

<h1>Rexroth</h1> <h2>Bosch Group</h2>	<h3>Installation Notes</h3> <h3>for Axial Piston Units</h3>	<h2>RA</h2> <h2>90 270/05.93</h2>
	<p><b>A2F, A2F0, A2FM, A2FE, A6VE, A6VM, A4VG, A4V, A11VG, A8VO, A7VO, A7FO</b></p>	

**General**

These installation requirements are intended for use with the axial piston units referred to in this data sheet. Strict compliance with these instructions will provide optimum results with the service life of the units.

The most important requirement is that the housing of the unit is completely filled with fluid on start-up or re-start and it remains full when operating.

Operating these axial piston units without filling the housing or with too little fluid in the housing will lead to damage to or immediate and complete destruction of the rotary group, and/or bearings.

The ideal filling procedure is specified on page 2. Only in these positions can the filling of the housing be ensured. In some cases, it is required to fill the housing before placing the unit in its final position. In addition, we differentiate between installation position (pump/motor to tank) and installation orientation (pump/motor shaft vertical, horizontal, etc.).

Please consult the factory for any other installation requirements.

**Installation Position**

The following installation positions are possible, see figure 1.

- (a) Pump/motor above the tank (above the minimum fluid level)
- (b) Pump/motor alongside or under the tank (below the minimum fluid level) or where the upper point on the unit housing is level with the minimum fluid level.
- (c) Pump/motor in the tank (below the minimum fluid level). When installing the unit inside the tank, (a) applies if the unit is above the minimum fluid level.

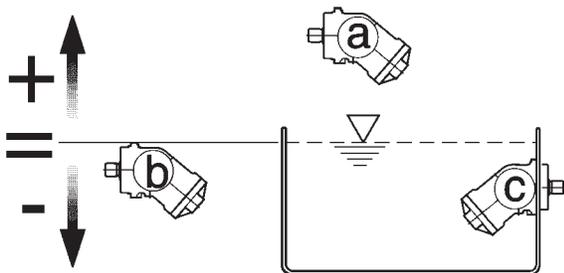
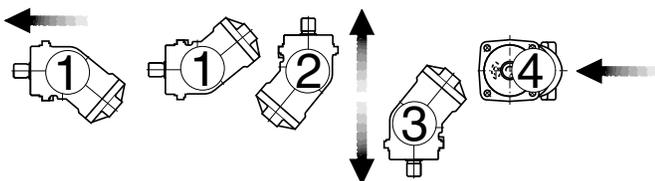


Fig. 1:

**Installation orientation**

The following installation orientations are possible, see figure 2.

- ① horizontal : drive shaft horizontal
- ② vertical: drive shaft up
- ③ vertical: drive shaft down
- ④ at side: drive shaft horizontal



Intermediate installation orientations require additional measures or are not permitted. Please discuss any other requirements with us at the project stage.

**Piping**

The installation position and installation orientation determine the layout of the suction, leakage (case drain) and bleed line. For all installation positions and orientations it should be noted, that the highest "T" port is used. Also, the end of the drain line may not end "above immersion depth 'E'", see page 3.

**Special Points**

Suction and drain lines should be as short and straight as possible. When the unit is stopped, vertical lines will empty themselves over a period of time due to gravity.

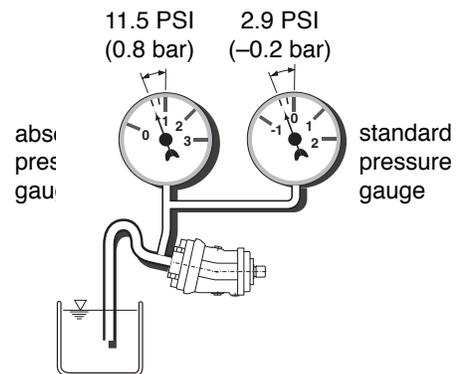
In this respect, the varying densities of the fluids must be observed, as denser fluids are more difficult to "suck" and fall more quickly. Limiting speeds of units for denser fluids are laid down in RA 90 221 and RA 90 223.

In mobile applications, the arrangement of the tank is particularly important. Centrifugal forces when driving around bends, and inertia effects when accelerating or braking influence the inclination of the surface of the fluid. As the level of fluid in the tank falls, these effects must be taken into consideration. The adverse effects of these forces can be avoided by correct layout of the tank, see RA 90 400.

In general, and for all installation positions and installation orientations, a minimum pressure at the suction port "S" is specified:

If the pressure falls below this specified value, damage can occur

minimum suction pressure  $\geq 11.5$  PSI (0.8 bar) absolute



or the unit can be destroyed. The maximum suction pressure is determined by the maximum casing pressure.

In variable units, the actual installation position and installation orientation may also have an effect on the control fitted to vary the displacement of the unit. The operating curves can be slightly offset, and variations to control times can occur due to inertia forces and the weight of the internal parts. Please note these points.

(During project and design work, the conditions laid down in RA 90 220, RA 90 221, RA 90 223, and RA 90 400).

If further questions arise, please consult us.

Installation notes for axial piston units

Filling the unit

Separate suction and drain chambers

Only after the housing is completely full can the installation of the axial piston unit take place. The housing is to be filled from the highest drain port and all other ports must be closed by means of pipe bends or check valves. This prevents air from entering the unit when turning it into its installation position. When installing the unit inside the tank (below the minimum fluid level), it should be noted that the ports are opened after the tank has been filled and when the unit is below fluid level. The sequence of operations is shown in figure 3.

