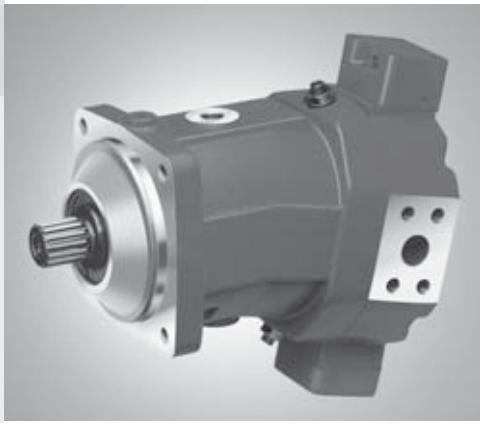
Rexroth
Bosch Group

Axial Piston Variable Motor A6VM

RE 91604/01.07 1/76
Replaces: 05.06

Technical data sheet



Series 6

Sizes	Nominal pressure/Peak pressure
28-200	400 bar/450 bar
250-1000	350 bar/400 bar

Open and closed circuits

Contents

Features

- Variable motor with axial tapered piston rotary group of bent axis design, for hydrostatic drives in open and closed circuits
- For use in mobile and stationary application areas
- The wide control range enables the variable motor to satisfy the requirement for high speed and high torque.
- The displacement is infinitely variable from $V_{g\,max}$ to $V_{g\,min} = 0$.
- The output speed is dependent on the flow of the pump and the displacement of the motor.
- The output torque increases with the pressure differential between the high and low pressure sides and with increasing displacement.
- Wide control range with hydrostatic transmission
- Wide selection of control devices
- Cost savings through elimination of gear shifts and possibility of using smaller pumps
- Compact, robust bearing system with long service life
- High power density
- Good starting characteristics
- Low moment of inertia

Ordering code / Standard program

	A6V		M					/	63	W		–	V								–	
01	02	03	04	05	06	07	08		09	10	11		12	13	14	15	16	17	18	19		20

Hydraulic fluid

01	Mineral oil and HFD. HFD for sizes 250 to 1000 only in combination with long-life bearing "L" (without code)		
	HFB, HFC hydraulic fluid	Sizes 28 to 200 (without code)	
		Sizes 250 to 1000 (only in combination with long-life bearing "L")	**E**

Axial piston unit

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

Drive shaft bearing

		28...200	250	355	500	1000	
03	Standard bearing (without code)	●	●	●	●	–	
	Long-life bearing	–	●	●	●	●	**L**

Operation mode

04	Motor (plug-in-motor A6VE see RE 91606)	**M**

Size

05	≈ Displacement $V_{g\,max}$ in cm³	**28**	**55**	**80**	**107**	**140**	**160**	**200**	**250**	**355**	**500**	**1000**	

Control device

			28	55	80	107	140	160	200	250	355	500	1000	
06	Hydraulic control, pilot-pressure related	Δp = 10 bar	●	●	●	●	●	●	●	●	●	●	●	**HD1**
		Δp = 25 bar	●	●	●	●	●	●	●	●	●	●	●	**HD2**
		Δp = 35 bar	–	–	–	–	–	–	–	●	●	●	●	**HD3**
	Hydraulic two-point control		–	–	–	–	–	–	–	●	●	●	●	**HZ**
			●	–	–	–	●	●	●	–	–	–	–	**HZ1**
			–	●	●	●	–	–	–	–	–	–	–	**HZ3**
	Electric control, proportional	12V	●	●	●	●	●	●	●	●	●	●	●	**EP1**
		24V	●	●	●	●	●	●	●	●	●	●	●	**EP2**
	Electric two-point control	12V	●	–	–	–	●	●	●	●	●	●	●	**EZ1**
		24V	●	–	–	–	●	●	●	●	●	●	●	**EZ2**
		12V	–	●	●	●	–	–	–	–	–	–	–	**EZ3**
		24V	–	●	●	●	–	–	–	–	–	–	–	**EZ4**
	Automatic control, high-pressure related	Without pressure increase	●	●	●	●	●	●	●	●	●	●	●	**HA1**
		With pressure increase Δp = 100 bar	●	●	●	●	●	●	●	●	●	●	●	**HA2**
	Hydraulic control, speed related													
	p_{St}/p_{HD} = 3/100,	Hydraulic travel direction valve	–	–	–	–	–	–	–	●	●	●	❍	**DA**
	p_{St}/p_{HD} = 5/100,	Hydraulic travel direction valve	●	●	●	●	●	●	●	–	–	–	–	**DA1**
		Electric travel direction valve + electric $V_{g\,max}$ circuit 12V	●	●	●	●	●	●	●	–	–	–	–	**DA2**
		Electric travel direction valve + electric $V_{g\,max}$ circuit 24V	●	●	●	●	●	●	●	–	–	–	–	**DA3**
	p_{St}/p_{HD} = 8/100,	Hydraulic travel direction valve	●	●	●	●	●	●	●	–	–	–	–	**DA4**
		Electric travel direction valve + electric $V_{g\,max}$ control 12V	●	●	●	●	●	●	●	–	–	–	–	**DA5**
		Electric travel direction valve + electric $V_{g\,max}$ control 24V	●	●	●	●	●	●	●	–	–	–	–	**DA6**

Pressure control (only for HD, EP)

			28	55	80	107	140	160	200	250	355	500	1000	
07	Without pressure control (without code)		●	●	●	●	●	●	●	●	●	●	●	
	Pressure control,	Direct	●	●	●	●	●	●	●	●	●	●	●	**D**
		Direct, with 2nd pressure setting	●	●	●	●	●	●	●	1)	1)	1)	1)	**E**
		Remote	–	–	–	–	–	–	–	●	●	●	●	**G**

Ordering code / Standard program

	A6V		M					/	63	W		–	V								–	
01	02	03	04	05	06	07	08		09	10	11		12	13	14	15	16	17	18	19		20

Overriding HA control (for HA1, HA2 only)

			28	55	80	107	140	160	200	250	355	500	1000	
08	Without override (without code)		●	●	●	●	●	●	●	●	●	●	●	
	Hydraulic override		●	●	●	●	●	●	●	●	●	●	●	T
	Electric override	12V	●	●	●	●	●	●	●	–	–	–	–	U1
		24V	●	●	●	●	●	●	●	–	–	–	–	U2
	Electric override + electric travel direction valve	12V	●	●	●	●	●	●	●	–	–	–	–	R1
		24V	●	●	●	●	●	●	●	–	–	–	–	R2

Series

09	Series 6, index 3	63

Direction of rotation

10	Viewed from shaft end, alternating	W

Setting range for displacement [2])

			28	55	80	107	140	160	200	250	355	500	1000	
11	$V_{g\,min} = 0$ to 0.8 $V_{g\,max}$ (without code)		●	●	●	●	●	●	●	–	–	–	–	
	$V_{g\,min} = 0$ to 0.4 $V_{g\,max}$	$V_{g\,max} = V_{g\,max}$ to 0.8 $V_{g\,max}$	–	–	–	–	–	–	–	●	●	●	●	1
	$V_{g\,min} > 0.4$ $V_{g\,max}$ to 0.8 $V_{g\,max}$	$V_{g\,max} = V_{g\,max}$ to 0.8 $V_{g\,max}$	–	–	–	–	–	–	–	●	●	●	●	2

Seals

12	FKM (fluor-caoutchouc)	V

Shaft end

		28	55	80	107	140	160	200	250	355	500	1000	
13	Splined shaft DIN 5480	●	●	●	●	–	●	●	–	–	–	–	A
		●	●	●	●	●	●	–	●	●	●	●	Z
	Parallel keyed shaft DIN 6885	–	–	–	–	–	–	–	●	●	●	●	P

Mounting flange

		28	55	80	107	140	160	200	250	355	500	1000	
14	4-hole – ISO 3019-2	●	●	●	●	●	●	●	●	–	–	–	B
	8-hole – ISO 3019-2	–	–	–	–	–	–	–	–	●	●	●	H

Service line port [3])

				28	55	80	107	140	160	200	250	355	500	1000	
15	SAE flange ports A/B, rear	01	0	●	●	●	●	●	●	●	●	●	●	●	010
			7	●	●	●	●	●	●	●	●	●	●	●	017
	SAE flange ports A/B side, opposite	02	0	●	●	●	●	●	●	●	●	●	●	●	020
			7	●	●	●	●	●	●	●	●	●	●	●	027
	Port plate for mounting a counterbalance valve on request	08	0	–	–	–	–	–	–	–	❍	–	–	–	080
	SAE flange ports A/B side, opposite + rear	15	0	–	–	–	–	–	–	–	●	●	●	●	150
	Port plate with pressure-relief valves,	37	0	–	–	–	●	–	–	–	–	–	–	–	370
	For mounting a counterbalance valve [4]) [5])	38	0	–	●	●	●	●	●	–	–	–	–	–	380

Valves

Without valve	0
With flush and boost pressure valve	7

Ordering code / Standard program

	A6V		M					/	63	W		–	V							–	
01	02	03	04	05	06	07	08		09	10	11		12	13	14	15	16	17	18	19	20

	Speed measurement	28	55	80	107	140	160	200	250	355	500	1000	
16	Without speed measurement (without code)	●	●	●	●	●	●	●	●	●	●	●	
	Prepared for speed measurement (ID) [6]	●	●	●	●	●	●	●	–	–	–	–	D
	Prepared for speed measurement (HDD) [6]	–	●	●	●	●	●	●	●	❍	❍	❍	F

	Swivel angle indicator	28	55	80	107	140	160	200	250	355	500	1000	
17	Without swivel angle indicator (without code)	●	●	●	●	●	●	●	●	●	●	–	
	With optical swivel angle indicator	–	–	–	–	–	–	–	●	●	●	●	V
	With electric swivel angle indicator	–	–	–	–	–	–	–	●	●	●	●	E

	Connector for solenoids (only sizes 28 to 200) [7]	EP1/2	EZ1/2	EZ3/4	HA.U.	HA.R.[8]	DA.	
18	DEUTSCH - molded connector, 2-pin – without suppressor diode	●	●	❍	❍	●	●	P
	DEUTSCH - molded connector, 2-pin – with suppressor diode	–	❍	–	–	–	❍	Q
	HIRSCHMANN - connector – without suppressor diode	▲	▲	▲	▲	▲	▲	H

	Start of control	28	55	80	107	140	160	200	250	355	500	1000	
19	At $V_{g\,min}$ (standard for HA)	●	●	●	●	●	●	●	●	●	●	●	A
	At $V_{g\,max}$ (standard for HD, HZ, EP, EZ, DA)	●	●	●	●	●	●	●	●	●	●	●	B

	Standard / special version		
20	Standard version	(without code)	
		With attachment part	-K
	Special version		-S
		With attachment part	-SK

1) Supplied as standard with version D (sizes 250 to 1000)
2) Please specify precise setting for $V_{g\,min}$ and $V_{g\,max}$ in plain text when ordering: $V_{g\,min}$ = ... cm^3, $V_{g\,max}$ = ... cm^3
3) Metric fixing thread
4) Only possible in combination with HD, EP, HA control
5) Complete order recommended, counterbalance valve pages 68...70
6) Complete order recommended, speed sensor page 72...73
7) The HIRSCHMANN DIN connector is only standard with sizes 250 to 1000 (without code)
8) With HA.R1 and HA.R2 for the 2nd solenoid (ø 45), the version with DEUTSCH molded connector is available on request.

● = available ❍ = on request ▲ = not for new projects – = not available

= preferred program

Technical data

Hydraulic fluid

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

The variable motor A6VM is unsuitable for operation with HFA. If HFB, HFC and HFD or environmentally acceptable hydraulic fluids are being used, the limitations regarding technical data and seals mentioned in RE 90221 and RE 90223 must be observed.

When ordering, please indicate the used hydraulic fluid.

Operating viscosity range

For optimum efficiency and service life, select an operating viscosity (at operating temperature) within the optimum range of

ν_{opt} = optimum operating viscosity 16 to 36 mm²/s

depending on the circuit temperature (closed circuit) and tank temperature (open circuit).

Limits of viscosity range

The limiting values for viscosity are as follows:

Sizes 28 to 200:

ν_{min} = 5 mm²/s,
short-term (t < 3 min)
at max. perm. temperature of t_{max} = +115°C.

ν_{max} = 1600 mm²/s,
short-term (t < 3 min)
at cold start (p ≤ 30 bar, n ≤ 1000 rpm, t_{min} = -40°C)
Only for starting up without load. Optimum operating viscosity must be reached within approx. 15 minutes.

Sizes 250 to 1000:

ν_{min} = 10 mm²/s,
short-term (t < 3 min)
at max. perm. temperature of t_{max} = +90°C.

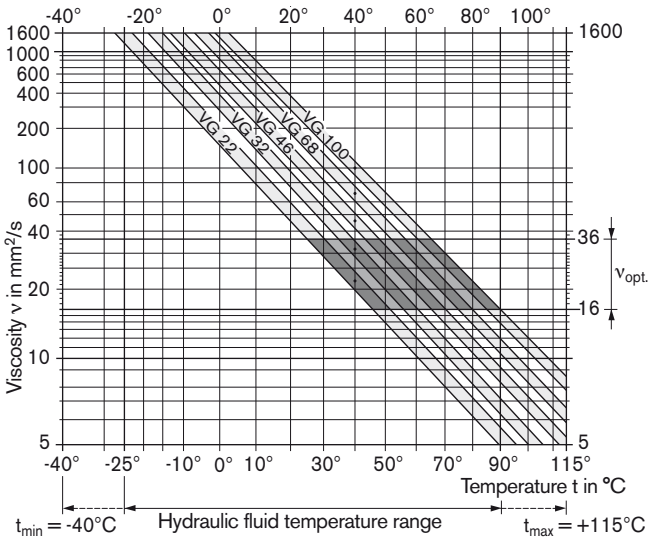
ν_{max} = 1000 mm²/s,
short-term (t < 3 min)
at cold start (p ≤ 30 bar, n ≤ 1000 rpm, t_{min} = -25°C).
Only for starting up without load. Optimum operating viscosity must be reached within approx. 15 minutes.

Note that the maximum hydraulic fluid temperature of 115°C must not be exceeded locally either (e.g. in the bearing area). The temperature in the bearing area is - depending on pressure and speed - up to 12 K higher than the average case drain temperature.

Special measures are necessary in the temperature range from -40°C and -25°C (cold start phase), please contact us.

For detailed information about use at low temperatures, see RE 90300-03-B.

Selection diagram



Details regarding the choice of hydraulic fluid

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

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

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

Please note:
The case drain temperature, which is affected by pressure and speed, is always higher than the control temperature or tank temperature. At no point in the system may the temperature be higher than 115°C for sizes 28 to 200 or 90°C for sizes 250 to 1000.

If the above conditions cannot be maintained due to extreme operating parameters, we recommend flushing the case at port U or using a flush and boost pressure valve (see pages 66-67).

Technical data

Filtration

The finer the filtration, the higher the cleanliness level of the hydraulic fluid and the longer the service life of the axial piston unit.

To ensure functional reliability of the axial piston unit, the hydraulic fluid must have a claenliness level of at least

20/18/15 according to ISO 4406.

At very high hydraulic fluid temperatures (90°C to max. 115°C) at least cleanliness level

19/17/14 according to ISO 4406 is required.

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

Operating pressure range

Maximum pressure on port A or B
(pressure data in accordance with DIN 24312)

for sizes 28 to 200

Nominal pressure p_N _____ 400 bar
Peak pressure p_{max} _____ 450 bar
Total pressure (pressure A + pressure B) p_{max} _____ 700 bar

for sizes 250 to 1000

Nominal pressure p_N _____ 350 bar
Peak pressure p_{max} _____ 400 bar
Total pressure (pressure A + pressure B) p_{max} _____ 700 bar

Please note:
Sizes 28 to 200: With shaft end **Z**, a nominal pressure of $p_N = 315$ bar is permissible for drives with radial loading of the drive shaft (pinions, V-belts)!
Sizes 250 to 1000: Please contact us.

In cases of pulsating loading above 315 bar, we recommend the version with splined shaft A (sizes 28 to 200) or with splined shaft Z (sizes 250 to 1000).

Direction of flow

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

Speed range

No limit to minimum speed n_{min}. If uniformity of motion is required, speed n_{min} must not be less than 50 rpm. See table of values on page 6 for maximum speed.

Long-Life bearing (sizes 250 to 1000)

For long service life and use with HF hydraulic fluids. Same external dimensions as motor with standard bearing. A long-life bearing can be specified. Flushing of bearing and case via port U recommended.

Flushing volumes (recommended)

Size	250	355	500	1000
$q_{v\ flush}$ (l/min)	10	16	16	16

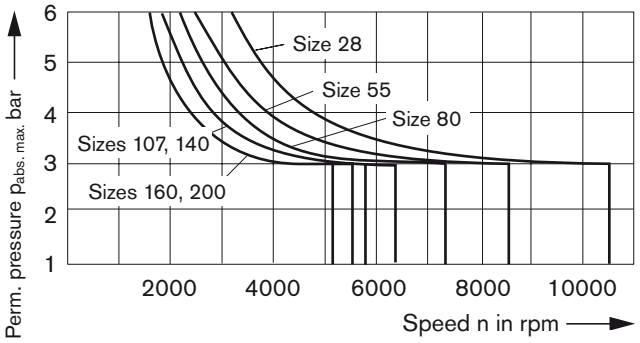
Shaft seal ring

Permissible pressure load

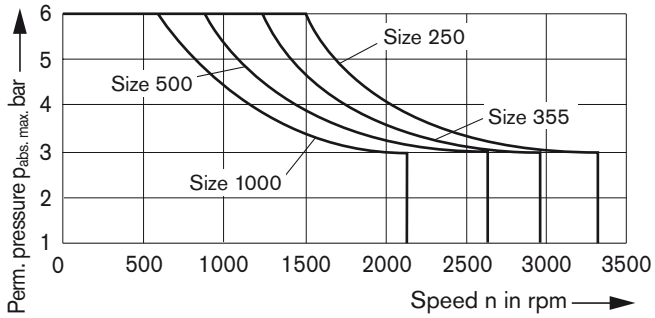
The service life of the shaft seal ring is affected by the speed of the motor and the case drain pressure. It is recommended that the average, continuous case drain pressure at operating temperature 3 bar absolute not be exceeded (max. permissible case drain pressure 6 bar absolute at reduced speed, see diagram). Short term ($t < 0.1$ s) pressure spikes of up to 10 bar absolute are permitted. The service life of the shaft seal ring decreases with an increase in the frequency of pressure spikes.

The case pressure must be equal to or greater than the external pressure on the shaft seal ring.

Sizes 28 to 200



Sizes 250 to 1000



Temperature range

The FKM shaft seal ring is permissible for case temperatures of -25°C to +115°C for sizes 28 to 200 and
-25°C to +90°C for sizes 250 to 1000

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

Effect of case pressure on start of control

An increase in the case pressure has an effect on the following controls when control of the variable motor begins:

HA1T (sizes 28 to 200) _____ increase
HD, EP, HA, HA.R, HA.U, HA.T (sizes 250 to 1000) __ increase
DA _____ decrease

The start of control is adjusted in the factory at a case pressure of $p_{abs} = 2$ bar for sizes 28 to 200 and $p_{abs} = 1$ bar for sizes 250 to 1000.

Technical data

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

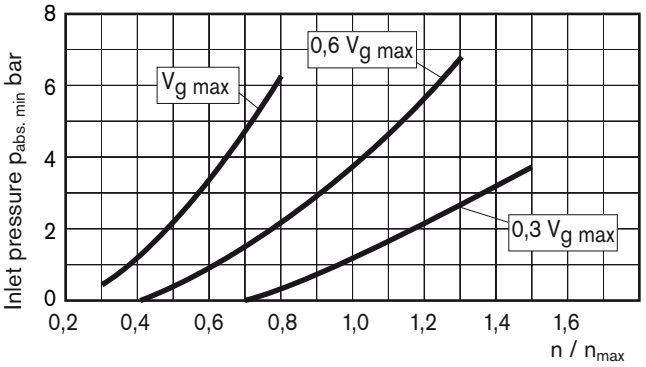
Size		Size	28	55	80	107	140	160	200	250	355	500	1000
Displacement [1]	$V_{g\,max}$	cm^3	28.1	54.8	80	107	140	160	200	250	355	500	1000
	$V_{g\,0}$	cm^3	0	0	0	0	0	0	0	0	0	0	0
Max. speed (while adhering to max. permitted flow)	n_{max} at $V_{g\,max}$	rpm	5550	4450	3900	3550	3250	3100	2900	2700	2240	2000	1600
	n_{max1} at $V_{g1} < V_{g\,max}$	rpm	8750	7000	6150	5600	5150	4900	4600	3600	2950	2650	2100
	$V_g = 0.63 \times V_{g\,max}$	cm^3	18	35	51	68	88	101	126	188 [2]	270 [2]	377 [2]	762 [2]
	$n_{max\,0}$ at $V_{g\,0}$	rpm	10450	8350	7350	6300	5750	5500	5100	3600	2950	2650	2100
Max. flow	$q_{V\,max}$	l/min	156	244	312	380	455	496	580	675	795	1000	1600
Max. torque	T_{max} at $V_{g\,max}$ [3]	Nm	179	349	509	681	891	1019	1273	1391	1978	2785	5571
Rotary stiffness		Nm/°	360	700	1150	1560	2095	2320	2910	3733	5092	8228	18753
Moment of inertia (of the turning parts)	J	kgm^2	0.0014	0.0042	0.0080	0.0127	0.0207	0.0253	0.0353	0.061	0.102	0.178	0.550
Filling capacity	V	L	0.5	0.75	1.2	1.5	1.8	2.4	2.7	3.0	5.0	7.0	16.0
Mass (approx.)	m	kg	16	26	34	47	60	64	80	90	170	210	430

[1]) the minimum and maximum displacements are infinitely variable, see ordering code on page 2.
(default setting for sizes 250 to 1000 unless specified in the order: $V_{g\,min} = 0.2 \bullet V_{g\,max}$, $V_{g\,max} = V_{g\,max}$).

[2]) $V_g = 0{,}75 \times V_{g\,max}$ (appr.)

[3]) sizes 28 to 200: $\Delta p = 400$ bar; sizes 250 to 1000: $\Delta p = 350$ bar

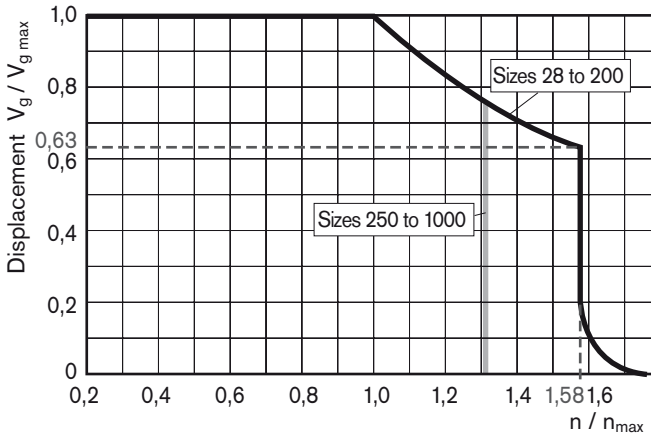
Minimum inlet pressure on service line port A(B)



To prevent damage to the variable motor, there must be a minimum inlet pressure in the inlet area. The minimum inlet pressure is dependent on the speed and swivel angle (displacement) of the variable motor.

Please contact us if these conditions cannot be satisfied.

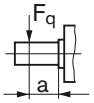
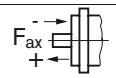
Permissible displacement in relation to speed



Technical data

Permissible radial and axial loading on the drive shaft

The specified values are maximum values and do not apply to continuous operation.

Size			Size	28	55	80	107	140	160	200	250	355	500	1000
Radial force, max.[1] at distance a (from shaft collar)		$F_{q\,max}$	N	5696	10440	13114	15278	17808	20320	22896	1200[2]	1500[2]	1900[2]	2600[2]
		a	mm	12.5	15	17.5	20	22.5	22.5	25	41	52.5	52.5	67.5
Axial force, max.[3]		$-F_{ax\,max}$	N	315	500	710	900	1030	1120	1250	1200	1500	1900	2600
		$+F_{ax\,max}$	N	315	500	710	900	1030	1120	1250	4000	5000	6250	10000
Permissible axial force/bar operating pressure		$-F_{ax\,per.}$/bar	N/bar	4.6	7.5	9.6	11.3	13.3	15.1	17.0	[4]	[4]	[4]	[4]

[1] during intermittent operation (sizes 28 to 200).
[2] when at a standstill or when axial piston unit operating in depressurized condition. Higher forces are permissible when under pressure. Please contact us.
[3] max. permissible axial force when at a standstill or when axial piston unit operating in depressurized condition.
[4] please contact us.

When considering the permissible axial force, the force-transfer direction must be taken into account.

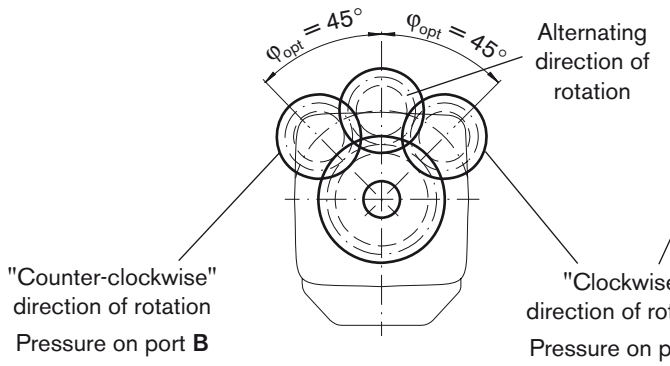
$-F_{ax\,max}$ = increase in service life of bearings

$+F_{ax\,max}$ = reduction in the service life of bearings (avoid)

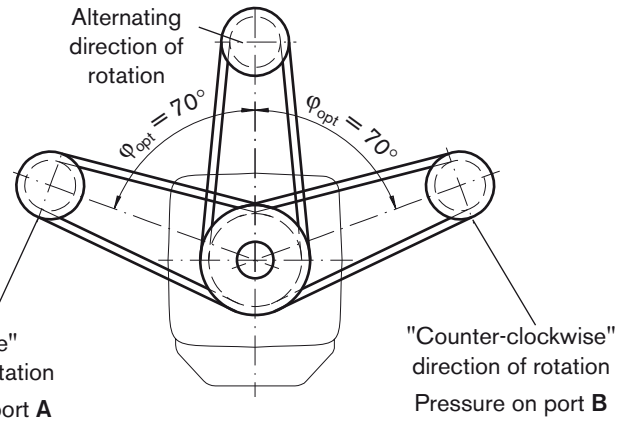
Effect of radial force F on the service life of bearings

By selecting a suitable force-transfer direction of F_q, the stress on the bearings caused by the internal transmission forces can be reduced, thus achieving the optimum service life of the bearings. Recommended position of mating gear is dependent on direction of rotation. Examples:

Toothed gear drive



V-belt drive



Determining the size

Flow $q_v = \dfrac{V_g \cdot n}{1000 \cdot \eta_v}$ l/min

Speed $n = \dfrac{q_V \cdot 1000 \cdot \eta_v}{V_g}$ rpm

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

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

V_g = Displacement per revolution in cm^3
Δp = Differential pressure in bar
n = Speed in rpm
η_v = Volumetric efficiency
η_{mh} = Mechanical-hydraulic efficiency
η_t = Overall efficiency

HD - Hydraulic control, pilot-pressure related

The pilot-pressure related hydraulic control permits infinite control of the displacement according to the pilot-pressure signal. The displacement is proportional to the pilot pressure applied to port X.

Standard configuration:

– Start of control at $V_{g\,max}$ (max. torque, min. speed)

– End of control at $V_{g\,min}$ (min. torque, max. permitted speed)

Please note:

– Maximum permissible pilot pressure: 100 bar

– For reliable control, an operating pressure of at least 30 bar is necessary in A (B). If a control operation is performed at an operating pressure < 30 bar, an auxiliary pressure of at least 30 bar must be applied at port G via an external check valve. Lower pressures may be adequate in individual cases.

– Please state the desired start of control in plain text when ordering, e.g.: start of control at 10 bar.

The following only applies to sizes 250 to 1000:

– The start of control and the HD characteristic are influenced by the case pressure. An increase in the case pressure causes an increase in the start of control and thus a parallel displacement of the characteristic (see page 6).

– Fluid escapes from port X at the rate of max. 0.3 l/min due to internal leakage (operating pressure > pilot pressure). To prevent a build-up in pilot pressure, port X must be vented to tank.

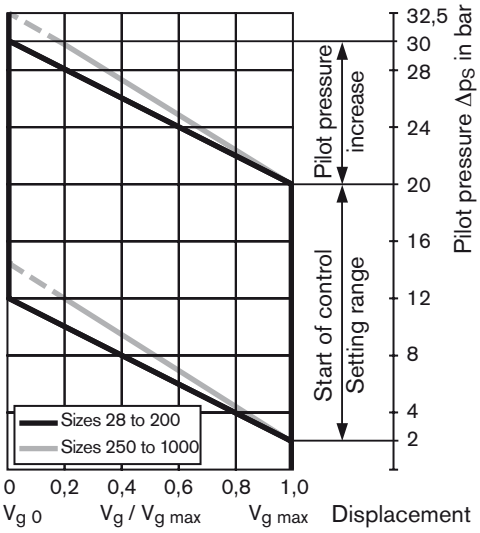
HD1 pilot pressure increase $\Delta p_S = 10$ bar

An increase in pilot pressure of 10 bar on port X causes a reduction in the displacement from $V_{g\,max}$ to 0 cm^3 (sizes 28 to 200) or from $V_{g\,max}$ to 0.2 $V_{g\,max}$ (sizes 250 to 1000).

Start of control (setting range) _____ 2 – 20 bar

Default setting:
start of control at 3 bar (end of control at 13 bar)

Characteristic HD1



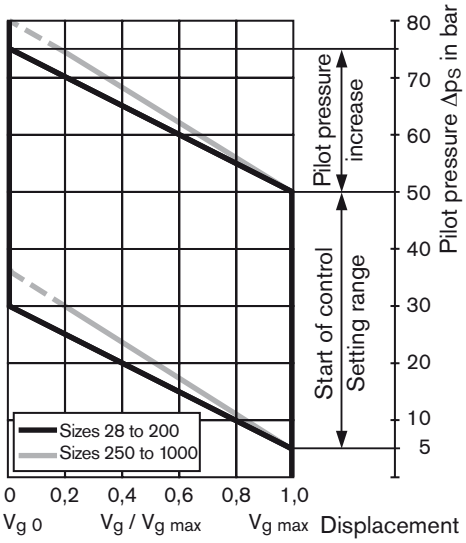
HD2 pilot pressure increase $\Delta p_S = 25$ bar

An increase in pilot pressure of 25 bar on port X causes a reduction in the displacement from $V_{g\,max}$ to 0 cm^3 (sizes 28 to 200) or from $V_{g\,max}$ to 0.2 $V_{g\,max}$ (sizes 250 to 1000).

Start of control, setting range _____ 5 – 50 bar

Default setting:
start of control at 10 bar (end of control at 35 bar)

Characteristic HD2



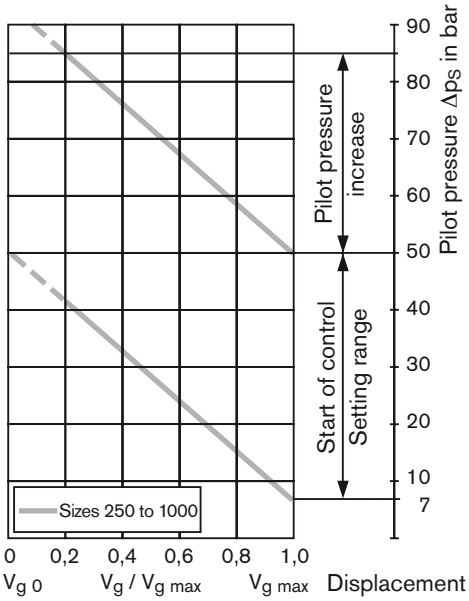
HD3 pilot pressure increase $\Delta p_S = 35$ bar

An increase in pilot pressure of 35 bar on port X causes a reduction in the displacement from $V_{g\,max}$ to 0.2 $V_{g\,max}$ (sizes 250 to 1000).

Start of control, setting range _____ 7 – 50 bar

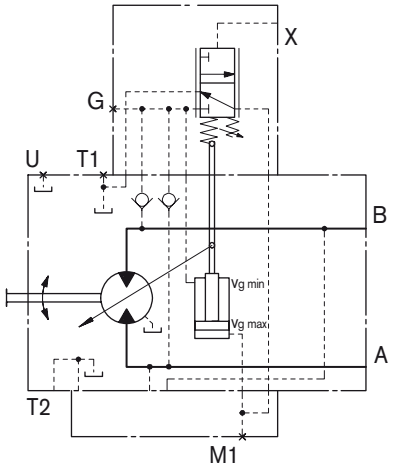
Default setting:
start of control at 10 bar (end of control at 45 bar)

Characteristic HD3

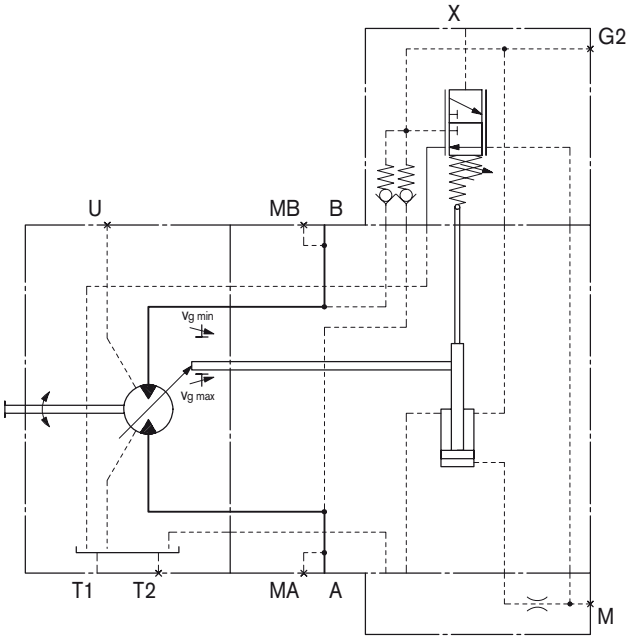


HD - Hydraulic control, pilot-pressure related

Circuit diagram HD1, HD2, HD3
Sizes 28 to 200



Sizes 250 to 1000



Note

The spring return in the control unit is not a security device.

The control spool and/or the positioning piston can be blocked in an undefined position by internal contamination – e.g. impure hydraulic fluid, abrasion or residual contamination from system components. As a result, the variable motor can no longer provide the speed and torque specified by the operator.

– Install an appropriate emergency-off function to ensure that the driven consumer can be brought to a safe position (e.g. immediate stop).

– Maintain the specified cleanliness level 20/18/15 (< 90°C) or 19/17/14 (> 90°C) in accordance with ISO 4406.

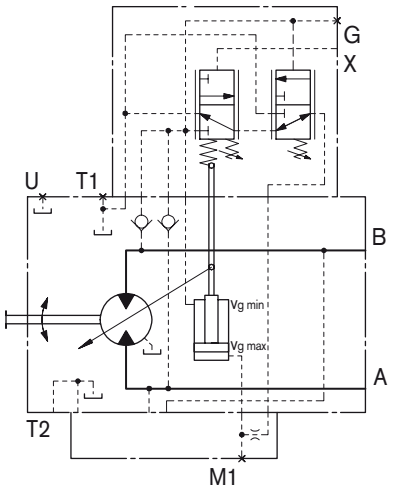
HD.D Pressure control, direct

The pressure control overlays the HD function. If the load increases, or a reduction in the swivel angle of the motor causes the system pressure to increase, the motor will start to swivel to a greater angle when the pressure reaches the setpoint value of the pressure control.

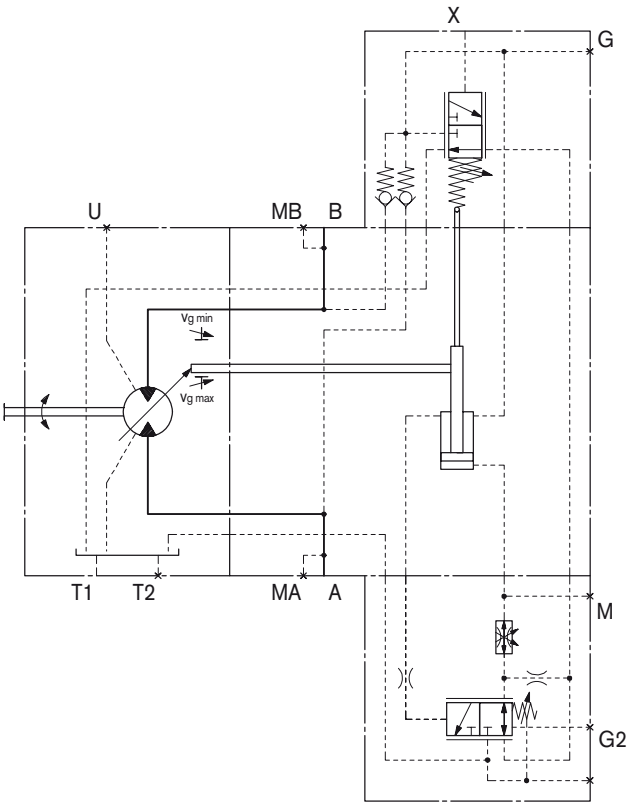
The increase in the displacement and the resulting reduction in pressure cause the control deviation to decrease. With the increase in displacement the motor develops more torque, while the pressure remains constant.

Setting range on the pressure control valve:
Sizes 28 to 200 _____ 80 – 400 bar
Sizes 250 to 1000 _____ 80 – 350 bar

Circuit diagram HD.D
Sizes 28 to 200



Sizes 250 to 1000



HD - Hydraulic control, pilot-pressure related

HD.E Pressure control, direct with 2nd pressure setting

Sizes 28 to 200

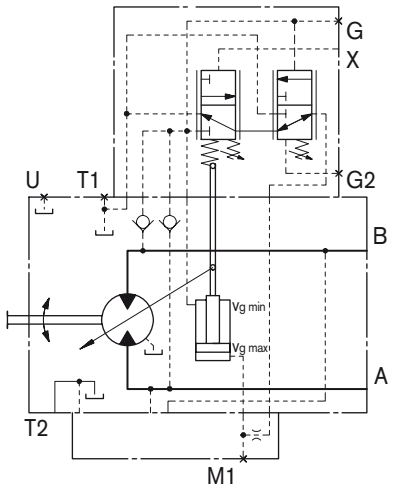
Connecting an external pilot pressure to port G2 allows the pressure controller setting to be over-ridden and a 2nd pressure setting to be used.

Required pilot pressure on port G2:

Sizes 28 to 200 _____ p_{St} = 20 – 50 bar

Please specify the 2nd pressure setting in plain text when ordering.

Circuit diagram HD.E
Sizes 28 to 200



Sizes 250 to 1000 (HD.D)

Pressure control with 2nd pressure setting provided as standard with HD.D (see page 10).

Connecting an external pilot pressure to port G2 allows the pressure controller setting to be over-ridden and a 2nd pressure setting to be used.

Required pilot pressure on port G2:

Sizes 250 to 1000 _____ p_{St} ≥ 100 bar

Please specify the 2nd pressure setting in plain text when ordering.

