

# Axial Piston Variable Pump A10VSNO

RE 92740/07.10

1/16

## Data sheet

Series 32  
Size 63  
Nominal pressure 210 bar  
Maximum pressure 250 bar  
Open circuit



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## Features

- Variable pump in axial piston swashplate design
- The flow is proportional to the drive speed and the displacement
- Hydrostatic unloading of the cradle bearings
- Low noise level
- Low pressure pulsations
- High efficiency
- Compact design
- Excellent power to weight ratio
- Proven A10 rotary group technology

## Type code for standard program

<b>A10VSN</b>	<b>O</b>	<b>63</b>		<b>/</b>	<b>32</b>		<b>-</b>	<b>V</b>		<b>B</b>	<b>12</b>	<b>N00</b>
01	02	03	04		05	06		07	08	09	10	11

### Axial piston unit

01	Swashplate design, variable, nominal pressure 210 bar, maximum pressure 250 bar	<b>A10VSN</b>
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### Type of operation

02	Pump, open circuit	<b>O</b>
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### Size (NG)

03	Theoretical displacement $V_{g\ max}$ in $cm^3$ see table of values page 5	<b>063</b>
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### Control devices

063

04	Two point control	directly operated	●	DG
	Pressure control		●	DR
		hydraulic remotely operated	●	DRG
		with flow control	X-T closed	●
	hydraulic	with flushing function		

### Series

063

05	Series 3, Index 2	●	<b>32</b>
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### Direction of rotation

063

06	With view on drive shaft	clockwise	●	R
		counter clockwise	●	L
		clockwise		

### Seals

063

07	FKM (Fluoro rubber)	●	<b>V</b>
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### Drive shaft

063

08	Splined shaft for higher torques to SAE J744	●	<b>R</b>
	Parallel keyed shaft to DIN 6885	●	<b>P</b>

### Mounting flange

09	ISO 3019-2 – 4-bolt		<b>B</b>
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### Ports for service lines

063

10	SAE flange on top and at the bottom, opposite, Metric fixing threads	●	<b>12</b>
	SAE flange on top and at the bottom, opposite, Metric fixing thread, with universal through drive	○	<b>22U</b>

### Through drive<sup>1)</sup>

063

11	Without through drive	●	<b>N00</b>
	With through drive shaft, without shaft coupler, without adapter flange, closed with proper cover	○	<b>00</b>

● = available      ○ = on request      – = not available

1) For through drives and mounting options see RE 92714

# Technical data

## Fluid

Prior to project design please observe the extensive information on the selection of hydraulic fluids in our data sheets RE 90220 (mineral oil), RE 90221 (ecologically acceptable fluids) and RE 90223 (HF-fluids).

When using HF- or ecologically acceptable fluids possible limitations on the technical data may be applicable, if necessary please consult us (when ordering please state the type of fluid to be used in clear text).

### Operating viscosity range

In order to obtain optimum efficiency and service life, we recommend that the operating viscosity (at operating temperature) be selected within the range

$$v_{\text{opt}} = \text{opt. operating viscosity } 16 \dots 36 \text{ mm}^2/\text{s}$$

referred to the reservoir temperature (open circuit).

### Limits of viscosity range

For extreme operating conditions the following limits apply:

$$v_{\text{min}} = 10 \text{ mm}^2/\text{s}$$

short term ( $t \leq 1 \text{ min}$ )  
at max. permissible case drain temperature of 90 °C.

Please note, that the max. case drain temperature of 90 °C is also not exceeded in certain areas (eg. bearing area). The temperature in the bearing area is approx. 5 K higher than the average case drain temperature.

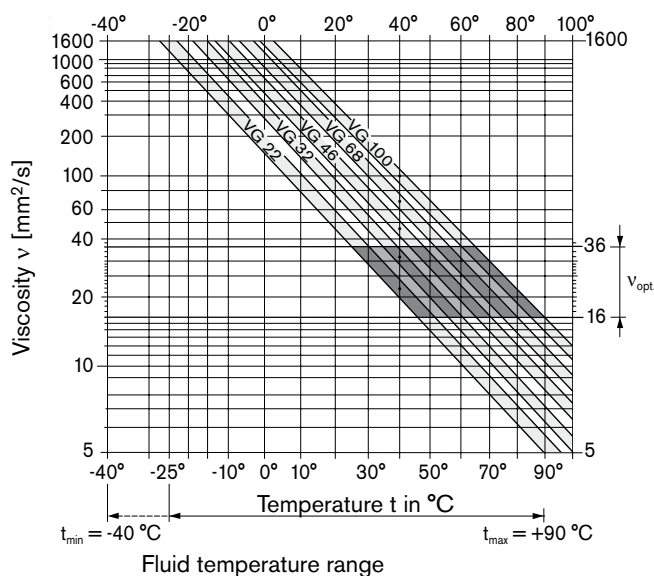
$$v_{\text{max}} = 1000 \text{ mm}^2/\text{s}$$

short term ( $t \leq 1 \text{ min}$ )  
on cold start  
( $t_{\text{min}} = p \leq 30 \text{ bar}, n \leq 1000 \text{ rpm}, -25 \text{ °C}$ )

At temperatures between -25 °C and -40 °C special measures may be required for certain installation positions, please contact us for further information.

For detailed information on operation at very low temperatures see RE 90300-03-B.

### Selection diagram



## Notes on the selection of hydraulic fluid

In order to select the correct fluid, it is necessary to know the operating temperature in the tank (open circuit) 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 ( $v_{\text{opt}}$ ) (see shaded section of the selection diagram). We recommend that the higher viscosity grade should be selected in each case.

Example: At an ambient temperature of X °C the fluid temperature in the tank is 60 °C. In the optimum viscosity range ( $v_{\text{opt}}$ ; shaded area) this corresponds to viscosity grades VG 46 or VG 68; VG 68 should be selected.

