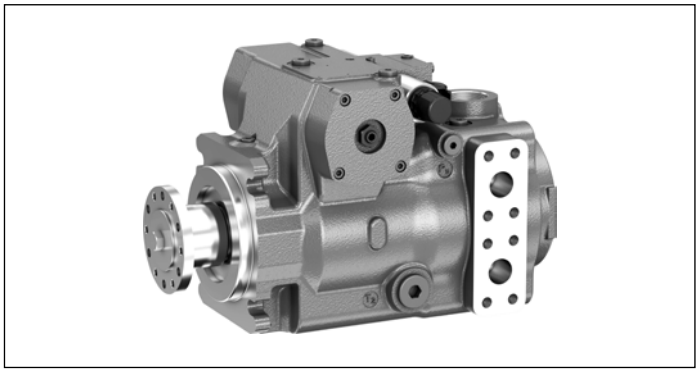
# Axial piston variable pump
# A10VGT Series 11

**RE 92770**
Edition: 11.2016



- High pressure pump for the drum drive in concrete mixer trucks
- Sizes 71, 90 and 115
- Maximum pressure 420 bar
- Closed circuit

**Features**

- Optional with coupling flange for direct cardan shaft drive
- Integrated boost pump for boost and pilot oil supply
- Flow direction changes smoothly when the swashplate is moved through the neutral position
- High-pressure relief valves with integrated boost function
- Boost-pressure relief valve
- Swashplate design

**Contents**

## Type code

| 01 | 02 | 03 | 04 | 05 | 06 | 07 | | 08 | 09 | 10 | 11 | 12 | 13 | | 14 | 15 | 16 | 17 | 18 | 19 | | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A10V** | **G** | **T** | | | | **0** | **/** | **11** | **N** | | **N** | **C4** | | **–** | **2** | **G** | | **A** | **S** | **0** | **–** | |

**Axial piston unit**

| | | |
|---|---|---|
| 01 | Swashplate design, variable | **A10V** |

**Operating mode**

| | | |
|---|---|---|
| 02 | Pump, closed circuit | **G** |

**Application**

| | | |
|---|---|---|
| 03 | Concrete mixer truck, maximum pressure 420 bar | **T** |

**Size (NG)**

| | | | | | |
|---|---|---|---|---|---|
| 04 | Geometric displacement, see “Technical data” on page 7 | **071** | **090** | **115** | |
| | | ● | ● | ○ | |

**Control device**

| | | | | |
|---|---|---|---|---|
| 05 | Proportional control, hydraulic | Mechanical servo, hexagon shaft with lever to rear | | **HW1** |
| | | Mechanical servo, hexagon shaft with lever to rear and neutral position switch | | **HW7** |
| | Proportional control, electric | with manual override and spring return | $U$ = 12 V | **EP3** |
| | | | $U$ = 24 V | **EP4** |

**Connectors for solenoids**[1)]

| | | |
|---|---|---|
| 06 | Without connectors (only for purely hydraulic control) | **0** |
| | DEUTSCH molded connector, 2-pin – without suppressor diode | **P** |

**Additional function**

| | | | | | |
|---|---|---|---|---|---|
| 07 | Without additional function | ● | ● | ● | **0** |
| | Sequence valve (only HW control) | ○ | ○ | ○ | **K** |

**Series**

| | | |
|---|---|---|
| 08 | Series 1, index 1 | **11** |

**Configuration of port and fastening threads**

| | | |
|---|---|---|
| 09 | Metric, DIN 3852 with profiled sealing ring | **N** |

**Direction of rotation**

| | | | |
|---|---|---|---|
| 10 | Viewed on drive shaft | clockwise | **R** |
| | | counter-clockwise | **L** |

**Sealing material**

| | | |
|---|---|---|
| 11 | NBR (nitrile rubber), shaft seal made of FKM (fluoroelastomer) | **N** |

**Mounting flange**

| | | | |
|---|---|---|---|
| 12 | SAE J744 | 127-4 | **C4** |

**Drive shaft**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 13 | Splined shaft ANSI B92.1a | 1 3/8 in | 21T 16/32DP | without coupling flange | ● | – | – | **V8** |
| | | | | with coupling flange | ● | – | – | **C8** |
| | | 1 1/2 in | 23T 16/32DP | without coupling flange | – | ● | ● | **V9** |
| | | | | with coupling flange | – | ● | ● | **C9** |

**Working port**

| | | | | | |
|---|---|---|---|---|---|
| 14 | SAE working port **A** and **B**, same side left | Suction port **S** bottom | ○ | ○ | ○ | **1** |
| | SAE working port **A** and **B**, same side right | Suction port **S** top | ● | ● | ● | **2** |

● = Available ○ = On request – = Not available

1) Connectors for other electric components may deviate

| 01 | 02 | 03 | 04 | 05 | 06 | 07 | | 08 | 09 | 10 | 11 | 12 | 13 | | 14 | 15 | 16 | 17 | 18 | 19 | | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A10V** | **G** | **T** | | | | **0** | **/** | **11** | **N** | | **N** | **C4** | | **–** | **2** | **G** | | **A** | **S** | **0** | **–** | |

**Boost pump**

| | | |
|---|---|---|
| 15 | Integrated boost pump | **G** |

**Through drive**

| | | | | | | 071 | 090 | 115 | |
|---|---|---|---|---|---|---|---|---|---|
| 16 | Without through drive | | | | | ● | ● | ● | **0000** |
| | Flange SAE J744 | | | Hub for splined shaft[2] | | | | | |
| | Diameter | Mounting[3] | Code | Diameter | Code | | | | |
| | 82-2 (A) | ⚯ | A2 | 5/8 in 9T 16/32DP | S2 | ○ | ○ | ○ | **A2S2** |
| | 101-2 (B) | ⚯ | B2 | 7/8 in 13T 16/32DP | S4 | ○ | ○ | ○ | **B2S4** |

**High-pressure relief valve**

| | | |
|---|---|---|
| 17 | High-pressure relief valve, direct operated | **A** |

**Filtration boost circuit**

| | | |
|---|---|---|
| 18 | Filtration in the boost pump suction line | **S** |

**Other sensors**

| | | |
|---|---|---|
| 19 | Without sensor | **0** |

**Standard / special version**

| | | |
|---|---|---|
| 20 | Standard version | **0** |
| | Standard version with installation variants, e.g. **T** ports against standard open or closed | **Y** |
| | Special version | **S** |

● = Available ○ = On request **–** = Not available

**Notice**

- ▶ Note the project planning notes on page 23!
- ▶ In addition to the type code, please specify the relevant technical data when placing your order.

