TYPE CODE

	K6V		M					/	10		W		–	V							–	
01	02	03	04	05	06	07	08		09	10	11	12		13	14	15	16	17	18	19	20	21

HYDRAULIC FLUID

01	Mineral oil and HFD hydraulic fluids for size 500	
	HFB and HFC hydraulic fluids for size 80~200	

AXIAL PISTON UNIT

02	Bent-axis design, variable	K6V

DRIVE SHAFT BEARING

		80	107	160	170	200	500	
03	Standard bearing			●			●	
	Long-life bearing			–			–	L

TYPE

		80	107	160	170	200	500	代号
04	Flange motor	●	●	●	●	●	●	M
	Plug-in motor	●	●	●	○	○	–	E

SIZE

		80	107	160	170	200	500
05	Geometric displacement per revolution (mL/r)						

CONTROL DEVICE

			80	107	160	170	200	500	
06	Pilot-pressure related hydraulic proportional control	Δp_{st} = 10 bar	○	●	●	●	●	○	HD1
		Δp_{st} = 25 bar	○	●	●	●	●	●	HD2
		Δp_{st} = 35 bar	–	–	–	–	–	○	HD3
	Two-point hydraulic control		–	–	–	–	–	○	HZ
			○	●	●	○	○	–	HZ1
			–	–	●	○	–	–	HZ3[1)]
	Electric proportional control	U=12 V	○	●	●	○	○	○	EP1
		U=24 V	○	●	●	●	●	○	EP2
	Two-point electric control	U=12 V	○	○	○	○	○	○	EZ1
		U=24 V	○	●	●	○	○	○	EZ2
	High-pressure related automatic control	Δp≤approx. 10 bar	●	●	●	○	●	●	HA1
		Δp = 100 bar	○	●	●	○	●	○	HA2

PRESSURE CONTROL (ONLY FOR HD1/HD2/EP2/EP2)

			80	107	160	170	200	500	
07	Without pressure control		○	●	●	○	●	○	
	Pressure control	fixed setting	○	●	●	○	●	○	D
		two-point hydraulic controlled override	–	–	–	–	–	–	E
		hydraulic proportional remote control	–	–	–	–	–	–	G

OVERRIDE (HA1/HA2)

		80	107	160	170	200	500	
08	Without override	●	●	●	●	●	●	
	Hydraulic proportional remote controlled override	○	●	●	○	●	●	T

NOTE: ● = available ○ = upon request ▲ = not for new projects — = unavailable ▭ = preferred

TYPE CODE

	K6V		M					/	10		W	–	V									–	
01	02	03	04	05	06	07	08		09	10	11		12	13	14	15	16	17	18	19	20		21

SERIES

		80	107	160	170	200	500	
09	Standard series	●	●	●	–	●	●	10
	Upgraded series	–	–	–	●	–	–	20

DRAIN PORT

		80	107	160	170	200	500	
10	Metric ports based on DIN 3852 with profile sealing	●	●	●	–	●	●	
	Metric ports based on ISO 6149 with metric conical screw thread	–	–	–	●	–	–	M
	BSP ports based on JIS B2351 with V-thread	–	●	–	–	–	–	J

DIRECTION OF ROTATION

11	Viewed on drive shaft, bidirectional	W

SETTING RANGE OF DISPLACEMENT2)

			80	107	160	170	200	500	
12	$V_{g,min} = 0 \sim 0.7\ V_{g,max}$		●	●	●	●	●	–	
	$V_{g,min} = 0 \sim 0.4\ V_{g,max}$	$V_{g,min} = 0.8 \sim 1.0\ V_{g,max}$	–	–	–	–	–	●	1
	$V_{g,min} = 0.4 \sim 0.8\ V_{g,max}$	$V_{g,min} = 0.8 \sim 1.0\ V_{g,max}$	–	–	–	–	–	●	2

SEALING

13	Fluoroelastomer (FKM)	V

DRIVE SHAFT

		80	107	160	170	200	500	
14	Splined shaft based on DIN 5480	○	●	●	○	●	–	A
		●	●	●	●	–	●	Z
	Parallel keyed shaft based on DIN 6885	–	–	–	–	–	○	P

MOUNTING FLANGE

			80	107	160	170	200	500	
15	Similar to ISO 3019-2	2-hole	●	●	●	○	○	–	L
		4-hole	●	●	●	●	●	–	B
		8-hole	–	–	–	–	–	●	H

WORKING PORT 3)

				80	107	160	170	200	500	
16	SAE working ports A/B at rear	01	0	○	●	●	●	●	○	010
			7	○	●	●	●	○	○	017
	SAE working ports A/B at opposite sides	02	0	○	●	●	●	●	○	020
			7	○	●	●	●	●	●	027
	SAE flange ports A/B at opposite sides; mounting thread according to ISO 11926 at rear.	03	0	–	●	●	○	–	–	030
	SAE flange ports A/B at opposite sides & A_1/B_1 at rear	15	0	–	–	–	–	–	○	150
	Port plate for mounting counterbalance valve 4) with 1-stage pressure relief valve	37	0	●	●	–	–	–	–	370 378
		38	8	–	○	●	○	–	–	380 388

VALVE

Without valve	0
With flushing & boost-pressure valve	7
With counterbalance valve 5)	

TYPE CODE

	K6V		M					/	10		W		–	V								–	
01	02	03	04	05	06	07	08		09	10	11	12		13	14	15	16	17	18	19	20		21

SPEED SENSOR

		80	107	160	170	200	500	
17	Without speed sensor	●	●	●	●	●	●	0
	Prepared for HDD speed sensor	○	●	●	○	●	○	F
	With HDD speed sensor mounted	○	●	●	○	●	○	H
	Prepared for DSA speed sensor	○	○	○	○	○	○	U
	With DSA speed sensor mounted	○	○	○	○	○	○	V

SWIVEL ANGLE SENSOR

		80	107	160	170	200	500	
18	Without swivel angle sensor	●	●	●	●	●	●	
	With optical swivel angle sensor	–	–	–	–	–	○	V
	With electric swivel angle sensor	–	–	–	–	–	○	E

CONNECTOR FOR SOLENOID

		80~200	500	
19	Without either connector or solenoid, only for hydraulic control	●	–	0
		–	●	
	DEUTSCH – molded connector, 2-pin, without suppressor diode	●	–	P
	HIRSCHMANN connector, without suppressor diode	–	○	

BEGINNING OF CONTROL

		80	107	160	170	200	500	
20	At $V_{g,min}$ (HA)	●	●	●	●	●	●	A
	At $V_{g,max}$ (HD/HZ/EP/EZ)	●	●	●	●	●	●	B

VERSION

21	Standard version	with combined pump or parts	–K
	Standard version with installation variants contrary to standard		–Y
	Special version		–S
		with combined pump or parts	–SK

1) Only in combination with a port plate 022 with integrated counterbalance valve as a special version.
2) $V_{g,min}$ & $V_{g,max}$ (cm^3) must be specified when ordering.
3) With metric fastening threads.
4) Only in combination with HD/EP/HA control.
5) Type code of counterbalance valve must be specified when ordering.

NOTE: ● = available ○ = upon request ▲ = not for new projects — = unavailable ▭ = preferred

TECHNICAL DATA

Size		80	107	160	170	200	500
Maximum displacement (mL/r)		80	107	160	171.8	200	500
Minimum displacement (mL/r)		0					
Direction of rotation		bidirectional					
Rotational speed (rpm) at V_g	n_N	3900	3550	3100	3100	2900	2000
	n_{max}	6150	5600	4900	4900	4600	2650
Rotational speed (rpm) at $V_{g,min}$	n_{max}	7350	6300	5500	5500	5100	2650
Pressure (bar)	p_N	400	400	400	450	400	350
	p_{max}	450	450	450	530	450	400
Maximum torque (N·m)		509 (ΔP =400bar)	681 (ΔP = 400bar)	1019 (ΔP = 400bar)	1218 (ΔP = 450bar)	1273 (ΔP = 400bar)	2785 (ΔP = 350bar)
Weight (kg)		34	47	64	62	80	210
Viscosity (mm^2/s)		50~1600, optimum range 16~36					
Oil temperature (°C)		-25 ~ 115					
Cleanliness level		19/17/14 ISO 4406					
Moment of inertia ($kg \cdot m^2$)		0.008	0.0127	0.0253	0.0213	0.0353	0.178

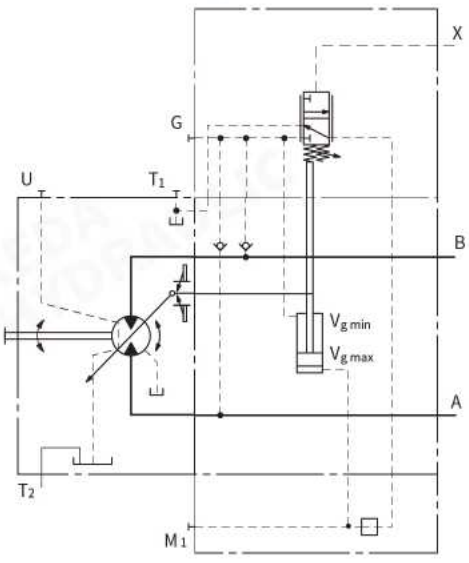
HD - Hydraulic proportional control

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

— Beginning of control at $V_{g,max}$ (maximum torque, minimum rotational speed at minimum pilot-pressure).
— End of control at $V_{g,min}$ (minimum torque, maximum permissible rotational speed at maximum pilot-pressure).
— Maximum permissible pilot-pressure: p_{St} = 100 bar.

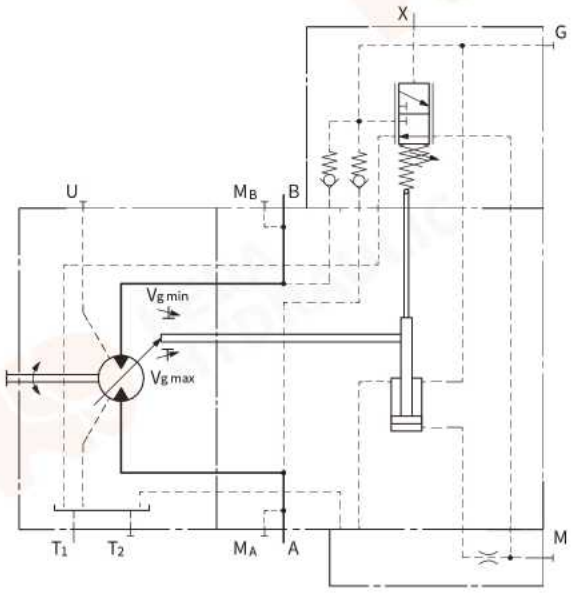
Circuit diagram HD1/HD2

Size 80~200



Circuit diagram HD1/HD2/HD3

Size 500

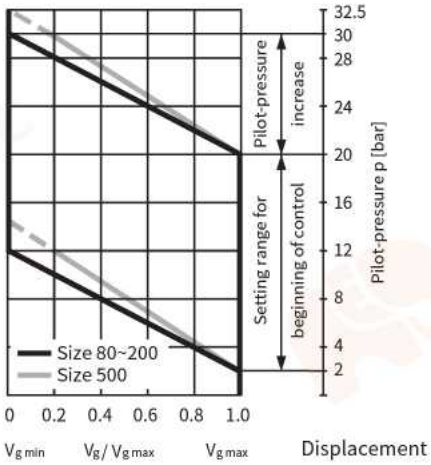


HD1 pilot-pressure increase Δp_{St} = 10 bar

A pilot-pressure increase of 10 bar at port X results in a decrease in displacement from $V_{g,\,max}$ to 0 cm^3 (size 80~200) or from $V_{g,\,max}$ to $0.2 \times V_{g,\,max}$ (size 500).

— Setting range for beginning of control: 2~20 bar;
— Standard setting for beginning of control: 3 bar;
— Standard setting for end of control: 13 bar.

Characteristic curve HD1

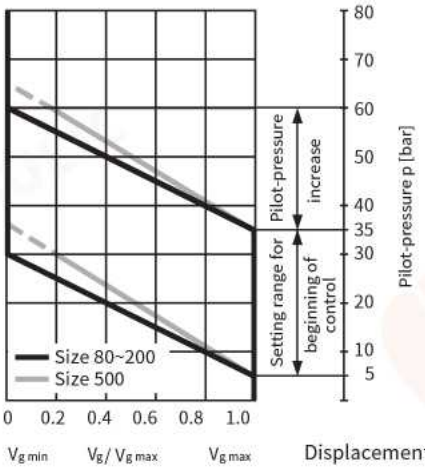


HD2 pilot-pressure increase Δp_{St} = 25 bar

A pilot-pressure increase of 25 bar at port X results in a decrease in displacement from $V_{g,\,max}$ to 0 cm^3 (size 80~200) or from $V_{g,\,max}$ to $0.2 \times V_{g,\,max}$ (size 500).

— Setting range for beginning of control: 5~35 bar;
— Standard setting for beginning of control: 10 bar;
— Standard setting for end of control: 35 bar.

Characteristic curve HD2

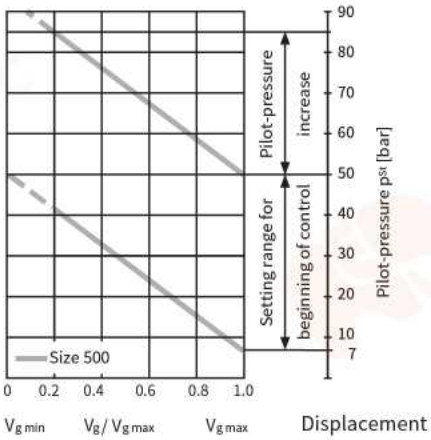


HD3 pilot-pressure increase Δp_{St} = 35 bar

A pilot-pressure increase of 35 bar at port X results in a decrease in displacement from $V_{g,\,max}$ to $0.2 \times V_{g,\,max}$ (size 500).

— Setting range for beginning of control: 7~50 bar;
— Standard setting for beginning of control: 10 bar;
— Standard setting for end of control: 45 bar.

Characteristic curve HD3



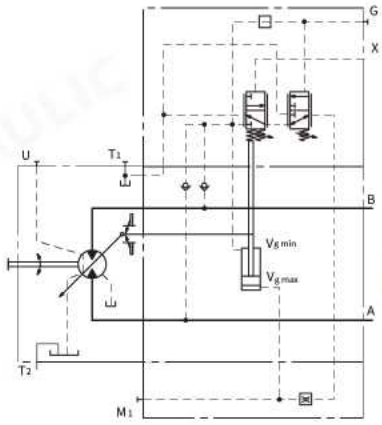
HD3 pilot-pressure increase Δp_{St} = 35 bar

The pressure control overrides the HD control function.

— Setting range of the pressure control valve is 80~400 bar (size 80~200) or 80~350 bar (size 500).

Circuit diagram HD.D

Size 80~200

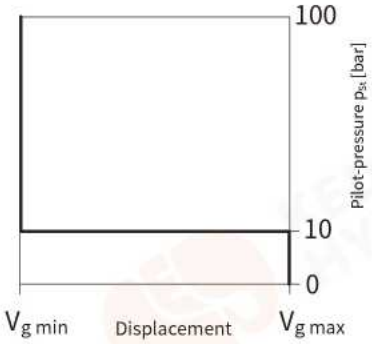


HZ - Two-point hydraulic control

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

— Position at $V_{g,\,max}$ (without pilot-pressure, maximum torque, minimum rotational speed).
— Position at $Vg_{,\,min}$ (with pilot-pressure >10 bar activated, minimum torque, maximum permissible rotational speed).

Characteristic curve HZ



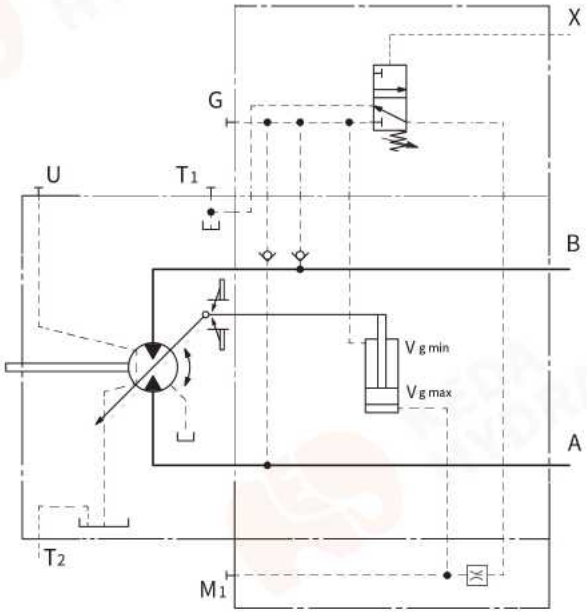
— Maximum permissible pilot-pressure: p_{St} = 100 bar.

NOTICE

— For reliable control, a working pressure of at least 30 bar is necessary in A/B.
— If a control operation is performed at working pressure < 30 bar, an auxiliary pressure of at least 30 bar must be applied at port G using an external check valve. For lower pressure, please contact us.
— Please keep in mind that a pressure up to 450 bar can occur at port G.

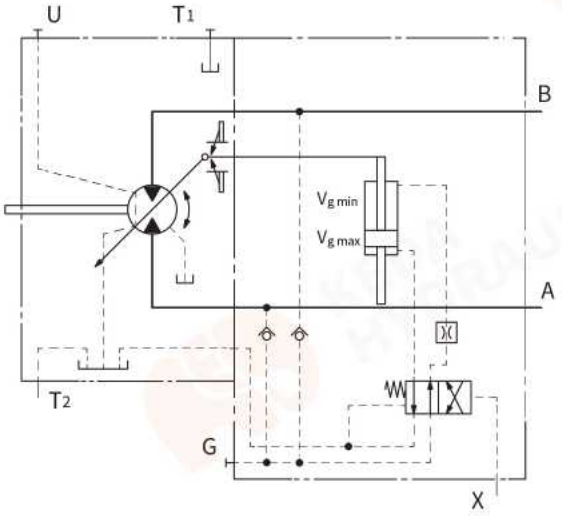
Circuit diagram HZ1

Size 80~200



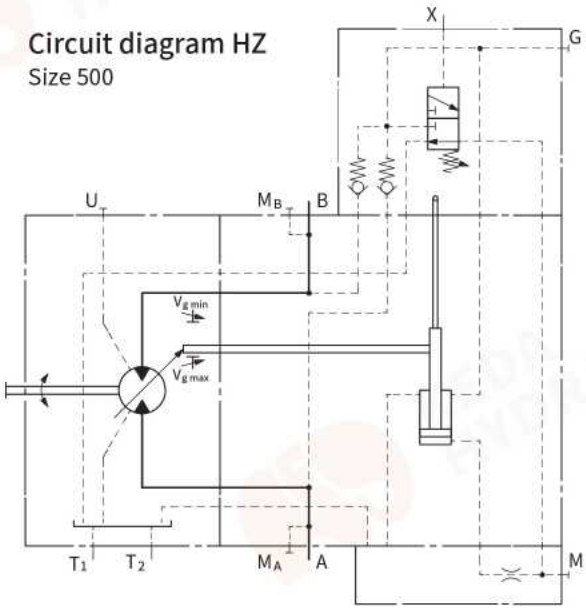
Circuit diagram HZ3

Size 80~200



Circuit diagram HZ

Size 500



EP - Electric proportional control

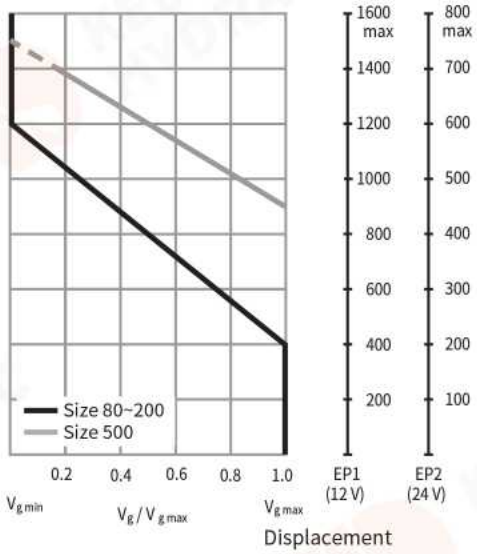
Electric proportional control with proportional solenoid (size 80~200) or proportional valve (size 500) provides infinite adjustment of the displacement. Control is proportional to the electric control current applied to the solenoid (size 80~200) or control valve (size 500).

The pilot oil supply requires an external pressure of p_{min} = 30 bar (p_{max} = 100 bar) at port G (size 500).

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

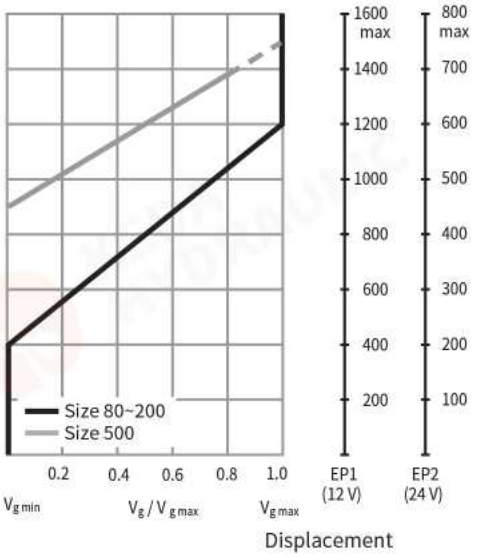
Characteristic curve, code B

(negative control, Beginning of control at $V_{g,\ max}$)



Characteristic curve, code A

(positive control, Beginning of control at $V_{g,\ min}$)



NOTICE

— For reliable control, a working pressure of at least 30 bar is necessary in A/B.
— If a control operation is performed at working pressure < 30 bar, an auxiliary pressure of at least 30 bar must be applied at port G using an external check valve. For lower pressures, please contact us.
— Size 500: The beginning of control and the EP characteristic curve are influenced by the case pressure. An increase in case pressure causes an increase in the beginning of control and thus a parallel offset of the characteristic curve.

