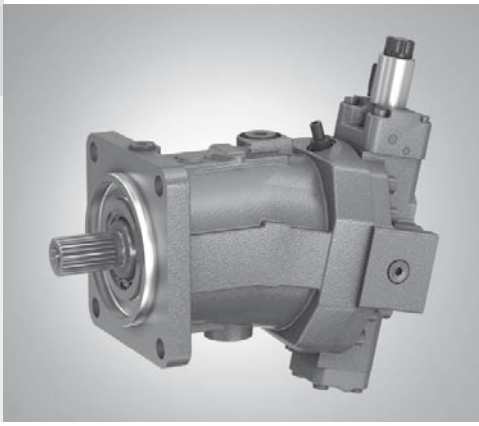
Rexroth
Bosch Group

Axial Piston Variable Motor A6VM (US-Version)

RA-A 91610/04.13 1/74
Replaces: 06.12

Data sheet



Series 71
Sizes 60 to 215
Nominal pressure 6500 psi (450 bar)
Maximum pressure 7250 psi (500 bar)
Open and closed circuits

Contents

Features

- Variable motor with axial tapered piston rotary group of bent-axis design, for hydrostatic drives in open and closed circuits
- For use in mobile and stationary applications
- The wide control range enables the variable motor to satisfy the requirement for high speed and high torque.
- The displacement can be infinitely changed from $V_{g\,max}$ to $V_{g\,min} = 0$.
- 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.
- Wide control range with hydrostatic transmissions
- Wide selection of control devices
- Cost savings through elimination of gear shifts and possibility of using smaller pumps
- Compact, robust motor with long service life
- High power density
- Good starting characteristics
- Version with 9-piston rotary group
- Good low speed characteristics
- High uniformity

Ordering code for standard program

A6V	M					0	0			/	71	A	W	V	0						–	
01	02	03	04	05	06	07	08	09	10		11	12	13	14	15	16	17	18	19	20		21

Axial piston unit

01	Bent-axis design, variable, nominal pressure 6500 psi (450 bar), maximum pressure 7250 psi (500 bar)	**A6V**

Operating mode

02	Motor	**M**

Sizes (NG)

03	Geometric displacement, see table of values on page 8	in cm^3/rev	**060**	**085**	**115**	**150**	**170**	**215**
		in in^3/rev	**3.66**	**5.19**	**7.02**	**9.15**	**10.37**	**13.12**

	Control devices			060	085	115	150	170	215	
04	Proportional control hydraulic	positive control	Δp_{St} = 145 psi (10 bar)	●	●	●	●	●	●	**HP1**
			Δp_{St} = 365 psi (25 bar)	●	●	●	●	●	●	**HP2**
		negative control	Δp_{St} = 145 psi (10 bar)	●	●	●	●	●	●	**HP5**
			Δp_{St} = 365 psi (25 bar)	●	●	●	●	●	●	**HP6**
	Proportional control electric	positive control	U = 12 V DC	●	●	●	●	●	●	**EP1**
			U = 24 V DC	●	●	●	●	●	●	**EP2**
		negative control	U = 12 V DC	●	●	●	●	●	●	**EP5**
			U = 24 V DC	●	●	●	●	●	●	**EP6**
	Two-point control hydraulic	negative control		–	–	–	●	●	●	**HZ5**
				●	●	●	–	–	–	**HZ7**
	Two-point control electric	negative control	U = 12 V DC	–	–	–	●	●	●	**EZ5**
			U = 24 V DC	–	–	–	●	●	●	**EZ6**
			U = 12 V DC	●	●	●	–	–	–	**EZ7**
			U = 24 V DC	●	●	●	–	–	–	**EZ8**
	Automatic control high-pressure related, positive control	with minimum pressure increase	$\Delta p \leq$ approx 145 psi (10 bar)	●	●	●	●	●	●	**HA1**
		with pressure increase	Δp =1450 psi (100 bar)	●	●	●	●	●	●	**HA2**
	Automatic control speed-related, negative control p_{St}/p_{HD} = 5/100	hydr. travel direction valve		●	●	●	●	●	●	**DA0**
		elect. travel direction valve + electric $V_{g\,max}$ circuit	U = 12 V DC	●	●	●	●	●	●	**DA1**
			U = 24 V DC	●	●	●	●	●	●	**DA2**

	Pressure control/overrides			060	085	115	150	170	215	
05	Without pressure control/override			●	●	●	●	●	●	**00**
	Pressure control fixed setting, only for HP5, HP6, EP5 and EP6			●	●	●	●	●	●	**D1**
	Override of the HA1 and HA2 controls	hydraulic remote control, proportional		●	●	●	●	●	●	**T3**
		electric, two-point	U = 12 V DC	●	●	●	●	●	●	**U1**
			U = 24 V DC	●	●	●	●	●	●	**U2**
		electric and travel direction valve, electric	U = 12 V DC	●	●	●	●	●	●	**R1**
			U = 24 V DC	●	●	●	●	●	●	**R2**

	Connector for solenoids[1] (see page 62)	060	085	115	150	170	215	
06	Without connector (without solenoid, only with hydraulic controls)	●	●	●	●	●	●	**0**
	DEUTSCH - molded connector, 2-pin – without suppressor diode	●	●	●	●	●	●	**P**

● = Available ❍ = On request – = Not available

1) Connectors for other electric components can deviate.

Ordering code for standard program

A6V	M					0	0			/	71	A	W	V	0						–	
01	02	03	04	05	06	07	08	09	10		11	12	13	14	15	16	17	18	19	20		21

Additional function 1

07	Without additional function	0

Additional function 2

08	Without additional function	0

Response time damping (for selection, see control)

09	Without damping (standard with HP and EP)		0
	With damping	HP, EP, HP5,6D. and EP5,6D., HZ, EZ, HA with counterbalance valve BVD/BVE	1
		One-sided in inlet to large stroking chamber (HA)	4
		One-sided in outlet from large stroking chamber (DA)	7

Setting ranges for displacement[2)]

			060	085	115	150	170	215	
10	$V_{g\,max}$-adjusting screw	$V_{g\,min}$-adjusting screw							
	Without adjusting screw	short (0-adjustable)	●	●	●	●	●	●	A
		medium	●	●	●	●	●	●	B
		long	●	●	●	●	●	●	C
		extra long	–	–	●	●	●	●	D
	Short	short (0-adjustable)	●	●	●	●	●	●	E
		medium	●	●	●	●	●	●	F
		long	●	●	●	●	●	●	G
		extra long	–	–	●	●	●	●	H
	Medium	short (0-adjustable)	●	●	●	●	●	●	J
		medium	●	●	●	●	●	●	K
		long	●	●	●	●	●	●	L
		extra long	–	–	●	●	●	●	M

Series

11	Series 7, index 1	71

Configuration of ports and fastening threads

12	ANSI, port threads with O-ring seal according to ISO 11926	A

Direction of rotation

13	Viewed on drive shaft, bidirectional	W

Seals

14	FKM (fluor-caoutchouc)	V

Drive shaft bearing

15	Standard bearing	0

Mounting flanges

			060	085	115	150	170	215	
16	SAE J744	127-4	●	–	–	–	–	–	C4
		127-2	–	●	–	–	–	–	C2
		152-4	–	–	●	●	●	–	D4
		165-4	–	–	–	–	–	●	E4

● = Available ❍ = On request – = Not available

2) The settings for the adjusting screws can be found in the table (pages 70 and 71).

Ordering code for standard program

A6V	M					0	0			/	71	A	W	V	0						–	
01	02	03	04	05	06	07	08	09	10		11	12	13	14	15	16	17	18	19	20		21

	Drive shafts		060	085	115	150	170	215	
17	Splined shaft ANSI B92.1a	1 1/4 in 14T 12/24DP	●	–	–	–	–	–	**S7**
		1 1/2 in 17T 12/24DP	–	●	–	–	–	–	**S9**
		1 3/4 in 13T 8/16DP	–	–	●	●	–	–	**T1**
		2 in 15T 8/16DP	–	–	–	❍	●	●	**T2**

	Port plates for service lines		060	085	115	150	170	215	
18	SAE flange ports A and B at rear		●	●	●	●	●	●	**1**
	SAE flange ports A and B at side, opposite		●	●	●	●	●	●	**2**
	Port plate with 1-level pressure-relief valves for mounting a counterbalance valve[3]	BVD20	●	●	●	–	–	–	**7**
		BVD25, BVE25	–	–	●	●	●	●	**8**

	Valves (see pages 66 to 71)		060	085	115	150	170	215	
19	Without valve		●	●	●	●	●	●	**0**
	Counterbalance valve BVD/BVE mounted[4]		●	●	●	●	●	●	**W**
	Flushing and boost pressure valve mounted, flushing on both sides Flushing flow with: $\Delta p = p_{ND} - p_G = 365$ psi (25 bar) and $\nu = 60$ SUS (10 mm²/s) (p_{ND} = low pressure, p_G = case pressure) Only possible with port plates 1 and 2	**Flushing flow q_v [gpm (L/min)]**							
		0.9 (3.5)	●	●	●	–	–	–	**A**
		1.3 (5)	●	●	●	–	–	–	**B**
		2.1 (8)	●	●	●	●	●	●	**C**
		2.6 (10)	●	●	●	●	●	●	**D**
		3.7 (14)	●	●	●	–	–	–	**F**
		4.5 (17)	–	–	–	●	●	●	**G**
		5.3 (20)	–	–	●[5]	●	●	●	**H**
		6.6 (25)	–	–	●[5]	●	●	●	**J**
		7.9 (30)	–	–	●[5]	●	●	●	**K**
		9.2 (35)	–	–	–	●	●	●	**L**
		10.6 (40)	–	–	–	●	●	●	**M**

	Speed sensors (see page 72)	060	085	115	150	170	215	
20	Without speed sensor	●	●	●	●	●	●	**0**
	Prepared for DSM speed sensor	●	●	●	●	●	●	**U**
	DSM speed sensor mounted[6]	●	●	●	●	●	●	**V**

	Standard / special version	
21	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

3) Only possible in combination with HP, EP and HA control. Note the restrictions on page 66.
4) Specify ordering code of counterbalance valve acc. to data sheet (BVD – RE 95522, BVE – RE 95525) separately. Note the restrictions on page 66.
5) Not for EZ7, EZ8 and HZ7
6) DSA on request. Specify ordering code of DSM acc. to data sheet RE 95132 separately and observe the requirements on the electronics.

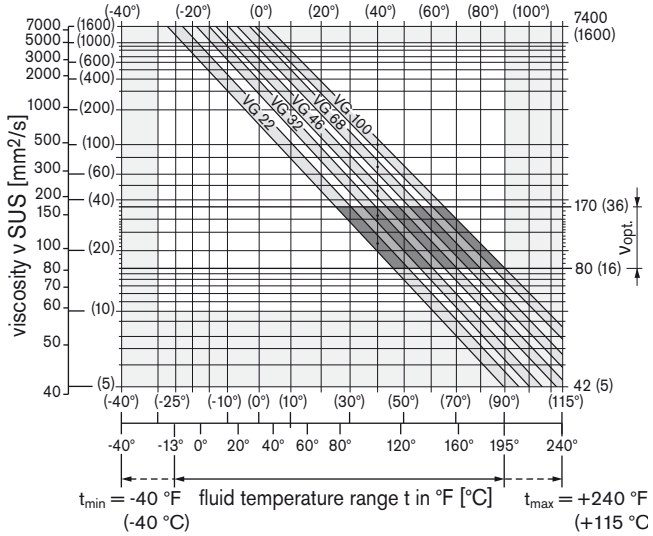
Technical data

Hydraulic fluid

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

The variable motor A6VM 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.
Please contact us.

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 (ν_{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 °F (X °C), an operating temperature of 140 °F (60 °C) is set in the circuit. In the optimum operating 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 240 °F (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 at port U or using a flushing and boost pressure valve (see pages 63 and 64).

Viscosity and temperature of hydraulic fluid

	Viscosity [SUS (mm²/s)]	Temperature	Comment
Transport and storage at ambient temperature		$T_{min} \geq$ -58 °F (-50 °C) T_{opt} = +41 °F to +68 °F (+5 °C to +20 °C)	factory preservation: up to 12 months with standard, up to 24 months with long-term
(Cold) start-up[1]	ν_{max} = 7400 (1600)	$T_{St} \geq$ -40 °F (-40 °C)	t ≤ 3 min, without load (p ≤ 725 psi (50 bar)), n ≤ 1000 rpm
Permissible temperature difference		ΔT ≤ 45 °F (25 °C)	between axial piston unit and hydraulic fluid
Warm-up phase	ν < 7400 to 1850 (1600 to 400)	T = -40 °F to -13 °F (-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. 22 °F (12 °C)	between hydraulic fluid in the bearing and at port T. The bearing temperature can be reduced by flushing via port U.
Maximum temperature		240 °F (115 °C)	in the bearing
		217 °F (103 °C)	measured at port T
Continuous operation	ν = 1850 to 47 (400 to 10) ν_{opt} = 170 to 74 (36 to 16)	T = -13 °F to +195 °F (-25 °C to +90 °C)	measured at port T, no restriction within the permissible data
Short-term operation	$\nu_{min} \geq$ 32 (7)	T_{max} = +217 °F (+103 °C)	measured at port T, t < 3 min, p < 0.3 • p_{nom}
FKM shaft seal[1]		T ≤ +240 °F (+115 °C)	see page 6

1) At temperatures below -13 °F (-25 °C), an NBR shaft seal is required (permissible temperature range: -40 °F to +195 °F (-40 °C to +90 °C)).

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 (195 °F to maximum 240 °F (90 °C to maximum 115 °C)), a cleanliness level of at least 19/17/14 according to ISO 4406 is necessary.

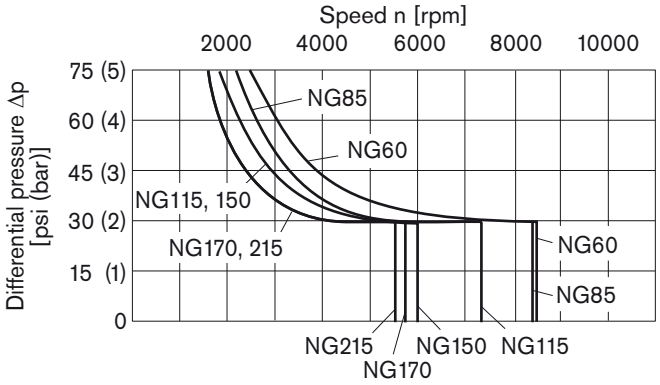
If the above classes cannot be achieved, please contact us.

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 30 psi (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 145 psi (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 $p_{abs} = 15$ psi (1 bar).

Temperature range

The FKM shaft seal may be used for case drain temperatures from -13 °F to +240 °F (-25 °C to +115 °C).

Note
For application cases below -13 °F (-25 °C), an NBR shaft seal is required (permissible temperature range:
-40 °F to +195 °F (-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:

HP, HA.T3 _____ increase
DA _____ decrease

With the following controls, an increase in the case pressure has no influence on the beginning of control:
HA.R and HA.U, EP, HA

The factory setting of the beginning of control is made at $p_{abs} = 30$ psi (2 bar) case pressure.

Direction of flow

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

Technical data

Operating pressure range

(operating with mineral oil)

Pressure at service line port A or B

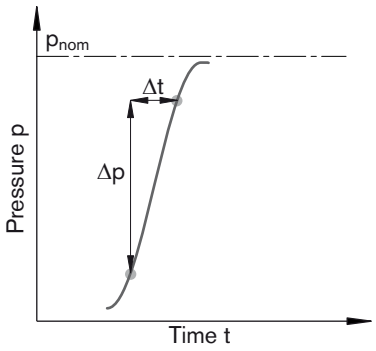
Nominal pressure p_{nom} _____ 6500 psi (450 bar) absolute

Maximum pressure p_{max} _____ 7250 psi (500 bar) absolute
Single operating period _____ 10 s
Total operating period _____ 300 h

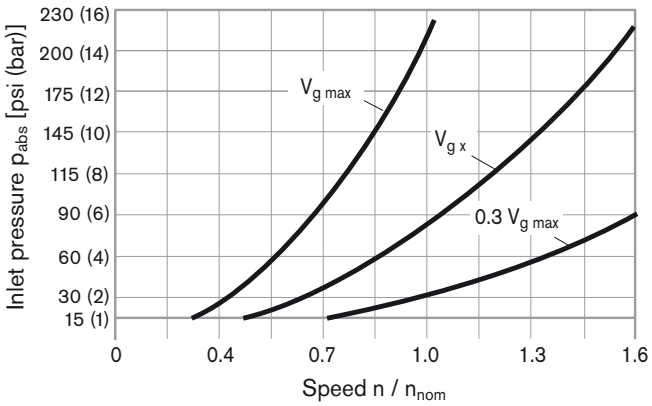
Minimum pressure
(high-pressure side) _____ 365 psi (25 bar) absolute

Summation pressure (pressure A + pressure B)
p_{Su} _____ 10150 psi (700 bar)

Rate of pressure change $R_{A\ max}$
with integrated pressure-relief valve__ 130000 psi/s (9000 bar/s)
without pressure-relief valve _____ 232000 psi/s (16000 bar/s)



Minimum pressure – pump mode (inlet)
To prevent damage to the axial piston motor in pump operating 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).



This diagram is valid only for the optimum viscosity range from ν_{opt} = 170 to 74 SUS (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

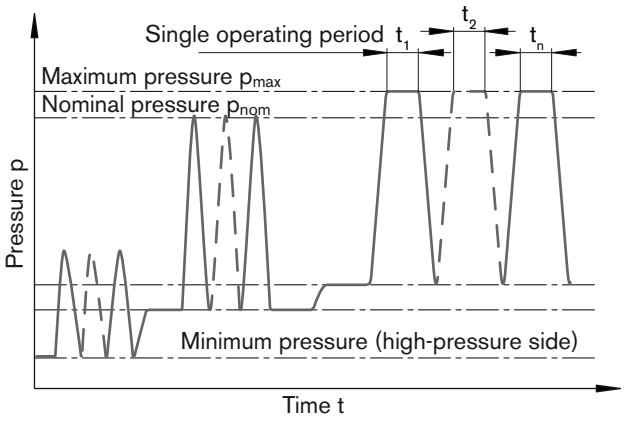
Nominal pressure p_{nom}
The nominal pressure corresponds to the maximum design pressure.

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

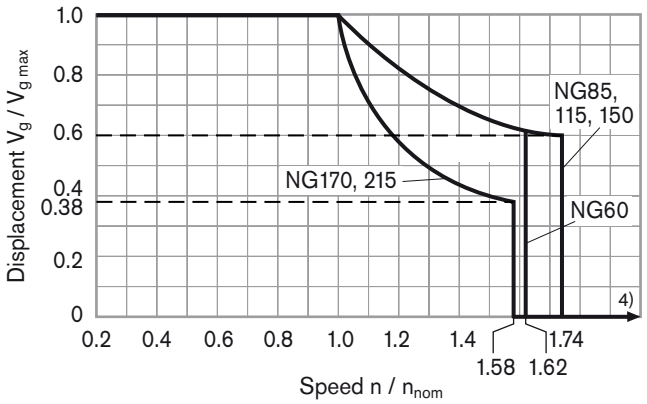
Table of values (theoretical values, without efficiency and tolerances; values rounded)

Size	NG		60	85	115	150	170	215
Displacement geometric, per revolution	$V_{g\,max}$	in^3	3.78	5.20	7.05	9.28	10.48	13.21
		cm^3	62.0	85.2	115.6	152.1	171.8	216.5
	$V_{g\,min}$	in^3	0	0	0	0	0	0
		cm^3	0	0	0	0	0	0
	$V_{g\,x}$	in^3	2.26	3.11	4.21	5.55	3.97	5.00
		cm^3	37	51	69	91	65	82
Speed maximum[1] (while adhering to the maximum permissible input flow)								
at $V_{g\,max}$	n_{nom}	rpm	4450	3900	3550	3250	3100	2900
at $V_g < V_{g\,x}$ (see diagram below)	n_{max}	rpm	7200	6800	6150	5600	4900	4600
at $V_{g\,0}$	n_{max}	rpm	8400	8350	7350	6000	5750	5500
Input flow[2]	$q_{V\,max}$	gpm	73	88	108	131	141	166
at n_{nom} and $V_{g\,max}$		L/min	276	332	410	494	533	628
Torque[3]	T	lb-ft	326	448	608	800	903	1139
at $V_{g\,max}$ and Δp = 6500 psi (450 bar)		Nm	444	610	828	1089	1230	1550
Rotary stiffness								
$V_{g\,max}$ to $V_g/2$	c_{min}	lb-ft/rad	10695	16521	27511	32084	38279	51334
		Nm/rad	14500	22400	37300	43500	51900	69600
$V_g/2$ to 0 (interpolated)	c_{max}	lb-ft/rad	33412	49785	76559	91458	115355	144267
		Nm/rad	45300	67500	103800	124000	156400	195600
Moment of inertia for rotary group	J_{GR}	$lb\text{-}ft^2$	0.1020	0.1709	0.2610	0.4295	0.5055	0.7190
		kgm^2	0.0043	0.0072	0.0110	0.0181	0.0213	0.0303
Maximum angular acceleration	α	rad/s^2	21000	17500	15500	11000	11000	10000
Case volume	V	Gal	0.21	0.26	0.40	0.45	0.61	0.74
		L	0.8	1.0	1.5	1.7	2.3	2.8
Weight (approx.)	m	lbs	62	79	101	134	137	172
		kg	28	36	46	61	62	78

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, 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 RE 90261.

Permissible displacement in relation to speed



The values are valid:

- for the optimum viscosity range from ν_{opt} = 170 to 74 SUS (36 to 16 mm^2/s)
- with hydraulic fluid on the basis of mineral oil

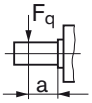
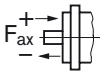
1) Restriction of input flow with counterbalance valve, see page 66

2) Torque without radial force, with radial force see page 9

3) Values in this range on request

Technical data

Permissible radial and axial forces of the drive shafts

Size	NG		60	85	115	150	150	170	215
Drive shaft		in	1 1/4	1 1/2	1 3/4	1 3/4	2	2	2
Maximum radial force[1] at distance a (from shaft collar) 	$F_{q\,max}$	lb	1713	2802	3350	3585	3917	4355	5081
		N	7620	12463	14902	15948	17424	19370	22602
	a	in	0.94	1.06	1.32	1.32	1.32	1.32	1.32
		mm	24.0	27.0	33.5	33.5	33.5	33.5	33.5
with permissible torque	T_{max}	lb-ft	229	439	611	656	803	907	1066
		Nm	310	595	828	890	1089	1230	1445
≙ permissible pressure Δp at $V_{g\,max}$	$p_{nom\,perm.}$	psi	4550	6400	6500	5350	6500	6500	6100
		bar	315	440	450	370	450	450	420
Maximum axial force[2] 	+ $F_{ax\,max}$	lb	0	0	0	0	0	0	0
		N	0	0	0	0	0	0	0
	– $F_{ax\,max}$	lb	112	160	202	232	232	252	281
		N	500	710	900	1030	1030	1120	1250
Permissible axial force per bar operating pressure	+ $F_{ax\,perm./psi}$	lb/psi	0.12	0.15	0.18	0.21	0.21	0.23	0.26
	+ $F_{ax\,perm./bar}$	N/bar	7.5	9.6	11.3	13.3	13.3	15.1	17.0

1) With intermittent operation.
2) Maximum permissible axial force during standstill or when the axial piston unit is operating in non-pressurized condition.

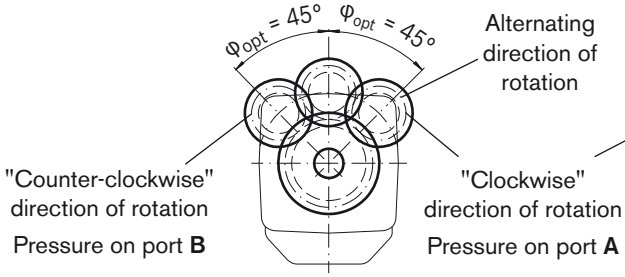
Note
Influence of the direction of the permissible axial force:

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

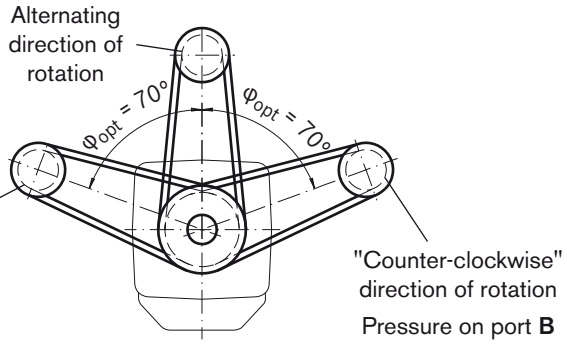
Effect of radial force F_q on the service life of bearings

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

Flow $q_v = \frac{V_g \cdot n}{231 \cdot \eta_v} = [gpm] \quad \left(\frac{V_g \cdot n}{1000 \cdot \eta_v}\ L/min\right)$

Speed $n = \frac{q_v \cdot 231 \cdot \eta_v}{V_g} = [rpm] \quad \left(\frac{q_v \cdot 1000 \cdot \eta_v}{V_g}\ [rpm]\right)$

Torque $T = \frac{V_g \cdot \Delta p \cdot \eta_{mh}}{24 \cdot \pi} = [lb\text{-}ft] \quad \left(\frac{V_g \cdot \Delta p \cdot \eta_{mh}}{20 \cdot \pi}\ [Nm]\right)$

Power $P = \frac{2\,\pi \cdot T \cdot n}{33000} = \frac{q_v \cdot \Delta p \cdot \eta_t}{1714}\ [HP] \quad \left(\frac{2\,\pi \cdot T \cdot n}{60000} = \frac{q_v \cdot \Delta p \cdot \eta_t}{600}\ [kW]\right)$

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

HP – Proportional control hydraulic

The proportional hydraulic control provides infinite setting of the displacement, proportional to the pilot pressure applied to port X.

HP1, HP2 positive control
- Beginning of control at $V_{g\,min}$ (minimum torque, maximum permissible speed at minimum pilot pressure)
- End of control at $V_{g\,max}$ (maximum torque, minimum speed at maximum pilot pressure)

HP5, HP6 negative control
- Beginning of control at $V_{g\,max}$ (maximum torque, minimum speed at minimum pilot pressure)
- End of control at $V_{g\,min}$ (minimum torque, maximum permissible speed at maximum pilot pressure)

Note
- Maximum permissible pilot pressure: p_{St} = 1450 psi (100 bar)
- 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 435 psi (30 bar) is required in A (B). If a control operation is performed at an operating pressure < 435 psi (30 bar), an auxiliary pressure of at least 435 psi (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 7250 psi (500 bar) can occur at port G.
- Please state the desired beginning of control in plain text when ordering, e. g.: beginning of control at 145 psi (10 bar).
- The beginning of control and the HP characteristic are influenced by the case pressure. An increase in the case pressure causes an increase in the beginning of control (see page 6) and thus a parallel shift of the characteristic.

HP1, HP5 pilot pressure increase Δp_{St} = 145 psi (10 bar)

HP1 positive control
A pilot pressure increase of 145 psi (10 bar) at port X results in an increase in displacement from $V_{g\,min}$ to $V_{g\,max}$.

HP5 negative control
A pilot pressure increase of 145 psi (10 bar) at port X results in a decrease in displacement from $V_{g\,max}$ to $V_{g\,min}$.

Beginning of control,
setting range _____ 30 to 290 psi (2 to 20 bar)

Standard setting:
Beginning of control at 45 psi (3 bar) (end of control at 190 psi (13 bar))

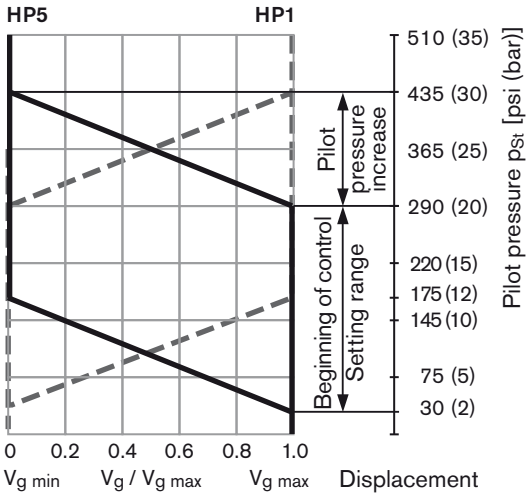
Note

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.

Characteristic



HP2, HP6 pilot pressure increase Δp_{St} = 365 psi (25 bar)

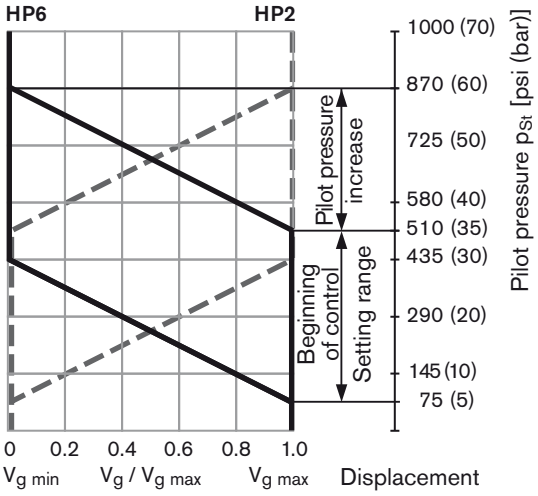
HP2 positive control
A pilot pressure increase of 365 psi (25 bar) at port X results in an increase in displacement from $V_{g\,min}$ to $V_{g\,max}$.

HP6 negative control
A pilot pressure increase of 365 psi (25 bar) at port X results in a decrease in displacement from $V_{g\,max}$ to $V_{g\,min}$.

Beginning of control,
setting range _____ 75 to 725 psi (5 to 50 bar)

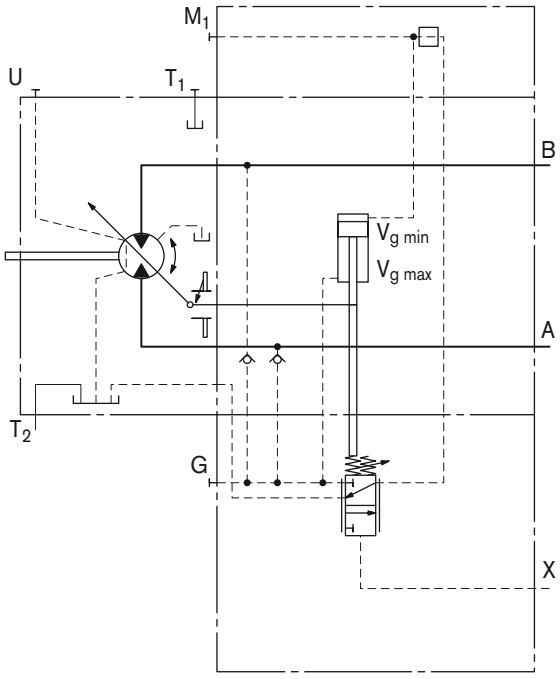
Standard setting:
Beginning of control at 145 psi (10 bar) (end of control at 510 psi (35 bar))

Characteristic

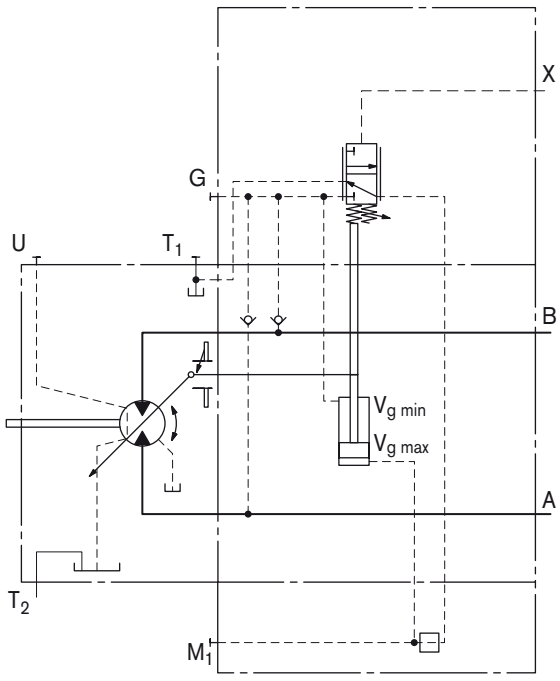


HP – Proportional control hydraulic

Schematic HP1, HP2: positive control



Schematic HP5, HP6: negative control



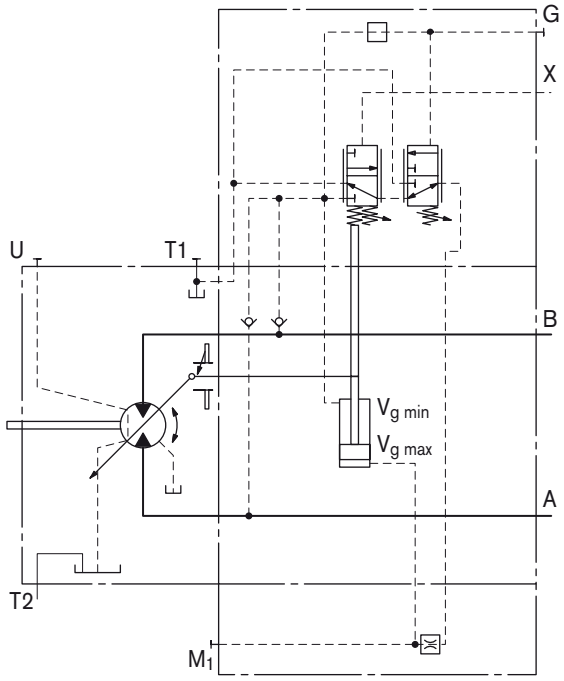
HP5D1, HP6D1
Pressure control, fixed setting

The pressure control overrides the HP control function. If the load torque or a reduction in motor swivel angle causes the system pressure to reach the setpoint of the pressure control, the motor will swivel towards a larger displacement.

