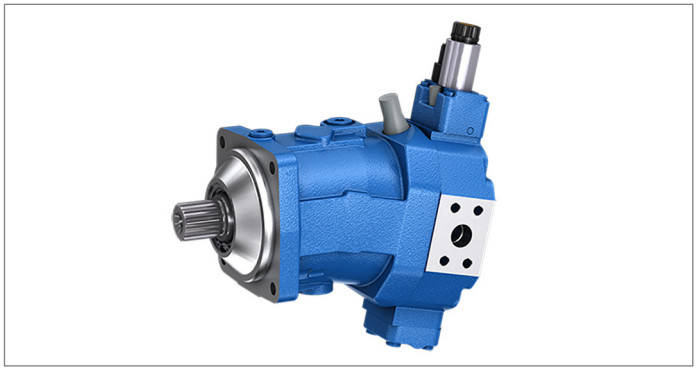
RE 91607/2022-11-14
Replaces: 06.2016

rexroth
A Bosch Company

Axial piston variable motor A6VM series 65



- All-purpose high pressure motor
- Sizes 28 to 200
- Nominal pressure 400 bar (sizes 28 to 200)
- Maximum pressure 450 bar (size 28)
- Maximum pressure 530 bar (sizes 55 to 200)
- Open and closed circuits

Features

- Robust motor with long service life
- Approved for very high rotational speeds
- High control range (can be swiveled to zero)
- High torque
- Large variety of controls
- Optionally with mounted flushing and boost-pressure valve
- Optionally with mounted high-pressure counterbalance valve
- Bent-axis design

Contents

Type code

01	02	03	04	05	06	07	08	09	10		11	12	13	14	15	16	17	18	19	20		21
A6V	**M**						**0**			**/**	**65**		**W**	**V**	**0**						**–**	

Axial piston unit

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

Operating mode

02	Motor	**M**

Size (NG)

03	Geometric displacement, see technical data on page 9	**028**	**055**	**080**	**107**	**140**	**160**	**200**	

Control device

				028	055	080	107	140	160	200	
04	Proportional control, hydraulic	positive control	Δp_{St} = 10 bar	●	●	●	●	●	●	●	**HP1**
			Δp_{St} = 25 bar	●	●	●	●	●	●	●	**HP2**
		negative control	Δp_{St} = 10 bar	●	●	●	●	●	●	●	**HP5**
			Δp_{St} = 25 bar	●	●	●	●	●	●	●	**HP6**
	electric	positive control	U = 12 V	●	●	●	●	●	●	●	**EP1**
			U = 24 V	●	●	●	●	●	●	●	**EP2**
		negative control	U = 12 V	●	●	●	●	●	●	●	**EP5**
			U = 24 V	●	●	●	●	●	●	●	**EP6**
	Two-point control,	negative control		●	–	–	–	●	●	●	**HZ5**
	hydraulic			–	●	●	●	–	–	–	**HZ7**
	electric	negative control	U = 12 V	●	–	–	–	●	●	●	**EZ5**
			U = 24 V	●	–	–	–	●	●	●	**EZ6**
			U = 12 V	–	●	●	●	–	–	–	**EZ7**
			U = 24 V	–	●	●	●	–	–	–	**EZ8**
	Automatic control	with minimum pressure increase	Δp ≤ approx. 10 bar	●	●	●	●	●	●	●	**HA1**
	high-pressure related, positive control	with pressure increase	Δp = 100 bar	●	●	●	●	●	●	●	**HA2**
	speed related, negative control p_{St} / p_{HD} = 5/100	hydr. travel direction valve		●	●	●	●	●	●	●	**DA0**
		electr. travel direction valve + electr. $V_{g\,max}$ override	U = 12 V	●	●	●	●	●	●	●	**DA1**
			U = 24 V	●	●	●	●	●	●	●	**DA2**

Pressure control/override

				028	055	080	107	140	160	200	
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	●	●	●	●	●	●	●	**U1**
			U = 24 V	●	●	●	●	●	●	●	**U2**
		electric and travel direction valve, electric	U = 12 V	●	●	●	●	●	●	●	**R1**
			U = 24 V	●	●	●	●	●	●	●	**R2**

Connector for solenoids[1] (see page 67)

		028	055	080	107	140	160	200	
06	Without connector (without solenoid, only for hydraulic control)	●	●	●	●	●	●	●	**0**
	DEUTSCH - molded connector, 2-pin, without suppressor diode	●	●	●	●	●	●	●	**P**

● = Available o = On request – = Not available

1) Connectors for other electric components may deviate

01	02	03	04	05	06	07	08	09	10		11	12	13	14	15	16	17	18	19	20		21
A6V	**M**						**0**			**/**	**65**		**W**	**V**	**0**						**–**	

Swivel angle sensor (see page 68)

		028	055	080	107	140	160	200	
07	Without	●	●	●	●	●	●	●	**0**
	Neutral position switch	–	–	●	●	●	●	●	**N**

Additional function

		028 to 200	
08	Without additional function	●	**0**

Stroking time damping (for selection, see control)

			028 to 200	
09	Without damping (standard with HP and EP)		●	**0**
	Damping	HP, EP, HP5,6D. and EP5,6D., HZ, EZ, HA with BVD/BVE counterbalance valves	●	**1**
		One-sided in inlet to large stroking chamber (HA)	●	**4**
		One-sided in outlet from large stroking chamber (DA)	●	**7**

Setting range for displacement[2)]

10	$V_{g\,max}$ setting screw	$V_{g\,min}$ setting screw	028	055	080	107	140	160	200	
	without setting screw[3)]	short (0-adjustable)	●	●	●	●	●	●	●	**A**
		moderate	●	●	●	●	●	●	●	**B**
		long	●	●	●	●	●	●	●	**C**
		extra long	–	–	●	●	●	●	●	**D**
	short	short (0-adjustable)	●	●	●	●	●	●	●	**E**
		moderate	●	●	●	●	●	●	●	**F**
		long	●	●	●	●	●	●	●	**G**
		extra long	–	–	●	●	●	●	●	**H**
	medium	short (0-adjustable)	●	●	●	●	●	●	●	**J**
		moderate	●	●	●	●	●	●	●	**K**
		long	●	●	●	●	●	●	●	**L**
		extra long	–	–	●	●	●	●	●	**M**

Series

		028 to 200	
11	Series 6, index 5	●	**65**

Version of port and fastening threads

		028	055	080	107	140	160	200	
12	Metric ports based on ISO 6149 with O-ring seal, metric fastening threads according to DIN 13	–	●	●	●	●	●	●	**M**
	Metric ports based on DIN 3852 with profile sealing ring, metric fastening thread according to DIN 13	●	–	–	–	–	–	–	**N**

Direction of rotation

		028 to 200	
13	Viewed on drive shaft, bidirectional	●	**W**

Sealing material

		028 to 200	
14	FKM (fluorocarbon rubber)	●	**V**

Drive shaft bearing

		028 to 200	
15	Standard bearing	●	**0**

● = Available o = On request – = Not available

2) The settings for the setting screws can be found in the table (page 81 and 82).

3) For NG28 with short threaded pin, not adjustable

01	02	03	04	05	06	07	08	09	10		11	12	13	14	15	16	17	18	19	20		21
A6V	**M**						**0**			**/**	**65**		**W**	**V**	**0**						**–**	

Mounting flange

			028	055	080	107	140	160	200	
16	ISO 3019-2	100-4	●	–	–	–	–	–	–	**L4**
		125-4	–	●	–	–	–	–	–	**M4**
		140-4	–	–	●	–	–	–	–	**N4**
		160-4	–	–	–	●	–	–	–	**P4**
		180-4	–	–	–	–	●	●	–	**R4**
		200-4	–	–	–	–	–	–	●	**S4**

Drive shaft

			028	055	080	107	140	160	200	
17	Splined shaft ANSI B92.1a	1 1/4 in 14T 12/24 DP	–	●	●	–	–	–	–	**S7**
		1 3/4 in 13T 8/16 DP	–	–	–	●	●	●	–	**T1**
		2 in 15T 8/16 DP	–	–	–	–	–	–	●	**T2**
	Splined shaft DIN 5480	W25×1.25×18×9g	●	–	–	–	–	–	–	**Z5**
		W30×2×14×9g	●	●	–	–	–	–	–	**Z6**
		W35×2×16×9g	–	●	●	–	–	–	–	**Z8**
		W40×2×18×9g	–	–	●	●	–	–	–	**Z9**
		W45×2×21×9g	–	–	–	●	●	●	–	**A1**
		W50×2×24×9g	–	–	–	–	–	●	●	**A2**

Working port

			028	055	080	107	140	160	200	
18	SAE working ports **A** and **B** at rear		●	●	●	●	●	●	●	**1**
	SAE working ports **A** and **B** at side, opposite		●	●	●	●	●	●	●	**2**
	SAE working port **A** and **B** at rear, with lateral measuring ports		–	–	●	●	●	●	●	**4**
	SAE working port **A** and **B** at bottom, with integrated counterbalance valve[4]		–	–	–	–	●	●	–	**6**
	Port plate for mounting a counterbalance valve, with 1-stage pressure relief valve (pilot operated)[5]	BVD20	–	●	●	●	–	–	–	**7**
		BVD25	–	–	–	●	●	●	–	**8**
		BVE25	–	–	–	●	–	–	–	**8**
	Port plate for mounting a counterbalance valve, with 1-stage pressure relief valve (direct operated)[5]	BVD25	–	–	–	–	–	–	●	**5**
		BVE25	–	–	–	–	●	●	●	**5**
		BVD/BVE 32	–	–	–	–	–	–	●	**9**

● = Available o = On request – = Not available

4) Only in combination with HZ5, EZ5, EZ6, HP or EP with respective negative control

5) Possible only in combination with HP, EP and HA control.

01	02	03	04	05	06	07	08	09	10		11	12	13	14	15	16	17	18	19	20		21
A6V	**M**						**0**			**/**	**65**	**M**	**W**	**V**	**0**						**–**	

Valve (see pages 69 to 79)

			028	055	080	107	140	160	200	
19	Without valve		●	●	●	●	●	●	●	**0**
	With integrated brake release valve (only with port plate 6)		–	–	–	–	●	●	–	**Y**
	With BVD/BVE counterbalance valves mounted[6)]		–	●	●	●	●	●	●	**W**
	With flushing and boost-pressure valve mounted, flushing on both sides Flushing flow at: $\Delta p = p_{ND} - p_G$ = 25 bar and v = 10 mm²/s (p_{ND} = low pressure, p_G = case pressure) Only possible with port plates 1 and 2	**Flushing flow q_v [l/min]**								
		3.5	●	●	●	●	–	–	–	**A**
		5	●	●	●	●	–	–	–	**B**
		8	●	●	●	●	●	●	●	**C**
		10	●	●	●	●	●	●	●	**D**
		14	●	●	●	●	–	–	–	**F**
		15	–	–	–	–	●	●	●	**G**
		16	●	●	●	●[7)]	–	–	–	**H**
		18	–	–	–	●[7)]	●	●	●	**I**
		21	–	–	–	●[7)]	●	●	●	**J**
		27	–	–	–	●[7)]	●	●	●	**K**
		31	–	–	–	●[7)]	●	●	●	**L**
		37	–	–	–	–	●	●	●	**M**

Speed sensor (see page 80)

		028	055	080	107	140	160	200	
20	Without speed sensor	●	●	●	●	●	●	●	**0**
	Prepared for sensor DSA/20 and DST	○	●	●	●	●	●	●	**W**
	DSA/20 speed sensor mounted[8)]	○	●	●	●	●	●	●	**C**
	DST speed sensor mounted[9)]	○	●	●	●	●	●	●	**E**

Standard/special version

21	Standard version	**0**
	Standard version with installation variants, e.g. **T** ports open and closed contrary to standard	**Y**
	Special version	**S**

● = Available ○ = On request – = Not available

Notice

- ▶ Note the project planning notes on page 86.
- ▶ In addition to the type code, please specify the relevant technical data when placing your order.
- ▶ Please note that not all type code combinations are available although the individual functions are marked as being available.

6) Type code of counterbalance valve according to data sheet 95522 (BVD), 95526 (BVE BR53), 95528 (BVE/BVD BR52), specify separately

7) Not for EZ3, 4, 7, 8 and HZ3, 7

8) Specify the type code separately for sensor in accordance with data sheet 95126 (DSA/20) and observe the requirements for the electronics.

9) Specify type code of the sensor acc. to data sheet 95131 (DST) separately and observe the requirements for the electronics

Hydraulic fluid

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

- 90220: Hydraulic fluids based on mineral oils and related hydrocarbons
- 90221: Environmentally acceptable hydraulic fluids
- 90222: Fire-resistant, water-free hydraulic fluids (HFDR/HFDU)
- 90223: Fire-resistant, water-containing hydraulic fluids (HFC/HFB/HFAE/HFAS)
- 90225: Limited technical data for operation with water-free and water-containing fire-resistant hydraulic fluids (HFDR, HFDU, HFAE, HFAS, HFB, HFC)

Selection of hydraulic fluid

Bosch Rexroth evaluates hydraulic fluids on the basis of the Fluid Rating according to the technical data sheet 90235. Hydraulic fluids with positive evaluation in the Fluid Rating are provided in the following technical data sheet:

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

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

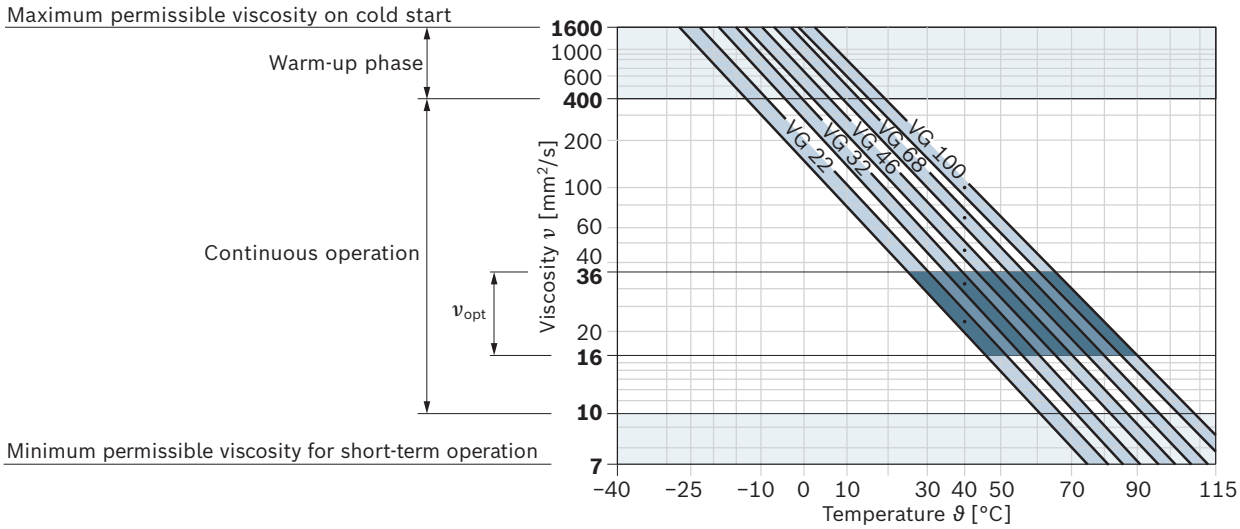
Notice
The axial piston unit is not suitable for operation with HFA hydraulic fluids.

Viscosity and temperature of hydraulic fluids

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

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

▼ **Selection diagram**



1) This corresponds, for example on the VG 46, to a temperature range of +4 °C to +85 °C (see selection diagram)

2) Special version, please contact us

3) If the temperature at extreme operating parameters cannot be adhered to, please contact us.

Filtration of the hydraulic fluid

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

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

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

For example, a viscosity of 10 mm²/s corresponds to the following temperatures with the following media:

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

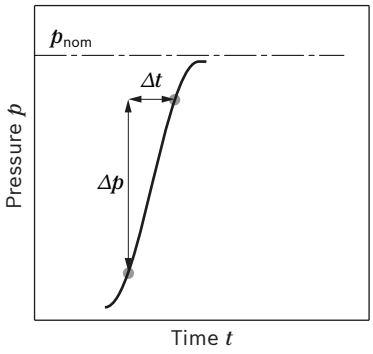
Flow direction

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

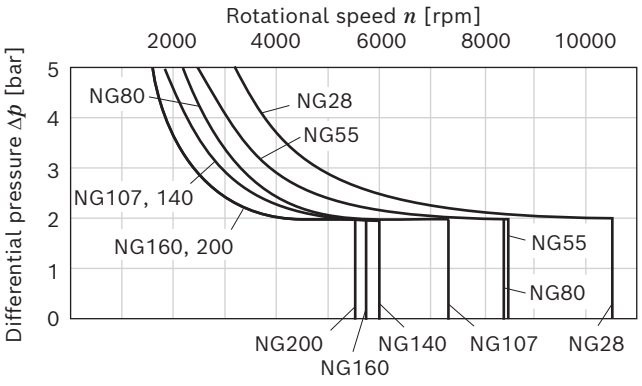
Working pressure range

Pressure at working port A or B		Definition
Nominal pressure p_{nom}	400 bar	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}	450 bar	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of single operating periods must not exceed the total operating period. Within the total operating period of 300 h, a maximum pressure of 450 bar to 530 bar is permissible for a limited period of 50 h for sizes 55 to 200.
Maximum single operating period	10 s	
Total operating period	300 h	
Swivel angle	100%	
Maximum pressure p_{max} NG55 to 200	530 bar	
Maximum single operating period	10 s	
Total operating period	50 h	
Minimum pressure (high-pressure side)	25 bar	Minimum pressure on the low-pressure side (**A** or **B**) required to prevent damage to the axial piston unit.
Minimum pressure – operation as a pump (inlet)	See diagram (next page)	To prevent damage to the axial piston motor during operation as a pump (change of the high-pressure side with constant direction of rotation, e.g. during brake applications) a minimum pressure has to be ensured at the working port (inlet). The minimum pressure depends on the rotational speed and displacement of the axial piston unit.
Summation pressure p_{Su} (pressure **A** + pressure **B**)	700 bar	The summation pressure is the sum of the pressures at the ports for the working lines (**A** and **B**).
Rate of pressure change $R_{A\,max}$		Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
with integrated pressure relief valve	9000 bar/s	
without pressure relief valve	16000 bar/s	
Case pressure at port T		
Continuous differential pressure $\Delta p_{T\,cont}$	2 bar	Maximum, averaged differential pressure at the shaft seal (housing to ambient pressure)
Maximum differential pressure $\Delta p_{T\,max}$	See diagram (next page)	Permissible differential pressure at the shaft seal (case pressure to ambient pressure)
Pressure peaks $p_{T\,peak}$	10 bar	t < 0.1 s

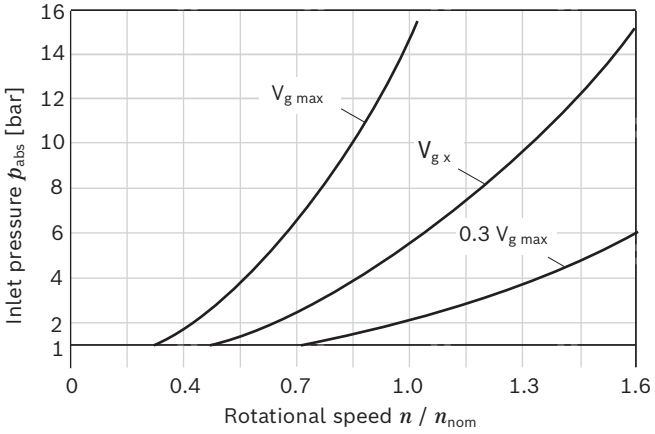
▼ **Rate of pressure change $R_{A\,max}$**



▼ **Maximum differential pressure at the shaft seal**

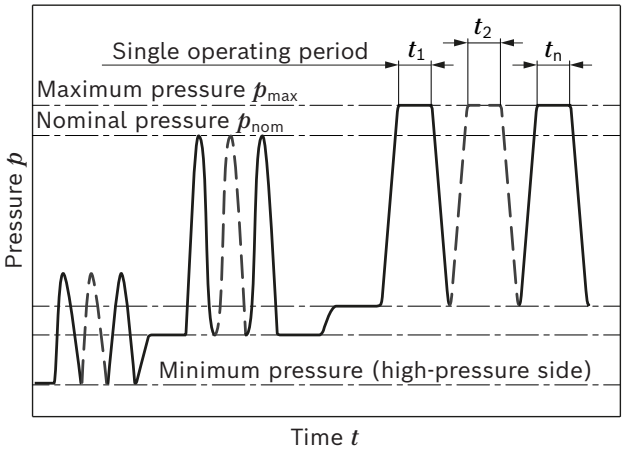


▼ **Minimum pressure – operation as a pump (inlet)**



This diagram is valid only for the optimum viscosity range from ν_{opt} = 36 to 16 mm²/s.
If the above-mentioned conditions cannot be ensured, please contact us.

▼ **Pressure definition**



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

Notice

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

Effect 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 settings, an increase in case pressure will have no effect on the beginning of control:
HA.R and HA.U, EP, HA
The factory setting for the beginning of control is made at p_{abs} = 2 bar case pressure.

Technical data

Size		NG		28	55	80	107	140	160	200
Displacement geometric, per revolution		$V_{g\,max}$	cm^3	28.1	54.8	80	107	140	160	200
		$V_{g\,min}$	cm^3	0	0	0	0	0	0	0
		$V_{g\,x}$	cm^3	18	35	51	68	88	61	76
Maximum rotational speed[1] (complying with the maximum permissible inlet flow)	at $V_{g\,max}$	n_{nom}	rpm	5550	4450	3900	3550	3250	3100	2900
	at $V_g < V_{g\,x}$ (see diagram)	n_{max}	rpm	8750	7000	6150	5600	5150	4900	4600
	at $V_{g\,0}$	n_{max}	rpm	10450	8350	7350	6300	5750	5500	5100
Inlet flow[2]	at n_{nom} and $V_{g\,max}$	$q_{v\,max}$	l/min	156	244	312	380	455	496	580
Torque[3]	at $V_{g\,max}$ and Δp = 400 bar	T	Nm	179	349	509	681	891	1019	1273
Rotary stiffness	$V_{g\,max}$ to $V_g/2$	c_{min}	kNm/rad	6	10	16	21	34	35	44
	$V_g/2$ to 0 (interpolated)	c_{min}	kNm/rad	18	32	48	65	93	105	130
Moment of inertia of the rotary group		J_{TW}	kgm^2	0.0014	0.0042	0.008	0.0127	0.0207	0.0253	0.0353
Case volume		V	l	0.5	0.75	1.2	1.5	1.8	2.4	2.7
Weight approx.		m	kg	16	28	36	46	61	62	78

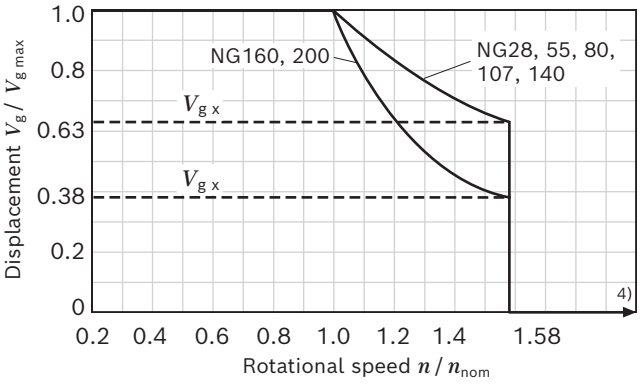
Speed range

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

Notice

- Theoretical values, without efficiency and tolerances; values rounded
- Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. Other permissible limit values, such as speed variation, reduced angular acceleration as a function of the frequency and the permissible angular acceleration at start (lower than the maximum angular acceleration) can be found in data sheet 90261.

Permissible displacement in relation to rotational speed



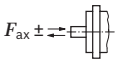
Determination of the operating characteristics					
Inlet flow	q_v	=	$\frac{V_g \times n}{1000 \times \eta_v}$		[l/min]
Rotational speed	n	=	$\frac{q_v \times 1000 \times \eta_v}{V_g}$		[rpm]
Torque	M	=	$\frac{V_g \times \Delta p \times \eta_{hm}}{20 \times \pi}$		[Nm]
Power	P	=	$\frac{2 \pi \times M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

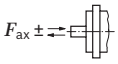
Key

V_g	Displacement per revolution [cm^3]
Δp	Differential pressure [bar]
n	Rotational speed [rpm]
η_v	Volumetric efficiency
η_{hm}	Hydraulic-mechanical efficiency
η_t	Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

1) The values are applicable:
   – for the optimum viscosity range from ν_{opt} = 36 to 16 mm^2/s
   – with hydraulic fluid based on mineral oils
2) Note inlet flow limitation due to counterbalance valve (page 71).
3) Torque without radial force, with radial force see page 10.
4) Values in this range on request

Permissible radial and axial loading on the drive shafts

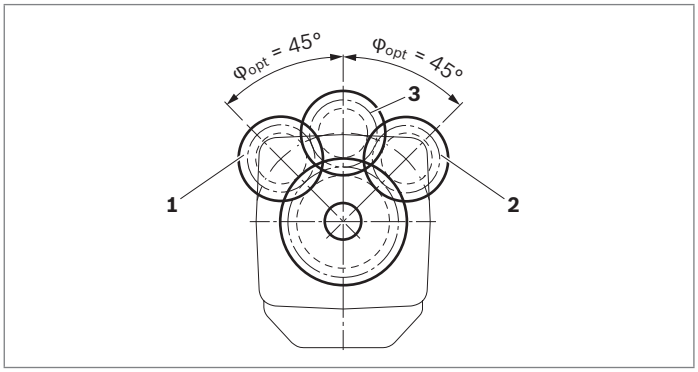
Size	NG		55	80	107	140	160	200
Drive shaft	⌀	in	1 1/4	1 1/4	1 3/4	1 3/4	1 3/4	2
Maximum radial force at distance a (from shaft collar) 	$F_{q\,max}$	N	7811	7559	12256	16036	14488	20047
	a	mm	24.0	24.0	33.5	33.5	33.5	33.5
Maximum torque at $F_{q\,max}$	$T_{q\,max}$	Nm	310	300	681	891	920	1273
Maximum differential pressure at V_{gmax} and $F_{q\,max}$	$\Delta p_{q\,max}$	bar	315	236	400	400	361	400
Maximum axial force at standstill or depressurized operation 	$+F_{ax\,max}$	N	0	0	0	0	0	0
	$-F_{ax\,max}$	N	500	710	900	1030	1120	1250
Permissible axial force per bar working pressure	$+F_{ax\,perm/bar}$	N/bar	7.5	9.6	11.3	13.3	15.1	17.0

Size	NG		28	28	55	55	80	80	107	107	140	160	160	200
Drive shaft	⌀	mm	W25	W30	W30	W35	W35	W40	W40	W45	W45	W45	W50	W50
Maximum radial force at distance a (from shaft collar) 	$F_{q\,max}$	N	6436	4838	7581	8069	10867	10283	13758	12215	15982	18278	16435	20532
	a	mm	14.0	17.5	17.5	20.0	20.0	22.5	22.5	25.0	25.0	25.0	27.5	27.5
Maximum torque at $F_{q\,max}$	$T_{q\,max}$	Nm	179	179	281	349	470	509	681	681	891	1019	1019	1273
Maximum differential pressure at V_{gmax} and $F_{q\,max}$	$\Delta p_{q\,max}$	bar	400	400	322	400	369	400	400	400	400	400	400	400
Maximum axial force at standstill or depressurized operation 	$+F_{ax\,max}$	N	8	0	0	0	0	0	0	0	0	0	0	0
	$-F_{ax\,max}$	N	315	315	500	500	710	710	900	900	1030	1120	1120	1250
Permissible axial force per bar working pressure	$+F_{ax\,perm/bar}$	N/bar	4.6	4.6	7.5	7.5	9.6	9.6	11.3	11.3	13.3	15.1	15.1	17.0

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

▼ **Gear output drive**



1 "Counter-clockwise" rotation, pressure at port **B**
2 "Clockwise" rotational direction, pressure at port **A**
3 Bidirectional direction of rotation

Notice

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

HP – Proportional control, hydraulic

The proportional hydraulic control provides infinite adjustment of the displacement. The control is proportional to the pilot pressure at port **X**.

HP1, HP2 positive control

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

HP5, HP6 negative control

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

Please note

- Maximum permissible pilot pressure: p_{St} = 100 bar
- The control oil is internally taken out of the high-pressure passage of the motor (**A** or **B**). For reliable control, a working pressure of at least 30 bar is required in **A** (**B**). If a control operation is performed at a working pressure < 30 bar, an auxiliary pressure of at least 30 bar must be applied at port **G** using an external check valve. For lower pressures, please contact us.
- Please note that at port **G** up to 450 bar (size 28) or 530 bar (sizes 55 to 200) can occur.
- Specify the desired beginning of control in plain text when ordering, e.g. beginning of control at 10 bar.
- The beginning of control and the HP characteristic curve are influenced by the case pressure. An increase in case pressure causes an increase in the beginning of control (see page 8) and thus a parallel shift of the characteristic curve.
- A leakage flow of maximum 0.3 l/min can occur at port **X** due to internal leakage (working pressure > pilot pressure). The external control is to be suitably configured to avoid an independent build-up of pilot pressure.

Stroking time damping

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

Standard

HP without damping.

HP.D with throttle pin on both sides, symmetrical (see table)

Option

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

▼ **Throttle pin overview**

Size	28	55	80	107	140	160	200
Groove size [mm]	0.30	0.45	0.45	0.55	0.55	0.55	0.65

HP1, HP5 – Pilot pressure increase Δp_{St} = 10 bar

HP1 positive control

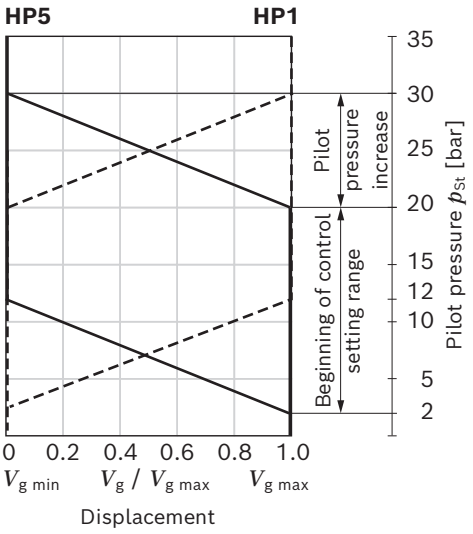
A pilot pressure increase of 10 bar at port **X** results in an increase in displacement from $V_{g\,min}$ to $V_{g\,max}$.

HP5 negative control

A pilot pressure increase of 10 bar at port **X** results in a decrease in displacement from $V_{g\,max}$ to $V_{g\,min}$.

- Beginning of control, setting range 2 to 20 bar
- Standard setting: beginning of control at 3 bar (end of control at 13 bar)

▼ **Characteristic curve**



HP2, HP6 Pilot pressure increase Δp_{St} = 25 bar

HP2 positive control

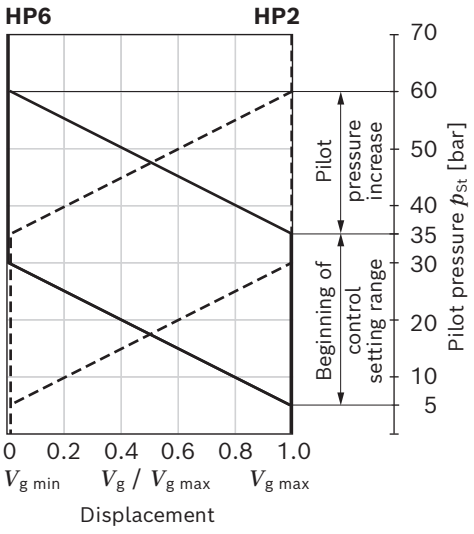
A pilot pressure increase of 25 bar at port X results in an increase in displacement from $V_{g\,min}$ to $V_{g\,max}$.

HP6 negative control

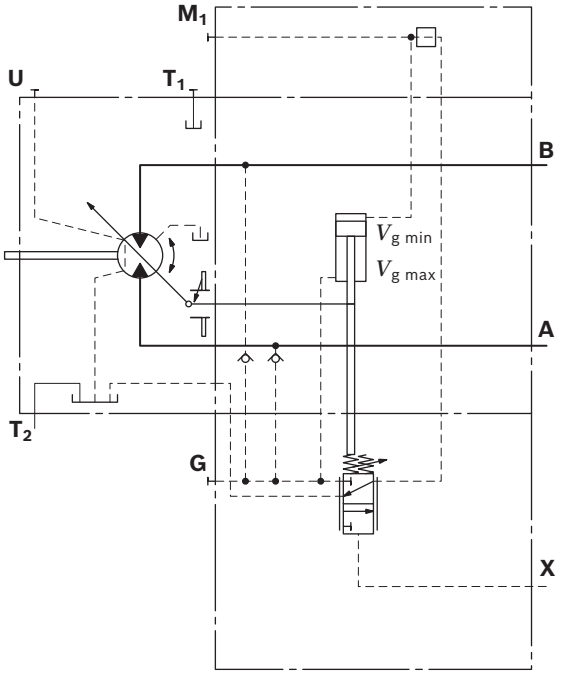
A pilot pressure increase of 25 bar at port **X** results in a decrease in displacement from $V_{g\,max}$ to $V_{g\,min}$.

- Beginning of control, setting range 5 to 35 bar
- Standard setting:
  Beginning of control at 10 bar (end of control at 35 bar)

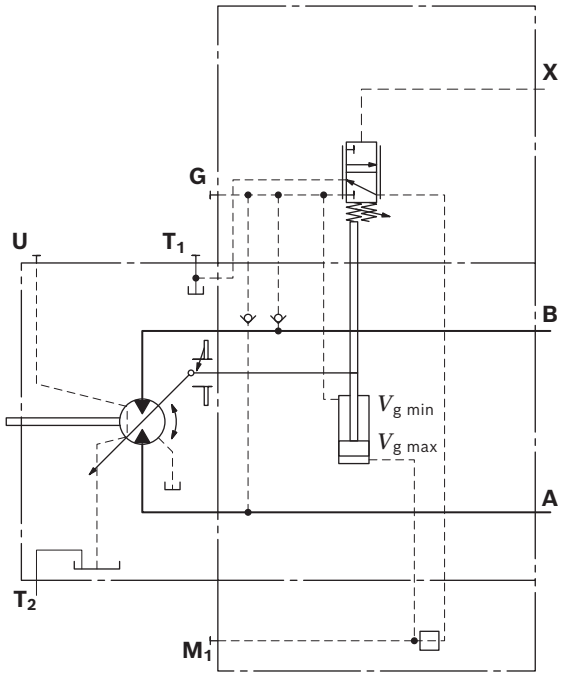
▼ **Characteristic curve**



▼ **Circuit diagram HP1, HP2 (positive control)**



▼ **Circuit diagram HP5, HP6 (negative control)**



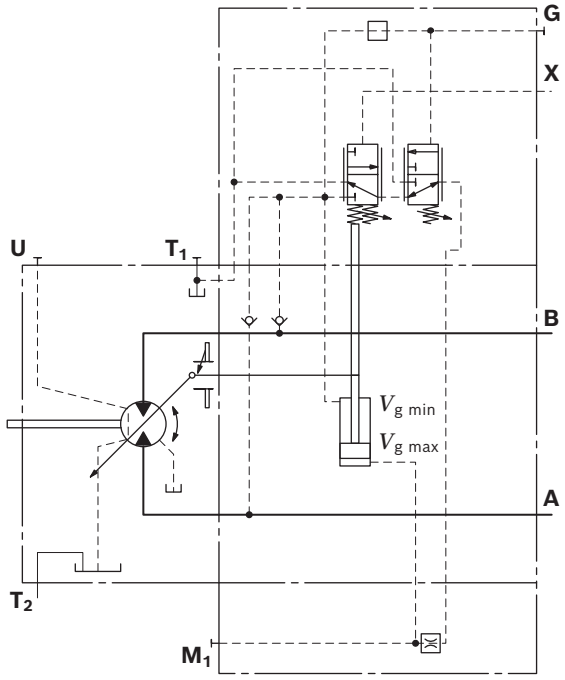
HP5D1, HP6D1 Pressure control, fixed setting

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 value of the pressure control, the motor will swivel towards a larger displacement.

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

Setting range of the pressure control valve 80 to 400 bar

▼ **Circuit diagram HP5D1, HP6D1 (negative control)**



EP – Proportional control, electric

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

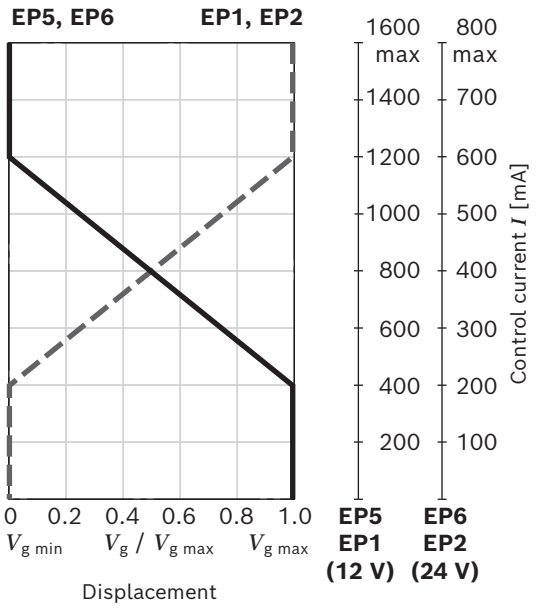
EP1, EP2 positive control

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

EP5, EP6 negative control

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

▼ **Characteristic curve**



Please note

- The control oil is internally taken out of the high-pressure passage of the motor (**A** or **B**). For reliable control, a working pressure of at least 30 bar is required in **A** (**B**). If a control operation is performed at a working pressure < 30 bar, an auxiliary pressure of at least 30 bar must be applied at port **G** using an external check valve. For lower pressures, please contact us.
- Please note that at port **G** up to 450 bar (size 28) or 530 bar (sizes 55 to 200) can occur.