### Important

The case drain temperature is influenced by pressure and speed and is typically higher than the tank temperature. However max. temperature at any point of the component may not exceed 90 °C.

If the above mentioned conditions cannot be kept due to extreme operating parameters or high ambient temperatures please consult us.

### Filtration of fluid

The finer the filtration, the better the achieved cleanliness of the fluid and the longer the life of the axial piston unit.

In order to guarantee a reliable function of the axial piston unit a gravimetric evaluation of the fluid to determine the particle contamination and the cleanliness class to ISO 4406 is necessary. A cleanliness class of at least 20/18/15 is necessary. At very high fluid temperatures (90 °C to maximum 115 °C) a cleanliness class of at least 19/17/14 to ISO 4406 is necessary.

If above mentioned cleanliness classes cannot be met please consult us.

# Technical data

## Operating pressure range

### Pressure at outlet port (pressure port) B

Nominal pressure  $p_{nom}$  \_\_\_\_\_ 210 bar absolute

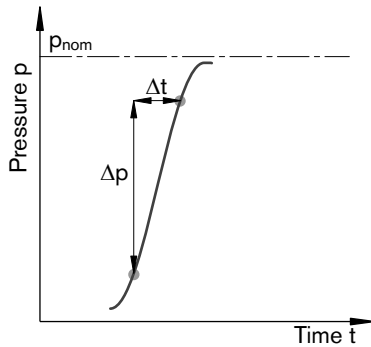
Maximum pressure  $p_{max}$  \_\_\_\_\_ 250 bar absolute

Individual operating period \_\_\_\_\_ 2.0 ms

Total operating period \_\_\_\_\_ 300 h

Minimum pressure (high pressure side) \_\_\_\_\_ 10 bar<sup>2)</sup>

Rate of pressure change  $R_{A \max}$  \_\_\_\_\_ 16000 bar/s



To safeguard against over pressure pump safety blocks to RE 25880 and RE 25890 for direct mounting onto the SAE flange ports can be ordered separately.

### Pressure at suction port S (inlet)

#### Inlet pressure

At 1800 rpm

Minimum suction pressure  $p_{abs \min}$  \_\_\_\_\_ 0.8 bar absolute

Maximum suction pressure  $p_{abs \max}$  \_\_\_\_\_ 5 bar<sup>1)</sup> absolute

#### Case drain pressure

Maximum permissible case drain pressure

(at port L, L<sub>1</sub>):

Maximum 0.5 bar higher than the inlet pressure at port S, however not higher than 2 bar absolute.

$p_{L \max \text{ abs}}$  \_\_\_\_\_ 2 bar<sup>1)</sup>

## Definition

### Nominal pressure $p_{nom}$

The nominal pressure corresponds to the maximum design pressure.

### Maximum pressure $p_{max}$

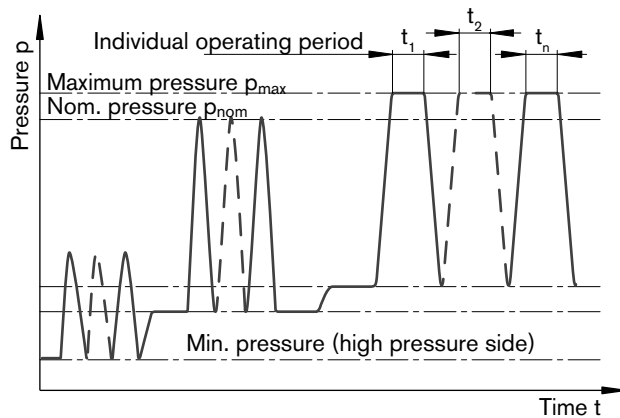
The maximum pressure corresponds to the maximum pressure within the individual operating period. The total of the individual operating periods must not exceed the total operating period.

### Minimum pressure (in pump outlet)

Minimum pressure in the pump outlet side (port B) that is required in order to prevent damage to the axial piston unit.

### Rate of pressure change $R_A$

Maximum permissible pressure build-up and pressure reduction speed with a pressure change over the entire pressure range.



Total operating period =  $t_1 + t_2 + \dots + t_n$

<sup>1)</sup> Other values on request

<sup>2)</sup> Lower pressure, depends on timeframe, please consult us.

# Technical data

**Tables of value** (theoretical values, without efficiencies and tolerances: values rounded)

Size	NG		63	
Displacement	$V_{g \max}$	cm <sup>3</sup>	63	
Speed <sup>1)</sup>				
maximum at $V_{g \max}$	$n_{o \max}$	rpm	1800	
Flow				
at $n_{o \max}$ and $V_{g \max}$	$q_{vo \max}$	L/min	113	
at $n_E = 1500$ rpm	$q_{vE \max}$	L/min	94	
Power				
at $n_{o \max}$ , $\Delta p = 210$ bar	$P_{\max}$	kW	39	
at $n_E = 1500$ rpm	$P_{\max}$	kW	33	
Torque				
at $V_{g \max}$ and	$\Delta p = 210$ bar	$T_{\max}$	Nm	210
	$\Delta p = 100$ bar	T	Nm	100
Torsional stiffness	Drive shaft P	c	Nm/rad	41232
	Drive shaft R	c	Nm/rad	41025
Moment of inertia rotary group	$J_{TW}$	kgm <sup>2</sup>	0.004	
Case volume	V	L	1.0	
Weight (without fluid fill) approx.	m	kg	30	

1) The values are applicable for a pressure of 0,8 bar at suction port S and mineral hydraulic fluid.

## Important

Exceeding the maximum or falling below the minimum permissible values can lead to a loss of function, a reduction in operational service life or total destruction of the axial piston unit. We recommend to check the loading through tests or calculation / simulation and comparison with the permissible data.

