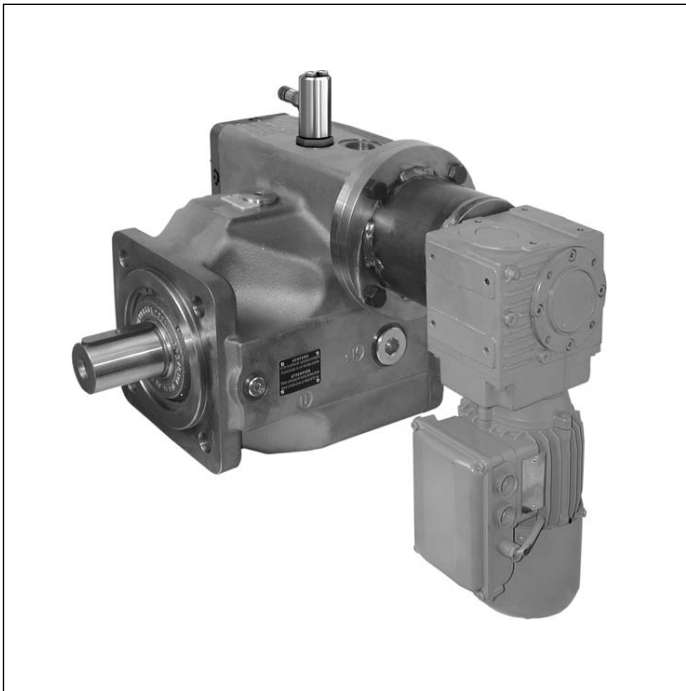


Control devices MA and EMA... for axial piston variable pump A4VSO and A4VSG



- ▶ Control systems for the axial piston variable pump A4VSO and A4VSG
- ▶ Open and closed circuit
- ▶ Series 1x and 3x

Features

- ▶ Stepless adjustment of the displacement volume by means of the electric motor control EMA...
Manual control MA is carried out via handwheel
- ▶ Control time selectable
- ▶ Swivel angle feedback via inductive position transducer
- ▶ Overload coupling for the protection of the variable displacement motor provided by default

Further information

- ▶ Variable pump A4VSO, data sheet 92050
- ▶ Variable pump A4VSG, data sheet 92100

Contents

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Type code

01	02	03	04	05	06	07	08	09	10	11	12	13	14
	A4VS				/		-						

Hydraulic fluid

01	For details see data sheet 92050 and 92100	
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Axial piston unit

02	Swashplate design, variable	A4VS
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Operating mode

Data sheet

03	Pump, open circuit	92050	O
	Pump, closed circuit	92100	G

Size (NG)

04	Geometric displacement V_g [cm ³]	40	71	125	180	250	355	500
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Control device

05	Manual control	○	○	○	○	○	○	○	MA
	Electric motor control with control times								
	with inductive position transducer AWAX	●	●	●	●	●	●	●	EMA...
	Control times e.g. EMA...stated in seconds ¹⁾	007	007	007	007	009	005	016	EMA ...

Series

06	Series 1, index 0	●	●	-	-	-	-	-	10
	Series 3, index 0	-	-	●	●	●	●	●	30
	Series 3, index 3	-	-	-	-	○	-	○	33

Further details on positions 07 to 13 can be found in data sheets 92050 and 92100

● = Available ○ = On request - = Not available

1) Further control times on request

MA – manual control

The displacement is infinitely variable by the handwheel via a ball screw drive.

The change of displacement can be monitored via the swivel angle display.

The MA adjustment has a locking lever for fixing the displacement during operation.

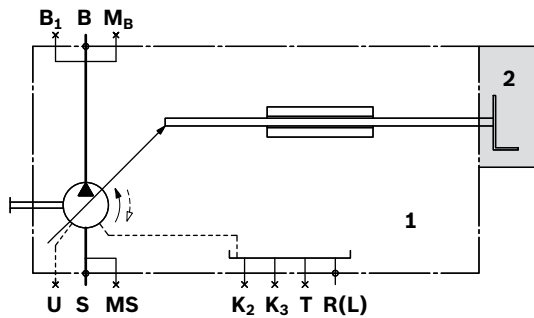
As standard, the handwheel is mounted on the right (when looking at the drive shaft), on the side of the high-pressure connection. For handwheel mounting on the left, please consult us.

