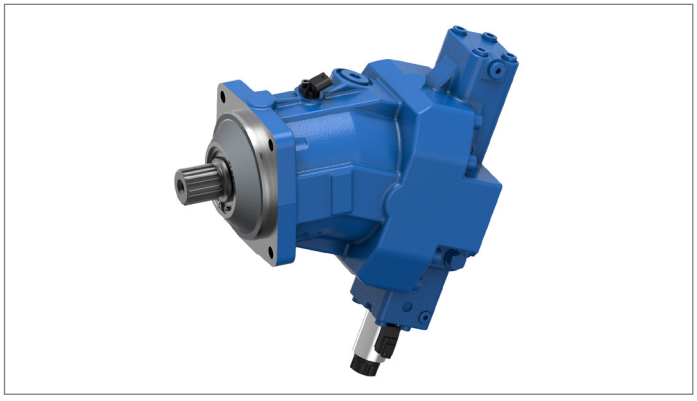
rexroth
A Bosch Company

Axial piston variable motor A36VM



- High-pressure motor for travel drives
- Sizes 125 and 255
- Nominal pressure 450 bar
- Maximum pressure 530 bar
- Closed circuit

Features

- Robust motor with long service life
- Approved for high rotational speeds
- High starting efficiency
- Excellent slow-running characteristics
- Very wide control range for high travel speeds
- High torque
- Integrated flushing and boost-pressure valve
- Bent-axis design

Contents

Type code

01	02	03	04	05	06	07	08	09		10	11	12	13	14	15	16	17	18	19	20		21
A36V	**M**					**0**			**/**	**10**	**M**	**W**	**V**	**0**							**–**	

Axial piston unit

01	Bent-axis design, variable				**A36V**

Operating mode				**125**	**255**	
02	Motor			●	●	**M**

Size (NG)

03	Geometric displacement, see page 8			**125**	**255**

Control device				**125**	**255**	
04	Proportional control electric	positive control	U = 12 V	●	●	**EP1**
			U = 24 V	●	●	**EP2**
		negative control	U = 12 V	●	●	**EP5**
			U = 24 V	●	●	**EP6**
	Automatic control high-pressure related	positive control with minimum pressure increase		o[1]	–	**HA1**

Override				**125**	**255**	
05	Without			●	●	**00**
	Override of control HA1	electric and travel direction valve, electric	U = 12 V	o	–	**R1**
			U = 24 V	o	–	**R2**

Connector for solenoids[2]				**125**	**255**	
06	Without connectors (only for purely hydraulic control)			o	–	**0**
	DEUTSCH - molded connector, 2-pin, without suppressor diode			●	●	**P**

Additional function				**125**	**255**	
07	Without			●	●	**0**

Stroking time damping (for selection, see control)				**125**	**255**	
08	Without damping (standard for EP)			●	●	**0**
	With damping	both sides (EP)		●	●	**1**
		One-sided in inlet to large stroking chamber (HA)		o	–	**4**

Setting ranges for displacement[3]

09	$V_{g\,max}$ setting screw	$V_{g\,min}$ setting screw	**125**	**255**	
	without	**without** (standard for EP, not for HA)	●	●	**0**
		short (standard for HA)	o	–	**A**

Series				**125**	**255**	
10	Series 1, index 0			●	●	**10**

● = Available o = On request – = Not available = Preferred program

1) Only available in combination with overrides **R1**/**R2**.
Delivery times for **HA1** without override will be extended by the development time

2) Connectors for other electric components may deviate.

3) The adjustment values for the setting screws can be found in the table (page 21).

01	02	03	04	05	06	07	08	09		10	11	12	13	14	15	16	17	18	19	20		21
A36V	**M**					**0**			**/**	**10**	**M**	**W**	**V**	**0**							**–**	

Version of port and fastening threads

		125	255	
11	Metric ports based on ISO 6149 with O-ring seal, metric fastening thread according to DIN 13	●	●	**M**

Direction of rotation

		125	255	
12	Viewed on drive shaft, bidirectional	●	●	**W**

Sealing material

		125	255	
13	FKM (fluorocarbon rubber)	●	●	**V**

Additional function

		125	255	
14	Without	●	●	**0**

Mounting flange

			125	255	
	ISO 3019-2 metric	140-4	●	–	**N4**
		180-4	–	●	**R4**

Drive shaft

			125	255	
	Splined shaft DIN 5480	W40×2×18×9g	●	–	**Z9**
		W50×2×24×9g	–	●	**A2**

Working port (port plate)

		125	255	
17	SAE flange ports A and B at rear	●	●	**1**
	SAE flange ports A and B at side, opposite	●	●	**2**

Valves

125	255	

● = Available ○ = On request – = Not available = Preferred program

01	02	03	04	05	06	07	08	09		10	11	12	13	14	15	16	17	18	19	20		21
A36V	**M**					**0**			**/**	**10**	**M**	**W**	**V**	**0**							**–**	

18	Without			○	○	**0**
	With flushing and boost-pressure valve, integrated, flushing on both sides Flushing flow at: $\Delta p = p_{ND} - p_G$ = 25 bar and ν = 10 mm²/s (p_{ND} = low pressure, p_G = case pressure) Possible with port plates 1 and 2	**Flushing flow q_v [l/min]**	3.5	●	–	**A**
			5	●	–	**B**
			8	●	●	**C**
			10	●	●	**D**
			12	●	–	**E**
			14	●	–	**F**
			15	–	●	**G**
			16	●	–	**H**
			18	–	●	**I**
			20	●	–	**N**
			21	–	●	**J**
			27	–	●	**K**
			35	–	●	**O**
			50	–	●	**Q**

Other ports

		125	255	
19	**T** ports at top/bottom, without **U** port, speed sensor at top (if selected)	●	●	**1**
	T ports at top/bottom, with **U** port at top, speed sensor at top (if selected)	○	○	**2**

Sensors

		125	255	
20	Without	●	●	**0**
	Prepared for sensor DSA/20 or DST	●	●	**W**
	Speed sensor DSA/20 mounted[4)]	●	●	**C**
	Speed sensor DST mounted[4)]	●	●	**E**

Standard/special version

21	Standard version	**0**

● = Available ○ = On request – = Not available = Preferred program

Notice

- ▶ Note the project planning notes on page 24!
- ▶ In addition to the type code, please specify the relevant technical data when placing your order.
- ▶ Please note that not all type code combinations are available although the individual functions are marked as being available.

4) Specify the type code separately for sensor in accordance with data sheet 95126 (DSA/20) or 95131 (DST/10) and observe the requirements for the electronics.

Hydraulic fluid

The axial piston unit is designed for operation with HLP mineral oil according to DIN 51524.
Application instructions and requirements for hydraulic fluid selection, behavior during operation as well as disposal and environmental protection should be taken from the following data sheets before the start of project planning:

- 90220: Hydraulic fluids based on mineral oils and related hydrocarbons

Selection of hydraulic fluid

Bosch Rexroth evaluates hydraulic fluids on the basis of the Fluid Rating according to the technical data sheet 90235.

Hydraulic fluids with positive evaluation in the Fluid Rating are provided in the following technical data sheet:

- 90245: Bosch Rexroth Fluid Rating List for Rexroth hydraulic components (pumps and motors).

Selection of hydraulic fluid shall make sure that the operating viscosity in the operating temperature range is within the optimum range (v_{opt}; see selection diagram).

Notice

- The axial piston unit is not suitable for operation with HF and environmentally acceptable hydraulic fluids.