## Determination of size

Flow	$q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$	[L/min]	$V_g$ = Geometr. displacement per revolution in cm <sup>3</sup>
			$\Delta p$ = Pressure differential in bar
Torque	$T = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}}$	[Nm]	n = Speed in rpm
			$\eta_v$ = Volumetric efficiency
Power	$P = \frac{2\pi \cdot T \cdot n}{60000} = \frac{q_v \cdot \Delta p}{600 \cdot \eta_t}$	[kW]	$\eta_{mh}$ = Mechanical-hydraulic efficiency
			$\eta_t$ = Overall efficiency ( $\eta_t = \eta_v \cdot \eta_{mh}$ )

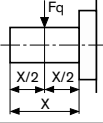
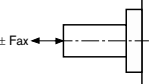
## Mechanical flow limitation

Versions with port plate 22 (optional through drive plate) are not available with mechanical flow limitation. The max. displacement as stated in the order will be set to a fixed value .

Please state the desired  $V_{g \min}$  or  $V_{g \max}$  values in clear text.

## Technical data

### Permissible radial and axial forces on the drive shaft

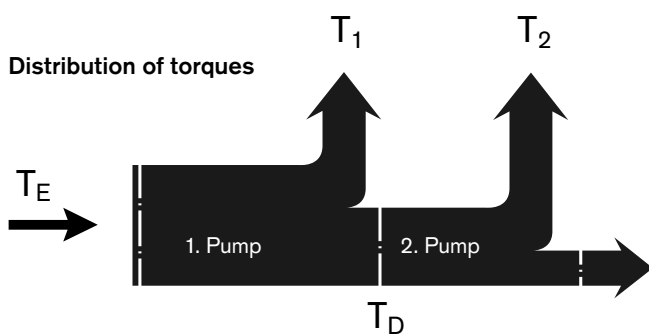
Size	NG	63	
Radial force, maximum	at X/2 	$F_{q \max}$ N	1000
Axial force, maximum		$F_{ax \max}$ N	1000

### Permissible input and through drive torques

Size	NG	63
Torque, max. (at $V_{g \max}$ and $\Delta p = 210 \text{ bar}^1$ )	$T_{\max}$ Nm	210
Input torque with drive shaft maximum <sup>2)</sup>		
P	$T_E$ Nm perm	210
DIN 6885	mm	25
R	$T_E$ Nm perm	400
SAE J744 (ANSI B92.1a-1996)	in	1
Through drive torque, maximum		
with drive shaft R	$T_D$ Nm perm	365

1) Without considering efficiency

2) For drive shafts without radial load



## DG – Zweipunktverstellung direktgesteuert

The pump can be set to a minimum swivel angle by connecting an external control pressure to port X.

This will supply control fluid directly to the stroking piston; a minimum pressure of  $p_{st} \geq 50$  bar is required.

The pump can only be switched between  $V_{g\ max}$  or  $V_{g\ min}$ .

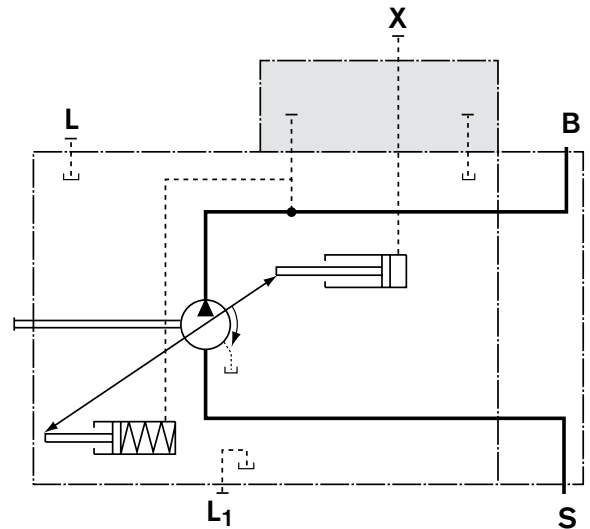
Please note, that the required control pressure at port X is directly dependent on the actual operating pressure  $p_B$  in port B. (see control pressure diagram).

Control pressure  $p_{st}$  in  $X = 0$  bar  $\hat{=} V_{g\ max}$

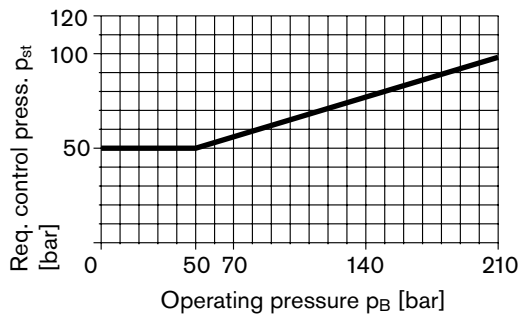
Control pressure  $p_{st}$  in  $X \geq 50$  bar  $\hat{=} V_{g\ min}$

The max. permissible control pressure amounts to  $p_{st} = 120$  bar.

### Schematic



### Control pressure diagram



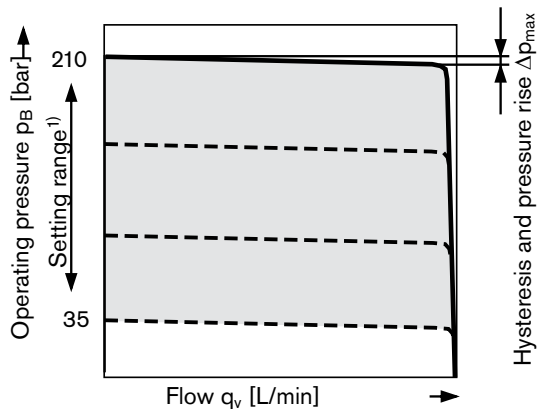
	Port for
<b>B</b>	Service line
<b>S</b>	Suction
<b>L, L<sub>1</sub></b>	Case drain fluid (L <sub>1</sub> plugged)
<b>X</b>	Control pressure (plugged)

## DR – Pressure control

The DR-pressure control limits the maximum pressure at the pump outlet within the pump's control range. The pump therefore supplies only the amount of fluid as required by the actuators. This maximum pressure level can be set steplessly at the control valve.