Stroking time damping

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

Standard

EP without damping.
EP.D with throttle pin on both sides, symmetrical (see table)

Option

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

▼ **Throttle pin overview**

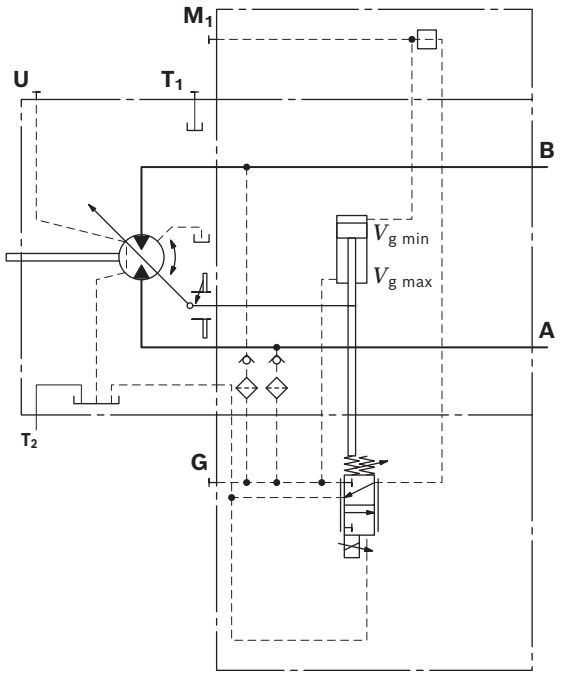
Size	28	55	80	107	140	160	200
Groove size [mm]	0.30	0.45	0.45	0.55	0.55	0.55	0.65

Technical data, solenoid	EP1, EP5	EP2, EP6
Voltage	12 V (±20%)	24 V (±20%)
Control current		
Start of control	400 mA	200 mA
End of control	1200 mA	600 mA
Current limit	1.54 A	0.77 A
Nominal resistance (at 20 °C)	5.5 Ω	22.7 Ω
Dither		
Frequency	100 Hz	100 Hz
Minimum oscillation range[1)]	240 mA	120 mA
Duty cycle	100%	100%
Type of protection: see connector version page 67		

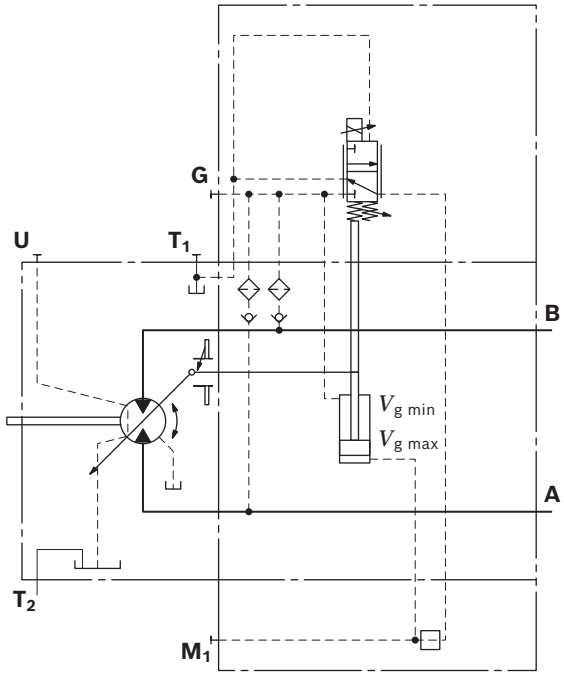
Various BODAS controllers with application software and amplifiers are available for controlling the proportional solenoids.
Further information can also be found online under www.boschrexroth.com/mobile-electronics.

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

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



▼ **Circuit diagram EP5, EP6 (negative control)**



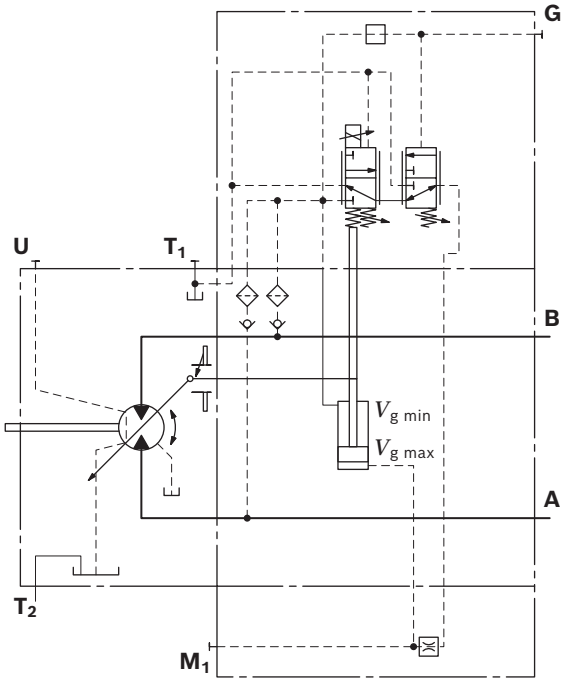
EP5D1, EP6D1 Pressure control, fixed setting

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 value of the pressure control, the motor will swivel towards a larger displacement.

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

Setting range of the pressure control valve 80 to 400 bar

▼ **Circuit diagram EP5D1, EP6D1 (negative control)**



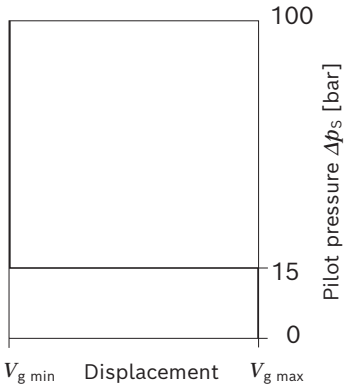
HZ – Two-point control, hydraulic

The hydraulic two-point 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 rotational speed)
- Position at $V_{g\,min}$ (with pilot pressure > 15 bar activated, minimum torque, maximum permissible rotational speed)

▼ **Characteristic curve HZ5, HZ7**



Please note

- Maximum permissible pilot pressure: 100 bar
- The control oil is internally taken out of the high-pressure passage of the motor (**A** or **B**). For reliable control, a working pressure of at least 30 bar is required in **A** (**B**). If a control operation is performed at a working pressure < 30 bar, an auxiliary pressure of at least 30 bar must be applied at port **G** using an external check valve. For lower pressures, please contact us.
  Please note that at port **G** up to 450 bar (size 28) or 530 bar (sizes 55 to 200) can occur.
- A leakage flow of maximum 0.3 l/min occurs at port **X** (working pressure > pilot pressure). To avoid a build-up of pilot pressure, pressure must be relieved from port **X** to the reservoir.

Stroking time damping

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

Standard for sizes 28, 140 to 200

HZ5 with throttle pin on both sides, symmetrical (see table)

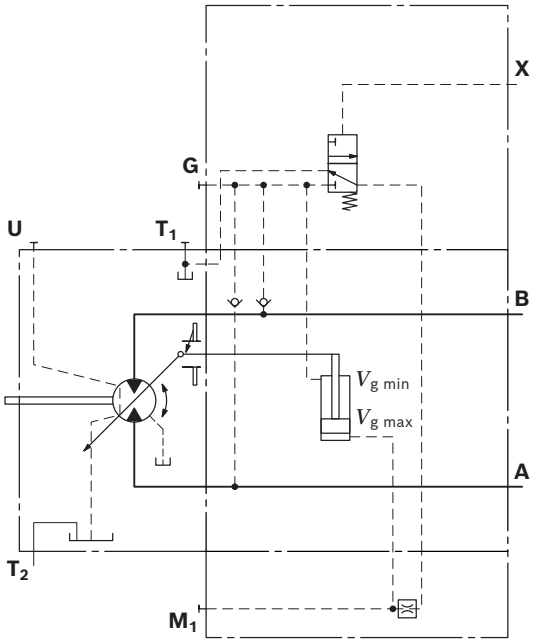
Standard for sizes 55 to 107

HZ7 (synchronous piston) with throttle pin on both sides, symmetrical (see table)

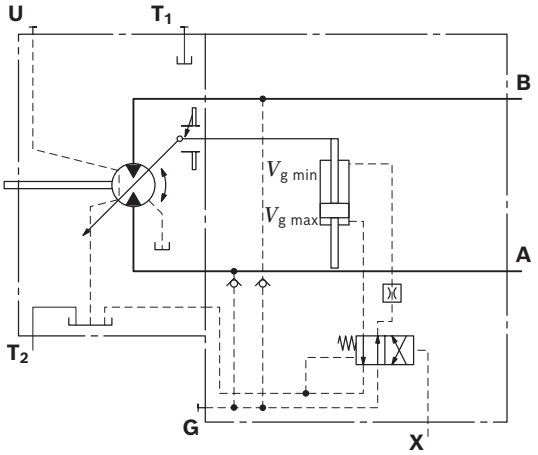
▼ **Throttle pin overview**

Size	28	55	80	107	140	160	200
Groove size [mm]	0.30	0.30	0.30	0.30	0.55	0.55	0.65

▼ **Circuit diagram HZ5 (negative control) sizes 28, 140 to 200**



▼ **Circuit diagram HZ7 (negative control) size 55 to 107**



EZ – Two-point control, electric

The electric two-point 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.

Please note

- The control oil is internally taken out of the high-pressure passage of the motor (**A** or **B**). For reliable control, a working pressure of at least 30 bar is required in **A** (**B**). If a control operation is performed at a working pressure < 30 bar, an auxiliary pressure of at least 30 bar must be applied at port **G** using an external check valve. For lower pressures, please contact us. Please note that at port **G** up to 450 bar (size 28) or 530 bar (size 200) can occur.

Stroking time damping

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

Standard for sizes 28, 140 to 200

EZ5, EZ6 with throttle pin on both sides, symmetrical (see table)

Standard for sizes 55 to 107

EZ7, EZ8 (synchronous piston) with throttle pin on both sides, symmetrical (see table)

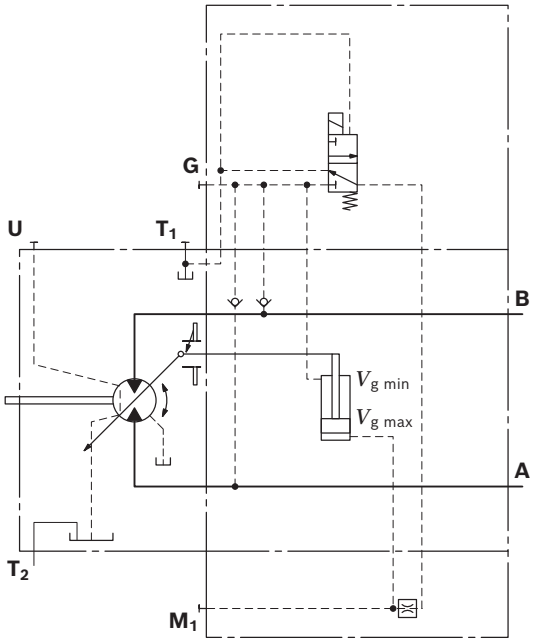
▼ **Throttle pin overview**

Size	28	55	80	107	140	160	200
Groove size [mm]	0.30	0.30	0.30	0.30	0.55	0.55	0.65

Size 28, 140 to 200

Technical data, solenoid with Ø37	EZ5	EZ6
Voltage	12 V (±20%)	24 V (±20%)
Position $V_{g\,max}$	De-energized	De-energized
Position $V_{g\,min}$	Current switched on	Current switched on
Nominal resistance (at 20 °C)	5.5 Ω	21.7 Ω
Nominal power	26.2 W	26.5 W
Minimum active current required	1.32 A	0.67 A
Duty cycle	100%	100%
Type of protection: see connector version page 67		

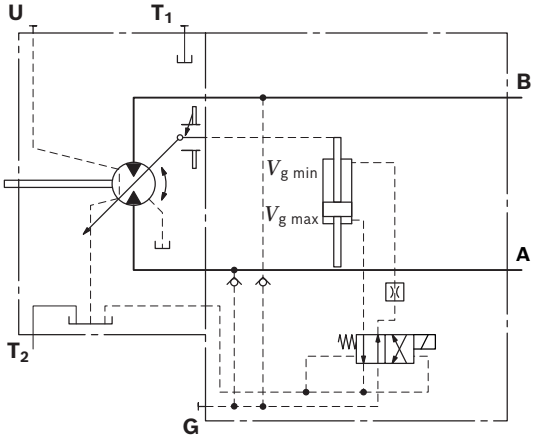
▼ **Circuit diagram EZ5, EZ6 (negative control) sizes 28, 140 to 200**



Sizes 55 to 107

Technical data, solenoid with Ø45	EZ7	EZ8
Voltage	12 V (±20%)	24 V (±20%)
Position $V_{g\,max}$	De-energized	De-energized
Position $V_{g\,min}$	Energized	Energized
Nominal resistance (at 20 °C)	4.8 Ω	19.2 Ω
Nominal power	30 W	30 W
Minimum active current required	1.5 A	0.75 A
Duty cycle	100%	100%
Type of protection: see connector version page 67		

▼ **Circuit diagram EZ7, EZ8 (negative control) sizes 55 to 107**



HA – Automatic control, high-pressure related

The automatic high-pressure related control adjusts the displacement automatically depending on the working pressure.
The displacement of the A6VM motor with HA control is $V_{g\,min}$ (maximum rotational speed and minimum torque). The control device measures internally the working 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 $V_{g\,max}$. The displacement is modulated between $V_{g\,min}$ and $V_{g\,max}$ depending on the load.

HA1, HA2 positive control

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

Please note

- For safety reasons, lifting winch drives are not permissible with beginning of control at $V_{g\,min}$ (standard for HA).
- The control oil is internally taken out of the high-pressure passage of the motor (A or B). For reliable control, a working pressure of at least 30 bar is required in A (B). If a control operation is performed at a working pressure < 30 bar, an auxiliary pressure of at least 30 bar must be applied at port **G** using an external check valve. For lower pressures, please contact us.
  Please note that at port **G** up to 450 bar (size 28) or 530 bar (sizes 55 to 200) can occur.
- The beginning of control and the HA.T3 characteristic curve are influenced by case pressure. An increase in case pressure causes an increase in the beginning of control (see page 8) and thus a parallel shift of the characteristic curve.
- A leakage flow of maximum 0.3 l/min occurs at port **X** (working pressure > pilot pressure). To avoid a build-up of pilot pressure, pressure must be relieved from port **X** to the reservoir. **Only for HA.T control**.

Stroking time damping

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

Standard for sizes 28 to 200

HA1,2 with throttle pin on one side, throttle from $V_{g\,min}$ to $V_{g\,max}$ (see table).
HA3 and HA3T3 with BVI and throttle pin on both sides, 0.30, symmetrical

▼ **Throttle pin overview**

Size	28	55	80	107	140	160	200
Groove size [mm]	0.30	0.45	0.45	0.55	0.55	0.55	0.65

Standard for sizes 55 to 200

HA with BVD or BVE counterbalance valve, with throttle screw (see table)

▼ **Throttle screw**

Size	55	80	107	140	160	200
Diameter [mm]	0.80	0.80	0.80	0.80	0.80	0.80

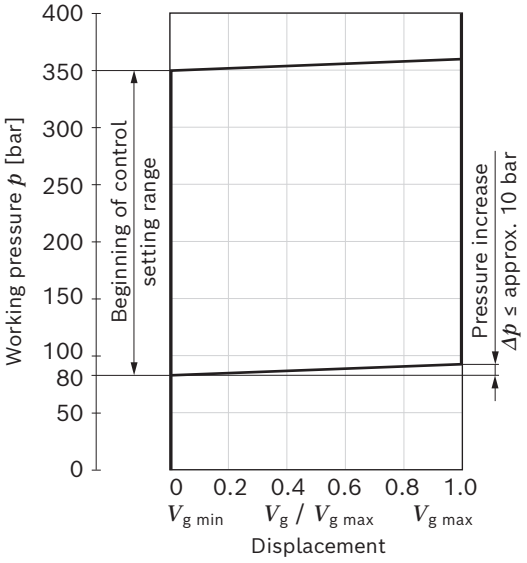
HA1 with minimum pressure increase, positive control

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

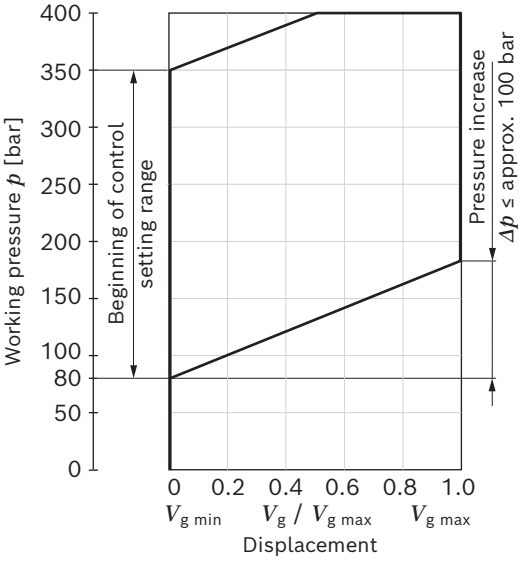
HA2 with pressure increase, positive control

A working pressure increase of Δp approx. 100 bar results in an increase in displacement from $V_{g\,min}$ to $V_{g\,max}$.
Beginning of control, setting range 80 to 350 bar
Specify the desired beginning of control in plain text when ordering, e.g. beginning of control at 200 bar.

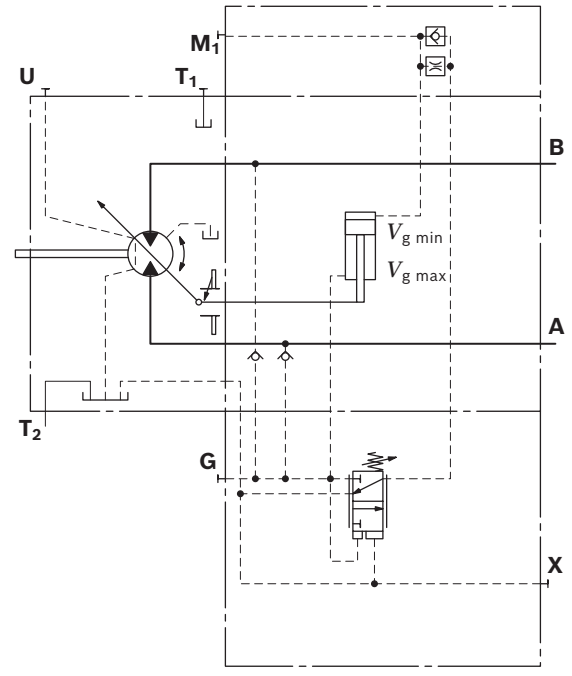
▼ **Characteristic curve HA1**



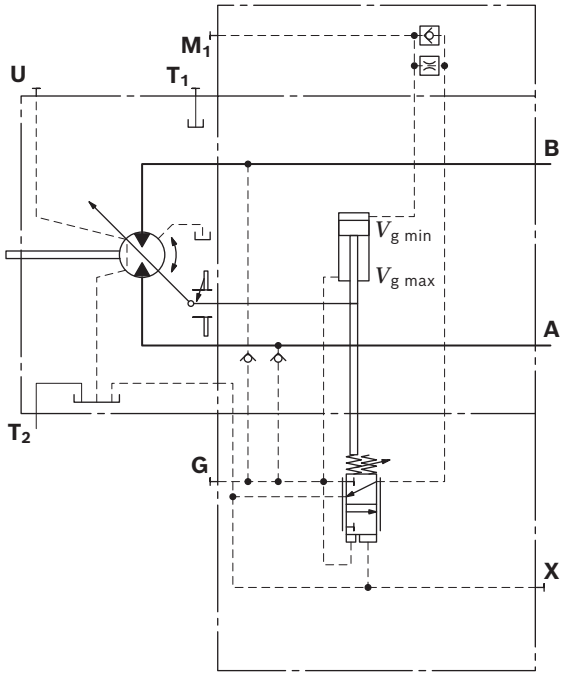
▼ **Characteristic curve HA2**



▼ **Circuit diagram HA1**



▼ **Circuit diagram HA2**



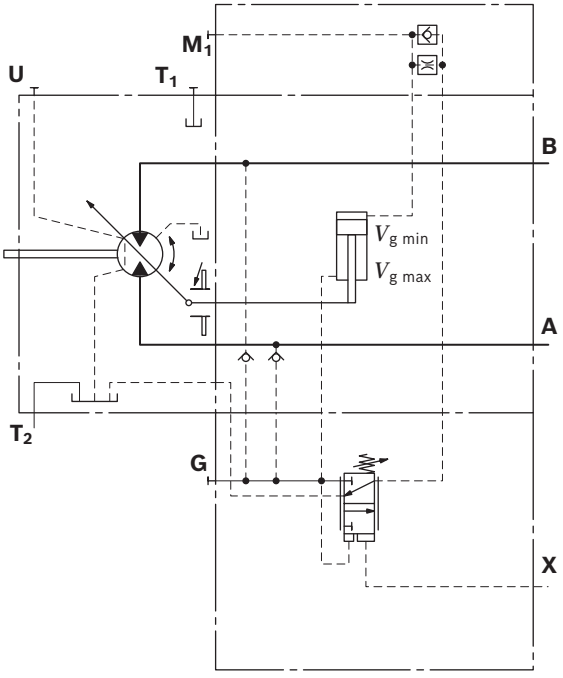
HA.T3 override, hydraulic, remote controlled, proportional

With the HA.T3 control, the beginning of control can be influenced by applying a pilot pressure to port **X**.
For each 1 bar of pilot pressure increase, the beginning of control is reduced by 17 bar.

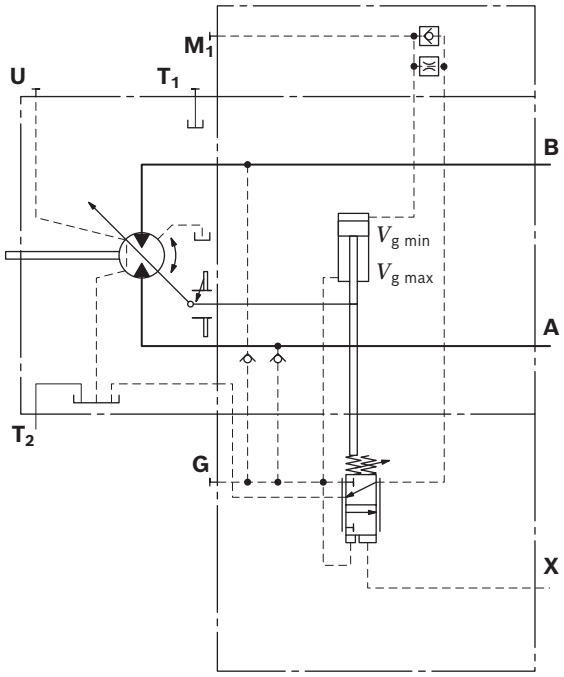
Beginning of control setting	300 bar	300 bar
Pilot pressure at port **X**	0 bar	10 bar
Beginning of control at	300 bar	130 bar

Please note
Maximum permissible pilot pressure 100 bar.

▼ **Circuit diagram HA1T3**



▼ **Circuit diagram HA2T3**

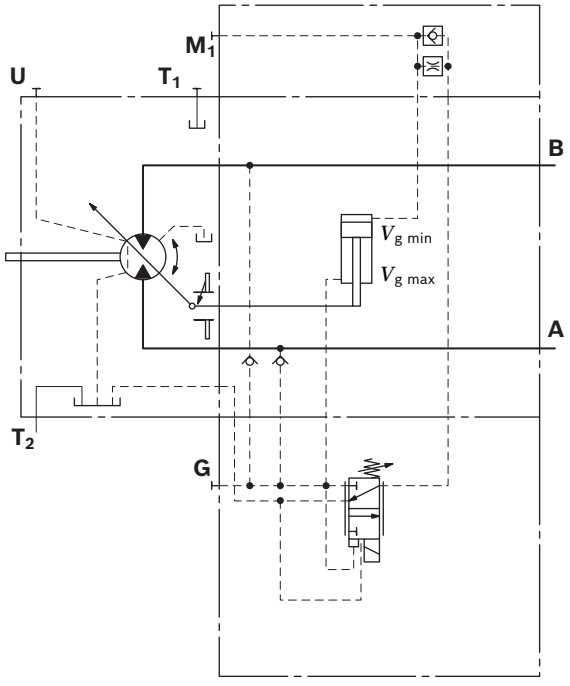


HA.U1, HA.U2 electric override, two-point

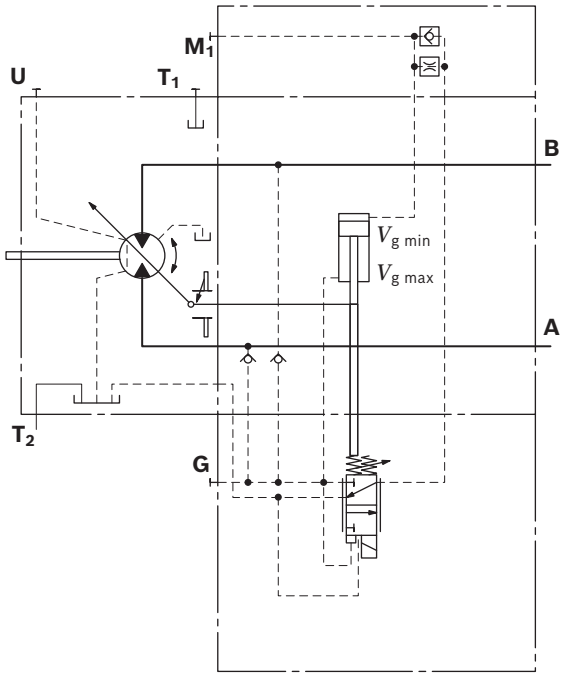
With the HA.U1 or HA.U2 control, the beginning of control can be overridden by an electric signal to a switching solenoid. When the override solenoid is energized, the variable motor swivels to maximum swivel angle, without intermediate position.
The beginning of control can be set between 80 and 300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

Technical data, solenoid with Ø45	U1	U2
Voltage	12 V (±20%)	24 V (±20%)
No override	De-energized	De-energized
Position $V_{g\,max}$	Energized	Energized
Nominal resistance (at 20 °C)	4.8 Ω	19.2 Ω
Nominal power	30 W	30 W
Minimum active current required	1.5 A	0.75 A
Duty cycle	100%	100%
Type of protection: see connector version page 67		

▼ **Circuit diagram HA1U1, HA1U2**



▼ **Circuit diagram HA2U1, HA2U2**



HA.R1, HA.R2 electric override, electric travel direction valve

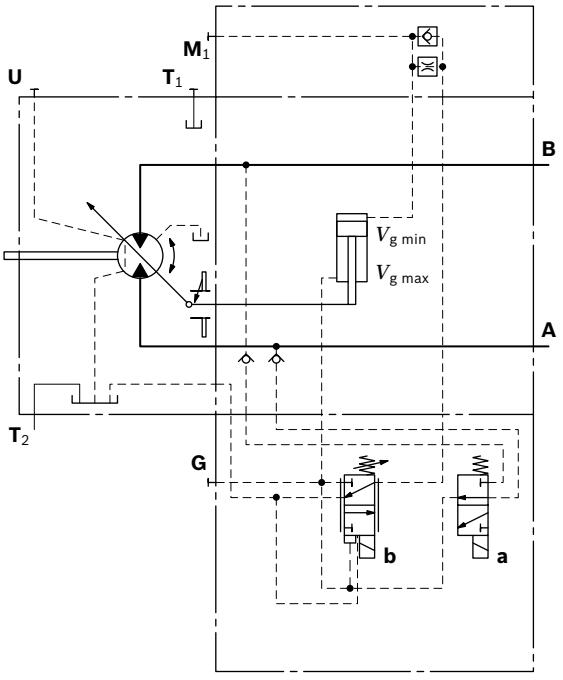
With the HA.R1 or HA.R2 control, the beginning of control can be overridden by an electric signal to switching solenoid **b**. When the override solenoid is energized, the variable motor swivels to maximum swivel angle, without intermediate position.

The travel direction valve ensures that the preselected pressure side of the hydraulic motor (**A** or **B**) is always connected to the HA control, and thus determines the swivel angle, even if the high-pressure side changes (e.g. travel drive during a downhill operation).

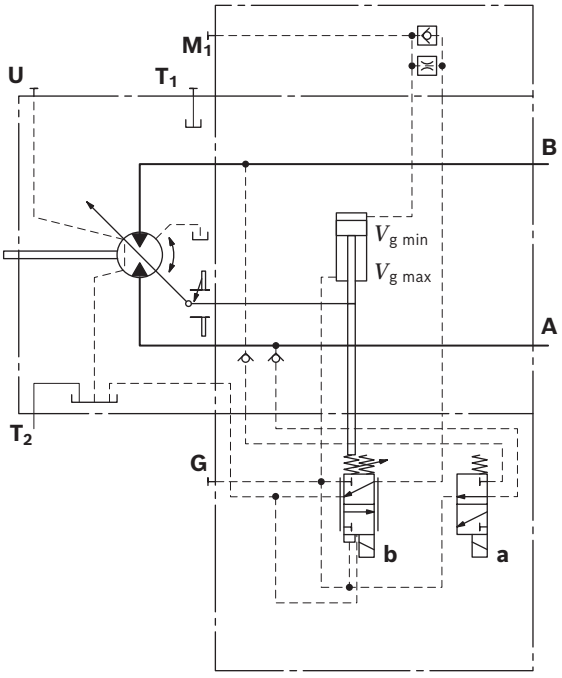
This thereby prevents undesired swiveling of the variable motor to a larger displacement (jerky deceleration and/or braking characteristics).

Depending on the direction of rotation (direction of travel), the travel direction valve is actuated through the compression spring or the switching solenoid **a** (see page 25).

▼ **Circuit diagram HA1R1, HA1R2**



▼ **Circuit diagram HA2R1, HA2R2**



Electric override

Technical data, solenoid b with Ø45	R1	R2
Voltage	12 V (±20%)	24 V (±20%)
No override	De-energized	De-energized
Position $V_{g\,max}$	Energized	Energized
Nominal resistance (at 20 °C)	4.8 Ω	19.2 Ω
Nominal power	30 W	30 W
Minimum active current required	1.5 A	0.75 A
Duty cycle	100%	100%
Type of protection: see connector version page 67		

Travel direction valve, electric

Technical data, solenoid a with Ø37		R1	R2
Voltage		12 V (±20%)	24 V (±20%)
Direction of rotation	Working pressure in		
Counter-clockwise	**B**	Energized	Energized
Clockwise	**A**	De-energized	De-energized
Nominal resistance (at 20 °C)		5.5 Ω	21.7 Ω
Nominal power		26.2 W	26.5 W
Minimum active current required		1.32 A	0.67 A
Duty cycle		100%	100%
Type of protection: see connector version page 67			

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 working pressure, regulates the swivel angle of the hydraulic motor.
Increasing drive speed, i.e. increasing pilot pressure, causes the motor to swivel to a smaller displacement (lower torque, higher rotational speed), depending on the working pressure.
If the working pressure exceeds the pressure command value of the controller, the variable motor swivels to a larger displacement (higher torque, lower rotational speed).

- Pressure ratio p_{St}/p_{HD} = 5/100

DA control is only suitable for certain types of travel drive systems and requires review of the motor 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.
Our Sales department will provide you detailed information.

Please note
The beginning of control and the DA characteristic curve are influenced by case pressure. An increase in case pressure causes a decrease in the beginning of control (see page 8) and thus a parallel shift of the characteristic curve.

Stroking time damping
The stroking time damping impacts the swivel behavior of the motor and consequently the machine response speed.
Standard for sizes 28 to 200
DA with throttle pin on one side, throttle from $V_{g\,min}$ to $V_{g\,max}$ (see table).

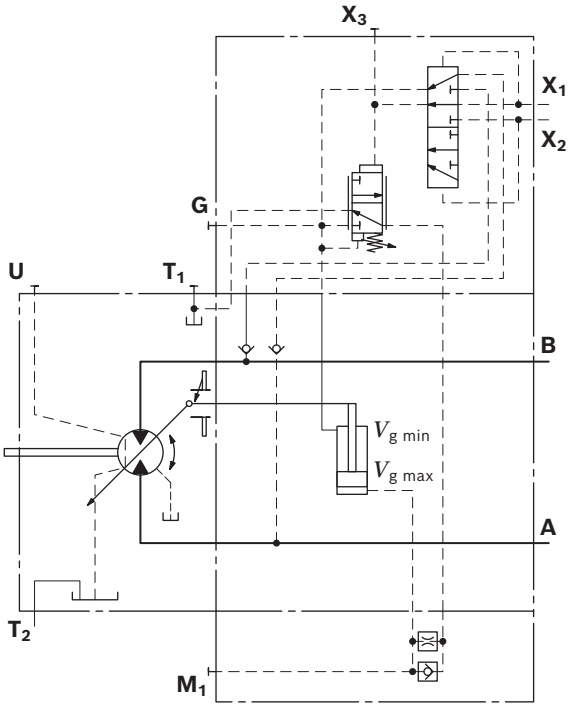
▼ **Throttle pin overview**

Size	28	55	80	107	140	160	200
Groove size [mm]	0.30	0.45	0.45	0.55	0.55	0.55	0.65

DA0 Hydraulic travel direction valve, negative control
Depending on the direction of rotation (travel direction), the travel direction valve is switched by using pilot pressure ports **X**$_1$ or **X**$_2$.

Direction of rotation	Working pressure in	Pilot pressure in
Clockwise	**A**	**X**$_1$
Counter-clockwise	**B**	**X**$_2$

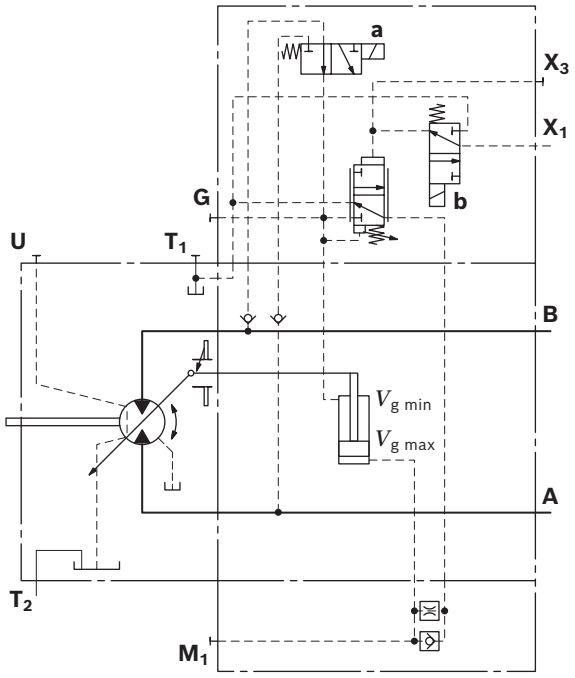
▼ **Circuit diagram DA0**



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

Depending on the direction of rotation (direction of travel), the travel direction valve is actuated through the compression spring or the switching solenoid **a**.
When switching solenoid **b** is energized, the control can be overridden and the motor can be swiveled to maximum displacement (high torque, lower rotational speed) (electric $V_{g\,max}$ override).

▼ **Circuit diagram DA1, DA2**



Travel direction valve, electric

Technical data, solenoid a with Ø37		DA1	DA2
Voltage		12 V (±20%)	24 V (±20%)
Direction of rotation	Working pressure in		
Counter-clockwise	**B**	De-energized	De-energized
Clockwise	**A**	Energized	Energized
Nominal resistance (at 20 °C)		5.5 Ω	21.7 Ω
Nominal power		26.2 W	26.5 W
Minimum active current required		1.32 A	0.67 A
Duty cycle		100%	100%
Type of protection: see connector version page 67			

Electric override

Technical data, solenoid b with Ø37	DA1	DA2
Voltage	12 V (±20%)	24 V (±20%)
No override	De-energized	De-energized
Position $V_{g\,max}$	Energized	Energized
Nominal resistance (at 20 °C)	5.5 Ω	21.7 Ω
Nominal power	26.2 W	26.5 W
Minimum active current required	1.32 A	0.67 A
Duty cycle	100%	100%
Type of protection: see connector version page 67		

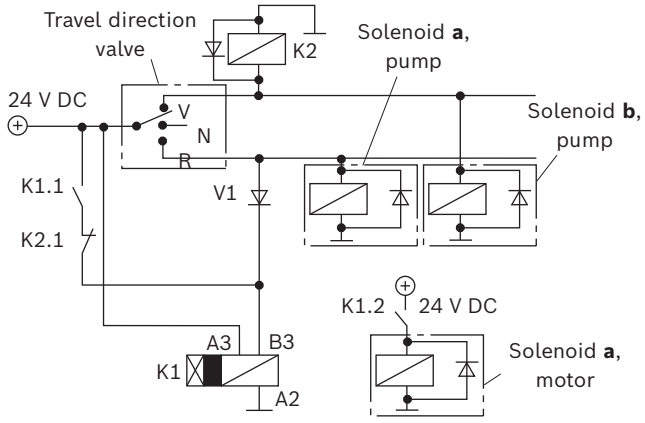
Electric travel direction valve (for DA, HA.R)

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

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

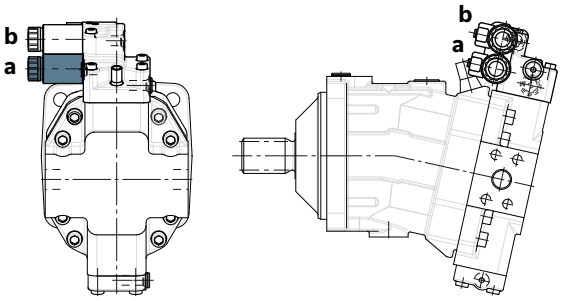
As a result, jerky deceleration or braking is prevented in both cases.