2) Hub for splined shaft according to ANSI B92.1a-1976 (drive shaft allocation according to SAE J744)

3) Mounting hole pattern viewed on through drive

## Hydraulic fluid

The A10VGT variable pump is designed for operation with HLP mineral oil according to DIN 51524.
Application instructions and requirements for hydraulic fluids should be taken from the following data sheets before the start project planning:

- 90220: Hydraulic fluids based on mineral oils and related hydrocarbons
- 90221: Environmentally acceptable hydraulic fluids
- 90222: Fire-resistant, water-free hydraulic fluids (HFDR/HFDU)

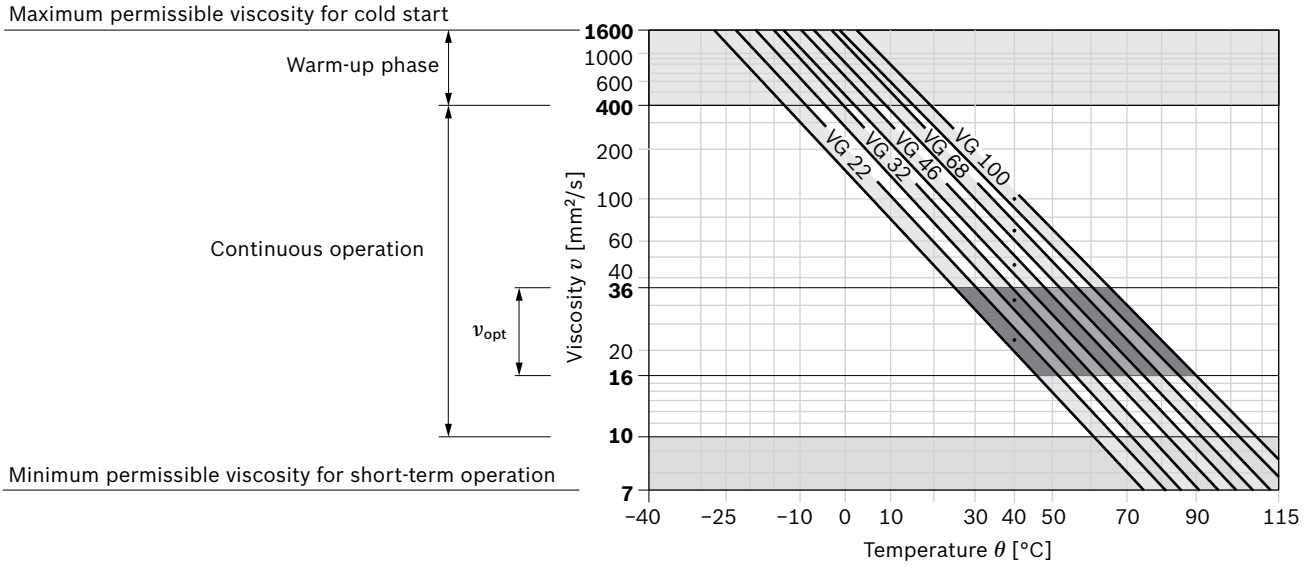
**Notes on selection of hydraulic fluid**
The hydraulic fluid should be selected so that the operating viscosity in the operating temperature range is within the optimum range ($v_{opt}$ see selection diagram).

**Note**
At no point of the component may the temperature be higher than 115 °C. The temperature difference specified in the table is to be taken into account when determining the viscosity in the bearing.
Please contact us if the above conditions cannot be met due to extreme operating parameters.

**Viscosity and temperature of hydraulic fluids**

| | Viscosity | Shaft seal | Temperature[2)] | Comment |
|---|---|---|---|---|
| Cold start | $v_{max}$ ≤ 1600 mm²/s | FKM | $\theta_{St}$ ≥ −25 °C | $t$ ≤ 3 min, without load ($p$ ≤ 50 bar), $n$ ≤ 1000 rpm<br>Permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 25 K |
| 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)] | FKM | $\theta$ = +110 °C | measured at port **T** |
| | $v_{opt}$ = 36 ... 16 mm²/s | | | Range of optimum operating viscosity and efficiency |
| Short-term operation | $v_{min}$ = 10 ... 7 mm²/s | FKM | $\theta$ = +110 °C | $t$ ≤ 3 min, $p$ ≤ 0.3 × $p_{nom}$ , measured at port **T** |

▼ **Selection diagram**




1) Corresponds e.g. for VG 46 to a temperature range of +4 °C to +85 °C (see selection diagram)

2) 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.

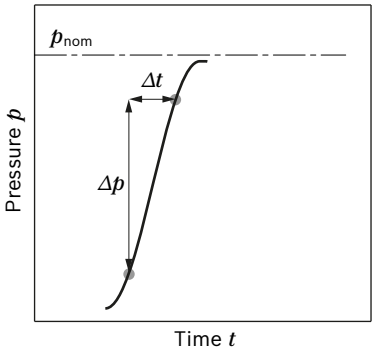
Depending on the system and the application, for the A10VGT, we recommend: Filter elements $\beta_{20} \geq 100$.

At very high hydraulic fluid temperatures (90 °C to maximum 110 °C, measured at port **T**), a cleanliness level of at least 19/17/14 according to ISO 4406 is necessary.

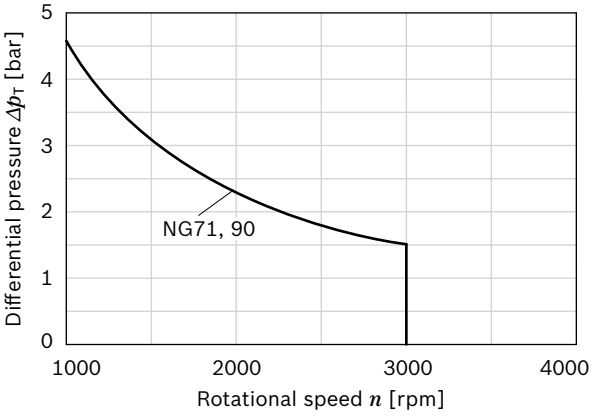
## Working pressure range

| **Pressure at working port A or B** | | **Definition** |
|---|---|---|
| Maximum pressure $p_{max}$ | 420 bar | The maximum pressure corresponds to the maximum working pressure within the single operating period. The sum of the single operating periods must not exceed the total operating period. |
| Single operating period | 10 s | |
| Total operating period | 200 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 (low-pressure side) | 10 bar above case pressure | Minimum pressure at the low-pressure side (**A** or **B**) which is required to prevent damage to the axial piston unit. |
| Rate of pressure change $R_{A\,max}$ | 9000 bar/s | Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range. |
| **Boost pump** | | |
| Maximum pressure $p_{Sp\,max}$ | 30 bar | |
| Standard setting $p_{Sp}$ | 22 bar | at $n$ = 1500 rpm |
| Pressure at suction port **S** (inlet) | | |
| Continuous $p_{S\,min}$ | ≥ 0.8 bar absolute | at $\nu \leq 30$ mm²/s |
| Short-term, at a cold start | ≥ 0.5 bar absolute | t < 3 min |
| Maximum pressure $p_{S\,max}$ | ≤ 5 bar absolute | |
| **Control pressure** | | |
| Minimum control pressure $p_{St\,min}$ at $n$ = 1500 rpm Controls EP, HW | 22 bar above case pressure | Required control pressure $p_{St}$ to ensure the function of the control. The required control pressure is depending on the rotational speed and working pressure. |
| **Case pressure at port T** | | |
| Maximum differential pressure $\Delta p_{T\,max}$ | See the diagram | Permissible differential pressure at the shaft seal (case to ambient pressure) |
| Pressure peak $p_{T\,peak}$ | 10 bar | $t$ < 0.1 s |

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




▼ **Maximum differential pressure at the shaft seal**[1)]




**Notice**

- Valid 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 ambient pressure.