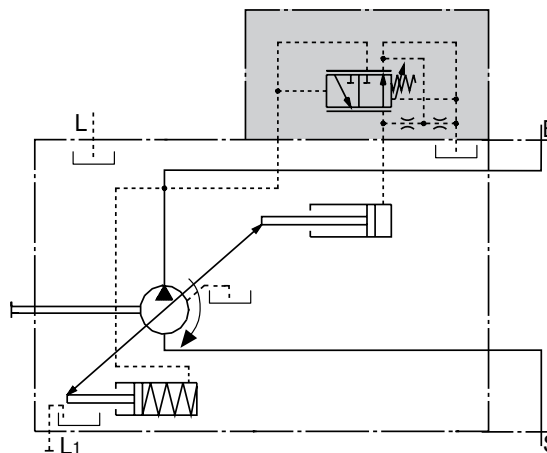
### Static characteristic

(at  $n_1 = 1500 \text{ rpm}$ ;  $t_{\text{fluid}} = 50^\circ\text{C}$ )



- 1) In order to prevent damage to the pump and the system the shown values in the pressure setting range are the maximum permissible and may not be exceeded. The valve is capable of higher settings.

### Schematic



	Port for
<b>B</b>	Service line
<b>S</b>	Suction
<b>L, L<sub>1</sub></b>	Case drain fluid (L <sub>1</sub> plugged)

### Control data

Hysteresis and repeatability  $\Delta p$  \_\_\_\_\_ max. 3 bar

### Pressure rise, max

<b>Size</b>	63
$\Delta p$	bar 6

Control fluid consumption \_\_\_\_\_ max. approx. 3 L/min



# DRG – Pressure control remotely operated

The DR-pressure control (see page 8) is overriding this DRG-remote setting of max. outlet pressure.

A pressure relief valve can be externally piped to port X for remote setting of pressure below the setting of the DR control valve spool. This relief valve is not included in the pump supply.

The differential pressure at the DRG-control spool is set as standard to 20 bar. This results in a pilot oil flow to the relief valve of approx. 1,5 L/min. If another setting is required (range from 10-22 bar) please state in clear text.

As a separate relief valve we can recommend:

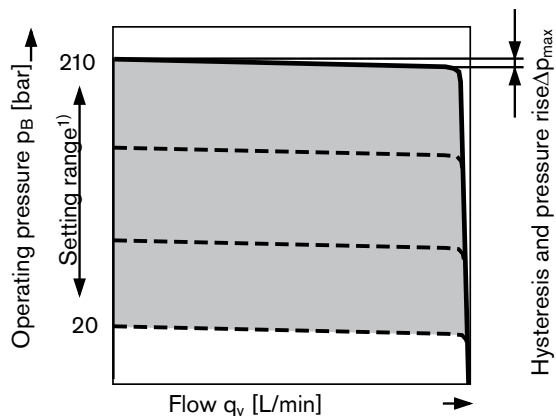
**DBDH 6** (hydraulic) to RE 25402 or

**DBETR-SO 381** with orifice dia. 0,8 mm in P (electric) to RE 29166.

The max. length of piping should not exceed 2 m.

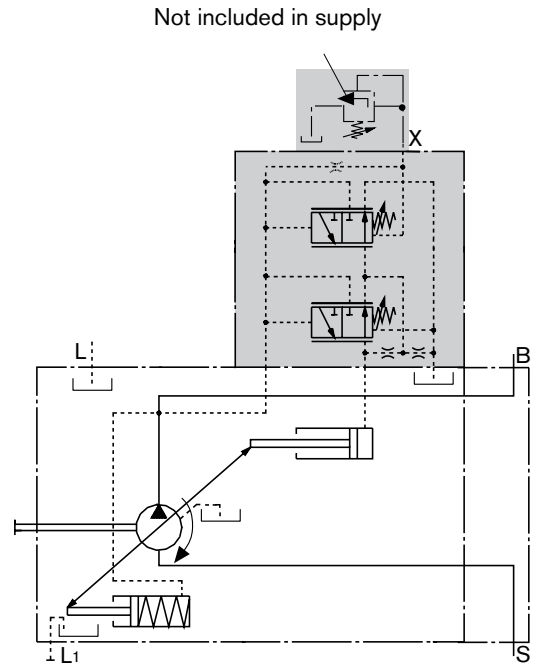
### Static characteristic

(at  $n_1 = 1500 \text{ rpm}$ ;  $t_{\text{fluid}} = 50^\circ\text{C}$ )



- In order to prevent damage to the pump and the system the shown values in the pressure setting range are the maximum permissible and may not be exceeded. The valve is capable of higher settings.

### Schematic DRG



	Port for
<b>B</b>	Service line
<b>S</b>	Suction
<b>L, L<sub>1</sub></b>	Case drain fluid (L <sub>1</sub> plugged)
<b>X</b>	Control pressure (plugged)
<b>M<sub>B</sub></b>	Measuring operating pressure (plugged)

### Control data

Hysteresis and repeatability  $\Delta p$  \_\_\_\_\_ max. 3 bar

### Pressure rise, max

Size	63
$\Delta p$ bar	6

Control fluid consumption \_\_\_\_\_ max. approx. 4.5 L/min

# DRS – Pressure and flow control

In addition to the pressure control function (see page 8), the pump flow may be varied by means of a differential pressure over an orifice or valve spool installed in the service line to the actuator. The pump flow is equal to the actual required flow by the actuator, regardless of changing pressure levels.

The pressure control overrides the flow control function.