The increase in the displacement and the resulting reduction in pressure cause the control deviation to decrease. With the increase in displacement the motor develops more torque, while the pressure remains constant.

Setting range of the pressure control valve__ 1150 to 6500 psi (80 to 450 bar)

Schematic HP5D1, HP6D1: negative control



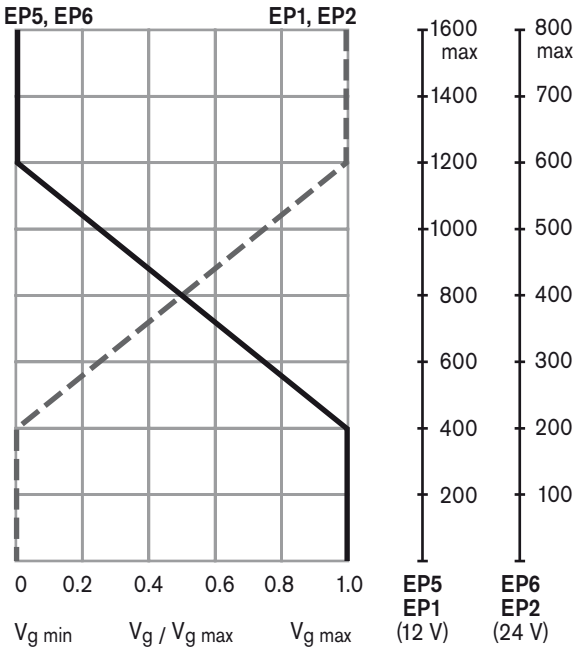
EP – Proportional control electric

The proportional electric control provides infinite setting of the displacement, proportional to the control current applied to the solenoid.

EP1, EP2 positive control
- Beginning of control at $V_{g\,min}$ (minimum torque, maximum permissible speed at minimum control current)
- End of control at $V_{g\,max}$ (maximum torque, minimum speed at maximum control current)

EP5, EP6 negative control
- 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 435 psi (30 bar) is required in A (B). If a control operation is performed at an operating pressure < 435 psi (30 bar), an auxiliary pressure of at least 435 psi (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 7250 psi (500 bar) can occur at port G.

Technical data, solenoid

	EP1, EP5	EP2, EP6
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 68 °F (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 62		

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

Note

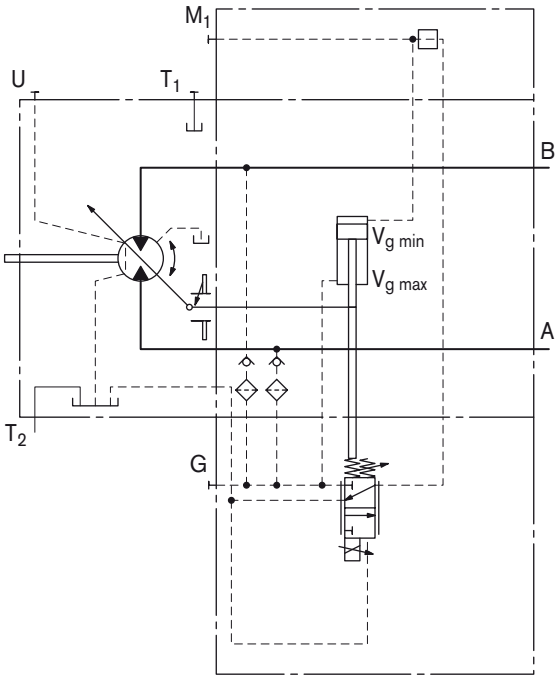
The spring return feature in the control part is not a safety device

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.

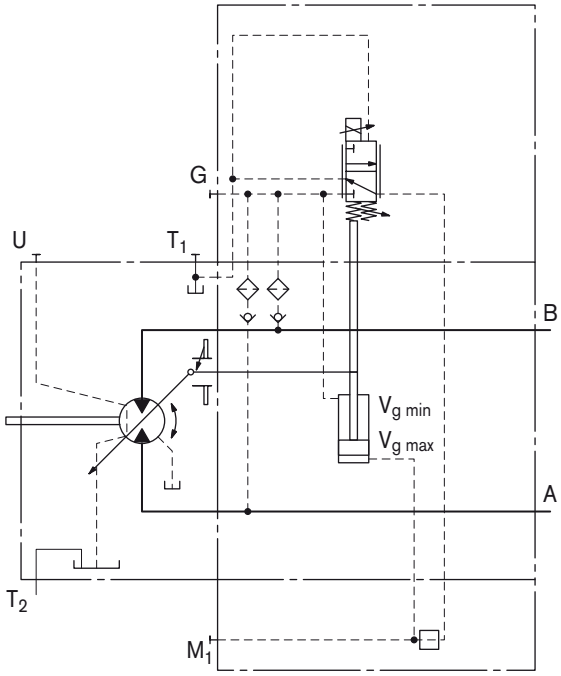
Check whether the application on your machine requires additional safety measures, in order to bring the driven actuator into a controlled and safe position (immediate stop). If necessary, make sure these are properly implemented.

EP – Proportional control electric

Schematic EP1, EP2: positive control



Schematic EP5, EP6: negative control



EP – Proportional control electric

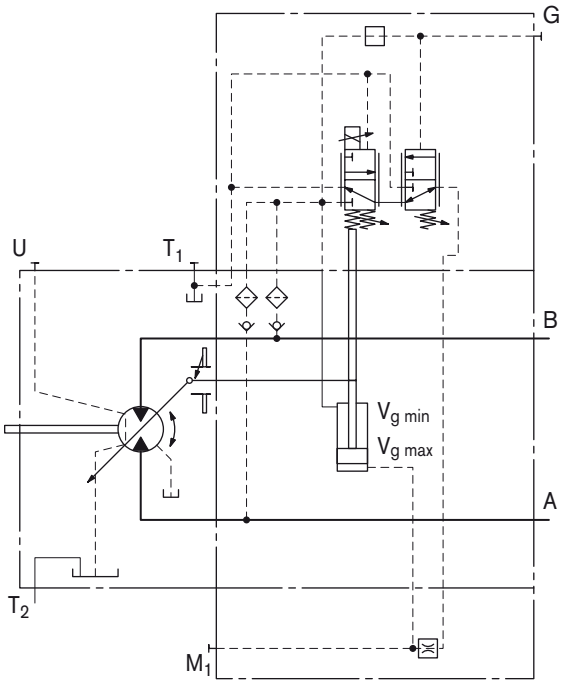
EP5**D1**, EP6**D1**
Pressure control, fixed setting

The pressure control overrides the EP control function. If the load torque or a reduction in motor swivel angle causes the system pressure to reach the setpoint of the pressure control, the motor will swivel towards a larger displacement.

The increase in the displacement and the resulting reduction in pressure cause the control deviation to decrease. With the increase in displacement the motor develops more torque, while the pressure remains constant.

Setting range of the pressure control valve__ 1150 to 6500 psi (80 to 450 bar)

Schematic EP5D1, EP6D1: negative control



HZ – Two-point control hydraulic

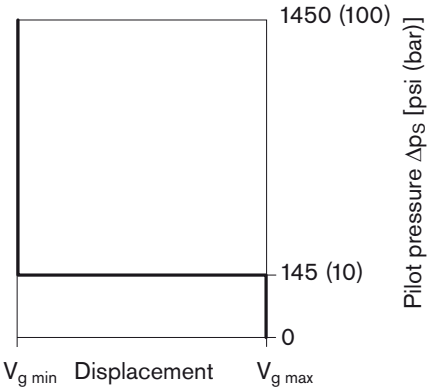
The two-point hydraulic control allows the displacement to be set to either $V_{g\,min}$ or $V_{g\,max}$ by switching the pilot pressure at port X on or off.

HZ5, HZ7 negative control

– Position at $V_{g\,max}$ (without pilot pressure, maximum torque, minimum speed)

– Position at $V_{g\,min}$ (with pilot pressure > 145 psi (10 bar) activated, minimum torque, maximum permissible speed)

Characteristic HZ5, HZ7

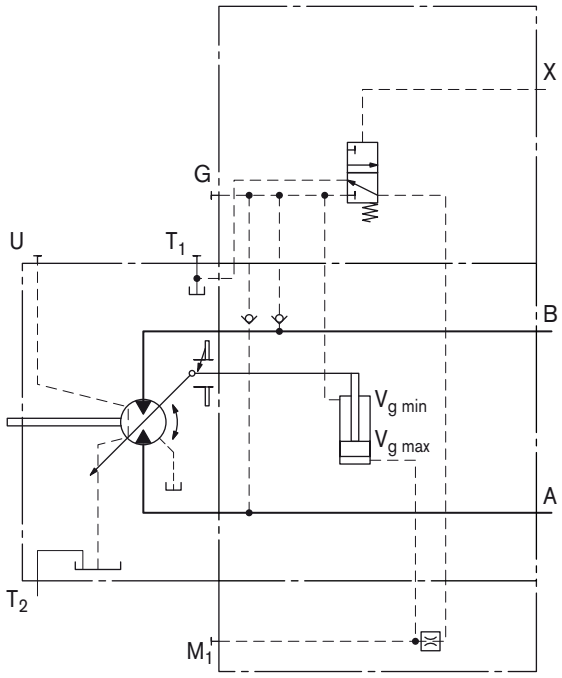


Note

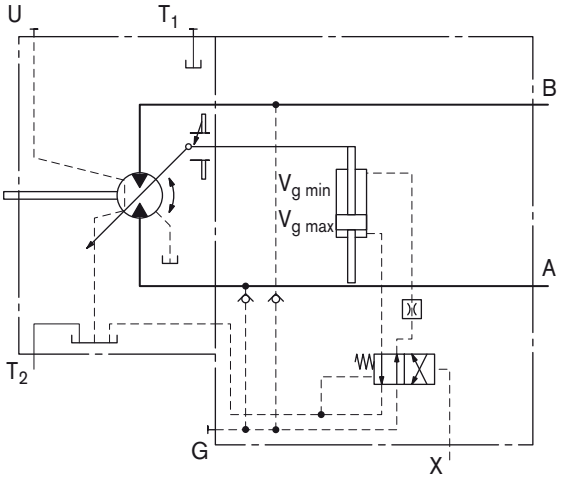
– Maximum permissible pilot pressure: 1450 psi (100 bar)

– 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 435 psi (30 bar) is required in A (B). If a control operation is performed at an operating pressure < 435 psi (30 bar), an auxiliary pressure of at least 435 psi (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 7250 psi (500 bar) can occur at port G.

Schematic HZ5: negative control
Sizes 150 to 215



Schematic HZ7: negative control
Sizes 60 to 115



EZ – Two-point control electric

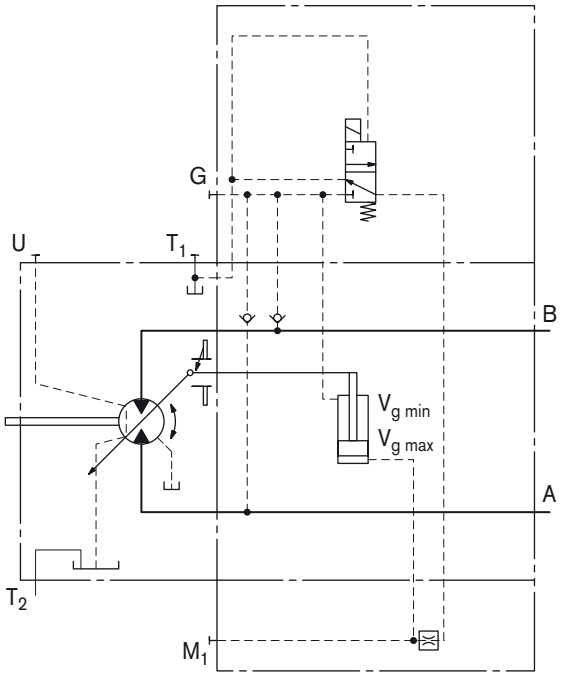
The two-point electric control allows the displacement to be set to either $V_{g\,min}$ or $V_{g\,max}$ by switching the electric current to a switching solenoid on or off.

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 435 psi (30 bar) is required in A (B). If a control operation is performed at an operating pressure < 435 psi (30 bar), an auxiliary pressure of at least 435 psi (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 7250 psi (500 bar) can occur at port G.

Technical data, solenoid with DIA37
Sizes 150 to 280

	EZ5	EZ6
Voltage	12 V (±20 %)	24 V (±20 %)
Displacement $V_{g\,max}$	de-energized	de-energized
Displacement $V_{g\,min}$	energized	energized
Nominal resistance (at 68 °F (20 °C))	5.5 Ω	21.7 Ω
Nominal power	26.2 W	26.5 W
Minimum required current	1.32 A	0.67 A
Duty cycle	100 %	100 %
Type of protection see connector design page 62		

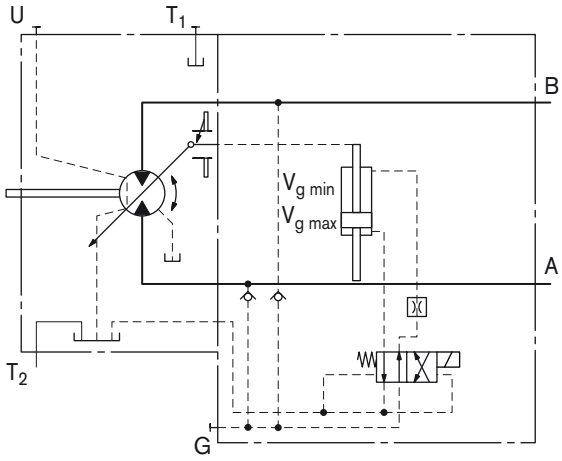
Schematic EZ5, EZ6: negative control
Sizes 150 to 215



Technical data, solenoid with DIA45
Sizes 60 to 115

	EZ7	EZ8
Voltage	12 V (±20 %)	24 V (±20 %)
Displacement $V_{g\,max}$	de-energized	de-energized
Displacement $V_{g\,min}$	energized	energized
Nominal resistance (at 68 °F (20 °C))	4.8 Ω	19.2 Ω
Nominal power	30 W	30W
Minimum required current	1.5 A	0.75 A
Duty cycle	100 %	100 %
Type of protection see connector design page 62		

Schematic EZ7, EZ8: negative control
Sizes 60 to 115



HA – Automatic control high-pressure related

The automatic high-pressure related control adjusts the displacement automatically depending on the operating pressure.

The displacement of the A6VM motor with HA control is $V_{g\ min}$ (maximum speed and minimum torque). The control unit measures internally the operating pressure at A or B (no control line required) and upon reaching the beginning of control , the controller swivels the motor from $V_{g\ min}$ to $V_{g\ max}$ with increase of pressure. The displacement is modulated between $V_{g\ min}$ and $V_{g\ max}$, thereby depending on load conditions.

HA1, HA2 positive control

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

Note

- For safety reasons, 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 side of the motor (A or B). For reliable control, an operating pressure of at least 435 psi (30 bar) is required in A (B). If a control operation is performed at an operating pressure < 435 psi (30 bar), an auxiliary pressure of at least 435 psi (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 7250 psi (500 bar) can occur at port G.
- The beginning of control and the HA.T3 characteristic are influenced by case pressure. An increase in case pressure causes an increase in the beginning of control (see page 6) and thus a parallel shift of the characteristic.

HA – Automatic control high-pressure related

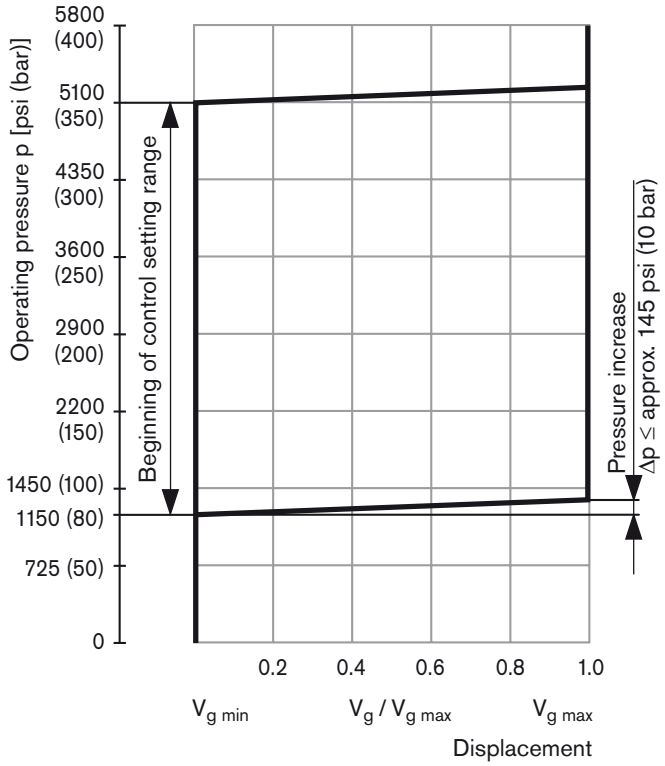
HA1
With minimum pressure increase, positive control

An operating pressure increase of $\Delta p \leq 145$ psi (10 bar) results in an increase in displacement from $V_{g\,min}$ towards $V_{g\,max}$.

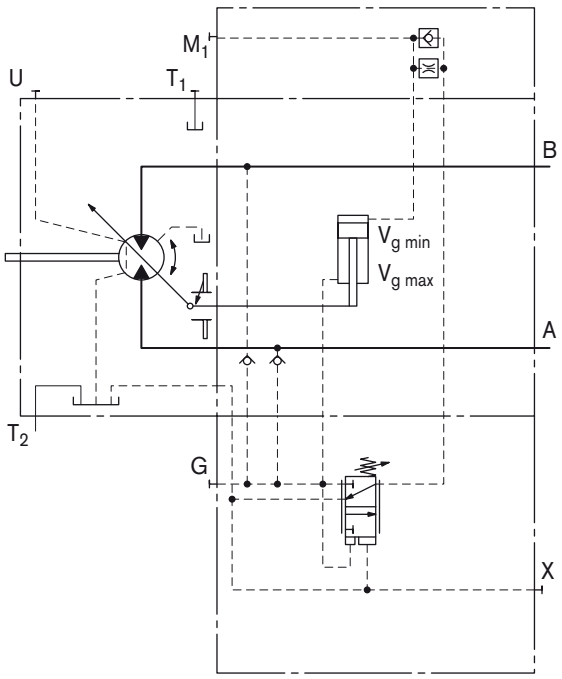
Beginning of control,
setting range _____ 1150 to 5100 psi (80 to 350 bar)

Please state the desired beginning of control in plain text when ordering, e. g.: beginning of control at 4350 psi (300 bar).

Characteristic HA1



Schematic HA1



HA – Automatic control high-pressure related

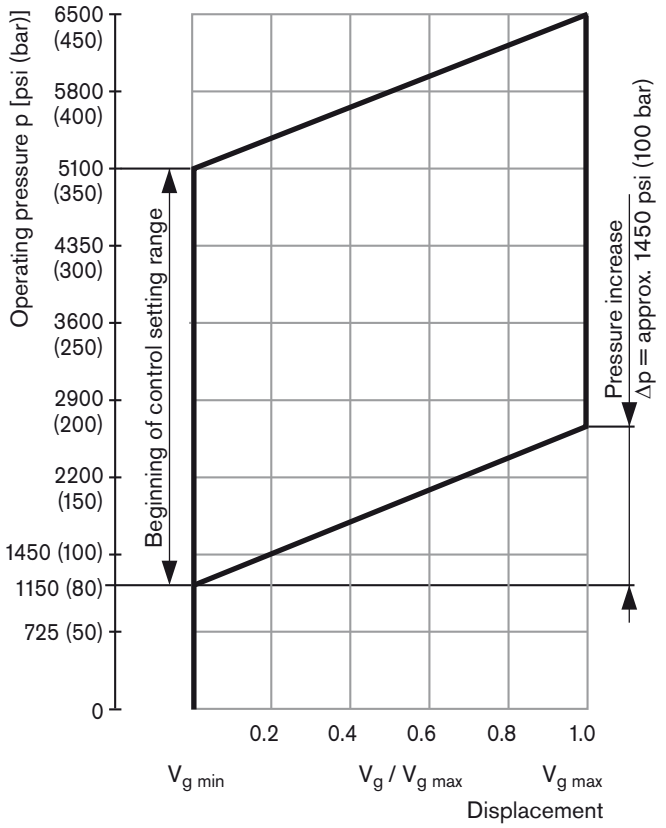
HA2
With pressure increase, positive control

An operating pressure increase of
Δp = approx. 1450 psi (100 bar) results in an increase in displacement from $V_{g\,min}$ to $V_{g\,max}$.

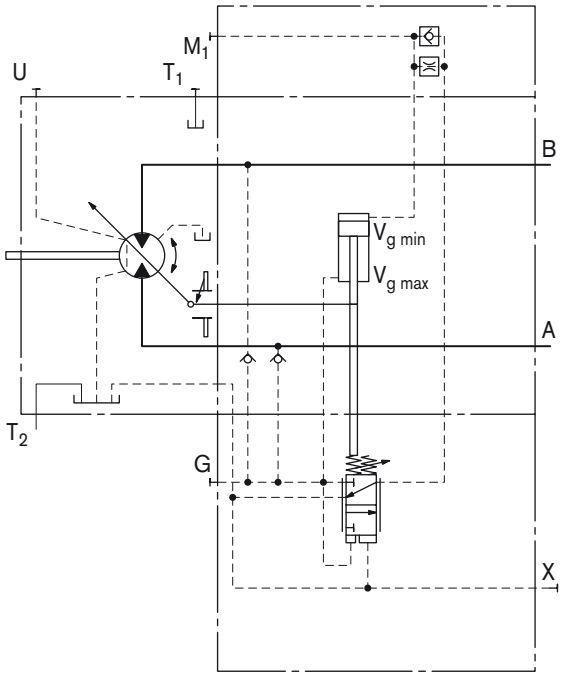
Beginning of control, setting range _____ 1150 to 5100 psi (80 to 350 bar)

Please state the desired beginning of control in plain text when ordering, e. g.: beginning of control at 2900 psi (200 bar)

Characteristic HA2



Schematic HA2



HA – Automatic control high-pressure related

HA.T3
Override hydraulic remote control, proportional

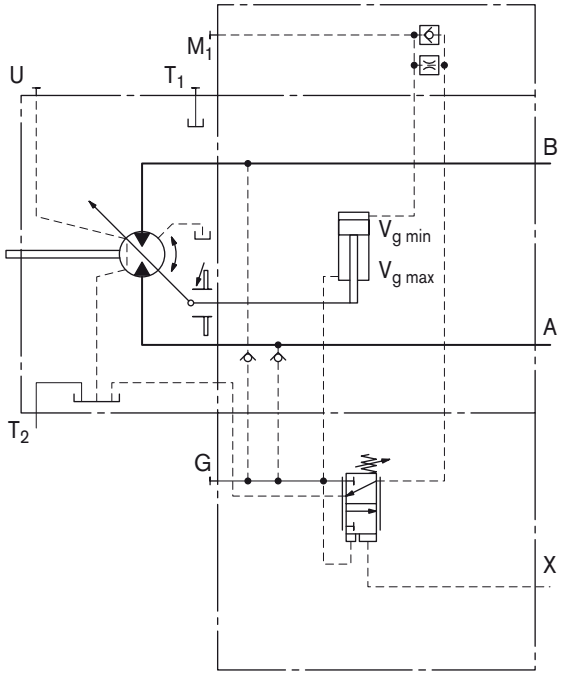
With the HA.T3 control, the beginning of control can be influenced by applying a pilot pressure to port X.

For each 15 psi (1 bar) of pilot pressure increase, the beginning of control is reduced by 250 psi (17 bar).

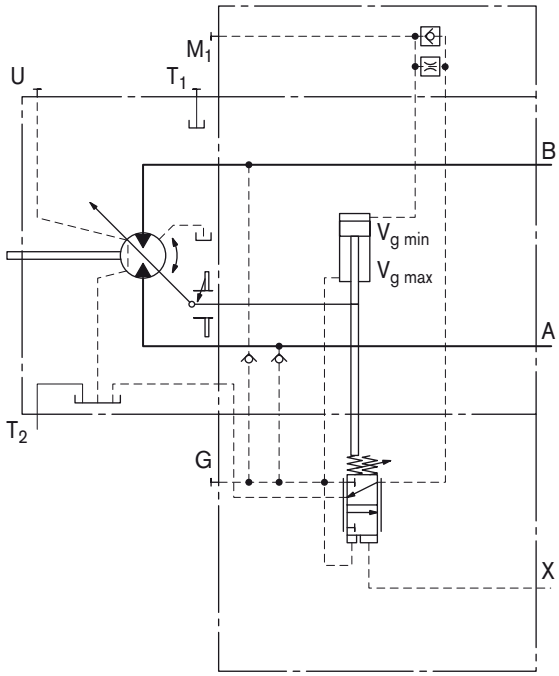
Beginning of control setting	4350 psi (300 bar)	4350 psi (300 bar)
Pilot pressure at port X	0 bar	145 psi (10 bar)
Beginning of control at	4350 psi (300 bar)	1900 psi (130 bar)

Note
Maximum permissible pilot pressure 1450 psi (100 bar).

Schematic HA1.T3



Schematic HA2.T3



HA – Automatic control high-pressure related

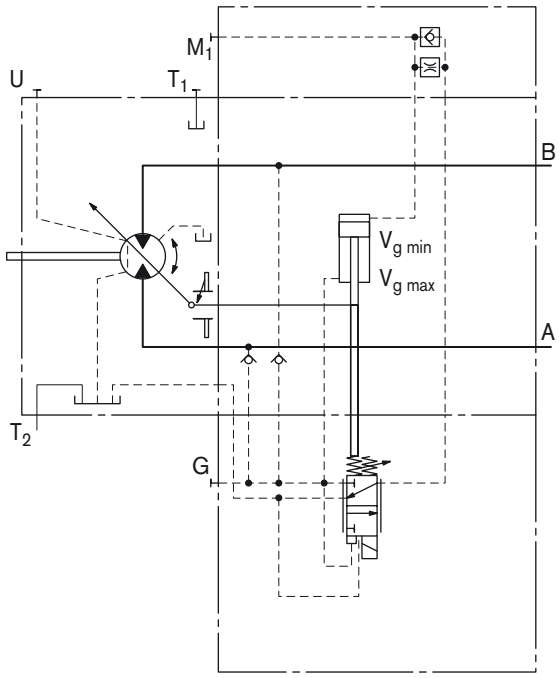
HA.**U1,** HA.**U2**
Override electric, two-point

With the HA.U1 or HA.U2 control, the beginning of control can be overridden by an electric signal to a switching solenoid. When the override solenoid is energized, the variable motor swivels to maximum swivel angle, without intermediate position. The beginning of control is adjustable between 1150 and 4350 psi (80 and 300 bar) (specify required setting in plain text when ordering).

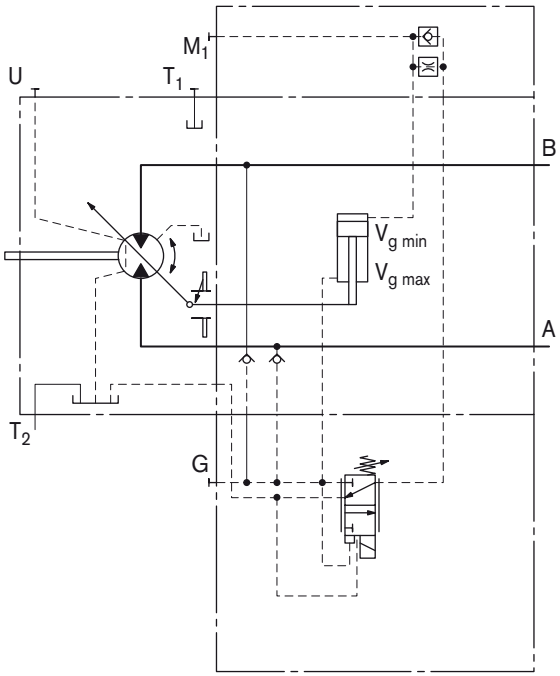
Technical data, solenoid with DIA45

	U1	U2
Voltage	12 V (±20 %)	24 V (±20 %)
No override	de-energized	de-energized
Displacement $V_{g\,max}$	energized	energized
Nominal resistance (at 68 °F (20 °C))	4.8 Ω	19.2 Ω
Nominal power	30 W	30 W
Minimum required current	1.5 A	0.75 A
Duty cycle	100 %	100 %
Type of protection see connector design page 62		

Schematic HA2U1, HA2U2



Schematic HA1U1, HA1U2



HA – Automatic control high-pressure related

HA.**R1,** HA.**R2**
Override electric, travel direction valve electric (see page 25)

With the HA.R1 or HA.R2 control, the beginning of control can be overridden by an electric signal to switching solenoid b. When the override solenoid b 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 jerky deceleration and/or braking characteristics.

Depending on the direction of rotation (direction of travel), the travel direction valve is actuated through the pressure spring or the switching solenoid a (see page 24 for further details).