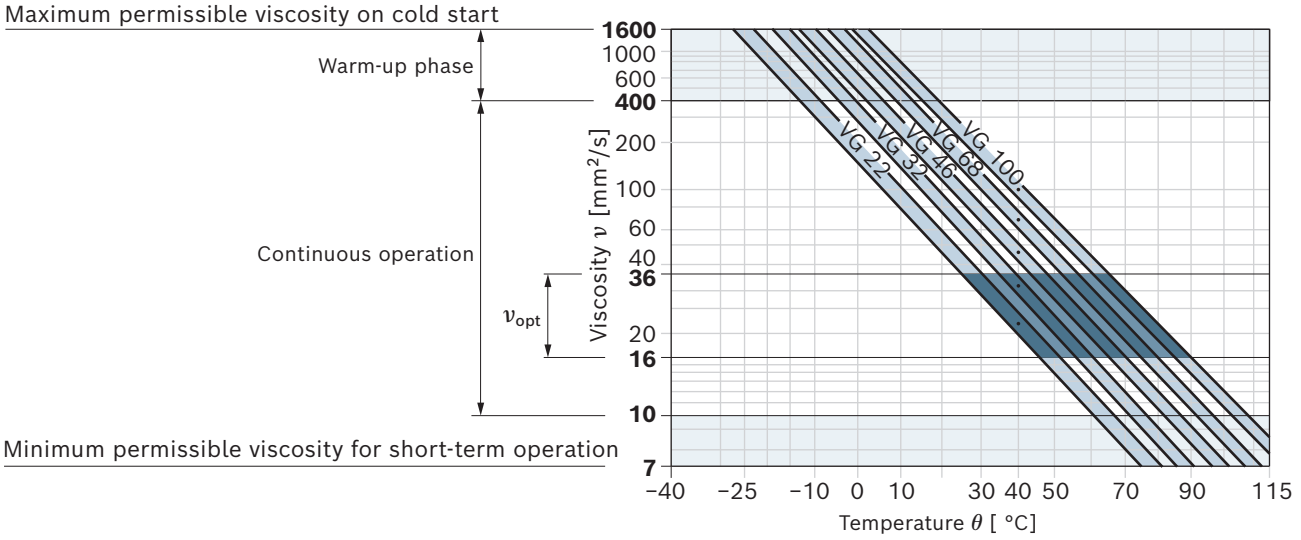
Viscosity and temperature of hydraulic fluids

	Viscosity	Shaft seal	Temperature[3]	Remarks
Cold start	v_{max} ≤ 1600 mm²/s	NBR[2]	θ_{St} ≥ -40 °C	t ≤ 3 min, without load (p ≤ 50 bar), n ≤ 1000 rpm Permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 25 K
		FKM	θ_{St} ≥ -25 °C	
Warm-up phase	v = 1600 ... 400 mm²/s			t ≤ 15 min, p ≤ 0.7 × p_{nom} and n ≤ 0.5 × n_{nom}
Continuous operation	v = 400 ... 10 mm²/s[1]	NBR[2]	θ ≤ +78 °C	Measured at port **T**
		FKM	θ ≤ +103 °C	
	v_{opt} = 36 ... 16 mm²/s			Optimal operating viscosity and efficiency range
Short-term operation	v_{min} = 10 ... 7 mm²/s	NBR[2]	θ ≤ +78 °C	t ≤ 3 min, p ≤ 0.3 × p_{nom}, measured at port **T**
		FKM	θ ≤ +103 °C	

Notice

The maximum circuit temperature of +115 °C must not be exceeded at the working ports **A** and **B** complying with the permissible viscosity.

▼ **Selection diagram**



1) This corresponds, for example on the VG 46, to a temperature range of +4 °C to +85 °C (see selection diagram).
2) Special version, please contact us
3) If the temperature at extreme operating parameters cannot be adhered to, please contact us.

Filtration of the hydraulic fluid

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

A cleanliness level of at least 20/18/15 is to be maintained according to ISO 4406.

At a hydraulic fluid viscosity of less than 10 mm²/s (e.g. due to high temperatures during short-term operation), a cleanliness level of at least 19/17/14 according to ISO 4406 is required.

For example, the viscosity corresponds to 10 mm²/s at:

- HLP 32 a temperature of 73 °C
- HLP 46 a temperature of 85 °C

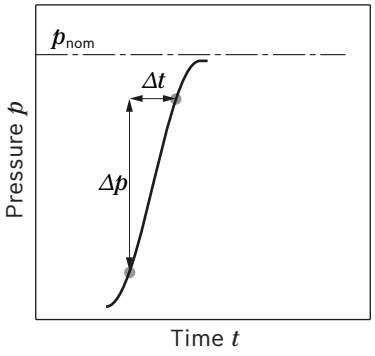
Flow direction

Direction of rotation, viewed on drive shaft	
clockwise	counter-clockwise
A to **B**	**B** to **A**

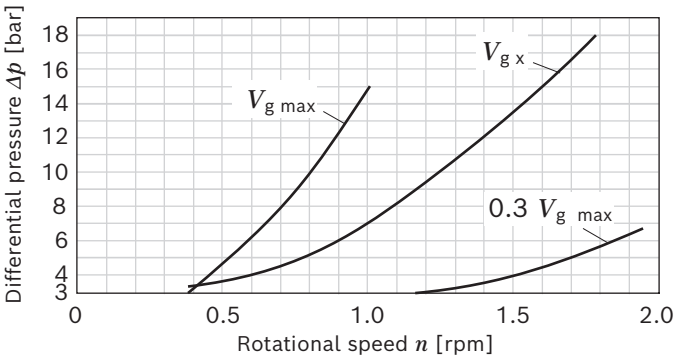
Working pressure range

Pressure at working port A or B		Definition
Nominal pressure p_{nom}	450 bar	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}	500 bar	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of single operating periods must not exceed the total operating period. Within the total operating period of 300 h, a maximum pressure of 500 bar to 530 bar is permissible for a limited period of 50 h.
Single operating period	max. 10 s	
Total operating period	300 h	
Maximum pressure p_{max}	530 bar	
Total operating period	50 h	
Minimum pressure (high-pressure side)	25 bar	Minimum pressure at the high-pressure side (**A** or **B**) which is required to prevent damage to the axial piston unit.
Minimum pressure – operation as a pump (inlet)	see diagram on page 7	To prevent damage to the axial piston motor during operation as a pump (change of the high-pressure side with constant direction of rotation, e.g. during brake applications) a minimum pressure has to be ensured at the working port (inlet). The minimum pressure is dependent on the rotational speed and displacement of the axial piston unit (see the characteristic curve).
Summation pressure p_{Su} (pressure **A** + pressure **B**)	700 bar	The summation pressure is the sum of the pressures at the ports for the working lines (**A** and **B**).
Rate of pressure change $R_{A\,max}$		Maximum permissible pressure build-up and reduction speed during a pressure change across the entire pressure range.
with integrated pressure relief valve	9000 bar/s	
without pressure relief valve	16000 bar/s	
Case pressure at port T		
Continuous differential pressure $\Delta p_{T\,cont}$	2 bar	Maximum, averaged differential pressure at the shaft seal (case to ambient pressure)
Pressure peaks $p_{T\,peak}$	10 bar	t < 0.1 s

▼ **Rate of pressure change $p_{A\,max}$**



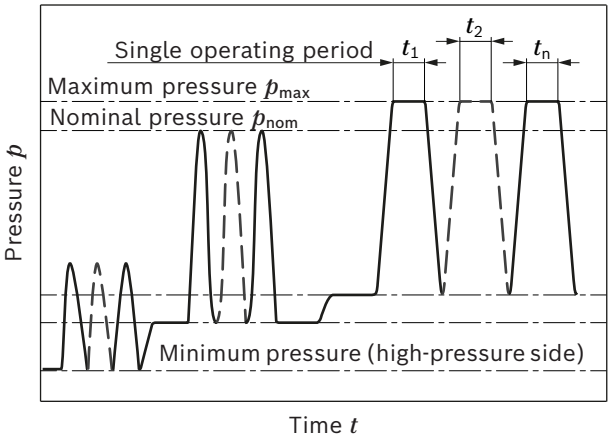
▼ **Minimum pressure – operation as a pump (inlet)**



Effect of case pressure on beginning of control

With the following control options, an increase in case pressure will have no effect on the beginning of control: EP, HA.R.

▼ **Pressure definition**



Total operating period = $t_1 + t_2 + ... + t_n$

Notice

- Working pressure range applies when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.
- In addition to the hydraulic fluid and the temperature, the service life of the shaft seal is influenced by the rotational speed of the axial piston unit and the case pressure.
- The service life of the shaft seal decreases with increasing frequency of pressure peaks and increasing mean differential pressure.
- The case pressure must be greater than the external pressure (ambient pressure) at the shaft seal.

