# Bosch Rexroth A6VE107EP1/63W-VAL027FPA-SK axial piston variable plug-in motor

Manufacturer: Bosch Rexroth

Manufacturer part number / published order designation: R902155056

Published model: A6VE107EP1/63W-VAL027FPA-SK

## About this compilation

Prepared by Hydmaster from selected manufacturer documentation. Original technical pages follow without cropped drawings, rewritten data or altered units. This cover and index are Hydmaster editorial material, not a manufacturer-issued exact-execution datasheet.

Coverage: applicable family/component reference. Exact execution documentation remains incomplete. Do not treat standard component or stage drawings as approval of the complete custom assembly.

## Execution notes and conditions

Binding installation drawing for exact execution, stop settings and unlisted options.

Shaft A for size 107 is not defined in the standard 2012 table; only the literal factory code is retained.

Not published; zero is a design capability, not a verified supplied mechanical-stop setting.

The literal factory designation is preserved; suffix-specific physical effects are not verified.

Archived manufacturer reference, edition 2012; the reference covers the base size 107 series, rather than the current 2026 size 250 sheet.

A6VM pages supplement the shared controller only; their motor-body geometry does not apply to A6VE.

## Source-page index

Source page numbers below are physical pages of each complete original PDF. The original printed page labels and technical content remain unchanged. Compiled page numbers count this cover/index.

## Source A: Bosch Rexroth A6Ve Series 63 Re91606 2012 Archive


| Original pages | Compiled pages | Relevant content |
|---|---|---|
| 1-8 | 2-9 | Applicable dated A6VE107 series overview; Applicable dated A6VE107 type key and setting limits; Applicable dated A6VE107 shaft, flange, port and valve key; Applicable dated A6VE107 fluid and viscosity conditions; Applicable dated A6VE107 case-pressure and shaft-seal conditions; Applicable dated A6VE107 working-pressure duty and inlet conditions; Applicable dated A6VE107 geometric displacement and qualified speed limits; Applicable dated A6VE107 radial and axial load limits |
| 12-13 | 10-11 | Applicable dated A6VE107 EP1 control, current and voltage; Applicable dated A6VE107 EP1 circuit |
| 24-25 | 12-13 | Applicable dated A6VE107 020 base-body reference; exact control envelopes refer to RE91604; Applicable dated A6VE107 size 107 flange and shaft drawing table |
| 28-30 | 14-16 | Applicable dated A6VE107 solenoid connector; separate-order conditions; Applicable dated A6VE107 flushing-valve family conditions; exact orifice setting unspecified; Applicable dated A6VE107 size 107 flushing-valve geometry; adjacent size 250 drawing inapplicable |
| 39-40 | 17-18 | Applicable dated A6VE107 installation and case-drain requirements; Applicable dated A6VE107 planning and tightening requirements |

Rexroth
Bosch Group

# Variable Plug-in Motor A6VE

**RE 91606/06.12** **1**/40
Replaces: 10.07

**Data sheet**



Series 63
Size — Nominal pressure/Maximum pressure
28 to 160 — 400 bar/450 bar
250 — 350 bar/400 bar
Open and closed circuits

## Contents


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## Features

- Variable plug-in motor with axial tapered piston rotary group of bent-axis design, for hydrostatic drives in open and closed circuits
- Far-reaching integration in mechanical gearbox due to a recessed mounting flange located on the center of the case (extremely space-saving construction)
- Easy to install, simply plug into the mechanical gearbox (no configuration specifications to be observed)
- Tested unit ready to install
- For use especially in mobile applications
- The displacement can be infinitely changed from $V_{g\,max}$ to $V_{g\,min} = 0$.
- The wide control range enables the variable motor to satisfy the requirement for high speed and high torque.
- The output speed is dependent on the flow of the pump and the displacement of the motor.
- The output torque increases with the pressure differential between the high-pressure and low-pressure side and with increasing displacement.

# Ordering code for standard program

| A6V | E | | | | | / | 63 | W | | – | V | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 02 | 03 | 04 | 05 | 06 | | 07 | 08 | 09 | | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |

**Axial piston unit**

| | | |
|---|---|---|
| 01 | Bent-axis design, variable | **A6V** |

**Operating mode**

| | | |
|---|---|---|
| 02 | Motor, plug-in version | **E** |

**Sizes (NG)**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 03 | Geometric displacement, see table of values on page 7 | **28** | **55** | **80** | **107** | **160** | **250** | |

| | **Control devices** | | **28** | **55** | **80** | **107** | **160** | **250** | |
|---|---|---|---|---|---|---|---|---|---|
| 04 | Proportional control hydraulic | $\Delta p = 10$ bar | ● | ● | ● | ● | ● | ● | **HD1** |
| | | $\Delta p = 25$ bar | ● | ● | ● | ● | ● | ● | **HD2** |
| | Two-point control hydraulic | | – | – | – | – | – | ● | **HZ** |
| | | | ● | – | – | – | ● | – | **HZ1** |
| | | | – | ● | ● | ● | ●[1] | – | **HZ3** |
| | Proportional control electric | 12 V | ● | ● | ● | ● | ● | ● | **EP1** |
| | | 24 V | ● | ● | ● | ● | ● | ● | **EP2** |
| | Two-point control electric | 12 V | ● | – | – | – | ● | ● | **EZ1** |
| | | 24 V | ● | – | – | – | ● | ● | **EZ2** |
| | | 12 V | – | ● | ● | ● | – | – | **EZ3** |
| | | 24 V | – | ● | ● | ● | – | – | **EZ4** |
| | Automatic control high-pressure related | with minimum pressure increase $\Delta p \leq 10$ bar | ● | ● | ● | ● | ● | ● | **HA1** |
| | | with pressure increase $\Delta p = 100$ bar | ● | ● | ● | ● | ● | ● | **HA2** |
| | | with minimum pressure increase $\Delta p \leq 10$ bar | – | ● | ● | ● | ● | – | **HA3[1]** |
| | Automatic control speed related<br>$p_{St}/p_{HD} = 3/100$, hydraulic travel direction valve | | – | – | – | – | – | ● | **DA** |
| | $p_{St}/p_{HD} = 5/100$, electric travel direction valve + electric $V_{g\,max}$-circuit | 24 V | ● | ● | ● | ● | ● | – | **DA3** |

**Pressure control (only for HD, EP)**

| | | |
|---|---|---|
| 05 | Without pressure control (without code) | |
| | Pressure control, fixed setting | **D** |

**Override of controls HA**

| | | |
|---|---|---|
| 06 | Without override (without code) | |
| | Hydraulic override, remote control, proportional | **T** |

**Series**

| | | |
|---|---|---|
| 07 | Series 6, index 3 | **63** |

**Direction of rotation**

| | | |
|---|---|---|
| 08 | Viewed on drive shaft, bidirectional | **W** |

| | **Setting ranges for displacement[2]** | | **28** | **55** | **80** | **107** | **160** | **250** | |
|---|---|---|---|---|---|---|---|---|---|
| 09 | $V_{g\,min} = 0$ to 0.7 $V_{g\,max}$ (without code) | | ● | ● | ● | ● | ● | – | |
| | $V_{g\,min} = 0$ to 0.4 $V_{g\,max}$ | $V_{g\,max} = V_{g\,max}$ to 0.8 $V_{g\,max}$ | – | – | – | – | – | ● | **1** |
| | $V_{g\,min} > 0.4$ $V_{g\,max}$ to 0.8 $V_{g\,max}$ | $V_{g\,max} = V_{g\,max}$ to 0.8 $V_{g\,max}$ | – | – | – | – | – | ● | **2** |

| | **Seals** | **28** | **55** | **80** | **107** | **160** | **250** | |
|---|---|---|---|---|---|---|---|---|
| 10 | FKM (fluor-caoutchouc) | ● | ● | ● | ● | ● | ● | **V** |

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

1) Only possible in combination with port plate 22 (integrated counterbalance valve).