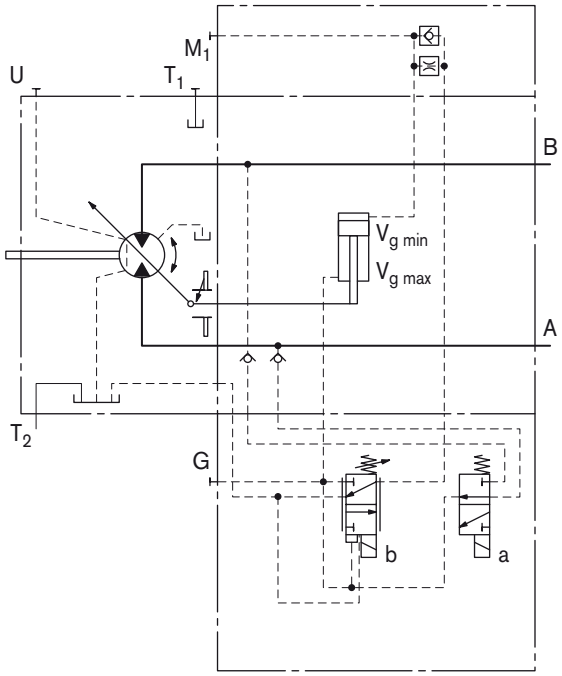
Technical data, solenoid a with DIA37
(travel direction valve)

		R1	R2
Voltage		12 V (±20 %)	24 V (±20 %)
No override		de-energized	de-energized
Direction of rotation	Operating pressure in		
ccw	B	energized	energized
cw	A	de-energized	de-energized
Nominal resistance (at 68 °F (20 °C))		5.5 Ω	21.7 Ω
Nominal power		26.2 W	26.5 W
Minimum required current		1.32 A	0.67 A
Duty cycle		100 %	100 %
Type of protection see connector design page 62			

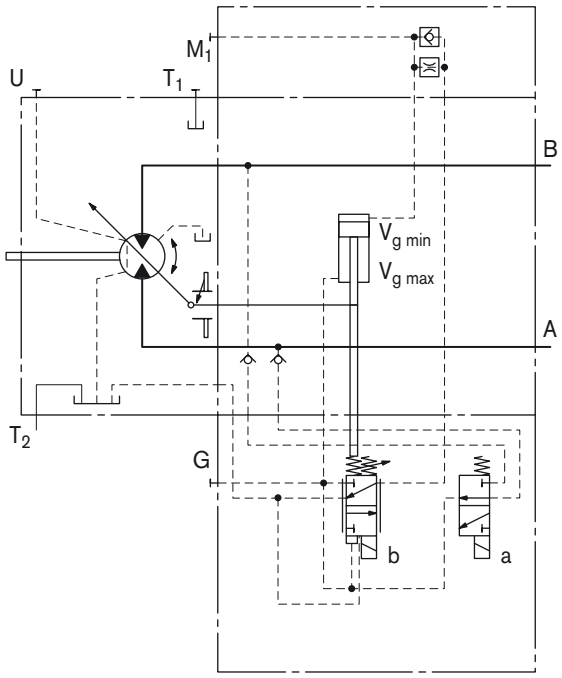
Technical data, solenoid b with DIA45
(electric override)

	R1	R2
Voltage	12 V (±20 %)	24 V (±20 %)
No override	de-energized	de-energized
Displacement $V_{g\,max}$	energized	energized
Nominal resistance (at 68 °F (20 °C))	4.8 Ω	19.2 Ω
Nominal power	30 W	30 W
Minimum required current	1.5 A	0.75 A
Duty cycle	100 %	100 %
Type of protection see connector design page 62		

Schematic HA1R1, HA1R2



Schematic HA2R1, HA2R2



DA – Automatic control speed-related

The variable motor A6VM with automatic speed-related control is intended for use in hydrostatic travel drives in combination with the variable pump A4VG with DA control.

A drive-speed-related pilot pressure signal is generated by the A4VG variable pump, and that signal, together with the operating pressure, regulates the swivel angle of the hydraulic motor.

Increasing pump speed, i.e. increasing pilot pressure, causes the motor to swivel to a smaller displacement (lower torque, higher speed), depending on the operating pressure.

If the operating pressure exceeds the pressure setpoint set on the controller, the variable motor swivels to a larger displacement (higher torque, lower speed).

Pressure ratio p_{St}/p_{HD} _____ 5/100

DA closed loop control is only suitable for certain types of drive systems and requires review of the engine and vehicle parameters to ensure that the motor is used correctly and that machine operation is safe and efficient. We recommend that all DA applications be reviewed by a Bosch Rexroth application engineer.

Detailed information is available from our sales department and on the Internet at www.boschrexroth.com/da-control.

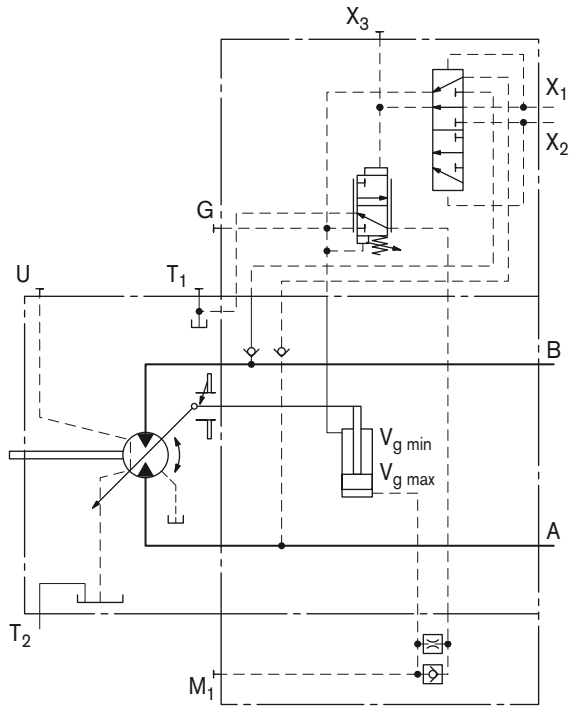
Note
The beginning of control and the DA characteristic are influenced by case pressure. An increase in case pressure causes a decrease in the beginning of control (see page 6) and thus a parallel shift of the characteristic.

DA0
Hydraulic travel direction valve, negative control

Dependent on the direction of rotation (travel direction), the travel direction valve is switched by using pilot pressures connections X_1 or X_2.

Direction of rotation	Operating pressure in	Pilot pressure in
cw	A	X_1
ccw	B	X_2

Schematic DA0



DA – Automatic control speed-related

DA1, DA2
Electric travel direction valve + electric $V_{g\,max}$-circuit, negative control

The travel direction valve is either spring offset or switched by energizing switching solenoid a, depending on the direction of rotation (travel direction).

When the switching solenoid b is energized, the DA control is overridden and the motor swivels to maximum displacement (high torque, lower speed) (electric $V_{g\,max}$-circuit).

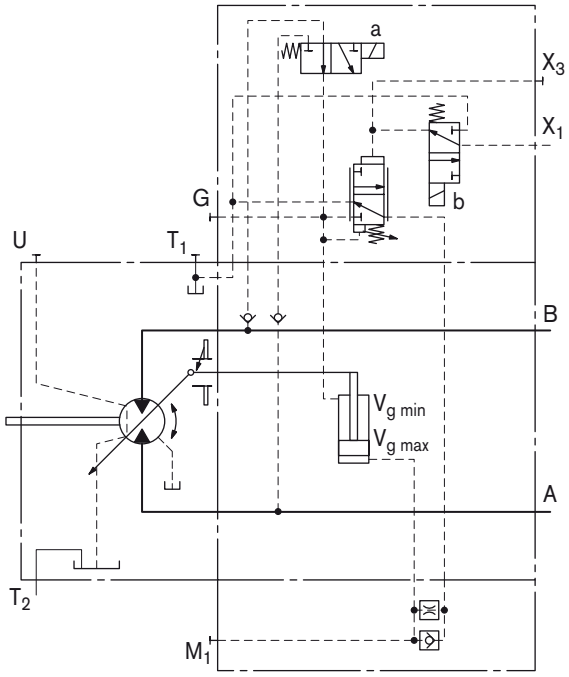
Technical data, solenoid a with DIA37
(travel direction valve)

		DA1	DA2
Voltage		12 V (±20 %)	24 V (±20 %)
Direction of rotation	Operating pressure in		
ccw	B	de-energized	de-energized
cw	A	energized	energized
Nominal resistance (at 68 °F (20 °C))		5.5 Ω	21.7 Ω
Nominal power		26.2 W	26.5 W
Minimum required current		1.32 A	0.67 A
Duty cycle		100 %	100 %
Type of protection see connector design page 62			

Technical data, solenoid b with DIA37
(electric override)

	DA1	DA2
Voltage	12 V (±20 %)	24 V (±20 %)
No override	de-energized	de-energized
Displacement $V_{g\,max}$	energized	energized
Nominal resistance (at 68 °F (20 °C))	5.5 Ω	21.7 Ω
Nominal power	26.2 W	26.5 W
Minimum required current	1.32 A	0.67 A
Duty cycle	100 %	100 %
Type of protection see connector design page 62		

Schematic DA1, DA2



Electric travel direction valve (for DA, HA.R)

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's mass and current travel speed.

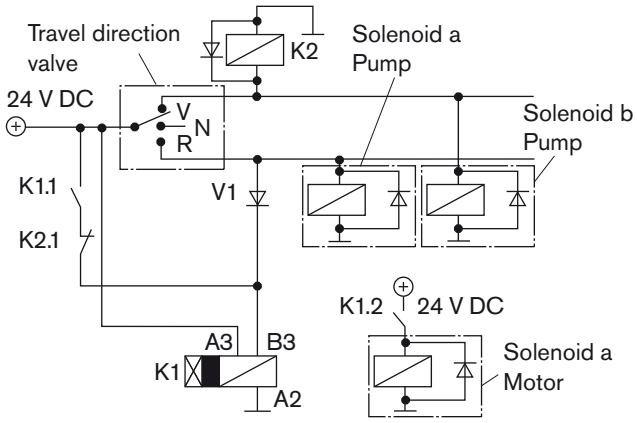
When the travel direction valve of the pump (e. g. 4/3-directional valve of the DA-control) is switched to

– the neutral position,
  the electric circuitry causes the previous signal on the travel direction valve on the motor to be retained.

– reversing,
  the electric circuitry causes the travel direction valve on the motor to switch to the other travel direction following a time delay (approx. 0.8 s) with respect to the pump.

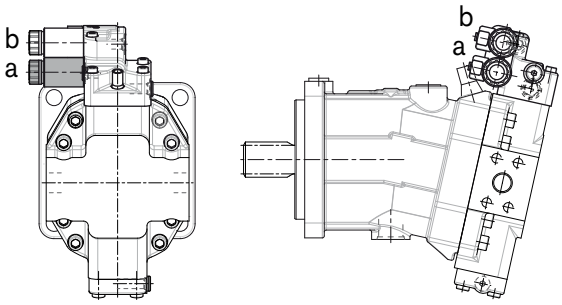
As a result, jerky deceleration or braking is prevented in both cases.

Schematic - electric travel direction valve

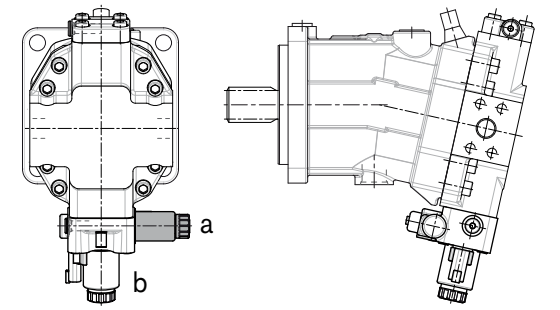


Note
The shown diodes and relays are not included in the delivery of the motor.

DA1, DA2 control (see page 24)



HA1R., HA2R. control (see page 22)



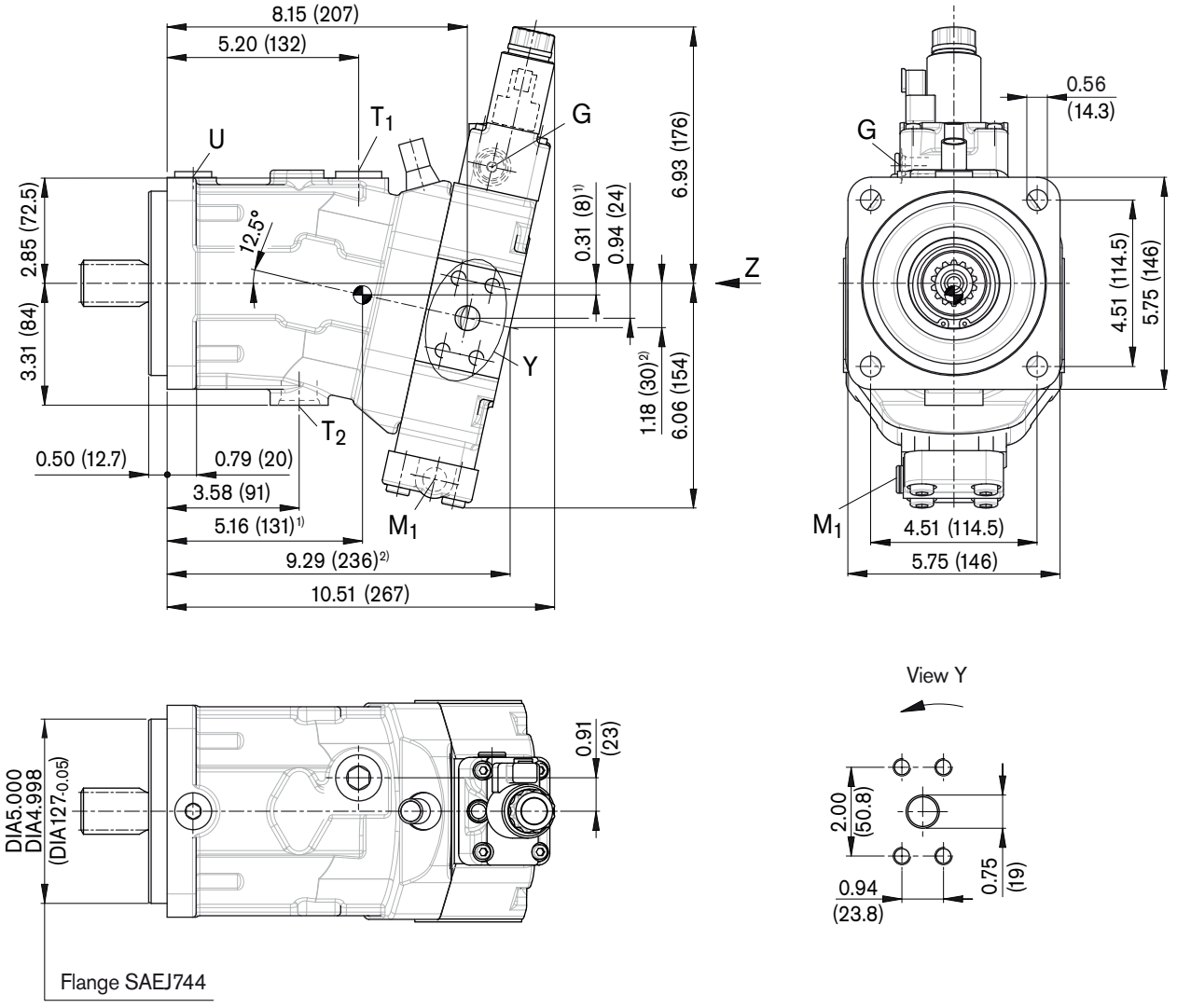
Switching solenoid a on the travel direction valve

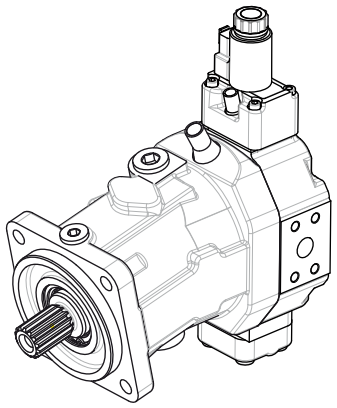
Dimensions size 60

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

EP5, EP6 – Proportional control electric, negative control

Port plate 2 – SAE flange ports A and B at side, opposite





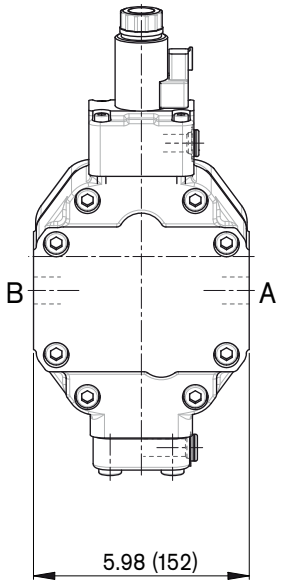
1) Center of gravity
2) Port plate 1 – SAE flange ports A and B at rear

Dimensions size 60

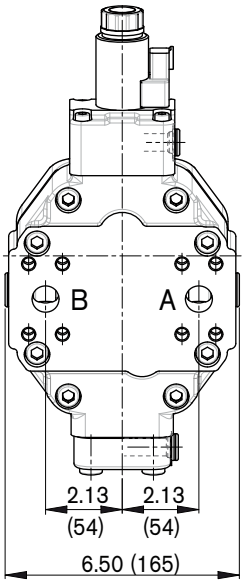
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

Location of the service line ports on the port plates (view Z)

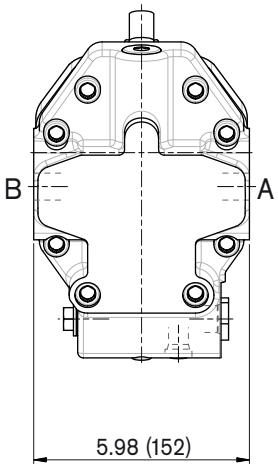
2 SAE flange ports A and B at side, opposite



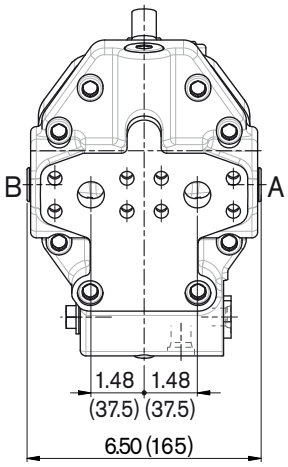
1 SAE flange ports A and B at rear



2 SAE flange ports A and B at side, opposite only HZ7, EZ7/8

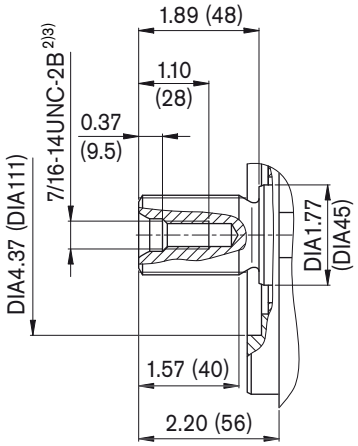


1 SAE flange ports A and B at rear only HZ7, EZ7/8



Drive shaft

S7 Splined shaft 1 1/4 in 14 T 12/24DP[1)]



1) ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Observe the general instructions on page 74 for the maximum tightening torques.

Dimensions size 60

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

Ports

Designation	Port for	Standard	Size[1]	Maximum pressure [psi (bar)][2]	State[7]
A, B[5]	Service line Fastening thread A/B, screw grade 8 with hardened washer	SAE J518[3] ASME B1.1	3/4 in 3/8 in - 16 UNC-2B; 0.83 (21) deep	7250 (500)	O
T_1	Drain line	ISO 11926[6]	1 1/16 in - 12 UN-2B; 0.79 (20) deep	45 (3)	X[4]
T_2	Drain line	ISO 11926[6]	1 1/16 in - 12 UN-2B; 0.79 (20) deep	45 (3)	O[4]
G	Synchronous control	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	7250 (500)	X
U	Bearing flushing	ISO 11926[6]	7/8 in - 14 UNF-2B; 0.67 (17) deep	45 (3)	X
X	Pilot signal (HP, HZ, HA1T/HA2T)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	1450 (100)	O
X	Pilot signal (HA1 and HA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	45 (3)	X
X_1, X_2	Pilot signal (DA0)	ISO 8434-1	SDSC–L8xM12–F	580 (40)	O
X_1	Pilot signal (DA1, DA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	580 (40)	O
X_3	Pilot signal (DA1, DA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	580 (40)	X
M_1	Measuring stroking chamber	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	7250 (500)	X

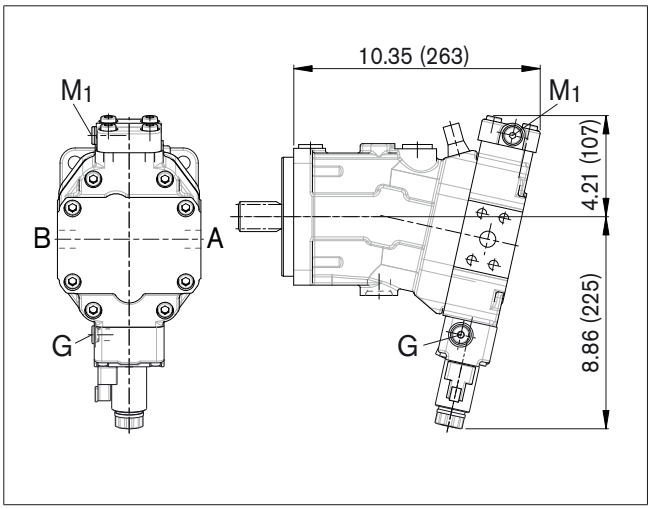
1) Observe the general instructions on page 74 for the maximum tightening torques.
2) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Only dimensions according to SAE J518.
4) Depending on installation position, T_1 or T_2 must be connected (see also installation instructions on page 72).
5) For the maximum utilization of pressure, only grade 8 screws and hardened washers are to be used to tighten the SAE flange shells.
6) The spot face can be deeper than specified in the appropriate standard.
7) O = Must be connected (plugged on delivery)
   X = Plugged (in normal operation)

Dimensions size 60

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

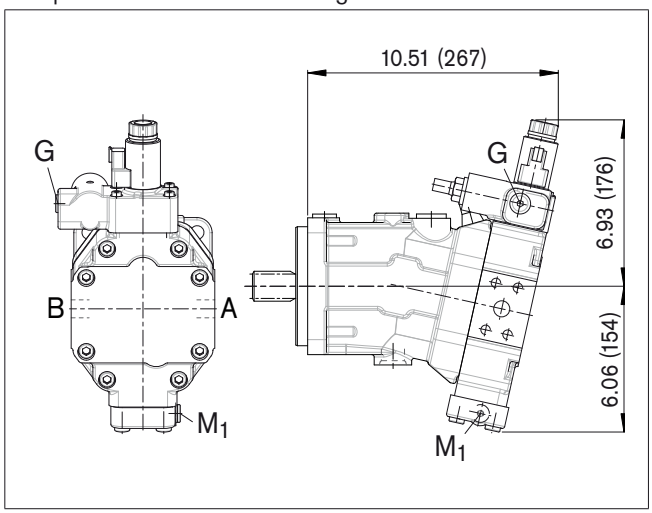
EP1, EP2

Proportional control electric, positive control



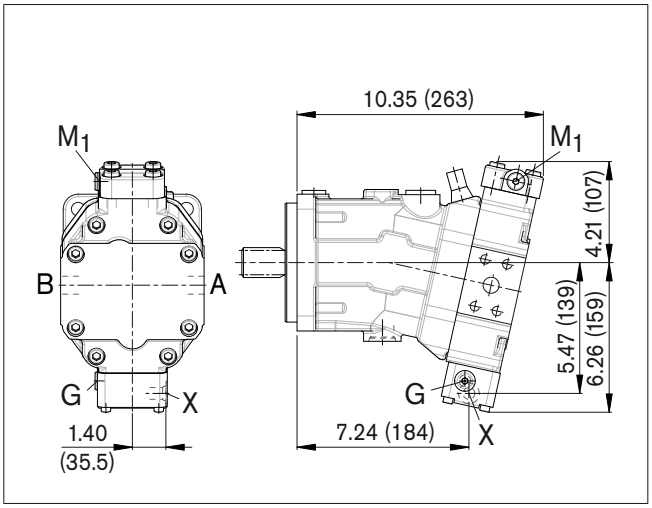
EP5D1, EP6D1

Proportional control electric, negative control, with pressure control fixed setting



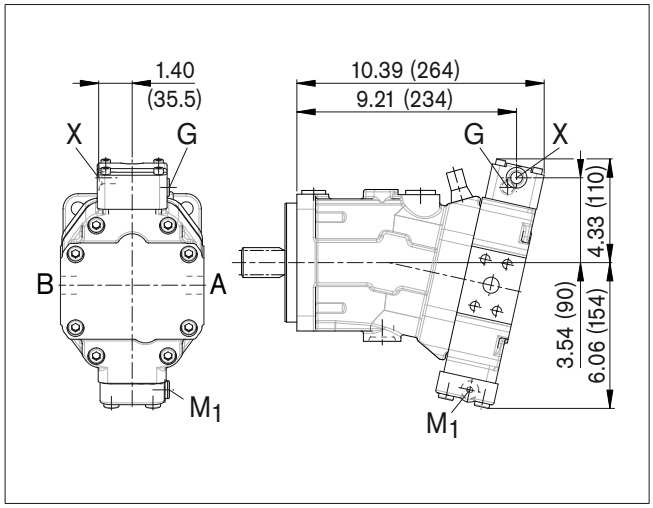
HP1, HP2

Proportional control hydraulic, positive control



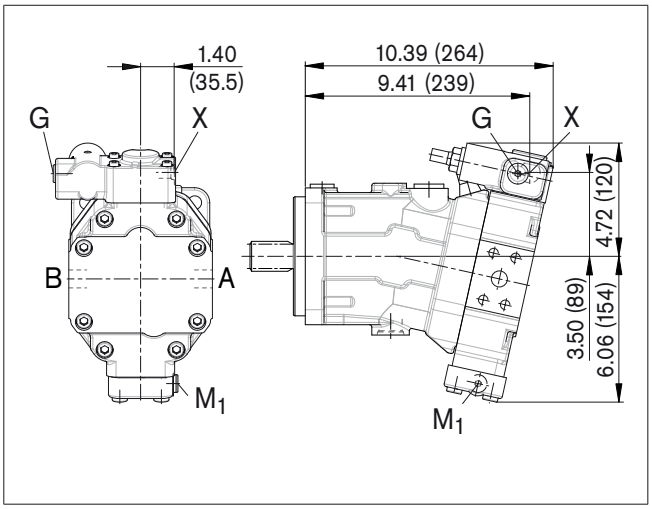
HP5, HP6

Proportional control hydraulic, negative control



HP5D1, HP6D1

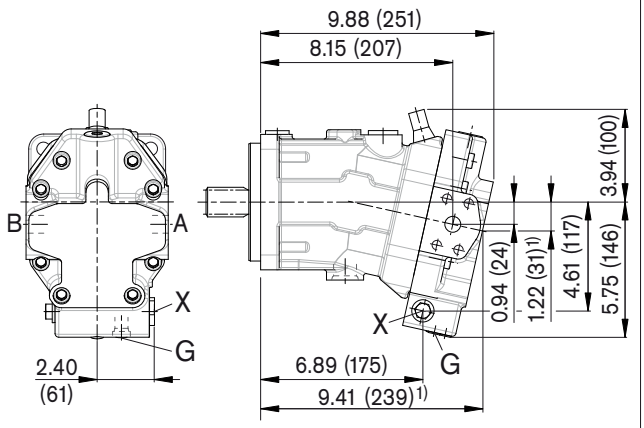
Proportional control hydraulic, negative control, with pressure control fixed setting



Dimensions size 60

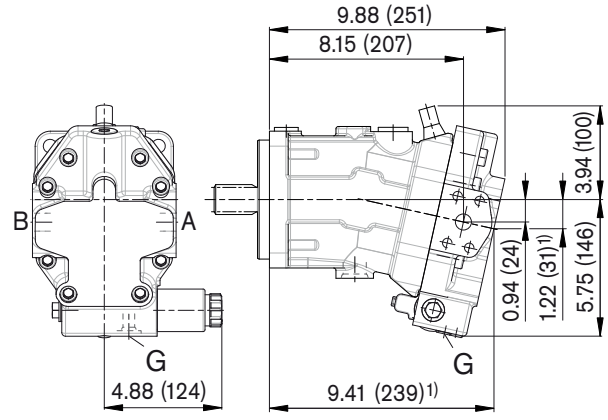
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

HZ7
Two-point control hydraulic, negative control



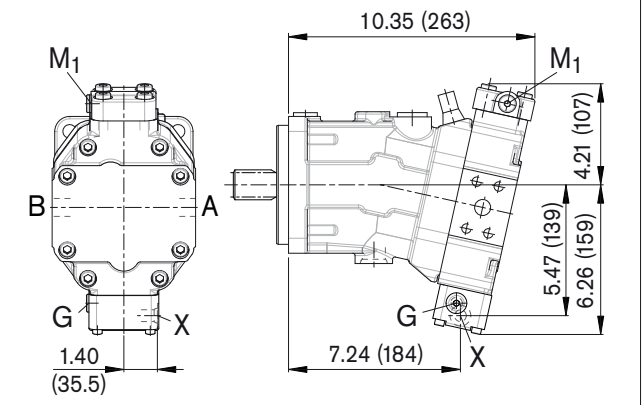
1) Port plate 1 – SAE flange ports A and B at rear

EZ7, EZ8
Two-point control electric, negative control



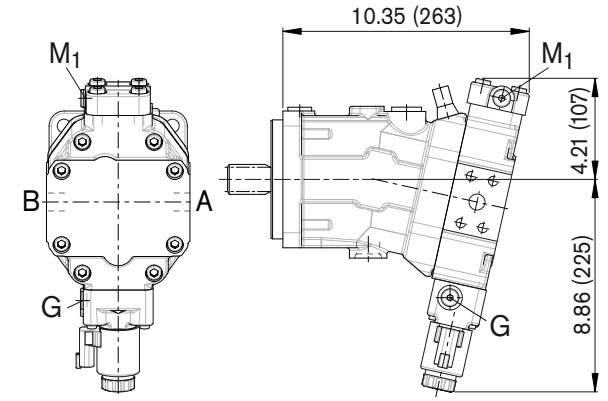
1) Port plate 1 – SAE flange ports A and B at rear

HA1, HA2 / HA1T3, HA2T3
Automatic control high-pressure related, positive control, with override hydraulic remote control, proportional

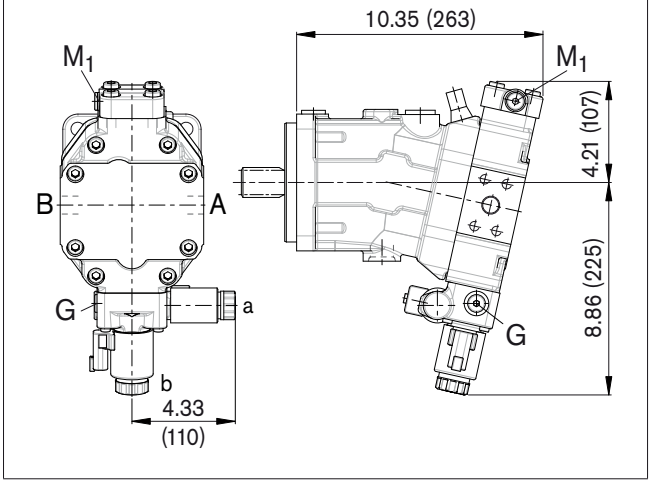


HA1 and HA2, X plugged
HA1T and HA2T, X open

HA1U1, HA2U2
Automatic control high-pressure related, positive control, with override electric, two-point



HA1R1, HA2R2
Automatic control high-pressure related, positive control, with override electric and travel direction valve electric

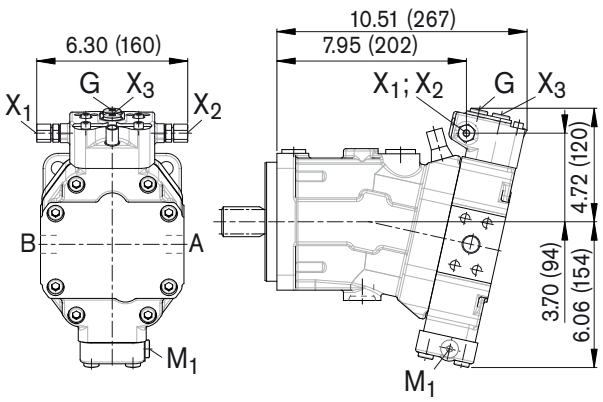


Dimensions size 60

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

DA0

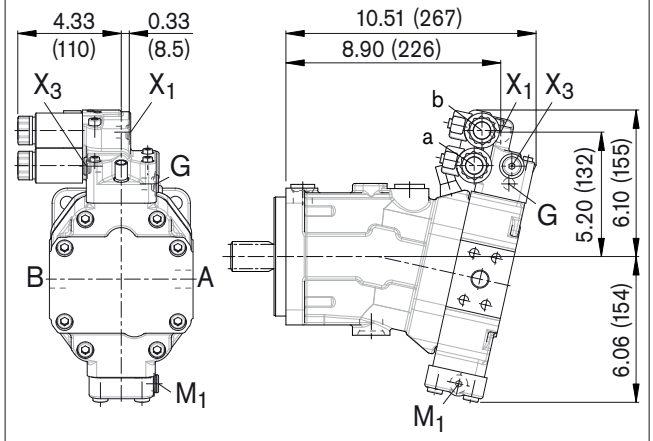
Automatic control speed related, negative control,
with hydraulic travel direction valve



X_1, X_2 Pipe fitting SDSC – L8xM12 – F acc. to ISO 8434-1
Use assembled fitting!