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

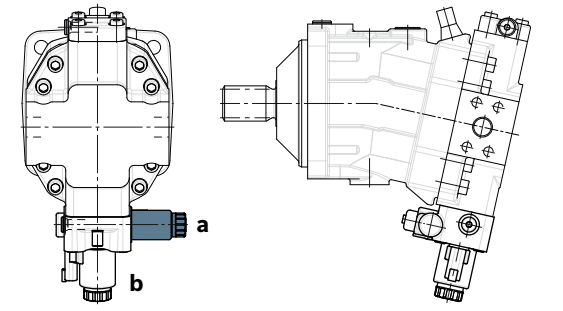


Notice
The shown diodes and relays are not included in the scope of delivery of the motor.

▼ **Control DA1, DA**



▼ **Control, HA1R., HA2R.**

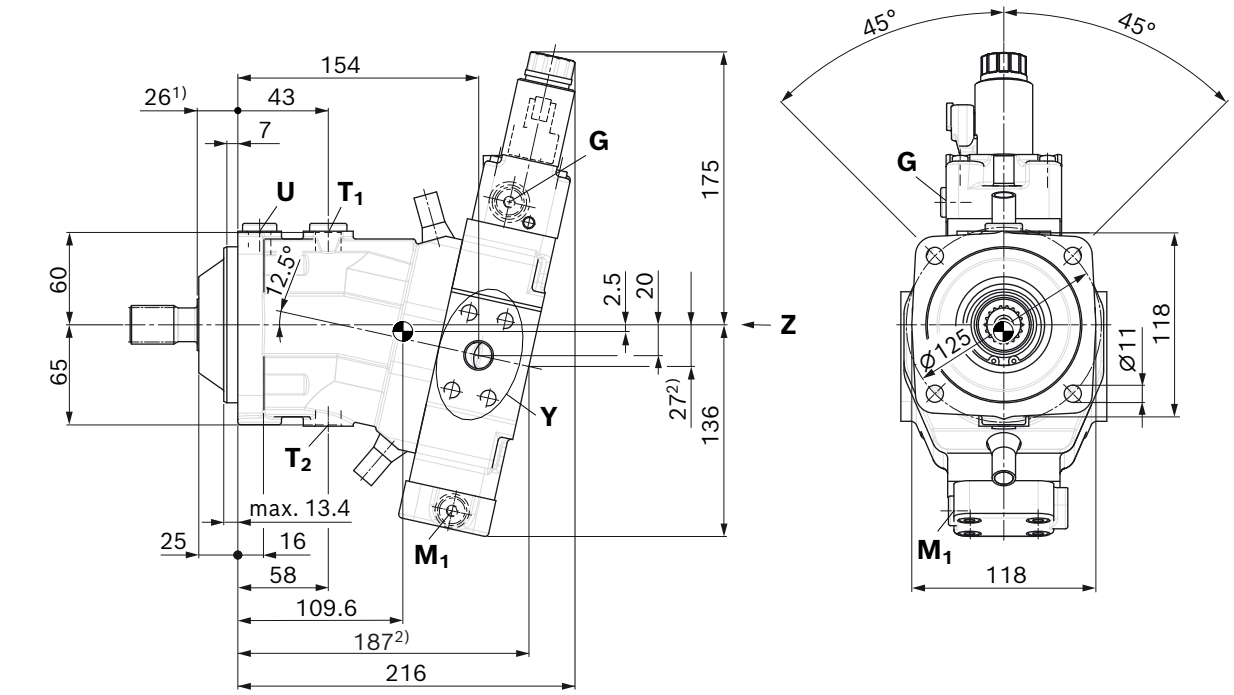


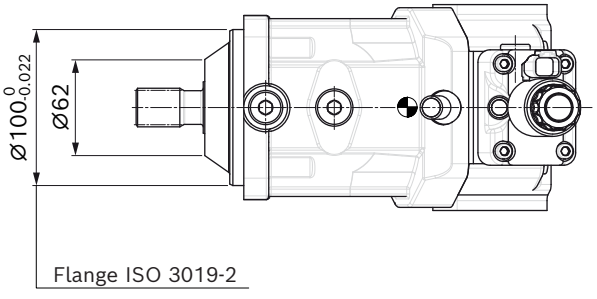
Switching solenoid **a** on travel direction valve

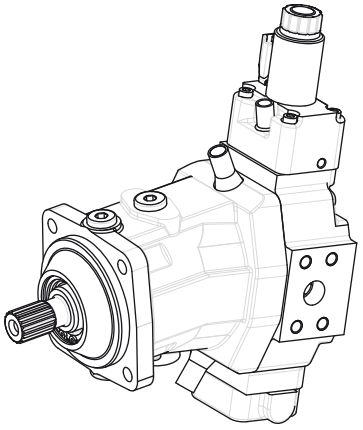
Dimensions, size 28

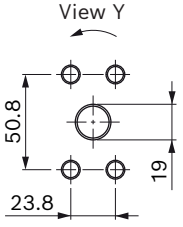
EP5, EP6 – Proportional electric control, negative control

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







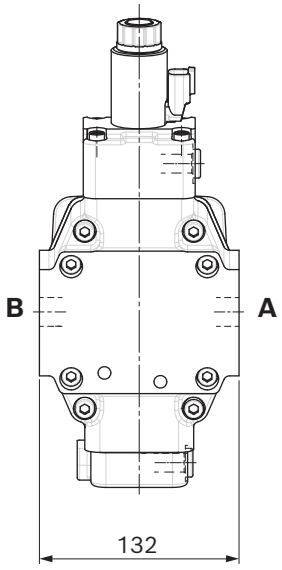


Center of gravity

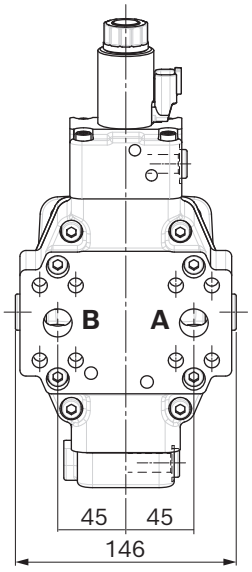
1) To shaft collar
2) Port plate 1 – SAE working ports **A** and **B** at rear

▼ **Location of working ports on the port plates** (View **Z**)

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

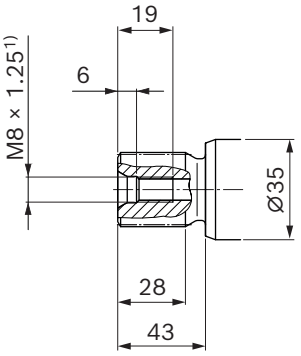


1 SAE working ports **A** and **B** at rear



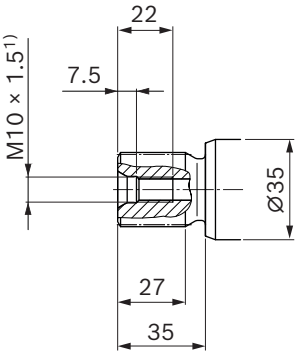
▼ **Splined shaft DIN 5480**

Z5 – W25×1.25×18×9g



▼ **Splined shaft DIN 5480**

Z6 –W30×2×14×9g

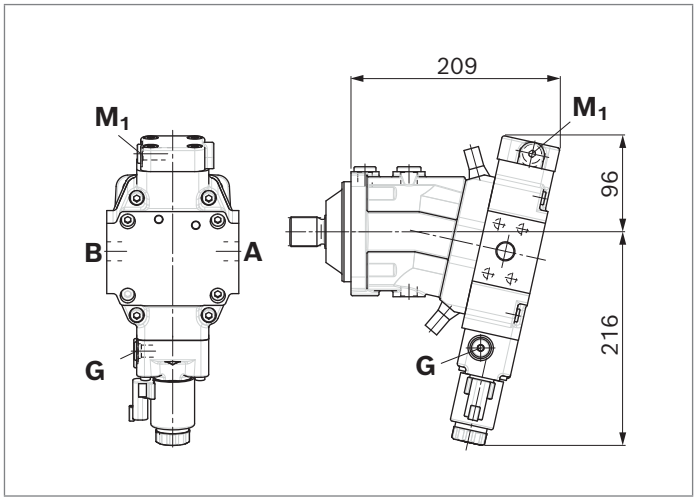


1) Center bore according to DIN 332 (thread according to DIN 13)

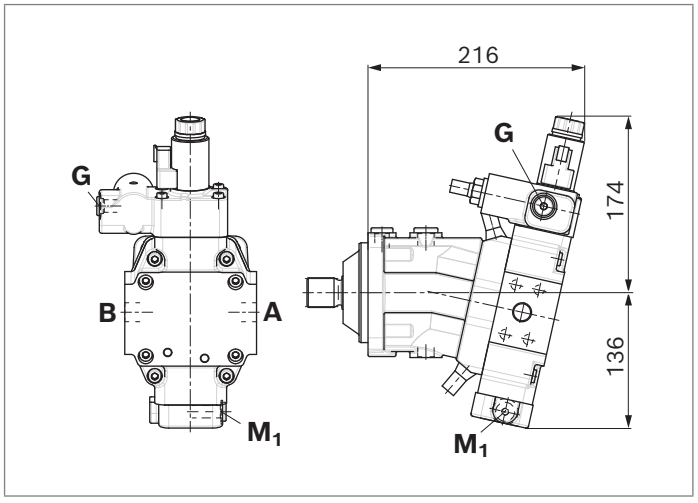
Ports		Standard	Size	p_{max} [bar][1]	State[5]
A, B	Working port Fastening thread A/B	SAE J518[2] DIN 13	3/4 in M10 × 1.5; 17 deep	450	O
T_1	Drain port	DIN 3852[4]	M18 × 1.5; 12 deep	3	X[3]
T_2	Drain port	DIN 3852[4]	M18 × 1.5; 12 deep	3	O[3]
G	Synchronous control	DIN 3852[4]	M14 × 1.5; 11.5 deep	450	X
U	Bearing flushing port	DIN 3852[4]	M16 × 1.5; 14.5 deep	3	X
X	Pilot pressure port (HP, HZ, HA1T/HA2T)	DIN 3852[4]	M14 × 1.5; 11.5 deep	100	O
X	Pilot pressure port (HA1, HA2)	DIN 3852[4]	M14 × 1.5; 11.5 deep	3	X
X_1, X_2	Pilot pressure port (DA1, DA4)	DIN 2353-CL	8B-ST	40	O
X_1	Pilot pressure port (DA1, DA2)	DIN 3852[4]	M14 × 1.5; 11.5 deep	40	O
X_3	Pilot pressure port (DA1, DA2)	DIN 3852[4]	M14 × 1.5; 11.5 deep	40	X
M_1	Measuring port, control pressure	DIN 3852[4]	M14 × 1.5; 11.5 deep	450	X

1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
2) Only dimensions according to SAE J518, metric fastening thread is a deviation from the standard.
3) Depending on installation position, **T_1** or **T_2** must be connected (see also installation instructions on page 83).
4) The countersink may be deeper than specified in the standard.
5) O = Must be connected (plugged on delivery) X = Plugged (in normal operation)

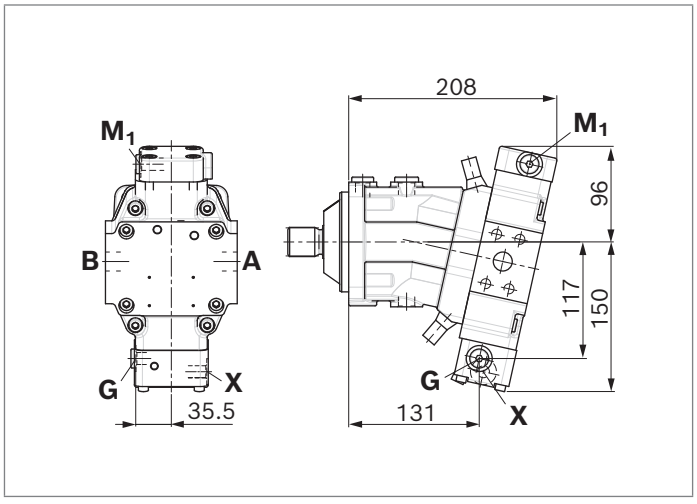
▼ **EP1, EP2** – Proportional electric control, positive control



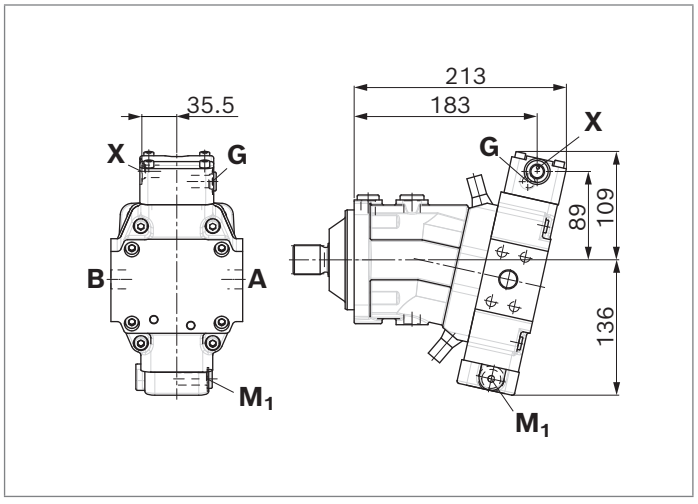
▼ **EP5D1, EP6D1** – Proportional electric control, negative control, with pressure control fixed setting



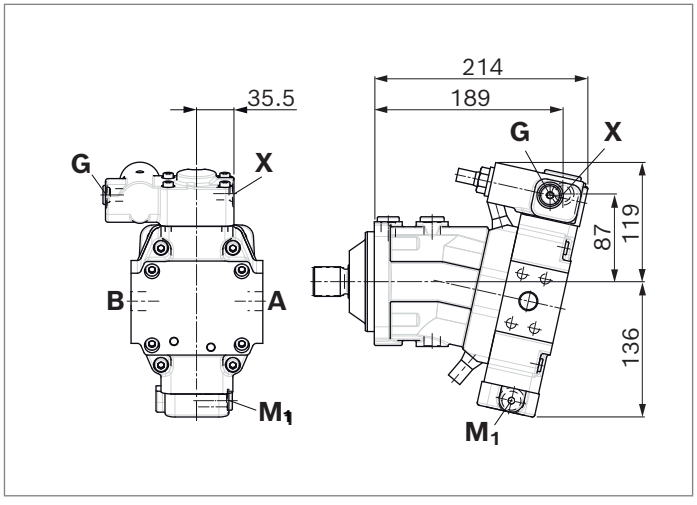
▼ **HP1, HP2** – Proportional hydraulic control, positive control



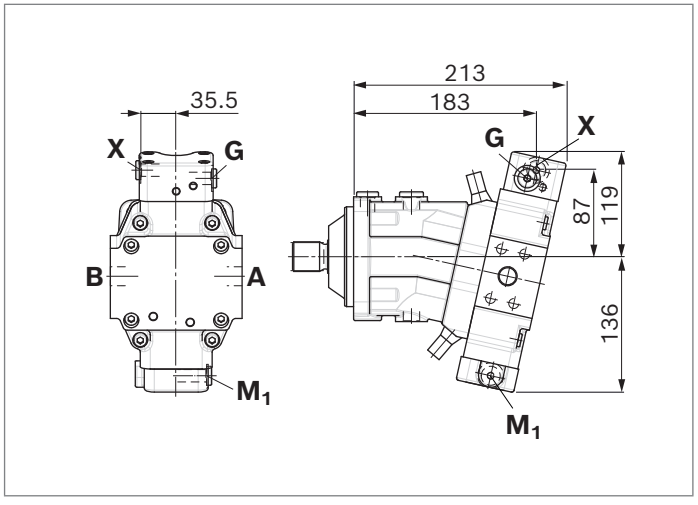
▼ **HP5, HP6** – Proportional hydraulic control, negative control



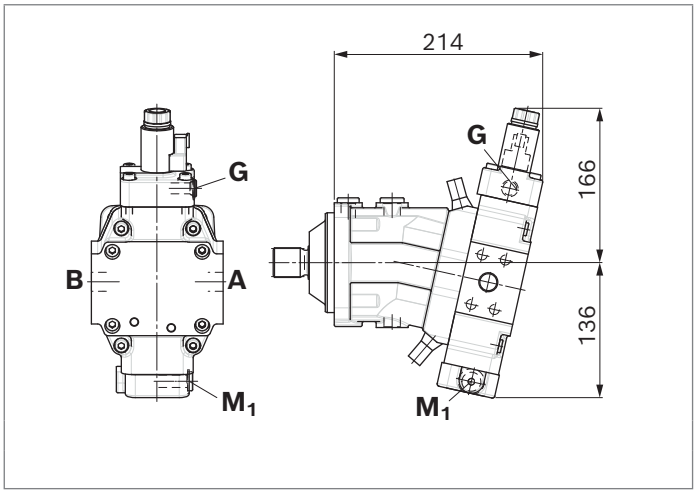
▼ **HP5D1, HP6D1** – Proportional hydraulic control, negative control, with pressure control fixed setting



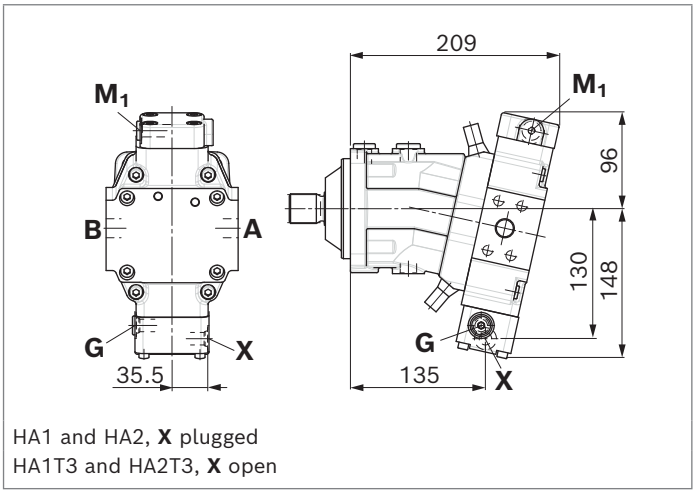
▼ **HZ5** – Two-point control, hydraulic



▼ **EZ5, EZ6** – Two-point control, electric, negative control

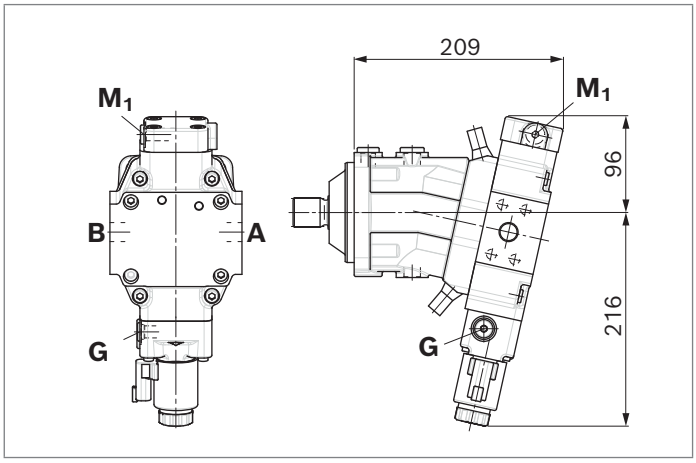


▼ **HA1, HA2 / HA1T3, HA2T3** – Automatic high-pressure related control, positive control, with hydraulic override, remote controlled, proportional

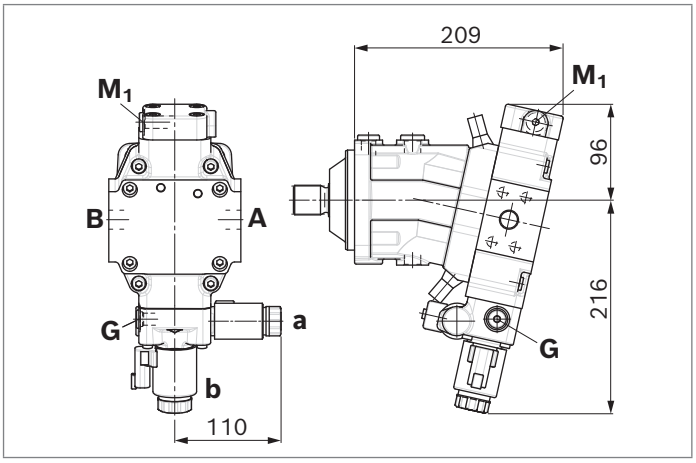


HA1 and HA2, **X** plugged
HA1T3 and HA2T3, **X** open

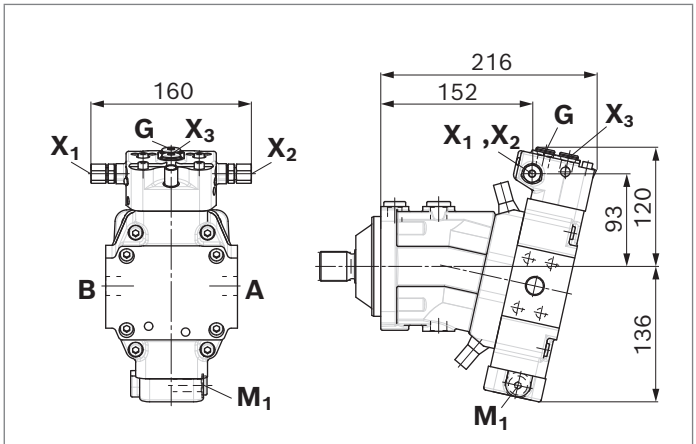
▼ **HA1U1, HA2U2** – Automatic high-pressure related control, positive control, with electric override, two-point



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

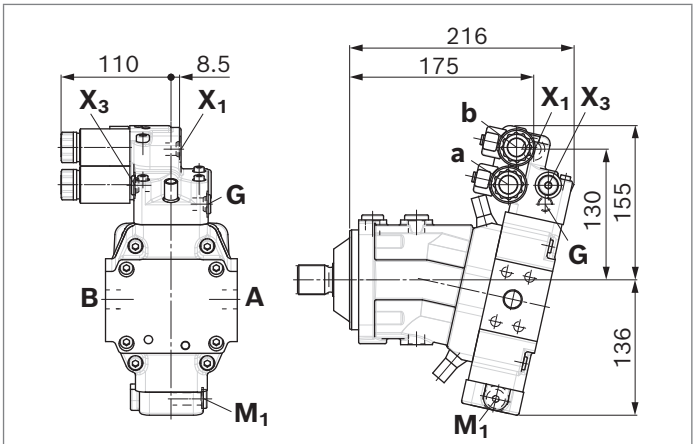


▼ **DA0** – Automatic speed related control, negative control, with hydraulic travel direction valve



X_1, X_2 Pipe fitting SDSC – L8×M12 – F acc. to ISO 8434-1
Use assembled fitting!

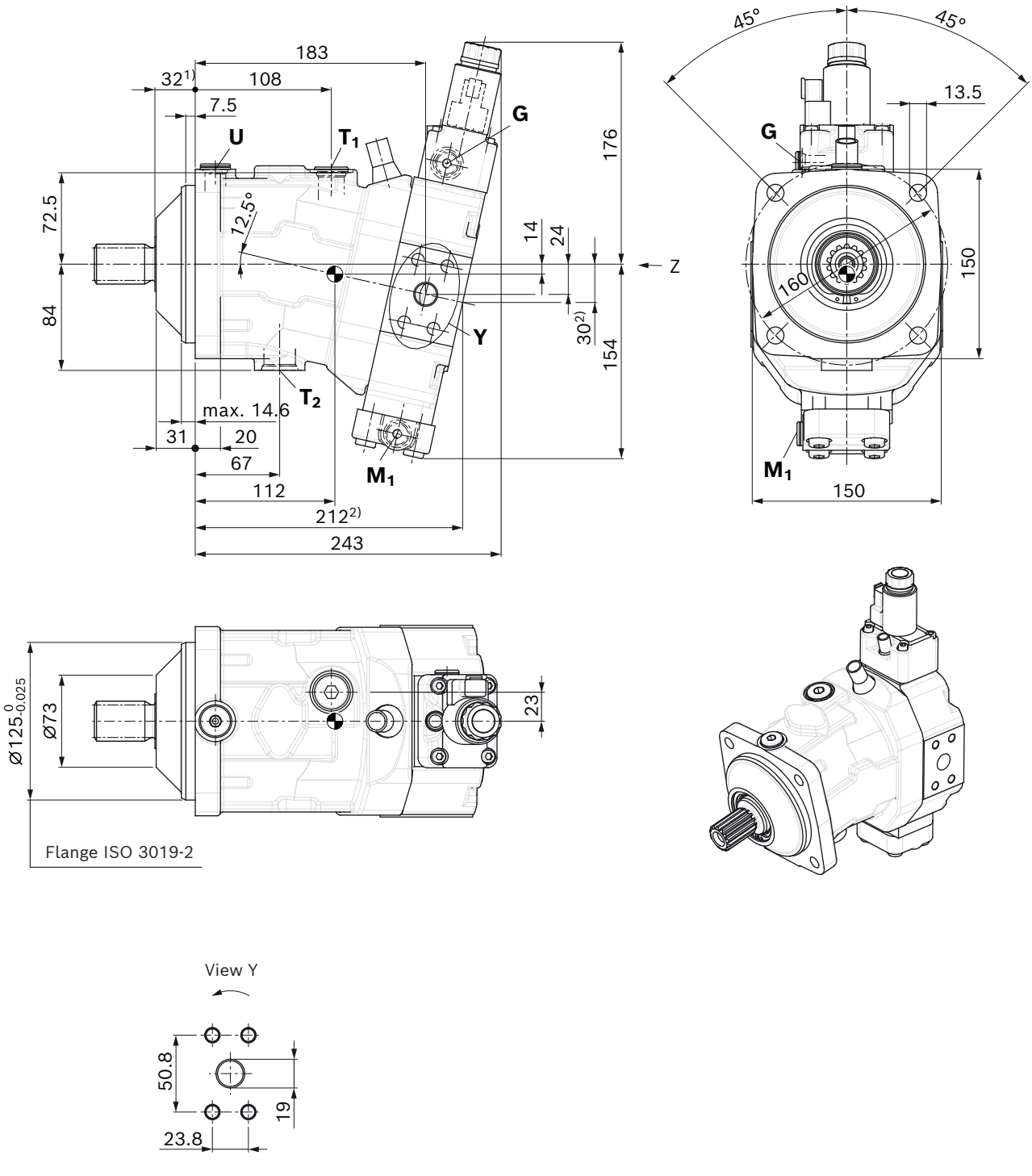
▼ **DA1, DA2** – Automatic speed related control, negative control, with electric travel direction valve and electric $V_{g\,max}$ override



Dimensions, size 55

EP5, EP6 – Proportional electric control, negative control

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

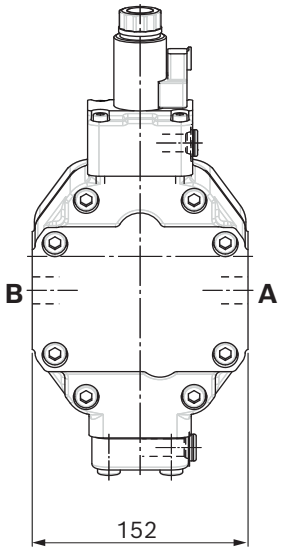


Center of gravity

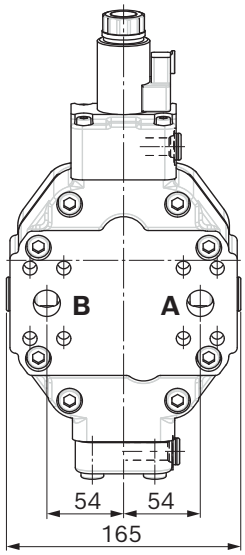
1) To shaft collar
2) Port plate 1 – SAE working ports **A** and **B** at rear

▼ **Location of working ports on the port plates** (View **Z**)

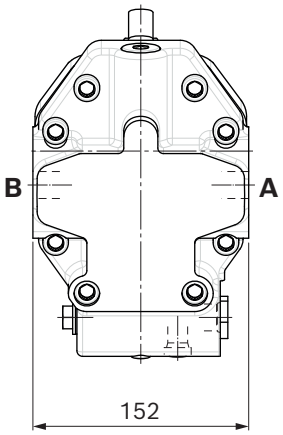
2 SAE working ports **A** and **B** at side, opposite



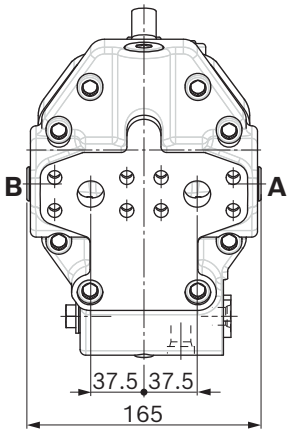
1 SAE working ports **A** and **B** at rear



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

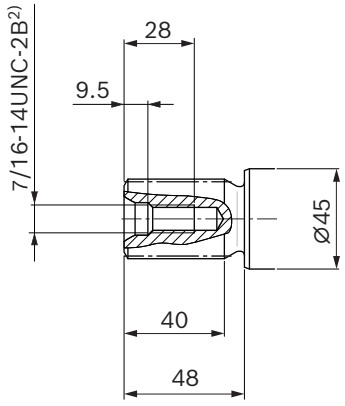


1 SAE working ports **A** and **B** at rear, only HZ7, EZ7/8



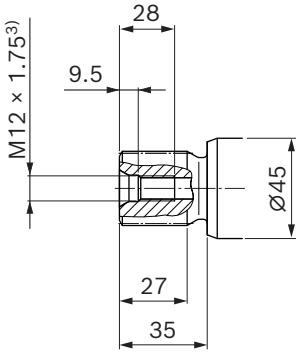
▼ **Splined shaft SAE J744**

S7 – 1 1/4 in 14T 12/24DP[1)]



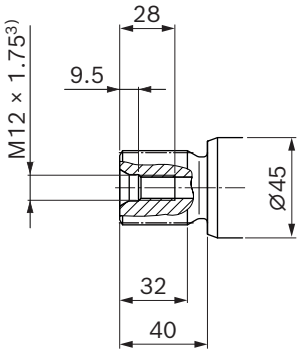
▼ **Splined shaft DIN 5480**

Z6 – W30×2×14×9g



▼ **Splined shaft DIN 5480**

Z8 – W35×2×16×9g

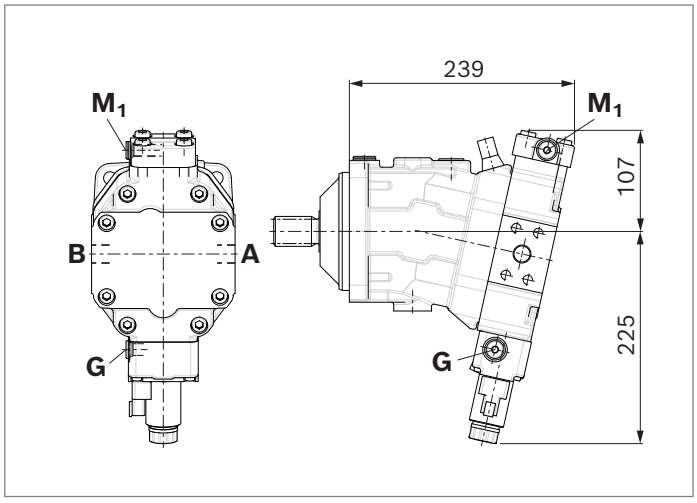


1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Center bore according to DIN 332 (thread according to DIN 13)

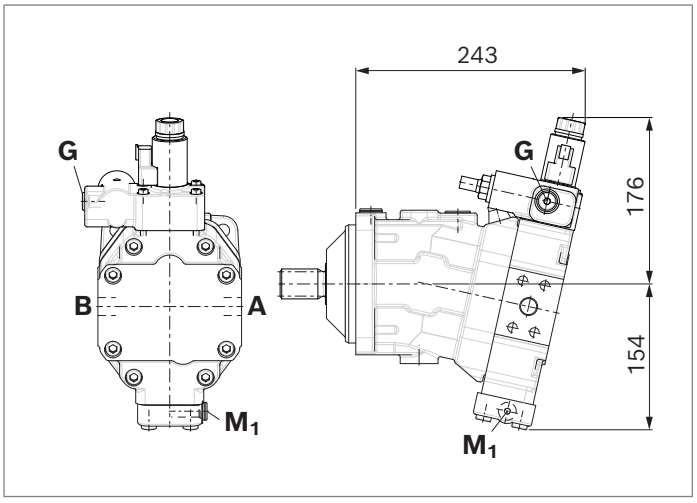
Ports		Standard	Size	p_{max} [bar][1]	State[5]
A, B	Working port Fastening thread A/B	SAE J518[2] DIN 13	3/4 in M10 × 1.5; 17 deep	530	O
T_1	Drain port	ISO 6149[4]	M22 × 1.5; 15.5 deep	3	X[3]
T_2	Drain port	ISO 6149[4]	M27 × 2; 19 deep	3	O[3]
G	Synchronous control	ISO 6149[4]	M14 × 1.5; 11.5 deep	530	X
U	Bearing flushing port	ISO 6149[4]	M18 × 1.5; 14.5 deep	3	X
X	Pilot pressure port (HP, HZ, HA1T/HA2T)	ISO 6149[4]	M14 × 1.5; 11.5 deep	530	O
X	Pilot pressure port (HA1, HA2)	ISO 6149[4]	M14 × 1.5; 11.5 deep	3	X
X_1, X_2	Pilot pressure port (DA0)	ISO 8434-1	SDSC-L8×M12-F	40	O
X_1	Pilot pressure port (DA1, DA2)	ISO 6149[4]	M14 × 1.5; 11.5 deep	40	O
X_3	Pilot pressure port (DA1, DA2)	ISO 6149[4]	M14 × 1.5; 11.5 deep	40	X
M_1	Measuring port, control pressure	ISO 6149[4]	M14 × 1.5; 11.5 deep	530	X

1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
2) Only dimensions according to SAE J518, metric fastening thread is a deviation from the standard.
3) Depending on installation position, **T_1** or **T_2** must be connected (see also installation instructions on page 83).
4) The countersink may be deeper than specified in the standard.
5) O = Must be connected (plugged on delivery) X = Plugged (in normal operation)

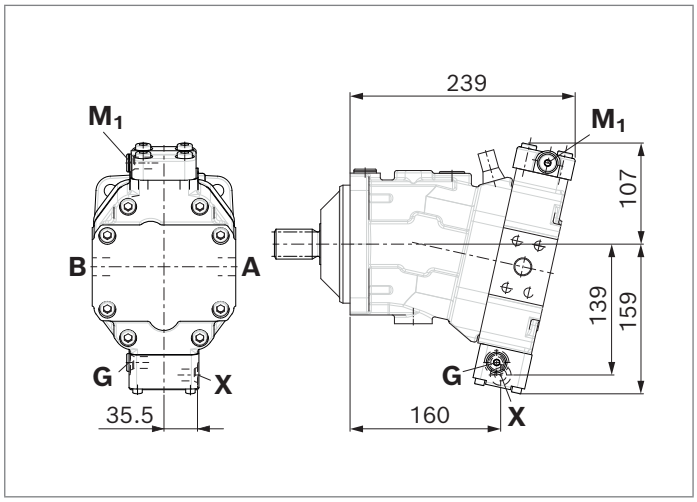
▼ **EP1, EP2** – Proportional electric control, positive control



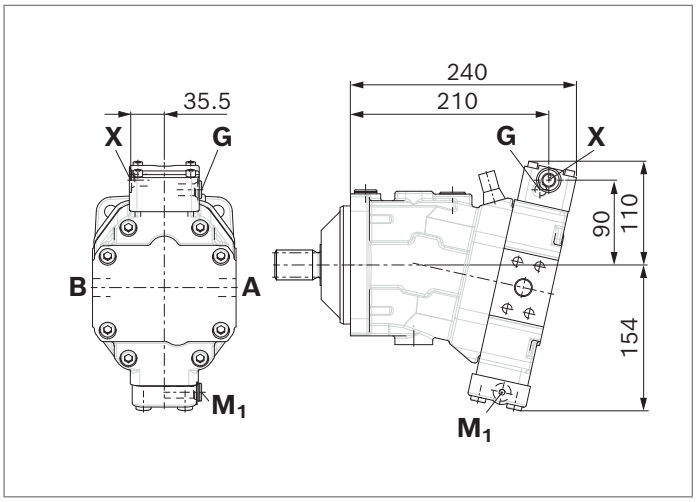
▼ **EP5D1, EP6D1** – Proportional electric control, negative control, with pressure control fixed setting



