YEOSHE

M-A2FE

Axial Piston Plug-in Motor



www.yeoshehydraulic.com

Efficient Performance

Innovative Technology

Reliable Quality and Service

YEOSHE HYDRAULICS CO.,LTD.

Ordering code for standard program



- **Series 6**
- **Size 28 to 180**
- **Nominal pressure : 400 bar**
- **Maximum pressure : 450 bar**
- **Open and closed circuits**

Features

1. Fixed plug-in motor with axial tapered piston rotary group of bent-axis design, for hydrostatic drives in open and closed circuits.
2. Far-reaching integration in mechanical gearbox due to recessed mounting flange located in the center of the case (extremely space-saving construction).
3. The output speed is dependent on the flow of the pump and the displacement of the motor.
4. The output torque increases with the pressure differential between the high-pressure and the low-pressure side.
5. Small dimensions
6. High total efficiency
7. Complete unit, ready-assembled and tested.
8. Easy to install, simply plug into the mechanical gearbox.
9. No configuration specifications to be observed when installing.

	A2F		E	28	/	6	0	W	-	V	A	L	100			
1	2	3	4	5		6	7	8		9	10	11	12	13	14	15

Hydraulic fluid

1	Mineral oil and HFD. HFD for sizes 250 and 355 only in combination with long-life bearings "L" (without code)		
	HFB, HFC hydraulic fluid	Sizes 28 to 180 (without code)	
		Sizes 250 to 355 (only in combination with long-life bearings "L")	E-

Axial piston unit

2	Bent-axis design, fixed	A2F

Drive shaft bearing

		28 to 180	
3	Standard bearing (without code)	■	
	Long-life bearing	–	L

Operating mode

4	Motor, plug-in version	E

Size (NG)

5	Geometric displacement, see table of values on page 7											
		28	32	45	56	63	80	90	107	125	160	180

Series

6		6

■ = Available □ = On request – = Not available = Preferred program

Ordering code for standard program

	A2F		E	28	/	6	0	W	-	V	A	L	100			
1	2	3	4	5		6	7	8		9	10	11	12	13	14	15

Index

7	NG28 to 180	1

Direction of rotation

8	Viewed on drive shaft, bidirectional	W

Seals

9	FKM (fluor-caoutchouc)	V

Drive shafts

		28	32	45	56	63	80	90	107	125	160	180	
10	Splined shaft DIN 5480	■	■	–	■	■	■	■	■	■	■	■	A
		■	–	■	■	–	■	–	■	–	■	–	Z

Mounting flanges

			28 to 180	
11	ISO 3019-2	2-hole	■	L
		4-hole	–	M

Port plates [1]

				28	32	45	56	63	80	90	107	125	160	180	
12	SAE flange ports A and B at rear		01	0	–	–	–	–	–	–	–	–	–	–	010
				7	–	–	–	–	–	–	–	–	–	–	017
	SAE flange ports A and B at side, opposite		02	0	–	–	–	–	–	–	–	–	–	–	020
				7	–	–	■	▲	▲	▲	▲	■	■	■	■	027
				9	–	–	–	■	■	■	■	–	–	–	–	029
	SAE flange ports A and B at bottom (same side)		10	0	■	■	■	■	■	■	■	■	■	■	■	100
				7	–	–	–	–	–	–	–	–	–	–	–	107
	Port plate with 1-level pressure-relief valves for mounting a counterbalance valve [2]	BVD	17	1	–	–	–	–	–	–	–	■	■	–	–	171 178
			18	8	■	■	■	■	■	■	■	■	■	■	■	181
		BVE	18		–	–	–	–	–	–	–	■	■	■	■	188
	Port plate with pressure-relief valves		19	1	■	■	■	■	■	■	■	■	■	■	■	191
				2	■	■	■	■	■	■	■	■	■	■	■	192

Valves (see pages 14 to 21)

Without valve	0
Pressure-relief valve (without pressure boost facility)	1
Pressure-relief valve (with pressure boost facility)	2
Flushing and boost pressure valve, mounted	7
Counterbalance valve BVD/BVE mounted [2] [3]	8
Flushing and boost pressure valve, integrated	9

■ = Available □ = On request – = Not available
▲ = Not for new projects = Preferred program

1) Fastening thread or threaded ports, metric.
2) Note the restrictions on page 19.
3) Specify ordering code of counterbalance valve according to data sheet (BVD – RE 95522, BVE – RE 95525) separately.
4) Please contact us.

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Ordering code for standard program

	A2F		E	28	/	6	0	W	-	V	A	L	100			
1	2	3	4	5		6	7	8		9	10	11	12	13	14	15

Speed sensor (see page 22)

		28 to 45	56 to 180	
13	Without speed sensor (without code)	■	■	
	Prepared for HDD speed sensor	–	▲	F
	HDD speed sensor mounted [2]	–	▲	H
	Prepared for DSA speed sensor	□	□	U
	DSA speed sensor mounted [2]	□	□	V

Special version (only sizes 28 to 180)

14	Standard version (without code)	
	Special version for slew drives (standard with port plate 19)	J

Standard / special version

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

■ = Available □ = On request – = Not available
▲ = Not for new projects = Preferred program

1) Please contact us.
2) Specify ordering code of sensor according to data sheet (DSA – RE 95133, HDD – RE 95135) separately and observe the requirements on the electronics.

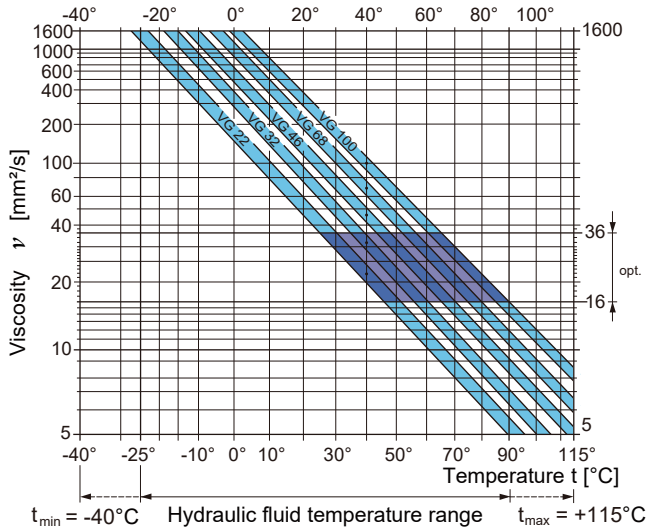
Technical data

Hydraulic fluid

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

The plug-in motor A2FE is not suitable for operation with HFA hydraulic fluid. If HFB, HFC or HFD or environmentally acceptable hydraulic fluids are used, the limitations regarding technical data or other seals must be observed.

Selection diagram



Details regarding the choice of hydraulic fluid

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

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

Example : At an ambient temperature of X°C , an operating temperature of 60°C is set in the circuit. In the optimum operating viscosity range (ν_{opt}, shaded area) this corresponds to the viscosity classes VG46 or VG68 ; to be selected: VG68.

Note

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

If the above conditions cannot be maintained due to extreme operating parameters, we recommend the use of a flushing and boost pressure valve (see page 14).