Technical data

Size		NG		125	255
Geometric displacement, per revolution[1]		$V_{g\,max}$	cm³	126.4	253.2
		$V_{g\,min}$	cm³	17.8	37.5
		$V_{g\,x}$	cm³	72.0	144
Maximum rotational speed[2] (complying with the maximum permissible inlet flow and pressure)	at $V_{g\,max}$	n_{nom}	rpm	2560	2050
	at $V_g < V_{g\,x}$ (see diagram on page 8)	$n_{max\,1}$	rpm	4500	3600
	at $V_g < 0.3\ V_{g\,max}$	$n_{max\,2}$	rpm	5000	4000
	intermittent[3] at $V_g < 0.3\ V_{g\,max}$	$n_{max\,3}$	rpm	please contact us	
Inlet flow	at n_{nom} and $V_{g\,max}$	$q_{v\,max}$	l/min	324	520
Torque[4]	at $V_{g\,max}$ and Δp = 450 bar	M	Nm	905	1813
Rotary stiffness		c_{min}	kNm/rad	9	27
Moment of inertia of the rotary group		J_{TW}	kgm²	0.010	0.033
Case volume		V	l	1.45	2.5
Weight approx.		m	kg	43.6	80

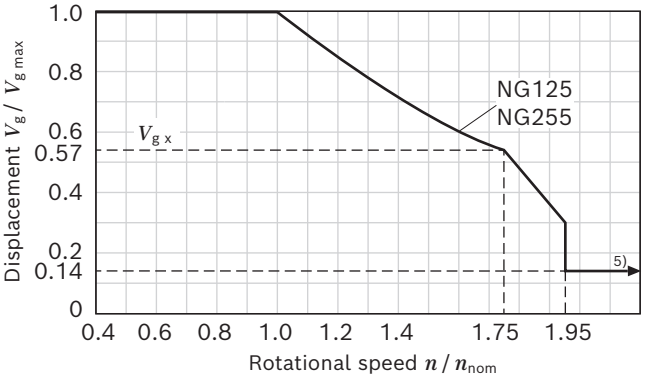
Speed range

The minimum rotational speed n_{min} is not limited.
For applications with requirements on the evenness of the rotation at low rotational speeds, please contact us.

Notice

- Theoretical values, without efficiency and tolerances; values rounded
- 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. Other permissible limit values, such as speed variation, reduced angular acceleration as a function of the frequency and the permissible angular acceleration at start (lower than the maximum angular acceleration) can be found in data sheet 90261.

Permissible displacement depending on the rotational speed



Determination of the operating characteristics		
Inlet flow	$q_v = \frac{V_g \times n}{1000 \times \eta_v}$	[l/min]
Rotational speed	$n = \frac{q_v \times 1000 \times \eta_v}{V_g}$	[rpm]
Torque	$T = \frac{V_g \times \Delta p \times \eta_{hm}}{20 \times \pi}$	[Nm]
Power	$P = \frac{2\pi \times T \times n}{60000} = \frac{q_v \times \Delta p \times \eta_t}{600}$	[kW]

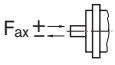
Key

V_g	Displacement per revolution [cm³]
Δp	Differential pressure [bar]
n	Rotational speed [rpm]
η_v	Volumetric efficiency
η_{hm}	Hydraulic-mechanical efficiency
η_t	Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

1) The minimum displacement is infinitely adjustable, see type code on page 2.
2) The values are applicable:
   – for the optimum viscosity range from ν_{opt} = 36 to 16 mm²/s
   – with hydraulic fluid based on mineral oils
3) Intermittent maximum speed: short-term overspeed, t < 30 s and Δp < 200 bar
4) Torque without radial force, with radial force see page 9.
5) Values in this range on request

Permissible radial and axial loading on the drive shafts

A36VM

Size		NG		125	255
Drive shaft		Code		**Z9**	**A2**
with splined shaft		⌀	mm	W40	W50
Maximum radial force at distance a (to the shaft collar)		$F_{q\ max}$	N	17374	29355
		a	mm	22.5	27.5
Maximum torque at $F_{q\ max}$		$M_{q\ max}$	Nm	860	**1820**
Maximum differential pressure at V_{gmax} and $F_{q\ max}$		$\Delta p_{q\ max}$	bar	430	450
Maximum axial force at standstill or depressurized operation		$+ F_{ax\ max}$	N	0	0
		$- F_{ax\ max}$	N	710	1120
Permissible axial force per bar working pressure		$+ F_{ax\ perm/bar}$	N/bar	9.6	15.1

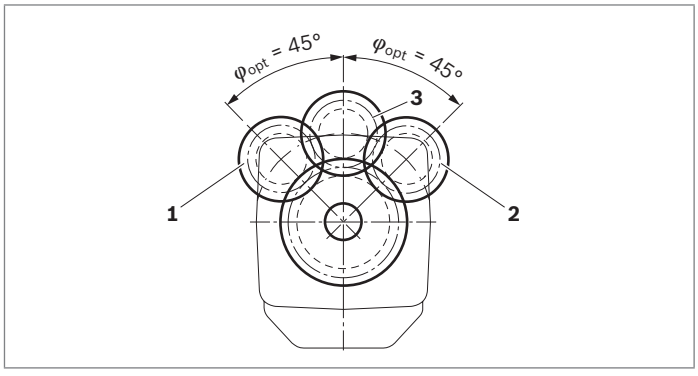
Effect of radial force F_q on bearing service life

By selecting a suitable direction of radial force F_q, the load on the bearings, caused by the internal rotary group forces can be reduced, thus optimizing the bearing service life. Recommended position of mating gear is dependent on the direction of rotation. Examples:

Notice

- The values given are maximum values and do not apply to continuous operation.
- The permissible axial force in direction $-F_{ax}$ is to be avoided as the bearing service life is reduced.
- Special requirements apply in the case of belt output drives. Please contact us.

▼ **Gear output drive**



- "Counter-clockwise" rotation, pressure at port **B**
- "Clockwise" rotation, pressure at port **A**
- "Bidirectional" rotation

EP – Proportional control, electric

The electric control with proportional solenoid provides infinite adjustment of the displacement. Control is proportional to the electric control current applied to the solenoid.

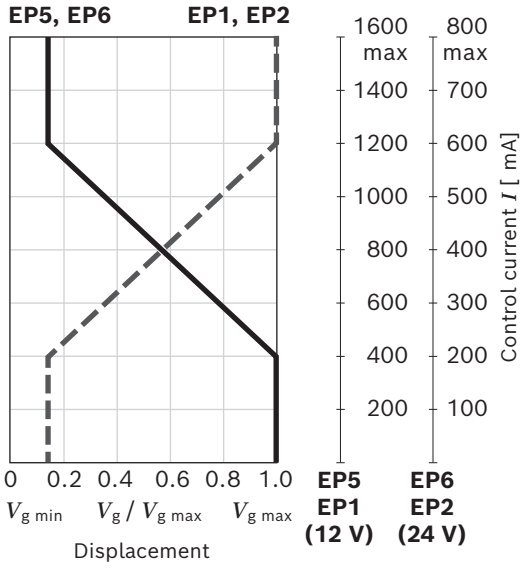
EP1, EP2 positive control

- Beginning of control at $V_{g\,min}$ (minimum torque, maximum permissible rotational speed at minimum control current)
- End of control at $V_{g\,max}$ (maximum torque, minimum rotational speed at maximum control current)

EP5, EP6 negative control

- Beginning of control at $V_{g\,max}$ (maximum torque, minimum rotational speed at minimum control current)
- End of control at $V_{g\,min}$ (minimum torque, maximum permissible rotational speed at maximum control current)

▼ **Characteristic curve**



Please note

- The control oil is internally taken out of the high-pressure passage of the motor (**A** or **B**). For reliable control, a working pressure of at least 30 bar is required in **A** (**B**).

Stroking time damping

The stroking time damping impacts the swivel behavior of the motor and consequently the machine response speed.

Standard

EP without damping.

Option

EP with throttle pin on both sides, symmetrical (see table)

▼ **Throttle pin overview**

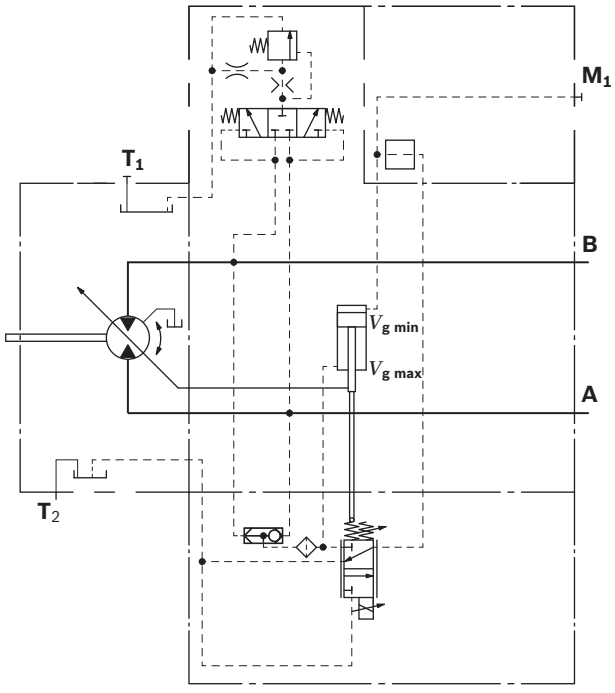
Size	125	255
Groove size [mm]	0.55	0.65

Technical data, solenoid	EP1, EP5	EP2, EP6
Voltage	12 V (±20%)	24 V (±20%)
Control current		
Start of control	400 mA	200 mA
End of control	1200 mA	600 mA
Current limit	1.54 A	0.77 A
Nominal resistance (at 20 °C)	5.5 Ω	22.7 Ω
Dither		
Frequency	100 Hz	100 Hz
minimum oscillation range[1)]	240 mA	120 mA
Duty cycle	100%	100%
Type of protection: see connector version page 18		

Various BODAS controllers with application software and amplifiers are available for controlling the proportional solenoids.