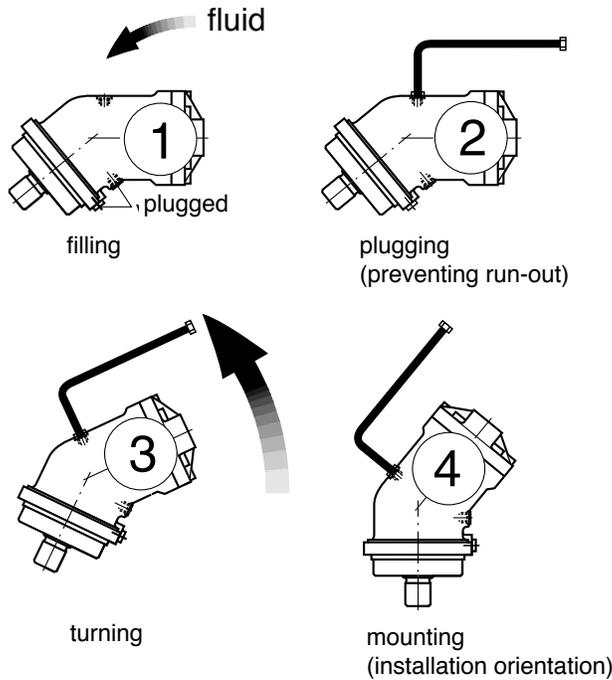


Fig. 3:

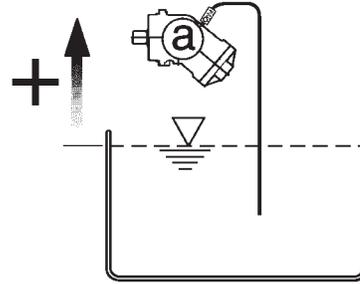
Suction and drain chambers connected internally

Filling of the housing in these units is not possible. The unit is filled when the tank is filled as the oil flows in via the "S" port. The units are bled via the highest "T" port in the housing.

Installation

Installation position (a)

Pump/motor above the tank (above the minimum fluid level)



In this position, the highest drain port "T" must be connected to tank via a non-return valve. The height difference between the unit and the tank can be negated in this way and the weight of the fluid column in the drain line causing a negative pressure at the case drain port does then not need to be considered. A height of 3.28 ft (1 meter) above fluid level causes  $\approx$  15 PSI (0.1 bar) negative pressure.

When selecting the cracking pressure of the valve, the maximum housing pressure must be observed. See the relevant data

sheet.

max. valve cracking pressure Dp  $\leq$  7.3 PSI (0.5 bar)

The higher the cracking pressure the higher the resulting casing pressure. This leads to a reduction in the shaft seal life (see shaft seal diagrams in the individual data sheets).

With long stationary periods, the fact that the unit may slowly empty itself due to internal leakage through the service line must also be taken into account.

Fitting check valves in the service lines can overcome this problem.

These measures do not mean that regular checking of the fluid level inside the housing can be overlooked. This check can be made at the highest drain port or bleed port.

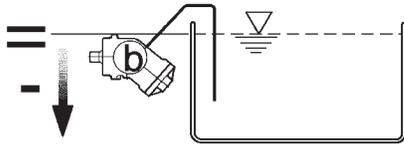
If the oil level has fallen, the unit should be re-commissioned if required.

The notes on page 12 should also be noted for variable pumps A7VO and fixed pumps A7FO.

Installation notes for axial piston units

Installation position (b)

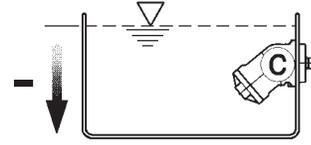
Pump/motor alongside or below the tank (below the minimum oil level).



The maximum height difference between the tank and the unit is dependent upon the maximum casing pressure. A height of 3.28 ft (1 meter) above fluid level causes ≈ 15 PSI (0.1 bar) pressure. With units in which the suction and drain chambers are connected internally, complete bleeding of the unit must be carried out, as it is not possible to fill the housing. Bleeding must take place via the highest bleed or drain port.

Installation position (c)

Pump/motor inside the tank (below the minimum oil level).



With units in which the suction and drain chambers are connected internally, complete bleeding of the unit must be carried out, as it is not possible to fill the housing. In units with separate suction and drain chambers, the unit must be filled before installation. The connections may then only be opened when they are below fluid level in order to avoid the entry of air and loss of fluid.

Minimum distances »TU« and »SU«.

Suction

Minimum immersion level »E«

For installation positions (a) and (b), the prescribed minimum immersion level »E« must be maintained. This dimension applies to suction, drain and bleed lines, see figure 4.

Minimum dimension »E« ≥ 8 inches (200 mm)

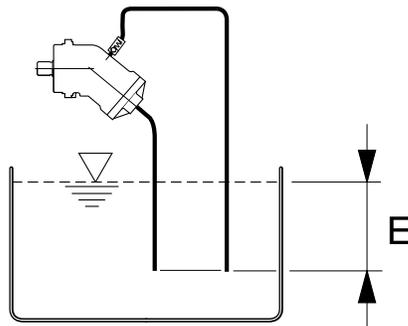


Fig. 4:

Dimension »TU« for the highest drain port »T«, and dimension »SU« for suction port »S« must be maintained. The bleed port »U« is not used in this case. In mobile installations, the tank layout must be carefully designed in order to prevent air being sucked in, see figure 5.

	A7VO, A7FO	
Dimension »TU«	≥ 2 in (50 mm)	≥ 4 in (100 mm)
Dimension »SU«	≥ 8 in (200 mm)	≥ 8 in (200 mm)

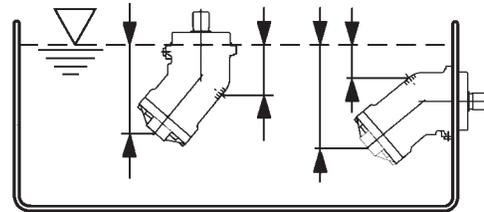


Fig. 5:

Note

The »optimum filling positions« and the permissible »installation positions« and »installation orientations« for our pumps and motors are shown on the following pages.

These pages are subdivided into three columns:

Installation positions (a), (b) and (c)

and also into five horizontal blocks:

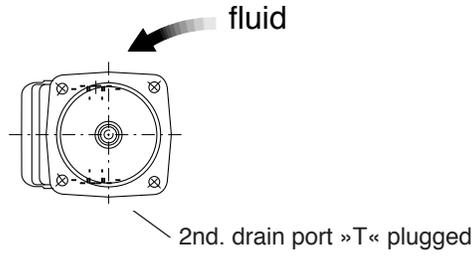
- 1.) installation orientation ①
- 2.) installation orientation ① (turned 180° about its longer axis)
- 3.) installation orientation ②
- 4.) installation orientation ③
- 5.) installation orientation ④

This sequence applies to each of the relevant pages. If a column or row is blank, this installation position or installation orientation is not permitted by Rexroth Hydromatik, or requires further steps to be taken to ensure correct installation. Please consult us for further information.