On request, additional fixed end stops can be installed to limit the swivel angle (please specify in plain text when ordering).

Technical data

Size			40	71	125	180	250	355	500
Control stroke (0 cm ³ to V _{g max})	S	mm	14.2	17.1	20.7	20.7	25.9	25.9	32.6
Handwheel rotations (0 cm ³ to V _{g max})			2.84	3.40	4.14	4.14	5.18	2.59	3.26
Change per rotation	V _g	cm ³	14.0	21.0	30.2	43.5	48.3	13.7	153.4
Adjusting torque on the handwheel at p _{max} 350 bar		Nm	approx. 6 to 40 depending on the size						
Weight approx. (A4VSO...MA...N00)		Kg	39	58	100	105	200	220	333

▼ Circuit diagram (example using A4VSO)



Components

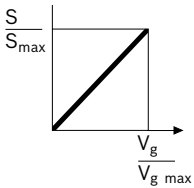
- 1 Axial piston variable pump A4VSO, A4VSG
- 2 Handwheel

Variable pump A4VSO – open circuit

Notice!

For the A4VSO variable displacement pumps for open circuit (one-sided swiveling), a residual flow rate of approx. 3% is defined at $V_{g \min}$.

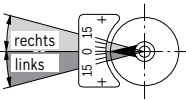
▼ **Characteristic curve A4VSO**



Overview of the interrelations in handwheel operation (if handwheel is mounted on the right side)

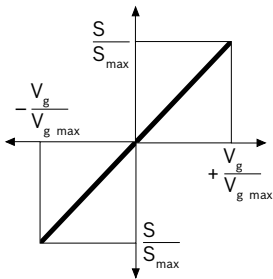
Direction of rotation of the pumps viewed on drive shaft	Direction of rotation for handwheel		Swivel direction	Direction of flow	Pressure side
	counter-clockwise	clockwise			
clockwise	$V_{g \min}$ to $V_{g \max}$	$V_{g \max}$ to $V_{g \min}$	counter-clockwise	S to B	B
counter-clockwise	$V_{g \max}$ to $V_{g \min}$	$V_{g \min}$ to $V_{g \max}$	clockwise	S to B	B

▼ **Swivel angle indicator**



Variable pump A4VSG – closed circuit

▼ **Characteristic curve A4VSG**

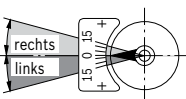


Overview of the interrelations in handwheel operation

(if handwheel is mounted on the right side)

Direction of rotation of the pumps viewed on drive shaft	Direction of rotation for handwheel	Swivel direction	Direction of flow	Pressure side
clockwise	clockwise	clockwise	B to A	A
	counter-clockwise	counter-clockwise	A to B	B
counter-clockwise	clockwise	clockwise	A to B	B
	counter-clockwise	counter-clockwise	B to A	A

▼ **Swivel angle indicator**



EMA.. – electric motor control

The displacement is infinitely variable by means of the electric variable displacement motor, a reduction gear and a ball screw drive.

Control times see type code, further control times on request. These apply to standard motors operating at 230/400 volts and 50 Hz. The mounted motor can also be operated at 60 Hz. The operating times are then reduced by approx. 20%.

With EMA.., the version is equipped with an inductive position transducer for swivel angles detection for

customer-specific solutions. **The EMA..** control is equipped with an overload coupling for the protection of the variable displacement motor in its standard version.

On request, additional fixed end stops can be installed to limit the swivel angle (please specify in plain text when ordering).

Actuation times and representation see type code, further actuation times on request.

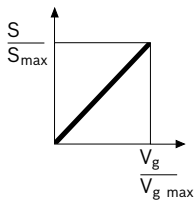
Characteristic curves EMA..

Variable pump A4VSO – open circuit

Notice!

For the A4VSO variable displacement pumps for open circuit (one-sided swiveling), a residual flow rate of approx. 3% is defined at $V_{g \min}$.

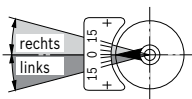
▼ Characteristic curve A4VSO EMA..



