Rexroth
Bosch Group

Axial Piston Variable Pump A1VO

RE 92650/01.12 **1**/20
Replaces: 11.11

Data sheet

Series 10
Size 35
Nominal pressure 250 bar
Maximum pressure 280 bar
Open circuit

Contents

Features

- Variable axial piston pump of swashplate design for hydrostatic drives in an open circuit
- The flow is proportional to the drive speed and displacement.
- The flow can be steplessly varied by adjusting the swashplate angle.
- A wide range of highly adaptable control devices with different control and regulating functions, for all important applications.
- Compact design
- High efficiency
- High power density
- Low noise level

Type code for standard program

A1V	O	035			C	1		0	/	10	B		V	B2		1		0	–	0
01	02	03	04	05	06	07	08	09		10	11	12	13	14	15	16	17	18		19

Axial piston unit

01	Swashplate design, variable, nominal pressure 250 bar, maximum pressure 280 bar	**A1V**

Operation mode

02	Pump, open circuit	**O**

Size (NG)

03	Geometric displacement, see table of values on page 7	**035**

Control device: basic controller

				035	
04	Pressure control with one-sided deflection			●	**DR**
		Proportional electric override with integrated solenoid	negative U = 12V	❍	**D3**
			negative U = 24V	❍	**D4**

Additional controller: load sensing
(can be combined with basic DR controller)

05	Without additional controller load sensing (without symbol)	●	
	Load sensing, internal pump pressure	●	**S0**

Controller design and mounting

06	Cartridge	**C**

Adjustment

07	Fixed setting	**1**

Connector for solenoids[1)]

08	Without solenoids (connectors)	●	**0**
	DEUTSCH - molded connector, 2-pin – without suppressor diode	❍	**P**

Additional function

09	Without	**0**

Series

10	Series 1, index 0	**10**

Configuration of ports and fastening threads

11	Ports according to ISO 11926, metric fixing thread on through drive version	**B**

Direction of rotation

12	Viewed on drive shaft	clockwise	●	**R**
		counter-clockwise	●	**L**

Seals

13	FKM (fluor-caoutchouc)	**V**

Mounting flange

14	SAE J744	101-2	**B2**

● = Available ❍ = On request – = Not available ▭ = Preferred program

[1)] Connectors for other electric components can deviate

Type code for standard program

A1V	O	035			C	1		0	/	10	B		V	B2		1		0	–	0
01	02	03	04	05	06	07	08	09		10	11	12	13	14	15	16	17	18		19

Drive shaft **035**

15	Splined shaft ANSI B92.1a-1976 with recess	7/8 in 13T 16/32 DP, not for through drive	❍	**S4**
		1 in 15T 16/32DP	●	**S5**

Service line port

16	Threaded ports B and S (suction), on opposite sides	**1**

Through drive

	SAE J744 flange			Coupling for splined shaft[2]				
		Mounting variant						
	Diameter	Symbol[3]	Designation	Diameter		Designation		
17	Without through drive						●	**0000**
	82-2 (A)	⚯	A2	5/8 in	9T 16/32DP	S2	❍	**A2S2**
				3/4 in	11T 16/32DP	S3	❍	**A2S3**
				7/8 in	13T 16/32 DP	S4	❍	**A2S4**
	101-2 (B)	⚯	B2	7/8 in	13T 16/32 DP	S4	❍	**B2S4**
				1in	15T 16/32 DP	S5	❍	**B2S5**

Additional function

18	Without	**0**

Standard / special version

19	Standard version	**0**

● = Available ❍ = On request – = Not available ▭ = Preferred program

[2] Coupling for splined shaft according to ANSI B92.1a

[3] Arrangement of mounting holes with view to through drive with service line port B right

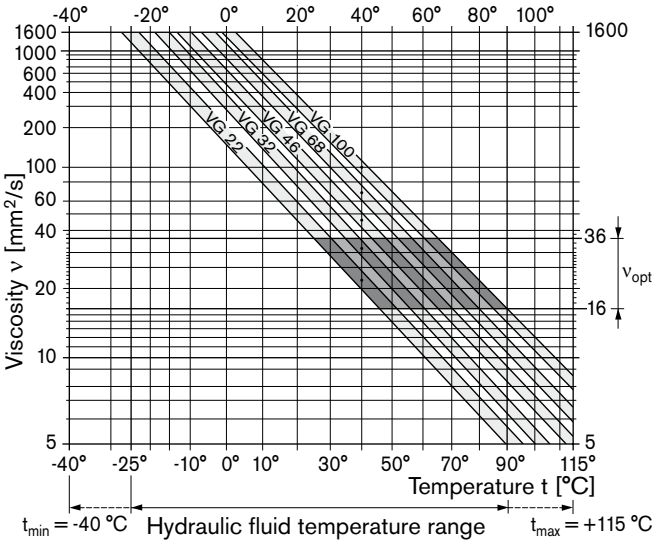
Technical data

Hydraulic fluid

Before starting project planning, please refer to our data sheet RE 90220 (mineral oil) for detailed information regarding the choice of hydraulic fluid and application conditions.

Further hydraulic fluids only after approval examination. Please contact us.

Selection diagram



Details regarding the choice of the hydraulic fluid

The correct choice of hydraulic fluid requires knowledge of the operating temperature in relation to the ambient temperature: in an open circuit the tank temperature.