2) Specify exact settings for $V_{g\,min}$ and $V_{g\,max}$ in plain text when ordering: $V_{g\,min} = \ldots$ cm³, $V_{g\,max} = \ldots$ cm³

# Ordering code for standard program

| A6V | E | | | | | / | 63 | W | | – | V | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 02 | 03 | 04 | 05 | 06 | | 07 | 08 | 09 | | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |

**Drive shafts**

| | | 28 | 55 | 80 | 107 | 160 | 250 | |
|---|---|---|---|---|---|---|---|---|
| 11 | Splined shaft DIN 5480 | ● | – | ● | – | ● | – | **A** |
| | | – | ● | – | ● | – | ● | **Z** |

**Mounting flanges**

| | | | 28 | 55 | 80 | 107 | 160 | 250 | |
|---|---|---|---|---|---|---|---|---|---|
| 12 | Similar to ISO 3019-2 | 2-hole | ● | ● | ● | ● | ● | – | **L** |
| | | 4-hole | – | – | – | – | – | ● | **M** |
| | Modified adapter flange | 2-hole | – | – | – | ● | – | – | **U** |

**Port plates for service lines**[3)]

| | | | | 28 | 55 | 80 | 107 | 160 | 250 | |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | SAE flange ports A and B at side, opposite | 02 | 0 | ● | ● | ● | ● | ● | ● | **020** |
| | | | 7 | ● | ● | ● | ● | ● | ● | **027** |
| | SAE flange ports A and B at bottom only with integrated counterbalance valve BVI[4)] | 22 | 1 | – | ● | ● | ● | ● | – | **221** |
| | | | 2 | – | ● | ● | ● | ● | – | **222** |
| | Port plate with 1-level pressure-relief valves for mounting a counterbalance valve[5)7)] BVD | 37 | 0 | – | – | – | ● | – | – | **370** **378** |
| | | 38 | 8 | – | ● | ● | ● | ● | ●[9)] | **380** |
| | BVE | 38 | | – | – | – | ● | ● | –[9)] | **388** |

**Valves** (see pages 29 to 37)

| | | | |
|---|---|---|---|
| 14 | Without valve | | **0** |
| | Brake release valve integrated (pilot pressure for brake release) | internal ducting | **1** |
| | | external piping | **2** |
| | Flushing and boost pressure valve mounted | | **7** |
| | Counterbalance valve mounted[6)7)] | | **8** |

**Speed sensor** (see page 38)

| | | 28 | 55 | 80 | 107 | 160 | 250 | |
|---|---|---|---|---|---|---|---|---|
| 15 | Without speed sensor | ● | ● | ● | ● | ● | ● | **0** |
| | Prepared for DSA speed sensor | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | **U** |
| | DSA speed sensor mounted[8)] | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | **V** |

**Connector for solenoids** (see page 28)

| | | 28 to 160 | 250 | |
|---|---|---|---|---|
| 16 | Without connector (without solenoid, only with hydraulic controls) | ● | – | **0** |
| | (size 250 without code) | – | ● | |
| | DEUTSCH – molded connector, 2-pin – without suppressor diode | ● | – | **P** |
| | HIRSCHMANN connector – without suppressor diode (without code) | – | ● | |

**Beginning of control**

| | | | 28 | 55 | 80 | 107 | 160 | 250 | |
|---|---|---|---|---|---|---|---|---|---|
| 17 | Port plate 02, 37, 38 | at $V_{g\,min}$ (standard for HA) | ● | ● | ● | ● | ● | ● | **A** |
| | | at $V_{g\,max}$ (standard for HD, HZ, EP, EZ, DA) | ● | ● | ● | ● | ● | ● | **B** |
| | Port plate 22 | at $V_{g\,min}$ (standard for HA3) | – | ● | ● | ● | ● | – | **B** |
| | | at $V_{g\,max}$ (standard for HZ3) | – | ● | ● | ● | ● | – | **B** |

**Standard / special version**

| | | |
|---|---|---|
| 18 | Standard version (without code) | |
| | Standard version with installation variants (e. g. T ports against standard open or closed) | **-Y** |
| | Special version | **-S** |

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

3) Metric fastening thread
4) Only for HZ3 and HA3. Add specification of integrated counterbalance valve BVI, see separate ordering code on page 35. Note the restrictions on page 36.
5) Only possible in conjunction with HD, EP and HA1 and HA2 control
6) Specify ordering code of counterbalance valve according to data sheet (BVD – RE 95522, BVE - RE 95525) separately.
7) Note the restrictions on page 32.
8) Specify ordering code of sensor according to data sheet (DSA – RE 95133) separately and observe the requirements on the electronics.
9) Counterbalance valve MHB32, please contact us.

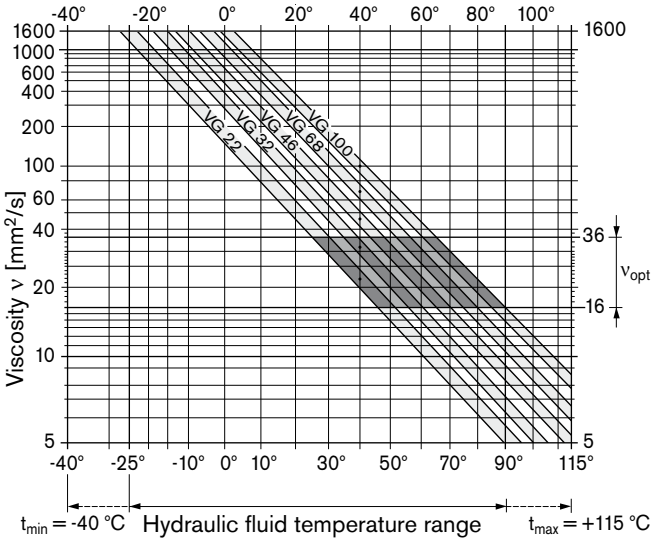
# Technical data

## Hydraulic fluid

Before starting project planning, please refer to our data sheets RE 90220 (mineral oil), RE 90221 (environmentally acceptable hydraulic fluids), RE 90222 (HFD hydraulic fluids) and RE 90223 (HFA, HFB, HFC hydraulic fluids) for detailed information regarding the choice of hydraulic fluid and application conditions.

The variable motor A6VE is not suitable for operation with HFA hydraulic fluid. If HFB, HFC, or HFD or environmentally acceptable hydraulic fluids are used, the limitations regarding technical data or other seals must be observed.

**Selection diagram**




**Details regarding the choice of hydraulic fluid**

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

The hydraulic fluid should be chosen so that the operating viscosity in the operating temperature range is within the optimum range ($\nu_{opt}$ see shaded area of the selection diagram). We recommended that the higher viscosity class be selected in each case.

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

**Note**

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

If the above conditions cannot be maintained due to extreme operating parameters, we recommend flushing the case with a flushing and boost pressure valve (see page 29).

**Viscosity and temperature of hydraulic fluid**

| | Viscosity [mm²/s] | Temperature | Comment |
|---|---|---|---|
| Transport and storage at ambient temperature | | $T_{min} \geq$ -50 °C<br>$T_{opt}$ = +5 °C to +20 °C | factory preservation: up to 12 months with standard, up to 24 months with long-term |
| (Cold) start-up[1] | $\nu_{max}$ = 1600 | $T_{St} \geq$ -40 °C | t ≤ 3 min, without load (p ≤ 50 bar), n ≤ 1000 rpm (sizes 28 to 160), n ≤ 0.25 • $n_{nom}$ (size 250) |
| Permissible temperature difference | | ΔT ≤ 25 K | between axial piston unit and hydraulic fluid |
| Warm-up phase | ν < 1600 to 400 | T = -40 °C to -25 °C | At p ≤ 0.7 • $p_{nom}$, n ≤ 0.5 • $n_{nom}$ and t ≤ 15 min |
| Operating phase | | | |
| Temperature difference | | ΔT = approx. 12 K | between hydraulic fluid in the bearing and at port T. |
| Maximum temperature | | 115 °C | in the bearing |
| | | 103 °C | measured at port T |
| Continuous operation | ν = 400 to 10<br>$\nu_{opt}$ = 36 to 16 | T = -25 °C to +90 °C | measured at port T, no restriction within the permissible data |
| Short-term operation[2] | $\nu_{min} \geq$ 7 | $T_{max}$ = +103 °C | measured at port T, t < 3 min, p < 0.3 • $p_{nom}$ |
| FKM shaft seal[1] | | T ≤ +115 °C | see page 5 |

1) At temperatures below -25 °C, an NBR shaft seal is required (permissible temperature range: -40 °C to +90 °C).
2) Size 250, please contact us.