**Note**

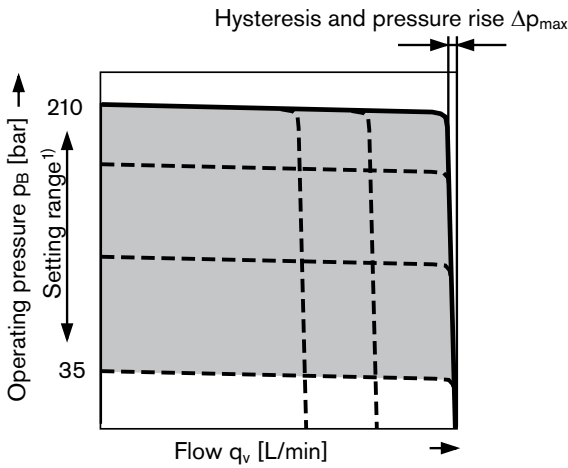
The DRS-valve version has no connection between X and the tank (pump housing).

Unloading the LS-pilot line must be possible in the valve system.

Because of the flushing function sufficient unloading of the X-line must also be provided.

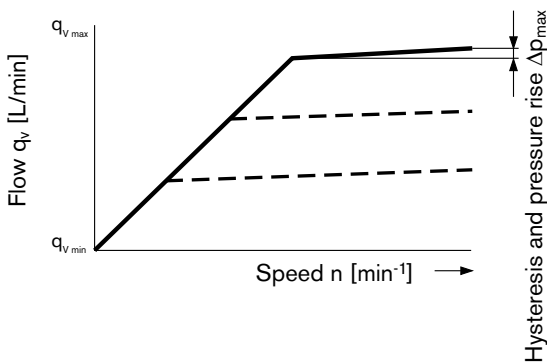
**Static characteristic**

Flow control at  $n_1 = 1500 \text{ rpm}$ ;  $t_{\text{fluid}} = 50^\circ\text{C}$

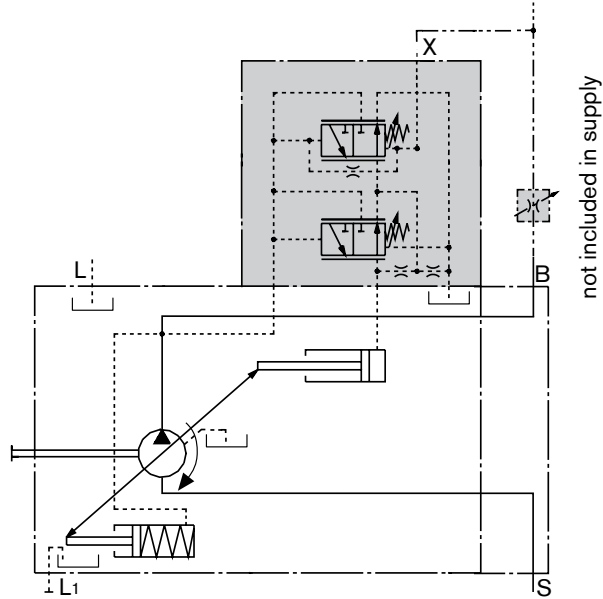


- 1) In order to prevent damage to the pump and the system the shown values in the pressure setting range are the maximum permissible and may not be exceeded. The valve is capable of higher settings.

**Static characteristic at variable speeds**



**Schematic**



	Port for
B	Service line
S	Suction
L, L1	Case drain fluid (L1 plugged)
X	Control pressure (plugged)

**Differential pressure Δp:**

Standard setting: 14 to 22 bar.

If another setting is required, please state in clear text. Unloading port X to tank (with outlet port B closed) results in a zero stroke (standby) pressure which lies about 1 to 2 bar higher than the Δp setting).

**Controller data**

Data pressure control DR see page 8  
 Maximum flow deviation measured with drive speed  $n = 1500 \text{ rpm}$ .

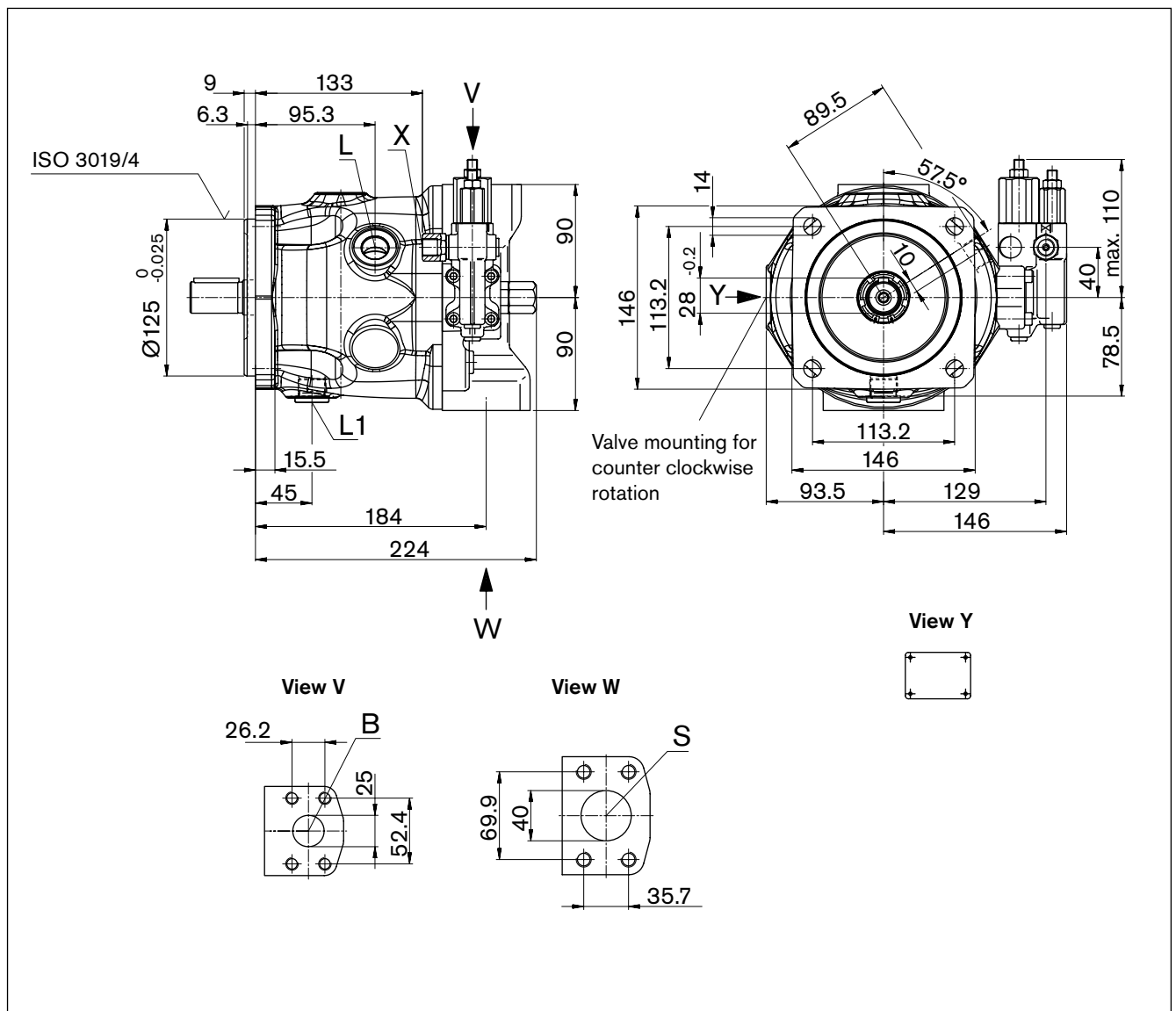
Size	63
$\Delta q_{v \text{ max}}$ L/min	1.8