The hydraulic fluid should be chosen so that the operating viscosity in the operating temperature range is within the optimum range (ν_{opt}), see shaded area of the selection diagram. We recommend to select the higher viscosity grade in each case.

Example: At an ambient temperature of X °C, an operating temperature of 60° C is set in the circuit. In the optimum operating viscosity range (ν_{opt}, shaded area), this corresponds to the viscosity classes VG 46 or VG 68; to be selected: VG 68.

Note

The case drain temperature, which is affected by pressure and speed, is always higher than the tank temperature. At no point of the component may the temperature be higher than 115 °C, however. The temperature difference specified below is to be taken into account when determining the viscosity in the bearing.

If the above conditions cannot be maintained due to extreme operating parameters, please contact us.

Viscosity and temperature

	Viscosity [mm²/s]	Temperature	Comment
Transport and storage		$T_{min} \geq$ -50 °C T_{opt} = +5 °C to +20 °C	up to 12 months with standard factory preservation up to 24 months with long-term factory preservation
(Cold) start-up[1)]	ν_{max} = 1600	$T_{St} \geq$ -25 °C	t ≤ 1 min, without load (p ≤ 30 bar), n ≤ 1000 rpm
Permissible temperature difference		ΔT ≤ 25 K	between axial piston unit and hydraulic fluid
Warm-up phase	ν < 1600 to 400		at p_{nom}, 0.5 • n_{nom} and t ≤ 15 min
Operating phase			
Temperature difference		ΔT = approx. 5 K	between hydraulic fluid in the bearing and the case drain fluid at port L
Maximum temperature		115 °C	in the bearing
		110 °C	measured at port L
Continuous operation	ν = 400 to 10 ν_{opt} = 16 to 36	T = -25 °C to +90 °C	measured at port L, no restriction within the permissible data
Short-term operation	ν_{min} = 10	T_{max} = +115 °C	measured at port L, t < 1 min, p < 0.3 • p_{nom}
FKM shaft seal		T ≤ +115 °C	see page 5

Technical data

Filtration of the hydraulic fluid

Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service lif of the axial piston unit.

To ensure the functional reliability of the axial piston unit, a gravimetric analysis of the fluid is necessary to determine the amount of solid contaminant and to determine the cleanliness level according to ISO 4406. A cleanliness level of at least 20/18/15 is to be maintained.

At very high hydraulic fluid temperatures (90 °C to maximum 115 °C), a cleanliness level of at least 19/17/14 according to ISO 4406 is necessary.

Shaft seal

Temperature range

The FKM shaft seal may be used for case drain temperatures from -25 °C to +115 °C.

Technical data

Operating pressure range

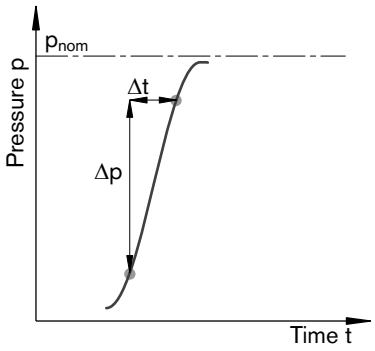
Pressure at service line port B

Nominal pressure p_{nom} _____ 250 bar absolute

Maximum pressure p_{max} _____ 280 bar absolute
Maximum single operating period _____ 0.05 s
Maximum number of cycles _____ 1 million

Minimum pressure (high-pressure side) _____ 14 bar
For lower pressure, please contact us.

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



Pressure at suction port S (inlet)

Minimum pressure $P_{S\ min}$ _____ ≥ 0.8 bar absolute
Maximum pressure $p_{S\ max}$ _____ ≤ 5 bar absolute

Case drain pressure

Maximum permissible case drain pressure (at port L1, L2): maximum 0.5 bar higher than the inlet pressure at port S, however not higher than

$p_{L\ max}$ _____ 2 bar absolute

Definition

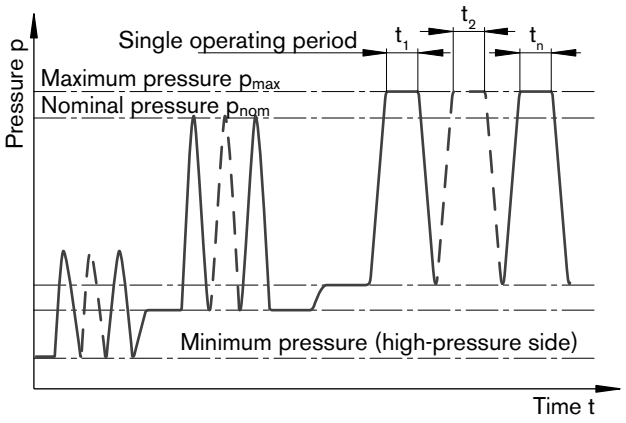
Nominal pressure p_{nom}
The nominal pressure corresponds to the maximum design pressure.

Maximum pressure p_{max}
The maximum pressure corresponds to the operating pressure within the single operating period. The total of the single operating periods must not exceed the total operating period.

Minimum pressure (high-pressure side)
Minimum pressure on the high-pressure side (B) that is required in order to prevent damage to the axial piston unit.

Minimum pressure (inlet)
Minimum pressure at suction port S (inlet) which is required in order to prevent damage to the axial piston unit. The minimum pressure depends on the speed and displacement of 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.