Viscosity and temperature of hydraulic fluid

	Viscosity [mm²/s]	Temperature	Comment
Transport and storage at ambient temperature		T_{min} ≥ -50°C T_{opt} = +5°C to +20°C	factory preservation: up to 12 months with standard, up to 24 months with long-term
(Cold) start-up [1]	ν_{max} = 1600	T_{St} ≥ -40°C	t ≤ 3 min, without load (p ≤ 50 bar) , n ≤ 1000 rpm (for sizes 28 to 180)
Permissible temperature difference		ΔT ≤ 25 K	between axial piston unit and hydraulic fluid
Warm-up phase	ν < 1600 to 400	T = -40°C to -25°C	at p ≤ 0.7 • p_{nom} , n ≤ 0.5 • n_{nom} and t ≤ 15 min
Operating phase			
Temperature difference		ΔT = approx. 12 K	between hydraulic fluid in the bearing and at port T.
Maximum temperature		115°C	in the bearing
		103°C	measured at port T
Continuous operation	ν = 400 to 10 ν_{opt} = 36 to 16	T = -25°C to +90°C	measured at port T, no restriction within the permissible data
Short-term operation[2]	ν_{min} ≥ 7	T_{max} = +103 °C	measured at port T , t < 3 min, p < 0.3 • p_{nom}
FKM shaft seal [1]		T ≤ +115°C	see page 5

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

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Technical data

Filtration of the hydraulic fluid

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

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

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

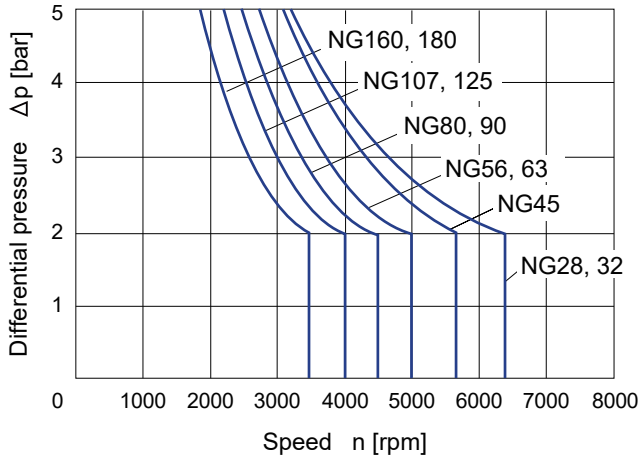
If the above classes cannot be achieved, please contact us.

Shaft seal

Permissible pressure loading

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

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



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

Temperature range

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

Note

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

Direction of flow

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

Speed range

No limit to minimum speed nmin. If uniformity of motion is required, speed nmin must not be less than 50 rpm. See table of values on page 7 for maximum speed.

Technical data

Operating pressure range

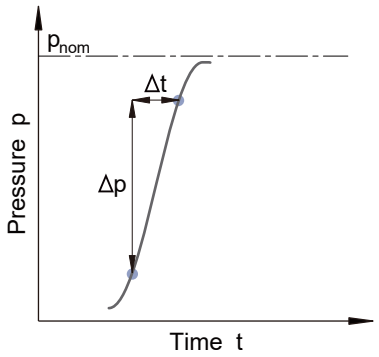
(operating with mineral oil)

Pressure at service line port A or B

Sizes 28 to 180

Nominal pressure p_{nom} _____ 400 bar absolute
Maximum pressure p_{max} _____ 450 bar absolute
Single operating period _____ 10s
Total operating period _____ 300h

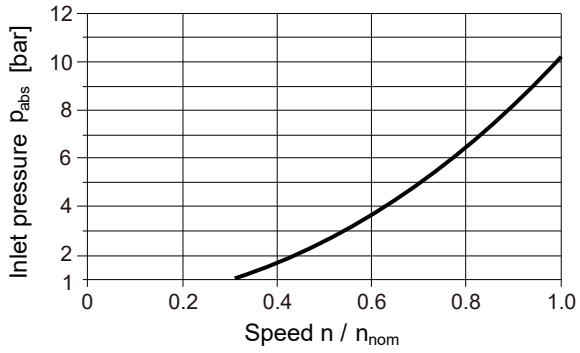
Summation pressure (pressure A + pressure B) p_{Su} _700 bar



Note
Values for other hydraulic fluids, please contact us.

Minimum pressure – pump mode (inlet)

To prevent damage to the axial piston motor in pump operating mode (change of high-pressure side with unchanged direction of rotation, e.g. when braking), a minimum pressure must be guaranteed at the service line port (inlet). The minimum pressure depends on the speed of the axial piston unit (see characteristic curve below).



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

Definition

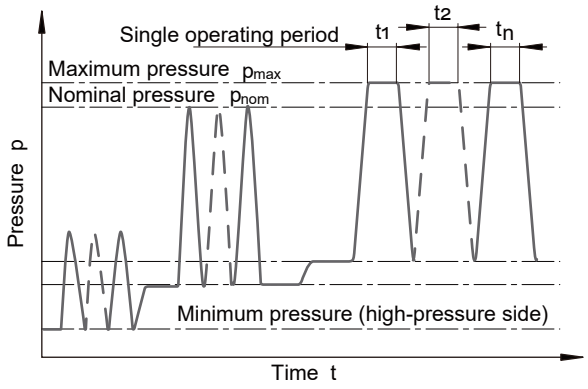
Nominal pressure p_{nom}
The nominal pressure corresponds to the maximum design pressure.

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

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

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

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



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

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Technical data

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

Size	NG		28	32	45	56	63	80
Displacement geometric, per revolution	V_g	cm³	28.1	32	45.6	56.1	63	80.4
Speed maximum [1]	n_{nom}	rpm	6300	6300	5600	5000	5000	4500
	n_{max} [2]	rpm	6900	6900	6200	5500	5500	5000
Input flow [3] at n_{nom} and V_g	q_V	L/min	177	202	255	281	315	362
Torque [4] at V_g and Δp = 350 bar	T	Nm	157	178	254	313	351	448
at V_g and Δp = 400 bar	T	Nm	179	204	290	357	401	512
Rotary stiffness	c	kNm / rad	2.93	3.12	4.18	5.94	6.25	8.73
Moment of inertia for rotary group	J_{GR}	kgm²	0.0012	0.0012	0.0024	0.0042	0.0042	0.0072
Maximum angular acceleration	α	rad/s²	6500	6500	14600	7500	7500	6000
Case volume	V	L	0.20	0.20	0.33	0.45	0.45	0.55
Mass (approx.)	m	kg	10.5	10.5	15	18	19	23

Size	NG		90	107	125	160	180
Displacement geometric, per revolution	V_g	cm³	90	106.7	125	160.4	180
Speed maximum [1]	n_{nom}	rpm	4500	4000	4000	3600	3600
	n_{max} [2]	rpm	5000	4400	4400	4000	4000
Input flow [3] at n_{nom} and V_g	q_V	L/min	405	427	500	577	648
Torque [4] at V_g and Δp = 350 bar	T	Nm	501	594	696	893	1003
at V_g and Δp = 400 bar	T	Nm	573	679	796	1021	1146
Rotary stiffness	c	kNm/ rad	9.14	11.2	11.9	17.4	18.2
Moment of inertia for rotary group	J_{GR}	kgm²	0.0072	0.0116	0.0116	0.0220	0.0220
Maximum angular acceleration	α	rad/s²	6000	4500	4500	3500	3500
Case volume	V	L	0.55	0.8	0.8	1.1	1.1
Mass (approx.)	m	kg	25	34	36	47	48