HD.G Pressure control, remote

Sizes 250 to 1000

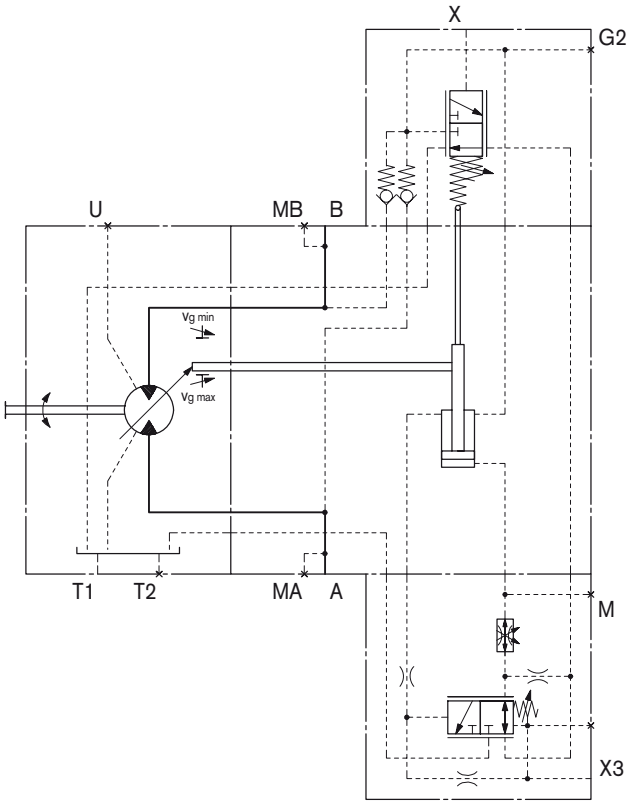
When the set pressure value is reached, the remote pressure control regulates the motor continuously up to the maximum displacement $V_{g\,max}$. A pressure-relief valve (not supplied) controls the internal pressure cut-off valve. The pressure-relief valve is separate from the motor and is connected to X3.
As long as operating pressure is below the set point of the external pressure-relief valve (80 – 350 bar), the pressure is equal on both sides of the internal pressure cut-off valve, and spring force keeps it closed. The external relief valve opens when the operating pressure exceeds the set point, and the pressure on the spring end of the pressure cut-off valve is reduced.
The pressure cut-off valve then modulates the motor displacement (i.e.-swivelling towards maximum displacement) to limit operating pressure.

The standard differential pressure setting of the internal pressure cut-off valve is 25 bar. We recommend the following for use as the external (i.e.-remote control) pressure-relief valve:

DBD 6 (hydraulic) according to RE 25402

The max. line length must not exceed 2 m.

Circuit diagram HD.G
Sizes 250 to 1000



HZ - Hydraulic two-point control

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

No pilot pressure ≙ position at $V_{g\,max}$

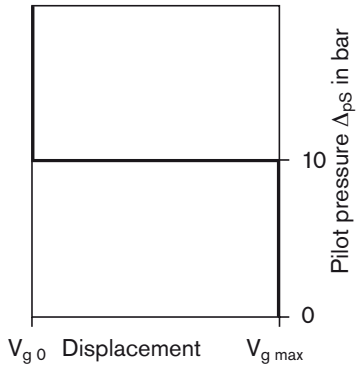
Pilot pressure switched (>10 bar) ≙ position at $V_{g\,min}$

Standard configuration:

– Start of control at $V_{g\,max}$ (max. torque, min. speed)

– End of control at $V_{g\,min}$ (min. torque, max. permitted speed)

Characteristic HZ



Please note:

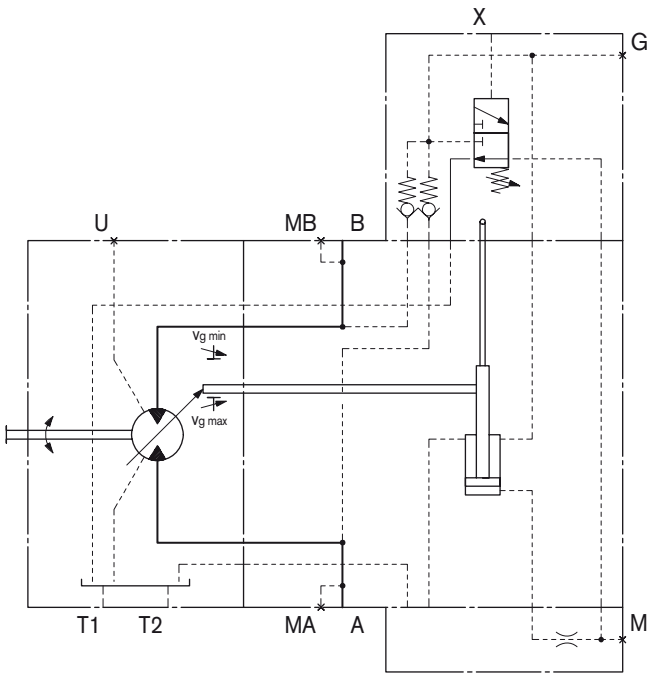
– Maximum permissible pilot pressure: 100 bar

– For reliable control, an operating pressure of at least 30 bar is necessary in A (B). If a control operation is performed at an operating pressure < 30 bar, an auxiliary pressure of at least 30 bar is to be applied at port G via an external check valve. Lower pressures may be adequate in individual cases.

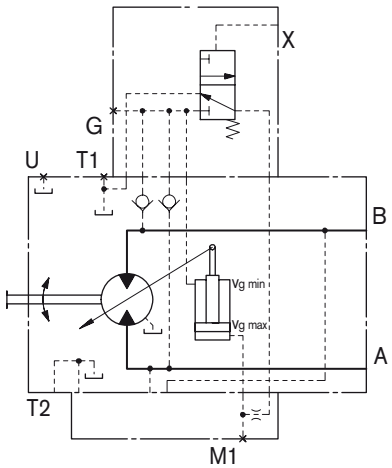
The following only applies to sizes 250 to 1000:

– Fluid escapes from port X at the rate of max. 0.3 l/min due to internal leakage (operating pressure > pilot pressure). To prevent a build-up in pilot pressure, port X must be vented to tank.

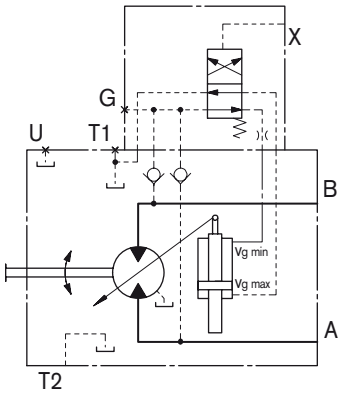
Circuit diagram HZ
Sizes 250 to 1000



Circuit diagram HZ1
Sizes 28, 140, 160, 200



Circuit diagram HZ3
Sizes 55, 80, 107



EP - Electric control with proportional solenoid

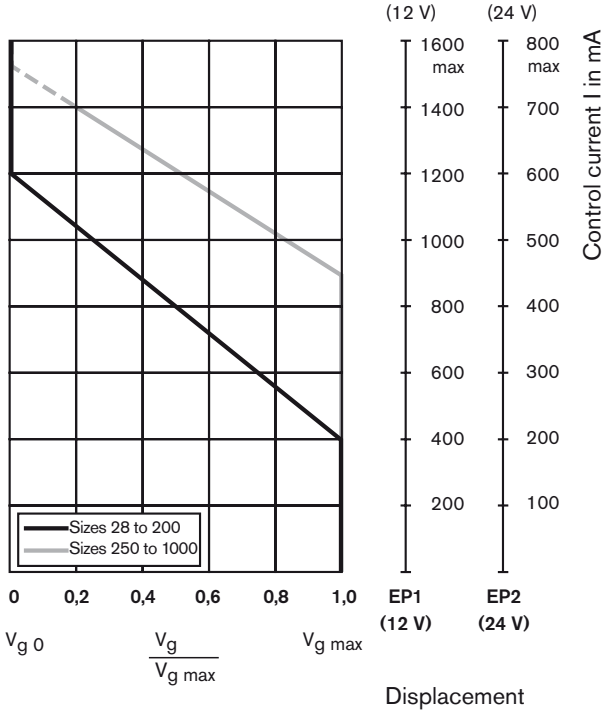
Electric control using a proportional solenoid (sizes 28 to 200) or proportional valve (sizes 250 to 1000) permits continuous control of the displacement according to an electric signal. The control is proportional to the applied electric control current. For sizes 250 to 1000, an external pressure of $p_{min} = 30$ bar is necessary for the control oil supply to port P ($p_{max} = 100$ bar).

Standard configuration:

– Start of control at $V_{g\,max}$ (max. torque, min. speed)

– End of control at $V_{g\,min}$ (min. torque, max. permitted speed)

Characteristic EP



Please note:

– For reliable control, an operating pressure of at least 30 bar is necessary in A (B). If a control operation is performed at an operating pressure < 30 bar, an auxiliary pressure of at least 30 bar is to be applied at port G via an external check valve. Lower pressures may be adequate in individual cases.

The following only applies to sizes 250 to 1000:

– The start of control and the EP characteristic are influenced by the case pressure. An increase in the case pressure causes an increase in the start of control and thus a parallel displacement of the characteristic (see page 6).

Technical data, solenoid for EP1, EP2
(sizes 28 to 200)

	EP1	EP2
Voltage	12 V (±20 %)	24 V (±20 %)
Control current		
Start of control at V_{gmax}	400 mA	200 mA
End of control at $V_{g\,min}$	1200 mA	600 mA
Limiting current	1.54 A	0.77 A
Nominal resistance (at 20°C)	5.5 Ω	22.7 Ω
Dither frequency	100 Hz	100 Hz
Actuated time	100 %	100 %
Type of protection	See connector design, page 73	

The following electronic controllers and amplifiers are available for controlling the proportional solenoids (sizes 28 to 200) (information is also available on the Internet at www.boschrexroth.com/mobile-electronics):

– **RC** BODAS controllers (RE 95200) and application software

– **RA** analog amplifier (RE 95230)

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

Technical data, proportional valve for EP1, EP2
(sizes 250 to 1000)

	EP1	EP2
Voltage	12 V (±20 %)	24 V (±20 %)
Control current		
Start of control at $V_{g\,max}$	900 mA	450 mA
End of control at $V_{g\,min}$	1400 mA	700 mA
Limiting current	2.2 A	1.0 A
Nominal resistance (at 20°C)	2.4 Ω	12 Ω
Actuated time	100 %	100 %
Type of protection	See connector design, page 73	

See also proportional pressure-reduction valve DRE 4K (RE 29 181).

Note

The spring return in the control unit is not a security device.

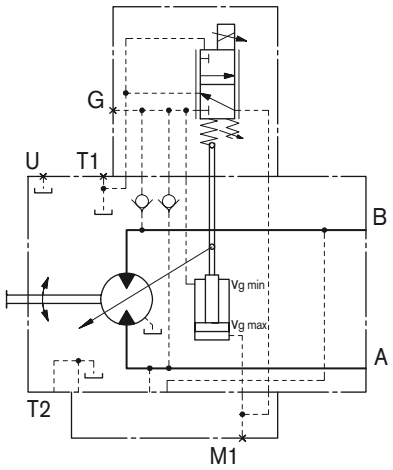
The control spool and/or the positioning piston can be blocked in an undefined position by internal contamination – e.g. impure hydraulic fluid, abrasion or residual contamination from system components. As a result, the variable motor can no longer provide the speed an torque specified by the operator.

– Install an appropriate emergency-off function to ensure that the driven consumer can be brought to a safe position (e.g. immediate stop).

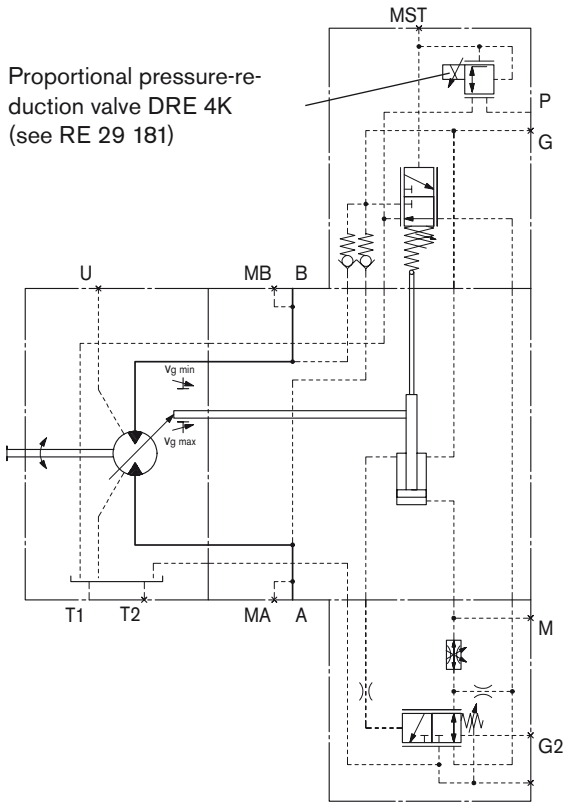
– Maintain the specified cleanliness level 20/18/15 (< 90°C) or 19/17/14 (> 90°C) in accordance with ISO 4406.

EP - Electric control with proportional solenoid

Circuit diagram EP1, EP2
Sizes 28 to 200



Sizes 250 to 1000



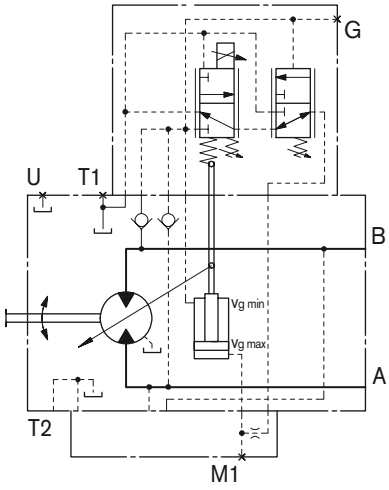
EP.D Electric control with pressure control, direct

The pressure control overlays the EP function. If the load increases or a reduction in the swivel angle of the motor causes the system pressure to increase, the motor will start to swivel to a greater angle when the pressure reaches the setpoint value of the pressure control.

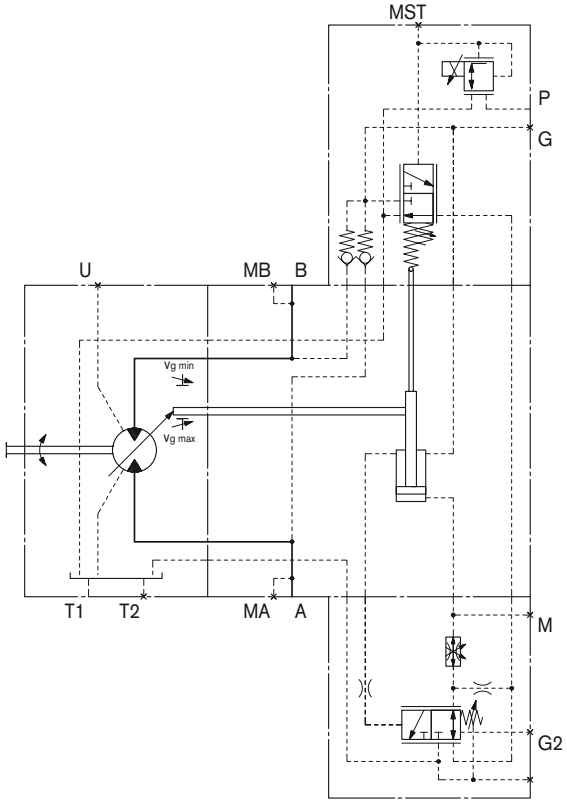
The increase in the displacement and the resulting reduction in pressure cause the control deviation to decrease. With the increase in displacement the motor develops more torque, while the pressure remains constant.

Setting range on the pressure-control valve:
Sizes 28 to 200 _____ 80 – 400 bar
Sizes 250 to 1000 _____ 80 – 350 bar

Circuit diagram EP.D
Sizes 28 to 200



Sizes 250 to 1000



EP - Electric control with proportional solenoid

EP.E Pressure control, direct with 2nd pressure setting

Sizes 28 to 200

Connecting an external pilot pressure to port G2 allows the pressure controller setting to be overridden and a 2nd pressure setting to be used.

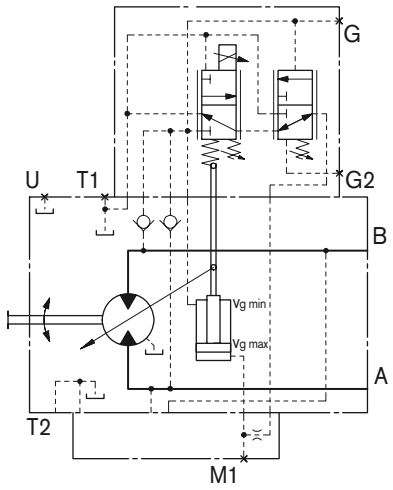
Required pilot pressure on port G2:

Sizes 28 to 200 _____ p_{St} = 20 – 50 bar

Please specify the 2nd pressure setting in plain text when ordering.

Circuit diagram EP.E

Sizes 28 to 200



Sizes 250 to 1000 (EP.D)

Pressure control with 2nd pressure setting provided as standard with EP.D (see control diagram, page 14).

Connecting an external pilot pressure to port G2 allows the pressure controller setting to be overridden and a 2nd pressure setting to be used.

Required pilot pressure on port G2:

Sizes 250 to 1000 _____ p_{St} ≥ 100 bar

Please specify the 2nd pressure setting in plain text when ordering.

EP.G Electric control with pressure control, remote

Sizes 250 to 1000

When the set pressure value is reached, the remote pressure control regulates the motor continuously up to the maximum displacement $V_{g\,max}$. A pressure-relief valve (not supplied) controls the internal pressure cut-off valve. The pressure-relief valve is separate from the motor and is connected to X3.
As long as operating pressure is below the set point of the external pressure-relief valve (80 – 350 bar), the pressure is equal on both sides of the internal pressure cut-off valve, and spring force keeps it closed. The external relief valve opens when the operating pressure exceeds the set point, and the pressure on the spring end of the pressure cut-off valve is reduced.
The pressure cut-off valve then modulates the motor displacement (i.e.-swivelling towards maximum displacement) to limit operating pressure.

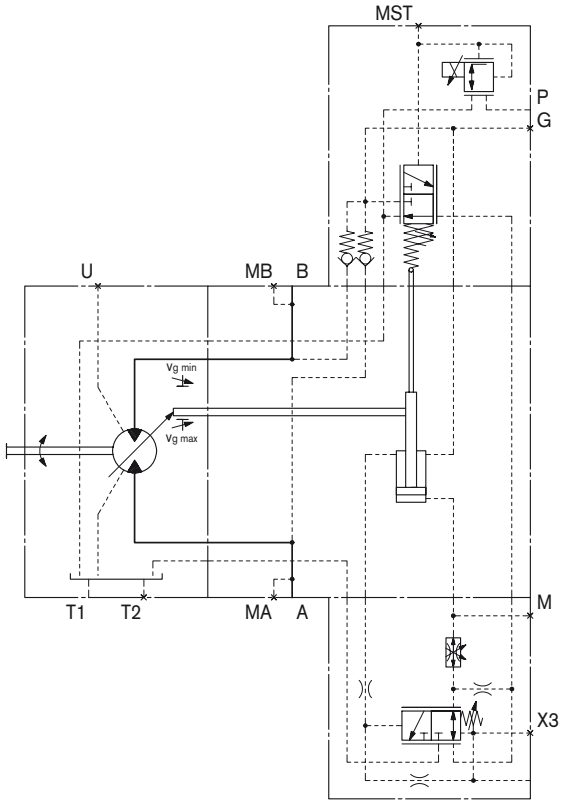
The standard differential pressure setting of the internal pressure cut-off valve is 25 bar. We recommend the following for use as the external (i.e.-remote control) pressure-relief valve:

DBD 6 (hydraulic) according to RE 25402

The max. line length must not exceed 2 m.

Circuit diagram EP.G

Sizes 250 to 1000



EZ - Electric two-point control, with switching solenoid

The electric control with switching solenoid (sizes 28 to 200) or switching valve (sizes 250 to 1000) permits setting the displacement to $V_{g\,max}$ or $V_{g\,min}$ by switching the electric current to the switching solenoid or switching valve on or off.

Please note:

– For reliable control, an operating pressure of at least 30 bar is necessary in A (B). If a control operation is performed at an operating pressure < 30 bar, an auxiliary pressure of at least 30 bar is to be applied at port G via an external check valve. Lower pressures may be adequate in individual cases.

Technical data, solenoid with EZ1, EZ2 with dia. 37
(sizes 28, 140, 160, 200)

	EZ1	EZ2
Voltage	12 V (±20 %)	24 V (±20 %)
Neutral 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 output	26.2 W	26.5 W
Active current, min. necessary	1.32 A	0.67 A
Actuated time	100 %	100 %
Type of protection	See connector design, page 73	

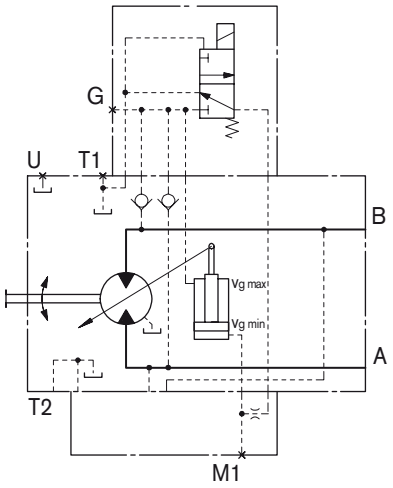
Technical data, solenoid with EZ3, EZ4 with dia. 45
(sizes 55, 80, 107)

	EZ3	EZ4
Voltage	12 V (±20 %)	24 V (±20 %)
Neutral position $V_{g\,max}$	de-energized	de-energized
Position $V_{g\,min}$	current switched on	current switched on
Nominal resistance (at 20°C)	4.8 Ω	19.2 Ω
Nominal output	30 W	30 W
Active current, min. necessary	1.5 A	0.75 A
Actuated time	100 %	100 %
Type of protection	See connector design, page 73	

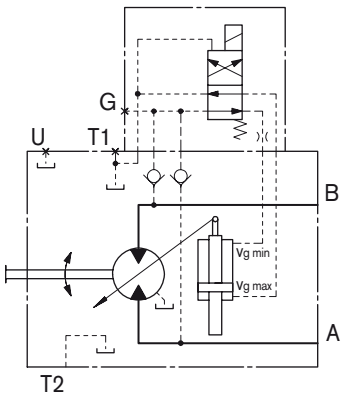
Technical data, switching valve with EZ1, EZ2
(sizes 250 to 1000)

	EZ1	EZ2
Voltage	12 V (±20 %)	24 V (±20 %)
Neutral position $V_{g\,max}$	de-energized	de-energized
Position $V_{g\,min}$	current switched on	current switched on
Nominal resistance (at 20°C)	6 Ω	23 Ω
Nominal output	26 W	26 W
Active current, min. necessary	2 A	1.04 A
Actuated time	100 %	100 %
Type of protection	See connector design, page 73	

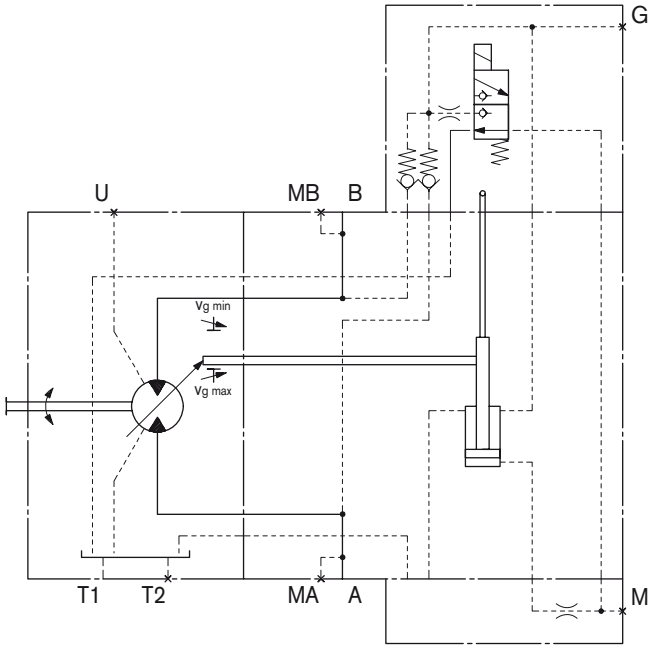
Circuit diagram EZ1, EZ2
Sizes 28, 140, 160, 200



Circuit diagram EZ3, EZ4
Sizes 55, 80, 107



Circuit diagram EZ1, EZ2
Sizes 250 to 1000



HA - Automatic control, high-pressure related

With the automatic high-pressure related control, the motor displacement is adjusted automatically depending on the operating pressure.

The control unit internally measures the operating pressure at A or B (no control line required) and, when the pressure reaches the set pressure value, the controller swivels the motor with increasing operating pressure from $V_{g\ min}$ to $V_{g\ max}$.

Standard configuration HA1, HA2:

Start of control at $V_{g\ min}$ (min. torque, max. speed)
End of control at $V_{g\ max}$ (max. torque, min. speed)

Please note:

- For safety reasons, winch drives are not permissible with start of control at $V_{g\ min}$ (standard for HA).
- For reliable control, an operating pressure of at least 30 bar is necessary in A (B). If a control operation is performed at an operating pressure < 30 bar, an auxiliary pressure of at least 30 bar is to be applied at port G via an external check valve. Lower pressures may be adequate in individual cases.
- The start of control and the HA characteristic are influenced by the case pressure. An increase in the case pressure causes an increase in the start of control and thus a parallel displacement of the characteristic. Only with HA1, HA2, HA.T, HA.R, HA.U (sizes 250 to 1000) and with HA1T (sizes 28 to 200), see page 5.

The following only applies to sizes 250 to 1000:

- Fluid escape from port X at the rate of 0.3 l/min due to internal leakage (operating pressure > pilot pressure). To prevent a build-up in pilot pressure, port X must be vented to tank. **Only with HA.T control.**

HA - automatic control, high-pressure related

HA1 Approximate without pressure increase

An increase in operating pressure of $\Delta p \leq 10$ bar causes an increase in the displacement from 0 cm^3 to $V_{g\,max}$ (sizes 28 to 200) or from 0.2 $V_{g\,max}$ to $V_{g\,max}$ (sizes 250 to 1000).

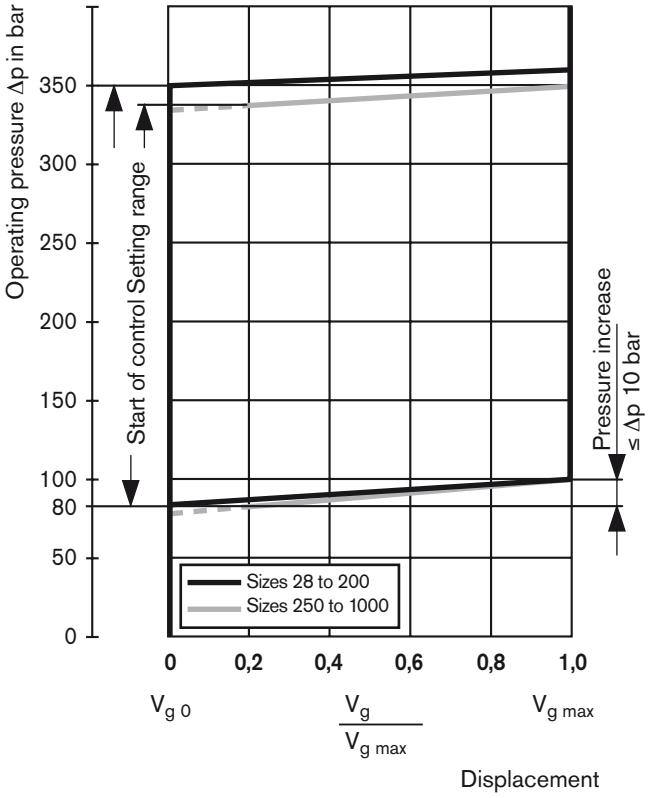
Start of control, setting range

Sizes 28 to 200 _____ 80 – 350 bar

Sizes 250 to 1000 _____ 80 – 340 bar

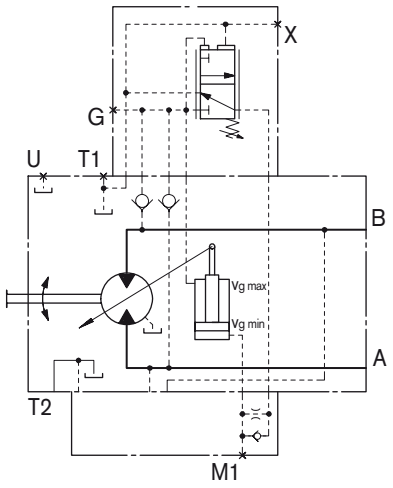
Please state the desired start of control in plain text when ordering, e.g.: start of control at 300 bar

Characteristic HA

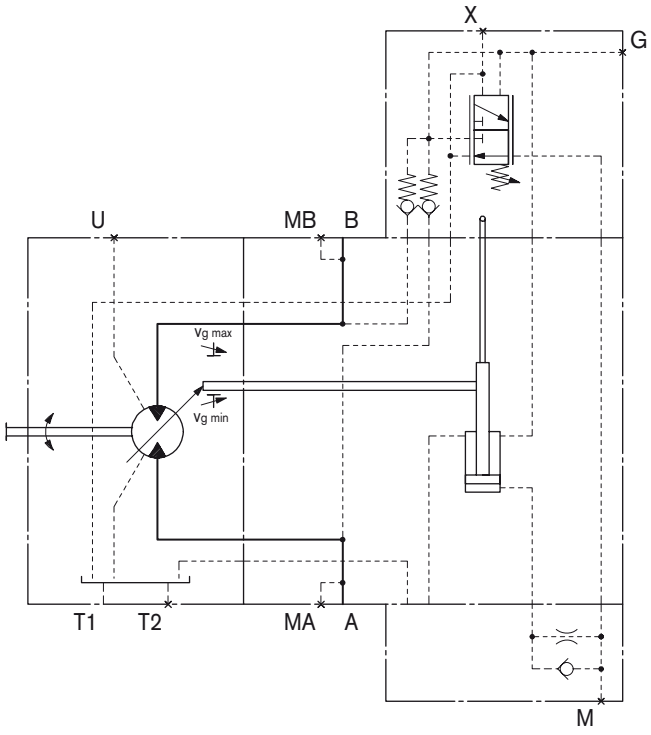


Circuit diagram HA1

Sizes 28 to 200



Sizes 250 to 1000



HA - Automatic control, high-pressure related

HA2 Pressure increase Δp = 100 bar

An increase in operating pressure of Δp = 100 bar causes an increase in the displacement from 0 cm^3 to $V_{g\,max}$ (sizes 28 to 200) or from 0.2 $V_{g\,max}$ to $V_{g\,max}$ (sizes 250 to 1000).

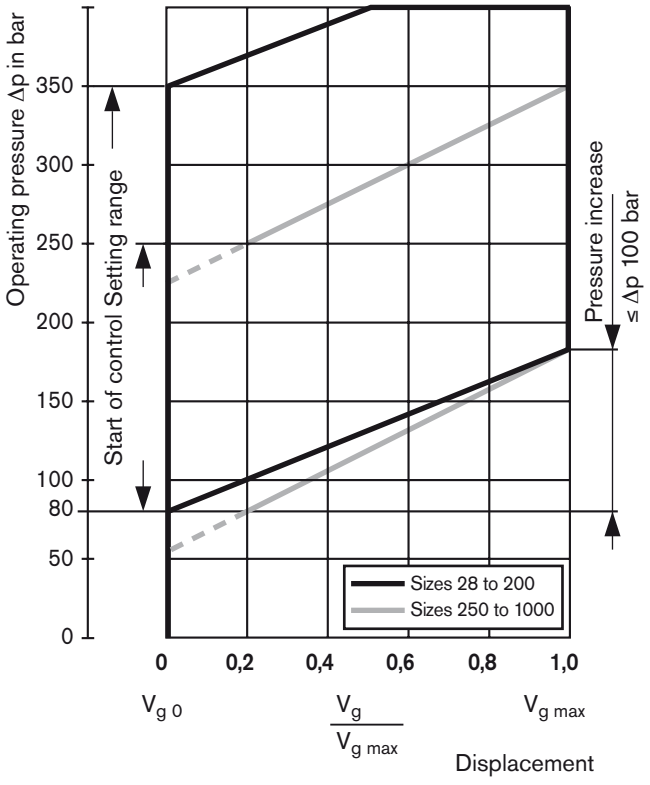
Start of control, setting range

Sizes 28 to 200 _____ 80 – 350 bar

Sizes 250 to 1000 _____ 80 – 250 bar

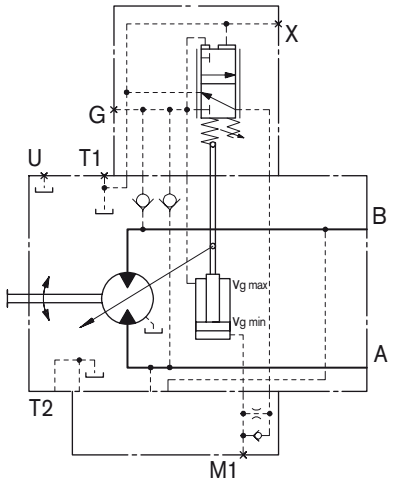
Please state the desired start of control in plain text when ordering, e.g.: start of control at 200 bar

Characteristic HA2

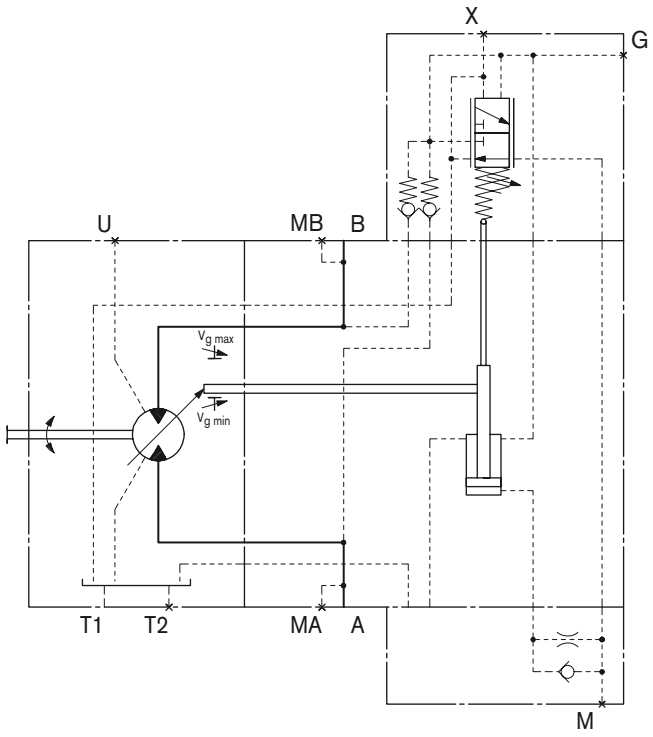


Circuit diagram HA2

Sizes 28 to 200



Sizes 250 to 1000



HA - Automatic control, high-pressure related (override)

HA.T Hydraulic override of pressure setting

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

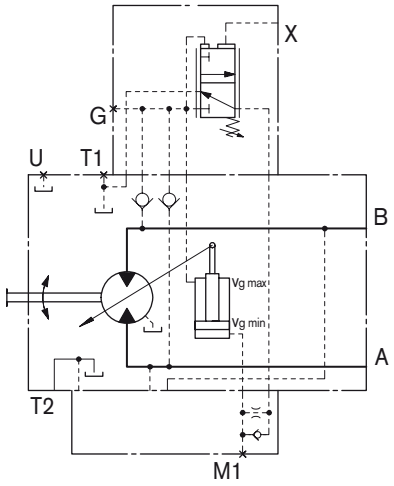
For each 1 bar of pilot pressure, the start of control is reduced by 17 bar for sizes 28 to 200 or 8 bar for sizes 250 to 1000.

Examples (sizes 28 to 200):

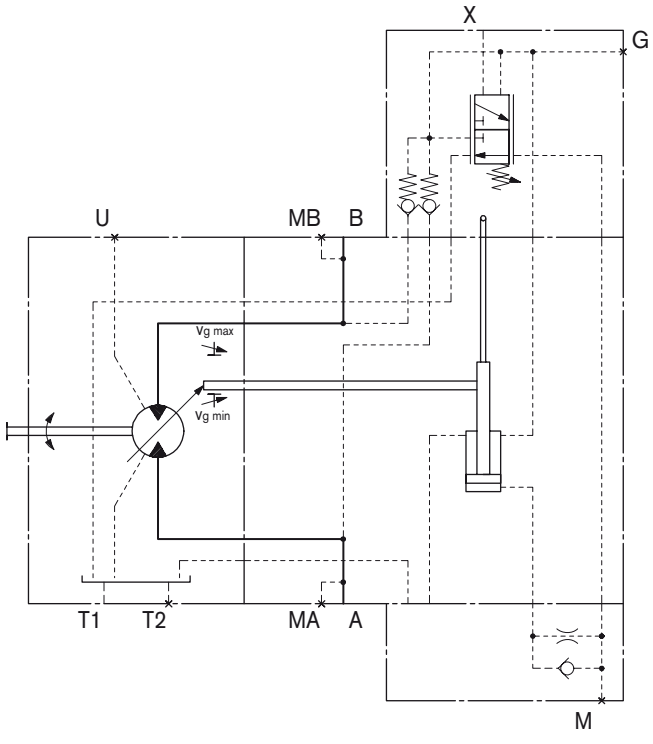
Start of control adjustment	300 bar	300 bar
Pilot pressure at port X	0 bar	10 bar
Start of control at	300 bar	130 bar

Note:
– Max. permissible pilot pressure 100 bar

Circuit diagram HA1.T
Sizes 28 to 200



Sizes 250 to 1000



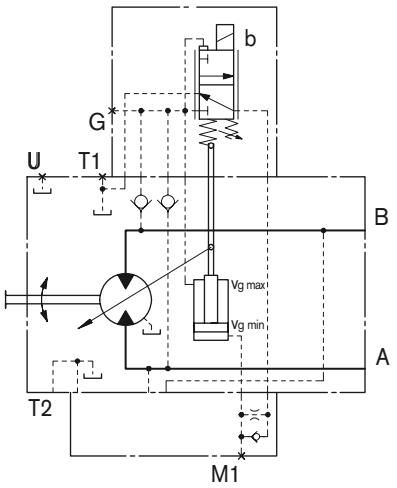
HA.U1, HA.U2 Electric override of pressure setting

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

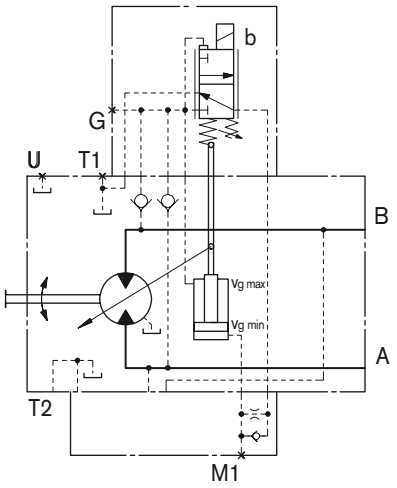
Technical data, solenoid b with dia. 45 (el. override)

	U1	U2
Voltage	12 V (±20 %)	24 V (±20 %)
No override	de-energized	de-energized
Position $V_{g\ max}$	current switched on	current switched on
Nominal resistance (at 20°C)	4.8 Ω	19.2 Ω
Nominal output	30 W	30 W
Active current, min. necessary	1.5 A	0.75 A
Actuated time	100 %	100 %
Type of protection	See connector design, page 73	

Circuit diagram HA1U1, HA1U2
Sizes 28 to 200



Circuit diagram HA2U1, HA2U2
Sizes 28 to 200



HA - Automatic control, high-pressure related (override)

HA.R1, HA.R2 Electric override of pressure setting, with elect. travel direction valve

(see page 24)

With the HA.R1 or HA.R2 control, the high-pressure related closed loop control can be overridden by an electric signal to switching solenoid b. When the over-ride solenoid is energized, the variable motor swivels to the maximum swivel angle without stopping at an intermediate position.

The travel direction valve ensures that the preselected pressure side of the hydraulic motor always controls the swivel angle, even if the high-pressure side changes (e.g. travel drive during a descent). This therefore prevents an undesirable swiveling of the variable motor to a larger displacement.

Depending on the direction of rotation (direction of travel), the travel direction valve (see page 24) can be actuated through the pressure spring or switching solenoid a.