Technical data

Table of values (theoretical values, without efficiencies and tolerances: values rounded)

Size	NG		035
Displacement geometric, per revolution	$V_{g\,max}$	cm^3	35
	$V_{g\,min}$	cm^3	0
Maximum speed[1)] at $V_{g\,max}$	n_{nom}	rpm	3000
Flow at n_{nom} and $V_{g\,max}$	$q_{v\,max}$	l/min	105
Power at n_{nom} , $V_{g\,max}$ and $\Delta p = 250$ bar	P_{max}	kW	44
Torque at $V_{g\,max}$ and $\Delta p = 250$ bar	T_{max}	Nm	139
Rotary stiffness, drive shaft S5	c	kNm/rad	28
Moment of inertia rotary group	J_{TW}	kgm^2	0.00159
Maximum angular acceleration[2)]	α	rad/s^2	5000
Filling capacity	V	L	0.6
Weight (without through drive) approx.	m	kg	16.9

1) The values are valid:
- for an absolute pressure $p_{abs} = 1$ bar at suction port S
- for the optimum viscosity range from $\nu_{opt} = 16$ to 36 mm^2/s
- for mineral-based operating material with a specific mass of 0.88 kg/l.

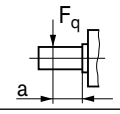
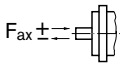
2) The scope of application lies between the minimum necessary and the maximum permissible drive speeds.
It applies for external stimuli (e.g. diesel engine 2 to 8 times rotary frequency, cardan shaft twice the rotary frequency).
The limiting value is only valid for a single pump.
The loading capacity of the connecting parts must be taken into account.

Note

Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. We recommend testing the loads by means of experiment or calculation / simulation and comparison with the permissible values.

Technical data

Permissible radial and axial forces of the drive shaft

Size		NG		35	35
Drive shaft			in	7/8	1
Maximum radial force at distance a (from shaft collar)		$F_{q\,max}$	N	Please consult us if lateral and/or axial forces occur	
		a	mm		
Axial force maximum		$+ F_{ax\,max}$	N		
		$- F_{ax\,max}$	N		

Note

Special requirements apply in the case of belt drives. Please contact us.

Influence of the direction of the permissible axial force:

+ $F_{ax\,max}$ = Increase in service life of bearings

– $F_{ax\,max}$ = Reduction in service life of bearings (avoid)

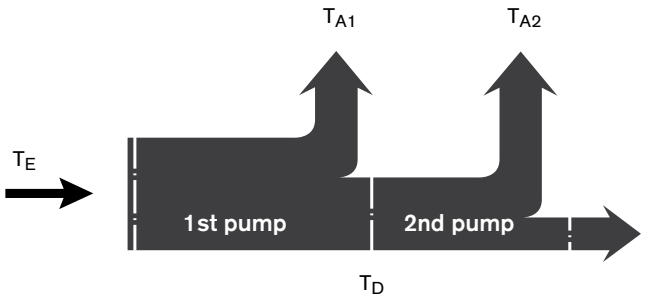
Permissible input and through-drive torques

Size			NG		035
Torque at $V_{g\,max}$ and $\Delta p = 250$ bar[1]			T_{max}	Nm	139
Input torque for drive shaft, maximum[2]					
	S4	7/8 in	$T_{E\,max}$	Nm	198
	S5	1 in	$T_{E\,max}$	Nm	319
Maximum through-drive torque			$T_{D\,max}$	Nm	139[1]

1) Efficiency not considered

2) For drive shafts free of radial load

Torque distribution



Determining the size

Flow $q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$ [l/min]

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

Power $P = \frac{2 \pi \cdot T \cdot n}{60000} = \frac{q_v \cdot \Delta p}{600 \cdot \eta_t}$ [kW]

V_g = Displacement per revolution in cm^3

Δp = Differential pressure in bar

n = Speed in rpm

η_v = Volumetric efficiency

η_{mh} = Mechanical-hydraulic efficiency

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

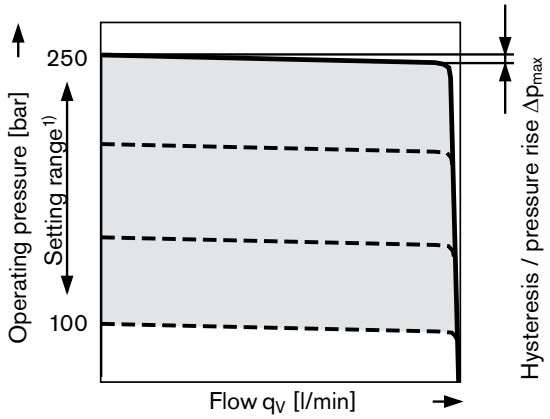
DR – Pressure control

The pressure control keeps the pressure in a hydraulic system constant within its control range even under varying flow conditions. The variable pump only supplies as much hydraulic fluid as is required by the consumers. If the operating pressure exceeds the target pressure set at the pressure control valve, the pump will regulate towards a smaller displacement, decreasing the control discrepancy.

