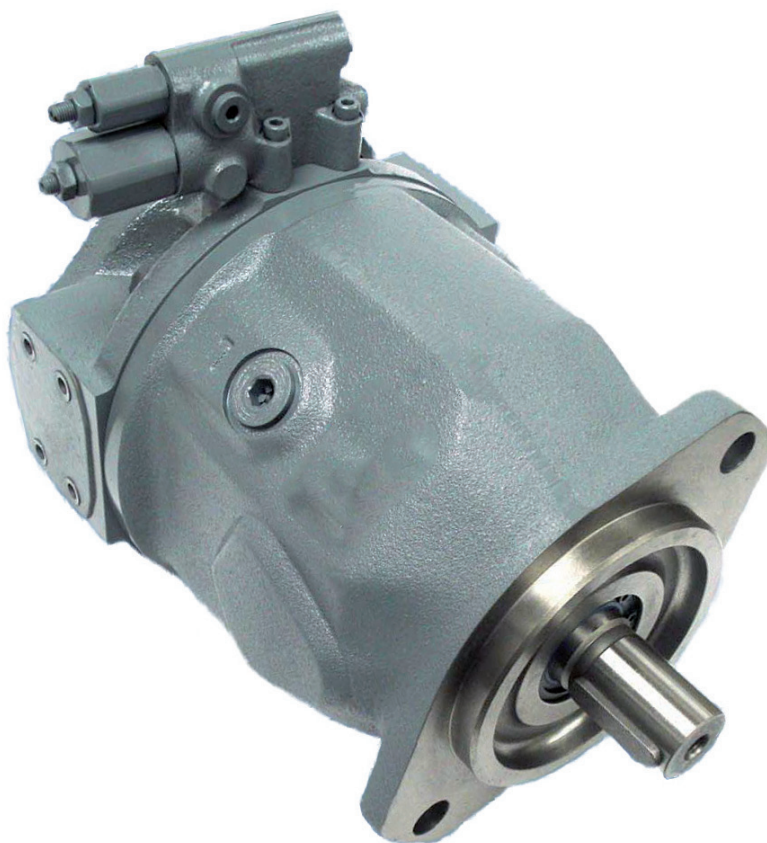


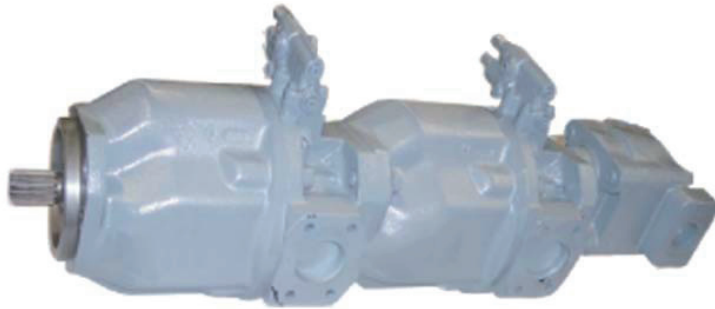
## PISTONS TECHNICAL CATALOG

– MA10V Series –





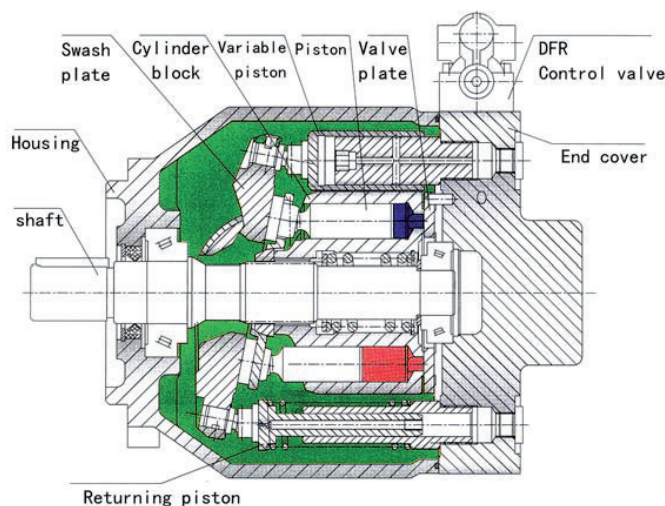
VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31



Features

Axial piston pump MA10VO 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 4000PSI (280 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 option for multi-circuit system
- SAE & ISO mounting ranges available



VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 31

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<sub>N</sub> 4000 PSI or (280 Bar)  
 Peak pressure ..... P<sub>max</sub> 5070 PSI or (350 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<sub>mh</sub> and η<sub>v</sub>; values rounded)

| Size                   |                                 |   | 18   | 28   | 45   | 71   | 100  | 140  |
|------------------------|---------------------------------|---|------|------|------|------|------|------|
| Displacement           |                                 | V <sub>gmax</sub> cm <sup>3</sup>         | 18   | 28   | 45   | 71   | 100  | 140  |
| Max. Speed             | at V <sub>gmax</sub>            | n <sub>omax</sub> rpm                     | 3000 | 3000 | 2600 | 2200 | 2000 | 1800 |
| Max. flow              | at n <sub>omax</sub>            | Q <sub>omax</sub> L/min                   | 59.4 | 84   | 117  | 156  | 200  | 252  |
| Max. power             | Δp = 4000 psi<br>(Δp = 280 bar) | at n <sub>omax</sub> P <sub>omax</sub> kW | 27.7 | 39   | 55   | 73   | 93   | 118  |
| Max. torque            | Δp = 4000 psi<br>(Δp = 280 bar) | at V <sub>gmax</sub> T <sub>max</sub> Nm  | 58.3 | 125  | 200  | 316  | 445  | 623  |
| Weight (without fluid) |                                 | m kg                                      | 26.5 | 15   | 21   | 33   | 45   | 60   |

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

6. Determination of Size

Imperial  
 Flow Q =  $\frac{V_g \cdot n \cdot \eta_v}{231}$  gpm

Metric  
 Flow Q =  $\frac{V_g \cdot n \cdot \eta_v}{1000}$  L/min

Torque T =  $\frac{V_g \cdot \Delta p}{24 \cdot \pi \cdot \eta_{mh}}$  lb-ft

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

Power P =  $\frac{Q \cdot \Delta p}{1714 \cdot \eta_t}$  HP

Power P =  $\frac{Q \cdot \Delta p}{600 \cdot \eta_t}$  kW

V<sub>g</sub> = geometric displacement cu.in. or [cm<sup>3</sup>] per rev.

Δp = differential pressure PSI or (Bar)

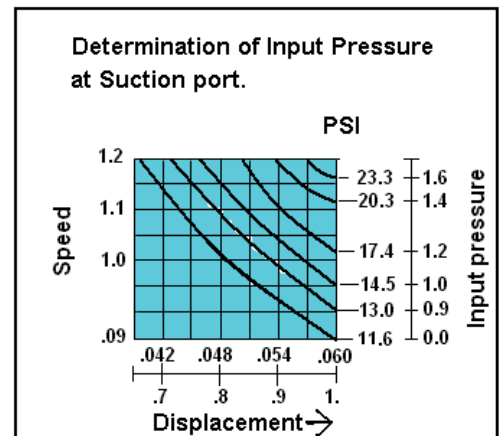
n = speed [rpm]

η<sub>v</sub> = volumetric efficiency

η<sub>mh</sub> = mechanical-hydraulic efficiency

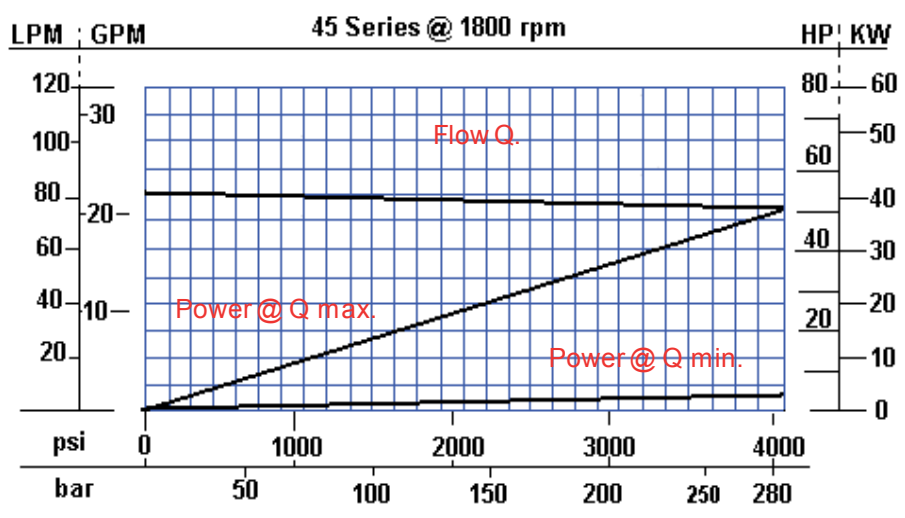
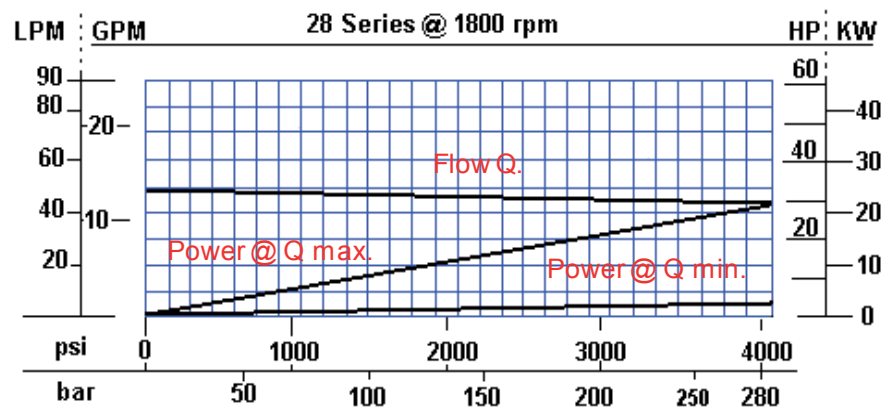
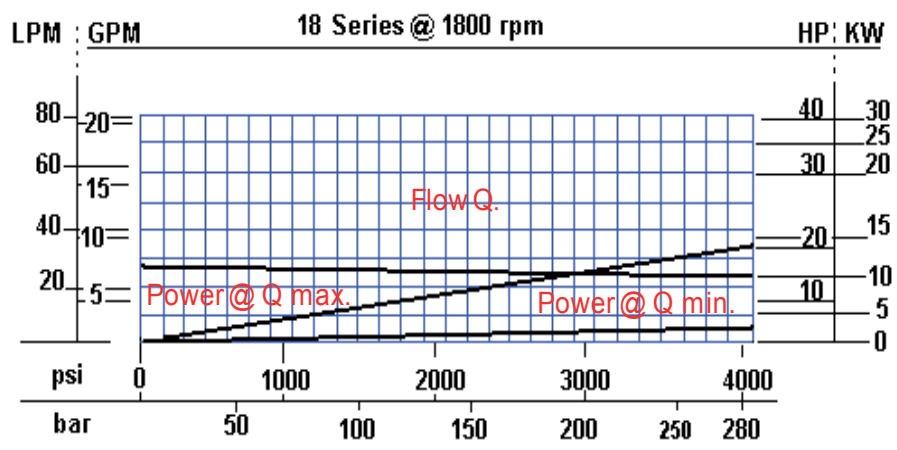
η<sub>t</sub> = total efficiency (η<sub>t</sub> = η<sub>v</sub> • η<sub>mh</sub>)

Q = Flow (gpm) or (L/min.)



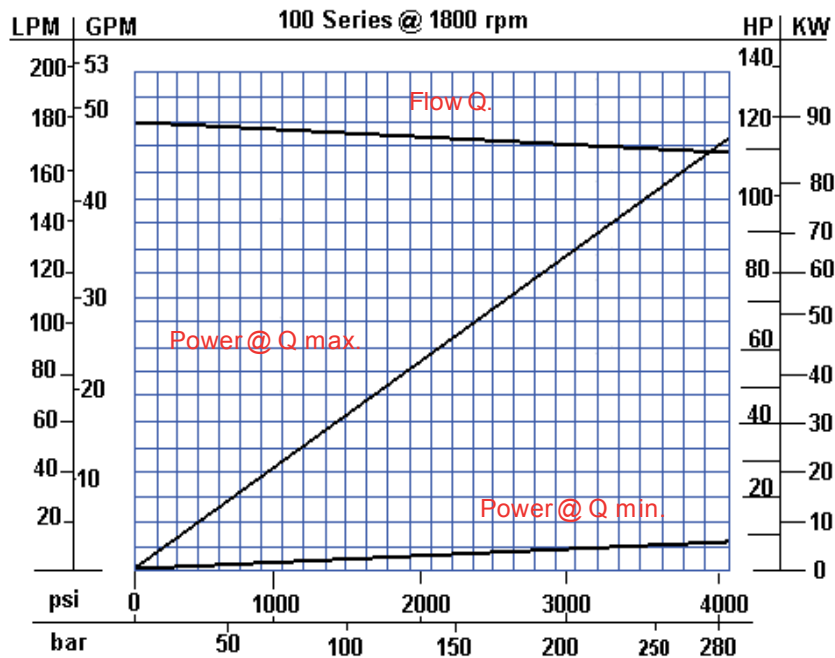
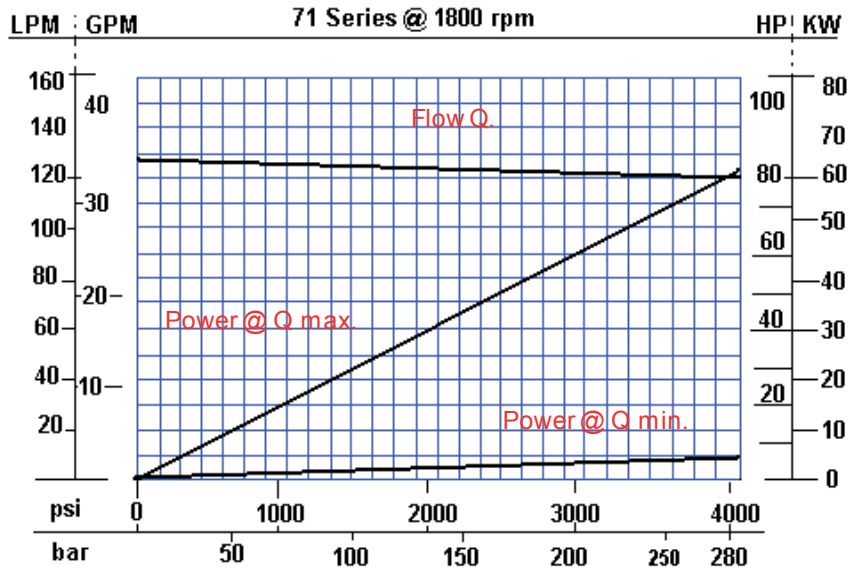
VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

Performance Information



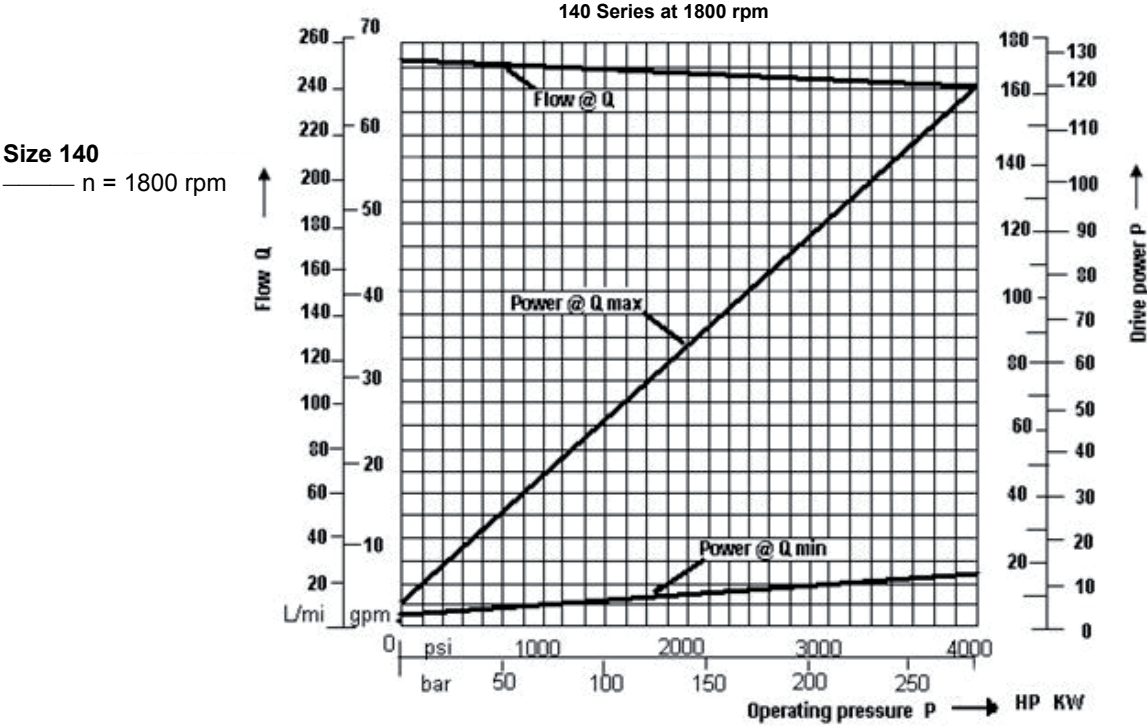
VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 31

