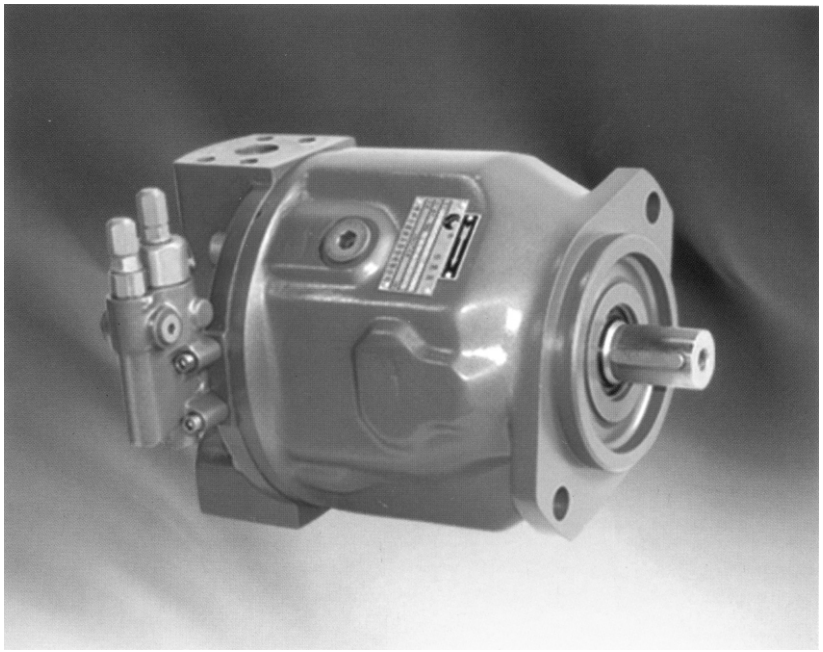
# Variable displacement pump LIOVO,Series 31



## Features:

Axial piston pump L10VO in swashplate design is used for hydrostatic transmissions 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 folw.

**-Flange connections to SAE-UNC or SAE metric**

**-2 leakage ports**

**-High permissible speeds**

**-Good suction characteristics**

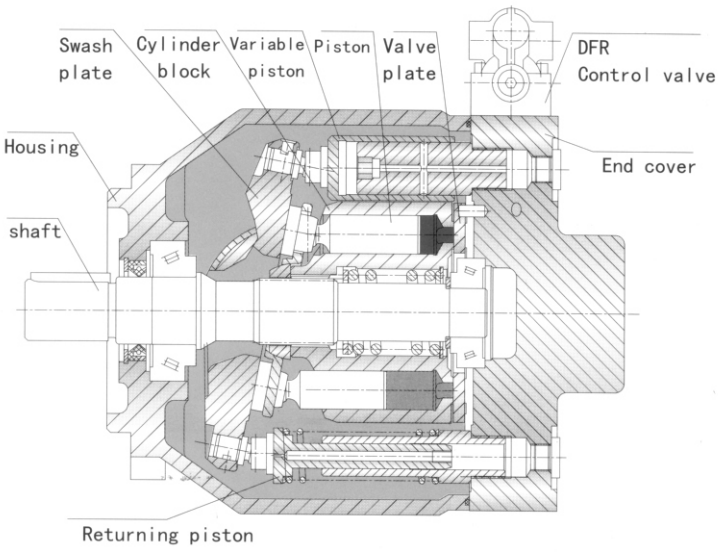
**-Low noise level**

**-Short control times**

**-Axial and radial loading of drive shaft possible**

**-Wide range of controls**

**-Through drive option for multi-circuit system**



# Technical date

## 1.Inut operating pressure range

Absolute pressure at port S (A)

Pabs min .....0.8bar

Pabs max.....3bar

## 2.Output operating pressure range

Pressure at port B

Nominal pressure $P_N$.....280bar

Peak pressure Pmax.....350bar

## 3.Case drain pressure

Maximum pressure of leakage fluid (at ports L, L1), Maximum 7 psi (0.5 bar) higher than input pressure at port S, but not higher than 30 psi (2 bar) absolute.

## 4. Direction of flow

(S to B)

## 5. Table of values (theoretical values, without considering mh and v ; values rounded)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Size** | | | | 28 | 45 | 71 | 100 |
| **Displacement** | | Vgmax | $cm^3$ | 28 | 45 | 71 | 100 |
| **Max. Sped** | At Vgmax | Nomax | rmp | 3000 | 2600 | 2200 | 2000 |
| **Max. Flow** | At Nomax | Nomax | L/min | 84 | 117 | 156 | 200 |
| **Max. Power** | At Nomax | Pomax | kW | 39 | 55 | 73 | 93 |
| **Max. Torque** | At Vgmax | Tmax | Nm | 125 | 200 | 316 | 445 |
| **Weight (without fluid)** | | m | kg | 15 | 21 | 33 | 45 |

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

## 6. Determination of size

**Flow** $Q=\frac{Vg \cdot n \cdot \eta_v}{1000}$

**Drive torque** $Q=\frac{1.59 \cdot Vg \cdot \Delta P}{100 \cdot \eta_{mh}}$

**Drive power** $Q=\frac{2 \cdot \pi \cdot T \cdot n}{60000}=\frac{Q \cdot \Delta P}{600 \cdot \eta_t}$

Vg=geometric displacement [$cm^3$] per rev.

ΔP=differential pressure [bar]

n=speed [rpm]

$\eta_v$=volumetric efficiency

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

$\eta_t$=($\eta_t=\eta_v \cdot \eta_{mh}$) todal efficiency

# Variable displacement pump LIOVO,Series 31

## Ordering Code:

| L10V | 0 | 71 | DR | / | 31 | R | - | P | S |
|---|---|---|---|---|---|---|---|---|---|

**Axial piston unit**

| | |
|---|---|
| Swash plate variable pump | L10V |
| Swash plate variable pump, for industrial | L10VS |

**Mode of operation**

| | |
|---|---|
| Pump, open circuit | 0 |

**Size**

| | | | | | |
|---|---|---|---|---|---|
| Displacement Vgmax ($cm^3$) | 28 | 45 | 71 | 100 | 140 |

**Control devices**

| | | | | | | |
|---|---|---|---|---|---|---|
| Pressure control<br>Remote control | ● | ● | ● | ○ | - | DR<br>DRG |
| Pressure and flow control.<br>X port closed | ● | ● | ● | ● | - | DFR<br>DFR1 |
| Pressure flow and power control | ● | ● | ● | ● | - | DFLR |
| Electronic flow control + pressure control | ● | ● | ● | ● | - | RZQZ |

**Series**

| | |
|---|---|
| Series | 31 |

**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 | 28 | 45 | 71 | 100 | 140 | |
|---|---|---|---|---|---|---|
| SAE-splined shaft | ● | ● | ● | ● | - | S |
| SEA-splined shaft, reinforced (higher thru drive torques) | ● | ● | ● | - | - | R |
| SAE-splined shaft, smaller size (not for pumps with thru drive) | - | ● | - | ● | - | U |
| SAE-splined shaft, reinforced U-ype shaft | - | ○ | - | ○ | - | W |
| SAE-keyed shaft | ● | ● | ● | ● | - | K |
| Parallel with key DIN 6885 | ● | ● | ● | ● | - | P |

| | C | 62 | N100 |
|---|---|---|---|

| Thru-drive | | | 28 | 45 | 71 | 100 | 140 | |
|---|---|---|---|---|---|---|---|---|
| Without through drive | | | ● | ● | ● | ● | - | N00 |
| With thru-drive, pump with side port only | | | | | | | | |
| Mounting flange | Shaft/coupling | For the mounting of: | | | | | | |
| 82-2 (SAE A) | 16-4 (SAE A) | G2,GC2/GC3-1X | ● | ● | ● | - | - | K01 |
| 101-2 (SAE B) | 22-4 (SAE B) | A10V028 (shaft S), G3 | ● | ○ | ● | - | - | K02 |
| 101-2 (SAE B) | 22-4 (SAE B) | A10V028 (shaft S), G4 | ○ | ● | ○ | - | - | K68 |
| 127-2 (SAE C) | 32-4(SAE C) | A10V0 71 (SHAFT S) | | | ● | - | - | K07 |

| Service ports (Pressure port B and suction port S) | 28 | 45 | 71 | 100 | 140 | | |
|---|---|---|---|---|---|---|---|
| Rear ports, UNC mounting screws | ● | ● | ● | - | - | 61 | Port pos.61, 11,91and 41 only for version without through drive |
| Opposite side ports, UNC mounting screws | ● | ● | ● | ● | - | 62 | |
| Rear ports, metric mounting screws | ○ | ○ | ● | - | - | 11 | |
| Opposite side ports, metric mounting screws | ● | ● | ● | ● | - | 12 | |
| Rear ports, UNC mounting screws | - | - | ● | - | - | 91 | |
| Opposite side ports, UNC mounting screws | - | - | ● | - | - | 92 | |
| Rear ports, metric mounting screws | | | ● | | - | 41 | |
| Opposite side ports, metric mounting screws | - | - | ○ | - | - | 42 | |

| Mounting flange | 28 | 45 | 71 | 100 | 140 | |
|---|---|---|---|---|---|---|
| SAE 2 hole | ● | ● | ● | ● | - | C |
| ISO 2 hole | ● | ● | ● | ● | - | A |
| SAE 4 hole | - | - | - | - | - | D |

**Multiple pumps**

1.If a second Liyuan hydraulic pump is to be factory-mounted, then both ordering codes are to bespecified, combined with a "+" . Order code 1st pomp + Order code 2nd pump
Ordering example; L10V071DR/31R-PSC62K02+L10V028DR/31R-PSC62N00

2.If a gear pump is to be factory-mounted please contact us.

● = available

○ = in preparation

- = not available

# Variable displacement pump LIOVO,Series 31

## Fluid

**1.Fluid: MR20S(Q/TCNK12-2001)**

**2.Operating viscosity range**

$V_{opt}$=16 $mm^2/s$ ~ 36 $mm^2/s$

For optimum efficiency and service life we recommend that the operating viscosity (at operating temperature) be selected in the range:

$V_{opt}$=opt. Operating viscosity 16 ~ 36 $mm^2/s$

Referred to tank temperature (open loop circuit).

Limits of viscosity range

(The following values are valid for extreme operating conditions:)

Vmin=10 $mm^2/s$

For short periods at max. leakage oil temperature of 80℃

Vmin=1000 $mm^2/s$

For short periods upon cold start.

**3.Temperature range**

$t_{min}$=-20℃; $t_{max}$ =+80℃

**4.Filtration**

In order to ensure reliable operation of the axial piston unit, theoperating fluid must be maintained to a cleanliness class of at least; 16/19 to ISO4406. This may be achieved with filter elements, cleanliness class of pump leakage fluid 10um.

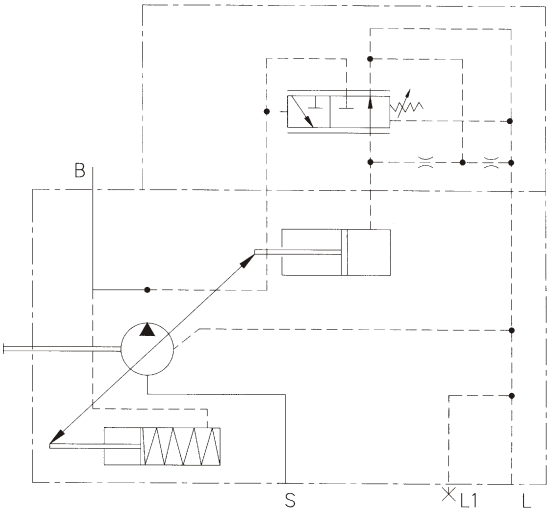
## Installation notes

The pump housing must be filled with fluid during commissioning and remain full when operating.

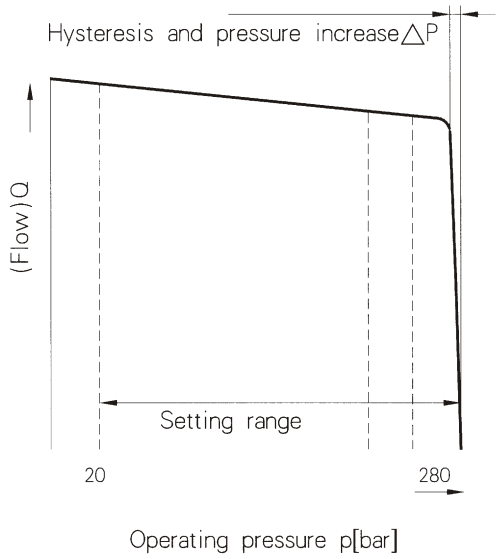
The concentricity between engine transmission shaft and pump shaft must less than Φ00.05mm

# Pressure control

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..




Static characteristic (at n1=1450rmp; toil=50℃)




**Ports**

| | |
|---|---|
| B | Pressure port |
| S | Suction port |
| L,L1 | Case drain ports (L1 sealed) |

## Control data

Hysteresis and repetitive accuracy △p.....max. 3bar

## Max. pressure increase

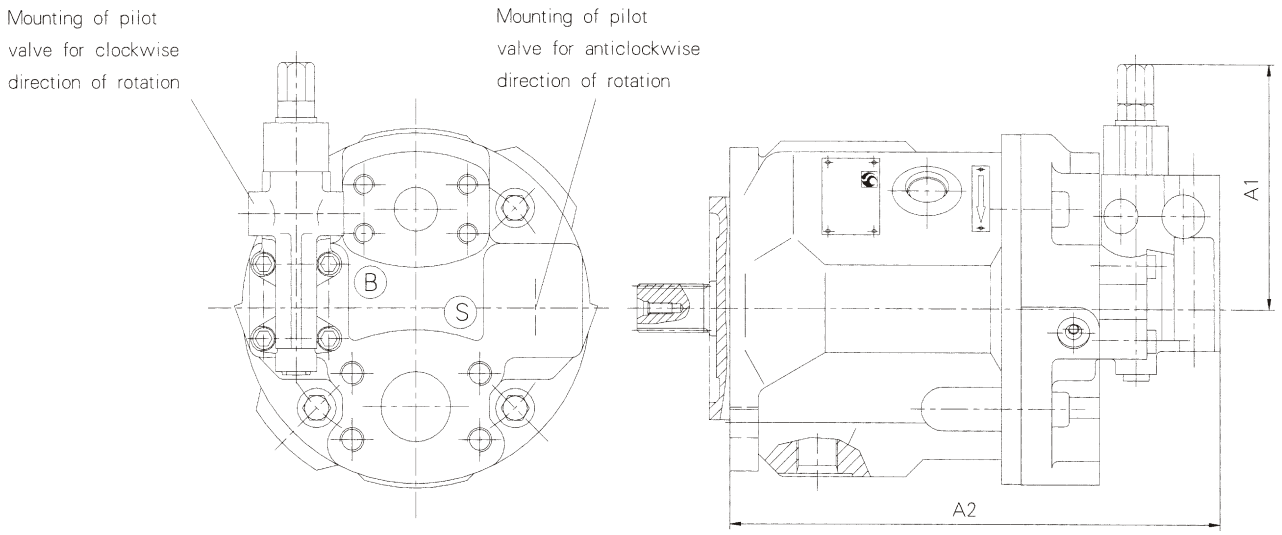
| Size | | 28 | 45 | 71 | 100 |
|---|---|---|---|---|---|
| △P | Bar | 4 | 6 | 8 | 10 |

Pilot oil consumption.0.....max. approx. 3 L/min

# Variable displacement pump LIOVO,Series 31

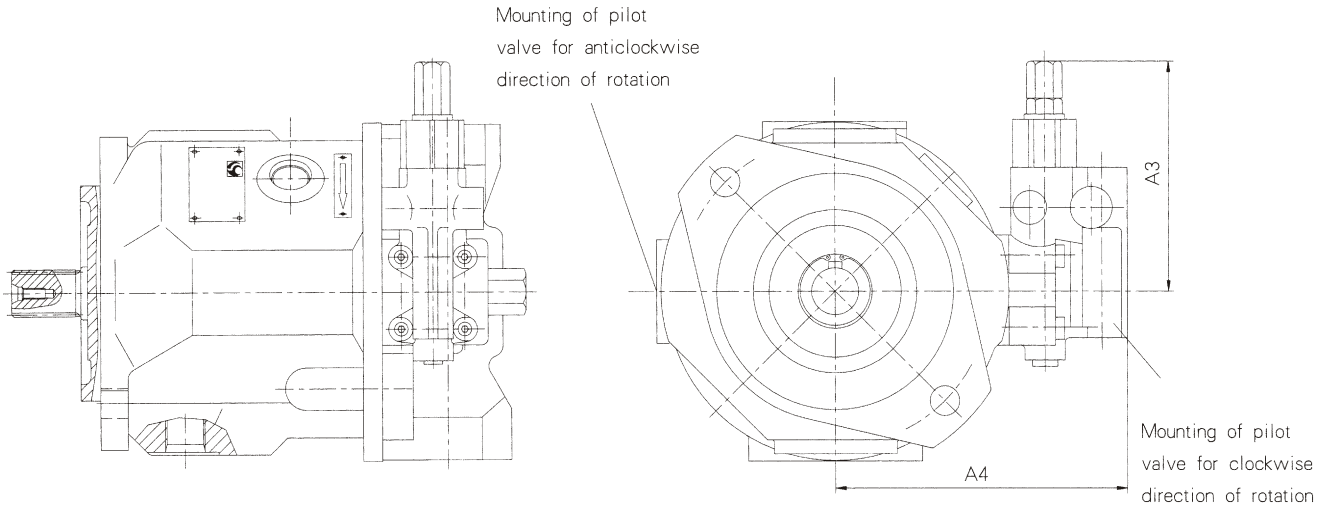
Unit dimensions DR
Service ports at rear; Models 61NOO and 11NOO