DA1, DA2

Automatic control speed related, negative control,
with electric travel direction valve and electric $V_{g\,max}$- circuit

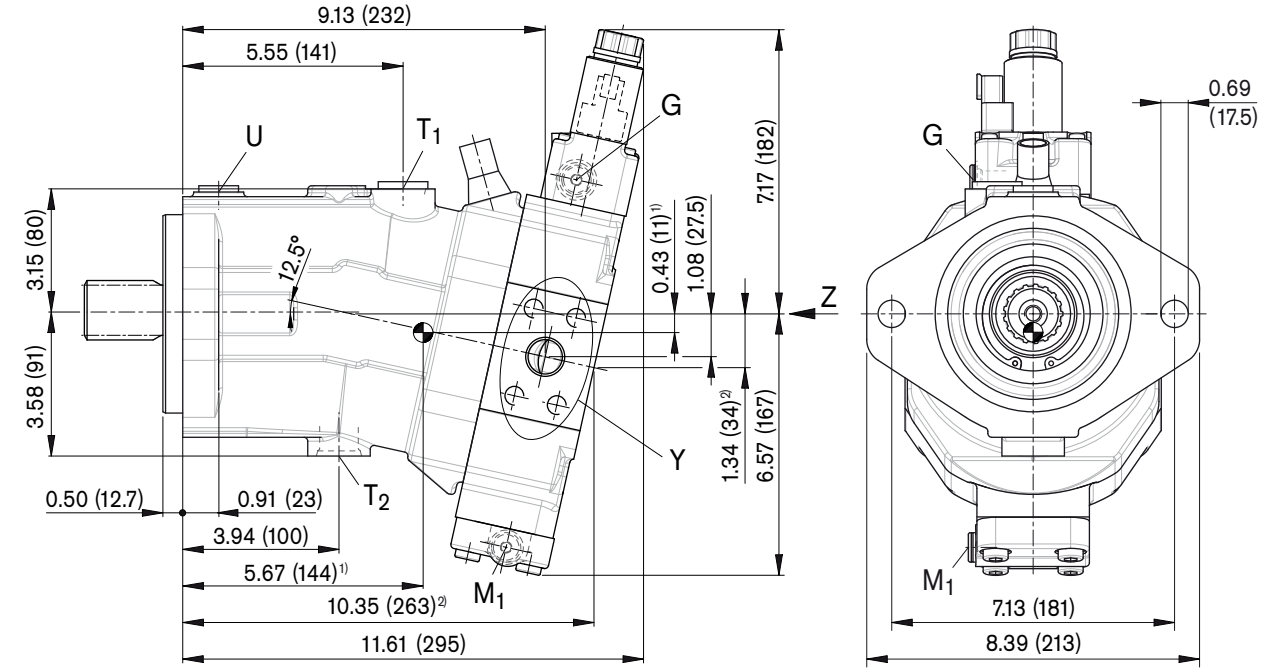


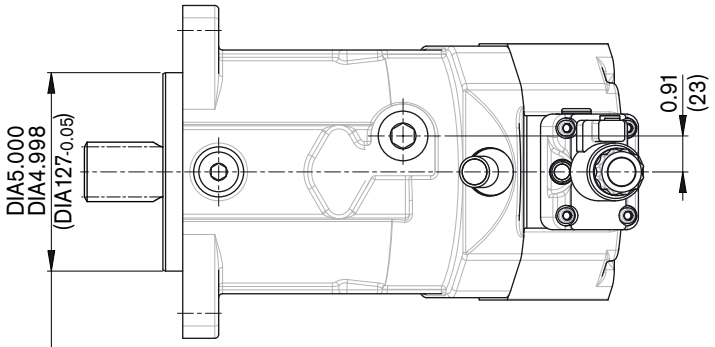
Dimensions size 85

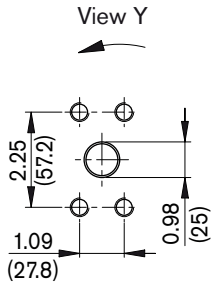
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

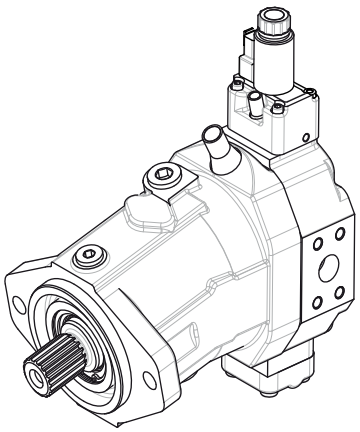
EP5, EP6 – Proportional control electric, negative control

Port plate 2 – SAE flange ports A and B at side, opposite









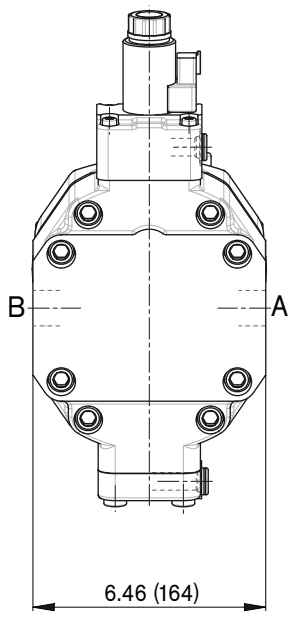
1) Center of gravity
2) Port plate 1 – SAE flange ports A and B at rear

Dimensions size 85

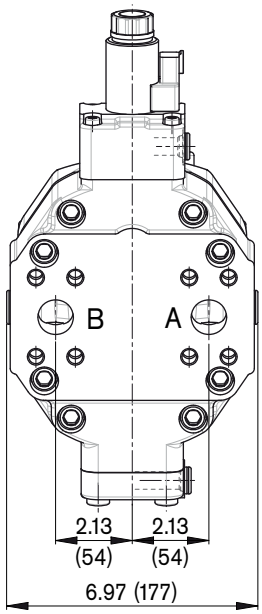
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

Location of the service line ports on the port plates (view Z)

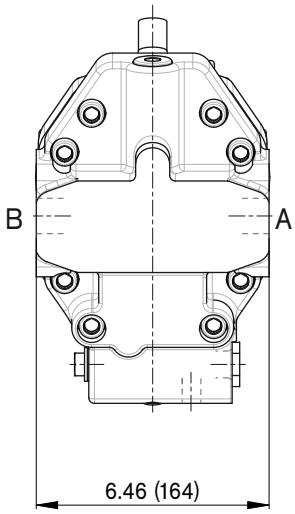
2 SAE flange ports A and B at side, opposite



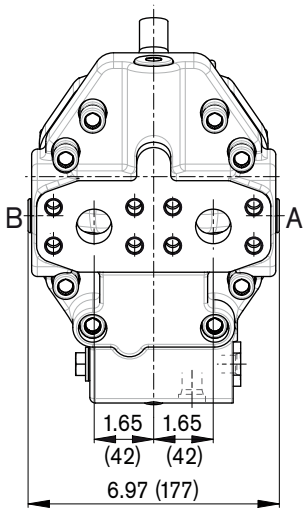
1 SAE flange ports A and B at rear



2 SAE flange ports A and B at side, opposite only HZ7, EZ7/8

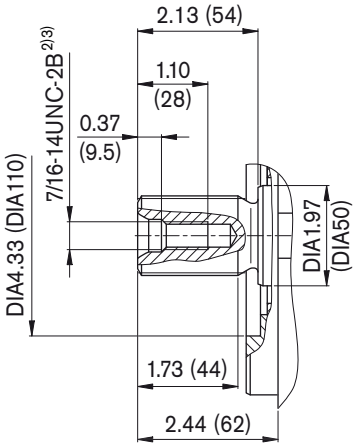


1 SAE flange ports A and B at rear only HZ7, EZ7/8



Drive shaft

S9 Splined shaft 1 1/2 in 17 T 12/24DP[1)]



1) ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Observe the general instructions on page 74 for the maximum tightening torques.

Dimensions size 85

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

Ports

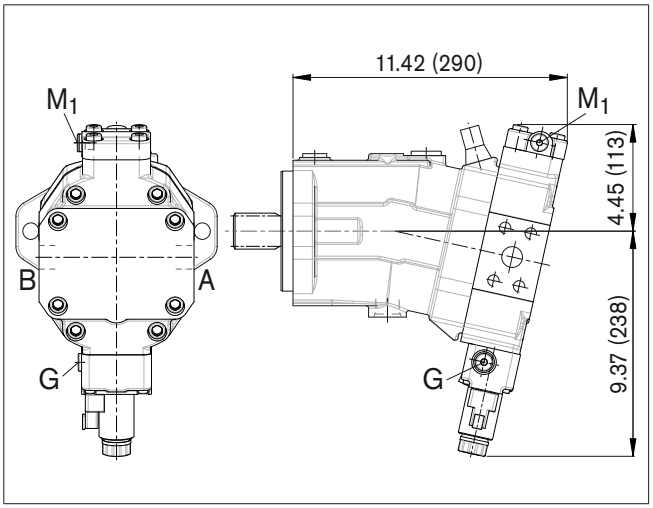
Designation	Port for	Standard	Size[1]	Maximum pressure [psi (bar)][2]	State[7]
A, B[5]	Service line Fastening thread A/B, screw grade 8 with hardened washer	SAE J518[3] ASME B1.1	1 in 7/16 in - 14 UNC-2B; 0.87 (22) deep	7250 (500)	O
T_1	Drain line	ISO 11926[6]	1 1/16 in - 12 UN-2B; 0.79 (20) deep	45 (3)	X[4]
T_2	Drain line	ISO 11926[6]	1 1/16 in - 12 UN-2B; 0.79 (20) deep	45 (3)	O[4]
G	Synchronous control	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	7250 (500)	X
U	Bearing flushing	ISO 11926[6]	7/8 in - 14 UNF-2B; 0.67 (17) deep	45 (3)	X
X	Pilot signal (HP, HZ, HA1T/HA2T)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	1450 (100)	O
X	Pilot signal (HA1 and HA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	45 (3)	X
X_1, X_2	Pilot signal (DA0)	ISO 8434-1	SDSC–L8xM12–F	580 (40)	O
X_1	Pilot signal (DA1, DA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	580 (40)	O
X_3	Pilot signal (DA1, DA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	580 (40)	X
M_1	Measuring stroking chamber	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	7250 (500)	X

1) Observe the general instructions on page 74 for the maximum tightening torques.
2) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.
4) Depending on installation position, T_1 or T_2 must be connected (see also installation instructions on page 72).
5) For the maximum utilization of pressure, only grade 8 screws and hardened washers are to be used to tighten the SAE flange shells.
6) The spot face can be deeper than specified in the appropriate standard.
7) O = Must be connected (plugged on delivery)
   X = Plugged (in normal operation)

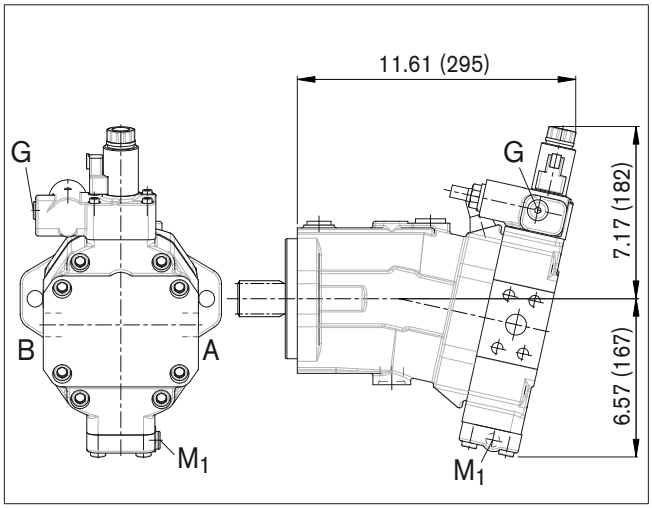
Dimensions size 85

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

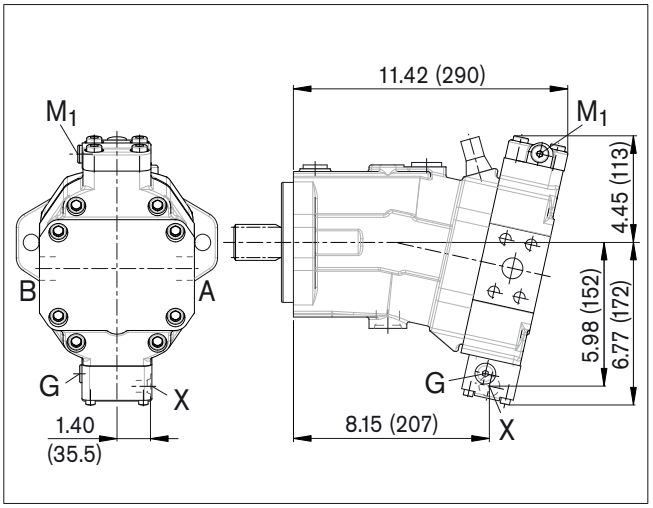
EP1, EP2
Proportional control electric, positive control



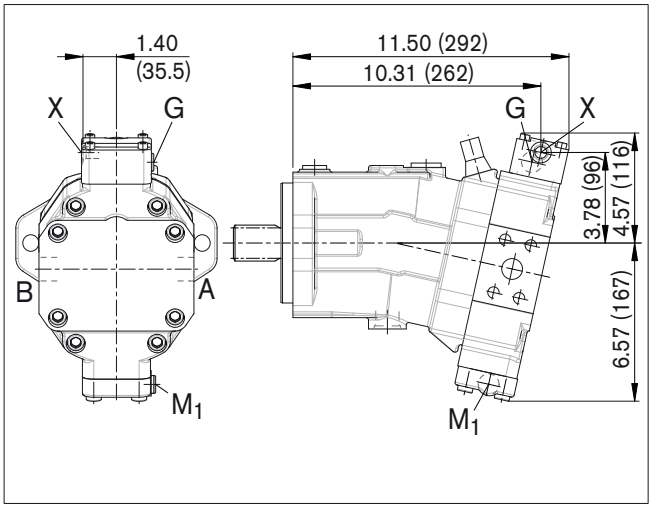
EP5D1, EP6D1
Proportional control electric, negative control, with pressure control fixed setting



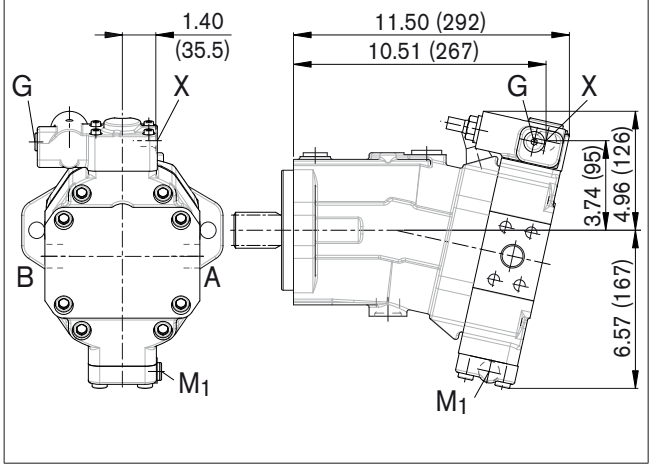
HP1, HP2
Proportional control hydraulic, positive control



HP5, HP6
Proportional control hydraulic, negative control



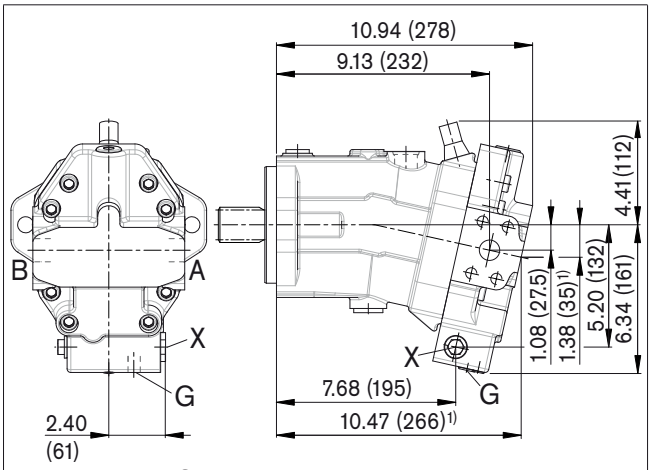
HP5D1, HP6D1
Proportional control hydraulic, negative control, with pressure control fixed setting



Dimensions size 85

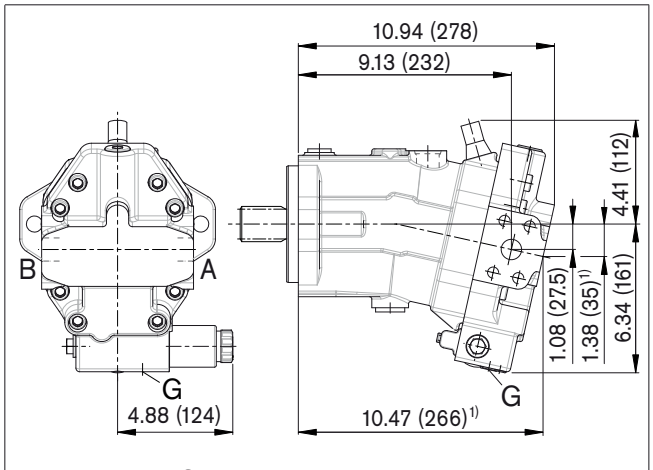
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

HZ7
Two-point control hydraulic, negative control



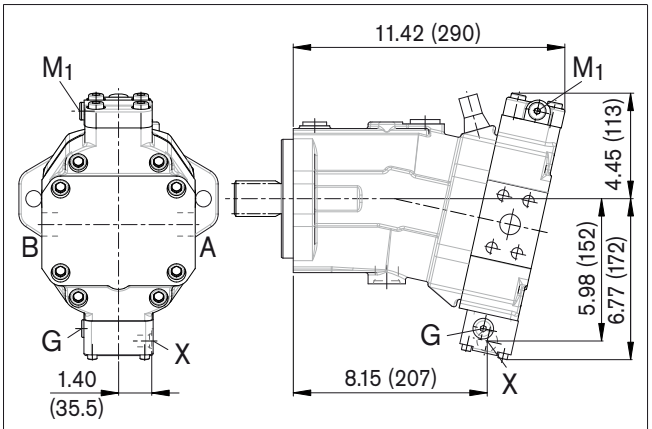
1) Port plate 1 – SAE flange ports A and B at rear

EZ7, EZ8
Two-point control electric, negative control



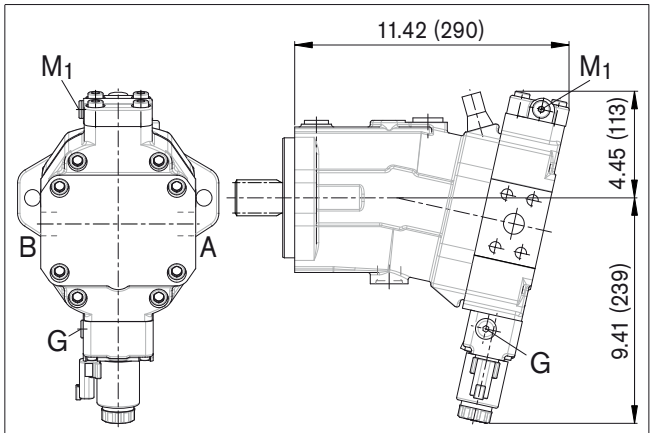
1) Port plate 1 – SAE flange ports A and B at rear

HA1, HA2 / HA1T3, HA2T3
Automatic control high-pressure related, positive control, with override hydraulic remote control, proportional

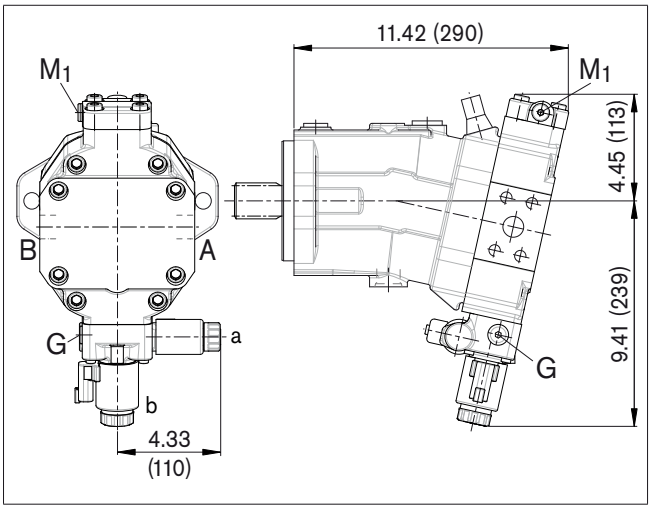


HA1 and HA2, X plugged
HA1T and HA2T, X open

HA1U1, HA2U2
Automatic control high-pressure related, positive control, with override electric, two-point



HA1R1, HA2R2
Automatic control high-pressure related, positive control, with override electric and travel direction valve electric

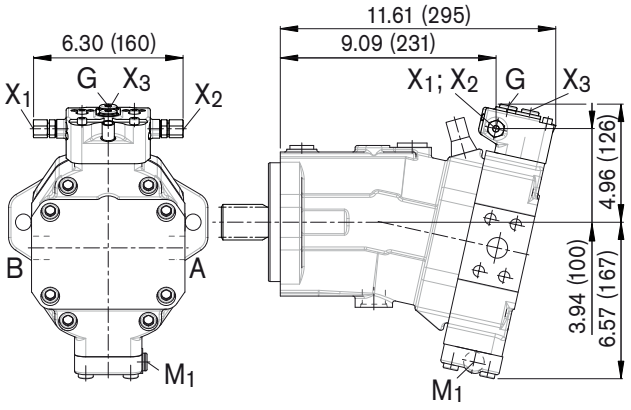


Dimensions size 85

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

DA0

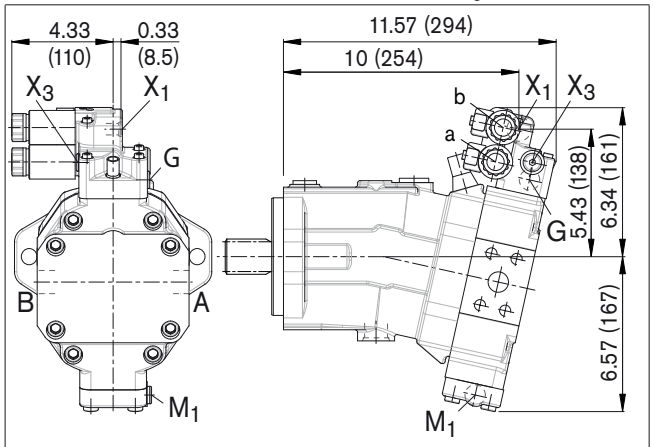
Automatic control speed related, negative control, with hydraulic travel direction valve



X_1, X_2 Pipe fitting SDSC – L8xM12 – F acc. to ISO 8434-1
Use assembled fitting!

DA1, DA2

Automatic control speed related, negative control, with electric travel direction valve and electric $V_{g\,max}$- circuit

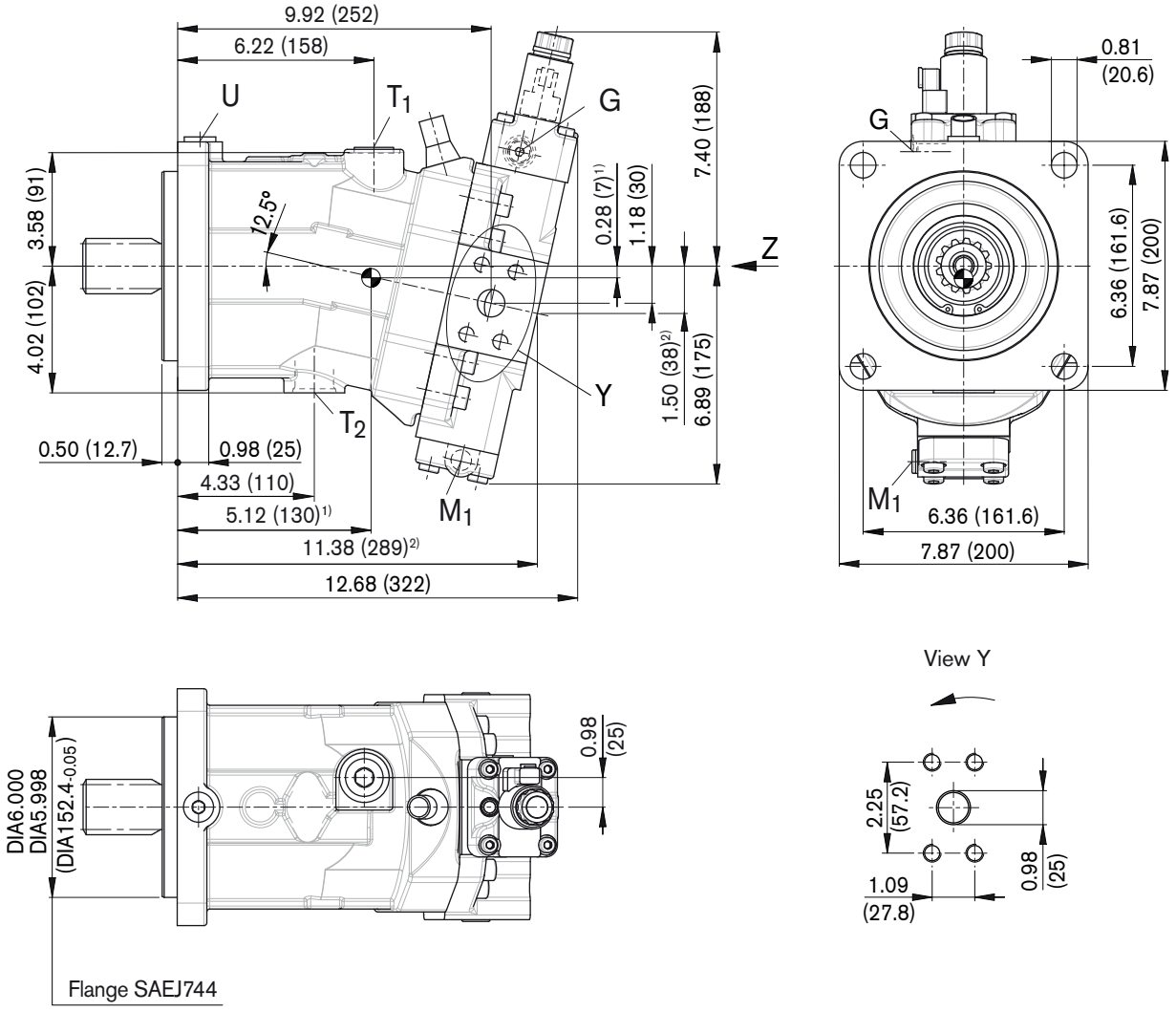


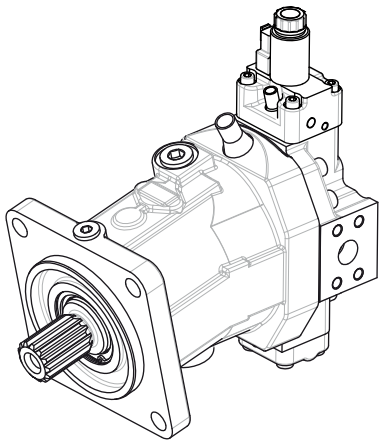
Dimensions size 115

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

EP5, EP6 – Proportional control electric, negative control

Port plate 2 – SAE flange ports A and B at side, opposite





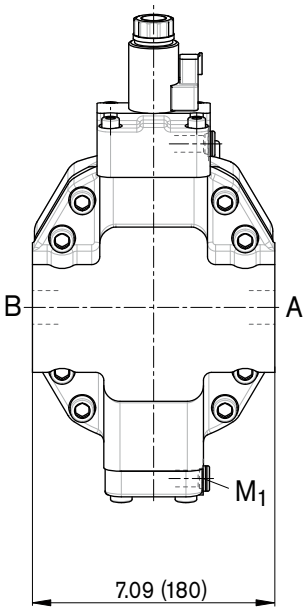
1) Center of gravity
2) Port plate 1 – SAE flange ports A and B at rear

Dimensions size 115

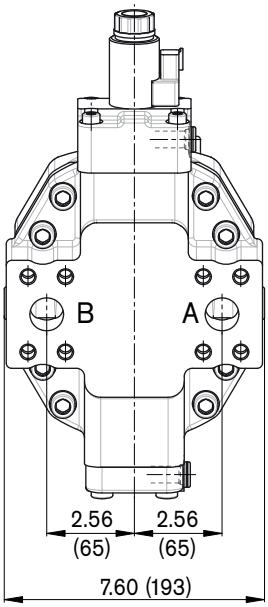
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

Location of the service line ports on the port plates (view Z)

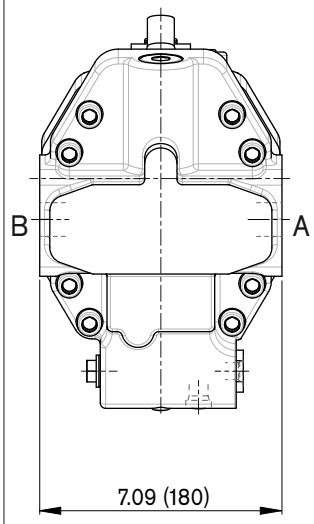
2 SAE flange ports A and B at side, opposite



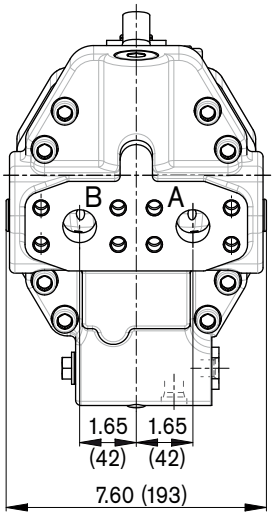
1 SAE flange ports A and B at rear



2 SAE flange ports A and B at side, opposite only HZ7, EZ7/8

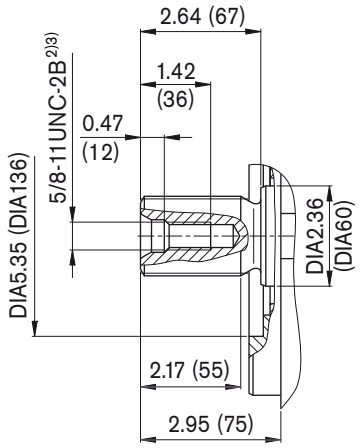


1 SAE flange ports A and B at rear only HZ7, EZ7/8



Drive shaft

T1 Splined shaft 1 3/4 in 13 T 8/16DP[1)]



1) ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Observe the general instructions on page 74 for the maximum tightening torques.