Further information can also be found on the Internet at www.boschrexroth.com/mobile-electronics.

▼ **Circuit diagram EP1, EP2 (positive control)**



1) Minimum required oscillation range of the control current $\Delta I_{p\text{-}p}$ (peak to peak) within the respective control range (start of control to end of control)

HA – Automatic control, high-pressure related

The automatic high-pressure related control adjusts the displacement automatically depending on the working pressure.
The beginning of control of the A36VM motor with HA control is $V_{g\,min}$ (maximum rotational speed and minimum torque). The control device internally measures the working pressure at **A** or **B** (no control line required) and, when the specified beginning of control is reached, the controller swivels the motor with increasing working pressure from $V_{g\,min}$ to $V_{g\,max}$. The displacement is controlled between $V_{g\,min}$ and $V_{g\,max}$ depending on the load.

HA1, positive control

- Beginning of control at $V_{g\,min}$ (minimum torque, maximum rotational speed)
- End of control at $V_{g\,max}$ (maximum torque, minimum rotational speed)

Please note

- For safety reasons, lifting winch drives are not permissible with beginning of control at $V_{g\,min}$ (standard for HA).
- The control oil is internally taken out of the high-pressure passage of the motor (**A** or **B**). For reliable control, a working pressure of at least 30 bar is required in **A** (**B**).

Stroking time damping

The stroking time damping impacts the swivel behavior of the motor and consequently the machine response speed.
Standard for size 125
HA with throttle pin on one side, throttle from $V_{g\,min}$ to $V_{g\,max}$ (see table).

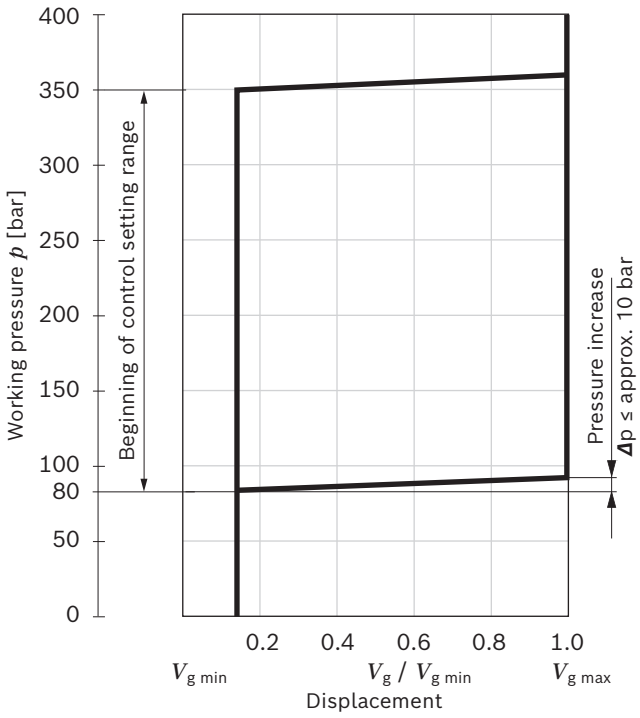
▼ **Throttle pin overview**

Size	125	255
Groove size [mm]	0.55	–

HA1 with minimum pressure increase, positive control

A working pressure increase of Δp ≤ approx. 10 bar results in an increase in displacement from $V_{g\,min}$ to $V_{g\,max}$.
Beginning of control: Setting range 80 to 350 bar
Specify the desired beginning of control in plain text when ordering, e.g. beginning of control at 300 bar.

▼ **Characteristic curve HA1**



HA1R1, HA1R2 electric override, electric travel direction valve

With the HA1R1 or HA1R2 control, the beginning of control can be overridden by an electric signal to switching solenoid **b**. When the override solenoid is energized, the variable motor swivels to maximum swivel angle, without intermediate position.

The travel direction valve ensures that the preselected pressure side of the hydraulic motor (**A** or **B**) is always connected to the HA control, and thus determines the swivel angle, even if the high-pressure side changes (e.g. travel drive during a downhill operation). This thereby prevents undesired swiveling of the variable motor to a larger displacement (jerky deceleration and/or braking characteristics).

Depending on the direction of rotation (direction of travel), the travel direction valve is actuated through the compression spring or the switching solenoid **a** (see page 13).

Electric override

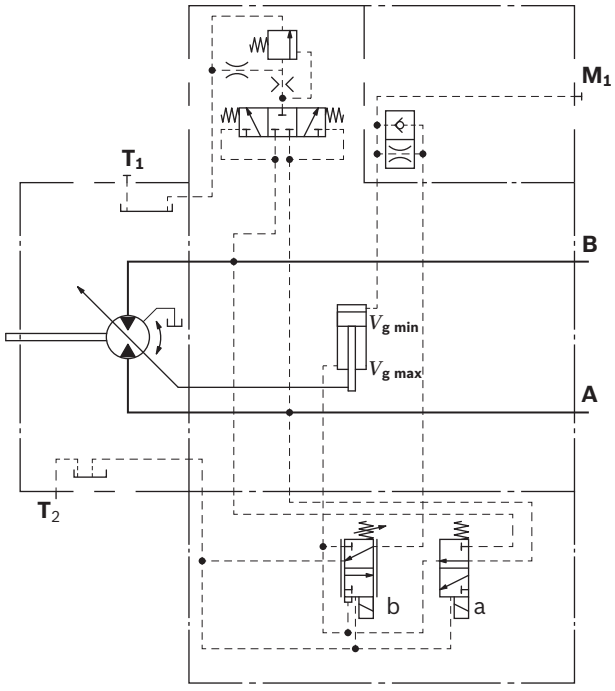
Technical data, solenoid b with Ø45	R1	R2
Voltage	12 V (±20%)	24 V (±20%)
No override	de-energized	de-energized
Position $V_{g\,max}$	Energized	Energized
Nominal resistance (at 20 °C)	4.8 Ω	19.2 Ω
Nominal power	30 W	30 W
Minimum active current required	1.5 A	0.75 A
Duty cycle	100%	100%
Type of protection: see connector version page 18		

Travel direction valve, electric

Technical data, solenoid a with Ø37		R1	R2
Voltage		12 V (±20%)	24 V (±20%)
Direction of rotation	Working pressure in		
counter-clockwise	**B**	Energized	Energized
clockwise	**A**	de-energized	de-energized
Nominal resistance (at 20 °C)		5.5 Ω	21.7 Ω
Nominal power		26.2 W	26.5 W
Minimum active current required		1.32 A	0.67 A
Duty cycle		100%	100%

Type of protection: see connector version page 18

▼ **Circuit diagram HA1R1, HA1R2**



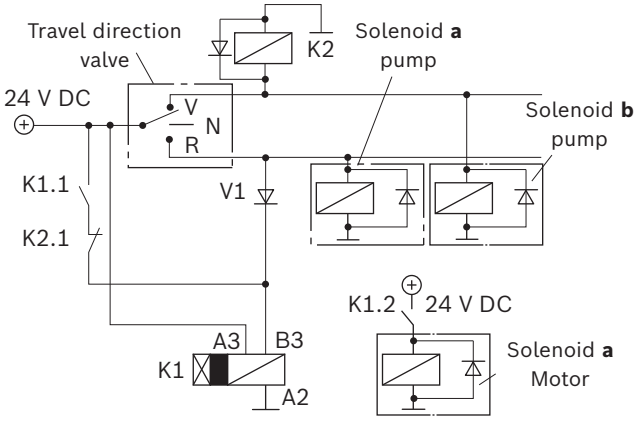
Electric travel direction valve (for HA1R.)

Application in travel drives in closed circuits. The travel direction valve of the motor is actuated by an electric signal that also switches the swivel direction of the travel drive pump (e.g. A4VG with DA control valve).
If the pump in the closed circuit is switched to the neutral position or into reverse, the vehicle may experience jerky deceleration or braking, depending on the vehicle weight and current travel speed.
When the travel direction valve of the pump (e.g. 4/3-way directional valve of the DA-control) is switched to

- neutral position,
  the electrical circuitry, which must be logically coordinated with the pump control, causes the previous signal on the travel direction valve on the motor to be retained.
- Reversing,
  the electrical circuitry, which must be logically coordinated with the pump control, causes the travel direction valve of the motor to switch to the other travel direction following a time delay (approx. 0.8 s) with respect to the pump.

