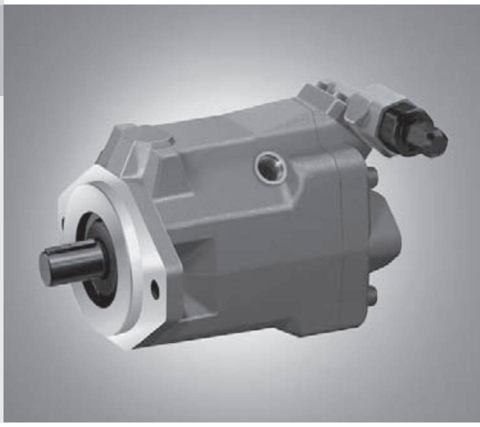
Rexroth
Bosch Group

Variable displacement pump A10VSO

RE 92 713/06.97 **1**/12
Replaces: 01.97

open circuit



Size 10
Series 52
Nominal pressure 250 bar
Peak pressure 315 bar

Contents

Features

– The variable displacement axial piston pump A10VSO in swashplate design was designed for hydrostatic drives in open circuits.
– The pump is suitable for use in both stationary and mobile applications.
– Volumetric flow is proportional to the drive speed and the displacement. By adjusting the position of the swashplate it is possible to vary the flow steplessly.
– SAE and ISO mounting flange
– Compact construction
– High power-weight ratio
– Low noise level
– Lower press loss
– Short control times
– Pressure and flow control

Further information:

Variable displacement pump A10VSO/3 Size 18	RE 92712
Variable displacement pump A10VSO/3 Size 28...140	RE 92711

Ordering Code

A10VS	O	10		/	52		–	P				N00

Fluid

Mineral oil (no desig.)	

Axial piston unit

Variable, swashplate design nominal pressure 250 bar, peak pressure 315 bar	A10VS

Mode of operation

Pump, open circuit	O

Size

≙ Displacement $V_{g\,max}$ (cm³)	10

Control devices

Pressure control	DR
Pressure-remote control	DRG
Pressure- and flow control	DFR1

Series

	52

Direction of rotation

Looking at driveshaft	clockwise	R
	counter-clockwise	L

Seals

NBR (Nitrile rubber to DIN ISO 1629)	P

Shaft end

	SAE	DIN	
Cylindrical with feather key 19-1(SAE A-B)	●	–	K
Cylindrical with feather key DIN 6885	–	●	P
Splined shaft 19-4 (SAE A-B, 3/4")	●	–	S
Splined shaft 16-4 (SAE A, 5/8")	●	–	U

Mounting flange

	SAE	DIN	
SAE 2-bolt	●	–	C
ISO 2-bolt	–	●	A

Service ports

		SAE	DIN	
Pressure port B Inlet port S	UNF-thread rear	●	–	64
Pressure port B Inlet port S	metric thread rear	–	●	14

Through drive

without through drive	N00

▭ = prefered program (with short delivery times)

● = available
– = not available

Hydraulic fluid

Prior to project design, please see our catalogue sheets RE 90220 (mineral oils) and RE 90221 (environmentally compatible fluids) for detailed information on the selection of hydraulic fluids and application conditions.
When operating with environmentally compatible fluids certain limitations may apply. Please consult us.

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

ν_{opt} = optimum operating viscosity 16...36 mm²/s

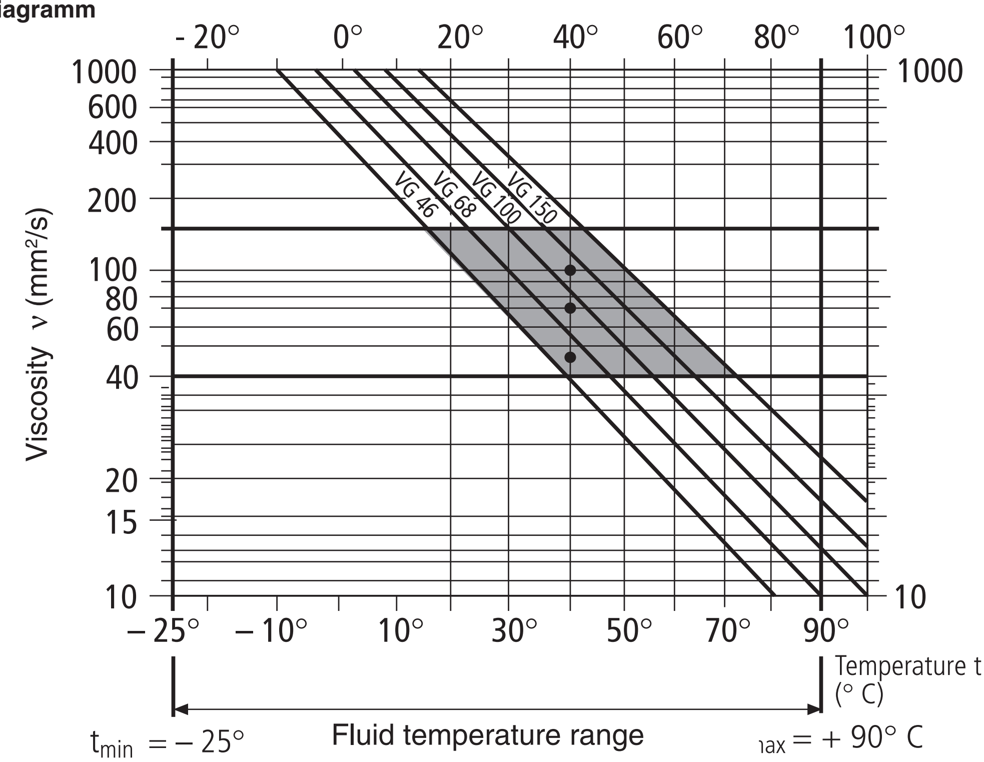
referred to tank temperature (open circuit).