Technical data of solenoid

Size 80~200

	EP1	EP2
Voltage	12 V (±20 %)	24 V (±20 %)
Control current		
Beginning of control	400 mA	200 mA
End of control	1200 mA	600 mA
Current limit	1.54 A	0.77 A
Nominal resistance (20°C)	5.5Ω	22.7Ω
Dither frequency	100 Hz	100 Hz
Duty cycle	100 %	100 %

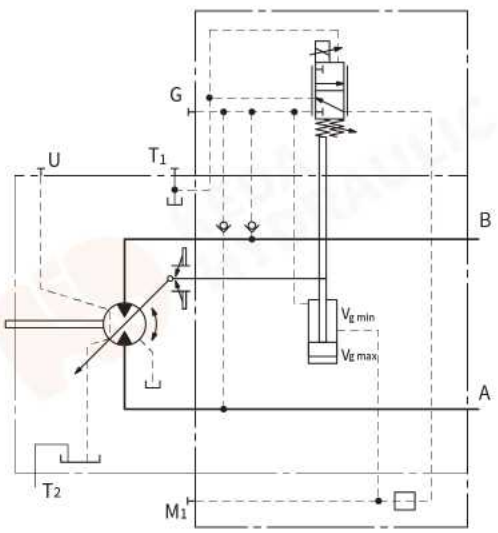
Technical data of proportional valve

Size 500

	EP1	EP2
Voltage	12 V (±20 %)	24 V (±20 %)
Control current		
Beginning of control	900 mA	450 mA
End of control	1400 mA	700 mA
Current limit	2.2 A	1.0 A
Nominal resistance (20°C)	2.4Ω	12Ω
Duty cycle	100 %	100 %

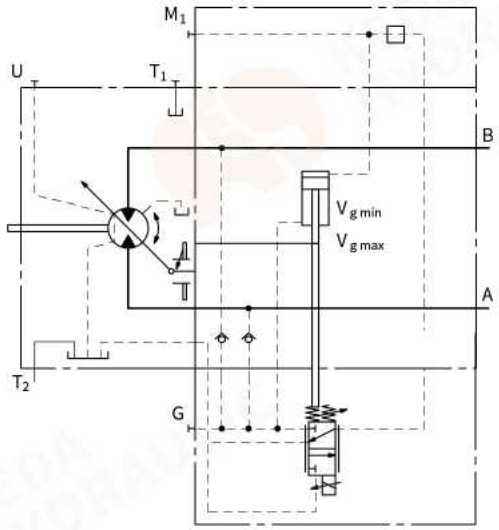
Circuit diagram EP1/EP2

Size 80~200 (neg. control, Beginning of control at $V_{g,\ max}$)



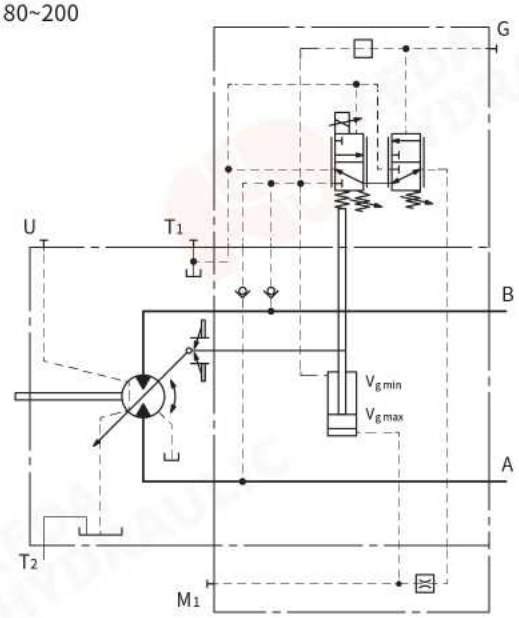
Circuit diagram EP1/EP2

Size 80~200 (pos. control, Beginning of control at $V_{g,min}$)



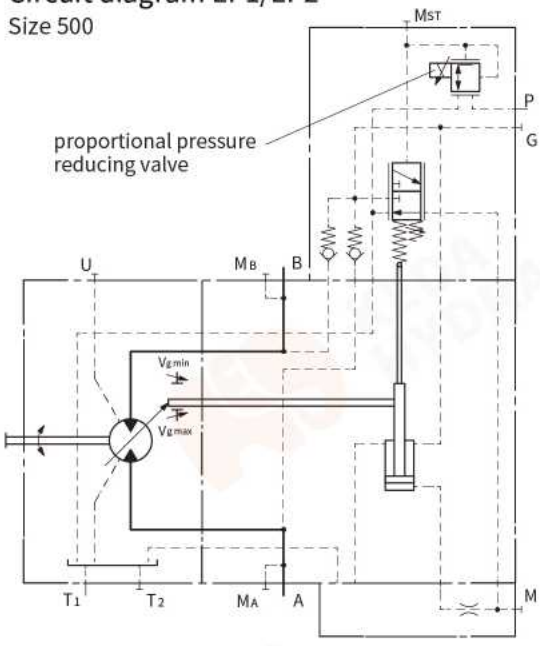
NOTCircuit diagram EP.D

Size 80~200



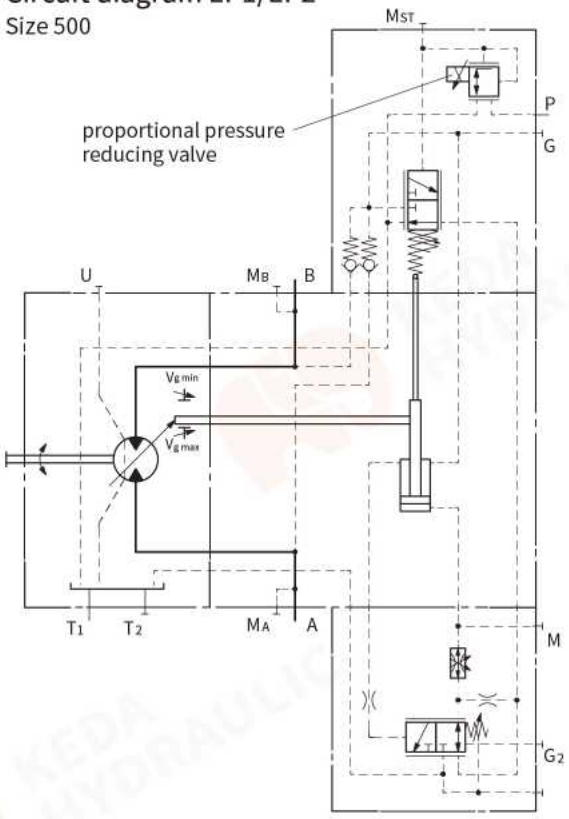
Circuit diagram EP1/EP2

Size 500



Circuit diagram EP1/EP2

Size 500



EP.D pressure control, fixed setting

The pressure control overrides the EP control function.

If the load torque or a reduction in motor swivel angle causes the system pressure to reach the set-point value of the pressure control, the motor will swivel towards a larger displacement.

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

— Setting range of the pressure control valve is 80~400 bar (size 80~200) or 80~350 bar (size 500).

EZ - Two-point electric control

Two-point electric control with switching solenoid (size 80~200) or on/off valve (size 500) allows the motor displacement to be set to either $V_{g,\,min}$ or $V_{g,\,max}$ by applying or canceling the electric current at the switching solenoid (size 80~200) or control valve (size 500).

NOTICE

— For reliable control, a working pressure of at least 30 bar is necessary in **A/B**.

— If a control operation is performed at working pressure < 30 bar, an auxiliary pressure of at least 30 bar must be applied at port **G** using an external check valve. For lower pressures, please contact us.

— Please keep in mind that a pressure up to 450 bar can occur at port **G**.

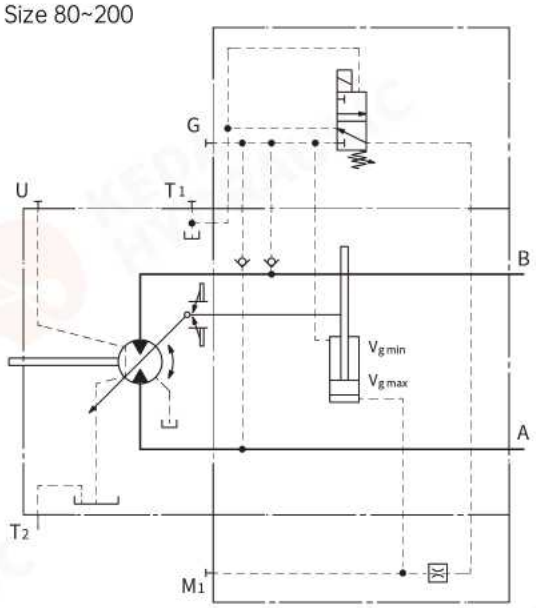
Technical data of solenoid with Ø 37

size 80~200

	EZ1	EZ2
Voltage	12 V (±20 %)	24 V (±20 %)
Position at $V_{g,\,max}$	de-energized	de-energized
Position at $V_{g,\,min}$	energized	energized
Nominal resistance (20°C)	5.5 Ω	21.7 Ω
Nominal power	26.2 W	26.5 W
Minimum active current	1.32 A	0.67 A
Duty cycle	100 %	100 %

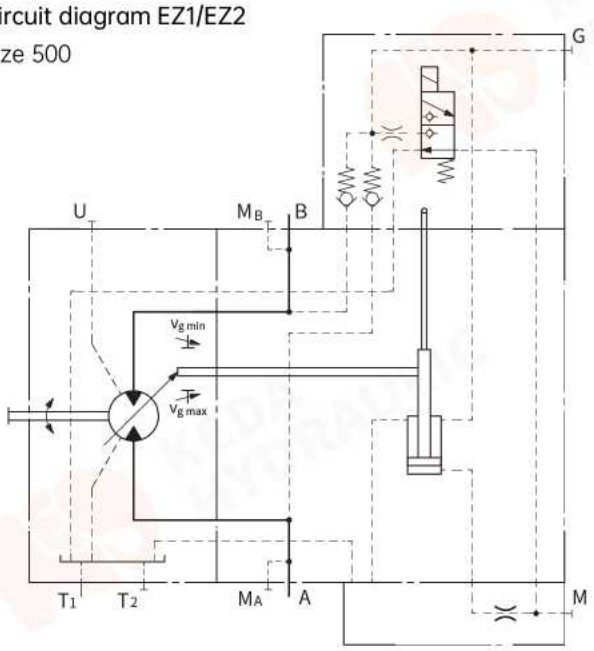
Circuit diagram EZ1/EZ2

Size 80~200



Circuit diagram EZ1/EZ2

Size 500



HA - High-pressure related automatic control

High-pressure related automatic control adjusts the displacement automatically depending on the working pressure.

The beginning of control of the K6VM(E) motor with HA control is $V_{g,\,min}$ (maximum rotational speed and minimum torque). The control device internal ly measures the working pressure at A/B (no control line required) and, when the specified beginning of control is reached, the controller swivels the motor with increasing working pressure from $V_{g,\,min}$ to $V_{g,\,max}$. The displacement is between $V_{g,\,min}$ and $V_{g,\,max}$ depending on the load.

— Beginning of control at $V_{g,min}$ (minimum torque, maximum rotational speed).

— End of control at $V_{g,\,max}$ (maximum torque, minimum rotational speed).

NOTICE

— For safety reasons, lifting winch drives with beginning of control at $V_{g,\,min}$ are not permissible (standard for HA). — For reliable control, a working pressure of at least 30 bar is necessary in A/B.

— If a control operation is performed at working pressure < 30 bar, an auxiliary pressure of at least 30 bar must be applied at port G using an external check valve. For lower pressures, please contact us.

— A pressure up to 450 bar can occur at port G.

— The beginning of control and HA characteristic curve are influenced by the case pressure. An increase in case pressure causes an increase in the beginning of control and thus a parallel offset of the characteristic curve. Only for HA1/HA2/HA.T (size 80~200).

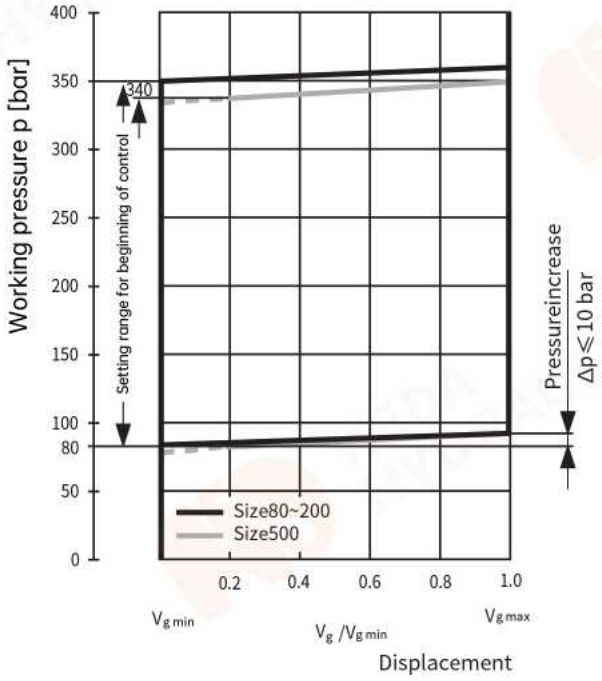
— Size 500: A leakage flow of maximum 0.3 L/min occurs at port X (working pressure > pilot-pressure). To avoid a build-up of pilot-pressure, pressure must be relieved from port X to the reservoir. Only for HA.T control.

HA1 with minimum pressure increase

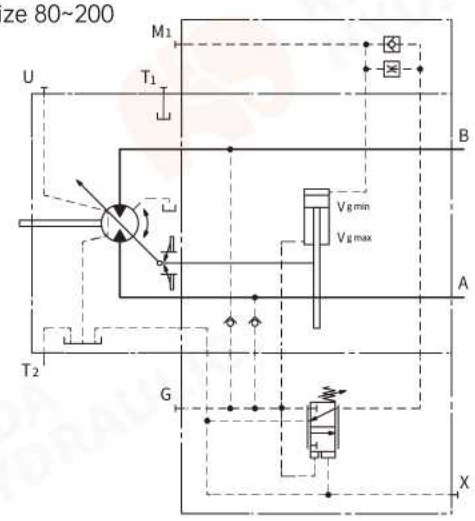
A working pressure increase of Δp ≤ approx. 10 bar will result in an increase in displacement from 0 cm^3 to $V_{g,max}$ (size 80~200) or from 0.2×$V_{g,max}$ to $V_{g,max}$ (size 500).

— Setting range of the beginning of control is 80~350 bar (size 80~200) or 80~340 bar (size 500).
— The required beginning of control must be specified when ordering, e.g.: Beginning of control at 300 bar.

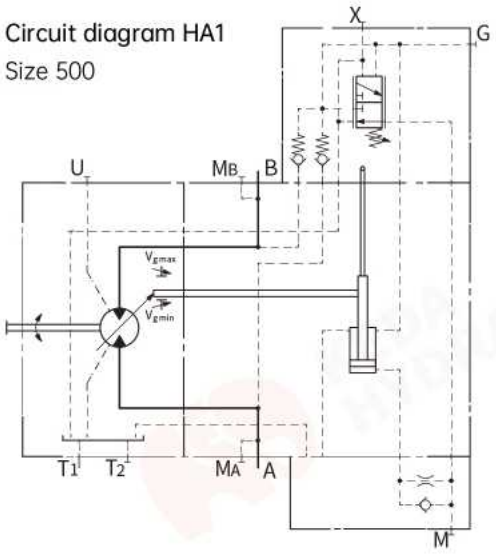
Characteristic curve HA1



Circuit diagram HA1
Size 80~200



Circuit diagram HA1
Size 500

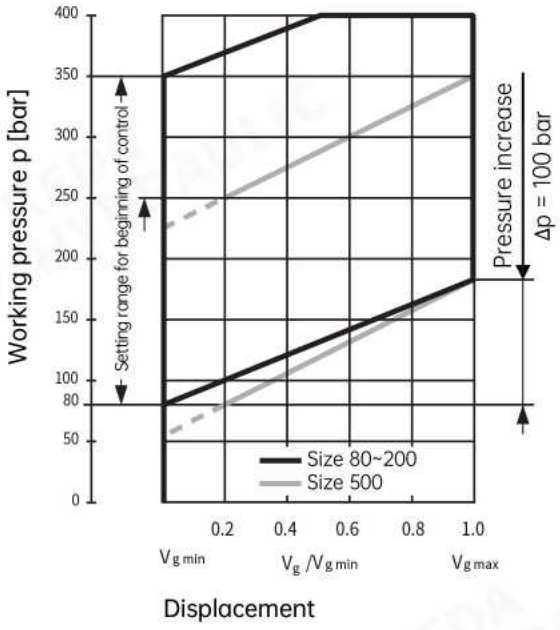


HA2 with pressure increase

A working pressure of Δp = 100 bar will cause an increase in displacement from 0 cm^3 to $V_{g,max}$ (size 80~200) or from 0.2×$V_{g,max}$ to $V_{g,max}$ (size 500).

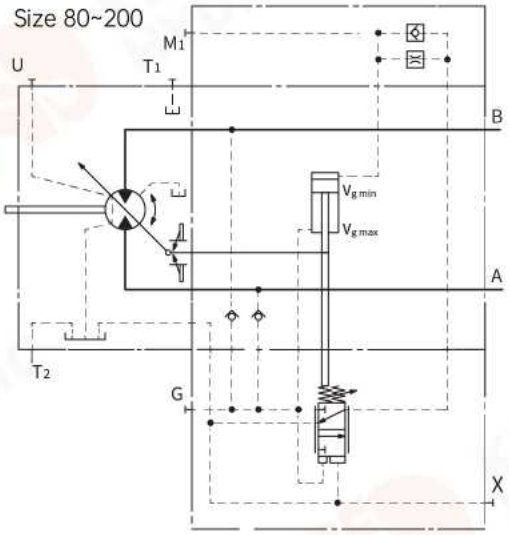
— Setting range of the beginning of control is 80~350 bar (size 80~200) or 80~250 bar (size 500).
— The desired beginning of control must be specified when ordering, e.g.: Beginning of control at 200 bar.

Characteristic curve HA2



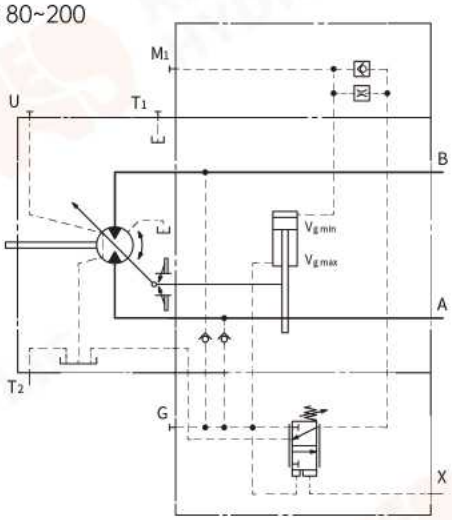
Circuit diagram HA2

Size 80~200



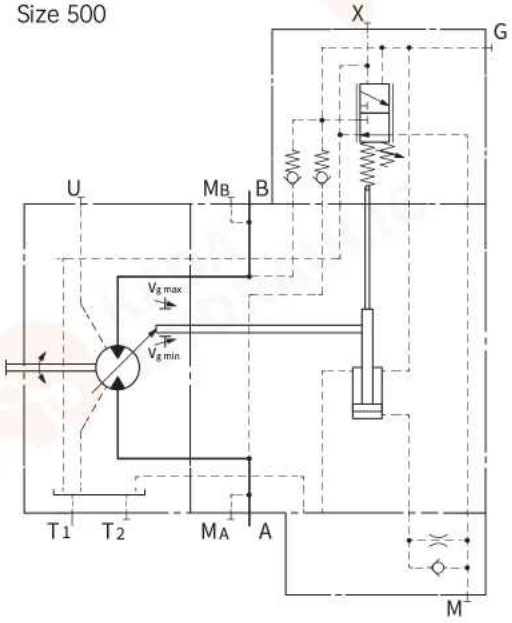
Circuit diagram HA1T

Size 80~200



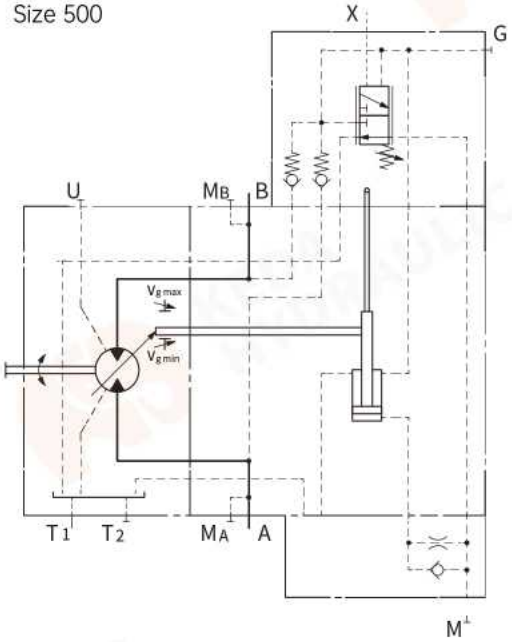
Circuit diagram HA2

Size 500



Circuit diagram HA1T

Size 500



HA.T hydraulic proportional remote controlled override

With HA.T control, the beginning of control can be influenced by applying a pilot-pressure to port X. The beginning of control is reduced by 17 bar (size 80~200) or 8 bar (size 500) per 1 bar pilot-pressure increase.