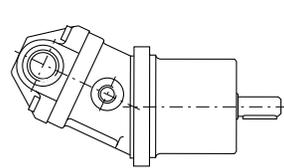
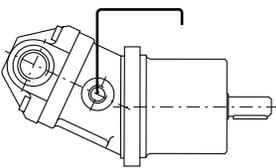
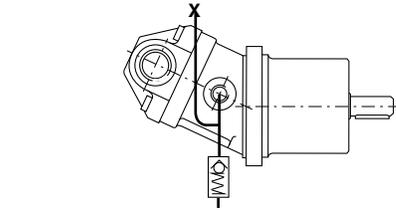
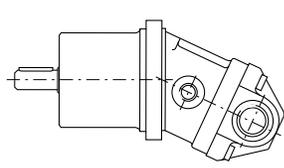
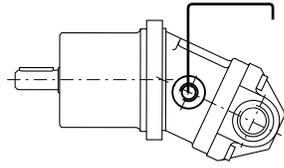
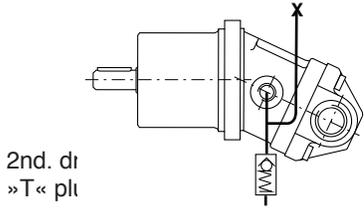
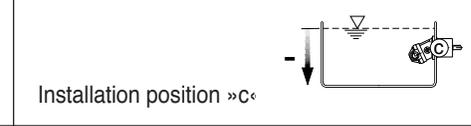
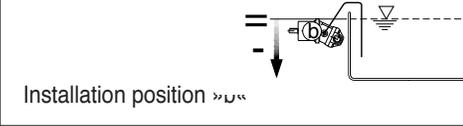
The piping shown should only be taken for reference. It is only shown to indicate the principles involved.

Fixed displacement pump/motor A2F 5, Series 6

Optimum filling orientation:



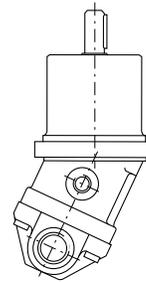
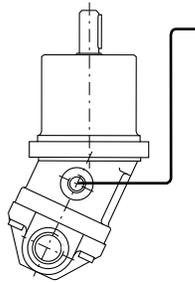
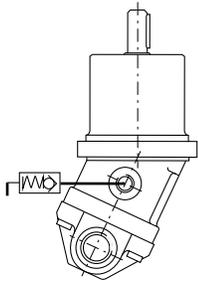
Before finalizing your design, please request a certified drawing.  
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2nd. drain port »T« plugged

2nd. drain port »T« plugged

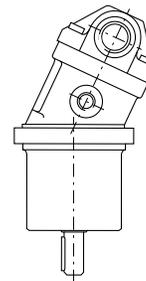
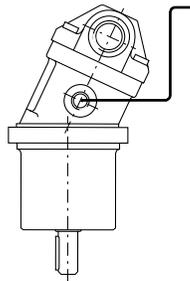
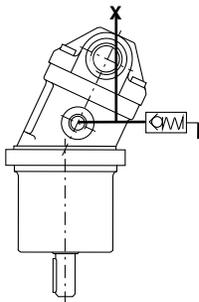
both drain ports »T« open



2nd. drain port »T« plugged

2nd. drain port »T« plugged

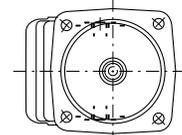
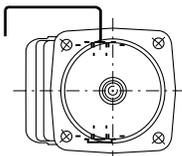
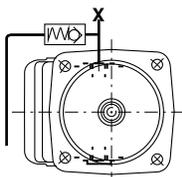
both drain ports »T« open



2nd. drain port »T« plugged

2nd. drain port »T« plugged

both drain ports »T« open



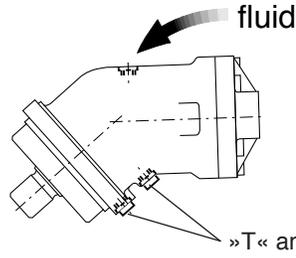
2nd. drain port »T« plugged

2nd. drain port »T« plugged

both drain ports »T« open

Fixed pump A2FO, Series 6 / Fixed motor A2FM, Series 6

Optimum filling orientation:

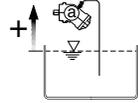


Before finalizing your design, please request a certified drawing.  
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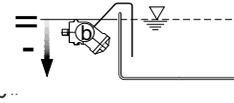
\* A2FM, when ordering, please state in clear text