Limits of viscosity range
The following values are valid for extreme operating conditions:
ν_{min} = 10 mm²/s
for short periods at max. leakage oil temperature of 90° C.
ν_{max} = 1000 mm²/s
for short periods upon cold start.

Temperature range (see selection diagram)
t_{min} = –25 °C
t_{max} = +90 °C

Notes on the selection of the hydraulic fluid
For correct selection of the fluid it is assumed that the operating temperature in the tank is known (open circuits), in relation to the ambient temperature.
The hydraulic fluid should be selected so that, within the operating temperature range, the operating viscosity lies within the optimum range ν_{opt}, (see shaded section of selection diagram). We recommend that the higher viscosity grade is selected in each case.
Example: At an ambient temperature of X °C the operating temperature in the tank will be 60° C. In the optimum operating viscosity range (ν_{opt}; shaded section) this corresponds to viscosity grade VG 46 or VG 68; VG 68 should be selected.
Important: The leakage oil temperature is influenced by pressure and speed and is always higher than the tank temperature. At no point in the system, however, may the temperature be higher than 90 °C.
If it is not possible to comply with the above conditions because of extreme operating parameters or a high ambient temperature, please consult us.

Selection diagramm



Filtration
In order to guarantee reliable function, the operating fluid must be maintained to a cleanliness grade of minimum
9 to NAS 1638 or
18/15 to ISO/DIS 4406

Technical Data

Operating pressure range - Inlet side
Absolute pressure at port S (inlet port)

$p_{abs\ min}$ ______ 0,8 bar
$p_{abs\ max}$ ______ 30 bar

Operating pressure range - Outlet side
pressure at port B
Nominal pressure p_N ______ 250 bar
Peak pressure p_{max} ______ 315 bar
(Pressure data to DIN 24312)

Direction of flow
S to B.

Case drain pressure
Maximum permissible pressure of leakage fluid (at port L, L_1): maximum 0.5 bar higher than the inlet pressure at port S, but not higher than 2 bar absolute.

Determination of inlet pressure p_{abs} at the inlet port, resp. the reduction in displacement for increasing speed.

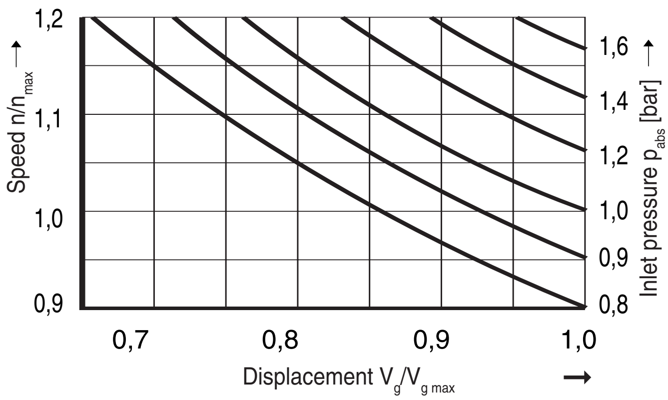
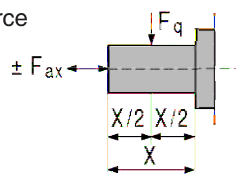


Table of values (theoretical values, without considering η_{mh} and η_v; values rounded)

Size				**10**
Displacement		$V_{g\ max}$	cm³	10,5
Max. speed[1])	at $V_{g\ max}$	$n_{o\ max}$	rpm	3600
Max. perm. speed (speed limit)	at increase in input pressure p_{abs} or V_g<$V_{g\ max}$	$n_{o\ max\ zul}$	rpm	4300
Max. volumetric flow	at $n_{o\ max}$	$q_{v\ max}$	L/min	37
	at n_E = 1450 min⁻¹		L/min	15
Max. power (Δp = 250 bar)	at $n_{o\ max}$	$P_{o\ max}$	kW	16
	at n_E = 1450 min⁻¹		kW	6,5
Max. torque (Δp = 250 bar)	at $V_{g\ max}$	T_{max}	Nm	42
Moment of intertia about drive axis		J	kgm²	0,0006
Fill capacity			L	0,2
Approx. weight (without oil fill)		m	kg	8
Permissible loading on drive shaft:				
max. perm. axial force		$F_{ax\ max}$	N	400
max. perm. radial force		$F_{q\ max}$	N	250

[1]) The values shown are valid provided there is an absolute pressure of 1 bar at suction inlet S.
By increasing the inlet pressure or reduction of the diplacement, the speed can be raised up to the maximum speed limit (see diagram).

Direction of force



Calculation of size

Volumetric flow $$q_v = \frac{V_g \cdot n \cdot \eta_v}{1000} \quad \text{[L/min]}$$

Drive torque $$T = \frac{1{,}59 \cdot V_g \cdot \Delta p}{100 \cdot \eta_{mh}} \quad \text{[Nm]}$$

Drive power $$P = \frac{2\pi \cdot T \cdot n}{60000} = \frac{T \cdot n}{9549} = \frac{q_v \cdot \Delta p}{600 \cdot \eta_t} \quad \text{[kW]}$$

V_g = geometr. displacement [cm³] per revolution
Δp = pressure differential [bar]
n = speed [rpm]
η_v = volumetric efficiency
η_{mh} = mech.-hydr. efficiency
η_t = overall efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Installation Notes

Installation position is optional. The pump housing must be filled with fluid during commissioning and remain full when operating. In order to achieve the lowest noise value, all connections (suction, pressure, case drain ports) must be linked by flexible couplings to tank.
Avoid placing a check valve in the case drain line.
This may, however, be permissible in individual cases, after consultation with us.