Basic position in depressurized state: $V_{g\,max}$

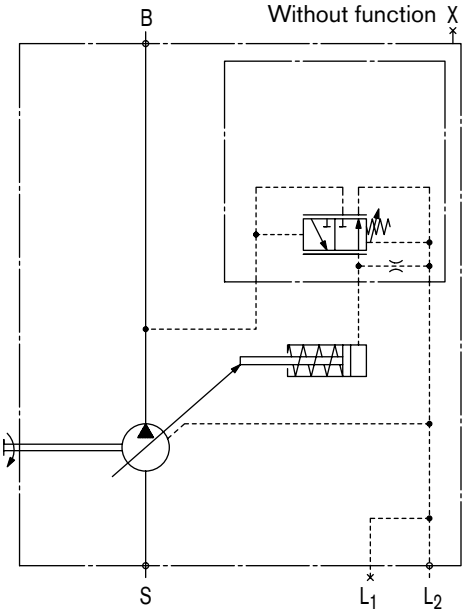
Static characteristic

(at $n_1 = 1500$ rpm; $t_{fluid} = 50$ °C)



1) In order to prevent damage to the pump and the system, this setting range is the permissible setting range and must not be exceeded.

Schematic DR



Controller data

Hysteresis and repeatability Δp _____ maximum 5 bar

Pilot fluid consumption _____ maximum approx. 3 l/min

DRS0 – Pressure control with load sensing

In addition to the pressure control function (DR), the load-sensing controller works as a flow controller that operates as a function of the load pressure to regulate the pump displacement to match the consumer flow requirement.

The load-sensing controller compares pressure before and after the sensing orifice and keeps the pressure drop (differential pressure Δp) across the orifice - and therefore the flow - constant as a function of the orifice size.

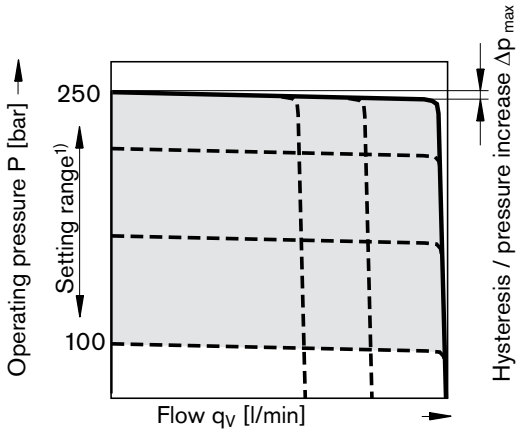
The swiveling in due to the pressure or flow controller will always take priority.

Note

The DRS0 version has no connection from X to the reservoir so the LS relief has to be incorporated into the system.

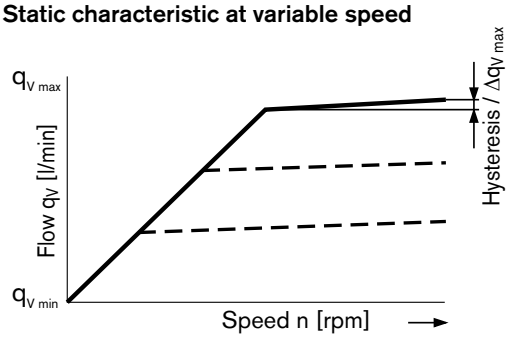
Static characteristic DRS0

Flow control at $n_1 = 1500$ rpm; $t_{fluid} = 50$ °C

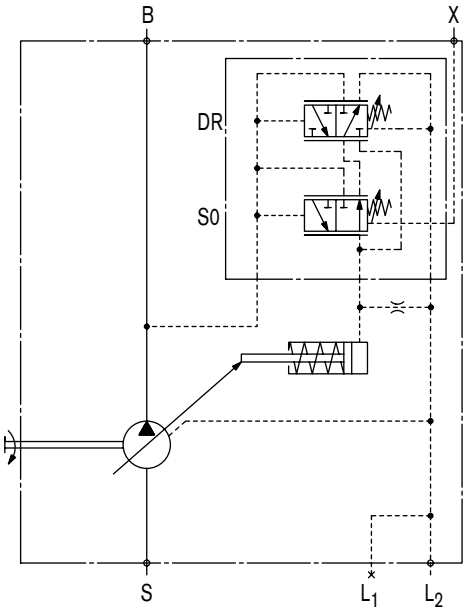


[1)] In order to prevent damage to the pump and the system, this setting range is the permissible setting range and must not be exceeded.

Static characteristic at variable speed



Schematic DRS0



Differential pressure Δp

Standard setting: 14 bar. If another setting is required, please state in clear text.

Controller data

For data for the pressure control DR, please refer to page 9.
Maximum flow differential (hysteresis and increase) measured at drive speed n = 1500 rpm and $t_{fluid} = 50$ °C

NG		35
$\Delta q_{V\,max}$	l/min	3

Pilot fluid consumption

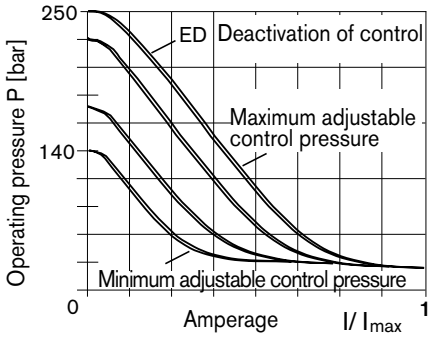
Maximum DRS0 approx. _____ 4 l/min

D3/D4 – Pressure control with one-sided deflection, proportional electric override with integrated solenoid, negative

With electric pressure adjustment using a proportional solenoid, the high pressure can be freely adjusted depending on the solenoid current. When the load pressure is changed at the consumer, the pump flow volume is adjusted so that the specified pressure is achieved again. If the solenoid current drops below the start of control, the unit will go to the set maximum pressure. The same thing applies if the pilot signal is lost.