# Technical data

## 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.

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

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

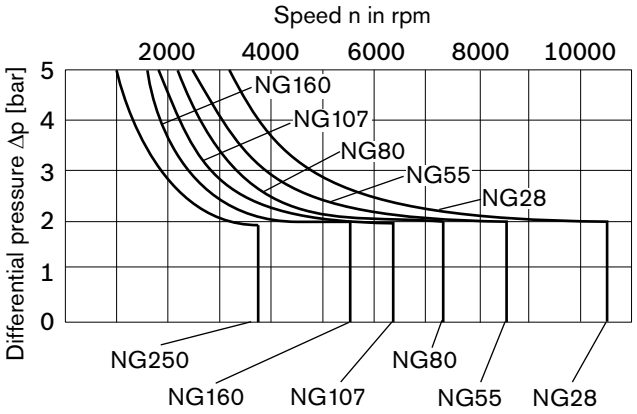
If the above classes cannot be achieved, please contact us.

## Shaft seal

### Permissible pressure loading

The service life of the shaft seal is influenced by the speed of the axial piston unit and the case drain pressure (case pressure). The mean differential pressure of 2 bar between the case and the ambient pressure may not be enduringly exceeded at normal operating temperature. For a higher differential pressure at reduced speed, see diagram. Momentary pressure spikes ($t < 0.1$ s) of up to 10 bar are permitted. The service life of the shaft seal decreases with an increase in the frequency of pressure spikes.

The case pressure must be equal to or higher than the ambient pressure.




The values are valid for an ambient pressure $p_{abs} = 1$ bar.

### Temperature range

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

**Note**
For application cases below -25 °C, an NBR shaft seal is required (permissible temperature range: -40 °C to +90 °C). State NBR shaft seal in plain text when ordering.
Please contact us.

## Influence of case pressure on beginning of control

An increase in case pressure affects the beginning of control of the variable motor when using the following control options:

HD, HA.T (sizes 28 to 160) _____ increase
HD, EP, HA, HA.T (size 250) _____ increase
DA _____ decrease

With the following controls, an increase in the case pressure has no influence on the beginning of control:
EP, HA (sizes 28 to 160)

The factory settings for the beginning of control are made at $p_{abs} = 2$ bar (sizes 28 to 160) or $p_{abs} = 1$ bar (size 250) case pressure.

## Direction of flow

| Direction of rotation, viewed on drive shaft | |
|---|---|
| **cw** | **ccw** |
| **A** to **B** | **B** to **A** |

# Technical data

## Operating pressure range

(operating with mineral oil)

**Pressure at service line port A or B**

Sizes 28 to 160

**Nominal pressure** $p_{nom}$ _____ 400 bar absolute

**Maximum pressure** $p_{max}$ _____ 450 bar absolute
Single operating period _____ 10 s
Total operating period _____ 300 h

Size 250

**Nominal pressure** $p_{nom}$ _____ 350 bar absolute

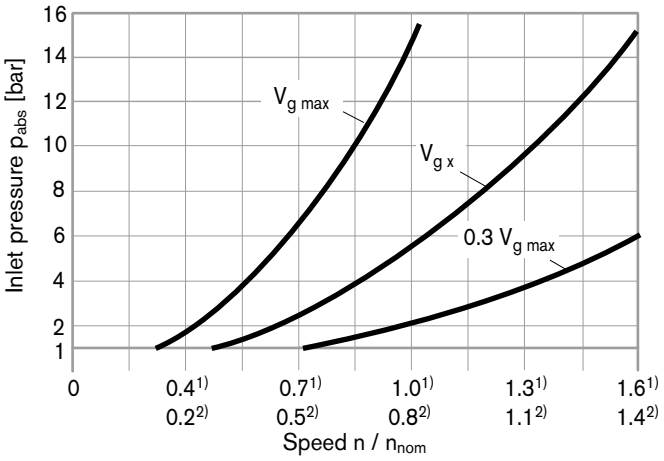
**Maximum pressure** $p_{max}$ _____ 400 bar absolute
Single operating period _____ 10 s
Total operating period _____ 300 h

**Minimum pressure (high-pressure side)** ___25 bar absolute

**Summation pressure** (pressure A + pressure B) $p_{Su}$ _ 700 bar

**Rate of pressure change** $R_{A\,max}$
with integrated pressure-relief valve _____ 9000 bar/s
without pressure-relief valve _____ 16000 bar/s

**Minimum pressure – pump mode (inlet)**
To prevent damage to the axial piston motor in pump operation mode (change of high-pressure side with unchanged direction of rotation, e. g. when braking), a minimum pressure must be guaranteed at the service line port (inlet). This minimum pressure is dependent on the speed and displacement of the axial piston unit (see characteristic curve below).




[1)] For sizes 28 to 160
[2)] For size 250

This diagram is valid only for the optimum viscosity range from $\nu_{opt}$ = 36 to 16 mm²/s.
Please contact us if the above conditions cannot be satisfied.

**Note**
Values for other hydraulic fluids, please contact us.

**Definition**

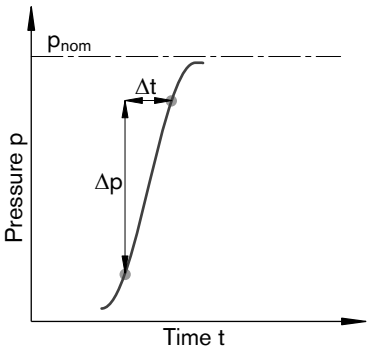
**Nominal pressure $p_{nom}$**
The nominal pressure corresponds to the maximum design pressure.

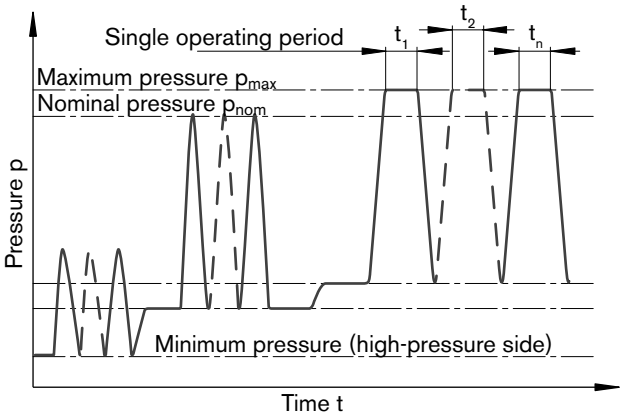
**Maximum pressure $p_{max}$**
The maximum pressure corresponds to the maximum operating pressure within the single operating period. The sum of the single operating periods must not exceed the total operating period.

**Minimum pressure (high-pressure side)**
Minimum pressure at the high-pressure side (A or B) which is required in order to prevent damage to the axial piston unit.

**Summation pressure $p_{Su}$**
The summation pressure is the sum of the pressures at both service line ports (A and B).

**Rate of pressure change $R_A$**
Maximum permissible rate of pressure rise and reduction during a pressure change over the entire pressure range.