Beginning of control by pilot-pressure

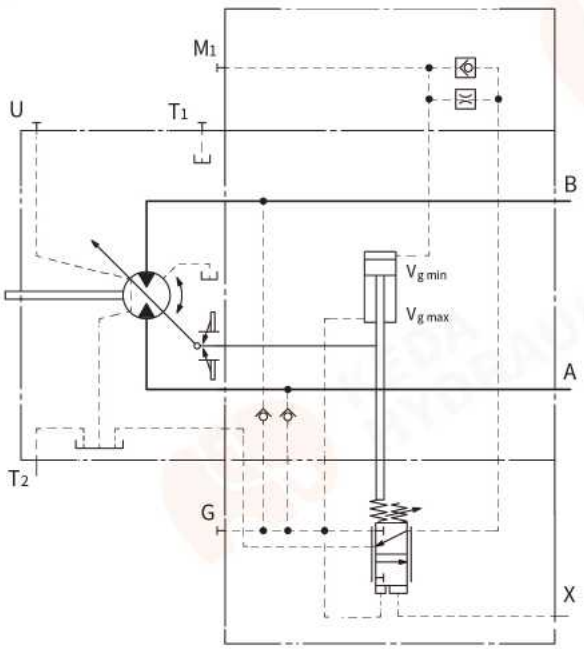
Size		80~200	500
Pilot-pressure at port X	0 bar	10 bar	10 bar
Beginning of control at	300 bar	130 bar	220 bar

NOTICE

— Maximum permissible pilot-pressure 100 bar.

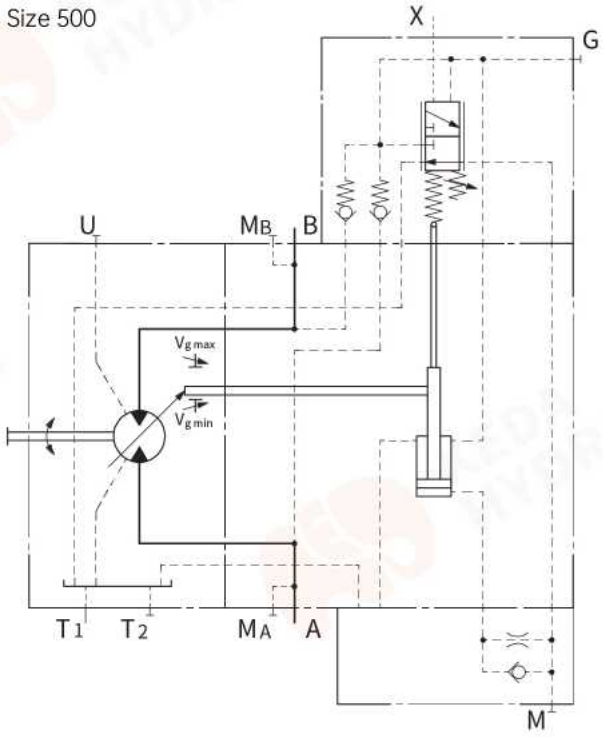
Circuit diagram HA2T

Size 80~200



Circuit diagram HA2T

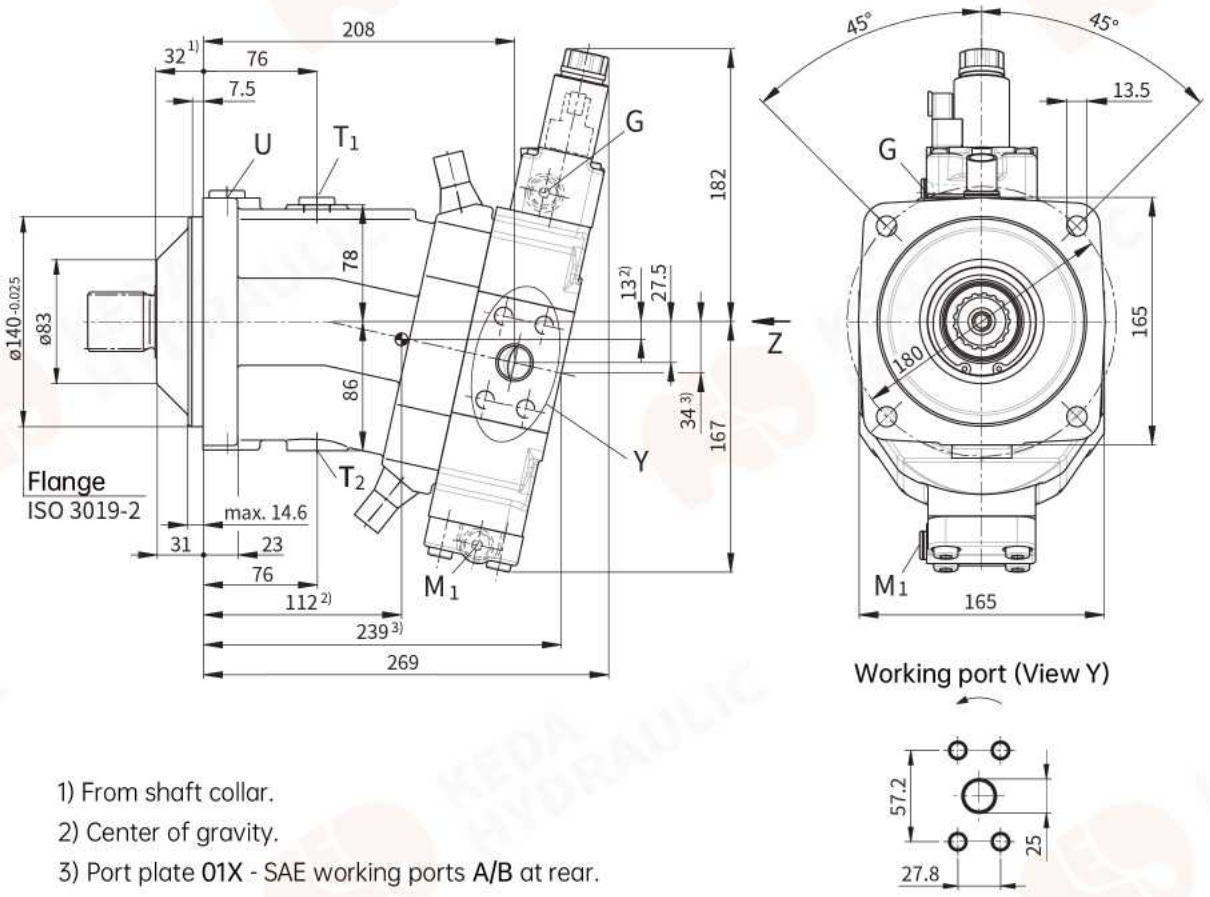
Size 500



DIMENSIONS, SIZE 80

EP1/EP2 - Electric proportional control

Port plate 02X - SAE working ports A/B at opposite sides



1) From shaft collar.

2) Center of gravity.

3) Port plate **01X** - SAE working ports **A/B** at rear.

WORKING PORT

Ports		Standard	Size[4]	p_{max} (bar) [5]	State
A/B	Working port Fastening thread	SAE J518 [6] DIN 13	1 inch M12X1.75; 17 deep	450	Connected
T_1	Drain port	DIN 3852 [8]	M18X1.5; 12 deep	3	Plugged [7]
T_2	Drain port	DIN 3852 [8]	M18X1.5; 12 deep	3	Connected [7]
G	Synchronous control	DIN 3852 [8]	M14X1.5; 12 deep	450	Plugged
U	Bearing flushing port	DIN 3852 [8]	M18X1.5; 12 deep	3	Plugged
X	Pilot-pressure port (HD/HZ/HA1T/HA2T)	DIN 3852 [8]	M14X1.5; 12 deep	100	Connected
X	Pilot-pressure port (HA1/HA2)	DIN 3852 [8]	M14X1.5; 12 deep	3	Plugged
M_1	Control pressure measuring port	DIN 3852 [8]	M14X1.5; 12 deep	450	Plugged

4) For notes on tightening torques, see **SAFETY INSTRUCTIONS** on page 43.

5) Depending on the application, momentary pressure peaks can occur. Please keep this in mind when selecting measuring devices and fittings.

6) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.

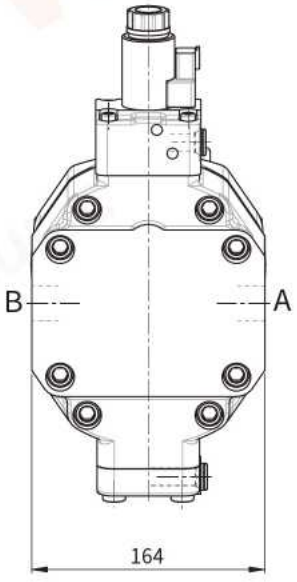
7) Depending on installation position, T_1/T_2 must be connected, see **INSTALLATION INSTRUCTIONS** on page 42.

8) The counter bore may be deeper than specified in the standard.

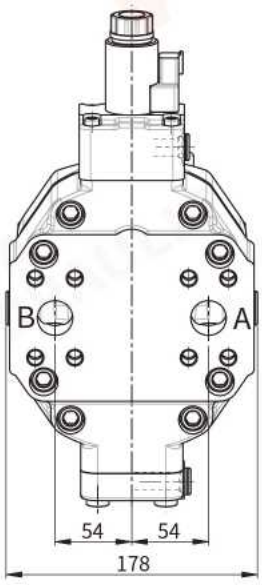
DIMENSIONS, SIZE 80

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

02X - SAE working ports A/B at opposite sides



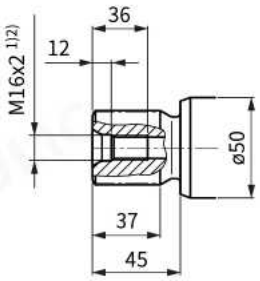
01X - SAE working ports A/B at rear



DRIVE SHAFT

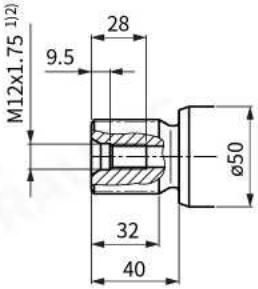
DIN 5480 splined shaft

A – W40×2×18×9g



DIN 5480 splined shaft

Z – W35×2×16×9g

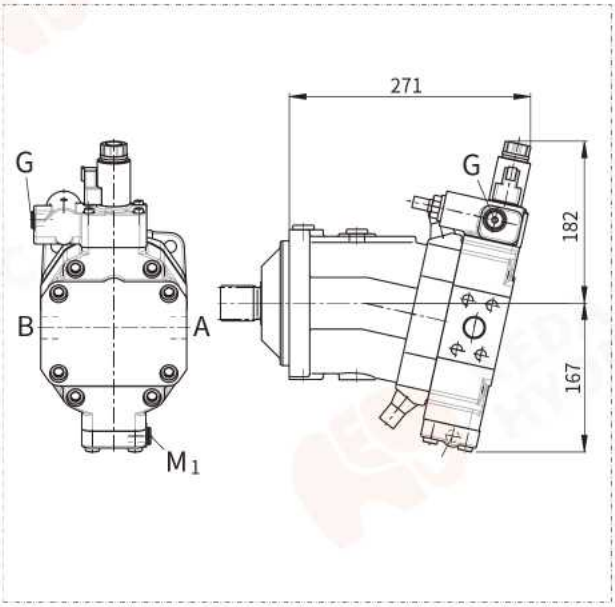


1) For notes on tightening torques, see SAFETY INSTRUCTIONS on page 43.

2) Center bore according to DIN 332 (thread according to DIN 13).

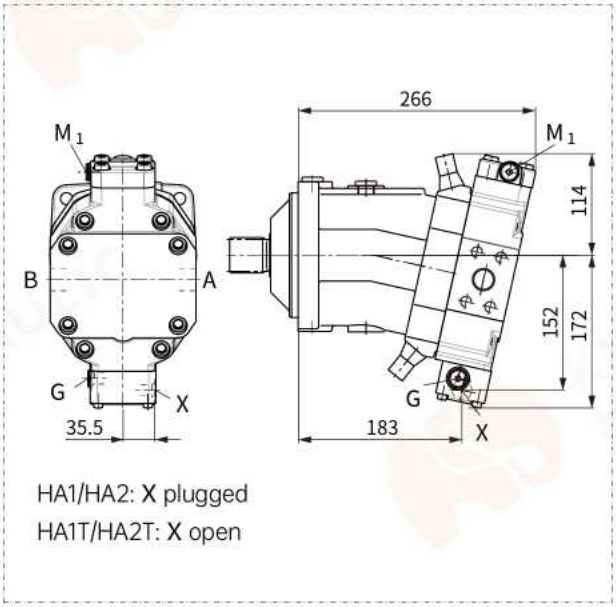
DIMENSIONS, SIZE 80

EP.D pressure control, fixed setting



HA - High-pressure related automatic control

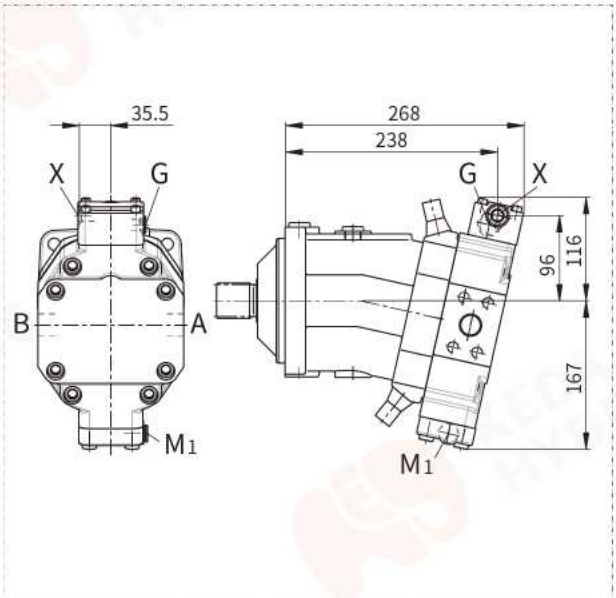
HA.T hydraulic proportional remote controlled override



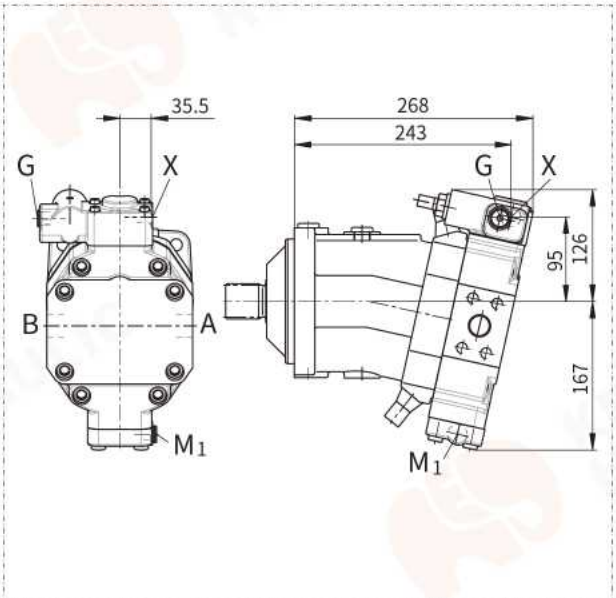
HA1/HA2: X plugged

HA1T/HA2T: X open

HD - Hydraulic proportional control

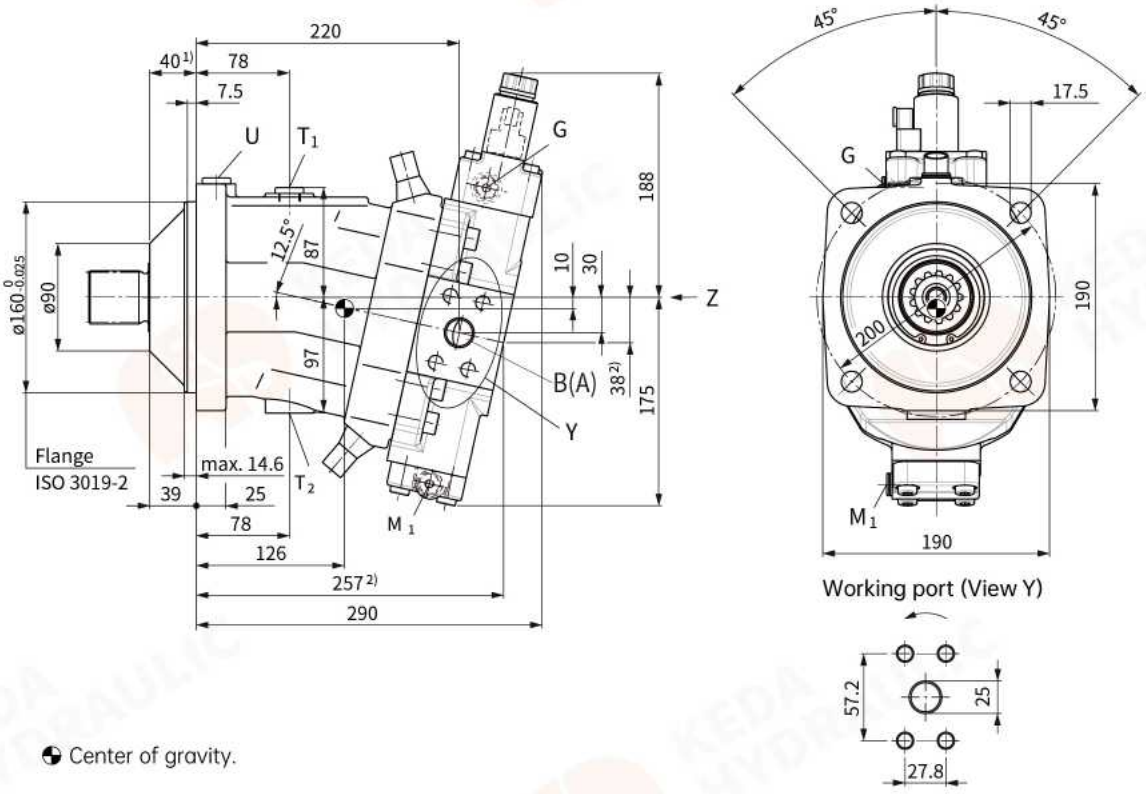


HD.D pressure control, fixed setting



DIMENSIONS, SIZE 107

EP1/EP2 - Electric proportional control
Port plate 02X - SAE working ports A/B at opposite sides
K6VM Flange motor



WORKING PORT

Ports		Standard	Size [1]	p_{max} (bar) [2]	State
A/B	Working port Fastening thread	SAE J518 [3] DIN 13	1 inch M12X1.75; 17 deep	450	Connected
T_1	Drain port	DIN 3852 [5]	M18X1.5; 12 deep	3	Plugged [4]
T_2	Drain port	DIN 3852 [5]	M18X1.5; 12 deep	3	Connected [4]
G	Synchronous control	DIN 3852 [5]	M14X1.5; 12 deep	450	Plugged
U	Bearing flushing port	DIN 3852 [5]	M18X1.5; 12 deep	3	Plugged
X	Pilot-pressure port (HD/HZ/HA1T/HA2T)	DIN 3852 [5]	M14X1.5; 12 deep	100	Connected
X	Pilot-pressure port (HA1/HA2)	DIN 3852 [5]	M14X1.5; 12 deep	3	Plugged
M_1	Control pressure measuring port	DIN 3852 [5]	M14X1.5; 12 deep	450	Plugged

1) For notes on tightening torques, see **SAFETY INSTRUCTIONS** on page 43.

2) Depending on the application, momentary pressure peaks can occur. Please keep this in mind when selecting measuring devices and fittings.

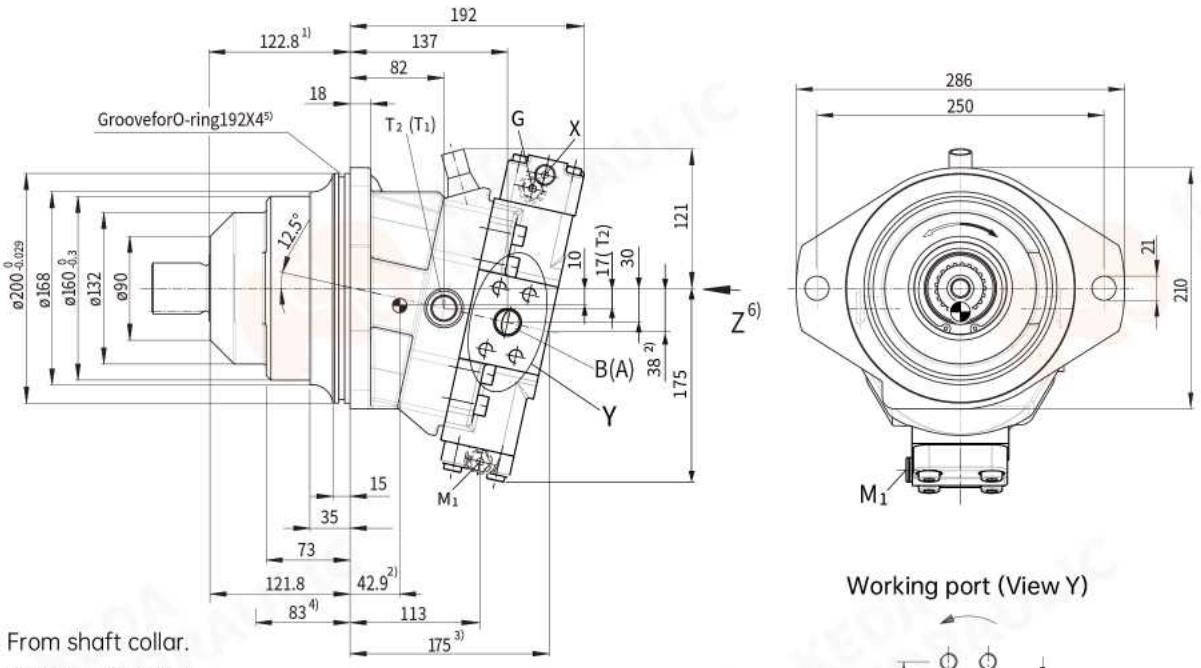
3) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.