Performance Information - *cont'd*



VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

Performance Information - *cont'd*



Total efficiency:

|  |   |
|--|---|
| Imperial   | Metric  |
| $\eta_t = \frac{Q \cdot P}{P_{Q \max} \cdot 1714}$ | $\eta_t = \frac{Q \cdot P}{P_{Q \max} \cdot 600}$ |

Volumetric efficiency:

$$\eta_v = \frac{Q}{Q_{\text{theor.}}}$$

VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

Ordering Code

|   |                   | MA10V | 0    | 71   | DR     | 31     | R      | P           | S |
|---|-------------------|-------|------|------|--------|--------|--------|-------------|---|
| <b>Axial piston unit</b>  |                   |       |      |      |        |        |        |             |   |
| Swash plate variable pump                                       | MA10V             |       |      |      |        |        |        |             |   |
| Swash plate variable pump, for industrial                       | MA10VS            |       |      |      |        |        |        |             |   |
| <b>Modes of operation</b>                                       |                   |       |      |      |        |        |        |             |   |
| Pump, open circuit  | O                 |       |      |      |        |        |        |             |   |
| <b>Size</b>   |                   |       |      |      |        |        |        |             |   |
| Displacement Vgmax (cm³)  |                   | 18    | 28   | 45   | 71     | 100    | 140    |             |   |
| <b>Control devices</b>  |                   |       |      |      |        |        |        |             |   |
| Pressure control  |                   | ●     | ●    | ●    | ●      | ●      | ●      | DR          |   |
| G - Remote control  |                   | ●     | ●    | ●    | ●      | ●      | ●      | DRG         |   |
| Pressure and flow control, X channel plugged                    |                   | ●     | ●    | ●    | ●      | ●      | ●      | DFR<br>DFR1 |   |
| Pressure flow and power control                                 |                   | —     | ●    | ●    | ●      | ●      | —      | DFLR        |   |
| <b>Series</b>   |                   |       |      |      |        |        |        |             |   |
| Series  |                   |       |      |      |        | 31     |        |             |   |
| <b>Direction of rotation</b>                                    |                   |       |      |      |        |        |        |             |   |
| Viewed on drive shaft   | clockwise         |       |      |      |        |        |        | R           |   |
|   | counter-clockwise |       |      |      |        |        |        | L           |   |
| <b>Seals</b>  |                   |       |      |      |        |        |        |             |   |
| Buna-N (NBR per DIN ISO 1629) ;                                 |                   |       |      |      |        |        |        | P           |   |
| FPM (fluorocarbon)  |                   |       |      |      |        |        |        | V           |   |
| <b>Shaft end</b>  |                   |       | 18   | 28   | 45     | 71     | 100    | 140         |   |
| SAE-splined shaft   |                   | 3/4"  | 7/8" | 1"   | 1 1/4" | 1 1/2" | 1 3/4" | S           |   |
| SAE-splined shaft, reinforced (higher thru drive torques)       |                   | 3/4"  | 7/8" | 1"   | 1 1/4" | *      | *      | R           |   |
| SAE-splined shaft, smaller size (not for pumps with thru drive) |                   | 5/8"  | *    | 7/8" | *      | 1 1/4" | *      | U           |   |
| SAE-splined shaft, reinforced U-type shaft                      |                   | *     | *    | 7/8" | *      | 1 1/4" | *      | W           |   |
| SAE-keyed shaft   |                   | 3/4"  | 7/8" | 1"   | 1 1/4" | 1 1/2" | 1 3/4" | K           |   |
| parallel with key DIN 6885                                      |                   | 18mm  | 22mm | 25mm | 32mm   | 40mm   | 45mm   | P           |   |



VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

Ordering Code

| C  | 62 | N00 |           |           |           |           |            |            |     |                        |  |  |           |           |           |           |            |            |   |
|--|----|-----|-----------|-----------|-----------|-----------|------------|------------|-----|------------------------|--|--|-----------|-----------|-----------|-----------|------------|------------|---|
| <b>Thru-drive</b>  |    |     | <b>18</b> | <b>28</b> | <b>45</b> | <b>71</b> | <b>100</b> | <b>140</b> |     |                        |  |  |           |           |           |           |            |            |   |
| Without through drive  |    |     | ●         | ●         | ●         | ●         | ●          | ●          | N00 |                        |  |  |           |           |           |           |            |            |   |
| <b>Thru-drive pumps are only fitted with side ports</b>            |    |     |           |           |           |           |            |            |     |                        |  |  |           |           |           |           |            |            |   |
| Mounting flange Shaft/coupling SAE BB A10V45                       |    |     | –         | ●         | ●         | ●         | ●          | ●          | K04 |                        |  |  |           |           |           |           |            |            |   |
| 82-2 (SAE A) 16-4 (SAE A) G2, GC2/GC3-1X                           |    |     | –         | ●         | ●         | ●         | ●          | ●          | K01 |                        |  |  |           |           |           |           |            |            |   |
| 101-2 (SAE B) 22-4 (SAE B) A10VO28 (shaft S), G3                   |    |     | –         | ●         | ●         | ●         | ●          | ●          | K02 |                        |  |  |           |           |           |           |            |            |   |
| 101-2 (SAE B) 22-4 (SAE B) A10VO28 (shaft S), G4                   |    |     | –         | ●         | ●         | ●         | ●          | –          | K68 |                        |  |  |           |           |           |           |            |            |   |
| 127-2 (SAE C) 32-4 (SAE C) A10VO71 (shaft S)                       |    |     | –         | –         | –         | ●         | ●          | ●          | K07 |                        |  |  |           |           |           |           |            |            |   |
| 152-4 (SAE D) 44-4 (SAE D) A10VO140 (S.E. S)                       |    |     | –         | –         | –         | –         | –          | ●          | K17 |                        |  |  |           |           |           |           |            |            |   |
| <i>For unlisted coupling sizes please contact GTA Lombardia</i>    |    |     |           |           |           |           |            |            |     |                        |  |  |           |           |           |           |            |            |   |
| <b>Service ports</b>   |    |     |           |           |           |           |            |            |     |                        |  |  |           |           |           |           |            |            |   |
| <b>(Pressure port B and Suction port S)</b>                        |    |     | <b>18</b> | <b>28</b> | <b>45</b> | <b>71</b> | <b>100</b> | <b>140</b> |     |                        |  |  |           |           |           |           |            |            |   |
| (Rear ports, UNC Mounting screws)                                  |    |     | ●         | ●         | ●         | ●         | ●          | ●          | 61  |                        |  |  |           |           |           |           |            |            |   |
| (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  |                        |  |  |           |           |           |           |            |            |   |
| Port pos. 61, 11, 91 and 41 only for version without through drive |    |     |           |           |           |           |            |            |     |                        |  |  |           |           |           |           |            |            |   |
|  |    |     |           |           |           |           |            |            |     | <b>Mounting flange</b> |  |  | <b>18</b> | <b>28</b> | <b>45</b> | <b>71</b> | <b>100</b> | <b>140</b> |   |
|  |    |     |           |           |           |           |            |            |     | SAE 2 hole             |  |  | 3.250"    | 4"        | 4"        | 5"        | 5"         | *          | C |
|  |    |     |           |           |           |           |            |            |     | ISO 2 hole             |  |  | 80mm      | 100mm     | 100mm     | 125mm     | 125mm      | 180mm      | A |
| SAE 4 hole   |    |     | *         | *         | *         | *         | *          | 6"         | D   |                        |  |  |           |           |           |           |            |            |   |

● = available

Multiple Pumps

1. If a second GTA hydraulic pump is to be factory-mounted, then both ordering codes are to be specified, combined with a "+". Ordering code 1st pump + Ordering code 2nd pump. Ordering example: MA10VO71DR/31R-PSC62K02 + MA10VO28DR/31R-PSC62N00
2. If a gear pump is to be factory-mounted please contact GTA support staff.

## VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

### Fluid

#### 1. Hydraulic Fluid

The MA10V 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 ( $v_{opt}$ ) \_\_80...170 SUS (16 / 36 mm<sup>2</sup>/s)

#### Limits of viscosity range

The following values are valid for extreme operating conditions:

$v_{min}$  = 60 SUS (10 mm<sup>2</sup>/s)

for short periods at max. leakage oil temperature of 93° C

$v_{max}$  = 4600SUS (1000 mm<sup>2</sup>/s)

1400 SUS (300 mm<sup>2</sup>/s) on short term cold start

#### 3. Temperature Range

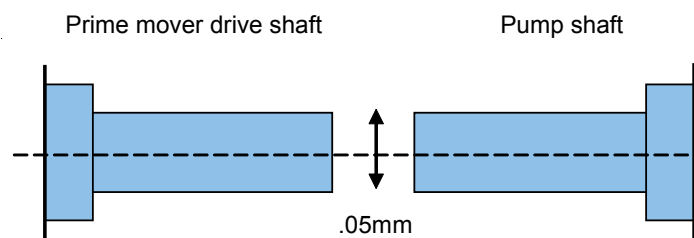
$t_{min}$  = -15°C;  $t_{max}$  = +80°C.;  $t_{min}$  = -5°F;  $t_{max}$  = +175°F

#### 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.



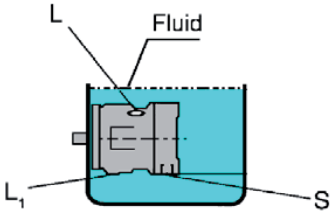
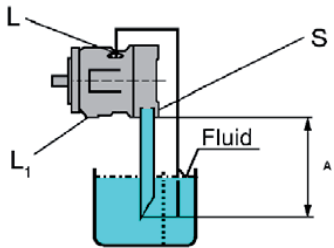
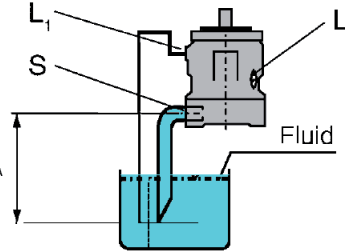
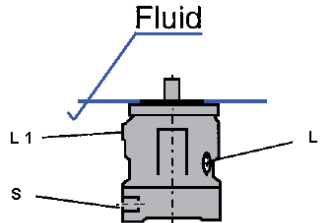
VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

Installation Information - *cont'd.*

The installation position of the pump is optional.

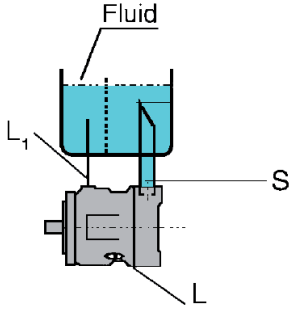
The pump housing must be filled with fluid both when commissioning and in operation. In order to achieve low noise levels, all connecting lines (inlet, case drain) should be isolated from the tank by flexible lines.

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

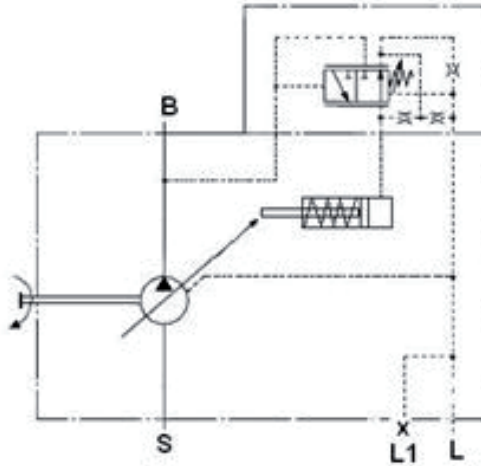
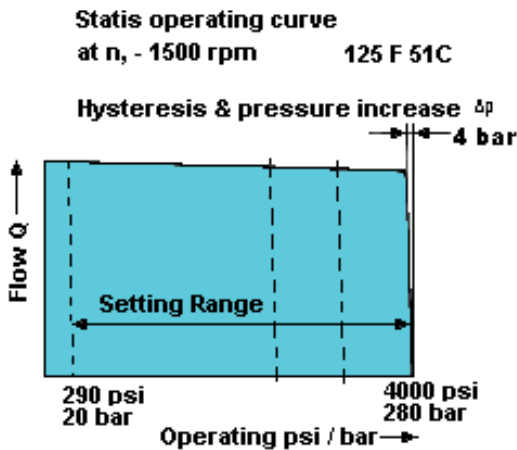
- Pipe "L", "L1" and "S" must be mounted below the oil level



VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 31

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 control valve.



Ports

|              |                              |
|--------------|------------------------------|
| <b>B</b>     | Pressure Port                |
| <b>S</b>     | Suction port                 |
| <b>L, L1</b> | Case drain ports (L1 sealed) |

Dynamic response curve

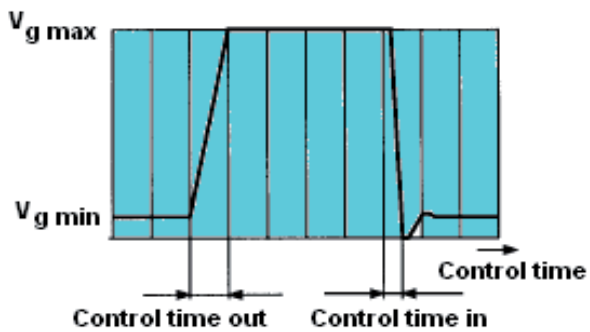
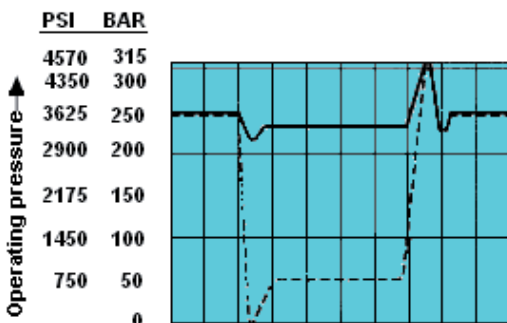
The operating curves values taken under the following conditions

Operating Conditions;    n = 1500 rpm  
Oil temperature            120 F / 50C  
Pressure cut-off            5100 psi / 350bar

Load values were taken by closing the pressure line with a load valve .