Direction of rotation, swivel direction, flow direction

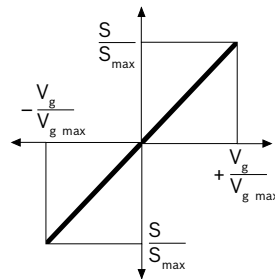
Direction of rotation of the pumps	Swiveling range	Direction of flow	Pressure side
clockwise	counter-clockwise	S to B	B
counter-clockwise	clockwise	S to B	B

▼ Swivel angle indicator



Variable pump A4VSG – closed circuit

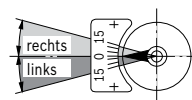
Characteristic curve A4VSG EMA..



Direction of rotation, swivel direction, flow direction

Direction of rotation of the pumps	Swiveling range	Direction of flow	Pressure side
clockwise	clockwise	B to A	A
	counter-clockwise	A to B	B
counter-clockwise	clockwise	A to B	B
	counter-clockwise	B to A	A

▼ Swivel angle indicator



Technical data EMA..

Technical data - general

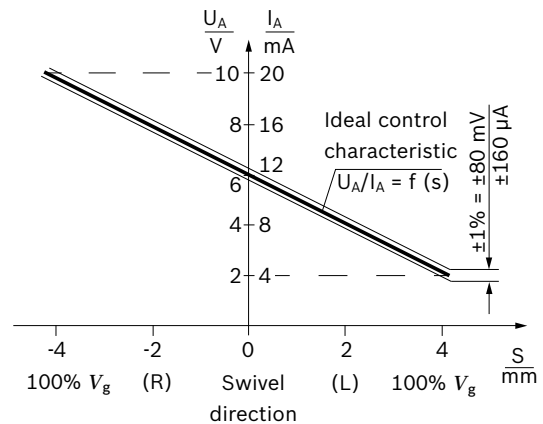
Size			40	71	125	180	250	355	500
Control stroke (0 cm ³ to V _{g max})	s	mm	14.2	17.1	20.7	20.7	25.9	25.9	32.6
Control time	t	s	7	7	7	7	9	5	16
Spindle pitch	h	mm	5	5	5	5	5	10	10
Spindle rotation (0 cm ³ to V _{g max})			2.84	3.42	4.14	4.14	5.18	2.59	3.26
Adjusting torque at the spindle	T	Nm					10		
maximum permissible ambient temperature		°C					80		

Technical data – electric

Electric motor please request specification with technical data for electric motor and gear unit separately			
Nominal operating voltage	U ¹⁾	V	230 / 400 3~
Frequency ²⁾		Hz	50
Type of protection according to DIN/EN 60529			IP54

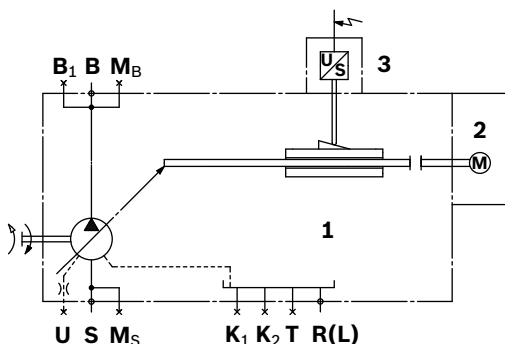
Control EMA.. – technical data for inductive position transducer

Inductive position transducer AWAX	Current-voltage diagram
Temperature range	-25 °C to +80 °C
Type of protection	IPX7 DIN VDE 0470-EN 60529 (Connector IP67)
Typical temperature drift	0.05%/K (related to the total output voltage)
Vibration resistance	10 g sine; 10 g noise; 15g shock
Use within minimum liquid level	approved for HLP 46 with mounted connector
Sealing element	FKM



Circuit diagram EMA..