Technical data, solenoid a with dia. 37 (travel direction valve)

		R1	R2
Voltage		12 V (±20 %)	24 V (±20 %)
No override		de-energized	de-energized
Direction of rotation	Operating pressure in	switching solenoid a	
counter-clockwise	B	actuated	actuated
clockwise	A	de-energized	de-energized
Nominal resistance (at 20°C)		5.5 Ω	21.7 Ω
Nominal output		26.2 W	26.5 W
Active current, min. necessary		1.32 A	0.67 A
Actuated time		100 %	100 %
Type of protection		See connector design, page 73	

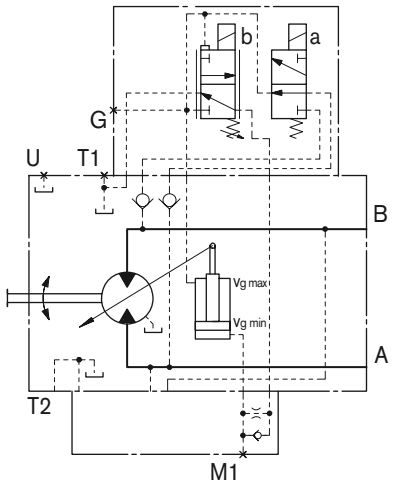
Technical data, solenoid b with dia. 45[1]) (el. override)

	R1	R2
Voltage	12 V (±20 %)	24 V (±20 %)
No override	de-energized	de-energized
Position $V_{g\ max}$	current switched on	current switched on
Nominal resistance (at 20°C)	4.8 Ω	19.2 Ω
Nominal output	30 W	30 W
Active current, min. necessary	1.5 A	0.75 A
Actuated time	100 %	100 %
Type of protection	See connector design, page 73	

[1]) for solenoids with dia. 45, the version "DEUTSCH - molded connector" is available on request.

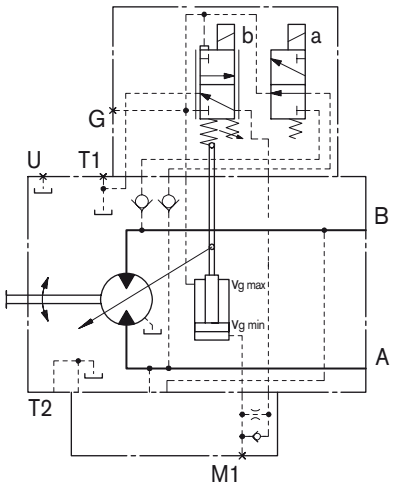
Circuit diagram HA1R1, HA1R2

Sizes 28 to 200



Circuit diagram HA2R1, HA2R1

Sizes 28 to 200



DA - Hydraulic control, speed related

The A6VM variable motor with speed-related hydraulic control is best used for hydrostatic drives in combination with the A4VG variable pump with DA control.

The pilot pressure derived from the drive speed of the A4VG variable pump, together with the operating pressure, regulate 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 speed), depending on the operating pressure.

If the operating pressure increase above the pressure setting of the controller, the variable motor swivels to a larger displacement (higher torque, lower speed).

The design of a drive with DA control must be carried out using the technical data relating to the A4VG variable pump with DA control.

Detailed information can be obtained from our sales departments and on the Internet at www.boschrexroth.com/da-control.

Please note:

– The start of control and the DA characteristic are influenced by the case pressure. An increase in the case pressure causes a drop in the start of control and thus a parallel displacement of the characteristic (see page 6).

DA - Hydraulic control, speed related

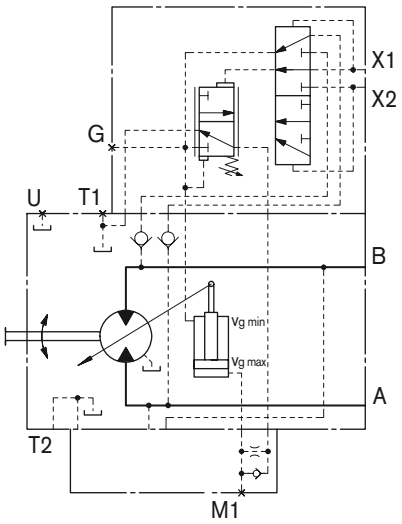
DA, DA1, DA4 Hydraulic control speed related with hydr. travel direction valve

The travel direction valve is operated according to the direction of rotation (direction of travel) using the pilot pressures X_1 or X_2.

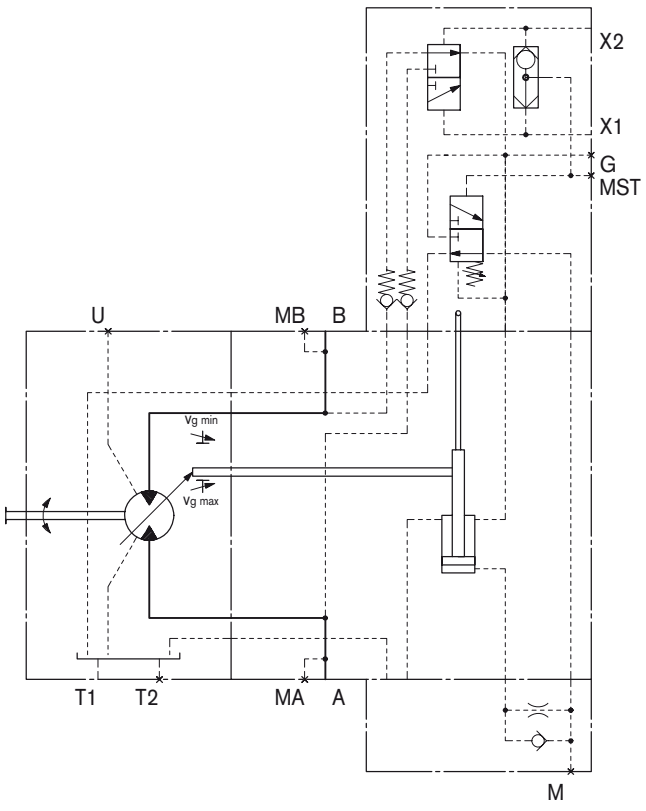
Direction of rotation	Operating pressure in	Pilot pressure in
clockwise	A	X_1
counter-clockwise	B	X_2

Circuit diagram DA, DA1, DA4

Sizes 28 to 200



Sizes 250 to 1000



DA2, DA3, DA5, DA6 Hydraulic control speed related with electr. travel direction valve + electr. $V_{g\,max}$ control

Depending on the direction of rotation (direction of travel), the travel direction valve can be actuated through the pressure spring or switching solenoid a.

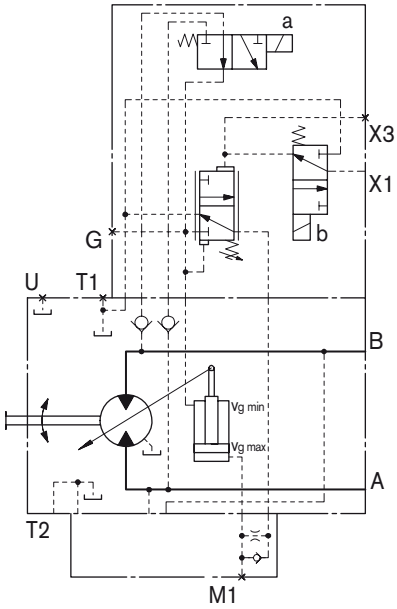
By connecting an electric current to switching solenoid b, the closed loop control can be overridden and the motor adjusted to max. displacement (high torque, low speed) (electric $V_{g\,max}$ circuit).

Technical data, solenoid A/B

		DA2, DA5	DA3, DA6
Voltage		12 V (±20 %)	24 V (±20 %)
Direction of rotation	Operating pressure in	switching solenoid a	
counter-clockwise	B	de-energized	de-energized
clockwise	A	actuated	actuated
Nominal resistance (at 20°C)		5.5 Ω	21.7 Ω
Nominal output		26.2 W	26.5 W
Active current, min. necessary		1.32 A	0.67 A
Actuated time		100 %	100 %
Type of protection		See connector design, page 73	

Circuit diagram DA2, DA3, DA5, DA6

Sizes 28 to 200



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

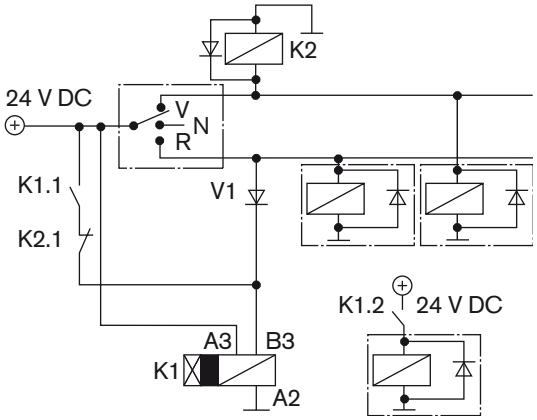
Application in travel drives in closed controls. The travel direction valve of the motor is switched using the 4/3-directional valve on the control device of the driving pump.

When the pump (A4VG, A10VG) is switched to the neutral position or into reverse, the vehicle may experience impulsive braking depending on the vehicle's mass and current speed.

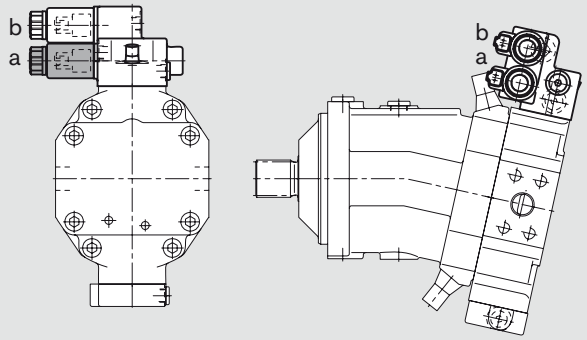
This impulsive braking is prevented through the use of the following electric control.

With this control, when the pump (A4VG, A10VG) is switched
1. to the neutral position: the previous travel direction is retained.
2. to reverse: the motor switches to the other travel direction following a time delay (approx. 0.8 s) with respect to the pump.

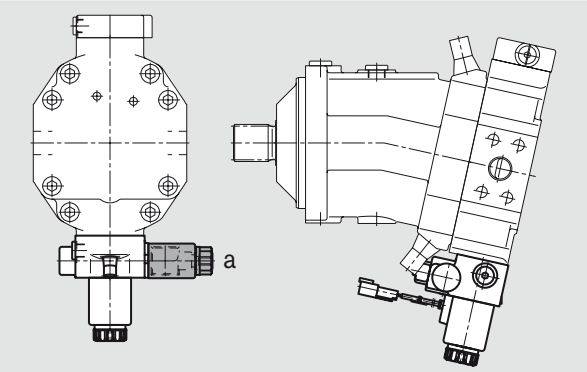
Electric travel direction valve control diagram



DA2, DA3, DA5, DA6 control



HA1R., HA2R. control (see page 21)



Switching solenoid a on travel direction valve

Notes

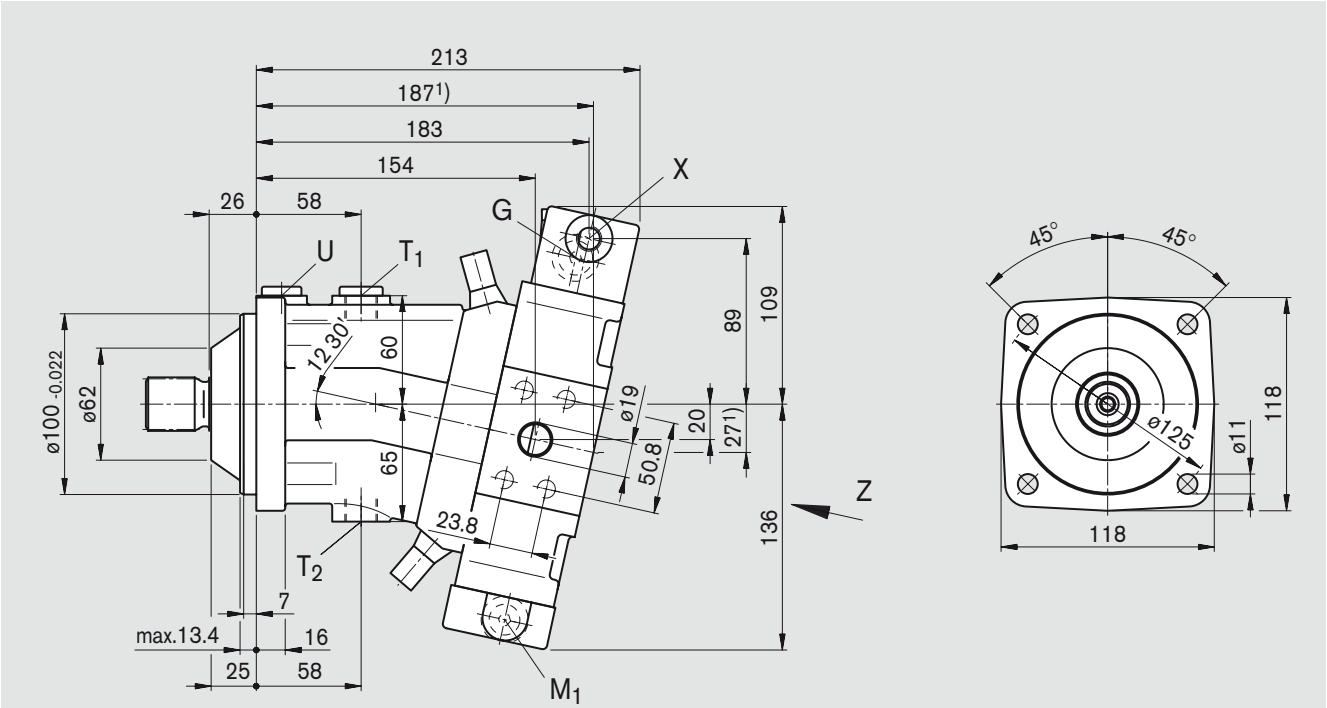
Unit dimensions, size 28

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

HD1, HD2 Hydraulic control, pilot-pressure related

HZ1 Hydraulic two-point control

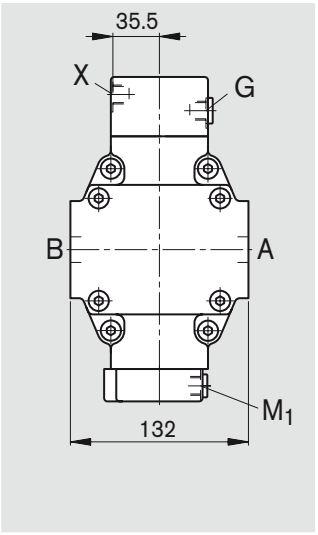
SAE flange ports A/B side, opposite **(02)**



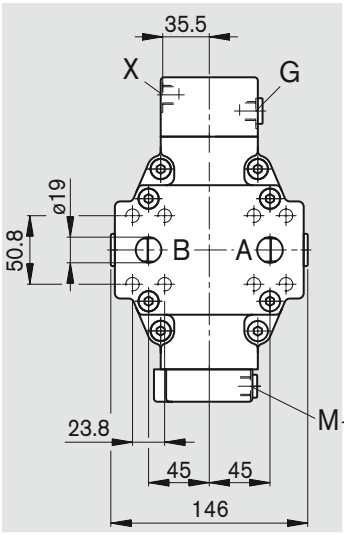
[1]) With service line ports A/B rear (plate 01)

View Z

SAE flange ports A/B side, opposite **(02)**



SAE flange ports A/B rear **(01)**

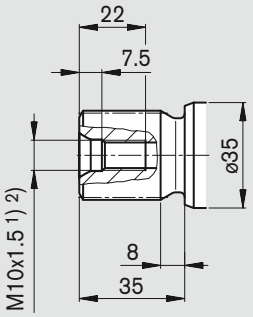


Unit dimensions, size 28

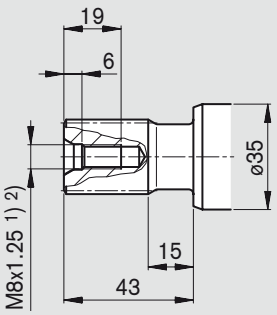
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

A Splined shaft DIN 5480
W30x2x30x14x9g



Z Splined shaft DIN 5480
W25x1 .25x30x18x9g



Ports

A, B	Service line ports (high-pressure series)	SAE J518	3/4 in	
	Fixing thread A/B	DIN 13	M10x1.5; 17 deep 2)	
T_1	Case drain port 3)	DIN 3852	M18x1.5; 12 deep	140 Nm 2)
T_2	Case drain port	DIN 3852	M18x1.5; 12 deep	140 Nm 2)
X, X_1, X_3	Pilot-pressure port	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
G	Port for synchronous control of multiple units and for remote control pressure 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
G_2	Port for 2nd pressure setting 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
U	Flow port 3)	DIN 3852	M16x1.5; 12 deep	100 Nm 2)
M_1	Gauge port for control pressure 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)

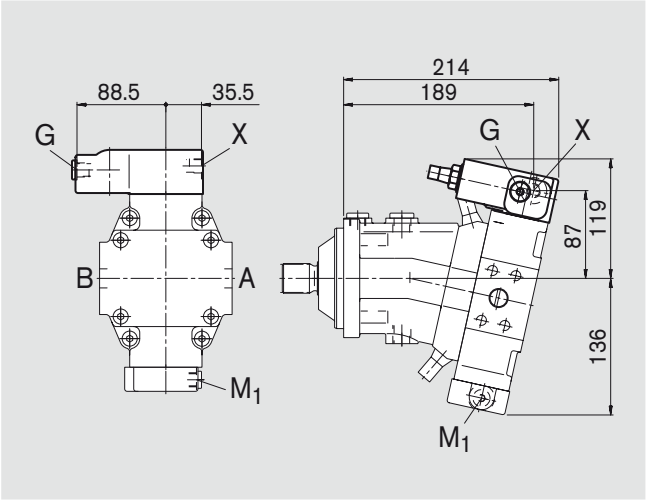
1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 75
3) Plugged

Unit dimensions, size 28

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

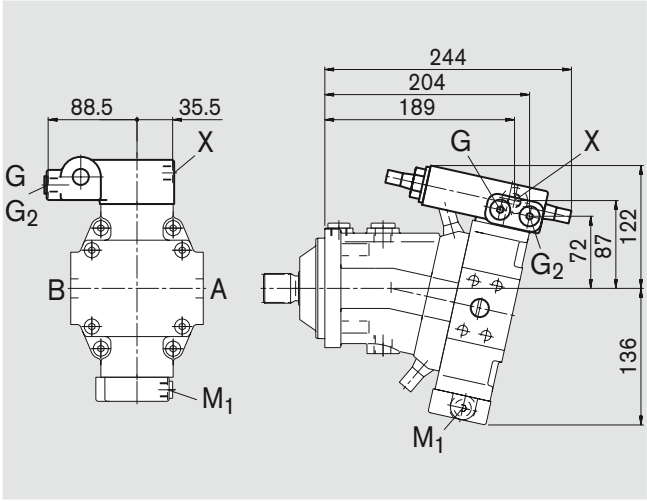
HD.D

Hydraulic control, pilot-pressure related,
with pressure control, direct



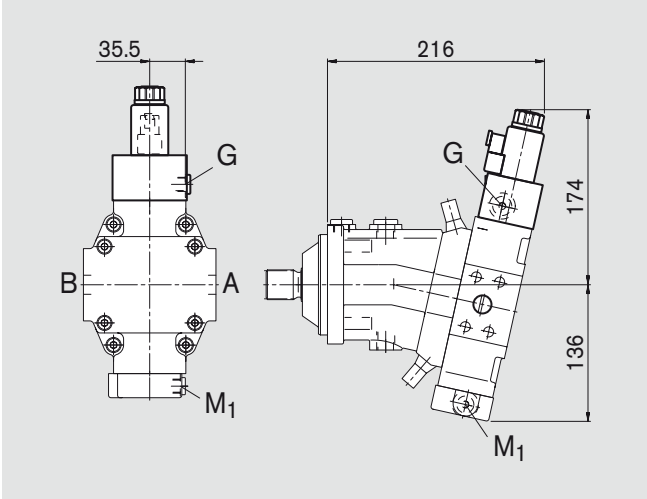
HD.E

Hydraulic control, pilot-pressure related,
with pressure control, direct and 2nd pressure setting



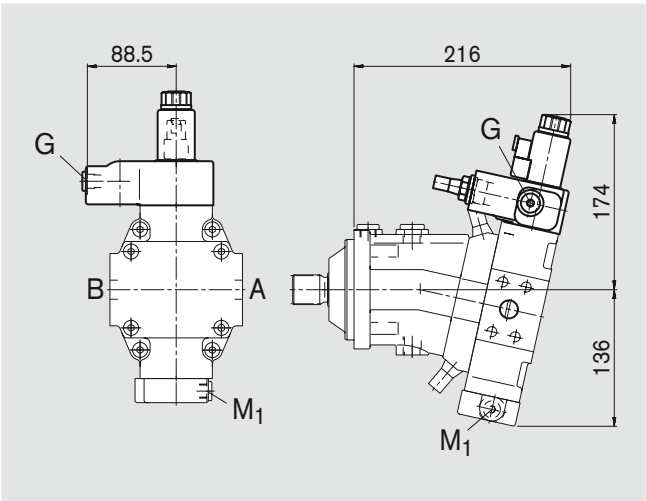
EP1, EP2

Electric control with proportional solenoid



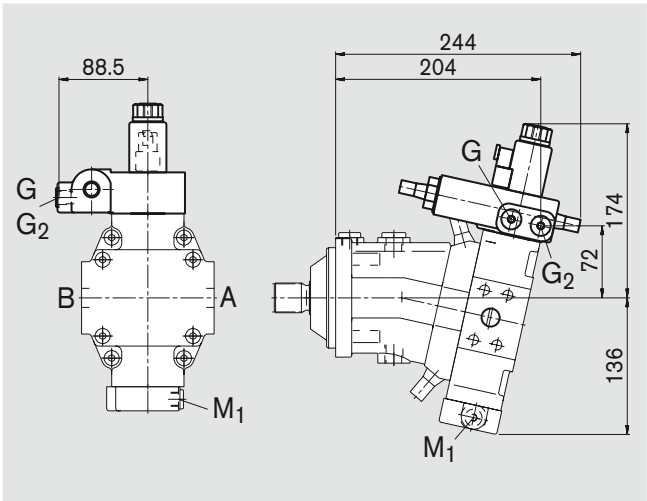
EP.D

Electric control (proportional solenoid)
with pressure control, direct



EP.E

Electric control (proportional solenoid)
with pressure control, direct and 2nd pressure setting

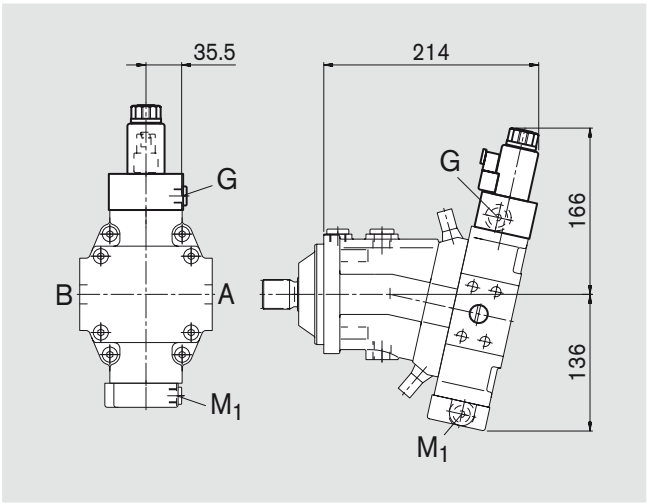


Unit dimensions, size 28

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

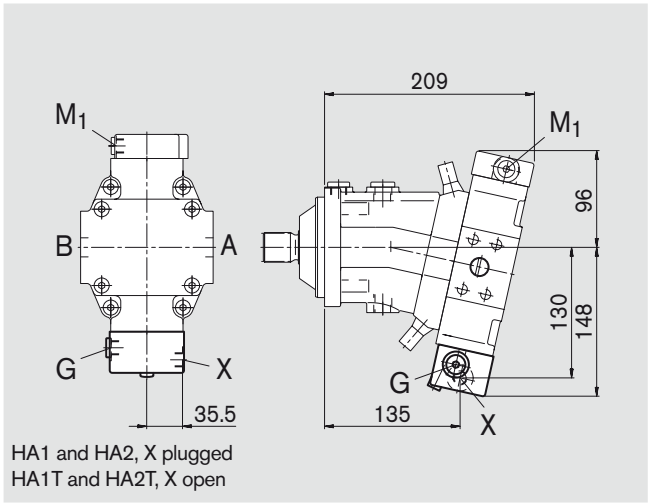
EZ1, EZ2

Electric two-point control with switching solenoid



HA1, HA2 / HA1T, HA2T

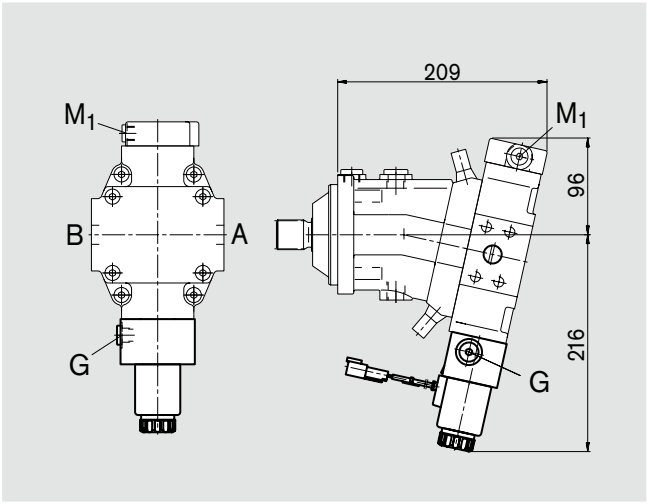
Automatic control, high-pressure related / hydraulic override



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

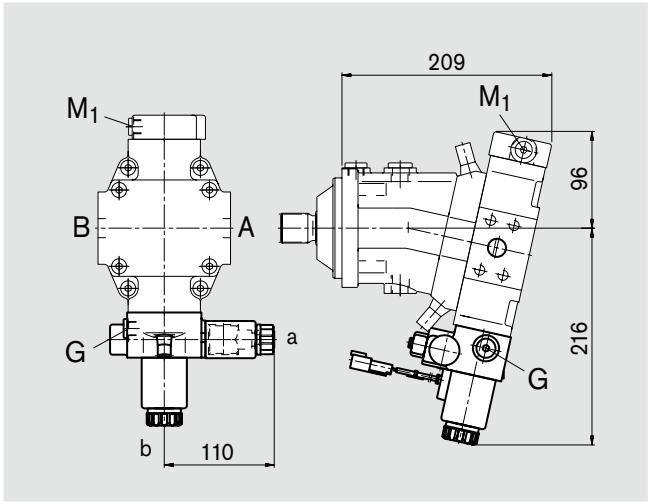
HA1U1, HA2U2

Automatic control, high-pressure related and electric override



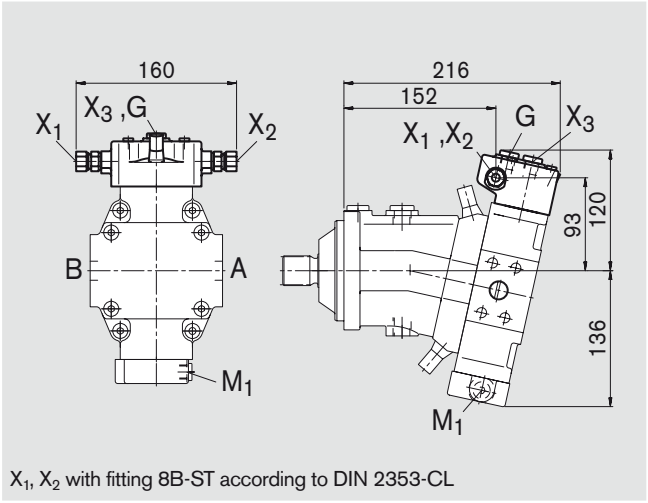
HA1R1, HA2R2

Automatic control, high-pressure related, electric override and electric travel direction valve



DA1, DA4

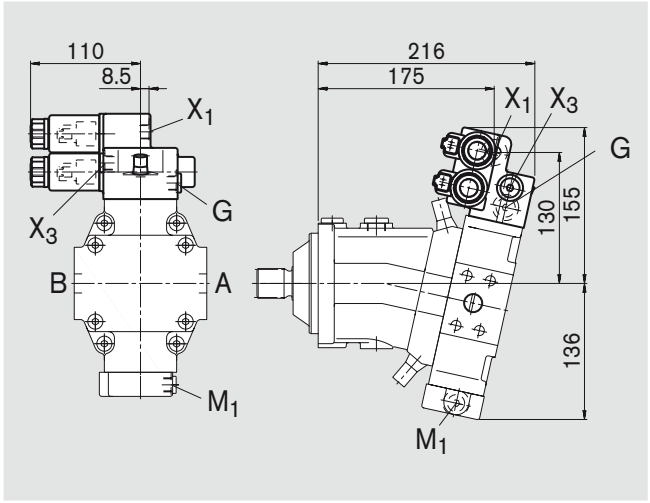
Hydraulic control, speed related and hydraulic travel direction valve



X_1, X_2 with fitting 8B-ST according to DIN 2353-CL

DA2, DA3, DA5, DA6

Hydraulic control, speed related, el. travel direction valve and el. $V_{g\ max}$ control

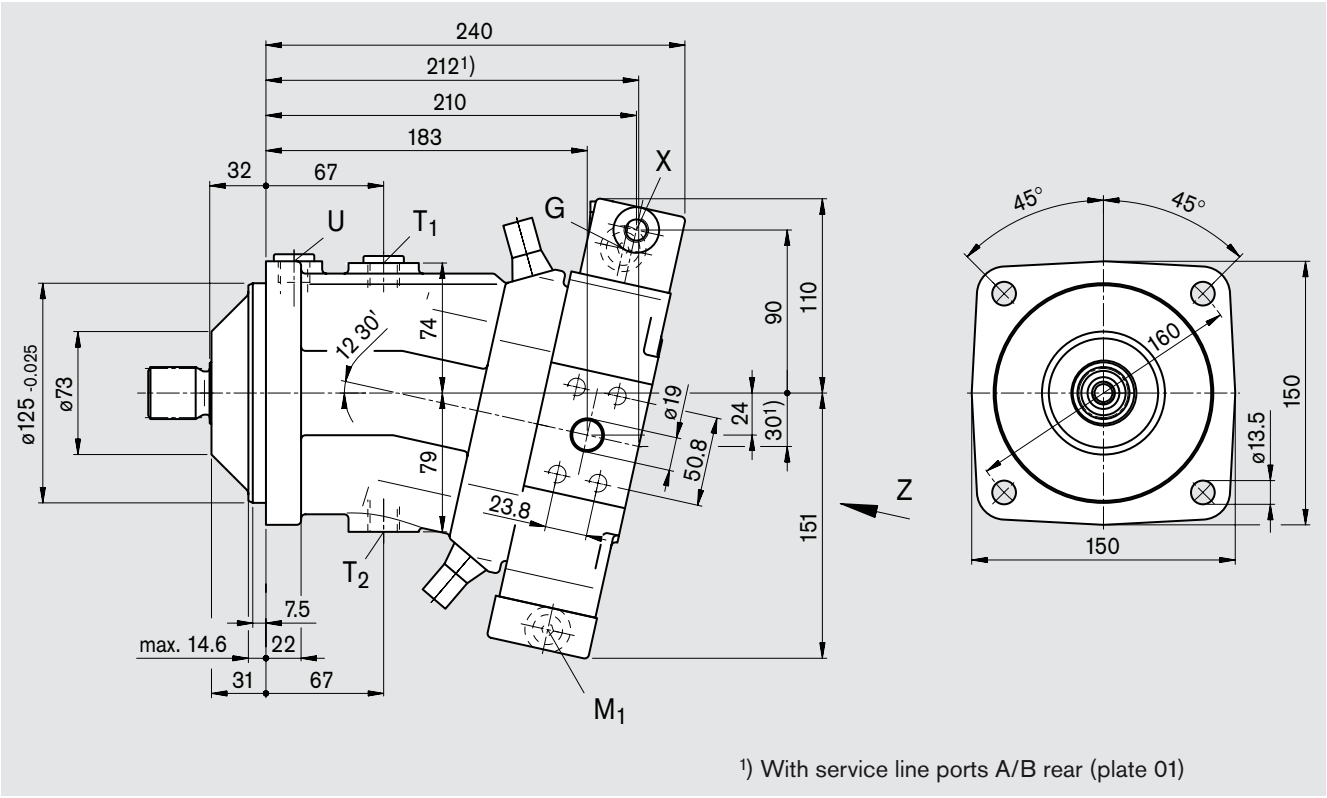


Unit dimensions, size 55

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

HD1, HD2 Hydraulic control, pilot-pressure related

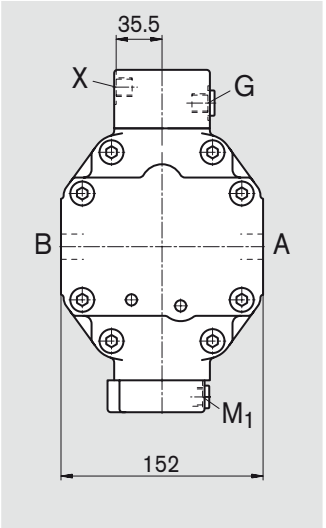
SAE flange ports A/B side, opposite **(02)**



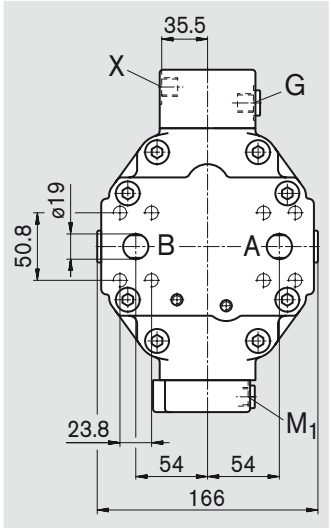
¹) With service line ports A/B rear (plate 01)

View Z

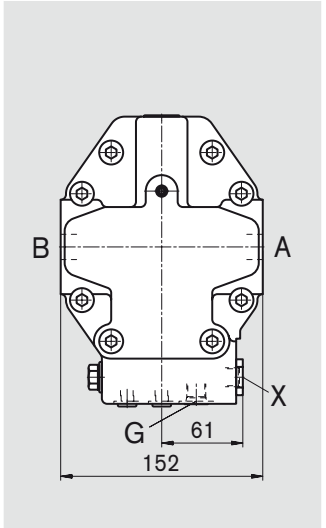
SAE flange ports A/B side, opposite **(02)**



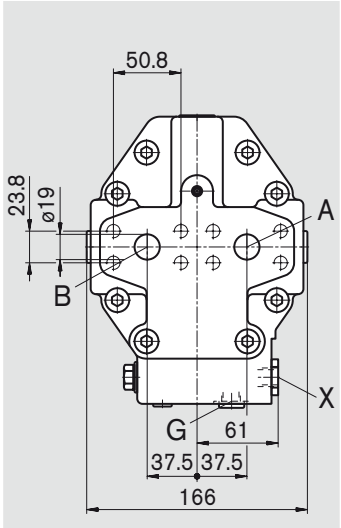
SAE flange ports A/B rear **(01)**



SAE flange ports A/B side, opposite with **HZ3, EZ3 (02)**



SAE flange ports A/B rear with **HZ3, EZ3 (01)**

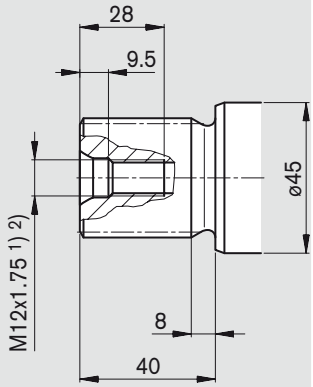


Unit dimensions, size 55

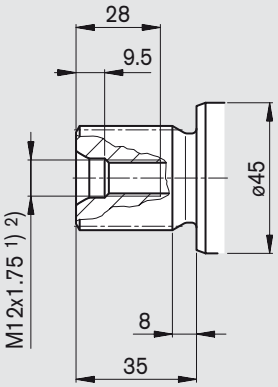
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

A Splined shaft DIN 5480
W35x2x30x16x9g



Z Splined shaft DIN 5480
W30x2x30x14x9g



Ports

A, B	Service line ports (high-pressure series)	SAE J518	3/4 in	
	Fixing thread A/B	DIN 13	M10x1.5; 17 deep [2]	
T_1	Case drain port [3]	DIN 3852	M18x1.5; 12 deep	140 Nm [2]
T_2	Case drain port	DIN 3852	M18x1.5; 12 deep	140 Nm [2]
X, X_1, X_3	Pilot-pressure port	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
G	Port for synchronous control of multiple units and for remote control pressure [3]	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
G_2	Port for 2nd pressure setting [3]	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
U	Flow port [3]	DIN 3852	M18x1.5; 12 deep	140 Nm [2]
M_1	Gauge port for control pressure [3]	DIN 3852	M14x1.5; 12 deep	80 Nm [2]

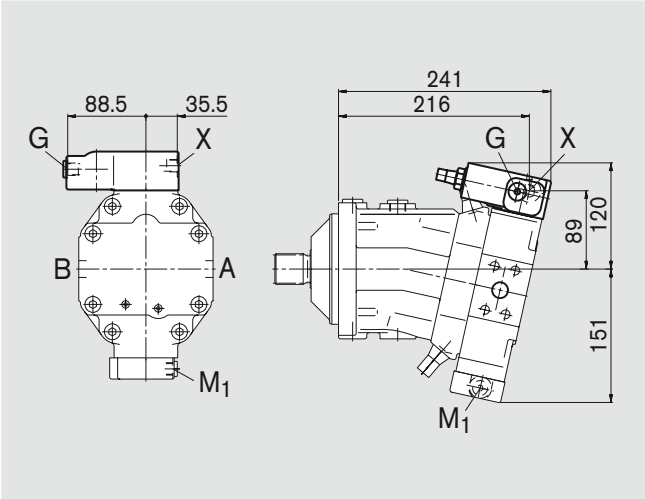
[1]) center bore according to DIN 332 (thread according to DIN 13)
[2]) please observe the general notes for the max. tightening torques on page 75
[3]) plugged

Unit dimensions, size 55

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

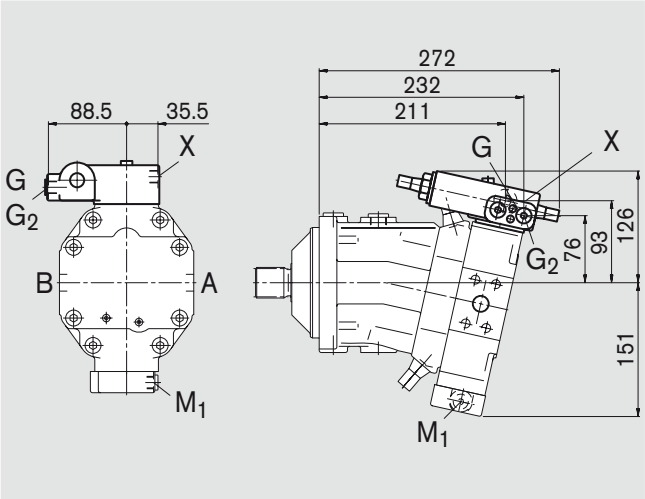
HD.D

Hydraulic control, pilot-pressure related,
with pressure control, direct



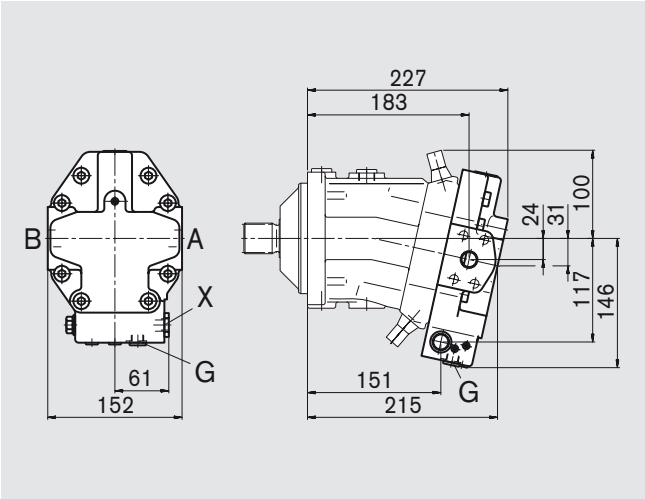
HD.E

Hydraulic control, pilot-pressure related,
with pressure control, direct and 2nd pressure setting