Air bleed port »R« standard in A2FO

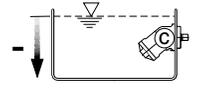
Installation position »a«



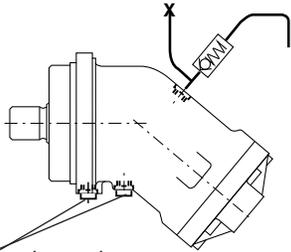
Installation position »b«



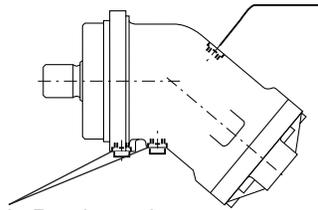
Installation position »c«



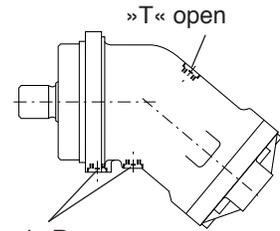
»T« and »R« plugged



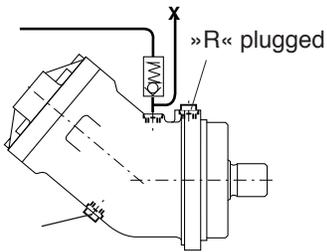
»T« and »R« plugged



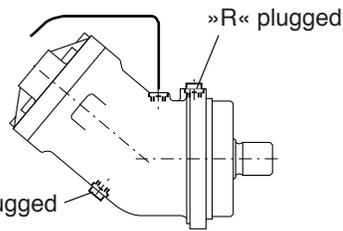
»T« and »R« open



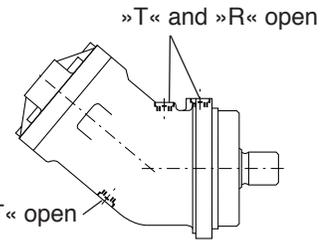
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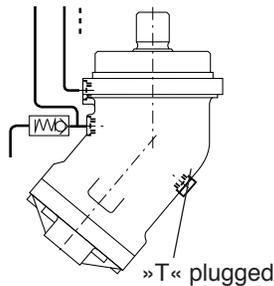
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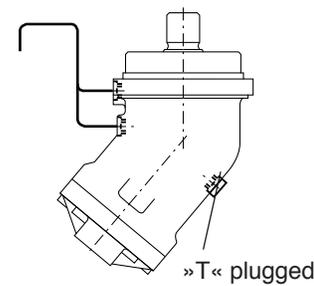
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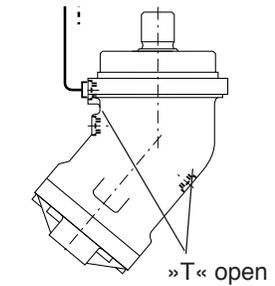
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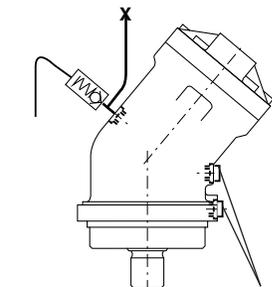
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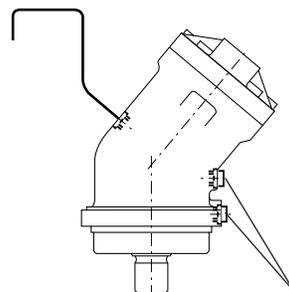
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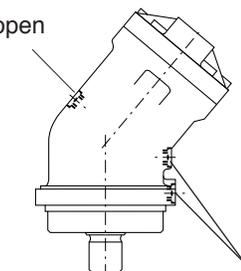
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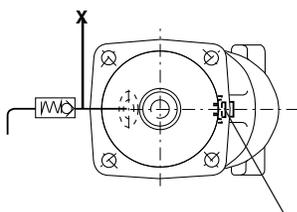
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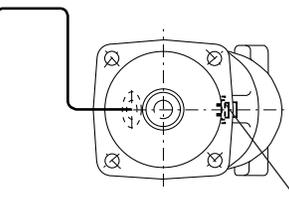
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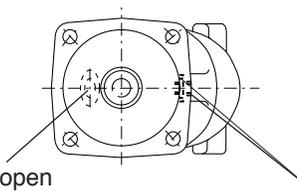
»T« and »R« plugged



»T« and »R« plugged



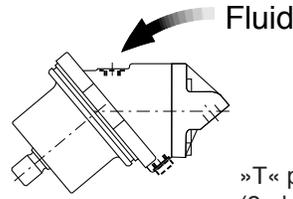
»T« open



»T« and »R« open

Plug-in motor, fixed displacement A2FE, Series 6

Optimum filling orientation:

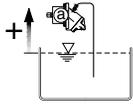


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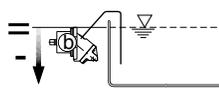
»T« plugged  
(2nd drain port not standard)

\* 2nd drain port, please state in clear text when ordering

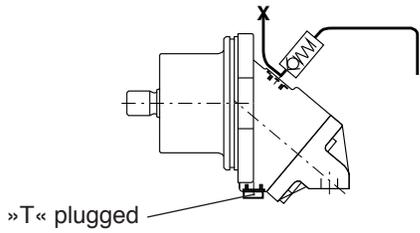
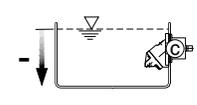
Installation position »a«



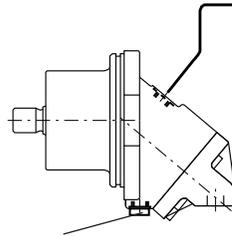
Installation position »



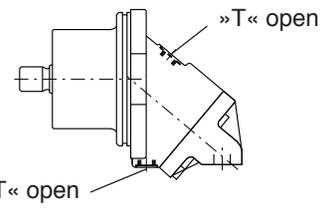
Installation position »c«



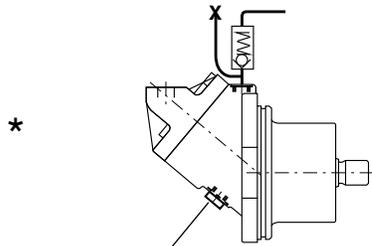
»T« plugged



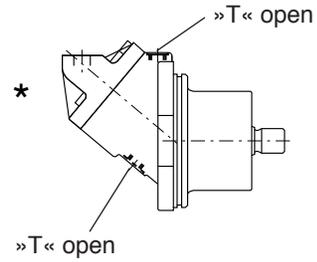
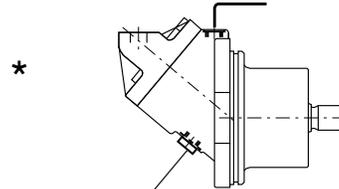
»T« plugged