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

# Technical data

**Table of values** (theoretical values, without efficiency and tolerances; values rounded)

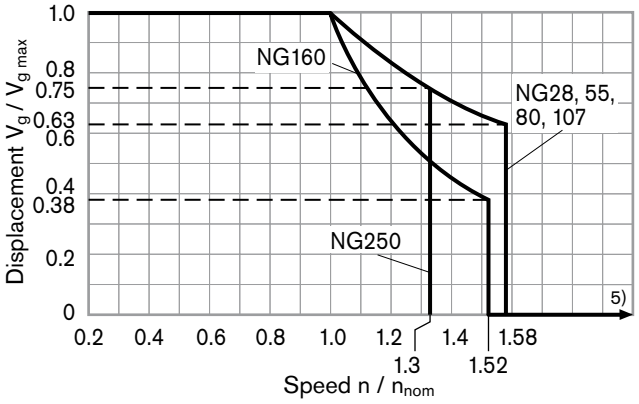
| Size | | NG | 28 | 55 | 80 | 107 | 160 | 250 |
|---|---|---|---|---|---|---|---|---|
| Displacement geometric[1], per revolution | $V_{g\,max}$ | $cm^3$ | 28.1 | 54.8 | 80 | 107 | 160 | 250 |
| | $V_{g\,min}$ | $cm^3$ | 0 | 0 | 0 | 0 | 0 | 0 |
| | $V_{g\,x}$ | $cm^3$ | 18 | 35 | 51 | 68 | 61 | 188 |
| Speed maximum[2] (while adhering to the maximum permissible input flow) | | | | | | | | |
| at $V_{g\,max}$ | $n_{nom}$ | rpm | 5550 | 4450 | 3900 | 3550 | 3100 | 2700 |
| At $V_g < V_{g\,x}$ (see diagram below) | $n_{max}$ | rpm | 8750 | 7000 | 6150 | 5600 | 4900 | 3600 |
| at $V_{g\,0}$ | $n_{max}$ | rpm | 10450 | 8350 | 7350 | 6300 | 5500 | 3600 |
| Input flow[3] | | | | | | | | |
| at $n_{nom}$ and $V_{g\,max}$ | $q_{V\,max}$ | L/min | 156 | 244 | 312 | 380 | 496 | 675 |
| Torque[4] | | | | | | | | |
| At $V_{g\,max}$ and $\Delta p = 400$ bar | T | Nm | 179 | 349 | 509 | 681 | 1019 | – |
| At $V_{g\,max}$ and $\Delta p = 350$ bar | T | Nm | 157 | 305 | 446 | 596 | 891 | 1391 |
| Rotary stiffness | | | | | | | | |
| $V_{g\,max}$ to $V_{g/2}$ | $c_{min}$ | KNm/rad | 6 | 10 | 16 | 21 | 35 | 60 |
| $V_{g/2}$ to 0 (interpolated) | $c_{max}$ | KNm/rad | 18 | 32 | 48 | 65 | 105 | 181 |
| Moment of inertia for rotary group | $J_{GR}$ | $kgm^2$ | 0.0014 | 0.0042 | 0.008 | 0.0127 | 0.0253 | 0.061 |
| Maximum angular acceleration | $\alpha$ | $rad/s^2$ | 47000 | 31500 | 24000 | 19000 | 11000 | 10000 |
| Case volume | V | L | 0.5 | 0.75 | 1.2 | 1.5 | 2.4 | 3.0 |
| Mass (approx.) | | | | | | | | |
| Port plate 02, 37, 38 | m | kg | 16 | 26 | 34 | 47 | 64 | 90 |
| Port plate 22 | m | kg | – | 35 | 43 | 53 | 72 | – |

1) The minimum and maximum displacement are infinitely adjustable, see ordering code, page 2. (standard setting for size 250 if not specified in the order: $V_{g\,min} = 0.2 \bullet V_{g\,max}$, $V_{g\,max} = V_{g\,max}$).
2) The values are valid:
- for the optimum viscosity range from $\nu_{opt} = 36$ to 16 $mm^2/s$
- with hydraulic fluid based on mineral oils
3) Restriction of input flow with counterbalance valve, see page 32
4) Torque without radial force, with radial force see page 8

**Note**

Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. Other permissible limit values, with respect to speed variation, reduced angular acceleration as a function of the frequency and the permissible startup angular acceleration (lower than the maximum angular acceleration) can be found in data sheet RE 90261.

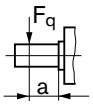
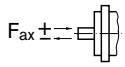
**Permissible displacement in relation to speed**




5) Values in this range on request

# Technical data

## Permissible radial and axial forces of the drive shafts

| Size | | NG | | 28 | 55 | 80 | 107 | 160 | 250 |
|---|---|---|---|---|---|---|---|---|---|
| Drive shaft | | ø | mm | 30 | 30 | 40 | 40 | 50 | 50 |
| Maximum radial force[1] at distance a (from shaft collar) |   | $F_{q\,max}$ | N | 4838 | 7581 | 10283 | 13758 | 16435 | 1200[3] |
| | | a | mm | 17.5 | 17.5 | 22.5 | 22.5 | 27.5 | 41 |
| with permissible torque | | $T_{max}$ | Nm | 179 | 281 | 509 | 681 | 1019 | [4] |
| ≙ Permissible pressure Δp at $V_{g\,max}$ | | $p_{nom\,perm.}$ | bar | 400 | 322 | 400 | 400 | 400 | [4] |
| Maximum axial force[2] |   | $+F_{ax\,max}$ | N | 315 | 500 | 710 | 900 | 1120 | 1200 |
| | | $-F_{ax\,max}$ | N | 0 | 0 | 0 | 0 | 0 | 0 |
| Permissible axial force per bar operating pressure | | $F_{ax\,perm./bar}$ | N/bar | 4.6 | 7.5 | 9.6 | 11.3 | 15.1 | [4] |

1) With intermittent operation.
2) Maximum permissible axial force during standstill or when the axial piston unit is operating in non-pressurized condition.
3) When at a standstill or when axial piston unit operating in non-pressurized conditions. Higher forces are permissible when under pressure, please contact us.
4) Please contact us.

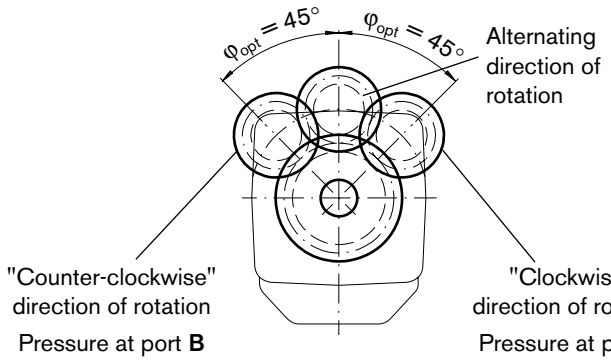
**Note**
Influence of the direction of the permissible axial force:

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

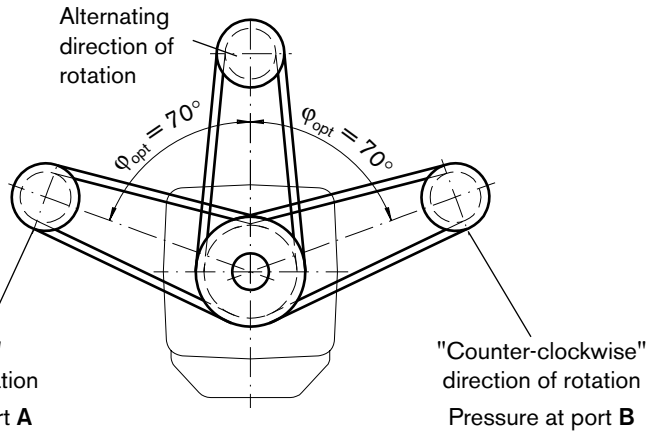
### Effect of radial force $F_q$ on the service life of bearings

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 service life of the bearings. Recommended position of mating gear is dependent on direction of rotation. Examples:

**Toothed gear drive**




**V-belt drive**




### Determining the operating characteristics

Input flow $q_v = \frac{V_g \cdot n}{1000 \cdot \eta_v}$ [L/min]

Speed $n = \frac{q_V \cdot 1000 \cdot \eta_v}{V_g}$ [min$^{-1}$]

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

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

$V_g$ = Displacement per revolution in cm$^3$
$\Delta p$ = Differential pressure in bar
$n$ = Speed in rpm
$\eta_v$ = Volumetric efficiency
$\eta_{mh}$ = Mechanical-hydraulic efficiency
$\eta_t$ = Total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

# EP – Proportional control electric

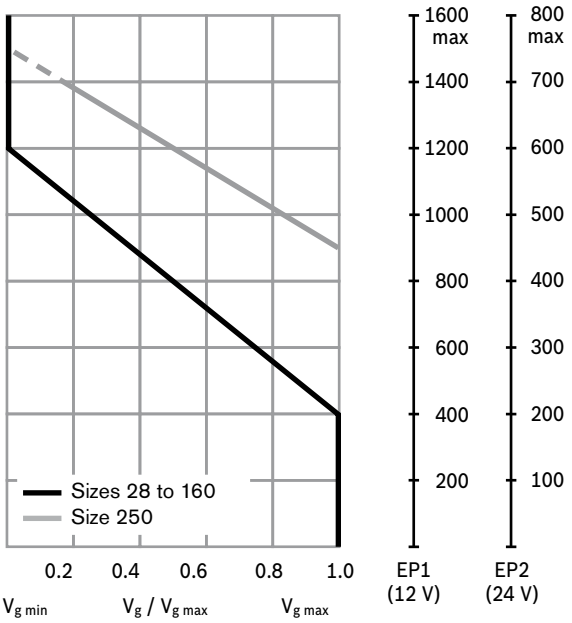
The proportional electric control provides infinite setting of the displacement, proportional to the control current applied to the solenoid (sizes 28 to 200) or proportional valve (sizes 250).