1) Values for NG115 on request

## Technical data

| Size | | | NG | | 71 | 90 | 115 |
|---|---|---|---|---|---|---|---|
| Displacement, geometric, per revolution | | | | | | | |
| | variable pump | | $V_{g\,max}$ | cm³ | 71 | 90 | 115 |
| | boost pump at $p$ = 22 bar | | $V_{g\,Sp}$ | cm³ | 27 | 27 | 32 |
| Rotational speed[1] | maximum at $V_{g\,max}$[2] | | $n_{nom}$ | rpm | 3000 | 3000 | On request |
| | minimum[3] | | $n_{min}$ | rpm | 500 | 500 | 500 |
| Flow | at $n_{nom}$ and $V_{g\,max}$ | | $q_v$ | l/min | 213 | 270 | On request |
| Power[4] | at $n_{nom}$, $V_{g\,max}$ and $\Delta p$ = 280 bar | | $P$ | kW | 99 | 126 | On request |
| Torque[4] | at $V_{g\,max}$ and | $\Delta p$ = 280 bar | $T$ | Nm | 316 | 401 | 512 |
| | | $\Delta p$ = 100 bar | $T$ | Nm | 113 | 143 | 183 |
| Rotary stiffness of drive shaft | | V8 | $c$ | kNm/rad | 122 | – | – |
| | | V9 | $c$ | kNm/rad | – | 140 | 164 |
| Moment of inertia for rotary group | | | $J_{TW}$ | kgm² | 0.01159 | 0.01159 | 0.01909 |
| Case volume | | | $V$ | l | 1.5 | 1.5 | 1.5 |
| Weight approx.[5] | | | $m$ | kg | 51 | 51 | 59 |

**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. Bosch Rexroth recommend testing the loads by means of experiment or calculation / simulation and comparison with the permissible values.

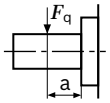
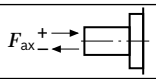
| **Determining the characteristics** | | | |
|---|---|---|---|
| Flow | $q_v = \frac{V_g \times n \times \eta_v}{1000}$ | | [l/min] |
| Torque | $T = \frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$ | | [Nm] |
| Power | $P = \frac{2 \pi \times T \times n}{60000}$ | $= \frac{q_v \times \Delta p}{600 \times \eta_t}$ | [kW] |

**Key**

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

1) The values are applicable:
   – for the optimum viscosity range from $n_{opt}$ = 36 to 16 mm²/s
   – with hydraulic fluid based on mineral oils
2) At $\Delta p \geq 50$ bar (t < 15 s) and boost pressure minimum 20 bar
3) The full function of the control is available from 800 rpm
4) Without boost pump
5) Weight may vary by equipment.

### Permissible radial and axial forces of the drive shafts

| Size | | NG | | 71 | 90 | 115 |
|---|---|---|---|---|---|---|
| Drive shaft | | | in | 1 3/8 | 1 1/2 | 1 1/2 |
| Maximum radial force at distance a (from shaft collar) |  | $F_{q\,max}$ | N | On request | On request | On request |
| | | a | mm | 24 | 24 | 24 |
| Maximum axial force |  | $+ F_{ax\,max}$ | N | 3500 | 3500 | 4800 |
| | | $- F_{ax\,max}$ | N | 3500 | 3500 | 4800 |

**Notice**

- The axial and radial forces generally influence the service life of the bearings.
- Special requirements apply in the case of belt drive and cardan shaft. Please contact us.

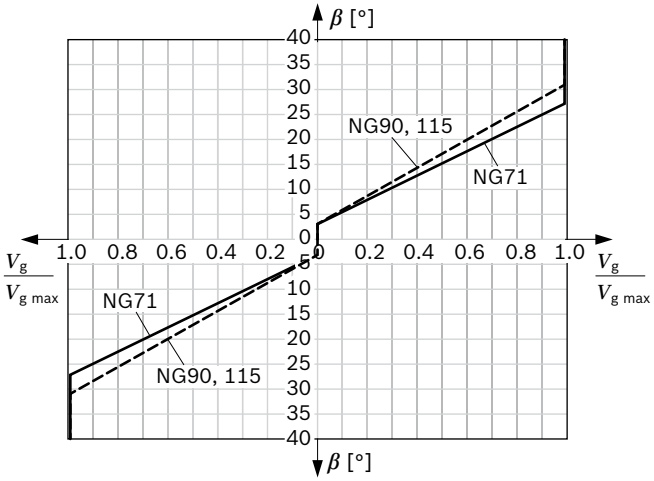
### Permissible input torque

| Size | | | NG | | 71 | 90 | 115 |
|---|---|---|---|---|---|---|---|
| Torque at $V_{g\,max}$ and $\Delta p$ = 280 bar[1)] | | | $T$ | Nm | 316 | 401 | 512 |
| Maximum input torque at drive shaft, maximum ANSI B92.1a (SAE J744)[2)] | V8 | 1 3/8 in | $T_{E\,max}$ | Nm | 970 | – | – |
| | V9 | 1 1/2 in | $T_{E\,max}$ | Nm | – | 1305 | 1305 |

1) Efficiency not considered
2) For drive shafts free of radial force

## HW – Proportional control, hydraulic, mechanical servo

The output flow of the pump is infinitely variable between 0 and 100%, proportional to the swivel angle of the control lever.
A feedback lever connected to the stroking piston maintains the pump flow for any given position of the control lever.




Swivel angle $\beta$ at the control lever for pump displacement change:

- Start of control at $\beta$ = ±3°
- End of control at $\beta$ (max. displacement $V_{g\,max}$)
  - Size 71 at ±27°
  - Size 90 and 115 at ±31°
- Rotational limit $\beta$ of the control lever (internal) ±38°

The maximum required torque at the lever is 170 Ncm.
To prevent damage to the HW control module, a positive mechanical stop of 36.5°±1 must be provided for the HW control lever on the customer side.

**Notice**

- Spring centering enables the pump, depending on pressure and speed, to move automatically to the neutral position ($V_g$ = 0) as soon as there is no longer any torque on the control lever of the HW control module.
- If necessary, the position of the lever can be changed. The procedure is defined in the instruction manual.
- On delivery, the position of the lever may differ from that shown in the drawing.

**Option: Sequence valve**

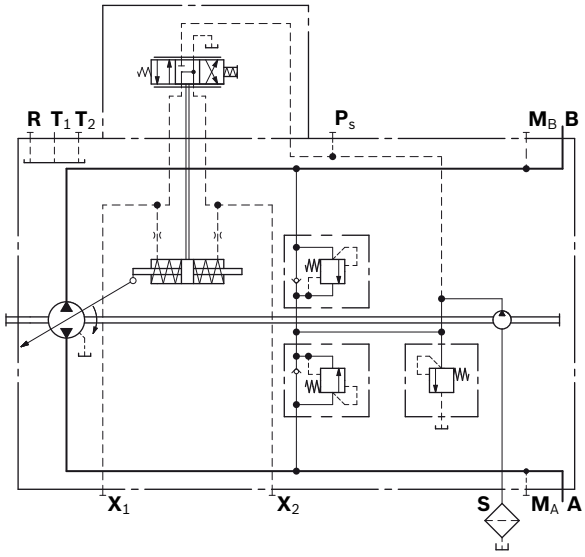
Actuation of the sequence valve establishes pressure equilibrium in the stroking chambers. The spring in the stroking chamber moves the stroking piston towards the central position (neutral position). The reset function is influenced by the current working pressure and the rotational speed.

**Option: Neutral position switch**

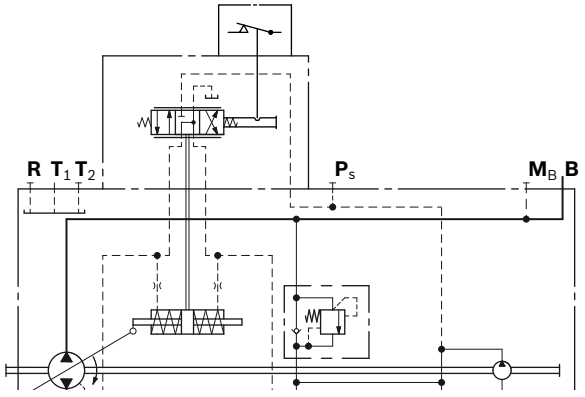
The switch contact in the neutral position switch is closed when the control lever on the HW control module is in its neutral position. The switch opens when the control lever is moved out of the central position in either direction. Thus, the neutral position switch provides a monitoring function for drive units that require the pump to be in the neutral position during certain operating conditions (e.g. starting diesel engines).