Response time

| Size | t <sub>sa</sub> (ms) | t <sub>sa</sub> (ms) | t <sub>sa</sub> (ms) |
|------|----------------------|----------------------|----------------------|
|      | 725 psi / 50 bar     | 3200 psi / 220 bar   | 4000 psi / 280 bar   |
| 28   | 60                   | 30                   | 20                   |
| 45   | 80                   | 40                   | 20                   |
| 71   | 100                  | 50                   | 25                   |
| 100  | 125                  | 90                   | 30                   |
| 140  | 130                  | 110                  | 30                   |



Control Data

Hysteresis and repetition accuracy  $\Delta p$  ..... Max. 3 bar

Max. Pressure Increase

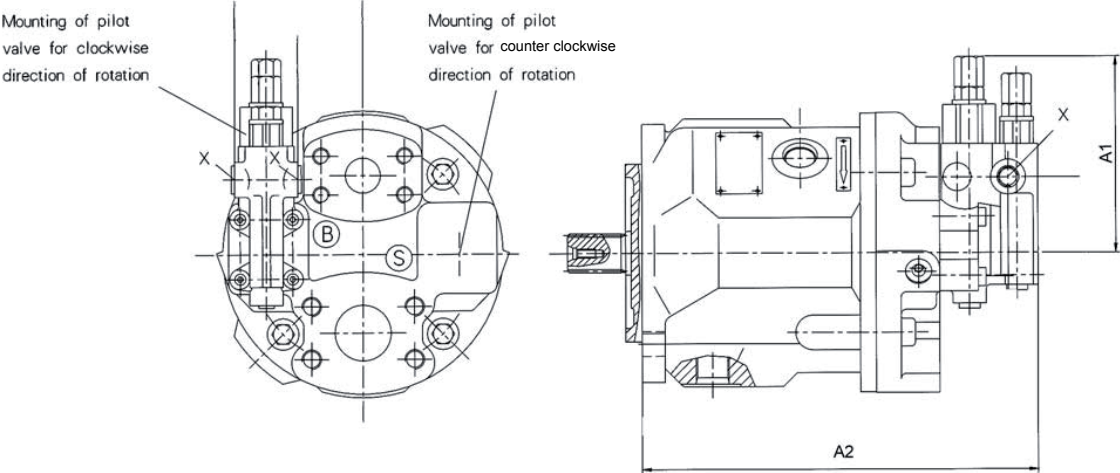
| Size       |     | 18 | 28 | 45 | 71 | 100 | 140 |
|------------|-----|----|----|----|----|-----|-----|
| $\Delta P$ | BAR | 4  | 4  | 6  | 8  | 10  | 12  |

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

VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

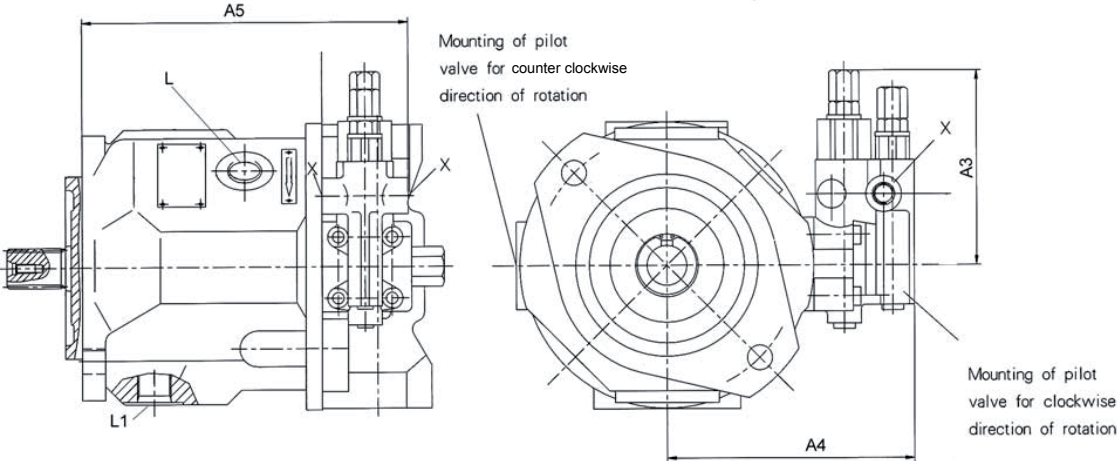
**Unit dimensions DR**  
**Service ports at rear; Models 61N00 and 11N00**

Size 18 to 140



**Unit dimensions DR**  
**Service ports at side; Models 62N00 and 12N00**

Size 18 to 140



| Size | A1 | A2 | A3  | A4  | A5  | Metric Adapter L & L1 | X             |
|------|----|----|-----|-----|-----|-----------------------|---------------|
| 18   | *  | *  | 121 | 126 | 167 | M16 X 1.5             | 7/16-20UNF-2B |
| 28   | 74 | 36 | 121 | 136 | 179 | M18 X 1.5             | 7/16-20UNF-2B |
| 45   | 81 | 36 | 121 | 146 | 189 | M22 X 1.5             | 7/16-20UNF-2B |
| 71   | 92 | 36 | 121 | 160 | 215 | M22 X 1.5             | 7/16-20UNF-2B |
| 100  | 98 | 36 | 121 | 158 | 285 | M27 X 2               | 7/16-20UNF-2B |
| 140  | *  | *  | 120 | 209 | 292 | M27 X 2               | 9/6-18UNF-2B  |

VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 31

DRG Pressure Control, Remote Control

Size 18 to 100

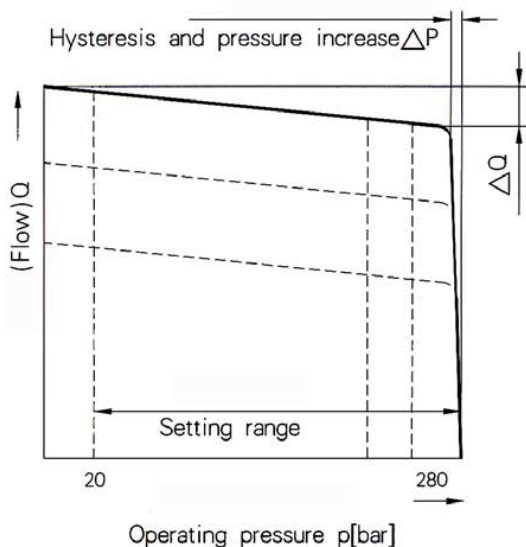
Function and design as for DR

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 text.

The remote pilot valve should be mounted no more than 78in (2 meters) from the pump.

Static charateristic  
(at n1=1500 rpm; oil temp. =125°F / 51°C)



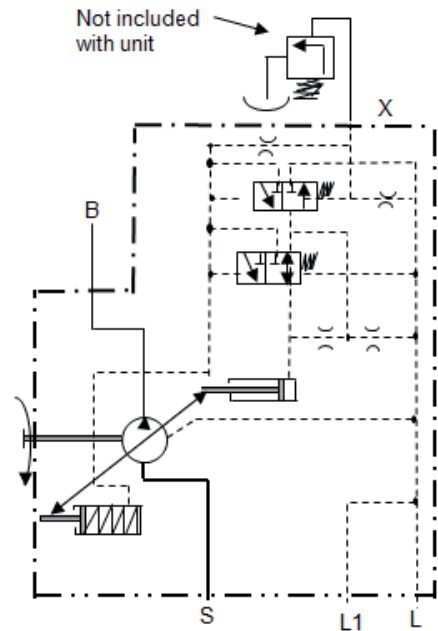
Control Data

Hysteresis and repetition accuracy  $\Delta p$  .....Max. 3 bar

Max. Pressure Increase

| Size       |     | 18 | 28 | 45 | 71 | 100 | 140 |
|------------|-----|----|----|----|----|-----|-----|
| $\Delta P$ | BAR | 4  | 4  | 6  | 8  | 10  | 12  |

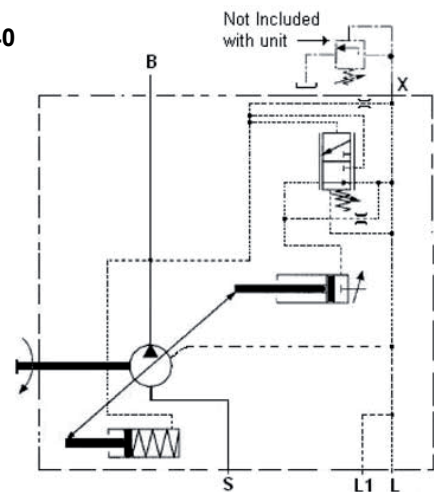
Pilot oil consumption .....max. approx. 4.5 L/min



Ports

|              |                              |
|--------------|------------------------------|
| <b>B</b>     | Pressure Port                |
| <b>S</b>     | Suction port                 |
| <b>L, L1</b> | Case drain ports (L1 sealed) |
| <b>X</b>     | Pilot pressure port          |

DRG 140

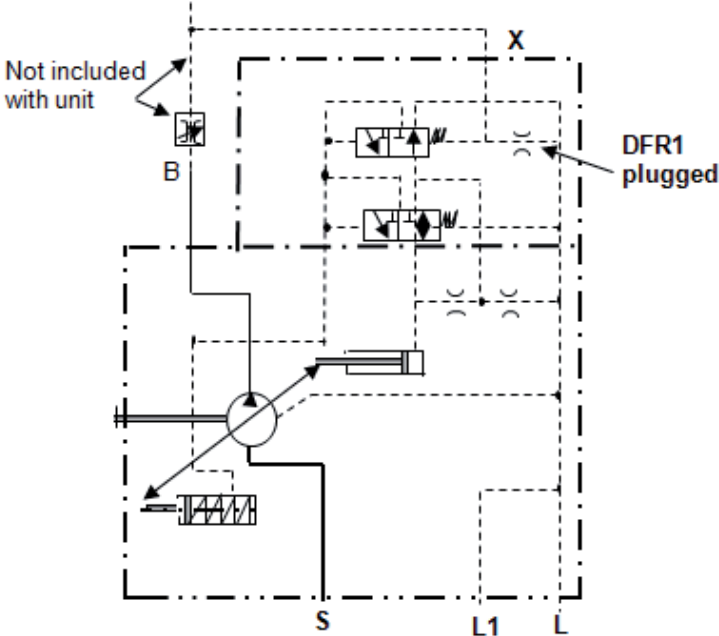


VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

DFR/DFR1 Pressure/Flow Control

In addition to the pressure control function, the pump flow may be varied by means of a differential pressure at the actuator (e.g. an orifice).

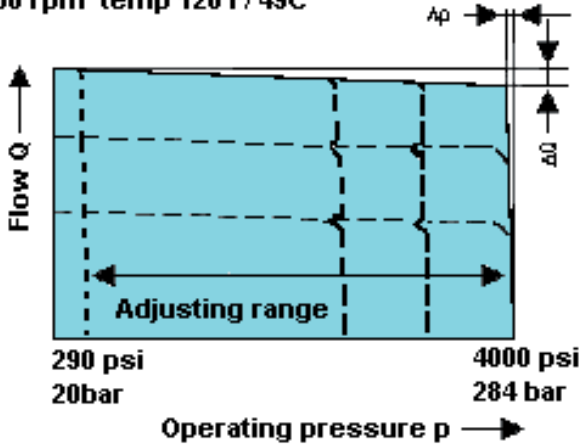
In model DFR1 the X orifice is plugged.



Ports

|              |                              |
|--------------|------------------------------|
| <b>B</b>     | Pressure Port                |
| <b>S</b>     | Suction port                 |
| <b>L, L1</b> | Case drain ports (L1 sealed) |
| <b>X</b>     | Pilot pressure port          |

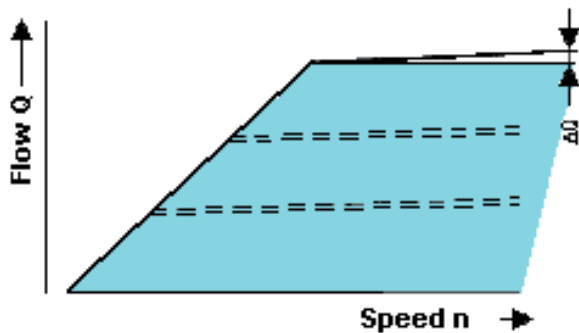
Static curve at 1500 rpm temp 120 F/ 49C



VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

DFR/DFR1 Pressure/Flow Control - *cont'd*

Static curve at variable rpm



**Flow Control/Differential Pressure  $\Delta p$ :**

Adjustable between 10 and 22 bar (higher values on request). Standard setting: 14 bar. If a different setting is required, please state in clear text.

When port X is unloaded to tank, a zero stroke pressure of

$p = 18 \pm 2$  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  $n = 1450$  rpm

| Size                   | 18  | 28 | 45  | 71  | 100 | 140 |
|------------------------|-----|----|-----|-----|-----|-----|
| $\Delta Q_{max}$ L/min | 0.5 | 1  | 1.8 | 2.8 | 4.0 | 6.0 |

Pilot oil consumption DFR ..... max. approx. 3-4.5 L/min

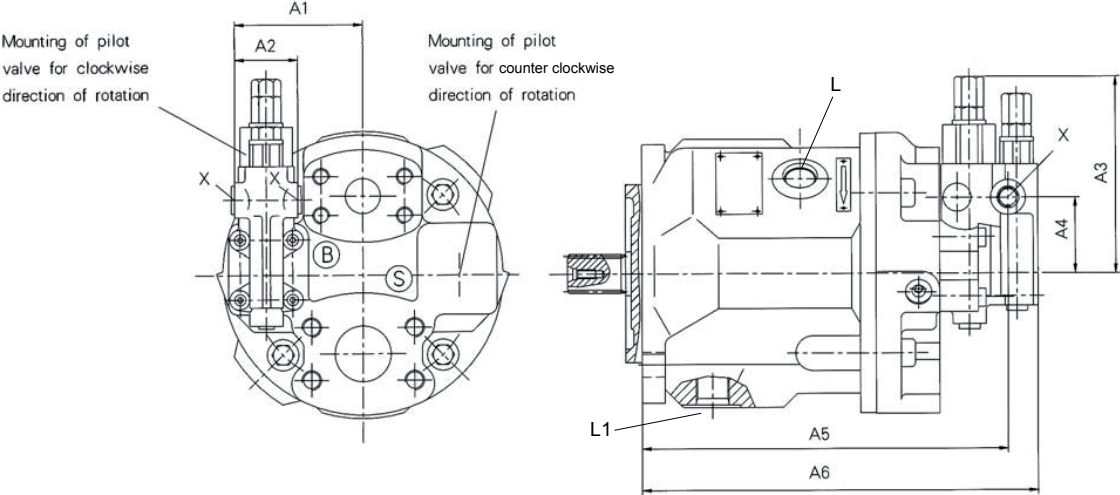
Pilot oil consumption DFR1 ..... max. approx. 3 L/min



VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

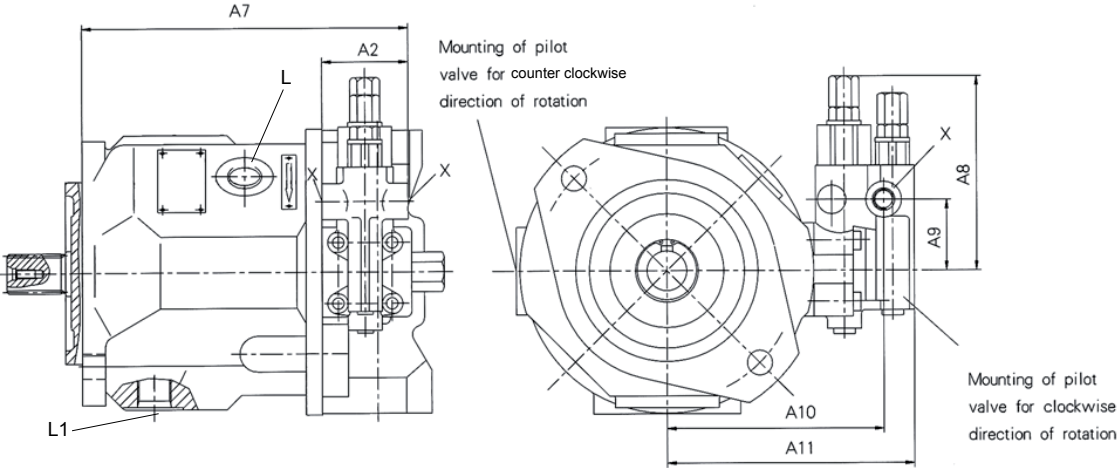
**Unit dimensions DFR / DFR1 / DRG**  
**Service ports at rear; Models 61N00 and 11N00**

Size 28 to 140



**Unit dimensions DFR / DFR1 / DRG**  
**Service ports on sides; Models 62N00 and 12N00**

Size 18 to 140



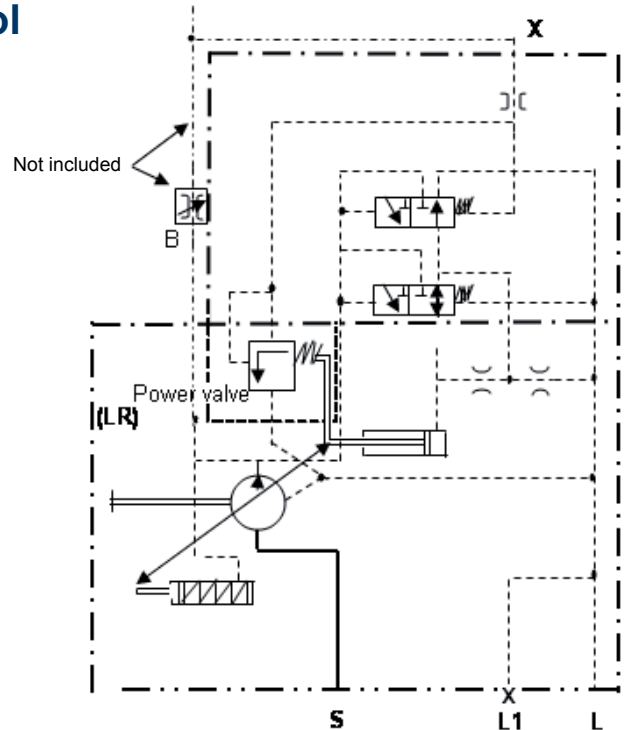
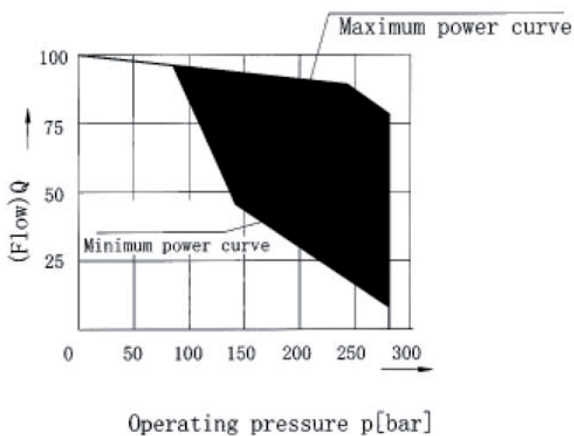
| Size | A1 | A2 | A3  | A4 | A5  | A6  | A7  | A8  | A9 | A10 | A11 | X                |
|------|----|----|-----|----|-----|-----|-----|-----|----|-----|-----|------------------|
| 18   | *  | 36 | *   | *  | *   | *   | 167 | 121 | 41 | 112 | 126 | 7/16-20UNF-2B    |
| 28   | 74 | 36 | 121 | 40 | 211 | 228 | 179 | 121 | 41 | 116 | 135 | 7/16-20UNF-2B    |
| 45   | 81 | 36 | 121 | 40 | 231 | 248 | 189 | 118 | 40 | 122 | 140 | 7/16-20UNF-2B    |
| 71   | 92 | 36 | 121 | 40 | 264 | 281 | 215 | 119 | 40 | 145 | 163 | 7/16-20UNF-2B    |
| 100  | 98 | 36 | 121 | 40 | 328 | 346 | 286 | 119 | 40 | 145 | 164 | 7/16-20UNF-2B    |
| 140  | *  | 50 | *   | *  | *   | *   | 292 | 120 | 26 | 186 | 210 | 9/16 - 18 UNF-2B |

**VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 31**

**DFLR 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>B</b>     | Pressure Port                |
| <b>S</b>     | Suction port                 |
| <b>L, L1</b> | Case drain ports (L1 sealed) |
| <b>X</b>     | Pilot pressure port          |

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

There are four spring arrangements used for the power valve set-up refer to the chart below.