1) The values are valid :
- for the optimum viscosity range from ν_{opt} = 36 to 16 mm²/s

2) Intermittent maximum speed: overspeed for unload and overhauling processes, t < 5 s and Δp < 150 bar

3) Restriction of input flow with counterbalance valve, see page 19

4) Torque without radial force, with radial force see page 8

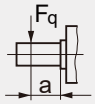
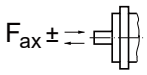
Note

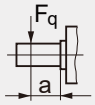
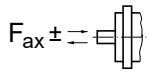
Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. Other permissible limit values, with respect to speed variation, reduced angular acceleration as a function of the frequency and the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

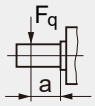
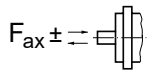
Technical data

Permissible radial and axial forces of the drive shafts

(splined shaft and parallel keyed shaft)

Size	NG		28	28	32	45	56	56 [4]	56
Drive shaft	ø	mm	25	30	30	30	30	30	35
Maximum radial force [1] at distance a (from shaft collar) 	$F_{q\,max}$	kN	5.7	5.4	5.4	7.6	9.5	7.8	9.1
	a	mm	16	16	16	18	18	18	18
with permissible torque	T_{max}	Nm	179	179	204	290	357	294	357
≙ permissible pressure Δp	Δp_{perm}	bar	400	400	400	400	400	330	400
Maximum axial force [2] 	$+F_{ax\,max}$	N	500	500	500	630	800	800	800
	$-F_{ax\,max}$	N	0	0	0	0	0	0	0
Permissible axial force per bar operating pressure	$\pm F_{ax\,perm/bar}$	N/bar	5.2	5.2	5.2	7.0	8.7	8.7	8.7

Size	NG		63	80	80 [4]	80	90	107	107
Drive shaft	ø	mm	35	35	35	40	40	40	45
Maximum radial force [1] at distance a (from shaft collar) 	$F_{q\,max}$	kN	9.1	11.6	11.1	11.4	11.4	13.6	14.1
	a	mm	18	20	20	20	20	20	20
with permissible torque	T_{max}	Nm	401	512	488	512	573	679	679
≙ permissible pressure Δp	Δp_{perm}	bar	400	400	380	400	400	330	400
Maximum axial force [2] 	$+F_{ax\,max}$	N	800	1000	1000	1000	1000	1250	1250
	$-F_{ax\,max}$	N	0	0	0	0	0	0	0
Permissible axial force per bar operating pressure	$\pm F_{ax\,perm/bar}$	N/bar	8.7	10.6	10.6	10.6	10.6	12.9	12.9

Size	NG		125	160	160	180
Drive shaft	ø	mm	45	45	50	50
Maximum radial force [1] at distance a (from shaft collar) 	$F_{q\,max}$	kN	14.1	18.1	18.3	18.3
	a	mm	20	25	25	25
with permissible torque	T_{max}	Nm	796	1021	1021	1146
≙ permissible pressure Δp	Δp_{perm}	bar	400	400	400	400
Maximum axial force [2] 	$+F_{ax\,max}$	N	1250	1600	1600	1600
	$-F_{ax\,max}$	N	0	0	0	0
Permissible axial force per bar operating pressure	$\pm F_{ax\,perm/bar}$	N/bar	12.9	16.7	16.7	16.7

[1] With intermittent operation

[2] Maximum permissible axial force during standstill or when the axial piston unit is operating in non-pressurized condition.

[3] Please contact us.

[4] Restricted technical data only for splined shaft

[5] When at a standstill or when axial piston unit operating in non-pressurized conditions. Higher forces are permissible when under pressure, please contact us.

Note

Influence of the direction of the permissible axial force :

$+F_{ax\,max}$ = Increase in service life of bearings

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

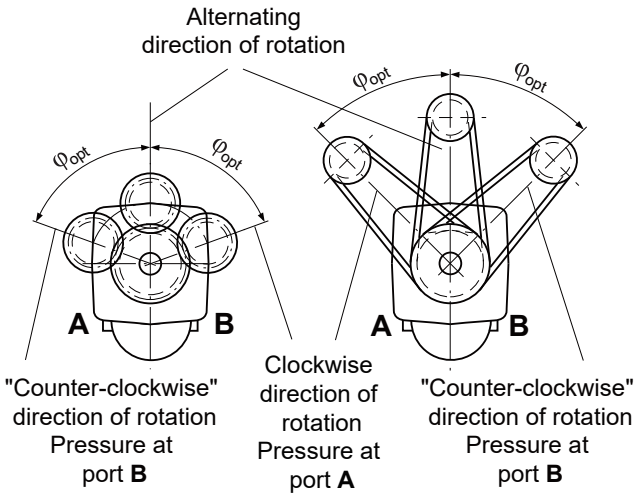
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Technical data

Effect of radial force F_q on the service life of bearings

By selecting a suitable direction of radial force F_q, the load on the bearings, caused by the internal rotary group forces can be reduced, thus optimizing the service life of the bearings. Recommended position of mating gear is dependent on direction of rotation. Examples :

NG	Toothed gear drive φ_{opt}	V-belt output φ_{opt}
28 to 180	± 70°	± 45°



"Counter-clockwise" direction of rotation Pressure at port **B**

Clockwise direction of rotation Pressure at port **A**

"Counter-clockwise" direction of rotation Pressure at port **B**

Determining the operating characteristics

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

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

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

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

V_g = Displacement per revolution in cm^3

Δp = Differential pressure in bar

n = Speed in rpm

η_v = Volumetric efficiency

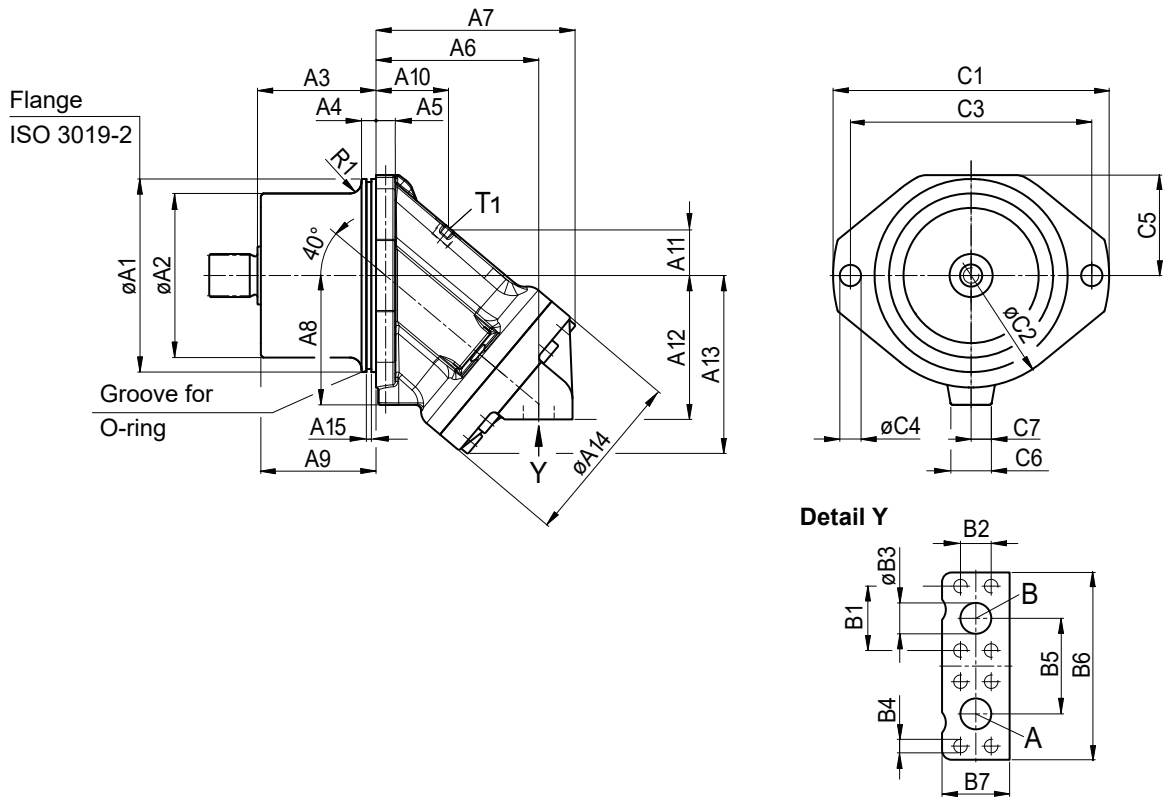
η_{mh} = Mechanical-hydraulic efficiency