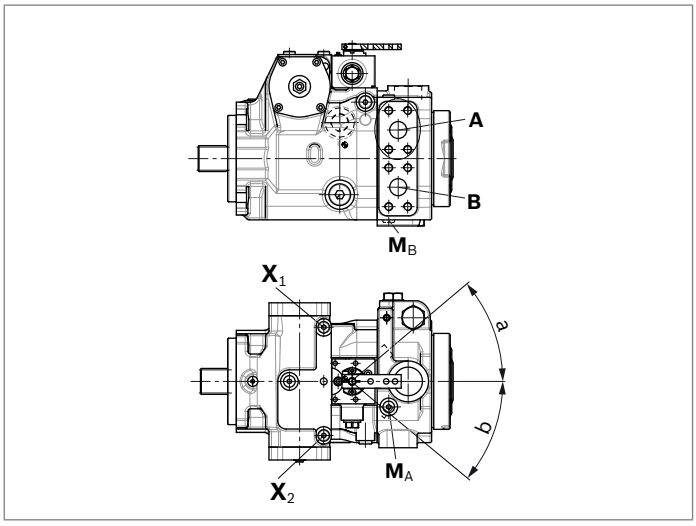
| **Technical data** | |
|---|---|
| Load capacity | 20 A (continuous), without switching operations |
| Switching capacity | 15 A / 32 V (resistive load) |
| | 4 A / 32 V (inductive load) |
| Connector version | DEUTSCH DT04-2P-EP04<br>(mating connector, see page 19) |

▼ **Standard version**




▼ **Version with neutral position switch**

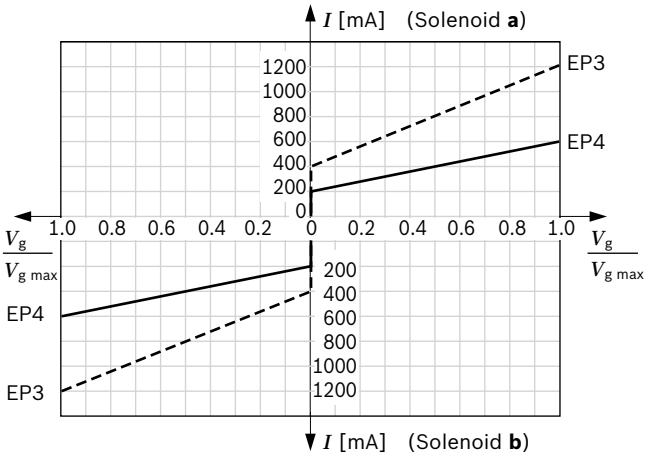





| **Correlation of direction of rotation, control and flow direction** | | | | |
|---|---|---|---|---|
| Direction of rotation | clockwise | | counter-clockwise | |
| Lever direction | **a** | **b** | **a** | **b** |
| Control pressure | $X_2$ | $X_1$ | $X_2$ | $X_1$ |
| Flow direction | **B** to **A** | **A** to **B** | **A** to **B** | **B** to **A** |
| Working pressure | $M_A$ | $M_B$ | $M_B$ | $M_A$ |

## EP – Proportional control, electric

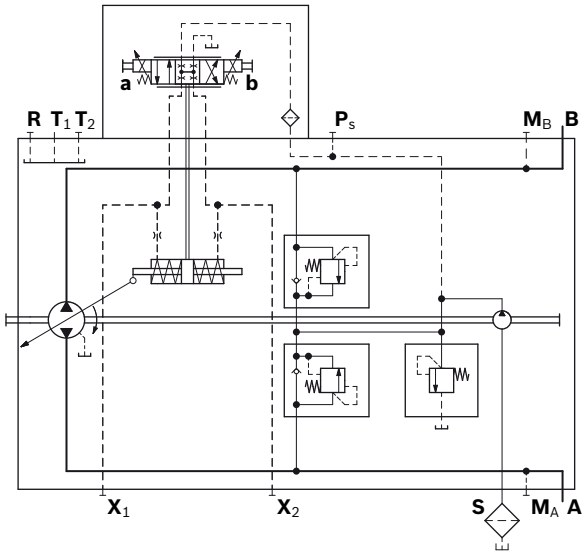
The output flow of the pump is infinitely variable between 0 and 100%, proportional to the electrical current supplied to solenoid **a** or **b**.
The electrical energy is converted into a force acting on the control spool.
This control spool then directs control oil into and out of the stroking cylinder to adjust pump displacement as required.
A feedback lever connected to the stroking piston maintains the pump flow for any given current within the control range.
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



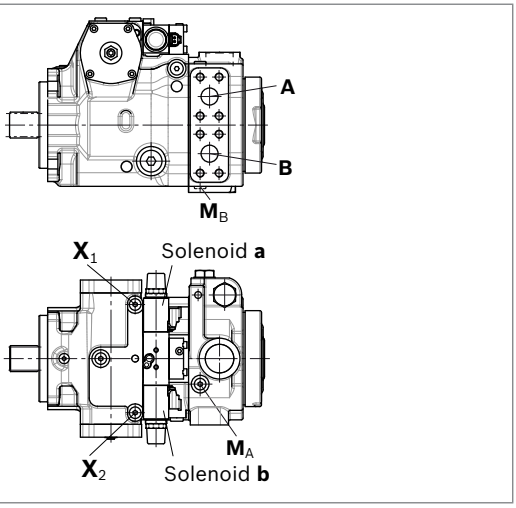

| Technical data, solenoid | EP3 | EP4 |
|---|---|---|
| Voltage | 12 V (±20%) | 24 V (±20%) |
| Control current | | |
| Start of control at $V_g$ = 0 | 400 mA | 200 mA |
| End of control at $V_{g\,max}$ | 1200 mA | 600 mA |
| Current limit | 1.54 A | 0.77 A |
| Nominal resistance (at 20 °C) | 5.5 Ω | 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 19 | | |

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)

▼ **Circuit diagram**




| Correlation of direction of rotation, control and flow direction | | | | |
|---|---|---|---|---|
| Direction of rotation | clockwise | | counter-clockwise | |
| Actuation of solenoid | **b** | **a** | **b** | **a** |
| Control pressure | $X_2$ | $X_1$ | $X_2$ | $X_1$ |
| Flow direction | **B** to **A** | **A** to **B** | **A** to **B** | **B** to **A** |
| Working pressure | $M_A$ | $M_B$ | $M_B$ | $M_A$ |