Dimensions size 115

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

Ports

Designation	Port for	Standard	Size[1]	Maximum pressure [psi (bar)][2]	State[7]
A, B[5]	Service line Fastening thread A/B, screw grade 8 with hardened washer	SAE J518[3] ASME B1.1	1 in 7/16 in - 14 UNC-2B; 0.87 (22) deep	7250 (500)	O
T_1	Drain line	ISO 11926[6]	1 1/16 in - 12 UN-2B; 0.79 (20) deep	45 (3)	X[4]
T_2	Drain line	ISO 11926[6]	1 5/16 in - 12 UN-2B; 0.79 (20) deep	45 (3)	O[4]
G	Synchronous control	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	7250 (500)	X
U	Bearing flushing	ISO 11926[6]	7/8 in - 14 UNF-2B; 0.67 (17) deep	45 (3)	X
X	Pilot signal (HP, HZ, HA1T/HA2T)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	1450 (100)	O
X	Pilot signal (HA1 and HA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	45 (3)	X
X_1, X_2	Pilot signal (DA0)	ISO 8434-1	SDSC–L8xM12–F	580 (40)	O
X_1	Pilot signal (DA1, DA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	580 (40)	O
X_3	Pilot signal (DA1, DA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	580 (40)	X
M_1	Measuring stroking chamber	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	7250 (500)	X

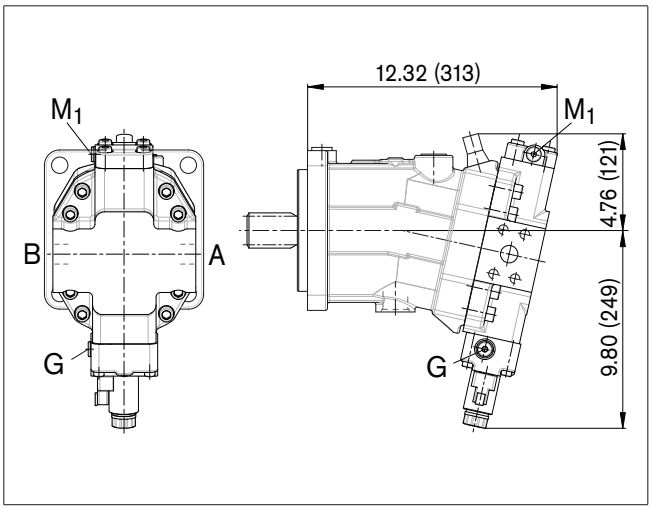
1) Observe the general instructions on page 74 for the maximum tightening torques.
2) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.
4) Depending on installation position, T_1 or T_2 must be connected (see also installation instructions on page 72).
5) For the maximum utilization of pressure, only grade 8 screws and hardened washers are to be used to tighten the SAE flange shells.
6) The spot face can be deeper than specified in the appropriate standard.
7) O = Must be connected (plugged on delivery)
   X = Plugged (in normal operation)

Dimensions size 115

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

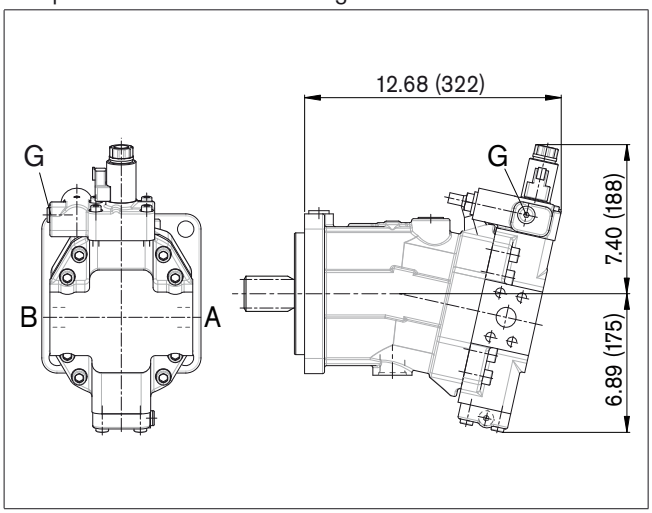
EP1, EP2

Proportional control electric, positive control



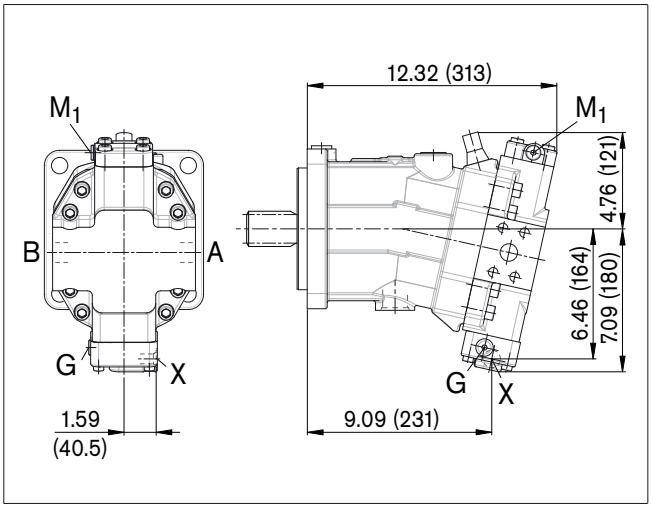
EP5D1, EP6D1

Proportional control electric, negative control, with pressure control fixed setting



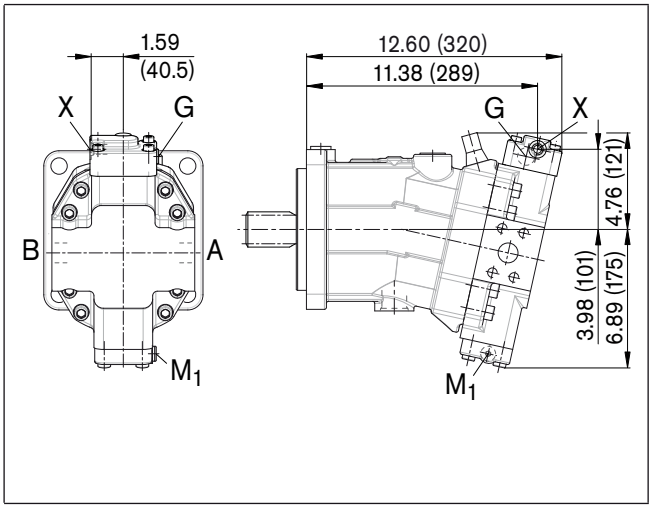
HP1, HP2

Proportional control hydraulic, positive control



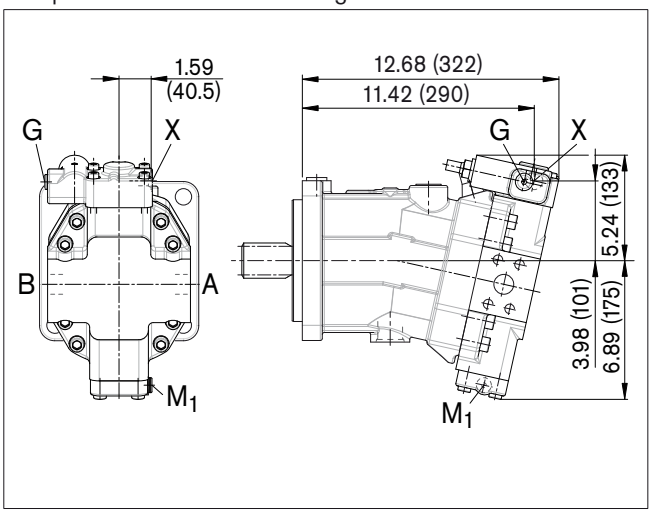
HP5, HP6

Proportional control hydraulic, negative control



HP5D1, HP6D1

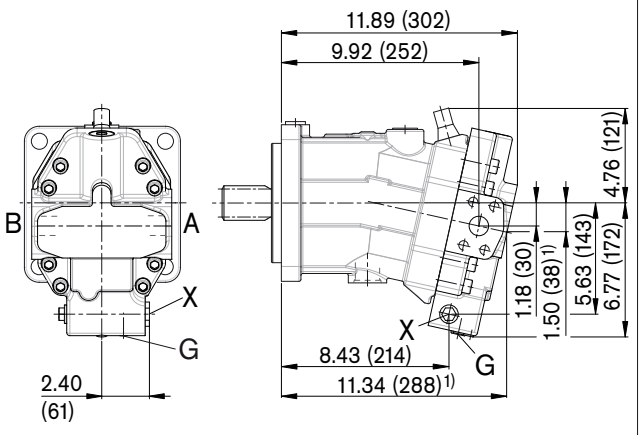
Proportional control hydraulic, negative control, with pressure control fixed setting



Dimensions size 115

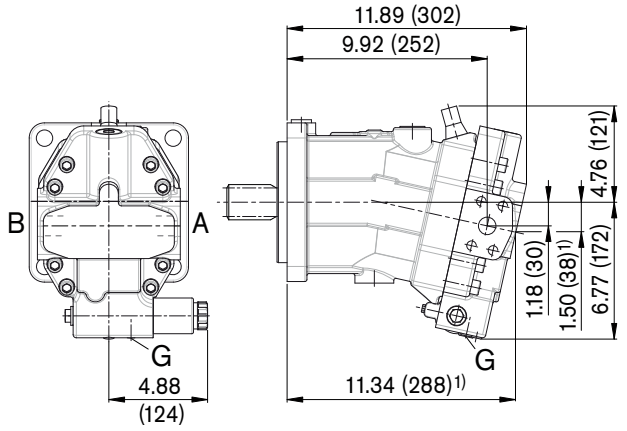
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

HZ7
Two-point control hydraulic, negative control



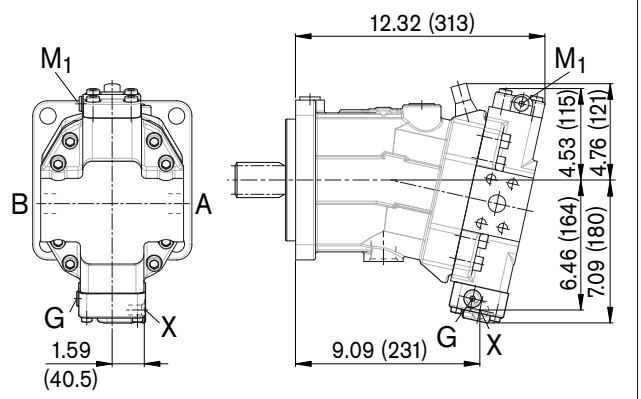
1) Port plate 1 – SAE flange ports A and B at rear

EZ7, EZ8
Two-point control electric, negative control



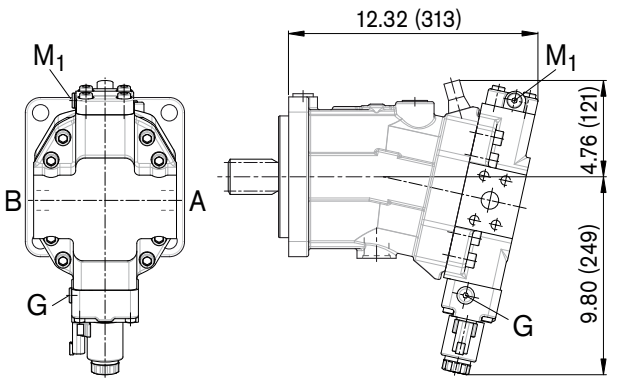
1) Port plate 1 – SAE flange ports A and B at rear

HA1, HA2 / HA1T3, HA2T3
Automatic control high-pressure related, positive control, with override hydraulic remote control, proportional

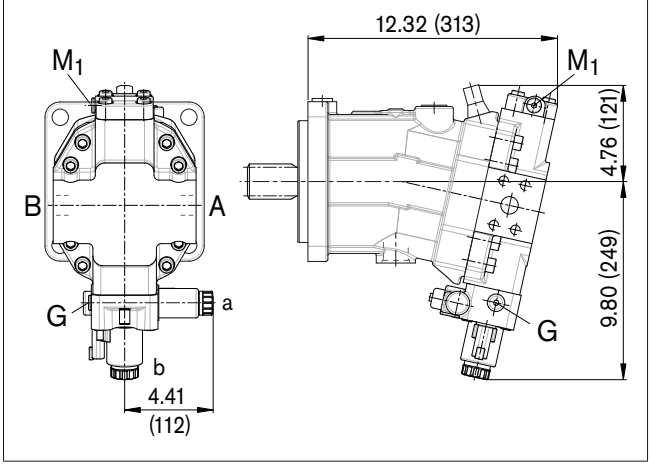


HA1 and HA2, X plugged
HA1T and HA2T, X open

HA1U1, HA2U2
Automatic control high-pressure related, positive control, with override electric, two-point



HA1R1, HA2R2
Automatic control high-pressure related, positive control, with override electric and travel direction valve electric

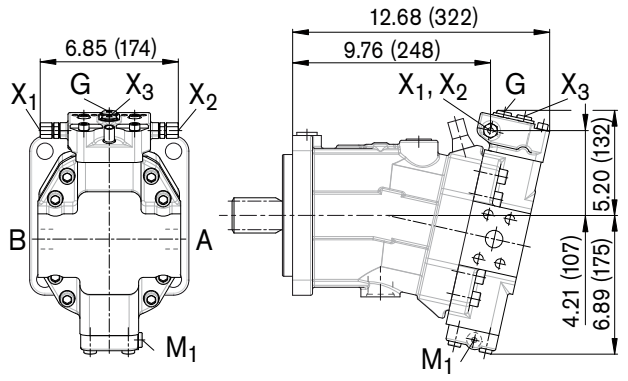


Dimensions size 115

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

DA0

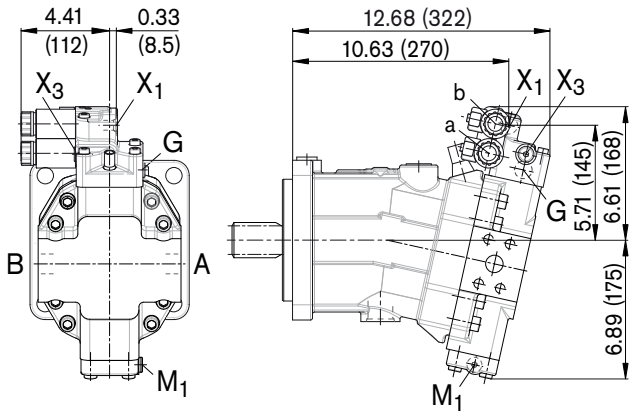
Automatic control speed related, negative control, with hydraulic travel direction valve



X_1, X_2 Pipe fitting SDSC – L8xM12 – F acc. to ISO 8434-1
Use assembled fitting!

DA1, DA2

Automatic control speed related, negative control, with electric travel direction valve and electric $V_{g\,max}$- circuit

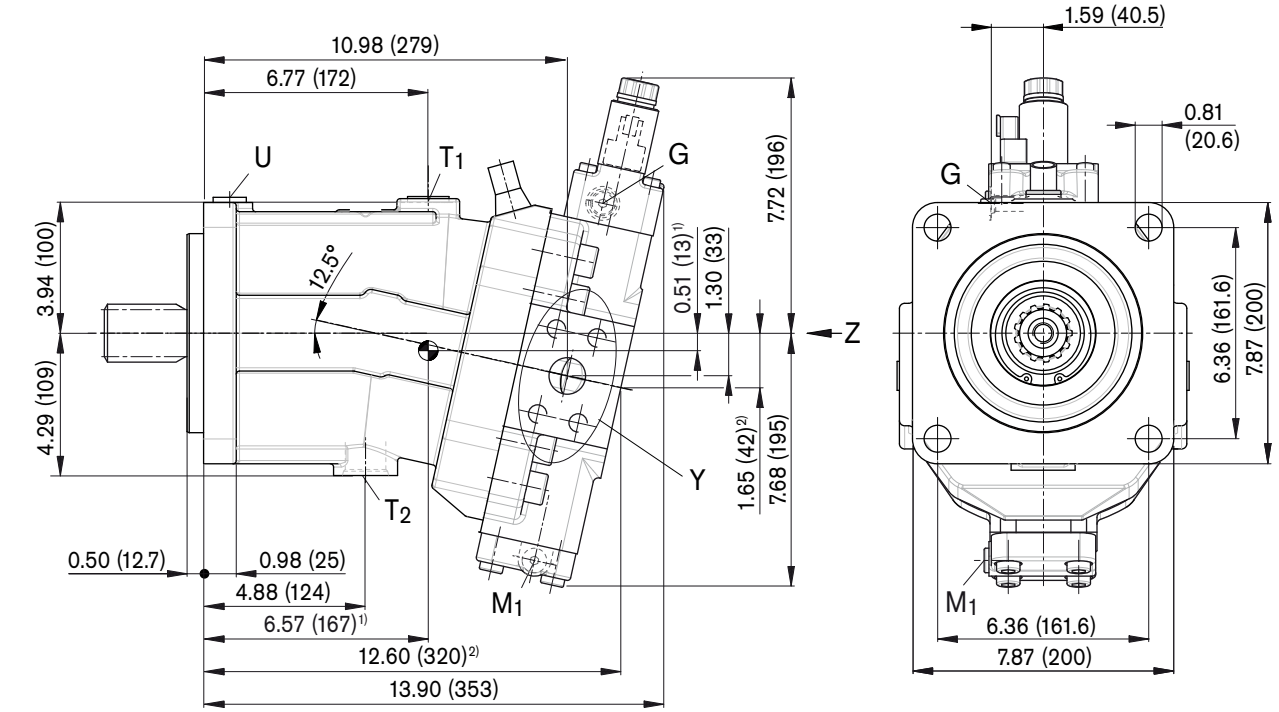


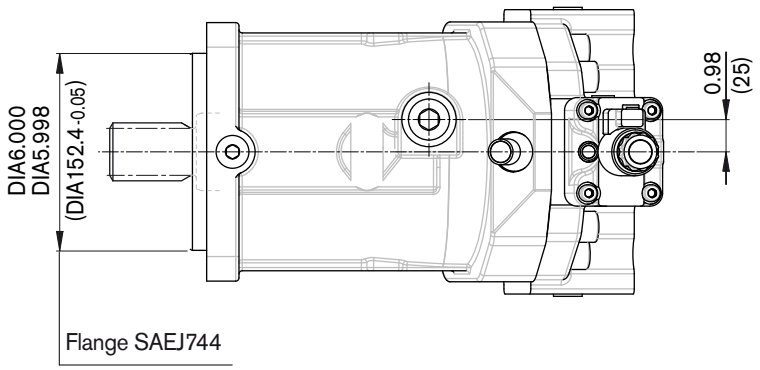
Dimensions size 150

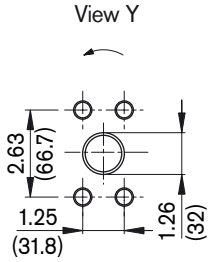
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

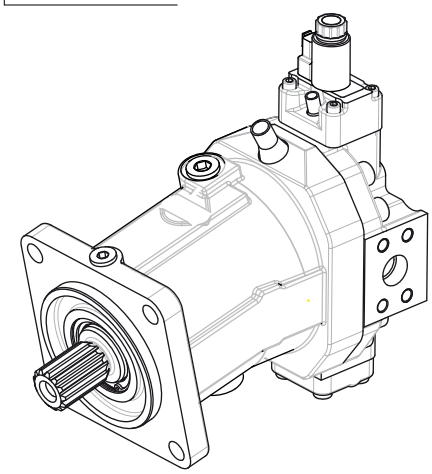
EP5, EP6 – Proportional control electric, negative control

Port plate 2 – SAE flange ports A and B at side, opposite







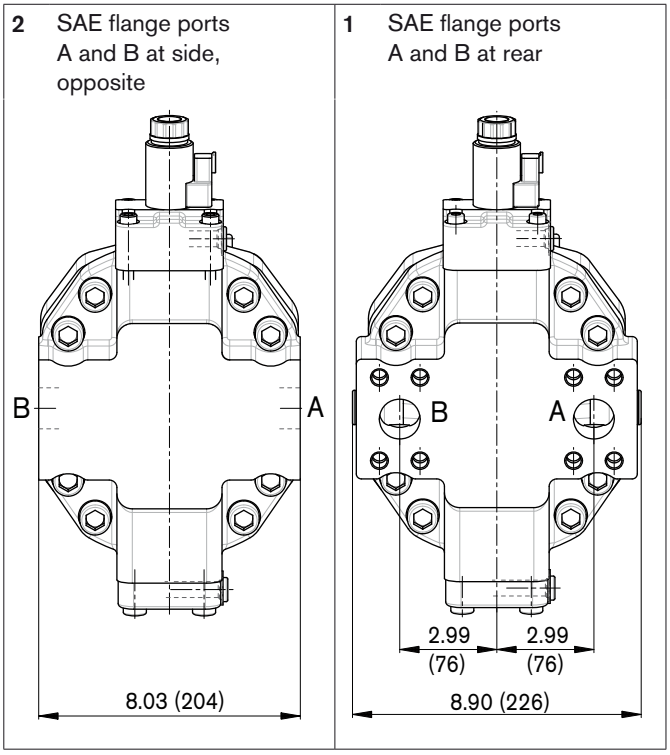


1) Center of gravity
2) Port plate 1 – SAE flange ports A and B at rear

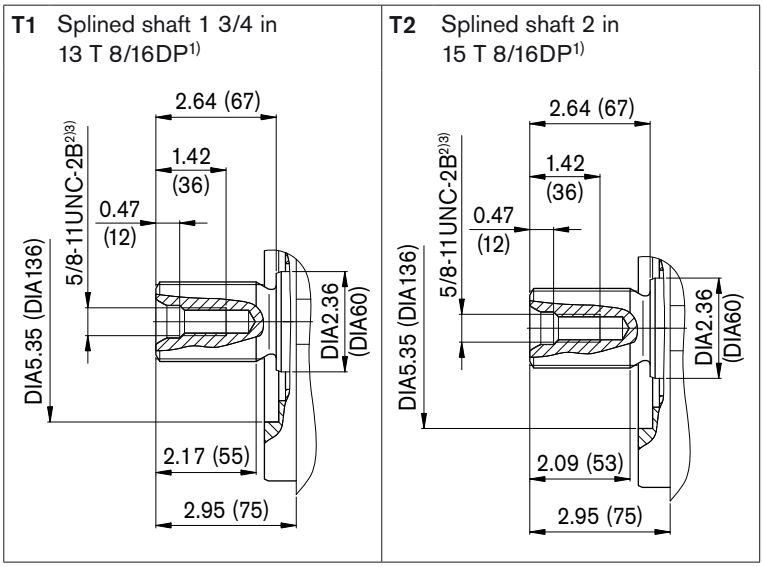
Dimensions size 150

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

Location of the service line ports on the port plates (view Z)



Drive shafts



1) ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Observe the general instructions on page 74 for the maximum tightening torques.

Dimensions size 150

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

Ports

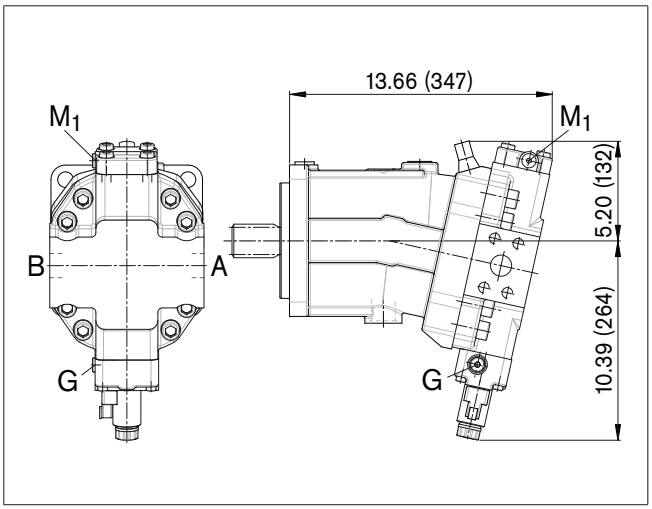
Designation	Port for	Standard	Size[1]	Maximum pressure [psi (bar)][2]	State[7]
A, B[5]	Service line Fastening thread A/B, screw grade 8 with hardened washer	SAE J518[3] ASME B1.1	1 1/4 in 1/2 in - 13 UNC-2B; 0.75 (19) deep	7250 (500)	O
T_1	Drain line	ISO 11926[6]	1 1/16 in - 12 UN-2B; 0.79 (20) deep	45 (3)	X[4]
T_2	Drain line	ISO 11926[6]	1 5/16 in - 12 UN-2B; 0.79 (20) deep	45 (3)	O[4]
G	Synchronous control	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	7250 (500)	X
U	Bearing flushing	ISO 11926[6]	7/8 in - 14 UNF-2B; 0.67 (17) deep	45 (3)	X
X	Pilot signal (HP, HZ, HA1T/HA2T)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	1450 (100)	O
X	Pilot signal (HA1 and HA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	45 (3)	X
X_1, X_2	Pilot signal (DA0)	ISO 8434-1	SDSC–L8xM12–F	580 (40)	O
X_1	Pilot signal (DA1, DA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	580 (40)	O
X_3	Pilot signal (DA1, DA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	580 (40)	X
M_1	Measuring stroking chamber	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	7250 (500)	X

1) Observe the general instructions on page 74 for the maximum tightening torques.
2) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.
4) Depending on installation position, T_1 or T_2 must be connected (see also installation instructions on page 72).
5) For the maximum utilization of pressure, only grade 8 screws and hardened washers are to be used to tighten the SAE flange shells.
6) The spot face can be deeper than specified in the appropriate standard.
7) O = Must be connected (plugged on delivery)
   X = Plugged (in normal operation)

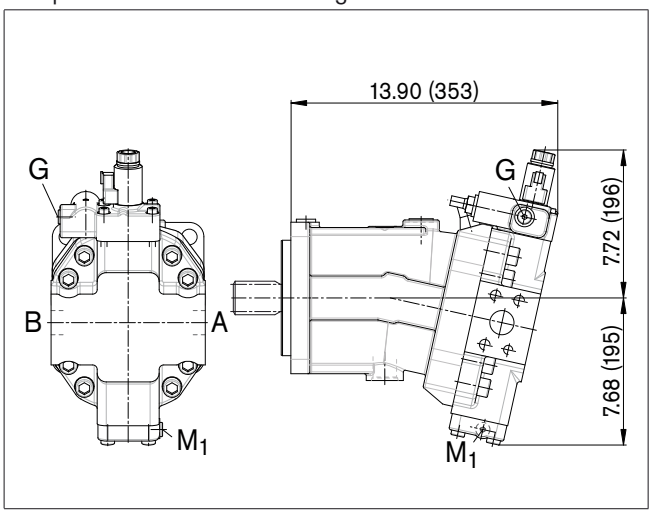
Dimensions size 150

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

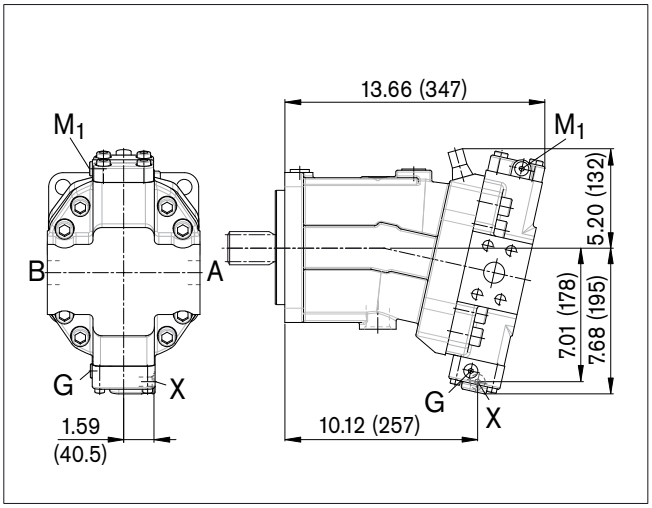
EP1, EP2
Proportional control electric, positive control



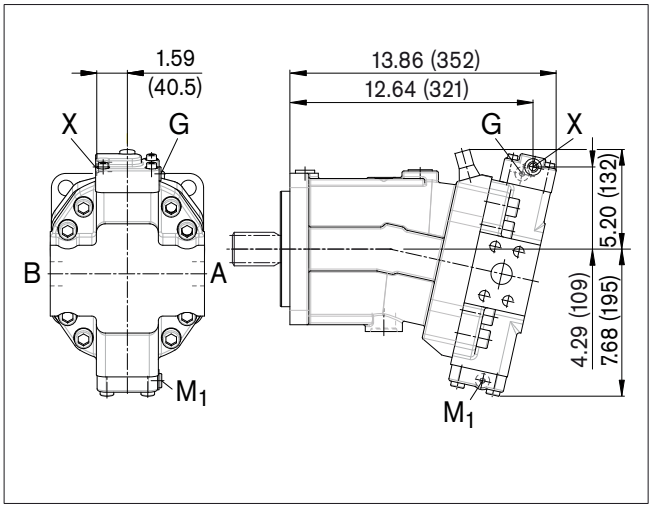
EP5D1, EP6D1
Proportional control electric, negative control, with pressure control fixed setting



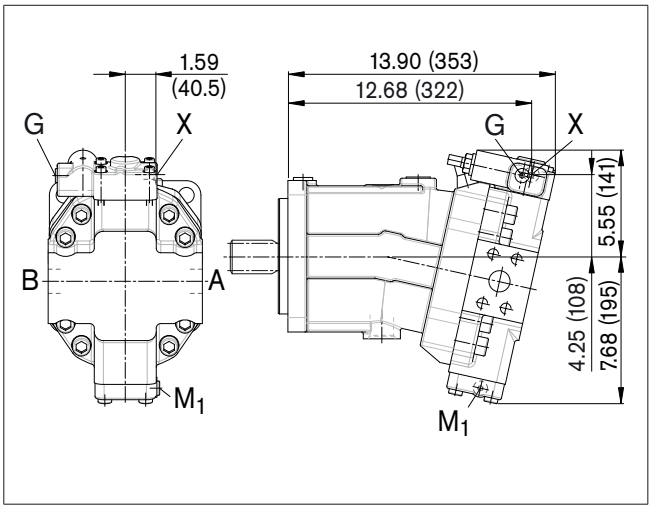
HP1, HP2
Proportional control hydraulic, positive control



HP5, HP6
Proportional control hydraulic, negative control



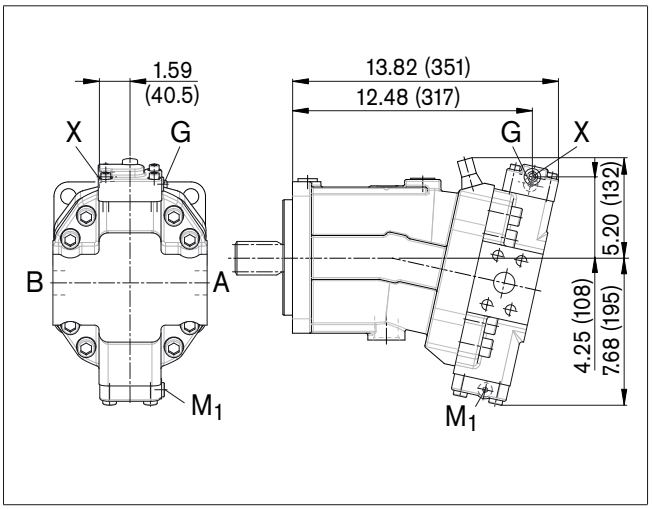
HP5D1, HP6D1
Proportional control hydraulic, negative control, with pressure control fixed setting



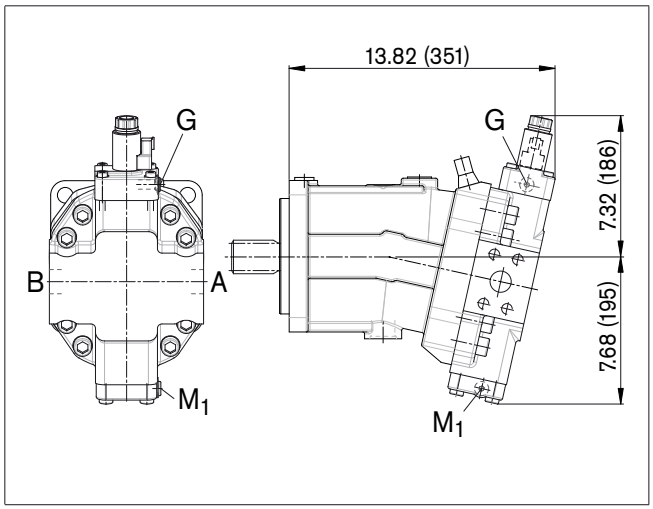
Dimensions size 150

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

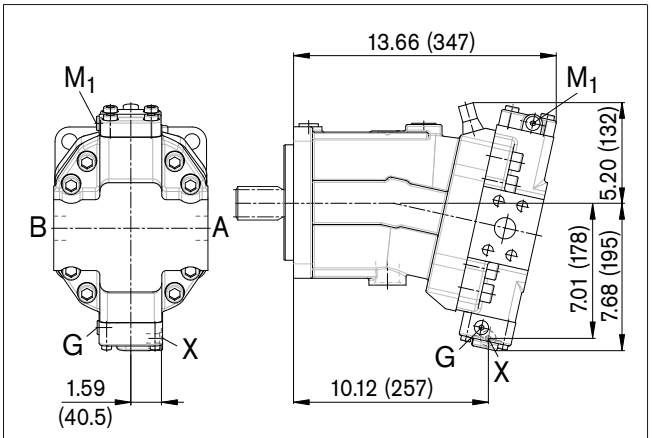
HZ5
Two-point control hydraulic, negative control



EZ5, EZ6
Two-point control electric, negative control

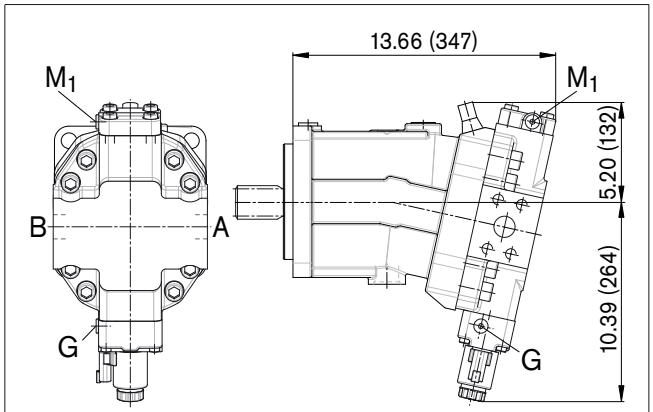


HA1, HA2 / HA1T3, HA2T3
Automatic control high-pressure related, positive control, with override hydraulic remote control, proportional

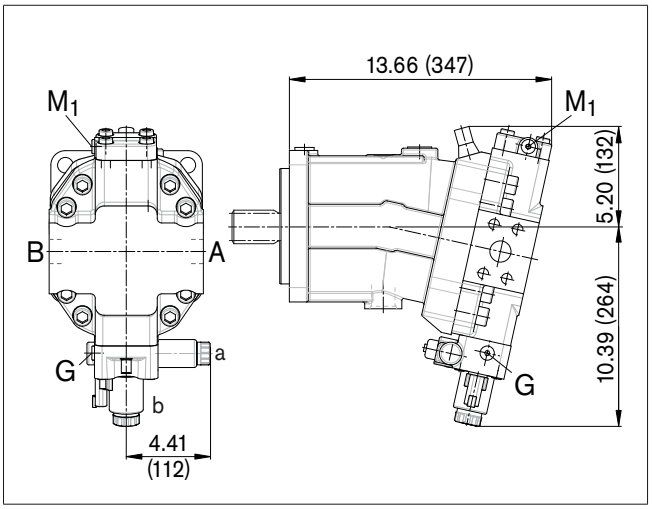


HA1 and HA2, X plugged
HA1T and HA2T, X open

HA1U1, HA2U2
Automatic control high-pressure related, positive control, with override electric, two-point



HA1R1, HA2R2
Automatic control high-pressure related, positive control, with override electric and travel direction valve electric

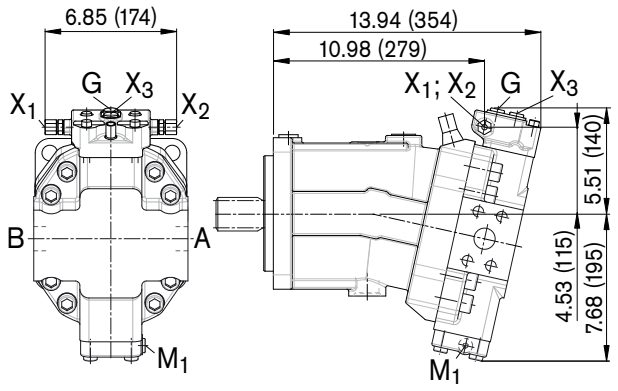


Dimensions size 150

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

DA0

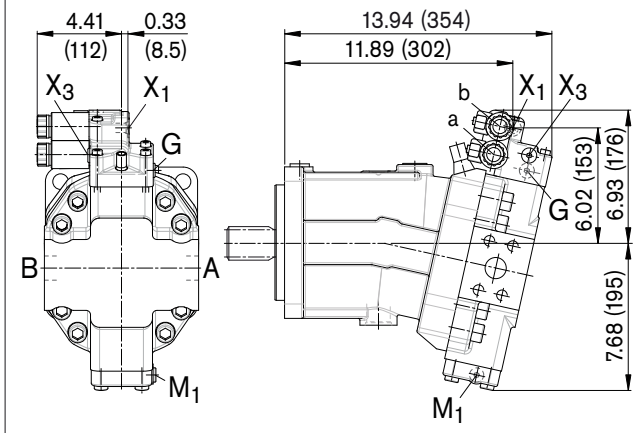
Automatic control speed related, negative control,
with hydraulic travel direction valve



X_1, X_2 Pipe fitting SDSC – L8xM12 – F acc. to ISO 8434-1
Use assembled fitting!