η_t = Total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Dimensions sizes 28 to 180

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

Port plate 10 – SAE flange ports at bottom



Size	øA1	øA2	A3[1]	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	øA14	A15
28 、32	135 -0.025	94 -0.5	88.8	15	16	94	114	95	87.1	45	27	91	106	106	5.2
45	160 -0.025	117 +1.5 -2	92.3	15	18	109	133	106	90	50	31.3	102	119	118	5.2
56 、63	160 -0.025	121 -0.5	92.3	15	18	122	146	109	90	59	34	107	130	128	5.2
80 、90	190 -0.029	140.3 -0.5	110	15	20	127	157	123	106	54	41	121	145	138	5.2
107 、125	200 -0.029	152.3 -0.5	122.8	15	20	143	178	135	119	58	41	136	157	150	5.2
160 、180	200 -0.029	171.6 -0.5	122.8	15	20	169	206	134	119.3	75	47	149	185	180	5.2

Size	B1	B2	øB3	B4, DIN 13[2]	B5	B6	B7	C1	øC2	C3	øC4	C5	C6	C7
28 、32	40.5	18.2	13	M8 x 1.25 ; 15 deep	59	115	40	188	154	160	14	71	42	13
45	50.8	23.8	19	M10 x 1.5 ; 17 deep	75	147	49	235	190	200	18	82	47.5	15
56 、63	50.8	23.8	19	M10 x 1.5 ; 17 deep	75	147	48	235	190	200	18	82	36	0
80 、90	57.2	27.8	25	M12 x 1.75 ; 17 deep	84	166	60	260	220	224	22	98	40	0
107 、125	66.7	31.8	32	M14 x 2 ; 19 deep	99	194	70	286	232	250	22	103	40	0
160 、180	66.7	31.8	32	M14 x 2 ; 19 deep	99	194	70	286	232	250	22	104	42	0

Size	R1	O-ring[3]	Service line port A, B SAE J518	Drain port T1 DIN 3852[2]
28 、32	10	126 x 4	1/2 in	M16 x 1.5 ; 12 deep
45	10	150 x 4	3/4 in	M18 x 1.5 ; 12 deep
56 、63	10	150 x 4	3/4 in	M18 x 1.5 ; 12 deep
80 、90	10	180 x 4	1 in	M18 x 1.5 ; 12 deep
107 、125	16	192 x 4	1 1/4 in	M18 x 1.5 ; 12 deep
160 、180	12	192 x 4	1 1/4 in	M22 x 1.5 ; 14 deep

1) To shaft collar

2) Observe the general instructions on page 24 for the maximum tightening torques.

3) Not included in the delivery contents

Note

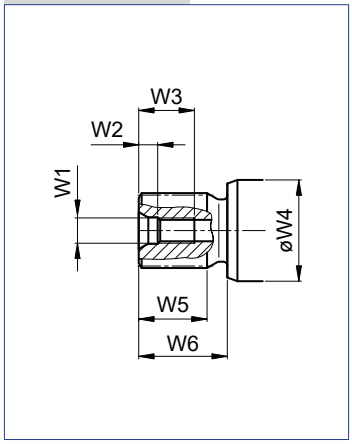
Port plates 17, 18 and 19; see pages 17 and 20.

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Dimensions sizes 28 to 180

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

Drive shaft



Size	Splined shaft (DIN5480)	W1 [1)]	W2	W3	øW4	W5	W6
28、32	**A** W30 x 2 x 14 x 9g	M10 x 1.5	7.5	22	35	27	35
28	**Z** W25 x 1.25 x 18 x 9g	M8 x 1.25	6	19	35	28	43
45	**Z** W30 x 2 x 14 x 9g	M12 x 1.75	9.5	28	35	27	35
56、63	**A** W35 x 2 x 16 x 9g	M12 x 1.75	9.5	28	40	32	40
56	**Z** W30 x 2 x 14 x 9g	M12 x 1.75	9.5	28	40	27	35
80、90	**A** W40 x 2 x 18 x 9g	M16 x 2	12	36	45	37	45
80	**Z** W35 x 2 x 16 x 9g	M12 x 1.75	9.5	28	45	32	40
107、125	**A** W45 x 2 x 21 x 9g	M16 x 2	12	36	50	42	50
107	**Z** W40 x 2 x 18 x 9g	M12 x 1.75	9.5	28	50	37	45
160、180	**A** W50 x 2 x 24 x 9g	M16 x 2	12	36	60	44	55
160	**Z** W45 x 2 x 21 x 9g	M16 x 2	12	36	60	42	50

1) Center bore according to DIN 332 (thread according to DIN 13), observe the general instructions on page 24 for the maximum tightening torques.

Flushing and boost pressure valve

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

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

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

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

With port plate 027 (sizes 45 to 180) the valve is mounted directly on the fixed motor.

Cracking pressure of pressure retaining valve

(observe when setting the primary valve)
Sizes 45 to 200, fixed setting _____ 16 bar

Switching pressure of flushing piston Δp

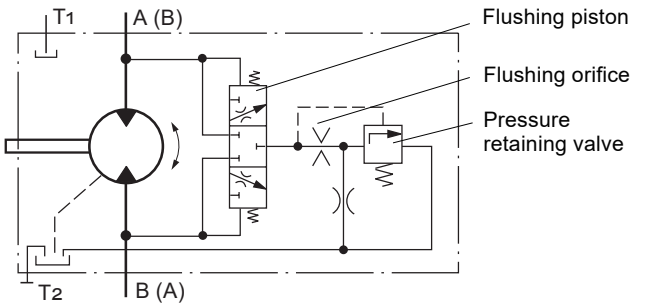
Sizes 45 to 200 _____ 8 ± 1 bar

Flushing flow q_v

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

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

Schematic



Standard flushing flows

Flushing and boost pressure valve, mounted (code 7)

Size	Flushing flow q_v [L/min]	ø [mm]	Mat. No. of orifice
45	3.5	1.2	R909651766
107、125	8	1.8	R909419696
160、180	10	2.0	R909419697

With sizes 45 to 180, orifices can be supplied for flushing flows from 3.5 to 10 L/min. For other flushing flows, please state the required flushing flow when ordering. The flushing flow without orifice is approx. 12 to 14 L at low pressure Δp_{ND} = 25 bar.