1. Vertical installation (shaft end upwards)
The following installation conditions must be taken into account:

1.1. Installation inside a tank
Before installation fill pump housing, keeping it in a horizontal position.

a) If the minimum fluid level is equal to or above the pump mounting surface leave ports "L", "L_1" and "S" open (see Fig.1).

b) If the minimum fluid level is below the pump mounting surface pipe port "L_1", and possibly "S" according to Fig. 2.
Close port "L" with respect to conditions in 1.2.1.

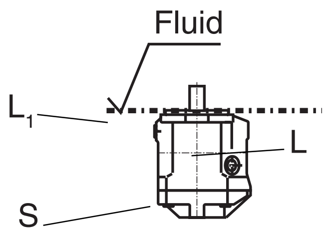


Fig. 1

1.2. Installation outside a tank
Before installing the pump, fill the pump with housing in the horizontal position.
For mounting above a tank see fig. 2.

Limiting conditions:
1.2.1. Minimum pump inlet pressure $p_{in\ min}$ = 0.8 bar both static and dynamic conditions.
Note: Avoid mounting above a tank wherever possible in order to achieve a low noise level.
The permissible suction height h is based on the overall pressure loss, but may **not** be greater than h_{max} = 800 mm (immersion depth $h_{d\ min}$ = 200 mm).

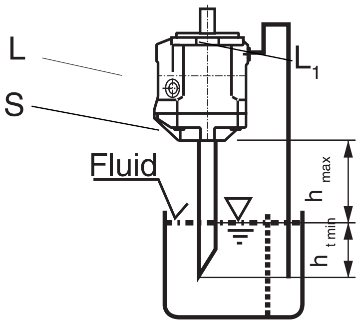


Fig. 2

Overall pressure loss $\Delta p_{total} = \Delta p_1 + \Delta p_2 + \Delta p_3 \leq (1 - p_{in.\ min}) = 0.2$ bar
Δp_1: Pressure loss in pipe due to accelerating column of fluid

$$\Delta p_1 = \frac{\rho \cdot l \cdot dv}{dt} \cdot 10^{-5} \text{ (bar)}$$

ρ = density (kg/m³)
l = pipe lenght (m)
dv/dt = change in rate of fluid velocity (m/s²)

Δp_2: Pressure loss due to static head
$\Delta p_2 = h \cdot \rho \cdot g \cdot 10^{-5}$ (bar)

h = head (m)
ρ = density (kg/m³)
g = gravity. = 9.81 m/s²

Δp_3: Line losses (elbows etc.)

2. Horizontal installation
The pump must be installed, so that "L" or "L_1" is at the top.

2.1. Installation inside a tank
a) If the minimum fluid level is equal to or above the top of the pump, ports "L", "L_1" and "S" should remain open (see fig. 3).

b) If the minimum fluid level is below the top of the pump, pipe ports "L", "L_1" and possibly "S" as fig. 4. The conditions correspond to item 1.2.1.

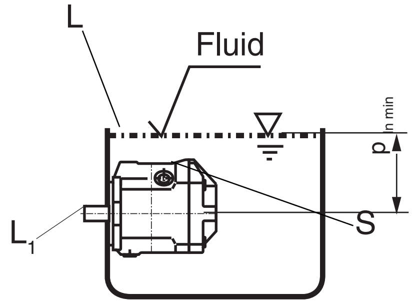


Fig. 3

2.2. Installation outside a tank
Fill the pump housing before commissioning.
Pipe ports "S" and the higher port "L" or "L_1".
a) When mounting above the tank, see fig. 4.
Conditions correspond to 1.2.1.

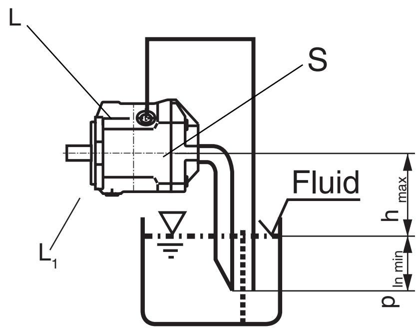


Fig. 4

b) Mounting below the tank
Pipe ports "L" and "S" according to fig.5.

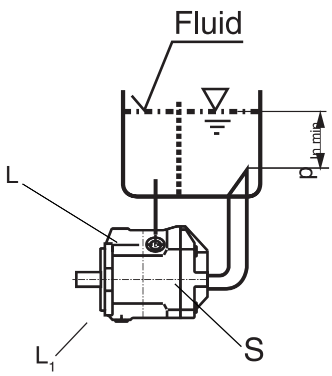
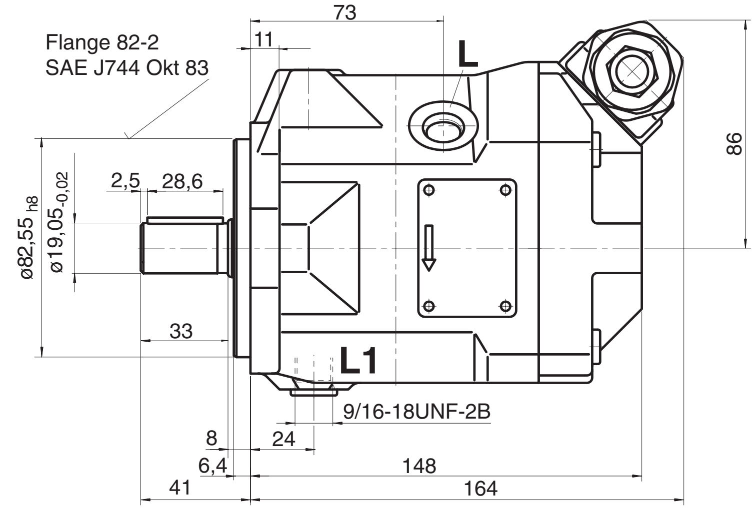