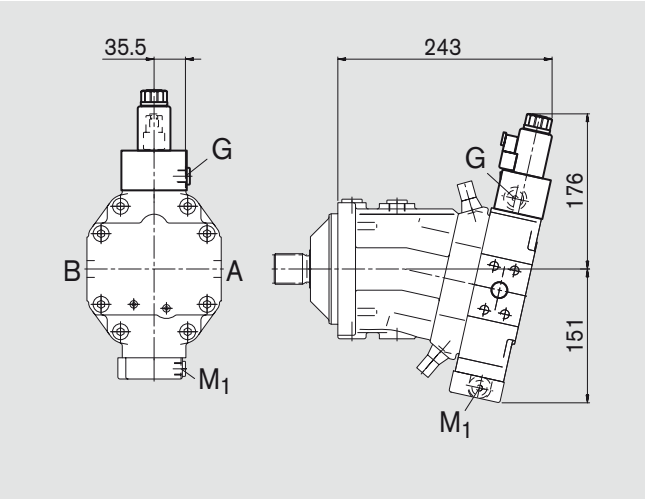
HZ3

Hydraulic two-point control



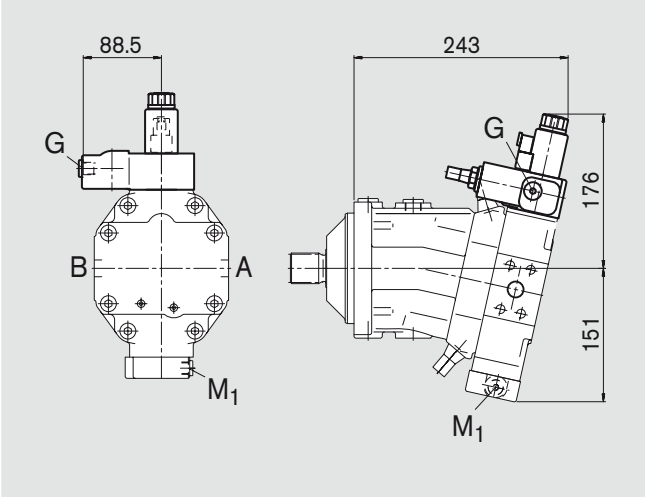
EP1, EP2

Electric control with proportional solenoid



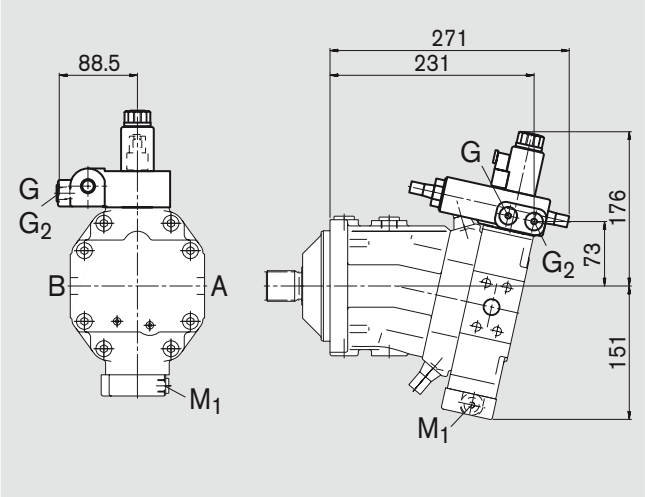
EP.D

Electric control (proportional solenoid)
with pressure control, direct



EP.E

Electric control (proportional solenoid)
with pressure control, direct and 2nd pressure setting

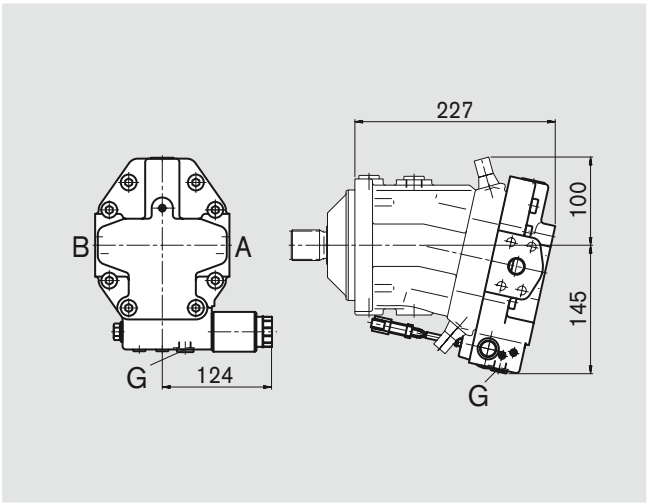


Unit dimensions, size 55

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

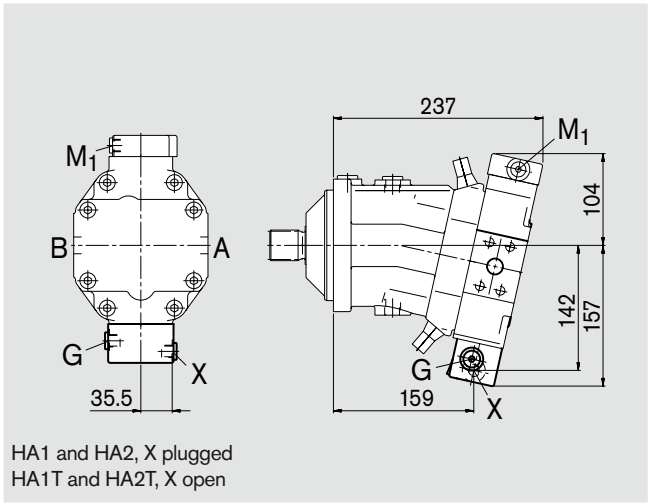
EZ3, EZ4

Electric two-point control with switching solenoid



HA1, HA2 / HA1T, HA2T

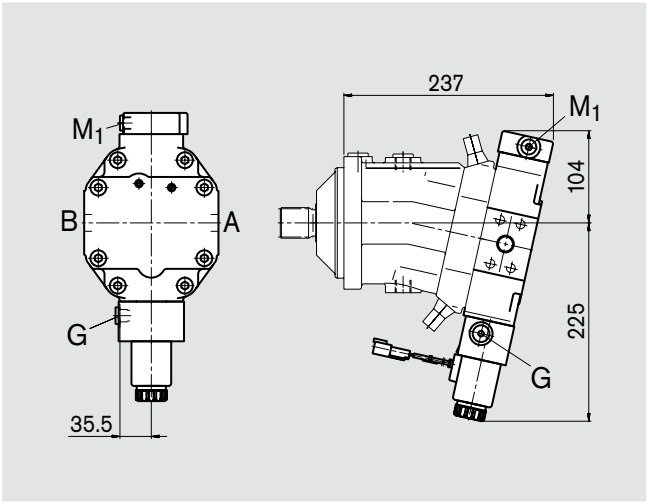
Automatic control, high-pressure related / hydraulic override



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

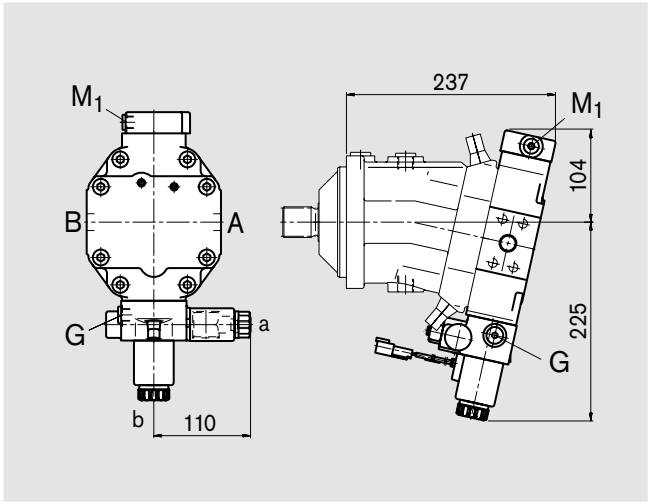
HA1U1, HA2U2

Automatic control, high-pressure related and electric override



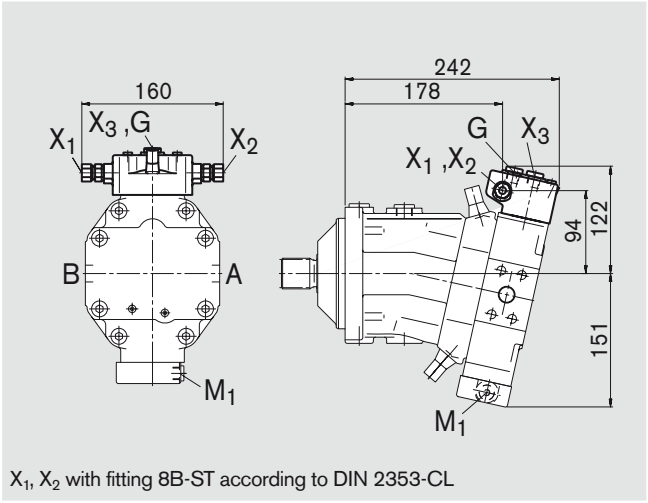
HA1R1, HA2R2

Automatic control, high-pressure related, electric override and electric travel direction valve



DA1, DA4

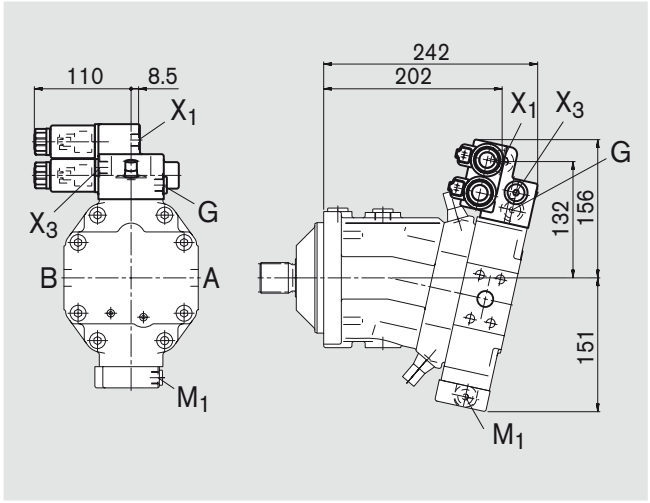
Hydraulic control, speed related and hydraulic travel direction valve



X_1, X_2 with fitting 8B-ST according to DIN 2353-CL

DA2, DA3, DA5, DA6

Hydraulic control, speed related, el. travel direction valve and el. $V_{g\ max}$ control

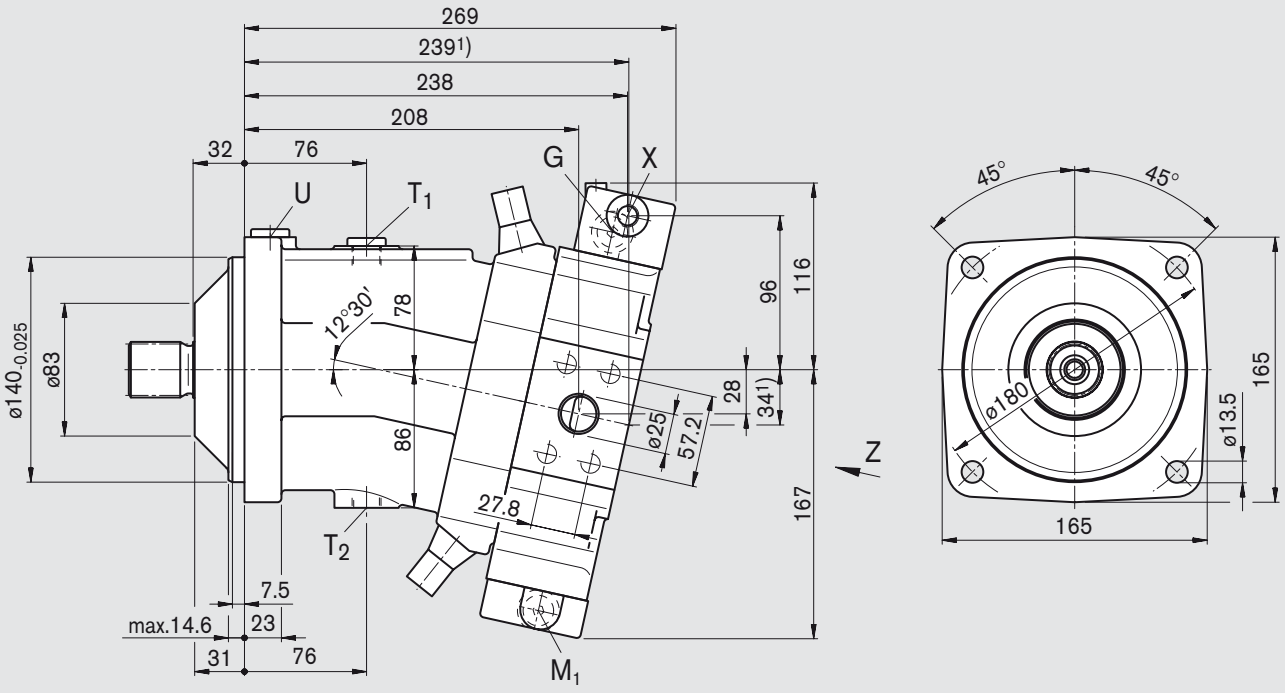


Unit dimensions, size 80

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

HD1, HD2 Hydraulic control, pilot-pressure related

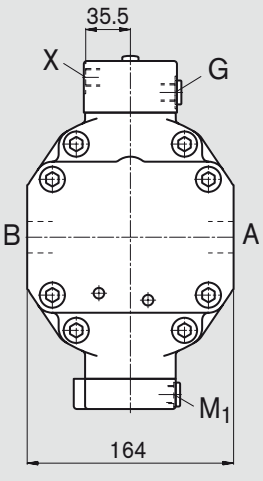
SAE flange ports A/B side, opposite **(02)**



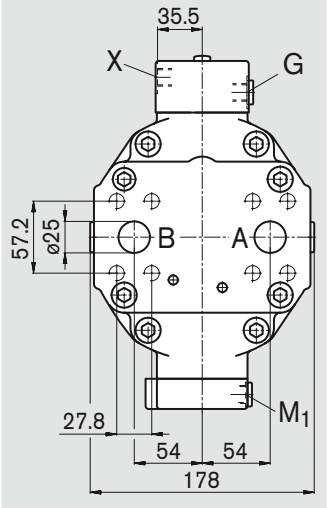
¹) With service line ports A/B rear (plate 01)

View Z

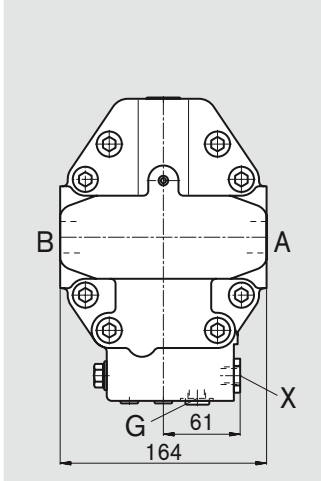
SAE flange ports A/B side, opposite **(02)**



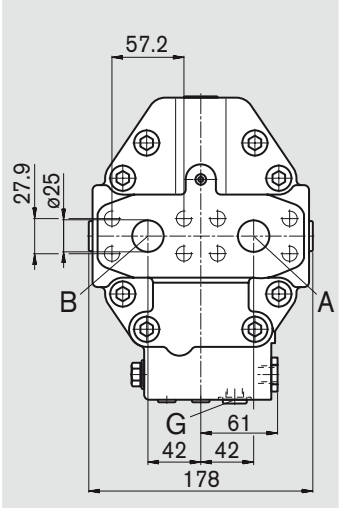
SAE flange ports A/B rear **(01)**



SAE flange ports A/B side, opposite with **HZ3, EZ3 (02)**



SAE flange ports, A/B rear with **HZ3, EZ3 (01)**

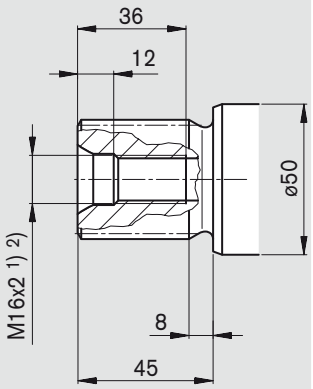


Unit dimensions, size 80

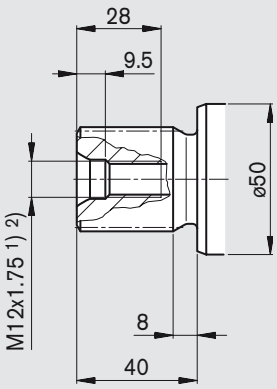
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

A Splined shaft DIN 5480
W40x2x30x18x9g



Z Splined shaft DIN 5480
W35x2x30x16x9g



Ports

A, B	Service line ports (high-pressure series)	SAE J518	1 in	
	Fixing thread A/B	DIN 13	M12x1.75;	17 deep 2)
T_1	Case drain port 3)	DIN 3852	M18x1.5; 12 deep	140 Nm 2)
T_2	Case drain port	DIN 3852	M18x1.5; 12 deep	140 Nm 2)
X, X_1, X_3	Pilot-pressure port	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
G	Port for synchronous control of multiple units and for remote control pressure 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
G_2	Port for 2nd pressure setting 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
U	Flow port 3)	DIN 3852	M18x1.5; 12 deep	140 Nm 2)
M_1	Gauge port for control pressure 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)

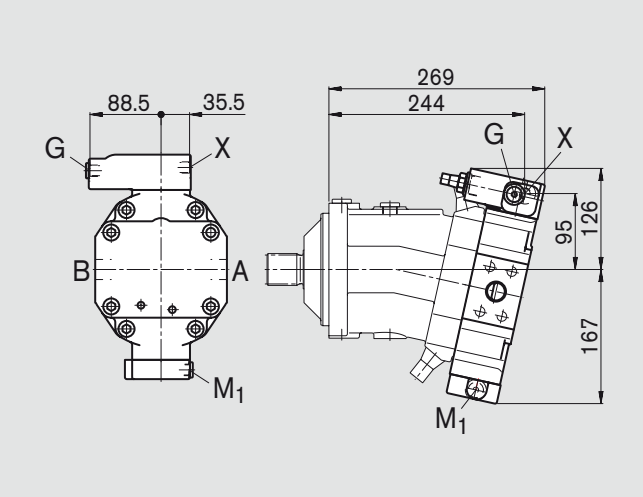
1) center bore according to DIN 332 (thread according to DIN 13)
2) please observe the general notes for the max. tightening torques on page 75
3) plugged

Unit dimensions, size 80

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

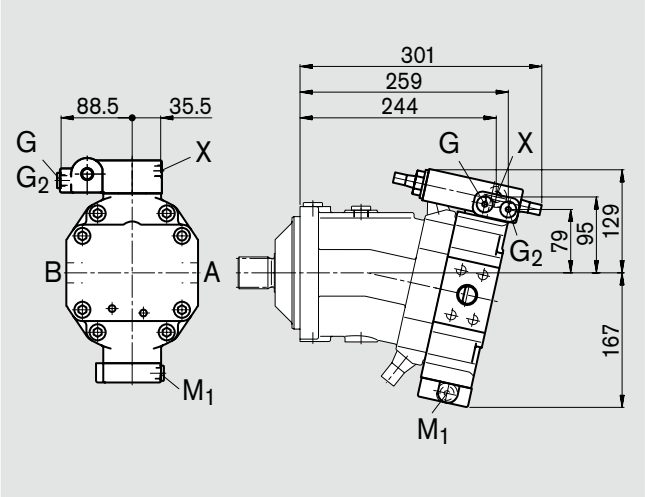
HD.D

Hydraulic control, pilot-pressure related,
with pressure control, direct



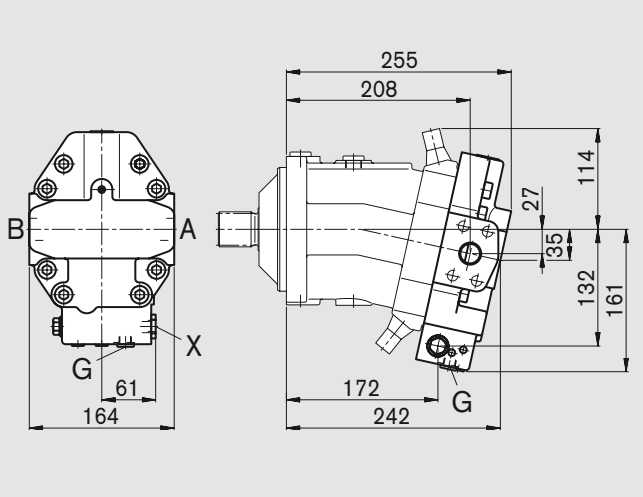
HD.E

Hydraulic control, pilot-pressure related,
with pressure control, direct and 2nd pressure setting



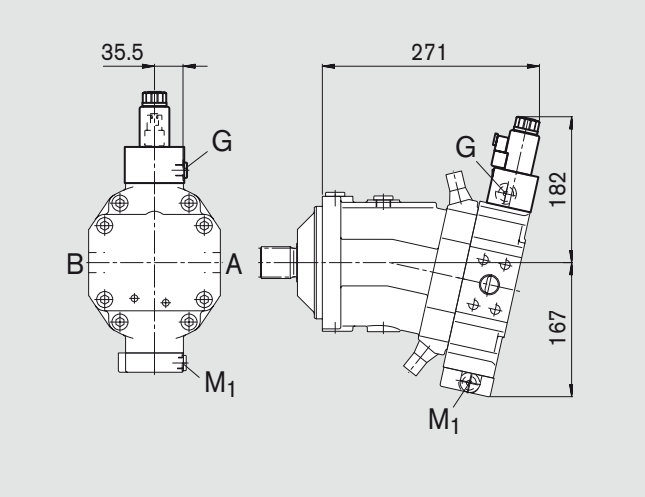
HZ3

Hydraulic two-point control



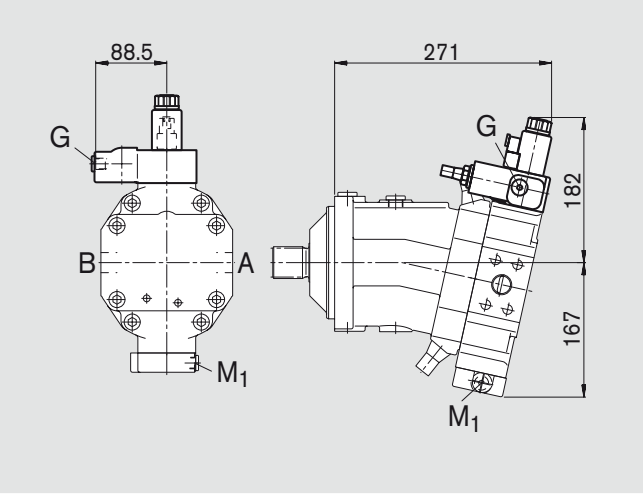
EP1, EP2

Electric control with proportional solenoid



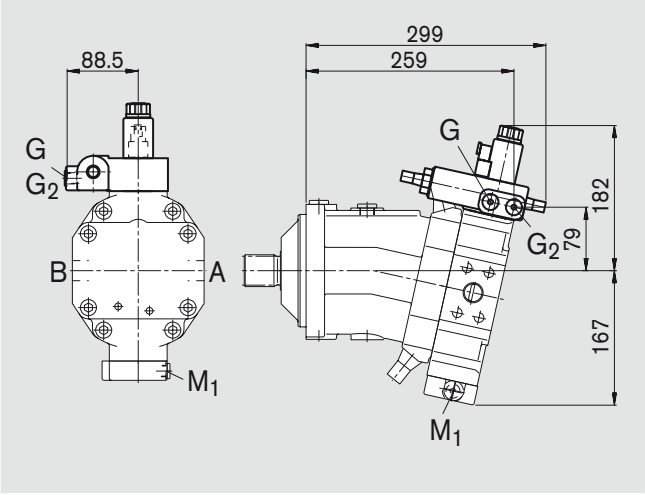
EP.D

Electric control (proportional solenoid)
with pressure control, direct



EP.E

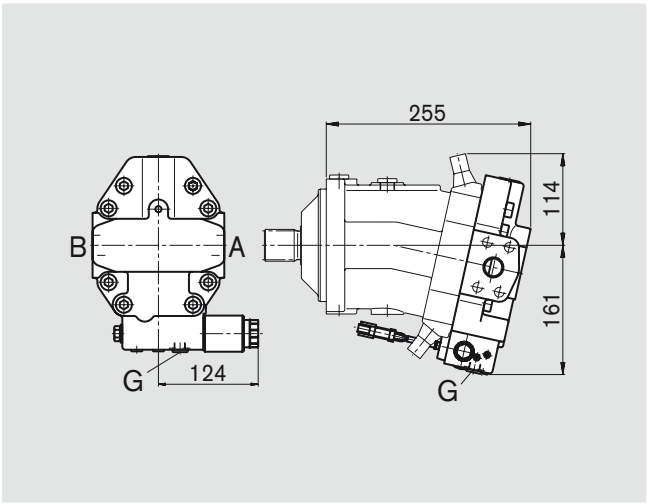
Electric control (proportional solenoid)
with pressure control, direct and 2nd pressure setting



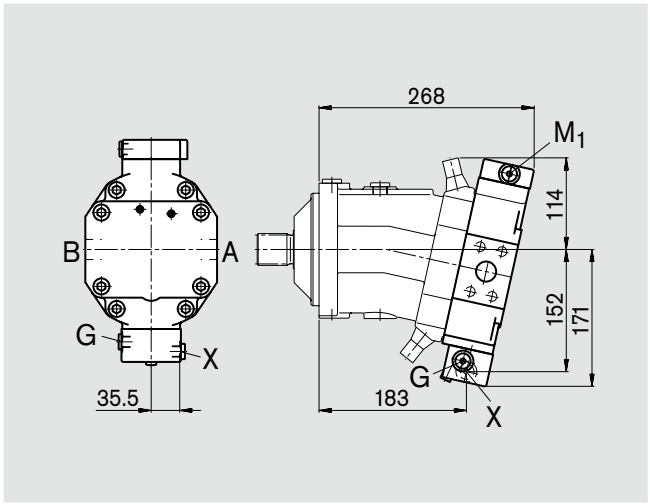
Unit dimensions, size 80

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

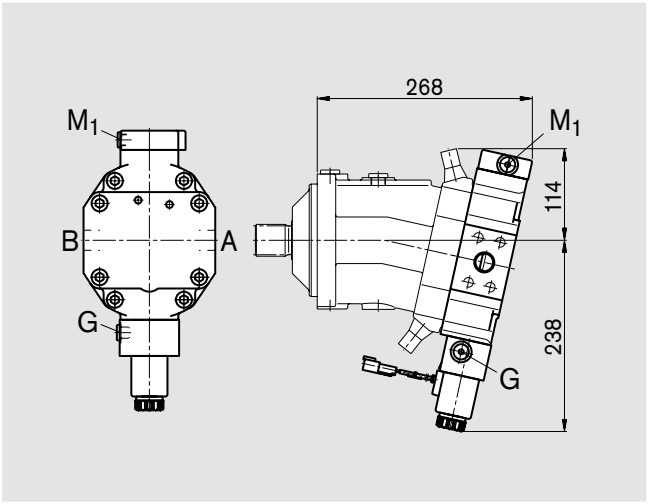
EZ3, EZ4
Electric two-point control with switching solenoid



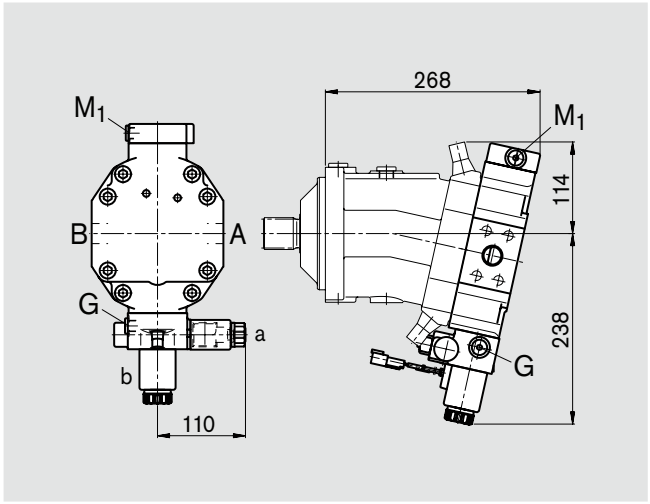
HA1, HA2 / HA1T, HA2T
Automatic control, high-pressure related / hydraulic override



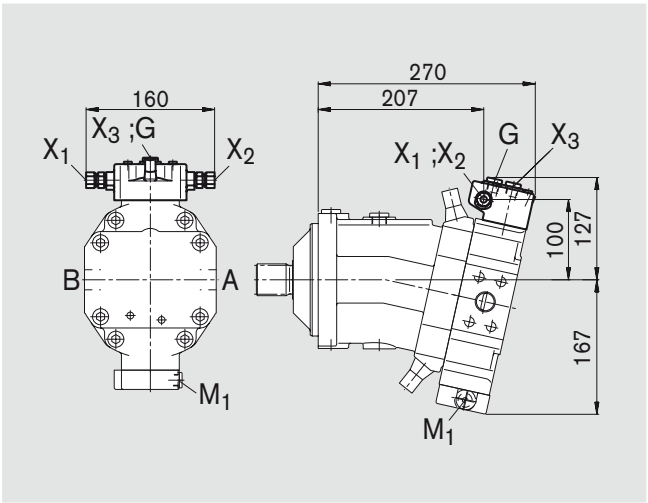
HA1U1, HA2U2
Automatic control, high-pressure related and electric override



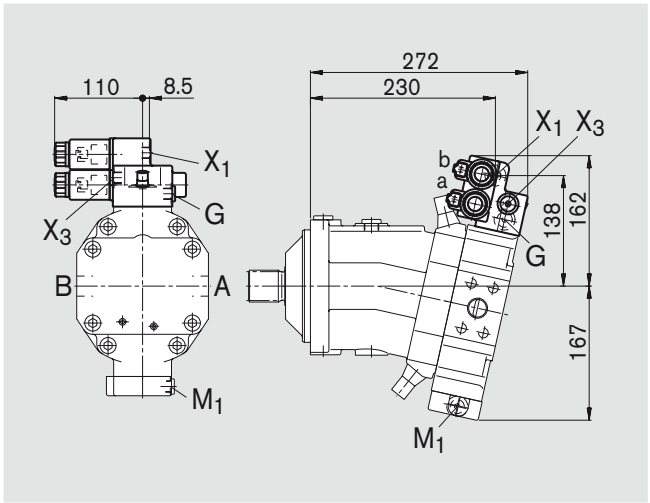
HA1R1, HA2R2
Automatic control, high-pressure related, electric override and electric travel direction valve



DA1, DA4
Hydraulic control, speed related and hydraulic travel direction valve



DA2, DA3, DA5, DA6
Hydraulic control, speed related, el. travel direction valve and el. $V_{g\ max}$ control

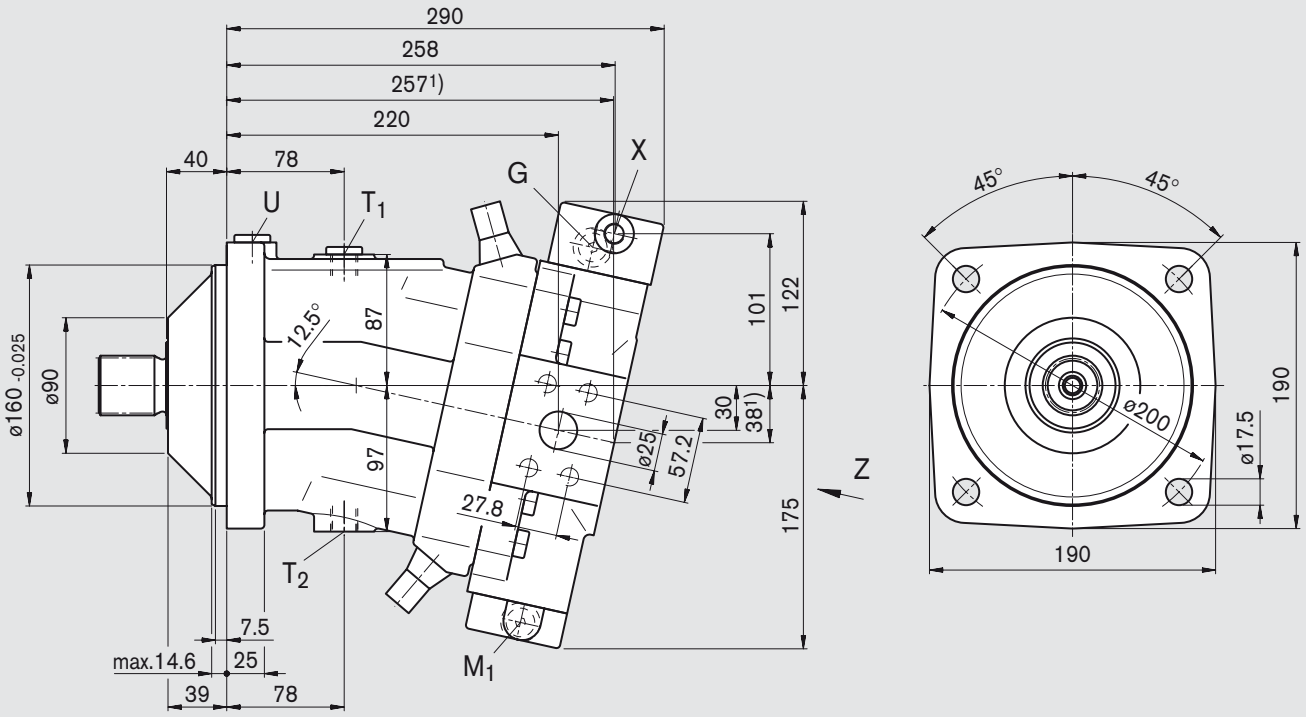


Unit dimensions, size 107

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

HD1, HD2 Hydraulic control, pilot-pressure related

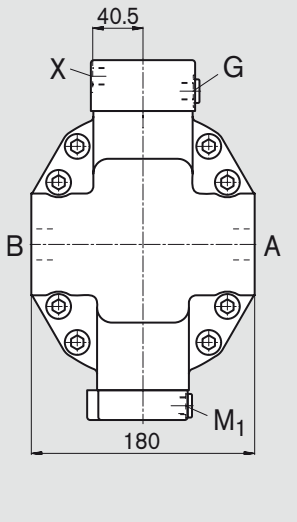
SAE flange ports A/B side, opposite **(02)**



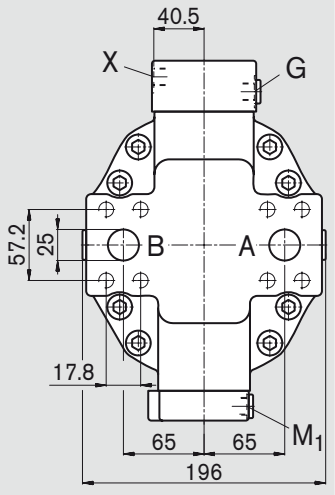
¹) With service line ports A/B rear (plate 01)

View Z

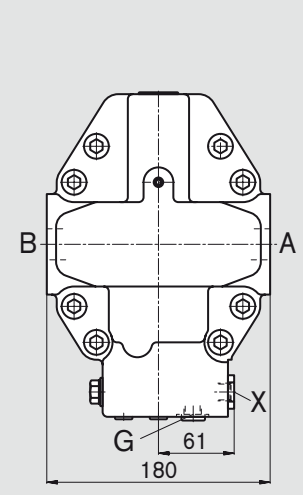
SAE flange ports A/B side, opposite **(02)**



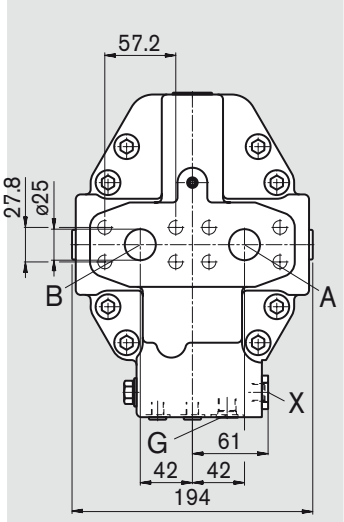
SAE flange ports A/B, rear **(01)**



SAE flange ports A/B side, opposite with **HZ3, EZ3 (02)**



SAE flange ports A/B, rear with **HZ3, EZ3 (01)**

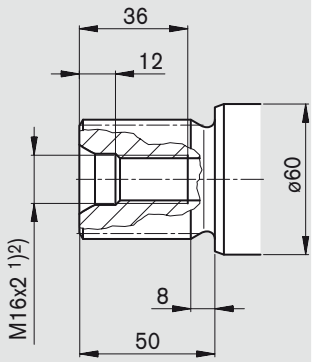


Unit dimensions, size 107

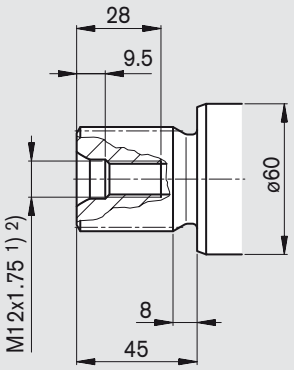
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

A Splined shaft DIN 5480
W45x2x30x21x9g



Z Splined shaft DIN 5480
W40x2x30x18x9g



Ports

A, B	Service line ports (high-pressure series)	SAE J518	1 in	
	Fixing thread A/B	DIN 13	M12x1.75;	17 deep 2)
T_1	Case drain port 3)	DIN 3852	M18x1.5; 12 deep	140 Nm 2)
T_2	Case drain port	DIN 3852	M18x1.5; 12 deep	140 Nm 2)
X, X_1, X_3	Pilot-pressure port	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
G	Port for synchronous control of multiple units and for remote control pressure 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
G_2	Port for 2nd pressure setting 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
U	Flow port 3)	DIN 3852	M18x1.5; 12 deep	140 Nm 2)
M_1	Gauge port for control pressure 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)

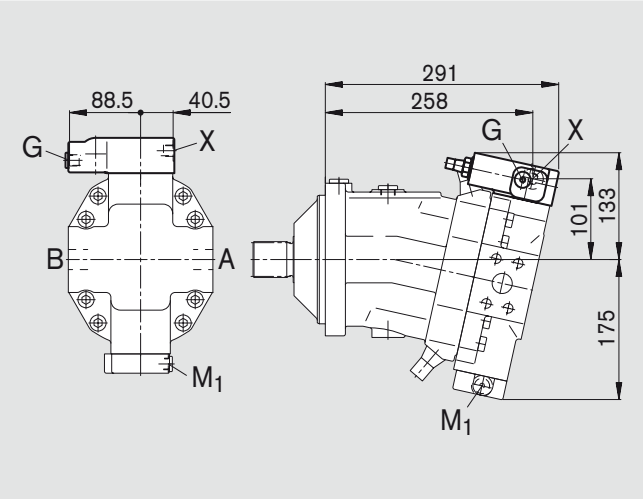
1) center bore according to DIN 332 (thread according to DIN 13)
2) please observe the general notes for the max. tightening torques on page 75
3) plugged