Flushing and boost pressure valve, integrated (code 9)

Size	Throttle ø [mm]	q_v [L/min]
56、63	1.5	6
80、90	1.8	7.3

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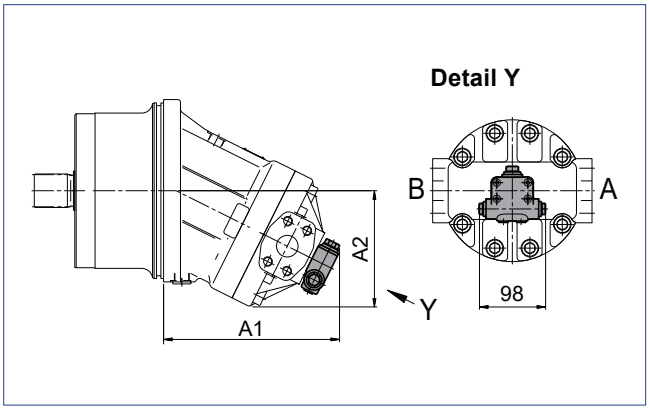
Flushing and boost pressure valve

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

Dimensions

Sizes 107 to 180

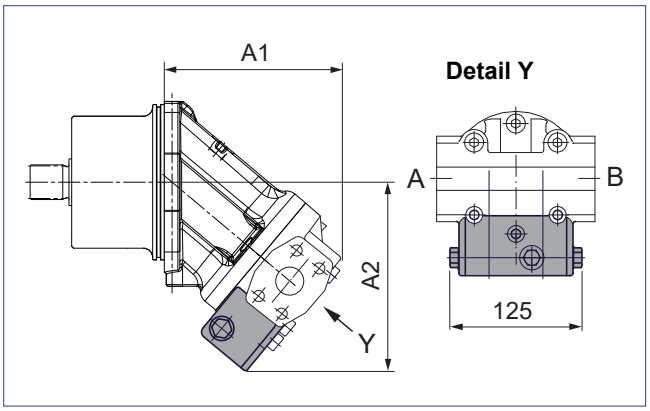
Port plate 027 – SAE flange ports at side



Size	A1	A2
107、125	211	192
160、180	232	201

Sizes 56 to 90

Port plate 029 – SAE flange ports at side



Size	A1	A2
56、63	165	176
80、90	178	186.7

[1] DIN 13, observe the general instructions on page 24 for the maximum tightening torques.

Pressure-relief valve

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

The MHDB pressure-relief valves (see RE 64642) protect the hydraulic motor from overload. As soon as the set cracking pressure is reached, the hydraulic fluid flows from the highpressure side to the low-pressure side.

The pressure-relief valves are only available in combination with port plates 181, 191 or 192 (counterbalance valve for mounting to port plate 181: see next page).

Cracking pressure setting range _____ 50 to 420 bar

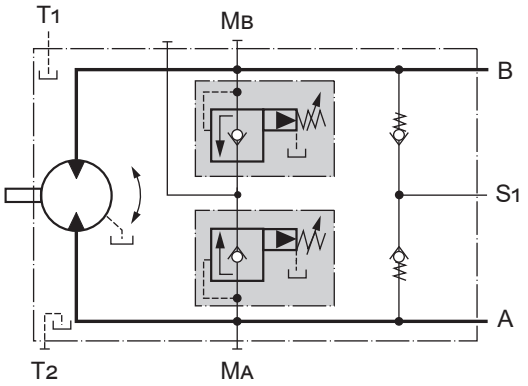
With the version "with pressure boost facility" (192), a higher pressure setting can be realized by applying an external pilot pressure of 25 to 30 bar to port P_{St}.

When ordering, please state in plain text :

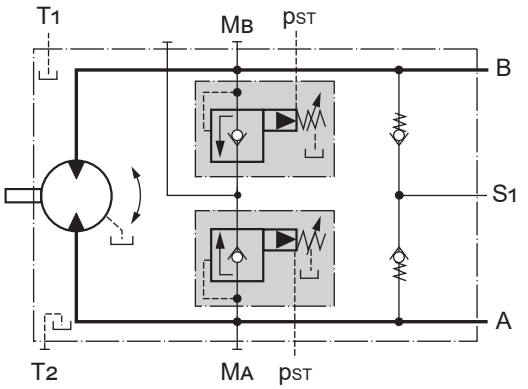
– Cracking pressure of pressure-relief valve

– Cracking pressure with pilot pressure applied to P_{St} (only with version 192)

Version without pressure boost facility "191"



Version with pressure boost facility "192"

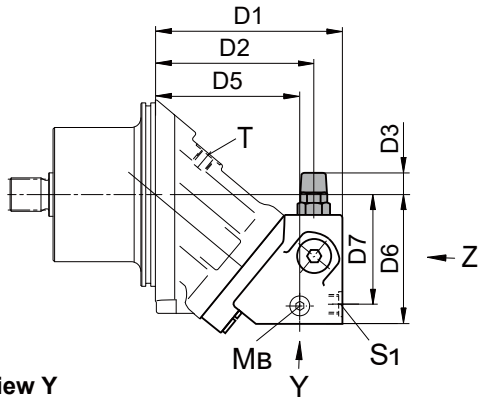


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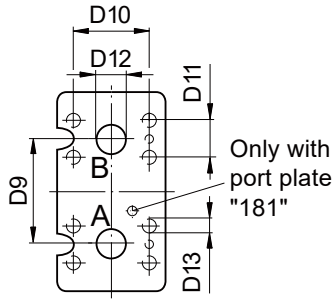
Pressure-relief valve

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

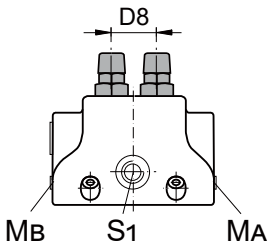
Dimensions



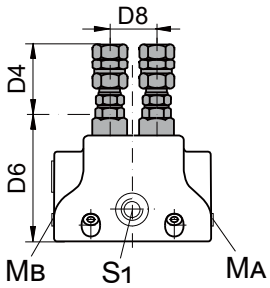
View Y



View Z :
Version without pressure boost facility "191" or "181"



View Z :
Version with pressure boost facility "192"



Size		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13 [2]
28 、32	MHDB.**16**	145	122	25	68	110	102	87	36	66	50.8	23.8	ø19	M10 ; 17 deep
45	MHDB.**16**	161	137	22	65	126	113	98	36	66	50.8	23.8	ø19	M10 ; 17 deep
56 、63	MHDB.**22**	189	162	19	61	147	124	105	42	75	50.8	23.8	ø19	M10 ; 13 deep
80 、90	MHDB.**22**	193	165	17.5	59	151	134	114	42	75	57.2	27.8	ø25	M12 ; 18 deep
107 、125	MHDB.**32**	216	184	10	52	168	149.5	130	53	84	66.7	31.8	ø32	M14 ; 19 deep
160 、180	MHDB.**32**	249	218	5	47	202	170	149	53	84	66.7	31.8	ø32	M14 ; 19 deep