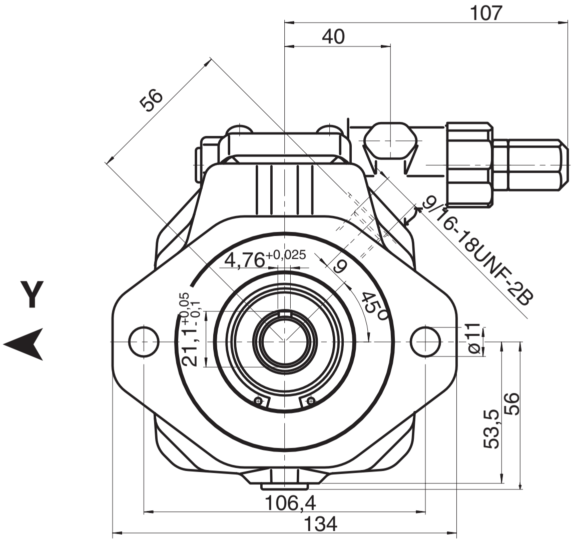
Fig. 5

Dimensions size 10

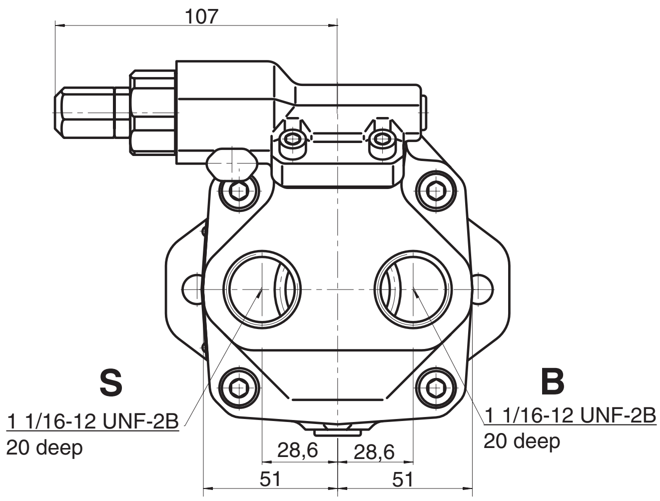
Version A10VSO 10 **DR** /52 R- XK**C64**N00 (R/L; S/K/U)

Shaft end "K"

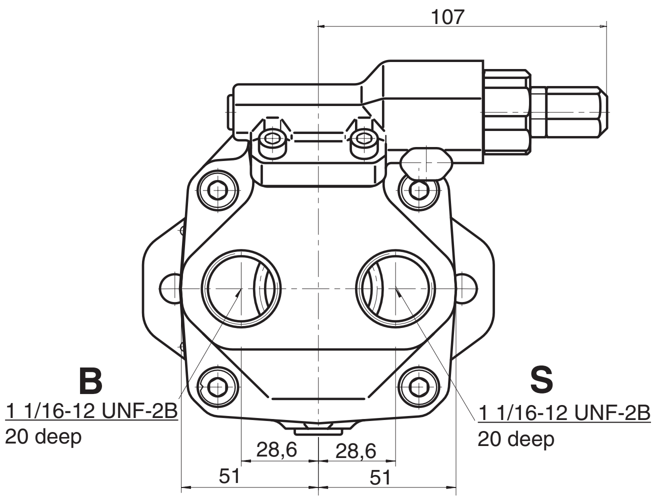




View Y
shown is clockwise rotation

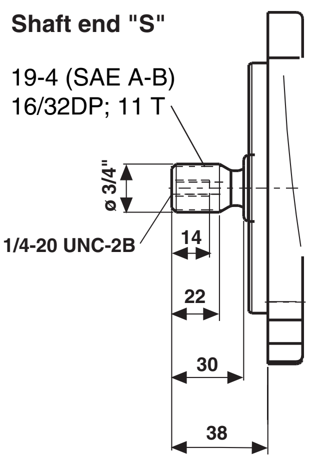


View Y
shown is counter-clockwise rotation



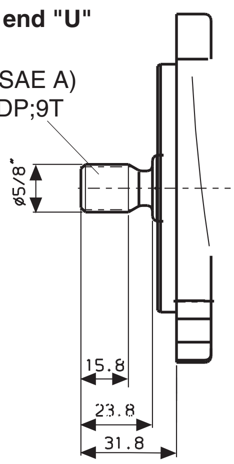
Shaft end "S"

19-4 (SAE A-B)
16/32DP; 11 T



Shaft end "U"