Size 28 to 100




Unit dimensions DR
Service ports at rear; Models 62NOO and 12NOO

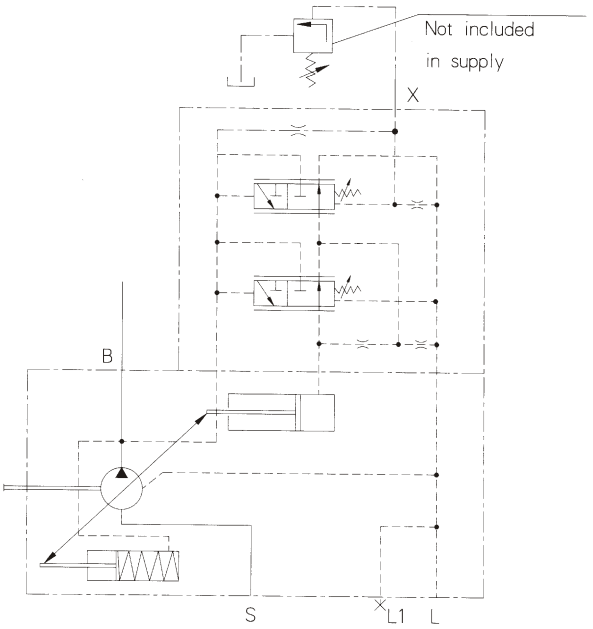
Size 28 to 100



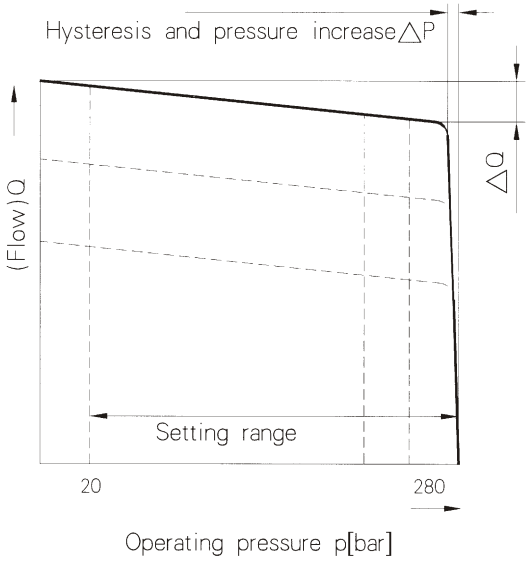

| Sizes | A1 | A2 | A3 | A4 |
|---|---|---|---|---|
| 28 | 108.5 | 226.2 | 108.5 | 136 |
| 45 | 108.5 | 245 | 108.5 | 146 |
| 71 | 106 | 279 | 108.5 | 160 |
| 100 | | | 108.5 | 158 |
| 140 | | | | |

# Pressure control, remote control

Function and design as for DR.
A pressure relief valve may be externally piped to port X for remote control purposes.It is not, however, included with the DRG control.
The differential pressure at the pilot valve is set as standard to 20 bar and this results in a pilot flow of 1,5 L/min,
If another setting is required (in the range 10-22 bar),
please state this in clear test.




Static characteristic (at n1=1450rmp; toil=50℃)




**Ports**

| | |
|---|---|
| B | Pressure port |
| S | Suction port |
| L,L1 | Case drain ports (L1 sealed) |
| X | Pilot pressure port |

## Control data

Hysteresis and repetitive accuracy p.....max. 3bar

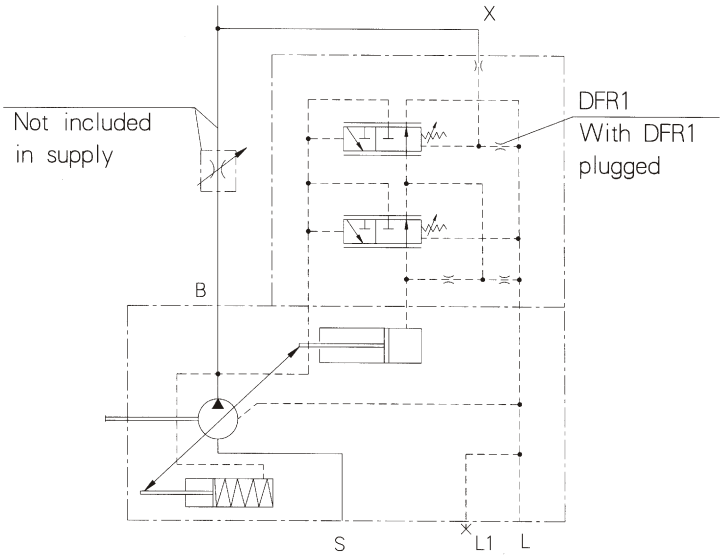
## Max. pressure increase

| Size | | 28 | 45 | 71 | 100 |
|---|---|---|---|---|---|
| △P | Bar | 4 | 6 | 8 | 10 |

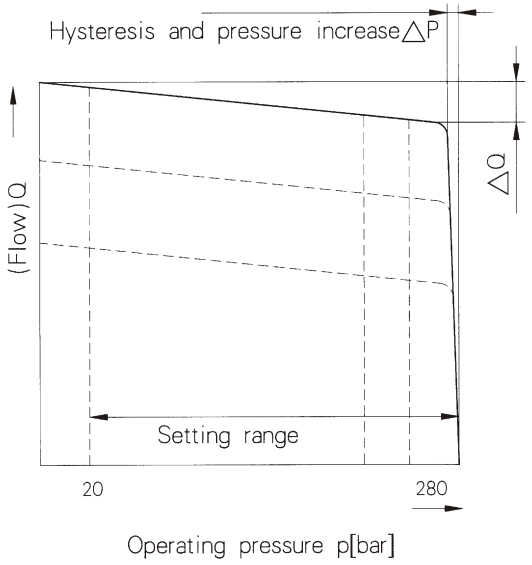
Pilot oil consumption.0.....max. approx. 4.5 L/min

# Variable displacement pump LIOVO ,Series 31

DFR/DFR1 Pressure /flow control
In addition to the pressure control function, the pump flow maybevaried by means of a differential pressure at the actuator (e.g. an orifice) .
In model DfR1 the X orifice is plugged .
Static characteristic



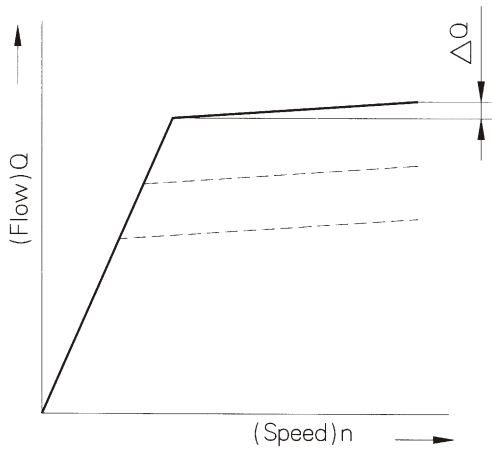

Static characteristic (at n1=1450rmp; toil=50℃)




**Ports**

| | |
|---|---|
| B | Pressure port |
| S | Suction port |
| L,L1 | Case drain ports (L1 sealed) |
| X | Pilot pressure port |

Static characteristic at variable speed




## Flow control/ differential pressure ΔP:

Adjustable between 10 and 22 bar (higher values on request) Standard setting: 14 bar . If a different setting is required, pleasestate in clear text. When port X is unloaded to tank, a zero stroke pressure of p=18 2 bar ("stand by") results.

## Control data

For pressure control technical data see DR Pressure control

Max. flow deviation (hysteresis and increase ) measured at drive speed n=1450rpm

| Size | | 28 | 45 | 71 | 100 |
|---|---|---|---|---|---|
| △Qmax | L/min | 1.0 | 1.8 | 2.8 | 4.0 |

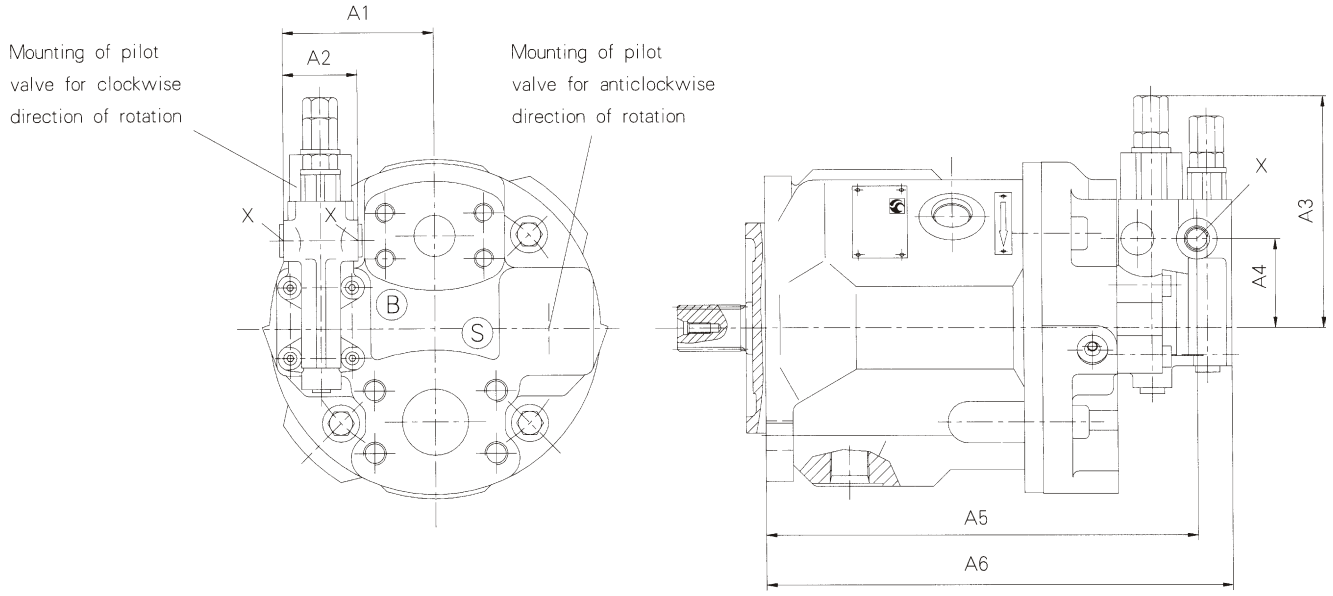
Pilot oil consumption DFR.....max. approx. 3-4, 5 L/min

Pilot oil consumption DFR1..... max. approx. 3 L/min

# Variable displacement pump LIOVO,Series 31

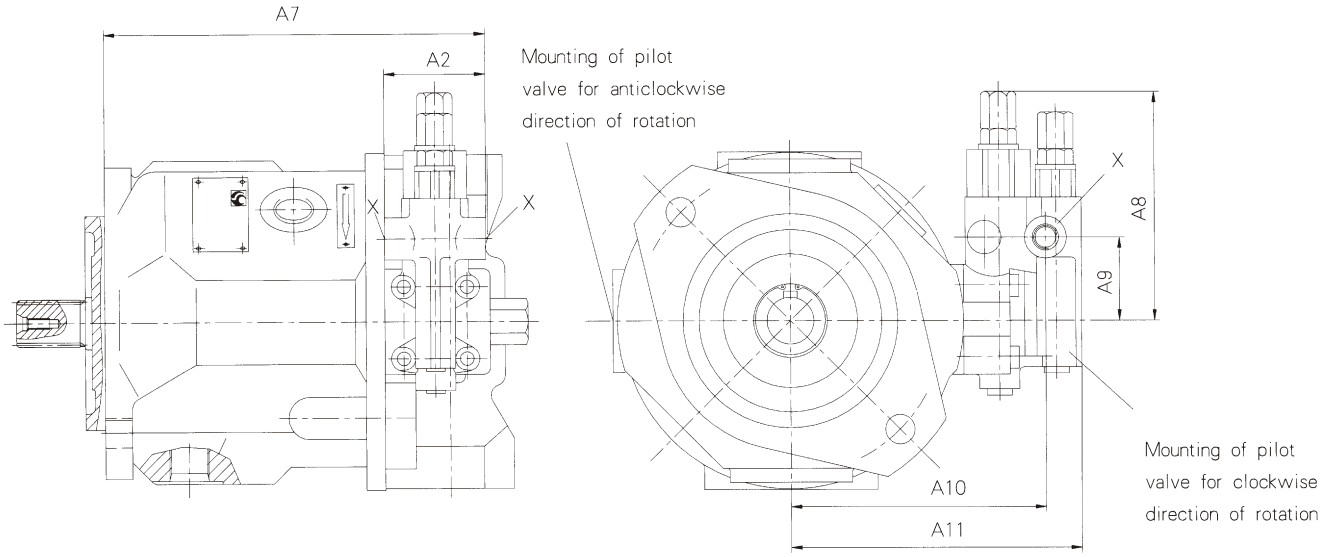
Unit dimensions DFR/DFR1/DRG
Service ports at rear; Models 61NOO and 11NOO

Sizes 28 to 100




Unit dimensions DFR/DFR1/DRG
Service ports on sides; Models 62NOO and 12NOO

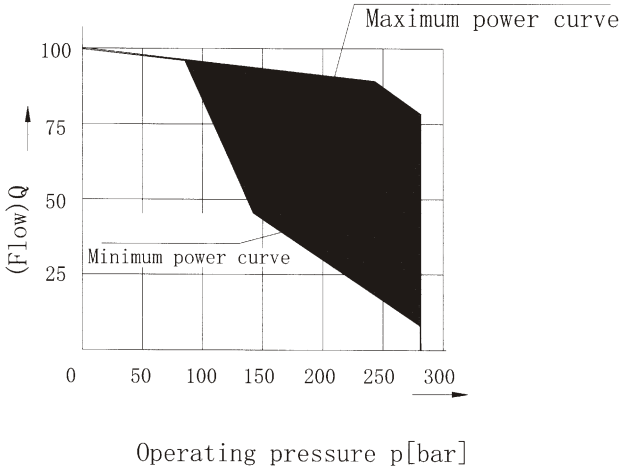
Sizes 28 to 100

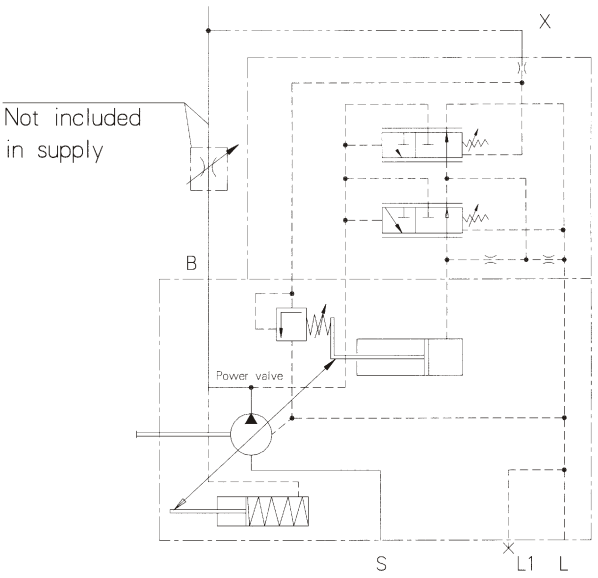



| Sizes | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | A11 | X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | 73 | 36 | 108.5 | 43 | 209.2 | 226.2 | 176 | 108.5 | 40 | 119 | 136 | 7/16-20UNF-2B |
| 45 | 82 | 36 | 108.5 | 40 | 229 | 245 | 191 | 108.5 | 40 | 129 | 146 | 7/16-20UNF-2B |
| 71 | 91 | 36 | 106 | 42 | 262 | 279 | 218.8 | 108.5 | 40 | 143 | 160 | 7/16-20UNF-2B |
| 100 | | | | | | | 287 | 108.5 | 40 | 141 | 158 | 7/16-20UNF-2B |
| 140 | | | | | | | | | | | | |

# Pressure/flow/power control

In order to achieve a constant drive torque with a varying operating pressure, the swivel angle and with it the output flow from the axial piston unit is varied so that the product of flow and pressure remain constant.
Flow control is possible below the limit of the power curve.




**Ports**

| | |
|---|---|
| B | Pressure port |
| S | Suction port |
| L,L1 | Case drain ports (L1 sealed) |
| X | Pilot pressure port |

The poweer characteristic is factory-set, so please enter details in clear text, e.g. 20kW at 1450 rpm.

