
   - $\nu_{\text{max}} = 4600$ SUS (1000 mm²/s) 1400 SUS (300 mm²/s) on short term cold start

3. **Temperature Range**
   $t_{\text{min}} = -15°C; t_{\text{max}} = +80°C; t_{\text{min}}$

4. **Filtration**
   In order to ensure reliable operation of the axial piston unit, the operating fluid must be maintained to a cleanliness class of 18/14 to ISO4406 or NAS 1638 class 9. As a guide the fluid cleanliness level may be achieved using a 10 micron filter.

**Installation Information**
   The pump housing must be filled with clean hydraulic fluid prior to pump start up and remain full. The concentricity between the prime mover drive shaft and the pump shaft 0.05mm.

![Diagram of prime mover drive shaft and pump shaft with 0.05mm concentricity](image)
**INSTALLATION INFORMATION**

The installation position of the pump is optional.

The pump housing must be filled with fluid both when commissioning and in operation. In order to achieve low noise levels, all connecting lines (inlet, case drain) should be isolated from the tank by flexible lines.

1. **Vertical Installation** the following conditions should be noted:
   - Before installing the pump inside a tank fill the pump case with fluid.
   - Make sure the ports are below the oil level (L), (L1) & S
   - Avoid mounting above the tank whenever possible in order to maintain a low noise level.
   - The permissible inlet height is a result of the overall pressure loss “A” may not be greater than 32 inches (800 mm).

2. **Horizontal Installation**
   - The pumps must be install so (L) or (L1) the case drain is at the top of the pump.
   - If the minimum fluid level is below the ports of the pump, pipe the ports L or L1 & S below the minimum oil level.
   - Avoid mounting above the tank whenever possible in order to maintain a low noise level.
   - The permissible inlet height (h) is a result of the overall pressure loss, “A” may not be greater then 32 inches (800 mm).

Below the tank position
- Pipe “L”, “L1” and “S” must be mounted below the oil level.
The pressure control serves to maintain a constant pressure in the hydraulic system, within the control range of the pump. The pump therefore supplies only the amount of hydraulic fluid required by the actuators. Pressure may be smoothly set at the pilot valve.

**CONTROL DATA**

<table>
<thead>
<tr>
<th>Hysteresis and repetitive accuracy</th>
<th>( \Delta p )</th>
<th>Max. 3 bar</th>
</tr>
</thead>
</table>

**Max. Pressure Increase**

<table>
<thead>
<tr>
<th>Size</th>
<th>( \Delta p )</th>
<th>BAR</th>
<th>45</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \Delta p )</td>
<td>6</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Pilot oil consumption .................. max. approx. 3 L/min

For other controls DRG and DFR see page 13 & 14
VARIABLE DISPLACEMENT PUMP HSP-10VO

SERIES 52

MOUNTING DIMENSION, SIZES 45 Pressure control DR

Version HSP-10VSO45DR/52R - XXC62/12NOO
VARIABLE DISPLACEMENT PUMP HSP-10VO

MOUNTING DIMENSION, SIZES 45

Version HSP-10VSO45
DFR
DFR1/52L - XXC64N00
DRG
VARIABLE DISPLACEMENT PUMP HSP-10VO

**SERIES 52**

**MOUNTING DIMENSION, SIZES 60**

Version HSP10VSO60

DFR

DFR1/52L - XXC62/12N00

DRG

Port plate 62/12 shown is anticlockwise rotation
For clockwise rotation, turn port plate 180°
VARIABLE DISPLACEMENT PUMP HSP-10VO

SERIES 52

MOUNTING DIMENSION, SIZES 60

Version HSP-10VSO60
DFR
DFR1/52L - XXC61/11N00
DGR

Port plate 81/11
shown in anticlockwise rotation
For clockwise rotation, turn port plate 180°

view W

model 61
4-3/8-10JNC-2B
dep17
model 61
4-1/2-13JNC-2B
dep20
model 11, 4-M10-8/H
dep17
model 11, 4-M12-6/1
dep20

φ25
φ50
52.4
61.6
26.2
46
42.5
33
VARIABLE DISPLACEMENT PUMP HSP-10VO

SERIES 52

MOUNTING DIMENSION, SIZES 60

Version HSP-10VSO60

DFR

DFR1/52L - XXC61/11N00

DVG

Port plate 61/11
shown is anticlockwise rotation
For clockwise rotation, turn port plate 180°

view W
hydraut