Unit dimensions, size 107

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

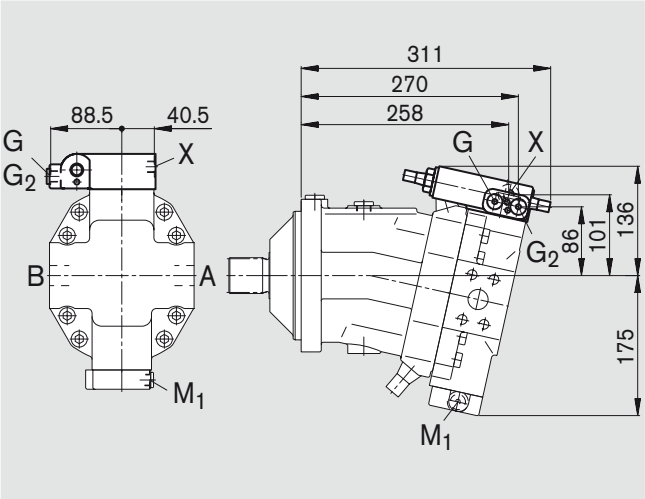
HD.D

Hydraulic control, pilot-pressure related,
with pressure control, direct



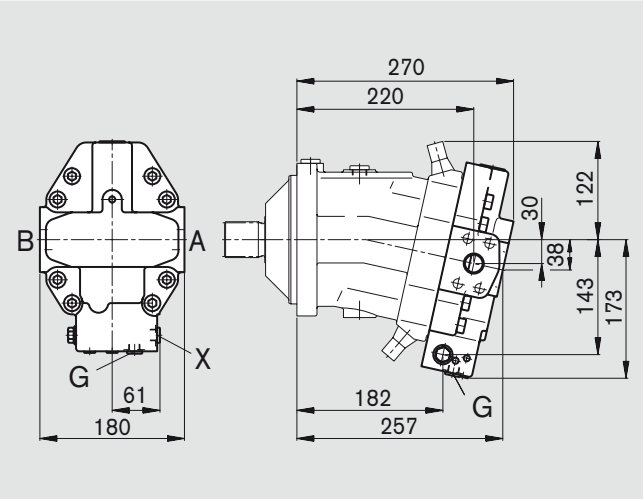
HD.E

Hydraulic control, pilot-pressure related,
with pressure control, direct and 2nd pressure setting



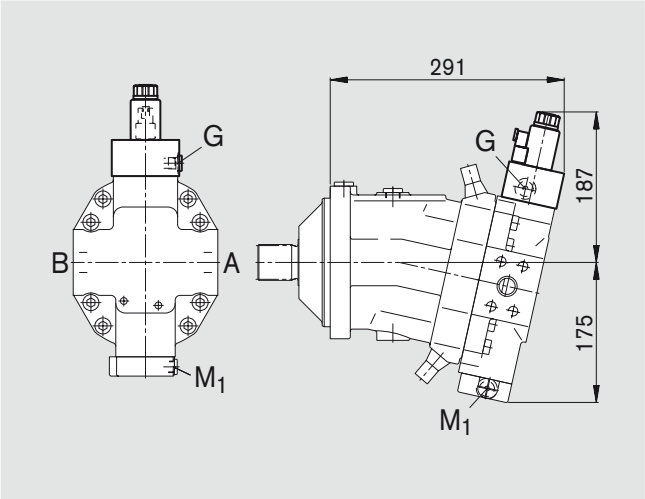
HZ3

Hydraulic two-point control



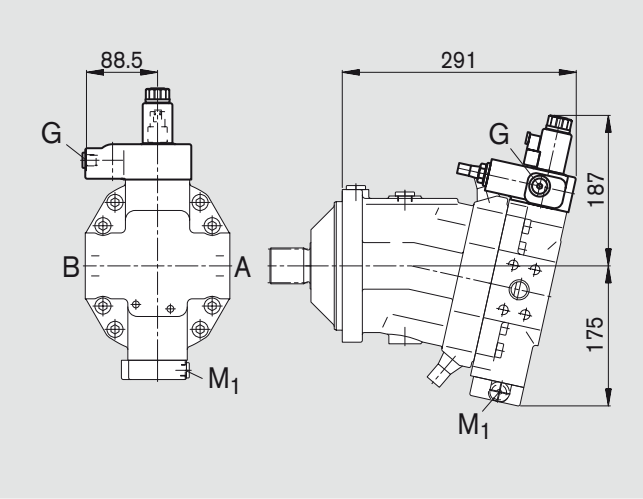
EP1, EP2

Electric control with proportional solenoid



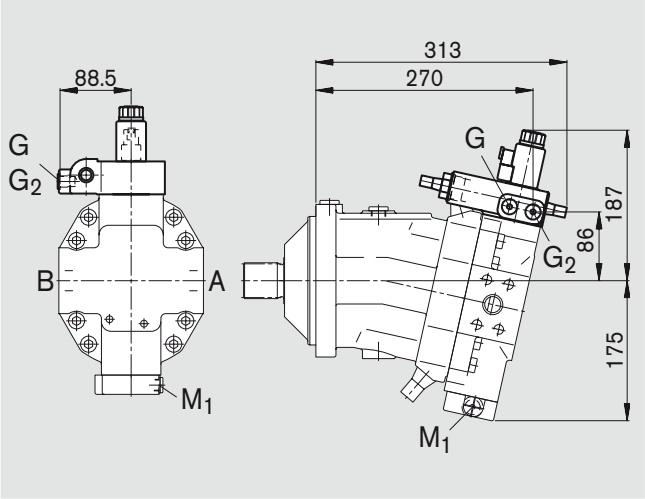
EP.D

Electric control (proportional solenoid)
with pressure control, direct



EP.E

Electric control (proportional solenoid)
with pressure control, direct and 2nd pressure setting

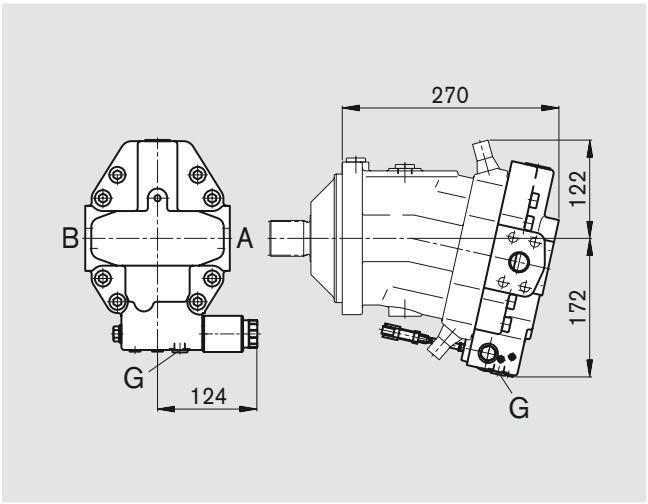


Unit dimensions, size 107

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

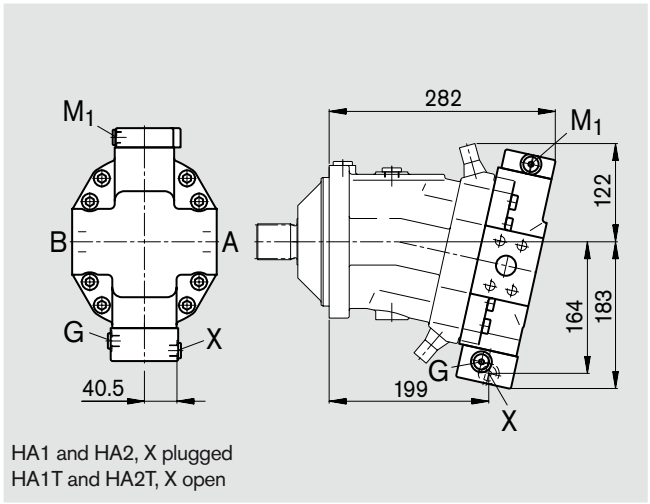
EZ3, EZ4

Electric two-point control witch switching solenoid



HA1, HA2 / HA1T, HA2T

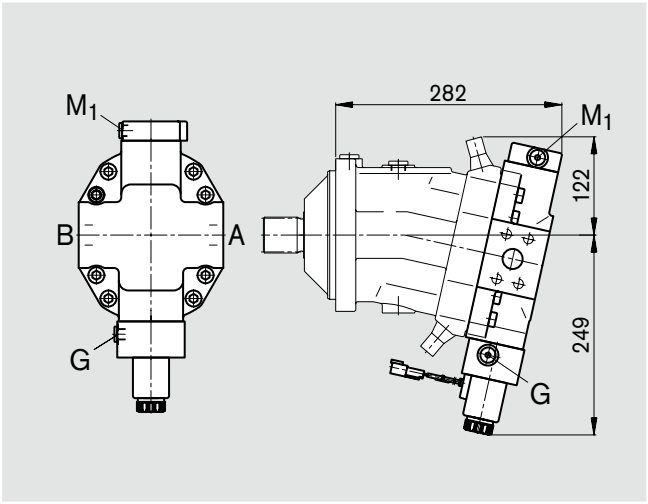
Automatic control, high-pressure related / hydraulic override



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

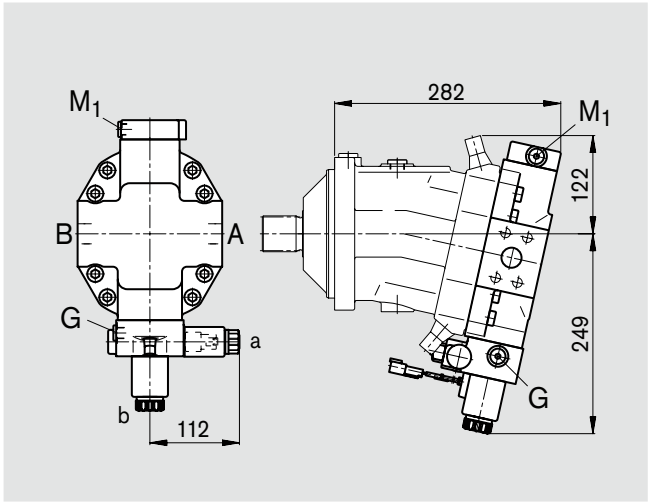
HA1U1, HA2U2

Automatic control, high-pressure related and electric override



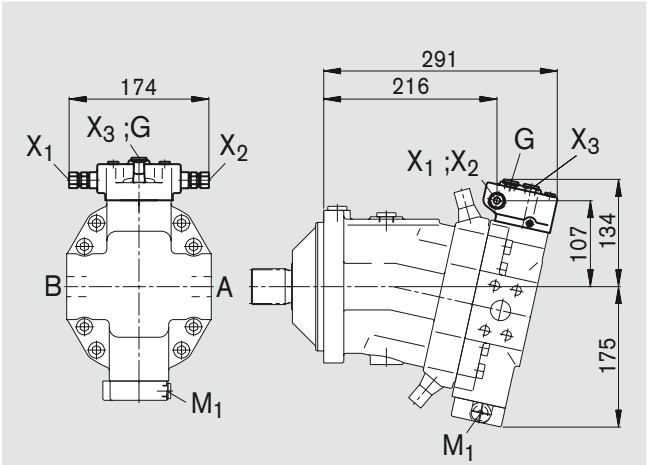
HA1R1, HA2R2

Automatic control, high-pressure related, electric override and electric travel direction valve



DA1, DA4

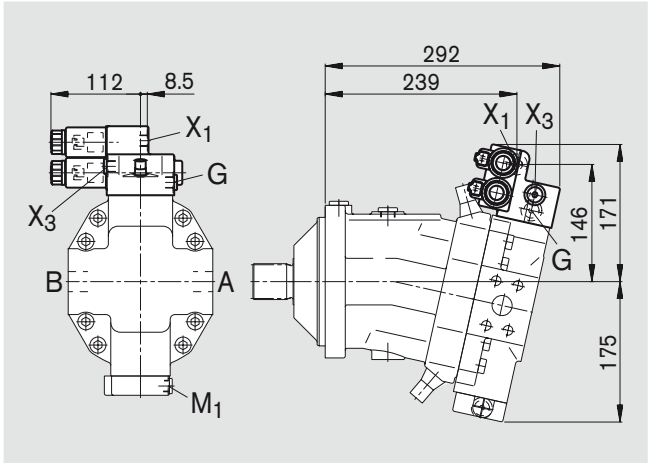
Hydraulic control, speed related and hydraulic travel direction valve



X_1, X_2 with fitting 8B-ST according to DIN 2353-CL

DA2, DA3, DA5, DA6

Hydraulic control, speed related, el. travel direction valve and el. $V_{g\ max}$ control



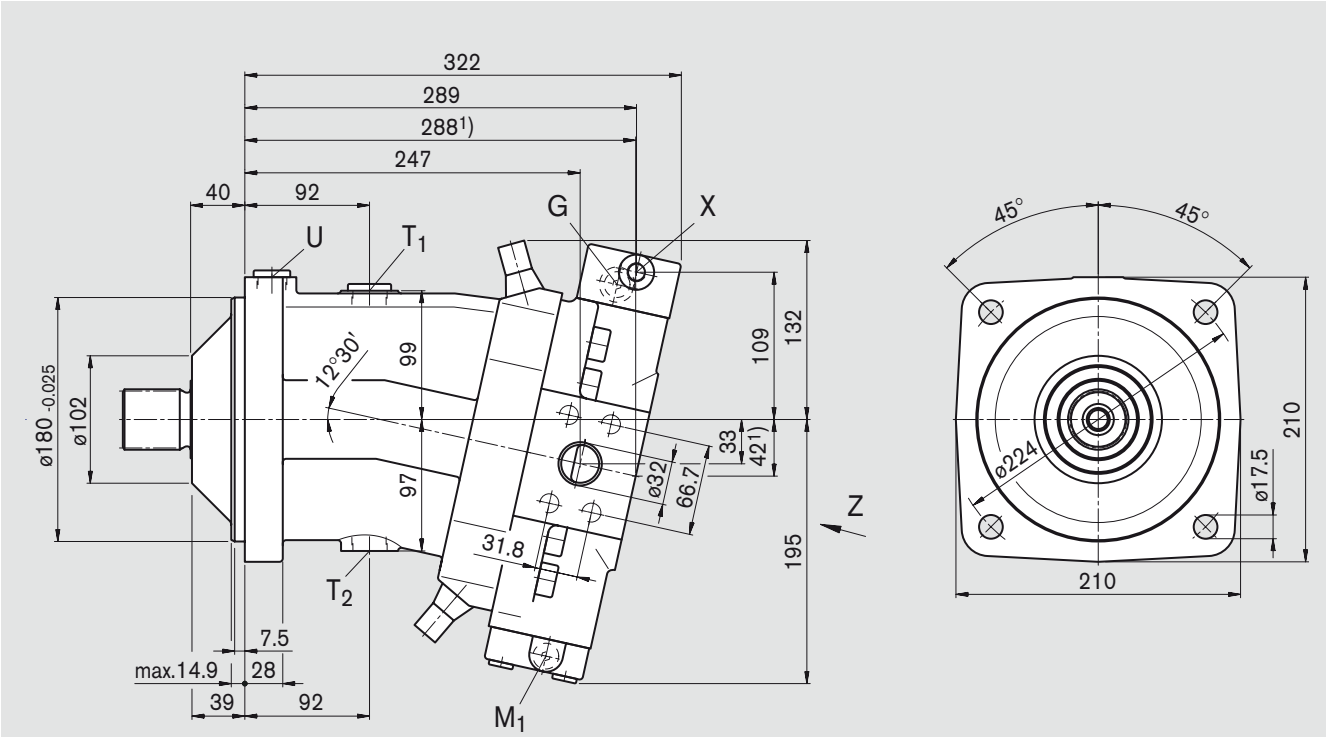
Unit dimensions, size 140

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

HD1, HD2 Hydraulic control, pilot-pressure related

HZ1 Hydraulic two-point control

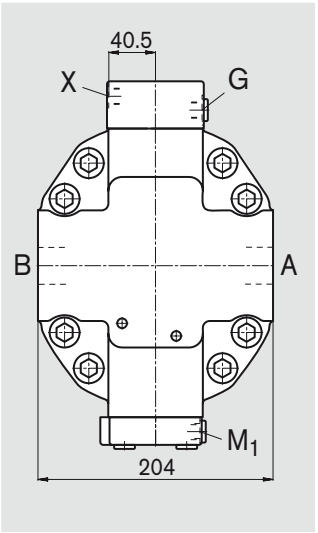
SAE flange ports A/B side, opposite **(02)**



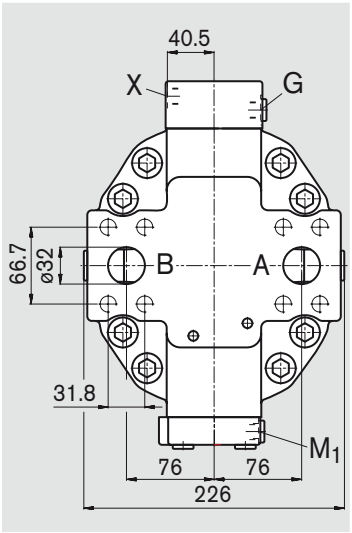
¹) With service line ports A/B rear (plate 01)

View Z

SAE flange ports A/B side, opposite **(02)**



SAE flange ports A/B rear **(01)**

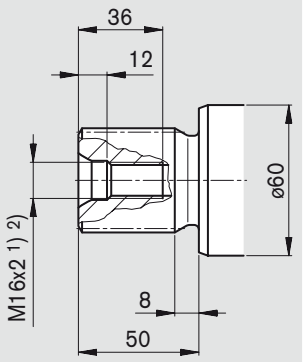


Unit dimensions, size 140

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

Shaft end

Z Splined shaft DIN 5480
W45x2x30x21x9g



Ports

A, B	Service line ports (high-pressure series)	SAE J518	1 1/4 in	
	Fixing thread A/B	DIN 13	M14x2; 19 deep 2)	
T_1	Case drain port 3)	DIN 3852	M26x1.5; 16 deep	230 Nm 2)
T_2	Case drain port	DIN 3852	M26x1.5; 16 deep	230 Nm 2)
X, X_1, X_3	Pilot-pressure port	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
G	Port for synchronous control of multiple units and for remote control pressure 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
G_2	Port for 2nd pressure setting 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
U	Flow port 3)	DIN 3852	M22x1.5; 14 deep	210 Nm 2)
M_1	Gauge port for control pressure 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)

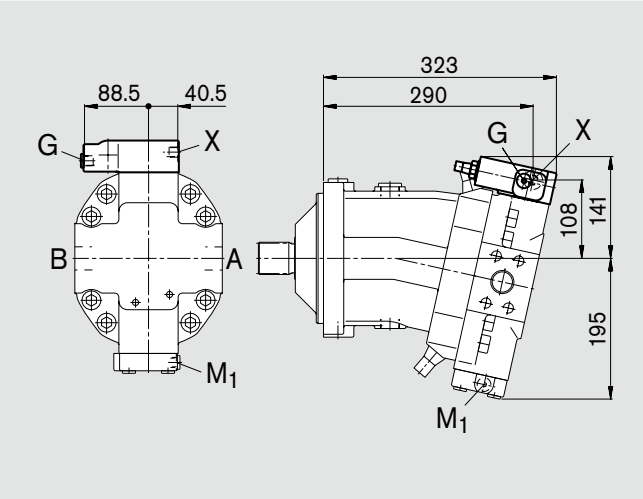
1) center bore according to DIN 332 (thread according to DIN 13)
2) please observe the general notes for the max. tightening torques on page 75
3) plugged

Unit dimensions, size 140

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

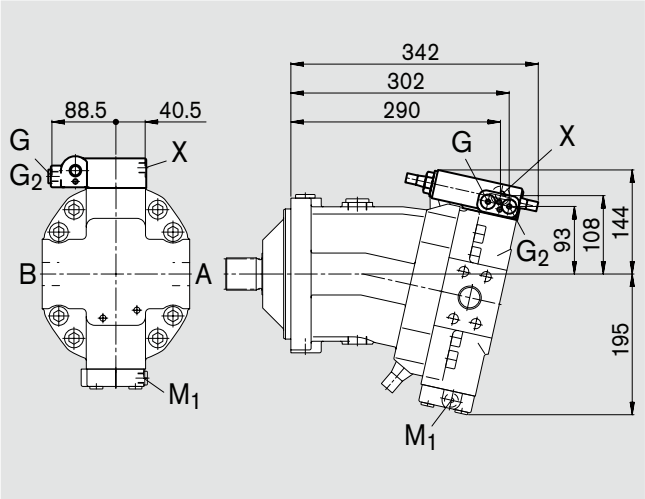
HD.D

Hydraulic control, pilot-pressure related,
with pressure control, direct



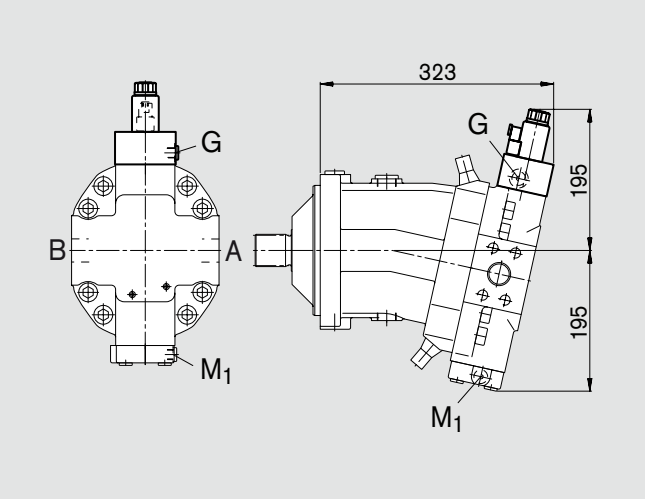
HD.E

Hydraulic control, pilot-pressure related,
with pressure control, direct and 2nd pressure setting



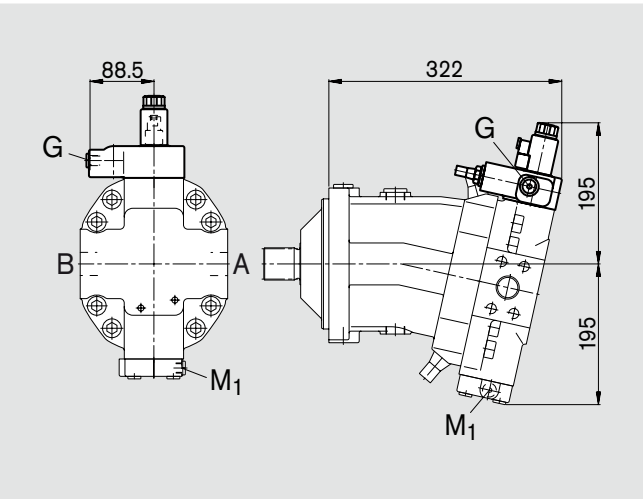
EP1, EP2

Electric control with proportional solenoid



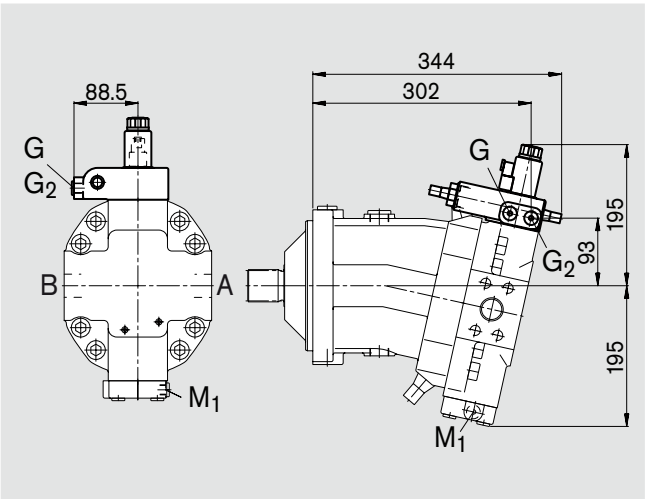
EP.D

Electric control (proportional solenoid)
with pressure control, direct



EP.E

Electric control (proportional solenoid)
with pressure control, direct and 2nd pressure setting

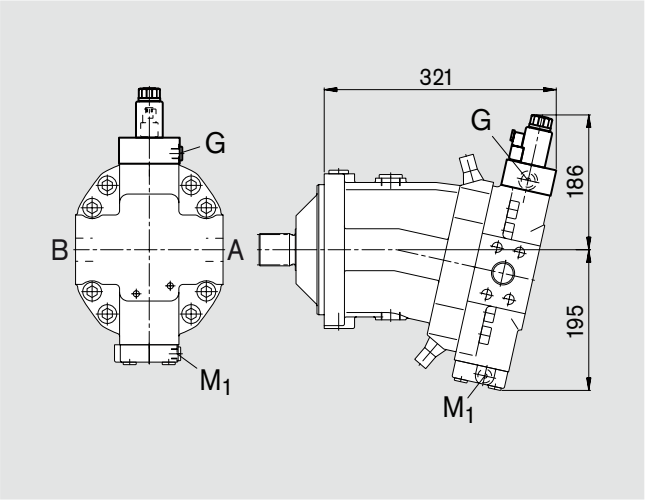


Unit dimensions, size 140

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

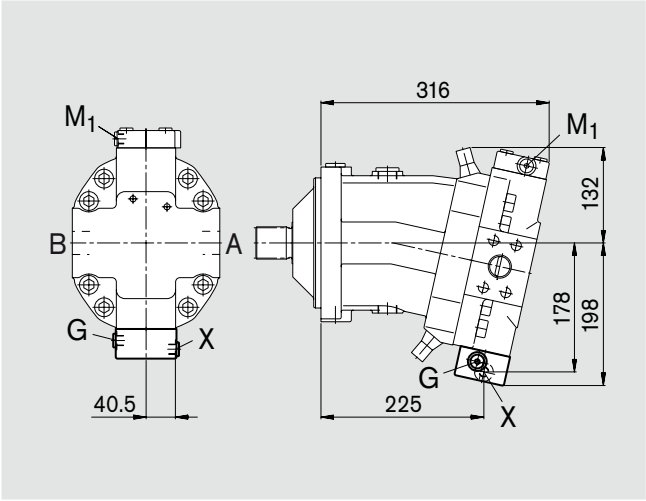
EZ1, EZ2

Electric two-point control with switching solenoid



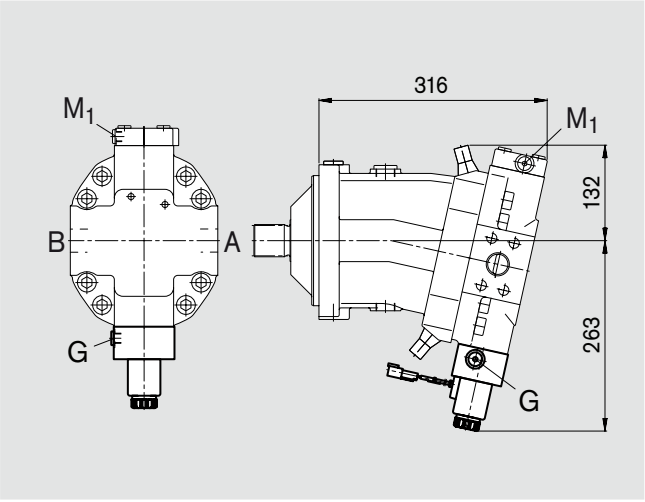
HA1, HA2 / HA1T, HA2T

Automatic control, high-pressure related / hydraulic override



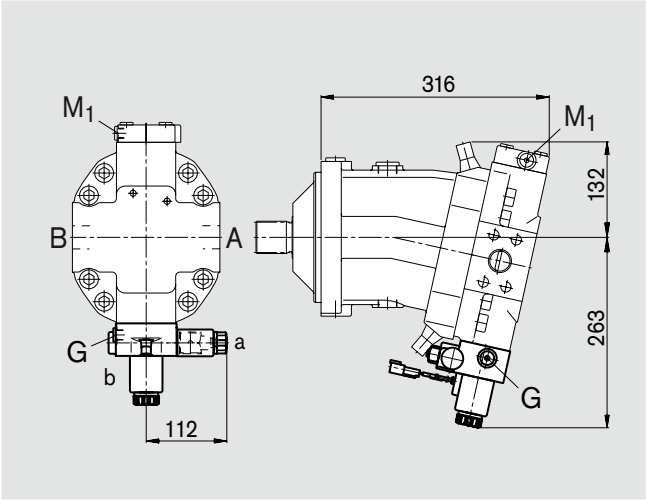
HA1U1, HA2U2

Automatic control, high-pressure related and electric override



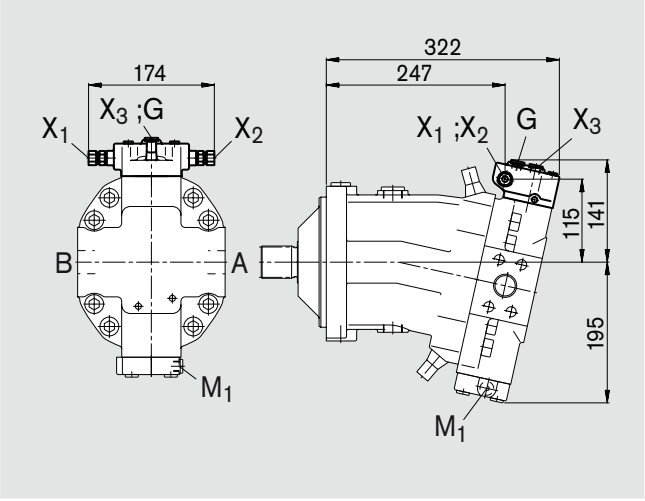
HA1R1, HA2R2

Automatic control, high-pressure related, electric override and electric travel direction valve



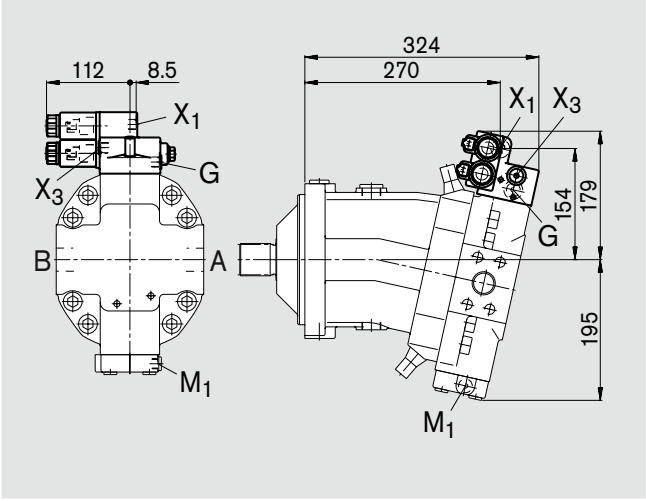
DA1, DA4

Hydraulic control, speed related and hydraulic travel direction valve



DA2, DA3, DA5, DA6

Hydraulic control, speed related, el. travel direction valve and el. $V_{g\ max}$ control



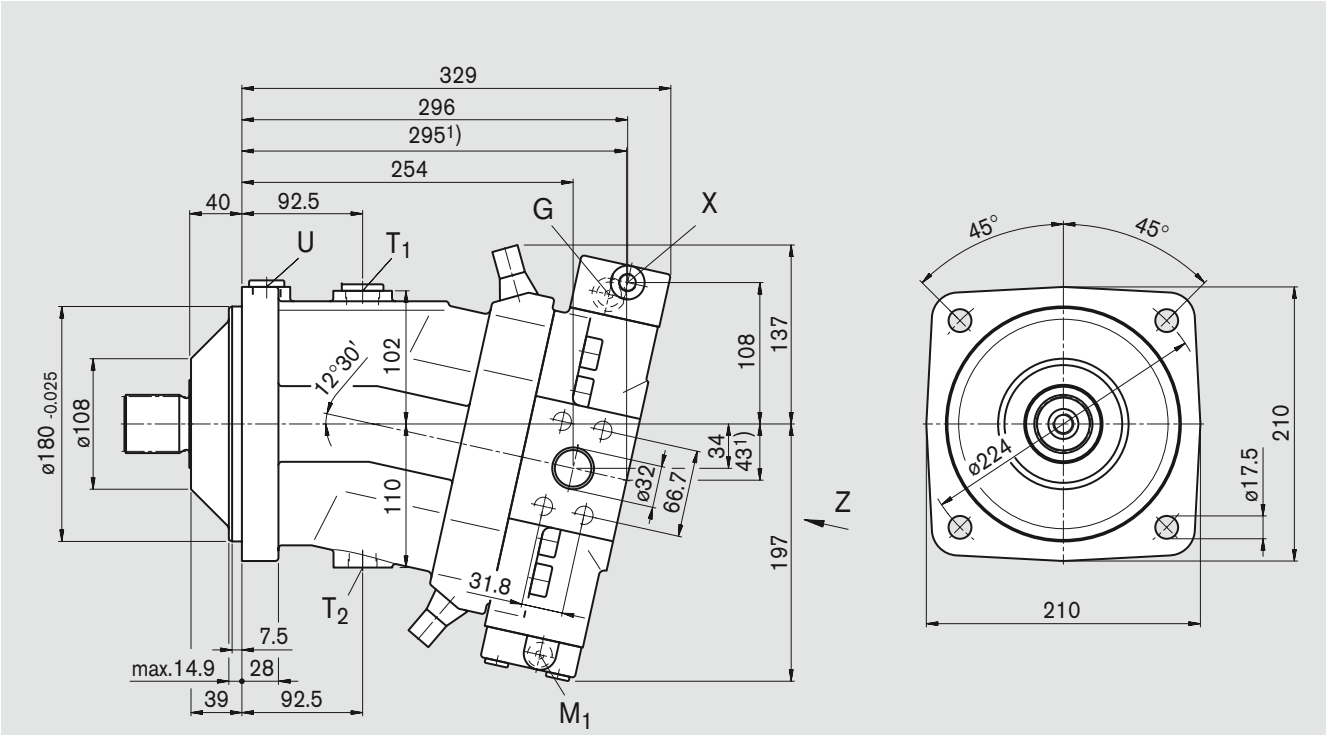
Unit dimensions, size 160

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

HD1, HD2 Hydraulic control, pilot-pressure related

HZ1 Hydraulic two-point control

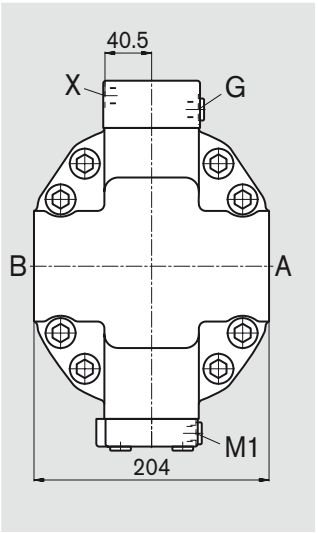
SAE flange ports A/B side, opposite **(02)**



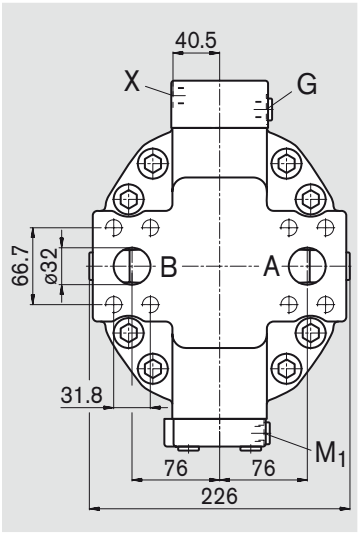
¹) With service line ports A/B rear (plate 01)

View Z

SAE flange ports A/B side, opposite **(02)**



SAE flange ports A/B rear **(01)**

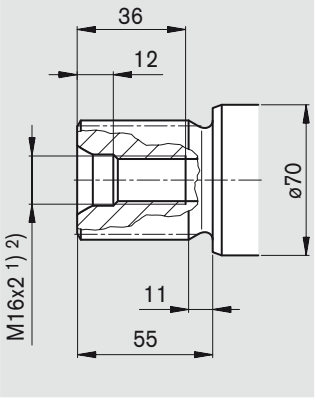


Unit dimensions, size 160

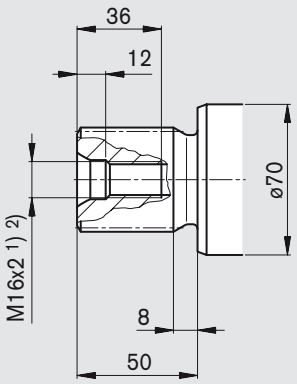
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

A Splined shaft DIN 5480
W50x2x30x24x9g



Z Splined shaft DIN 5480
W45x2x30x21x9g



Ports

A, B	Service line ports (high-pressure series)	SAE J518	1 1/4 in		
	Fixing thread A/B	DIN 13	M14x2;	19 deep 2)	
T_1	Case drain port 3)	DIN 3852	M26x1.5;	16 deep	230 Nm 2)
T_2	Case drain port	DIN 3852	M26x1.5;	16 deep	230 Nm 2)
X, X_1, X_3	Pilot-pressure port	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
G	Port for synchronous control of multiple units and for remote control pressure 3)	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
G_2	Port for 2nd pressure setting 3)	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
U	Flow port 3)	DIN 3852	M22x1.5;	14 deep	230 Nm 2)
M_1	Gauge port for control pressure 3)	DIN 3852	M14x1.5;	12 deep	80 Nm 2)

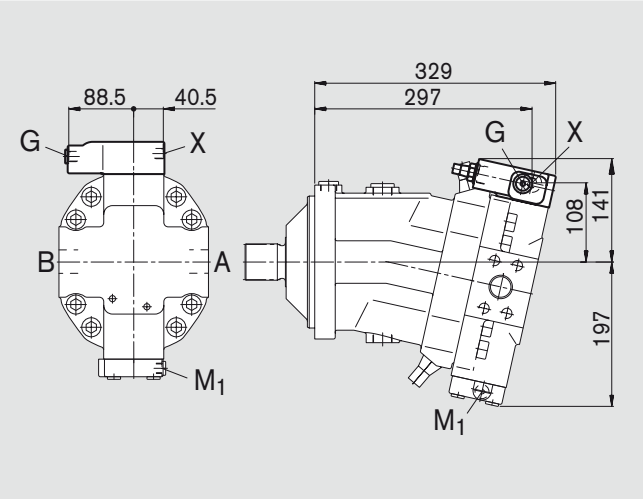
1) center bore according to DIN 332 (thread according to DIN 13)
2) please observe the general notes for the max. tightening torques on page 75
3) plugged

Unit dimensions, size 160

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

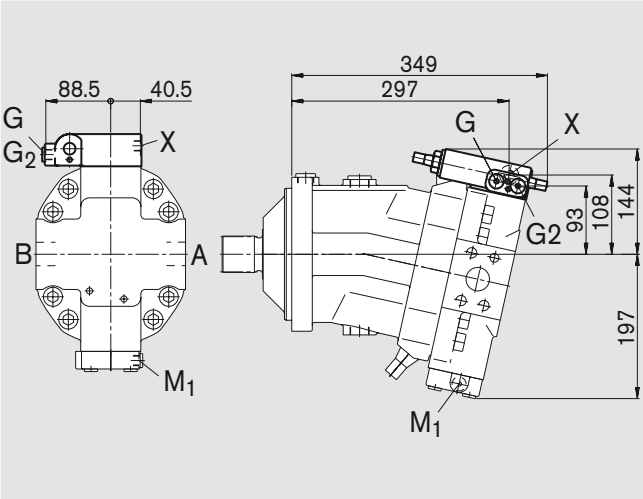
HD.D

Hydraulic control, pilot-pressure related,
with pressure control, direct



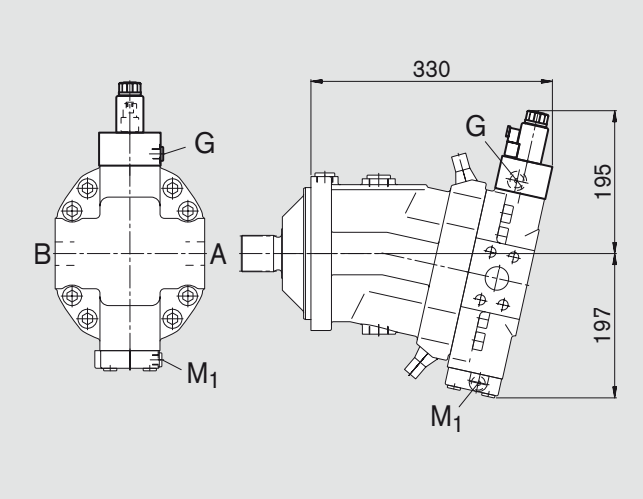
HD.E

Hydraulic control, pilot-pressure related,
with pressure control, direct and 2nd pressure setting