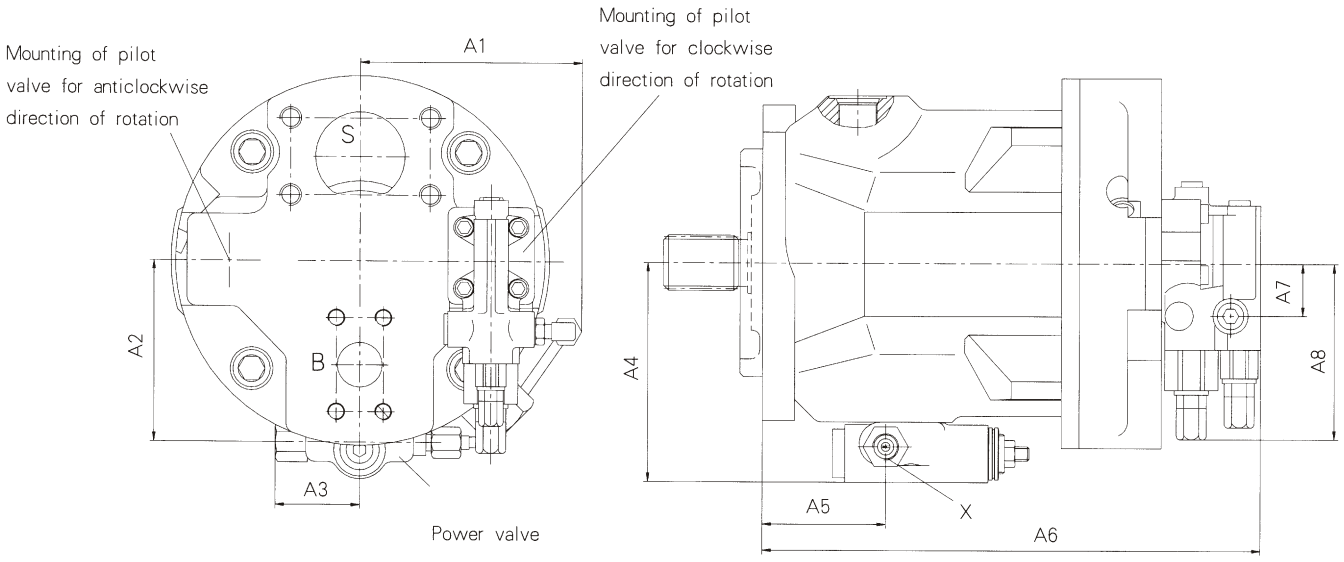
## Control data

For pressure control technical data see DR Pressure control.
For flow control technical data see DFR control..
Start pf cpmtrol.....from 80 bar
Pilot oil consumption.....max. approx. 5.5 L/min

# Variable displacement pump LIOVO,Series 31

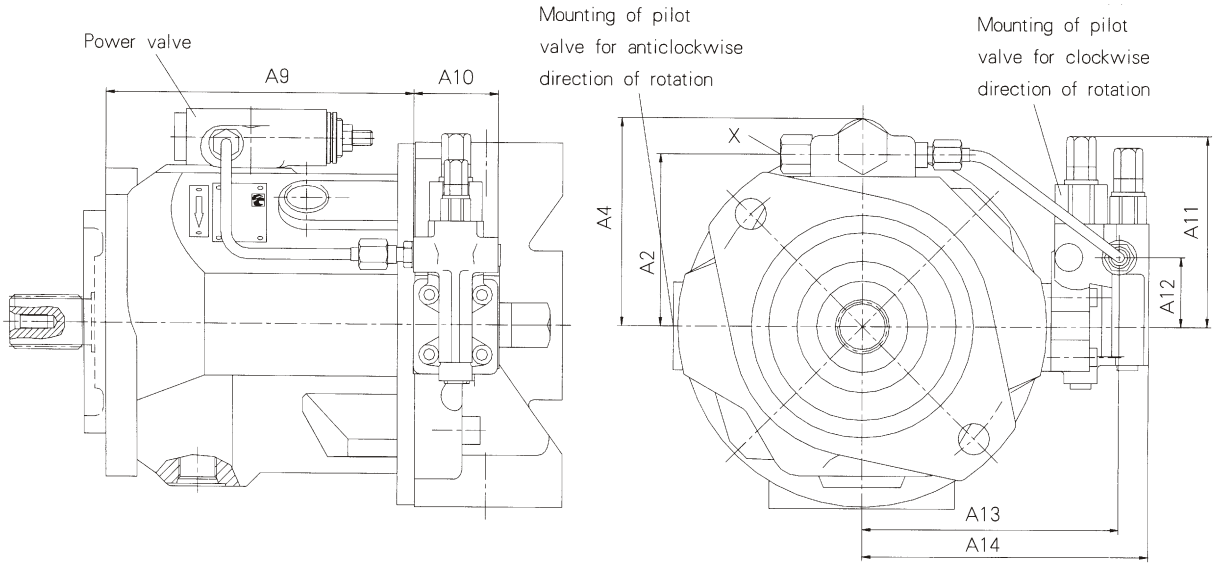
Unit dimensions DFLR
Service ports at rear; Models 61NOO and 11NOO

Sizes 28 to 100




Unit dimensions DFLR
Service ports on sides; Models 62NOO and 12NOO

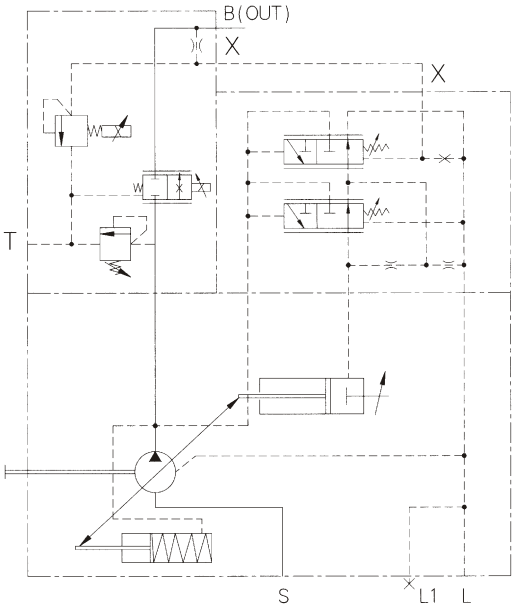
Sizes 28 to 100

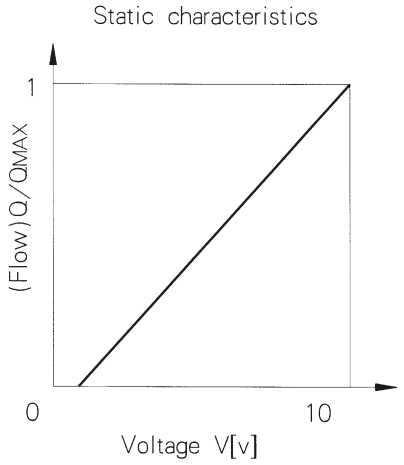


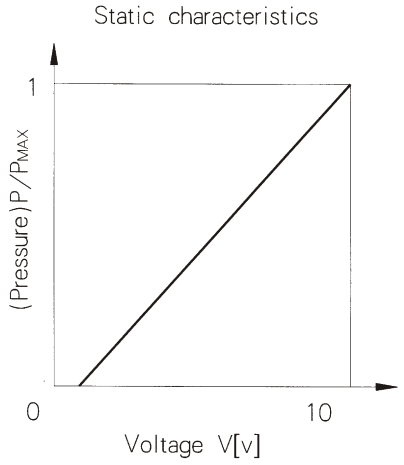

| Sizes | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | A11 | A12 | A13 | A14 | X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | | 87.5 | | | | | | | 140 | 36 | 108.5 | 40 | 119 | 136 | 7/16-20UNF-2B |
| 45 | | | | | | | | | | | | | | | |
| 71 | 123.5 | 103.5 | 48 | 124 | 69 | 279 | 42 | 106 | 218.8 | 36 | 108.5 | 40 | 143 | 160 | 7/16-20UNF-2B |
| 100 | | | | | | | | | 250 | 36 | 108.5 | 40 | 141 | 158 | M14x1.5-6H |
| 140 | | | | | | | | | | | | | | | |

# Electronic flow control + Electronic pressure control

Pressure and flow control of the pump are carried out by an electrically controlled proportional valve mounting at pressure port.
Pressure and flow increased with voltage.



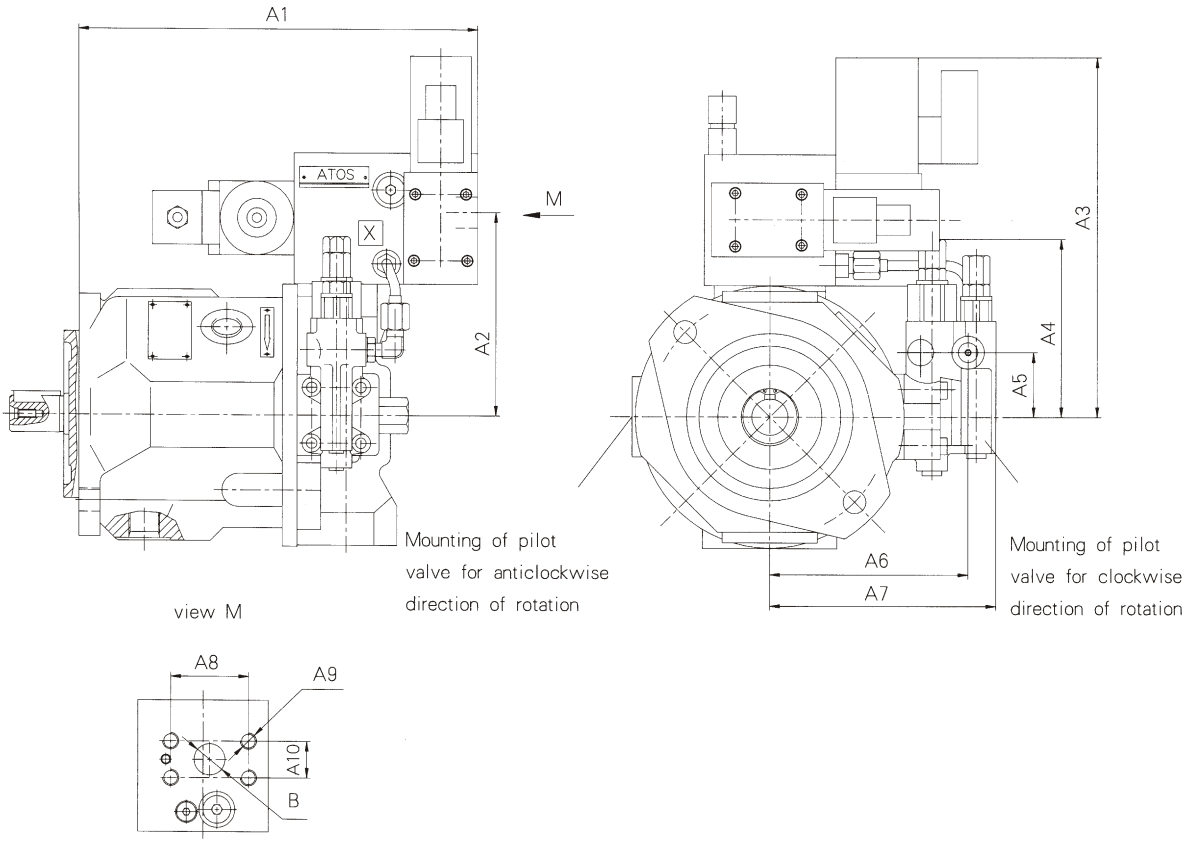

**Ports**

| | |
|---|---|
| B | Pressure port |
| S | Suction port |
| L,L1 | Case drain ports (L1 sealed) |
| T | Drain port |
| X | Pilot pressure port |

# Variable displacement pump LIOVO,Series 31

Unit dimensions RZQZ
Service ports on sides; Models 62NOO and 12NOO

Sizes 28 to 100

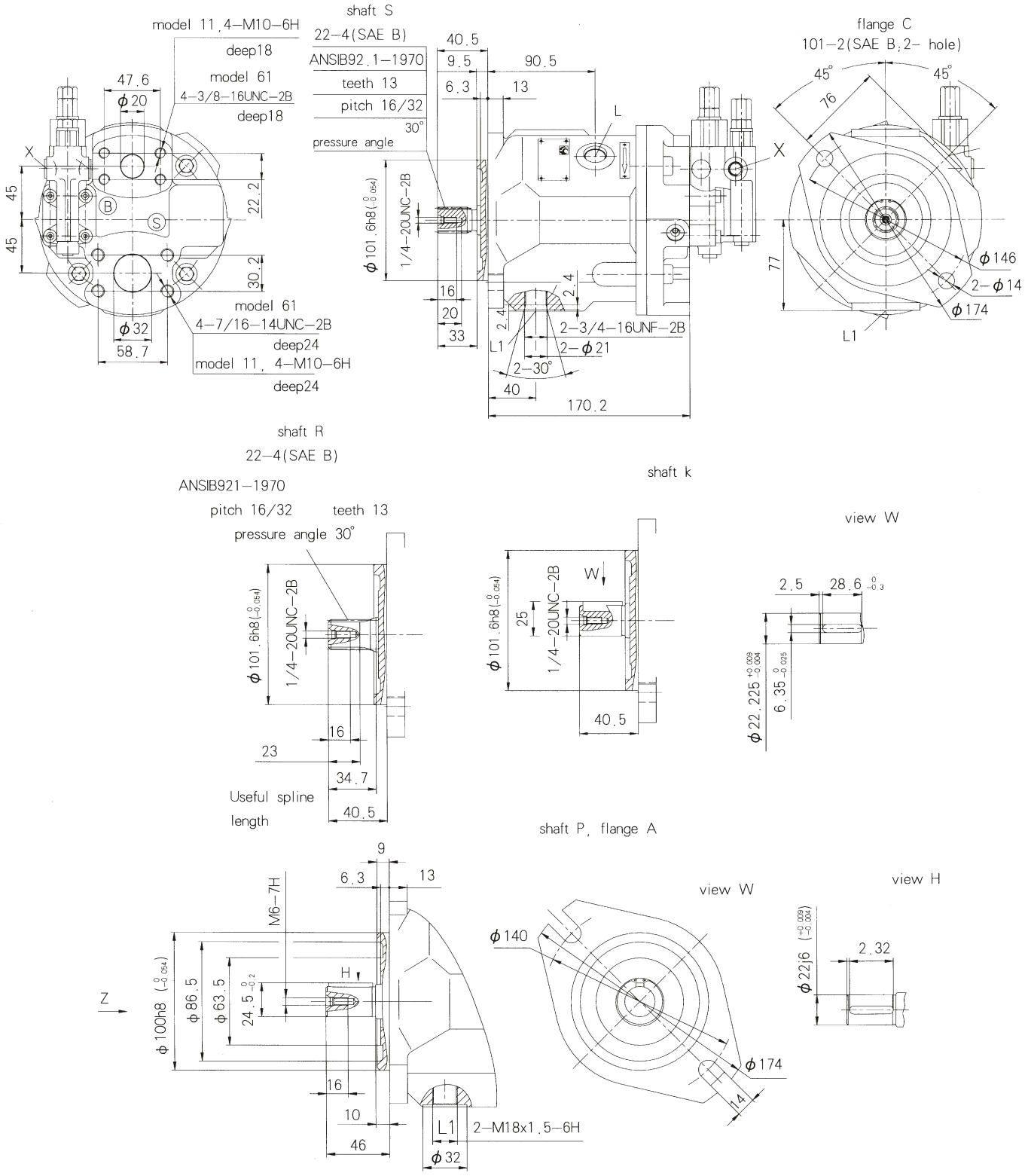



| Sizes | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | (B Port) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | 245.2 | 144 | 222.5 | 108.5 | 40 | 119 | 136 | 47.6 | 4-M10-6H, 21 deep | 22.2 | Ø 19 |
| 45 | 270.5 | 147.5 | 232 | 108.5 | 40 | 129 | 146 | 52.4 | 4-M10-6H, 21 deep | 26.2 | Ø 24.5 |
| 71 | 303.8 | 160 | 251.5 | 108.5 | 40 | 143 | 160 | 58.7 | 4-M10-6H, 21 deep | 30.2 | Ø 32 |
| 100 | | | | | | | | | | | |
| 140 | | | | | | | | | | | |

# Mounting Dimension, Size28

Service ports at rear; no through drive, Models 61NOO and 11NOO

Without considering adjustment

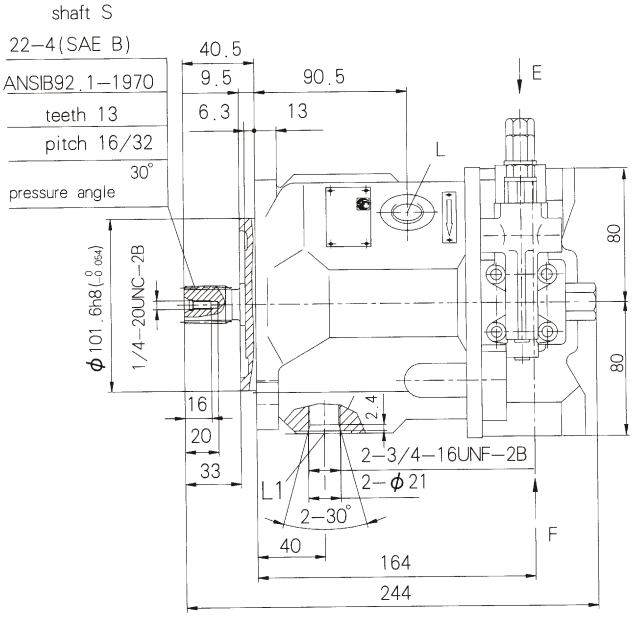


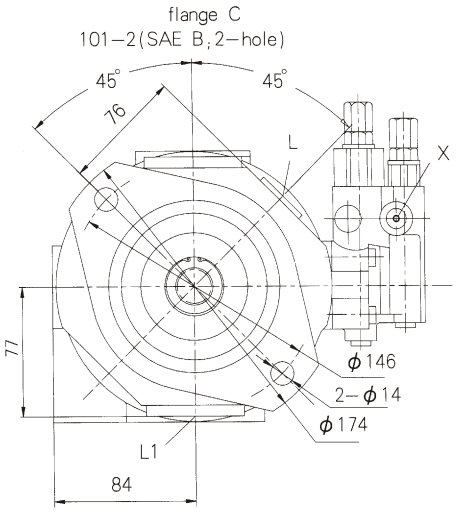
# Variable displacement pump LIOVO, Series 31