Static current-pressure characteristic (negative characteristic)

(measured with pump in zero stroke)



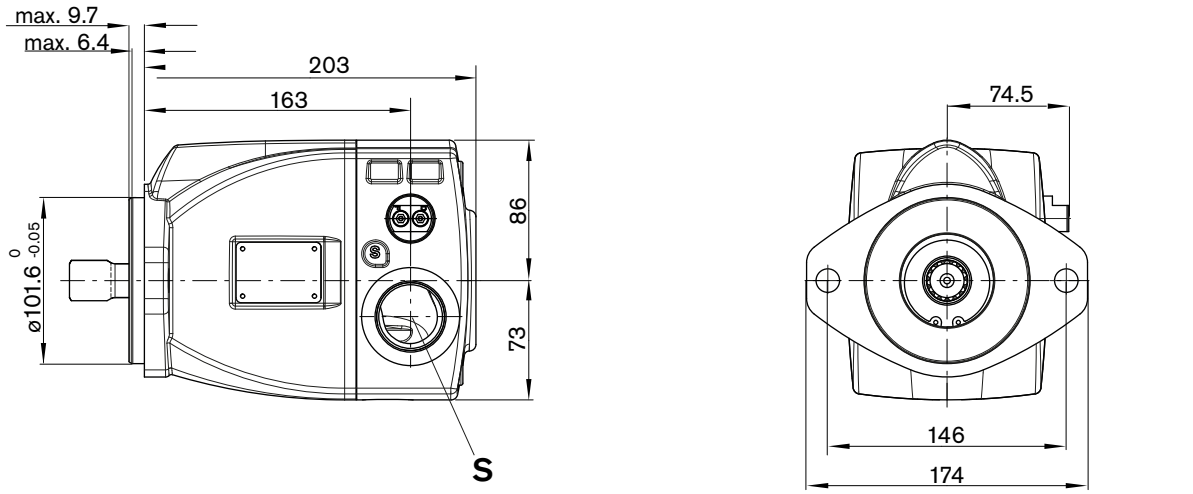
Further information about the controllers D3/D4 are in preparation.

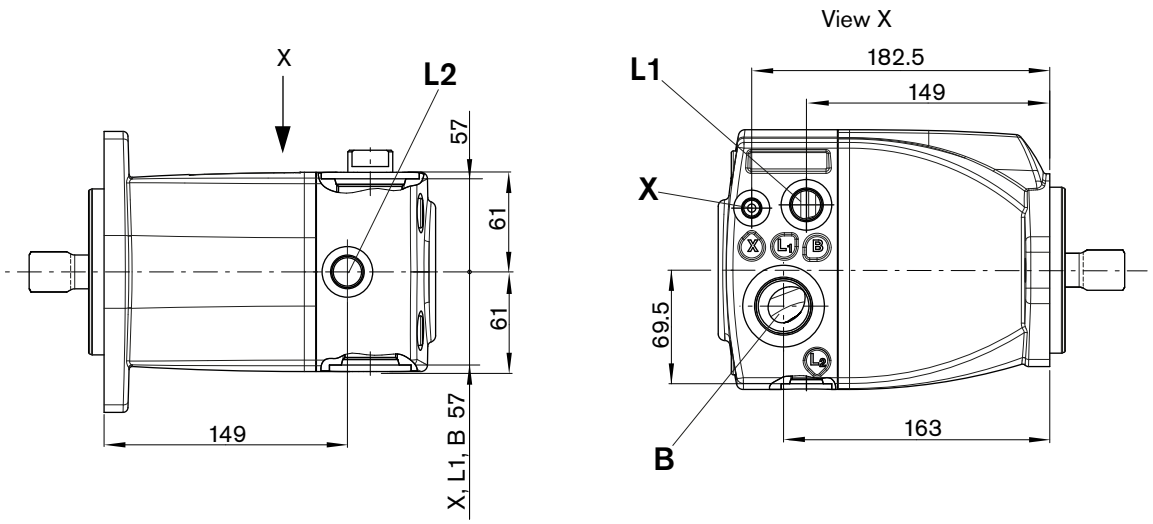
Dimensions, size 35

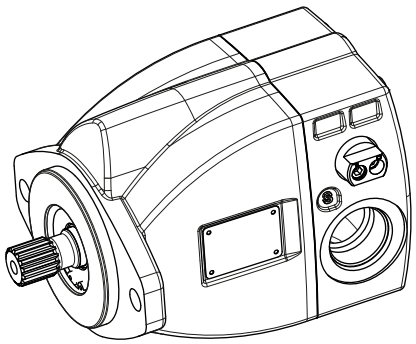
Before finalizing your design request a certified installation drawing. Dimensions in mm.