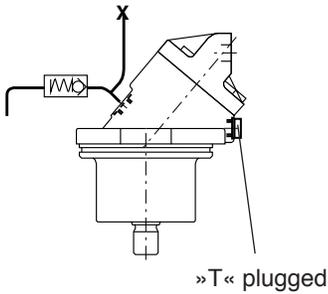
»T« open



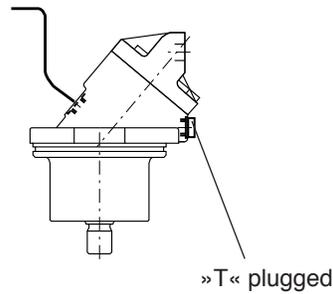
»T« plugged



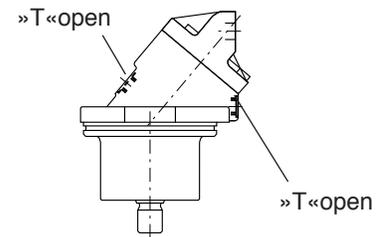
»T« open



»T« plugged

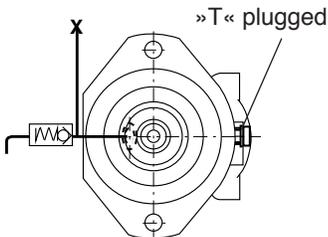


»T« plugged

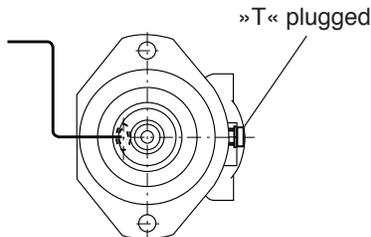


»T« open

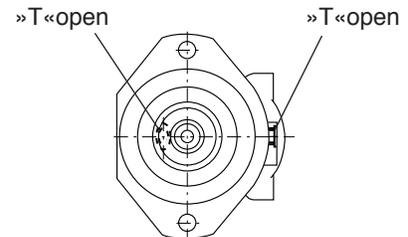
»T« open



»T« plugged



»T« plugged

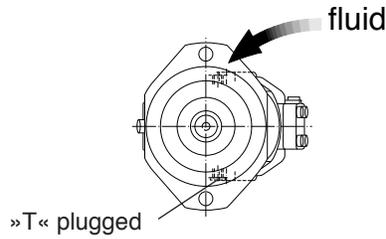


»T« open

»T« open

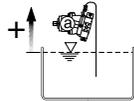
Plug-in motor, variable displacement A6VE, Series 6, Index 1

Optimum filling orientation:

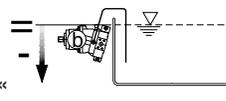


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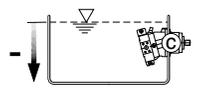
Installation position »a«



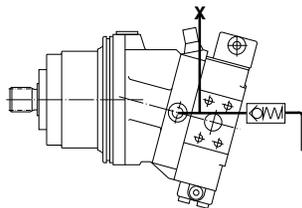
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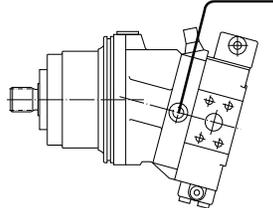
Installation position »c«



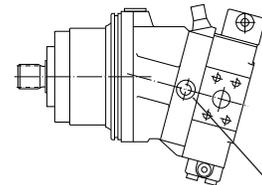
2nd drain port »T« plugged



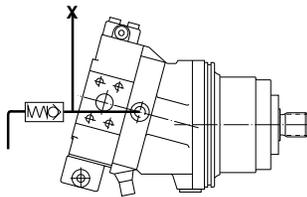
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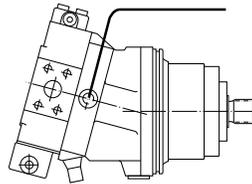
both drain ports »T« open



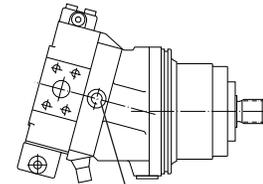
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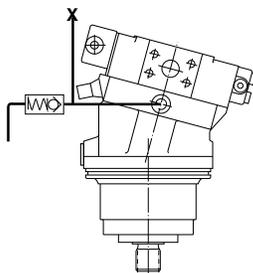
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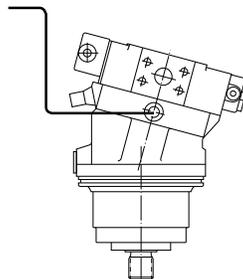
both drain ports »T« open



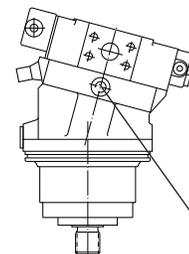
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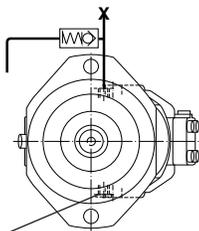
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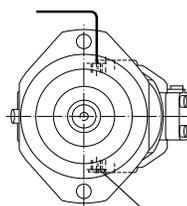
both drain ports »T« open



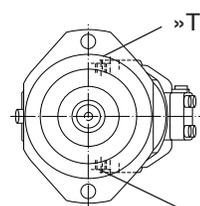
»T« plugged



»T« plugged

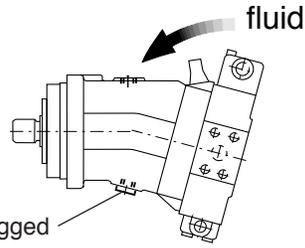


»T« open



# Variable motor A6VM, Series 6

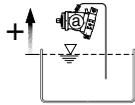
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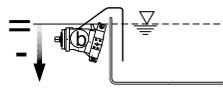
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\* Flushing port »U« when ordering, please state in clear text