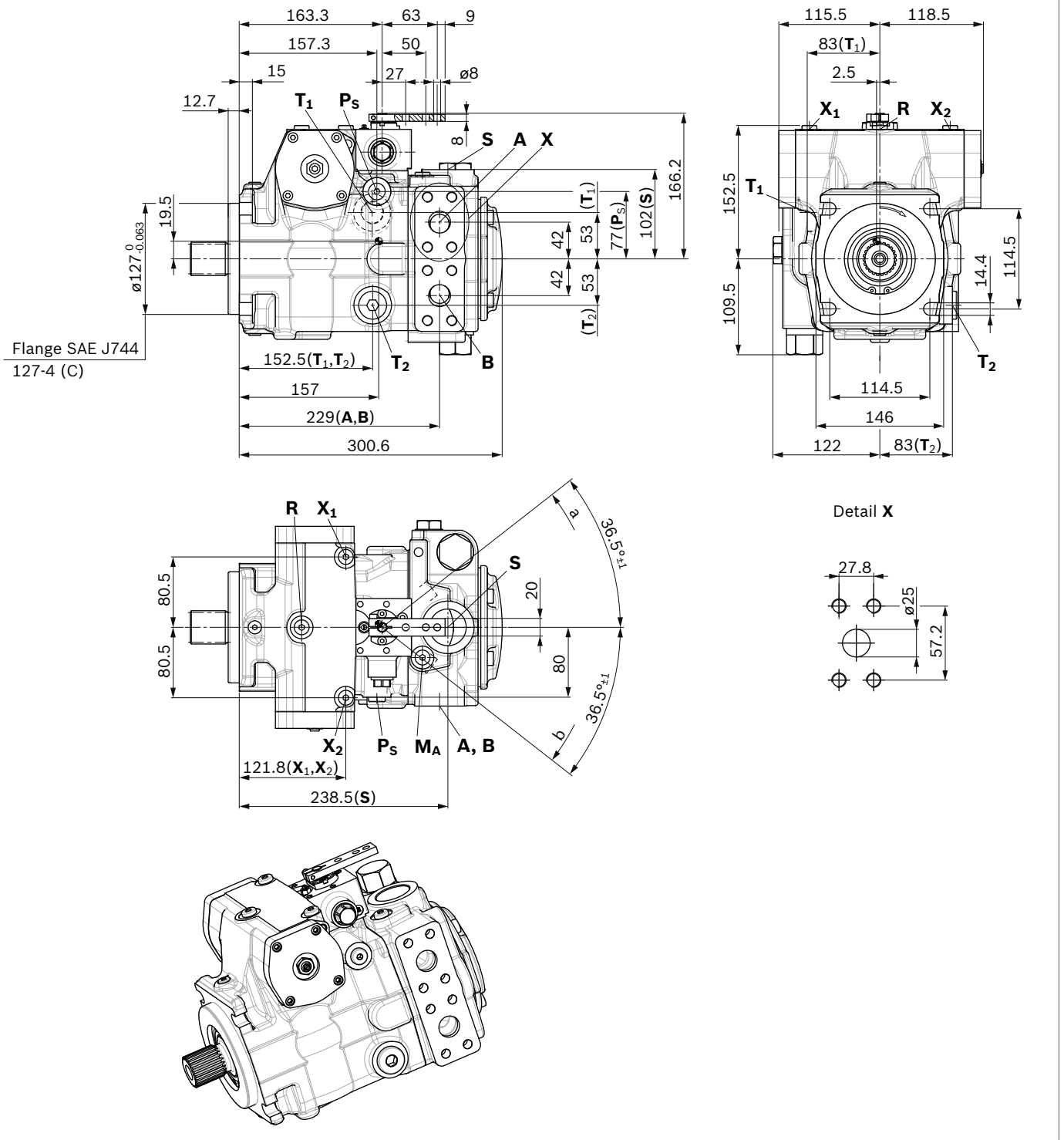



**Notice**
The proportional solenoids in the EP3/EP4 version have manual override and spring return.

## Dimensions sizes 71, 90

### HW – Proportional control, hydraulic, mechanical servo

Standard: SAE working port **A** and **B** same side right, suction port **S** top (2)

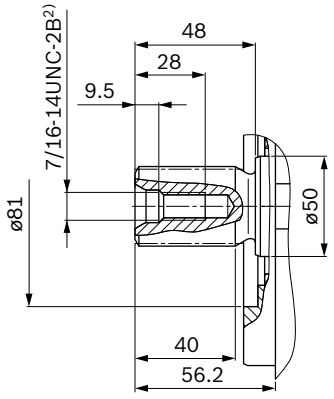



Center of gravity

## Drive shaft size 71

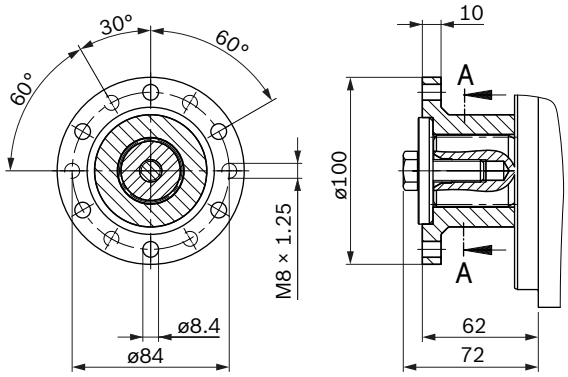
▼ **Splined shaft ANSI B92.1a**

**V8 – 1 3/8 in 21T 16/32DP**[1)]




▼ **Splined shaft ANSI B92.1a with coupling flange**

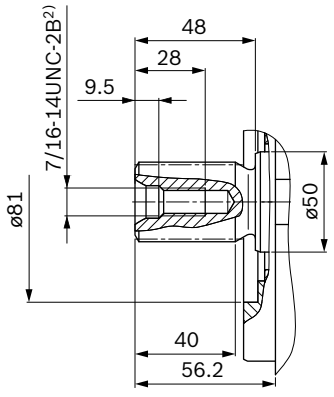
**C8 – 1 3/8 in 21T 16/32DP**[1)]




## Drive shaft size 90

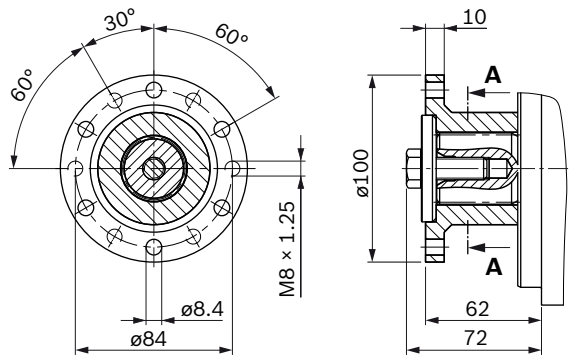
▼ **Splined shaft ANSI B92.1a**

**V9 – 1 1/2 in 23T 16/32DP**[1)]




▼ **Splined shaft ANSI B92.1a with coupling flange**

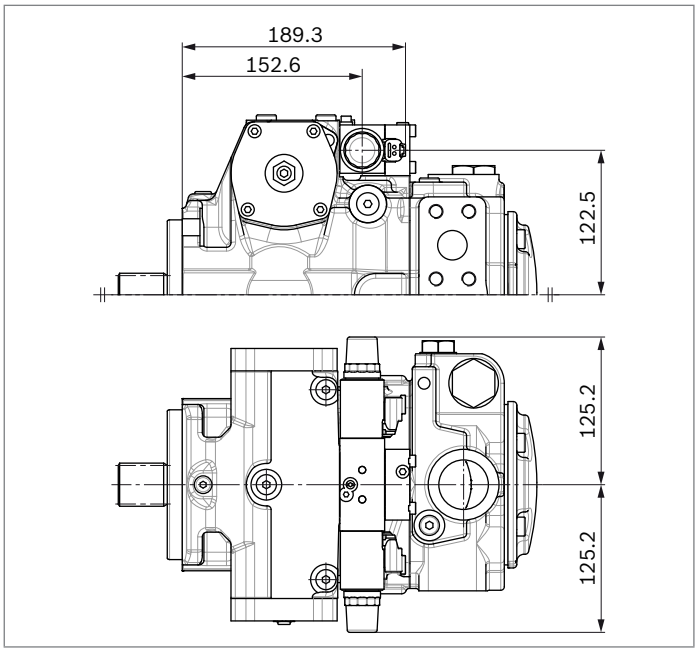
**C9 – 1 1/2 in 23T 16/32DP**[1)]