- Spring group A ..... to 1300 psi/90 bar
- Spring group B ..... to 2320 psi/160 bar
- Spring group C ..... to 3480 psi/240 bar
- Spring group D ..... over 3480 psi/240 bar

**Control data**

For pressure control technical data see DR Pressure control.

For flow control technical data see DFR control.

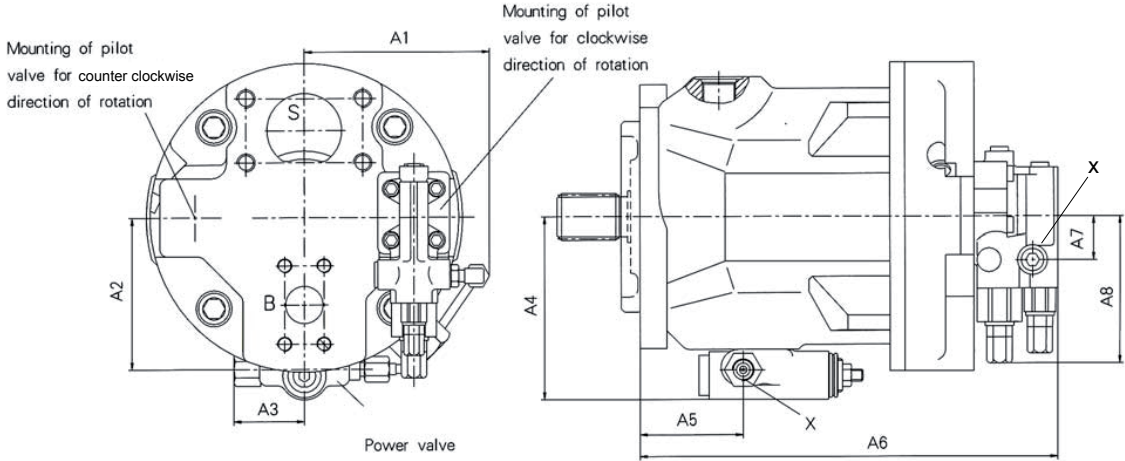
Start of control ..... from 80 bar

Pilot oil consumption ..... max. approx. 5.5 L/min

VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

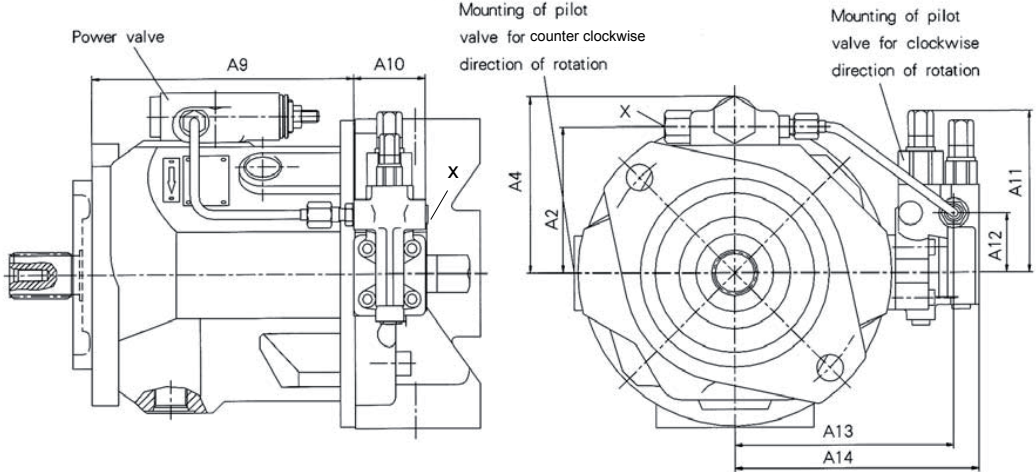
**Unit dimensions DFLR**  
**Service ports at rear; Models 61N00 and 11N00**

Size 28 to 100



**Unit dimensions DFR / DFR1 / DRG / DFLR**  
**Service ports on sides; Models 62N00 and 12N00**

Size 18 to 100

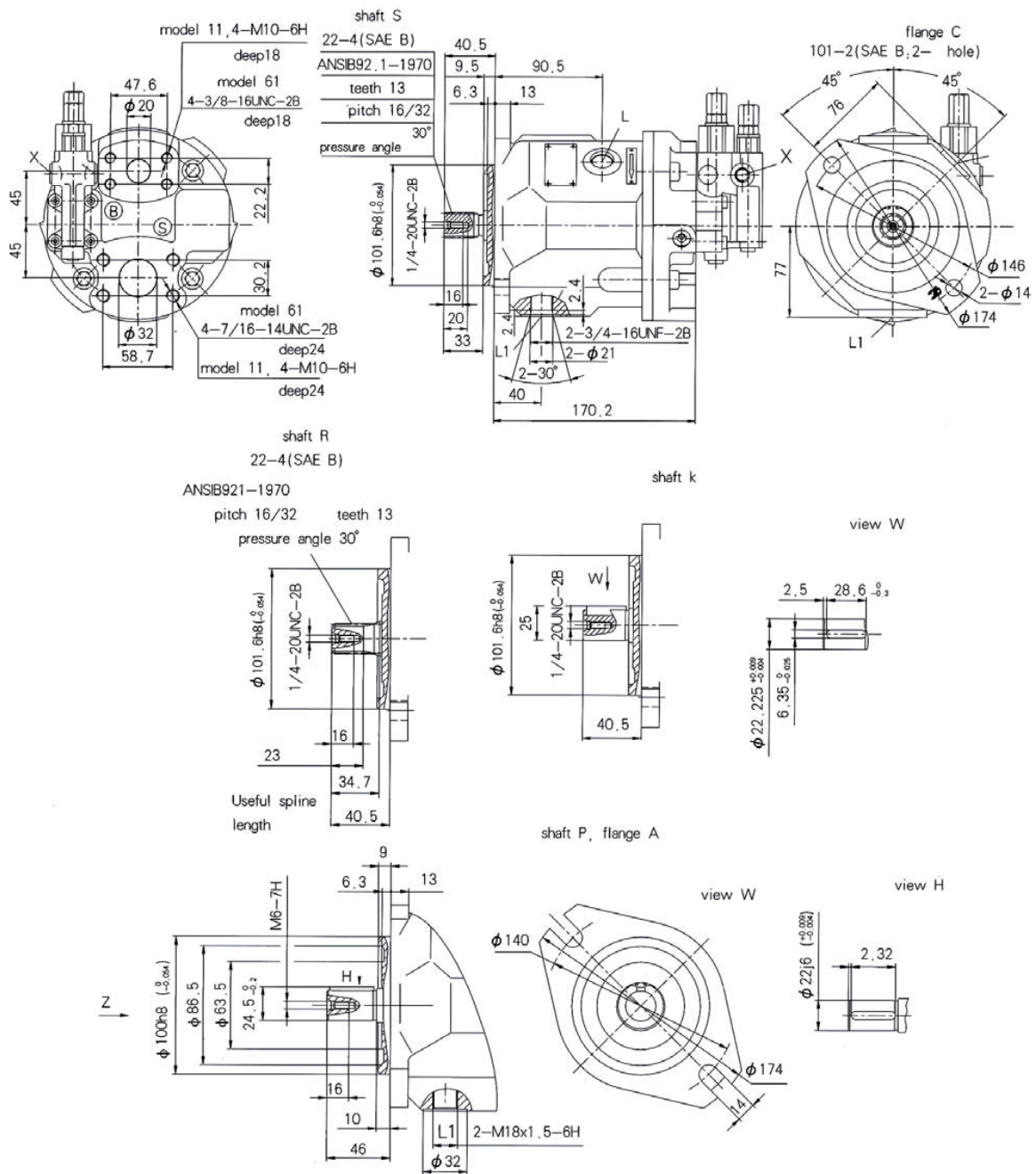


| Size | A1  | A2  | A3 | A4  | A5  | A6  | A7 | A8  | A9  | A10 | A11 | A12 | A13 | A14 | X             |
|------|-----|-----|----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|---------------|
| 18   | *   | *   | *  | *   | *   | *   | 40 | 121 | 130 | 36  | 121 | 40  | 109 | 126 | 7/16-20UNF-2B |
| 28   | 102 | 88  | 57 | 109 | 48  | 228 | 40 | 121 | 143 | 36  | 121 | 40  | 116 | 135 | 7/16-20UNF-2B |
| 45   | 109 | 90  | 57 | 111 | 54  | 248 | 40 | 121 | 153 | 36  | 118 | 40  | 122 | 140 | 7/16-20UNF-2B |
| 71   | 120 | 103 | 57 | 124 | 70  | 281 | 40 | 121 | 180 | 36  | 119 | 40  | 145 | 163 | 7/16-20UNF-2B |
| 100  | 126 | 112 | 57 | 133 | 112 | 345 | 40 | 121 | 249 | 36  | 119 | 40  | 146 | 164 | 7/16-20UNF-2B |
| 140  | *   | *   | *  | *   | *   | *   | *  | *   | *   | *   | *   | *   | *   | *   | *             |

VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 31

Mounting Dimension, Sizes 28

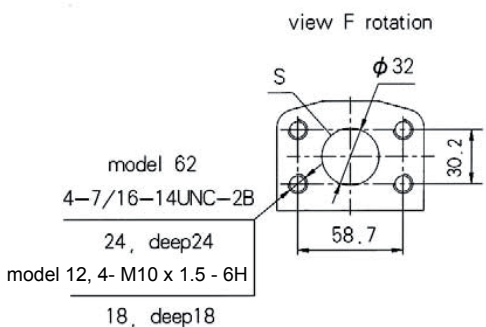
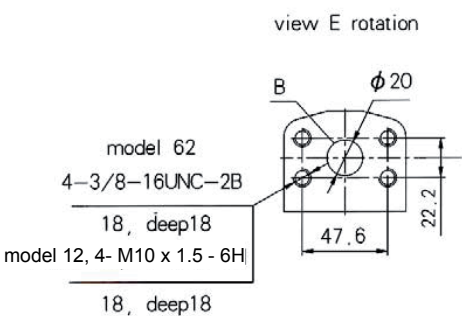
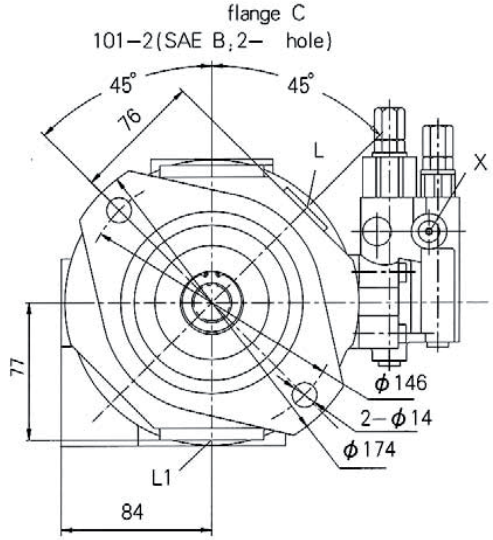
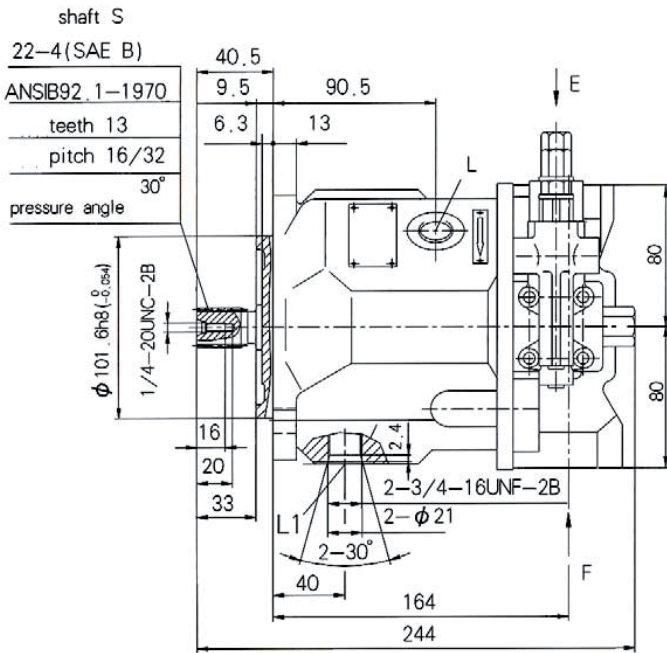
Service ports at rear: no through drive  
Models 61N00 and 11N00



VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

Mounting Dimension, Sizes 28

Service ports on side;  
no through drive, Models 62N00 and 12N00

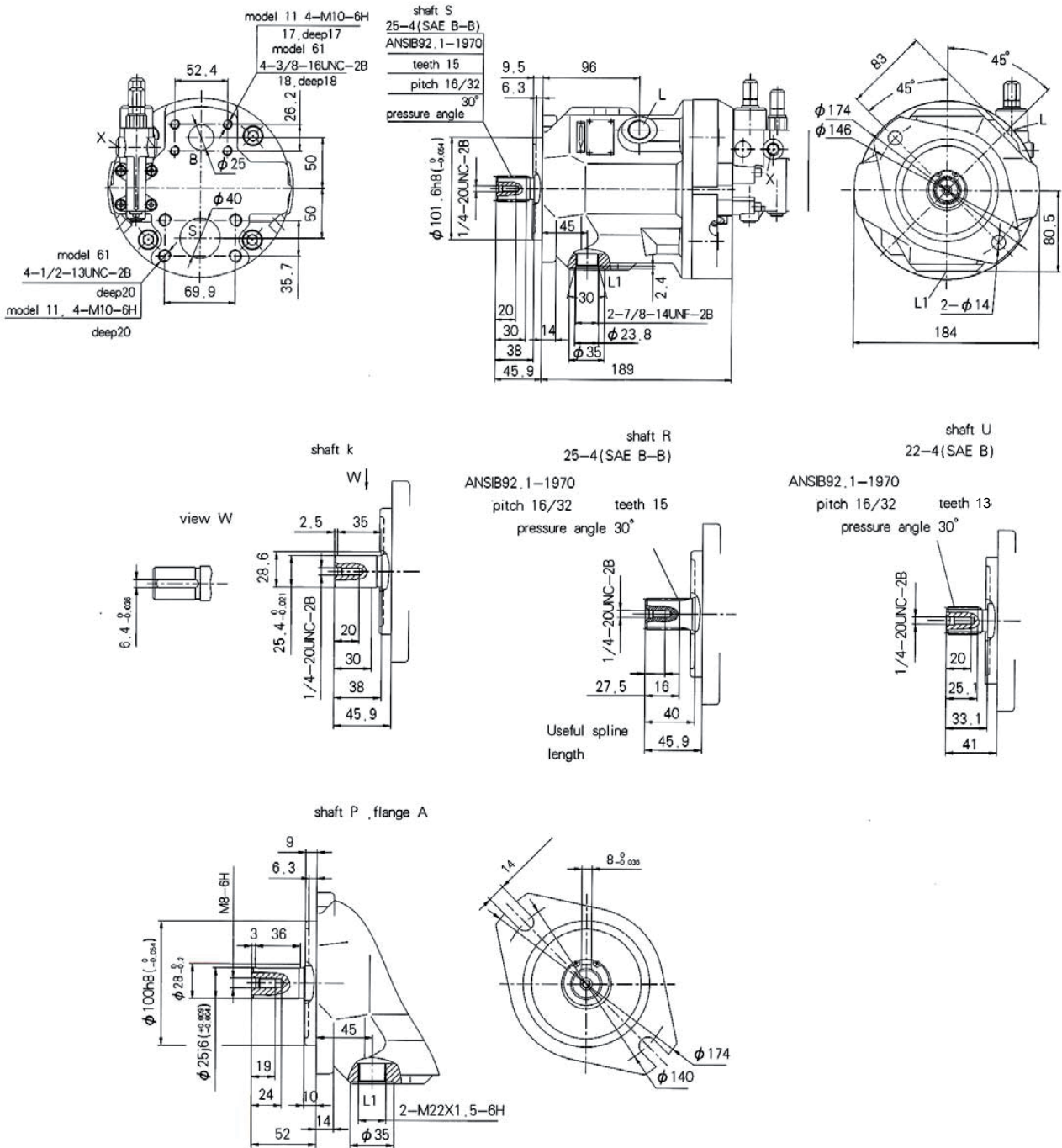




## VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 31

### Mounting Dimension, Sizes 45

**Service ports at rear;  
no through drive, Models 61N00 and 11N00**

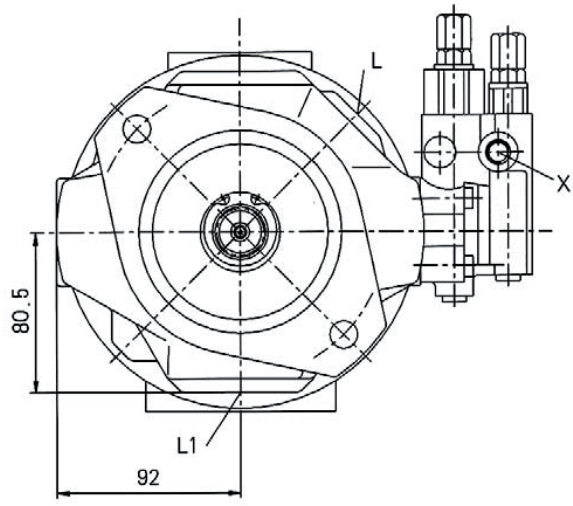
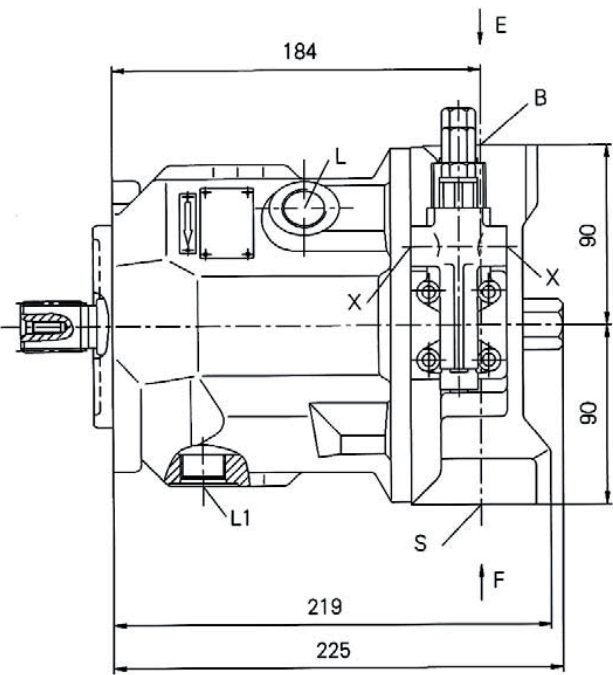


VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

Mounting Dimension, Sizes 45

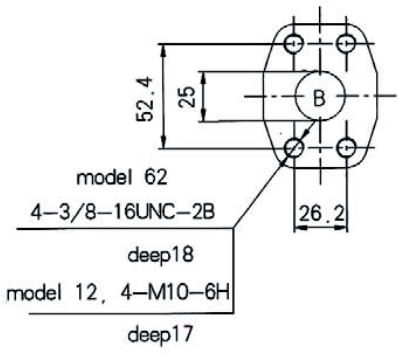
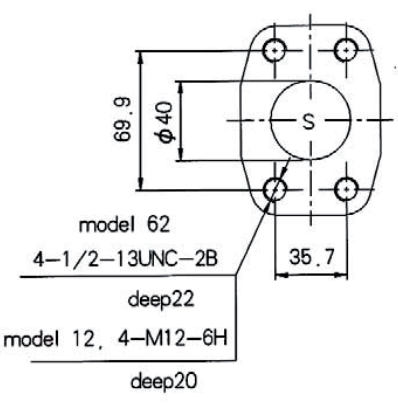
Service ports on side;  
no through drive, Models 62N00 and 12N00

Without considering adjustments



view F rotation

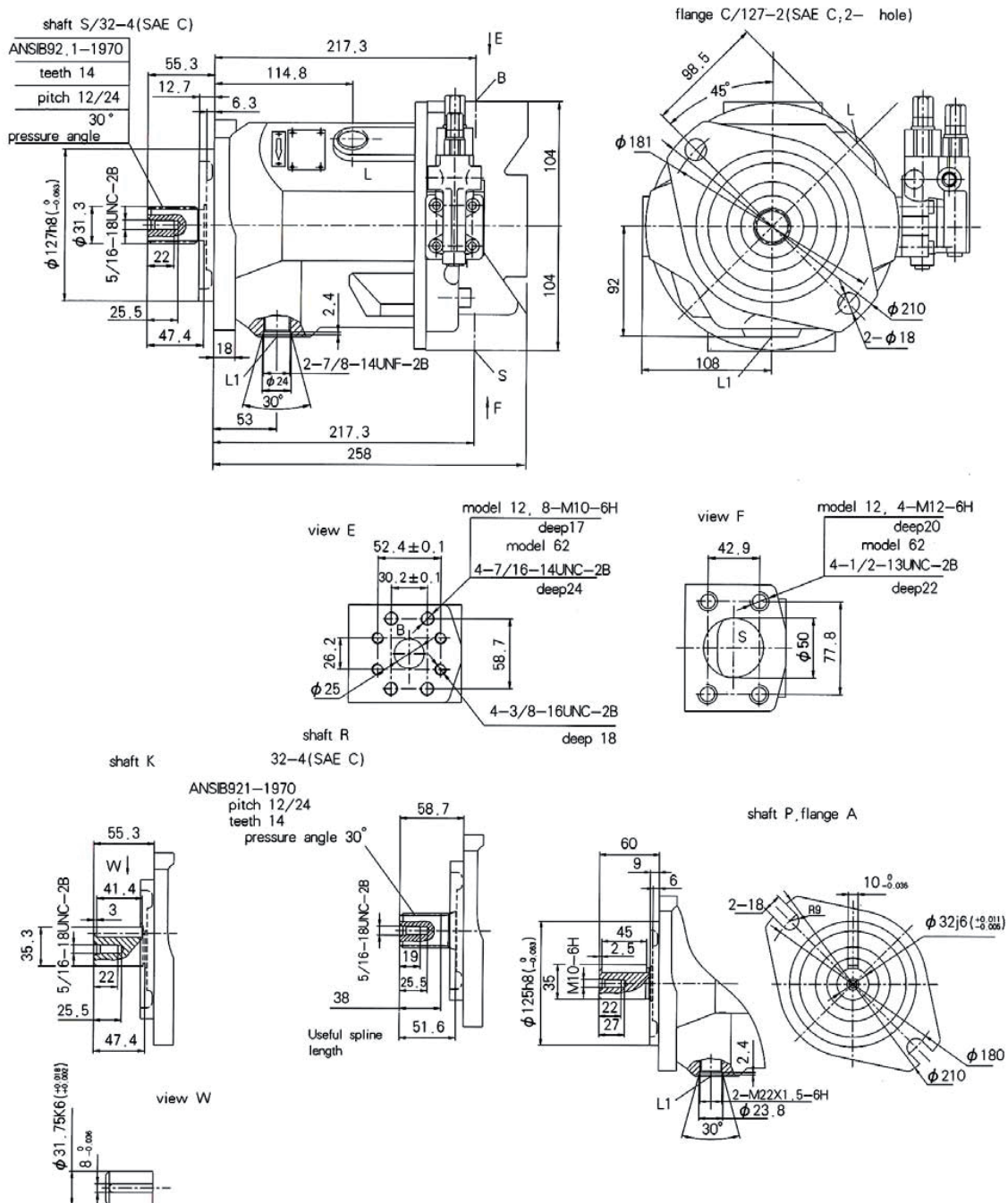
view E rotation



## VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 31

### Mounting Dimension, Sizes 71

**Service ports on sides:  
no through drive, Models 62N00 and 12N00**

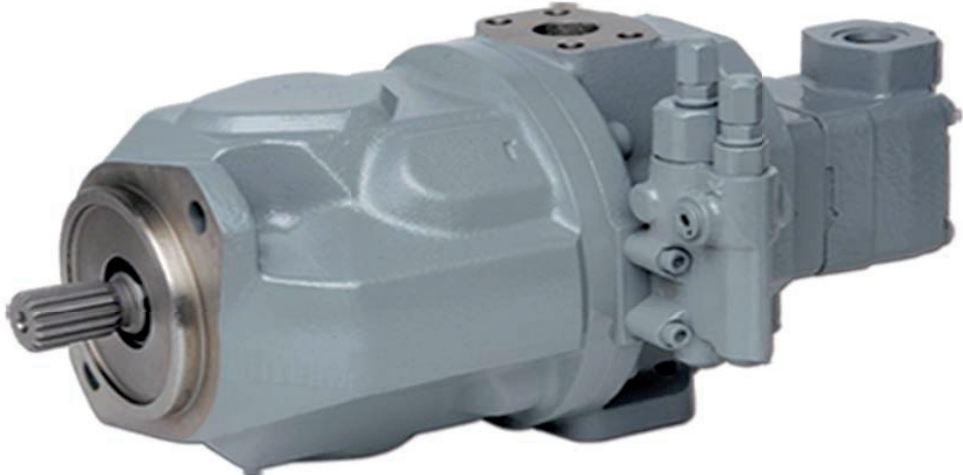
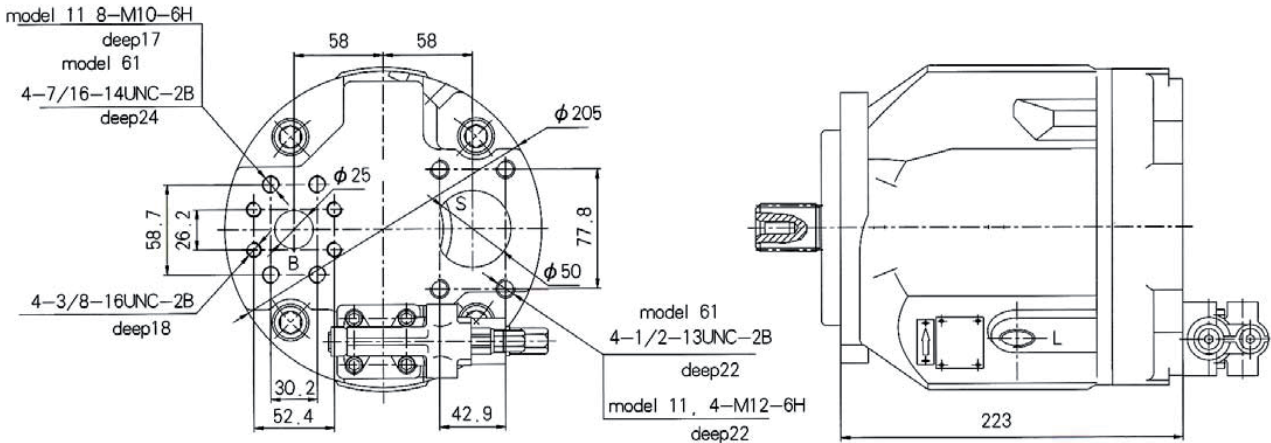




VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

Mounting Dimension, Sizes 71

Service ports at rear;  
no through drive, Models 61N00 and 11N00

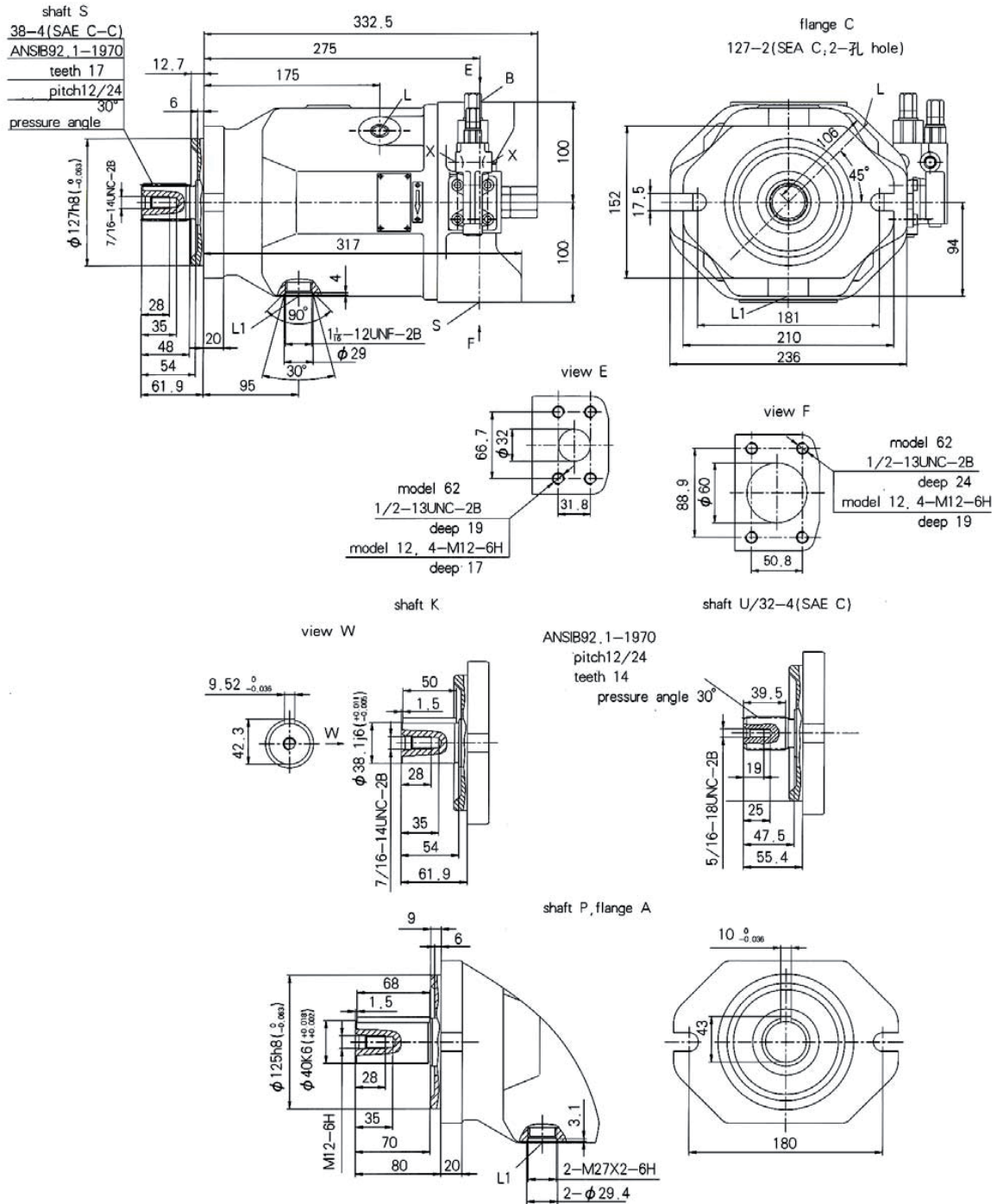


MA10 Piston pump with MV10 Vane pump fitted

VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 31

Mounting Dimension, Sizes 100

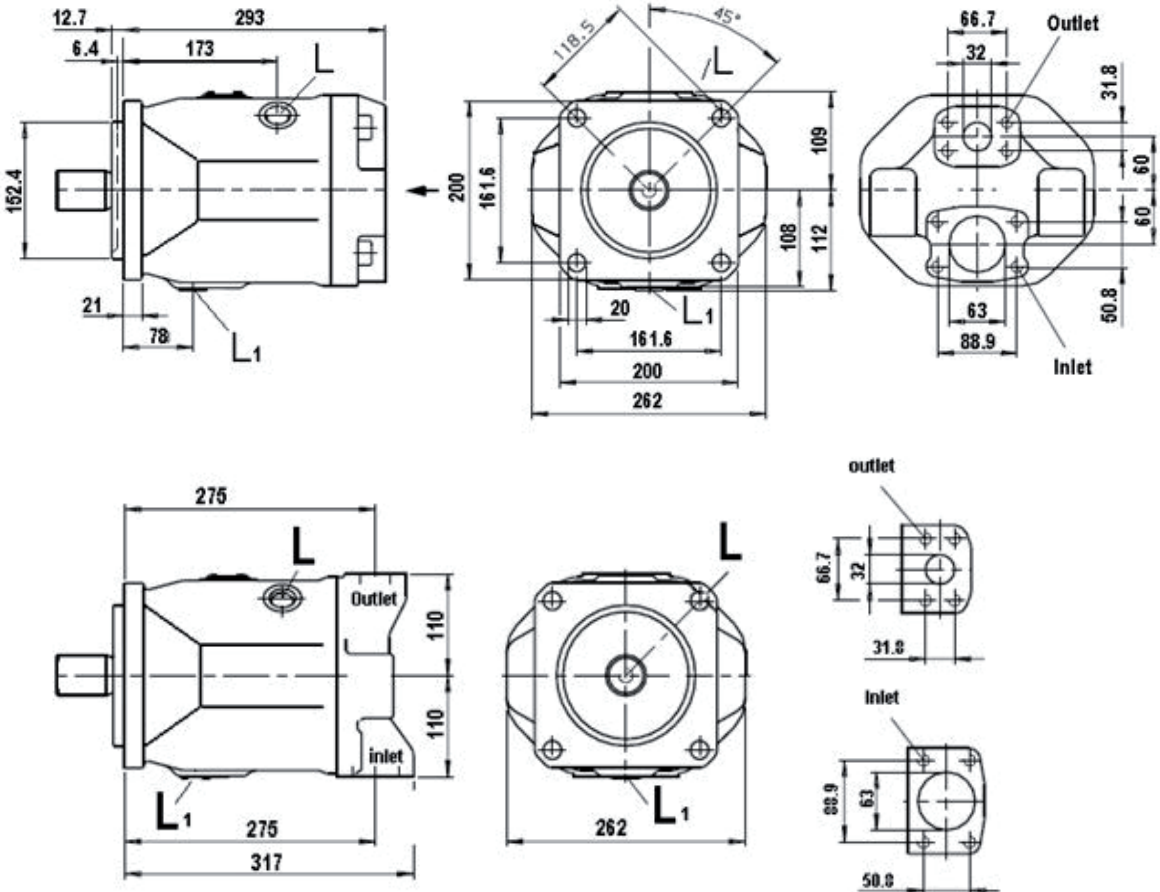
Service ports on sides;  
no through drive, Models 62N00 and 12N00



VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 31

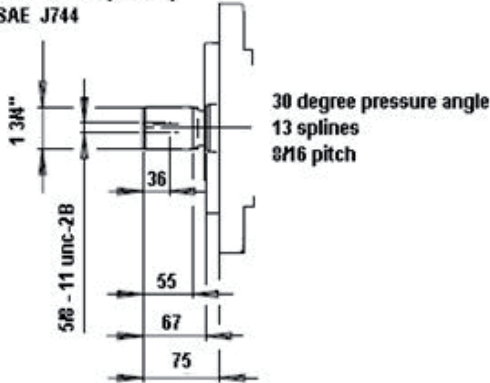
Mounting Dimension, Sizes 140

Service ports on sides; Models 62N00 and 12N00  
Service ports on rear; Models 61N00 and 11N00



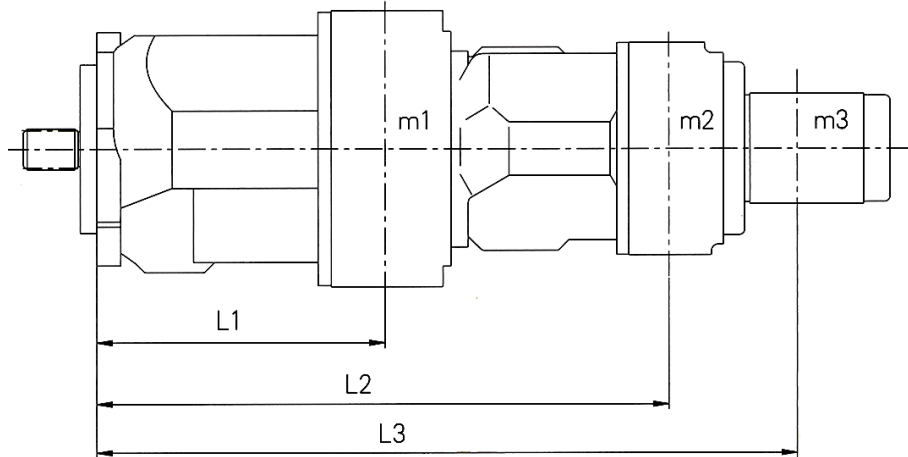
Shaft S

Shaft 44 - 4; {SAE D}  
SAE J744



VARIABLE DISPLACEMENT PUMP MA10VO, SERIES 31

Permissible Bending



$m_1, m_2, m_3$  Weight of pump lbs (kg)  
 $l_1, l_2, l_3$  Distance to center of gravity in (mm)  
 $T_m = (m_1 \cdot l_1 + m_2 \cdot l_2 + m_3 \cdot l_3) \cdot \frac{1}{12}$  lb-ft  
 $T_m = (m_1 \cdot l_1 + m_2 \cdot l_2 + m_3 \cdot l_3) \cdot \frac{1}{102}$  (Nm)

| Size                          |       |       | 28   | 45   | 71   | 100  | 140  |
|-------------------------------|-------|-------|------|------|------|------|------|
| Permissible bending moment    | $T_m$ | lb-ft | 65   | 101  | 159  | 221  | 332  |
|                               |       | Nm    | 88   | 137  | 216  | 300  | 450  |
| Weight                        | $m_1$ | lbs   | 33   | 46   | 73   | 99   | 132  |
|                               |       | kg    | 15   | 21   | 33   | 45   | 60   |
| Distance to center of gravity | $l_1$ | in    | 4.33 | 5.11 | 5.91 | 6.30 | 6.30 |
|                               |       | mm    | 110  | 130  | 150  | 160  | 160  |

Through Drive

Axial piston unit MA10VO can be supplied with a through drive, as shown in the ordering code on page 7 & 8.

The type of through drive is determined by codes (K01-K17). If the combination pump is not mounted in the factory, the simple type code is sufficient.

Included with the pump are: Coupling sleeve, seals and necessary hardware.

Combination pumps

By mounting combination pumps circuits independent of each other are available for use.

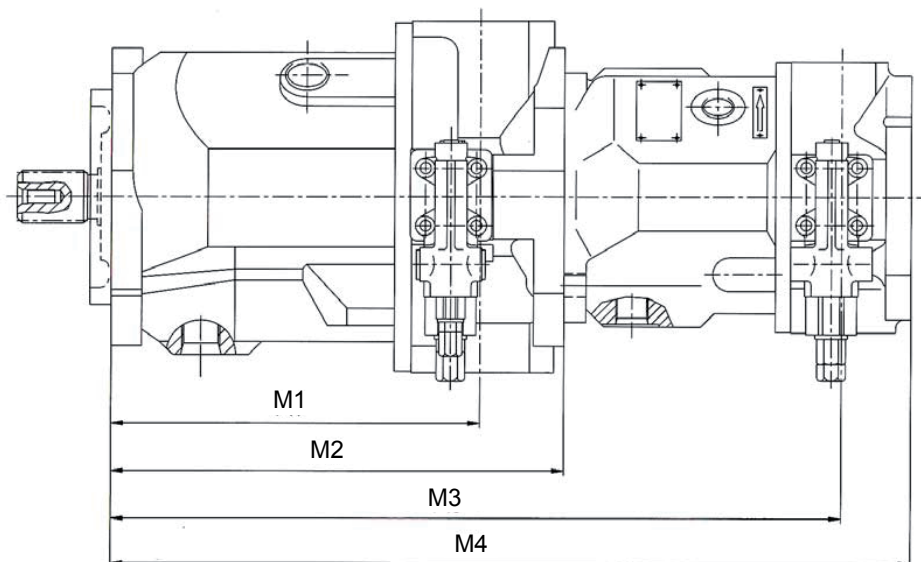
1. If the combination pump consists of 2 MA10VO pumps and if these are to be delivered ready assembled, then the two type codes are to be combined with a "+".

Ordering example: MA10VO71DR/31R-PSC62K02 + MA10VO28DR/31R-PSC62N00

2. If a gear pump, vane or other type pump is to be mounted in the factory as a second or third pump, please consult the factory for available mounting information.

VARIABLE DISPLACEMENT PUMP MA10VO, SERIES 31

Unit Dimensions of Combination Pumps



| Pump 1    |     | MA10VO28 |      |       |       | MA10VO45 |      |       |       | MA10VO71 |       |       |       | MA10VO100 |       |       |       | MA10VO140 |       |       |       |
|-----------|-----|----------|------|-------|-------|----------|------|-------|-------|----------|-------|-------|-------|-----------|-------|-------|-------|-----------|-------|-------|-------|
|           |     | M1       | M2   | M3    | M4    | M1       | M2   | M3    | M4    | M1       | M2    | M3    | M4    | M1        | M2    | M3    | M4    | M1        | M2    | M3    | M4    |
| MA10VO18  | in. | 6.5      | 8.03 | 13.74 | 15.71 | 7.24     | 9.02 | 14.72 | 16.69 | 8.54     | 10.51 | 16.21 | 18.19 | 10.83     | 13.31 | 19.02 | 20.98 | 10.83     | 13.78 | 19.49 | 21.46 |
|           | mm  | 165      | 204  | 349   | 399   | 184      | 229  | 373   | 424   | 217      | 267   | 412   | 462   | 275       | 338   | 483   | 533   | 275       | 350   | 495   | 545   |
| MA10VO28  | in. | 6.5      | 8.03 | 14.53 | 15.67 | 7.24     | 9.02 | 15.51 | 16.65 | 8.54     | 10.51 | 17.01 | 18.15 | 10.83     | 13.31 | 19.8  | 20.94 | 10.83     | 13.78 | 20.28 | 21.42 |
|           | mm  | 165      | 204  | 369   | 398   | 184      | 229  | 394   | 423   | 217      | 267   | 432   | 461   | 275       | 338   | 503   | 532   | 275       | 350   | 515   | 544   |
| MA10VO45  | in. |          |      |       |       | 7.24     | 9.02 | 16.3  | 17.64 | 8.54     | 10.51 | 17.76 | 19.36 | 10.83     | 13.31 | 20.55 | 21.93 | 10.83     | 13.78 | 21.02 | 22.4  |
|           | mm  |          |      |       |       | 184      | 229  | 413   | 448   | 217      | 267   | 451   | 486   | 275       | 338   | 522   | 557   | 275       | 350   | 534   | 569   |
| MA10VO71  | in. |          |      |       |       |          |      |       |       | 8.54     | 10.51 | 19.06 | 20.63 | 10.83     | 13.31 | 21.85 | 23.43 | 10.83     | 13.78 | 22.32 | 23.9  |
|           | mm  |          |      |       |       |          |      |       |       | 217      | 267   | 484   | 524   | 275       | 338   | 555   | 585   | 275       | 350   | 567   | 607   |
| MA10VO100 | in. |          |      |       |       |          |      |       |       |          |       |       |       | 10.83     | 14.02 | 24.84 | 26.5  | 10.83     | 14.49 | 24.31 | 29.97 |
|           | mm  |          |      |       |       |          |      |       |       |          |       |       |       | 275       | 356   | 631   | 673   | 275       | 368   | 643   | 685   |
| MA10VO140 | in. |          |      |       |       |          |      |       |       |          |       |       |       |           |       |       |       | 10.83     | 14.49 | 25.31 | 29.97 |
|           | mm  |          |      |       |       |          |      |       |       |          |       |       |       |           |       |       |       | 275       | 368   | 643   | 685   |

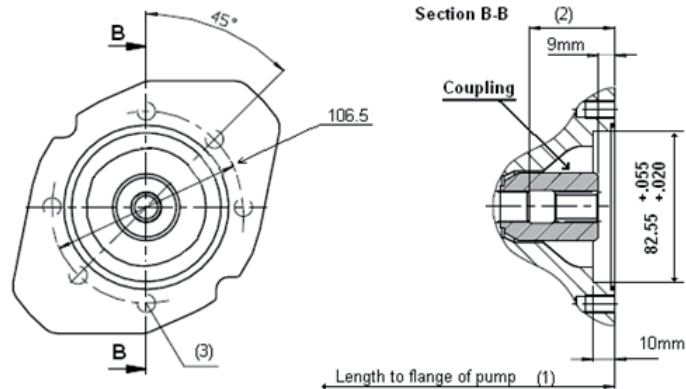
VARIABLE DISPLACEMENT PUMP MA10VO, SERIES 31

Dimensions of Through Drive Covers:

Mounting Flange for SAE A 2-holes 3.250 (82.55) pilot

Ordering code with 5/8" 9T spline coupling K01

Ordering code with 3/4" 11T spline coupling K52



| SIZE | (1)   | (2)  | (3)           |
|------|-------|------|---------------|
| 28   | 204mm | 47mm | M10-16mm deep |
| 45   | 229mm | 53mm | M10-16mm deep |
| 71   | 267mm | 60mm | M10-20mm deep |
| 100  | 338mm | 65mm | M10-20mm deep |
| 140  | 350mm | 77mm | M10-20mm deep |

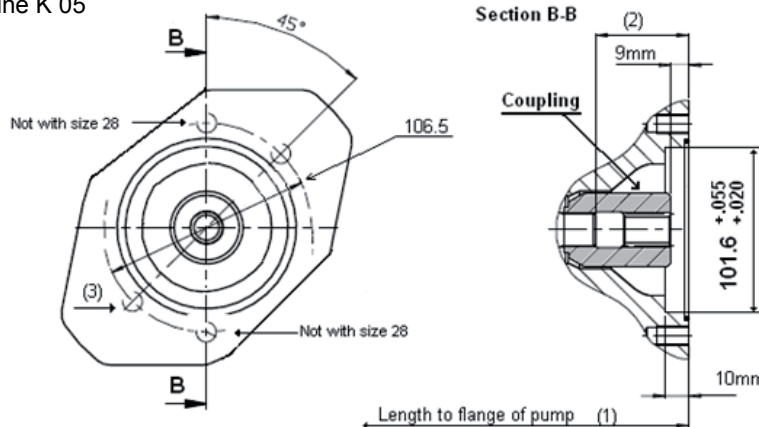
Mounting Flange for SAE B 2-hole 4" (101.6) pilot

Ordering code with 7/8" 13T spline coupling K 02 & K 68

Ordering code with 1" 15T spline coupling K 04

Ordering code 7/8" keyed coupling K 03

Ordering code 1" keyed coupline K 05



| SIZE | (1)   | (2)  | (3)           |
|------|-------|------|---------------|
| 28   | 204mm | 47mm | M12-15mm deep |
| 45   | 229mm | 53mm | M12-18mm deep |
| 71   | 267mm | 60mm | M12-20mm deep |
| 100  | 338mm | 65mm | M12-20mm deep |
| 140  | 350mm | 77mm | M12-20mm deep |

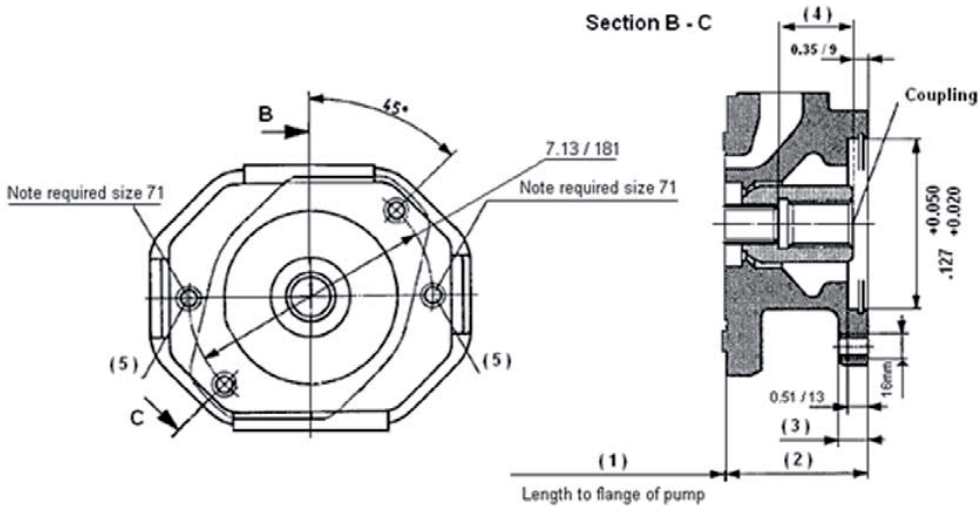


VARIABLE DISPLACEMENT PUMP MA10V0, SERIES 31

Mounting flange for SAE 2 hole 5" (127) pilot

Ordering code with 1 1/4" 14T spline coupling K07

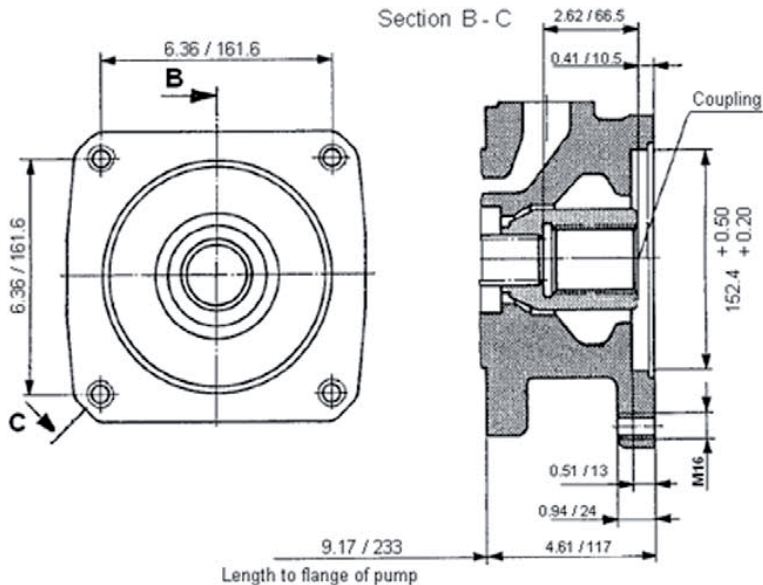
Ordering code with 1 1/4" Keyed coupling K08