DA1, DA2

Automatic control speed related, negative control,
with electric travel direction valve and electric $V_{g\,max}$- circuit

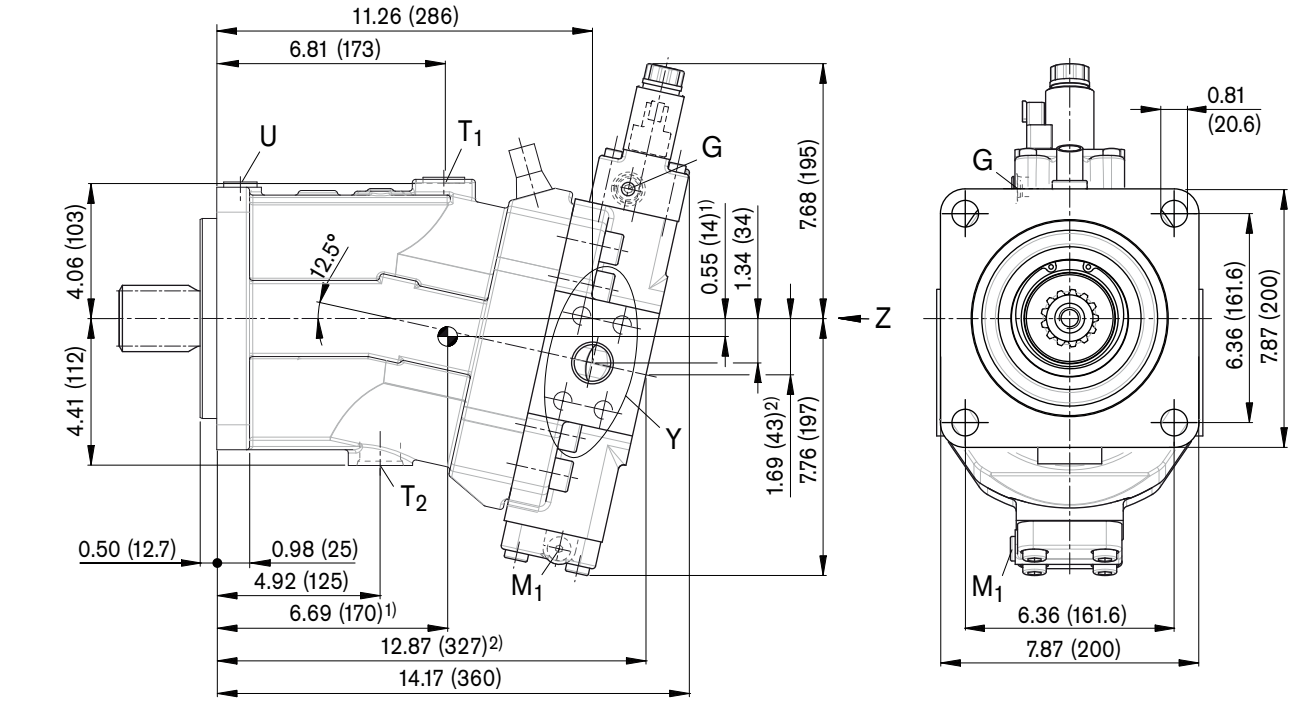


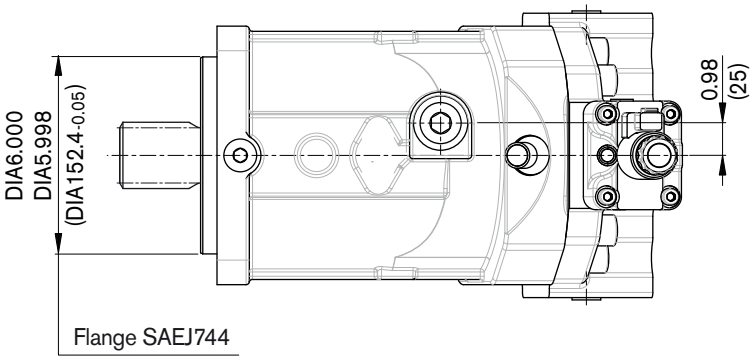
Dimensions size 170

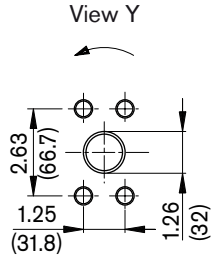
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

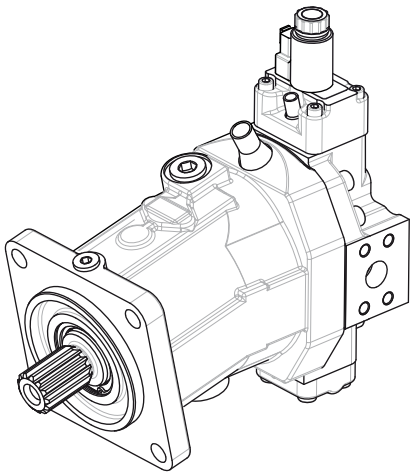
EP5, EP6 – Proportional control electric, negative control

Port plate 2 – SAE flange ports A and B at side, opposite









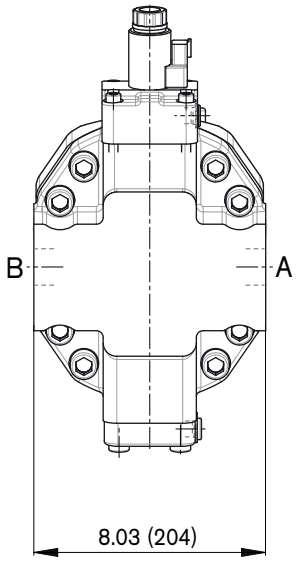
1) Center of gravity
2) Port plate 1 – SAE flange ports A and B at rear

Dimensions size 170

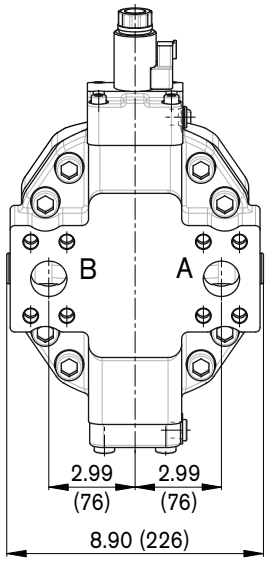
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

Location of the service line ports on the port plates (view Z)

2 SAE flange ports A and B at side, opposite

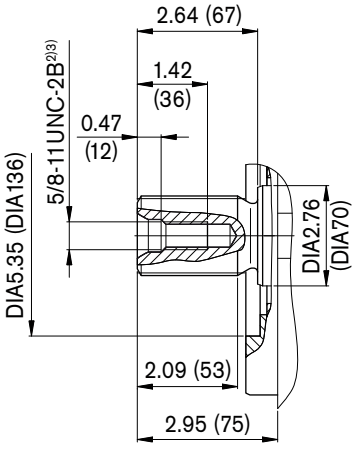


1 SAE flange ports A and B at rear



Drive shaft

T2 Splined shaft 2 in 15 T 8/16DP[1)]



1) ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Observe the general instructions on page 74 for the maximum tightening torques.

Dimensions size 170

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

Ports

Designation	Port for	Standard	Size[1]	Maximum pressure [psi (bar)][2]	State[7]
A, B[5]	Service line Fastening thread A/B, screw grade 8 with hardened washer	SAE J518[3] ASME B1.1	1 1/4 in 1/2 in - 13 UNC-2B; 0.75 (19) deep	7250 (500)	O
T_1	Drain line	ISO 11926[6]	1 1/16 in - 12 UN-2B; 0.79 (20) deep	45 (3)	X[4]
T_2	Drain line	ISO 11926[6]	1 5/16 in - 12 UN-2B; 0.79 (20) deep	45 (3)	O[4]
G	Synchronous control	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	7250 (500)	X
U	Bearing flushing	ISO 11926[6]	7/8 in - 14 UNF-2B; 0.67 (17) deep	45 (3)	X
X	Pilot signal (HP, HZ, HA1T/HA2T)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	1450 (100)	O
X	Pilot signal (HA1 and HA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	45 (3)	X
X_1, X_2	Pilot signal (DA0)	ISO 8434-1	SDSC–L8xM12–F	580 (40)	O
X_1	Pilot signal (DA1, DA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	580 (40)	O
X_3	Pilot signal (DA1, DA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	580 (40)	X
M_1	Measuring stroking chamber	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	7250 (500)	X

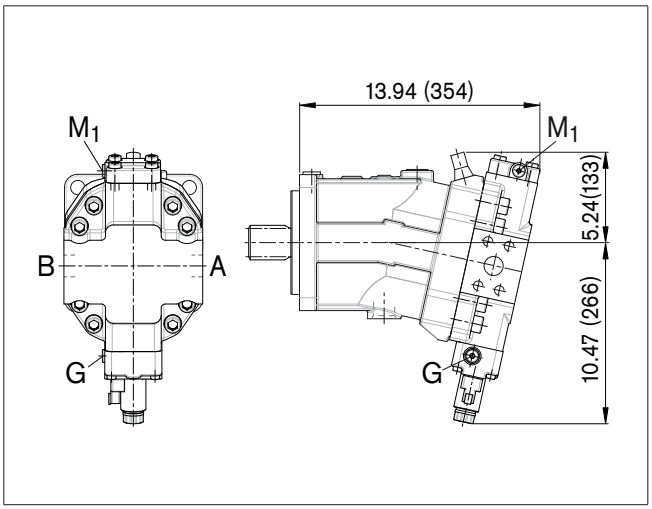
1) Observe the general instructions on page 74 for the maximum tightening torques.
2) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.
4) Depending on installation position, T_1 or T_2 must be connected (see also installation instructions on page 72).
5) For the maximum utilization of pressure, only grade 8 screws and hardened washers are to be used to tighten the SAE flange shells.
6) The spot face can be deeper than specified in the appropriate standard.
7) O = Must be connected (plugged on delivery)
   X = Plugged (in normal operation)

Dimensions size 170

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

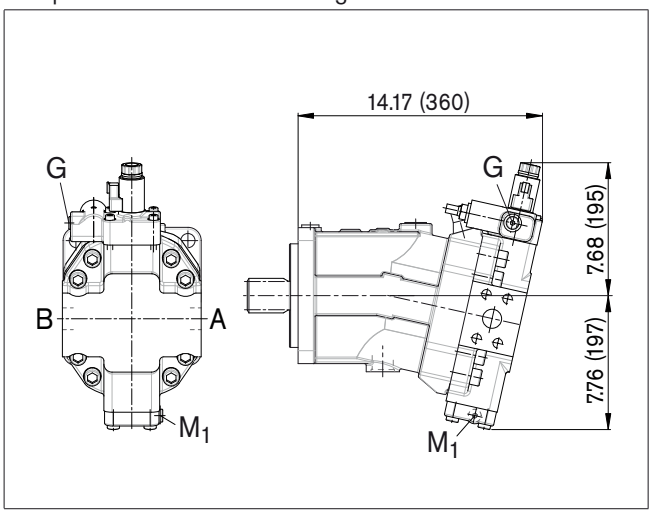
EP1, EP2

Proportional control electric, positive control



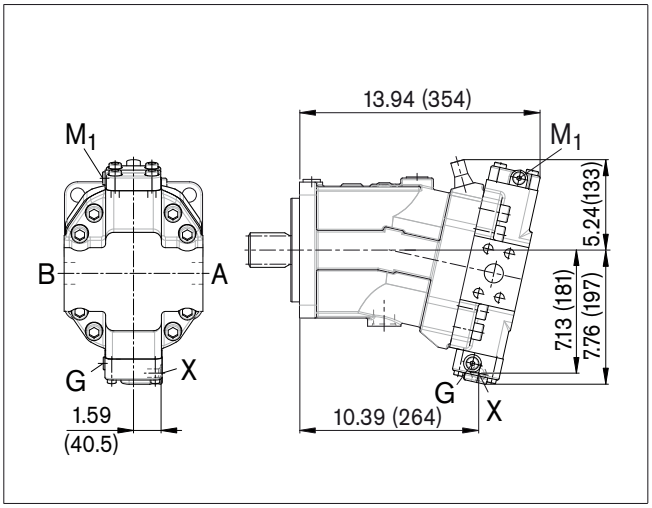
EP5D1, EP6D1

Proportional control electric, negative control, with pressure control fixed setting



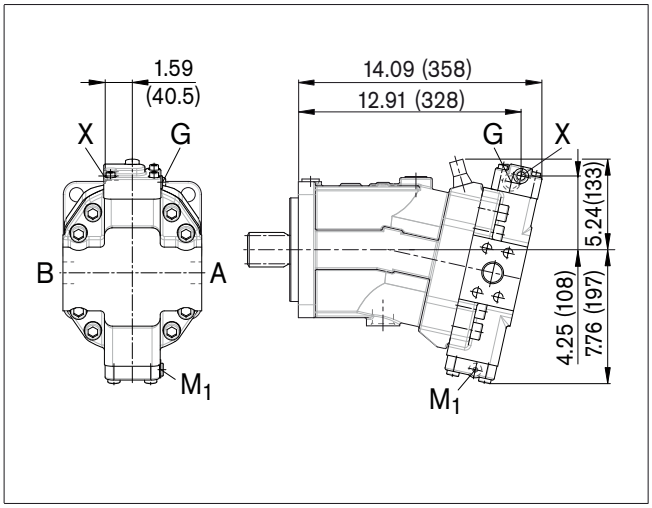
HP1, HP2

Proportional control hydraulic, positive control



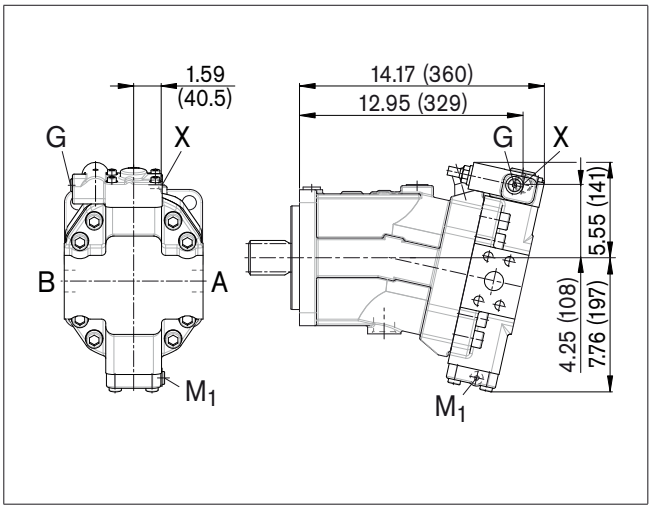
HP5, HP6

Proportional control hydraulic, negative control



HP5D1, HP6D1

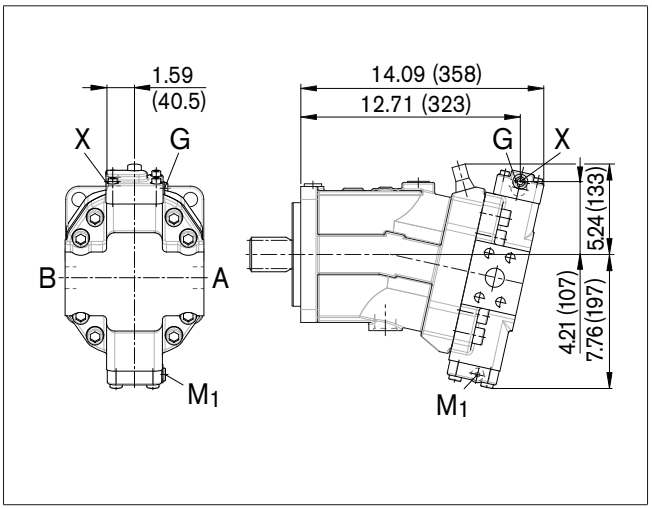
Proportional control hydraulic, negative control, with pressure control fixed setting



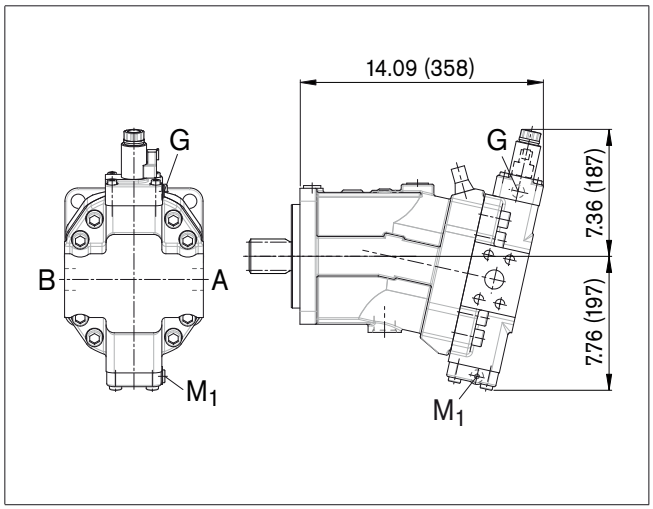
Dimensions size 170

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

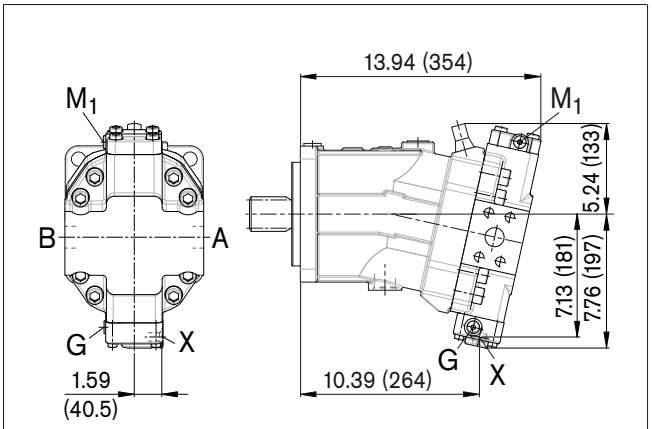
HZ5
Two-point control hydraulic, negative control



EZ5, EZ6
Two-point control electric, negative control

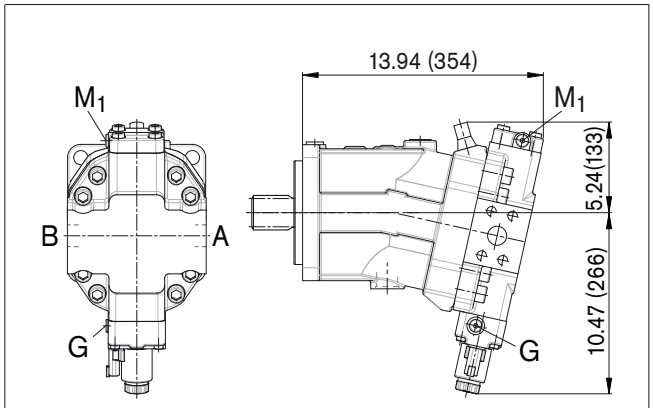


HA1, HA2 / HA1T3, HA2T3
Automatic control high-pressure related, positive control, with override hydraulic remote control, proportional

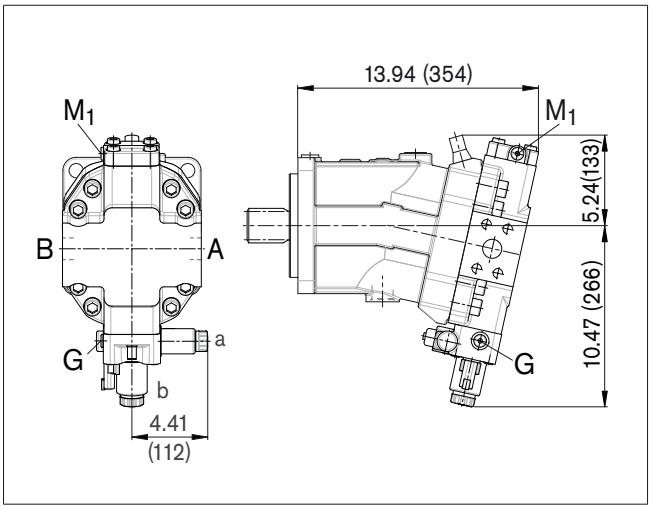


HA1 and HA2, X plugged
HA1T and HA2T, X open

HA1U1, HA2U2
Automatic control high-pressure related, positive control, with override electric, two-point



HA1R1, HA2R2
Automatic control high-pressure related, positive control, with override electric and travel direction valve electric

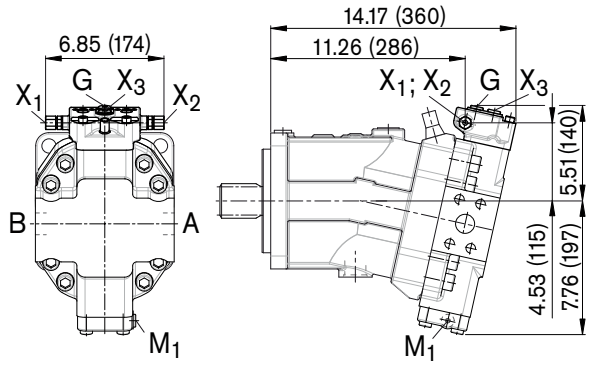


Dimensions size 170

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

DA0

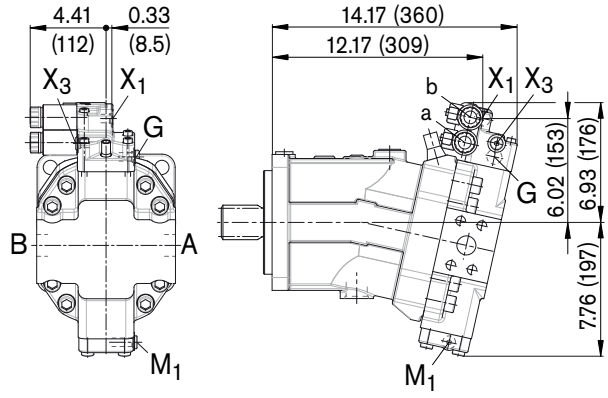
Automatic control speed related, negative control,
with hydraulic travel direction valve



X_1, X_2 Pipe fitting SDSC – L8xM12 – F acc. to ISO 8434-1
Use assembled fitting!

DA1, DA2

Automatic control speed related, negative control,
with electric travel direction valve and electric $V_{g\,max}$- circuit

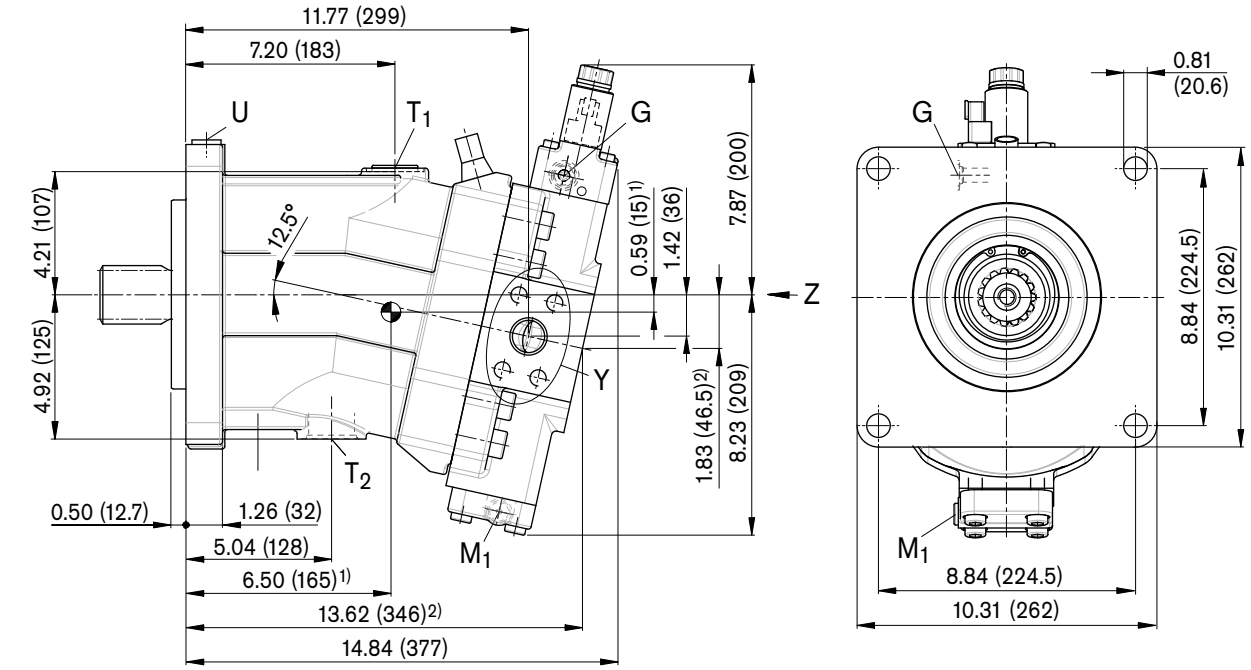


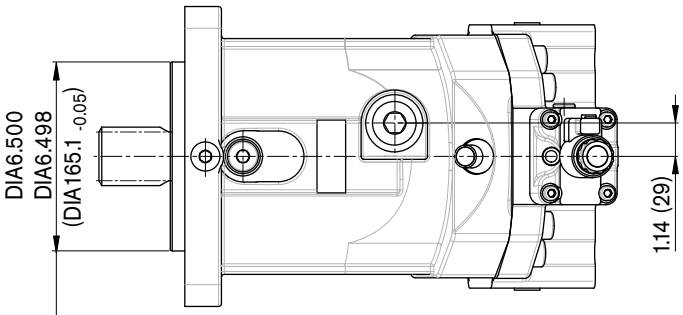
Dimensions size 215

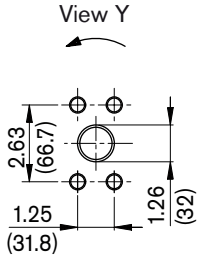
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

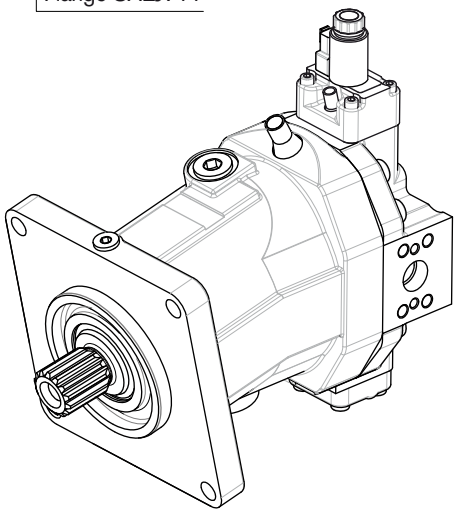
EP5, EP6 – Proportional control electric, negative control

Port plate 2 – SAE flange ports A and B at side, opposite









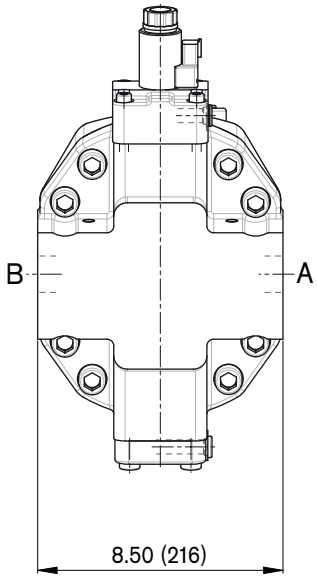
1) Center of gravity
2) Port plate 1 – SAE flange ports A and B at rear

Dimensions size 215

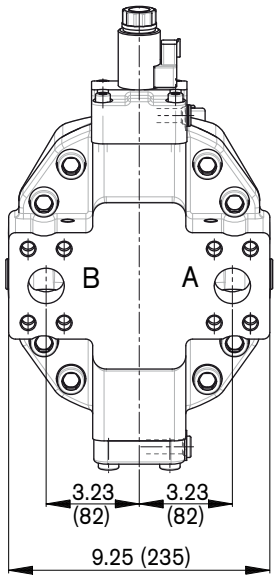
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

Location of the service line ports on the port plates (view Z)

2 SAE flange ports A and B at side, opposite

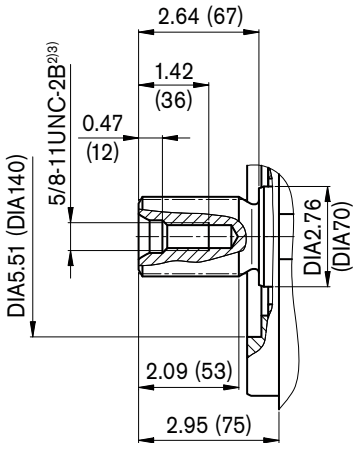


1 SAE flange ports A and B at rear



Drive shaft

T2 Splined shaft 2 in 15 T 8/16DP[1)]



1) ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Observe the general instructions on page 74 for the maximum tightening torques.