4) Depending on installation position, T_1/T_2 must be connected, see **INSTALLATION INSTRUCTIONS** on page 42.

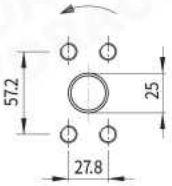
5) The counter bore may be deeper than specified in the standard.

DIMENSIONS, SIZE 107

HD1/HD2 - Hydraulic proportional control
Port plate 02X - SAE working ports A/B at opposite sides
K6VE Plug-in motor



Working port (View Y)

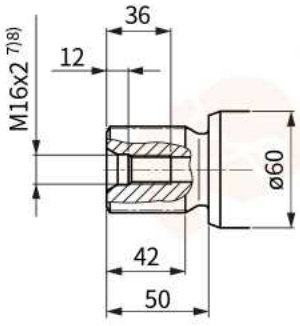


1) From shaft collar.
2) Center of gravity.
3) Port plate **01X** - SAE working ports **A/B** at rear.
4) Difference in dimensions of mounting flange A6VM to A6VE.
5) The O-ring is included in the scope of delivery.
6) See page 23.

DRIVE SHAFT

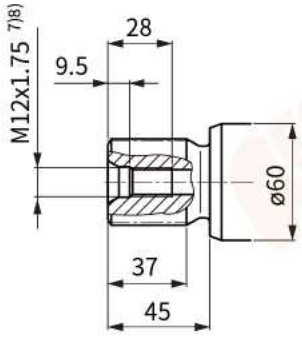
DIN 5480 splined shaft

A - W45×2×21×9g



DIN 5480 splined shaft

Z - W40×2×18×9g

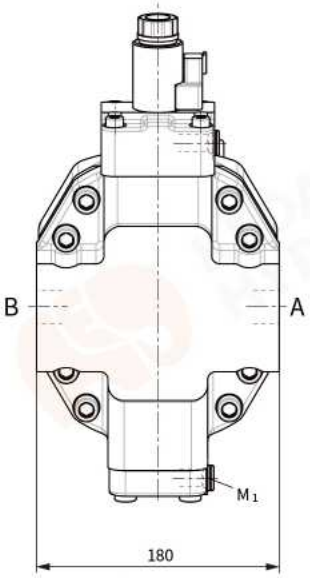


7) For notes on tightening torques, see **SAFETY INSTRUCTIONS** on page 43.
8) Center bore according to DIN 332 (thread according to DIN 13).

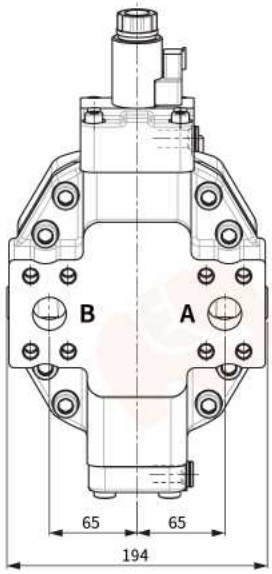
DIMENSIONS, SIZE 107

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

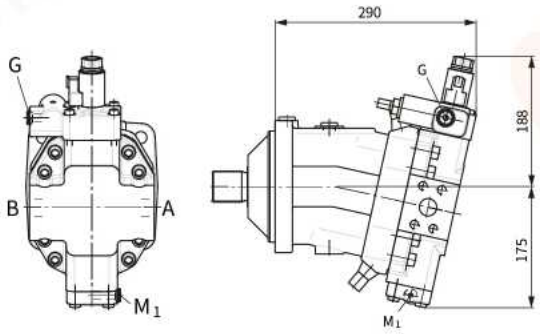
02X - SAE working ports A/B at opposite sides



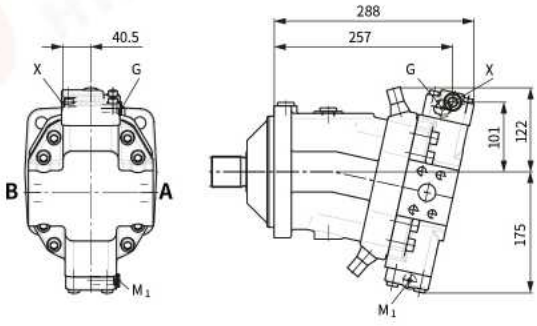
01X - SAE working ports A/B at rear



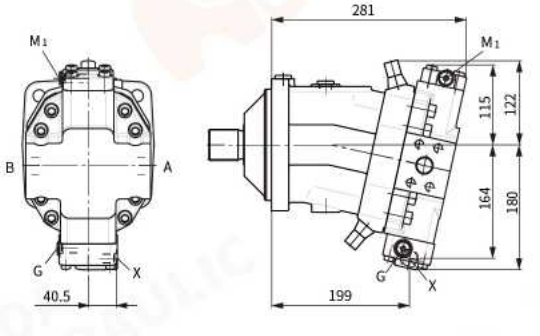
EP.D pressure control, fixed setting



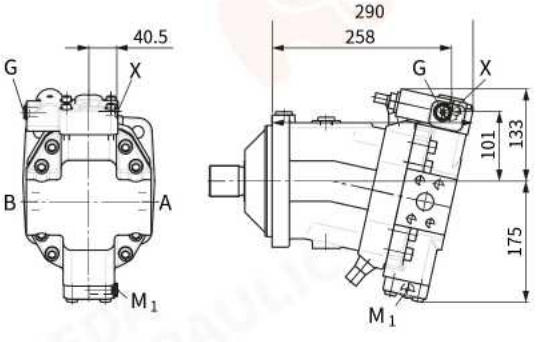
HD - Hydraulic proportional control



HA - High-pressure related automatic control
HA.T hydraulic proportional remote controlled override



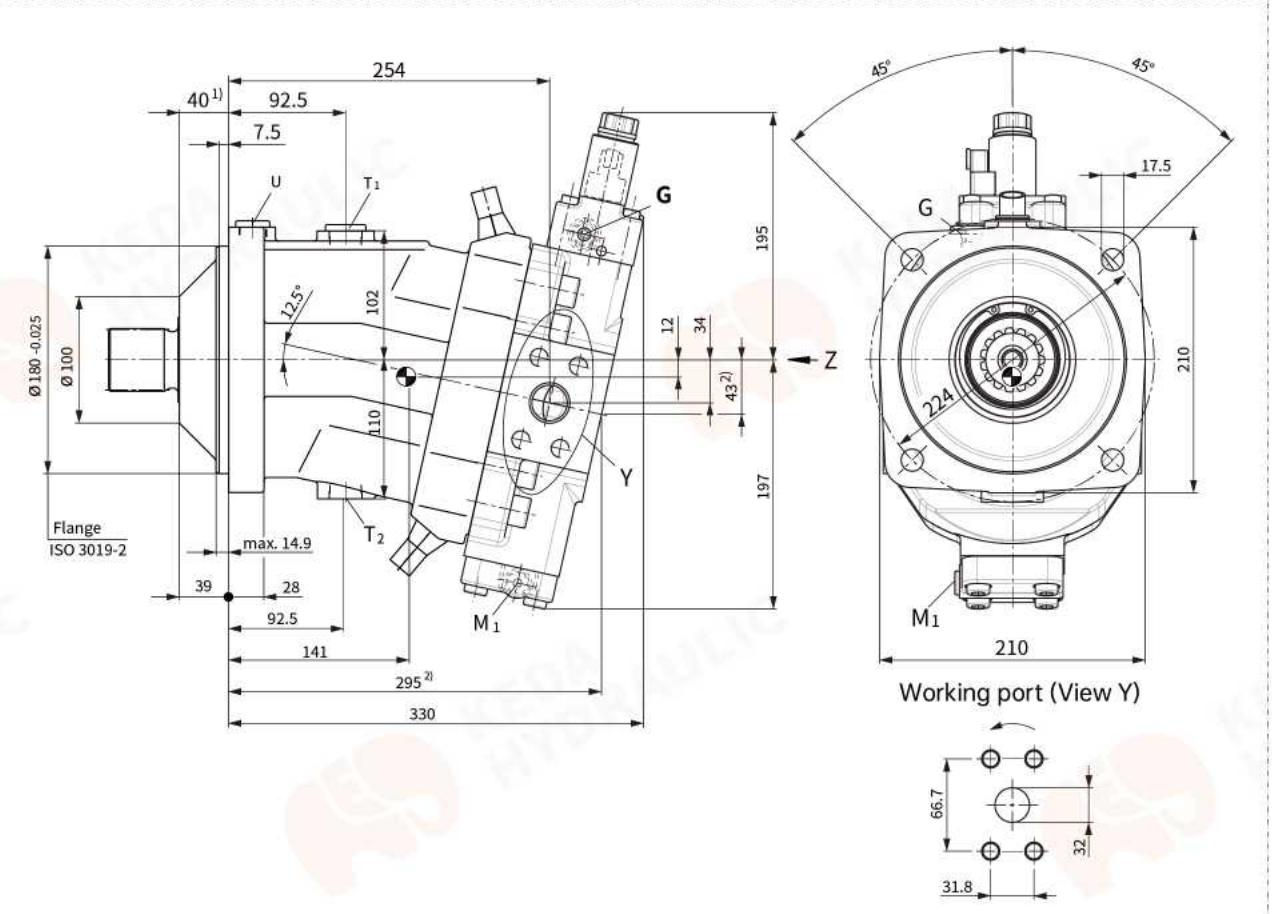
HD.D pressure control, fixed setting



DIMENSIONS, SIZE 160

EP1/EP2 - Electric proportional control

Port plate 02X - SAE working ports A/B at opposite sides



WORKING PORT

Ports		Standard	Size 1)	p_{max} (bar) 2)	State
A/B	Working port Fastening thread	SAE J518 3) DIN 13	1 ¼ inch M14X2; 19 deep	450	Connected
T_1	Drain port	DIN 3852 5)	M26X1.5; 16 deep	3	Plugged 4)
T_2	Drain port	DIN 3852 5)	M26X1.5; 16 deep	3	Connected 4)
G	Synchronous control	DIN 3852 5)	M14X1.5; 12 deep	450	Plugged
U	Bearing flushing port	DIN 3852 5)	M22X1.5; 14 deep	3	Plugged
X	Pilot-pressure port (HD/HZ/HA1T/HA2T)	DIN 3852 5)	M14X1.5; 12 deep	100	Connected
X	Pilot-pressure port (HA1/HA2)	DIN 3852 5)	M14X1.5; 12 deep	3	Plugged
M_1	Control pressure measuring port	DIN 3852 5)	M14X1.5; 12 deep	450	Plugged

1) For notes on tightening torques, see **SAFETY INSTRUCTIONS** on page 43.

2) Depending on the application, momentary pressure peaks can occur. Please keep this in mind when selecting measuring devices and fittings.

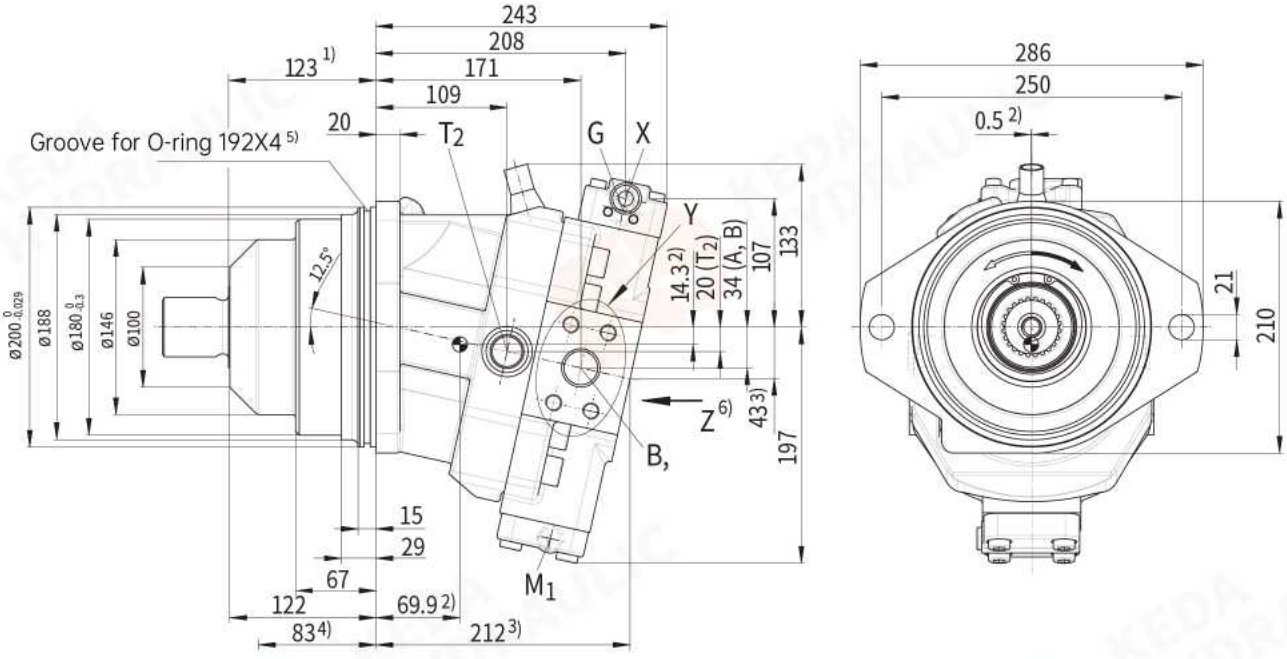
3) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.

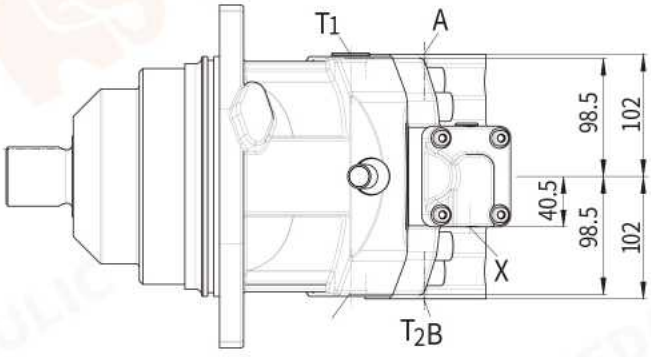
4) Depending on installation position, T_1/T_2 must be connected, see **INSTALLATION INSTRUCTIONS** on page 42.

5) The counter bore may be deeper than specified in the standard.

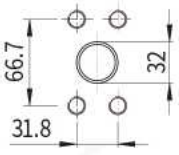
DIMENSIONS, SIZE 160

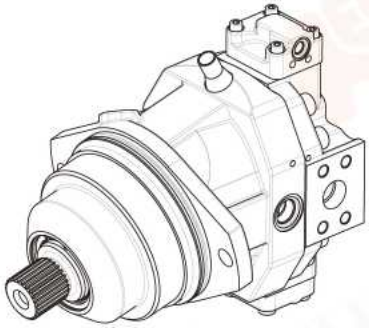
HZ1 - Two-point hydraulic control
Port plate 02X - SAE working ports A/B at opposite sides
K6VE Plug-in motor





Working port (View Y)



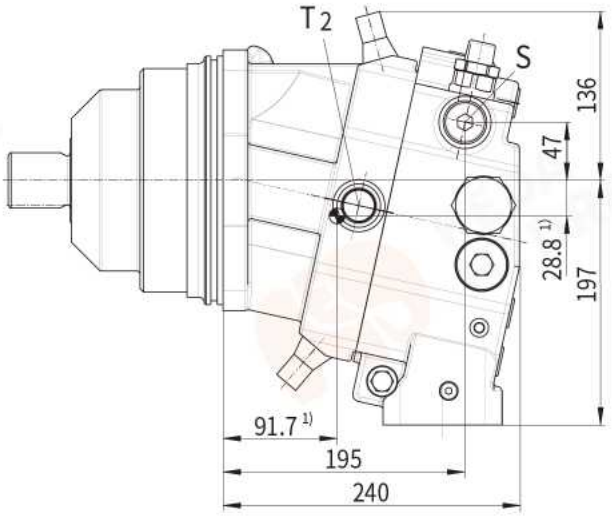


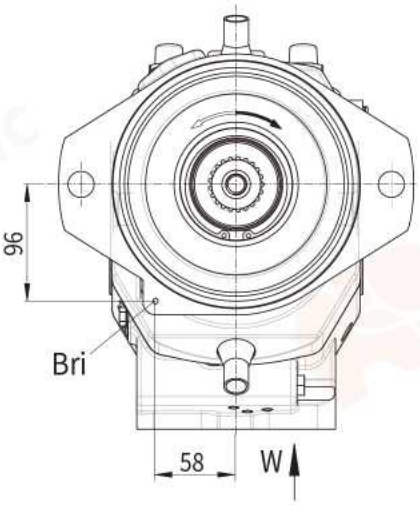
1) From shaft collar.
2) Center of gravity.
3) Port plate **01X** - SAE working ports **A/B** at rear.
4) Difference in dimensions of mounting flange A6VM to A6VE.
5) The O-ring is included in the scope of delivery.

DIMENSIONS, SIZE 160

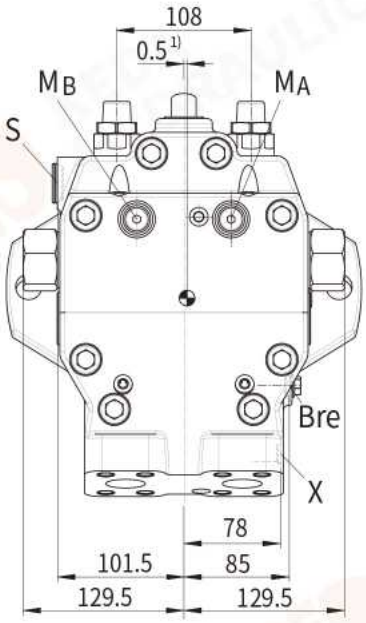
HZ3-Two-pointhydrauliccontrol

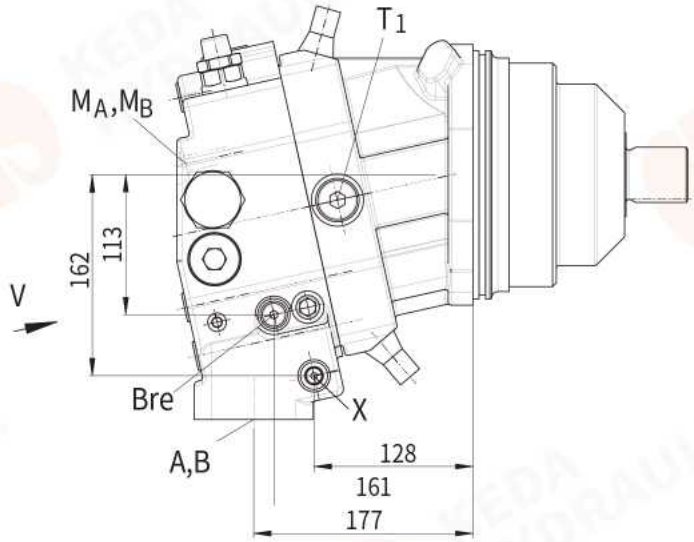
Portplate022-SAEworkingportsA/Batoppositesideswithintegratedcounterbalancevalve BVI K6VEPlug-inmotor

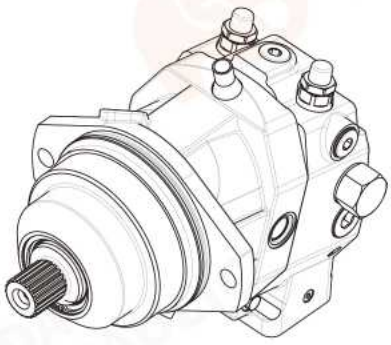




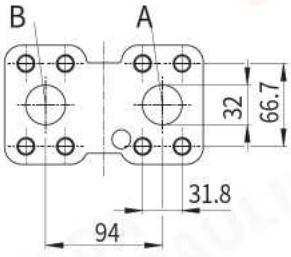
Working port (View V)







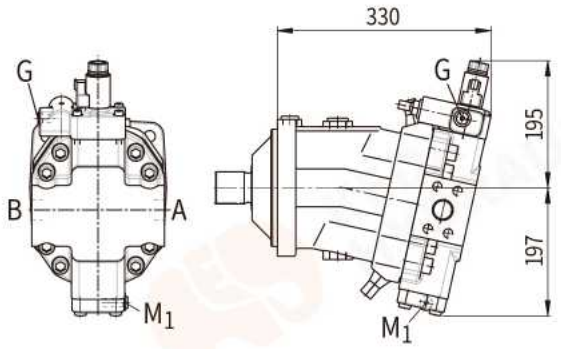
Working port (View W)



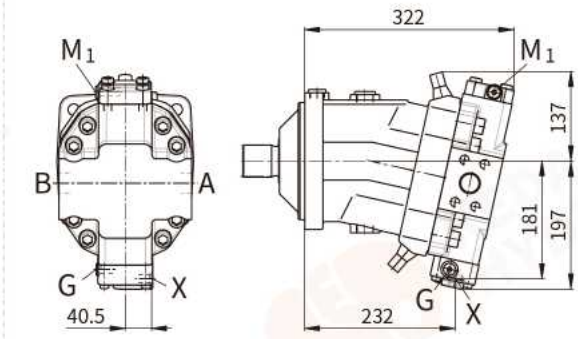
1) Center of gravity.