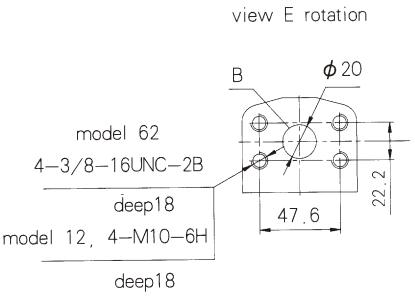
## Mounting Dimension, Size28

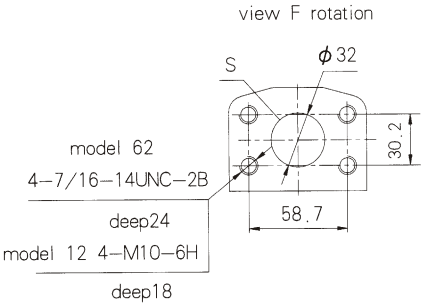
Service ports at rear; no through drive, Models 62NOO and 12NOO

Without considering adjustment



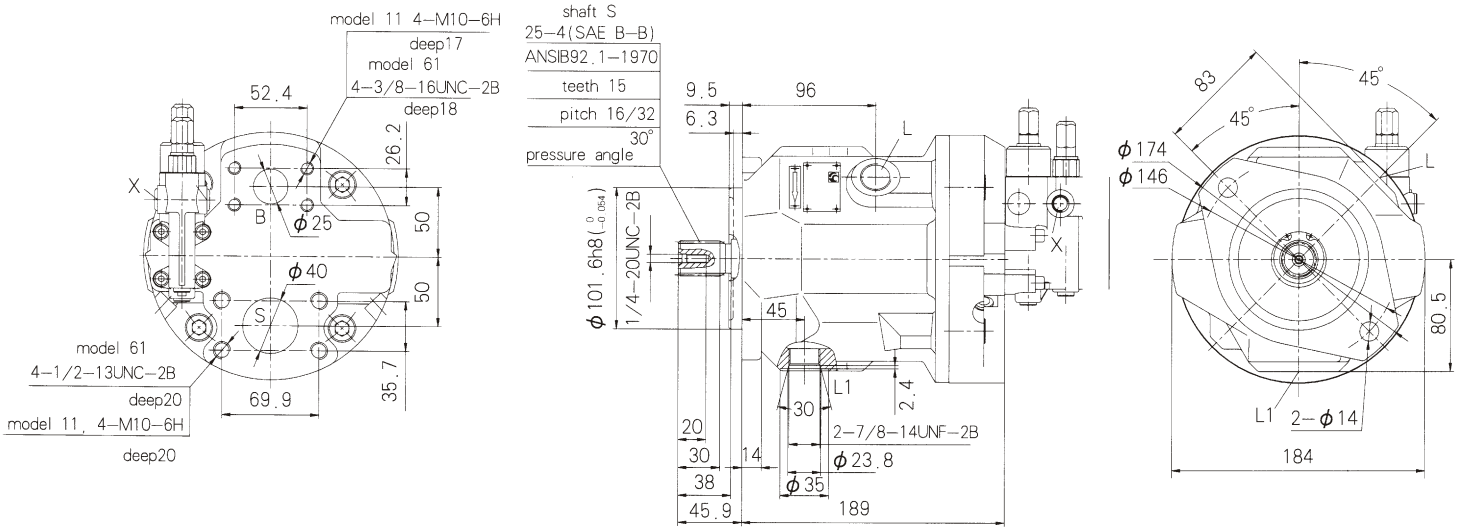



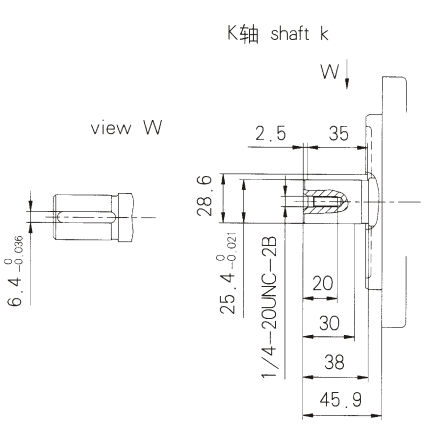



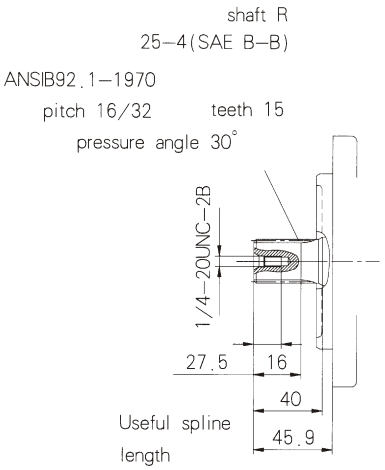
# Mounting Dimension, Size45

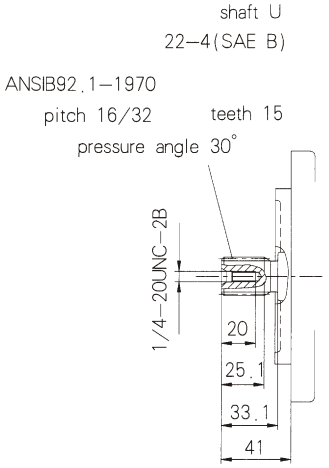
Service ports at rear; no through drive, Models 61NOO and 11NOO