16-4 (SAE A)
16/32DP;9T



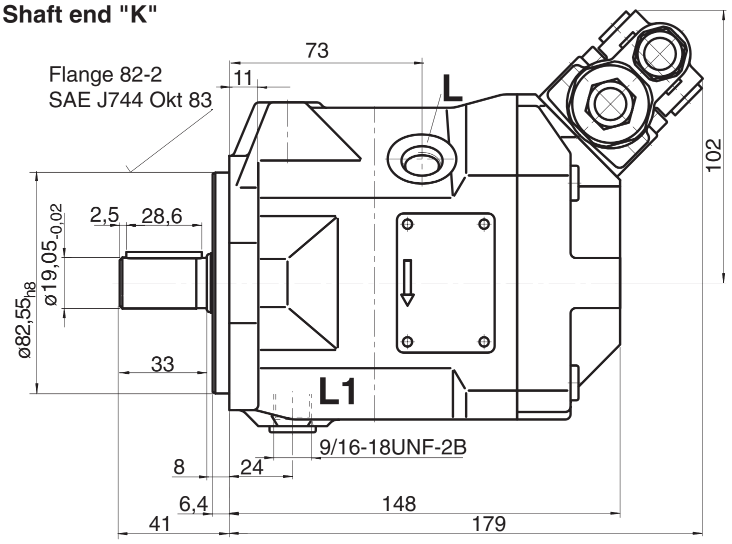
Ports

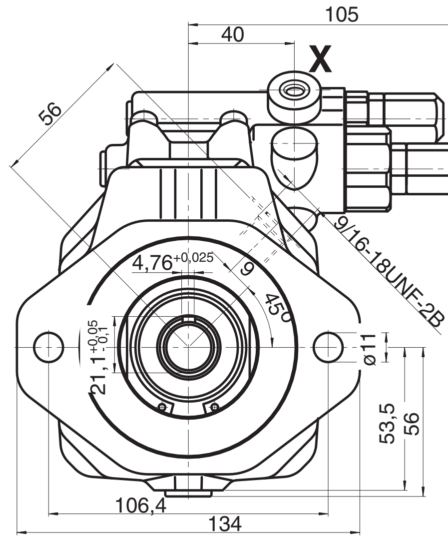
B	Pressure port	1 1/16-12UNF-2B
S	Inlet port	1 1/16-12UNF-2B
L/L_1	Case drain	9/16-18UNF-2B

Dimensions size 10

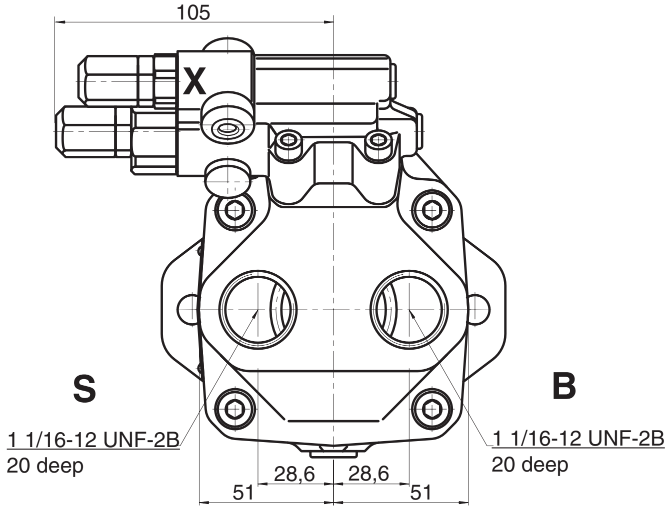
Version A10VSO 10 **DRG** /52 R- P **S** **K** **C64** N00
DFR1 L U

Shaft end "K"

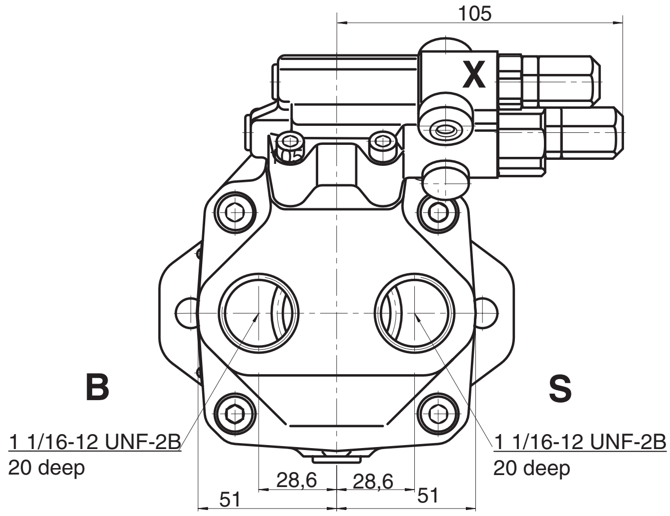




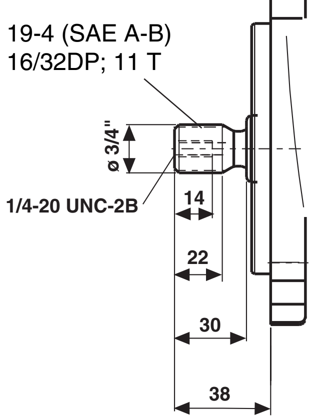
View Y
shown is clockwise rotation



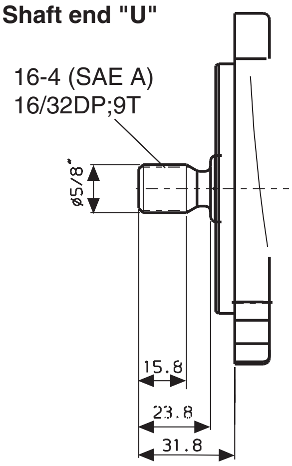
View Y
shown is counter-clockwise rotation



Shaft end "S"



Shaft end "U"