| Ports | | Standard | Size | $p_{max}$ [bar][3)] | State[6)] |
|---|---|---|---|---|---|
| **A, B** | Working port<br>Fastening thread | SAEJ518[4)]<br>DIN 13 | 1 in<br>M12 × 1.75; 17 deep | 420 | O |
| **S** | Suction port | DIN 3852 | M42 × 2; 20 deep | 5 | O |
| **$T_1$** | Drain port | DIN 3852 | M26 × 1.5; 16 deep | 3 | O[5)] |
| **$T_2$** | Drain port | DIN 3852 | M26 × 1.5; 16 deep | 3 | X[5)] |
| **R** | Air bleed port | DIN 3852 | M12 × 1.5; 12 deep | 3 | X |
| **$X_1$, $X_2$** | Control pressure port (upstream of orifice) | DIN 3852 | M12 × 1.5; 12 deep | 30 | X |
| **$P_S$** | Pilot pressure port | DIN 3852 | M14 × 1.5; 12 deep | 30 | X |
| **$M_A$, $M_B$** | Measuring port pressure A, B | DIN 3852 | M12 × 1.5; 12 deep | 420 | X |

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
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 21).
6) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

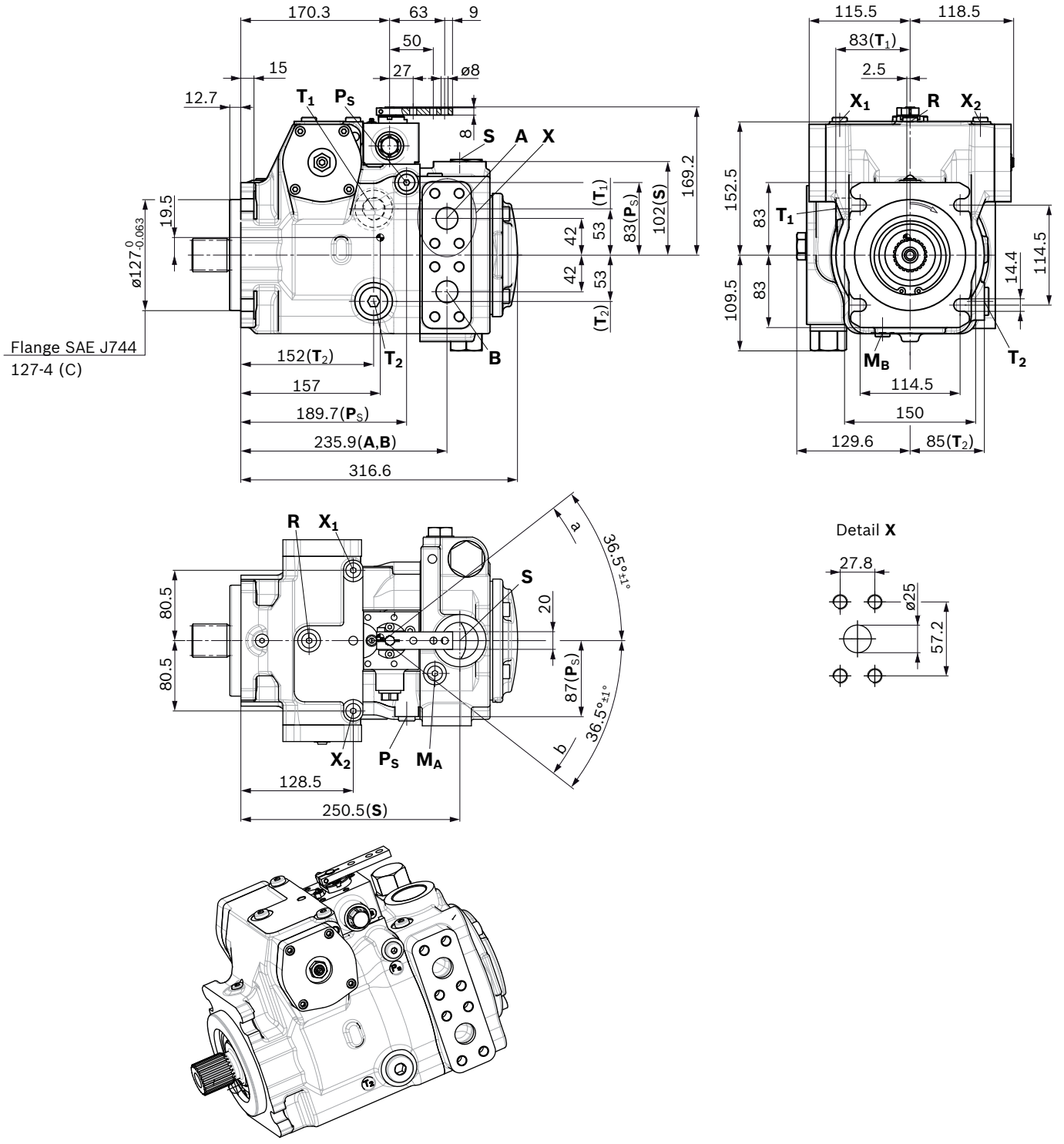
**EP – Proportional control, electric**



## Dimensions, size 115

**HW – Proportional control, hydraulic, mechanical servo**

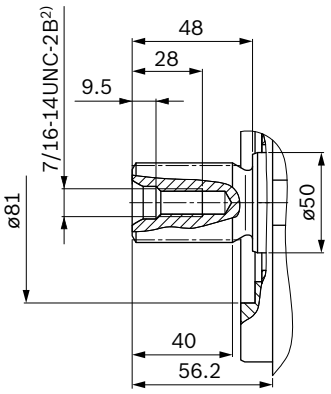
Standard: SAE working port **A** and **B** same side right, suction port **S** top (2)