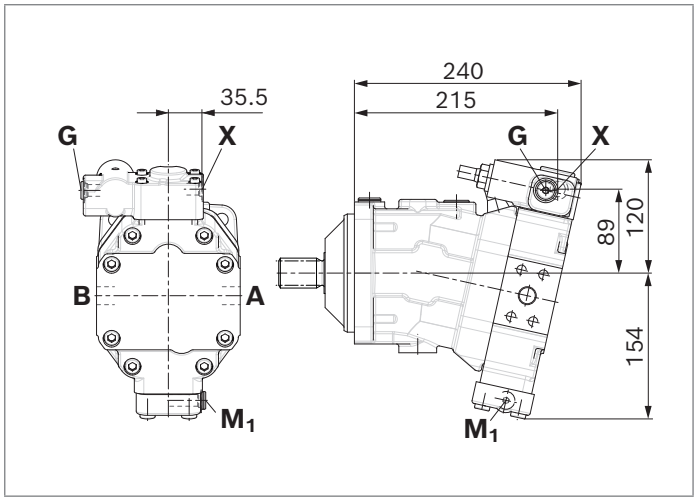
▼ **HP1, HP2** – Proportional hydraulic control, positive control



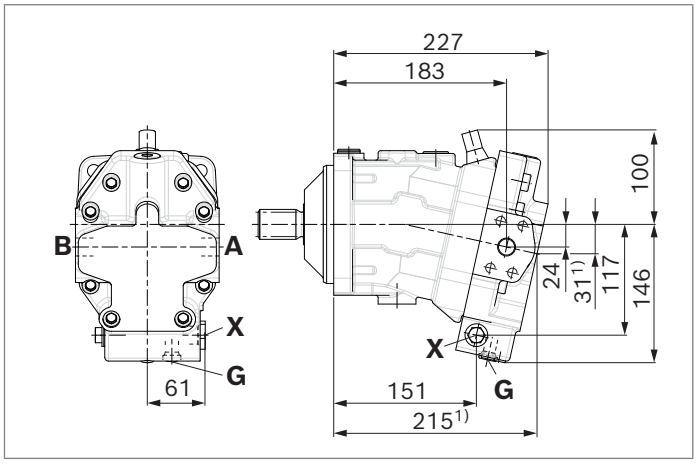
▼ **HP5, HP6** – Proportional hydraulic control, negative control



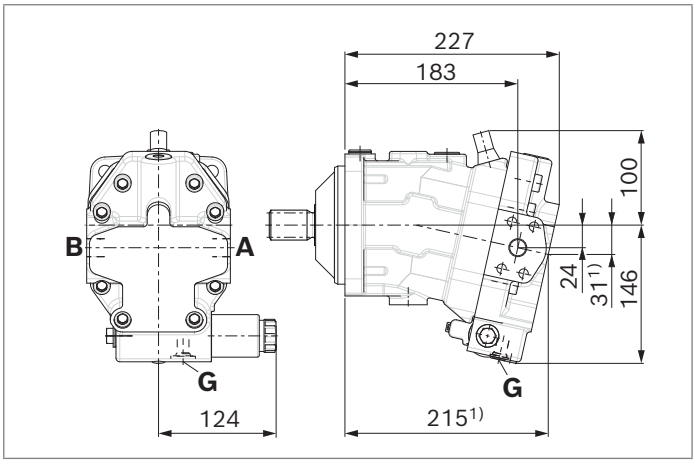
▼ **HP5D1, HP6D1** – Proportional hydraulic control, negative control, with pressure control fixed setting



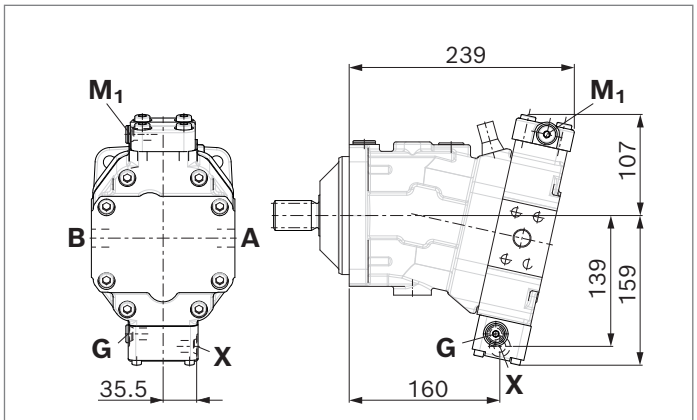
▼ **HZ7** – Two-point control, hydraulic, negative control



▼ **EZ7, EZ8** – Two-point control, electric, negative control



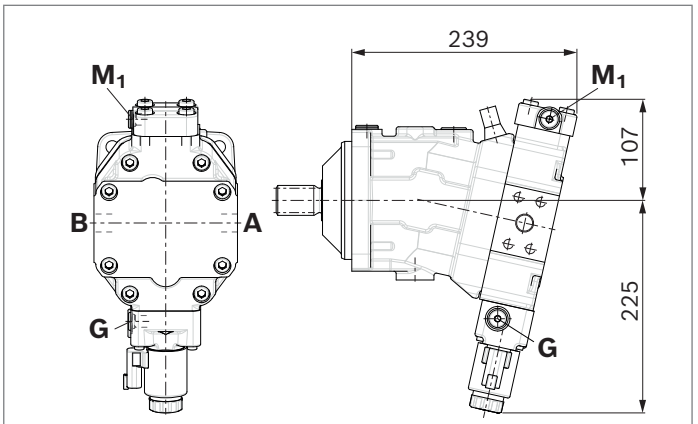
▼ **HA1, HA2 / HA1T3, HA2T3** – Automatic high-pressure related control, positive control, with hydraulic override, remote controlled, proportional



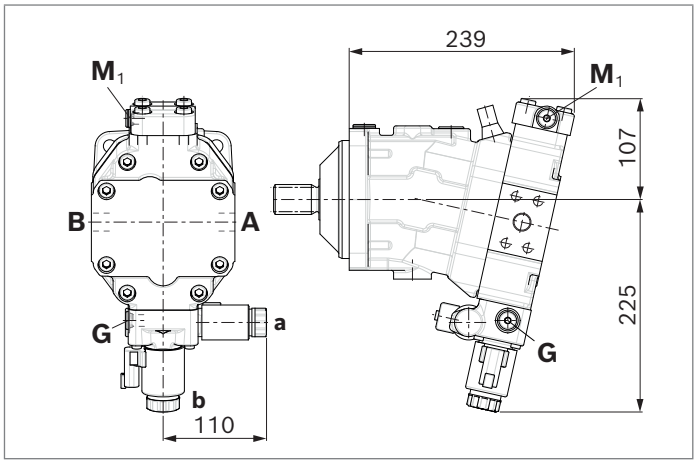
HA1 and HA2, **X** plugged

HA1T and HA2T, **X** open

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

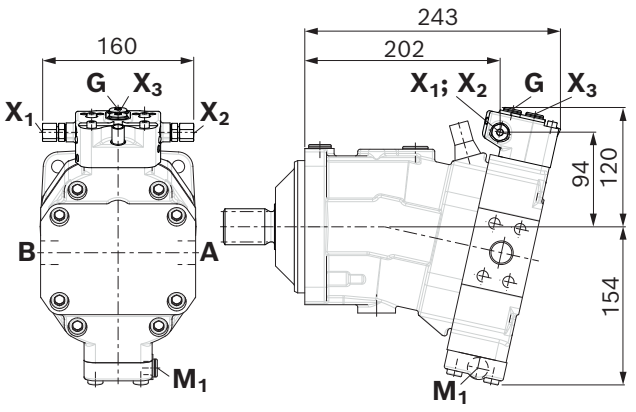


▼ **HA1R1, HA2R2** – Automatic high-pressure related control, positive control, with electric override and electric travel direction valve



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

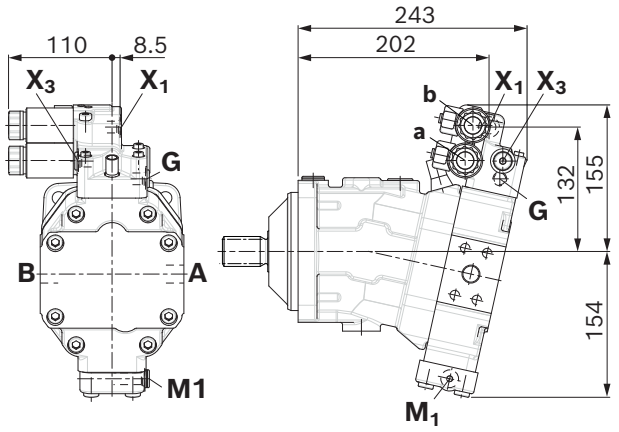
▼ **DA0** – Automatic speed related control, negative control, with hydraulic travel direction valve



X$_1$, **X**$_2$ Pipe fitting SDSC – L8×M12 – F acc. to ISO 8434-1

Use assembled fitting!

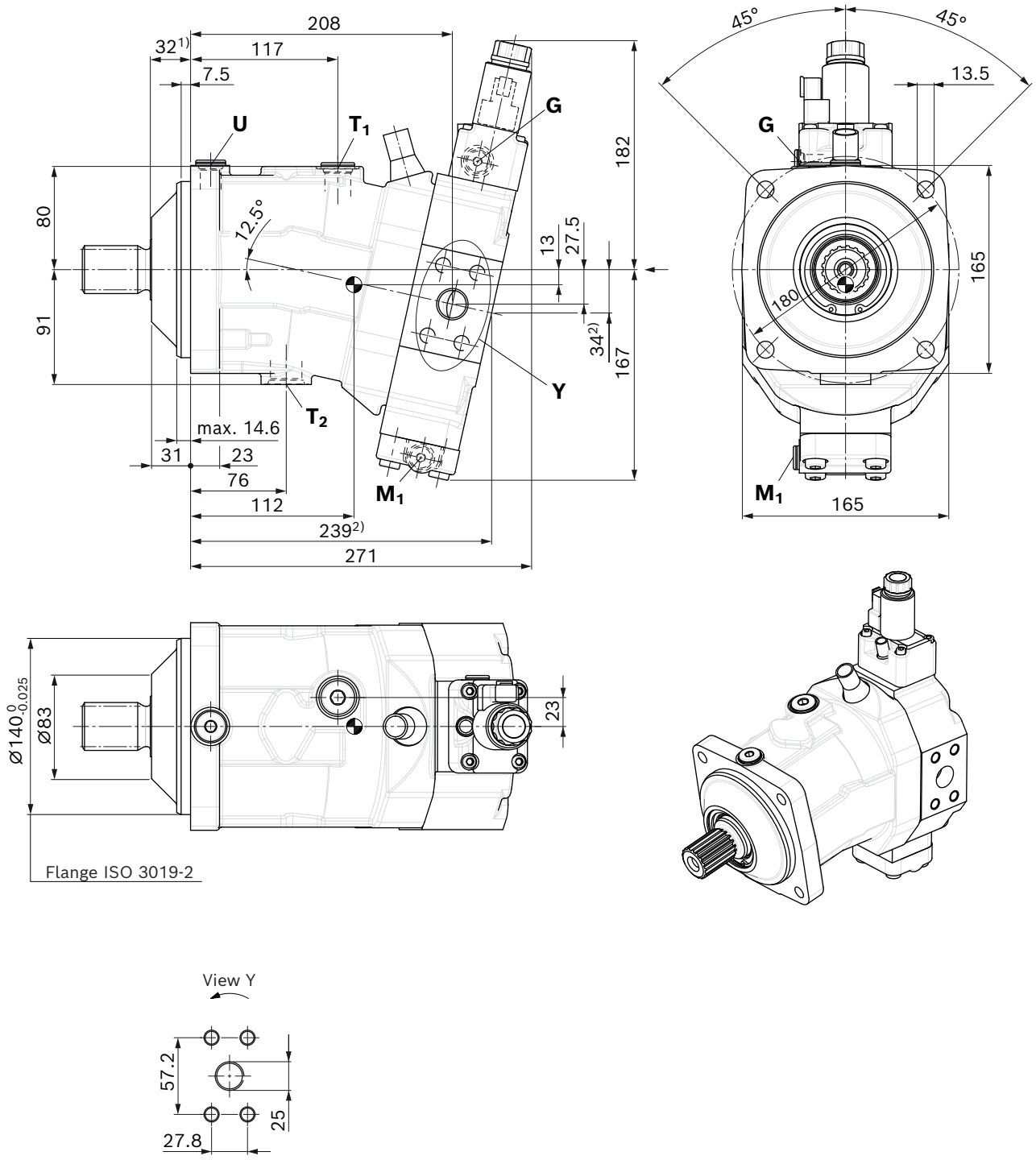
▼ **DA1, DA2** – Automatic speed related control, negative control, with electric travel direction valve and electric $V_{g\,max}$ override



Dimensions, size 80

EP5, EP6 – Proportional electric control, negative control

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

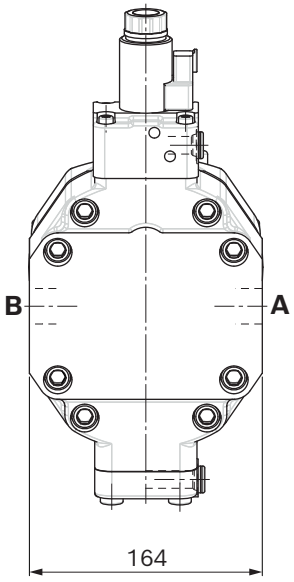


Center of gravity

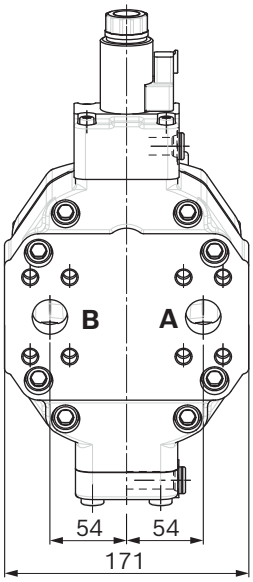
1) To shaft collar
2) Port plate 1 — SAE working ports **A** and **B** at rear

▼ **Location of working ports on the port plates** (View **Z**)

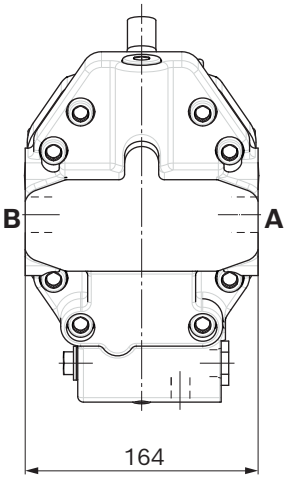
2 SAE working ports **A** and **B** at side, opposite



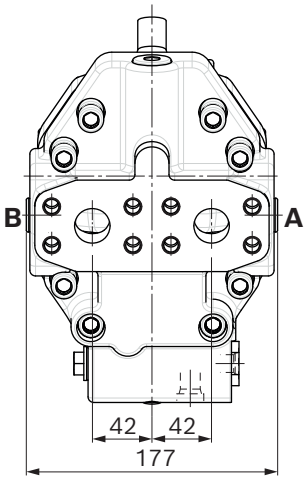
1 SAE working ports **A** and **B** at rear



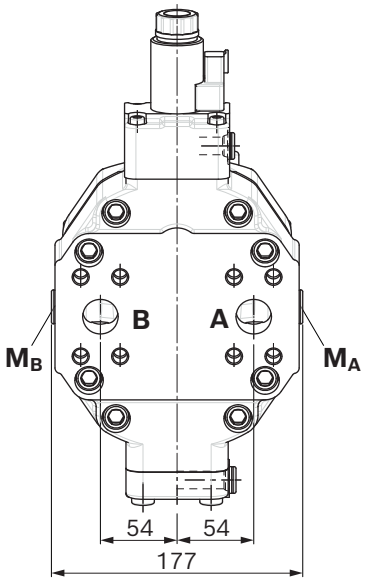
2 SAE working ports **A** and **B** at side, opposite, only HZ7, EZ7/8



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

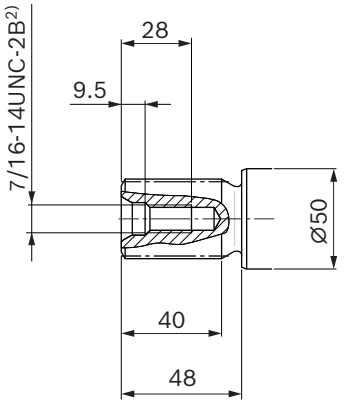


4 SAE working ports **A** and **B** at rear, with lateral measuring ports



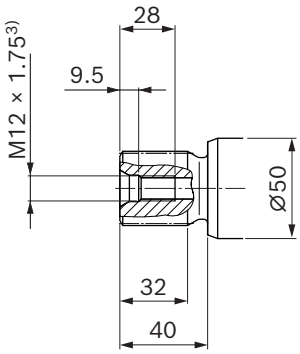
▼ **Splined shaft SAE J744**

S7 – 1 1/4 in 14T 12/24DP[1)]



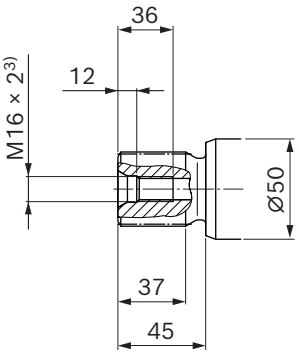
▼ **Splined shaft DIN 5480**

Z8 – W35×2×16×9g



▼ **Splined shaft DIN 5480**

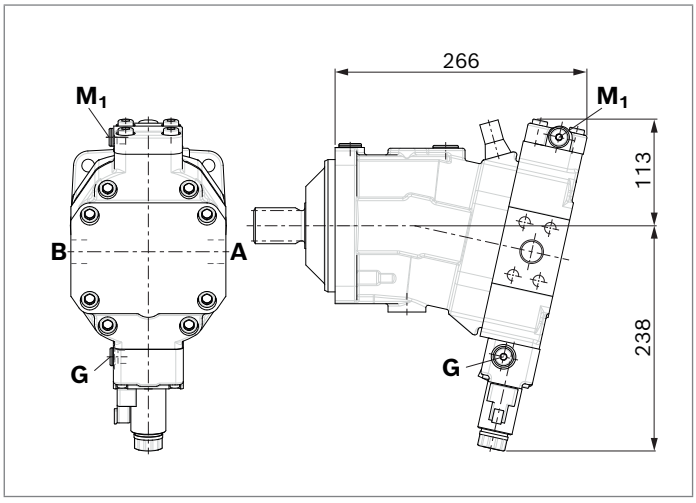
Z9 – W40×2×18×9g



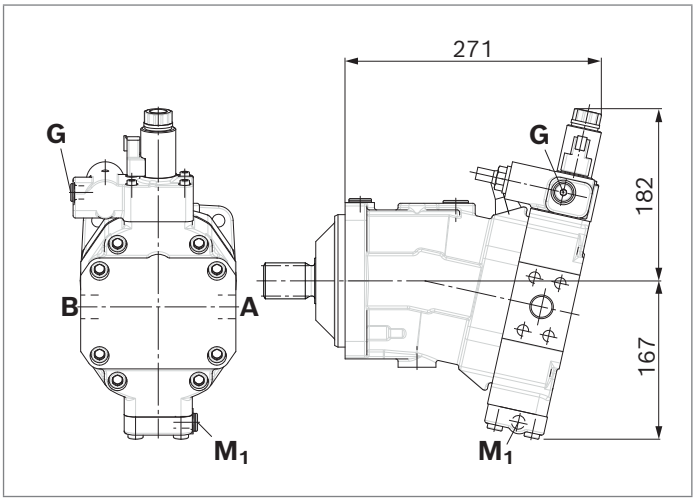
Ports		Standard	Size	p_{max} [bar][4)]	State[8)]
A, B	Working port Fastening thread A/B	SAE J518[5)] DIN 13	1 in M12 × 1.75; 17 deep	530	O
T_1	Drain port	ISO 6149[7)]	M22 × 1.5; 15.5 deep	3	X[6)]
T_2	Drain port	ISO 6149[7)]	M27 × 2; 19 deep	3	O[6)]
G	Synchronous control	ISO 6149[7)]	M14 × 1.5; 11.5 deep	530	X
U	Bearing flushing port	ISO 6149[7)]	M18 × 1.5; 14.5 deep	3	X
X	Pilot pressure port (HP, HZ, HA1T/HA2T)	ISO 6149[7)]	M14 × 1.5; 11.5 deep	530	O
X	Pilot pressure port (HA1, HA2)	ISO 6149[7)]	M14 × 1.5; 11.5 deep	3	X
X_1, X_2	Pilot pressure port (DA0)	ISO 8434-1	SDSC-L8×M12-F	40	O
X_1	Pilot pressure port (DA1, DA2)	ISO 6149[7)]	M14 × 1.5; 11.5 deep	40	O
X_3	Pilot pressure port (DA1, DA2)	ISO 6149[7)]	M14 × 1.5; 11.5 deep	40	X
M_1	Measuring port, control pressure	ISO 6149[7)]	M14 × 1.5; 11.5 deep	530	X
M_A, M_B	Measuring port, pressure A, B	ISO 6149[7)]	M18 × 1.5; 14.5 deep	530	X

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Center bore according to DIN 332 (thread according to DIN 13)
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) Only dimensions according to SAE J518, metric fastening thread is a deviation from the standard.
6) Depending on installation position, **T_1** or **T_2** must be connected (see also installation instructions on page 83).
7) The countersink may be deeper than specified in the standard.
8) O = Must be connected (plugged on delivery) X = Plugged (in normal operation)

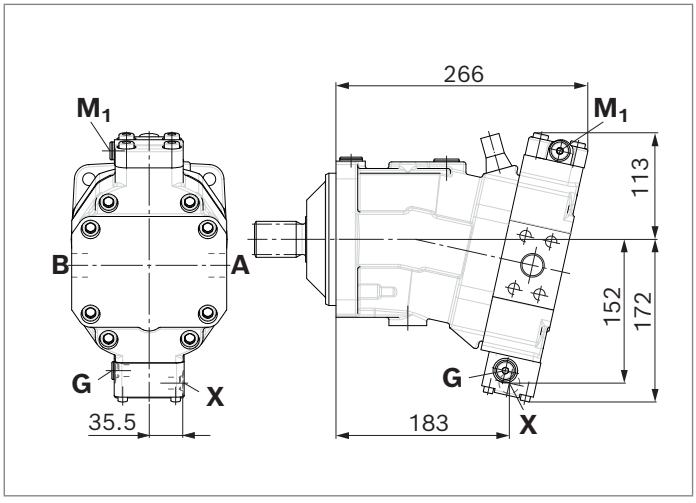
▼ **EP1, EP2** – Proportional electric control, positive control



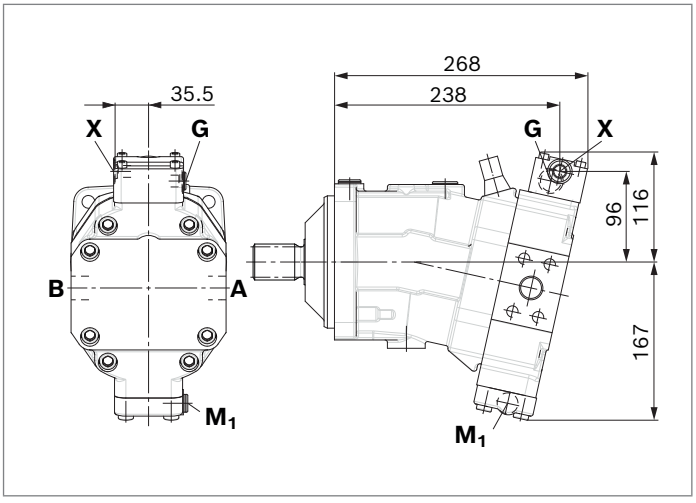
▼ **EP5D1, EP6D1** – Proportional electric control, negative control, with pressure control fixed setting



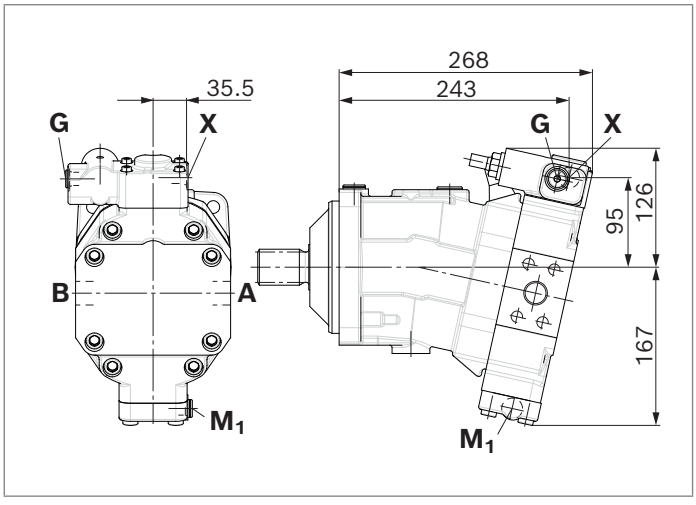
▼ **HP1, HP2** – Proportional hydraulic control, positive control



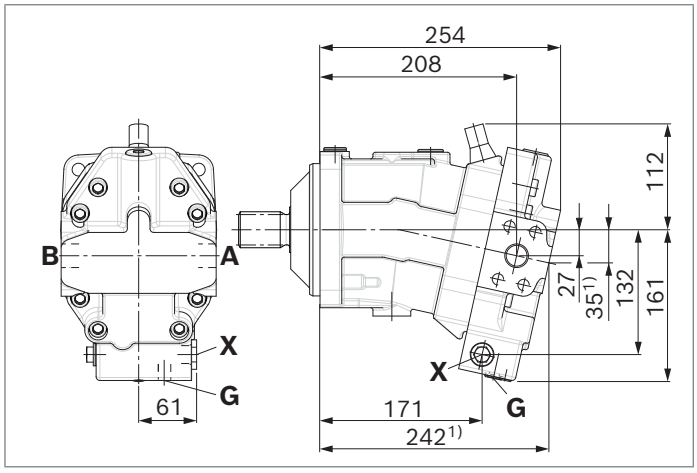
▼ **HP5, HP6** – Proportional hydraulic control, negative control



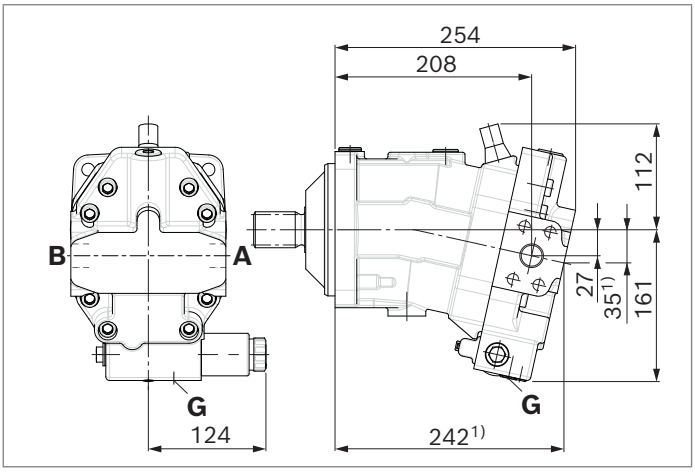
▼ **HP5D1, HP6D1** – Proportional hydraulic control, negative control, with pressure control fixed setting



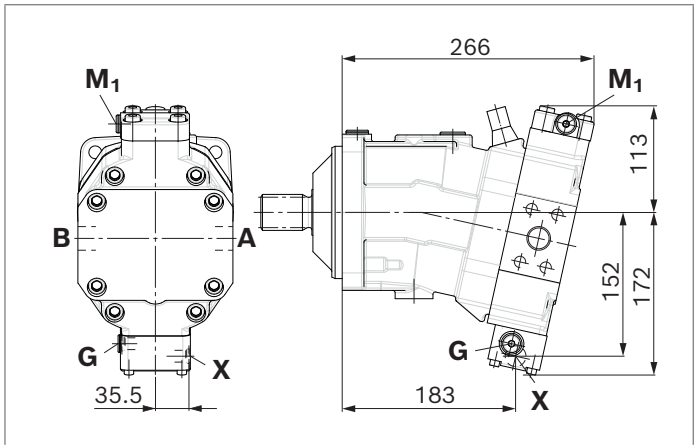
▼ **HZ7** – Two-point control, hydraulic, negative control



▼ **EZ7, EZ8** – Two-point control, electric, negative control

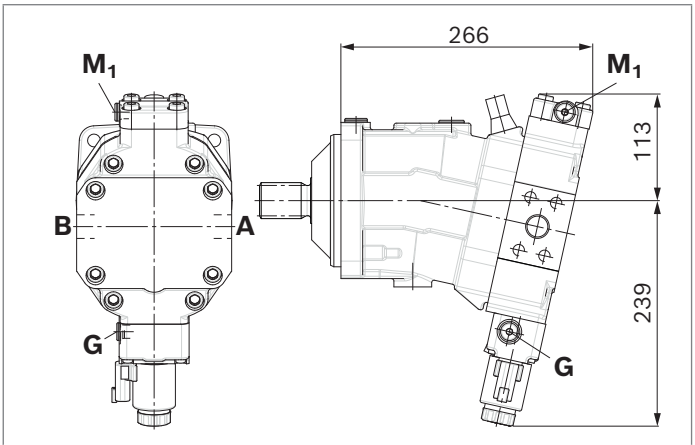


▼ **HA1, HA2 / HA1T3, HA2T3** – Automatic high-pressure related control, positive control, with hydraulic override, remote controlled, proportional

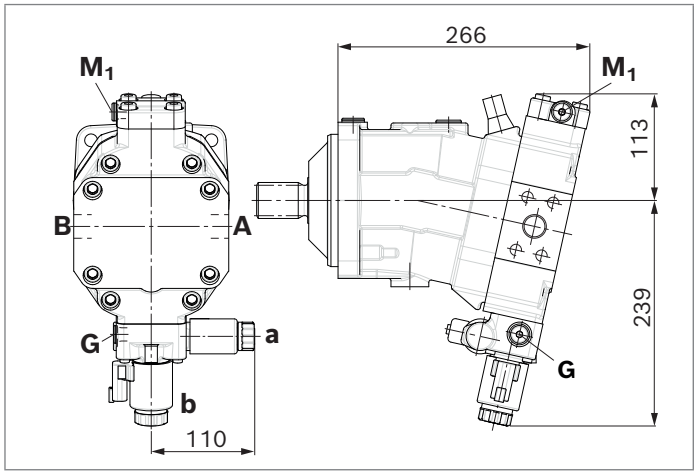


HA1 and HA2, **X** plugged
HA1T and HA2T, **X** open

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

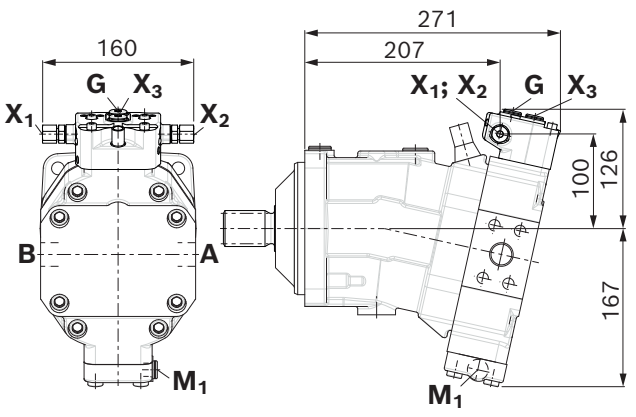


▼ **HA1R1, HA2R2** – Automatic high-pressure related control, positive control, with electric override and electric travel direction valve



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

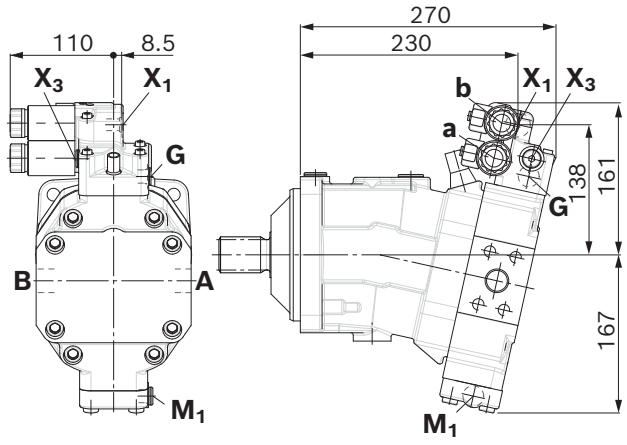
▼ **DA0** – Automatic speed related control, negative control, with hydraulic travel direction valve



X$_1$, **X**$_2$ Pipe fitting SDSC – L8×M12 – F acc. to ISO 8434-1

Use assembled fitting!