DR - pressure control / DRS0 - pressure control with load sensing

Clockwise rotation





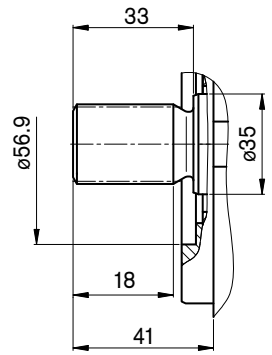


Dimensions, size 35

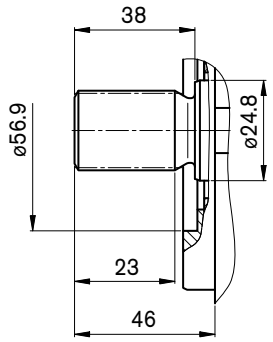
Before finalizing your design request a certified installation drawing. Dimensions in mm.

Drive shaft

S4 Splined shaft 7/8 in
13T 16/32DP[1)] (SAE J744)



S5 Splined shaft 1 in
15T 16/32DP [1)] (SAE J744)



Ports

Designation	Port for	Standard[5)]	Size[2)]	Maximum pressure [bar][3)]	State
B	Service line	ISO 11926	1 5/16-12UN-2B	280	O
S	Suction line	ISO 11926	1 5/8-12UN-2B	5	O
L_1	Case drain fluid	ISO 11926	3/4-16UNF-2B	10	O[4)]
L_2	Case drain fluid	ISO 11926	3/4-16UNF-2B	10	X[4)]
X	Load sensing	ISO 11926	7/16-20UNF-2B	280	O

1) ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Observe the general instructions on page 20 for the maximum tightening torques.
3) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
4) Depending on installation position, L_1 or L_2 must be connected (please refer to pages 18, 19).
5) The spot face can be deeper than specified in the appropriate standard.

O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

Through drive dimensions

Before finalizing your design, please request approved installation drawing. Dimensions in mm.

Flange (SAE J744)			Coupling for splined shaft[1]				
	Mounting variant						
Diameter	Symbol[2]	Designation	Diameter		Designation	035	
Without through drive						●	**0000**
82-2 (A)	⚯	A2	5/8 in	9T 16/32DP	S2	❍	**A2S2**
			3/4 in	11T 16/32DP	S3	❍	**A2S3**
			7/8 in	13T 16/32 DP	S4	❍	**A2S4**
101-2 (B)	⚯	B2	7/8 in	13 16/32 DP	S4	❍	**B2S4**
			1 in	15T 16/32 DP	S5	❍	**B2S5**

[1] Coupling for splined shaft in accordance with ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
[2] Arrangement of mounting holes with view to through drive with service line port B right

Overview of mounting options

Through drive[1]			Mounting option for 2nd pump							
Flange	Coupling for splined shaft	Short code	A1VO/10 NG (shaft)	A4VG/32 NG (shaft)	A10VG/10 NG (shaft)	A10VO/52 and 53 NG (shaft)	A10VNO/52 and 53 NG (shaft)	A10VWO/52 NG (shaft)	A10V(S)O/31 NG (shaft)	Gear pump
82-2 (A)	5/8 in	**A2S2**	–	–	–	10 (U), 18 (U)	–	–	18 (U)	Series F[2]
	3/4 in	**A2S3**	–	–	–	10 (S), 18 (S, R)	28 (R)	–	18 (S, R)	–
101-2 (B)	7/8 in	**B2S4**	–	–	18 (S)	28 (S, R)	–	28 (S)	28 (S, R)	Series N & G[2]
	1 in	**B2S5**	35 (S5)	28 (S)	28 (S)	–	–	–	–	–

[1] Other through drives on request

[2] Bosch Rexroth recommends special versions of the gear pumps. Please contact us.

Combination pumps A1VO + A1VO

Before finalizing your design, please request approved installation drawing. Dimensions in mm.

Total length A

A1VO (1st pump)	A1VO (2nd pump) NG35
NG35	431

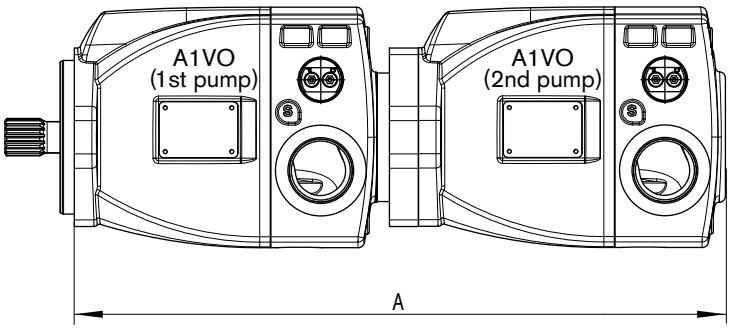
By using combination pumps, it is possible to have independent circuits without the need for splitter gearboxes.

When ordering combination pumps the type designation of the first and the second pumps must be linked by a "**+**".

Order example:
A1VO035DRS0C100/10BRVB2S51B2S500+
A1VO035DRS0C100/10BRVB2S51000000

A tandem pump consisting of two equal sizes is permissible without additional supports assuming that the dynamic acceleration does not exceed maximum 10 *g* (= 98.1 m/s^2).

For combination pumps consisting of more than two pumps, the mounting flange must be rated for the permissible mass torque.



Connector for solenoids

Before finalizing your design, please request approved installation drawing. Dimensions in mm.