Control fluid consumption DRF \_\_ max. approx. 3 bis 4.5 L/min  
 Control fluid consumption DRS \_\_\_\_\_ max. approx. 3 L/min

# Dimensions size 63

Before finalising your design request a certified installation drawing. Dimensions in mm

## DRS Pressure and flow control



### Ports

Designation	Port for	Standard	Size <sup>1)</sup>	Maximum pressure [bar] <sup>2)</sup>	State
B	Service line (standard pressure range) Fixing thread	SAE J518 DIN 13	1 in M10 x 1.5; 17 deep	250	O
S	Suction (standard pressure range) Fixing thread	SAE J518 DIN 13	1 1/2 in M12 x 1.75; 20 deep	5	O
L	Case drain fluid	DIN 3852 <sup>4)</sup>	M 22 x 1.5; 14 deep	2	O <sup>3)</sup>
L <sub>1</sub>	Case drain fluid	DIN 3852 <sup>4)</sup>	M 22 x 1.5; 14 deep	2	plugged <sup>3)</sup>
X	Load sensing pressure	DIN 3852	M14x1.5; 12 deep	250	O
X	Control pressure for DG control	DIN 3852	G 1/4 in	250	O

1) For the maximum tightening torques the general information on page 14 must be observed.

2) Depending on the application, momentary pressure spikes can occur. Consider this when selecting measuring devices and fittings.

3) Depending on the installation position, L or L<sub>1</sub> must be connected

4) The spot face can be deeper than as specified in the standard.

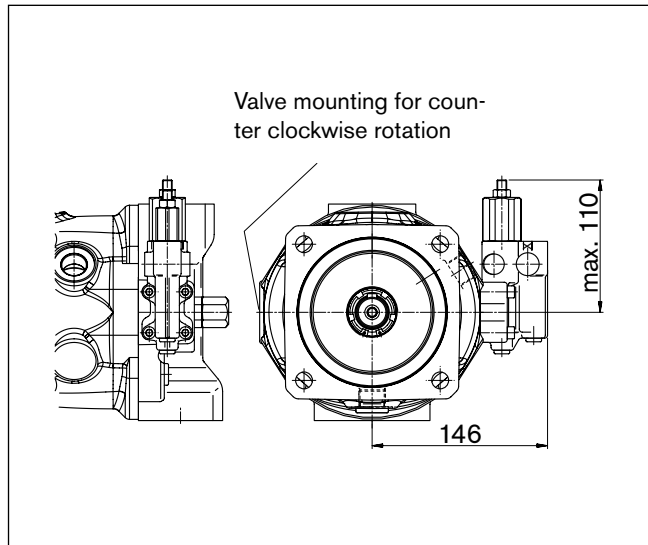
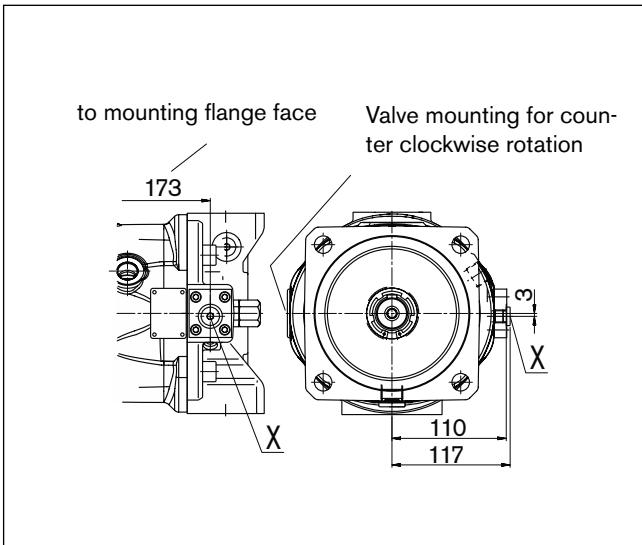
O = Must be connected (plugged on delivery)