For size 250, the pilot oil supply at port P requires an external pressure of $p_{min} = 30$ bar ($p_{max} = 100$ bar).

– Beginning of control at $V_{g\,max}$ (maximum torque, minimum speed at minimum control current)

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

**Characteristic**




**Note**

The control oil is internally taken out of the high-pressure side of the motor (A or B). For reliable control, an operating pressure of at least 30 bar is required in A (B). If a control operation is performed at an operating pressure < 30 bar, an auxiliary pressure of at least 30 bar must be applied at port G via an external check valve. For lower pressures, please contact us.
Please note that pressures up to 450 bar can occur at port G.

The following only needs to be noted for size 250:

– The beginning of control and the EP characteristic are influenced by the case pressure. An increase in case pressure causes an increase in the beginning of control (see page 5) and thus a parallel shift of the characteristic.

**Technical data, solenoid**
Sizes 28 to 160

| | EP1 | EP2 |
|---|---|---|
| Voltage | 12 V (±20 %) | 24 V (±20 %) |
| Control current | | |
| Beginning of control | 400 mA | 200 mA |
| End of control | 1200 mA | 600 mA |
| Limiting current | 1.54 A | 0.77 A |
| Nominal resistance (at 20 °C) | 5.5 Ω | 22.7 Ω |
| Dither frequency | 100 Hz | 100 Hz |
| Duty cycle | 100 % | 100 % |
| Type of protection see connector design page 28 | | |

The following electronic controllers and amplifiers are available for controlling the proportional solenoids:

– BODAS controller RC
  Series 20 ____ RE 95200
  Series 21 ____ RE 95201
  Series 22 ____ RE 95202
  Series 30 ____ RE 95203, RE 95204
  and application software

– Analog amplifier RA ____ RE 95230

– Electric amplifier VT 2000, series 5X (see RE 29904) (for stationary application)

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

**Technical data, proportional valve**
Size 250

| | EP1 | EP2 |
|---|---|---|
| Voltage | 12 V (±20 %) | 24 V (±20 %) |
| Beginning of control at $V_{g\,max}$ | 900 mA | 450 mA |
| End of control at $V_{g\,min}$ | 1400 mA | 700 mA |
| Limiting current | 2.2 A | 1.0 A |
| Nominal resistance (at 20 °C) | 2.4 Ω | 12 Ω |
| Duty cycle | 100 % | 100 % |
| Type of protection see connector design page 28 | | |

See also proportional pressure-reducing valve DRE 4K (RE 29181).

Note

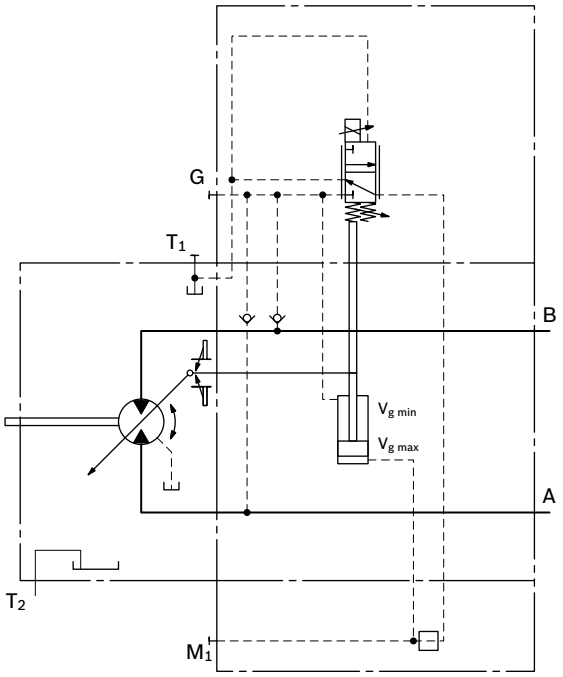
**The spring return feature in the control part is not a safety device**

The control part can stick in an undefined position by internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the control will no longer respond correctly to the operator's commands.

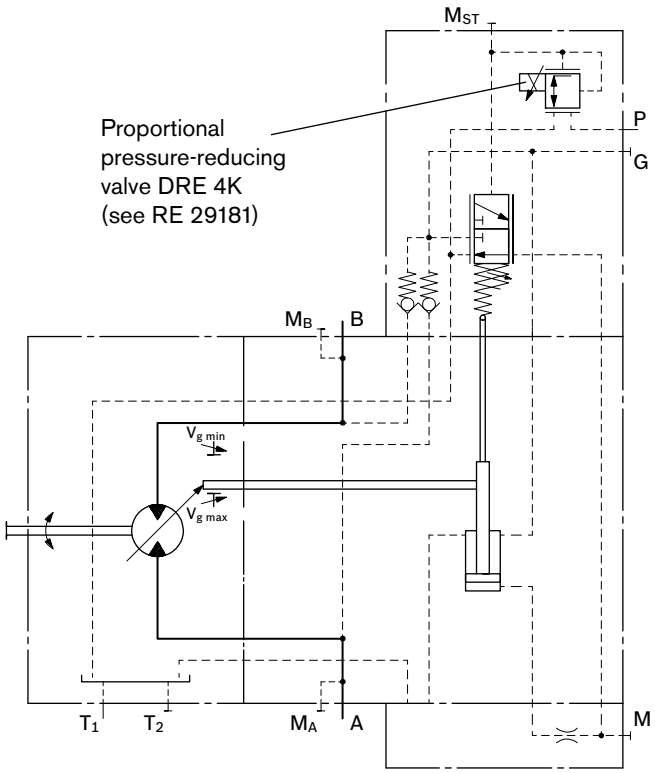
Check whether the application on your machine requires additional safety measures, in order to bring the driven actuator into a controlled and safe position (immediate stop). If necessary, make sure these are properly implemented.