(Example A4VSO)

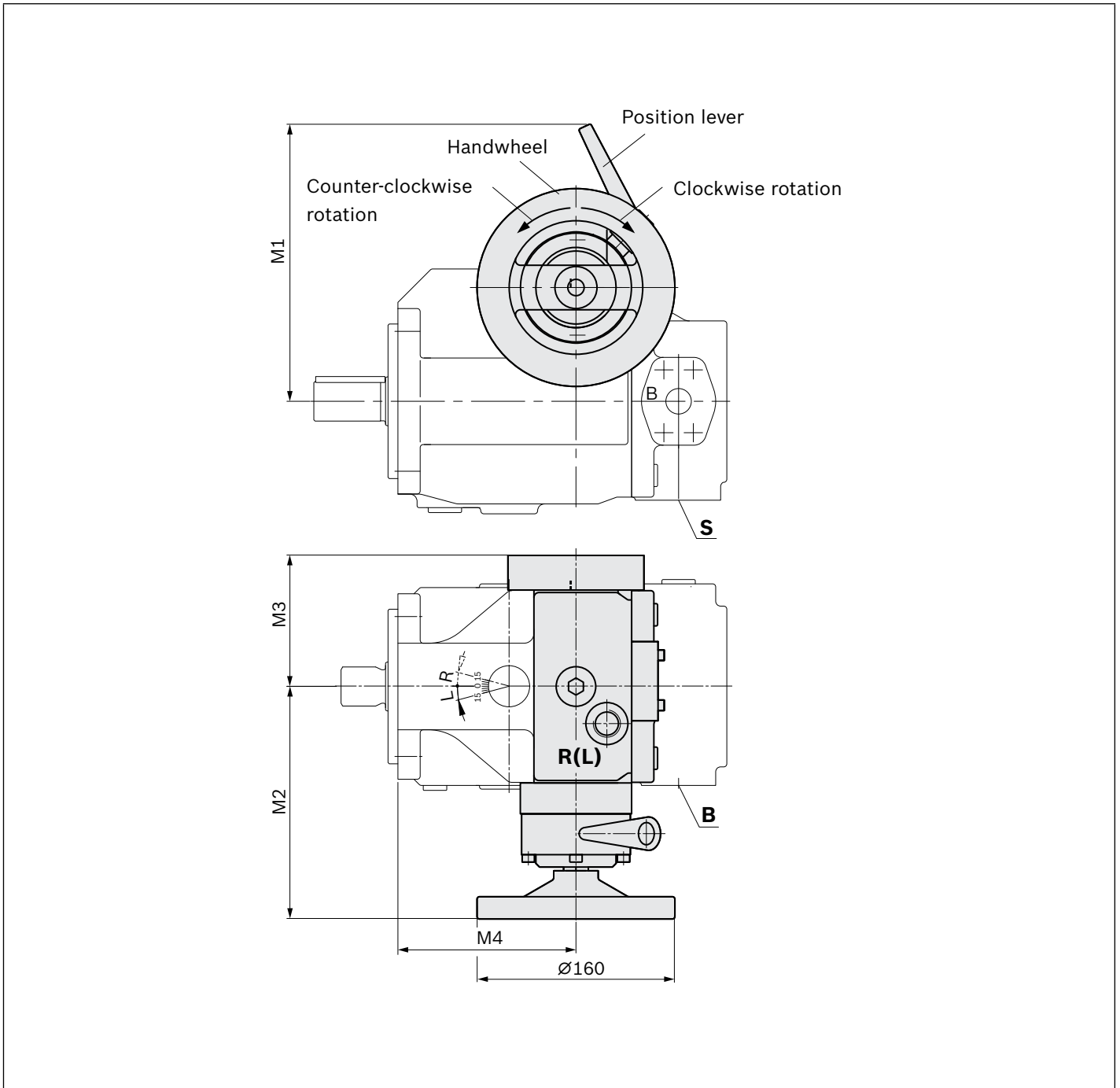


Components	
Position	
1	Pump with mechanical control device Data sheet A4VSO 92050 A4VSG 92100
2	Electric motor type of protection IP54 A separate specification is available for the technical data of the electric motor and the gear unit, please request
3	Swivel angle sensor for detecting pump swivel angle

- 1) Special voltages on request
- 2) Operation also possible at 60 Hz, the control times are then reduced by approx. 20%