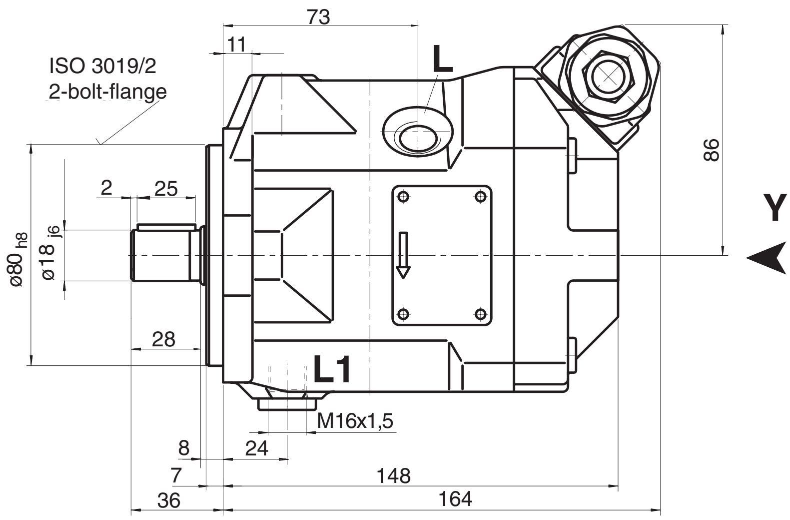


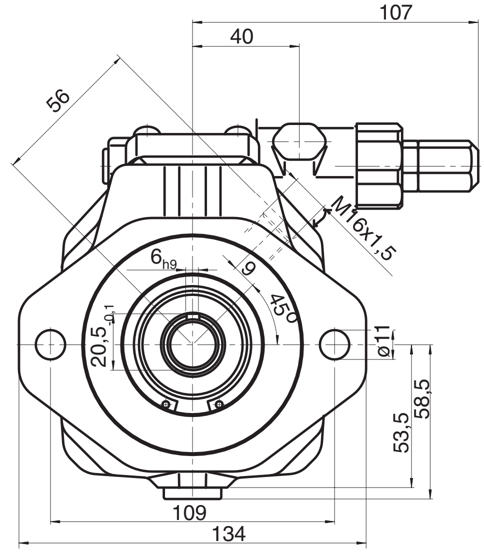
Ports

B	Pressure port	1 1/16-12UNF-2B
S	Inlet port	1 1/16-12UNF-2B
L/L_1	Case drain	9/16-18UNF-2B
X	Pilot port	7/16-20UNF-2B