Dimensions size 215

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

Ports

Designation	Port for	Standard	Size[1]	Maximum pressure [psi (bar)][2]	State[7]
A, B[5]	Service line Fastening thread A/B, screw grade 8 with hardened washer	SAE J518[3] ASME B1.1	1 1/4 in 1/2 in - 13 UNC-2B; 0.75 (19) deep	7250 (500)	O
T_1	Drain line	ISO 11926[6]	1 5/16 in - 12 UN-2B; 0.79 (20) deep	45 (3)	X[4]
T_2	Drain line	ISO 11926[6]	1 5/8 in - 12 UN-2B; 0.79 (20) deep	45 (3)	O[4]
G	Synchronous control	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	7250 (500)	X
U	Bearing flushing	ISO 11926[6]	7/8 in - 14 UNF-2B; 0.67 (17) deep	45 (3)	X
X	Pilot signal (HP, HZ, HA1T/HA2T)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	1450 (100)	O
X	Pilot signal (HA1 and HA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	45 (3)	X
X_1, X_2	Pilot signal (DA0)	ISO 8434-1	SDSC–L8xM12–F	580 (40)	O
X_1	Pilot signal (DA1, DA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	580 (40)	O
X_3	Pilot signal (DA1, DA2)	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	580 (40)	X
M_1	Measuring stroking chamber	ISO 11926[6]	9/16 in - 18 UNF-2B; 0.51 (13) deep	7250 (500)	X

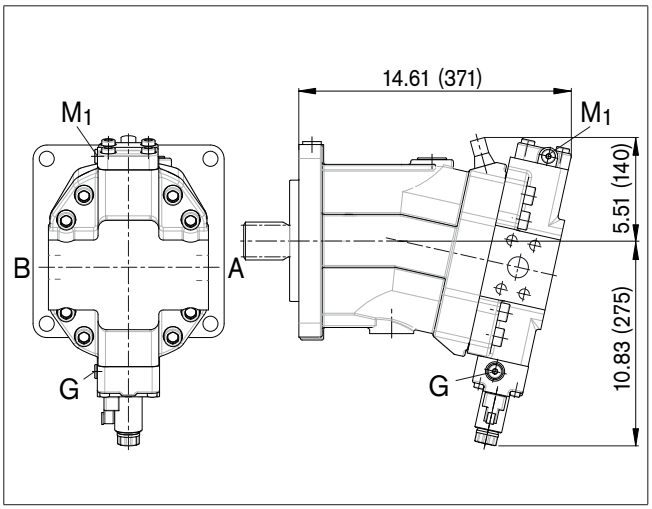
1) Observe the general instructions on page 74 for the maximum tightening torques.
2) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.
3) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.
4) Depending on installation position, T_1 or T_2 must be connected (see also installation instructions on page 72).
5) For the maximum utilization of pressure, only grade 8 screws and hardened washers are to be used to tighten the SAE flange shells.
6) The spot face can be deeper than specified in the appropriate standard.
7) O = Must be connected (plugged on delivery)
   X = Plugged (in normal operation)

Dimensions size 215

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

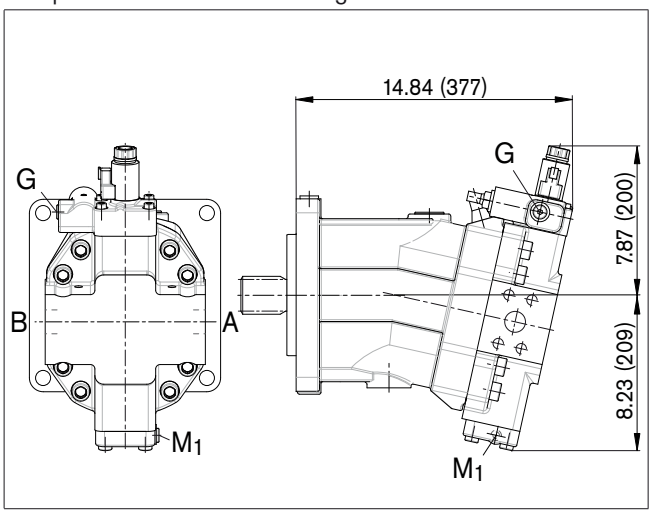
EP1, EP2

Proportional control electric, positive control



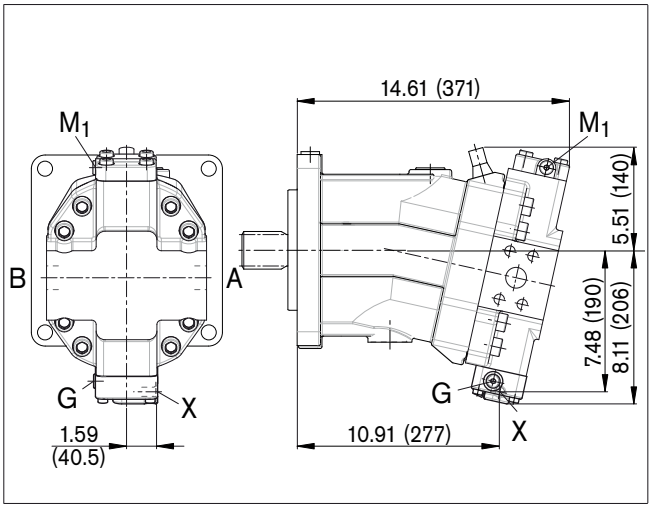
EP5D1, EP6D1

Proportional control electric, negative control, with pressure control fixed setting



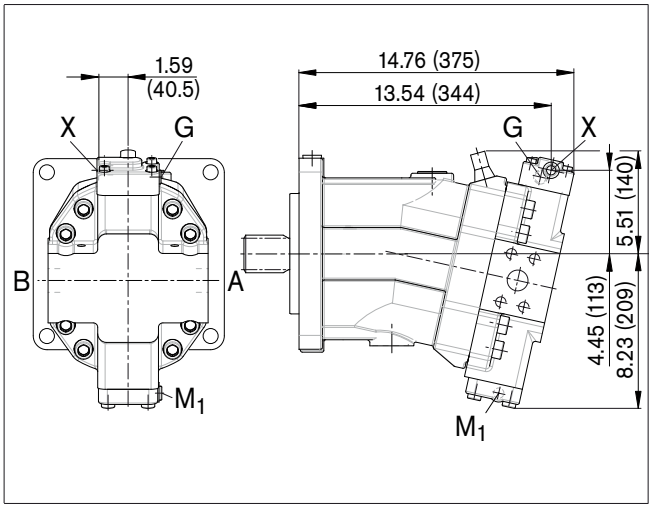
HP1, HP2

Proportional control hydraulic, positive control



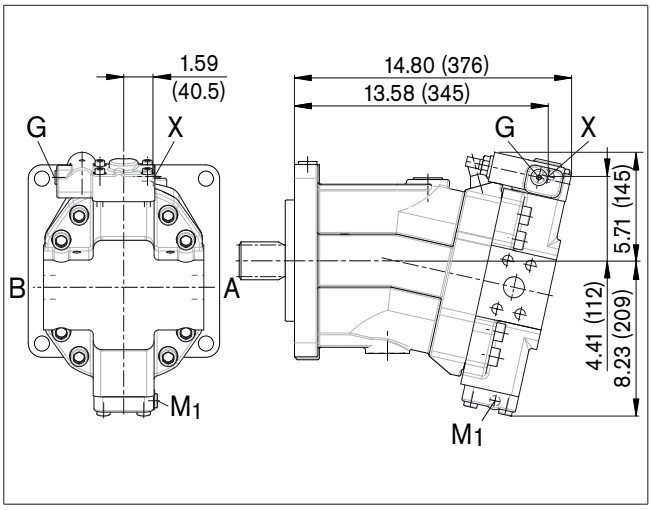
HP5, HP6

Proportional control hydraulic, negative control



HP5D1, HP6D1

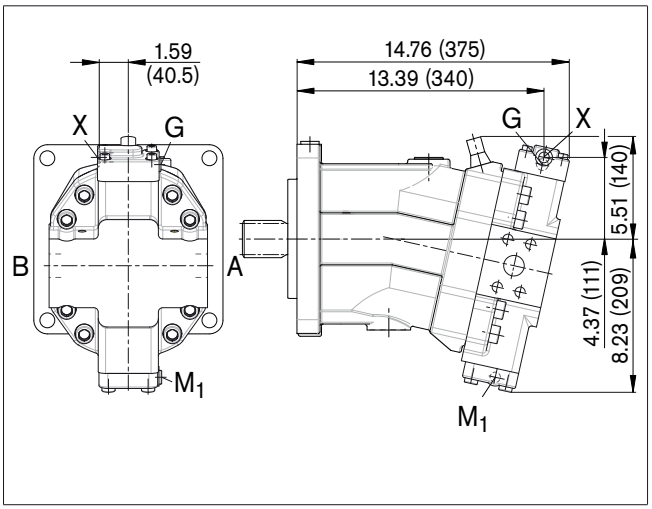
Proportional control hydraulic, negative control, with pressure control fixed setting



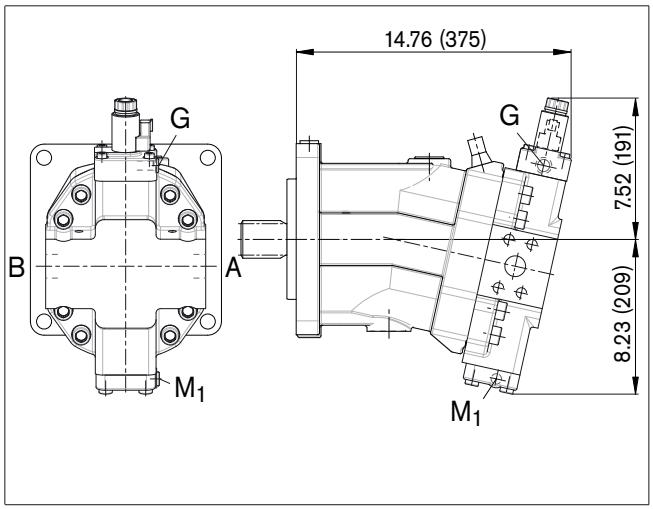
Dimensions size 215

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

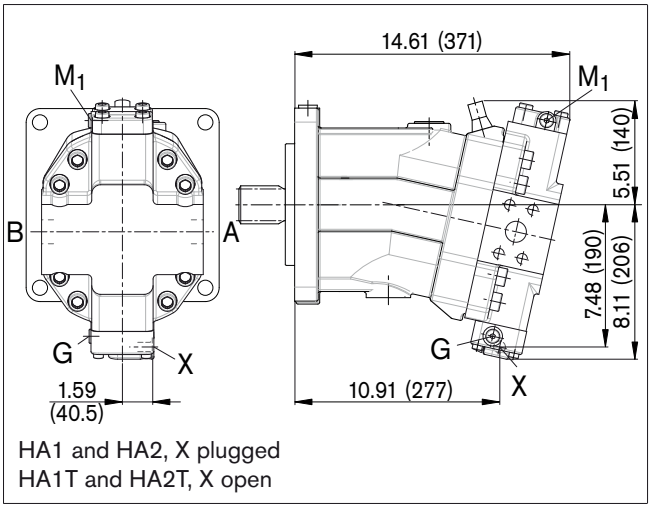
HZ5
Two-point control hydraulic, negative control



EZ5, EZ6
Two-point control electric, negative control

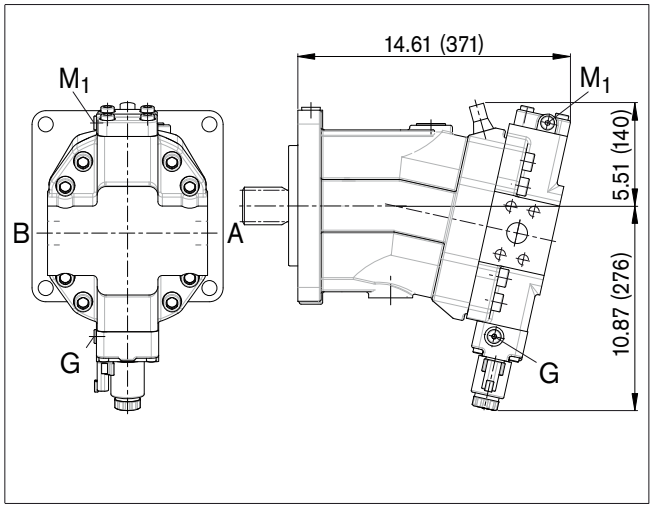


HA1, HA2 / HA1T3, HA2T3
Automatic control high-pressure related, positive control, with override hydraulic remote control, proportional

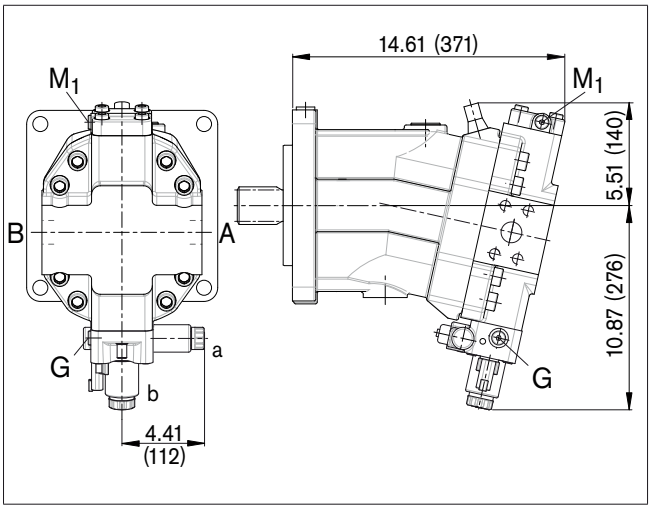


HA1 and HA2, X plugged
HA1T and HA2T, X open

HA1U1, HA2U2
Automatic control high-pressure related, positive control, with override electric, two-point



HA1R1, HA2R2
Automatic control high-pressure related, positive control, with override electric and travel direction valve electric

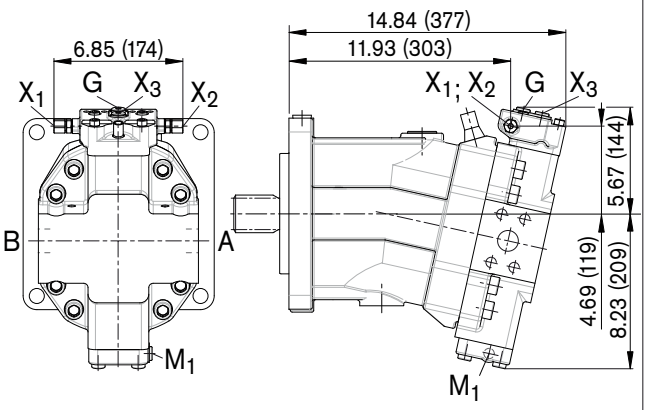


Dimensions size 215

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

DA0

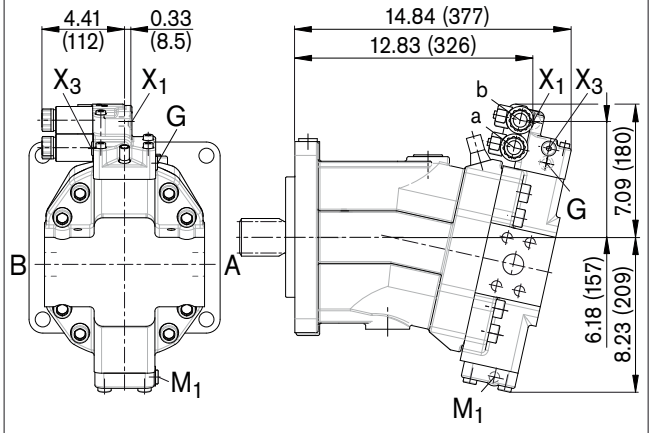
Automatic control speed related, negative control, with hydraulic travel direction valve



X_1, X_2 Pipe fitting SDSC – L8xM12 – F acc. to ISO 8434-1
Use assembled fitting!

DA1, DA2

Automatic control speed related, negative control, with electric travel direction valve and electric $V_{g\,max}$- circuit



Connector for solenoids

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

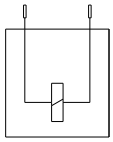
DEUTSCH DT04-2P-EP04

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

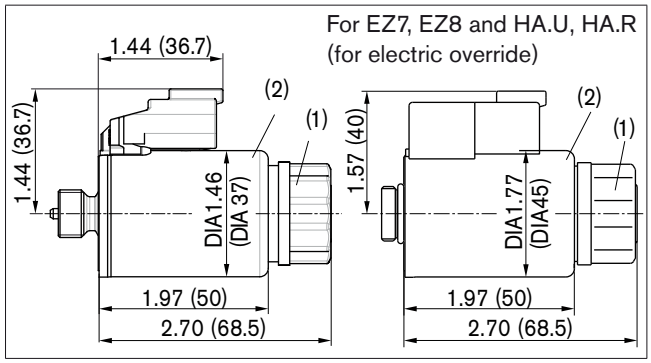
Consisting of: DT designation

– 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.



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: 3.7+0.7 lb-ft (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

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

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)
Sizes 60 to 215, fixed setting _____ 230 psi (16 bar)

Switching pressure of flushing piston Δp
Sizes 60 to 115 (small flushing valve) ___115±15 psi (8±1 bar)
Sizes 115 to 215 (medium and large flushing valve) 255±22.5 psi (17.5±1.5 bar)

Flushing flow q_v
Orifices can be used to set the flushing flows as required.
Following parameters are based on:
$\Delta p_{ND} = p_{ND} - p_G = 365$ psi (25 bar) and $\nu = 60$ SUS (10 mm²/s)
(p_{ND} = low pressure, p_G = case pressure)

Small flushing valve for sizes 60 to 115

Material number of orifice	DIA [mm]	q_v [gpm(L/min)]	Code
R909651766	1.2	0.9 (3.5)	A
R909419695	1.4	1.3 (5)	B
R909419696	1.8	2.1 (8)	C
R909419697	2.0	2.6 (10)	D
R909444361	2.4	3.7 (14)	F

Medium flushing valve for size 115

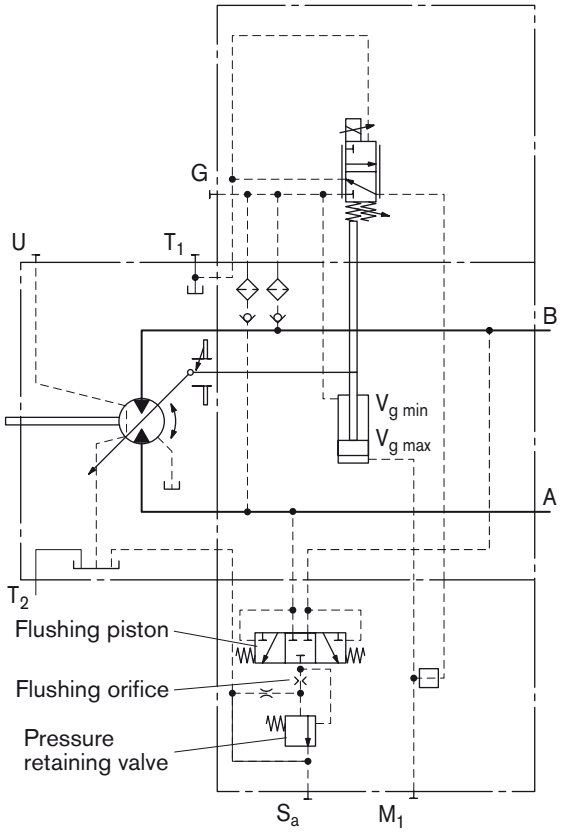
Material number of orifice	DIA [mm]	q_v [gpm(L/min)]	Code
R909431310	2.8	5.3 (20)	H
R909435172	3.5	6.6 (25)	J
R909449967	5.0	7.9 (30)	K

Large flushing valve for sizes 150 to 215

Material number of orifice	DIA [mm]	q_v [gpm(L/min)]	Code
R909449998	1.8	2.1 (8)	C
R909431308	2.0	2.6 (10)	D
R909431309	2.5	4.5 (17)	G
R909431310	2.8	5.3 (20)	H
R902138235	3.1	6.6 (25)	J
R909435172	3.5	7.9 (30)	K
R909436622	4.0	9.2 (35)	L
R909449967	5.0	10.6 (40)	M

For a flushing flow greater than 9.2 gpm (35 L/min), it is recommended that port S_a be connected in order to prevent an increase in case pressure. An increased case pressure reduces the flushing flow.

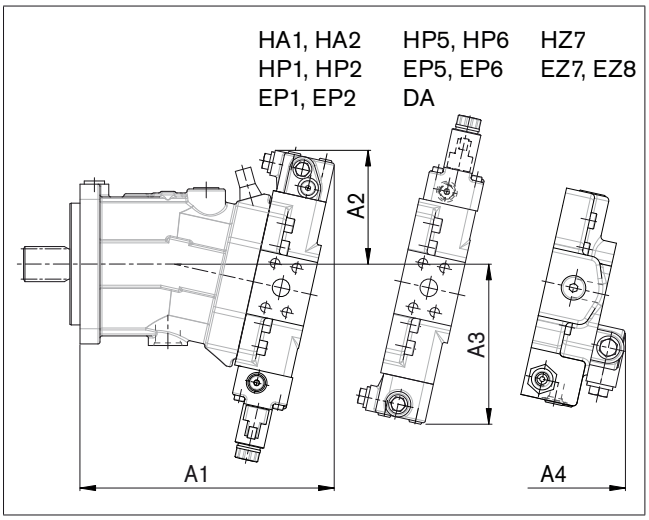
Schematic EP
Port S_a only for sizes 150 to 215



Flushing and boost pressure valve

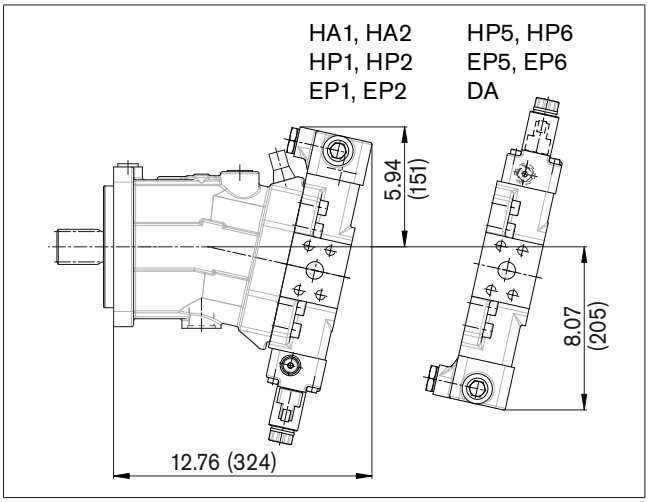
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

Dimensions of sizes 60 to 115 (small flushing valve)



NG	A1	A2	A3	A4
060	10.51	5.24	6.93	10.24
	(267)	(133)	(176)	(260)
085	11.69	5.59	7.64	10.94
	(297)	(142)	(194)	(278)
115	12.56	5.63	7.95	11.85
	(319)	(143)	(202)	(301)

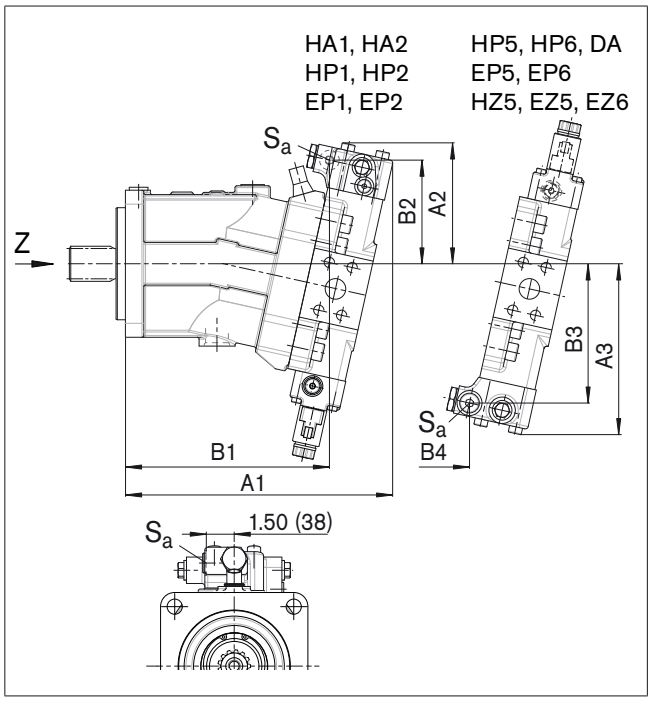
Dimensions of size 115 (medium flushing valve)



NG	S_a[1)]
150	7/8-14UNF-2B; 0.67 (17) deep
170	7/8-14UNF-2B; 0.67 (17) deep
215	7/8-14UNF-2B; 0.67 (17) deep

1) ISO 11926, ports plugged (in normal operation)
Observe the general instructions on page 74 for the maximum tightening torques.
The spot face can be deeper than specified in the appropriate standard.

Dimensions for sizes 150 to 215 (large flushing valve)



NG	A1	B1	A2	B2	A3	B3	B4
150	14.06	10.67	6.50	5.59	9.06	7.36	7.80
	(357)	(271)	(165)	(142)	(230)	(187)	(198)
170	14.33	10.94	6.50	5.59	9.17	7.48	8.03
	(364)	(278)	(165)	(142)	(233)	(190)	(204)
215	15.00	11.61	6.77	5.83	9.61	7.91	8.54
	(381)	(295)	(172)	(148)	(244)	(201)	(217)

Counterbalance valve BVD and BVE

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

Function

Travel drive/winch counterbalance valves are designed to reduce the danger of overspeeding and cavitation of axial piston motors in open circuits. Cavitation occurs if the motor speed is greater than it should be for the given input flow while braking, travelling downhill, or lowering a load.

If the inlet pressure drops, the counterbalance spool throttles the return flow and brakes the motor until the inlet pressure returns to approx. 290 psi (20 bar).

Note

– BVD available for sizes 60 to 215 and BVE available for sizes 115 to 215.

– The counterbalance valve must be ordered additionally. We recommend ordering the counterbalance valve and the motor as a set. Ordering example: A6VM085HA1T30004A/71AWV0C2S97W0-0 + BVD20F27S/41B–V03K16D0400S12

– For safety reasons, controls with beginning of control at $V_{g\ min}$ (e. g. HA) are not permissible for winch drives!

– The counterbalance valve does not replace the mechanical service brake and park brake.

– Observe the detailed notes on the BVD counterbalance valve in RE 95522 and BVE counterbalance valve in RE 95525!

– For the design of the brake release valve, we must know for the mechanical park brake:

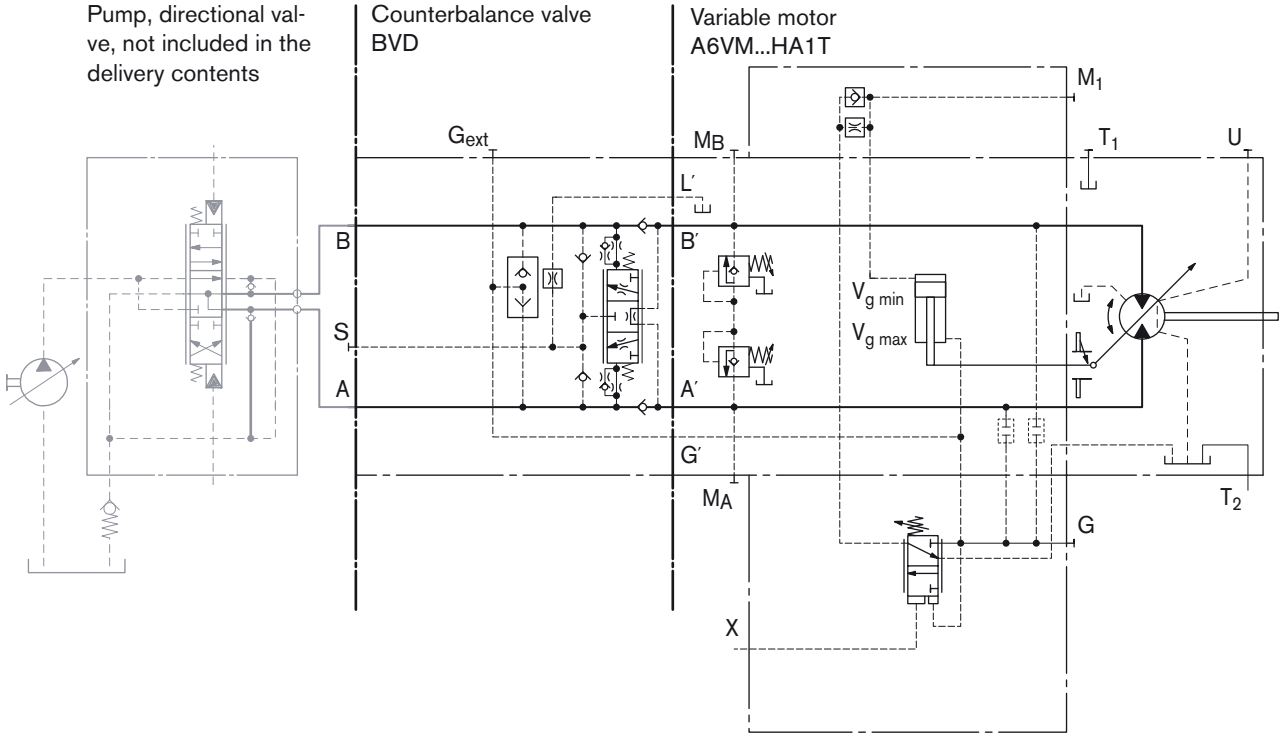
- the pressure at the start of opening
- the volume of the brake piston between minimum stroke (brake closed) and maximum stroke (brake released with 305 psi (21 bar))
- the required closing time for a warm device (oil viscosity approx. 69.6 SUS (15 mm^2/s))

Travel drive counterbalance valve BVD...F

Application option

– Travel drive on wheeled excavators

Example schematic for travel drive on wheeled excavators
A6VM085HA1T30004A/71AWV0C2S97W0-0 + BVD20F27S/41B–V03K16D0400S12



Counterbalance valve BVD and BVE

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

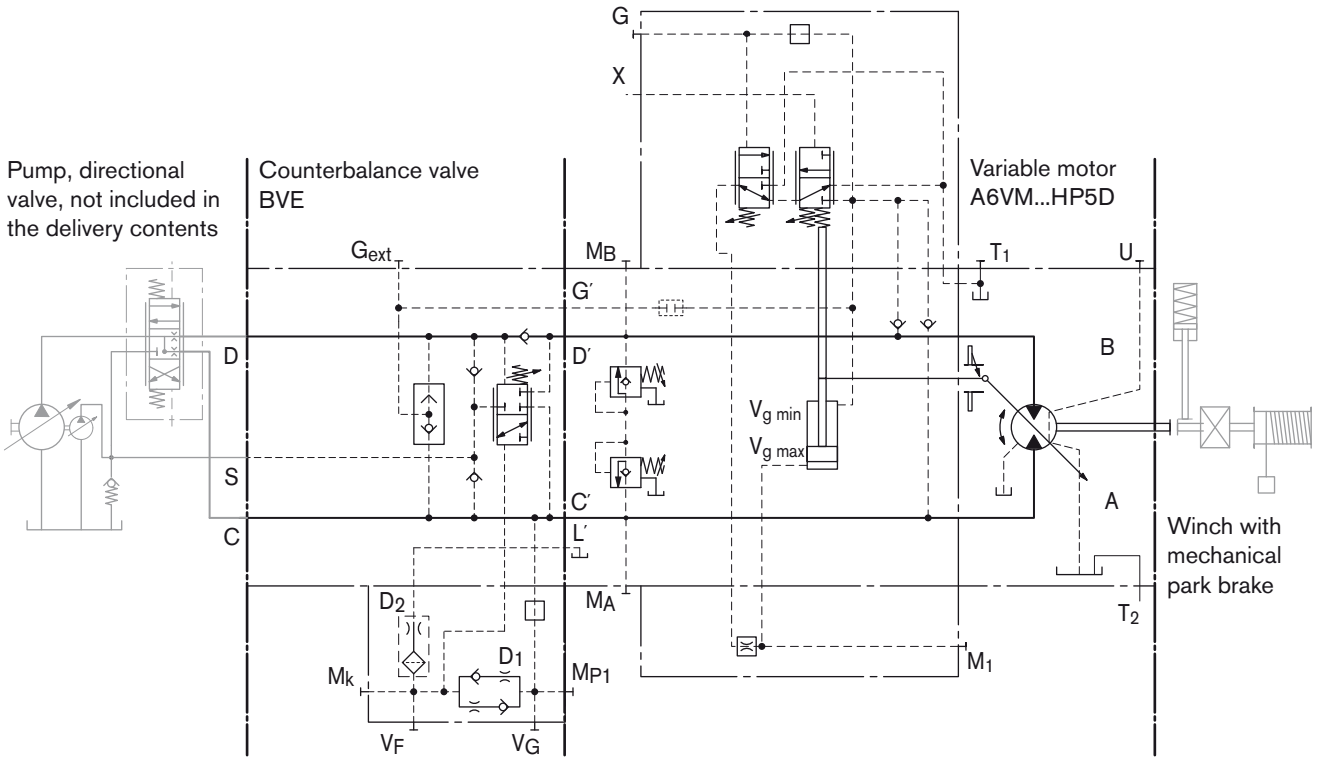
Winch counterbalance valve BVD...W and BVE

Application options

– Winch drive in cranes (BVD and BVE)

– Track drive in excavator crawlers (BVD)

Example schematic for winch drive in cranes
A6VM085HP5D10001A/71AWV0C2S97W0-0 + BVE25W38S/51ND-V100K00D4599T30S00-0



Permissible input flow or pressure in operation with DBV and BVD/BVE

Motor	Without valve		Restricted values in operation with DBV and BVD/BVE							
			DBV				BVD/BVE			
NG	p_{nom}/p_{max} [bar]	$q_{V\ max}$ [L/min]	NG	p_{nom}/p_{max} [bar]	q_V [L/min]	Code	NG	p_{nom}/p_{max} [bar]	q_V [L/min]	Code
60	6500/7250 (450/500)	73 (276)	22	5100/6100 (350/420)	63 (240)	7	20 (BVD)	5100/6100 (350/420)	58 (220)	7W
85		88 (332)								
115		108 (410)	32		106 (400)					
115		108 (410)				8	25 (BVD/BVE)		85 (320)	8W
150		131 (494)								
170		141 (533)								
215		166 (628)	On request							

DBV _____ pressure-relief valve

BVD _____ counterbalance valve, double-acting

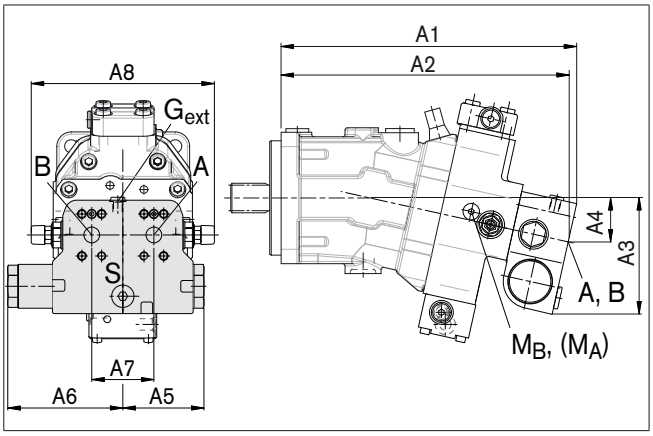
BVE _____ counterbalance valve, one-sided

Counterbalance valve BVD and BVE

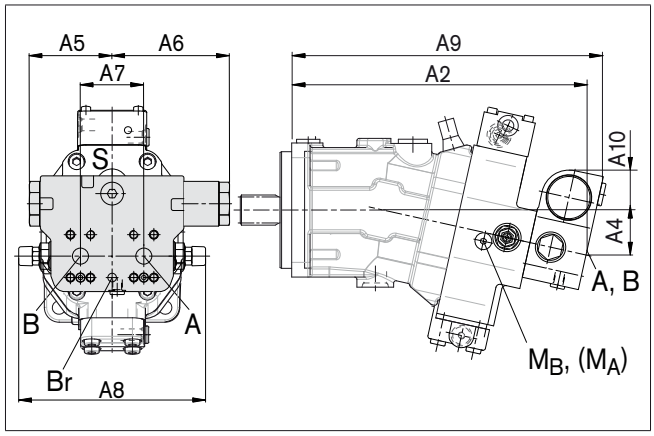
Before finalizing your design, request a binding installation drawing. Dimensions in inch (mm).