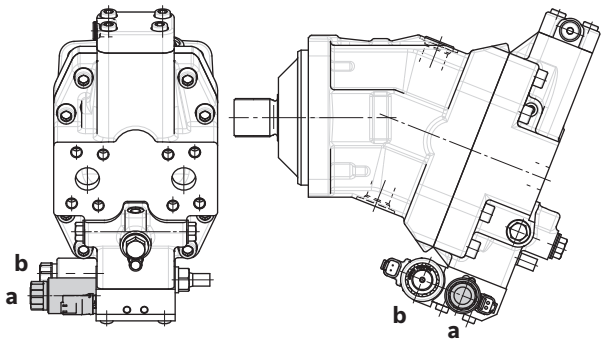
As a result, jerky deceleration or braking is prevented in both cases.

▼ **Circuit diagram, electric travel direction valve**



Notice
The shown diodes and relays are not included in the scope of delivery of the motor.

▼ **Control HA1R.**

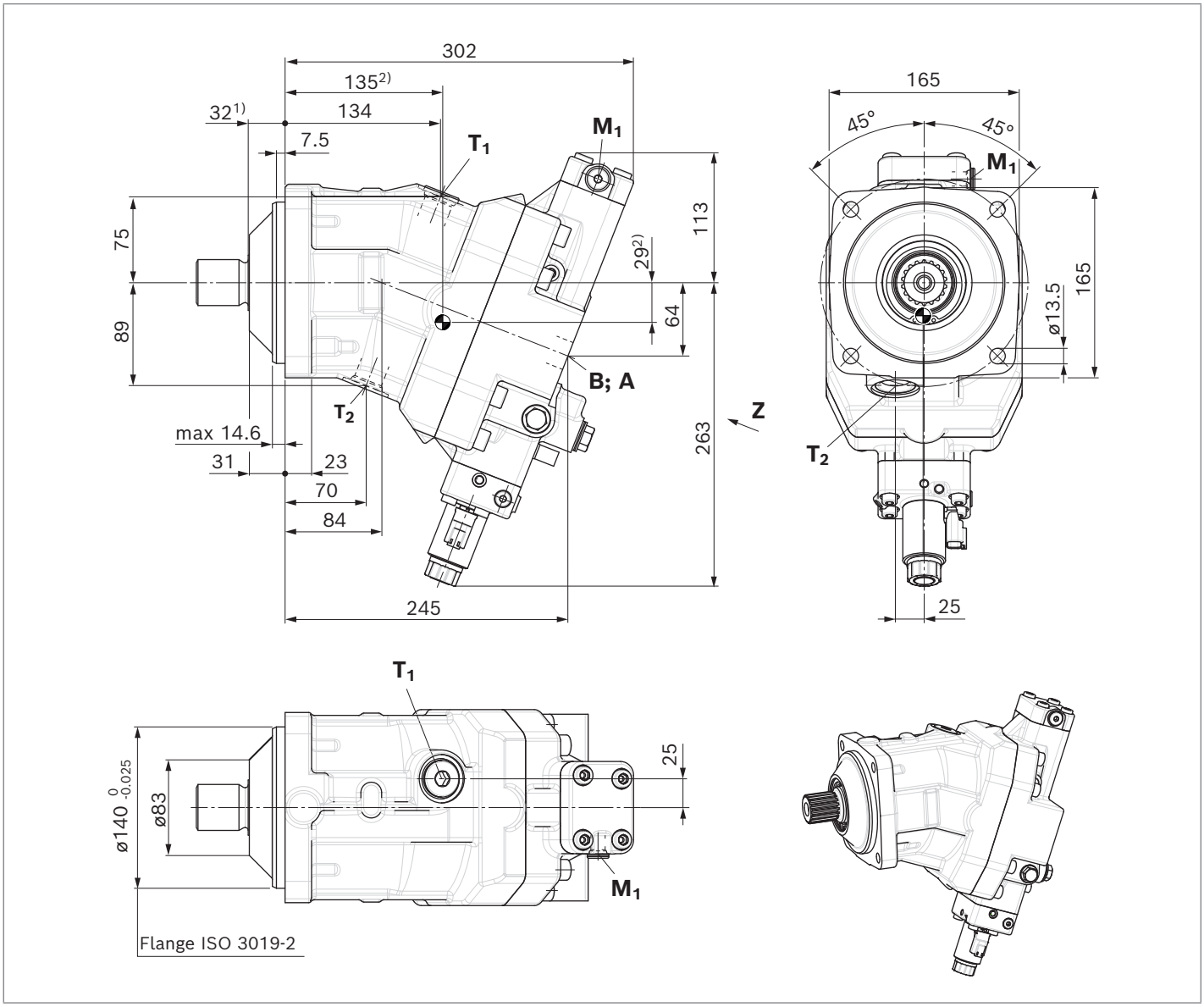


Switching solenoid **a** on travel direction valve

Dimensions, size 125

EP1, EP2 – Proportional electric control, positive control

Port plate 1 — SAE working ports **A** and **B** at rear

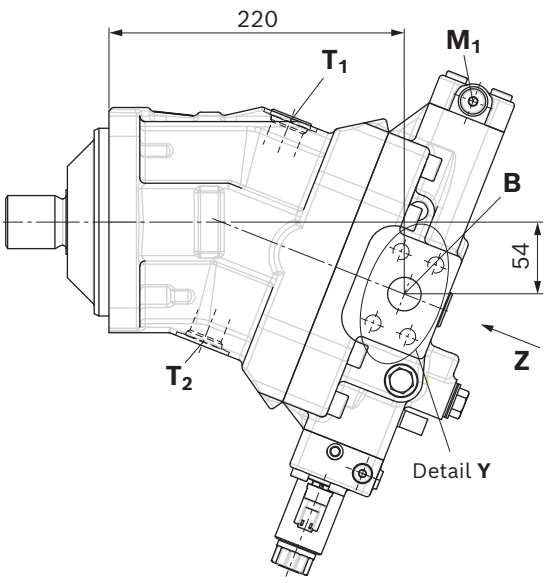


Ports		Standard	Size	p_{max} [bar][3]	State[7]
A, B	Working port Fastening thread	SAE J518[4] DIN 13	1 in M12 × 1.75; 23 deep	530	O
T_1	Drain port	ISO 6149[6]	M27 × 2; 19 deep	3	X[5]
T_2	Drain port	ISO 6149[6]	M27 × 2; 19 deep	3	O[5]
M_1	Control pressure measuring port	ISO 6149[6]	M14 × 1.5; 11.5 deep	530	X

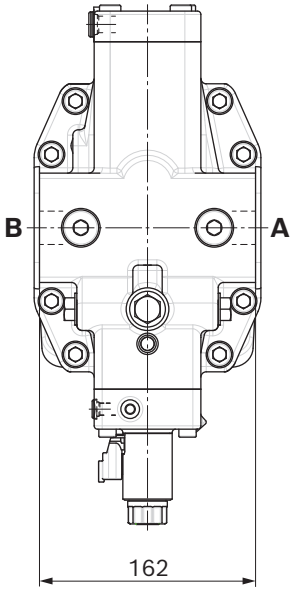
1) To shaft collar
2) Center of gravity
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) Only dimensions according to SAE J518, metric fastening thread is a deviation from the standard.
5) Depending on installation position, **T_1** or **T_2** must be connected (see also installation instructions on page 22).
6) The countersink may be deeper than specified in the standard.
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

▼ **Location of working ports on port plates**

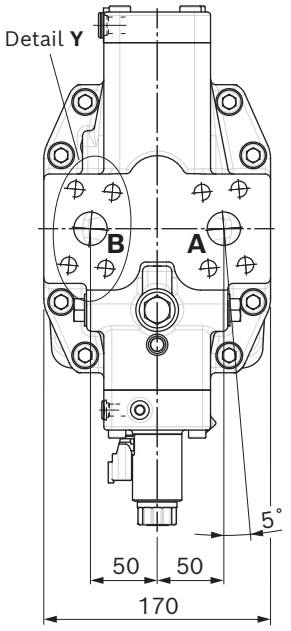
2 SAE working ports
A and **B** at side, opposite