Size	A 、B	S1 [1]	MA 、MB [1]	Pst [1]
28 、32	3/4 in	M22 x 1.5 ; 14 deep	M20 x 1.5 ; 14 deep	G 1/4
45	3/4 in	M22 x 1.5 ; 14 deep	M20 x 1.5 ; 14 deep	G 1/4
56 、63	3/4 in	M26 x 1.5 ; 16 deep	M26 x 1.5 ; 16 deep	G 1/4
80 、90	1 in	M26 x 1.5 ; 16 deep	M26 x 1.5 ; 16 deep	G 1/4
107 、125	1 1/4 in	M26 x 1.5 ; 16 deep	M26 x 1.5 ; 16 deep	G 1/4
160 、180	1 1/4 in	M26 x 1.5 ; 16 deep	M30 x 1.5 ; 16 deep	G 1/4

Assembly instruction for port plate with pressure boost facility "192" :
The lock nut must be counterheld when installing the hydraulic line at the p_{St} port !

Ports

Designation	Port for	Standard	Size	Maximum pressure [bar] [2]	State [3]
A 、B	Service line	SAE J518	See above	450	O
S1	Supply (only with port plate 191/192)	DIN 3852	See above	5	O
MA 、MB	Measuring operating pressure	DIN 3852	See above	450	X
Pst	Pilot pressure (only with port plate 192)	DIN ISO 228	See above	30	O

1) Observe the general instructions on page 24 for the maximum tightening torques.

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

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

Counterbalance valve BVD and BVE

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

Function

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

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

Note

– BVD available for sizes 28 to 180 and BVE available for sizes 107 to 180.

– The counterbalance valve must be ordered additionally. We recommend ordering the counterbalance valve and the motor as a set. Ordering example : A2FE90/61W–VAB**188** + BVD20F27S/41B–V03K16D0400S12

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

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

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

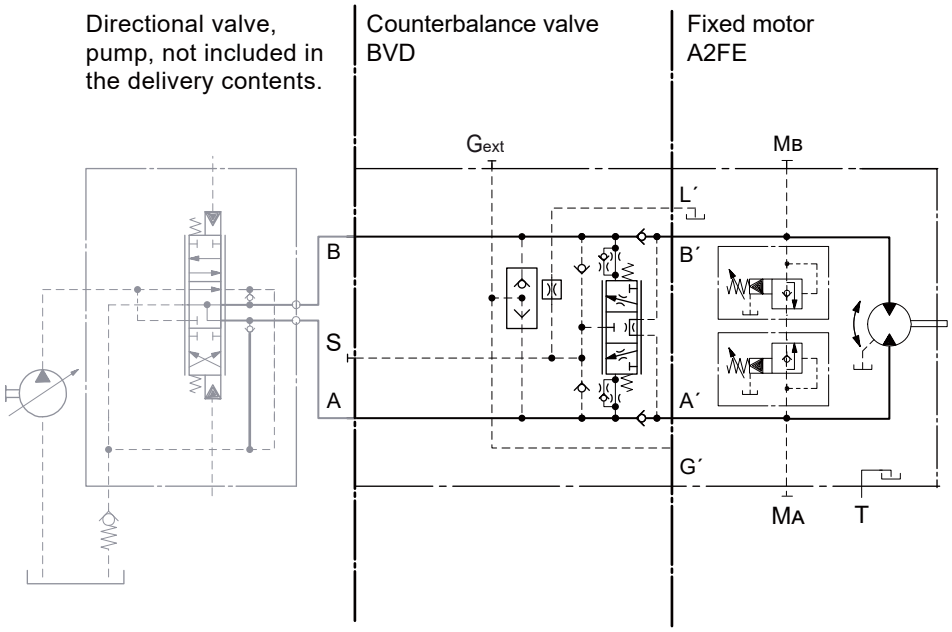
- the pressure at the start of opening
- the volume of the counterbalance spool between minimum stroke (brake closed) and maximum stroke (brake released with 21 bar)
- the required closing time for a warm device (oil viscosity approx. 15 mm2/s)

Travel drive counterbalance valve BVD...F

Application option

– Travel drive on wheeled excavators

Example schematic for travel drive on wheeled excavators
A2FE090/61W-VAB188 + BVD20F27S/41B–V03K16D0400S12



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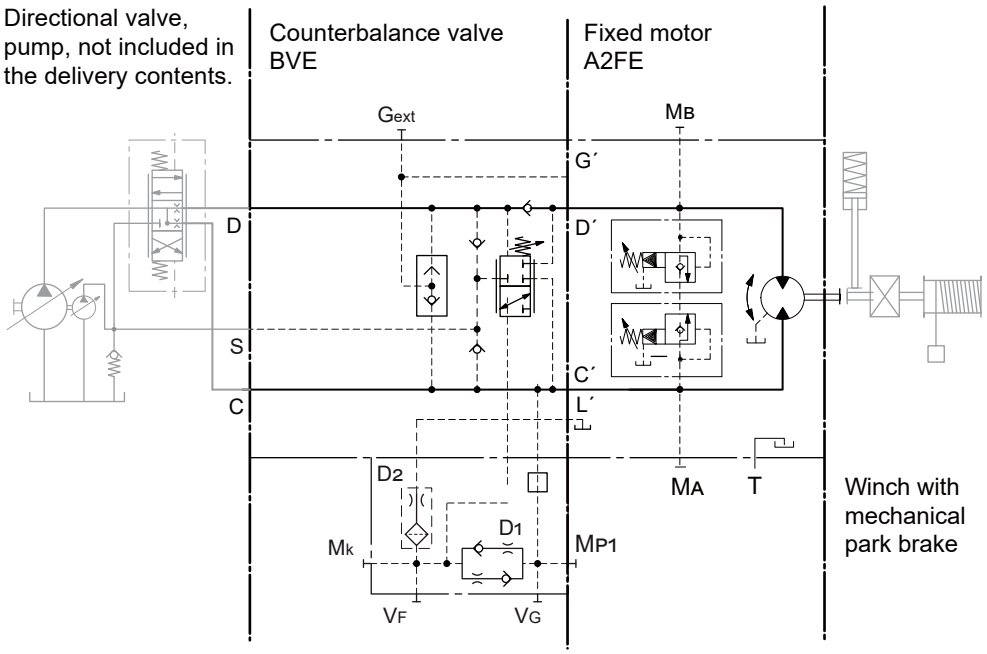
Counterbalance valve BVD and BVE

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

Winch counterbalance valve BVD...W and BVE

Application options
– Winch drive in cranes (BVD and BVE)
– Track drive in excavator crawlers (BVD)

Example schematic for winch drive in cranes
A2FE090/61W-VAB188 + BVE25W385/51ND-V100K00D4599T30S00-0