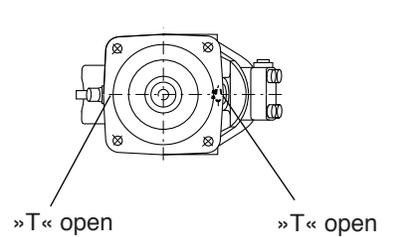
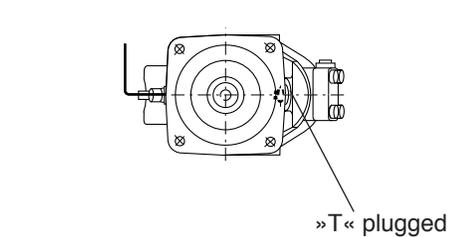
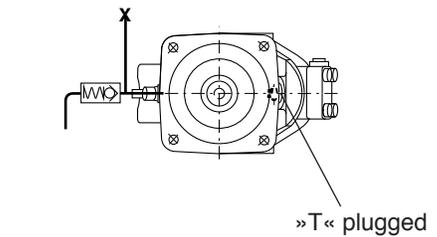
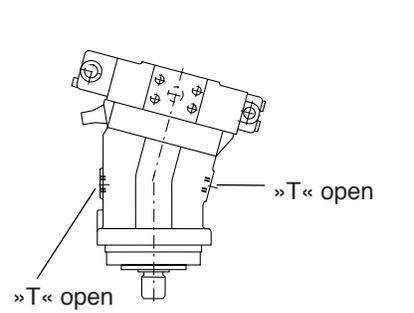
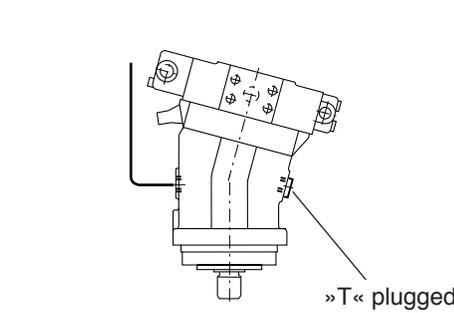
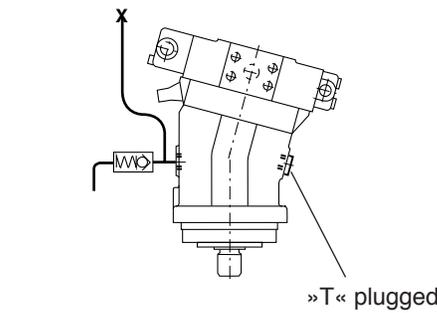
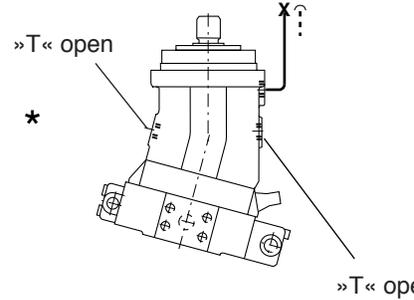
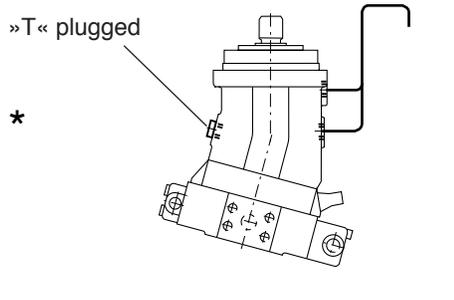
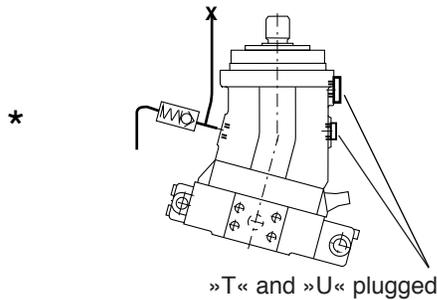
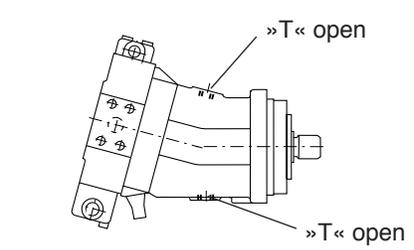
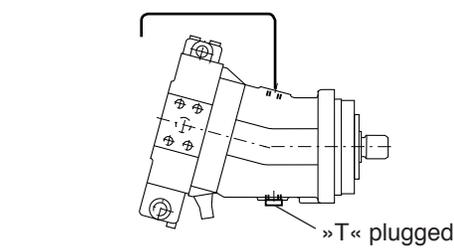
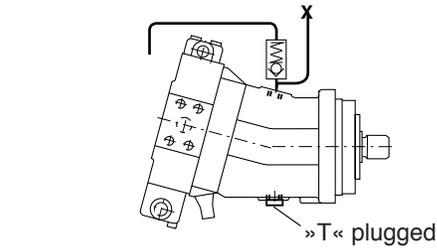
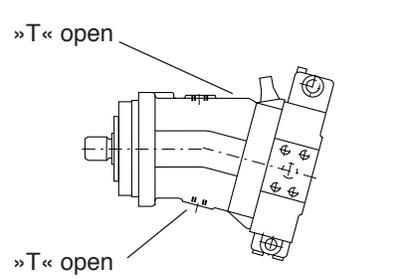
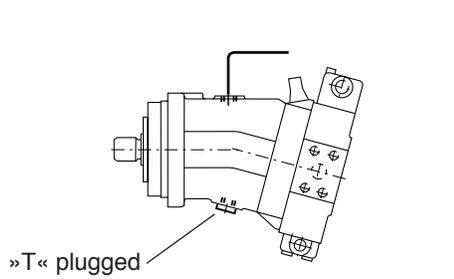
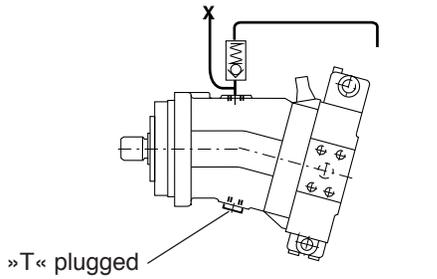
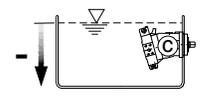
Installation position »a«



Installation position »b«

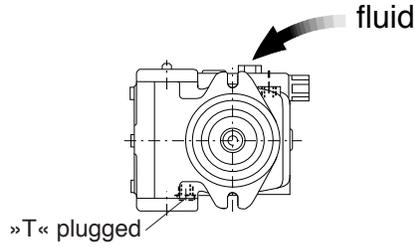


Installation position »c«



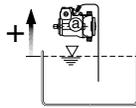
Variable pump A4VG, Series 6 / Variable pump A4V, Series 1 / Variable pump A11VG, Series 1

Optimum filling orientation:

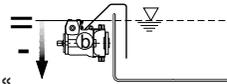


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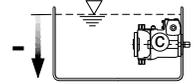
Installation position »a«