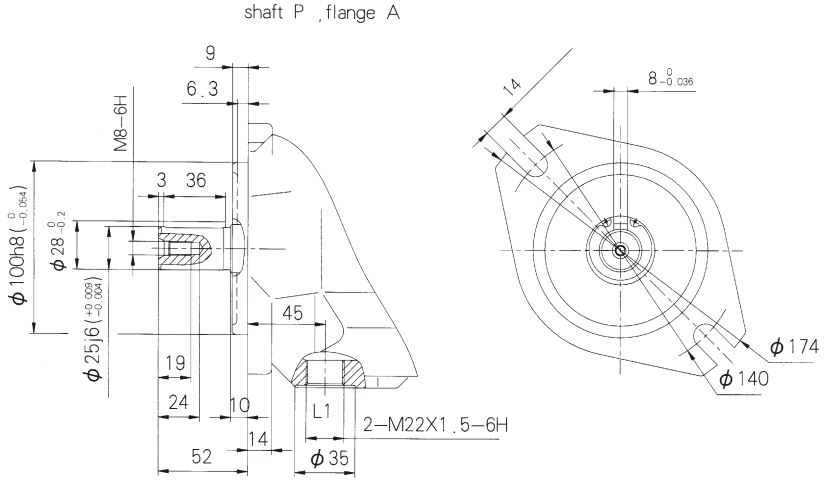
Without considering adjustment



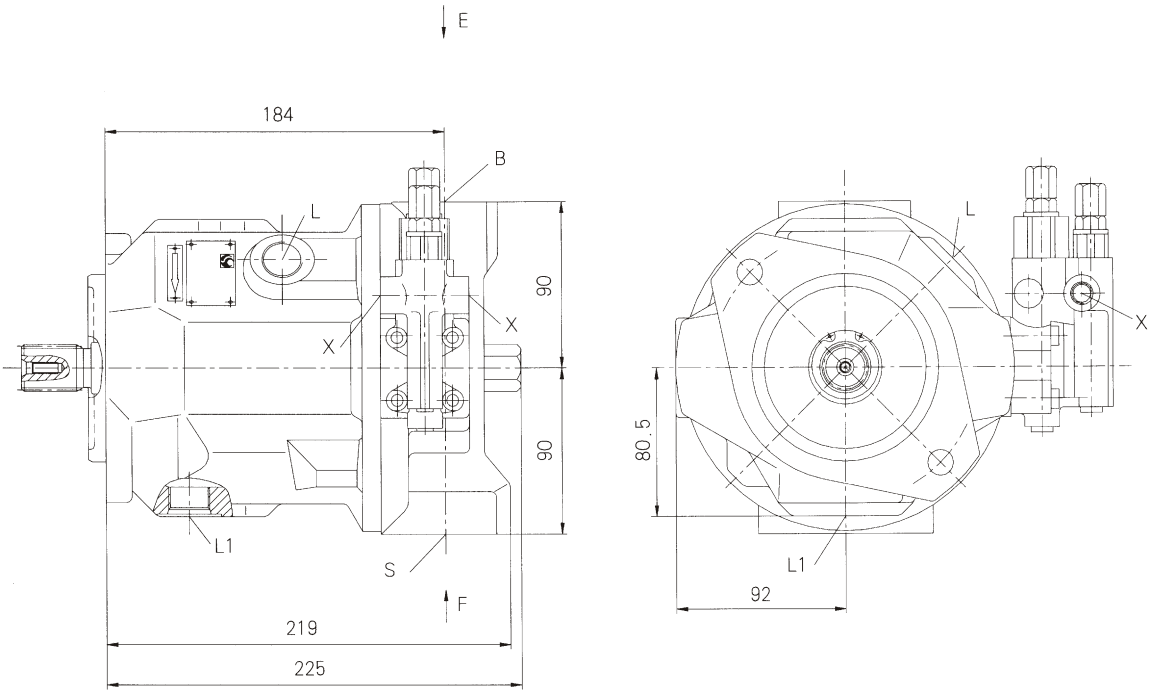



# Variable displacement pump LIOVO, Series 31

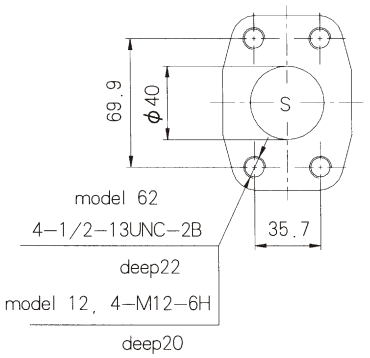
## Mounting Dimension, Size45

Service ports on sides; no through drive, Models 62NOO and 12NOO

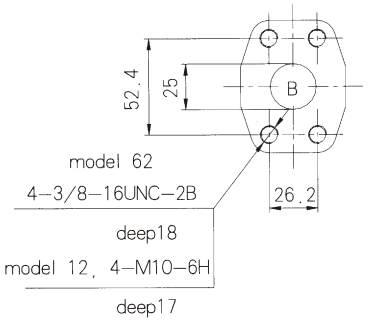
Without considering adjustment




view F rotation



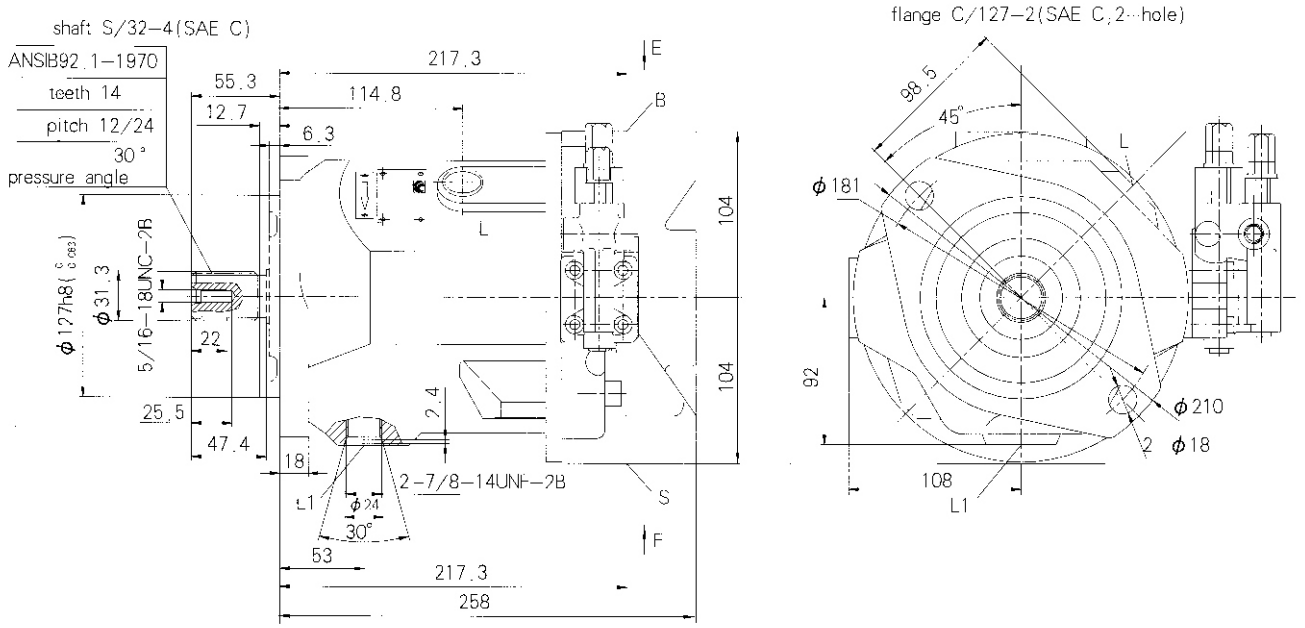

view E rotation

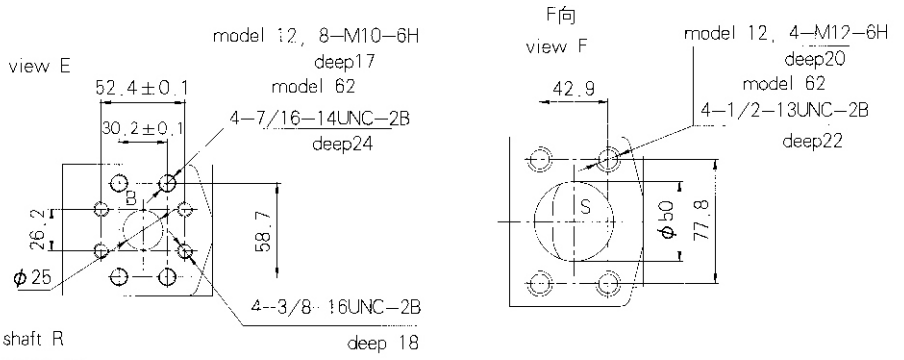


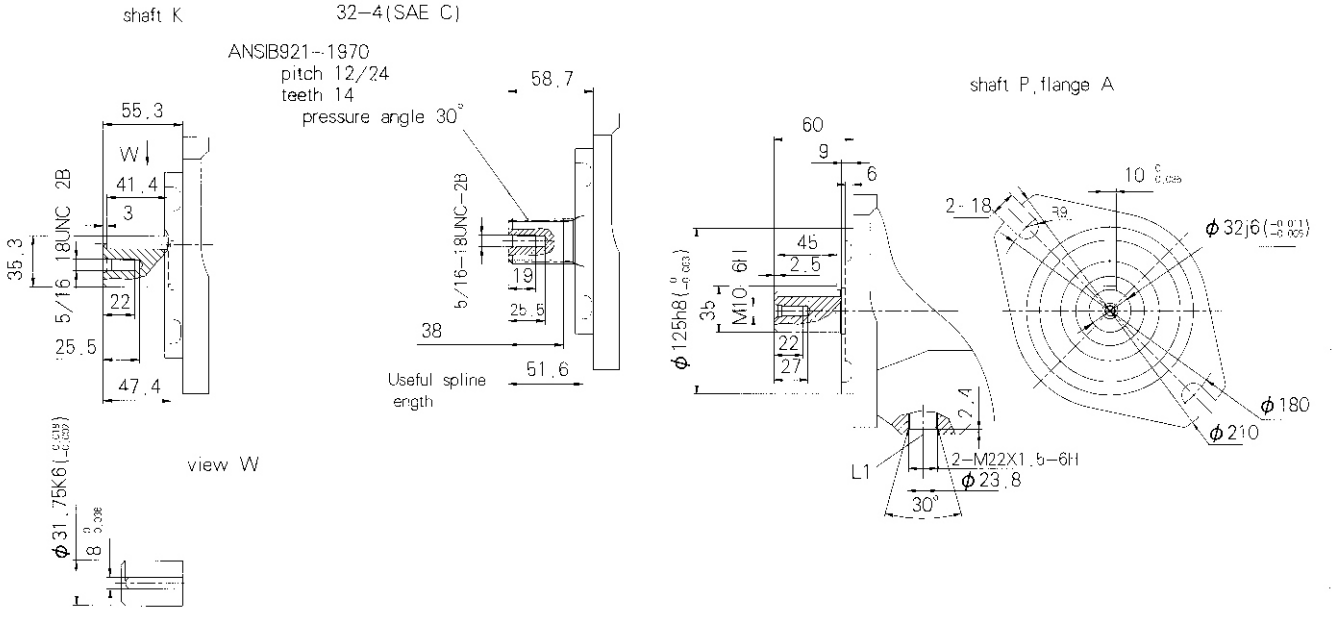
# Mounting Dimension, Size71

Service ports on sides; no through drive, Models 62NOO and 12NOO

Without considering adjustment



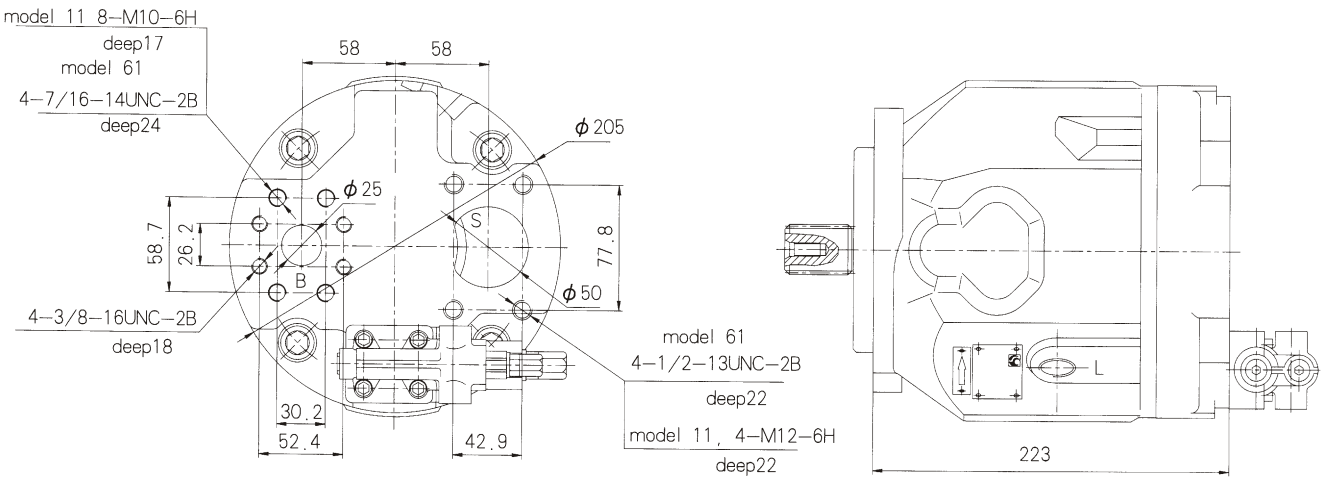



# Variable displacement pump LIOVO, Series 31

## Mounting Dimension, Size71

Service ports at rear; no through drive, Models 61NOO and 11NOO

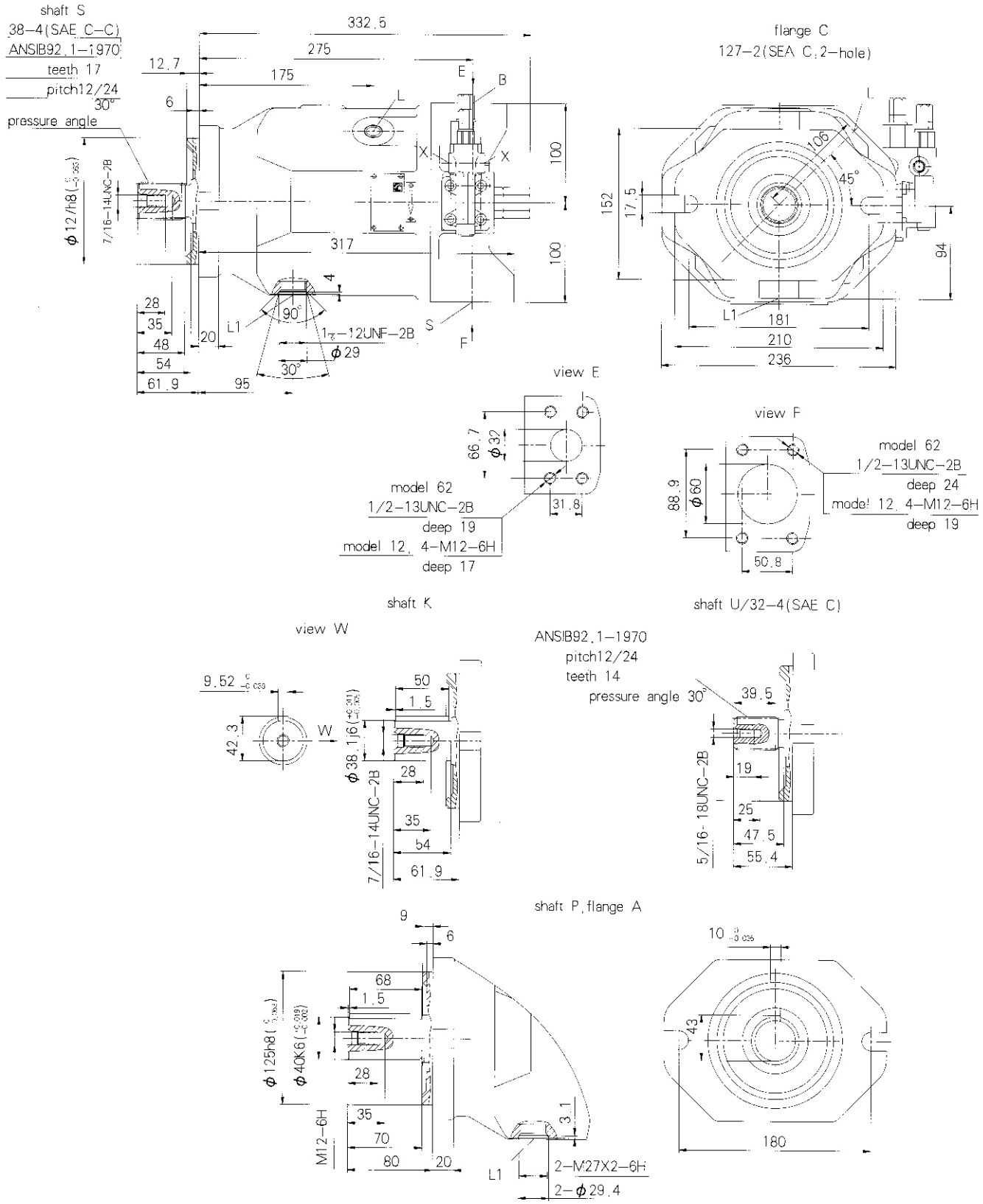
Without considering adjustment



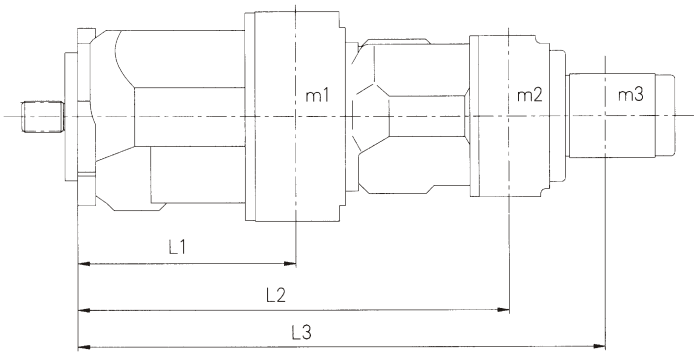
# Mounting Dimension, Size100

Service ports at rear; no through drive, Models 62NOO and 12NOO

Without considering adjustment



Permissible moment of inertia




m1 , m2 , m3 [Kg] Mass of pump
L1 , L2 , L3 [mm] Distance between centres of gravity

$Mm=(m1 \cdot L1+m2 \cdot L2+m3 \cdot L3) \cdot \frac{1}{102}$ [Nm]

| Sizes | | 28 | 45 | 71 | 100 | 140 |
|---|---|---|---|---|---|---|
| Mm | Nm | 88 | 137 | 216 | 300 | |
| m1 | kg | 15 | 21 | 33 | 45 | |
| L1 | mm | 110 | 130 | 150 | 160 | |

## Through drive

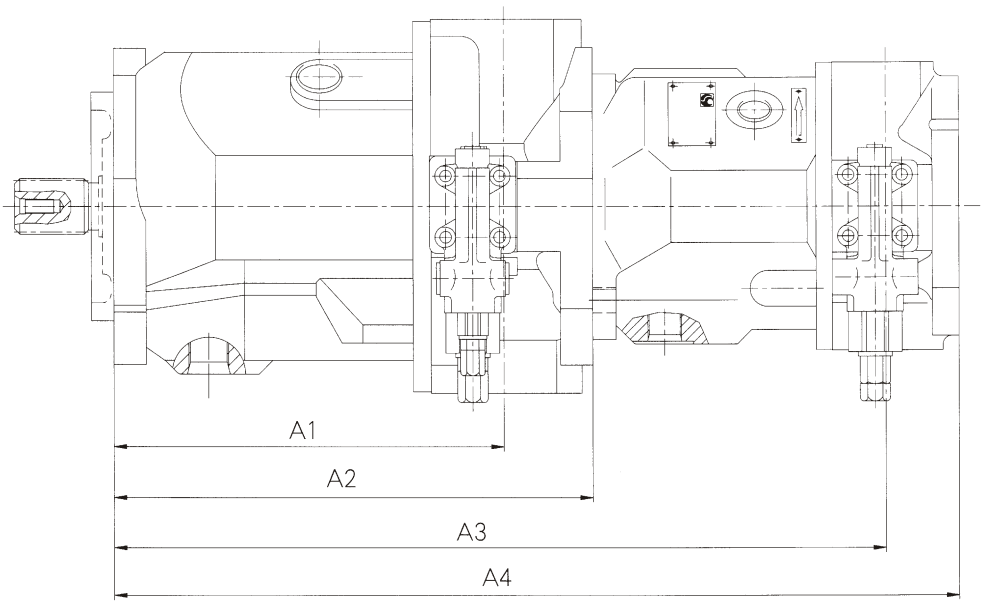
Axial piston unit L10VO can be supplied with a through drive, as shown in the ordering code on page 3.
The type of through drive is determined by codes (K01-K17). If the combination pump is not mounted in the factory, t
he simple type code is sufficient.
Included in this case are;
Coupling sleeve, seals and if necessary a sandwich flange.

## Combination pumps

By mounting combination pumps circuits independent of each other are available for use.
1.If the combination pump consists of 2 L10VO pumps and if these are to be delivered ready assembled, then the two type codes ate to be combined with a "+"
Ordering Example; L10VO71DR/3R-PSC62K02+L10VO28DR/31R-PSC62NOO
2. If a gear pump or radial piston pump is to be mounted in the factory as a second pump. It contains a list of the various pump combinations together with the type code of the first pump.

# Unit dimensions of combination pumps

L10VO+L10VO



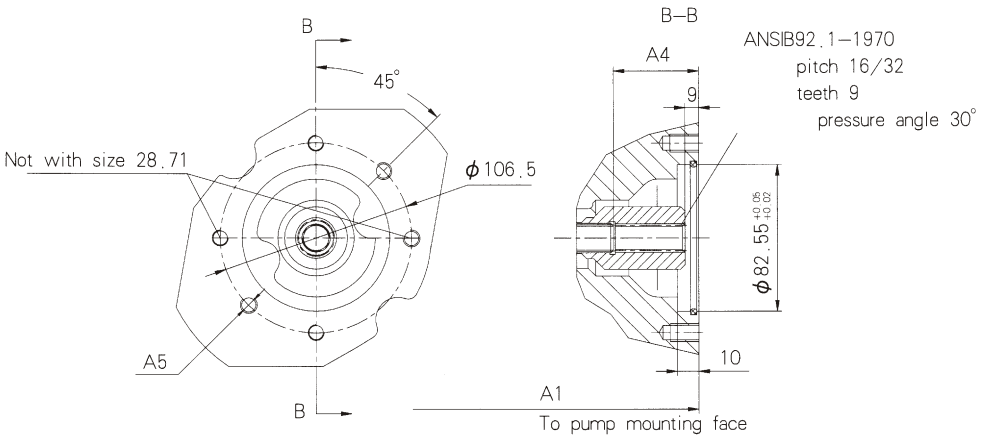

| Pump 1 / Pump 2 | L10VO28 | | | | L10VO45 | | | | L10VO71 | | | | L10VO100 | | | | L10VO140 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A1 | A2 | A3 | A4 | A1 | A2 | A3 | A4 | A1 | A2 | A3 | A4 | A1 | A2 | A3 | A4 | | | | |
| **L10VO28** | 165 | 204 | 369 | 408 | 184 | 229 | 394 | 423 | 217 | 267 | 432 | 461 | 275 | 338 | 503 | 532 | | | | |
| **L10VO45** | - | - | - | - | 184 | 229 | 413 | 458 | 217 | 267 | 451 | 486 | 275 | 338 | 522 | 557 | | | | |
| **L10VO71** | - | - | - | - | - | - | - | - | 217 | 267 | 484 | 534 | 275 | 338 | 555 | 605 | | | | |
| **L10VO100** | - | - | - | - | - | - | - | - | - | - | - | - | 275 | 338 | 613 | 676 | | | | |
| **L10VO140** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | |

# Variable displacement pump LIOVO,Series 31

## Dimensions of through drives

### Flange SAE 82-2

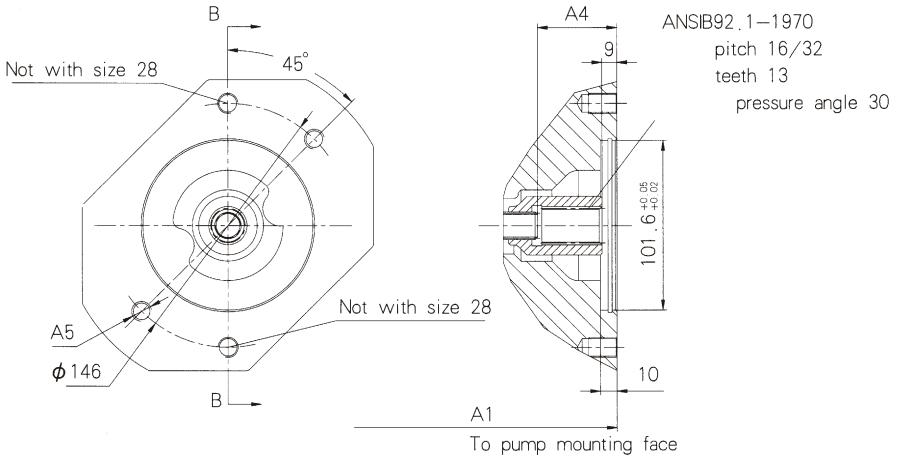
(SAE A 2-hole) for mounting of external gear pump G2 or internal gear pump 1 PF2GC2/3-1X/XXXXR07MU2; Ordering code K01




| Sizes | A1 | A4 | A5 |
|---|---|---|---|
| 28 | 204 | 47 | 4-M10-6H (16 deep) |
| 45 | 229 | 53 | 6-M10-6H (16 deep) |
| 71 | 267 | 60 | 4-M10-6H (20 deep) |
| 100 | 338 | 65 | 6-M10-6H (20 deep) |
| 140 | | | |

### Flange SAE 101-2

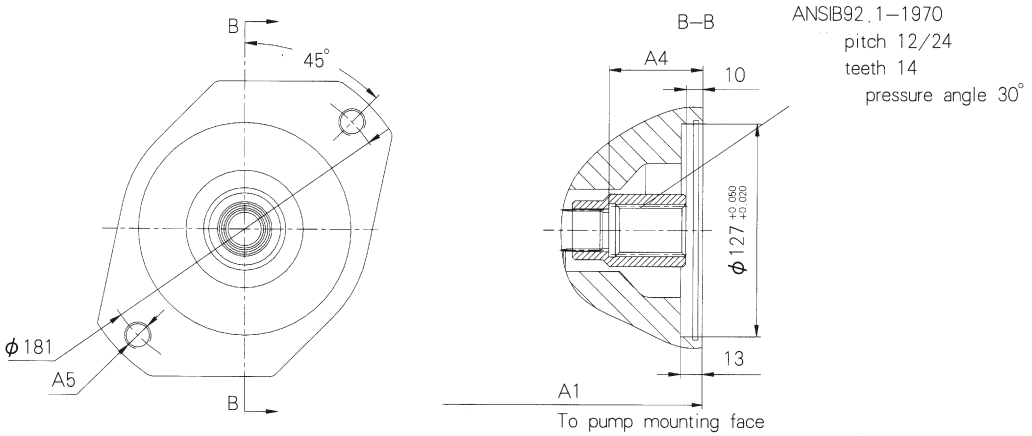
(SAE B 2-hole) for mounting of external gear pump G3 or L10VO28 (shaft S)




| Sizes | A1 | A4 | A5 |
|---|---|---|---|
| 28 | 204 | 47 | 2-M10-6H (15 deep) |
| 45 | 229 | 53 | 4-M10-6H (18 deep) |
| 71 | 267 | 60 | 4-M10-6H (20 deep) |
| 100 | 338 | 65 | 4-M10-6H (20 deep) |
| 140 | | | |

## Flange SAE 101-2

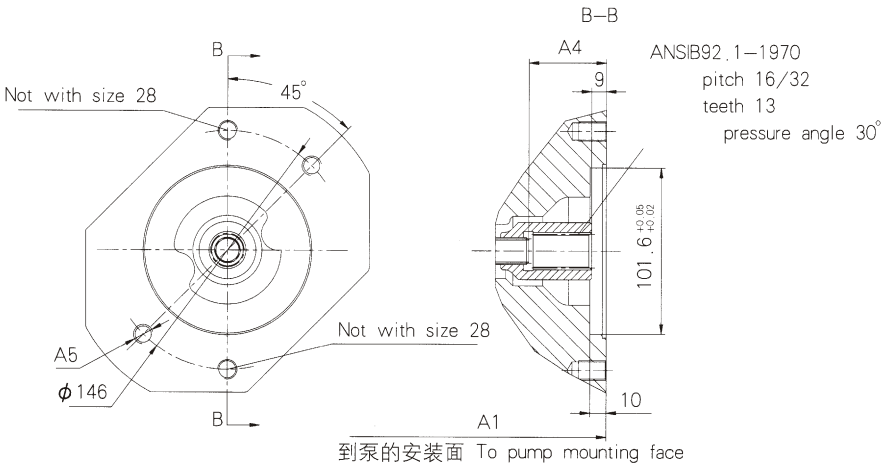
(SAE B 2-hole) for mounting of G4 OR L10VO28 (shaft S); Ordering code




| Sizes | A1 | A4 | A5 |
|---|---|---|---|
| 28 | 204 | 47 | 2-M12-6H (15 deep) |
| 45 | 229 | 53 | 4-M12-6H (18 deep) |
| 71 | 267 | 60 | 4-M12-6H (20 deep) |
| 100 | 338 | 65 | 4-M12-6H (20 deep) |
| 140 | | | |