View **Z**

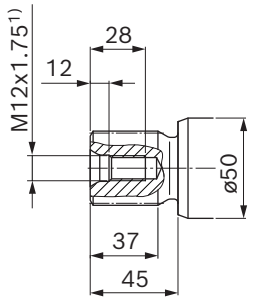


1 SAE working ports
A and **B** at rear (view **Z**)

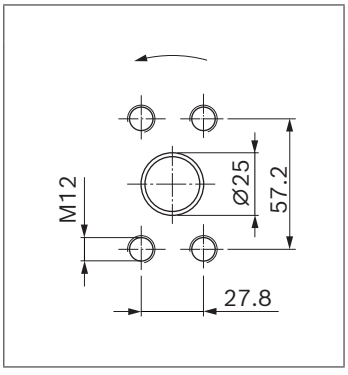


▼ **Splined shaft DIN 5480**

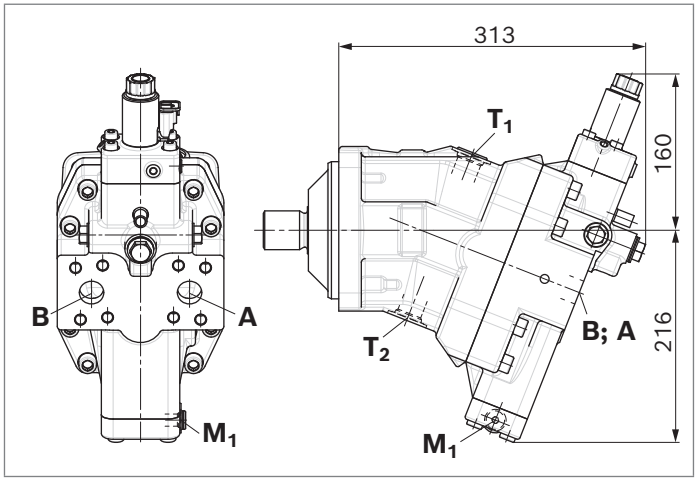
Z9 – W40×2×18×9g



Detail **Y**



▼ **EP5, EP6** – Proportional control, electric, negative control

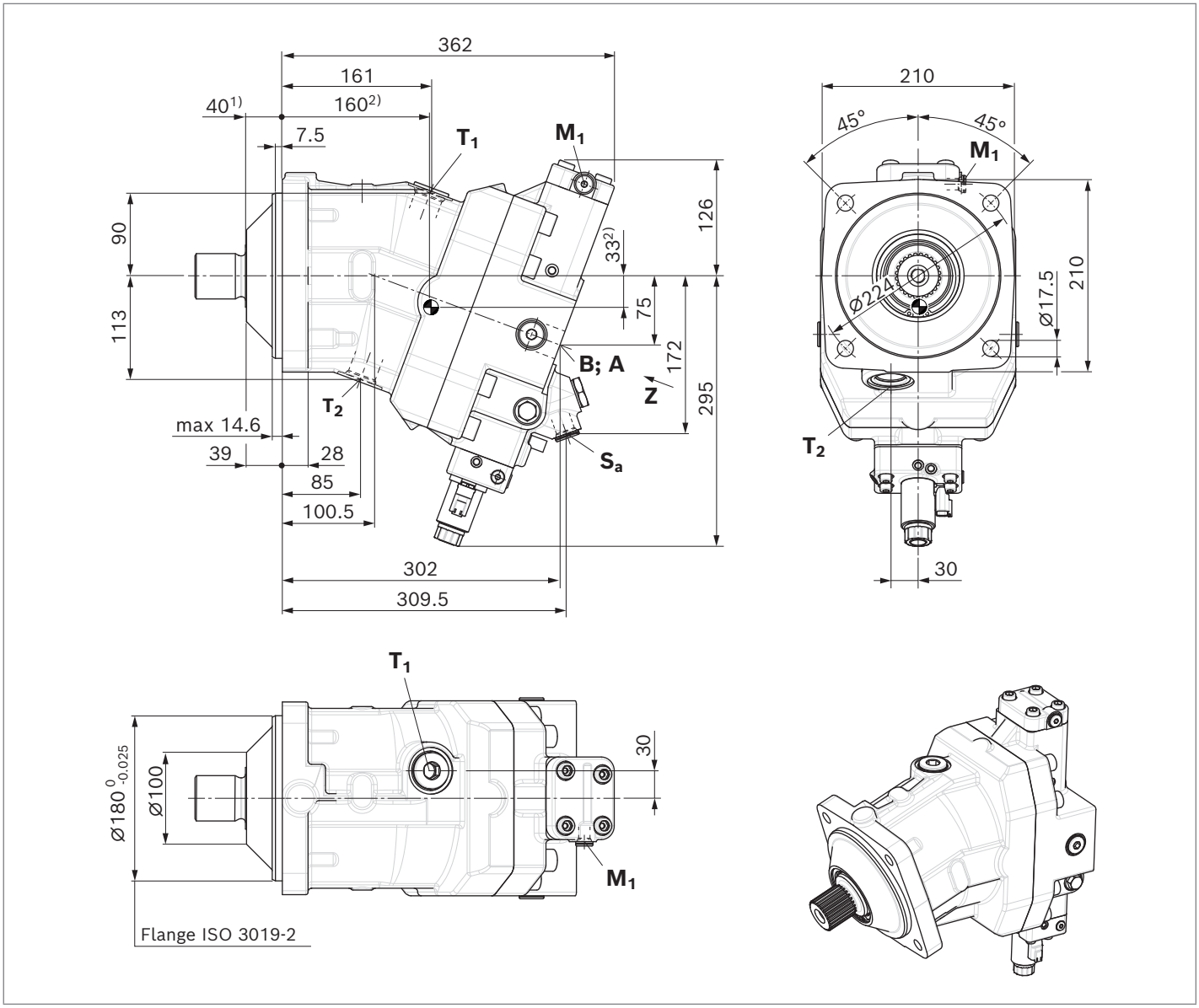


1) Center bore according to DIN 332 (thread according to DIN 13)

Dimensions, size 255

EP1, EP2 – Proportional electric control, positive control

Port plate 1 — SAE working ports **A** and **B** at rear

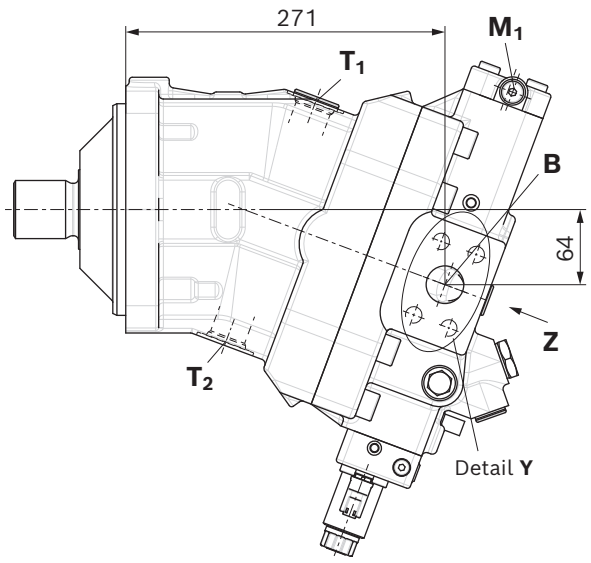


Ports		Standard	Size	p_{max} [bar][3)]	State[7)]
A, B	Working port Fastening thread	SAE J518[4)] DIN 13	1 1/4 in M14 × 2; 23 deep	530	O
T_1	Drain port	ISO 6149[6)]	M33 × 2; 19 deep	3	X[5)]
T_2	Drain port	ISO 6149[6)]	M33 × 2; 19 deep	3	O[5)]
M_1	Control pressure measuring port	ISO 6149[6)]	M14 × 1.5; 11.5 deep	530	X

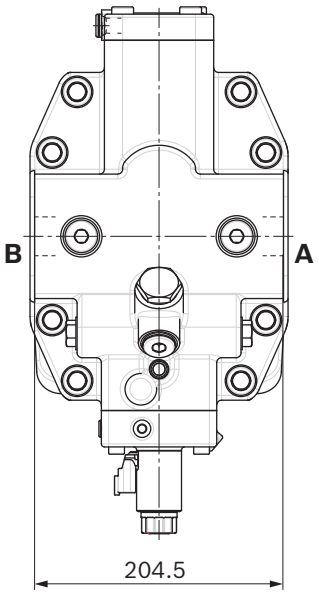
1) To shaft collar
2) Center of gravity
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) Only dimensions according to SAE J518, metric fastening thread is a deviation from the standard.
5) Depending on installation position, **T_1** or **T_2** must be connected (see also installation instructions on page 22).
6) The countersink may be deeper than specified in the standard.
7) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

▼ **Location of working ports on port plates**

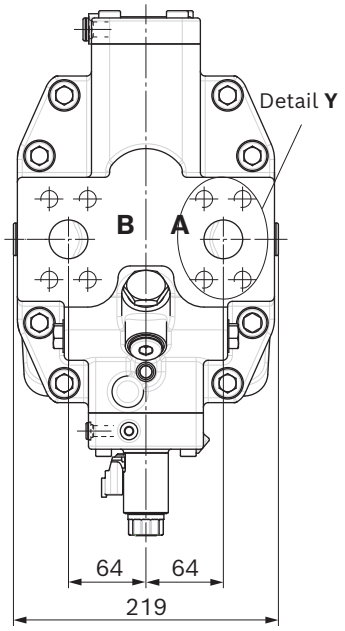
2 SAE working ports
A and **B** at side, opposite