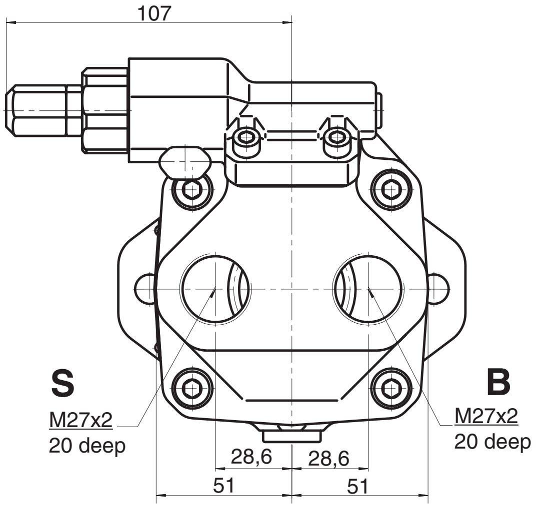
Dimensions size 10

Version A10VSO 10 **DR** /52 R- X**PA14**N00
L

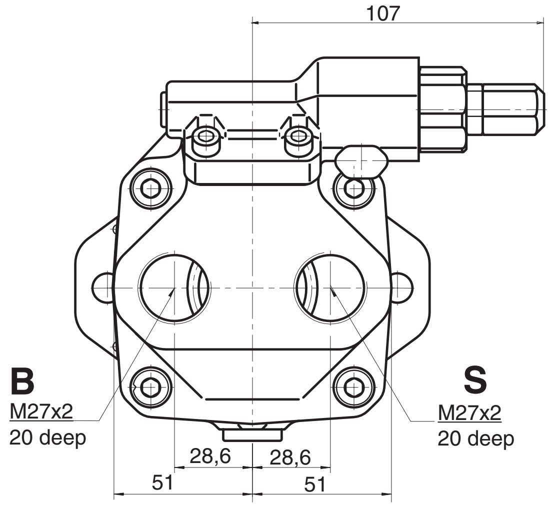




View Y
shown is clockwise rotation



View Y
shown is counter-clockwise rotation

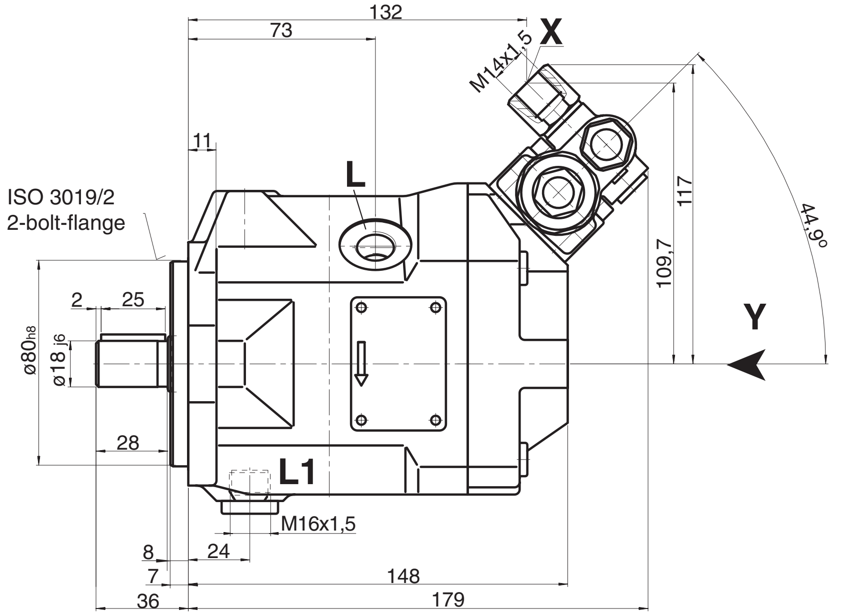


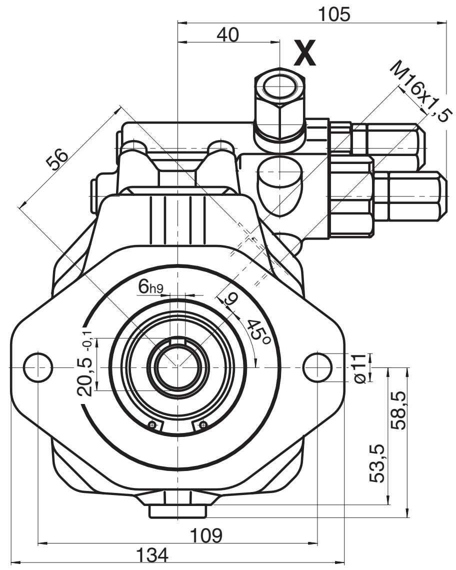
Ports

B	Pressure port	M27x2
S	Inlet port	M27x2
L/L_1	Case drain	M16x1,5

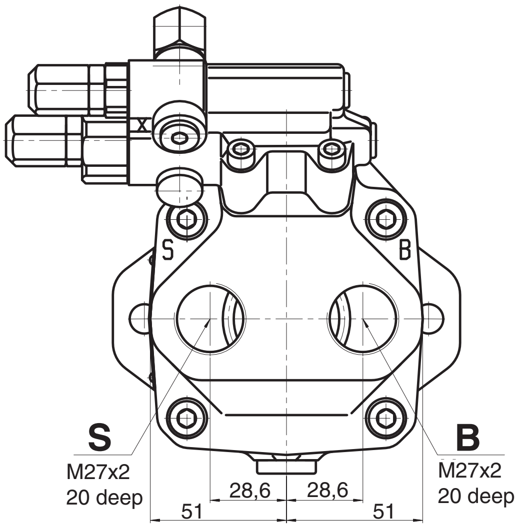
Dimensions size 10

Version A10VSO 10 **DRG** /52 R- X**PA14**N00
DFR1 L

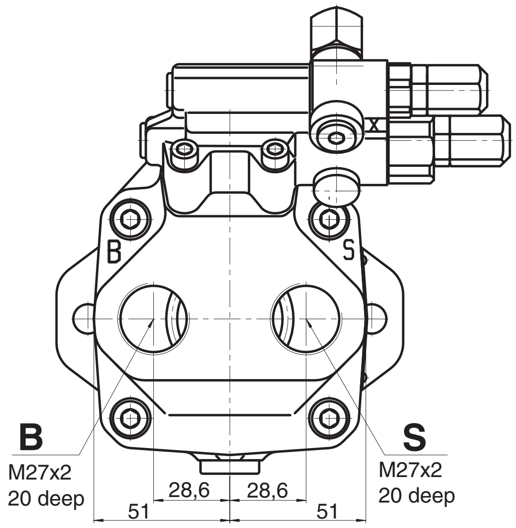




View Y
shown is clockwise rotation



View Y
shown is counter-clockwise rotation



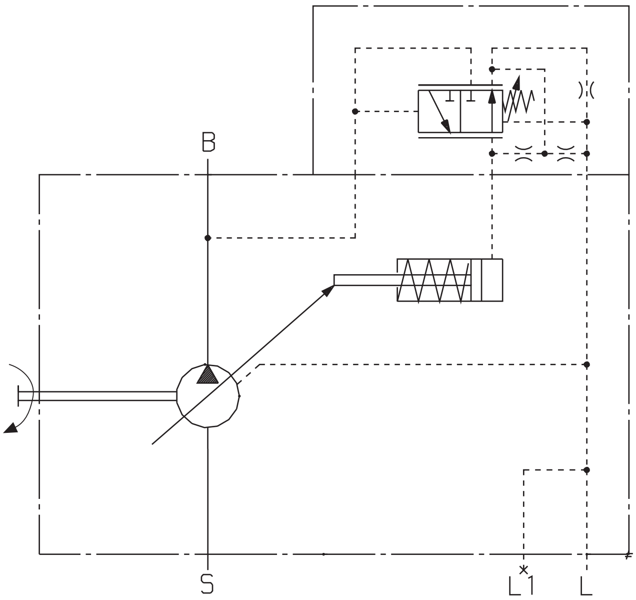
Ports

B	Pressure port	M27x2
S	Inlet port	M27x2
L/L_1	Case drain	M16x1,5
X	Pilot port	M14x1,5

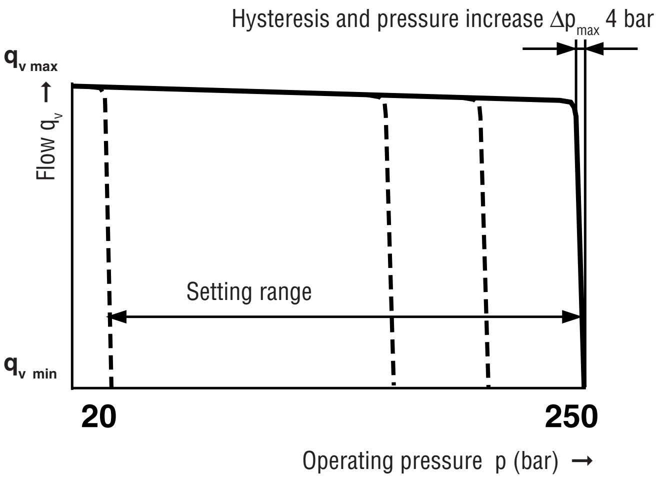
DR Pressure control

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 steplessly set at the pilot valve.

Dimensions see page 6 and 8.