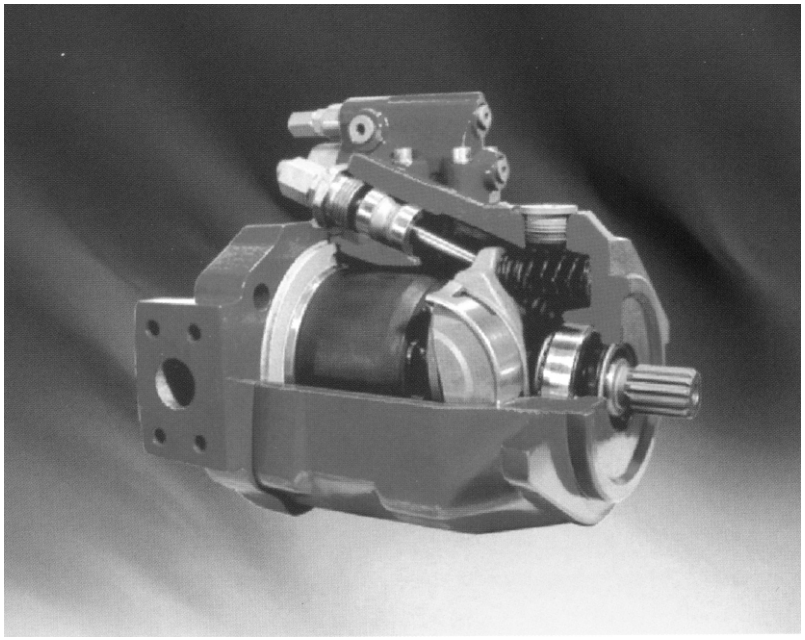
## Flange SAE 127-2

(SAE C 2-hole) for mounting of L10VO71 (shaft S); Ordering code K07




| Sizes | A1 | A4 | A5 |
|---|---|---|---|
| 71 | 267 | 60 | 2-M16-6H (18 deep) |
| 100 | 338 | 65 | 2-M16-6H (25 deep) |
| 140 | | | |

# Variable displacement pump L10SO, Series 52/53



## Features:

Axial piston pump L10VSO in swashplate design is used for hydrostatic transmissions in open loop circuits. Flow is proportional to drive speed and displacement. By adjusting the position of the swashplate it is possible o smoothly vary the flow.

**-flange connections to SAE-UNC or SAE metric**

**-2 leakage ports**

**-High permissible speeds**

**-Good suction characteristics**

**-Low service life**

**-High power/weight ratio**

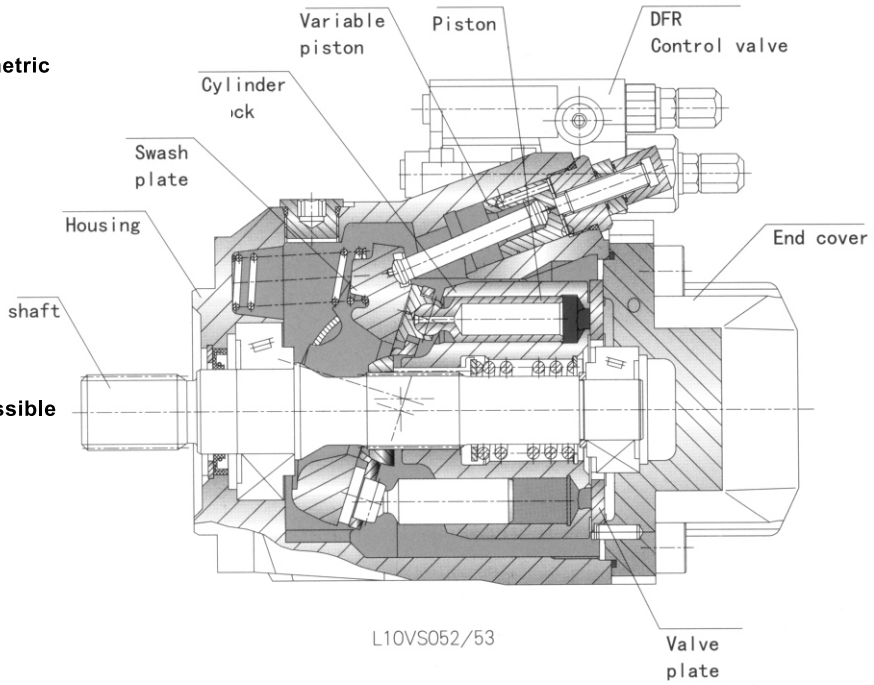
**-Long service life**

**-Short control times**

**-Axial and radial loading of drive shaft possible**

**-Wide range of controls**

**Through drive option for multi-circuit**



# Technical date

## 1.Inut operating pressure range

Absolute pressure at port S (A)

Pabs min .....0.8bar

Pabs max.....3bar

## 2.Output operating pressure range

Pressure at port B

Nominal pressure $P_N$.....250bar

Peak pressure Pmax.....315bar

## 3.Case drain pressure

Maximum pressure of leakage fluid (at ports L, L1), Maximum 7 psi (0.5 bar) higher than input pressure at port S, but not higher than 30 psi (2 bar) absolute.

## 4. Direction of flow

(S to B)

## 5. Table of values (theoretical values, without considering mh and v ; values rounded)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Size** | | | | 28 | 45 | 60 | 85 |
| **Displacement** | | Vgmax | $cm^3$ | 28 | 45 | 60 | 85 |
| **Max. Sped** | At Vgmax | Nomax | rmp | | 2600 | 2700 | |
| **Max. Flow** | At Nomax | Nomax | L/min | | 117 | 162 | |
| **Max. Power** | At Nomax | Pomax | kW | | 49 | 68 | |
| **Max. Torque** | At Vgmax | Tmax | Nm | | 179 | 238 | |
| **Weight (without fluid)** | | m | kg | | 18 | 22 | |

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

# Variable displacement pump L10SO,Series 52/53

## Ordering Code:

| L10V | 0 | 45 | DFR | / | 52/53 | R | - | P | S |
|---|---|---|---|---|---|---|---|---|---|

**Axial piston unit**

| | |
|---|---|
| Swash plate variable pump | L10VS |

**Mode of operation**

| | |
|---|---|
| Pump, open circuit | 0 |

**Size**

| | | | | |
|---|---|---|---|---|
| Displacement Vgmax ($cm^3$) | 28 | 45 | 60 | 85 |

**Control devices**

| | | | | | |
|---|---|---|---|---|---|
| Pressure control<br>Remote control | - | ● | ● | - | DR<br>DRG |
| Pressure and flow control.<br>X port closed | - | ● | ● | - | DFR<br>DFR1 |

**Series**

| | |
|---|---|
| Series | 52/53 |

**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 | 45 | 71 | 100 | 140 | |
|---|---|---|---|---|---|
| SAE-splined shaft | - | ● | ● | - | S |
| SEA-splined shaft, reinforced (higher thru drive torques) | - | ● | ○ | - | R |
| SAE-splined shaft, smaller size (not for pumps with thru drive) | - | ● | ● | - | U |
| SAE-splined shaft, reinforced U-ype shaft | - | - | - | - | W |
| SAE-keyed shaft | - | ● | ● | - | K |
| Parallel with key DIN 6885 | - | ● | ● | - | P |

| | C | 62 | N00 |
|---|---|---|---|

| Thru-drive | | | 28 | 45 | 60 | 85 | |
|---|---|---|---|---|---|---|---|
| Without through drive | | | - | ● | ● | - | N00 |
| With thru-drive, pump with side port only | | | | | | | |
| Mounting flange | Shaft/coupling | For the mounting of: | | | | | |
| 82-2 (SAE A) | 16-4 (SAE A) | G2,GC2/GC3-1X | - | ● | - | - | K01 |
| 101-2 (SAE B) | 25-4 (SAE B-B) | L10V045 (shaft S), PGH4 | - | ● | - | - | K04 |
| 101-2 | | Gear pump | - | ○ | - | - | K10 |
| 80-2 | Keyed shaft | Gear pump | - | ● | - | - | Kp1 |

| Service ports (Pressure port B and suction port S) | 28 | 45 | 60 | 85 | | |
|---|---|---|---|---|---|---|
| Rear ports, UNC mounting screws | - | ○ | ● | - | 61 | Port pos.61,11,91and 41 only for version without through drive |
| Opposite side ports, UNC mounting screws | - | ● | ● | - | 62 | |
| Rear ports, metric mounting screws | - | ○ | ● | - | 11 | |
| Opposite side ports, metric mounting screws | - | ● | ● | - | 12 | |
| SAE-threaded rear | - | ● | ○ | - | 64 | |

| Mounting flange | 28 | 45 | 60 | 85 | |
|---|---|---|---|---|---|
| SAE 2 hole | - | ● | ● | - | C |
| ISO 2 hole | - | ○ | ○ | - | A |
| SAE 4 hole | - | ○ | ● | - | D |

**Multiple pumps**

1.If a second Liyuan hydraulic pump is to be factory-mounted, then both ordering codes are to bespecified, combined with a "+" . Order code 1st pomp + Order code 2nd pump
Ordering example; L10V071DR/31R-PSC62K02+L10V028DR/31R-PSC62N00

2.If a gear pump is to be factory-mounted please contact us.

● = available

○ = in preparation

- = not available

# Variable displacement pump LIOVSO,Series 52/53

## Fluid

**1.Fluid: MR20S(Q/TCNK12-2001)**

**2.Operating viscosity range**

For optimum efficiency and service life we recommend that the operating viscosity (at operating temperature) be selected in the range:

Referred to tank temperature (open loop circuit).

Limits of viscosity range

(The following values are valid for extreme operating conditions:)

Vmin=10 mm2/s

For short periods at max. leakage oil temperature of 80℃

Vmin=1000 mm2/s

For short periods upon cold start.

**3.Temperature range**

$t_{min}$=-20℃; $t_{max}$ =+80℃

**4.Filtration**

In order to ensure reliable operation of the axial piston unit, theoperating fluid must be maintained to a cleanliness class of at least; 16/19 to ISO4406. This may be achieved with filter elements, cleanliness class of pump leakage fluid 10um.

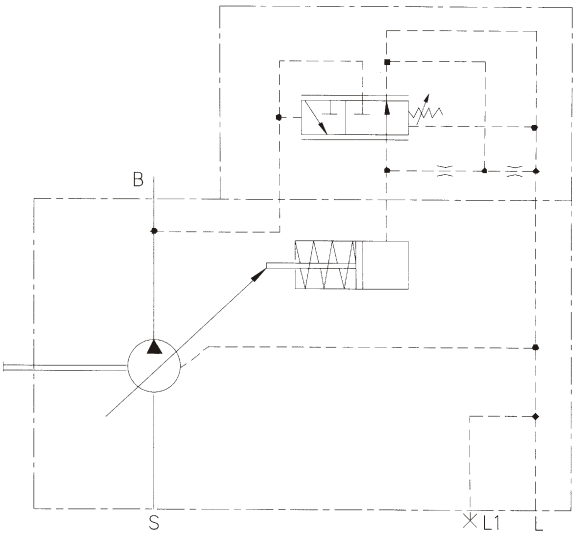
## Installation notes

The pump housing must be filled with fluid during commissioning and remain full when operating.

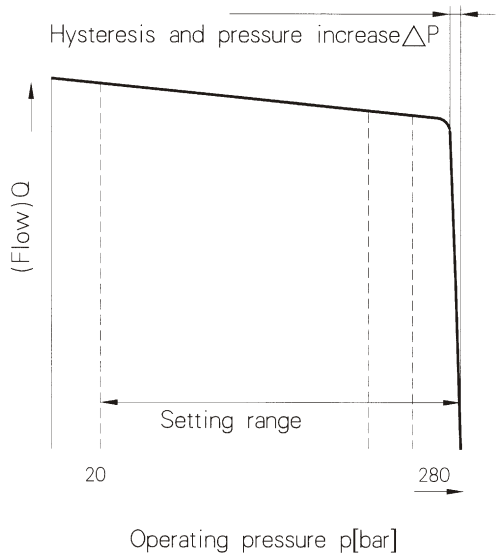
The concentricity between engine transmission shaft and pump shaft must less than Φ00.05mm

# DR Pressure control

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.




Static characteristic (at n1=1450rmp; toil=50℃)




**Ports**

| | |
|---|---|
| B | Pressure port |
| S | Suction port |
| L,L1 | Case drain ports (L1 sealed) |

## Control data

Hysteresis and repetitive accuracy △p.....max. 3bar

**Max. pressure increase**

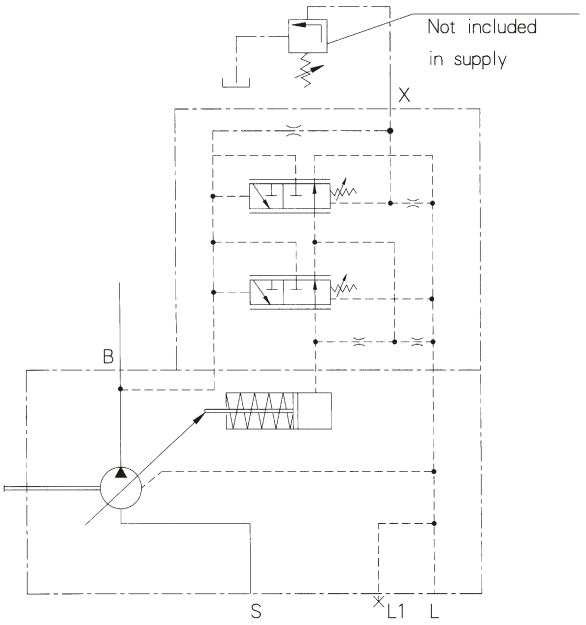
| Size | | 28 | 45 | 60 | 85 |
|---|---|---|---|---|---|
| △P | Bar | | 6 | 8 | |

Pilot oil consumption.0.....max. approx. 3 L/min

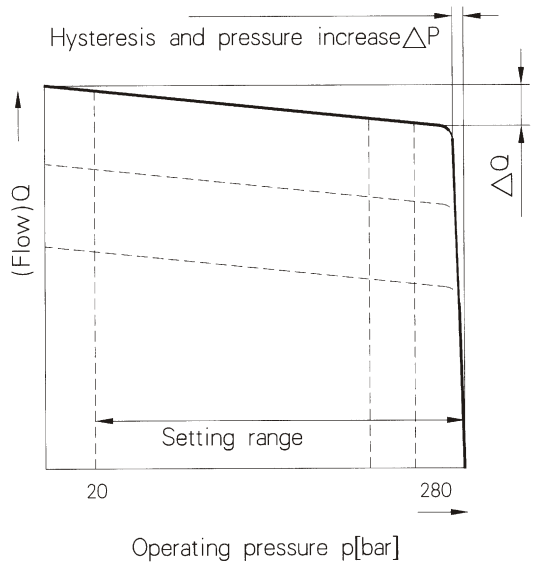
# Variable displacemen pump LIOVSO,Series 52/53

## Pressure control, remote control

Function and design as for DR.
A pressure relief valve may be externally piped to port X for remote control purposes. It is not, however, included with the DRG control.
The differential pressure at the pilot b\valve is set as standard to 20 bar and this results in a pilot flow of 1,5 L/min. If antother setting is required (in the range 10-20 bar ), please state this in clear text.




Static characteristic (at n1=1450rmp; toil=50℃)




**Ports**

| | |
|---|---|
| B | Pressure port |
| S | Suction port |
| L,L1 | Case drain ports (L1 sealed) |
| X | Pilot pressure port |

### Control data

Hysteresis and repetitive accuracy p.....max. 3bar

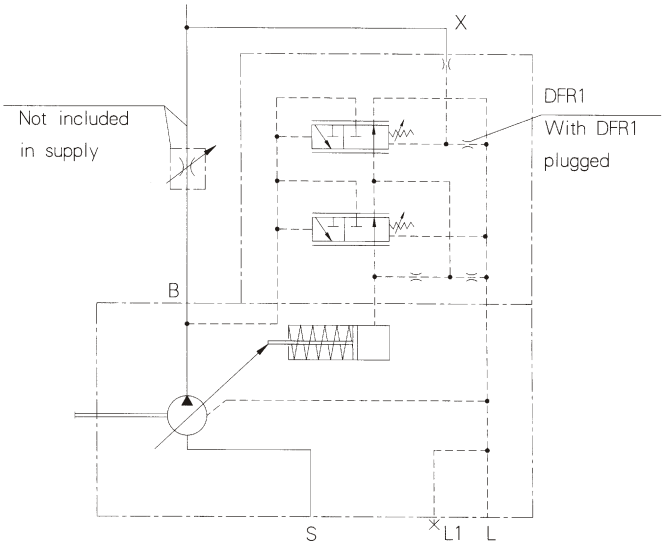
### Max. pressure increase

| Size | | 28 | 45 | 60 | 85 |
|---|---|---|---|---|---|
| △P | Bar | | 6 | 8 | |

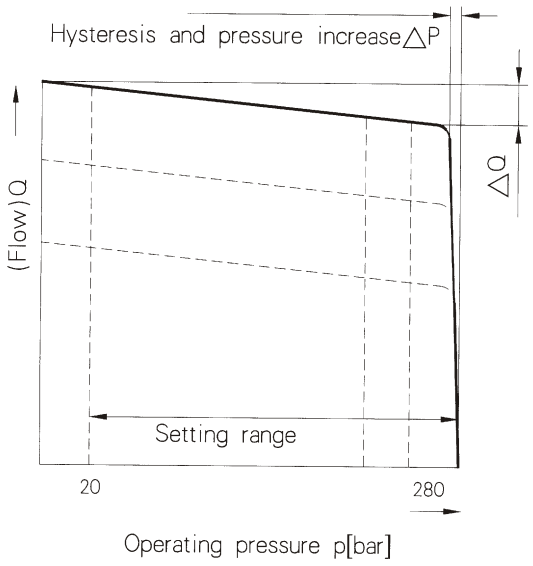
Pilot oil consumption.0.....max. approx. 4.5 L/min

# DFR/DFR1 Pressure / flow control

In addition to the pressure control function, the pump flow may bevaried by means of a differential pressure at the actuator (e.g. an orifice).
In model DFR1 the X orifice is plugged.