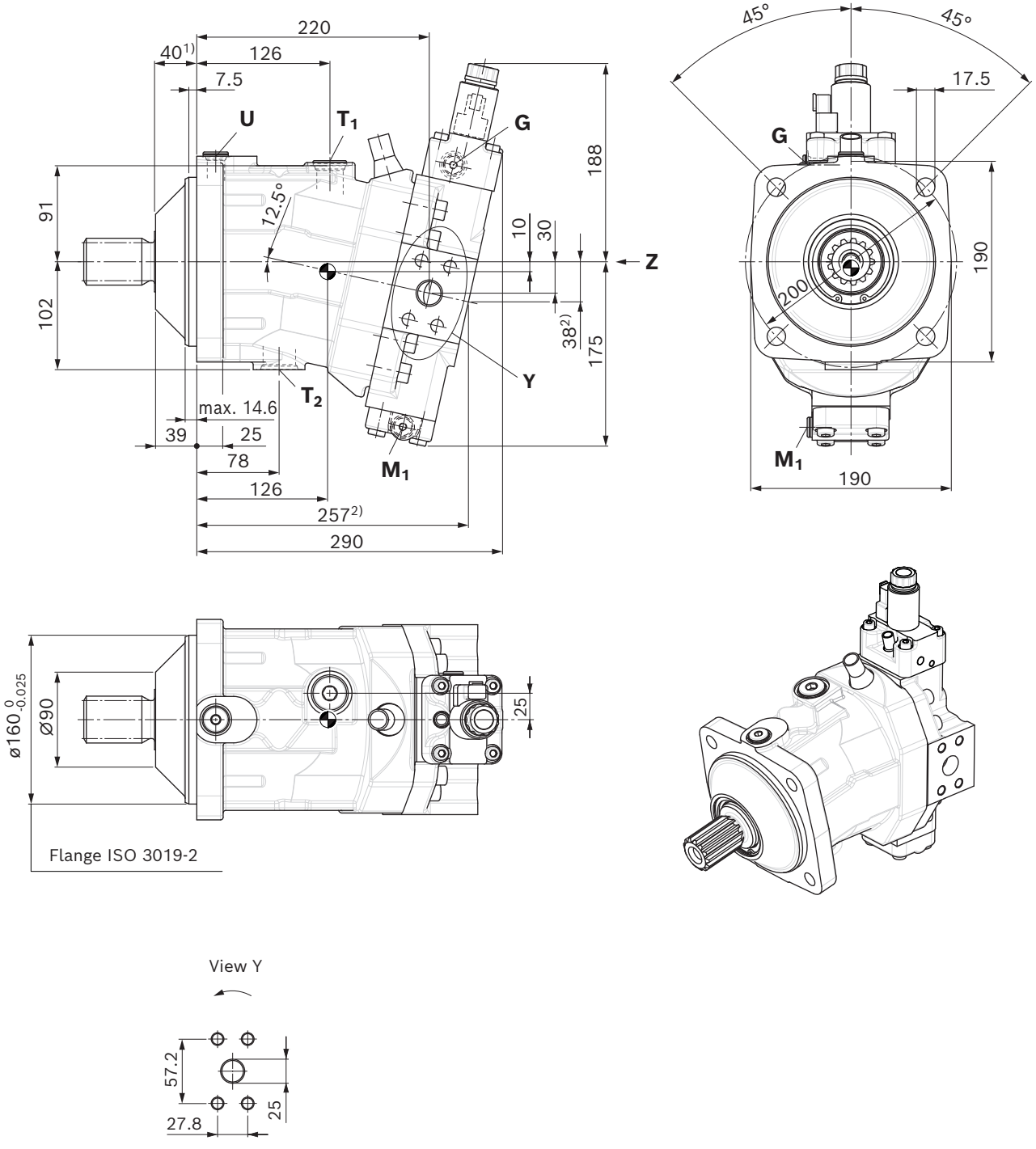
▼ **DA1, DA2** – Automatic speed related control, negative control, with electric travel direction valve and electric $V_{g\,max}$ override



Dimensions, size 107

EP5, EP6 – Proportional electric control, negative control

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



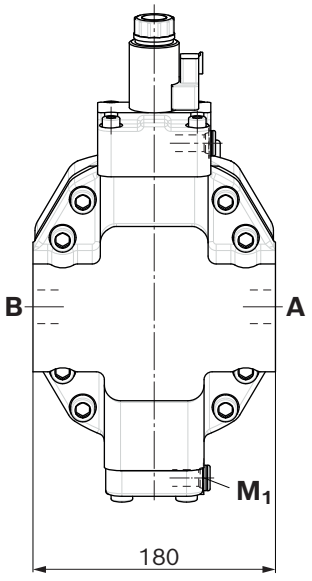
Center of gravity

1) To shaft collar

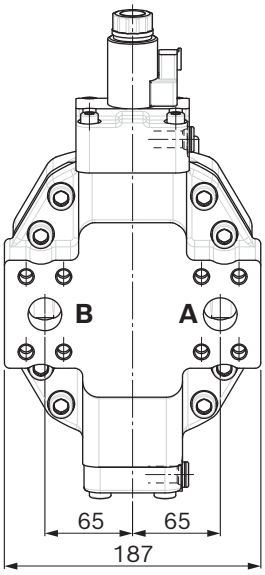
2) Port plate 1 — SAE working ports **A** and **B** at rear

▼ **Location of working ports on the port plates** (View **Z**)

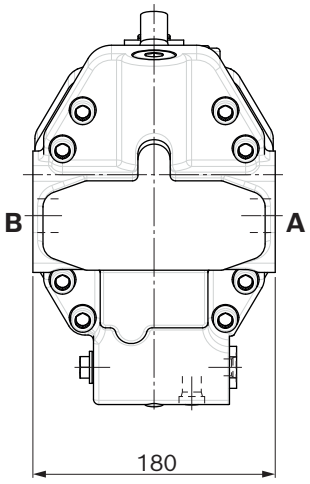
2 SAE working ports **A** and **B** at side, opposite



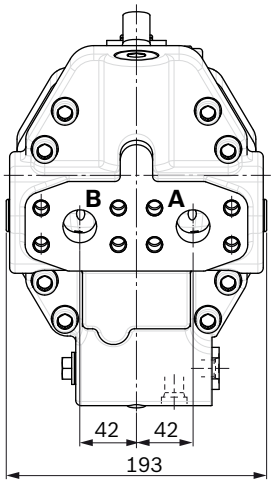
1 SAE working ports **A** and **B** at rear



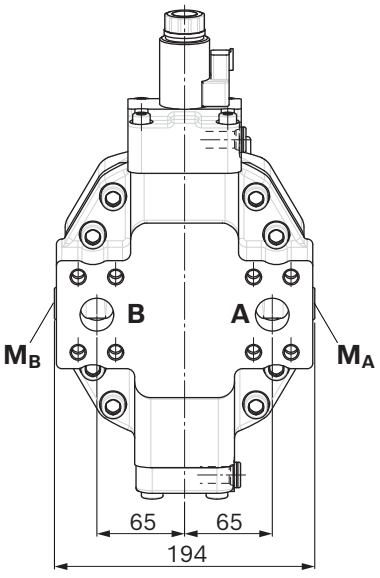
2 SAE working ports **A** and **B** at side, opposite, only HZ7, EZ7/8



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

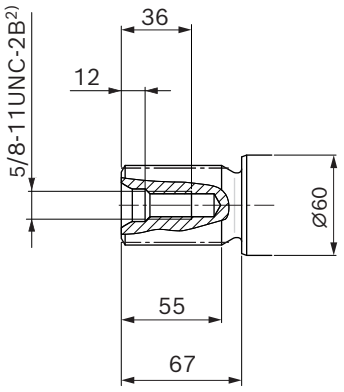


4 SAE working ports **A** and **B** at rear, with lateral measuring ports



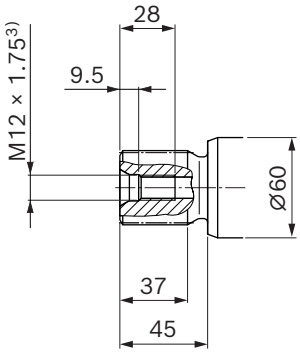
▼ **Splined shaft SAE J744**

T1 – 1 3/4 in 13T 8/16DP[1)]



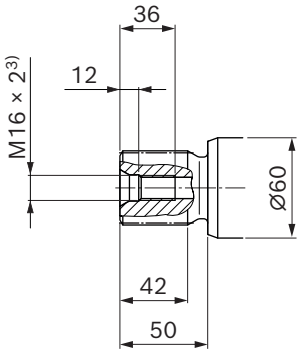
▼ **Splined shaft DIN 5480**

Z9 – W40×2×18×9g



▼ **Splined shaft DIN 5480**

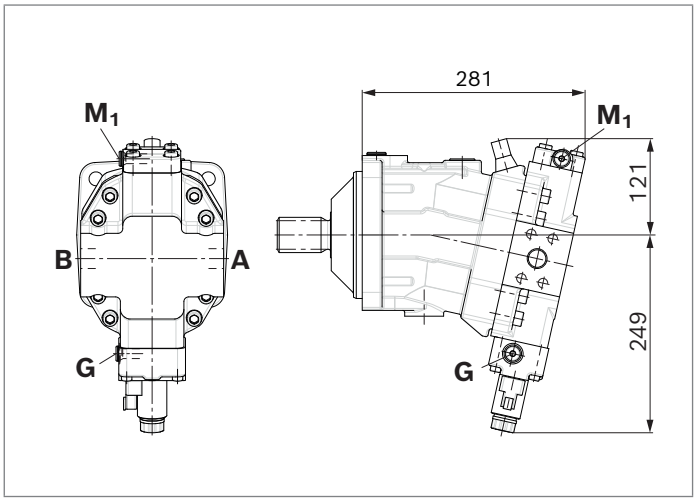
A1 – W45×2×21×9g



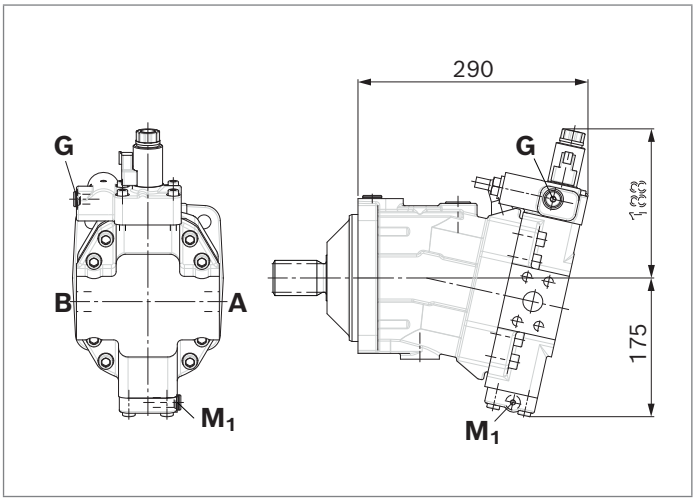
Ports		Standard	Size	p_{max} [bar][4)]	State[8)]
A, B	Working port Fastening thread A/B	SAE J518[5)] DIN 13	1 in M12 × 1.75; 17 deep	530	O
T_1	Drain port	ISO 6149[7)]	M27 × 2; 19 deep	3	X[6)]
T_2	Drain port	ISO 6149[7)]	M33 × 2; 19 deep	3	O[6)]
G	Synchronous control	ISO 6149[7)]	M14 × 1.5; 11.5 deep	530	X
U	Bearing flushing port	ISO 6149[7)]	M18 × 1.5; 14.5 deep	3	X
X	Pilot pressure port (HP, HZ, HA1T/HA2T)	ISO 6149[7)]	M14 × 1.5; 11.5 deep	530	O
X	Pilot pressure port (HA1, HA2)	ISO 6149[7)]	M14 × 1.5; 11.5 deep	3	X
X_1, X_2	Pilot pressure port (DA0)	ISO 8434-1	SDSC-L8×M12-F	40	O
X_1	Pilot pressure port (DA1, DA2)	ISO 6149[7)]	M14 × 1.5; 11.5 deep	40	O
X_3	Pilot pressure port (DA1, DA2)	ISO 6149[7)]	M14 × 1.5; 11.5 deep	40	X
M_1	Measuring port, control pressure	ISO 6149[7)]	M14 × 1.5; 11.5 deep	530	X
M_A, M_B	Measuring port, pressure A, B	ISO 6149[7)]	M18 × 1.5; 14.5 deep	530	X

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Center bore according to DIN 332 (thread according to DIN 13)
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) Only dimensions according to SAE J518, metric fastening thread is a deviation from the standard.
6) Depending on installation position, **T_1** or **T_2** must be connected (see also installation instructions on page 83).
7) The countersink may be deeper than specified in the standard.
8) O = Must be connected (plugged on delivery) X = Plugged (in normal operation)

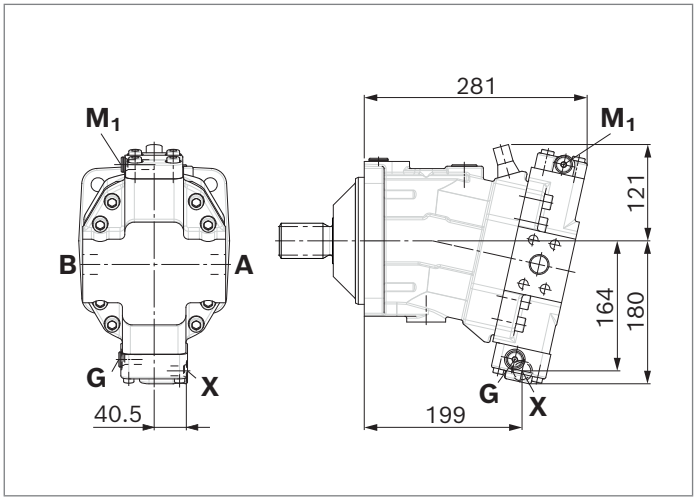
▼ **EP1, EP2** – Proportional electric control, positive control



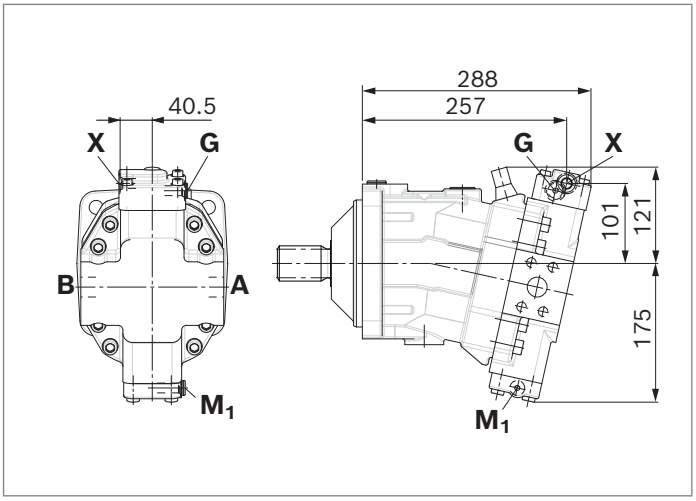
▼ **EP5D1, EP6D1** – Proportional electric control, negative control, with pressure control fixed setting



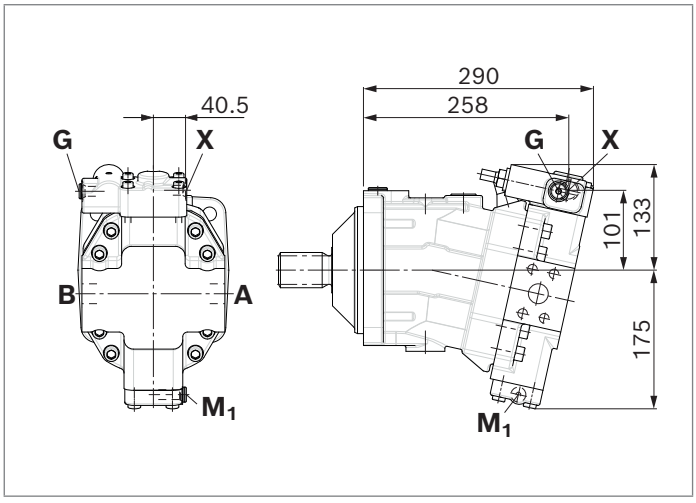
▼ **HP1, HP2** – Proportional hydraulic control, positive control



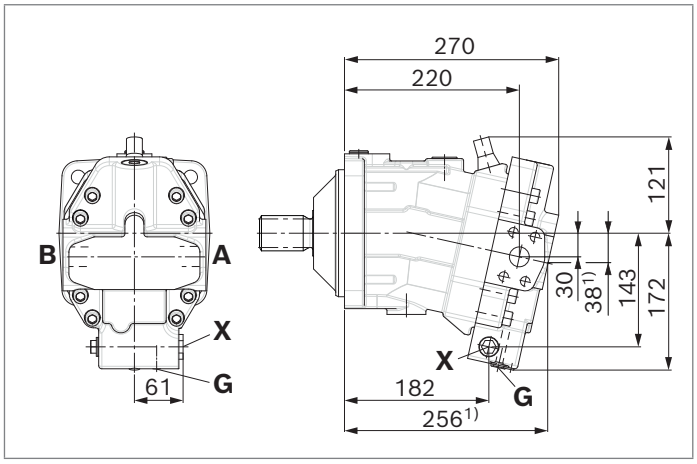
▼ **HP5, HP6** – Proportional hydraulic control, negative control



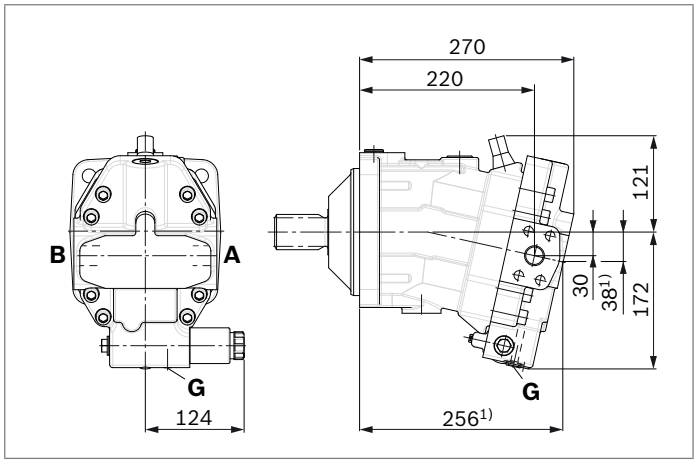
▼ **HP5D1, HP6D1** – Proportional hydraulic control, negative control, with pressure control fixed setting



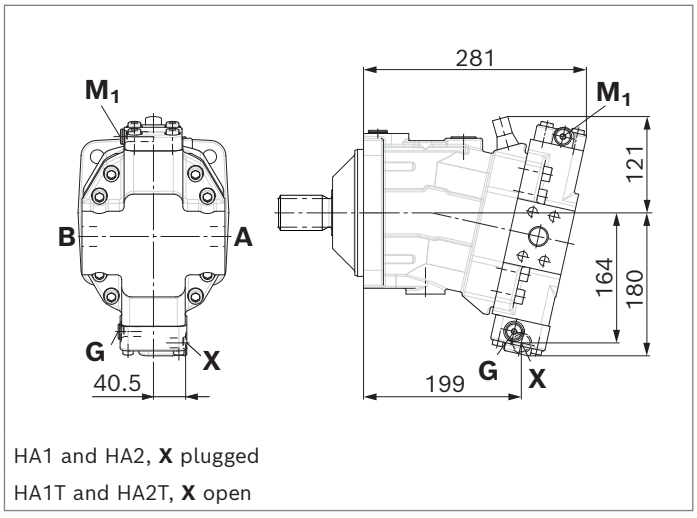
▼ **HZ7** – Two-point control, hydraulic, negative control



▼ **EZ7, EZ8** – Two-point control, electric, negative control



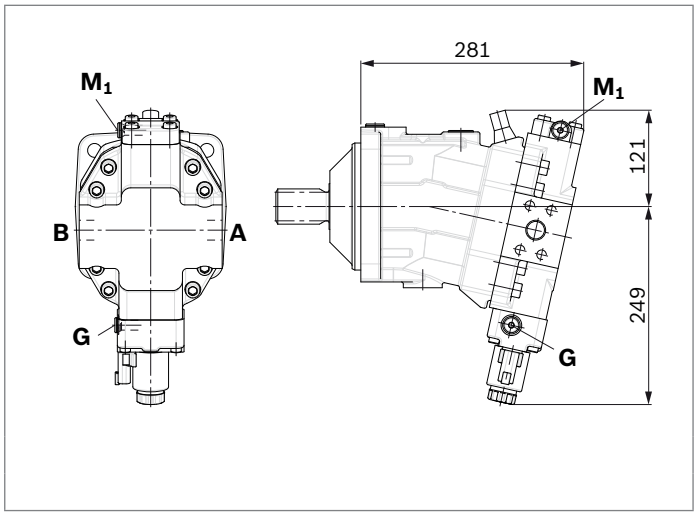
▼ **HA1, HA2 / HA1T3, HA2T3** – Automatic high-pressure related control, positive control, with hydraulic override, remote controlled, proportional



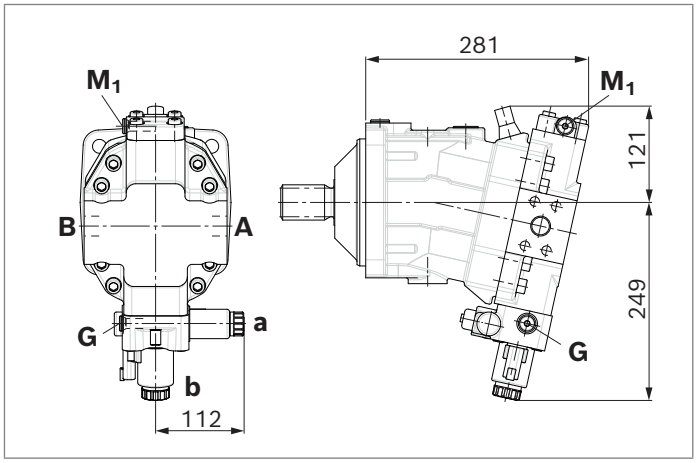
HA1 and HA2, **X** plugged

HA1T and HA2T, **X** open

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

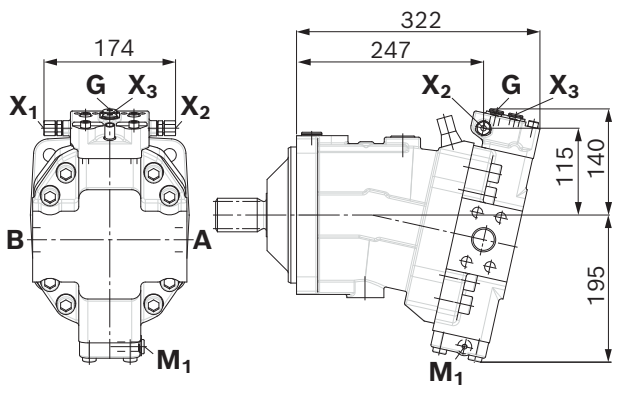


▼ **HA1R1, HA2R2** – Automatic high-pressure related control, positive control, with electric override and electric travel direction valve



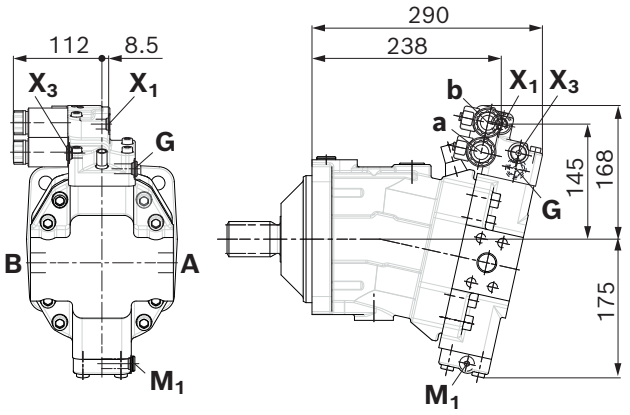
1) Port plate 1 — SAE working ports **A** and **B** at rear

▼ **DA0** – Automatic speed related control, negative control, with hydraulic travel direction valve



X$_1$, **X**$_2$ Pipe fitting SDSC – L8×M12 – F acc. to ISO 8434-1
Use assembled fitting!

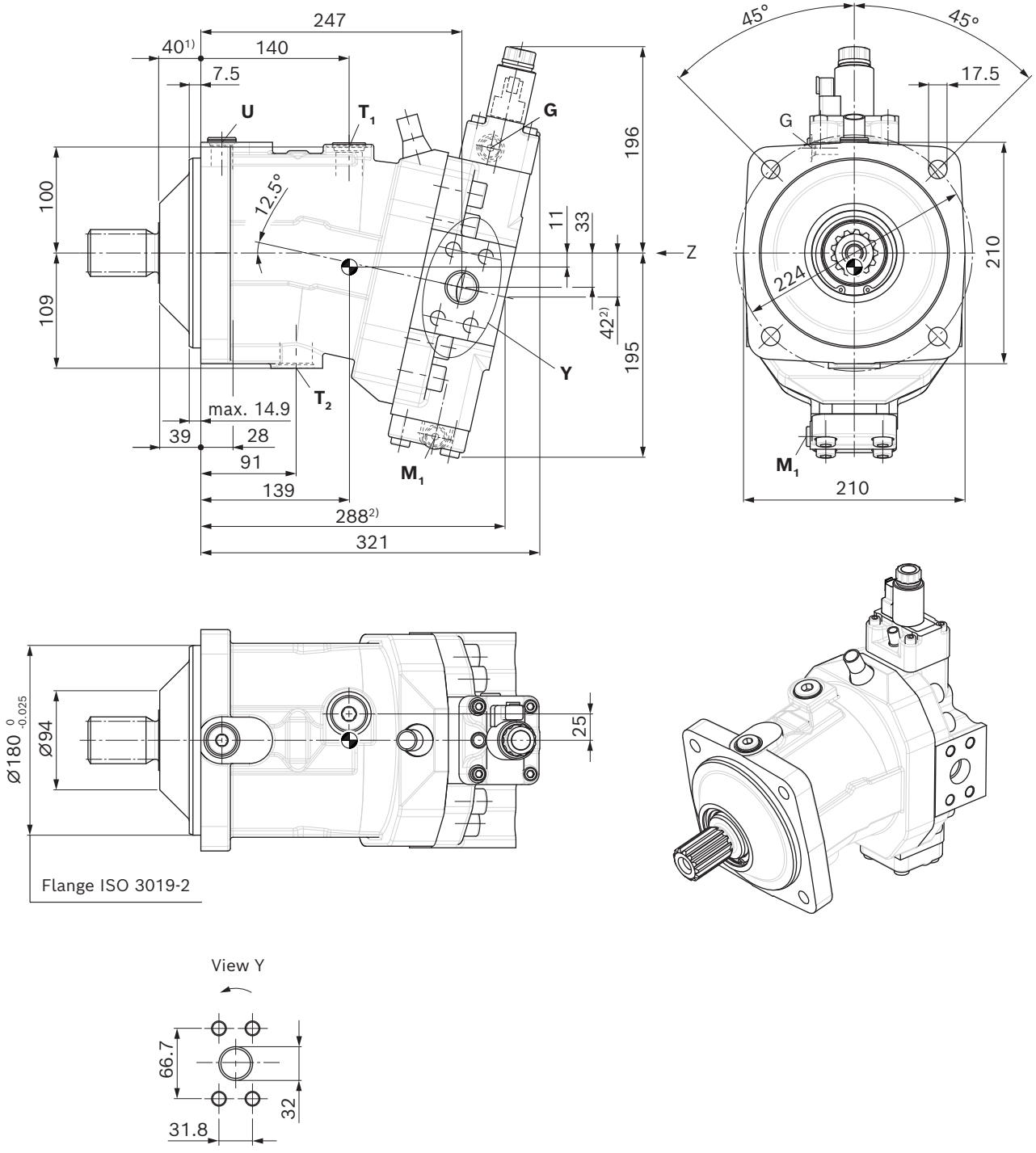
▼ **DA1, DA2** – Automatic speed related control, negative control, with electric travel direction valve and electric $V_{g\,max}$ override



Dimensions, size 140

EP5, EP6 – Proportional electric control, negative control

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



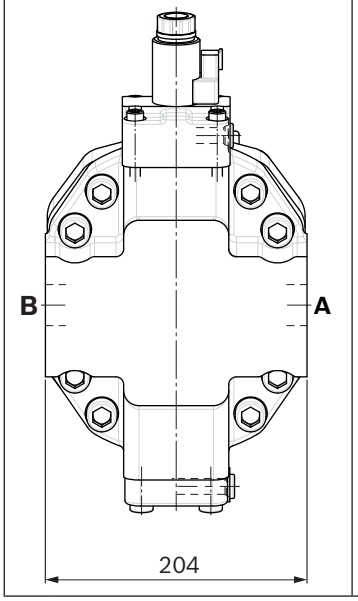
Center of gravity

1) To shaft collar

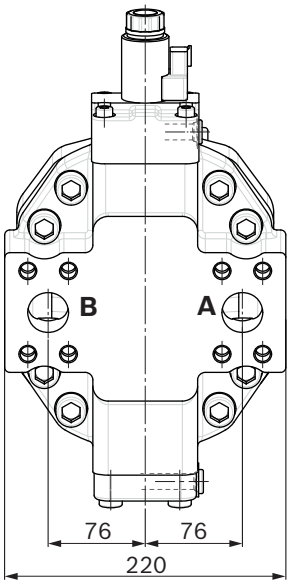
2) Port plate 1 — SAE working ports **A** and **B** at rear

▼ **Location of working ports on the port plates** (View **Z**)

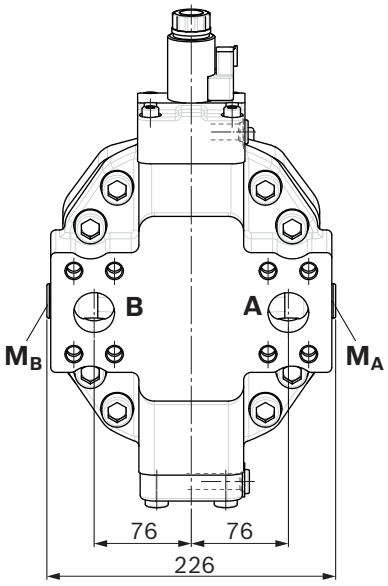
2 SAE working ports **A** and **B** at side, opposite



1 SAE working ports **A** and **B** at rear

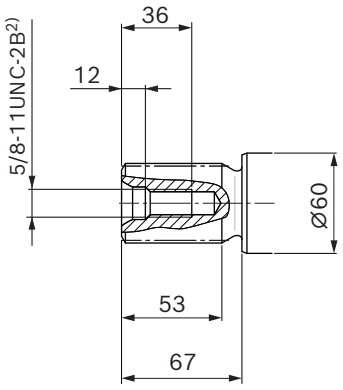


4 SAE working ports **A** and **B** at rear, with lateral measuring ports



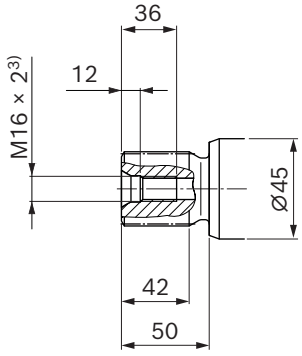
▼ **Splined shaft SAE J744**

T1 – 1 3/4 in 13T 8/16DP[1)]



▼ **Splined shaft DIN 5480**

A1 – W45×2×21×9g

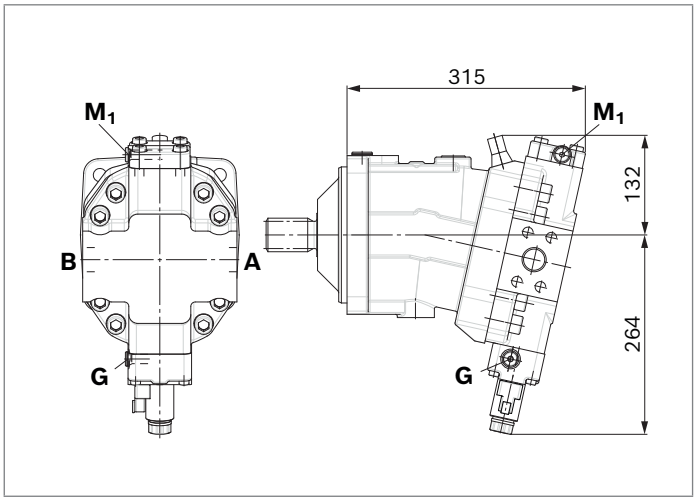


1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Center bore according to DIN 332 (thread according to DIN 13)

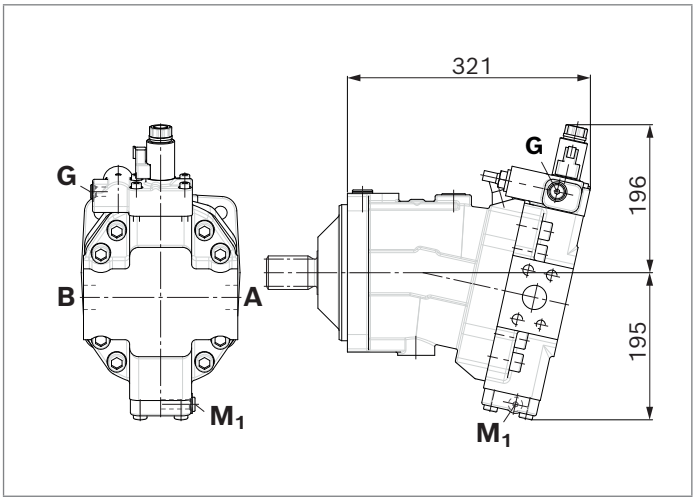
Ports		Standard	Size	p_{max} [bar][1]	State[5]
A, B	Working port Fastening thread A/B	SAE J518[2] DIN 13	1 1/4 in M14 × 2; 19 deep	530	O
T_1	Drain port	ISO 6149[4]	M27 × 2; 19 deep	3	X[3]
T_2	Drain port	ISO 6149[4]	M33 × 2; 19 deep	3	O[3]
G	Synchronous control	ISO 6149[4]	M14 × 1.5; 11.5 deep	530	X
U	Bearing flushing port	ISO 6149[4]	M22 × 1.5; 15.5 deep	3	X
X	Pilot pressure port (HP, HZ, HA1T/HA2T)	ISO 6149[4]	M14 × 1.5; 11.5 deep	530	O
X	Pilot pressure port (HA1, HA2)	ISO 6149[4]	M14 × 1.5; 11.5 deep	3	X
X_1, X_2	Pilot pressure port (DA0)	ISO 8434-1	SDSC-L8×M12-F	40	O
X_1	Pilot pressure port (DA1, DA2)	ISO 6149[4]	M14 × 1.5; 11.5 deep	40	O
X_3	Pilot pressure port (DA1, DA2)	ISO 6149[4]	M14 × 1.5; 11.5 deep	40	X
M_1	Measuring port, control pressure	ISO 6149[4]	M14 × 1.5; 11.5 deep	530	X
M_A, $M_{A;}$	Measuring port, pressure A, B	ISO 6149[4]	M22 × 1.5; 15.5 deep	530	X

1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
2) Only dimensions according to SAE J518, metric fastening thread is a deviation from the standard.
3) Depending on installation position, **T_1** or **T_2** must be connected (see also installation instructions on page 83).
4) The countersink may be deeper than specified in the standard.
5) O = Must be connected (plugged on delivery) X = Plugged (in normal operation)

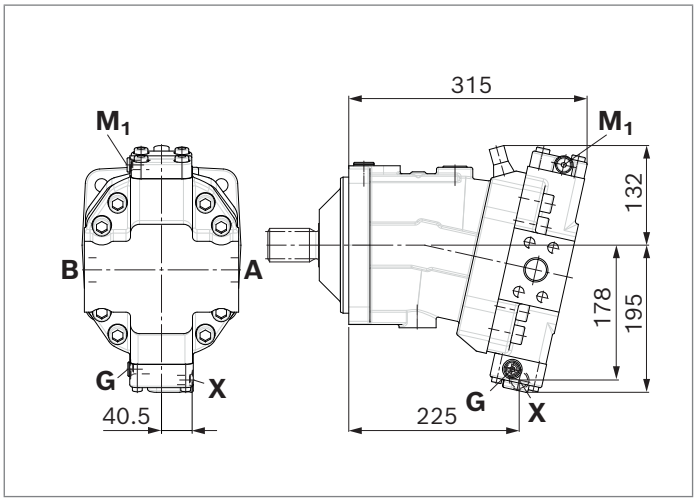
▼ **EP1, EP2** – Proportional electric control, positive control



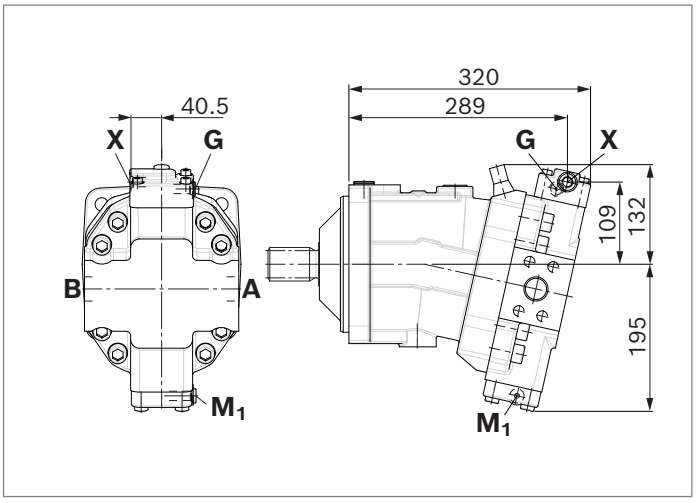
▼ **EP5D1, EP6D1** – Proportional electric control, negative control, with pressure control fixed setting



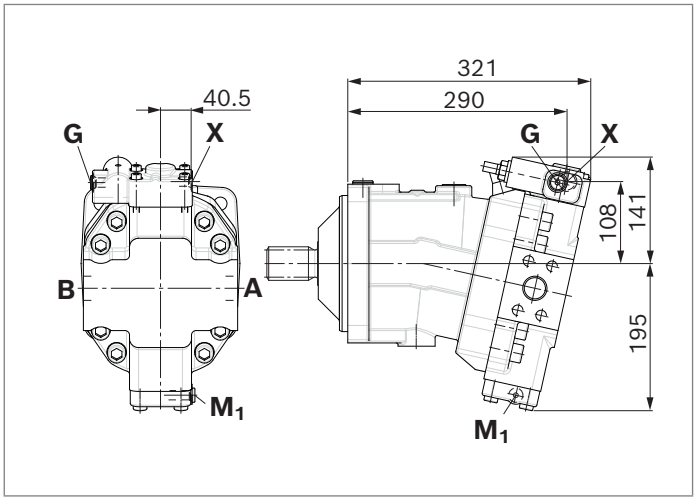
▼ **HP1, HP2** – Proportional hydraulic control, positive control



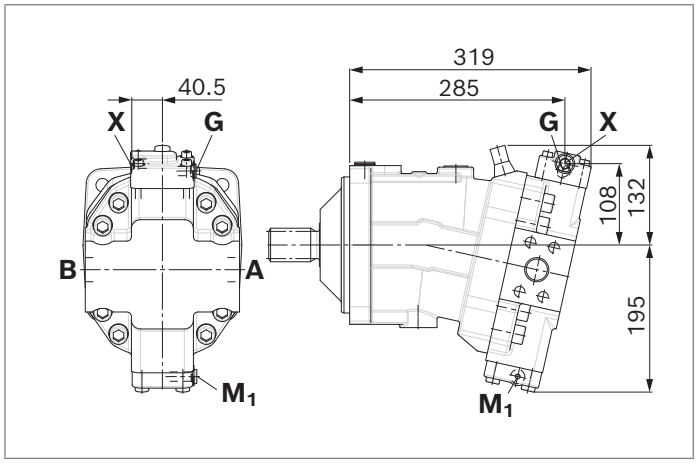
▼ **HP5, HP6** – Proportional hydraulic control, negative control



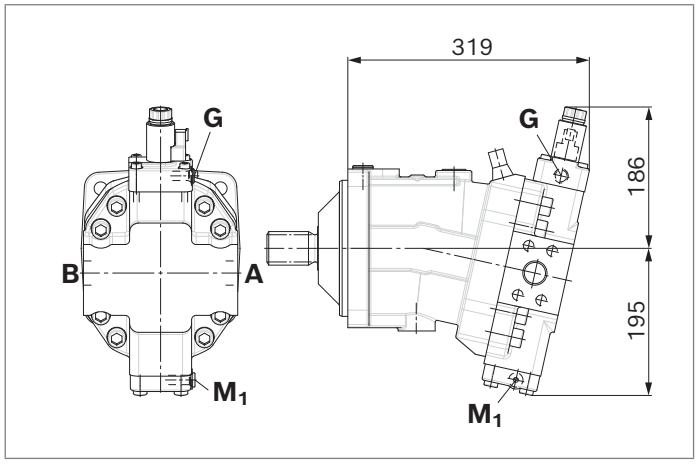
▼ **HP5D1, HP6D1** – Proportional hydraulic control, negative control, with pressure control fixed setting



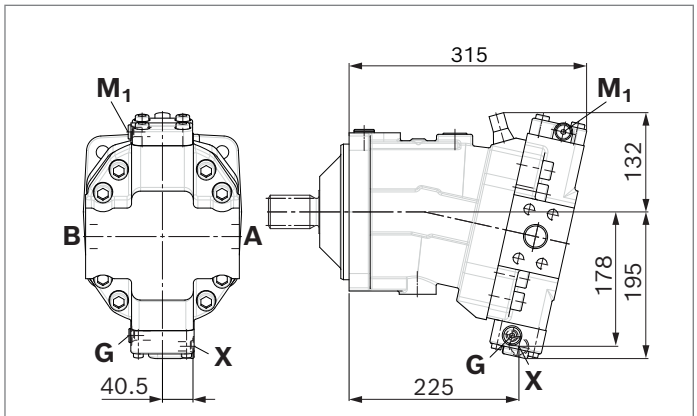
▼ **HZ5** – Two-point control, hydraulic, negative control



▼ **EZ5, EZ6** – Two-point control, electric, negative control



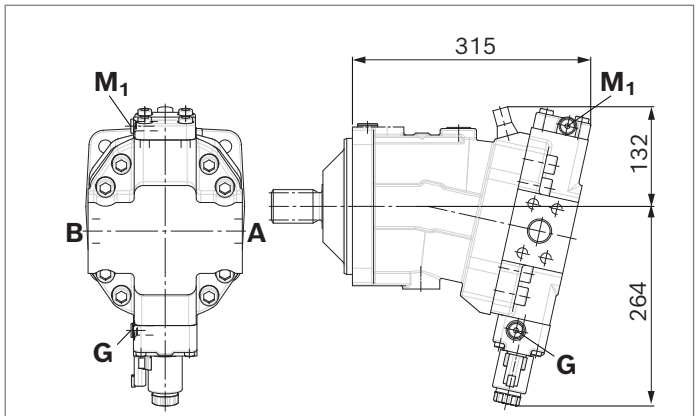
▼ **HA1, HA2 / HA1T3, HA2T3** – Automatic high-pressure related control, positive control, with hydraulic override, remote controlled, proportional



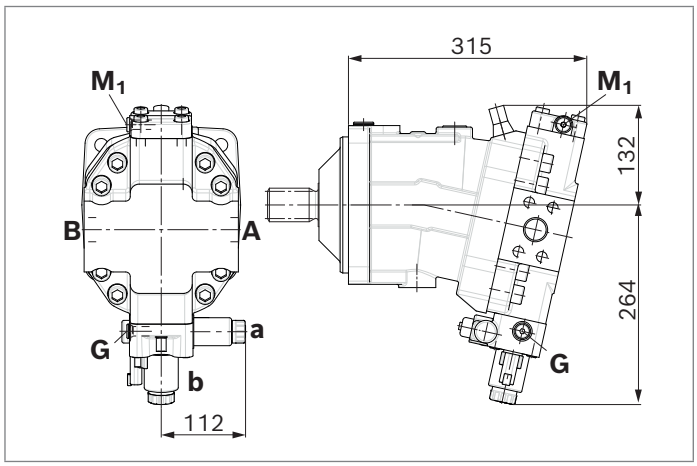
HA1 and HA2, **X** plugged

HA1T and HA2T, **X** open

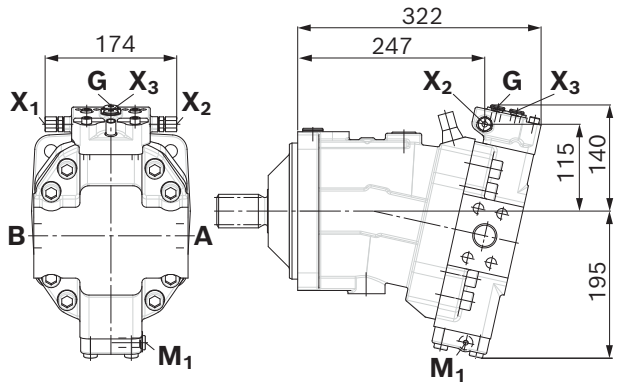
▼ **HA1U1, HA2U2** – Automatic high-pressure related control, positive control, with electric override, two-point



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



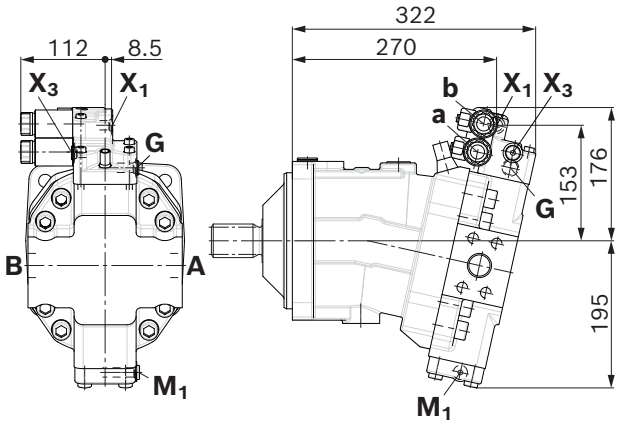
▼ **DA0** – Automatic speed related control, negative control, with hydraulic travel direction valve



X$_1$, **X**$_2$ Pipe fitting SDSC – L8×M12 – F acc. to ISO 8434-1

Use assembled fitting!