# Dimensions size 63

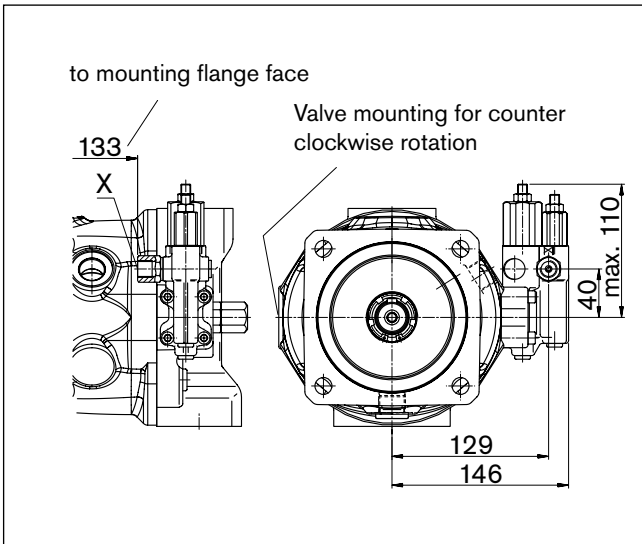
Before finalising your design request a certified installation drawing. Dimensions in mm

## DG - Two point control, directly operated

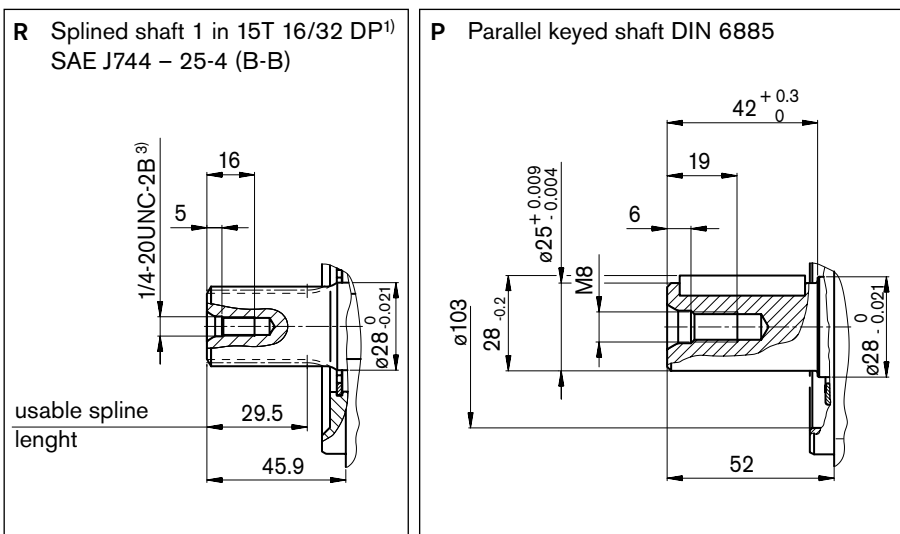
## DR - Pressure control



## DRG - Pressure control, remotely operated



## Drive shaft



1) ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, tolerance class 5  
 2) Thread in drive shaft „P“ to DIN 332.  
 3) For the maximum tightening torques the general information on page 14 must be observed.

# Notes

# Installation notes

## General

The pump housing must be filled with fluid and deaerated during commissioning and operation. This is also to be observed, following a longer standstill periode as the system may empty via the hydraulic lines.

Especially with the installation position „drive shaft upwards or drive shaft downwards“ attention must be paid to a complete filling and deaeration, since there is a risk, that the bearings and shaft seal run dry and overheat therefore.

The highest of the case drain ports must be connected to tank with piping material for standard pressure rating suitable for the port size. In order to obtain the lowest noise level, all connections (inlet, outlet, and case drain line) must be linked by flexible members to the tank. Also, avoid above-tank installation.

In case of a combination pump with different case drain pressures make sure, that each pump has it's own case drain line to tank

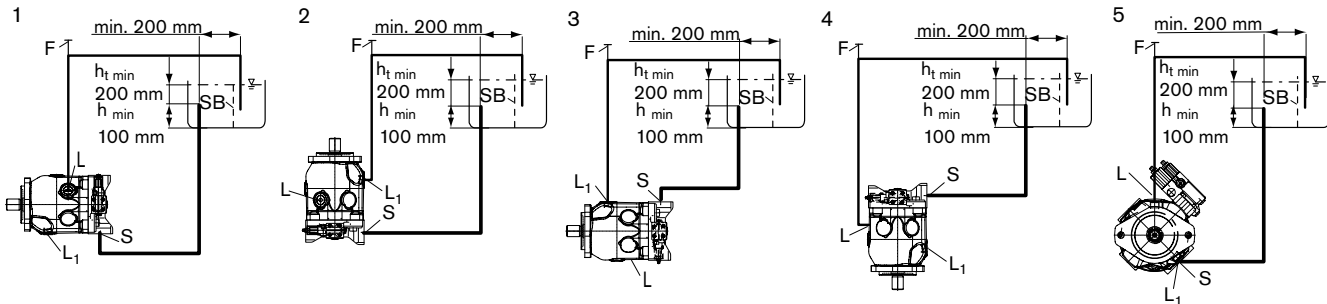
In all operating conditions, the suction line and case drain line must flow into the tank below the minimum fluid level ( $h_{t\ min} = 200\ mm$ ). The permissible suction height  $h$  is a result of the overall pressure loss, but may not be greater than  $h_{max} = 800\ mm$ . Under static and dynamic loading the suction pressure at port S may not be below  $p_{abs\ min} = 0,8\ bar$  absolute.

## Installation position

See the following examples 1 to 15. Recommended positions: 1 and 3. Other installation positions are also possible, please consult us.