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

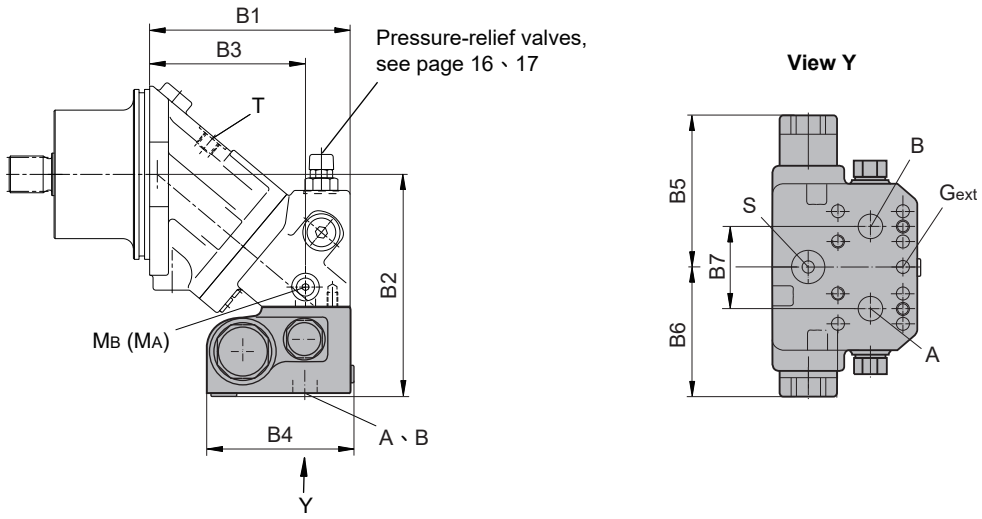
Motor NG	Without valve		Restricted values in operation with DBV and BVD/BVE							
	pnom / pmax [bar]	qv max [L/min]	DBV NG	pnom / pmax [bar]	qv [L/min]	Code	BVD/BVE NG	pnom / pmax [bar]	qv [L/min]	Code
28	400 / 450	176	16	350 / 420	100	181 191、192	20 (BVD)	350 / 420	100	188
32		201								
45		255								
56		280	22		240				220	
63		315								
80		360								
90		405								
107		427				171 191、192				178
125		500								
107		427	32		400	181 191、192	25 (BVD / BVE)		320	188
125		500								
160		577								
180		648								

DBV _____ pressure-relief valve
BVD _____ counterbalance valve, double-acting
BVE _____ counterbalance valve, one-sided

Counterbalance valve BVD and BVE

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

Dimensions



A2FE Size	Counterbalance valve									
	Type	Ports A 、B	Dimensions							
			B1	B2	B3	B4 (S)	B4 (L)	B5	B6	B7
28 、32	BVD**20**..16	3/4 in	145	175	110	142	147	139	98	66
45	BVD**20**..16	3/4 in	161	196	126	142	147	139	98	66
56 、63	BVD**20**..17	3/4 in	189	197	147	142	147	139	98	75
80 、90	BVD**20**..27	1 in	193	207	151	142	147	139	98	75
107、125	BVD**20**..28	1 in	216	238	168	142	147	139	98	84
107、125	BVD**25**..38	1 1/4 in	216	239	168	158	163	175	120.5	84
160 、180	BVD**25**..38	1 1/4 in	249	260	202	158	163	175	120.5	84
107、125	BVE**25**..38	1 1/4 in	216	240	168	167	172	214	137	84
160 、180	BVE**25**..38	1 1/4 in	249	260	202	167	172	214	137	84

Ports

Designation	Port for	Version	Standard	Size [1]	Maximum pressure [bar] [2]	State [4]
A 、B	Service line		SAE J518	see table above	420	O
S	Infeed	BVD20	DIN 3852 [3]	M22 x 1.5 ; 14 deep	30	X
		BVD25 、BVE25	DIN 3852 [3]	M27 x 2 ; 16 deep	30	X
Br	Brake release, reduced high pressure	L	DIN 3852 [3]	M12 x 1.5 ; 12.5 deep	30	O
Gext	Brake release, high pressure	S	DIN 3852 [3]	M12 x 1.5 ; 12.5 deep	420	X
MA 、MB	Measuring pressure A and B		ISO 61493 [3]	M12 x 1.5 ; 12 deep	420	X

1) Observe the general instructions on page 24 for the maximum tightening torques.

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

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

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

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Counterbalance valve BVD and BVE

Mounting the counterbalance valve

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

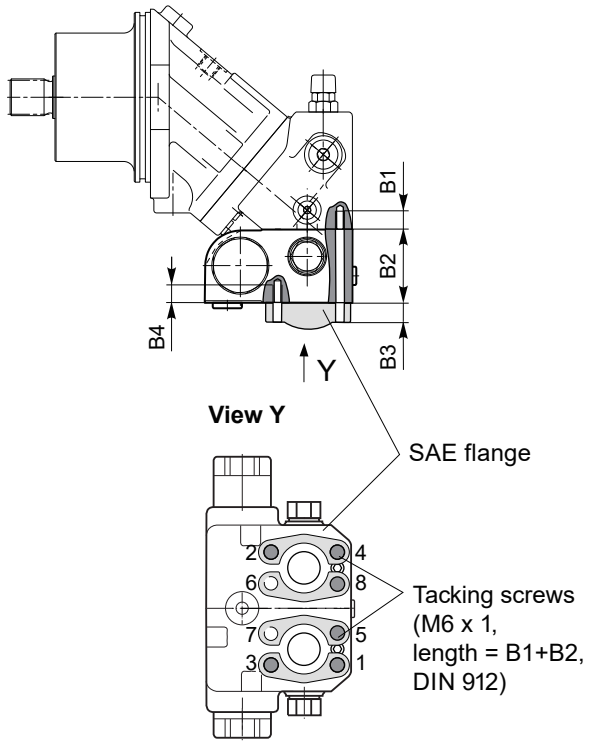
6 screws (1 、2 、3 、4 、5 、8) _____ length B1+B2+B3
2 screws (6 、7) _____ length B3+B4

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

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

Thread	Strength class	Tightening torque [Nm]
M6 x 1 (tacking screw)	10.9	15.5
M10	10.9	75
M12	10.9	130
M14	10.9	205

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



Size	28 、32 、45	56 、63	80 、90	107 、125 、160 、180	107 、125
Port plate	18	18	18	18	17
B1 [1)]	M10 x 1.5 ; 17 deep	M10 x 1.5 ; 17 deep	M12 x 1.75 ; 18 deep	M14 x 2 ; 19 deep	M12 x 1.75 ; 17 deep
B2	78 [2)]	68	68	85	68
B3	customer-specific				
B4	M10 x 1.5 ; 15 deep	M10 x 1.5 ; 15 deep	M12 x 1.75 ; 16 deep	M14 x 2 ; 19 deep	M12 x 1.75 ; 16 deep

1) Minimum required thread reach 1 x ø-thread
2) Including sandwich plate

Speed sensors

The versions A2FE...U and A2FE...F ("prepared for speed sensor", i.e. without sensor) is equipped with a toothed ring.

On deliveries "prepared for speed sensor", the port is plugged with a pressure-resistant cover.

With the DSA or HDD speed sensor mounted a signal proportional to motor speed can be generated. The sensors measures the speed and direction of rotation.