Static characteristic (at n1=1450rmp; toil=50℃)

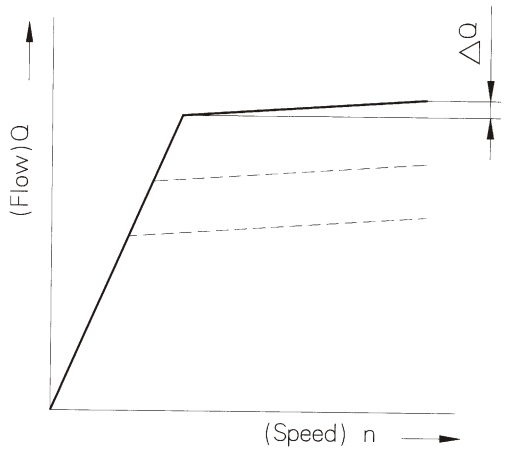



**Ports**

| | |
|---|---|
| B | Pressure port |
| S | Suction port |
| L,L1 | Case drain ports (L1 sealed) |
| X | Pilot pressure port |

# Variable displacemen pump LIOVSO,Series 52/53

Static characteristic at variable speed




## Flow control/ differential pressure △P:

Adjustable between 10 and 22 bar (higher values on request)
Standard setting: 14 bar.
If a different setting is required, pleasestate in clear text.
When port X is unloaded to tank, a zero stroke pressure of P=18.2 bar ("stand by") results.

## Control data

For pressure control technical data see DR Pressure control

Max. flow deviation (hysteresis and increase ) measured at drive speed n=1450rpm

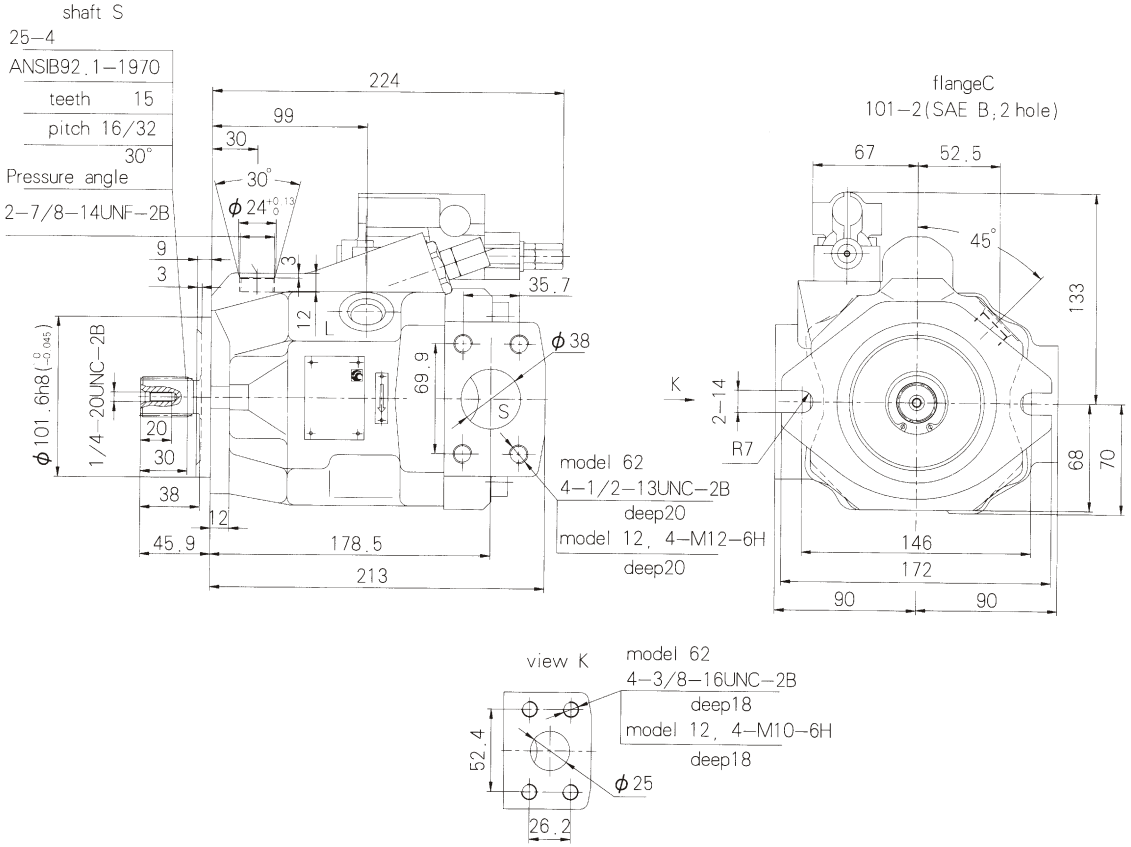
| Size | | 28 | 45 | 60 | 85 |
|---|---|---|---|---|---|
| △Qmax | L/min | | 1.8 | 2.8 | |

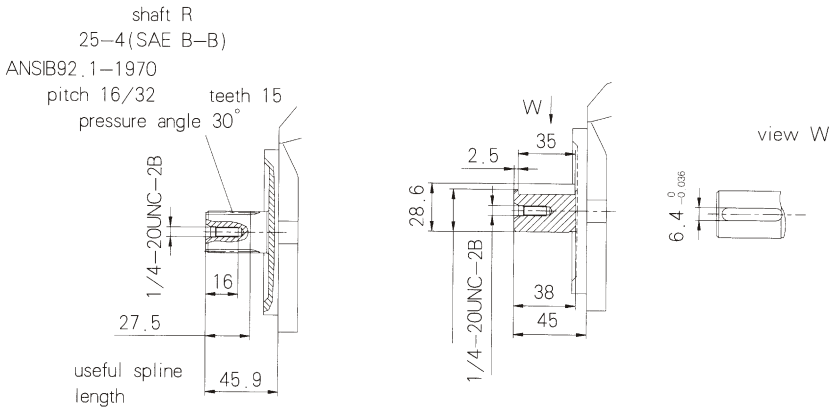
Pilot oil consumption DFR.....max. approx. 3-4, 5 L/min

Pilot oil consumption DFR1..... max. approx. 3 L/min

# Mounting Dimension, sizes45

Version L10VSO45DR/52R-XXC62/12NOO

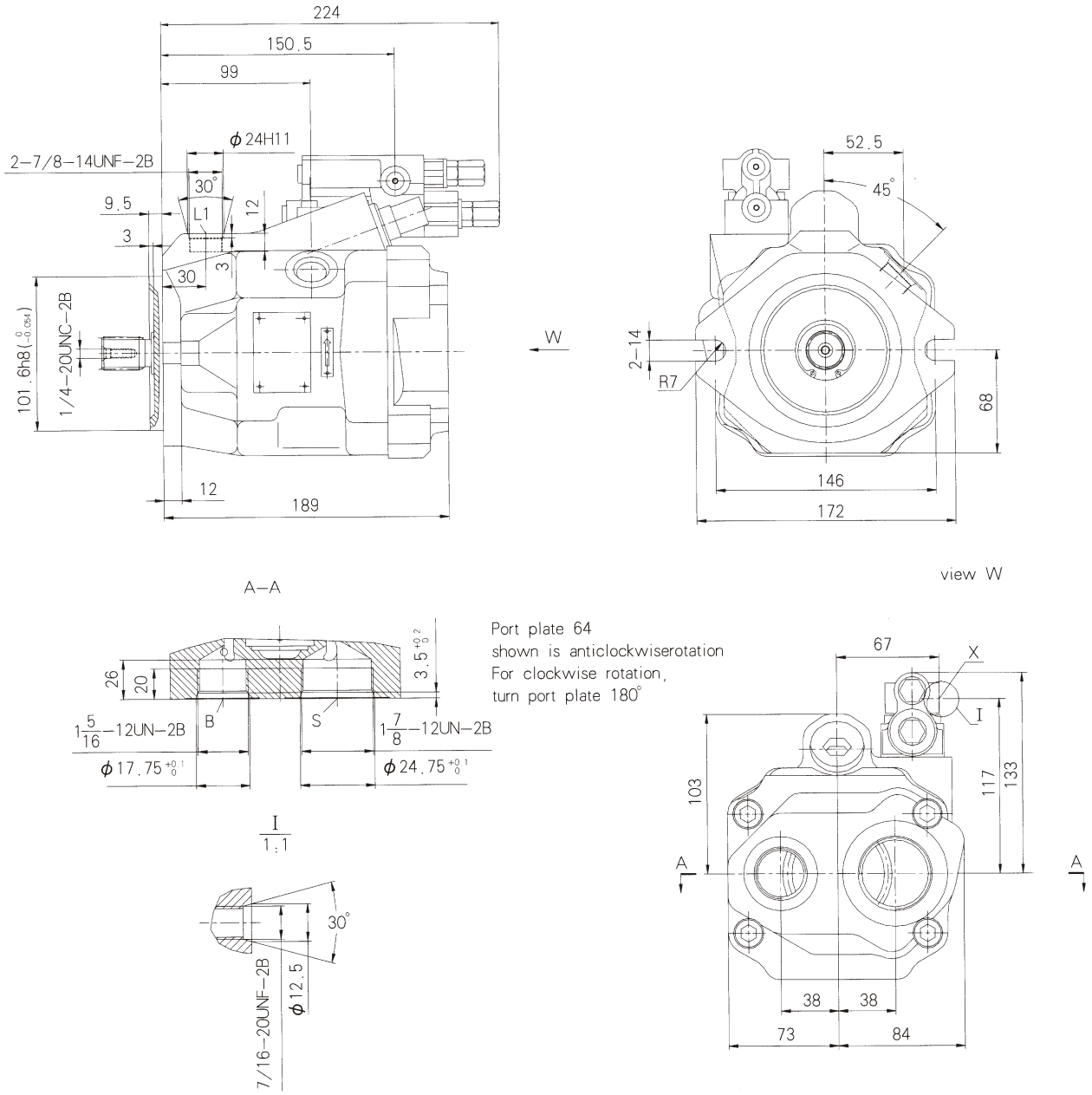


# Variable displacement pump L10VSO, Series 52/53

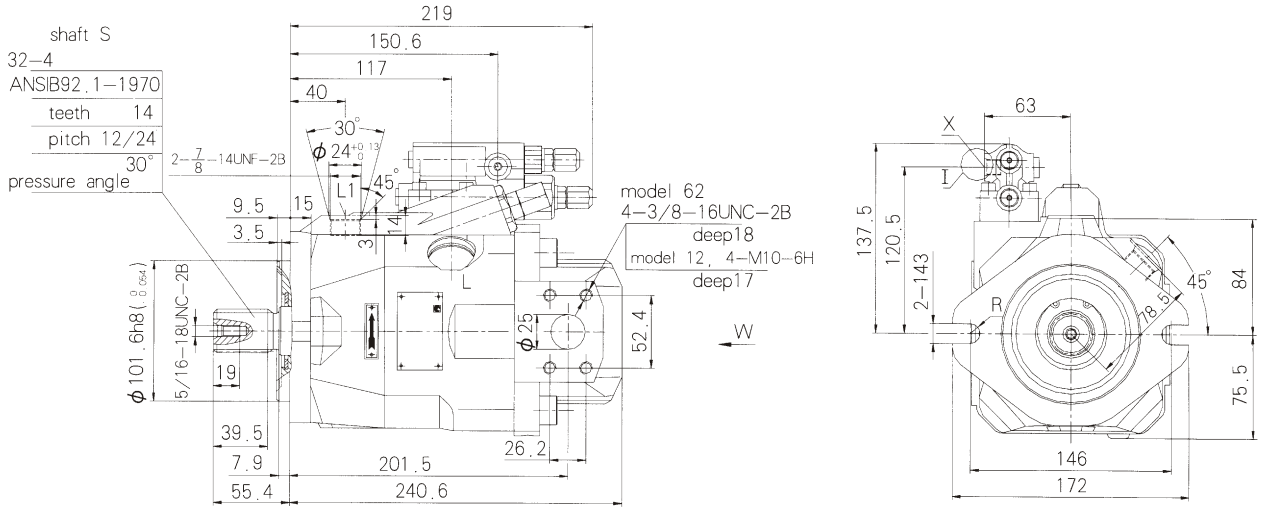
## Mounting Dimension, sizes45

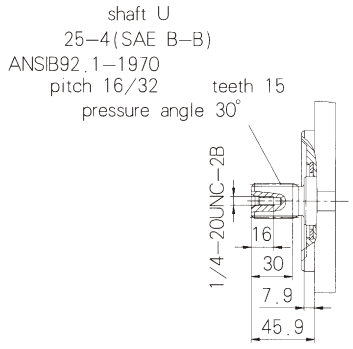
| | |
|---|---|
| Version L10VSO45 | DFR<br>DFR1 /52L-XXC64N00<br>DRG |