DEUTSCH DT04-2P-EP04, 2-pin

Molded, without bidirectional suppressor diode **P**

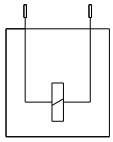
Connector with following type of protection:

IP67 DIN/EN 60529

and IP69K DIN 40050-9

Circuit symbol

Without bidirectional suppressor diode

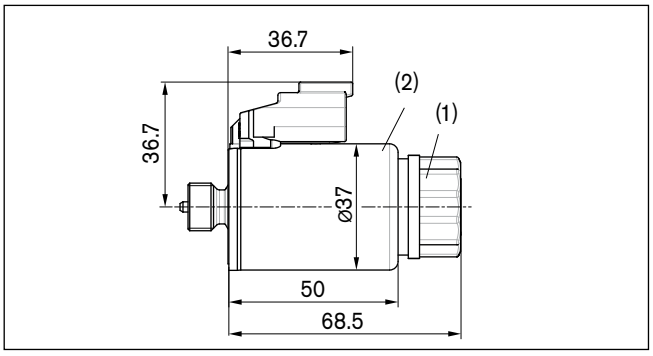


Mating connector

DEUTSCH DT06-2S-EP04
Bosch Rexroth mat. no. R902601804

Consisting of:	DT designation
– 1 case	DT06-2S-EP04
– 1 wedge	W2S
– 2 sockets	0462-201-16141

The mating connector is not included in the delivery contents. This can be supplied by Bosch Rexroth on request.



Changing connector position

If necessary, you can change the position of the connector by turning the solenoid.

To do this, proceed as follows:

1. Loosen the mounting nut (1) of the solenoid. To do this, turn the mounting nut (1) one revolution counter-clockwise.
2. Turn the solenoid body (2) to the desired position.
3. Retighten the mounting nut of the solenoid. Tightening torque: 5 +1 Nm (size WAF 26, 12 kt DIN 3124).

On delivery, the position of the connector may differ from that shown in the brochure or drawing.

Installation instructions

General

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation. This is also to be observed following a relatively long standstill as the system may empty via the hydraulic lines.

Particularly in the installation position "drive shaft upwards/ downwards", filling and air bleeding must be carried out completely as there is, for example, a danger of the bearing dry running.

The case drain fluid in the pump housing must be directed to the reservoir via the highest available drain port (L_1, L_2).

For combination of multiple units, make sure that the respective case pressure in each unit is not exceeded. In the event of pressure differences at the drain ports of the units, the shared drain line must be changed so that the minimum permissible case pressure of all connected units is not exceeded in any situation. If this is not possible, separate drain lines must be laid if necessary.

To achieve favorable noise values, decouple all connecting lines using elastic elements and avoid above-reservoir installation.

In all operating conditions, the suction line and case drain line must flow into the reservoir below the minimum fluid level . The permissible suction height h_S results from the overall loss of pressure. It must not, however, be higher than $h_{S\,max} = 800$ mm. The minimum suction pressure at port S must also not fall below the minimum value of 0.8 bar absolute during operation.

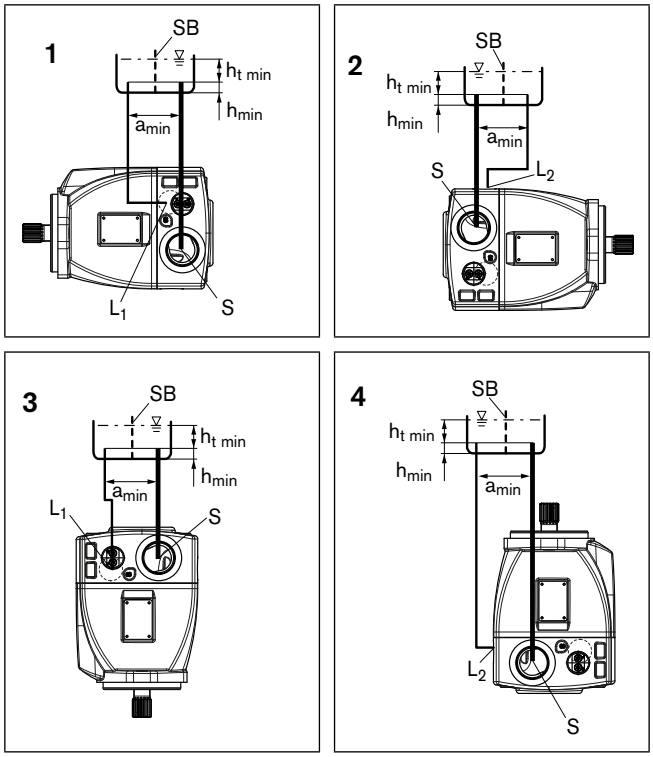
Installation position

See the following examples 1 to 11.
Further installation positions are available upon request.

Recommended installation positions: 1 and 2

Below-reservoir installation (standard)

Below-reservoir installation means the axial piston unit is installed outside of the reservoir below the minimum fluid level.



Installation position	Air bleed	Filling
1	L_1	S + L_1
2	L_2	S + L_2
3	L_1 or L_2	S + L_1 or L_2
4[1)]	L_1 or L_2	S + L_1 or L_2

Key, see page 19.

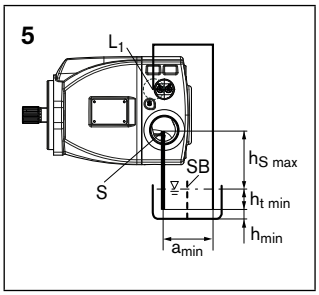
[1)] A complete air bleed / fill is not possible in this position. Fill / air bleed in horizontal position necessary.