# EP – Proportional control electric

**Schematic EP1, EP2**
Sizes 28 to 160




**Schematic EP1, EP2**
Size 250



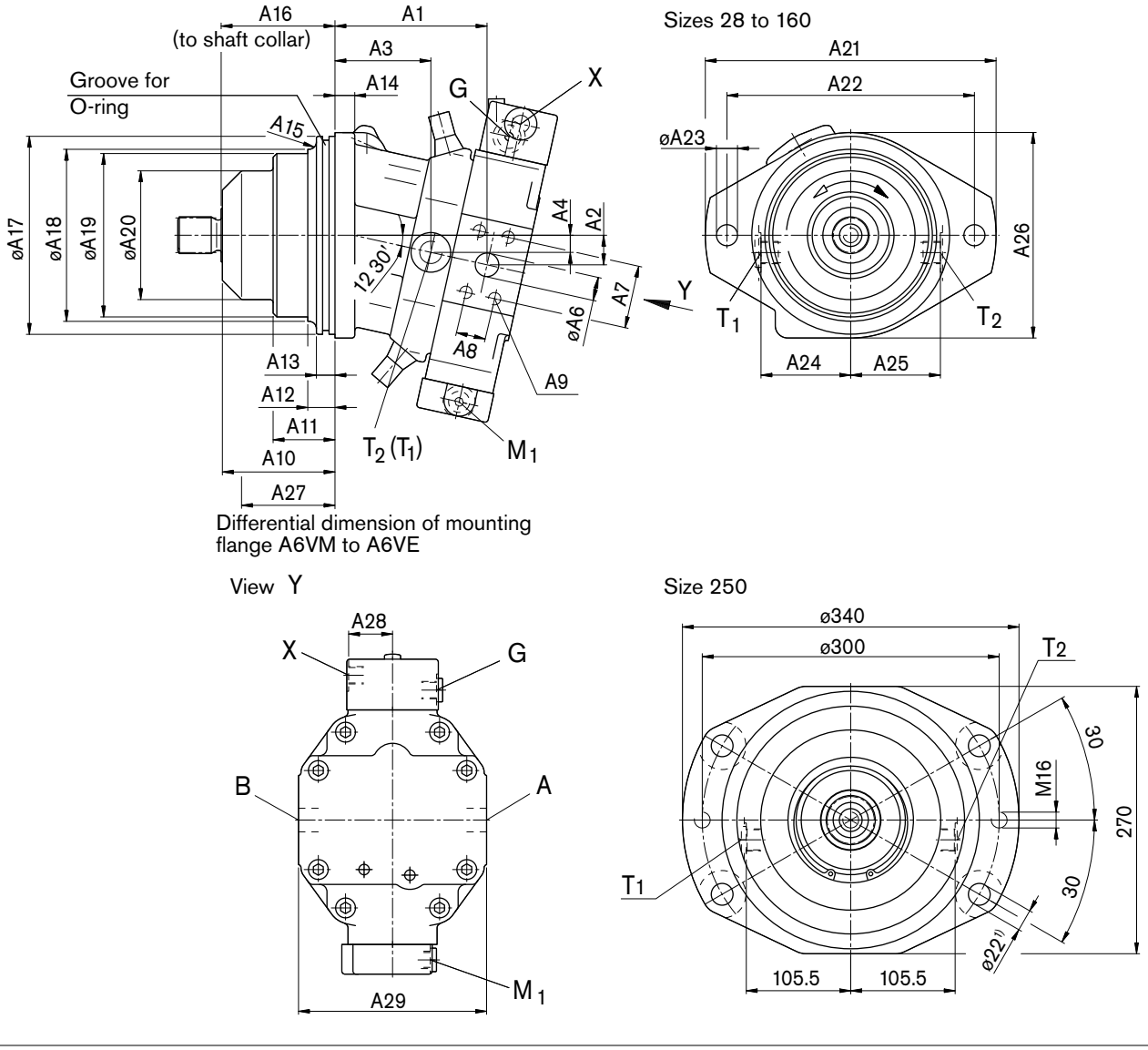
# Dimensions

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

## HD1, HD2 – Proportional control hydraulic

Port plate 02 – SAE flange port A and B at side, opposite

For dimensions of control devices, see data sheet for variable motor A6VM (RE 91604)




## Ports

| Size | Service line port A, B<br>SAE J518 | Drain port $T_1$; $T_2$ [2]<br>DIN 3852 [3] |
|---|---|---|
| 28 | 3/4 in | M18 x 1.5; 12 deep |
| 55 | 3/4 in | M18 x 1.5; 12 deep |
| 80 | 1 in | M18 x 1.5; 12 deep |
| 107 | 1 in | M18 x 1.5; 12 deep |
| 160 | 1 1/4 in | M26 x 1.5; 16 deep |
| 250 | 1 1/4 in | M22 x 1.5; 14 deep |

1) Hole ø22 with spot face ø48; 2 deep

2) 1x plugged

3) Observe the general instructions on page 40 for the maximum tightening torques.

For further ports, see variable motor A6VM (RE 91604)!

# Dimensions

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

**Standard flange L** (sizes 28 to 160), **M** (size 250)

| NG | A1 | A2 | A3 | A4 | øA6 | A7 | A8 | A9 (DIN 13)[2] | A10 | A11 | A12 | A13 | A14 | A15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **28** | 91 | 20 | 47 | 10 | ø19 | 50.8 | 23.8 | M10 x 1.5; 17 deep | 88 | 54 | – | 15 | 14 | R10 |
| **55** | 123 | 24 | 77 | 14 | ø19 | 50.8 | 23.8 | M10 x 1.5; 17 deep | 91 | 50 | 22 | 15 | 16 | R6 |
| **80** | 129 | 28 | 78 | 16 | ø25 | 57.2 | 27.8 | M12 x 1.75; 17 deep | 109.5 | 65 | 30 | 15 | 18 | R10 |
| **107** | 137 | 30 | 84 | 18 | ø25 | 57.2 | 27.8 | M12 x 1.75; 17 deep | 121.8 | 72 | 35 | 15 | 18 | R12 |
| **160** | 171 | 34 | 109 | 20 | ø32 | 66.7 | 31.8 | M14 x 2; 19 deep | 122 | 67 | 29 | 15 | 20 | R5 |
| **250** | 204 | 44 | 103 | 20 | ø32 | 66.7 | 31.8 | M14 x 2; 19 deep | 131.5 | – | – | 14 | 25[1] | – |

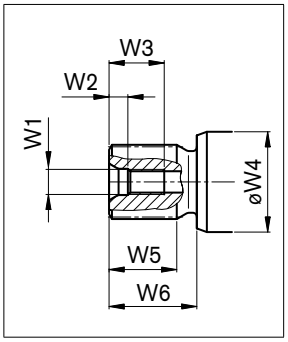
| NG | A16[3] | A17 | A18 | A19 | A20 | A21 | A22 | øA23 | A24 | A25 | A26 | A27 | A28 | A29 | O-ring[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **28** | 89 | $135_{-0.025}$ | 110 | – | 86 | 188 | 160 | ø13.5 | 62.5 | 62.5 | 142 | 64 | 35.5 | 132 | 126x4 |
| **55** | 92 | $160_{-0.025}$ | 139 | 132 | 104 | 235 | 200 | ø17 | 72.5 | 72.5 | 166 | 59 | 35.5 | 152 | 150x4 |
| **80** | 110.5 | $190_{-0.029}$ | 151 | 143 | 116 | 260 | 224 | ø21 | 78.5 | 78.5 | 198 | 79 | 35.5 | 164 | 182x4 |
| **107** | 122.8 | $200_{-0.029}$ | 168 | 160 | 132 | 286 | 250 | ø21 | 86.5 | 86.5 | 210 | 82 | 40.5 | 180 | 192x4 |
| **160** | 123 | $200_{-0.029}$ | 188 | 180 | 146 | 286 | 250 | ø21 | 98.5 | 98.5 | 210 | 83 | 40.5 | 204 | 192x4 |
| **250** | 133.5 | $260_{-0.081}$ | 230 | – | – | – | – | – | – | – | – | 83.5 | 48.5 | 224 | 250x5 |

**Adapter flange U** (size 107)

| NG | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 (DIN 13)[2] | A10 | A11 | A12 | A13 | A14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **107** | 150 | 30 | 96 | 18 | 15.5 | 25 | 57.2 | 27.8 | M12 x 1.75; 17 deep | 109.5 | 59.7 | 22.7 | 18 | 15 |

| NG | A15 | A16 | A17 | A18 | A19 | A20 | A21 | A22 | A23 | A24 | A25 | A26 | A27 | A28 | A29 | O-ring[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **107** | R8 | 110.5 | $190_{-0.025}$ | 168 | 160 | 132 | 260 | 224 | 22 | 86.5 | 86.5 | 198 | 91.5 | 13.8 | 70 | 182x4 |

## Drive shafts




| NG | Splined shaft DIN 5480 | W1[2)5] | W2 | W3 | øW4 | W5 | W6 |
|---|---|---|---|---|---|---|---|
| 28 | **A** (W30x2x14x9g) | M10 x 1.5 | 7.5 | 22 | ø35 | 27 | 35 |
| 55 | **Z** (W30x2x14x9g) | M12 x 1.75 | 9.5 | 28 | ø45 | 27 | 35 |
| 80 | **A** (W40x2x18x9g) | M16 x 2 | 12 | 36 | ø50 | 37 | 45 |
| 107 | **Z** (W40x2x18x9g) | M12 x 1.75 | 9.5 | 28 | ø60 | 37 | 45 |
| 160 | **A** (W50x2x24x9g) | M16 x 2 | 12 | 36 | ø70 | 44 | 55 |
| 250 | **Z** (W50x2x24x9g) | M16 x 2 | 12 | 36 | ø60 | 49 | 58 |

1) Hole ø22 with spot face ø48; 2 deep
2) Observe the general instructions on page 40 for the maximum tightening torques.
3) To shaft collar
4) The O-ring is not included in the delivery contents
5) Center bore according to DIN 332 (thread according to DIN 13)