View **Z**

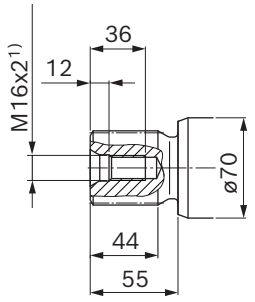


1 SAE working ports
A and **B** at rear (view **Z**)

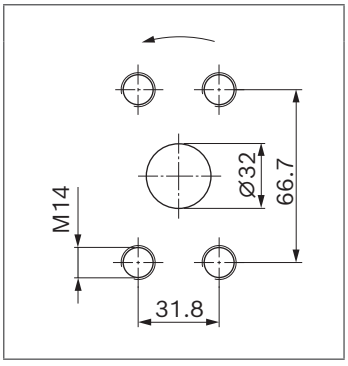


▼ **Splined shaft DIN 5480**

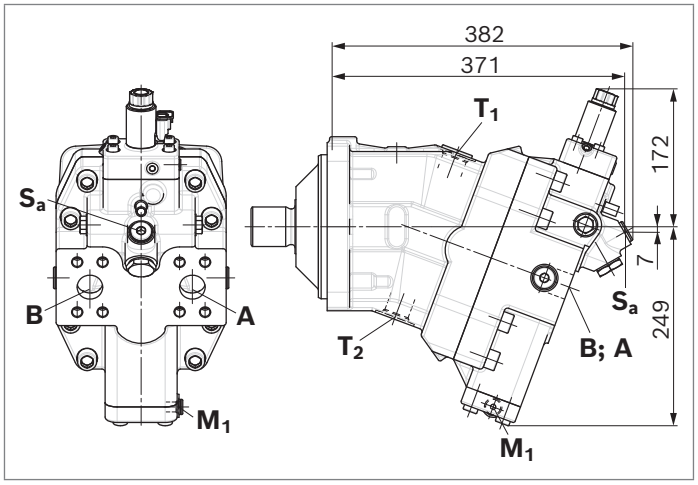
A2 – W50×2×24×9g



Detail **Y**



▼ **EP5, EP6** – Proportional control, electric, negative control



1) Center bore according to DIN 332 (thread according to DIN 13)

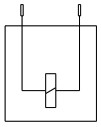
Connector for solenoids

DEUTSCH DT04-2P-EP04

Molded, 2-pin, without bidirectional suppressor diode
The following type of protection ensues with the installed mating connector:

- IP67 (DIN/EN 60529) and
- IP69K (DIN 40050-9)

▼ **Switching symbol**



▼ **Mating connector DEUTSCH DT06-2S-EP04**

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

The mating connector is not included in the scope of delivery. This can be supplied by Bosch Rexroth on request (material number R902601804).

Notice

- If necessary, you can change the position of the connector by turning the solenoid body.
- The procedure is defined in the instruction manual.

Flushing and boost-pressure valve

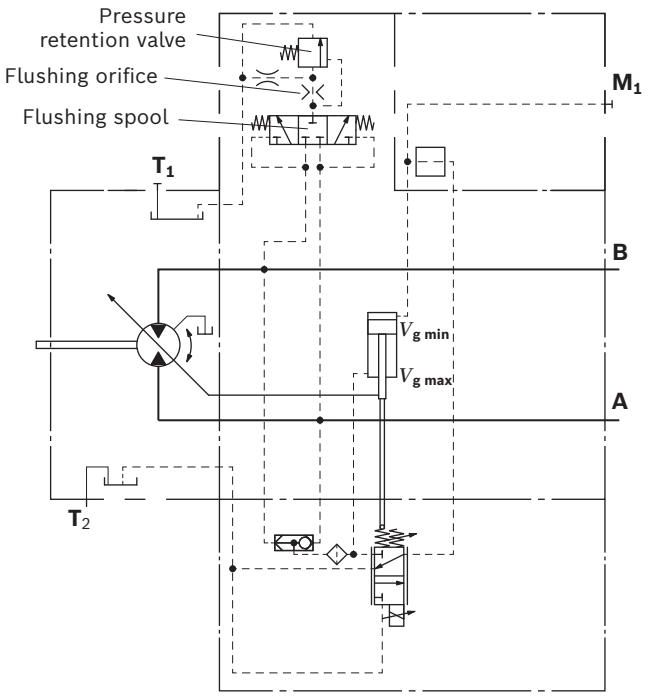
The flushing and boost-pressure valve is used to remove heat from the hydraulic circuit.
In a closed circuit, it is used for flushing the housing and safeguarding the minimum boost pressure.
Hydraulic fluid is directed from the respective low-pressure side into the motor housing. This is then fed into the reservoir, together with the leakage. In the closed circuit, the removed hydraulic fluid must be replaced by cooled hydraulic fluid supplied by the boost pump.
The valve is integrated in the port plate.

Cracking pressure of pressure retention valve
(observe when setting the primary valve)
▶ fixed setting 16 bar

Switching pressure of flushing spool Δp
▶ 8±1 bar

Flushing flow q_v
Orifices can be used to adjust the flushing flows as required. The following parameters are based on:
$\Delta p_{ND} = p_{ND} - p_G$ = 25 bar and ν = 10 mm²/s
(p_{ND} = low pressure, p_G = case pressure)

▼ **Circuit diagram EP**



Flushing valve for size 125

Material number of orifice	Code	ø [mm]	q_v [l/min]
R909651766	A	1.2	3.5
R909419695	B	1.4	5
R909419696	C	1.8	8
R909419697	D	2.0	10
R902107424	E	2.3	12
R909444361	F	2.4	14
R902004465	H	3.0	16
without	N	without	20

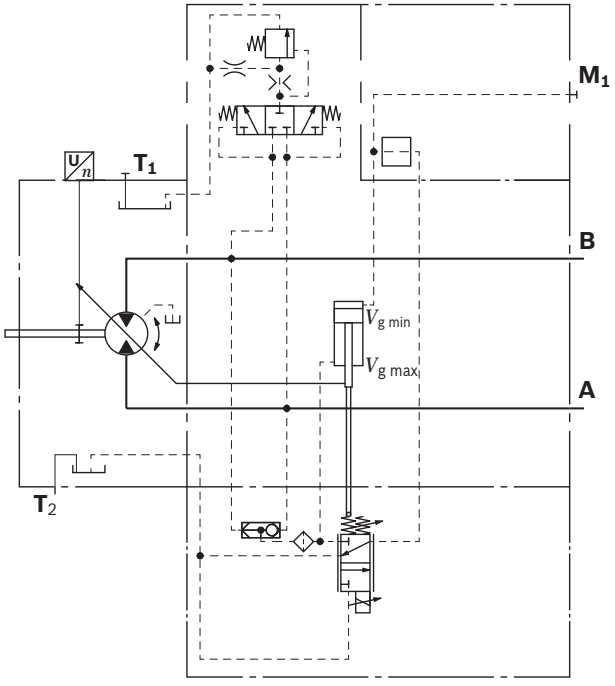
Flushing valve for size 255

Material number of orifice	Code	ø [mm]	q_v [l/min]
R909449998	C	1.8	8
R909431308	D	2.0	10
R909431309	G	2.5	15
R909431310	I	2.8	18
R902138235	J	3.1	21
R909435172	K	3.5	27
R909436622	O	4.0	35
R909449967	Q	5.0	50