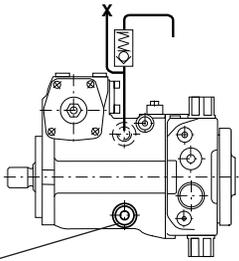
Installation position »b«



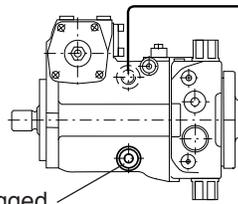
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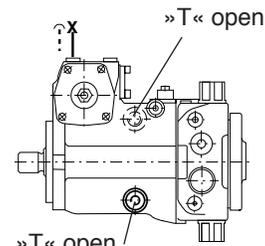
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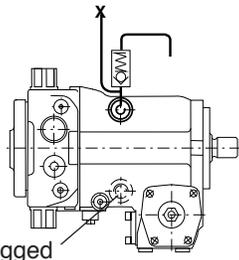
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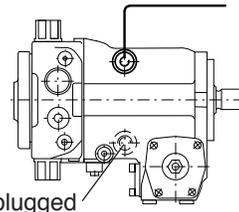
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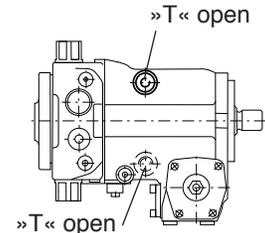
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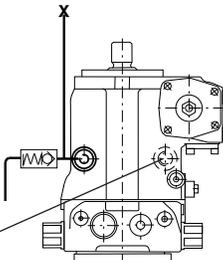
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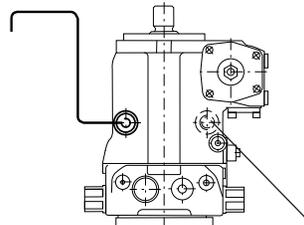
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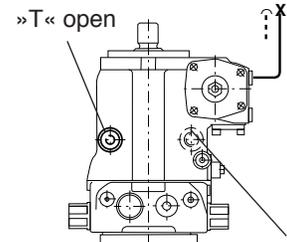
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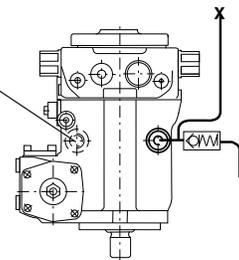
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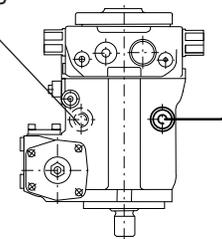
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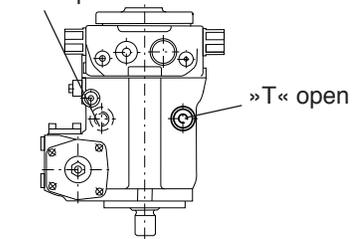
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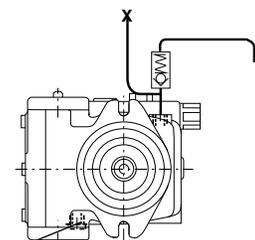
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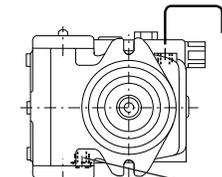
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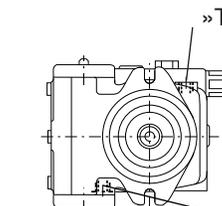
»T« plugged



»T« plugged



»T« open



»T« open

Variable pump A8VO, Series 6

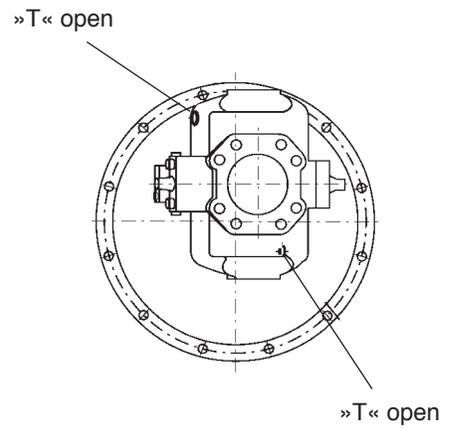
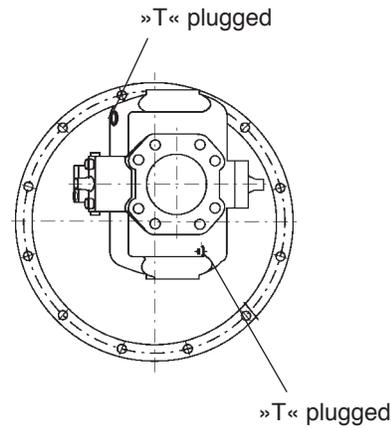
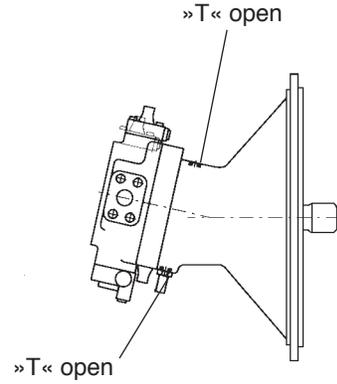
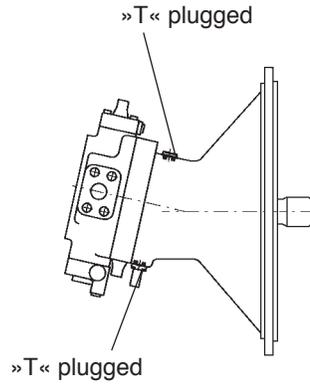
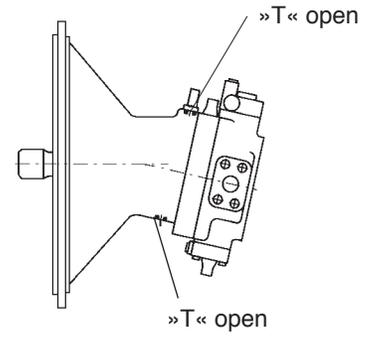
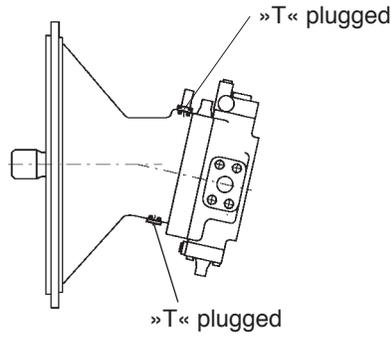
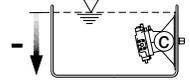
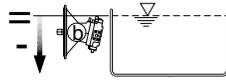
Filling not possible