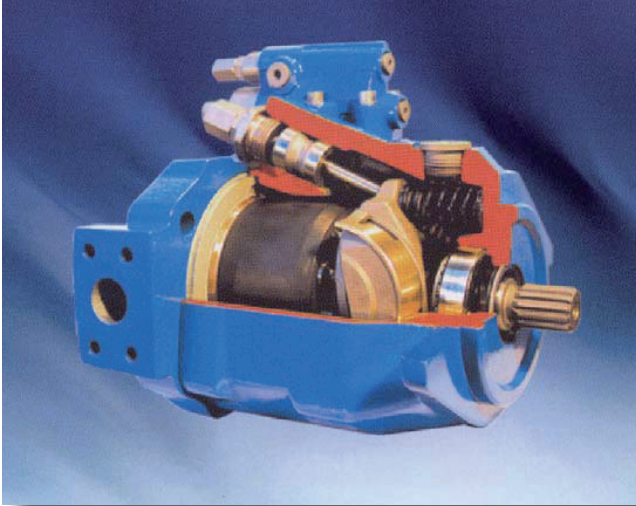
| SIZE | (1)   | (2)   | (3)  | (4)  | (5)           |
|------|-------|-------|------|------|---------------|
| 71   | 177mm | 90mm  | 18mm | 52mm | M16-18mm deep |
| 100  | 233mm | 105mm | 20mm | 57mm | M16-25mm deep |
| 144  | 233mm | 117mm | 24mm | 68mm | M16-25mm deep |

Mounting flange for SAE D 4 hole MA10V140

Ordering code K17



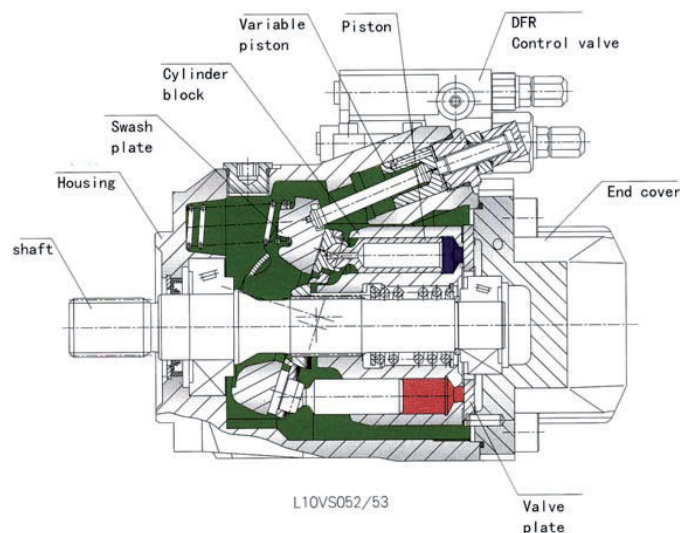
## VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 52



### Features

Axial piston pump MA10VO 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 MA10VO/VSO, 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<sub>N</sub> 3625 PSI or (250 Bar)  
 Peak pressure ..... P<sub>max</sub> 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<sub>mh</sub> and η<sub>v</sub>; values rounded)

| Size                   |                      |                   |                 | 45   | 60   |
|------------------------|----------------------|-------------------|-----------------|------|------|
| Displacement           |                      | V <sub>gmax</sub> | cm <sup>3</sup> | 45   | 60   |
| Max. Speed             | at V <sub>gmax</sub> | n <sub>omax</sub> | rmp             | 2600 | 2700 |
| Max. flow              | at n <sub>omax</sub> | Q <sub>omax</sub> | L/min           | 117  | 162  |
| Max. power             | at n <sub>omax</sub> | P <sub>omax</sub> | kW              | 49   | 68   |
| Max. torque            | at V <sub>gmax</sub> | T <sub>max</sub>  | 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 flow is reduced or if the inlet pressure is increased the speed may be increased.

Hydraulic Formula

1. Determination of Size

Imperial  
 Flow  $Q = \frac{V_g \cdot n \cdot \eta_v}{231} \text{ gpm}$

Metric  
 $\frac{V_g \cdot n \cdot \eta_v}{1000} \text{ L/min}$

V<sub>g</sub> = geometric displacement cu.in. or [cm<sup>3</sup>] per rev.

Torque  $T = \frac{V_g \cdot \Delta p}{24 \cdot \pi \cdot \eta_{mh}} \text{ lb-ft}$

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

Δp = differential pressure PSI or (Bar)

n = speed [rpm]

η<sub>v</sub> = volumetric efficiency

η<sub>mh</sub> = mechanical-hydraulic efficiency

Power  $P = \frac{Q \cdot \Delta p}{1714 \cdot \eta_t} \text{ HP}$

$\frac{Q \cdot \Delta p}{600 \cdot \eta_t} \text{ kW}$

η<sub>t</sub> = total efficiency (η<sub>t</sub> = η<sub>v</sub> • η<sub>mh</sub>)

Q = Flow (gpm) or (L/min.)

VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 52

Ordering Code

|   |                   | MA10VS | 0  | 45 | DFR         | 52 | R         | P         | S |
|---|-------------------|--------|----|----|-------------|----|-----------|-----------|---|
| <b>Axial piston unit</b>  |                   |        |    |    |             |    |           |           |   |
| Swash plate variable pump                                       | MA10VS            |        |    |    |             |    |           |           |   |
| <b>Modes of operation</b>                                       |                   |        |    |    |             |    |           |           |   |
| Pump, open circuit  |                   |        | ●  |    |             |    |           |           |   |
| <b>Size</b>   |                   |        |    |    |             |    |           |           |   |
| Displacement Vgmax (cm³)  |                   |        | 45 | 60 |             |    |           |           |   |
| <b>Control devices</b>  |                   |        |    |    |             |    |           |           |   |
| Pressure control  |                   |        | ●  | ●  | DR          |    |           |           |   |
| G - Remote control  |                   |        |    |    | DRG         |    |           |           |   |
| Pressure and flow control,<br>X channel plugged                 |                   |        | ●  | ●  | DFR<br>DFR1 |    |           |           |   |
| <b>Series</b>   |                   |        |    |    |             |    |           |           |   |
| Series<br>Consult the factory for other series 50/53            |                   |        |    |    |             | 52 |           |           |   |
| <b>Direction of rotation</b>                                    |                   |        |    |    |             |    |           |           |   |
| Viewed on drive shaft   | clockwise         |        |    |    |             |    | R         |           |   |
|   | counter-clockwise |        |    |    |             |    | L         |           |   |
| <b>Seals</b>  |                   |        |    |    |             |    |           |           |   |
| Buna-N (NBR per DIN ISO 1629) ;                                 |                   |        |    |    |             |    |           | P         |   |
| FPM (fluorocarbon)  |                   |        |    |    |             |    |           | V         |   |
| <b>Shaft end</b>  |                   |        |    |    |             |    | <b>45</b> | <b>60</b> |   |
| SAE-splined shaft   |                   |        | ●  | ●  |             |    |           |           | S |
| SAE-splined shaft, smaller size (not for pumps with thru drive) |                   |        | ●  | ●  |             |    |           |           | U |
| SAE-splined shaft, reinforced U-type shaft                      |                   |        | —  | —  |             |    |           |           | W |
| SAE-keyed shaft   |                   |        | ●  | ●  |             |    |           |           | K |
| parallel with key DIN 6885                                      |                   |        | ●  | ●  |             |    |           |           | P |

VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 52

Ordering Code

| C | 62 | N00 |   |           |   |
|---|----|-----|---|-----------|---|
|   |    |     |   | <b>45</b> | <b>60</b>   |
|   |    |     | Without through drive                         | ●         | ● N00   |
|   |    |     | Thru-drive pump with side ports only          |           |   |
|   |    |     | 82-2 SAE A 16-4 SAE A                         | ●         | ● K01   |
|   |    |     | 101-2 SAE B 22-4 SAE B                        | ●         | ● K02 & K04   |
|   |    |     | <b>Service ports</b>                          |           |   |
|   |    |     | <b>(Pressure port B and Suction port S)</b>   |           |   |
|   |    |     |   | <b>45</b> | <b>60</b>   |
|   |    |     | (Rear ports, UNC Mounting screws)             | ●         | ● 61  |
|   |    |     | (Opposite side ports, UNC mounting screws)    | ●         | ● 62  |
|   |    |     | (Rear ports, metric mounting screws)          | ●         | ● 11  |
|   |    |     | (Opposite side ports, metric mounting screws) | -         | - 12  |
|   |    |     | (SAE-threaded rear)                           | ●         | - 64  |
|   |    |     |   |           | Port pos. 61, 11 only for version without through drive |
|   |    |     | <b>Mounting flange</b>                        |           |   |
|   |    |     |   | <b>45</b> | <b>60</b>   |
|   |    |     | SAE 2 Bolt hole                               | ●         | ● C   |
|   |    |     | SAE 4 Bolt hole                               | -         | ● D   |

|   |             |
|---|-------------|
| ● | = available |
|---|-------------|

## VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 52

### Fluid

#### 1. Hydraulic Fluid

The MA10V 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 by selected from within the range.

At operating temperature

Optimum viscosity ( $v_{opt}$ ) \_\_80...170 SUS (16 / 36 mm<sup>2</sup>/s)

#### Limits of viscosity range

The following values are valid for extreme operating conditions:

$v_{min}$  = 60 SUS (10 mm<sup>2</sup>/s)

for short periods at max. leakage oil temperature of 93° C

$v_{max}$  = 4600SUS (1000 mm<sup>2</sup>/s)

1400 SUS (300 mm<sup>2</sup>/s) on short term cold start

#### 3. Temperature Range

$t_{min}$  = -15°C;  $t_{max}$  = +80°C.;  $t_{min}$

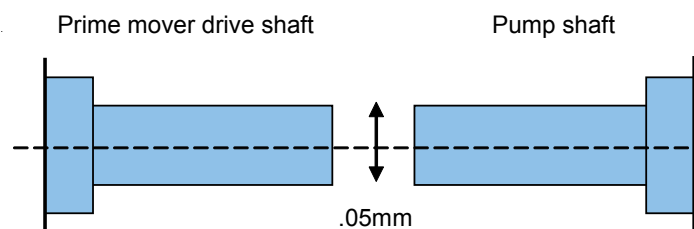
#### 4. Filtration

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.

### Installation Information



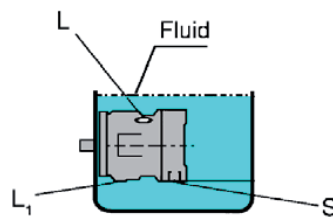
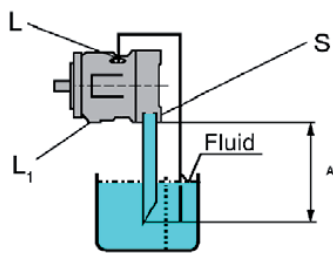
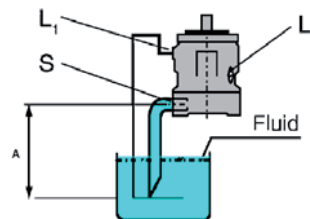
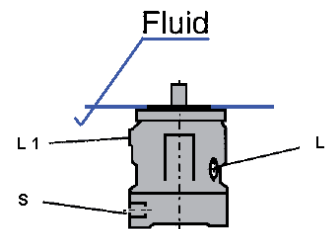
VARIABLE DISPLACEMENT PUMP MA10VO/VSO, SERIES 52

Installation Information - *cont'd.*

The installation position of the pump is optional.

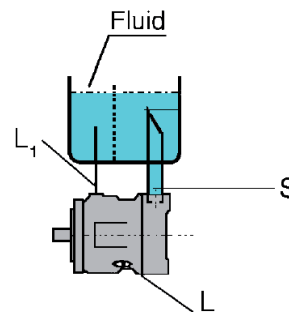
The pump housing must be filled with fluid both when commissioning and in operation. In order to achieve low noise levels, all connecting lines (inlet, case drain) should be isolated from the tank by flexible lines.

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

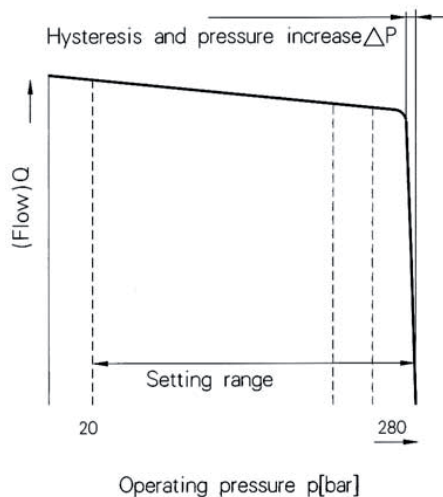
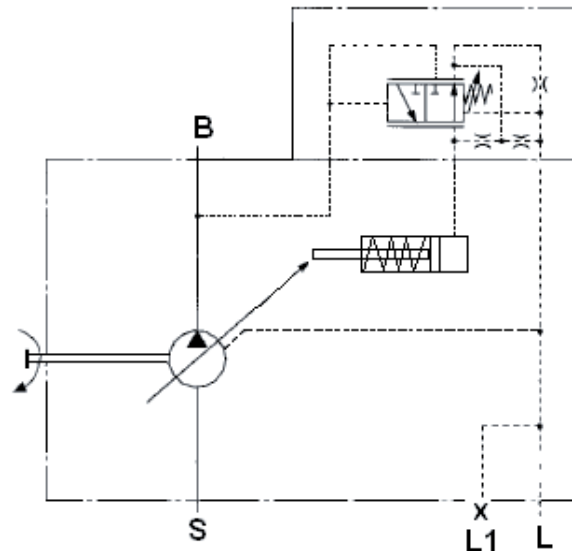
- Pipe "L", "L1" and "S" must be mounted below the oil level



**VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 52**

**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.



**Ports**

|              |                              |
|--------------|------------------------------|
| <b>B</b>     | Pressure Port                |
| <b>S</b>     | Suction port                 |
| <b>L, L1</b> | Case drain ports (L1 sealed) |

**Control Data**

Hysteresis and repetitive accuracy  $\Delta p$  ..... Max. 3 bar

**Max. Pressure Increase**

| Size       |     | 45 | 60 |
|------------|-----|----|----|
| $\Delta P$ | BAR | 6  | 8  |