DIMENSIONS, SIZE 160

EP.D pressure control, fixed setting

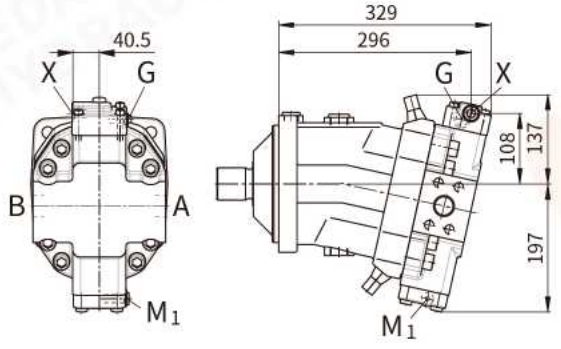


HA - High-pressure related automatic control
HA.T hydraulic proportional remote controlled override

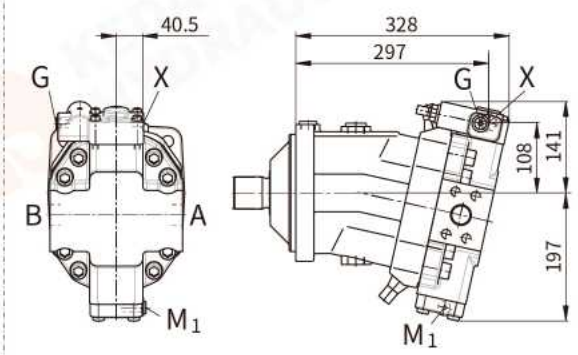


HA1/HA2: X plugged
HA1T/HA2T: X open

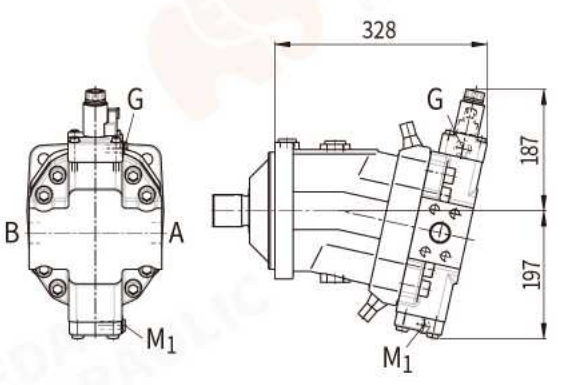
HD - Hydraulic proportional control
HZ1 - Two-point hydraulic control



HD.D pressure control, fixed setting



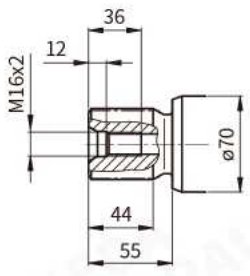
EP - Electric proportional control
EZ - Two-point electric control



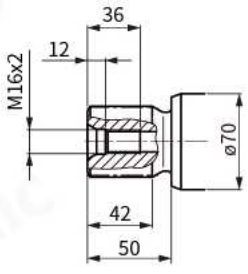
DRIVE SHAFT

DIN 5480 splined shaft

A - W50X2X24X9g



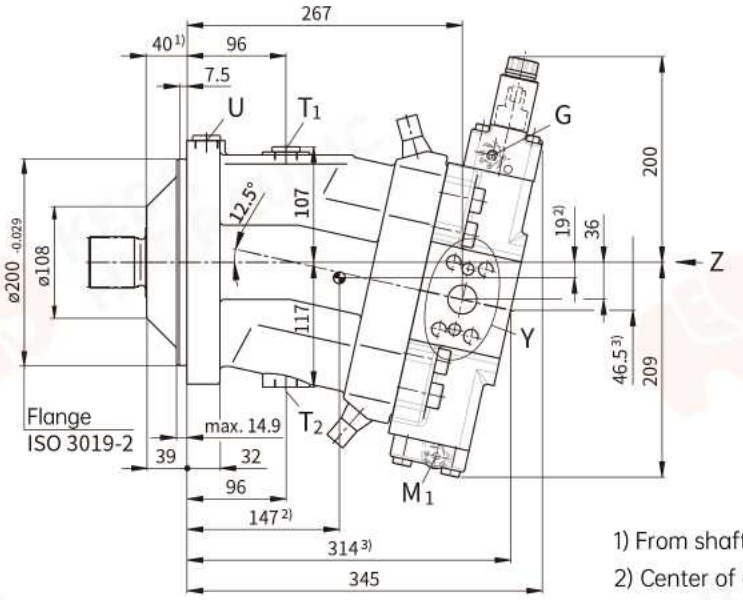
Z - W45X2X21X9g

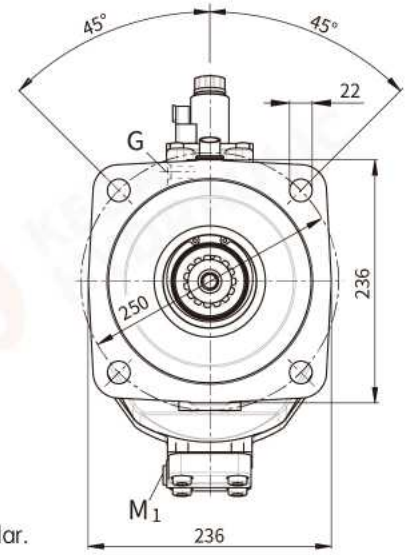


DIMENSIONS, SIZE 200

EP1/EP2 - Electric proportional control

Port plate 02X - SAE working ports A/B at opposite sides





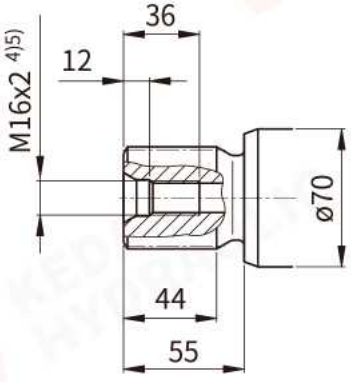
1) From shaft collar.

2) Center of gravity.

3) Port plate **01X** - SAE working ports **A/B** at rear.

DRIVE SHAFT

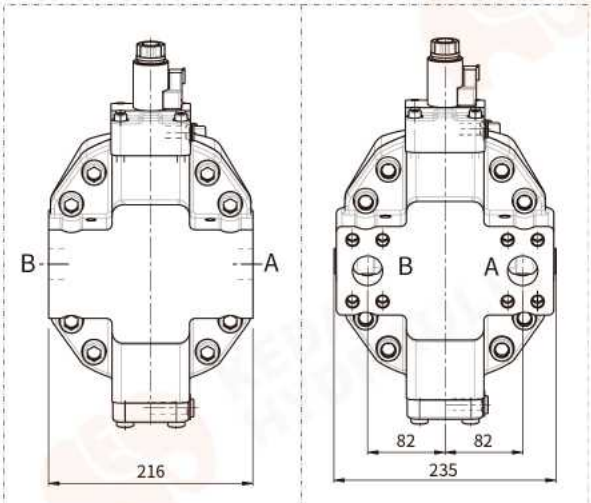
DIN 5480 splined shaft



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

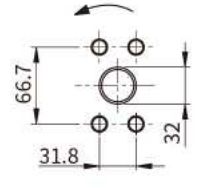
left: **02X** - SAE working ports A/B at opposite sides

right: **01X** - SAE working ports A/B at rear



4) For notes on tightening torques, see **SAFETY INSTRUCTIONS** on page 43.

5) Center bore according to DIN 332 (thread according to DIN 13).



Working port (View Y)

DIMENSIONS, SIZE 200

WORKING PORT

Ports		Standard	Size [1]	p_{max} (bar) [2]	State
A/B	Working port Fastening thread	SAE J518 [3] DIN 13	1 ¼ inch M14X2; 19 deep	450	Connected
T_1	Drain port	DIN 3852 [5]	M26X1.5; 16 deep	3	Plugged [4]
T_2	Drain port	DIN 3852 [5]	M26X1.5; 16 deep	3	Connected [4]
G	Synchronous control	DIN 3852 [5]	M14X1.5; 12 deep	450	Plugged
U	Bearing flushing port	DIN 3852 [5]	M22X1.5; 14 deep	3	Plugged
X	Pilot-pressure port (HD/HZ/HA1T/HA2T)	DIN 3852 [5]	M14X1.5; 12 deep	100	Connected
X	Pilot-pressure port (HA1/HA2)	DIN 3852 [5]	M14X1.5; 12 deep	3	Plugged
M_1	Control pressure measuring port	DIN 3852 [5]	M14X1.5; 12 deep	450	Plugged

1) For notes on tightening torques, see **SAFETY INSTRUCTIONS** on page 43.

2) Depending on the application, momentary pressure peaks can occur. Please keep this in mind when selecting measuring devices and fittings.

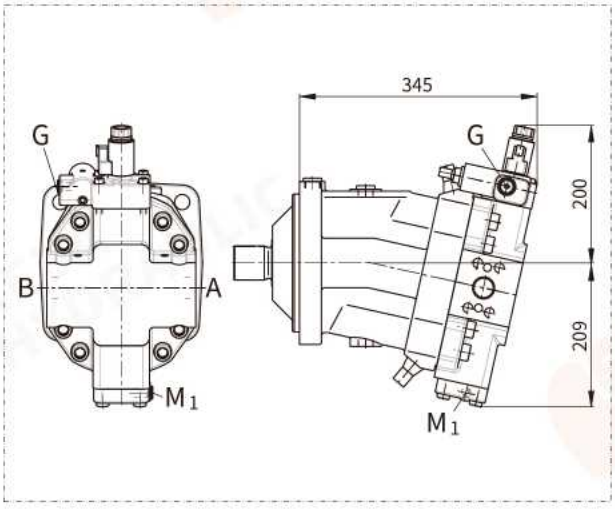
3) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.

4) Depending on installation position, T_1/T_2 must be connected, see **INSTALLATION INSTRUCTIONS** on page 42.

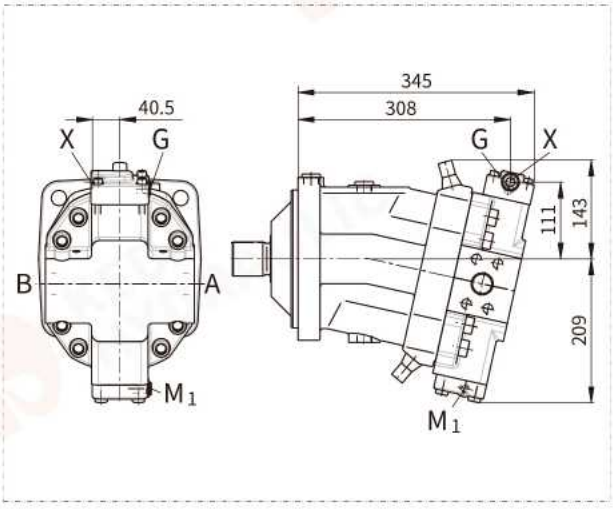
5) The counter bore may be deeper than specified in the standard.

DIMENSIONS, SIZE 200

EP.D pressure control, fixed setting

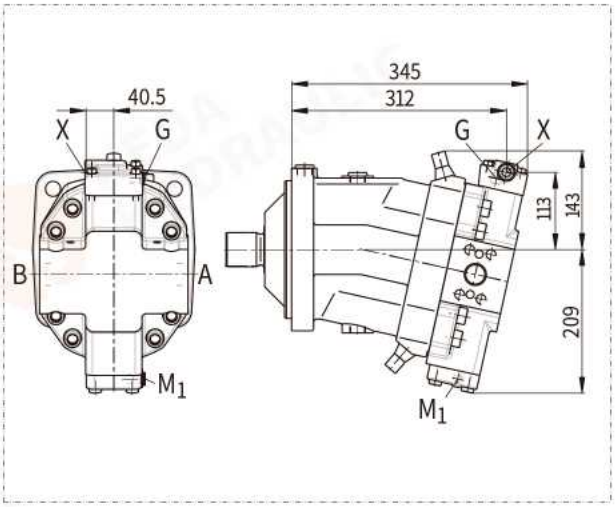


HZ1 - Two-point hydraulic control

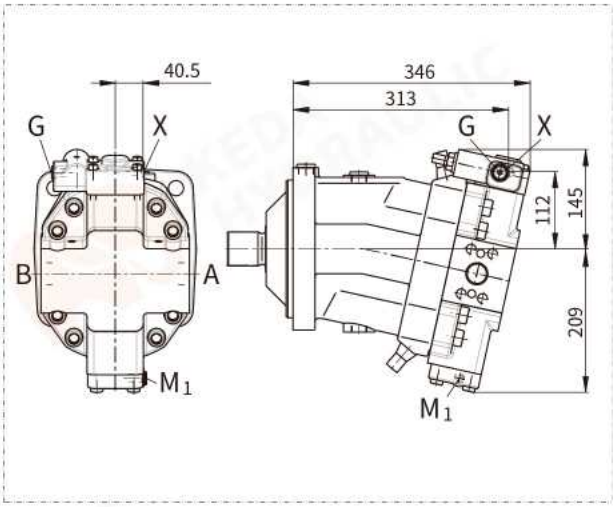


DIMENSIONS, SIZE 200

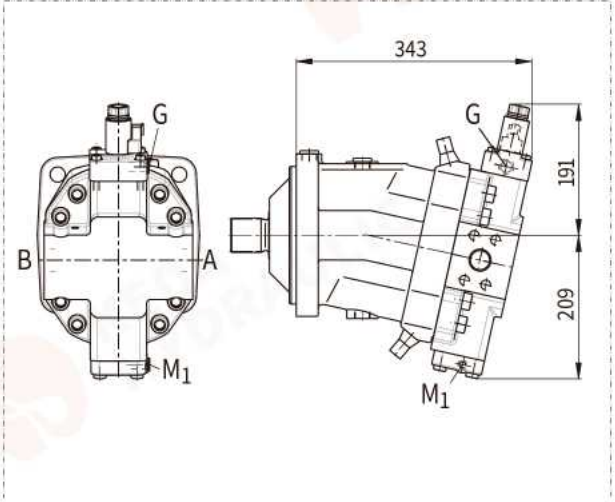
HD - Hydraulic proportional control



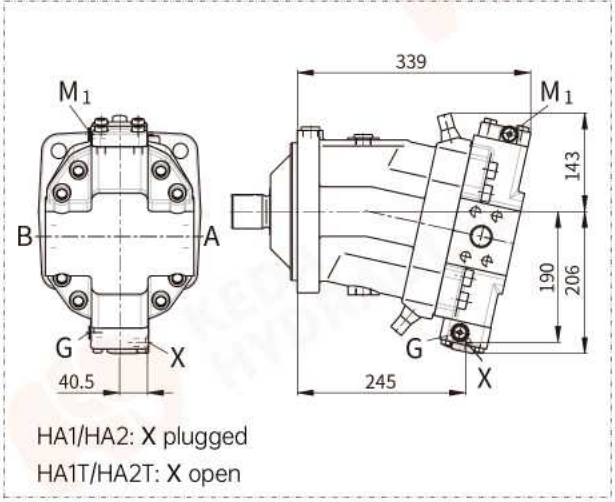
HD.D pressure control, fixed setting



EZ - Two-point electric control



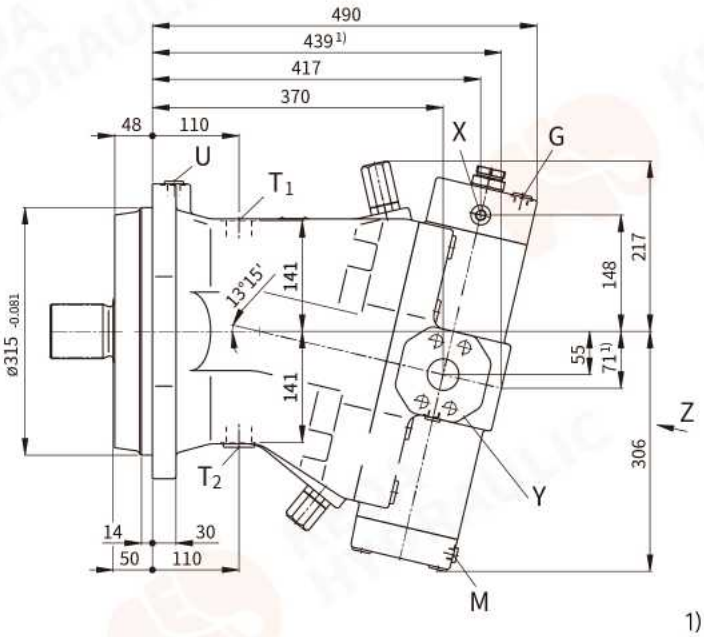
HA - High-pressure related automatic control
HA.T hydraulic proportional remote controlled override

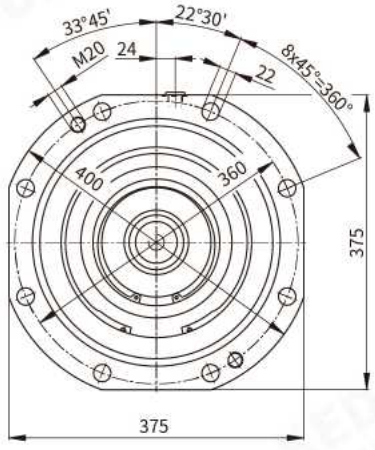


HA1/HA2: X plugged
HA1T/HA2T: X open

DIMENSIONS, SIZE 500

HD1/HD2 - Hydraulic proportional control
HZ - Two-point hydraulic control
Port plate 02X - SAE working ports A/B at opposite sides

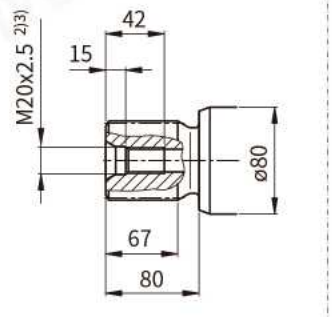


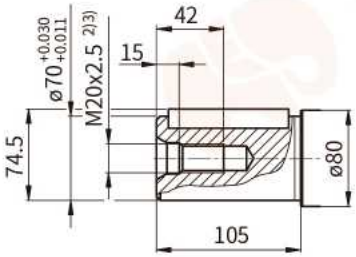


1) Port plate 01X - SAE working ports A/B at rear or port plate 15X SAE flange ports A/B at opposite sides & A1/B1 at rear.

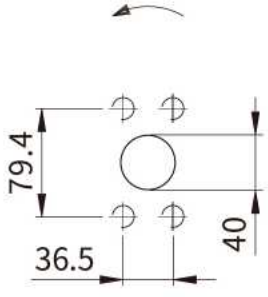
DRIVE SHAFT

left: **DIN 5480 splined shaft**
right: **DIN 6885 parallel keyed shaft**





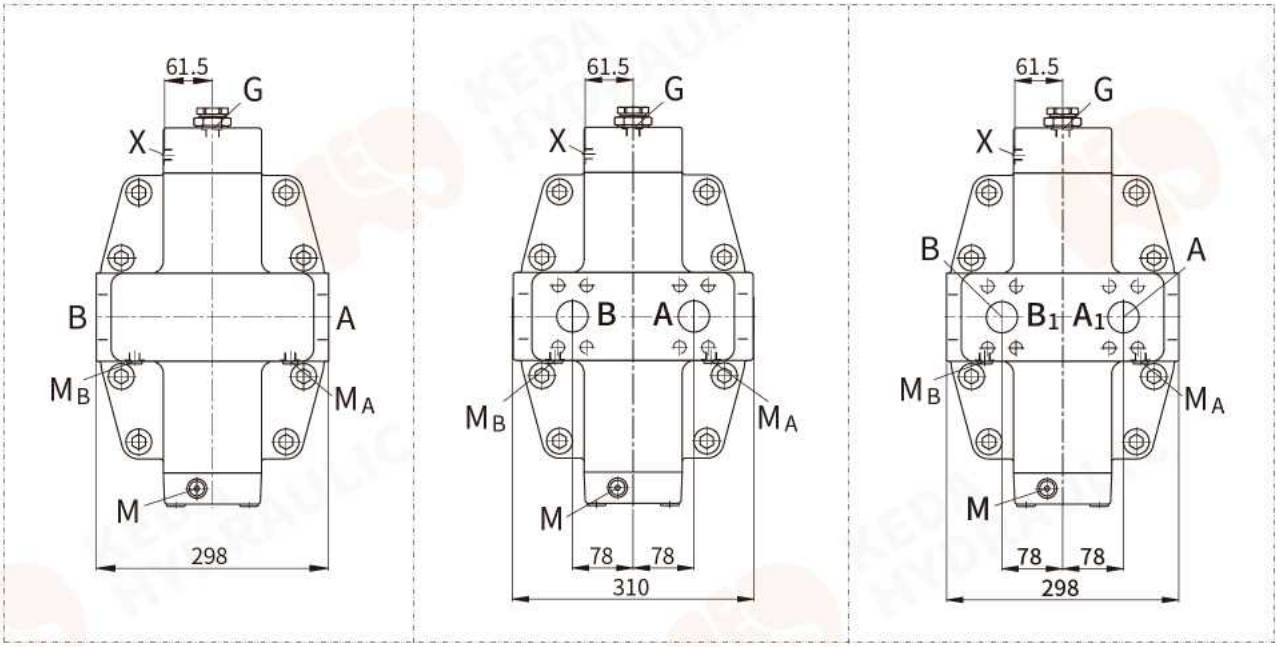
Working port (View Y)



2) For notes on tightening torques, see **SAFETY INSTRUCTIONS** on page 43.
3) Center bore according to DIN 332 (thread according to DIN 13).