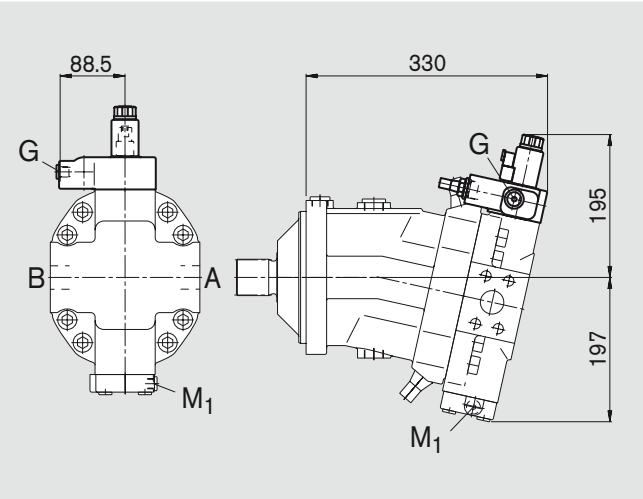
EP1, EP2

Electric control with proportional solenoid



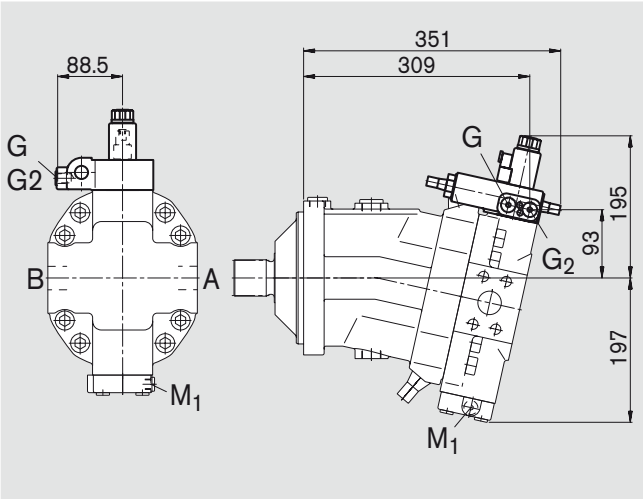
EP.D

Electric control (proportional solenoid)
with pressure control, direct



EP.E

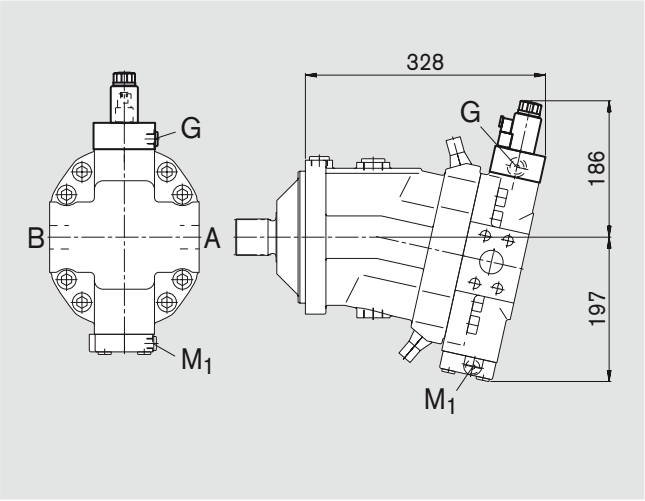
Electric control (proportional solenoid)
with pressure control, direct and 2nd pressure setting



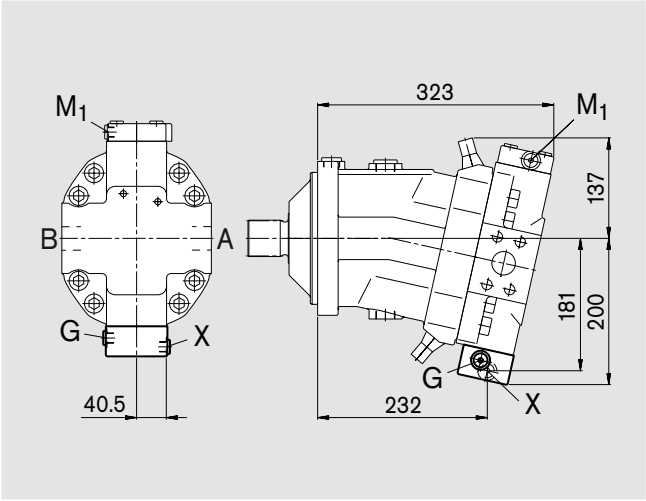
Unit dimensions, size 160

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

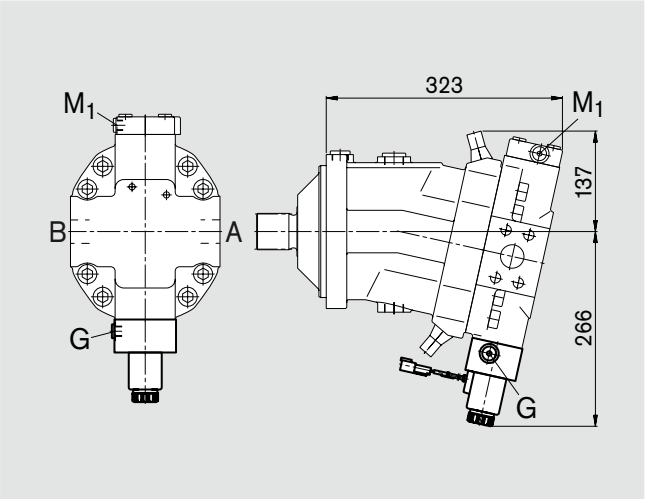
EZ1, EZ2
Electric two-point control with switching solenoid



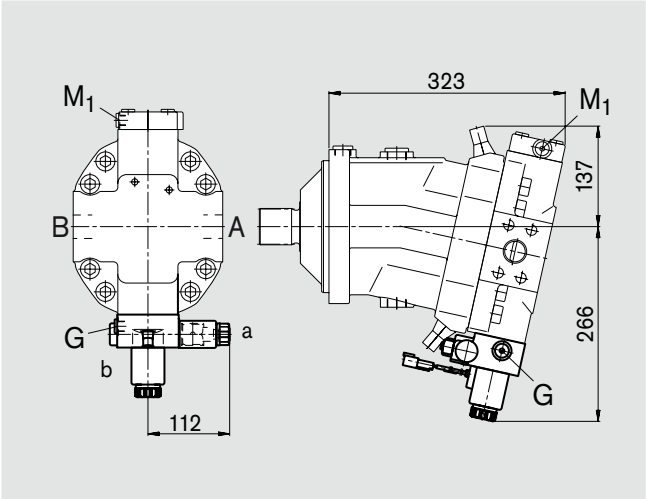
HA1, HA2 / HA1T, HA2T
Automatic control, high-pressure related / hydraulic override



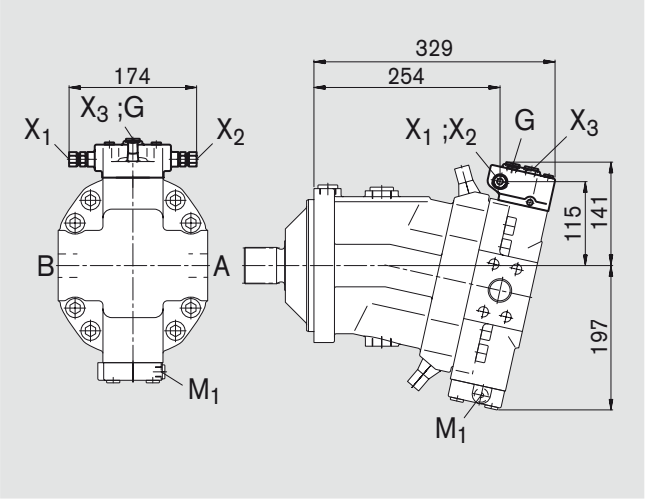
HA1U1, HA2U2
Automatic control, high-pressure related and electric override



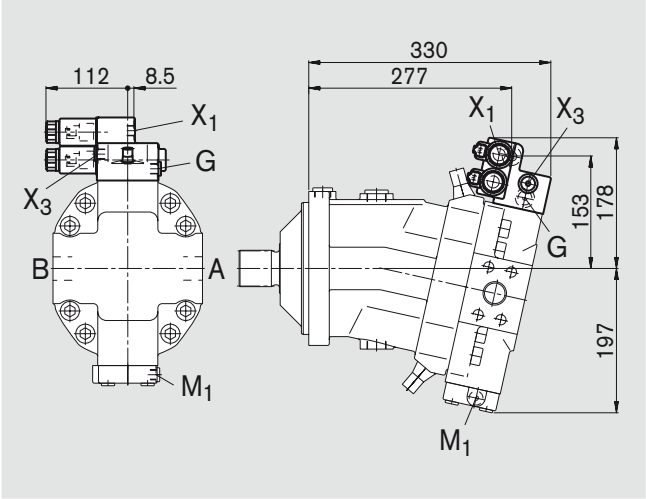
HA1R1, HA2R2
Automatic control, high-pressure related, electric override and electric travel direction valve



DA1, DA4
Hydraulic control, speed related and hydraulic travel direction valve



DA2, DA3, DA5, DA6
Hydraulic control, speed related, el. travel direction valve and el. $V_{g\ max}$ control



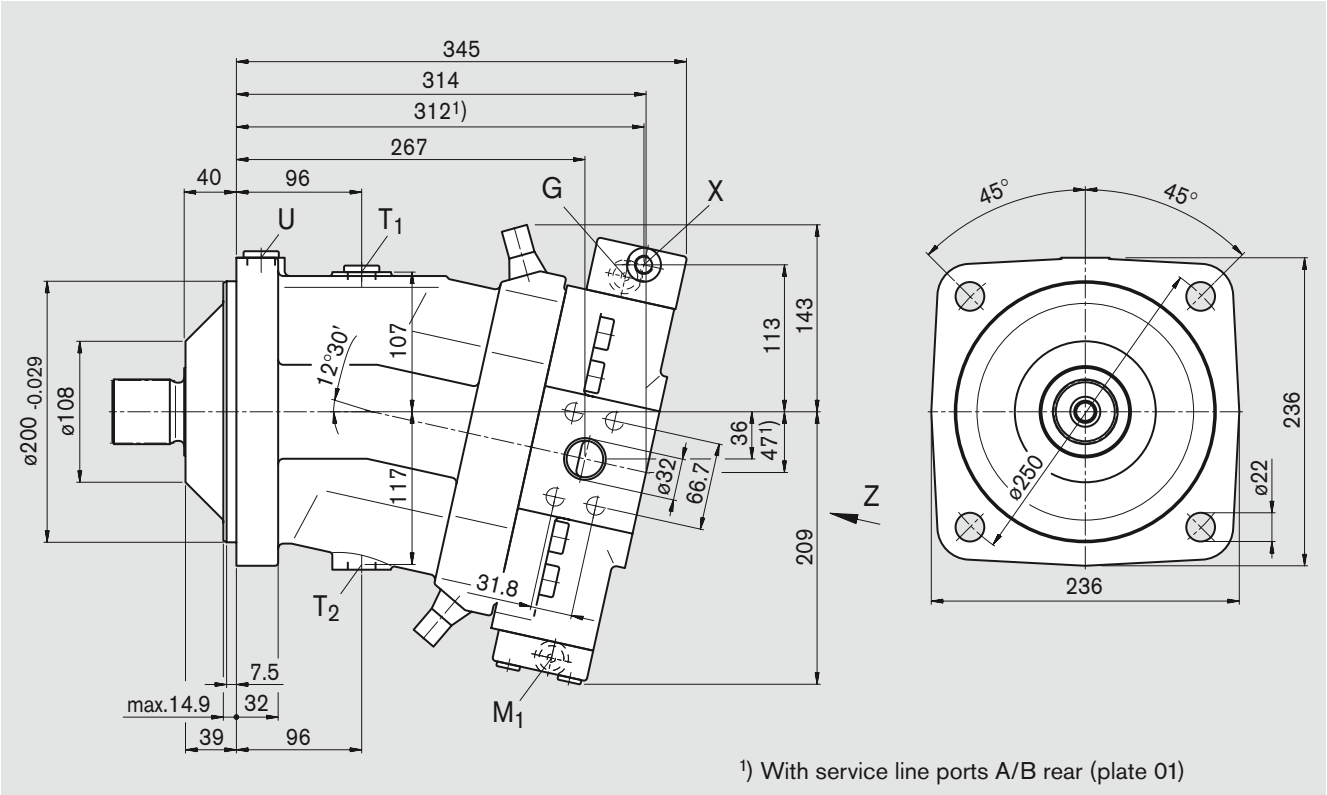
Unit dimensions, size 200

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

HD1, HD2 Hydraulic control, pilot-pressure related

HZ1 Hydraulic two-point control

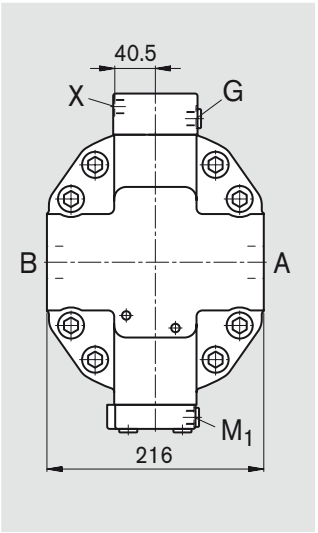
SAE flange ports A/B side, opposite **(02)**



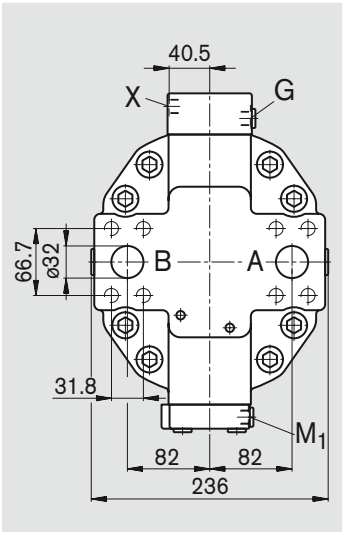
¹) With service line ports A/B rear (plate 01)

View Z

SAE flange ports A/B side, opposite **(02)**



SAE flange ports A/B rear **(01)**

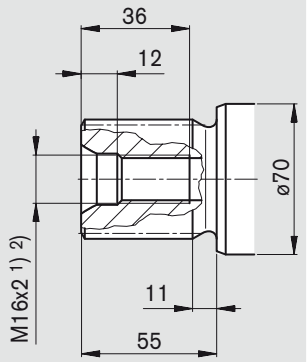


Unit dimensions, size 200

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

Shaft end

A Splined shaft DIN 5480
W50x2x30x24x9g



Ports

A, B	Service line ports (high-pressure series)	SAE J518	1 1/4 in	
	Fixing thread A/B	DIN 13	M14x2; 19 deep 2)	
T_1	Case drain port 3)	DIN 3852	M26x1.5; 16 deep	230 Nm 2)
T_2	Case drain port	DIN 3852	M26x1.5; 16 deep	230 Nm 2)
X, X_1, X_3	Pilot-pressure port	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
G	Port for synchronous control of multiple units and for remote control pressure 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
G_2	Port for 2nd pressure setting 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)
U	Flow port 3)	DIN 3852	M22x1.5; 14 deep	210 Nm 2)
M_1	Gauge port for control pressure 3)	DIN 3852	M14x1.5; 12 deep	80 Nm 2)

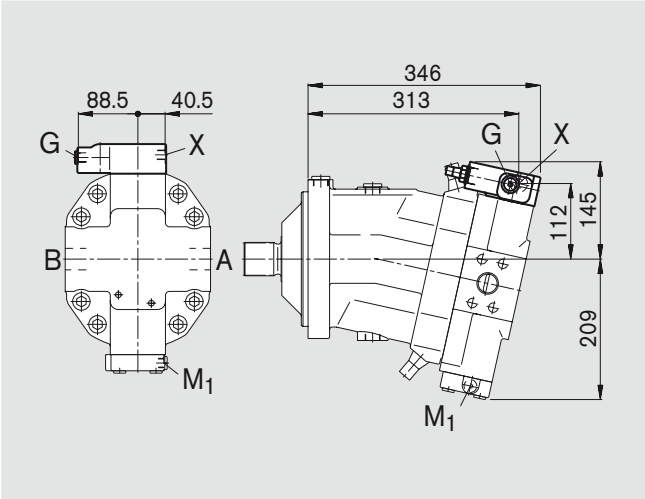
1) center bore according to DIN 332 (thread according to DIN 13)
2) please observe the general notes for the max. tightening torques on page 75
3) plugged

Unit dimensions, size 200

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

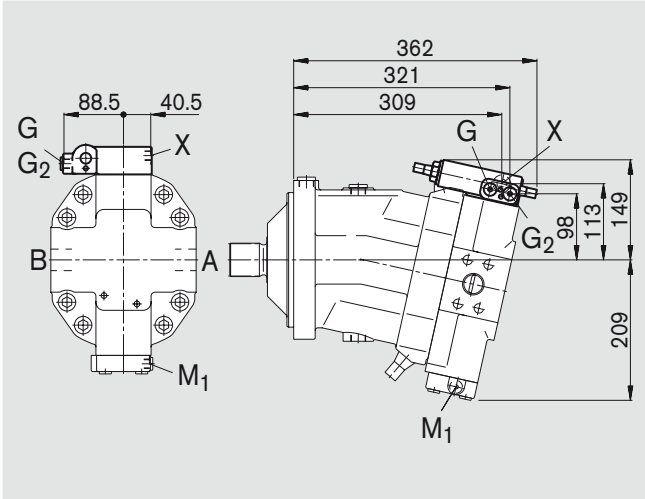
HD.D

Hydraulic control, pilot-pressure related,
with pressure control, direct



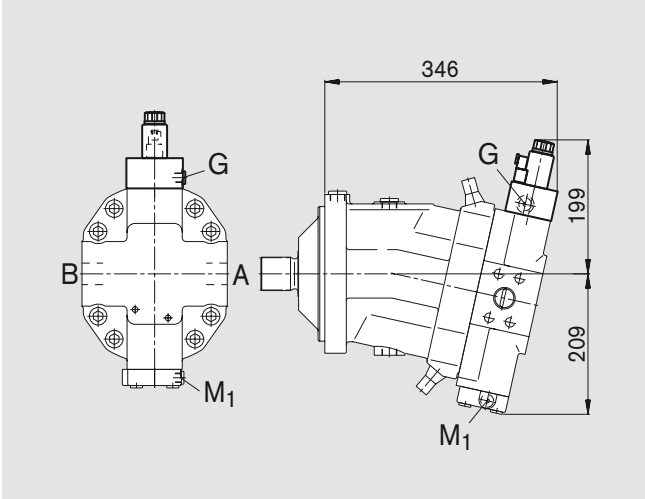
HD.E

Hydraulic control, pilot-pressure related,
with pressure control, direct and 2nd pressure setting



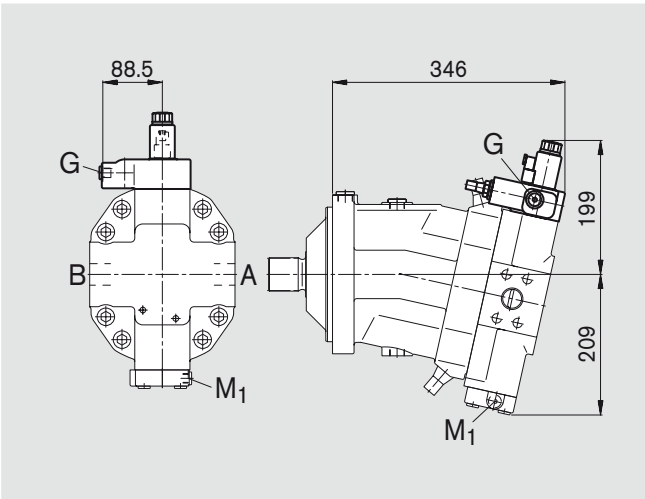
EP1, EP2

Electric control with proportional solenoid



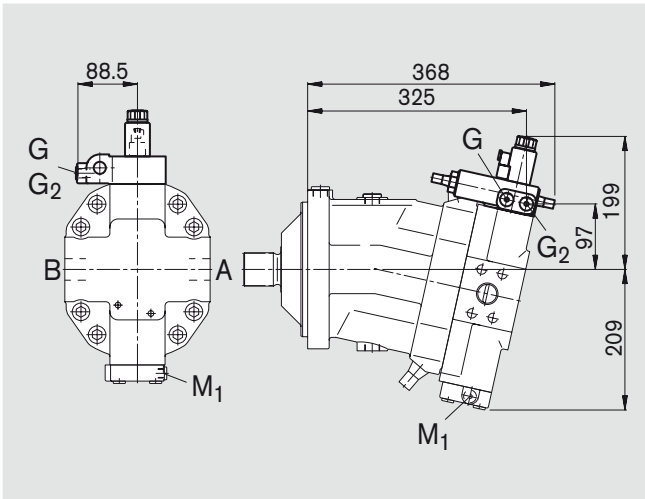
EP.D

Electric control (proportional solenoid)
with pressure control, direct



EP.E

Electric control (proportional solenoid)
with pressure control, direct and 2nd pressure setting

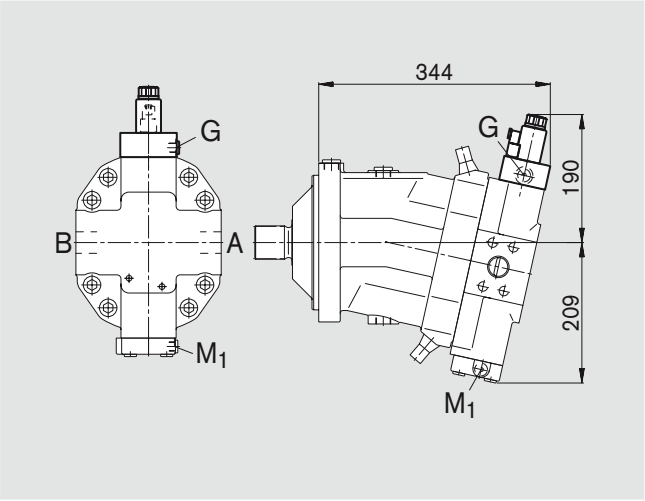


Unit dimensions, size 200

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

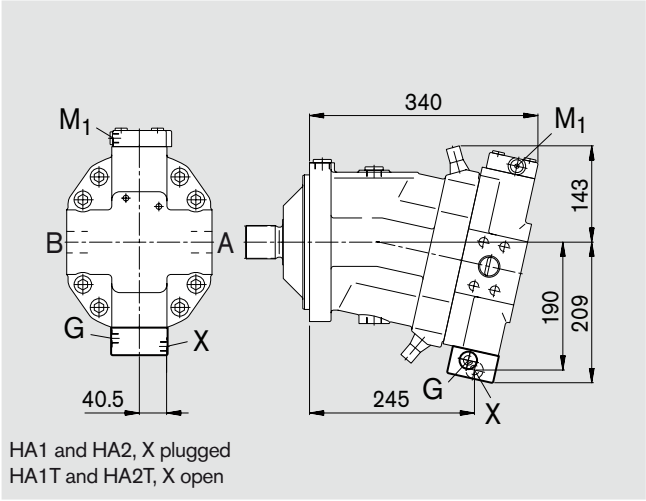
EZ1, EZ2

Electric two-point control with switching solenoid



HA1, HA2 / HA1T, HA2T

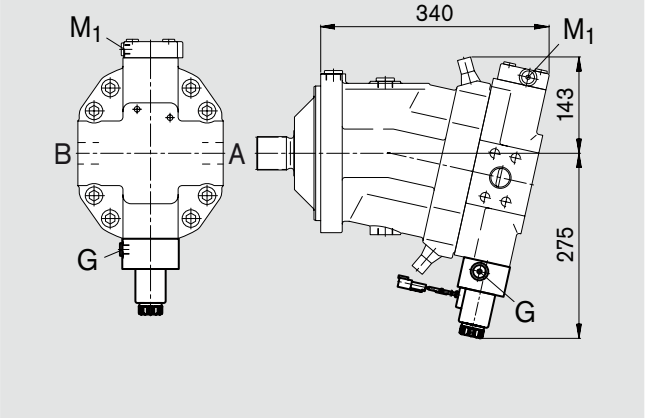
Automatic control, high-pressure related / hydraulic override



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

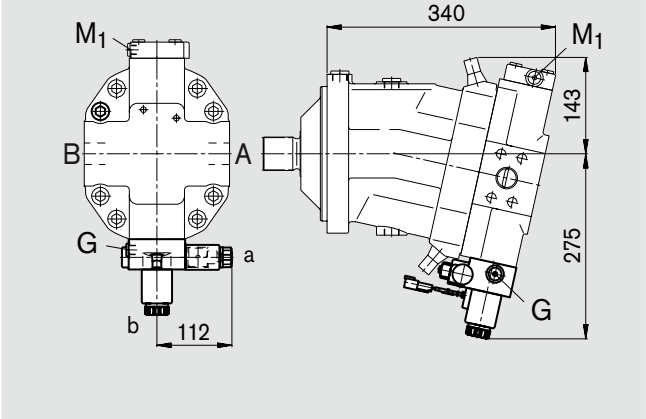
HA1U1, HA2U2

Automatic control, high-pressure related and electric override



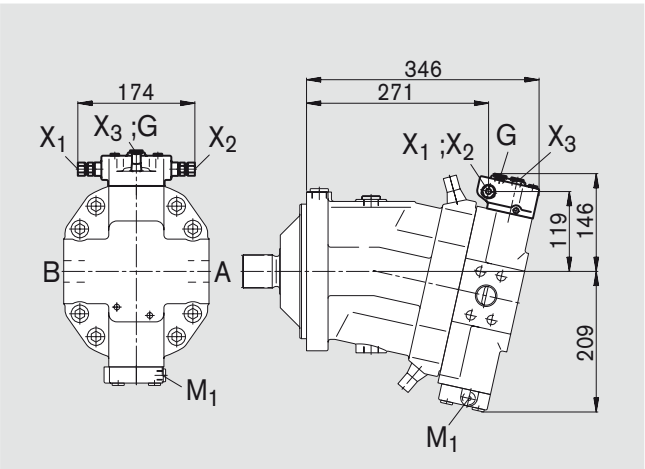
HA1R1, HA2R2

Automatic control, high-pressure related, electric override and electric travel direction valve



DA1, DA4

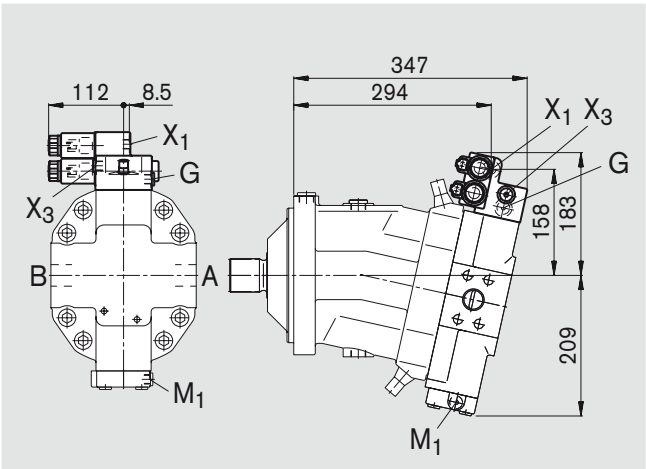
Hydraulic control, speed related and hydraulic travel direction valve



X_1, X_2 with fitting 8B-ST according to DIN 2353-CL

DA2, DA3, DA5, DA6

Hydraulic control, speed related, el. travel direction valve and el. $V_{g\ max}$ control



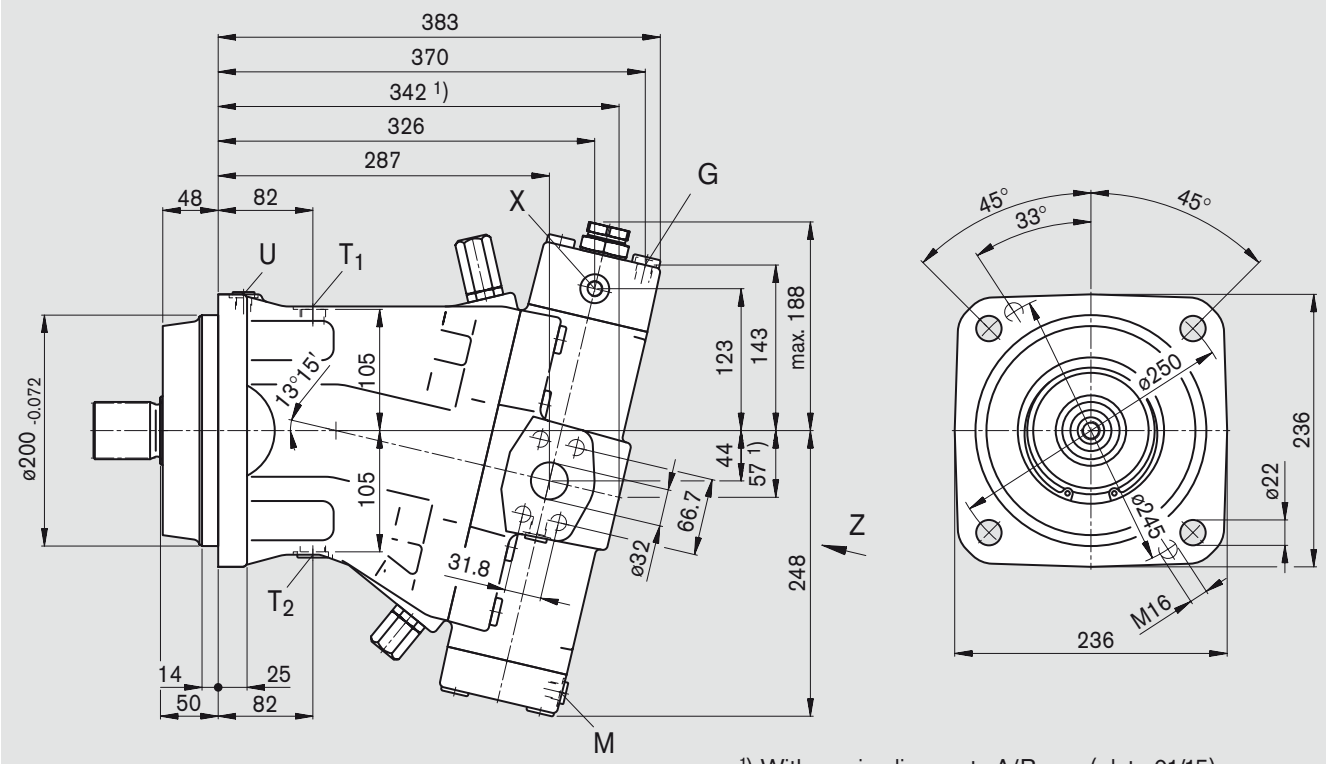
Unit dimensions, size 250

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

HD1, HD2 Hydraulic control, pilot-pressure related

HZ - Hydraulic two-point control

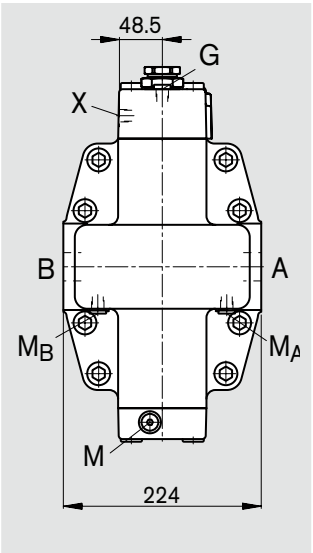
SAE flange ports A/B side, opposite **(02)**



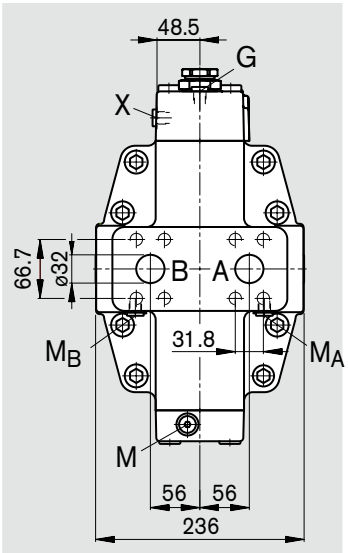
1) With service line ports A/B rear (plate 01/15)

View Z

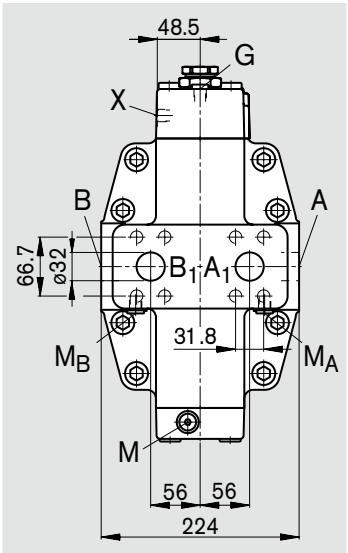
SAE flange ports A/B side, opposite **(02)**



SAE flange ports A/B rear **(01)**



SAE flange ports A/B side, opposite + A_1/B_1 rear **(15)**

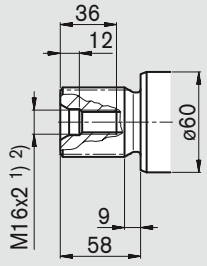


Unit dimensions, size 250

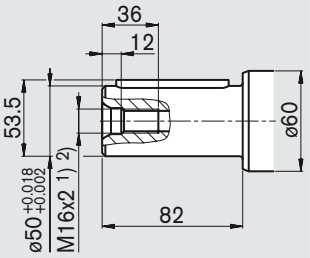
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

Z Splined shaft DIN 5480
W50x2x30x24x9g



P Parallel shaft with key
DIN 6885, AS14x9x80



Ports

A, B	Service line ports (high-pressure series)	SAE J518	1 1/4 in	
A_1, B_1	Additional service line ports with plate 15	SAE J518	1 1/4 in	
	Fixing thread A/B and A_1/B_1	DIN 13	M14x2; 19 deep [2]	
T_1	Case drain port	DIN 3852	M22x1.5; 14 deep	210 Nm [2]
T_2	Case drain port [3]	DIN 3852	M22x1.5; 14 deep	210 Nm [2]
X	Pilot-pressure port	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
X_3	Port for remote control valve	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
P	Port for control oil supply	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
G	Port for synchronous control of multiple units and for remote control pressure [3]	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
G_2	Port for 2nd pressure setting [3]	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
U	Flow port [3]	DIN 3852	M14x1.5; 12 deep	140 Nm [2]
M	Gauge port for control pressure [3]	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
M_A, M_B	Gauge port for operating pressure [3]	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
M_{St}	Gauge port for pilot pressure [3]	DIN 3852	M14x1.5; 12 deep	80 Nm [2]

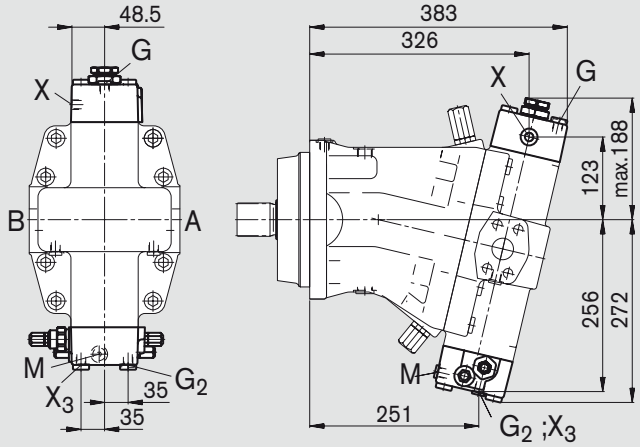
[1]) center bore according to DIN 332 (thread according to DIN 13)
[2]) please observe the general notes for the max. tightening torques on page 75
[3]) plugged

Unit dimensions, size 250

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

HD.D

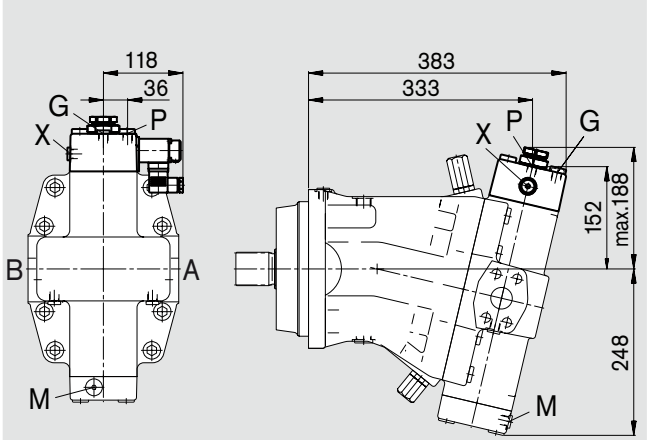
Hydraulic control pilot-pressure related,
with pressure control, direct; **HD.G** remote



HD.D with G_2, without X_3
HD.G with X_3, without G_2

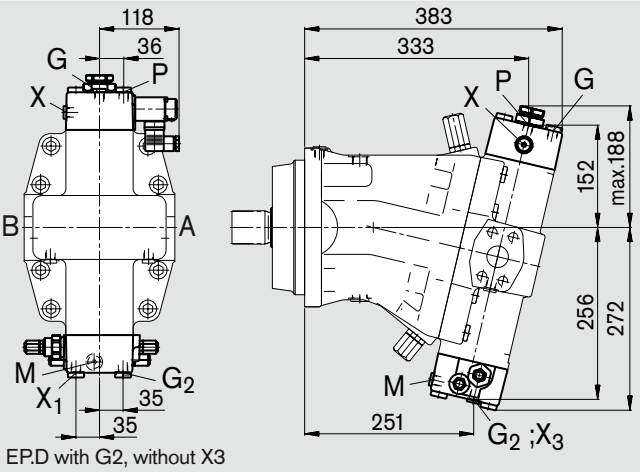
EP1, EP2

Electric control, with proportional valve



EP.D

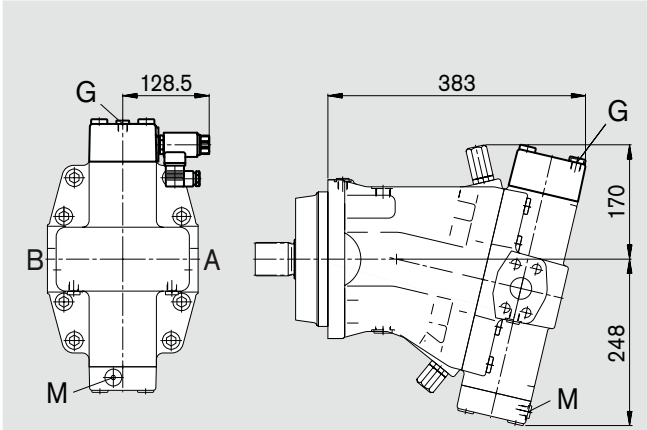
Electric control (proportional valve)
with pressure control, direct; **EP.G** remote