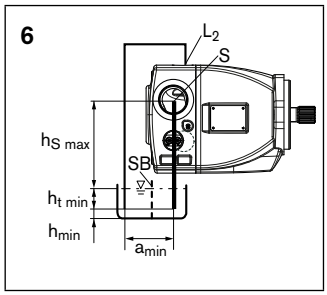
Installation instructions

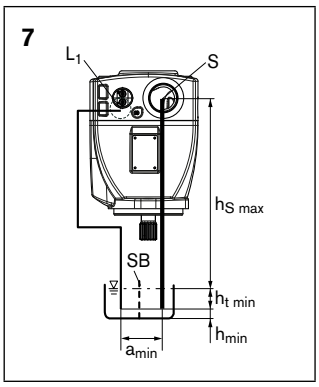
Above-reservoir installation

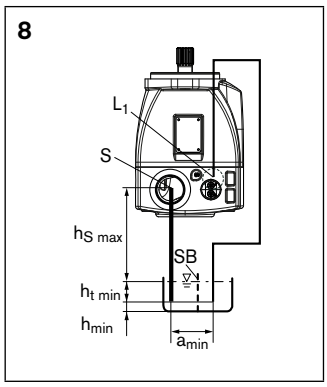
Above-reservoir installation means the axial piston unit is installed above the minimum fluid level of the reservoir.

Observe the maximum permissible suction height $h_{S\,max} = 800$ mm.









Installation position	Air bleed	Filling
5	L1	L1
6	L2	L2
7	L1	L1
8[1)]	L1	L1

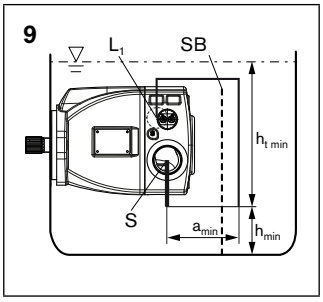
Inside-reservoir installation

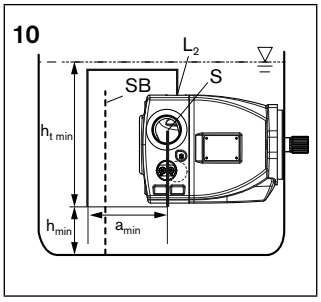
Inside-reservoir installation is when the axial piston unit is installed in the reservoir below the minimum fluid level. The axial piston unit is completely below the hydraulic fluid.

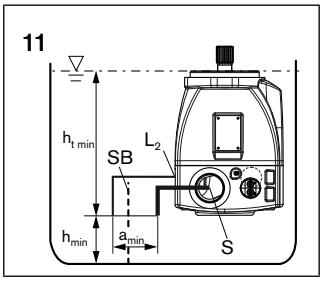
If the minimum fluid level is equal to or below the upper edge of the pump, see chapter "Above-reservoir installation".

Note

Axial piston units with electrical component must not be installed below the hydraulic fluid level.







Installation position	Air bleed	Filling
9	L1	S + L1
10	L2	S + L2
11[1)]	L2	S + L2

[1)] A complete air bleed or fill is not possible in this position. To do this, a horizontal position is needed

$L_{1/2}$	Filling / air bleeding
S	Suction port
T	Reservoir port
SB	Baffle (baffle plate)
$h_{t\,min}$	Minimum required immersion depth (200 mm)
h_{min}	Minimum required spacing from suction port to tank base (100 mm)
$h_{S\,max}$	Maximum permissible suction height (800 mm)
a_{min}	When designing the reservoir, ensure adequate distance between the suction line and the case drain line. This prevents the heated, return flow from being drawn directly back into the suction line.

General instructions

– The A1VO pump is designed to be used in open circuit.

– Project planning, installation and commissioning of the axial piston unit require the involvement of qualified personnel.

– Before operating the axial piston unit, please read the appropriate instruction manual thoroughly and completely. If necessary, request these from Bosch Rexroth.

– 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.

– Service line 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 application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.

  - The service line ports and function ports are only designed to accommodate hydraulic lines.

– Pressure cut-off and pressure control do not provide security against pressure overload. A separate pressure relief valve is to be provided in the hydraulic system.

– 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 ISO 13849.

– The following tightening torques apply:

  - Fittings:
    Observe the manufacturer's instruction regarding the tightening torques of the used fittings.

  - Fixing screws:
    For mounting bolts with metric ISO thread according to DIN 13 or thread according to ASME B1.1, we recommend checking the tightening torque individually according to VDI 2230.

  - 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.

  - Threaded plugs:
    For the metallic threaded plugs supplied with the axial piston unit, the required tightening torques of the threaded plugs M_V apply. For values, see the following table.

Ports		Maximum permissible tightening torque for female threads $M_{G\ max}$	Required tightening torque of the threaded plugs M_V	WAF hexagon socket of the threaded plugs
Standard	Size of thread			
ISO 11926	7/16-20UNF-2B	40 Nm	18 Nm	3/16 in
	3/4-16 UNF-2B	160 Nm	70 Nm	5/16 in
	1 5/16-12 UN-2B	540 Nm	270 Nm	5/8 in
	1 5/8-12 UN-2B	960 Nm	320 Nm	3/4 in

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