Dimensions A4VSO and A4VSG MA

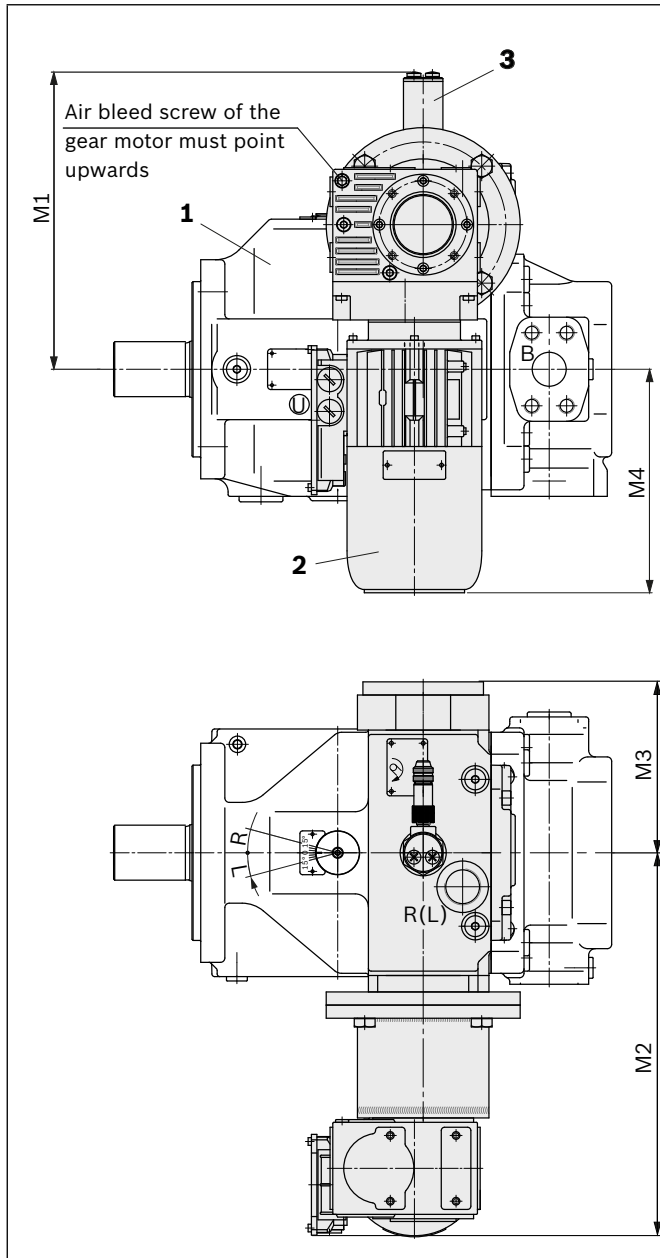
▼ **Sizes 40 to 500**



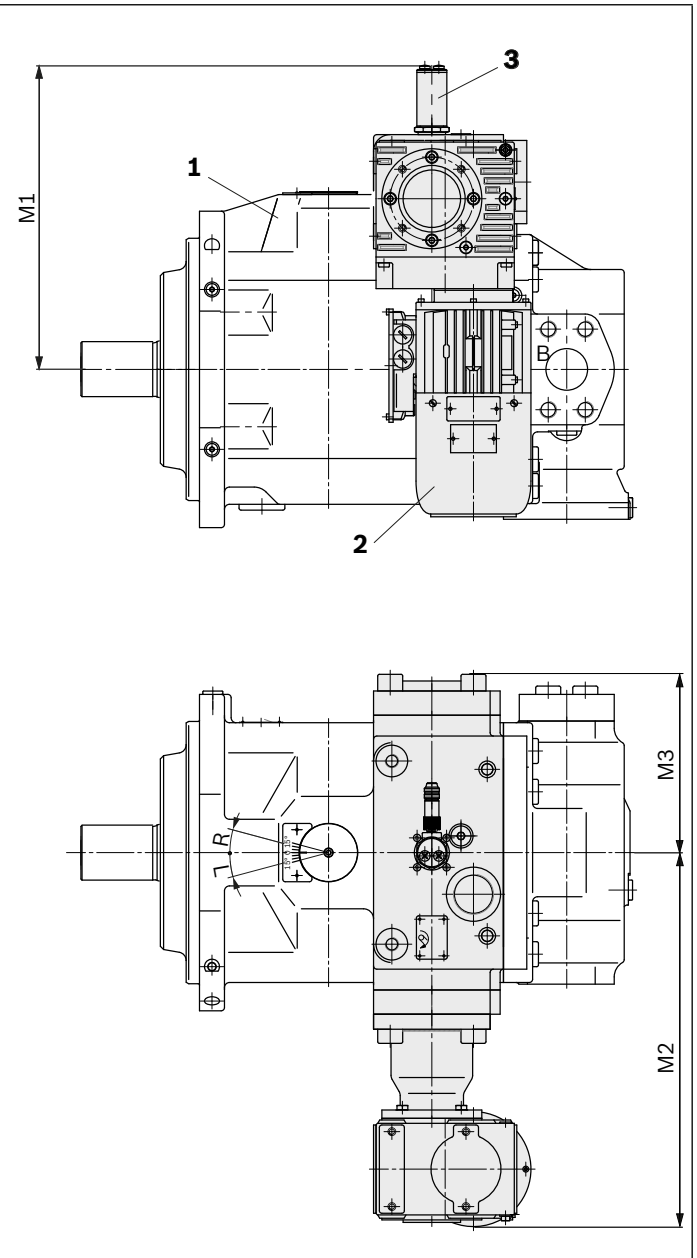
Size	M1	M2	M3	M4
40	224	188	106	144
71	207	200	120	166
125	241	229	144	203
180	241	229	144	203
250	287	258	172	248
355	274	287	201	248
500	314	308	214	279