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Installation position »a«

Installation position »x«

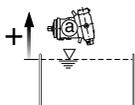
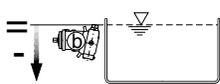
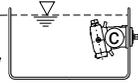
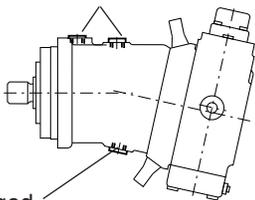
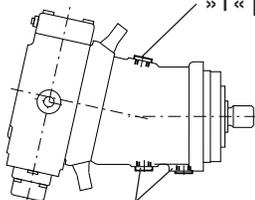
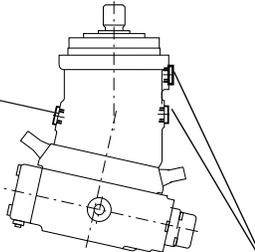
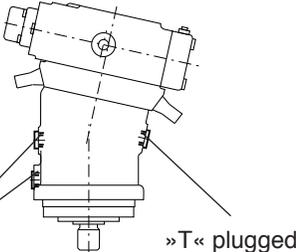
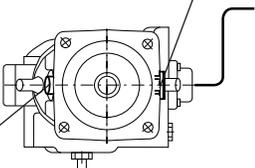
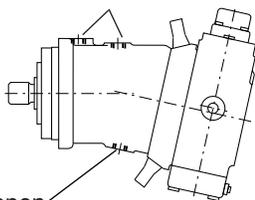
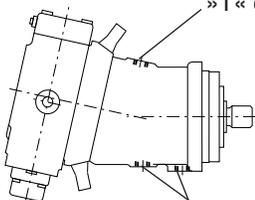
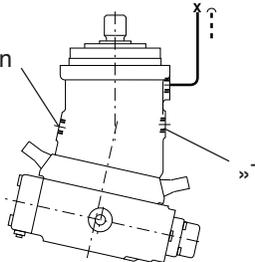
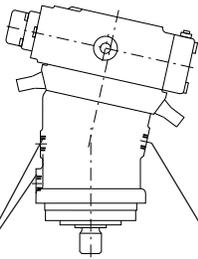
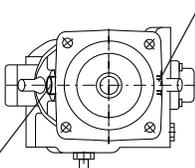
Installation position »c«



Variable pump A7VO, Series 6 / Fixed pump, adjustable A7FO, Series 6

Filling not possible

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<p>Installation position »a«</p> 	<p>Installation position »b«</p> 	<p>Installation position »c«</p> 
<p>see page 12</p>	<p>»T« and »U« plugged</p>  <p>»T« plugged</p>  <p>»T« plugged</p> <p>»T« and »U« plugged</p>  <p>»T« plugged</p> <p>»T« and »U« plugged</p>  <p>»T« plugged</p> <p>»T« and »U« plugged</p>  <p>»T« plugged</p> <p>»T« and »U« plugged</p>	<p>»T« and »U« open</p>  <p>»T« open</p>  <p>»T« open</p> <p>»T« and »U« open</p>  <p>»T« open</p> <p>»T« open</p>  <p>»T« and »U« open</p> <p>»T« open</p>  <p>»T« open</p> <p>»T« and »U« open</p>

Variable pump A7VO, Series 6 / Fixed pump, adjustable A7FO, Series 6

Installation position »a«

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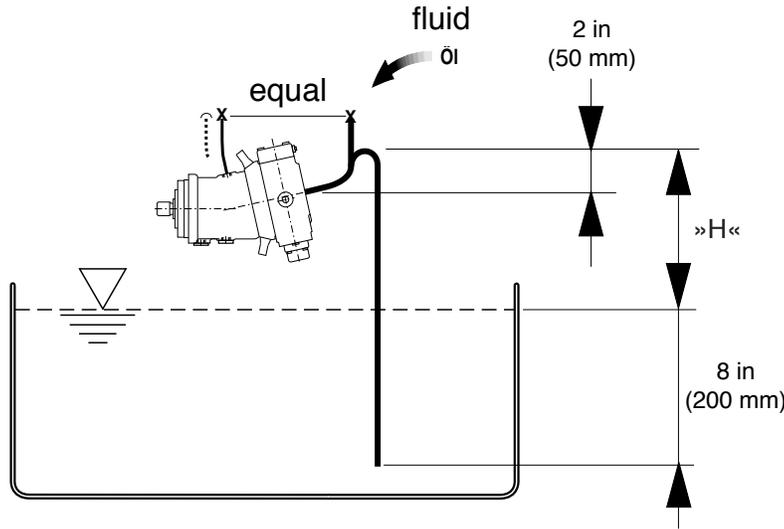


Fig. 6:

A7VO/6 Size	A7FO/6 Size	max. suction pipe length »H« in (mm)	Speed »n <sub>max</sub> « rpm
28	-	24 (600)	2650
55	29 ... 55	30 (750)	2240
80	56 ... 80	30 (750)	2000
107	81 ... 107	30 (750)	1800
160	108 ... 160	34 (850)	1600
200	-	34 (850)	1450

Special Measures

- Maintain max. speed and suction pipe length requirements
- Fit 2 shaft seals in order to prevent the ingress of air (make note on ordering code)
- Horizontal installation only with bent axis to top, see figure 6
- Fill pump and bleed pump housing before commissioning or re-commissioning
- Swivel out to full swivel angle and set max. operating pressure  $p_{HD} \leq 1451 \text{ PSI (10 bar)}$  before start-up
- Limit pump to residual flow  $V_{g \text{ min}} \geq 5\% V_{g \text{ max}}$
- Impossible with stalled (zero stroke) operation

**Bosch Rexroth Corporation**

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www.boschrexroth-us.com