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

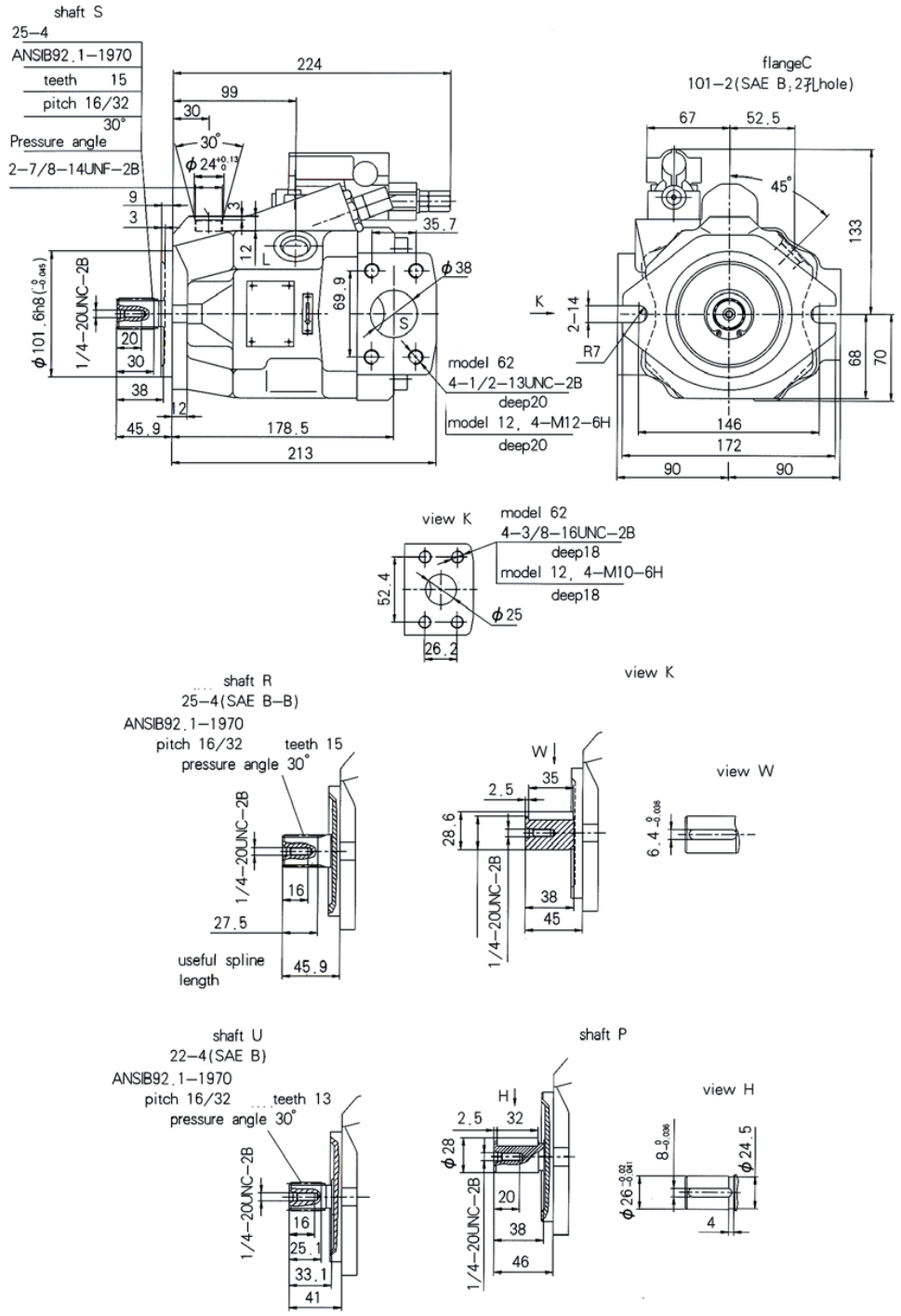
For other controls DRG and DFR see page 13 & 14



VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 52

Mounting Dimension, Sizes 45

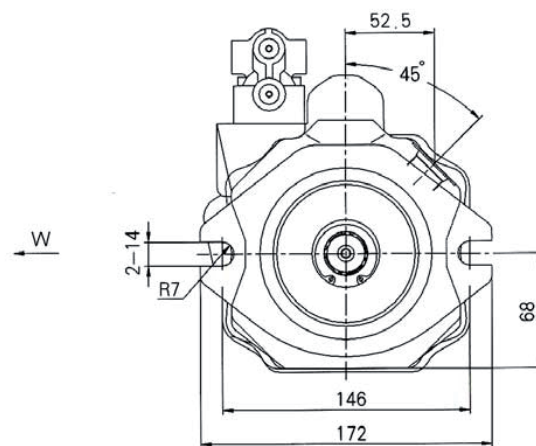
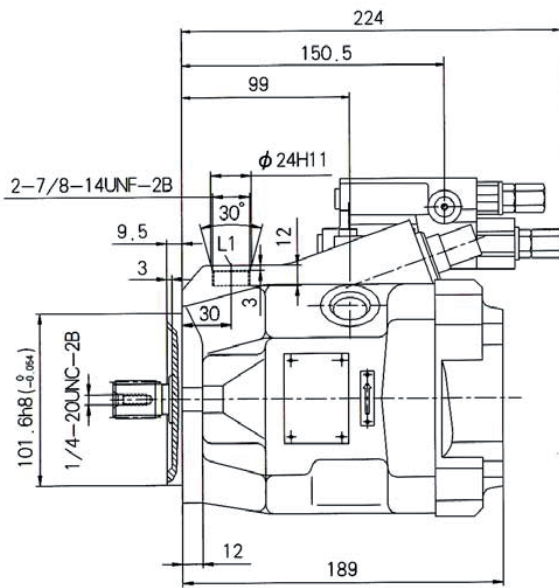
Pressure control DR  
Version MA10VSO45DR/52R-XXC62/12NOO



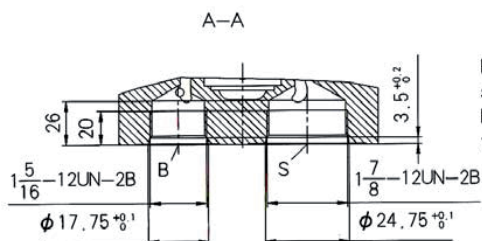
## VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 52

### Mounting Dimension, Sizes 45

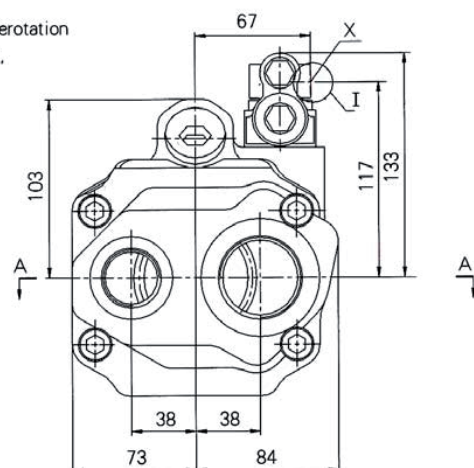
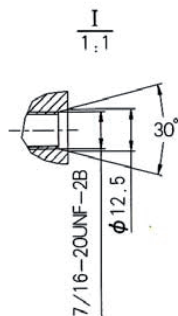
**DFR**  
**Version MA10VSO45 DFR1/52L-XXC64N00**  
**DRG**



W向; view W



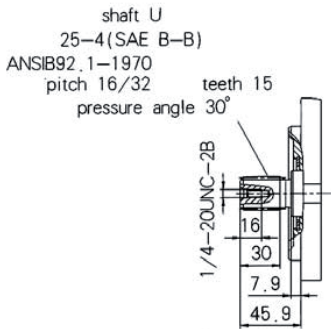
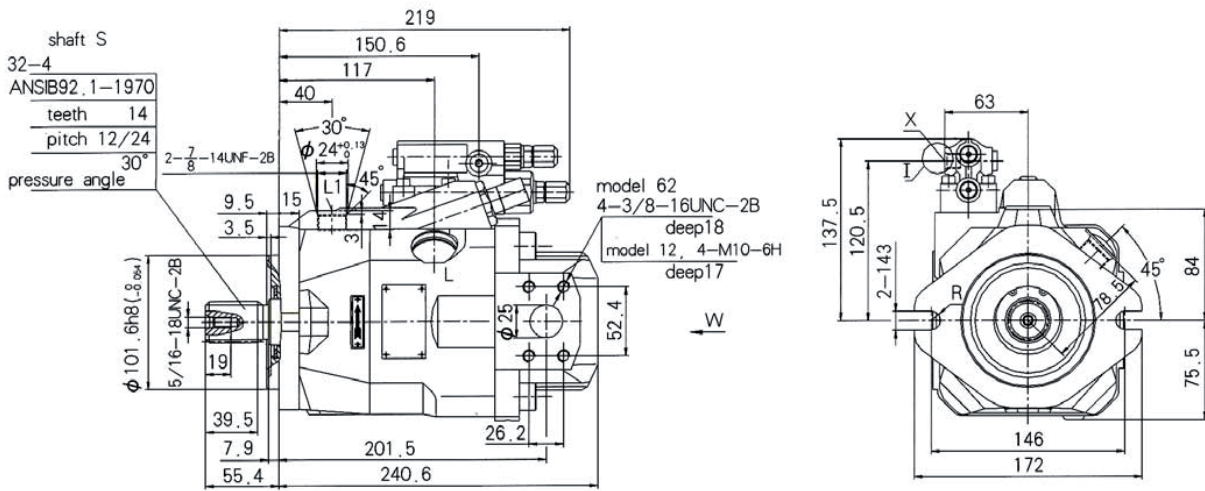
Port plate 64 shown is anticlockwise rotation  
 For clockwise rotation, turn port plate 180°



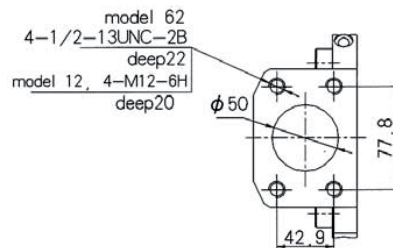
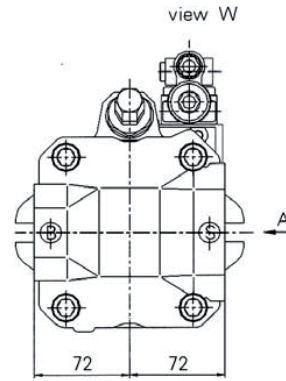
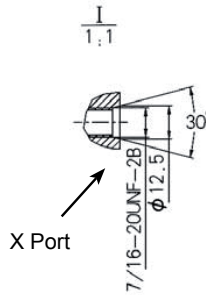
VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 52

Mounting Dimension, Sizes 60

**DFR**  
**Version MA10VSO60 DFR1/52L-XXC62/12N00**  
**DRG**



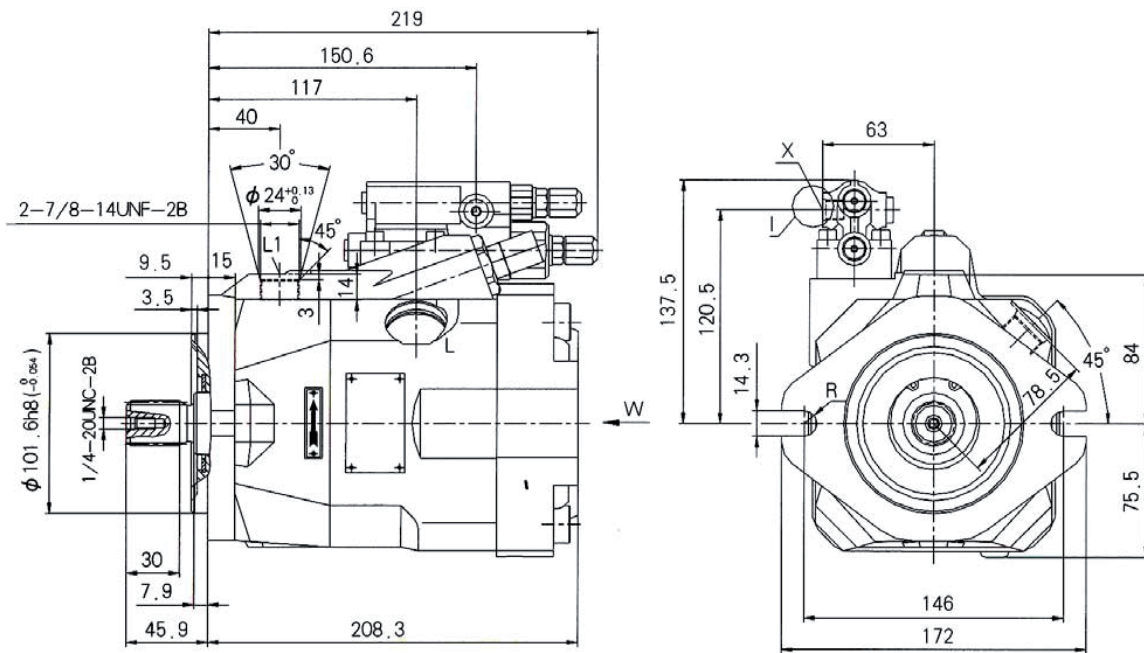
Port plate 62/12  
 shown is anticlockwise rotation  
 For clockwise rotation,  
 turn port plate 180°



VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 52

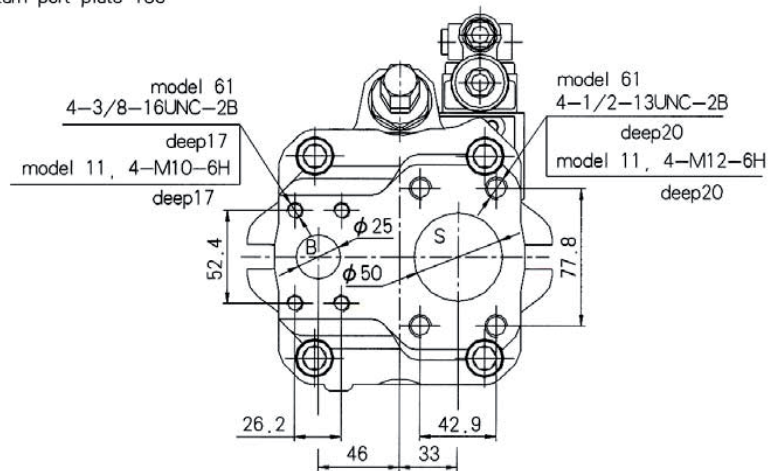
Mounting Dimension, Sizes 60

DFR  
Version MA10VSO60 DFR1/52L-XXC61/11N00  
DRG



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

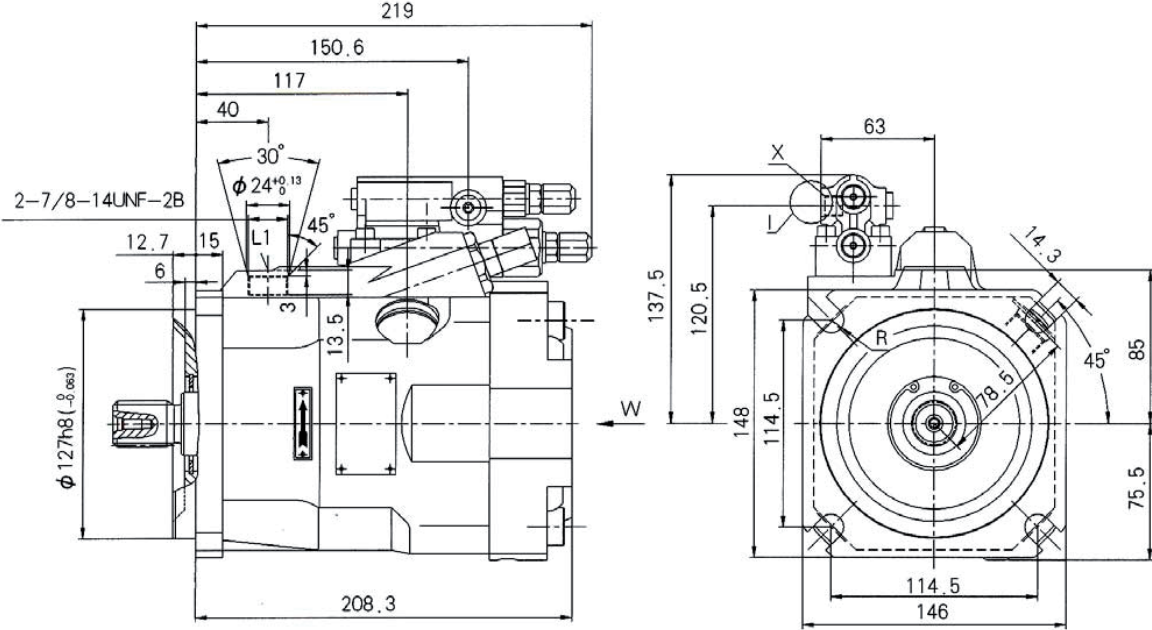
view W



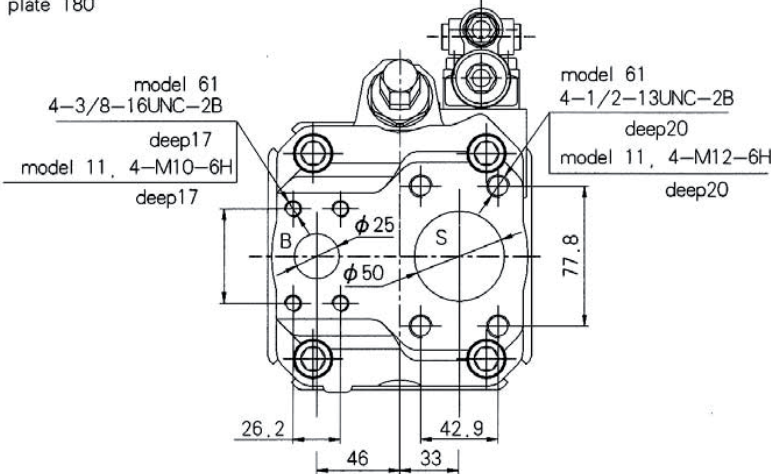
VARIABLE DISPLACEMENT PUMP MA10VO/VS0, SERIES 52

Mounting Dimension, Sizes 60

**DFR**  
**Version MA10VSO60 DFR1/52L-XXC61/11N00**  
**DRG**



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



2010

## **GTA Lombardia srl**

[www.gtalombardia.it](http://www.gtalombardia.it)  
[info@gtalombardia.it](mailto:info@gtalombardia.it)

### **Sede**

Via S.Maria, 104  
20093 Cologno Monzese (MI)  
Tel. +39 02/27300668  
Fax. +39 02/27300692

### **Filiale**

Via Stelvio, snc  
25038 Rovato (BS)  
Tel. +39 030/7704916  
Fax. +39 030/7704918