Center of gravity

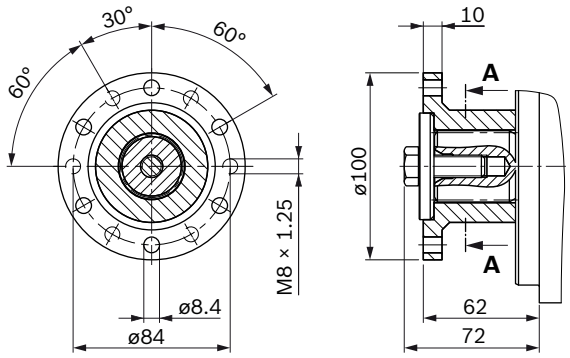
▼ **Splined shaft ANSI B92.1a**

**V9 – 1 1/2 in 23T 16/32DP**[1)]




▼ **Splined shaft ANSI B92.1a with coupling flange**

**C9 – 1 1/2 in 23T 16/32DP**[1)]




| Ports | | Standard | Size | $p_{max}$ [bar][3)] | State[6)] |
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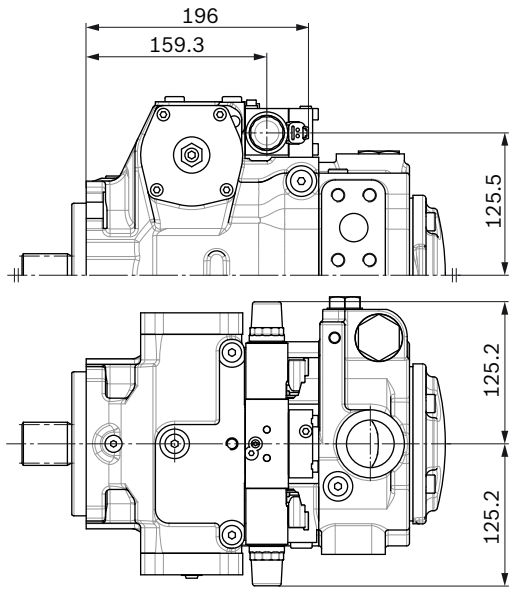
| **A, B** | Working port<br>Fastening thread | SAEJ518[4)]<br>DIN 13 | 1 in<br>M12 × 1.75; 17 deep | 420 | O |
| **S** | Suction port | DIN 3852 | M42 × 2; 20 deep | 5 | O |
| **$T_1$** | Drain port | DIN 3852 | M26 × 1.5; 16 deep | 3 | O[5)] |
| **$T_2$** | Drain port | DIN 3852 | M26 × 1.5; 16 deep | 3 | X[5)] |
| **R** | Air bleed port | DIN 3852 | M12 × 1.5; 12 deep | 3 | X |
| **$X_1$, $X_2$** | Control pressure port (upstream of orifice) | DIN 3852 | M12 × 1.5; 12 deep | 30 | X |
| **$P_S$** | Pilot pressure port | DIN 3852 | M14 × 1.5; 12 deep | 30 | X |
| **$M_A$, $M_B$** | Measuring port pressure A, B | DIN 3852 | M12 × 1.5; 12 deep | 420 | X |

▼ **EP – Proportional control, electric**




1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
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 21).
6) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

## High-pressure relief valves

The two high-pressure relief valves protect the hydrostatic transmission (pump and motor) from overloading. They limit the maximum pressure in the respective high-pressure line and serve simultaneously as boost valves.
High-pressure relief valves are not working valves and are only suitable for pressure peaks or high rates of pressure change.

### Setting range

| High-pressure relief valve, A and B | Differential pressure setting $\Delta p_{HD}$ |
|---|---|
| Standard value | 398 bar |
| Optional value | 370 bar |

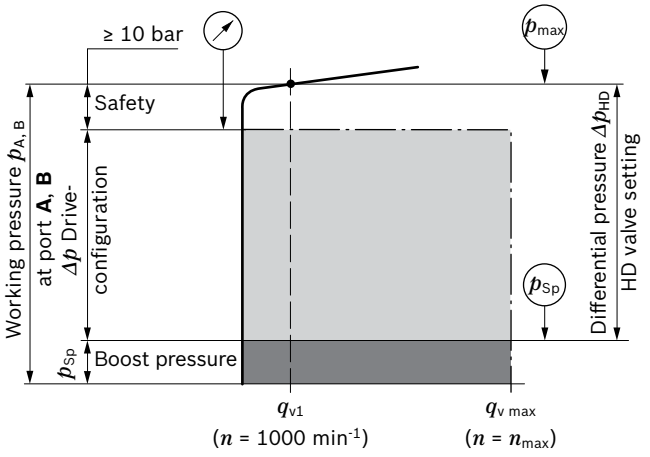
| Settings on high-pressure relief valve A and B | |
|---|---|
| Differential pressure setting | $\Delta p_{HD}$ = ... bar |
| Cracking pressure of the HD valve (at $q_{V\,1}$) ($p_{max} = \Delta p_{HD} + p_{Sp}$) | $p_{max}$ = ... bar |

- The valve settings are made at $n$ = 1000 rpm and at $V_{g\,max}$ ($q_{v\,1}$). There may be deviations in the cracking pressures with other operating parameters.
- When ordering, state differential pressure setting in plain text.

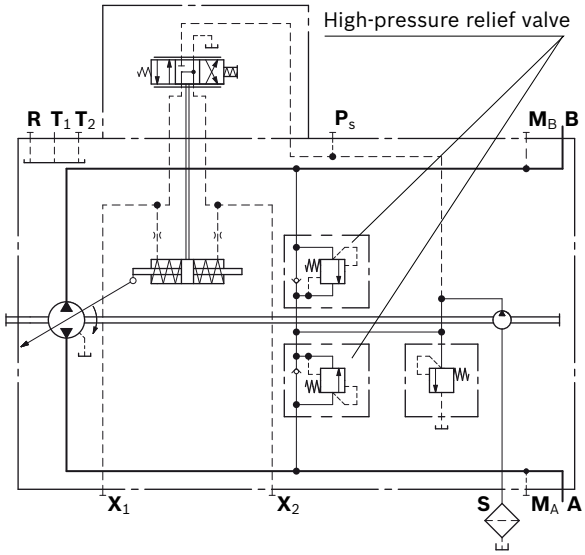
▼ **Example**

| Working pressure | | Boost pressure | | Differential pressure |
|---|---|---|---|---|
| $p_{A,B}$ | – | $p_{Sp}$ | = | $p_{HD}$ |
| 420 bar | | 22 bar | | **398 bar** |

▼ **Setting diagram**




▼ **Circuit diagram**



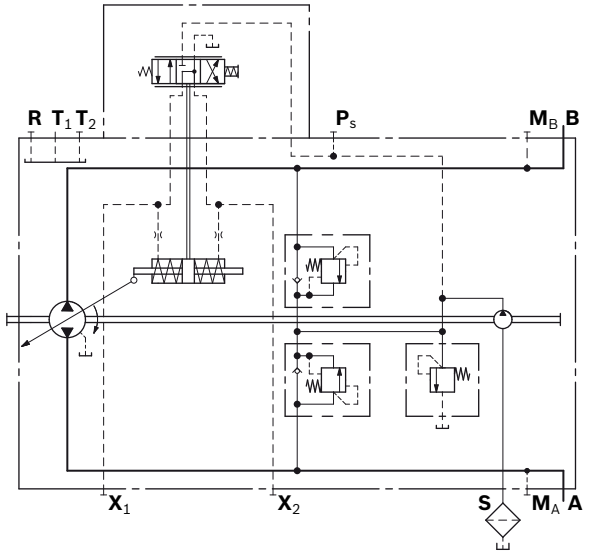
## Filtration in the boost pump suction line

### Version S

| **Filter version** | **Suction filter without bypass** |
|---|---|
| Recommendation | With contamination indicator |
| **Recommended flow resistance at filter element** | |
| At $\nu$ = 30 mm²/s, $n = n_{max}$ | $\Delta p \leq 0.1$ bar |
| At $\nu$ = 1000 mm²/s, $n = n_{max}$ | $\Delta p \leq 0.3$ bar |
| **Pressure at suction port S** | |
| Continuous $p_{S\ min}$ ($\nu \leq 30$ mm²/s) | ≥ 0.8 bar absolute |
| Short-term, at a cold start ($t$ < 3 min) | ≥ 0.5 bar absolute |
| Maximum $p_{S\ max}$ | ≤ 5 bar absolute |

The suction filter is not included in the scope of delivery.

▼ **Circuit diagram**



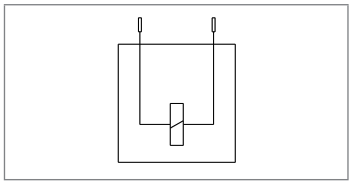
## Connector for solenoids

**DEUTSCH DT04-2P-EP04**

Molded, 2-pin, without bidirectional suppressor diode
The following type of protection ensues with an 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).