EP.D with G2, without X3
EP.G with X3, without G2

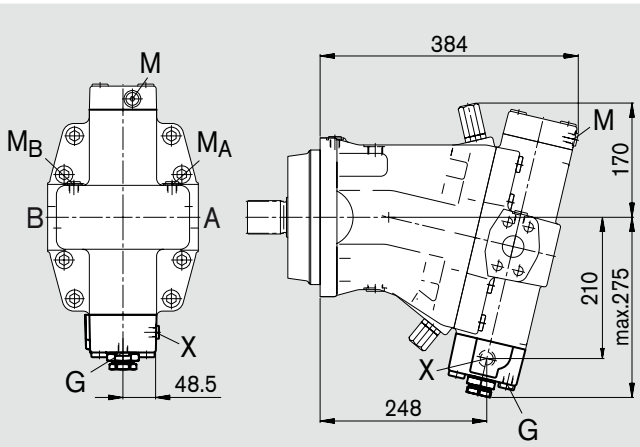
EZ1, EZ2

Electric two-point control with switching valve



HA1, HA2 / HA1T, HA2T

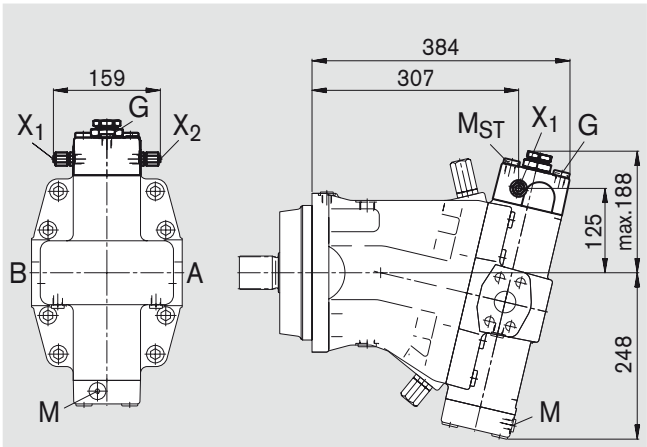
Automatic control, high-pressure related /
hydraulic override



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

DA

Hydraulic control, speed related



X_1, X_2 With B-fitting B0-GEV 8L/M14x1 .5-WD

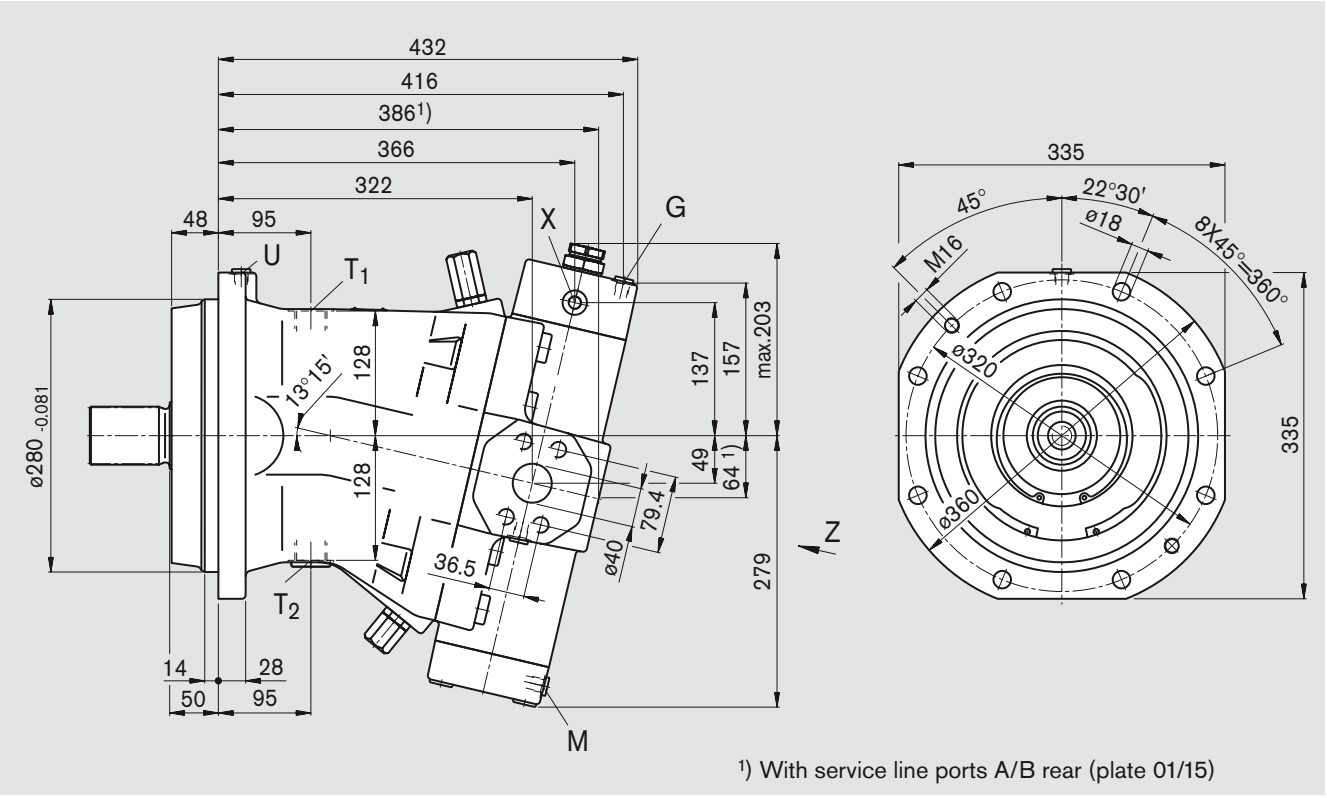
Unit dimensions, size 355

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

HD1, HD2 Hydraulic control, pilot-pressure related

HZ - Hydraulic two-point control

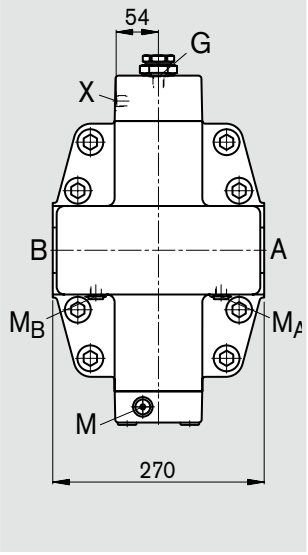
SAE flange ports A/B side, opposite **(02)**



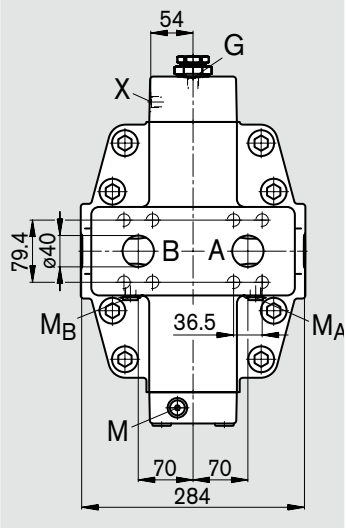
[1]) With service line ports A/B rear (plate 01/15)

View Z

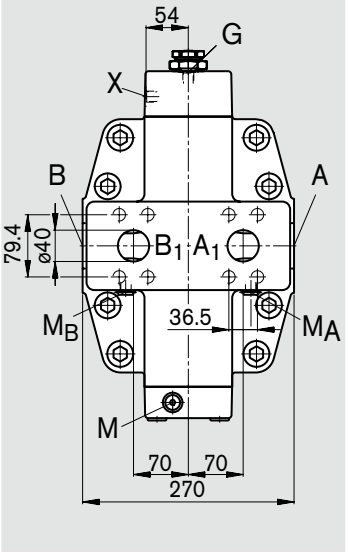
SAE flange ports A/B side, opposite **(02)**



SAE flange ports A/B rear **(01)**



SAE flange ports A/B side, opposite + A_1/B_1 rear **(15)**

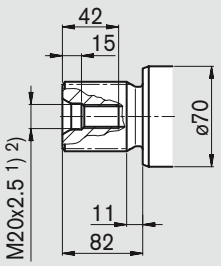


Unit dimensions, size 355

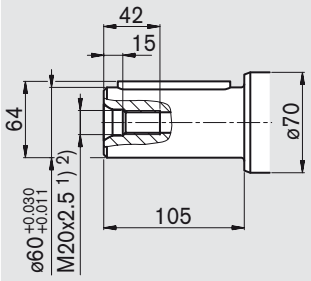
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

Z Splined shaft DIN 5480
W60x2x30x28x9g



P Parallel shaft with key
DIN 6885, AS18x11x100



Ports

A, B	Service line ports (high-pressure series)	SAE J518	1 1/2 in		
A_1, B_1	Additional service line ports with plate 15	SAE J518	1 1/2 in		
	Fixing thread A/B and A_1/B_1	DIN 13	M16x2;	24 deep [2]	
T_1	Case drain port	DIN 3852	M33x2;	18 deep	540 Nm [2]
T_2	Case drain port [3]	DIN 3852	M33x2;	18 deep	540 Nm [2]
X, X_1, X_2	Pilot-pressure port	DIN 3852	M14x1.5;	12 deep	80 Nm [2]
X_3	Port for remote control valve	DIN 3852	M14x1.5;	12 deep	80 Nm [2]
P	Port for control oil supply	DIN 3852	M14x1.5;	12 deep	80 Nm [2]
G	Port for synchronous control of multiple units and for remote control pressure [3]	DIN 3852	M14x1.5;	12 deep	80 Nm [2]
G_2	Port for 2nd pressure setting [3]	DIN 3852	M14x1.5;	12 deep	80 Nm [2]
U	Flow port [3]	DIN 3852	M14x1.5;	12 deep	80 Nm [2]
M	Gauge port for control pressure [3]	DIN 3852	M14x1.5;	12 deep	80 Nm [2]
MA, M_B	Gauge port for operating pressure [3]	DIN 3852	M14x1.5;	12 deep	80 Nm [2]
M_{St}	Gauge port for pilot pressure [3]	DIN 3852	M14x1.5;	12 deep	80 Nm [2]

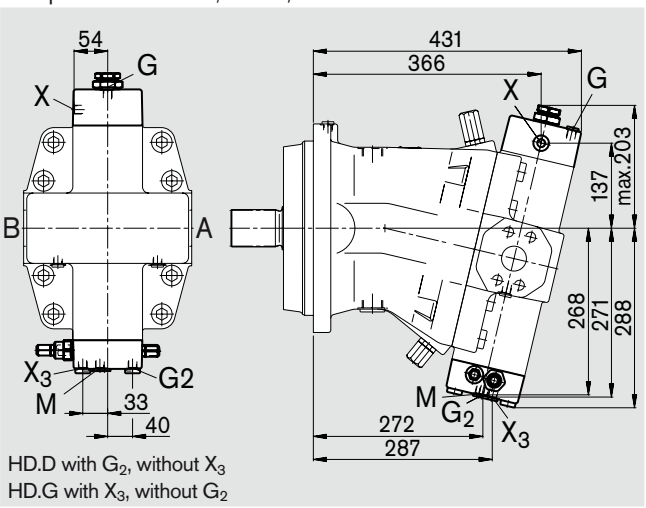
[1] center bore according to DIN 332 (thread according to DIN 13)
[2] please observe the general notes for the max. tightening torques on page 75
[3] plugged

Unit dimensions, size 355

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

HD.D

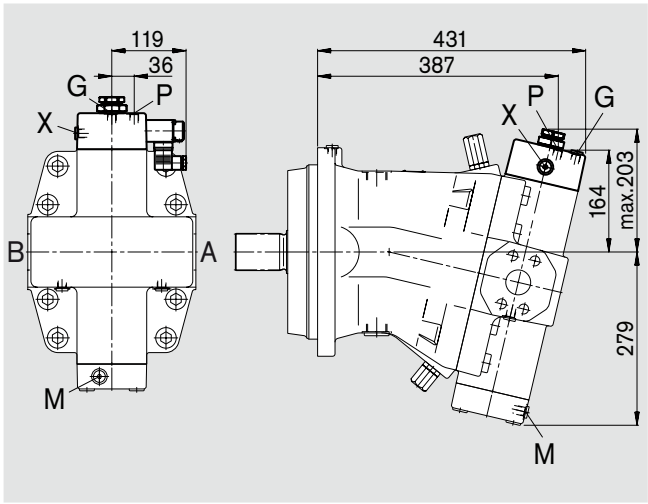
Hydraulic control pilot-pressure related,
with pressure control, direct; **HD.G** remote



HD.D with G_2, without X_3
HD.G with X_3, without G_2

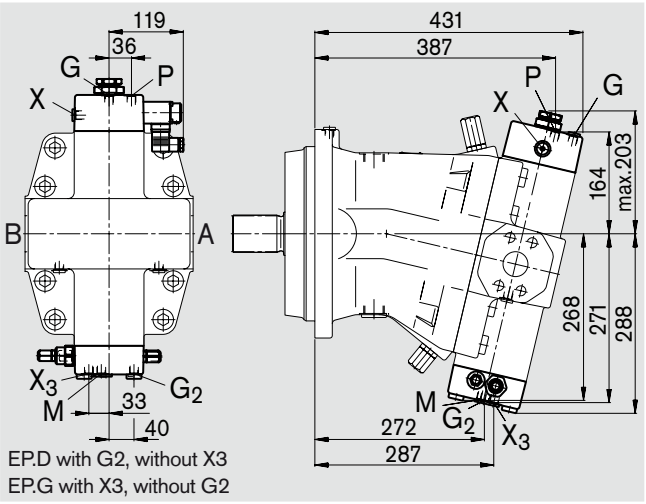
EP1, EP2

Electric control, with proportional valve



EP.D

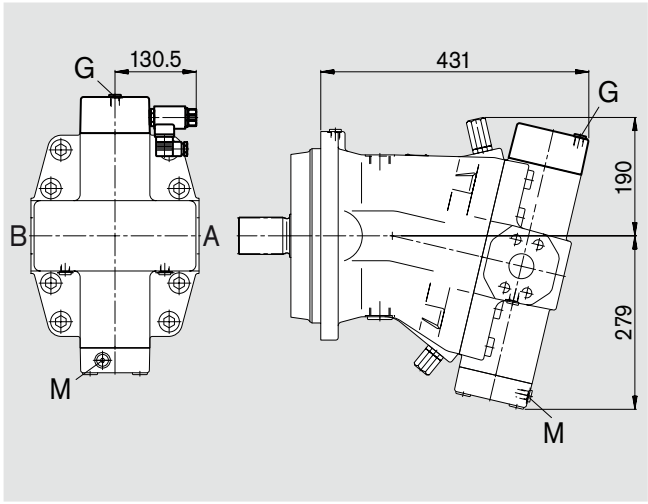
Electric control (proportional valve),
with pressure control, direct; **EP.G** remote



EP.D with G2, without X3
EP.G with X3, without G2

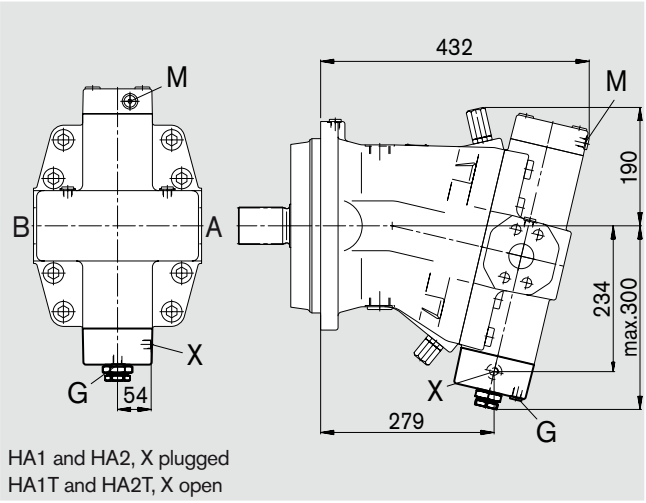
EZ1, EZ2

Electric two-point control with switching valve



HA1, HA2 / HA1T, HA2T

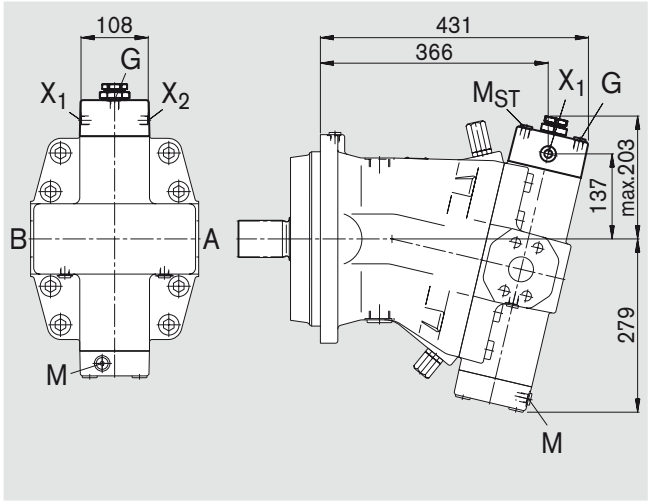
Automatic control, high-pressure related /
hydraulic override



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

DA

Hydraulic control, speed related



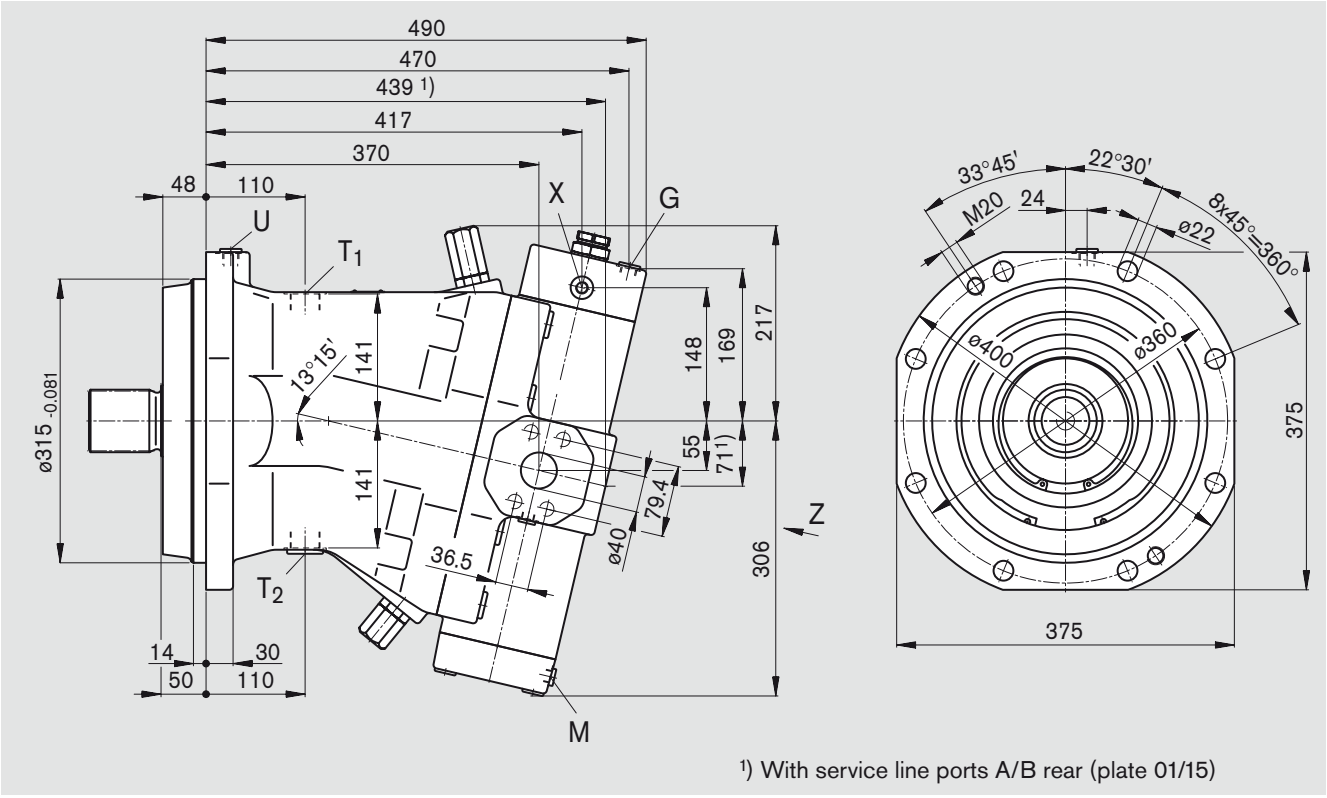
Unit dimensions, size 500

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

HD1, HD2 Hydraulic control, pilot-pressure related

HZ - Hydraulic two-point control

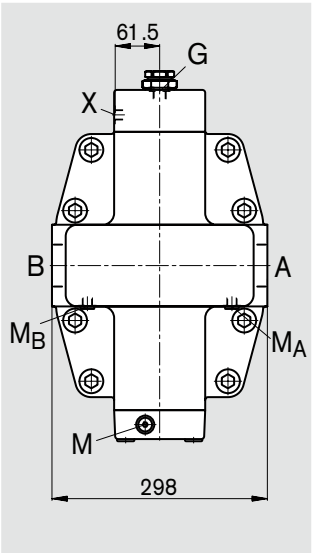
SAE flange ports A/B side, opposite **(02)**



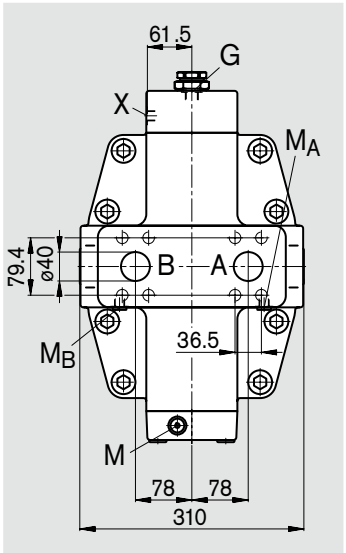
1) With service line ports A/B rear (plate 01/15)

View Z

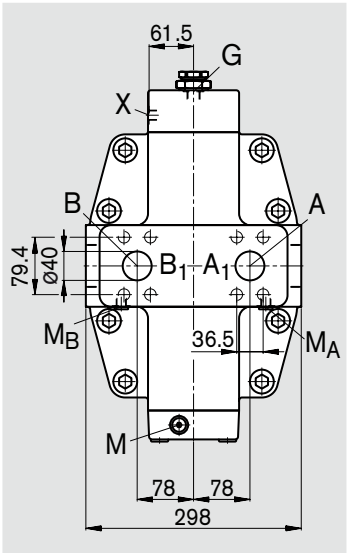
SAE flange ports A/B side, opposite **(02)**



SAE flange ports A/B rear **(01)**



SAE flange ports A/B side, opposite + A_1/B_1 rear **(15)**

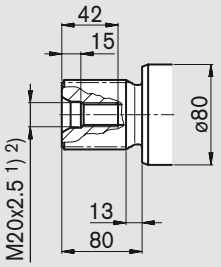


Unit dimensions, size 500

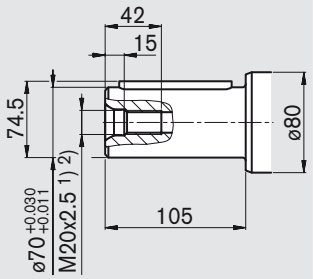
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

Z Splined shaft DIN 5480
W70x3x30x22x9g



P Parallel shaft with key
DIN 6885, AS20x12x100



Ports

A, B	Service line ports (high-pressure series)	SAE J518	1 1/2 in		
A_1, B_1	Additional service line ports with plate 15	SAE J518	1 1/2 in		
	Fixing thread A/B and A_1/B_1	DIN 13	M16x2;	24 deep 2)	
T_1	Case drain port	DIN 3852	M33x2;	18 deep	540 Nm 2)
T_2	Case drain port 3)	DIN 3852	M33x2;	18 deep	540 Nm 2)
X, X_1, X_2	Pilot-pressure port	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
X_3	Port for remote control valve	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
P	Port for control oil supply	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
G	Port for synchronous control of multiple units and for remote control pressure 3)	DIN 3852	M18x1.5;	12 deep	140 Nm 2)
G_2	Port for 2nd pressure setting 3)	DIN 3852	M18x1.5;	12 deep	140 Nm 2)
U	Flow port 3)	DIN 3852	M18x1.5;	12 deep	140 Nm 2)
M	Gauge port for control pressure 3)	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
M_A, M_B	Gauge port for operating pressure 3)	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
M_{St}	Gauge port for pilot pressure 3)	DIN 3852	M14x1.5;	12 deep	80 Nm 2)

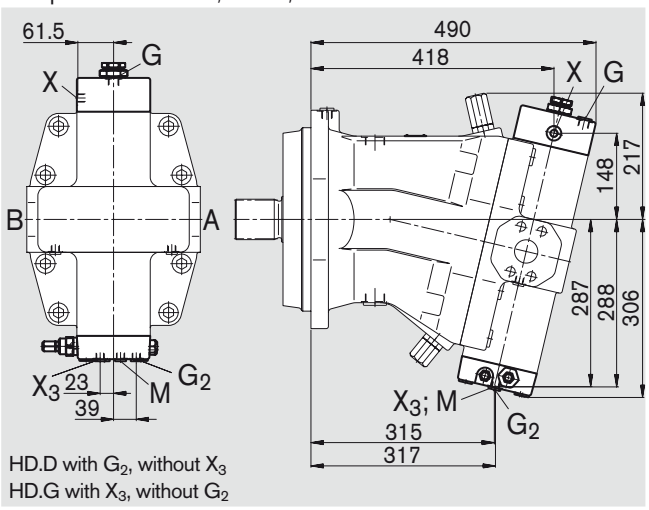
1) center bore according to DIN 332 (thread according to DIN 13)
2) please observe the general notes for the max. tightening torques on page 75
3) plugged

Unit dimensions, size 500

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

HD.D

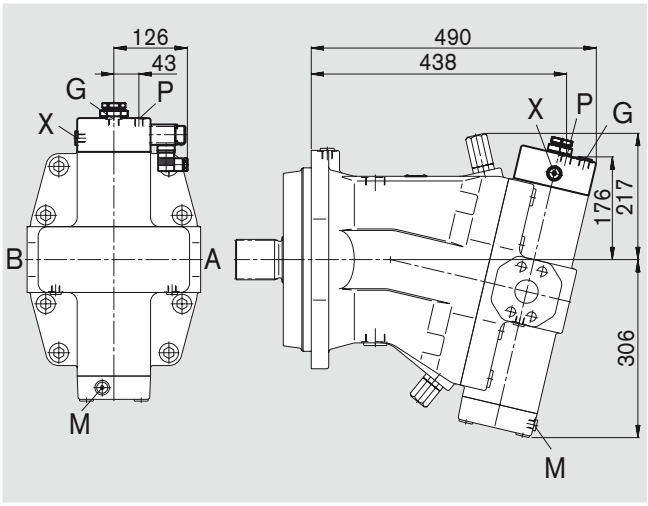
Hydraulic control pilot-pressure related,
with pressure control, direct; **HD.G** remote



HD.D with G_2, without X_3
HD.G with X_3, without G_2

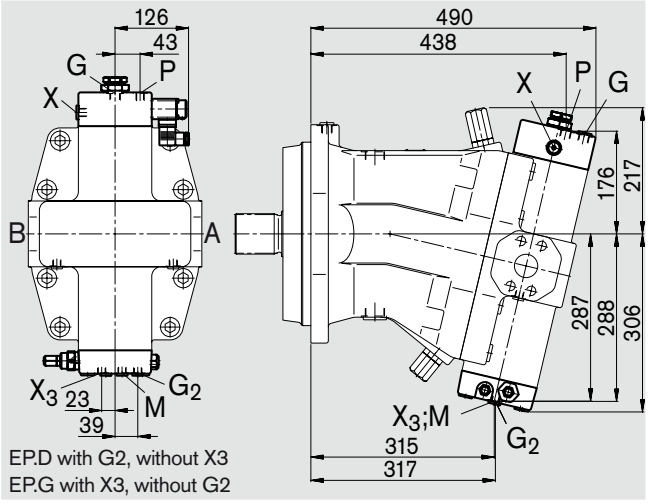
EP1, EP2

Electric control, with proportional valve



EP.D

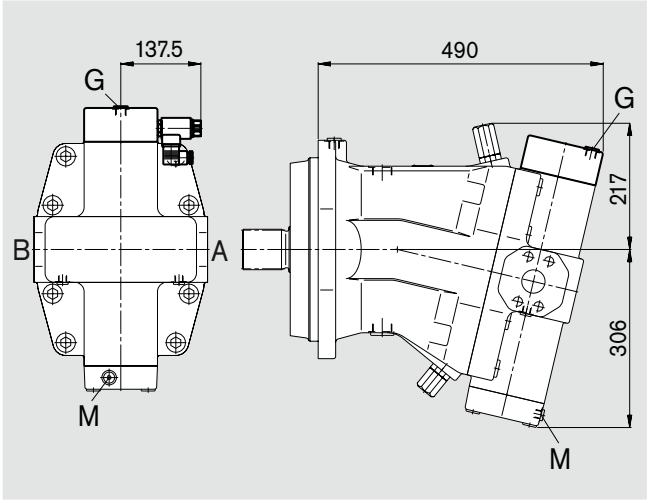
Electric control (proportional valve),
with pressure control, direct; **EP.G** remote



EP.D with G2, without X3
EP.G with X3, without G2

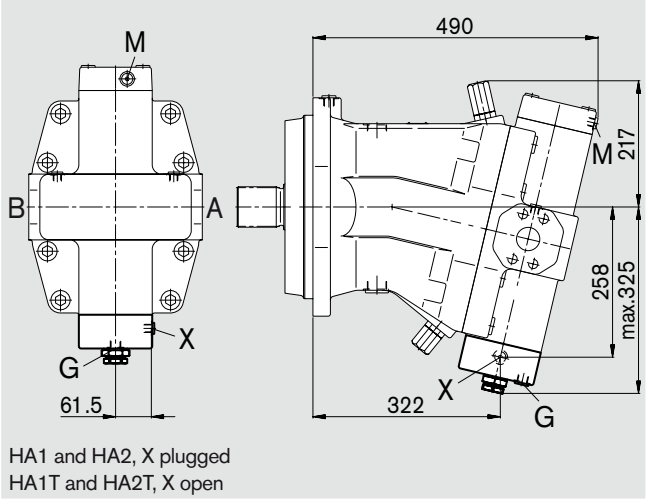
EZ1, EZ2

Electric two-point control with switching valve



HA1, HA2 / HA1T, HA2T

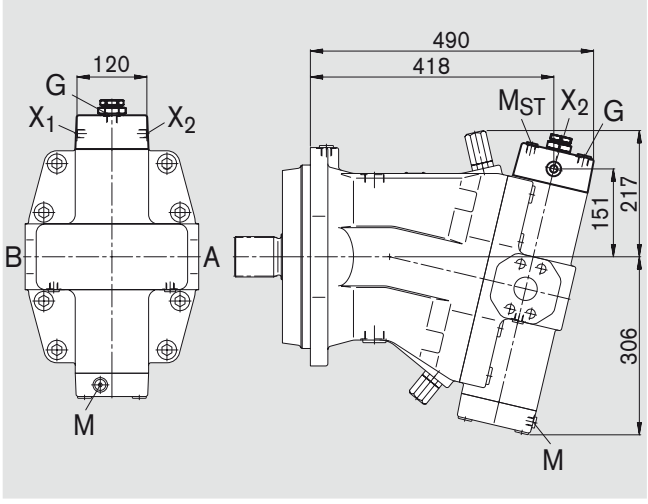
Automatic control, high-pressure related /
hydraulic override



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

DA

Hydraulic control, speed related



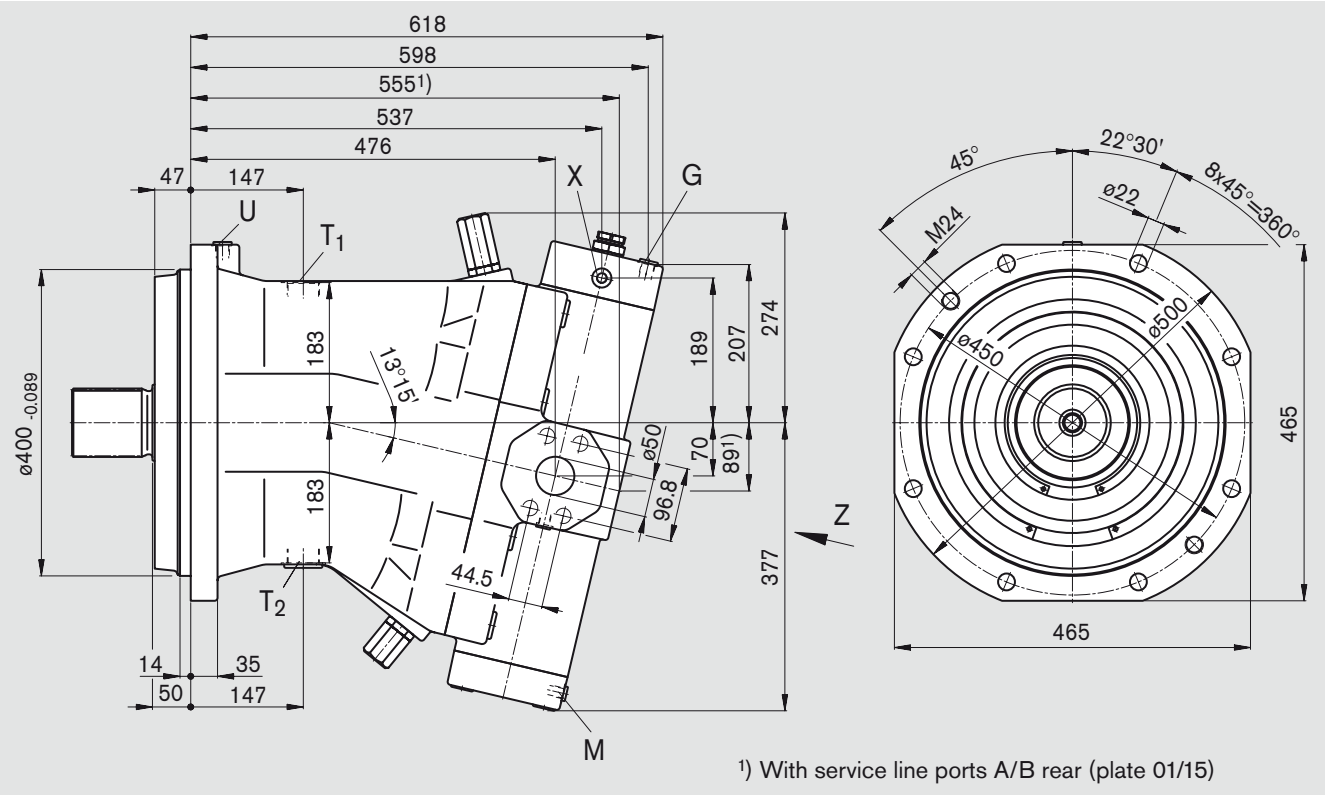
Unit dimensions, size 1000

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

HD1, HD2 Hydraulic control, pilot-pressure related

HZ Hydraulic two-point control

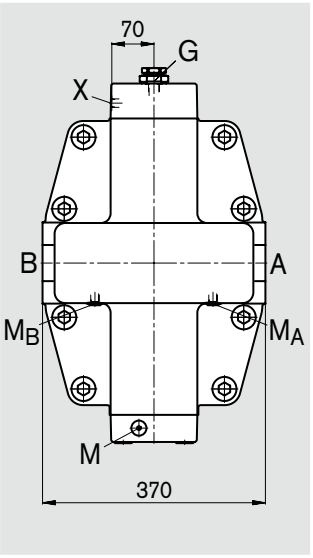
SAE flange ports A/B side, opposite **(02)**



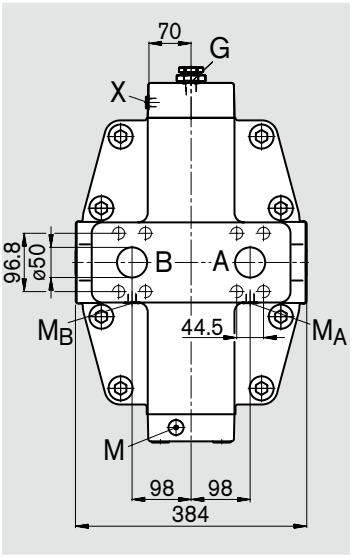
¹) With service line ports A/B rear (plate 01/15)

View Z

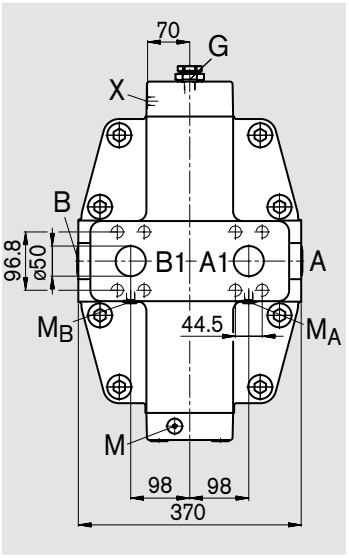
SAE flange ports A/B side, opposite **(02)**



SAE flange ports A/B rear **(01)**



SAE flange ports A/B side, opposite + A_1/B_1 rear **(15)**

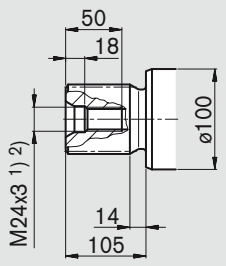


Unit dimensions, size 1000

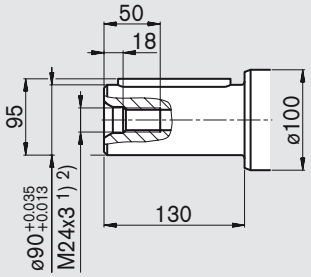
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

Z Splined shaft DIN 5480
W90x3x30x28x9g



P Parallel shaft with key
DIN 6885, AS25x14x125



Ports

A, B	Service line ports (high-pressure series)	SAE J518	2 in		
A_1, B_1	Additional service line ports with plate 15	SAE J518	2 in		
	Fixing thread A/B and A_1/B_1	DIN 13	M20x2.5;	24 deep 2)	
T_1	Case drain port	DIN 3852	M42x2;	20 deep	720 Nm 2)
T_2	Case drain port 3)	DIN 3852	M42x2;	20 deep	720 Nm 2)
X	Pilot-pressure port	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
X_3	Port for remote control valve	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
P	Port for control oil supply	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
G	Port for synchronous control of multiple units and for remote control pressure 3)	DIN 3852	M18x1.5;	12 deep	140 Nm 2)
G_2	Port for 2nd pressure setting 3)	DIN 3852	M18x1.5;	12 deep	140 Nm 2)
U	Flow port 3)	DIN 3852	M18x1.5;	12 deep	140 Nm 2)
M	Gauge port for control pressure 3)	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
M_A, M_B	Gauge port for operating pressure 3)	DIN 3852	M14x1.5;	12 deep	80 Nm 2)
M_{St}	Gauge port for pilot pressure 3)	DIN 3852	M14x1.5;	12 deep	80 Nm 2)

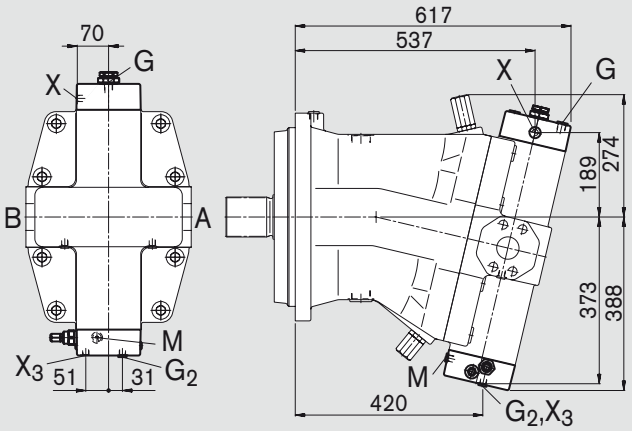
1) center bore according to DIN 332 (thread according to DIN 13)
2) please observe the general notes for the max. tightening torques on page 75
3) plugged

Unit dimensions, size 1000

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

HD.D

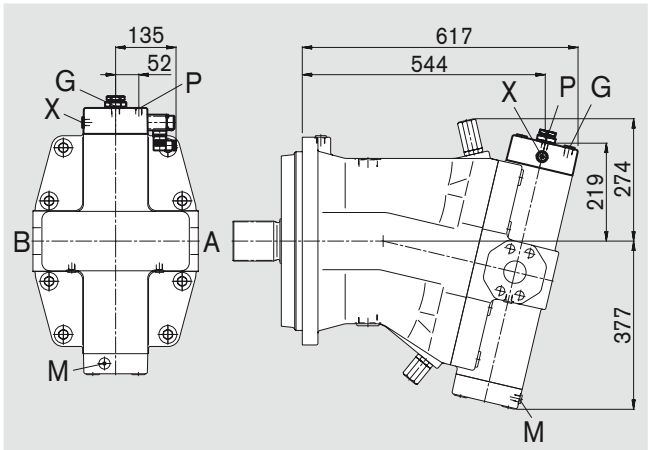
Hydraulic control pilot-pressure related,
with pressure control, direct; **HD.G** remote



HD.D with G_2, without X_3
HD.G with X_3, without G_2

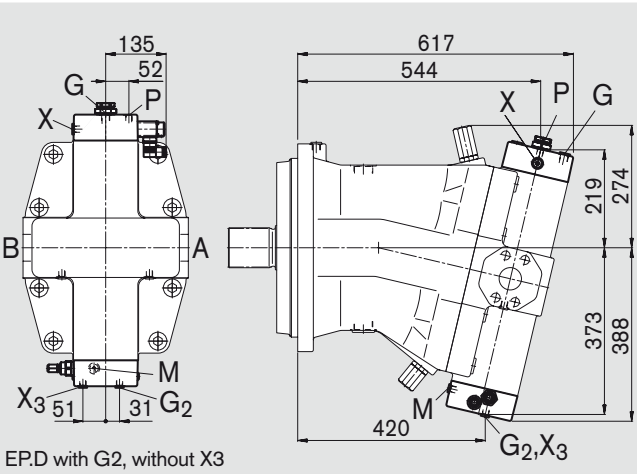
EP1, EP2

Electric control, with proportional valve



EP.D

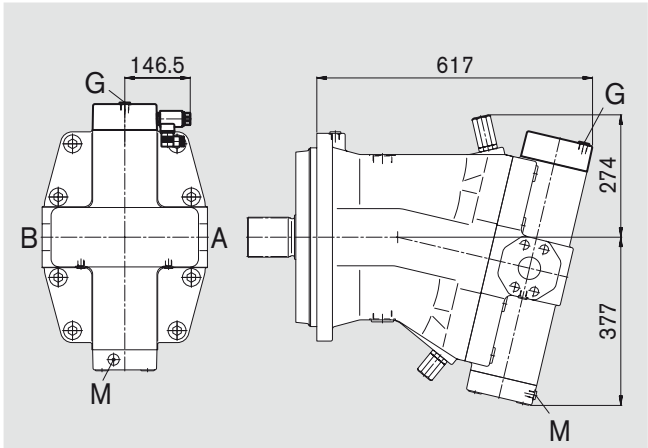
Electric control (proportional valve),
with pressure control, direct; **EP.G** remote



EP.D with G2, without X3
EP.G with X3, without G2

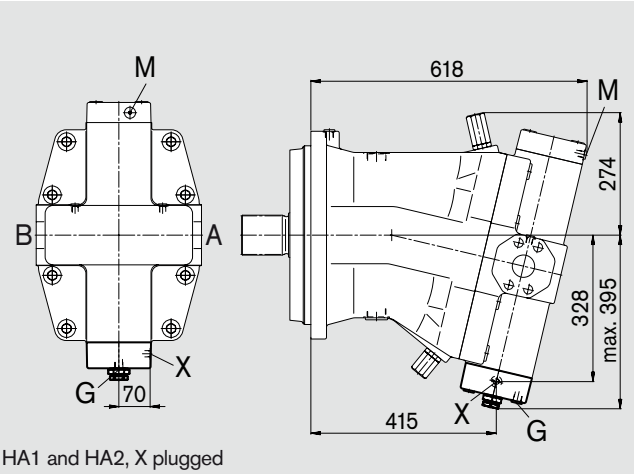
EZ1, EZ2

Electric two-point control with switching valve



HA1, HA2 / HA1T, HA2T

Automatic control, high-pressure related /
hydraulic override



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

Flush and boost pressure valve

The flush and boost pressure valve is used to remove heat from the closed control and to ensure that a minimum boost pressure is present (opening pressure 16 bar, fixed; note when setting primary valve). A side effect is flushing of the case.