DSA _____ RE 95133

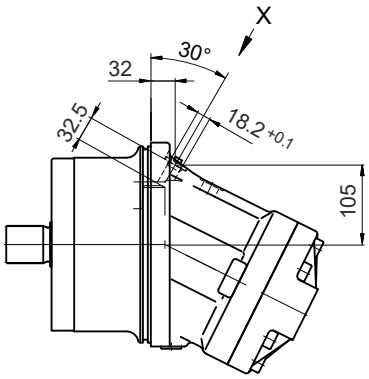
HDD _____ RE 95135

The sensor is mounted on the port provided for this purpose with a mounting bolt.

We recommend ordering the A2FE plug-in motor complete with sensor mounted.

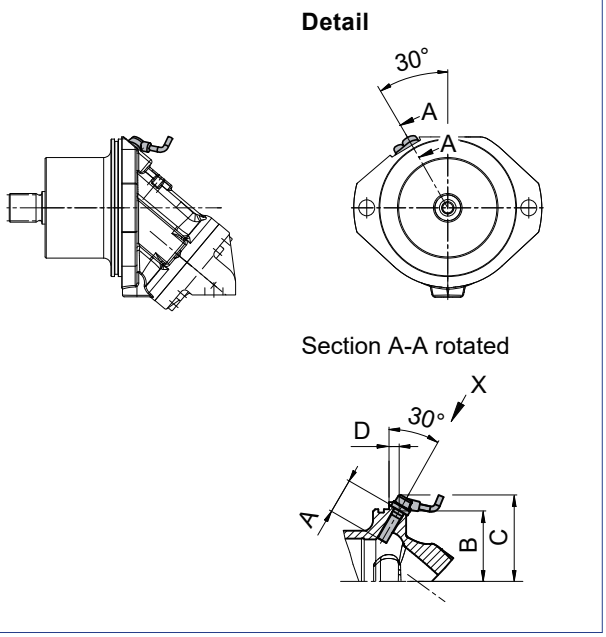
Before finalizing your design, request a binding installation drawing. Dimensions in mm.

Version "H"

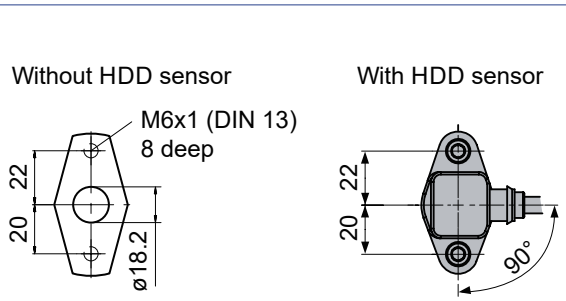


Version "V"

Sizes 28 to 180 with DSA sensor.



View X



Size			28 、32	45	56 、63	80 、90	107 、125	160 、180
Number of teeth			38	45	47	53	59	67
DSA	A	Insertion depth (tolerance±0.1)	32	32	32	32	32	32
	B	Contact surface	66	On request				
	C			On request				
	D		12.3	On request				

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Installation instructions

General

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

The case drain fluid in the motor housing must be directed to the reservoir via the highest available drain port (T1 、T2).

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

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

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

Installation position

See the following examples 1 to 5.
Further installation positions are possible upon request.

Recommended installation positions : 1 and 2.

Installation position	Air bleed	Filling
1	–	T1
2	–	T1 (sizes 28 to 180)
3	–	T1
4	(L1)	T1 、(L1)
5	(L1)	T2 、(L1)
6	(L1)	T1 、(L1)

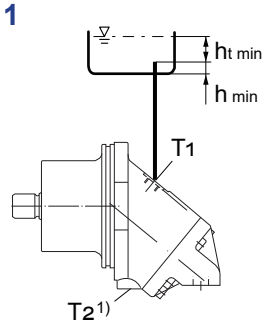
L1 Filling / air bleed
T1 、T2 Drain port
ht min Minimum required immersion depth (200 mm)
h min Minimum required spacing to reservoir bot-tom (100 mm)

1) special version for sizes 28 to 180.
2) Piping suggestion without port T2 (standard for sizes 28 to 180).
3) Piping suggestion with port T2 (special version for sizes 28 to 180).
4) Installation position only permissible if port T2 is fitted (special version for sizes 28 to 180).

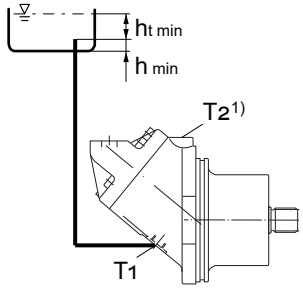
Below-reservoir installation (standard)

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

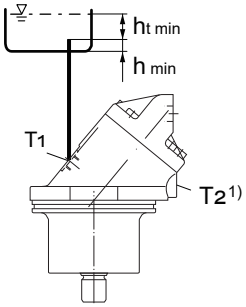
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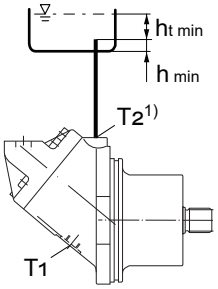
2a 2)



3



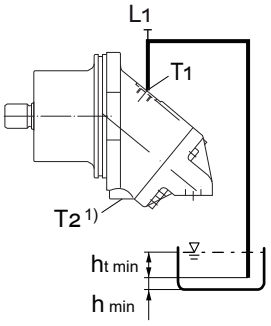
2b 3)



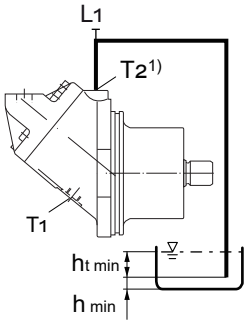
Above-reservoir installation

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

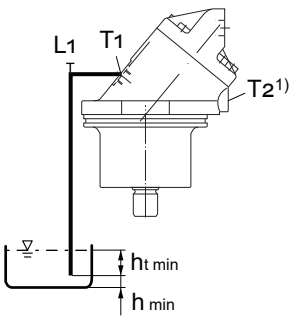
4



5 4)



6



General instructions

– The motor A2FE is designed to be used in open and closed circuits.

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

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

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

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

– Service line ports :

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

- The service line ports and function ports can only be used to accommodate hydraulic lines.

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

– The following tightening torques apply :

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

- Mounting bolts:
For mounting bolts with metric ISO thread according to DIN 13 or with thread according to ASME B1.1, we recommend checking the tightening torque in individual cases in accordance with VDI 2230.

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

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

Ports Standard	Size of thread	Maximum permissible tightening torque of the female threads $M_{G\,max}$	Required tightening torque of the threaded plugs M_V [1]	WAF hexagon socket of the threaded plugs
DIN 3852	M12 x 1.5	50 Nm	25 Nm [2]	6 mm
	M16 x 1.5	100 Nm	50 Nm	8 mm
	M18 x 1.5	140 Nm	60 Nm	8 mm
	M20 x 1.5	170 Nm	80 Nm	10 mm
	M22 x 1.5	210 Nm	80 Nm	10 mm
	M26 x 1.5	230 Nm	120 Nm	12 mm
	M27 x 2	330 Nm	135 Nm	12 mm
	M30 x 2	420 Nm	215 Nm	17 mm
	M33 x 2	540 Nm	225 Nm	17 mm
DIN ISO 228	G 1/4	40 Nm	–	–

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

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

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