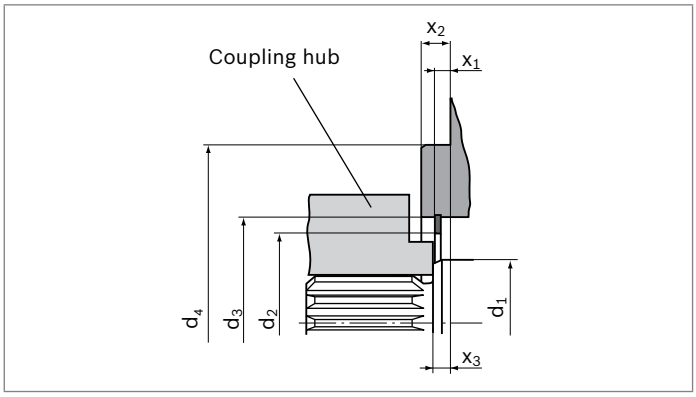
**Notice**

- If necessary, you can change the position of the connector by turning the solenoid.
- The procedure is defined in the instruction manual.
- Manual override can be used on the electric system in case of malfunction. Not permissible for continuous operation!

## Installation dimensions for coupling assembly

To ensure that rotating components (coupling hub) and fixed components (housing, snap ring) do not come into contact with each other, the installation conditions described here must be observed. This depends on the pump size and the splined shaft.

**SAE splined shaft (spline according to ANSI B92.1a)**
Splined shaft **V8** and **V9**
The outer diameter of the coupling hub must be smaller than the inner diameter of the snap ring (dimension $d_2$) in the area near the drive shaft collar (dimension $x_2 - x_3$).




| NG | ød$_1$ | ød$_{2\ min}$ | ød$_3$ | ød$_4$ | x$_1$ | x$_2$ | x$_3$ |
|---|---|---|---|---|---|---|---|
| **71** | 50 | 66.5 | 81±0.1 | 127 | $7.0^{+0.2}$ | $12.7_{-0.5}$ | $8\ ^{+0.9}_{-0.6}$ |
| **90** | 50 | 66.5 | 81±0.1 | 127 | $7.0^{+0.2}$ | $12.7_{-0.5}$ | $8\ ^{+0.9}_{-0.6}$ |
| **115** | 55 | 76.3 | 91±0.1 | 127 | $8^{+0.2}$ | $12.7_{-0.5}$ | $8\ ^{+0.9}_{-0.6}$ |

## 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 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 operational conditions, 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 suction line and 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. However, it must not be higher than $h_{S\ max}$ = 800 mm.

The suction pressure at port **S** must also not fall below the minimum value of 0.8 bar absolute during operation (cold start 0.5 bar absolute).

### Installation position

See the following examples 1 to 4.

Further installation positions are available upon request.

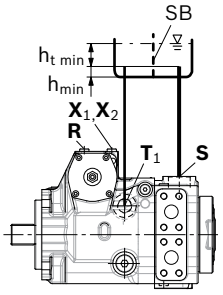
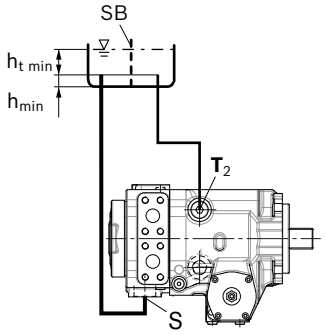
Recommended installation position: 1 and 2.

**Notice**

- If filling the stroking chambers via **$X_1$** to **$X_2$** is not possible in the final installation position, then this must take place before installation, e.g. in installation position 2.
- To prevent unexpected actuation and damage, the stroking chambers must be air bled via the ports **$X_1$** and **$X_2$** depending on the installation position.
- In certain installation positions, an influence on the control or closed loop control can be expected. Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in response time.

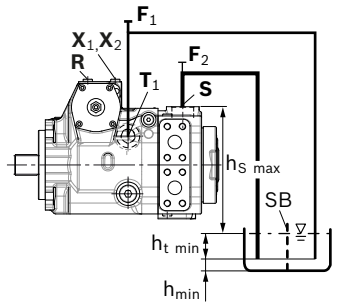
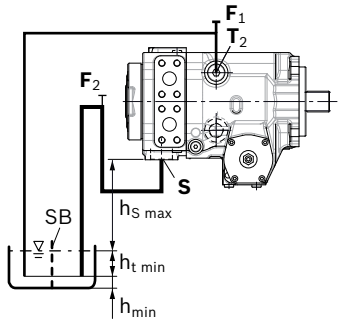
### Below-reservoir installation (standard)

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

| Installation position | Air bleeding the housing | Air bleeding the stroking chamber | Filling |
|---|---|---|---|
| **1** | **R** | **$X_1$, $X_2$** | **S** + **$T_1$** + **$X_1$** + **$X_2$** |
| |  | | |
| **2** | – | – | **S** + **$T_2$** |
| |  | | |

### Above-reservoir installation

Above-reservoir installation means that 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 bleeding the housing | Air bleeding the stroking chamber | Filling |
|---|---|---|---|
| 3 | **$F_2$ (S)+ R** | **$X_1$, $X_2$** | **$F_2$ (S)+ $F_1$** |
| |  | | |
| 4 | **$F_2$ + $F_1$ ($T_2$)** | – | **$F_2$ + $F_1$ ($T_2$)** |
| |  | | |

| Key | |
|---|---|
| **$F_1$, $F_2$** | Filling / air bleeding |
| **R** | Air bleed port |
| **S** | Suction port |
| **$T_1$, $T_2$** | Drain port |
| **$X_1$, $X_2$** | Control pressure port |
| SB | Baffle (baffle plate) |
| $h_{t\ min}$ | Minimum required immersion depth (200 mm) |
| $h_{min}$ | Minimum required distance to the reservoir bottom (100 mm) |
| $h_{S\ max}$ | Maximum permissible suction height (800 mm) |

**Notice**

Ports **$F_1$** and **$F_2$** are part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

## Project planning notes

- The pump A10VGT is designed to be used as a drum drive in concrete mixer trucks in closed circuits.
- The pump has been specifically designed and constructed for the load spectra in this particular application. The performance data given is based on this load spectrum.
- The project planning, installation and commissioning of the axial piston unit requires the involvement of qualified 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.
- 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 preservative protection for a maximum of 12 months. If longer preservative 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 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 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. When a direct current is applied, solenoids do not cause electromagnetic interference nor is their operation impaired by electromagnetic interference.
  Other behavior can result when a modulated direct current (e.g. PWM signal) is applied. Potential electromagnetic interference for persons (e.g. persons with a pacemaker) and other components must be tested by the machine manufacturer.
- 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 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.

## Safety instructions

- During and shortly after operation, there is a risk of getting burnt on the axial piston unit and especially on the solenoids. Take 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. 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 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.
- Moving parts in high-pressure relief valves may in certain circumstances become stuck in an undefined position due to contamination (e.g. impure hydraulic fluid). This can result in restriction or loss of the load holding function in lifting winches.
  The machine/system manufacturer must check whether additional measures are required on the machine for the relevant application in order to keep the load in a safe position and ensure they are properly implemented.
- If the sequence valve option is used in a different application than a drum drive in concrete mixer trucks, then the machine manufacturer has to verify that the pump will always go into the central position (neutral position) when the sequence valve is actuated (e.g. travel drive downhill-slope).

**Bosch Rexroth AG**
Mobile Applications
Glockeraustraße 4
89275 Elchingen, Germany
Tel. +49 7308 82-0
info.ma@boschrexroth.de
www.boschrexroth.com