Warm hydraulic fluid is directed from the respective low pressure side into the motor case. This is then fed into the tank, together with the case drain. The hydraulic fluid drawn out of the closed control in this way must be replaced by cooled hydraulic fluid that is supplied by the boost pump.

In an open control system, the flush and boost pressure valve is used solely to flush the case from the return line.

The valve is fitted to the variable motor (or integrated into the control unit, depending on the type of control and the size).

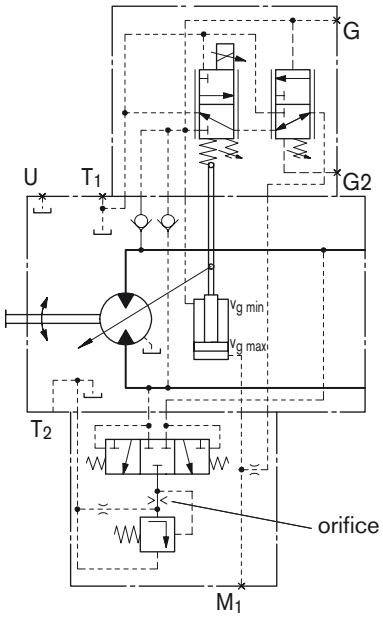
Orifices can be used to adjust the flushing volumes as required.

Standard flushing volumes (at low pressure $\Delta p_{LP} = 25$ bar)

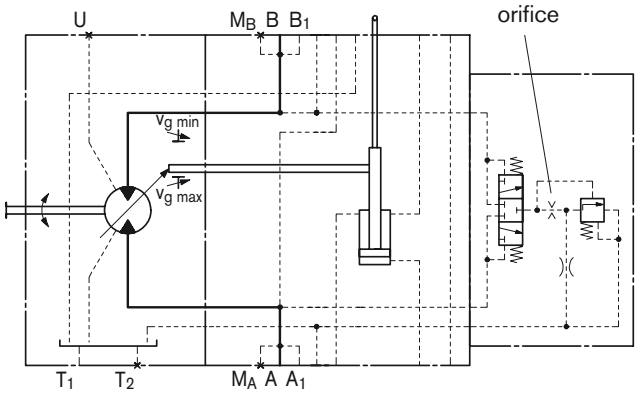
Size	Flushing volume	Mat. no. of the orifice
28, 55	3.5 l/min	R909651766
80	5 l/min	R909419695
107	8 l/min	R909419696
140, 160, 200	10 l/min	R909419697
250	10 l/min	R909419697
355, 500, 1000	16 l/min	R910803019

For sizes 28 to 200, orifices for flushing volumes of 3.5 - 10 l/min can be supplied. In the case of non-standard flushing volumes, please specify the desired flushing volume when ordering. The flushing volume without orifice is approx. 12 to 14 l at low pressure $\Delta p_{LP} = 25$ bar.

Circuit diagram
Sizes 28 to 200



Circuit diagram
Sizes 250 to 1000

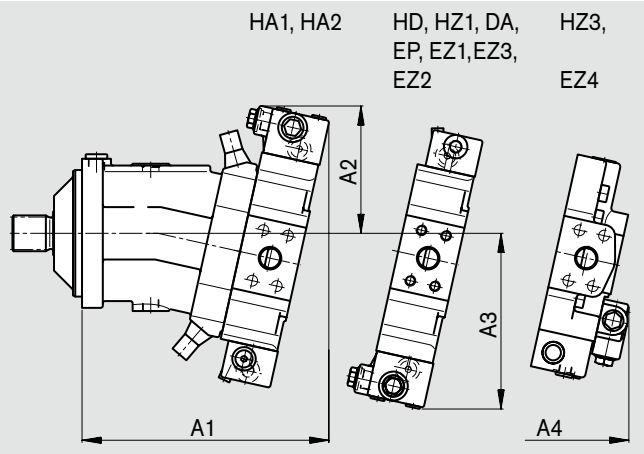


Flush and boost pressure valve

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

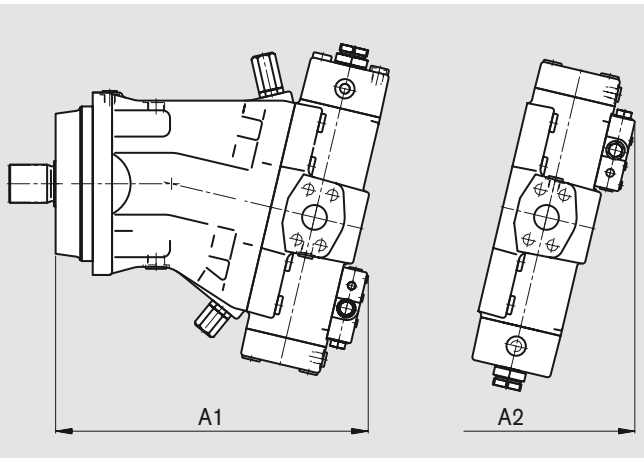
Dimensions

Sizes 28 to 200



Size	A1	A2	A3	A4
28	214	125	161	–
55	243	133	176	236
80	273	142	193	254
107	288	144	200	269
140	321	154	218	–
160	328	154	220	–
200	345	160	231	–

Sizes 250 to 1000



Size	A1	A2
250	357	402
355	397	446
500	440	504
1000	552	629

BVD counterbalance valve (sizes 55 to 160)

Function

Driving/winch counterbalance valves are designed to reduce the danger of overspeeding and cavitation of axial piston motors in open controls. Cavitation occurs if the motor speed is greater than it should be for the given flow during braking, downhill travel or decrease in motor load.

Please note

- The BVD counterbalance valve must be specified explicitly in the order. We recommend ordering the counterbalance valve and the motor as a set. Ordering example: A6VM80HA1T/63W–VSC380A + BVD20F27S/41B–V03K16D0400S12
- For safety reasons, winch drives are forbidden with start of control at $V_{g\,min}$ (e.g. HA)!
- The counterbalance valve does not replace the mechanical service brake and parking brake.
- Note the detailed information about the BVD counterbalance valve contained in RE 95522

Driving counterbalance valve BVD...F

Example of application

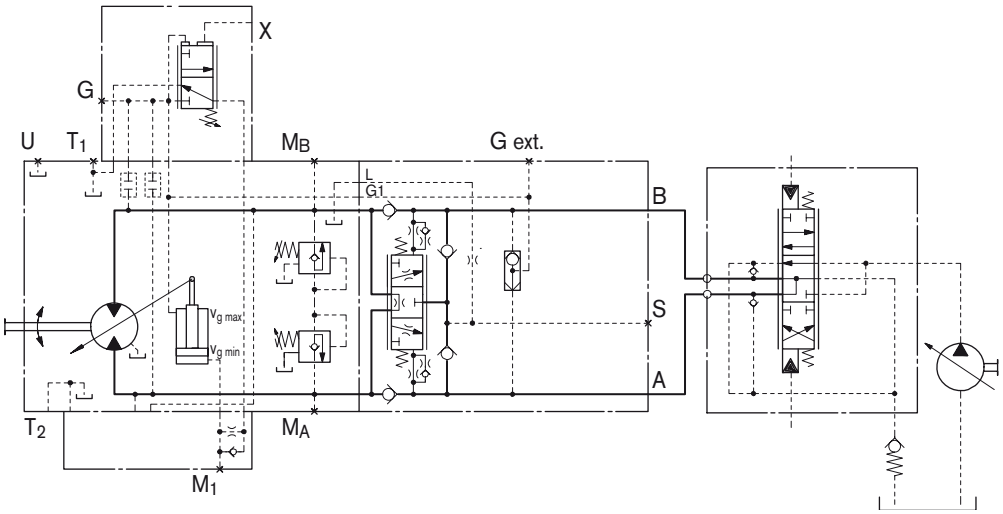
- Travel drive on wheeled excavators

Winch counterbalance valve BVD...W

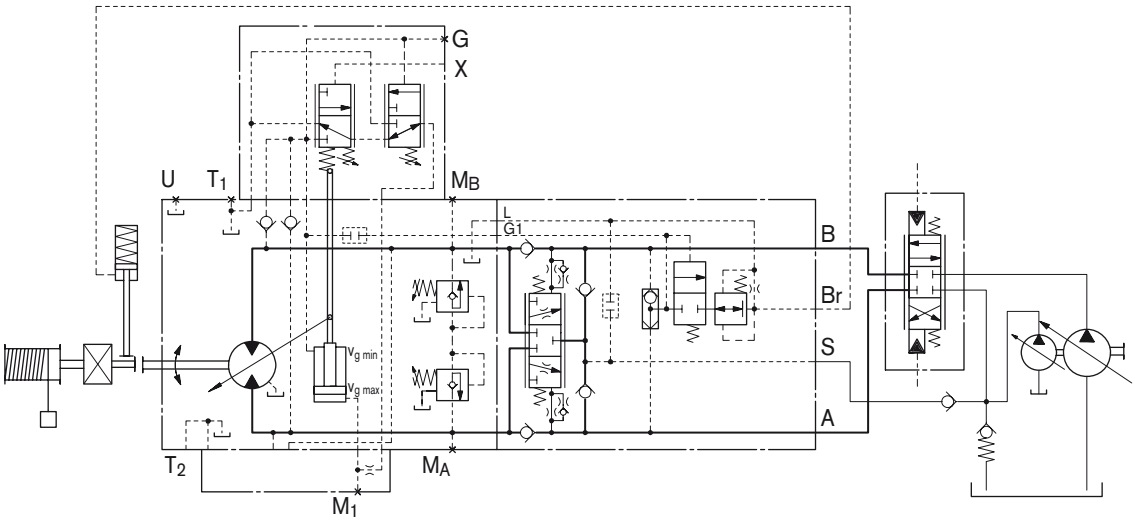
Typical applications

- Winch gears in cranes
- Track drive in excavator crawlers

Example control diagram for travel drive on wheeled excavators
A6VM80HA1T/63W–VSC380A + BVD20F27S/41B–V03K16D0400S12



Example control diagram for winch gears in cranes
A6VM80HD1D/63W–VSC380B + BVD20W27L/41B–V01K00D0600S00

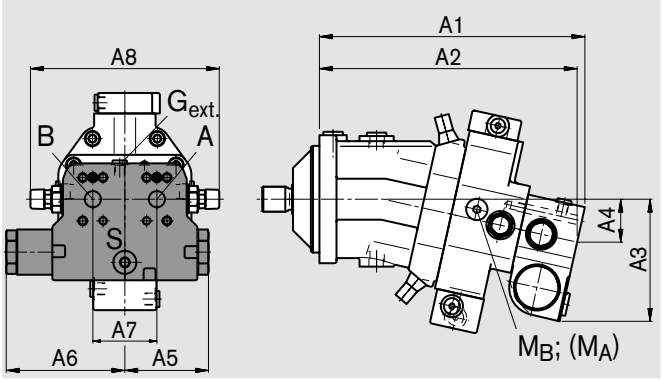


BVD counterbalance valve (sizes 55 to 160)

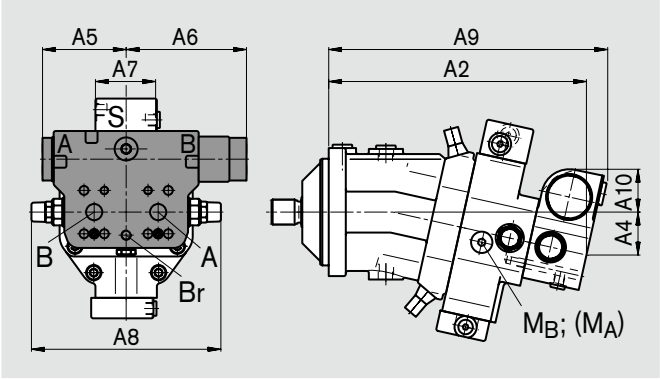
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Dimensions

A6VM to HA



A6VM to HD and EP [1]



A6VM	Counter balance valve	Ports [2]					Ports on the motor
Size...Plate	Type	A, B	S	$G_{ext.}$ (version S)	$G_{ext.}$ (version L)	Br (version L)	M_A, M_B Gauge port (plugged)
55...38	BVD20...17	3/4 in	M22x1.5; 14 deep	M12x1.5; 12.5 deep	M14x1.5; 8 deep	M12x1.5; 12.5 deep	M18x1.5; 12 deep
80...38	BVD20...27	1 in	M22x1.5; 14 deep	M12x1.5; 12.5 deep	M14x1.5; 8 deep	M12x1.5; 12.5 deep	M18x1.5; 12 deep
107...37	BVD20...28	1 in	M22x1.5; 14 deep	M12x1.5; 12.5 deep	M14x1.5; 8 deep	M12x1.5; 12.5 deep	M18x1.5; 12 deep
107...38	BVD25...38	1 1/4 in	M27x2; 16 deep	M12x1.5; 12.5 deep	M14x1.5; 8 deep	M12x1.5; 12 deep	M18x1.5; 12 deep
140...38	BVD25...38	1 1/4 in	M27x2; 16 deep	M12x1.5; 12.5 deep	M14x1.5; 8 deep	M12x1.5; 12 deep	M18x1.5; 12 deep
160...38	BVD25...38	1 1/4 in	M27x2; 16 deep	M12x1.5; 12.5 deep	M14x1.5; 8 deep	M12x1.5; 12 deep	M18x1.5; 12 deep
250...08	on request						

A6VM	Dimensions									
Size...Plate	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
55...38	311	302	143	50	98	139	75	222	326	50
80...38	340	331	148	55	98	139	75	222	355	46
107...37	362	353	152	59	98	139	84	234	377	41
107...38	380	370	165	63	120.5	175	84	238	395	56
140...38	411	401	168	67	120.5	175	84	238	446	53
160...38	417	407	170	68	120.5	175	84	238	432	51
250...08	on request									

[1] In the installation version for the HD and EP controls, the molded connection designations on the brake valve do not correspond with the connection designation of the A6VM. The designation of the connections on the engine drawing is binding!

[2] **Ports on the counterbalance valve**

A, B Service line ports
S Boosting (plugged)
$G_{ext.}$ Brake release, high pressure, plugged
Br Brake release, reduced high pressure, open
Version S "Port for brake release with high pressure"
Version L "Port for brake release with reduced high pressure"

BVD counterbalance valve (sizes 55 to 160)

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

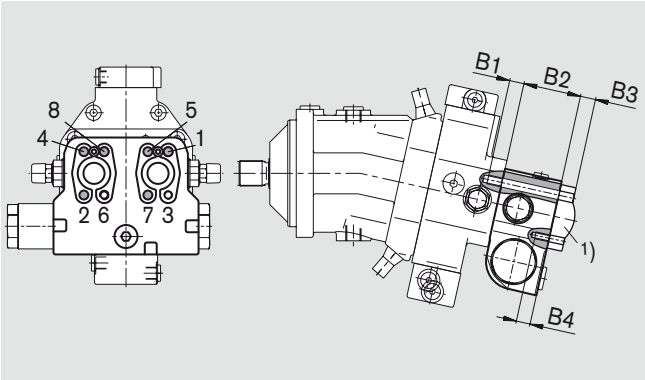
Attaching the counterbalance valve

When delivered, the counterbalance valve is attached to the motor using 2 tacking screws. Do not remove the tacking screws when connecting the service lines. If the counterbalance valve and motor are delivered separately, the counterbalance valve must first be attached to the motor port plate using the provided tacking screws. In both cases, the final attachment of the counterbalance valve to the motor is by the connectio of the service lines, e.g. using SAE 4-bolt flanges. A total of 6 screws with thread lengths B1+B2+B3 and 2 screws with thread lengths B3+B4 are required.

When tightening the screws, it is imperative that the sequence 1 to 8 (as shown in the adjacent diagram) be adhered to and carried out in two phases.

In the first phase the screws should be tightened to 50% of their tightening torque before being tightened to maximum tightening torque in the second phase (see table below).

Thread	Property class	Tightening torque in Nm
M10	10.9	75
M12	10.9	130
M14	10.9	205



1) Flange, e.g. SAE flange

Size...Plate	55...38	80...38 107...37	107, 140, 160...38
B1 2)	M10x1.5 17 deep	M12x1.75 15 deep	M14x2 19 deep
B2	68	68	85
B3	Customer specific		
B4	M10x1.5 15 deep	M12x1.75 16 deep	M14x2 19 deep

2) Minimum required reach 1 x DIA. thread

Swivel angle indicator (Sizes 250 to 1000)

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

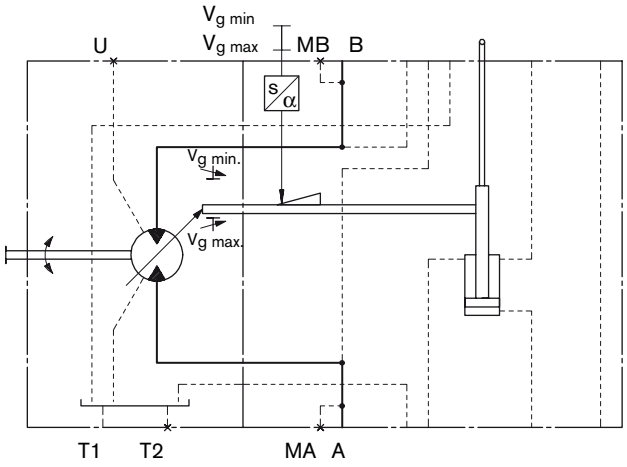
Optical swivel angle indicator (V)

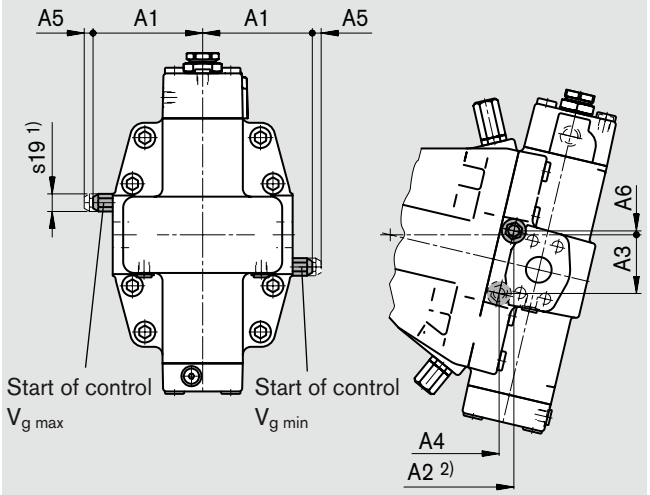
The swivel position is indicated by a pin on the side of the port plate. The length of the protruding pin is dependent on the position of the lens plate.

If the pin is flush with the port plate, the motor is positioned at the start of control. At max. swivel, the pin length is 8 mm (visible after removing the cap nut).

Sizes 250 to 1000

Example: Start of control at $V_{g\,min}$





Size	A1	A2[2)]	A3	A4	A5[3)]	A6
250	136.5	256	73	238	11	5
355	159.5	288	84	266	11	8
500	172.5	331	89	309	11	3
1000	208.5	430	114	402	11	3

[1]) Width across flats
[2]) Distance to mounting flange
[3]) Clearance required for removing the cap nut

Electric swivel angle indicator (E)

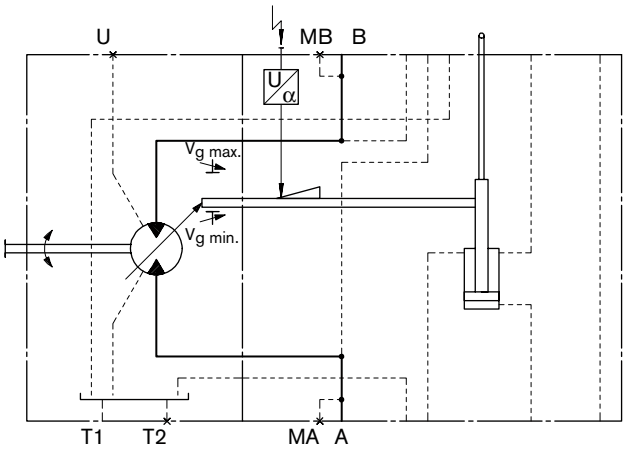
The motor position is measured by an inductive pos. transducer. It converts the stroke of the control device to an electric signal.

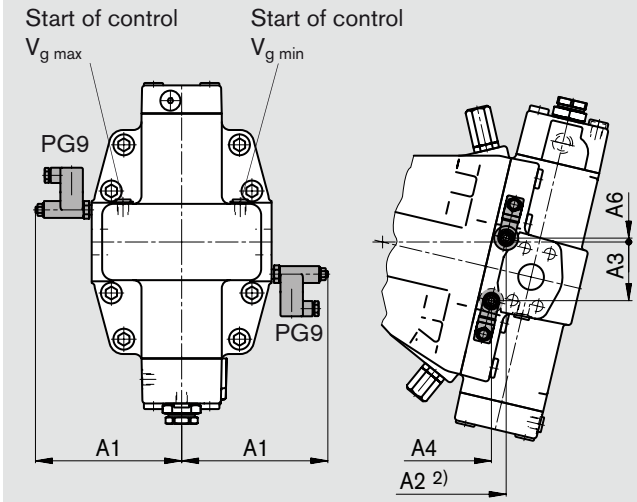
This signal can be used to pass the swivel position to an electric controller.

Inductive pos. transducer type IW9–03–01
Type of protection according to DIN/EN 60529: IP65

Sizes 250 to 1000

Example: Start of control at $V_{g\,max}$





Size	A1	A2[2)]	A3	A4	A6
250	182	256	73	238	5
355	205	288	84	266	8
500	218	331	89	309	3
1000	254	430	114	402	3

[2]) Distance to mounting flange

Speed measurement (sizes 28 to 250)

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

The A6VM...D and A6VM...F ("prepared for speed measurement", i.e. without sensor) versions have teeth on the rotary group. The rotating, toothed rotary group generates a signal in proportion to the speed. The signal is picked up by a sensor and can be forwarded for evaluation.

Note

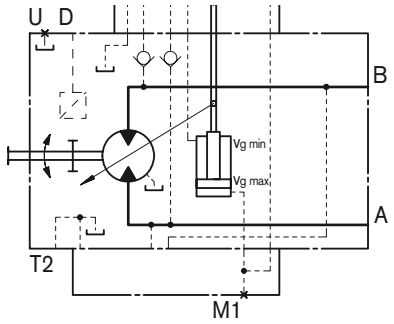
– For sizes 28 to 200 with speed measurement, only port T_2 may be used to drain the case drain.

Version "D" (NG 28-200)
Suitable for mounting the inductive speed sensor ID (see RE 95130). The ID sensor is screwed into the upper case drain port T_1. The spacer ring (sizes 28 to 107) or threaded-reducing connector stud (sizes 140 to 200) required for the inductive speed sensor ID is included in the supply volume of the sensor.

Version "F" (NG 55-250)
Suitable for mounting the HDD Hall-effect speed sensor (see RE 95135). With sizes 28 to 200, the HDD sensor is flanged onto the upper case drain port T_1; with size 250, it is flanged onto the port provided for this purpose with two fixing screws. In the standard version, the port is plugged with a pressure-resistant flange cover.

We recommend ordering the A6VM variable motor complete with mounted sensor. Please specify the ordering code for the sensor separately.

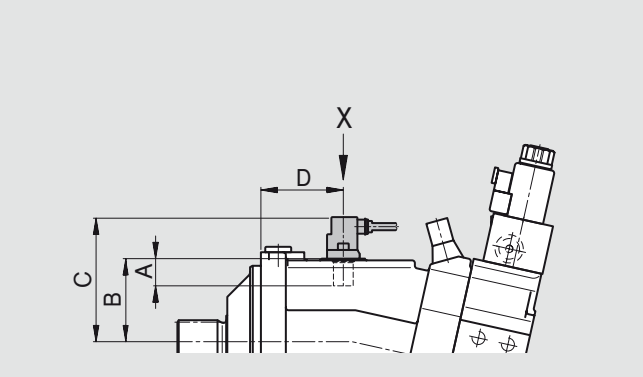
Circuit diagram
A6VM 28...200 EP



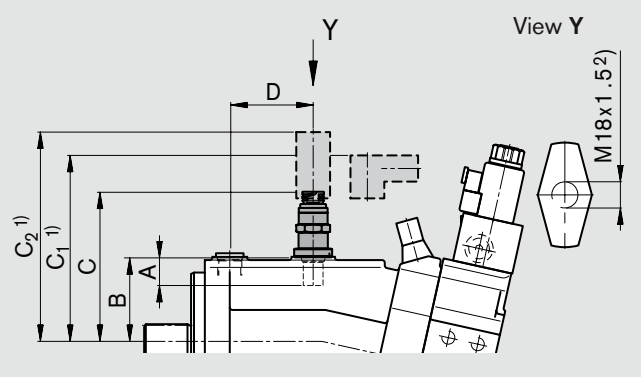
Speed measurement (sizes 28 to 250)

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

Version "F" (sizes 55 to 200): with HDD sensor



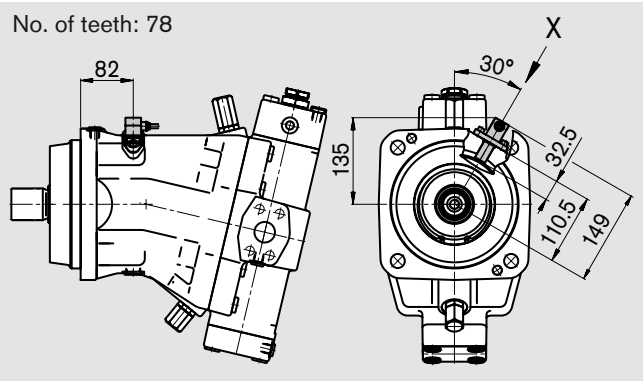
Version "D" (sizes 28 - 200): with ID sensor



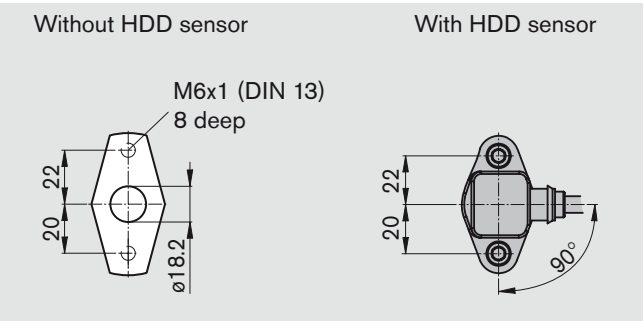
1) Clearance required for attaching/detaching the mating connector: min 13 mm

2) Tightening torque, max.: 50 Nm (ID sensor)

Version "F" (size 250): with HDD.L32 sensor



View X



Size			28	55	80	107	140	160	200
Sensor selection			IDR 18/20 – L250				IDR 18/20 – L400		
			HDD.L16.../20						
Number of teeth			40	54	58	67	72	75	80
HDD	A	Insertion depth (tolerance ± 0,1)	16	16	16	16	16	16	16
	B	Contact surface	58.6	72.6	76.6	85.6	90.6	93.6	98.6
	C		97	111	115	124	129	132	137
	D		58	67	76	78	92	92.5	96
ID	A	Insertion depth (tolerance ± 0,1)	17.5	17.5	17.5	17.5	24.5	24.5	24.5
	B	Contact surface	60	74	78	87	99	102	107
	C	without mating connector	120	134	138	147	157	160	165
	C1	with 90° mating connector	175	189	193	202	212	215	220
	C2	with 180° mating connector	153.5	167.5	171.5	180.5	190.5	193.5	198.5
	D		58	67	76	78	92	92.5	96

Connectors for solenoids (for EP, EZ, HA.U, HA.R, DA only)

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

DEUTSCH DT04-2P-EP04, 2-pin

Molded, without bidirectional suppressor diode
(for EP, EZ1/2, DA) _____ **P**

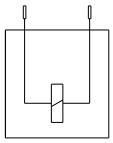
Molded, with bidirectional suppressor diode
(for switching solenoid for the EZ1/2, DA control units) _____ **Q**

Type of protection according to DIN/EN 60529: IP67 and IP69K

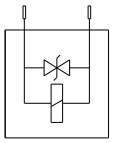
The protection control with a bidirectional suppressor diode is necessary for limiting overvoltages. Overvoltages are generated by disconnecting the current using switches, relay contacts or by unplugging an energized mating connector.

Switching symbol

Without bidirectional suppressor diode



With bidirectional suppressor diode

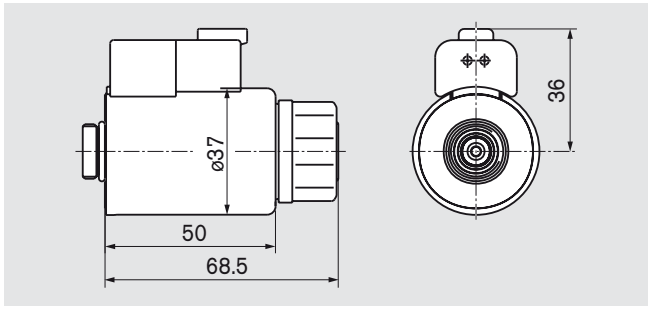


Mating connector

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

Consisting of:	Designation
– 1 case	DT06-2S-EP04
– 1 wedge	W2S
– 2 sockets	0462-201-16141

The mating connector is not included in supply.
This can be supplied by Rexroth on request.



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

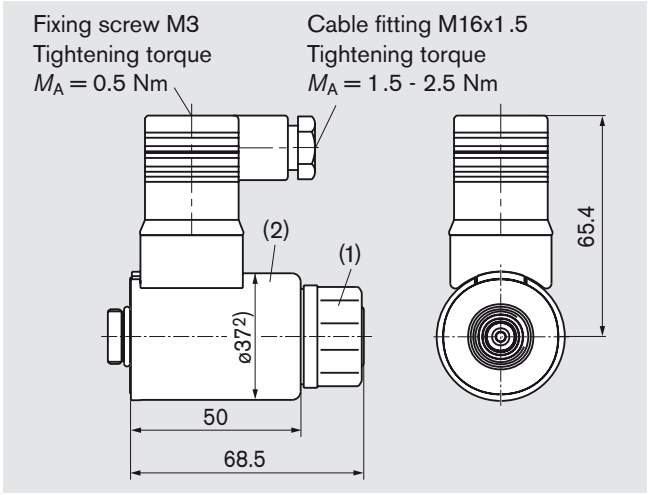
(not for new projects with sizes 28 - 200)

Without bidirectional suppressor diode
(for EP, EZ, HA.U, HA.R, DA) _____ H

Type of protection according to DIN/EN 60529: IP65

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

The HIRSCHMANN connector is included in the supply volume for the motor.



[2]) Solenoid with dia. 45 for following controls:
HA.U, HA.R (for elec. override), EZ3 and EZ4.

Note for cylindric solenoids:

The position of the connector can be changed by turning the solenoid body.

Proceed as follows:
1. Loosen the fixing nut (1)
2. Turn the solenoid body (2) to the desired position
3. Tighten the fixing nut
   Tightening torque of the fixing nut: 5^{+1} Nm (width across flats WAF26, 12-sided DIN 3124)

Installation notes

General

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

The case drain inside the case interior must be drained to the tank via the highest case drain port.

In all operating states, the case drain line must flow into the tank below the minimum fluid level.

Installation position

See examples below. Additional installation positions are available upon request.

Below-tank installation (standard)

Motor below the minimum fluid level of the tank.

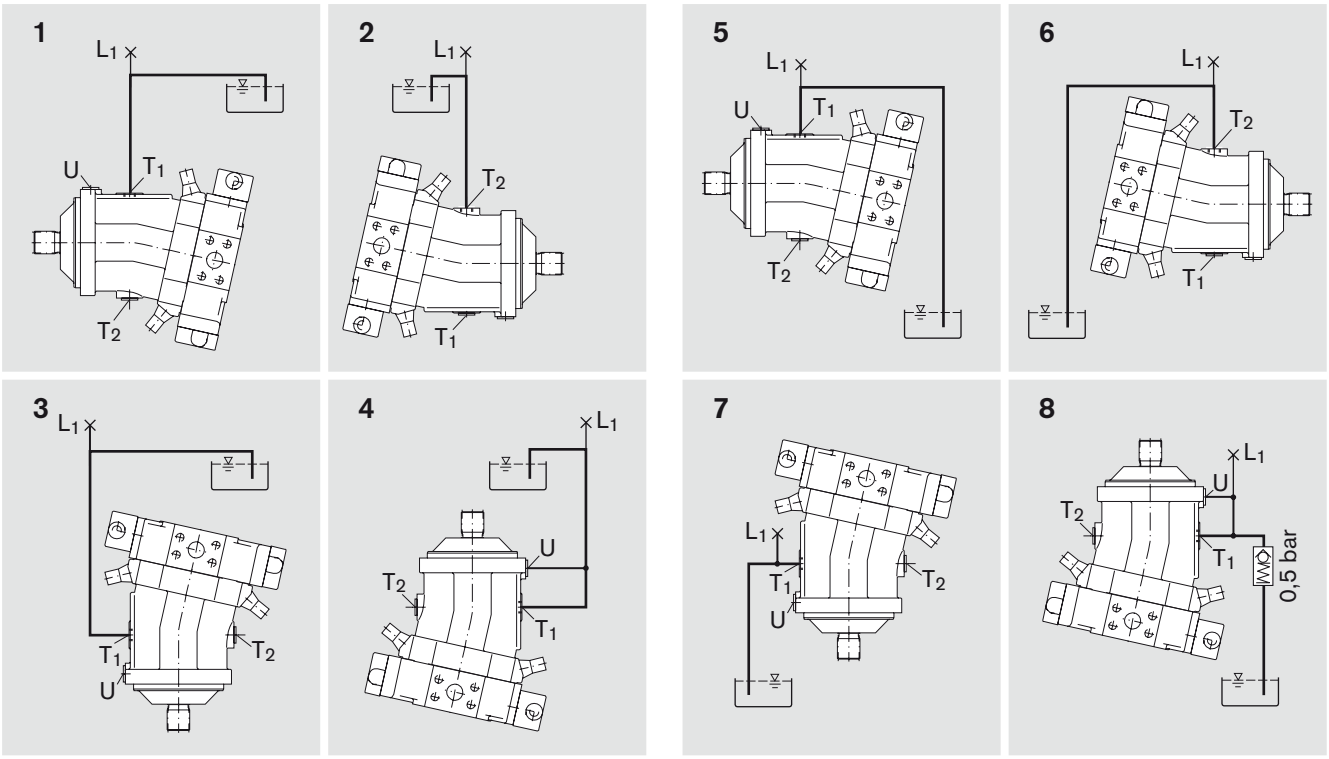
Recommended installation positions: 1 and 2.

Above-tank installation

Motor above the min. fluid level of the tank

– Note: Installation position 8 (shaft up)

  In this installation position, if the case interior is only partially drained, lubrication of the bearings will no longer be adequate. A check valve (opening pressure 0.5 bar) in the case drain line can prevent the system emptying through the case drain line.



Installation position	Air bleeding	Filling
1	–	T_1 (L_1)
2	–	T_2 (L_1)
3	–	T_1 (L_1)
4	U	T_1 (L_1)

Installation position	Air bleeding	Filling
5	–	T_1 (L_1)
6	–	T_2 (L_1)
7	–	T_1 (L_1)
8	U	T_1 (L_1)

General notes

– The A6VM motor is designed to be used in open and closed controls.

– Project planning, assembly, and commissioning of the motor require the involvement of qualified personnel.

– The service line ports and function ports are only designed to accommodate hydraulic lines.

– During and shortly after operation, there is a risk of burns on the motor and especially on the solenoids. Take suitable safety precautions, e.g. wear protective clothing

– There may be shifts in the characteristic depending on the operating state of the motor (operating pressure, fluid temperature).

– Tightening torques:
  - The tightening torques specified in this data sheet are maximum values and must not be exceeded (maximum values for screw thread).
    Manufacturer's instruction for the max. permissible tightening torques of the used fittings must be observed!
  - For DIN 13 fixing screws, we recommend checking the tightening torque individually according to VDI 2230 Edition 2003.

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

Bosch Rexroth AG
Hydraulics
Product Unit Axial Piston Units
Elchingen Plant
Glockeraustraße 2
89275 Elchingen, Germany
Telephone +49 (0) 73 08 82-0
Fax +49 (0) 73 08 72 74
info.brm-ak@boschrexroth.de
www.boschrexroth.com/axial-piston-motors

Horb Plant
An den Kelterwiesen 14
72160 Horb, Germany
Telephone +49 (0) 74 51 92-0
Fax +49 (0) 74 51 82 21

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Subject to change.