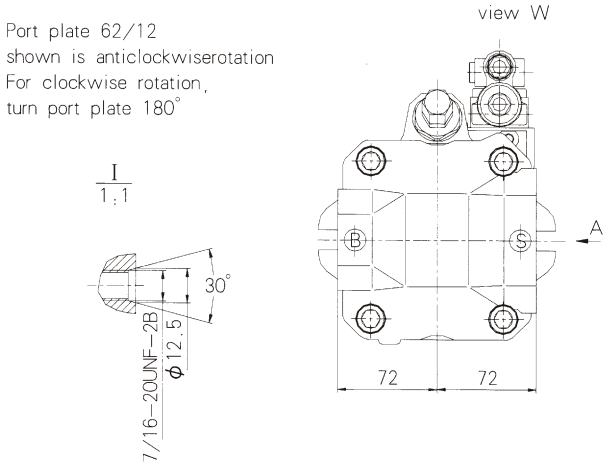


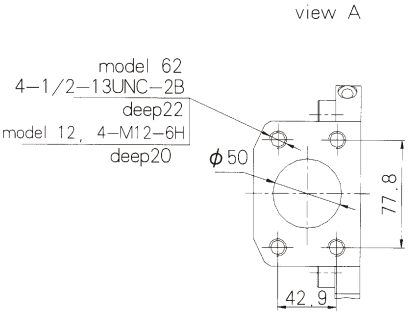
# Mounting Dimension, sizes60

| | |
|---|---|
| Version L10VSO60 | DFR<br>DFR1 /53L-XXC62/12N00<br>DRG |



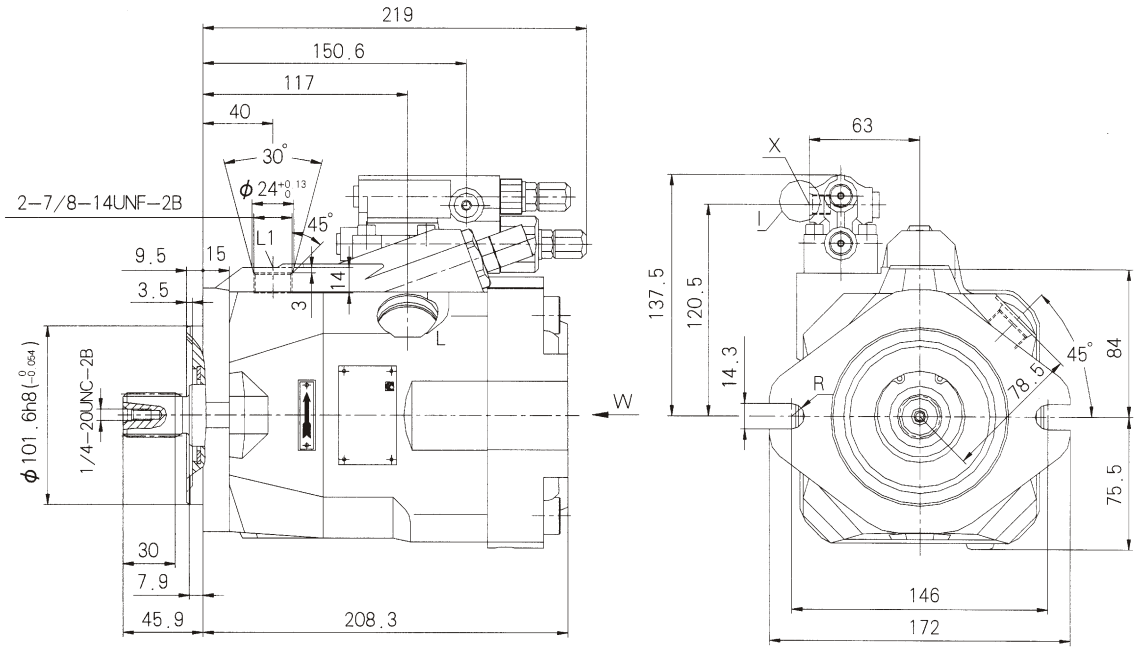



# Variable displacement pump LIOVSO, Series 52/53

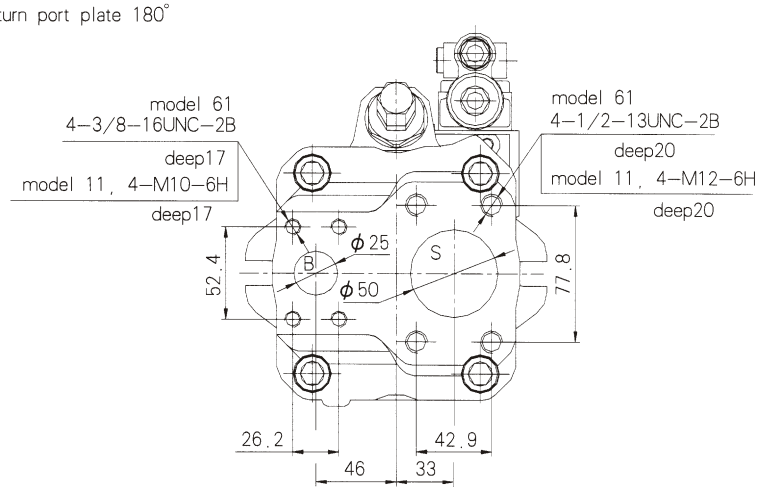
## Mounting Dimension, sizes60

| | |
|---|---|
| Version L10VSO60 | DFR<br>DFR1 /53L-XXC61/11N00<br>DRG |



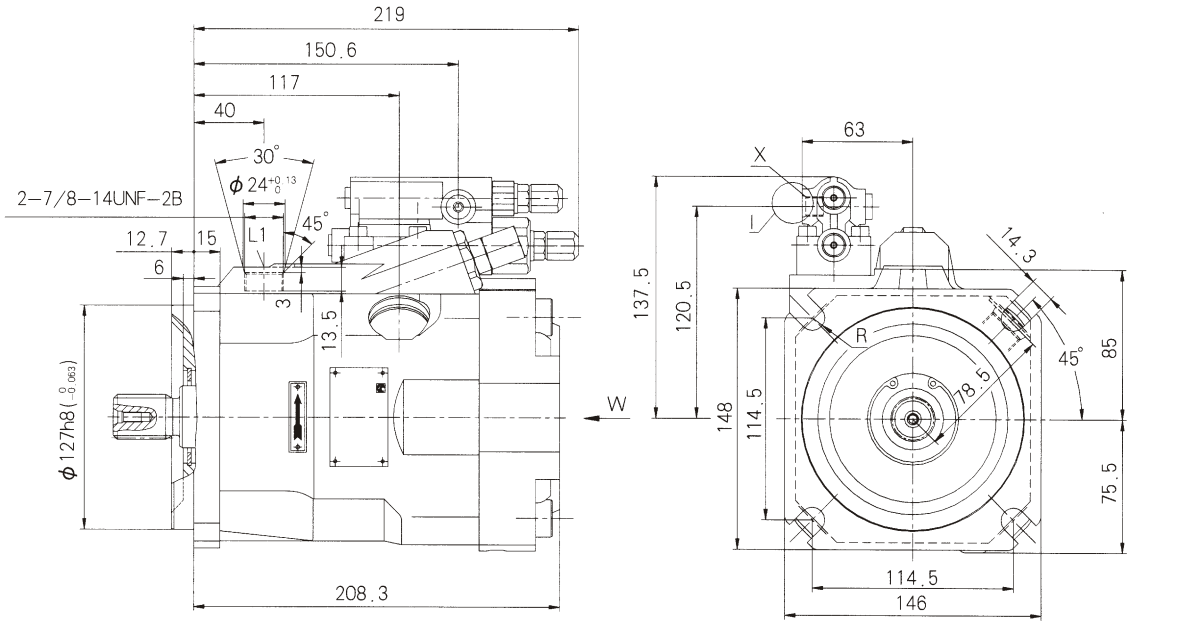

Port plate 61/11
shown is anticlockwiserotation
For clockwise rotation,
turn port plate 180°

view W



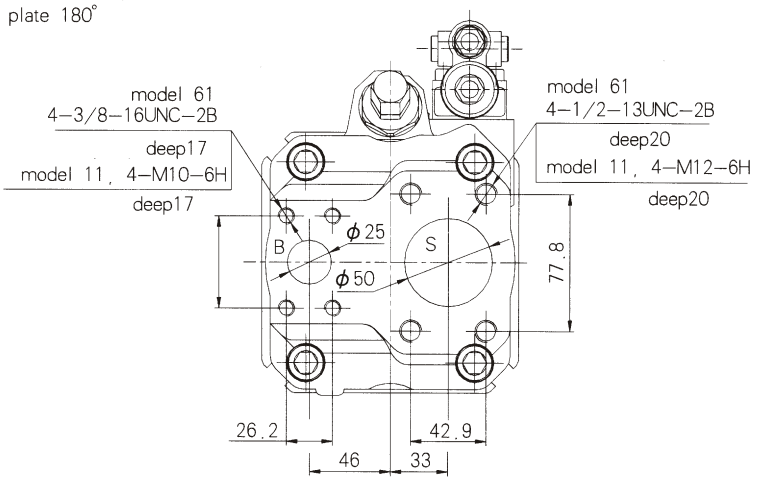
## Mounting Dimension, sizes60

| | |
|---|---|
| Version L10VSO60 | DFR<br>DFR1 /53L-XXD61/11N00<br>DRG |

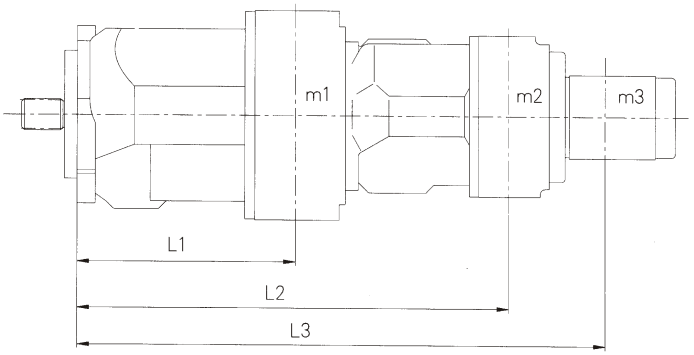



view W

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



Permissible moment of inertia




m1, m2, m3 [Kg] Mass of pump
L1, L2, L3 [mm] Distance between centres of gravity

$$Mm=(m1\cdot L1+m2\cdot L2+m3\cdot L3)\cdot \frac{1}{102}\ [Nm]$$

| Sizes | | 28 | 45 | 60 | 85 |
|---|---|---|---|---|---|
| m1 | kg | | 18 | 22 | |
| L1 | mm | | 95 | 100 | |

## Through drive

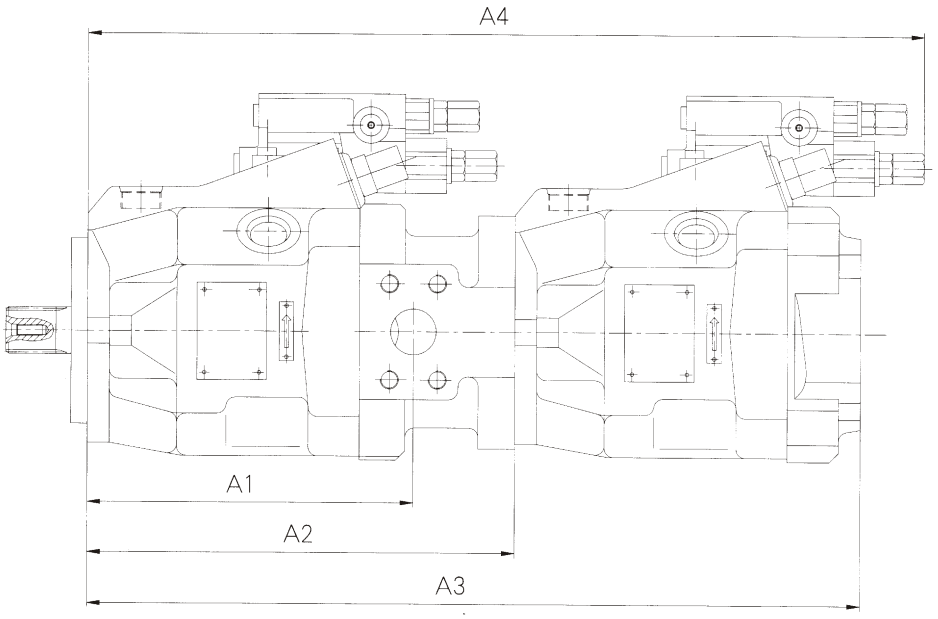
Axial piston unit L10VO can be supplied with a through drive, as shown in the ordering code on page 3.
The type of through drive is determined by codes (K01-K04). If the combination pump is not mounted in the factory, the simple type code is sufficient.
Included in this case are:
Coupling sleeve, seals and if necessary a sandwich flange.

## Combination pumps

1.If the combination pump consists of 2 L10VO pumps and if these are to be delivered ready assembled, then the two type codes ate to be combined with a "+"
Ordering Example; L10VSO45DR/52R-PSC62K04+L10VSO45DFR/52R-PSC62NOO
2.If a gear pump or radial piston pump is to be mounted in the factory as a second pump.
It contains a list of the various pump combinations together with the type code of the first pump.

# Unit dimensions of combination pumps

L10VSO+L10VSO



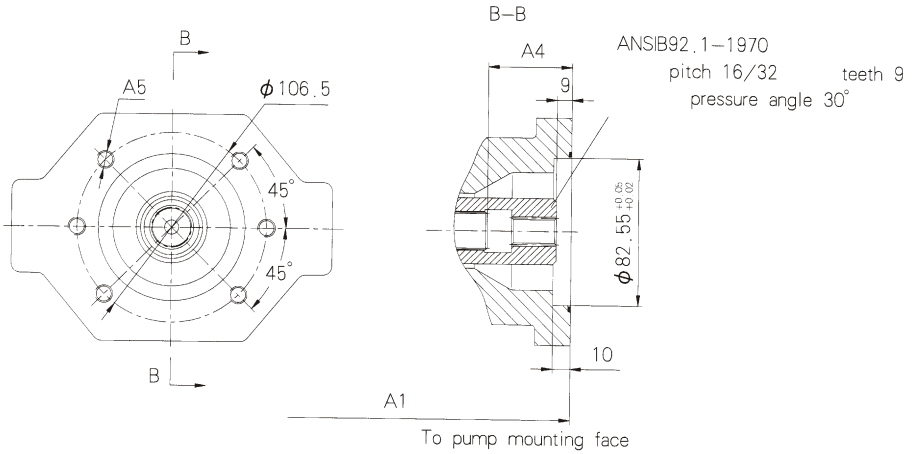

| Pump 1<br>Pump 2 | L10VO28 | | | | L10VO45 | | | | L10VO60 | | | | L10VO85 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A1 | A2 | A3 | A4 | A1 | A2 | A3 | A4 | A1 | A2 | A3 | A4 | A1 | A2 | A3 | A4 |
| **L10VO28** | | | | | | | | | | | | | | | | |
| **L10VO45** | - | - | - | - | 178 | 229 | 418 | 445 | 202 | 255 | 444 | 471 | | | | |
| **L10VO60** | - | - | - | - | - | - | - | - | 202 | 255 | 463 | 571 | | | | |
| **L10VO85** | - | - | - | - | - | - | - | - | - | - | - | - | | | | |

# Variable displacement pump LIOVO, Series 52/53

## Dimensions of through drives

### Flange SAE 82-2

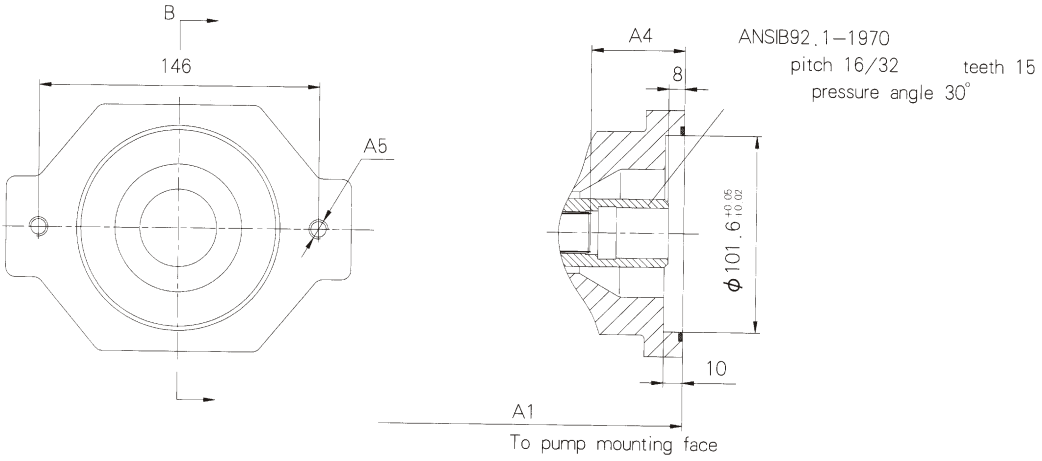
(SAE A 2-hole) for mounting of external gear pump G2 or internal gear pump 1 PF2GC2/3-1X/XXXXR07MU2; Ordering code K01




| Sizes | A1 | A4 | A5 |
|---|---|---|---|
| 28 | | | |
| 45 | 234 | 53 | 6-M10-6H (16 deep) |
| 60 | 255 | 59 | 6-M10-6H (16 deep) |
| 85 | | | |

### Flange SAE 101-2

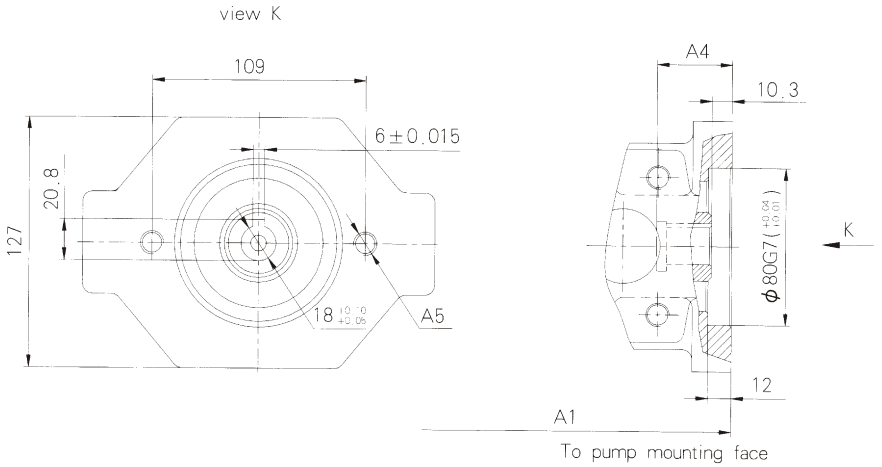
(SAE B 2-hole) for mounting an internally geared gear pump PGH4; Ordering code K04




| Sizes | A1 | A4 | A5 |
|---|---|---|---|
| 45 | 234 | 53 | 2-M12-6H (18 deep) |
| 60 | 255 | 59 | 2-M12-6H (18 deep) |

## Flange 80-2

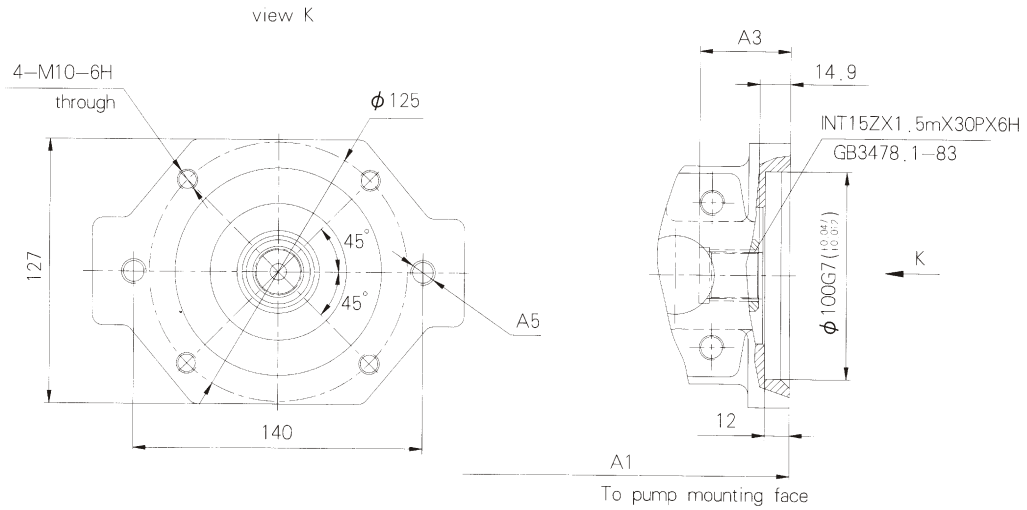
(2-hole) for mounting of gear pump; Ordering code KP1




| Sizes | A1 | A4 | A5 |
|---|---|---|---|
| 45 | 234 | 38.3 | 2-M10-6H (18 deep) |

## Flange 100-2

(2-hole) for gear pump; Ordering code K10




| Sizes | A1 | A4 | A5 |
|---|---|---|---|
| 45 | 234 | 43.9 | 2-M12-6H (18 deep) |