Dimensions A4VSO and A4VSG EMA..

▼ Sizes 40 to 355



▼size 500



Size	M ₁	M ₂	M ₃	M ₄
40	223.7	309	118	172
71	244.7	314	132	156
125	271.2	350	156	203
180	271.2	350	156	204
250	318.2	378	184	167
355	318.2	399	213	167
500	365.2	450	214	-

Components	
1	Axial Piston variable Pump A4VS
2	Electric motor
3	Inductive position transducer AWAX

- The indicated dimensions are maximum dimensions, depending on the version of the electric motor these may differ.
- Detailed dimensions of the respective sizes and their working ports can be found in the respective data sheets 92050 (A4VSO) and 92100 (A4VSG)

Project planning notes

- ▶ The A4VSO axial piston variable pump is designed to be used in open circuit.
The A4VSG axial piston variable pump is designed to be used in closed circuit.
- ▶ The project planning, assembly and commissioning of the axial piston unit require the involvement of qualified skilled persons.
- ▶ Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, this can be requested from Bosch Rexroth.
- ▶ Before finalizing your design, please request a binding installation drawing.
- ▶ The specified data and notes contained herein must be observed.
- ▶ Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- ▶ The characteristic curve may also shift due to the dither frequency or control electronics.
- ▶ Preservation: Our axial piston units are supplied as standard with preservative protection for a maximum of 12 months. If longer preservation is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, which can be found in data sheet 90312 or in the instruction manual.
- ▶ Not all versions of the product are approved for use in a safety function according to ISO 13849. Please consult the proper contact at Bosch Rexroth if you require reliability parameters (e.g., $MTTF_d$) for functional safety.
- ▶ Electromagnetic effects can be produced when using electric components. The machine manufacturer should conduct appropriate tests and take appropriate measures to ensure that other components or operators (e.g., with a pacemaker) are not affected by this potentiality.
- ▶ Pressure controllers are not safeguards against pressure overload. A pressure relief valve is to be fitted in the hydraulic system.
- ▶ For drives that are operated for a long period with constant rotational speed, the natural frequency of the hydraulic system can be stimulated by the excitation frequency of the pump (rotational speed frequency $\times 9$). This can be prevented with suitably designed hydraulic lines.
- ▶ Please note the details regarding the tightening torques of port threads and other threaded joints in the instruction manual.
- ▶ Working ports:
 - The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
 - The working ports and function ports are only intended to accommodate hydraulic lines.

Safety instructions

- ▶ During and shortly after operation, there is a risk of burns on the axial piston unit, in particular on the electric motor. Take the appropriate safety measures (e.g., by wearing protective clothing).
- ▶ Under certain circumstances, moving parts in control equipment (e.g., valve spools) can get stuck in an undefined position due to contamination (e.g., impure hydraulic fluid, abrasion or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk. The machine/system manufacturer should test whether additional measures are required on the machine for the relevant application in order to bring the driven consumer into a safe position (e.g., safe stop) and make sure any measures are properly implemented.

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