### Mounting below the reservoir (standard)

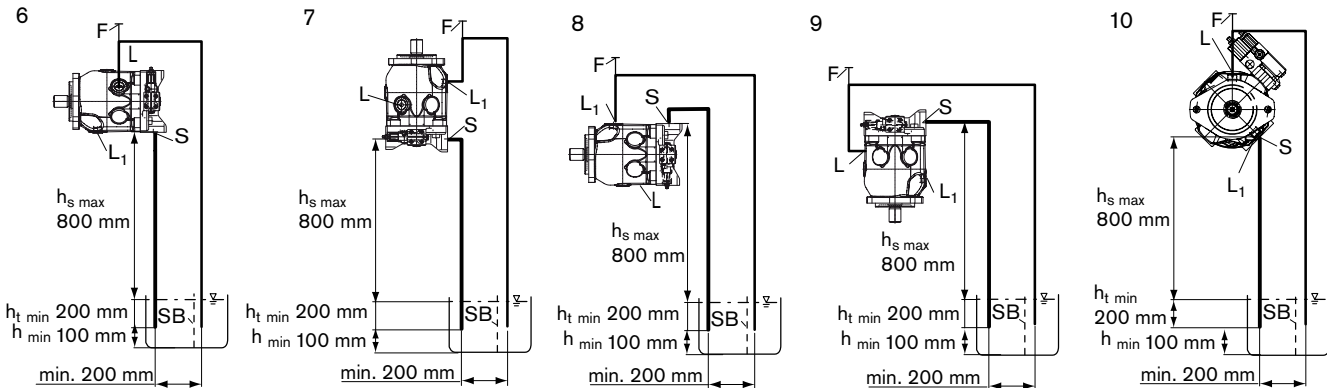
Mounting below the reservoir means, that the pump is mounted below the minimum fluid level. The pump can be mounted next to or below the reservoir.



installation position	Air bleed	Filling
1, 3 and 5	F	S + L, L <sub>1</sub> (F)
2 and 4	F	S + L, L <sub>1</sub> (F)

### Installation above the reservoir

Installation above the reservoir means, that the pump is mounted above the minimum fluid level. A check valve in the case drain line is only permissible in individual cases. Consult us for approval



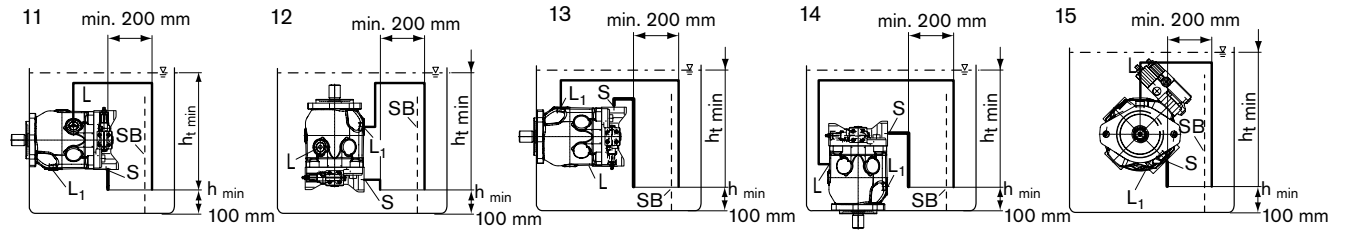
Installation position	Air bleed	Filling
6, 8 and 10	F	L, L <sub>1</sub> (F)
7 and 9	F	S + L, L <sub>1</sub> (F)

L/L<sub>1</sub> = case drain port, F = air bleed or filling port, S = suction port, SB = Baffle,  $h_{t\ min}$  = minimum permissible immersion depth,  $h_{s\ max}$  = maximum permissible suction height

# Installation notes

## Mounting inside the reservoir

Mounting inside the reservoir means, that the pump is mounted within the minimum fluid level.



Installation position	Air bleed	Filling
11, 13 und 15	L, L <sub>1</sub>	L, L <sub>1</sub>
12 und 14	L, L <sub>1</sub>	S + L, L <sub>1</sub>

L/L<sub>1</sub> = case drain port, F = air bleed or filling port, S = suction port, SB = baffle,  $h_{t\ min}$  = minimum permissible immersion depth,  $h_{t\ max}$  = maximum permissible suction height

# General information

- The A10VSNO pump is designed to be used in open circuit.
- Project planning, assembly and commissioning of the axial piston unit require the involvement of qualified personnel
- Before operating the axial piston unit, read the appropriate operating instructions thoroughly and completely. If needed, request these from Rexroth.
- The service line ports and function ports are only designed to accommodate hydraulic lines.
- During and shortly after operation, there is a risk of burns on the axial piston unit and especially on the solenoids. Take appropriate safety measures (e. g. by wearing protective clothing).
- Depending on the operating conditions of the axial piston unit (operating pressure, fluid temperature), the characteristics may shift.
- Pressure ports:  
The ports and fixing threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified operating conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
- Pressure cut off and pressure control are not suitable for providing system protection against excessive pressures. A suitable overall main line relief valve must be incorporated.
- The data and notes contained herein must be adhered to.
- The product is not approved as a component for the safety concept of a general machine according to DIN EN ISO 13849
- The following tightening torques apply:
  - Female threads in axial piston unit:  
The maximum permissible tightening torques  $M_{G \max}$  are maximum values for the female threads and must not be exceeded. For values, see the following table.
  - Fittings:  
Observe the manufacturer's instructions regarding the tightening torques of the used fittings.
  - Fixing screws:  
For fixing screws according to DIN 13, we recommend checking the tightening torque individually according to VDI 2230.
  - Plugs:  
For the metal plugs, supplied with the axial piston unit, the required tightening torques of plugs  $M_V$  apply. For values, see the following table

Thread size of ports		Maximum permissible tightening torque for female threads $M_{G \max}$	Required tightening torque for the plugs $M_V$	WAF hexagon socket of the plugs
G 1/4 in	DIN 3852	70 Nm		
7/16-20 UNF-2B	ISO 11926	40 Nm	15 Nm	3/16 in
1 1/16-12 UNF-2B	ISO 11926	360 Nm	147 Nm	9/16 in
M14x1,5	DIN 3852	80 Nm	35 Nm	6 mm
M16x1,5	DIN 3852	100 Nm	50 Nm	8 mm
M18x1,5	DIN 3852	140 Nm	60 Nm	8 mm
M22x1,5	DIN 3852	210 Nm	80 Nm	10 mm
M27x2	DIN 3852	330 Nm	135 Nm	12 mm