Dimensions

A6VM...HA, HP1, HP2 and EP1, EP2



A6VM...HP5, HP6 and EP5, EP6[1)]



A6VM	Counterbalance valve											
NG...plate	Type	Ports	Dimensions in inch (mm)									
		A, B	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
60...7	BVD20...17	3/4 in	13.2(335)	12.8(326)	5.6(143)	2.0(50)	3.9(98)	5.5(139)	3.0(75)	8.7(222)	13.8(350)	2.0(50)
85...7	BVD20...27	1 in	14.3(364)	14.0(355)	5.8(148)	2.2(55)	3.9(98)	5.5(139)	3.0(75)	8.7(222)	14.9(379)	1.8(46)
115...7	BVD20...28	1 in	15.5(394)	15.2(385)	6.0(152)	2.3(59)	3.9(98)	5.5(139)	3.3(84)	9.2(234)	16.1(409)	1.6(41)
115...8	BVD25...38	1 1/4 in	16.2(412)	15.8(402)	6.5(165)	2.5(63)	4.7(120.5)	6.9(175)	3.3(84)	9.4(238)	16.8(427)	2.2(56)
150...8	BVD25...38	1 1/4 in	17.4(443)	17.0(433)	6.6(168)	2.6(67)	4.7(120.5)	6.9(175)	3.3(84)	9.4(238)	18.0(458)	2.1(53)
170...8	BVD25...38	1 1/4 in	17.7(449)	17.3(439)	6.7(170)	2.7(68)	4.7(120.5)	6.9(175)	3.3(84)	9.4(238)	18.3(464)	2.0(51)
215...8	BVD25...38	1 1/4 in	18.9(480)	18.5(470)	6.9(176)	2.9(74)	4.7(120.5)	6.9(175)	3.3(84)	11.7(299)	19.5(495)	1.8(46)
115...8	BVE25...38	1 1/4 in	16.2(412)	15.8(402)	6.7(171)	2.5(63)	5.4(137)	8.4(214)	3.3(84)	9.4(238)	16.9(429)	2.5(63)
150...8	BVE25...38	1 1/4 in	17.4(443)	17.0(433)	6.9(175)	2.6(67)	5.4(137)	8.4(214)	3.3(84)	9.4(238)	17.9(455)	2.3(59)
170...8	BVE25...38	1 1/4 in	17.7(449)	17.3(439)	6.9(176)	2.7(68)	5.4(137)	8.4(214)	3.3(84)	9.4(238)	18.3(464)	2.3(59)
215...8	BVE25...38	1 1/4 in	18.9(480)	18.5(470)	7.1(182)	3.0(74)	5.4(137)	8.4(214)	3.3(84)	11.7(299)	19.5(495)	2.0(52)

Ports

Designation	Port for	Version	A6VM plate	Standard	Size[2)]	Maximum pressure [psi (bar)][3)]	State[5)]
A, B	Service line			SAE J518	see table above	6100 (420)	O
S	Infeed	BVD20		DIN 3852[4)]	M22 x 1.5; 0.55 (14) deep	435 (30)	X
		BVD25, BVE25		DIN 3852[4)]	M27 x 2; 0.63 (16) deep	435 (30)	X
Br	Brake release, reduced high-pressure	L	7	DIN 3852[4)]	M12 x 1.5; 0.49 (12.5) deep	435 (30)	O
			8	DIN 3852[4)]	M12 x 1.5; 0.47 (12) deep	435 (30)	O
G_{ext}	Brake release, high-pressure	S		DIN 3852[4)]	M12 x 1.5; 0.49 (12.5) deep	6100 (420)	X
M_A, M_B	Measuring pressure A and B			ISO 6149[4)]	M18 x 1.5; 0.57 (14.5) deep	6100 (420)	X

1) At the mounting version for the controls HP5, HP6 and EP5, EP6, the cast-in port designations A and B on the counterbalance valve BVD do not correspond with the connection drawing of the A6VM motor.
The designation of the ports on the installation drawing of the motor is binding!

2) Observe the general instructions on page 74 for the maximum tightening torques.

3) Momentary pressure spikes may occur depending on the application. Keep this in mind when selecting measuring devices and fittings.

4) The spot face can be deeper than specified in the appropriate standard.

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

Counterbalance valve BVD and BVE

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

Mounting the counterbalance valve

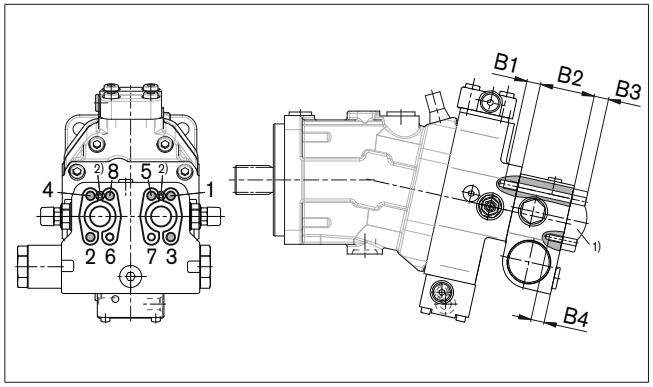
When delivered, the counterbalance valve is mounted to the motor with two tacking screws (transport protection). The tacking screws may not be removed while mounting the service lines. If the counterbalance valve and motor are delivered separately, the counterbalance valve must first be mounted to the motor port plate using the provided tacking screws. The counterbalance valve is finally mounted to the motor by screwing on the SAE flange with the following screws:

6 screws (**1, 2, 3, 4, 5, 8**) _____ length B1+B2+B3
2 screws (**6, 7**) _____ length B3+B4

Tighten the screws in two steps in the specified sequence from 1 to 8 (see following scheme).

In the first step, the screws must be tightened with half the tightening torque, and in the second step with the maximum tightening torque (see following table).

Thread	Strength class	Tightening torque [lb-ft (Nm)]
M6 x 1 (tacking screw)	10.9	11.4 (15.5)
M10	10.9	55.3 (75)
M12	10.9	95.9 (130)
M14	10.9	151.2 (205)



1) SAE flange
2) Tacking screw (M6 x 1, length = B1 + B2, DIN 912)

NG...plate	60...7	85...7 115...7	115...8, 150...8, 170...8
B1[3]	M10 x 1.5 0.67 (17) deep	M12 x 1.75 0.59 (15) deep	M14 x 2 0.75 (19) deep
B2	2.68 (68)	2.68 (68)	3.35 (85)
B3	customer-specific		
B4	M10 x 1.5 0.59 (15) deep	M12 x 1.75 0.63 (16) deep	M14 x 2 0.75 (19) deep

3) Minimum required thread reach 1 x DIA-thread

Additional information of general instructions (page 74)

Ports Standard	Size of thread	Maximum permissible tightening torque of the female threads $M_{G\ max}$	Required tightening torque of the threaded plugs M_V	WAF hexagon socket of the threaded plugs
ISO 11926	9/16-18 UNF-2B	59 lb-ft	26 lb-ft	1/4 in
		80 Nm	35 Nm	
	7/8-14 UNF-2B	177 lb-ft	81 lb-ft	3/8 in
		240 Nm	110 Nm	
	1 1/16-12 UN-2B	266 lb-ft	125 lb-ft	9/16 in
		360 Nm	170 Nm	
	1 5/16-12 UN-2B	398 lb-ft	199 lb-ft	5/8 in
		540 Nm	270 Nm	
	1 5/8-12 UN-2B	708 lb-ft	236 lb-ft	3/4 in
		960 Nm	320 Nm	
DIN 3852	M12 x 1.5	37 lb-ft	18 lb-ft[1)2)]	0.24 in
		50 Nm	25 Nm[1)2)]	6 mm
	M22 x 1.5	155 lb-ft	59 lb-ft[1)]	0.39 in
		210 Nm	80 Nm[1)]	10 mm
	M27 x 2	243 lb-ft	100 lb-ft[1)]	0.47 in
		330 Nm	135 Nm[1)]	12 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 12.5 lb-ft (17 Nm) for M12 x 1.5.

Speed sensor

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

Version A6VM...U ("prepared for speed sensing", i.e. without sensor) is equipped with a toothed ring on the rotary group.

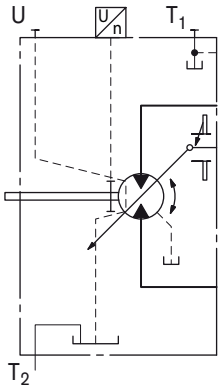
With the speed sensor DSM mounted, a signal proportional to motor speed can be generated.The DSM sensor measures the speed and direction of rotation.

Ordering code, technical data, dimensions and details on the connector, plus safety information about the sensor can be found in the relevant data sheet (DSM – RE 95132).

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.

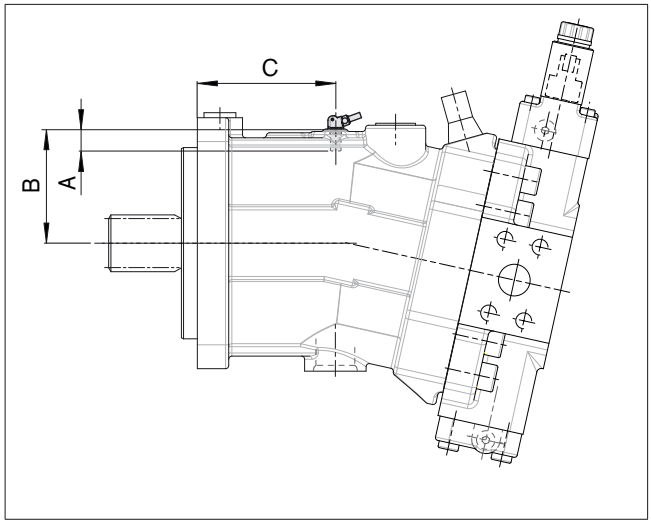
We recommend ordering the A6VM variable motor complete with sensor mounted.

Schematic



Dimensions

Version "V" with mounted speed sensor



Size		60	85	115	150	170	215
Number of teeth		54	58	67	72	75	80
A	Insertion depth tolerance -0.0098 (-0.25)	0.72	0.72	0.72	0.72	0.72	0.72
		(18.4)	(18.4)	(18.4)	(18.4)	(18.4)	(18.4)
B	Contact surface	2.95	3.11	3.46	3.66	3.78	3.98
		(75)	(79)	(88)	(93)	(96)	(101)
C		3.55	3.91	4.30	4.85	4.87	5.01
		(90.2)	(99.2)	(109.2)	(123.2)	(123.7)	(127.2)

Setting range for displacement

	60				85				115				150			
	$V_{g\,max}$ [in³/rev (cm³/rev)]		$V_{g\,min}$ [in³/rev (cm³/rev)]		$V_{g\,max}$ [in³/rev (cm³/rev)]		$V_{g\,min}$ [in³/rev (cm³/rev)]		$V_{g\,max}$ [in³/rev (cm³/rev)]		$V_{g\,min}$ [in³/rev (cm³/rev)]		$V_{g\,max}$ [in³/rev (cm³/rev)]		$V_{g\,min}$ [in³/rev (cm³/rev)]	
	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to
A	3.78 (62.0)	3.78 (62.0)	0.0	0.92 (15.0)	5.20 (85.2)	5.20 (85.2)	0.0	1.92 (31.5)	7.05 (115.6)	7.05 (115.6)	0.0	1.46 (24.0)	9.28 (152.1)	9.28 (152.1)	0.0	2.68 (44.0)
	without screw		M10 x 60 R909154690		without screw		M12 x 70 R909085976		without screw		M12 x 70 R909085976		without screw		M12 x 80 R909153075	
B	3.78 (62.0)	3.78 (62.0)	> 0.92 (15.0)	1.86 (30.5)	5.20 (85.2)	5.20 (85.2)	> 1.92 (31.5)	3.17 (52.0)	7.05 (115.6)	7.05 (115.6)	> 1.46 (24.0)	2.90 (47.5)	9.28 (152.1)	9.28 (152.1)	> 2.68 (44.0)	4.21 (69.0)
	without screw		M10 x 70 R909153779		without screw		M12 x 80 R909153075		without screw		M12 x 80 R909153075		without screw		M12 x 90 R909154041	
C	3.78 (62.0)	3.78 (62.0)	> 1.86 (30.5)	2.62 43.0	5.20 (85.2)	5.20 (85.2)	> 3.17 (52.0)	3.60 (59.0)	7.05 (115.6)	7.05 (115.6)	> 2.90 (47.5)	4.33 (71.0)	9.28 (152.1)	9.28 (152.1)	> 4.21 (69.0)	6.04 (99.0)
	without screw		M10 x 80 R909154058		without screw		M12 x 90 R909154041		without screw		M12 x 90 R909154041		without screw		M12 x 100 R909153975	
D	x		x		x		x		7.05 (115.6)	7.05 (115.6)	> 4.33 (71.0)	4.88 (80.0)	9.28 (152.1)	9.28 (152.1)	> 6.04 (99.0)	6.47 (106.0)
									without screw		M12 x 100 R909153975		without screw		M12 x 110 R909154212	
E	< 3.78 (62.0)	2.90 (47.5)	0.0	0.92 (15.0)	< 5.20 (85.2)	3.39 (55.5)	0.0	1.92 (31.5)	< 7.05 (115.6)	5.71 (93.5)	0.0	1.46 (24.0)	< 9.28 (152.1)	6.77 (111.0)	0.0	2.68 (44.0)
	M10 x 60 R909154690		M10 x 60 R909154690		M12 x 70 R909085976		M12 x 70 R909085976		M12 x 70 R909085976		M12 x 70 R909085976		M12 x 80 R909153075		M12 x 80 R909153075	
F	< 3.78 (62.0)	2.90 (47.5)	> 0.92 (15.0)	1.86 (30.5)	< 5.20 (85.2)	3.39 (55.5)	> 1.92 (31.5)	3.17 (52.0)	< 7.05 (115.6)	5.71 (93.5)	> 1.46 (24.0)	2.90 (47.5)	< 9.28 (152.1)	6.77 (111.0)	> 2.68 (44.0)	4.21 (69.0)
	M10 x 60 R909154690		M10 x 70 R909153779		M12 x 70 R909085976		M12 x 80 R909153075		M12 x 70 R909085976		M12 x 80 R909153075		M12 x 80 R909153075		M12 x 90 R909154041	
G	< 3.78 (62.0)	2.90 (47.5)	> 1.86 (30.5)	2.62 43.0	< 5.20 (85.2)	3.39 (55.5)	> 3.17 (52.0)	3.60 (59.0)	< 7.05 (115.6)	5.71 (93.5)	> 2.90 (47.5)	4.33 (71.0)	< 9.28 (152.1)	6.77 (111.0)	> 4.21 (69.0)	6.04 (99.0)
	M10 x 60 R909154690		M10 x 80 R909154058		M12 x 70 R909085976		M12 x 90 R909154041		M12 x 70 R909085976		M12 x 90 R909154041		M12 x 80 R909153075		M12 x 100 R909153975	
H	x		x		x		x		< 7.05 (115.6)	5.71 (93.5)	> 4.33 (71.0)	4.88 (80.0)	< 9.28 (152.1)	6.77 (111.0)	> 6.04 (99.0)	6.47 (106.0)
									M12 x 70 R909085976		M12 x 100 R909153975		M12 x 80 R909153075		M12 x 110 R909154212	
J	< 2.90 (47.5)	2.01 (33.0)	0.0	0.92 (15.0)	< 3.39 (55.5)	2.14 (35.0)	0.0	1.92 (31.5)	< 5.71 (93.5)	4.33 (71.0)	0.0	1.46 (24.0)	< 6.77 (111.0)	5.31 (87.0)	0.0	2.68 (44.0)
	M10 x 70 R909153779		M10 x 60 R909154690		M12 x 80 R909153075		M12 x 70 R909085976		M12 x 80 R909153075		M12 x 70 R909085976		M12 x 90 R909154041		M12 x 80 R909153075	
K	< 2.90 (47.5)	2.01 (33.0)	> 0.92 (15.0)	1.86 (30.5)	< 3.39 (55.5)	2.14 (35.0)	> 1.92 (31.5)	3.17 (52.0)	< 5.71 (93.5)	4.33 (71.0)	> 1.46 (24.0)	2.90 (47.5)	< 6.77 (111.0)	5.31 (87.0)	> 2.68 (44.0)	4.21 (69.0)
	M10 x 70 R909153779		M10 x 70 R909153779		M12 x 80 R909153075		M12 x 80 R909153075		M12 x 80 R909153075		M12 x 80 R909153075		M12 x 90 R909154041		M12 x 90 R909154041	
L	< 2.90 (47.5)	2.01 (33.0)	> 1.86 (30.5)	2.62 43.0	< 3.39 (55.5)	2.14 (35.0)	> 3.17 (52.0)	3.60 (59.0)	< 5.71 (93.5)	4.33 (71.0)	> 2.90 (47.5)	4.33 (71.0)	< 6.77 (111.0)	5.31 (87.0)	> 4.21 (69.0)	6.04 (99.0)
	M10 x 70 R909153779		M10 x 80 R909154058		M12 x 80 R909153075		M12 x 90 R909154041		M12 x 80 R909153075		M12 x 90 R909154041		M12 x 90 R909154041		M12 x 100 R909153975	
M	x		x		x		x		< 5.71 (93.5)	4.33 (71.0)	> 4.33 (71.0)	4.88 (80.0)	< 6.77 (111.0)	5.31 (87.0)	> 6.04 (99.0)	6.47 (106.0)
									M12 x 80 R909153075		M12 x 100 R909153975		M12 x 90 R909154041		M12 x 110 R909154212	

Specify exact settings for $V_{g\,min}$ and $V_{g\,max}$ in plain text when ordering: $V_{g\,min}$ = ... in³ (cm³), $V_{g\,max}$ = ... in³ (cm³)

Theoretical, maximum setting: for $V_{g\,min} = 0.7 \cdot V_{g\,max}$
for $V_{g\,max} = 0.3 \cdot V_{g\,max}$

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

Setting range for displacement

	170				215			
	$V_{g\,max}$ [in³/rev (cm³/rev)]		$V_{g\,min}$ [in³/rev (cm³/rev)]		$V_{g\,max}$ [in³/rev (cm³/rev)]		$V_{g\,min}$ [in³/rev (cm³/rev)]	
	from	to	from	to	from	to	from	to
A	10.48 (171.8)	10.48 (171.8)	0.0	2.14 (35.0)	13.21 (216.5)	13.21 (216.5)	0.0	2.72 (44.5)
	without screw		M12 x 80 R909153075		without screw		M12 x 80 R909153075	
B	10.48 (171.8)	10.48 (171.8)	> 2.14 (35.0)	3.87 (63.5)	13.21 (216.5)	13.21 (216.5)	> 2.72 (44.5)	4.88 (80.0)
	without screw		M12 x 90 R909154041		without screw		M12 x 90 R909154041	
C	10.48 (171.8)	10.48 (171.8)	> 3.87 (63.5)	5.98 (98.0)	13.21 (216.5)	13.21 (216.5)	> 4.88 (80.0)	7.02 (115.0)
	without screw		M12 x 100 R909153975		without screw		M12 x 100 R909153975	
D	10.48 (171.8)	10.48 (171.8)	> 5.98 (98.0)	9.15 (150.0)	13.21 (216.5)	13.21 (216.5)	> 7.02 (115.0)	9.15 (150.0)
	without screw		M12 x 110 R909154212		without screw		M12 x 110 R909154212	
E	< 10.48 (171.8)	8.48 (139.0)	0.0	2.14 (35.0)	< 13.21 (216.5)	10.68 (175.0)	0.0	2.72 (44.5)
	M12 x 80 R909153075		M10 x 80 R909153075		M12 x 80 R909153075		M12 x 80 R909153075	
F	< 10.48 (171.8)	8.48 (139.0)	> 2.14 (35.0)	3.87 (63.5)	< 13.21 (216.5)	10.68 (175.0)	> 2.72 (44.5)	4.88 (80.0)
	M12 x 80 R909153075		M12 x 90 R909154041		M12 x 80 R909153075		M12 x 90 R909154041	
G	< 10.48 (171.8)	8.48 (139.0)	> 3.87 (63.5)	5.98 (98.0)	< 13.21 (216.5)	10.68 (175.0)	> 4.88 (80.0)	7.02 (115.0)
	M12 x 80 R909153075		M12 x 100 R909153975		M12 x 80 R909153075		M12 x 100 R909153975	
H	< 10.48 (171.8)	8.48 (139.0)	> 5.98 (98.0)	7.32 (120.0)	< 13.21 (216.5)	10.68 (175.0)	> 7.02 (115.0)	9.15 (150.0)
	M12 x 80 R909153075		M12 x 110 R909154212		M12 x 80 R909153075		M12 x 110 R909154212	
J	< 8.48 (139.0)	6.83 (112.0)	0.0	2.14 (35.0)	< 10.68 (175.0)	8.60 (141.0)	0.0	2.72 (44.5)
	M12 x 90 R909154041		M12 x 80 R909153075		M12 x 90 R909154041		M12 x 80 R909153075	
K	< 8.48 (139.0)	6.83 (112.0)	> 2.14 (35.0)	3.87 (63.5)	< 10.68 (175.0)	8.60 (141.0)	> 2.72 (44.5)	4.88 (80.0)
	M12 x 90 R909154041		M12 x 90 R909154041		M12 x 90 R909154041		M12 x 90 R909154041	
L	< 8.48 (139.0)	6.83 (112.0)	> 3.87 (63.5)	5.98 (98.0)	< 10.68 (175.0)	8.60 (141.0)	> 4.88 (80.0)	7.02 (115.0)
	M12 x 90 R909154041		M12 x 100 R909153975		M12 x 90 R909154041		M12 x 100 R909153975	
M	< 8.48 (139.0)	6.83 (112.0)	> 5.98 (98.0)	7.32 (120.0)	< 10.68 (175.0)	8.60 (141.0)	> 7.03 (115.0)	9.15 (150.0)
	M12 x 90 R909154041		M12 x 110 R909154212		M12 x 90 R909154041		M12 x 110 R909154212	

Specify exact settings for $V_{g\,min}$ and $V_{g\,max}$ in plain text when ordering: $V_{g\,min}$ = ... in³ (cm³), $V_{g\,max}$ = ... in³ (cm³)

Theoretical, maximum setting: for $V_{g\,min} = 0.7 \cdot V_{g\,max}$
for $V_{g\,max} = 0.3 \cdot V_{g\,max}$

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

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.

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

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 8.
Further installation positions are possible upon request.

Recommended installation position: 1 and 2.

Note
In certain installation positions, 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_1
2	–	T_2
3	–	T_1
4	U	T_1
5	U (L_1)	T_1 (L_1)
6	L_1	T_2 (L_1)
7	L_1	T_1 (L_1)
8	U	T_1 (L_1)

L_1 Filling / air bleed

U Bearing flushing / air bleed port

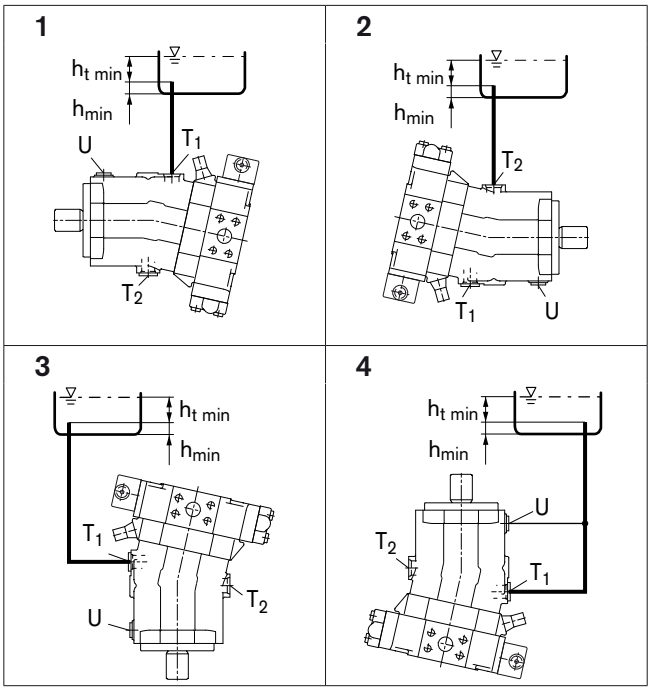
T_1, T_2 Drain port

$h_{t\,min}$ Minimum required immersion depth (7.87 inch (200 mm))

h_{min} Minimum required spacing to reservoir bottom (3.94 inch (100 mm))

Below-reservoir installation (standard)

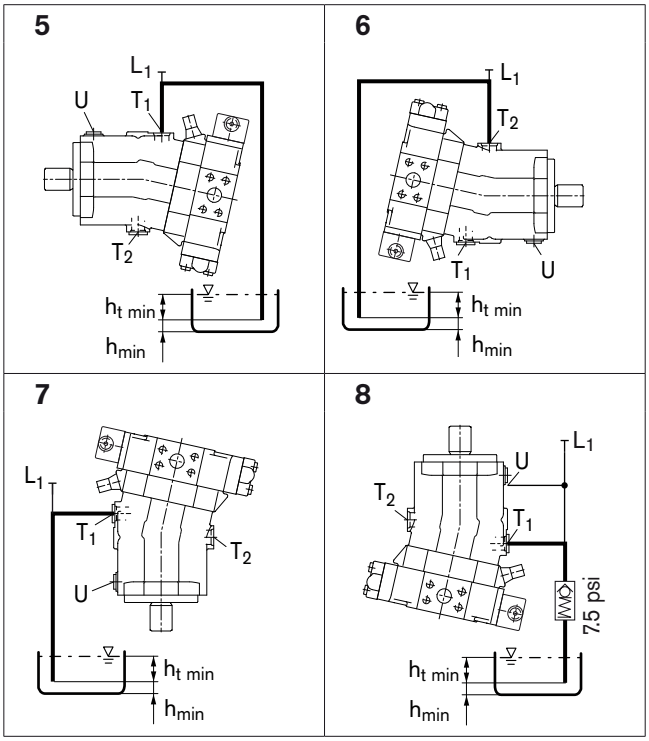
Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level.



Above-reservoir installation

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

Recommendation for installation position 8 (drive shaft upward): A check valve in the drain line (cracking pressure 7.5 psi (0.5 bar)) can prevent draining of the motor housing.



General instructions

Ports Standard	Size of thread	Maximum permissible tightening torque of the female threads $M_{G\ max}$	Required tightening torque of the threaded plugs M_V	WAF hexagon socket of the threaded plugs
ISO 11926	9/16-18 UNF-2B	59 lb-ft	26 lb-ft	1/4 in
		80 Nm	35 Nm	
	7/8-14 UNF-2B	177 lb-ft	81 lb-ft	3/8 in
		240 Nm	110 Nm	
	1 1/16-12 UN-2B	266 lb-ft	125 lb-ft	9/16 in
		360 Nm	170 Nm	
	1 5/16-12 UN-2B	398 lb-ft	199 lb-ft	5/8 in
		540 Nm	270 Nm	
	1 5/8-12 UN-2B	708 lb-ft	236 lb-ft	3/4 in
		960 Nm	320 Nm	
DIN 3852	M12 x 1.5	37 lb-ft	18 lb-ft[1)2)]	0.24 in
		50 Nm	25 Nm[1)2)]	6 mm
	M22 x 1.5	155 lb-ft	59 lb-ft[1)]	0.39 in
		210 Nm	80 Nm[1)]	10 mm
	M27 x 2	243 lb-ft	100 lb-ft[1)]	0.47 in
		330 Nm	135 Nm[1)]	12 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 12.5 lb-ft (17 Nm) for M12 x 1.5.

General instructions

– The motor A6VM 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.

– Not all versions of the product are approved for use in a safety function pursuant to ISO 13849. If you require characteristic values relating to reliability (e. g. $MTTF_d$) for functional safety, please consult the responsible contact person at Bosch Rexroth.

– The following tightening torques apply:

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

  - Mounting bolts:
    For mounting bolts with metric ISO thread according to DIN 13 or thread according to ASME B1.1, 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 of the female threads and must not be exceeded. For values, see table on page 73.

  - 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 table on page 73.

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