DIMENSIONS, SIZE 500

Location of working ports on the port plates (View Z)
left: 02X - SAE working ports A/B at opposite sides
middle: 01X - SAE working ports A/B at rear
right: 15X - SAE working ports A/B at opposite sides & A_1/B_1 at rear



WORKING PORT

Ports		Standard	Size [1]	p_{max} (bar) [2]	State
A/B	Working port Fastening thread	SAE J518 [3] DIN 13	1 ½ inch M16X2; 24 deep	400	Connected
A_1/B_1	Additional working port for plate 15X Fastening thread	SAE J518 [3] DIN 13	1 ½ inch M16X2; 24 deep	400	Connected
T_1	Drain port	DIN 3852 [5]	M33X2; 18 deep	3	Plugged [4]
T_2	Drain port	DIN 3852 [5]	M33X2; 18 deep	3	Connected [4]
G	Synchronous control	DIN 3852 [5]	M18X1.5; 12 deep	400	Plugged
G_2	Secondary pressure control (HD.D/EP.D)	DIN 3852 [5]	M18X1.5; 12 deep	400	Plugged
P	Pilot-pressure port (EP)	DIN 3852 [5]	M14X1.5; 12 deep	100	Connected
U	Bearing flushing port	DIN 3852 [5]	M18X1.5; 12 deep	3	Plugged
X	Pilot-pressure port (HD/HZ/HA1T/HA2T)	DIN 3852 [5]	M14X1.5; 12 deep	100	Connected
X	Pilot-pressure port (HA1/HA2)	DIN 3852 [5]	M14X1.5; 12 deep	3	Plugged
M	Control pressure measuring port	DIN 3852 [5]	M14X1.5; 12 deep	400	Plugged
M_A/M_B	Working pressure measuring port	DIN 3852 [5]	M14X1.5; 12 deep	400	Plugged
M_{St}	Pilot-pressure measuring port	DIN 3852 [5]	M14X1.5; 12 deep	400	Plugged

1) For notes on tightening torques, see **SAFETY INSTRUCTIONS** on page 43.

2) Depending on the application, momentary pressure peaks can occur. Please keep this in mind when selecting measuring devices and fittings.

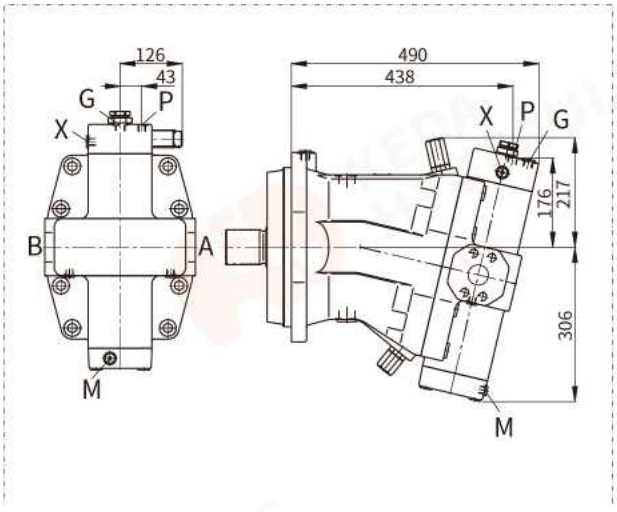
3) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.

4) Depending on installation position, T_1/T_2 must be connected, see **INSTALLATION INSTRUCTIONS** on page 42.

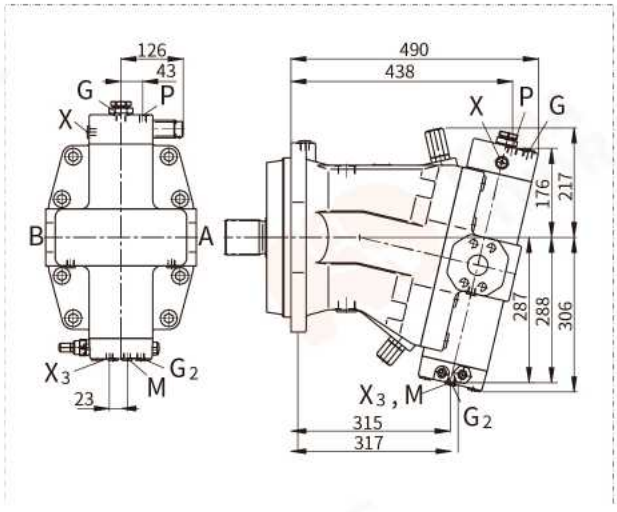
5) The counter bore may be deeper than specified in the standard.

DIMENSIONS, SIZE 500

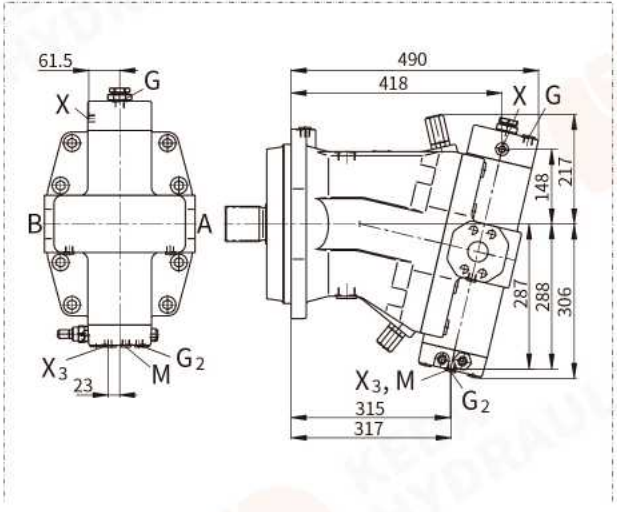
EP - Electric proportional control



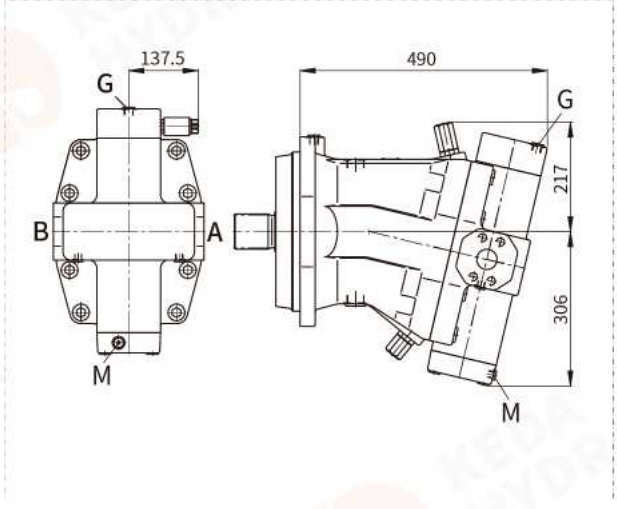
EP.D pressure control, fixed setting



HD.D pressure control, fixed setting

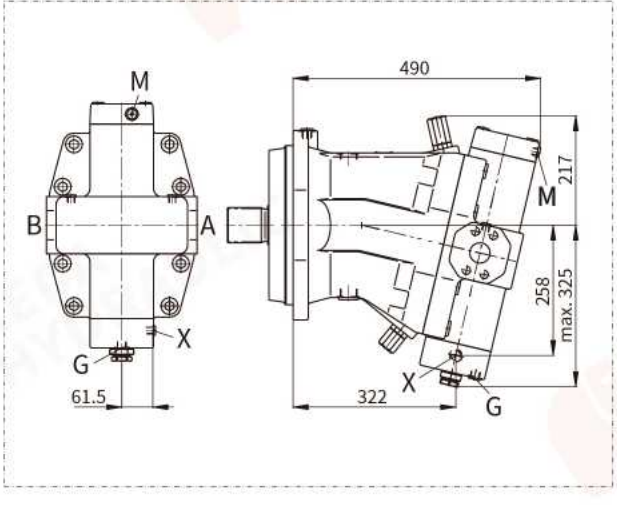


EZ - Two-point electric control



HA - High-pressure related automatic control

HA.T hydraulic proportional remote controlled override

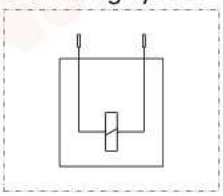


CONNECTOR FOR SOLENOIDS

DEUTSCH DT04-2P-EP04
Size 80~200
Molded, 2-pin, without bidirectional suppressor diode

Types of protection with mounted mating connector
— **IP67** according to DIN EN 60529
— **IP69K** according to DIN 40050-9

Switching symbol



HIRSCHMANN DIN EN 175301-803 Type A /ISO 4400
Size 500
Without bidirectional suppressor diode

— **Type of protection: IP65** according to DIN EN 60529.
— The seal ring in the cable fitting is suitable for lines of diameter 4.5~10 mm.
— The mating connector is included in the scope of delivery.

Mating connector DEUTSCH DT06-2S-EP04

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

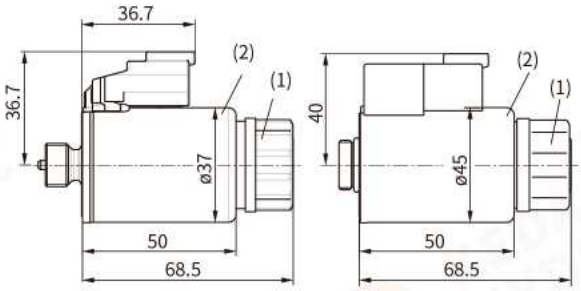
— The mating connector is not included in the scope of delivery. This can be supplied upon request.

NOTICE

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

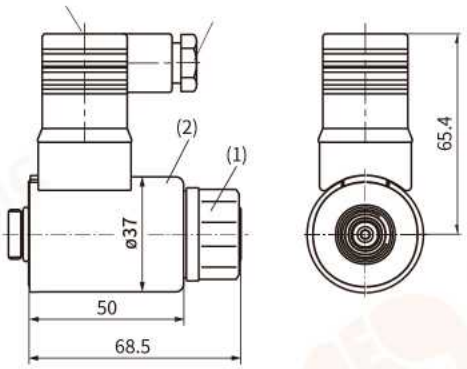
1. Turning the **locknut of solenoid (1)** counterclockwise for 1 lap to open.
2. Turning the **solenoid body (2)** to desired direction.
3. Fixing the **locknut of solenoid (1)** with tightening torque 5^{+1} N·m. Socket wrench according to DIN 3124 WAF26, 12 edges.
4. The direction of connector may differ from those in following figures.

suitable for EZ3/EZ4



Mounting bolt M3
Tightening torque
M_A = 0.5 N·m

Cable fitting M16X1.5
Tightening torque
M_A = 1.5~2.5 N·m



FLUSHING & BOOST-PRESSURE VALVE

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

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

— In a closed circuit, it is used for flushing the housing and safeguarding the minimum boost-pressure.

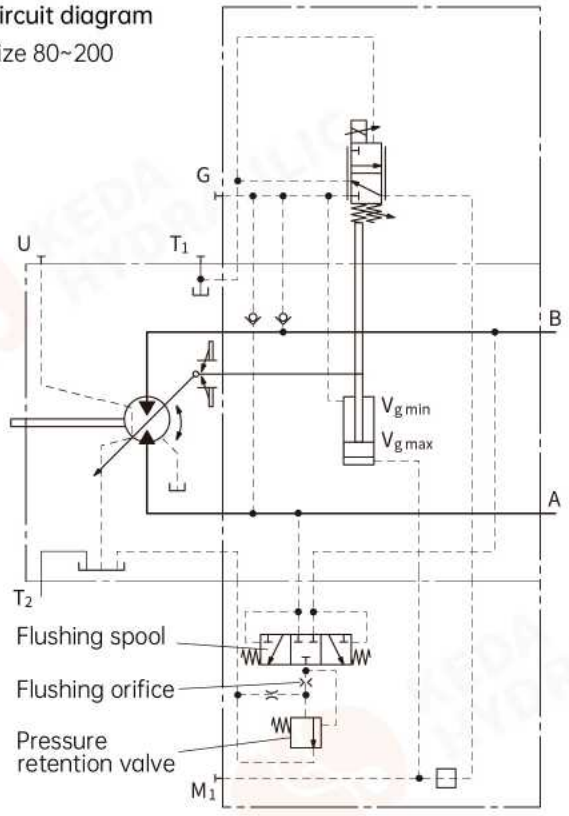
Hydraulic fluid is directed from the respective low-pressure side into the motor housing. This is then fed into the reservoir, together with the leakage. In a closed circuit, the removed hydraulic fluid must be replaced by cooled hydraulic fluid supplied by the boost pump.

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

Cracking pressure of pressure retention valve
(observe when setting the primary valve)
— fixed setting 15 bar

Switching pressure of flushing spool Δp
— 8±1 bar.

Circuit diagram
Size 80~200

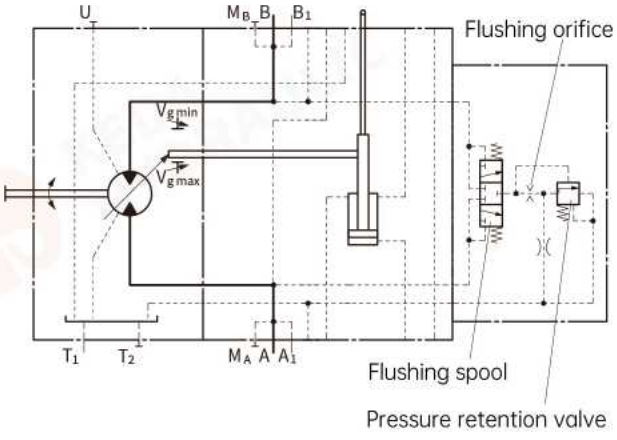


Flushing flow q_v
Orifices can be used to adjust the flushing flows as required. The following parameters are based on:
— Δp_{ND} = (low-pressure p_{ND}) − (case pressure p_G) = 25 bar;
— ν = 10 mm²/s.

Size	q_v (L/min)
80	5
107	8
160/170/200	10
500	16

NOTICE
— Size 80~200: orifices can be supplied for flushing flows 3.5~10 L/min. For other flushing flows, please specify the required flushing flow when ordering.
— At low pressure p_{ND} = 25 bar, flushing flow without any orifice is approx. 12~14 L/min.

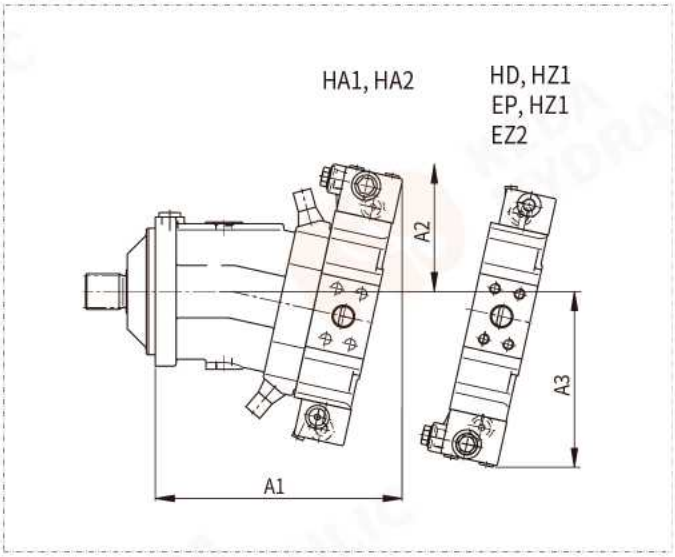
Circuit diagram
Size 500



FLUSHING & BOOST-PRESSURE VALVE

Dimensions

Size 80~200

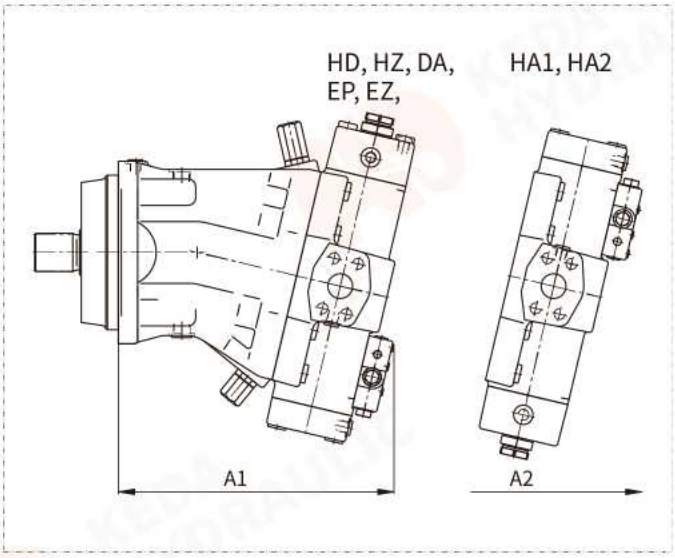


Size	A1	A2	A3
80	273	142	193
107	288	144	200
160	328	154	220
170	▲	▲	▲
200	345	160	231

NOTE: ▲ = pending

Dimensions

Size 500



Size	A1	A2
500	440	504

BVD & BVE COUNTERBALANCE VALVE

Function

Counterbalance valves for travel drives and winches should reduce the danger of over-speed and cavitation of axial piston motors in open circuits. Cavitation occurs if, during braking, when going downhill or during the load-lowering process, the motor speed is greater than it should be for the given inlet flow and thus the supply pressure falls sharply.

If the supply pressure falls below the level specified for the relevant counterbalance valve, the counterbalance valve spool moves into the closed position. The cross-sectional area of the counterbalance valve return passage is then reduced, creating a bottleneck in the return flow of the hydraulic fluid. The pressure increases and brakes the motor until the rotational speed of the motor reaches the specified value for the given inlet flow.

NOTICE

— BVD available for sizes 80~200 and BVE available for sizes 107~200.

— The counterbalance valve must be ordered additionally. We recommend ordering the counterbalance valve and the motor as a set. Order example:

K6VM80HA1T/10W-VAB38800A + BVD20F27S/41B–V03K16D0400S12

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

— The counterbalance valve does not replace the mechanical service brake and holding brake.

— For the design of the brake release valve, we must know the following data for the mechanical holding brake:

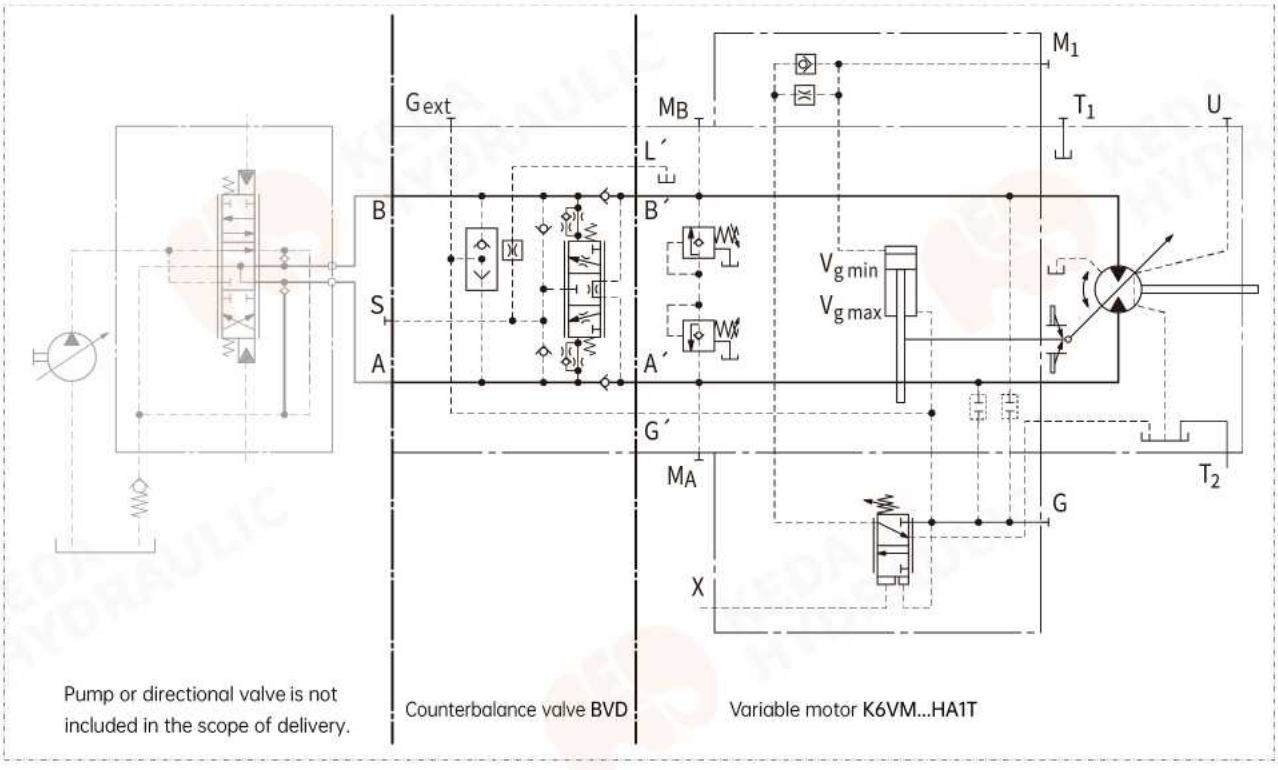
1. The cracking pressure;
2. The volume of the brake spool between minimum stroke (brake closed) & maximum stroke (brake released with 21 bar);
3. The required closing time for a warm device (oil viscosity approx. 15 mm²/s).