Static characteristic
(at n_1 = 1500 rpm; t_{oil} = 50 °C)



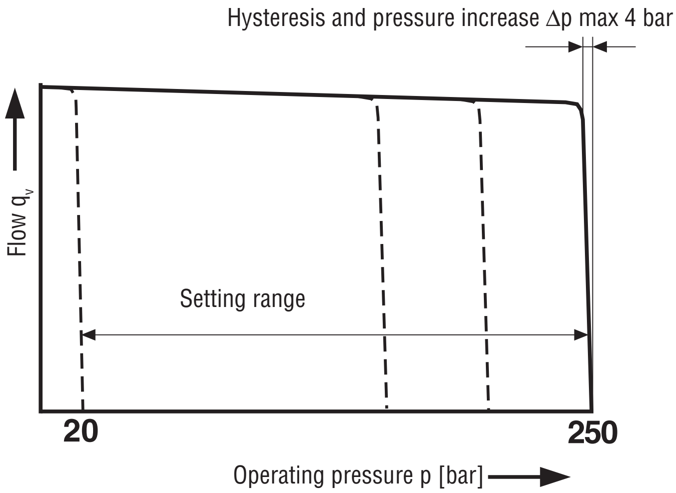
DRG Pressure control, remote controlled

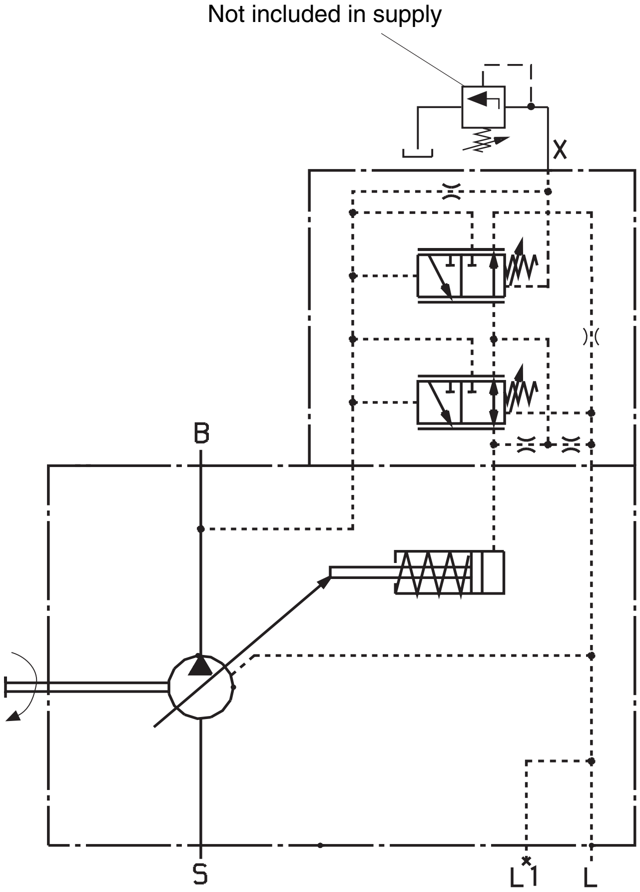
Function and design as for DR.

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.

We recommend that one of the following is used as the separate pressure relief valve:
DBDH 6 (hydraulic) to RE 25402,
DBETR-SO 437 with 0.8 mm dia. nozzle in P (electrical) to RE 29166.
The length of piping must not exceed 2 m.

Static characteristic
(at n_1 = 1500 rpm; t_{oil} = 50 °C)



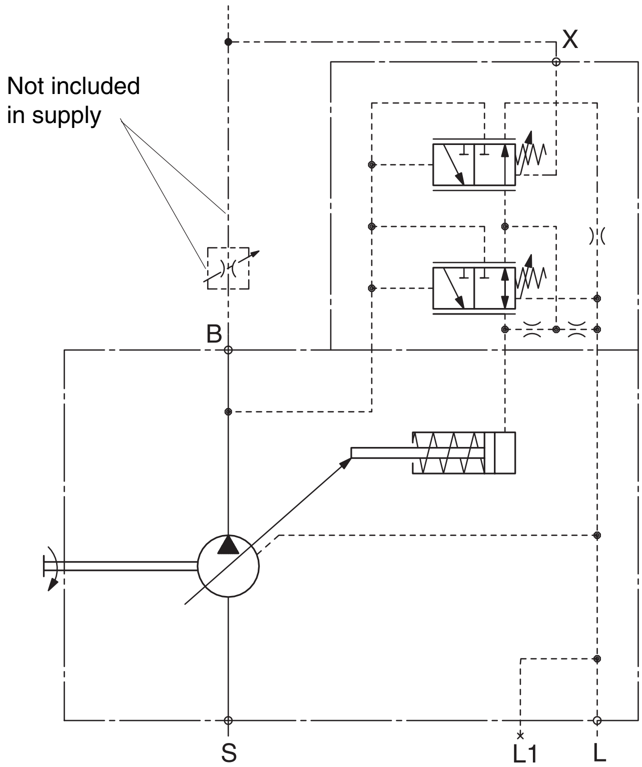


Dimensions see page 7 and 9.

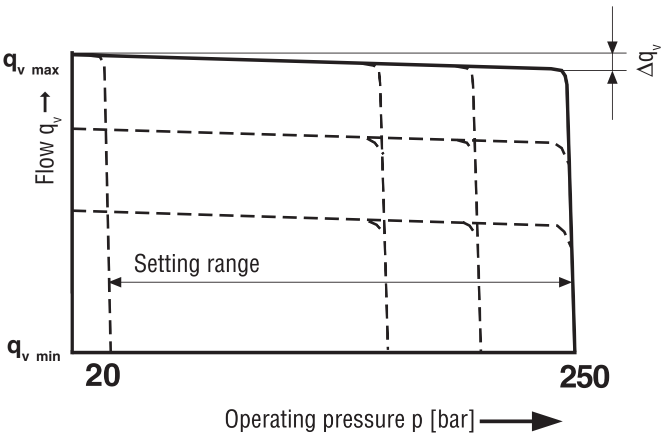
DFR1 Pressure/flow control

n 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, not included in supply). The pump flow is equal to the actual required flow by the actuator.
The DFR1-valve has no connection between X and tank.

Dimensions see page 7 and 9.



Static characteristic (at n_1 = 1500 rpm; t_{oil} = 50 °C)



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