# Connector for solenoids

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

## DEUTSCH DT04-2P-EP04

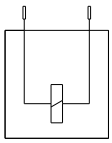
**Sizes 28 to 160**

Molded, 2-pin, without bidirectional suppressor diode

There is the following type of protection with mounted mating connector:
IP67 _____ DIN/EN 60529

and IP69K _____ DIN 40050-9

**Circuit symbol**



**Mating connector**

DEUTSCH DT06-2S-EP04
Bosch Rexroth Mat. No. R902601804

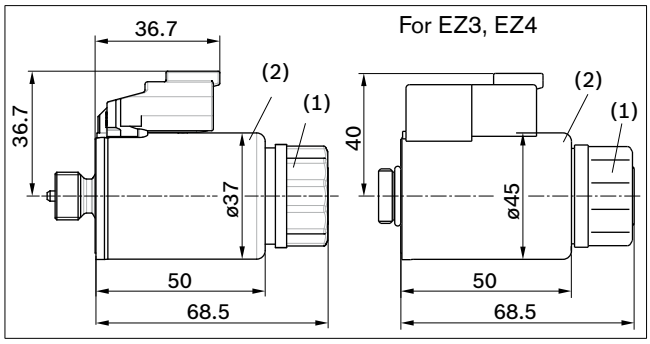
Consisting of: DT designation

– 1 housing _____ DT06-2S-EP04

– 1 wedge _____ W2S

– 2 sockets _____ 0462-201-16141

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




## HIRSCHMANN DIN EN 175 301-803-A/ISO 4400

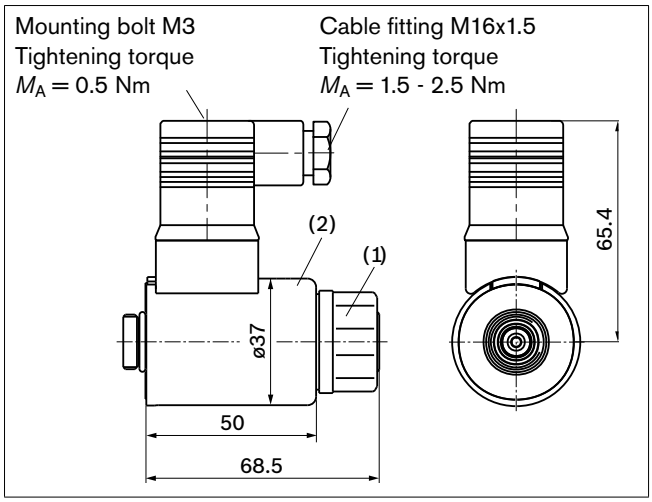
**Size 250**

Without bidirectional suppressor diode

There is the following type of protection with mounted mating connector:
IP65 _____ DIN/EN 60529

The seal ring in the cable fitting is suitable for line diameters of 4.5 mm to 10 mm.

The HIRSCHMANN connector is included in the delivery contents of the motor.




**Changing connector orientation**

If necessary, you can change the connector orientation by turning the solenoid housing.

To do this, proceed as follows:

1. Loosen the mounting nut (1) of the solenoid. To do this, turn the mounting nut (1) one turn counter-clockwise.
2. Turn the solenoid body (2) to the desired orientation.
3. Retighten the mounting nut. Tightening torque: 5+1 Nm. (WAF26, 12-sided DIN 3124)

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

# Flushing and boost pressure valve

The flushing and boost pressure valve is used to remove heat from the hydraulic circuit.

In an open circuit, it is used only for flushing the housing.

In a closed circuit, it ensures a minimum boost pressure level in addition to the case flushing.

Hydraulic fluid is directed from the respective low pressure side into the motor housing. This is then fed into the reservoir, together with the case drain fluid. The hydraulic fluid, removed out of the closed circuit must be replaced by cooled hydraulic fluid from the boost pump.

The valve is mounted onto the port plate or integrated (depending on the control type and size).

**Cracking pressure of pressure retaining valve**
(observe when setting the primary valve)
fixed setting _____ 16 bar

**Switching pressure of flushing piston $\Delta p$** _____ 8±1 bar

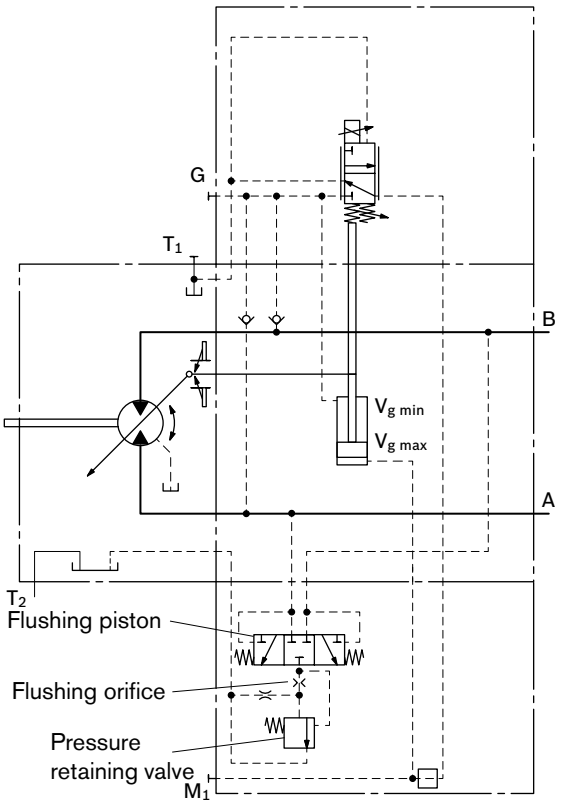
**Flushing flow $q_v$**

Orifices can be used to set the flushing flows as required.
Following parameters are based on:
$\Delta p_{ND} = p_{ND} - p_G = 25$ bar and $\nu = 10$ mm²/s
($p_{ND}$ = low pressure, $p_G$ = case pressure)

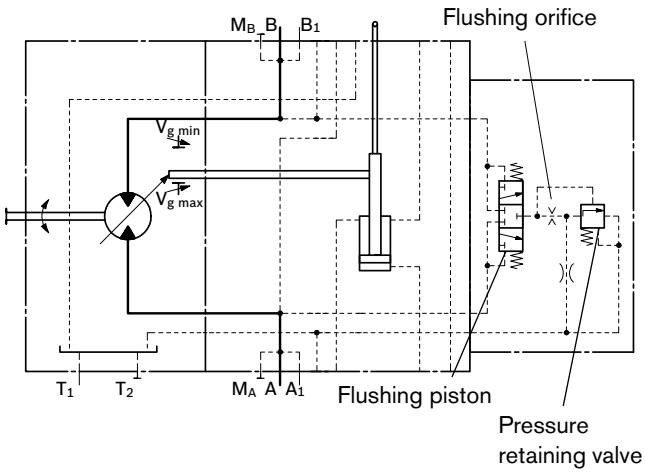
| Size | Flushing flow $q_V$ [L/min] | Mat. No. of orifice |
|---|---|---|
| **28, 55** | 3.5 | R909651766 |
| **80** | 5 | R909419695 |
| **107** | 8 | R909419696 |
| **160** | 10 | R909419697 |
| **250** | 10 | R909419697 |

With sizes 28 to 160, orifices can be supplied for flushing flows from 3.5 to - 10 L/min. For other flushing flows, please state the required flushing flow when ordering. The flushing flow without orifice is approx. 12 to 14 L at low pressure $\Delta p_{ND} = 25$ bar.

**Schematic EP**
Sizes 28 to 160




**Schematic**
Size 250

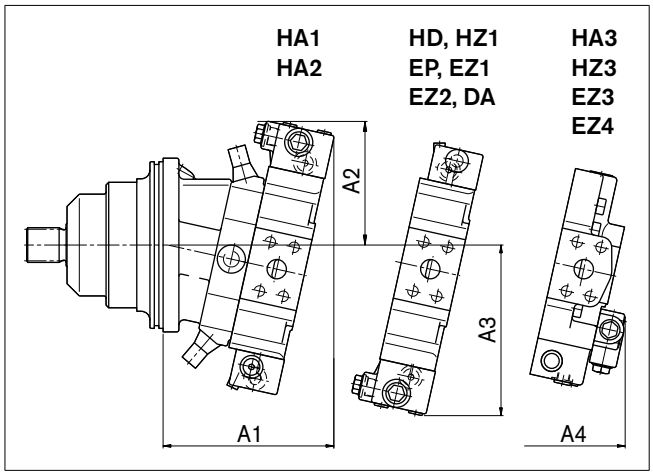


# Flushing and boost pressure valve

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

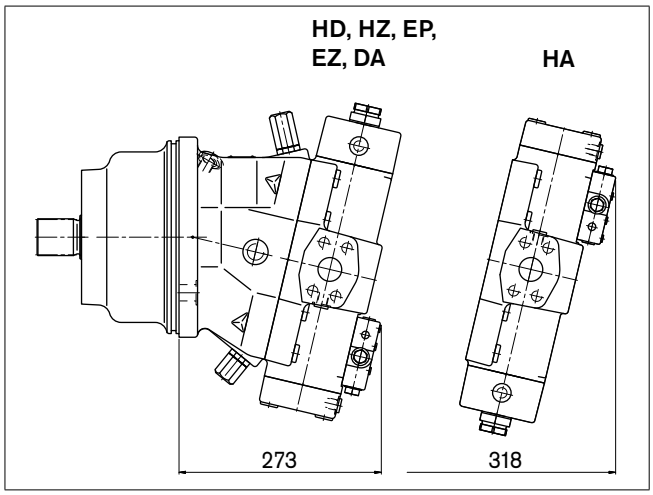
## Dimensions

### Sizes 28 to 160




| NG | A1 | A2 | A3 | A4 |
|---|---|---|---|---|
| 28 | 152 | 125 | 161 | – |
| 55 | 182 | 133 | 176 | 176 |
| 80 | 194 | 141 | 192 | 176 |
| 107 (L flange) | 204 | 143 | 202 | 186 |
| 107 (U flange) | 217 | 143 | 202 | 199 |
| 160 | 245 | 154 | 220 | – |