Counterbalance valve for travel drives BVD...F

Application option: travel drives for wheeled excavators

Example circuit diagram K6VM80HA1T/10W-VAB38800A + BVD20F27S/41B–V03K16D0400S12

Travel drive in wheeled excavators



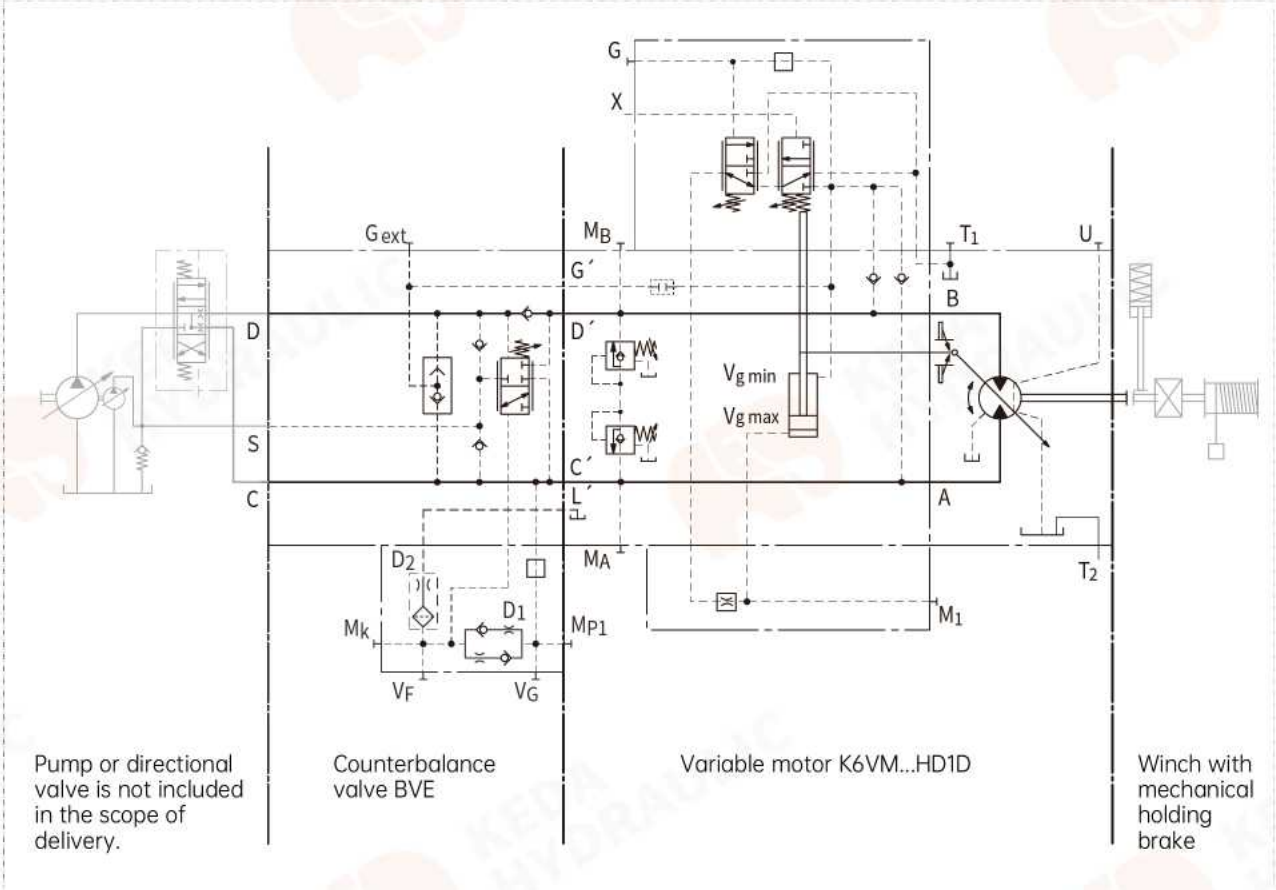
BVD & BVE COUNTERBALANCE VALVE

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

Application option: Winch drives in cranes (BVD and BVE); Track drive in excavator crawlers (BVD)

Example circuit diagram K6VM80HD1D/10W-VAB38800B + BVE25W38S/51ND-V100K00D4599T30S00-0

Winch drive in cranes



Permissible inlet flow or pressure

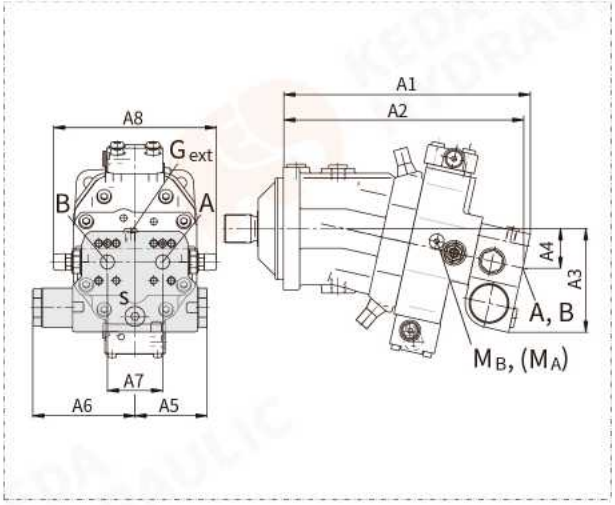
when using pressure relief valve **DBV**, double-acting counterbalance valve **BVD** and one-sided counterbalance valve **BVE**

Motor	Without valve		With pressure relief valve DBV				With counterbalance valve BVD/BVE			
Size (mL/r)	p_N/p_{max} (bar)	$q_{v,max}$ (L/min)	Valve size	p_N/p_{max} (bar)	$q_{v,max}$ (L/min)	Type code	Valve size *	p_N/p_{max} (bar)	$q_{v,max}$ (L/min)	Type code
80	400/450	312	22	350/420	240	380	20	350/420	220	388
107		380	32		400	370	20		220	378
						380	25		320	388
160		496	32		400	380	25		320	388
170		▲	32		400	380	25		320	388
200		620	upon request				upon request			

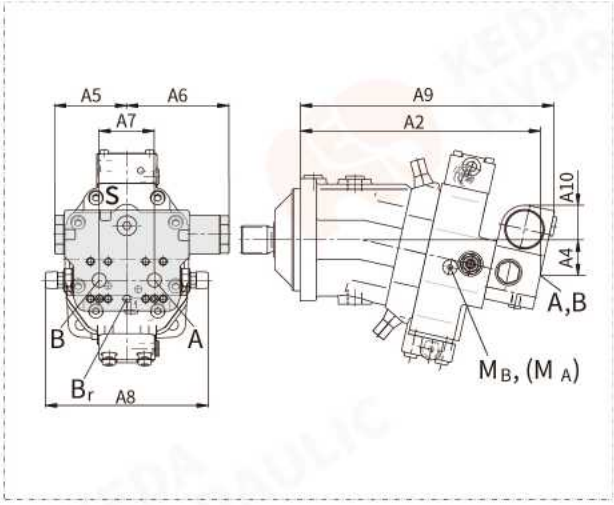
NOTE: ▲ = pending * Valve size 20 = **BVD**, valve size 25 = **BVD/BVE**

BVD & BVE COUNTERBALANCE VALVE

Dimensions
K6VM...HA



Dimensions
K6VM...HD/EP [1]



Dimensions

K6VM Size...plate	Counterbalance valve type	Ports A/B	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
80...38	BVD20...27	1"	340	331	148	55	98	139	75	222	355	46
107...37	BVD20...28	1"	362	353	152	59	98	139	84	234	377	41
107...38	BVD25...38	1 ¼"	380	370	165	63	120.5	175	84	238	395	56
160...38	BVD25...38	1 ¼"	417	407	170	68	120.5	175	84	238	432	51
200...38	BVD25...38	1 ¼"	448	438	176	74	120.5	175	84	299	463	46
107...38	BVE25...38	1 ¼"	380	370	171	63	137	214	84	238	397	63
160...38	BVE25...38	1 ¼"	417	407	176	68	137	214	84	238	432	59
200...38	BVE25...38	1 ¼"	448	438	182	74	137	214	84	299	463	52

Working port

Ports		Version	Plate	Standard	Size [2]	p_{max} (bar) [3]	State
A/B	Working port			SAE J518	(see table above)	420	Connected
S	Boost port	BVD20 BVD25 BVE25		DIN 3852 [4]	M22X1.5; 14 deep M27X2; 16 deep M27X2; 16 deep	30	Plugged
B_r	Brake release port, reduced high-pressure	L	7 8	DIN 3852 [4]	M12X1.5; 12.5 deep	30	Connected
G_{ext}	Brake release port, high-pressure	S		DIN 3852 [4]	M12X1.5; 12.5 deep	420	Plugged
M_A/M_B	Working pressure measuring port			ISO 6149 [4]	M18X1.5; 14.5 deep	420	Plugged

1) At the mounting version for control **HP/EP**, the cast-in port designations **A/B** on counterbalance valve **BVD** do not correspond with those of K6VM motor. The designations of the ports on the installation drawing of the motor is binding!

2) For notes on tightening torques, see **SAFETY INSTRUCTIONS** on page 43.

3) Depending on the application, momentary pressure peaks can occur. Please keep this in mind when selecting measuring devices and fittings.

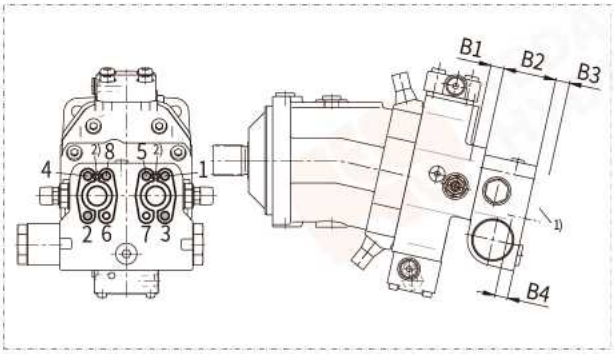
4) The counter bore may be deeper than specified in the standard.

BVD & BVE COUNTERBALANCE VALVE

Mounting the counterbalance valve

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

The counterbalance valve is finally mounted to the motor by fitting the SAE flange. The screws to be used and the instructions for mounting can be found in the following figure with steps **1~8**.



Tacking screws

Size...plate	80...38/107...37	107~200...38
B1[3]	M12X1.75; 15 deep	M14X2; 19 deep
B2	68	85
B3	upon request	
B4	M12X1.75; 16 deep	M14X2; 19 deep

— Length of 6 screws (**1/2/3/4/5/8**) = B1+B2+B3;

— Length of 2 screws (**6/7**) = B3+B4.

Tightening torque

Thread	Strength level	Torque (N·m)
M6X1	10.9	15.5
M10	10.9	75
M12	10.9	130
M14	10.9	205

— All the tacking screws should be preassembled with half the tightening torques.

— Fixing the screws with the tightening torques.

1) SAE flange.

2) Fastening thread M6X1 according to DIN 912, length = B1+B2.

3) Minimum required depth of thread up to 10 times pitch of screw.

SPEED SENSOR

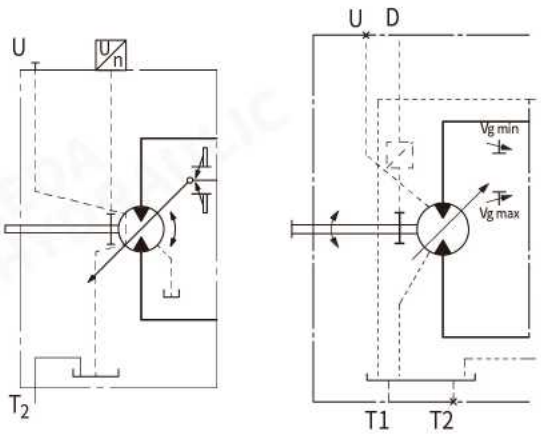
GENERAL

The K6VM(E)...**U/F** versions ("prepared for speed sensor", i.e. without sensor) are equipped with a spline on the rotary group. On deliveries "prepared for speed sensor", the port is plugged with a pressure-resistant cover. On deliveries with sensor, the sensor is mounted on the port provided for this purpose with several mounting bolts. We recommend ordering the K6VM(E) variable motor complete with mounted sensor.

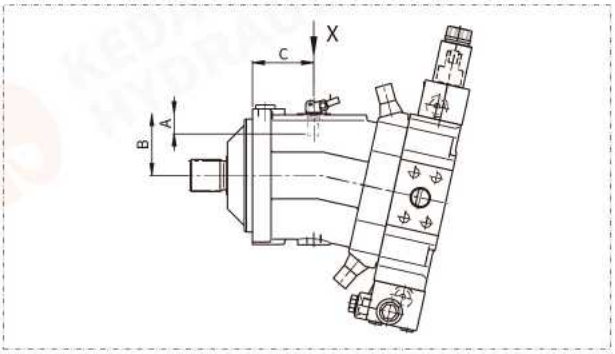
A signal proportional to the rotational speed of the motor can be generated with the mounted **HDD/DSA** speed sensor. The **HDD/DSA** sensor measures the rotational speed and direction of rotation.

Type code, technical data, dimensions and details on the connector, plus safety instructions about the sensor can be found in the relevant data sheet.

Circuit diagram
left: **Size 80~200**
right: **Size 500**

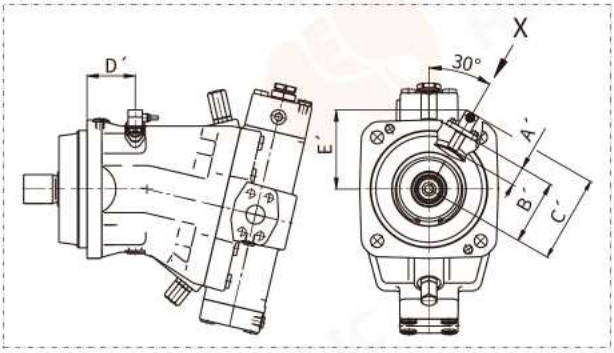


Dimensions
Version **V** with **DSA** mounted to port T_1 (size 80~200)

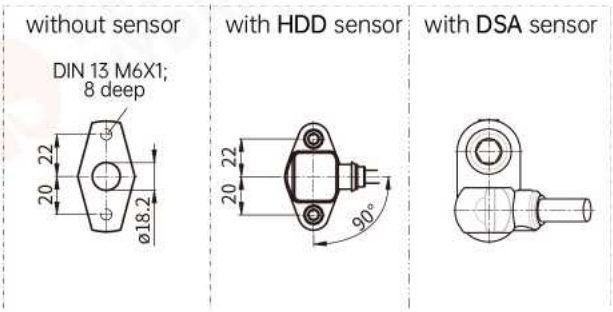


NOTE: Only T_2 as drain port when the rotational speed being measured.

Dimensions
Version **H** with **HDD** mounted to particular port for sensor, by fitting the mounting flange with 2 bolts (size 500)



View X



Dimensions

Size			80	107	160	200	500
Number of teeth			58	67	75	80	80
DSA	A	Insertion depth (tolerance -0.25)	18.4	18.4	18.4	18.4	–
	B	Contact surface	79	88	96	101	–
	C		75.2	77.2	91.7	95.2	–
HDD	A'	Insertion depth (tolerance±0.1)	–	–	–	–	32.5
	B'	Contact surface	–	–	–	–	132.5
	C'		–	–	–	–	171
	D'		–	–	–	–	113
	E'		–	–	–	–	154

INSTALLATION INSTRUCTIONS

General

The axial piston unit must be with hydraulic fluid filled and air bled during the commissioning and operation. This must also be observed after a long standstill as the axial piston unit may empty via the hydraulic lines. Particularly in the installation position "drive shaft upwards", filling and air bleeding must be carried out completely as there is danger of dry running, and so on.

The leakage in the housing must be directed to reservoir via the highest drain port T_1/T_2.

If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating condition, particularly at cold start. If this is not possible, separate drain line must be laid, if necessary.

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

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

NOTICE

Effects on the control system are to be expected in certain installation positions. Gravity, case pressure and dead weight can cause minor characteristic shifts and changes in response time.

— Recommended installation positions are 1 and 2.
— Further installation positions are possible upon request.

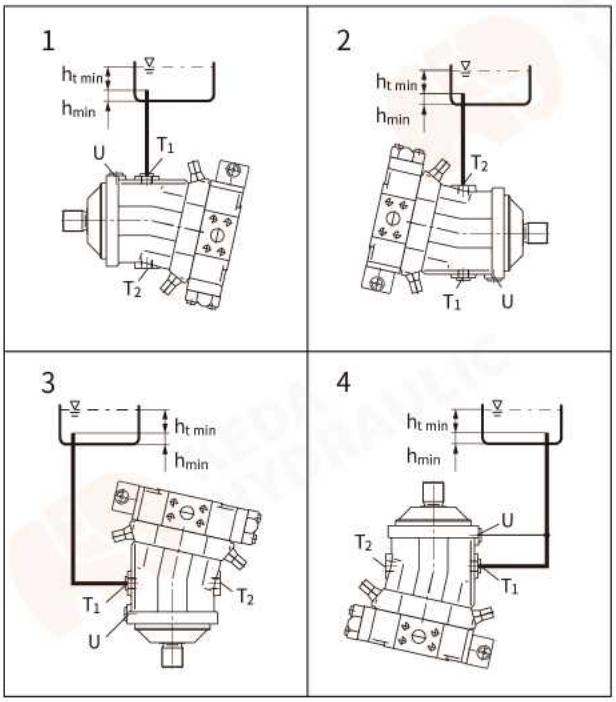
Connecting ports

Position	Air bleed	Filling
1	–	T_1
2	–	T_2
3	–	T_1
4	U	T_1
5	U(L_1)	T_1(L_1)
6	L_1	T_2(L_1)
7	L_1	T_1(L_1)
8	U	T_1(L_1)

L_1 Filling & air bleeding port
U Bearing flushing & air bleeding port
T_1/T_2 Drain port
$h_{t,\,min}$ Minimum required immersion depth = 200 mm
h_{min} Minimum required distance to reservoir bottom = 100 mm

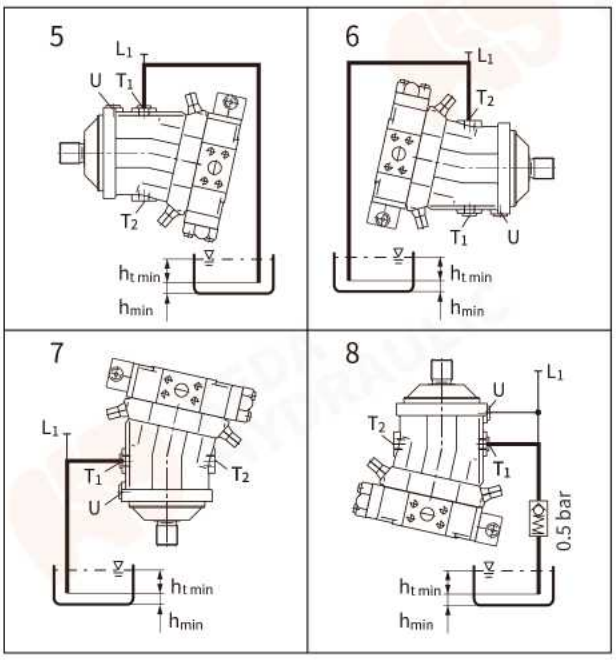
Below-reservoir installation (standard)

The axial piston unit is installed outside of the reservoir and below the minimum fluid level of the reservoir.



Above-reservoirinstallation

The axial piston unit is installed above the minimum fluid level of the reservoir. We recommend installation position 8 with drive shaft upwards. A check valve in the drain line (cracking pressure 0.5 bar) can prevent draining of the housing area.



SAFETY INSTRUCTIONS

General

K6VM(E) is designed to be used in open/close circuits.

— The project planning, installation and commissioning of the axial piston unit require the involvement of qualified specialists.

— Please read the corresponding instruction manual completely and thoroughly before using the axial piston unit.

— The specified data and notes contained herein must be observed.

— Not all versions of the product are approved for use in safety functions according to ISO 13849.

Operation

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

— Depending on the operating conditions (e.g. working pressure, fluid temperature) of the axial piston unit, the characteristic curve may shift

Working port

— The ports and fastening threads are designed for the specified maximum pressure. Manufacturer of machine or system must ensure the connecting elements and lines correspond to the specified application conditions (e.g. pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.

— The working ports and function ports are only intended to accommodate hydraulic lines.

Tightening torque

— Please note the details regarding the tightening torques of port threads and other threaded joints in the instruction manual. Mounting bolts with DIN 13 metric thread or ASME B1.1 thread.

— Tightening torque of a threaded hole should not exceed the **maximum permissible tightening torque $M_{G,\,max}$**, see following table.

— **Tightening torque M_V** for the tacking screws, which are delivered along with the axial piston unit, should refer to following table.

Standard for port	Thread	Maximum permissible torque for threaded holes $M_{G,\,max}$ (N·m)	Tightening torque for tacking screws M_V [1] (N·m)	Wrench size (mm)
DIN 3852	M12x1.5	50	25 [2]	6
	M14x1.5	80	35	6
	M16x1.5	100	50	8
	M18x1.5	140	60	8
	M22x1.5	210	80	10
	M26x1.5	230	120	12
	M27x2	330	135	12
	M33x2	540	225	17
	M42x2	720	360	22

1) Tightening torque for dry screws when delivered and for slightly lubricated screws when mounted.

2) Reduced torque down to 17 N·m for slightly lubricated screws with thread M12X1.5.

TYPE CODE OF BVD VALVE

BVD					/	41		-	V				
01	02	03	04	05		06	07		08	09	10	11	12

COUNTERBALANCE VALVE

01	Double-acting counterbalance valve	BVD

SIZE

02	Maximum flow $q_{V,max}$ = 220 L/min	20
	Maximum flow $q_{V,max}$ = 320 L/min	25

APPLICATION (PRESSURE WHEN SPOOL STARTS/STOPS TO OPEN)

03	7~30 bar for travel drive	F
	20~40 bar for winches and track drive	W

WORKING PORT

	Size	K2FM/E./.181	K2FE./.171	K6VM./.370	K6VM./.380	
04	20	28、32、45 [1])				16
		56、63			55	17
		80、90			80	27
			107、125	107		28
	25	107、125、160、180			107、140、160	38

BRAKE RELEASE VALVE

05	With high-pressure	S
	With reduced high-pressure 21^{+4} bar	L

SERIES

06	Series 4, index 1	41

CONNECTION

07	Side B (Standard)	B
	Side A	A

SEALING

08	Fluoroelastomer (FKM)	V

SPOOL DESIGN

09	100% × $q_{V,max}$ (see SIZE)	01
	75% × $q_{V,max}$ (see SIZE)	02
	50% × $q_{V,max}$ (see SIZE)	03

RESIDUAL OPENING

10	Without residual opening for winches		K00
	With residual opening	Ø 1.2	K12
		Ø 1.6	K16
		Ø 1.8	K18
		Ø 2.0	K20

1) Size 28, 32 and 45 require a distance plate between motor port plate 181 and counterbalance valve.