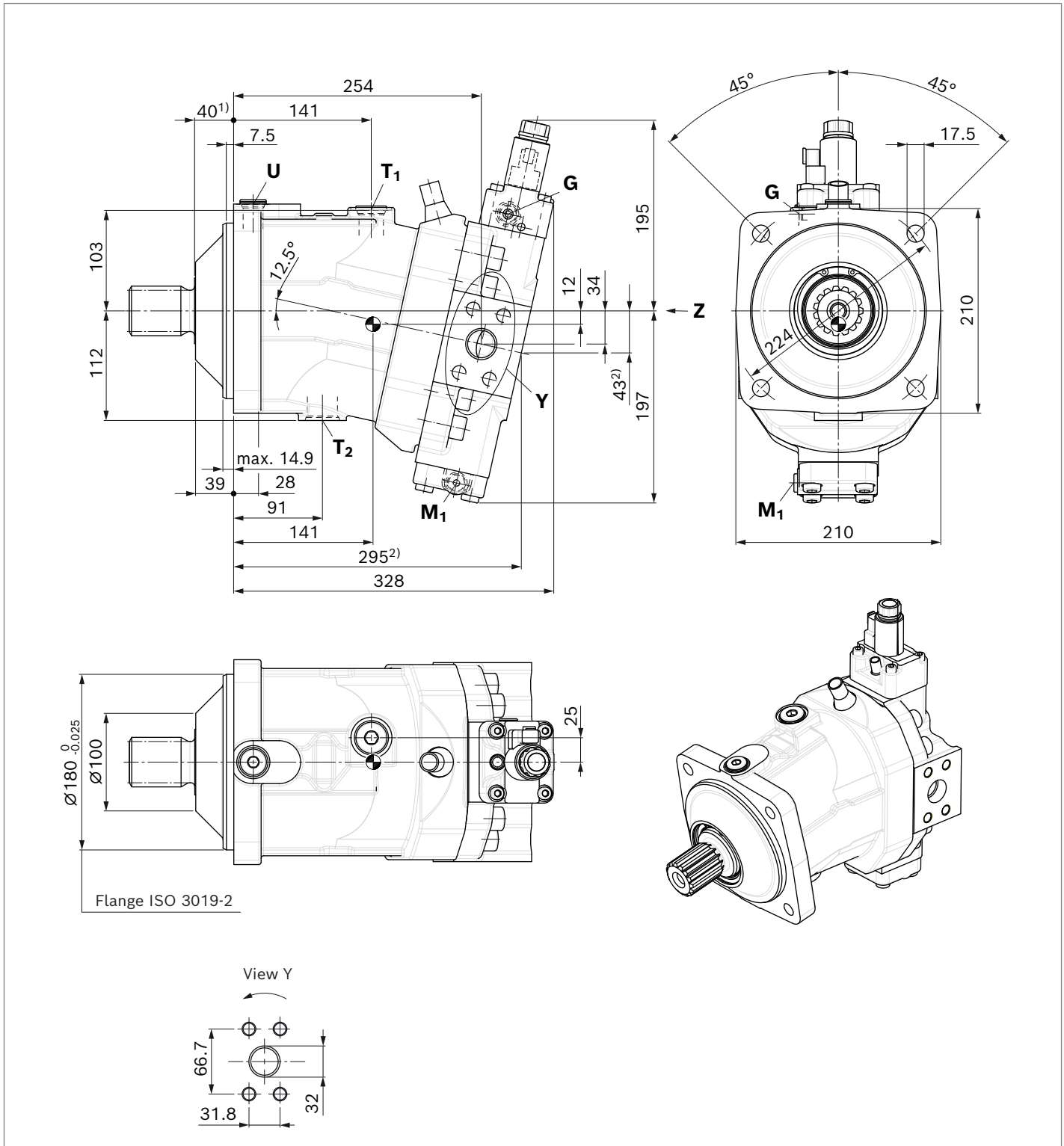
▼ **DA1, DA2** – Automatic speed related control, negative control, with electric travel direction valve and electric $V_{g\,max}$ override



Dimensions, size 160

EP5, EP6 – Proportional electric control, negative control

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

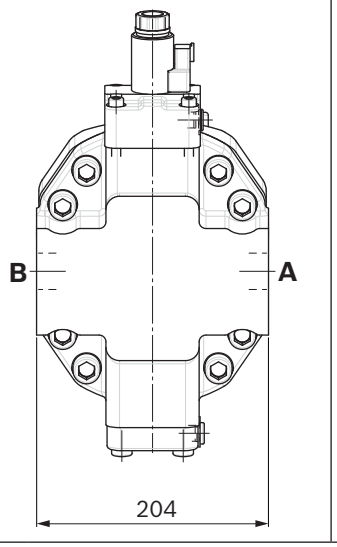


Center of gravity

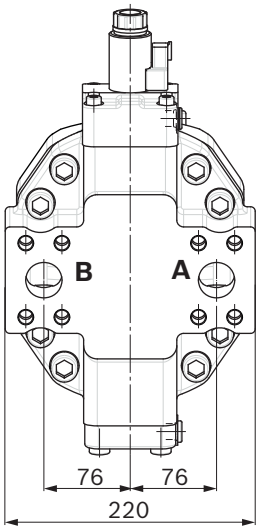
1) To shaft collar
2) Port plate 1 — SAE working ports **A** and **B** at rear

▼ **Location of working ports on the port plates** (View **Z**)

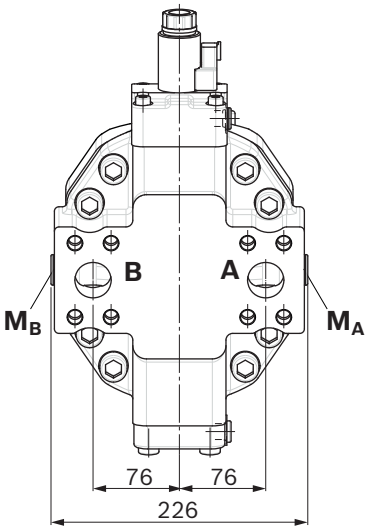
2 SAE working ports **A** and **B** at side, opposite



1 SAE working ports **A** and **B** at rear

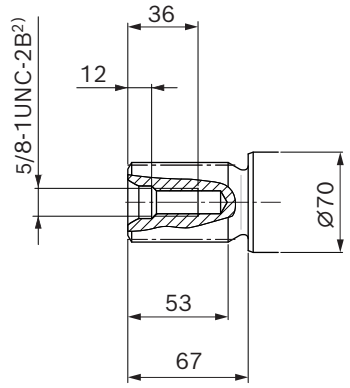


4 SAE working ports **A** and **B** at rear, with lateral measuring ports



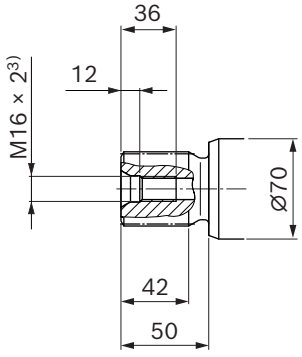
▼ **Splined shaft SAE J744**

T2 – 2 in 15T 8/16DP[1)]



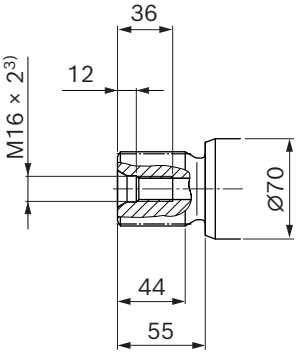
▼ **Splined shaft DIN 5480**

A1 – W45×2×21×9g



▼ **Splined shaft DIN 5480**

A2 – W50×2×24×9g

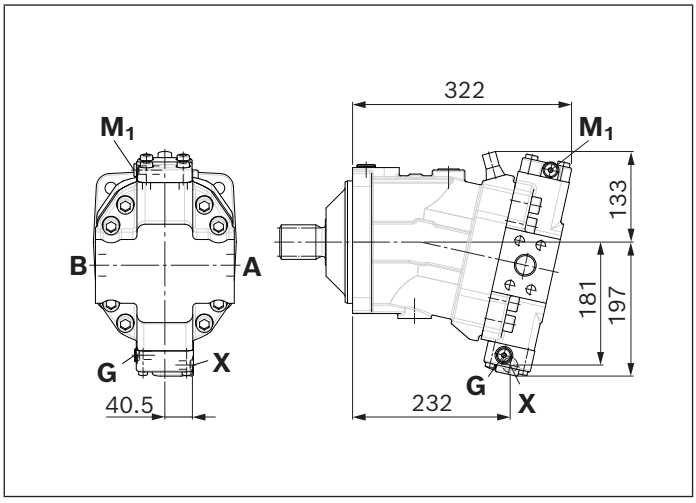


1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Center bore according to DIN 332 (thread according to DIN 13)

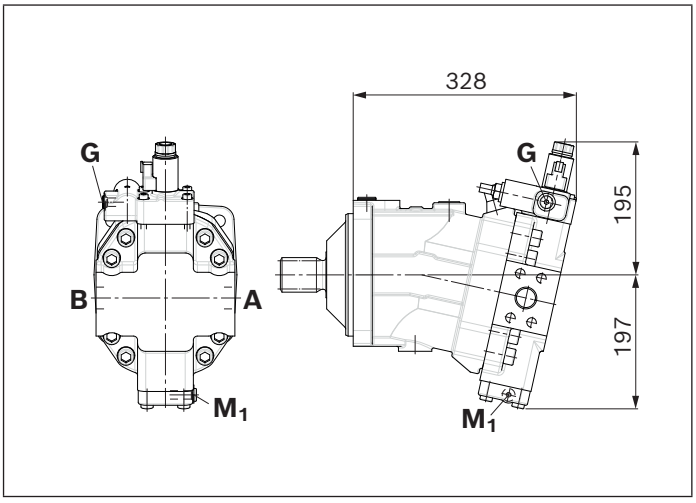
Ports		Standard	Size	p_{max} [bar][1]	State[5]
A, B	Working port Fastening thread A/B	SAE J518[2] DIN 13	1 1/4 in M14 × 2; 19 deep	530	O
T_1	Drain port	ISO 6149[4]	M27 × 2; 19 deep	3	X[3]
T_2	Drain port	ISO 6149[4]	M33 × 2; 19 deep	3	O[3]
G	Synchronous control	ISO 6149[4]	M14 × 1.5; 11.5 deep	530	X
U	Bearing flushing port	ISO 6149[4]	M22 × 1.5; 15.5 deep	3	X
X	Pilot pressure port (HP, HZ, HA1T/HA2T)	ISO 6149[4]	M14 × 1.5; 11.5 deep	530	O
X	Pilot pressure port (HA1, HA2)	ISO 6149[4]	M14 × 1.5; 11.5 deep	3	X
X_1, X_2	Pilot pressure port (DA0)	ISO 8434-1	SDSC-L8×M12-F	40	O
X_1	Pilot pressure port (DA1, DA2)	ISO 6149[4]	M14 × 1.5; 11.5 deep	40	O
X_3	Pilot pressure port (DA1, DA2)	ISO 6149[4]	M14 × 1.5; 11.5 deep	40	X
M_1	Measuring port, control pressure	ISO 6149[4]	M14 × 1.5; 11.5 deep	530	X
M_A, M_B	Measuring port, pressure A, B	ISO 6149[4]	M22 × 1.5; 15.5 deep	530	X

1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
2) Only dimensions according to SAE J518, metric fastening thread is a deviation from the standard.
3) Depending on installation position, **T_1** or **T_2** must be connected (see also installation instructions on page 83).
4) The countersink may be deeper than specified in the standard.
5) O = Must be connected (plugged on delivery) X = Plugged (in normal operation)

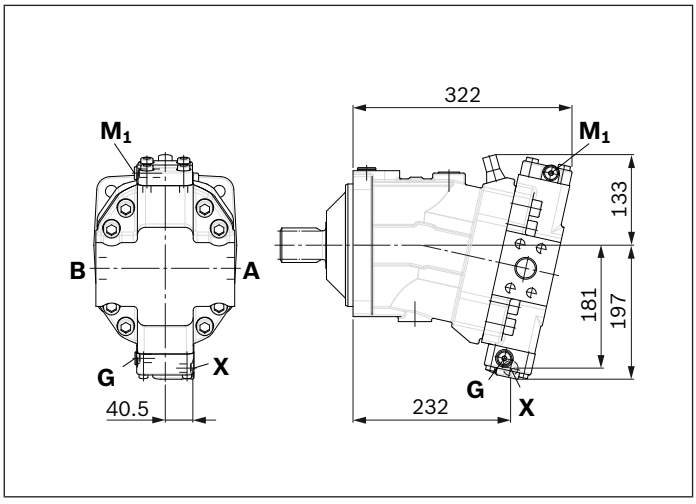
▼ **EP1, EP2** – Proportional electric control, positive control



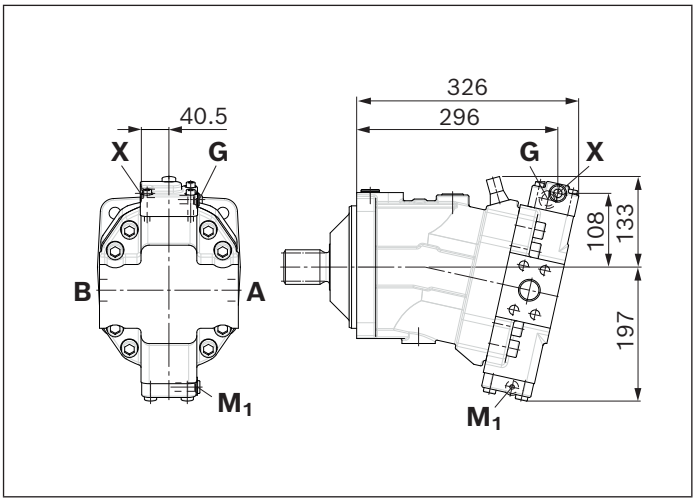
▼ **EP5D1, EP6D1** – Proportional electric control, negative control, with pressure control fixed setting



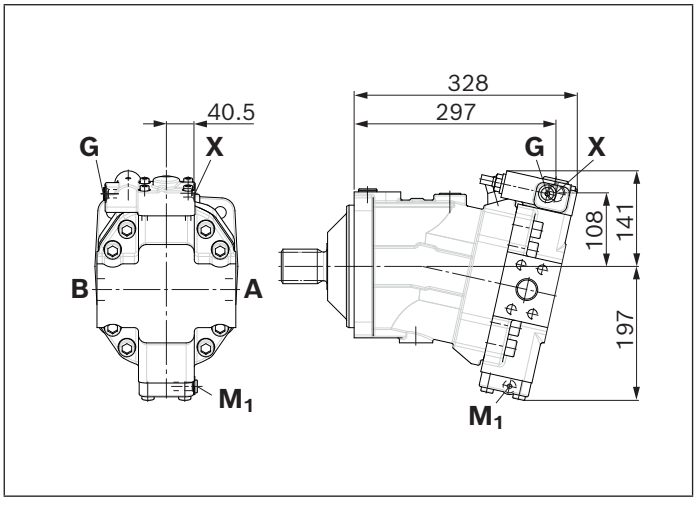
▼ **HP1, HP2** – Proportional hydraulic control, positive control



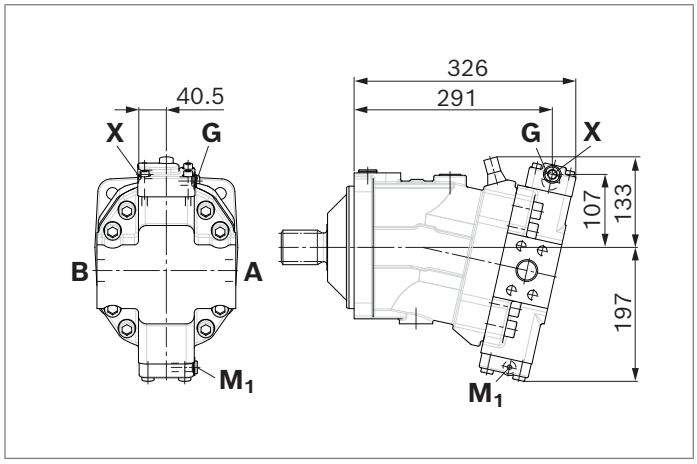
▼ **HP5, HP6** – Proportional hydraulic control, negative control



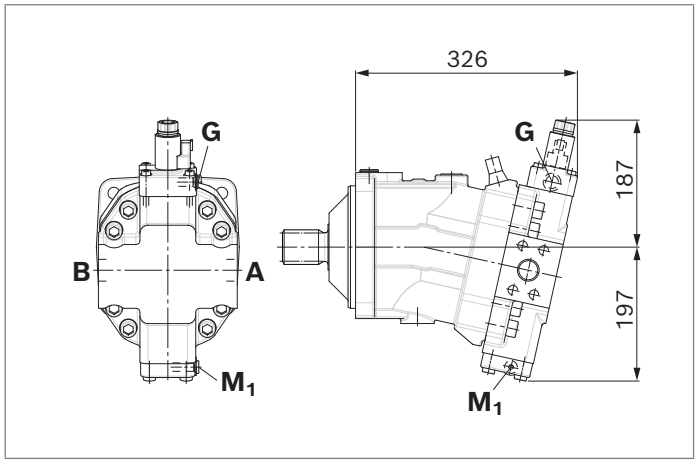
▼ **HP5D1, HP6D1** – Proportional hydraulic control, negative control, with pressure control fixed setting



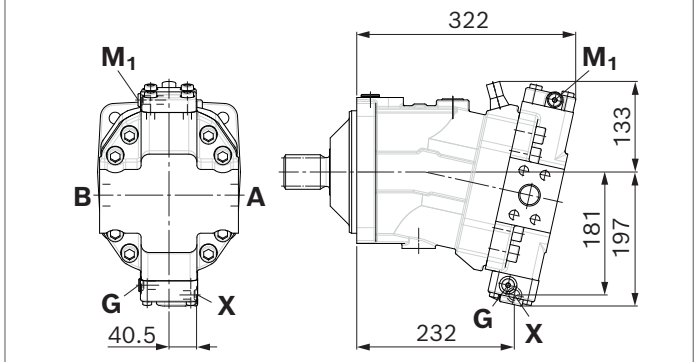
▼ **HZ5** – Two-point control, hydraulic, negative control



▼ **EZ5, EZ6** – Two-point control, electric, negative control



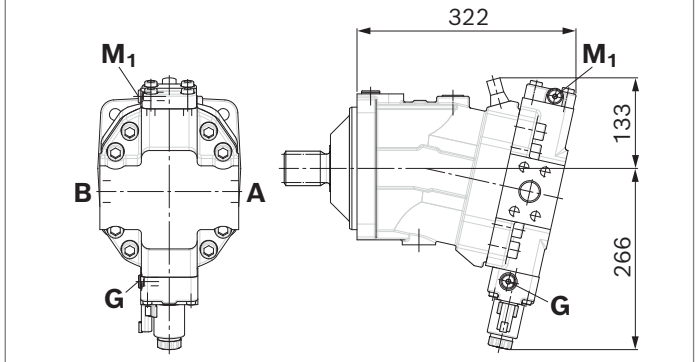
▼ **HA1, HA2 / HA1T3, HA2T3** – Automatic high-pressure related control, positive control, with hydraulic override, remote controlled, proportional



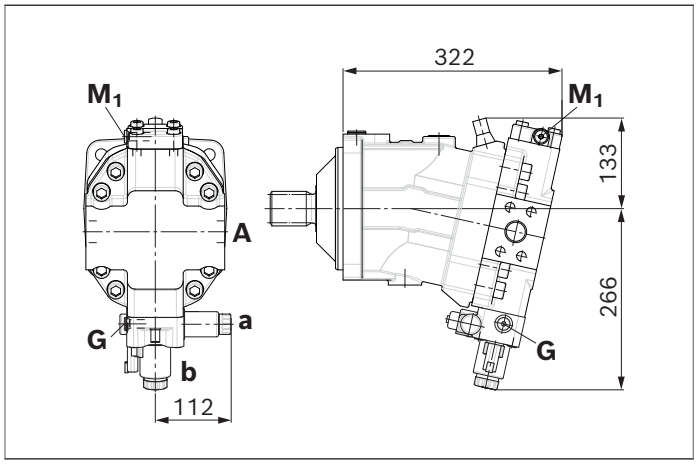
HA1 and HA2, **X** plugged

HA1T and HA2T, **X** open

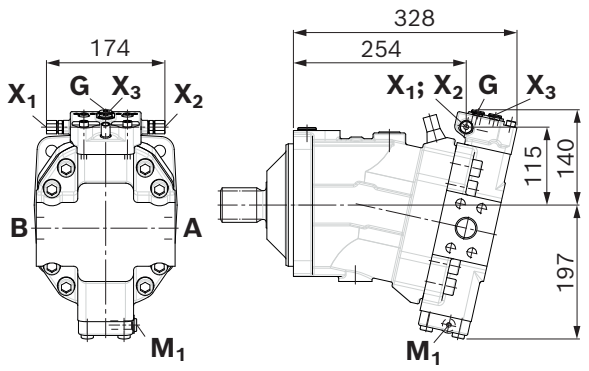
▼ **HA1U1, HA2U2** – Automatic high-pressure related control, positive control, with electric override, two-point



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



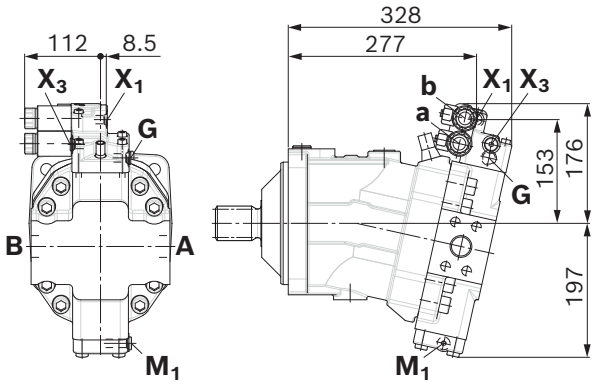
▼ **DA0** – Automatic speed related control, negative control, with hydraulic travel direction valve



X$_1$, **X**$_2$ Pipe fitting SDSC – L8×M12 – F acc. to ISO 8434-1

Use assembled fitting!

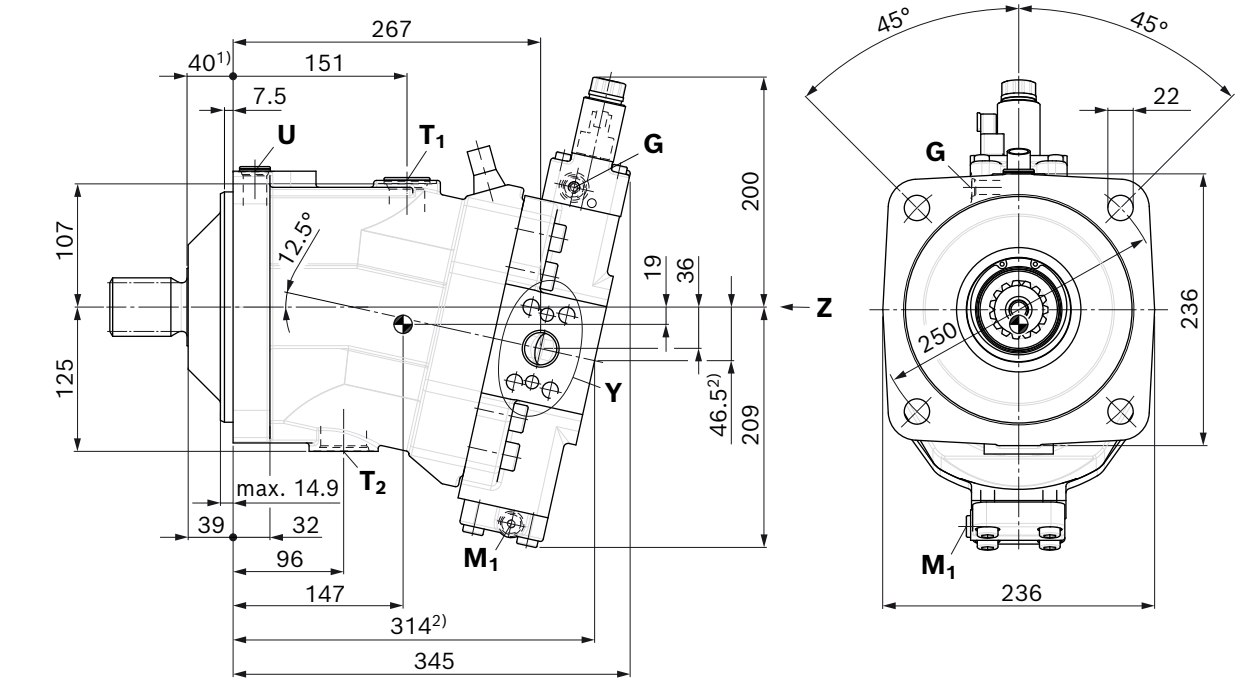
▼ **DA1, DA2** – Automatic speed related control, negative control, with electric travel direction valve and electric $V_{g\,max}$ override

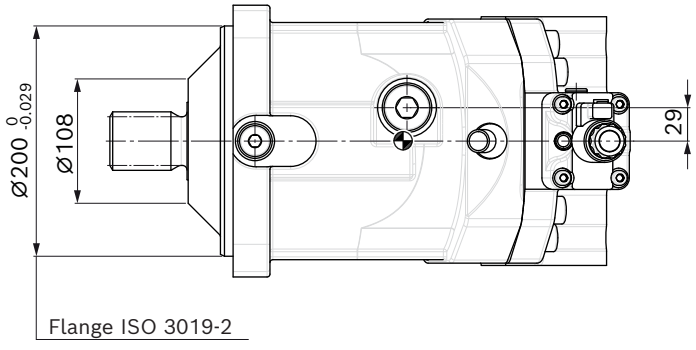


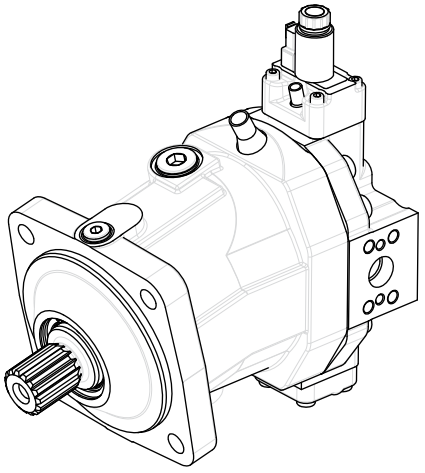
Dimensions, size 200

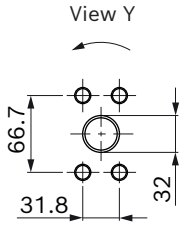
EP5, EP6 – Proportional electric control, negative control

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







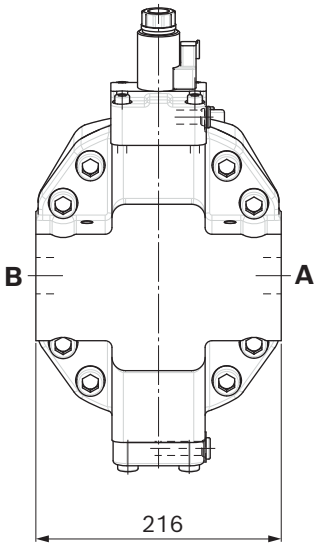


Center of gravity

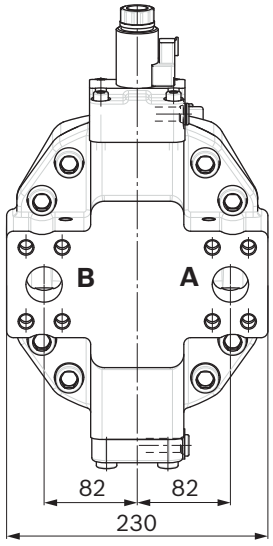
1) To shaft collar
2) Port plate 1 — SAE working ports **A** and **B** at rear

▼ **Location of working ports on the port plates** (View **Z**)

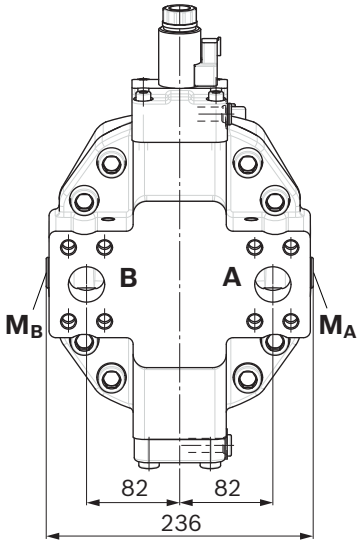
2 SAE working ports **A** and **B** at side, opposite



1 SAE working ports **A** and **B** at rear

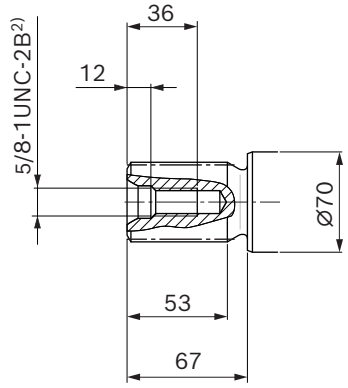


4 SAE working ports **A** and **B** at rear, with lateral measuring ports



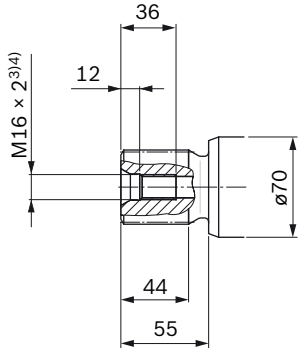
▼ **Splined shaft SAE J744**

T2 – 2 in 15T 8/16DP[1)]



▼ **Splined shaft DIN 5480**

A2 – W50×2×24×9g

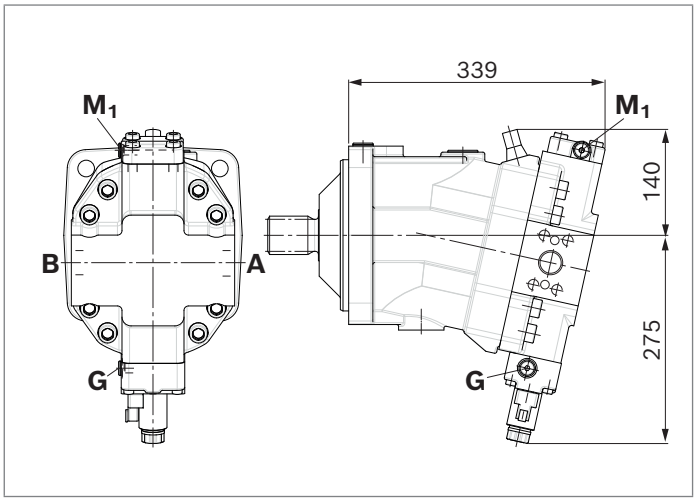


1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Thread according to ASME B1.1
3) Center bore according to DIN 332 (thread according to DIN 13)

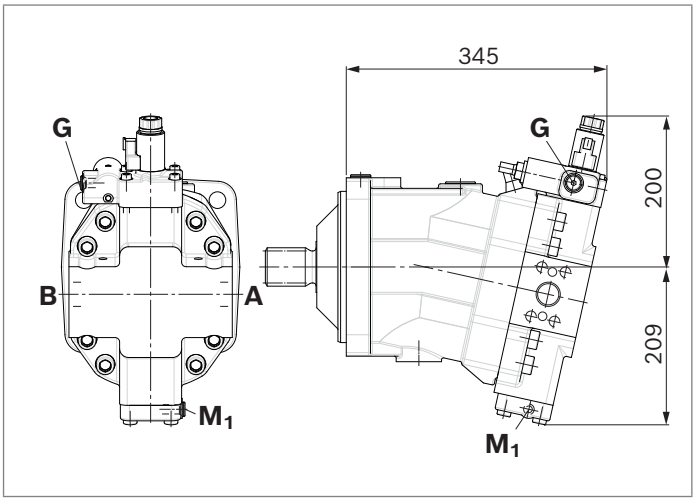
Ports		Standard	Size	p_{max} [bar][1]	State[5]
A, B	Working port Fastening thread A/B	SAE J518[2] DIN 13	1 1/4 in M14 × 2; 19 deep	530	O
$\mathbf{T}_1$	Drain port	ISO 6149[4]	M33 × 2; 19 deep	3	X[3]
$\mathbf{T}_2$	Drain port	ISO 6149[4]	M42 × 2; 19.5 deep	3	O[3]
G	Synchronous control	ISO 6149[4]	M14 × 1.5; 11.5 deep	530	X
U	Bearing flushing port	ISO 6149[4]	M22 × 1.5; 15.5 deep	3	X
X	Pilot pressure port (HP, HZ, HA1T/HA2T)	ISO 6149[4]	M14 × 1.5; 11.5 deep	530	O
X	Pilot pressure port (HA1, HA2)	ISO 6149[4]	M14 × 1.5; 11.5 deep	3	X
$\mathbf{X}_1$, $\mathbf{X}_2$	Pilot pressure port (DA0)	ISO 8434-1	SDSC-L8×M12-F	40	O
$\mathbf{X}_1$	Pilot pressure port (DA1, DA2)	ISO 6149[4]	M14 × 1.5; 11.5 deep	40	O
$\mathbf{X}_3$	Pilot pressure port (DA1, DA2)	ISO 6149[4]	M14 × 1.5; 11.5 deep	40	X
$\mathbf{M}_1$	Measuring port, control pressure	ISO 6149[4]	M14 × 1.5; 11.5 deep	530	X
$\mathbf{M}_A$, $\mathbf{M}_B$	Measuring port, pressure A, B	ISO 6149[4]	M22 × 1.5; 15.5 deep	530	X