Speed sensor

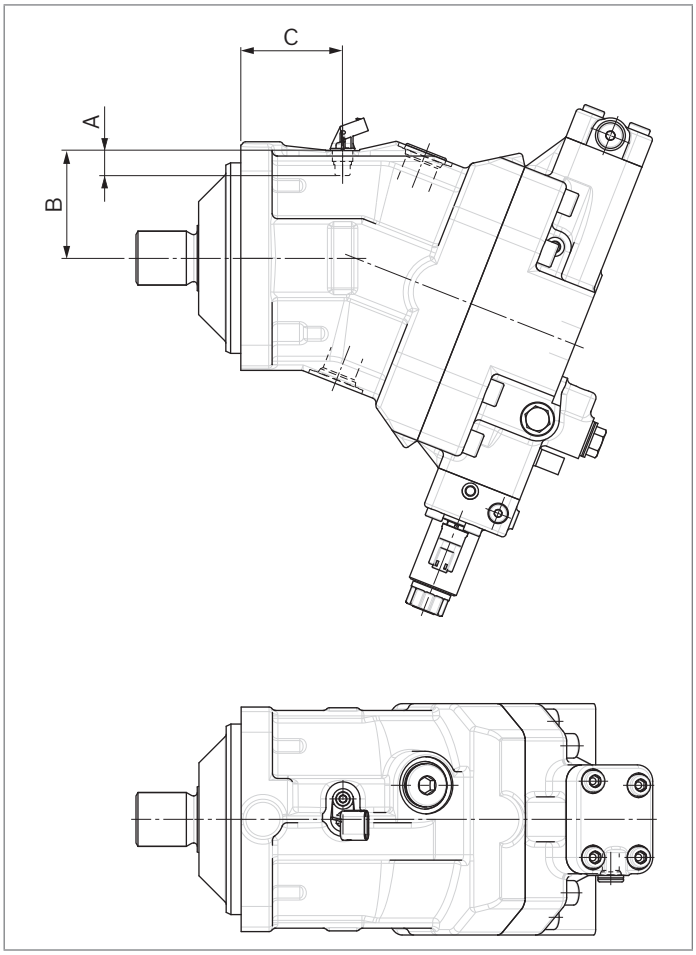
The A36VM...W version ("prepared for speed sensor", i.e. without sensor) is equipped with a spline on the rotary group.
A signal proportional to the rotational speed of the motor can be generated with the mounted DST or DSA/20 speed sensor. The DST/DSA sensor registers the rotational speed and direction of rotation.
Type code, technical data, dimensions and details on the connector, plus safety instructions about the sensor can be found in the relevant data sheet 95131 (DST) or 95126 (DSA/20).
The sensor is mounted on the port provided for this purpose with a mounting bolt. On deliveries without sensor, the port is plugged with a pressure-resistant cover. We recommend ordering the A36VM variable motor complete with mounted sensor.

▼ **Circuit diagram**



▼ **Dimensions**

Version "E" with DST sensor mounted



NG		125	255
Number of teeth		58	75
A	Insertion depth (tolerance - -0.25)	18.4	18.4
B	Contact surface	79	96
C		74.8	87

Setting range for displacement

	125				255			
	$V_{g\,max}$ (cm³/rev)		$V_{g\,min}$ (cm³/rev)		$V_{g\,max}$ (cm³/rev)		$V_{g\,min}$ (cm³/rev)	
	from	to	from	to	from	to	from	to
0	126.4	126.4	17.8	17.8	253.2	253.2	37.5	37.5
	without screw		without screw		without screw		without screw	
A	126.4	126.4	> 17.8	33	253.2	253.2	> 37.5	62.5
	without screw		M12 × 60 R909083530		without screw		M12 × 70 R909085976	

Specify exact settings for $V_{g\,min}$ and $V_{g\,max}$ in plain text when ordering:

- $V_{g\,min}$ = ... cm³, $V_{g\,max}$ = ... cm³

Theoretical, maximum setting:

- for $V_{g\,min}$ = 0.3 × $V_{g\,max}$

Settings that are not listed in the table may lead to damage. Please contact us.

Installation instructions

General

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation. This must also be observed following a longer standstill as the axial piston unit may empty via the hydraulic lines.
The leakage in the housing area must be directed to the reservoir via the highest drain port (**T_1**, **T_2**).
If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating condition, particularly at cold start. If this is not possible, separate drain line must be laid, if necessary.
To achieve favorable noise values, decouple all connecting lines using elastic elements and avoid above-reservoir installation.
Under all operating conditions, the drain line must flow into the reservoir below the minimum fluid level.

Notice

In certain installation positions, an influence on the adjustment or control can be expected.
Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in stroking time.

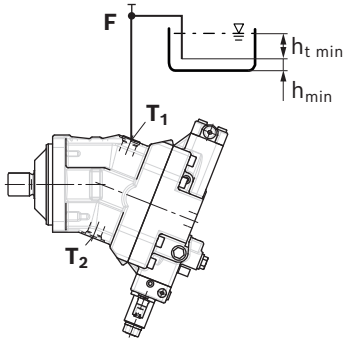
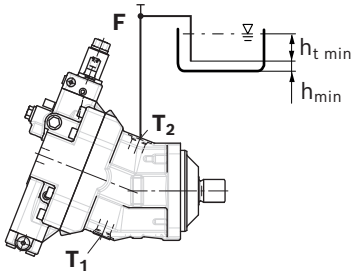
Key	
F	Filling/air bleeding
T_1, T_2	Drain port
$h_{t\ min}$	Minimum required immersion depth (200 mm)
h_{min}	Minimum required distance to reservoir bottom (100 mm)

Installation position

See the following examples **1** to **4**.
Further installation positions are available upon request.
Recommended installation position: **1** and **2**

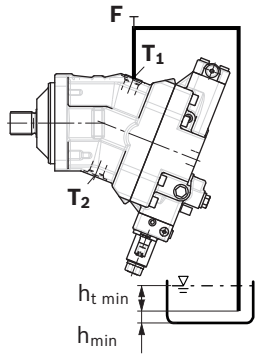
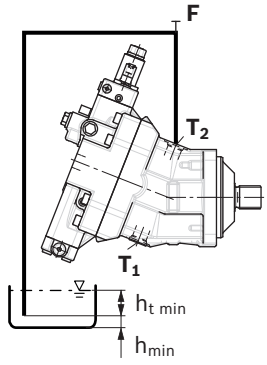
Below-reservoir installation (standard)

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

Installation position	Air bleed	Filling
1 	**F**	**T_1**
2 	**F**	**T_2**

Above-reservoir installation

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

Installation position	Air bleed	Filling
3 	F	T_1 (F)
4 	F	T_2 (F)

Notice

Port **F** is part of the external piping and must be provided on the customer side to simplify the filling and air bleeding.

Project planning notes

- The motor A36VM is designed to be used in closed circuits.
- The project planning, installation and commissioning of the axial piston unit requires the involvement of skilled personnel.
- 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.
- For safety reasons, controls with beginning of control at $V_{g\,min}$ (e.g., HA) are not permissible for winch drives, e.g. anchor winches!
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- Preservation: Our axial piston units are supplied as standard with preservation protection for a maximum of 12 months. If longer preservation protection is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, details of which can be found in the data sheet 90312 or the instruction manual.
- Not all versions of the product are approved for use in a safety function according to ISO 13849. Please consult the responsible contact person at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_D$) for functional safety.
- Depending on the type of control used, electromagnetic effects can be produced when using solenoids. Applying a direct voltage signal (DC) to solenoids does not create electromagnetic interference (EMI) nor is the solenoid affected by EMI. Electromagnetic interference (EMI) potential exists when operating and controlling a solenoid with a modulated direct voltage signal (e.g. PWM signal) Appropriate testing and measures should be taken by the machine manufacturer to ensure other components or operators (e.g. with pacemaker) are not affected by this potential.
- Be sure to add a pressure relief valve to the hydraulic system.
- Please note that a hydraulic system is an oscillating system. This can lead, for example, to the stimulation the natural frequency within the hydraulic system during operation at constant rotational speed over a long period of time. The frequency of the motor to be observed is 9 times the rotational speed frequency. This can be prevented, for example, with suitably designed hydraulic lines.
- Please note the details regarding the tightening torques of port threads and other threaded joints in the instruction manual.
- The ports and fastening threads are designed for the permissible pressures p_{max} of the respective ports, see the port tables. 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 working ports and function ports are only intended to accommodate hydraulic lines.
- The control behavior of the motor can change slightly due to natural influences such as running-in or setting behavior over time. Calibration may be required.

Safety instructions

- During and shortly after operation, there is a risk of burns on the axial piston unit and especially on the solenoids. Take the appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. contaminated 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 must test whether remedial measures are needed on the machine for the application concerned in order to bring the driven consumer into a safe position (e.g. safe stop) and ensure any measures are properly implemented.
- In certain conditions, moving parts in high pressure relief valves might get stuck in an undefined position due to contamination (e.g. contaminated hydraulic fluid). This can result in restriction or loss of load-holding functions in lifting winches.
  Therefore it is the machine and/or system manufacturers responsibility to make sure that the load can always be put in a safe mode if needed. Also, he needs to ensure that these measures are properly implemented.
- When using the axial piston motor in winch drives, make certain that the technical limit values are not exceeded under all operating conditions. If the axial piston motor is extremely overloaded (e.g. if the maximum permissible rotational speeds are exceeded during weighing of the anchor while the ship is in motion), the rotary group may be damaged and, in the worst case, the axial piston motor may burst. The machine manufacturer/system manufacturer is to undertake additional measures, up to and including encapsulation.