### Size 250



# Installation instructions

## General

During commissioning and operation, the axial piston unit must be filled with hydraulic fluid and air bled. This must also be observed following a relatively long standstill as the axial piston unit may drain back to the reservoir via the hydraulic lines.

The case drain fluid in the motor housing must be directed to the reservoir via the highest available drain port ($T_1$, $T_2$).

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

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

In all operating conditions, the drain line must flow into the reservoir below the minimum fluid level.

## Installation position

See the following examples 1 to 6.
Further installation positions are possible upon request.

Recommended installation positions: 1 and 2.

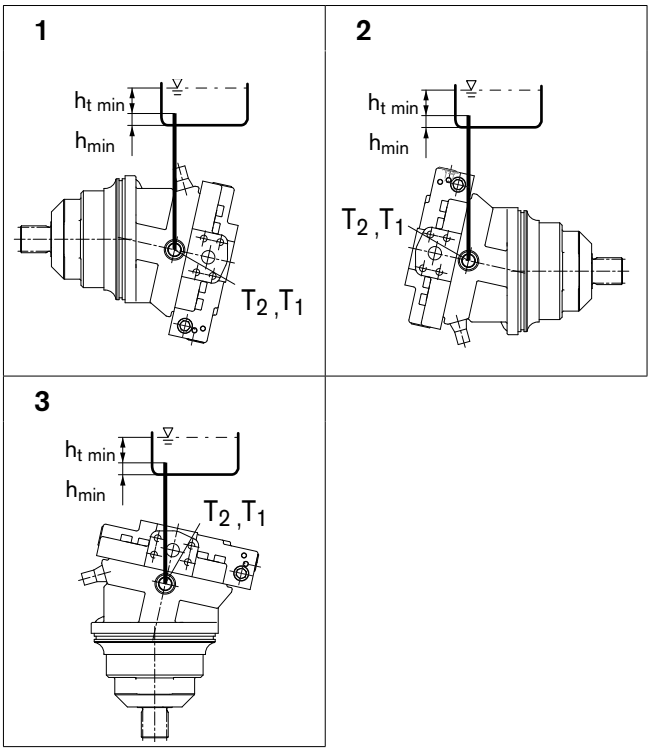
**Note**
In certain installation conditions, an influence on the control characteristics can be expected. Gravity, dead weight and case pressure can cause minor shifts in control characteristics and changes in response time.

| Installation position | Air bleed | Filling |
|---|---|---|
| 1 | – | $T_2$, $T_1$ |
| 2 | – | $T_2$, $T_1$ |
| 3 | – | $T_2$, $T_1$ |
| 4 | $L_1$ | $T_2$, $T_1$ ($L_1$) |
| 5 | $L_1$ | $T_2$, $T_1$ ($L_1$) |
| 6 | $L_1$ | $T_2$, $T_1$ ($L_1$) |

| | |
|---|---|
| **$L_1$** | Filling / air bleed |
| **$T_1$, $T_2$** | Drain port |
| **$h_{t\,min}$** | Minimum required immersion depth (200 mm) |
| **$h_{min}$** | Minimum required spacing to reservoir bottom (100 mm) |

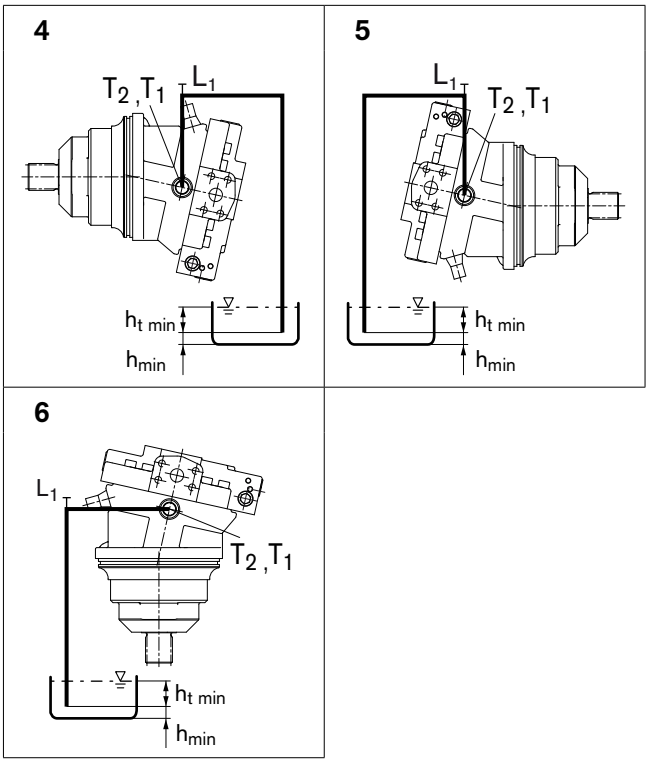
**Below-reservoir installation (standard)**

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




**Above-reservoir installation**

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



# General instructions

– The motor A6VE is designed to be used in open and closed circuits.

– The project planning, installation and commissioning of the axial piston unit requires the involvement of qualified personnel.

– Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, these can be requested from Bosch Rexroth.

– During and shortly after operation, there is a risk of burns on the axial piston unit and especially on the solenoids. Take appropriate safety measures (e. g. by wearing protective clothing).

– Depending on the operating conditions of the axial piston unit (operating pressure, fluid temperature), the characteristic may shift.

– Service line 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 service line ports and function ports can only be used to accommodate hydraulic lines.

– The data and notes contained herein must be adhered to.

– The product is not approved as a component for the safety concept of a general machine according to ISO 13849.

– The following tightening torques apply:

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

  - Mounting bolts:
    For mounting bolts with metric ISO threads according to DIN 13, we recommend checking the tightening torque in individual cases in accordance with VDI 2230.

  - Female threads in the axial piston unit:
    The maximum permissible tightening torques $M_{G\,max}$ are maximum values for the female threads and must not be exceeded. For values, see the following table.

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

| Ports<br>Standard | Size of thread | Maximum permissible tightening torque of the female threads $M_{G\,max}$ | Required tightening torque of the threaded plugs $M_V$[1)] | WAF hexagon socket of the threaded plugs |
|---|---|---|---|---|
| DIN 3852 | M12 x 1.5 | 50 Nm | 25 Nm[2)] | 6 mm |
| | M14 x 1.5 | 80 Nm | 35 Nm | 6 mm |
| | M16 x 1.5 | 100 Nm | 50 Nm | 8 mm |
| | M18 x 1.5 | 140 Nm | 60 Nm | 8 mm |
| | M22 x 1.5 | 210 Nm | 80 Nm | 10 mm |
| | M26 x 1.5 | 230 Nm | 120 Nm | 12 mm |
| | M27 x 2 | 330 Nm | 135 Nm | 12 mm |
| | M33 x 2 | 540 Nm | 225 Nm | 17 mm |
| | M42 x 2 | 720 Nm | 360 Nm | 22 mm |

1) The tightening torques apply for screws in the "dry" state as received on delivery and in the "lightly oiled" state for installation.

2) In the "lightly oiled" state, the $M_V$ is reduced to 17 Nm for M12 x 1.5.

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