1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
2) Only dimensions according to SAE J518, metric fastening thread is a deviation from the standard.
3) Depending on installation position, $\mathbf{T}_1$ or $\mathbf{T}_2$ must be connected (see also installation instructions on page 83).
4) The countersink may be deeper than specified in the standard.
5) O = Must be connected (plugged on delivery) X = Plugged (in normal operation)

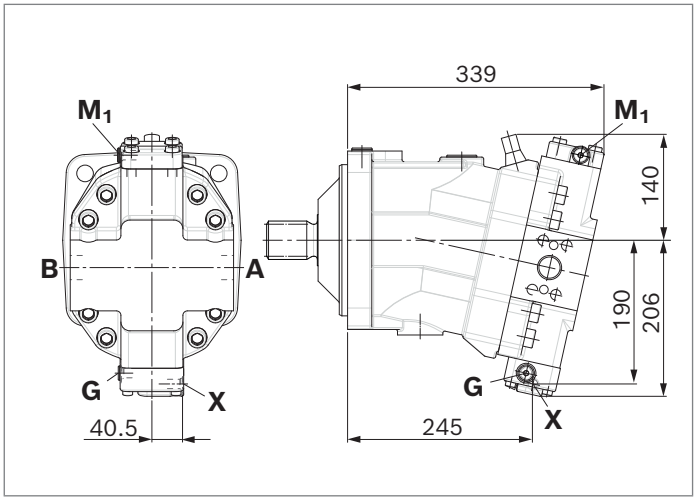
▼ **EP1, EP2** – Proportional electric control, positive control



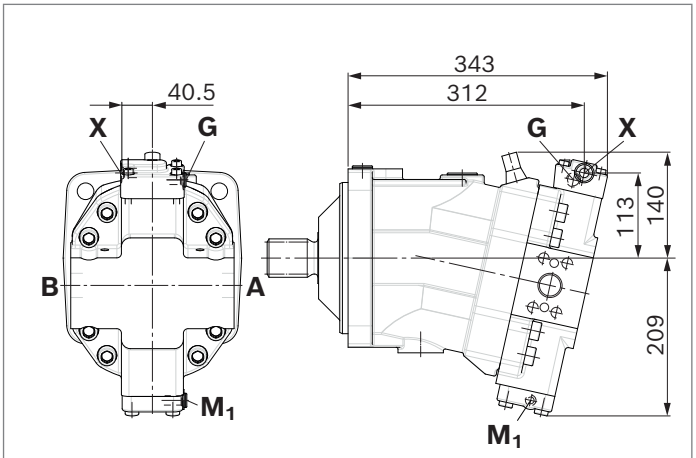
▼ **EP5D1, EP6D1** – Proportional electric control, negative control, with pressure control fixed setting



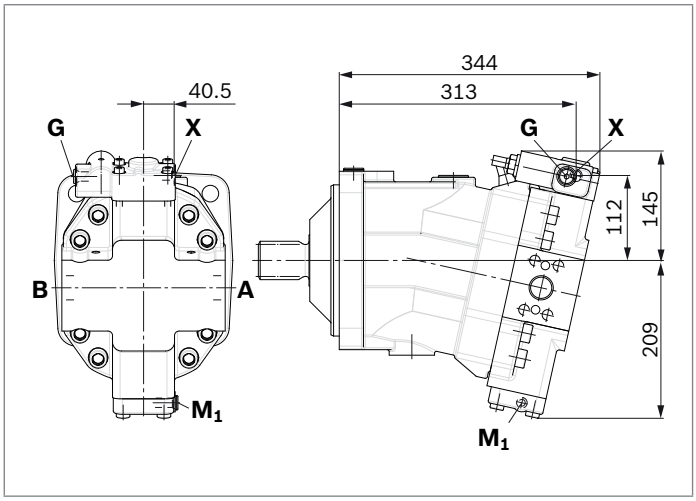
▼ **HP1, HP2** – Proportional hydraulic control, positive control



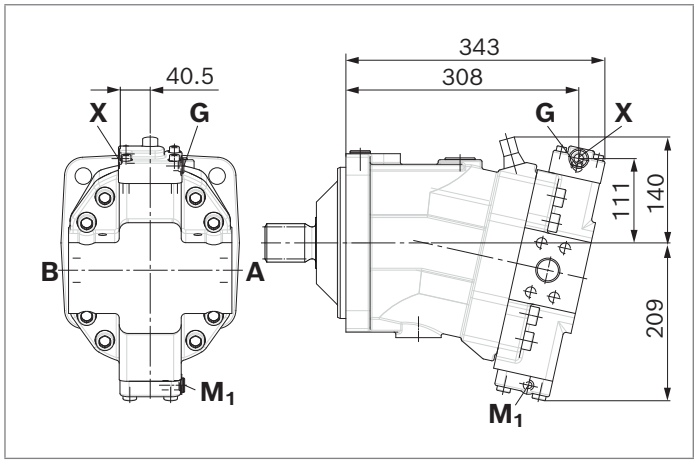
▼ **HP5, HP6** – Proportional hydraulic control, negative control



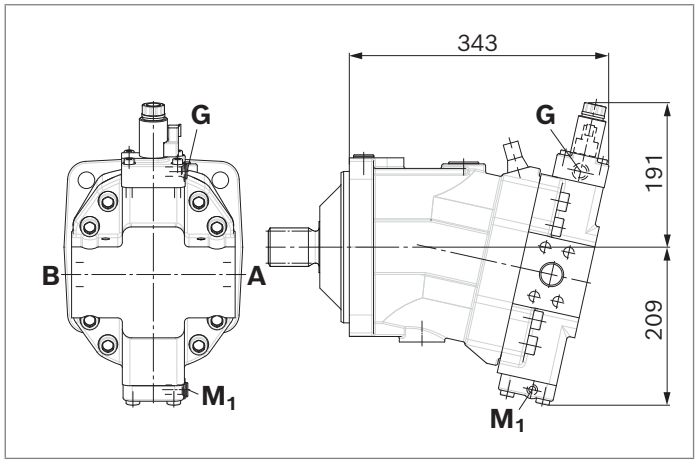
▼ **HP5D1, HP6D1** – Proportional hydraulic control, negative control, with pressure control fixed setting



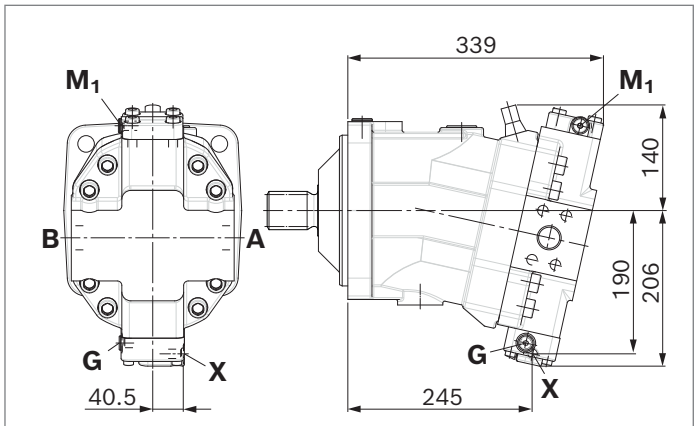
▼ **HZ5** – Two-point control, hydraulic, negative control



▼ **EZ5, EZ6** – Two-point control, electric, negative control



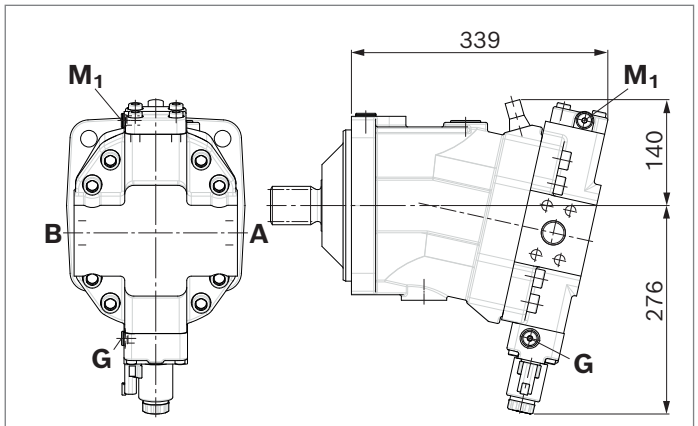
▼ **HA1, HA2 / HA1T3, HA2T3** – Automatic high-pressure related control, positive control, with hydraulic override, remote controlled, proportional



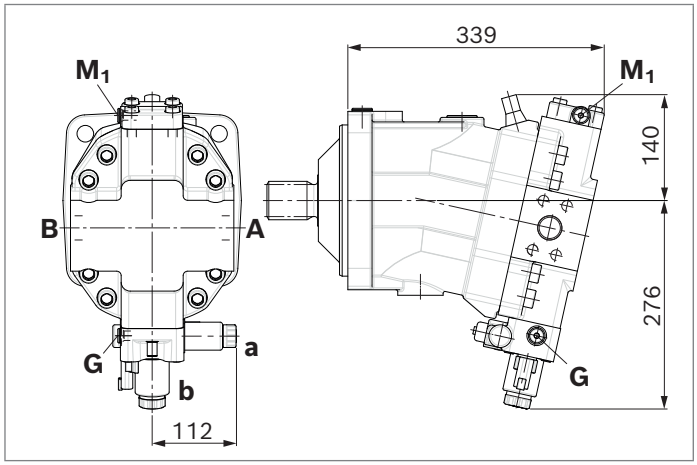
HA1 and HA2, **X** plugged

HA1T and HA2T, **X** open

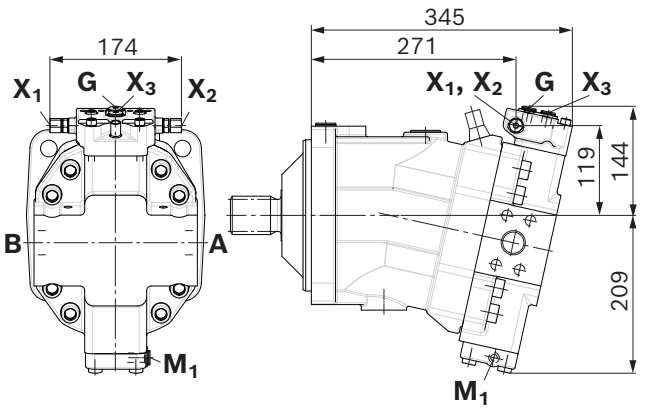
▼ **HA1U1, HA2U2** – Automatic high-pressure related control, positive control, with electric override, two-point



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



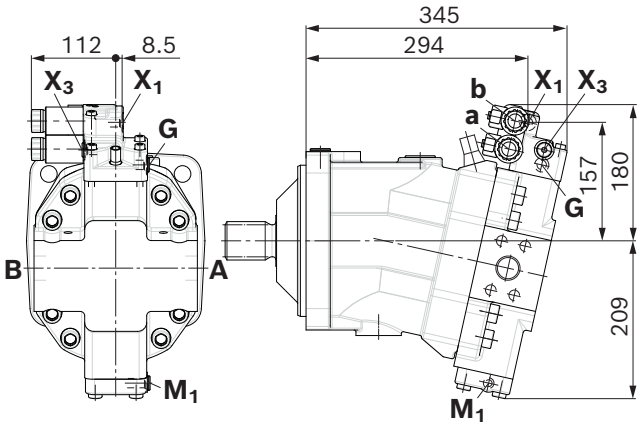
▼ **DA0** – Automatic speed related control, negative control, with hydraulic travel direction valve



X$_1$, **X**$_2$ Pipe fitting SDSC – L8×M12 – F acc. to ISO 8434-1

Use assembled fitting!

▼ **DA1, DA2** – Automatic speed related control, negative control, with electric travel direction valve and electric $V_{g\,max}$ override



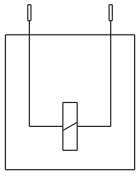
Connector for solenoids

DEUTSCH DT04-2P-EP04

Molded, 2-pin, without bidirectional suppressor diode.
There is the following type of protection with the mounted mating connector:

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

▼ Switching symbol



▼ Mating connector DEUTSCH DT06-2S-EP04

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

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

Notice

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

Neutral position switch

The neutral position switch NLS electronically detects the neutral position of the A6VM, thereby ensuring the torque freedom of the motor. The use of the NLS in a gearbox control provides a faster switching cycle in the drive. In addition, the switch reliability is improved and thereby the service life of the drive increased.
Type code, technical data, dimensions and details on the connector, plus safety instructions about the sensor can be found in NLS data sheet 95152.

Technical data

Type		NLS
Recommended operating voltage		5 V
Maximum voltage	not actuated	32 V
	actuated	11.5 V
Minimum permissible current		0 mA
Maximum permissible current		10 mA
Maximum switching cycle number		1 million
Contact type		Normally open contact (open in non-actuated state)
Type of protection (with mating connector plugged)		IP67/IP69K
Temperature range of sensor (medium and ambient temperature)[1]		−40 °C ... 125 °C
Temperature range of thread seal ring FKM[1]		−15 °C ... 125 °C
Pressure resistance	nominal	3 bar
	maximum (momentary peaks)	10 bar[2]

Notice
The minimum swivel angle is dependent on the $V_{g\,min}$-stop

▼ **Mating connector**

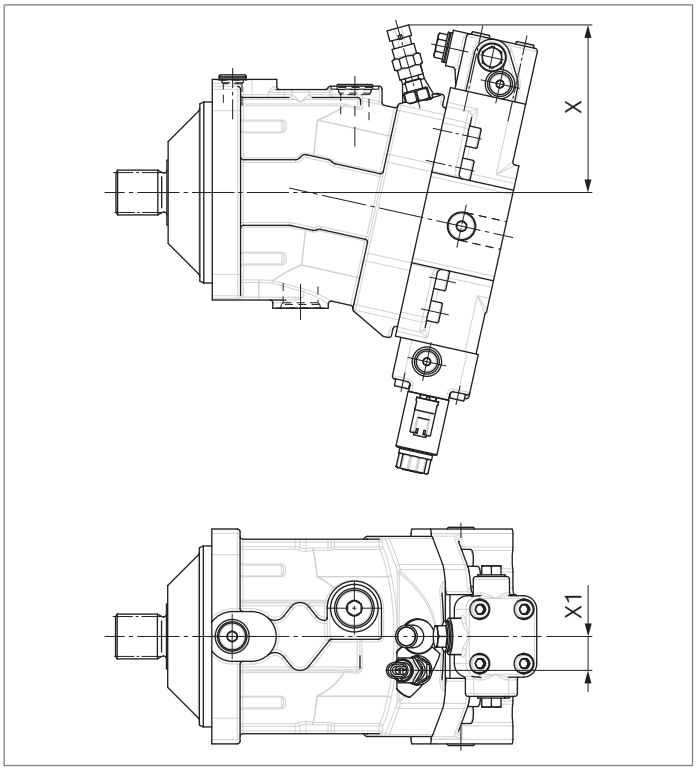
Consisting of	Material number
1 housing	282080
1 socket contact	282403-1

The mating connector is not included in the scope of delivery.
This mating connector can be ordered from AMP.

1) Observe the permissible temperature range of the axial piston motor.
2) Observe the permissible viscosity range of the axial piston motor. At oil viscosities >1800 mm²/s, the switch may be unintentionally actuated by case pressure peaks of >10 bar.

▼ **Dimensions**

Version "N" with neutral position switch mounted



Size	Adjustable angle		X [mm]		X1 [mm]
	min.	max.	at min angle	at max angle	
80	0°	2°	144.7	141.4	28.0
107	0°	4°	148.1	140.4	30.0
140	0°	1°	153.1	150.9	30.0
160	0°	0°		153.1	30.0
200	0°	0°		159.1	30.0

Flushing and boost-pressure valve

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

Cracking pressure of pressure retention valve
(observe when setting the primary valve)

- Size 28 to 200, fixed setting 16 bar

Switching pressure, flushing spool Δp

- Size 28 to 107 (small flushing valve) 8 ± 1 bar
- Size 107 to 200 (medium and large flushing valve) 17.5 ± 1.5 bar

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

Small flushing valve for sizes 28 to 107

Material number of orifice	Ø [mm]	q_v [l/min]	Code
R909651766	1.2	3.5	A
R909419695	1.4	5	B
R909419696	1.8	8	C
R909419697	2.0	10	D
R909444361	2.4	14	F
R902004465	3.0	16	H

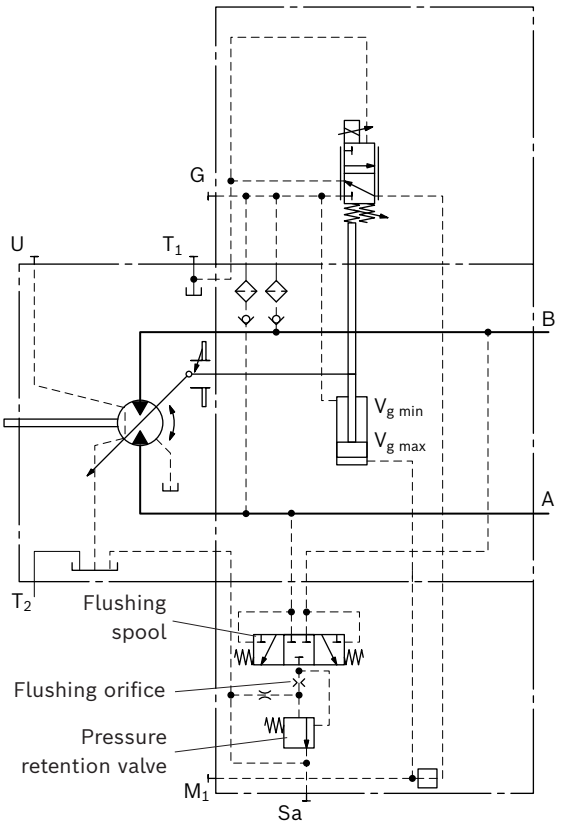
Medium flushing valve for size 107

Material number of orifice	Ø [mm]	q_v [l/min]	Code
R909431310	2.8	18	I
R902138235	3.1	21	J
R909435172	3.5	27	K
R909449967	5.0	31	L

Large flushing valve for sizes 140 to 200

Material number of orifice	Ø [mm]	q_v [l/min]	Code
R909449998	1.8	8	C
R909431308	2.0	10	D
R909431309	2.5	15	G
R909431310	2.8	18	I
R902138235	3.1	21	J
R909435172	3.5	27	K
R909436622	4.0	31	L
R909449967	5.0	37	M

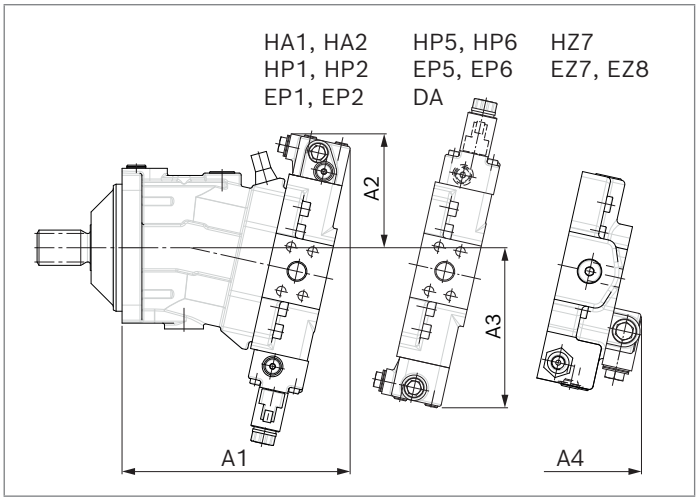
▼ **Circuit diagram EP**



Notice

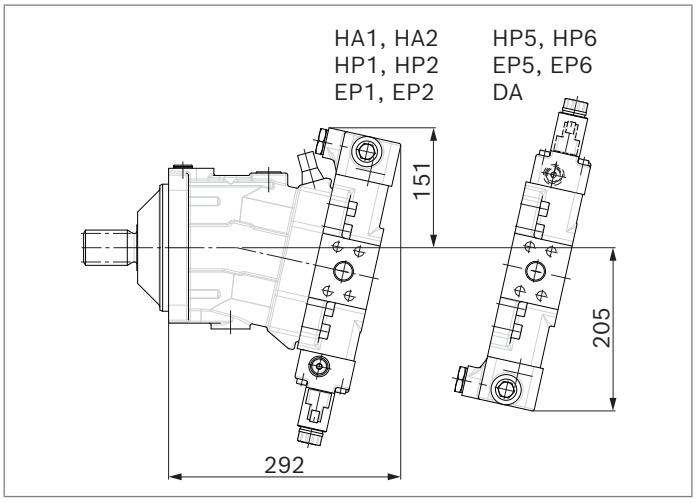
- Port **S**$_a$ only for sizes 140 to 200
- From a flushing flow of 35 l/min, it is recommended that port **S**$_a$ be connected in order to prevent an increase in case pressure. An increased case pressure reduces the flushing flow.

▼ Dimensions, sizes 28 to 107 (small flushing valve)

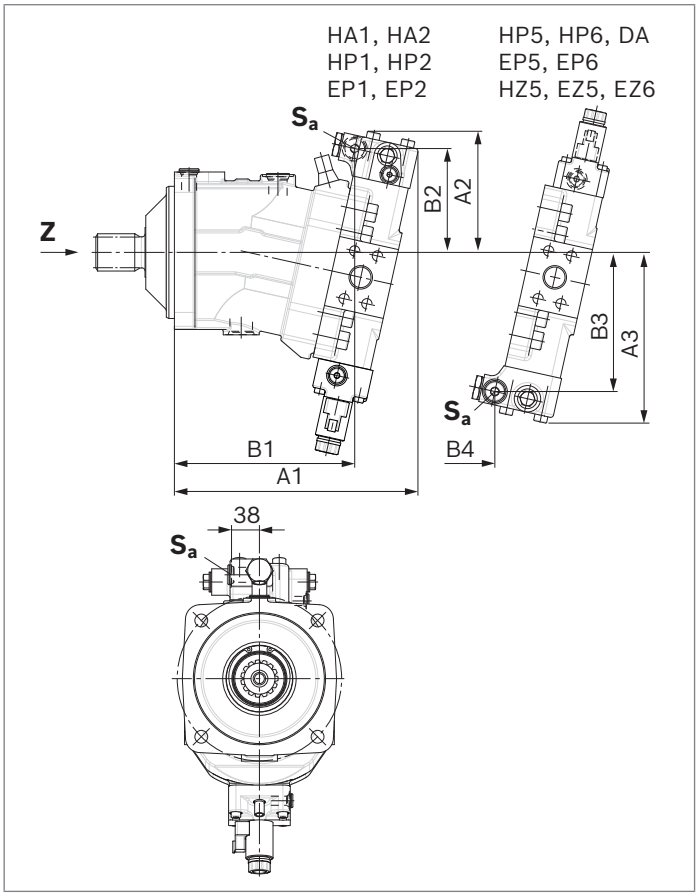


NG	A1	A2	A3	A4
28	214	125	161	
55	245	137	183	236
80	273	142	1940	254
107	287	143	202	269

▼ Dimensions, size 107 (medium flushing valve)



▼ Dimensions, sizes 140 to 200 (large flushing valve)



NG	A1	B1	A2	B2	A3	B3	B4	Sa[1)]
140	325	239	165	142	230	187	166	M22 × 1.5; 15.5 deep
160	332	246	165	142	233	190	172	M22 × 1.5; 15.5 deep
200	349	263	172	148	244	201	185	M22 × 1.5; 15.5 deep

1) ISO 6149, ports plugged (in normal operation).
For notices on tightening torques, see the instruction manual.
The countersink may be deeper than specified in the standard.

BVD and BVE counterbalance valve

Function

Counterbalance valves for travel drives and winches should reduce the danger of overspeed and cavitation of axial piston motors in open circuits. Cavitation occurs if, during braking, when going downhill or during the load-lowering process, the motor speed is greater than it should be for the given inlet flow and thus the supply pressure falls sharply.
If the supply pressure falls below the value specified for the relevant counterbalance valve, the counterbalance spool moves into the closed position. The cross-sectional area of the counterbalance valve return passage is then reduced, creating a bottleneck in the return flow of the hydraulic fluid. The pressure increases and brakes the motor until the rotational speed of the motor reaches the specified value for the given inlet flow.

Notice

- BVD available for sizes 55 to 200 and BVE available for sizes 107 to 200.
- The counterbalance valve must be ordered additionally. We recommend ordering the counterbalance valve and the motor as a set.
- Order example: A6VM080HA1T30004A/65MWV0N4S 97W0-0 + BVD20F27S/41B–V03K16D0400S12
- For safety reasons, controls with beginning of control at $V_{g\ min}$ (e.g. HA) are not permissible for lifting winch drives!
- Counterbalance valves must be optimized during prototype commissioning to prevent unacceptable operating conditions, and compliance with the specification must be verified.
- The counterbalance valve does not replace the mechanical service brake and holding brake.
- Observe detailed information on the counterbalance valve in data sheets 95522 (BVD), 95525 (BVE) and 95528 (BVD/BVE32)!
- For the design of the brake release valve, we require the following data for the mechanical holding brake:
  - the cracking pressure
  - the volume of the brake spool between minimum stroke (brake closed) and maximum stroke (brake released with 21 bar)
  - the required closing time for a warm device (oil viscosity approx. 15 mm^2/s)

Permissible inlet flow or pressure when using pressure relief valve and BVD/BVE

Motor NG	Without valve		Limited values when using pressure relief valves and BVD/BVE						
			DBV[1]			BVD[2]/BVE[3]			
	p_{nom}/p_{max} [bar]	$q_{V\ max}$ [l/min]	p_{nom}/p_{max} [bar]	q_V [l/min]	Code	NG	p_{nom}/p_{max} [bar]	q_V [l/min]	Code
55	450/530	244	350/420	240	7	20 (BVD)	350/420	220	7W
80		312							
107		380		400					
107		380			8	25 (BVD/BVE)		320	8W
140		455				25 (BVD)			
160		496							
140		455	300/460	550	5	25 (BVE)	350/400	320	5W
160		496							
200		580				25 (BVD/BVE)			
200		580			9	32 (BVD/BVE)	350/420	628	9W

Mounting the counterbalance valve

When delivered, the counterbalance valve is fastened to the motor with two tacking screws (transport lock).
The tacking screws may not be removed while mounting the working lines. If the counterbalance valve and motor are delivered separately, the counterbalance valve must first be fastened to the motor port plate using the provided tacking screws.

The counterbalance valve is finally mounted to the motor by fitting the SAE flange.
The screws to be used and the instructions for mounting can be found in the instruction manual.

1) Pressure relief valve
2) Counterbalance valve, double-acting
3) Counterbalance valve, one-sided

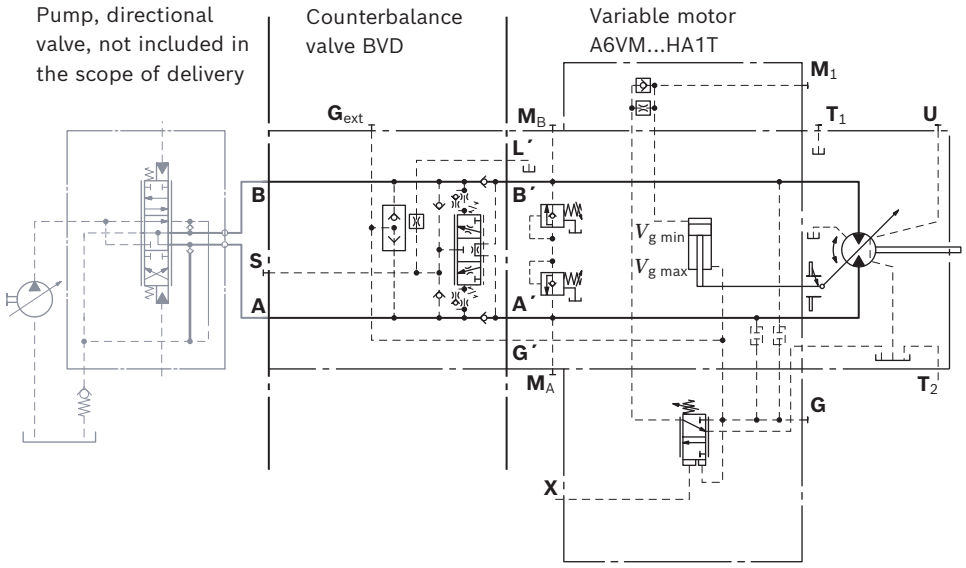
Counterbalance valve for travel drives BVD...F

Application option

- Travel drive for wheeled excavators (BVD and BVE)

▼ **Example circuit diagram for travel drive in wheeled excavators**

A6VM080HA1T30004A/65MWV0N4S97W0-0 + BVD20F27S/41B–V03K16D0400S12



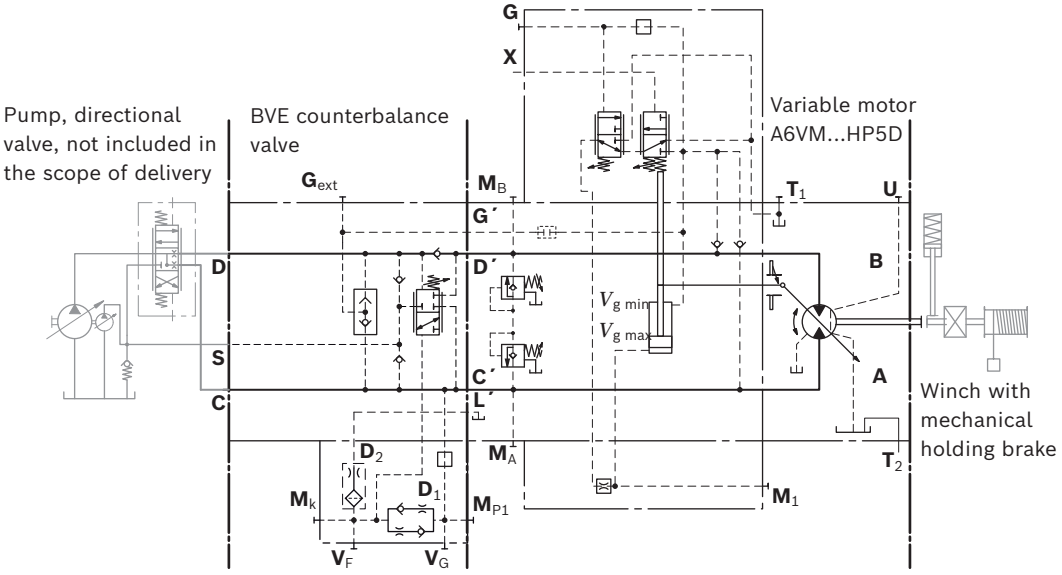
Counterbalance valve for winches and track drive BVD...W and BVE

Application option

- Winch drives in cranes (BVD and BVE)
- Track drive in crawler excavators (BVD)

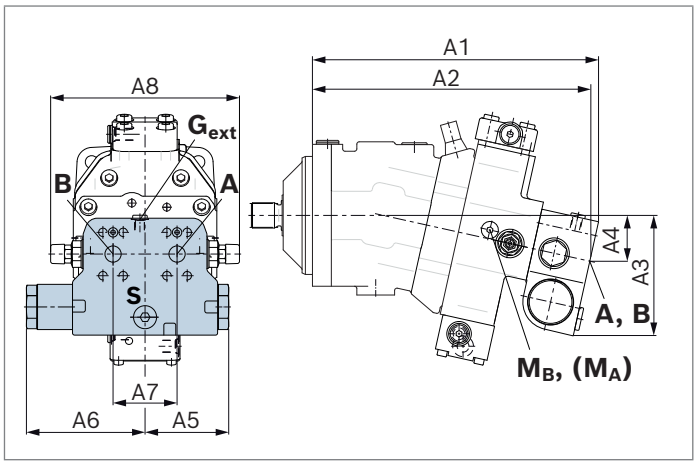
▼ **Example circuit diagram for winch drive in cranes**

A6VM080HP5D10001A/65MWV0N4S97W0-0 + BVE25W38S/51ND-V100K00D4599T30S00-0

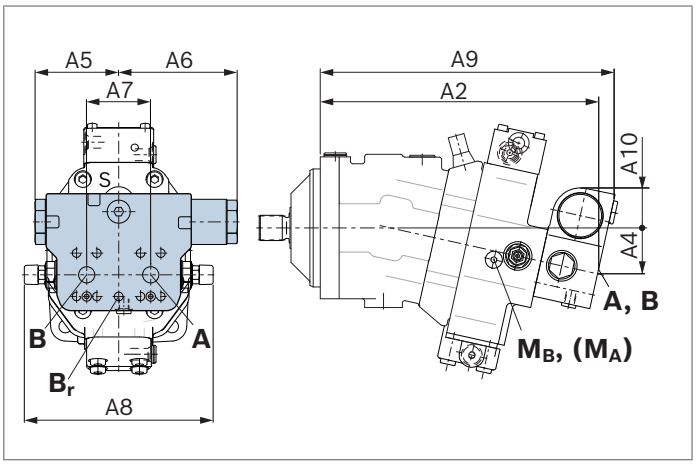


Dimensions

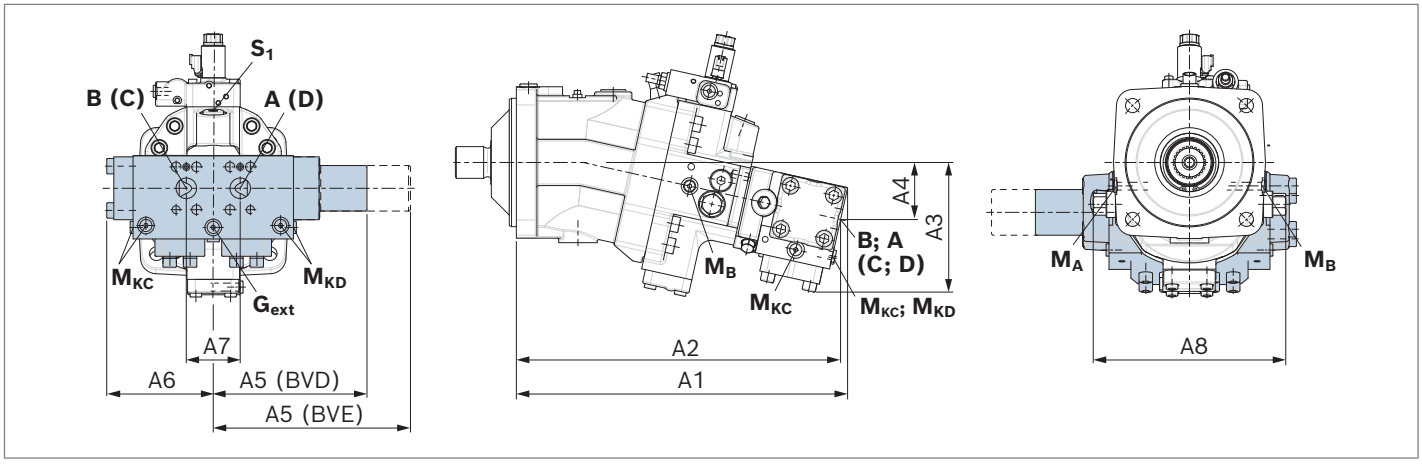
▼ **A6VM...HA, HP1, HP2 or EP1, EP2 with BVD20 or BVD/BVE25**



▼ **A6VM...HP5, HP6 or EP5, EP6[1] with BVD20 or BVD/BVE25**



▼ **A6VM...HA, HP5, HP6 or EP5, EP6 with BVD/BVE 32**



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 port designation of the A6VM motor.
The designation of the ports on the installation drawing of the motor is binding!