TYPE CODE OF BVD VALVE

BVD					/	41		–	V				
01	02	03	04	05		06	07		08	09	10	11	12

DAMPING

11	Equivalent surface area (mm^2)	0.0361 mm^2	Damping shuttle 25	D2500
		0.0520 mm^2	3	D0300
		0.0836 mm^2	38[2])	D0400
		0.1762 mm^2	55	D0600
		0.2798 mm^2	69[3])	D0800

FLUSHING CAVITY

12	Plugged		S00
	With throttle (only for K6VM)	Ø1.2	S12
		Ø1.6	S16
		Ø1.8	S18

2) Standard for travel drive.

3) Standard for winches and track drive.

ORDERING

Ordering the gearbox/counterbalance valve and motor as a set is possible. Please specify following information when ordering to ensure the right setting during delivery test.

—Type code of motor
—Type code of counterbalance valve
—Flow
—Application
—Settings of boost-pressure valve & pressure relief valve

SELECTION OF COUNTERBALANCE VALVE

SIZE

depends on the required flow and available port plate.

APPLICATION

defines the pressure value at which the counterbalance valve's spool starts to open.

— Code F: travel drive for wheel vehicles require the spool to start opening at approximately 7 bar △p between A and B.

— Code W: start to open the spool at 20 bar. Thus the mechanical brake of winches and track drive is fully open (usually at 18 bar) before the spool opens.

CONNECTION

depends on the motor size used. Motor port plates have different distances and sizes of the A/B line connections. Refer to the respective table on page 47.

K2FM(E)28/32/45 require a distance plate between motor port plate 181 and counterbalance valve. When ordering motor and counterbalance valve in a set, the displace plate is included in the scope of delivery.

BRAKE RELEASE VALVE

is necessary when the mechanical brake cannot handle the system's high-pressure. Ask the winch manufacturer about the maximum brake lifting pressure. Brake release valve limits the high-pressure to 21~25 bar (tolerance=4 bar). It opens 10~14 bar below this setting.

SPOOLDESIGN

depends on the maximum flow across the counterbalance valve. The different spools are designed such that the nominal flow rate creates a pressure loss of 15 bar across the counterbalance valve.

If for instance your maximum operational flow is only some 110L/min while using a size 20 counterbalance valve which features a nominal volumetric flow of 220 L/min, then select the 50% spool with code 03. If the desired flow rate is not in the range of the offered ones, please contact us.

RESIDUAL OPENING

within the spool ensures a smooth final stopping of a wheeled vehicle. The throttle size defines the smoothness. In winch applications there is NO residual opening since otherwise the machine would not stay suspended.

DAMPING

defines how quick the counterbalance valve closes/opens. For travel drive size D0400 or D0600 is reliable. Winches or track drives usually work best with a dampening code of D0600 or D0800.

FLUSHING CAVITY

provides flushing oil for motor via an internal port. Only available with K6VM motors.

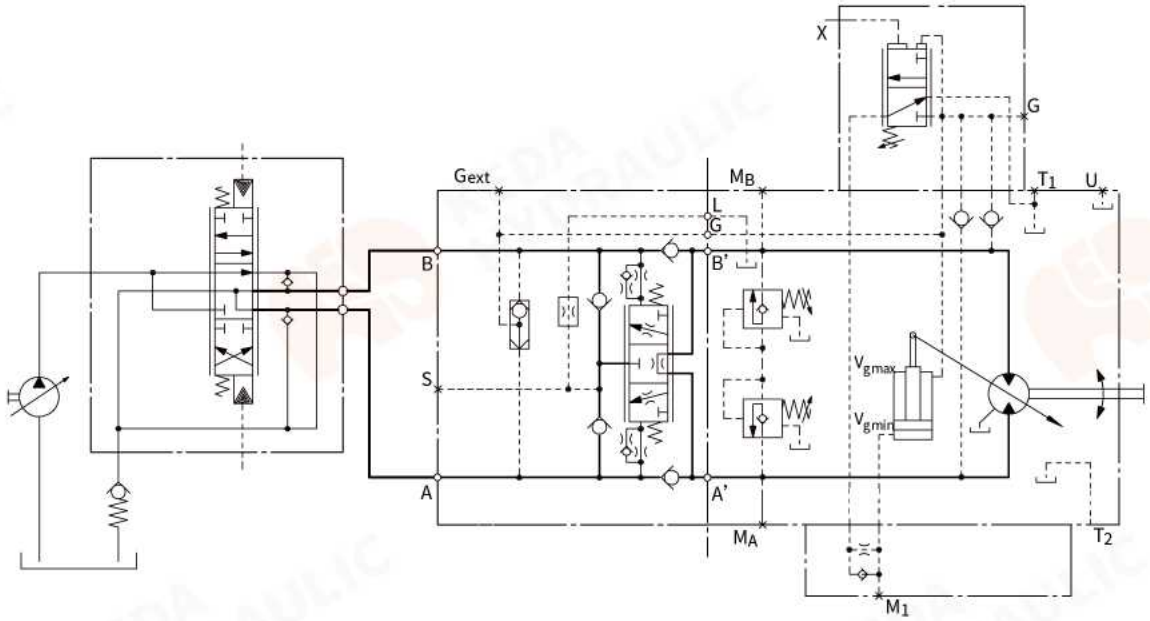
OPERATION

Example circuit diagram BVD...F: K6VM80HA1T/10W-VAB380A + BVD 20F27S/41B-V03 K16 D0400 S12

Travel drive in wheeled excavators

— Variable motor **K6VM** with hydraulic proportional remote controlled override of the automatic high-pressure related control **HA1T**, and port plate **380** for mounting counterbalance valve with integrated pressure relief valve.

— A size **20** counterbalance valve **BVD** and a 50% spool with code **03** to achieve a volumetric flow of 110 L/min. A residual opening **K16** within the spool and a damping with code **D0400** to ensure smooth operation. Flushing cavity with throttle Ø 1.2 inside (code **S12**).

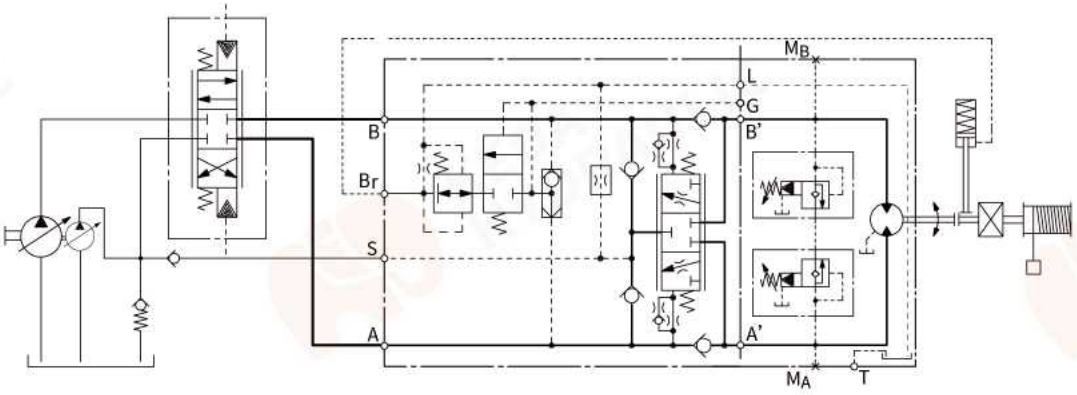


Example circuit diagram BVD...W: K2FE160/61W-VAL181 + BVD 25W38L/41B-V02 K00 D0600S00

Winch drive in cranes; Track drive in excavator crawlers

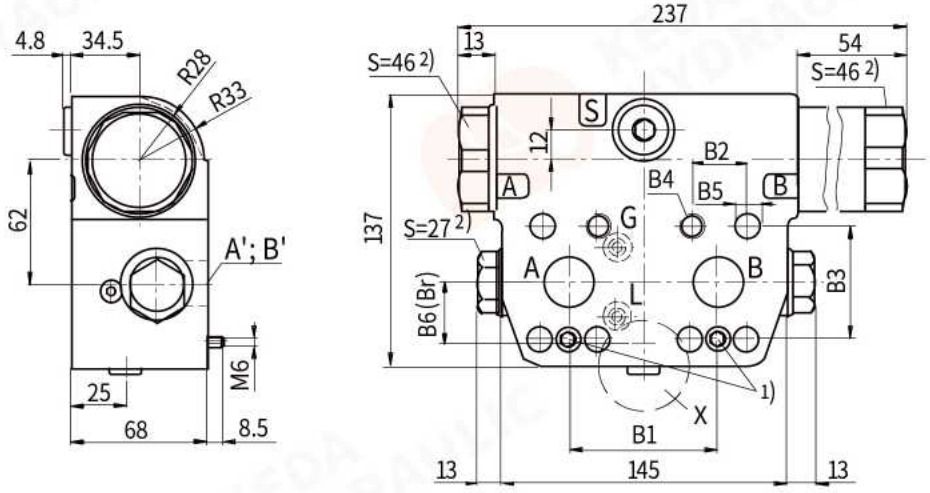
— Plug-in fixed motor **K2FE** with port plate **181** for mounting counterbalance valve with integrated pressure relief valve.

— A size **25** counterbalance valve **BVD** and a 75% spool with code **02** to achieve a volumetric flow of 240 L/min, plus a brake release valve **L**. Essential for winches is no residual opening (code **K00**) but with a damping code of **D0600**.



— Other types of axial piston motor like **K6VM** and **K2FM(E)** can also be selected.

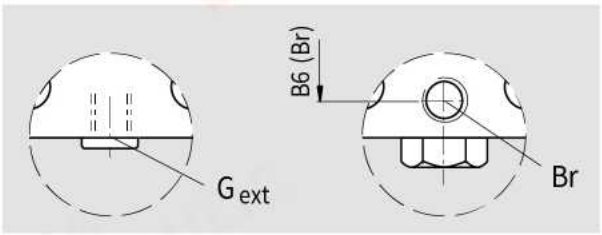
DIMENSIONS, SIZE 20



View X

left: Code S - with selection valve and port G_{ext}

right: Code L - with selection valve, brake release valve and port B_r



Dimensions

Size...plat	B1	B2	B3	B4	ØB5	B6
BVD 20...16	66	23.8	50.8	M10x1.5	10.5	25.5
BVD 20...17	75	23.8	50.8	M10x1.5	10.5	27.0
BVD 20...27	75	27.8	57.2	M12x1.75	13	27.0
BVD 20...28	84	27.8	57.2	M12x1.75	13	27.0

WORKING PORT

Ports			Standard	Size[3]	p_{max} (bar)[4]	State
A/B	Working port Fastening thread	Code 16/17	SAE J518[5] DIN13	¾ inch M10X1.5; 15 deep	420	Connected
		Code 27/28	SAE J518[5] DIN13	1 inch M10X1.75; 16 deep	420	Connected
S	Boost port		DIN 3852	M22X1.5; 14 deep	30	Plugged
B_r	Brake release port, reduced high-pressure	Code L	DIN 3852	M12X1.5; 12.5 deep	30	Connected
G_{ext}	Brake release port, high-pressure	Code S	DIN 3852	M12X1.5; 12.5 deep	420	Plugged
A'/B'	Working port	Code 16/17	AS 568A	24.99X3.53 (FKM 90)	/	with O-ring
		Code 27/28	AS 568A	32.92X3.53 (FKM 90)	/	with O-ring
G	High-pressure port (K6VM...HA)		DIN 3771	9X2 (FKM 80)	/	with O-ring
L	Flushing port		DIN 3771	9X2 (FKM 80)	/	with O-ring

1) Countersink Ø 11X6.5 and through-hole Ø 6.6 for M6 tacking screws to fasten the counterbalance valve to the motor.

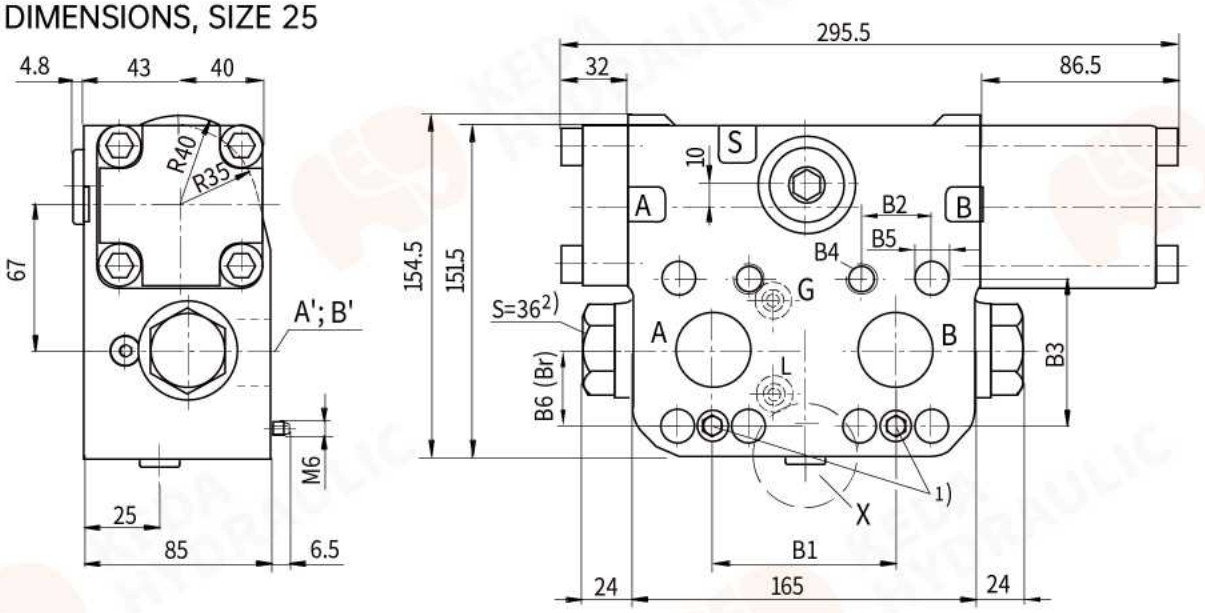
2) Wrench size.

3) For notes on tightening torques, see **NOTICE** on page 50.

4) Depending on the application, momentary pressure peaks can occur. Please keep this in mind when selecting measuring devices and fittings.

5) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.

DIMENSIONS, SIZE 25



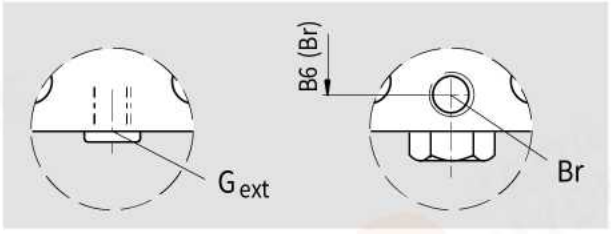
View X

left: Code S - with selection valve and port G_{ext}

right: Code L - with selection valve, brake release valve and port B_r

Dimensions

Size...plate	B1	B2	B3	B4	ØB5	B6
BVD 25...38	84	31.8	66.7	M14x2	15	31.6



WORKING PORT

Ports			Standard	Size[3]	p_{max} (bar)[4]	State
A/B	Working port Fastening thread	Code 38	SAE J518[5] DIN13	1 ¼ inch M14X2; 19 deep	420	Connected
S	Boost port		DIN 3852	M27X2; 16 deep	30	Plugged
B_r	Brake release port, reduced high-pressure	Code L	DIN 3852	M12X1.5; 12 deep	30	Connected
G_{ext}	Brake release port, high-pressure	Code S	DIN 3852	M12X1.5; 12.5 deep	420	Plugged
A'/B'	Working port	Code 38	AS 568A	37.69X3.53 (FKM 90)	/	with O-ring
G	High-pressure port (K6VM...HA)		DIN 3771	9X2 (FKM 90)	/	with O-ring
L	Flushing port		DIN 3771	9X2 (FKM 90)	/	with O-ring

1) Countersink Ø 11X6.5 and through-hole Ø 6.6 for M6 tacking screws to fasten the counterbalance valve to the motor.

2) Wrench size.

3) For notes on tightening torques, see **NOTICE** on page 50.

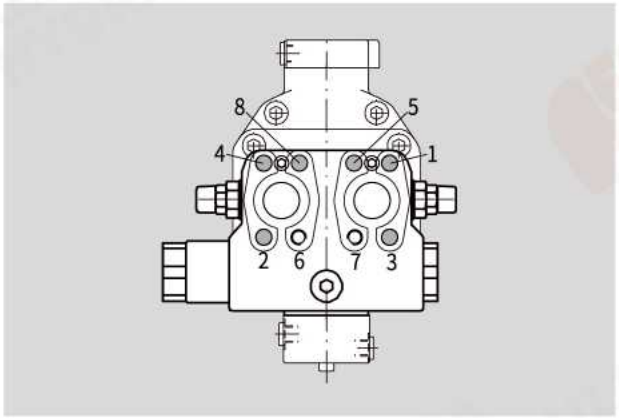
4) Depending on the application, momentary pressure peaks can occur. Please keep this in mind when selecting measuring devices and fittings.

5) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.

INSTALLATION OF COUNTERBALANCE VALVE

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

The counterbalance valve is finally mounted to the motor by fitting the SAE flange. The screws to be used and the instructions for mounting can be found in the following figure with steps 1~8.



— Length of 6 screws (1/2/3/4/5/8) = B1+B2+B3;

— Length of 2 screws (6/7) = B3+B4.

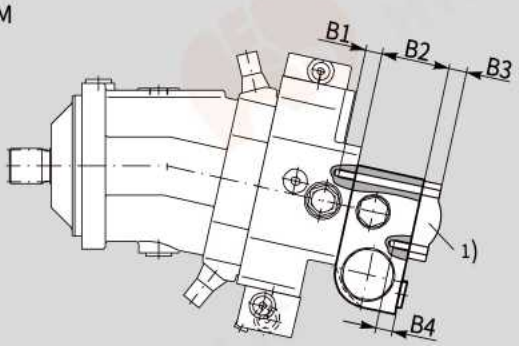
Tightening torque

Thread	Strength level	Torque (N·m)
M10	10.9	75
M12	10.9	130
M14	10.9	205

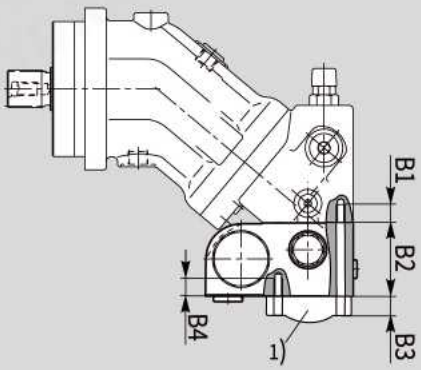
— All the tacking screws should be preassembled with half the tightening torques.

— Fixing the screws with the tightening torques.

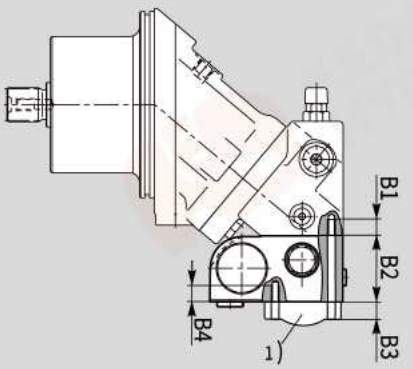
K6VM



K2FM



K2FE



Tacking screws

Motor	K2FM/E	K2FM/E	K6VM	K2FM/E	K6VM	K2FE	K6VM	K2FM/E	K6VM
Size	28,32,45	56,63	55	80,90	80	107,125	107	107,125, 168,180	107,140,160
B1[2)]	M10x1.5 17(deep)	M10x1.5 17(deep)	M10x1.5 17(deep)	M12x1.75 18(deep)	M12x1.75 15(deep)	M12x1.75 17(deep)	M12x1.75 15(deep)	M14x2 19(deep)	M14x2 19(deep)
B2	78[3)]	68	68	68	68	68	68	85	85
B3	upon request								
B4	M10x1.5 15(deep)	M10x1.5 15(deep)	M10x1.5 15(deep)	M12x1.75 16(deep)	M12x1.75 16(deep)	M12x1.75 16(deep)	M12x1.75 16(deep)	M14x2 19(deep)	M14x2 19(deep)

1) SAE flange.

2) Minimum required depth of thread up to 10 times pitch of screw.

3) Included the distance plate between motor and counterbalance valve.

WORKING PORT

Counterbalance valve size	20							25	
Port plate of valve	16	17		27		28		38	
Working port A/B	¾ inch	¾ inch		1 inch		1 inch		1 ¼ inch	
Boost port S (plugged)	M22X1.5; 14 deep							M27X2; 16 deep	
Distance between A'/B'	66	75		75		84		84	
Mounted to motor	K2FM/E	K2FM/E	K6VM	K2FM/E	K6VM	K2FE	K6VM	K2FM/E	K6VM
Motor size	28,32,45	56,63	55	80,90	80	107,125	107	107,125 160,180	107,140 160
Required motor port plate	181	181	380	181	380	171	370	181	380

NOTICE

General

— Counterbalance valve is designed to be used in open circuits.

— The project planning, installation and commissioning of the axial piston unit with counterbalance valve require the involvement of qualified specialists.

— The working ports and function ports are only intended to accommodate hydraulic lines.

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

— Depending on the operating conditions (e.g. working pressure, fluid temperature) of the axial piston unit, the characteristic curve may shift.

—The specified data and notes contained herein must be observed.

Tightening torque

— Tightening torque of mounting bolts with DIN 13 metric thread should be checked separately according to VDI 2230.

— Tightening torque of a threaded hole should not exceed the **maximum permissible tightening torque $M_{G,max}$**, see following table.

— **Tightening torque M_V** for the tacking screws, which are delivered along with the axial piston unit, should refer to following table.

Thread	Standard for port	Maximum permissible torque for threaded holes $M_{G,max}$ (N·m)	Tightening torque for tacking screws M_V (N·m)	Wrench size (mm)
M12x1.5	DIN 3852	50	25	6
M22x1.5	DIN 3852	210	80	10
M27x2	DIN 3852	330	135	12