A6VM	Counterbalance valve											
NG...plate	Type	Ports	Dimensions									
		A, B	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
55...7	BVD20...17	3/4 in	311	302	143	50	98	139	75	222	326	50
80...7	BVD20...27	1 in	340	331	148	55	98	139	75	222	355	46
107...7	BVD20...28	1 in	362	353	152	59	98	139	84	234	377	41
107...8	BVD25...38	1 1/4 in	380	370	165	63	120.5	175	84	238	395	56
140...8	BVD25...38	1 1/4 in	411	401	168	67	120.5	175	84	238	426	53
160...8	BVD25...38	1 1/4 in	417	407	170	68	120.5	175	84	238	432	51
200...5	BVD25...38	1 1/4 in	448	438	176	74	120.5	175	84	299	463	46
200...9	BVD32...38	1 1/4 in	516	505	202	89	240	166	84	299	–	46
107...8	BVE25...38	1 1/4 in	380	370	171	63	137	214	84	238	397	63
140...5	BVE25...38	1 1/4 in	411	401	175	67	137	214	84	238	423	59
160...5	BVE25...38	1 1/4 in	417	407	176	68	137	214	84	238	432	59
200...5	BVE25...38	1 1/4 in	448	438	182	74	137	214	84	299	463	52
200...9	BVE32...38	1 1/4 in	516	505	202	89	307	166	84	299	–	46

Ports		Version	A6VM plate	Standard	Size[1]	p_{max} [bar][2]	State[4]
A, B	Working line			SAE J518	See table above	420	O
S, S_1	Boost pressure supply	BVD20, BVE25		DIN 3852[3]	M22 × 1.5; 14 deep	30	X
		BVD25, BVE25		DIN 3852[3]	M27 × 2; 16 deep	30	X
B_r	Brake release, reduced high pressure	L	7	DIN 3852[3]	M12 × 1.5; 12.5 deep	30	O
			8	DIN 3852[3]	M12 × 1.5; 12 deep	30	O
G_{ext}	Brake release, high pressure	S		DIN 3852[3]	M12 × 1.5; 12.5 deep	420	X
M_A, M_B	Pressure measurement **A** and **B**			ISO 6149[3]	M18 × 1.5; 14.5 deep	420	X
M_C	Measuring port, pressure counterbalance spool	BVE25/53		DIN 3852[3]	M14 × 1.5; 12 deep	350	X
M_K	Measuring port, pressure counterbalance spool	BVE25/53		DIN 3852[3]	M14 × 1.5; 12 deep	350	X
M_{KC}	Measuring port, pressure counterbalance spool **C**	BVD32, BVE32		DIN 3852[3]	M14 × 1.5; 12 deep	350	X
M_{KD}	Measuring port, pressure counterbalance spool **D**	BVE32, BVE32		DIN 3852[3]	M14 × 1.5; 12 deep	350	X
M_{P1}	Measuring port, pressure counterbalance spool	BVE25/53		DIN 3852[3]	M14 × 1.5; 12 deep	350	X

1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
2) The countersink may be deeper than specified in the standard.
3) O = Must be connected (plugged on delivery) X = Plugged (in normal operation)

Integrated counterbalance valve BVI

Function

The integrated counterbalance valves for track drives in crawler excavators should reduce the danger of overspeed and cavitation of axial piston motors in open circuits. Cavitation occurs if, during braking or driving downhill, the rotational speed of the motor is greater than it should be for the given inlet flow, causing the supply pressure to fall sharply.
If the supply pressure falls below the value specified for the relevant counterbalance valve, the counterbalance spool moves into the closed position. The cross-sectional area of the counterbalance valve return passage is then reduced, creating a bottleneck in the return flow of the hydraulic fluid. The pressure increases and brakes the motor until the rotational speed of the motor reaches the specified value for the given inlet flow.

Notice

- BVI available for sizes 140 and 160.
- The counterbalance valve must be ordered additionally. Order example: A6VM140HP6000001A/65MWV0R4A 16Y0-0 + BVI540603002-0
- Counterbalance valves must be optimized during prototype commissioning to prevent unacceptable operating conditions, and compliance with the specification must be verified.
- The counterbalance valve does not replace the mechanical service brake and holding brake.
- For the design of the brake release valve, we require the following data for the mechanical holding brake:
  - the cracking pressure
  - the volume of the brake spool between minimum stroke (brake closed) and maximum stroke (brake released with 21 bar)
  - the required closing time for a warm device (oil viscosity approx. 15 mm^2/s)

Type code

01	02	03	04	05		06
BVI					**–**	

Counterbalance valve

01	Counterbalance valve integrated	**BVI**

Brake spool version		q_v **[l/min]**	**Material number**	
02	Volume preselection	≤ 150	R902038832	**51**
		= 150 – 210	R902038936	**52**
		= 210 – 270	R902038833	**53**
		= 270 – 330	R902038834	**54**
		= 330 – 400	R902038835	**55**
		≥ 400	R902038836	**56**

Throttle mounting

03	Constant throttle	R909432302	**0008**
	Throttle pin	R909651165	**0603**

Check valve

04	Without residual opening	**00**

Brake release valve

05	With brake release valve (standard HZ)	Without disable function	**1**
	With brake release valve (standard HP, EP)	With disable function	**2**

Standard/special version

06	Standard version	**0**
	Special version	**S**

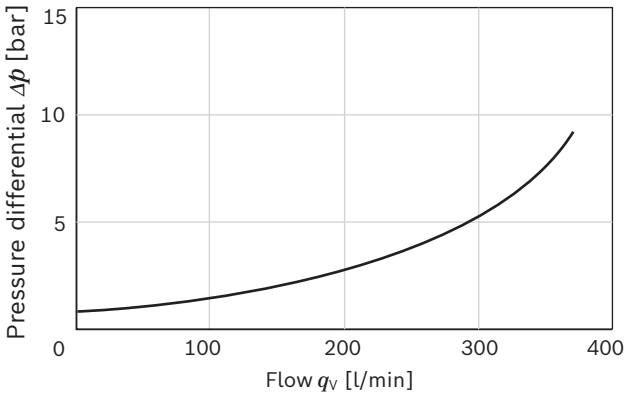
Technical data

Working pressure	Nominal pressure	p	350 bar
	Maximum pressure	p	420 bar
Flow, maximum		$q_{v\,max}$	400 l/min
Counterbalance spool	Start of opening	p	12 bar
	Fully open	p	26 bar
Pressure reducing valve for brake release (fixed setting)	Control pressure	p	21^{+4} bar
	beginning of control	p	10^{+4} bar

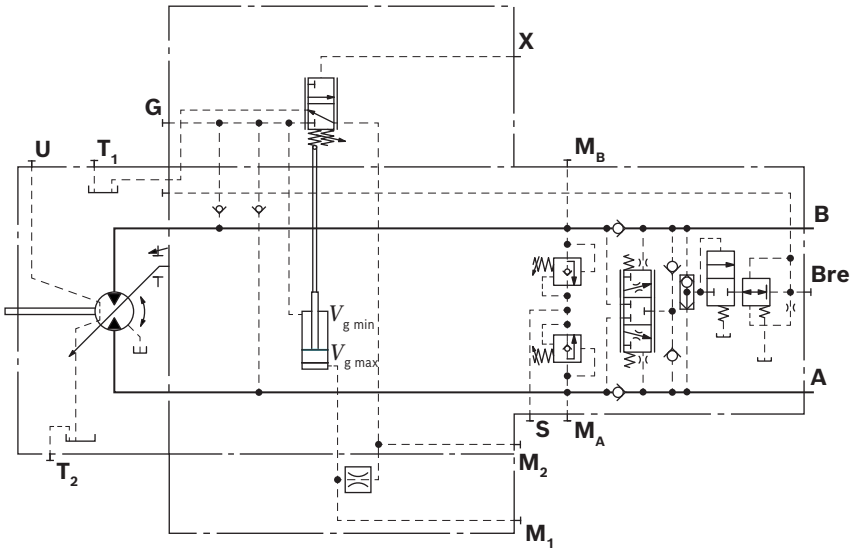
Permissible inlet flow or pressure when using pressure relief valve and BVI

Motor NG	**Without restrictions Standard plate (1 + 2)**		**Restricted values Plate with integrated counterbalance valve (6)**	
				BVI + DBV
	p_{nom}/p_{max} **[bar]**	$q_{V\,max}$ **[l/min]**	p_{nom}/p_{max} **[bar]**	q_V **[l/min]**
140	450/530	410	350/420	400
160		533		

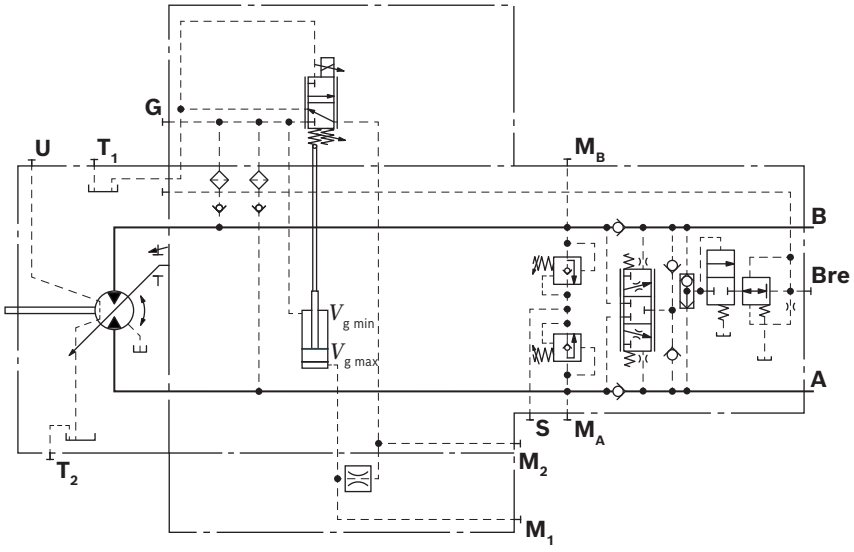
▼ **Boost characteristic**



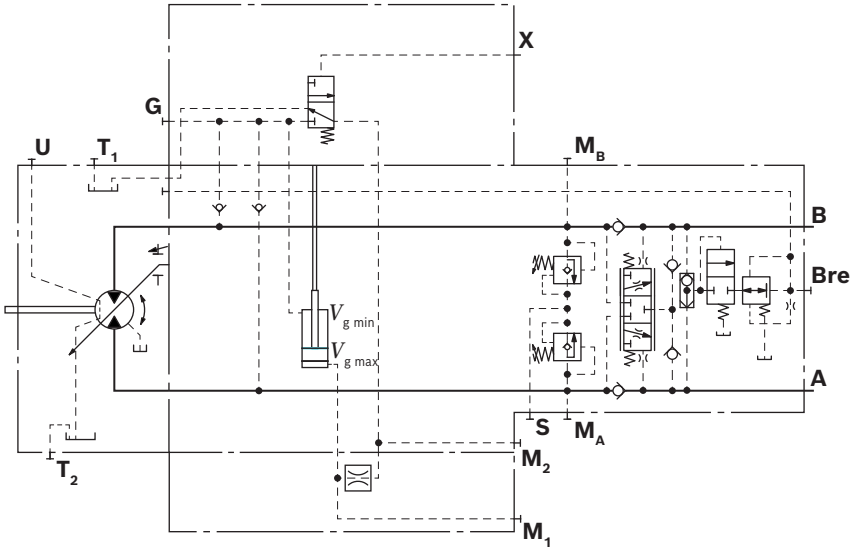
▼ **Circuit diagram HP5**



▼ **Circuit diagram EP5**



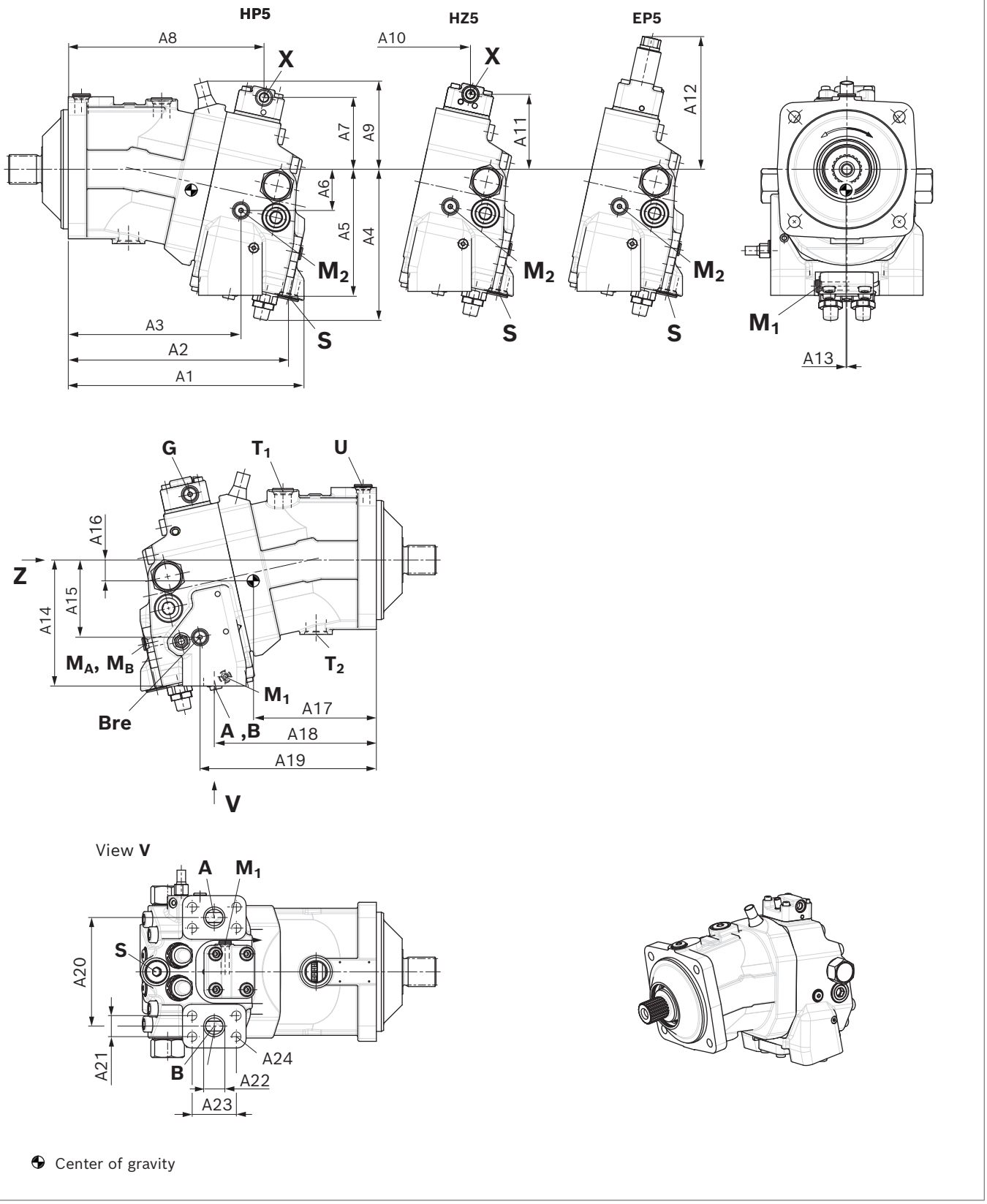
▼ **Circuit diagram HZ5**



Integrated counterbalance valve BVI dimensions

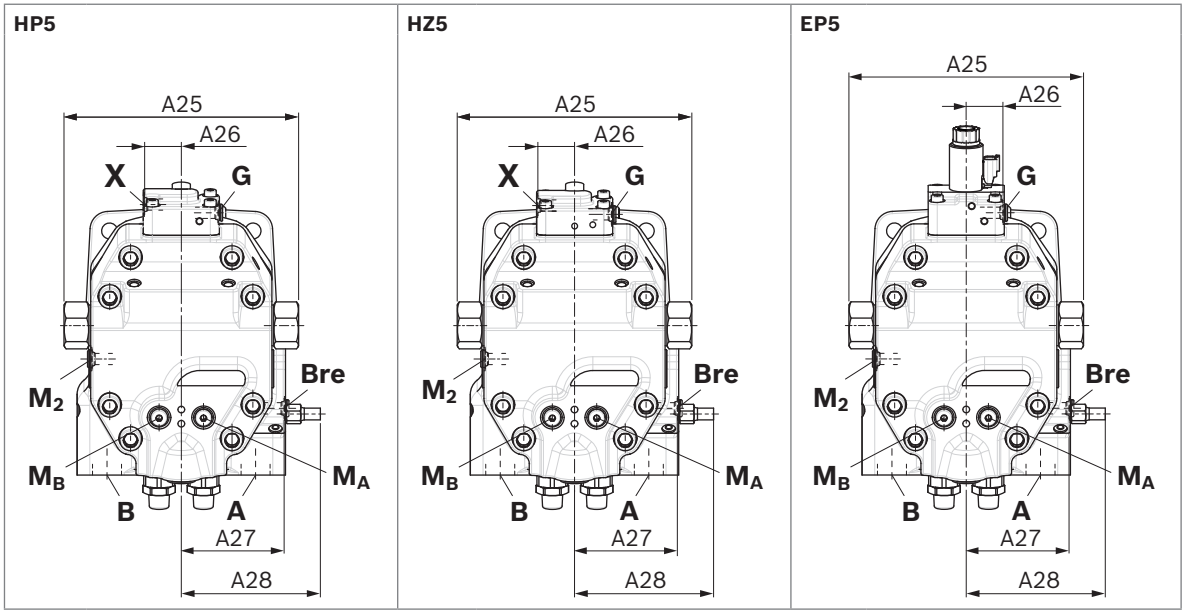
HP5 – Two-point control, hydraulic

Port plate 6, with integrated counterbalance valve BVI — SAE working ports **A** and **B** at bottom



Center of gravity

▼ **Location of working ports on the port plates** (View **Z**)



A6VM NG	Port	Dimensions												
	A, B	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13
140	1 1/4 in	350	326	254	227	190	61	109	289	max. 134	285	108	196	1.0
160	1 1/4 in	357	332	261	228	192	62	108	296	max. 135	291	107	195	1.0

A6VM NG	Dimensions													
	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24 (DIN 13)	A25	A26	A27	A28
140	189	115	25	170	238	260	164	31.8	32	66.7	M14 × 2; 19 deep	259	40.5	113.5	154
160	190	117	29	191	245	266	164	31.8	32	66.7	M14 × 2; 19 deep	259	40.5	113.5	154

Ports	Working line SAE J518[1]	Drain port ISO 6149[2]	Drain port ISO 6149[2]	Bearing flushing port ISO 6149[2]	Pilot pressure port ISO 6149[2]	Boost pressure supply ISO 6149[2]
NG	A, B	T_1	T_2	U	X	S
140	See table above	M27 x 2; 19 deep	M33 × 2; 19 deep	M22 × 1.5; 15.5 deep	M14 x 1.5; 11.5 deep	M27 x 2; 19 deep
160		M27 x 2; 19 deep	M33 × 2; 19 deep	M22 × 1.5; 15.5 deep	M14 x 1.5; 11.5 deep	M27 x 2; 19 deep
p_{max} [bar][3]	420	3	3	3	100	30
State[5]	O	X[4]	O[4]	X	O	X

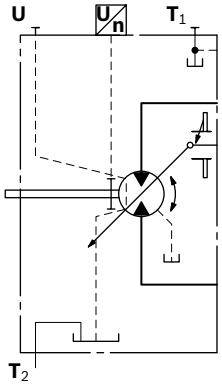
Ports	Measuring port, pressure A / pressure B	Measuring port, control pressure	Measuring port, stroking chamber	Brake release, external	Synchronous control ISO 6149[2]
NG	M_A, M_B	M_1	M_2	Bre	G
140	M14 x 1.5; 11.5 deep	M14 × 1; 11.5 deep	M14 × 1; 11.5 deep	M14 × 1; 11.5 deep	M14 × 1; 11.5 deep
160	M14 x 1.5; 11.5 deep	M14 × 1; 11.5 deep	M14 × 1; 11.5 deep	M14 × 1; 11.5 deep	M14 × 1; 11.5 deep
p_{max} [bar][3]	420	420	420	30	420
State[5]	X	X	X	X/O	X

1) Only dimensions according to SAE J518, metric fastening thread is a deviation from the standard.
2) The countersink may be deeper than specified in the standard.
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) Depending on installation position, T_1 or T_2 must be connected (see also installation instructions on page 83).
5) O = Must be connected (plugged on delivery) X = Plugged (in normal operation)

Speed sensor

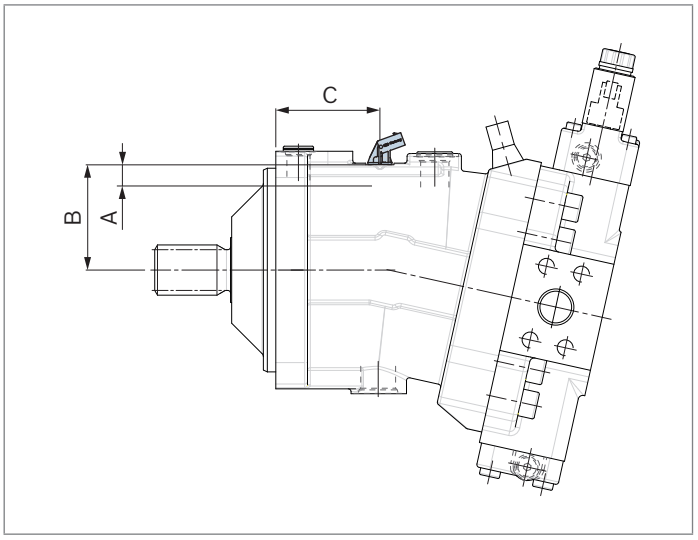
The motor speed can be recorded by the mounted DST or DSA speed sensor. The proportional frequency signal required is generated by splines at the rotary group. In addition to the rotational speed, the DST or DSA sensor detects the direction of rotation of the motor and the temperature at the installation location.
Type code, technical data, dimensions and details on the connector, plus safety instructions about the sensor can be found in the relevant data sheet 95131 (DST) or 95126 (DSA/20).
The sensor is mounted on the port provided for this purpose with a mounting bolt. On deliveries without sensor, the port is plugged with a pressure-resistant cover. We recommend ordering the A6VM variable motor complete with mounted sensor.

▼ **Circuit diagram EP**



▼ **Dimensions**

Version "E" with mounted DST speed sensor



Size		28	55	80	107	140	160	200
Number of teeth		40	54	58	67	72	75	80
A	Insertion depth (tolerance - -0.25)	18.4	18.4	18.4	18.4	18.4	18.4	18.4
B	Contact surface	61	75	79	88	93	96	101
C		57.2	66.2	75.2	77.2	91.2	91.7	95.2

Setting range for displacement

	28				55				80				107			
	$V_{g\,max}$ (cm³/rev)		$V_{g\,min}$ (cm³/rev)		$V_{g\,max}$ (cm³/rev)		$V_{g\,min}$ (cm³/rev)		$V_{g\,max}$ (cm³/rev)		$V_{g\,min}$ (cm³/rev)		$V_{g\,max}$ (cm³/rev)		$V_{g\,min}$ (cm³/rev)	
	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to
A	28.1	28.1	0.0	6.9	54.8	54.8	0.0	13.3	80.0	80.0	0.0	9.0	107.0	107.0	0.0	22.2
	M8 × 40 R909086115		M8 × 50 R909153076		without screw		M10 × 60 R909154690		without screw		M12 × 60 R909083530		without screw		M12 × 70 R909085976	
B	28.1	28.1	> 6.9	15.0	54.8	54.8	> 13.3	27	80.0	80.0	> 9.0	26.0	107.0	107.0	> 22.2	43.8
	M8 × 40 R909086115		M8 × 60 R909153811		without screw		M10 × 70 R909153779		without screw		M12 × 70 R909085976		without screw		M12 × 80 R909153075	
C	28.1	28.1	> 15.0	20.0	54.8	54.8	> 27.0	38.0	80.0	80.0	> 26.0	44.0	107.0	107.0	> 43.8	65.5
	M8 × 40 R909086115		M8 × 70 R909154506		without screw		M10 × 80 R909154058		without screw		M12 × 80 R909153075		without screw		M12 × 90 R909154041	
D	x		x		x		x		80.0	80.0	> 44.0	56.0	107.0	107.0	> 65.5	75.0
									without screw		M12 × 90 R909154041		without screw		M12 × 100 R909153975	
E	< 28.1	21.6	0.0	6.9	< 54.8	42.0	0.0	13.3	< 80.0	72.0	0.0	9.0	< 107.0	86.0	0.0	22.2
	M8 × 50 R909153076		M8 × 50 R909153076		M10 × 60 R909154690		M10 × 60 R909154690		M12 × 60 R909083530		M12 × 60 R909083530		M12 × 70 R909085976		M12 × 70 R909085976	
F	< 28.1	21.6	> 6.9	15.0	< 54.8	42.0	> 13.3	27.0	< 80.0	72.0	> 9.0	26.0	< 107.0	86.0	> 22.2	43.8
	M8 × 50 R909153076		M8 × 60 R909153811		M10 × 60 R909154690		M10 × 70 R909153779		M12 × 60 R909083530		M12 × 70 R909085976		M12 × 70 R909085976		M12 × 80 R909153075	
G	< 28.1	21.6	> 15.0	20.0	< 54.8	42.0	> 27.0	38.0	< 80.0	72.0	> 26.0	44.0	< 107.0	86.0	> 43.8	65.5
	M8 × 50 R909153076		M8 × 70 R909154506		M10 × 60 R909154690		M10 × 80 R909154058		M12 × 60 R909083530		M12 × 80 R909153075		M12 × 70 R909085976		M12 × 90 R909154041	
H	x		x		x		x		< 80.0	72.0	> 44.0	56.0	< 107.0	86.0	> 65.5	75.0
									M12 × 60 R909083530		M12 × 90 R909154041		M12 × 70 R909085976		M12 × 100 R909153975	
J	< 21.6	13.8	0.0	6.9	< 42.0	29.0	0.0	13.3	< 72.0	55.0	0.0	9.0	< 86.0	64.0	0.0	22.2
	M8 × 60 R909153811		M8 × 50 R909153076		M10 × 70 R909153779		M10 × 60 R909154690		M12 × 70 R909085976		M12 × 60 R909083530		M12 × 80 R909153075		M12 × 70 R909085976	
K	< 21.6	13.8	> 6.9	15.0	< 42.0	29.0	> 13.3	27.0	< 72.0	55.0	> 9.0	26.0	< 86.0	64.0	> 22.2	43.8
	M8 × 60 R909153811		M8 × 60 R909153811		M10 × 70 R909153779		M10 × 70 R909153779		M12 × 70 R909085976		M12 × 70 R909085976		M12 × 80 R909153075		M12 × 80 R909153075	
L	< 21.6	13.8	> 15.0	20.0	< 42.0	29.0	> 27.0	38.0	< 72.0	55.0	> 26.0	44.0	< 86.0	64.0	> 43.8	65.5
	M8 × 60 R909153811		M8 × 70 R909154506		M10 × 70 R909153779		M10 × 80 R909154058		M12 × 70 R909085976		M12 × 80 R909153075		M12 × 80 R909153075		M12 × 90 R909154041	
M	x		x		x		x		< 72.0	55.0	> 44.0	56.0	< 86.0	64.0	> 65.5	75.0
									M12 × 70 R909085976		M12 × 90 R909154041		M12 × 80 R909153075		M12 × 100 R909153975	

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

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

Theoretical, maximum setting:

- for $V_{g\,min}$ = 0.7 × $V_{g\,max}$
- for $V_{g\,max}$ = 0.3 × $V_{g\,max}$

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

	140				160				200			
	V_{gmax} (cm³/U)		$V_{g\,min}$ (cm³/rev)		$V_{g\,max}$ (cm³/rev)		$V_{g\,min}$ (cm³/rev)		$V_{g\,max}$ (cm³/rev)		$V_{g\,min}$ (cm³/rev)	
	from	to	from	to	from	to	from	to	from	to	from	to
A	140.0	140.0	0.0	38.0	160.0	160.0	0.0	32.6	200.0	200.0	0.0	39.0
	without screw		M12 × 80 R909153075		without screw		M12 × 80 R909153075		without screw		M12 × 80 R909153075	
B	140.0	140.0	> 38.0	63.5	160.0	160.0	> 32.6	59.2	200.0	200.0	> 39.0	72.0
	without screw		M12 × 90 R909154041		without screw		M12 × 90 R909154041		without screw		M12 × 90 R909154041	
C	140.0	140.0	> 63.5	89.0	160.0	160.0	> 59.2	89.0	200.0	200.0	> 72.0	105.0
	without screw		M12 × 100 R909153975		without screw		M12 × 100 R909153975		without screw		M12 × 100 R909153975	
D	140.0	140.0	> 89.0	98.0	160.0	160.0	> 89.0	112.0	200.0	200.0	> 105.0	140.0
	without screw		M12 × 110 R909154212		without screw		M12 × 110 R909154212		without screw		M12 × 110 R909154212	
E	< 140.0	105.0	0.0	38.0	< 160.0	129.0	0.0	32.6	< 200.0	164.0	0.0	39.0
	M12 × 80 R909153075		M12 × 80 R909153075		M12 × 80 R909153075		M12 × 80 R909153075		M12 × 80 R909153075		M12 × 80 R909153075	
F	< 140.0	105.0	> 38.0	63.5	< 160.0	129.0	> 32.6	59.2	< 200.0	164.0	> 39.0	72.0
	M12 × 80 R909153075		M12 × 90 R909154041		M12 × 80 R909153075		M12 × 90 R909154041		M12 × 80 R909153075		M12 × 90 R909154041	
G	< 140.0	105.0	> 63.5	89.0	< 160.0	129.0	> 59.2	89.0	< 200.0	164.0	> 72.0	105.0
	M12 × 80 R909153075		M12 × 100 R909153975		M12 × 80 R909153075		M12 × 100 R909153975		M12 × 80 R909153075		M12 × 100 R909153975	
H	< 140.0	105.0	> 89.0	98.0	< 160.0	129.0	> 89.0	112.0	< 200.0	164.0	> 105.0	140.0
	M12 × 80 R909153075		M12 × 110 R909154212		M12 × 80 R909153075		M12 × 110 R909154212		M12 × 80 R909153075		M12 × 110 R909154212	
J	< 105.0	80.0	0.0	38.0	< 129.0	100.0	0.0	32.6	< 164.0	130.5	0.0	39.0
	M12 × 90 R909154041		M12 × 80 R909153075		M12 × 90 R909154041		M12 × 80 R909153075		M12 × 90 R909154041		M12 × 80 R909153075	
K	< 105.0	80.0	> 38.0	63.5	< 129.0	100.0	> 32.6	59.2	< 164.0	130.5	> 39.0	72.0
	M12 × 90 R909154041		M12 × 90 R909154041		M12 × 90 R909154041		M12 × 90 R909154041		M12 × 90 R909154041		M12 × 90 R909154041	
L	< 105.0	80.0	> 63.5	89.0	< 129.0	100.0	> 59.2	89.0	< 164.0	130.5	> 72.0	105.0
	M12 × 90 R909154041		M12 × 100 R909153975		M12 × 90 R909154041		M12 × 100 R909153975		M12 × 90 R909154041		M12 × 100 R909153975	
M	< 105.0	80.0	> 89.0	98.0	< 129.0	100.0	> 89.0	112.0	< 164.0	130.5	> 105.0	140.0
	M12 × 90 R909154041		M12 × 110 R909154212		M12 × 90 R909154041		M12 × 110 R909154212		M12 × 90 R909154041		M12 × 110 R909154212	

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

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

Theoretical, maximum setting:

- for $V_{g\,min}$ = 0.7 × $V_{g\,max}$
- for $V_{g\ max}$ = 0.3 × $V_{g\,max}$

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

Please contact us.

Installation instructions

General

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation.
This must also be observed following a longer standstill as the axial piston unit may empty via the hydraulic lines.
Particularly in the installation position "drive shaft upwards", filling and air bleeding must be carried out completely as there is, for example, a danger of dry running.
The leakage in the housing area must be directed to the reservoir via the highest drain port (**T**$_1$, **T**$_2$).
If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating condition, particularly at cold start. If this is not possible, separate drain line must be laid, if necessary.
To prevent the transmission of structure-borne noise, use elastic elements to decouple all connecting lines from all vibration-capable components (e.g. reservoir, frame parts).
Under all operating conditions, the drain line must flow into the reservoir below the minimum fluid level.

Notice

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

Key	
F	Filling/air bleeding
U	Bearing flushing / air bleed port
R$_1$	Air bleed port (special version)
T$_1$, **T**$_2$	Drain port
$h_{t\ min}$	Minimum required immersion depth (200 mm)
h_{min}	Minimum required distance to reservoir bottom (100 mm)

Installation position

See the following examples **1** to **8**.
Further installation positions are available upon request.
Recommended installation position: **1** and **2**

Notice

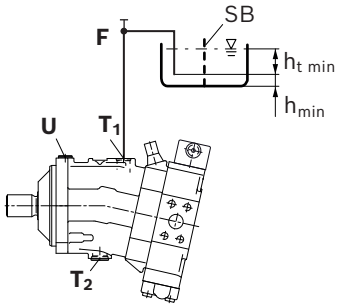
Port **F** is part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

Below-reservoir installation (standard)

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

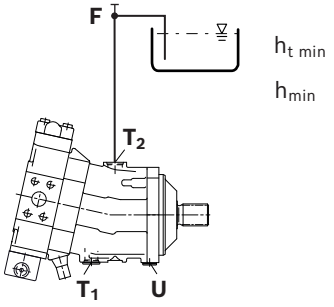
▼ Installation position 1

Air bleeding the housing	Filling
U	**T**$_1$ (F)



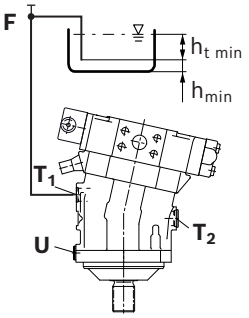
▼ Installation position 2

Air bleeding the housing	Filling
–	**T**$_2$ (F)



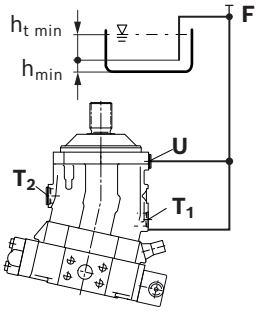
▼ Installation position 3

Air bleeding the housing	Filling
–	**T**$_1$ (F)



▼ Installation position 4

Air bleeding the housing	Filling
U	**T**$_2$ (F)

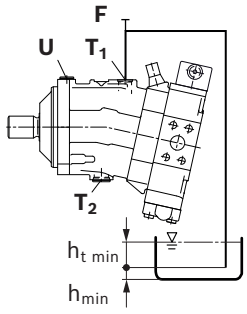


Above-reservoir installation

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 up): A check valve in the drain line (cracking pressure 0.5 bar) can prevent draining of the housing area.

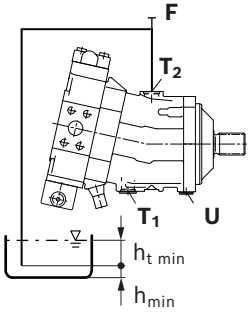
▼ **Installation position 5**

Air bleeding the housing	Filling
U (**T_1**)	**T_1** (**F**)



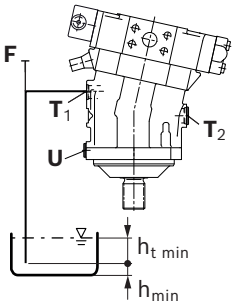
▼ **Installation position 6**

Air bleeding the housing	Filling
T_2 (**F**)	**T_2** (**F**)



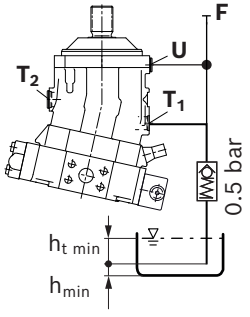
▼ **Installation position 7**

Air bleeding the housing	Filling
T_1 (F)	**T_1** (**F**)



▼ **Installation position 8**

Air bleeding the housing	Filling
U	**T_1** (**F**)



Project planning notes

- 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 skilled personnel.
- Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, this can be requested from Bosch Rexroth.
- Before finalizing your design, please request a binding installation drawing.
- The specified data and notes contained herein must be observed.
- For safety reasons, controls with beginning of control at $V_{g\,min}$ (e.g., HA) are not permissible for winch drives, e.g. anchor winches!
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- Preservation: Our axial piston units are supplied as standard with preservation protection for a maximum of 12 months. If longer preservation protection is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, details of which can be found in the data sheet 90312 or the instruction manual.
- Not all configuration variants of the product are approved for use in a safety function according to ISO 13849. Please consult the responsible contact person at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_D$) for functional safety.
- Depending on the type of control used, electromagnetic effects can be produced when using solenoids. When a direct current is applied, solenoids do not cause electromagnetic interference nor is their operation impaired by electromagnetic interference. Other behavior can result when a modulated direct current (e.g. PWM signal) is applied. Appropriate testing and measures should be taken by the machine manufacturer to ensure other components or operators (e.g. with pacemaker) are not affected by this potential.
- Be sure to add a pressure relief valve to the hydraulic system.
- Please note that a hydraulic system is an oscillating system. This can lead, for example, to the stimulation the natural frequency within the hydraulic system during operation at constant rotational speed over a long period of time. The frequency of the motor to be observed is 7 times the rotational speed frequency. This can be prevented, for example, with suitably designed hydraulic lines.
- Please note the details regarding the tightening torques of port threads and other threaded joints in the instruction manual.
- The ports and fastening threads are designed for the p_{max} permissible pressures of the respective ports, see the connection tables. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
- The service ports and function ports are only intended to accommodate hydraulic lines.
- Please note that the series connection of motors and the operation under summation pressure affect the efficiency of the units.
- The control behavior of the motor can change slightly due to natural influences such as running-in or setting behavior over time. Calibration may be required.

Safety instructions

- During and shortly after operation, there is a risk of burning on the axial piston unit and especially on the solenoids. Take the appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. contaminated hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk.
  The machine/system manufacturer must test whether remedial measures are needed on the machine for the application concerned in order to bring the driven consumer into a safe position (e.g. safe stop) and ensure any measures are properly implemented.
- In certain conditions, moving parts in high-pressure relief valves might get stuck in an undefined position due to contamination (e.g. contaminated hydraulic fluid). This can result in restriction or loss of load-holding functions in lifting winches.
  Therefore it is the machine and/or system manufacturers responsibility to make sure that the load can always be put in a safe mode if needed. Also, he needs to ensure that these measures are properly implemented.
- When using the axial piston motor in winch drives, make certain that the technical limit values are not exceeded under all operating conditions.
  If the axial piston motor is extremely overloaded (e.g. if the maximum permissible rotational speeds are exceeded during weighing of the anchor while the ship is in motion), the rotary group may be damaged and, in the worst case, the axial piston motor may burst.
  The machine manufacturer/system manufacturer is to undertake additional measures, up to and including encapsulation.

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