THM HYDRAULICS

TS-A2FM

Axial Piston Fixed Motor
Bent Axis Design
Size: 5
Nominal/Maximum pressure: 315/350 Bar
Size: 10 to 180
Nominal/Maximum pressure: 400/450 Bar
Open & Closed Circuits

Index

Ordering Code

	TS-A2F		M		/	6		W	–	V			
01	02	03	04	05		06	07	08		09	10	11	12

Hydraulic fluid

01	Mineral oil and HFD.	
	HFB, HFC hydraulic fluid	

Axial piston unit

02	Bent-axis design, fixed	TS-A2F

Drive shaft bearing

		5 to 180	
03	Standard bearing (without code)	●	
	Long-life bearing	–	L

Operating mode

04	Motor (plug-in motor A2FE)	M

Size (NG)

05	Geometric displacement																
		5	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180

Series

06		6

Index

07		NG10 to 180	1

Direction of rotation

08	Viewed on drive shaft, bidirectional	W

Seals

09	FKM (fluor-caoutchouc)	V

	Drive shafts	**5**	**10**	**12**	**16**	**23**	**28**	**32**	**45**	**56**	**63**	**80**	**90**	**107**	**125**	**160**	**180**	
10	Splined shaft DIN 5480	–	●	●	●	●	●	●	–	●	●	●	●	●	●	●	●	A
		–	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	Z
	Parallel keyed shaft DIN 6885	●	●	●	●	●	●	●	–	●	●	●	●	●	●	●	●	B
		–	●	●	●	●	●	●	●	●	–	●	–	●	–	●	–	P
	Conical shaft	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	C

Mounting flanges

			5 to 180	
11	ISO 3019-2	4-hole	●	B

● = Available ❍ = On request – = Not available

Ordering Code

	TS-A2F		M		/	6		W	–	V			
01	02	03	04	05		06	07	08		09	10	11	12

	Port plates for service lines			5	10-16	23	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
	Threaded ports A and B at side, opposite	03	0	–	●	–	–	–	–	–	–	–	030
	Threaded ports A and B at side and rear	04	0	–	●	–	–	–	–	–	–	–	040
	SAE flange ports A and B at bottom (same side)	10	0	–	–	–	–	–	●	●	–	–	100
	Port plate with 1-level pressure-relief valves BVD	17	1	–	–	–	–	–	–	●	–	–	171 178
		18	8	–	–	–	–	–	–	●	–	–	181
	Port plate with pressure-relief valves	19	1	–	–	–	–	–	●	●	–	–	191
			2	–	–	–	–	–	●	●	–	–	192

	Valves	
	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 mounted	8
	Flushing and boost pressure valve, integrated	9

	Speed sensors	5 to 16	23 to 180	
13	Without speed sensor (without code)	●	●	
	Prepared for HDD speed sensor	–	●	F
	HDD speed sensor mounted	–	●	H
	Prepared for DSA speed sensor	–	❍	U
	DSA speed sensor mounted	–	❍	V

● = Available ❍ = On request – = Not available

Technical data

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

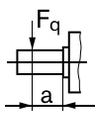
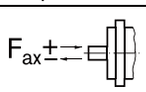
Size	NG		5	10	12	16	23	28	32	45	56	63	80
Displacement geometric, per revolution	V_g	cm^3	4.93	10.3	12	16	22.9	28.1	32	45.6	56.1	63	80.4
Speed maximum[1)]	n_{nom}	rpm	10000	8000	8000	8000	6300	6300	6300	5600	5000	5000	4500
	n_{max}[2)]	rpm	11000	8800	8800	8800	6900	6900	6900	6200	5500	5500	5000
Input flow[3)] at n_{nom} and V_g	q_V	L/min	49	82	96	128	144	177	202	255	281	315	362
Torque[4)] at V_g and $\Delta p = 350$ bar	T	Nm	24.7[5)]	57	67	89	128	157	178	254	313	351	448
$\Delta p = 400$ bar	T	Nm	–	66	76	102	146	179	204	290	357	401	512
Rotary stiffness	c	kNm/rad	0.63	0.92	1.25	1.59	2.56	2.93	3.12	4.18	5.94	6.25	8.73
Moment of inertia for rotary group	J_{GR}	kgm^2	0.00006	0.0004	0.0004	0.0004	0.0012	0.0012	0.0012	0.0024	0.0042	0.0042	0.0072
Maximum angular acceleration	α	rad/s^2	5000	5000	5000	5000	6500	6500	6500	14600	7500	7500	6000
Case volume	V	L		0.17	0.17	0.17	0.20	0.20	0.20	0.33	0.45	0.45	0.55
Mass (approx.)	m	kg	2.5	5.4	5.4	5.4	9.5	9.5	9.5	13.5	18	18	23

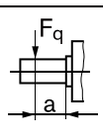
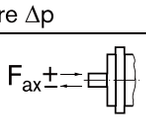
Size	NG		90	107	125	160	180
Displacement geometric, per revolution	V_g	cm^3	90	106.7	125	160.4	180
Speed maximum[1)]	n_{nom}	rpm	4500	4000	4000	3600	3600
	n_{max}[2)]	rpm	5000	4400	4400	4000	4000
Input flow[3)] at n_{nom} and V_g	q_V	L/min	405	427	500	577	648
Torque[4)] at V_g and $\Delta p = 350$ bar	T	Nm	501	594	696	893	1003
$\Delta p = 400$ 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}	kgm^2	0.0072	0.0116	0.0116	0.0220	0.0220
Maximum angular acceleration	α	rad/s^2	6000	4500	4500	3500	3500
Case volume	V	L	0.55	0.8	0.8	1.1	1.1
Mass (approx.)	m	kg	23	32	32	45	45

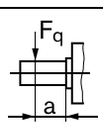
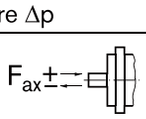
Technical data

Permissible radial and axial forces of the drive shafts

(splined shaft and parallel keyed shaft)

Size	NG		5	5	10	10	12	12	16	23	23
Drive shaft	ø	mm	12	12	20	25	20	25	25	25	30
Maximum radial force at distance a (from shaft collar) 	$F_{q\ max}$	kN	1.6	1.6	3.0	3.2	3.0	3.2	3.2	5.7	5.4
	a	mm	12	12	16	16	16	16	16	16	16
with permissible torque	T_{max}	Nm	24.7	24.7	66	66	76	76	102	146	146
≙ permissible pressure Δp	Δp_{perm}	bar	315	315	400	400	400	400	400	400	400
Maximum axial force 	$+F_{ax\ max}$	N	180	180	320	320	320	320	320	500	500
	$-F_{ax\ max}$	N	0	0	0	0	0	0	0	0	0
Permissible axial force per bar operating pressure	$\pm F_{ax\ perm/bar}$	N/bar	1.5	1.5	3.0	3.0	3.0	3.0	3.0	5.2	5.2

Size	NG		28	28	32	45	56	56	56	63	80
Drive shaft	ø	mm	25	30	30	30	30	30	35	35	35
Maximum radial force at distance a (from shaft collar) 	$F_{q\ max}$	kN	5.7	5.4	5.4	7.6	9.5	7.8	9.1	9.1	11.6
	a	mm	16	16	16	18	18	18	18	18	20
with permissible torque	T_{max}	Nm	179	179	204	290	357	294	357	401	512
≙ permissible pressure Δp	Δp_{perm}	bar	400	400	400	400	400	330	400	400	400
Maximum axial force 	$+F_{ax\ max}$	N	500	500	500	630	800	800	800	800	1000
	$-F_{ax\ max}$	N	0	0	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	8.7	10.6

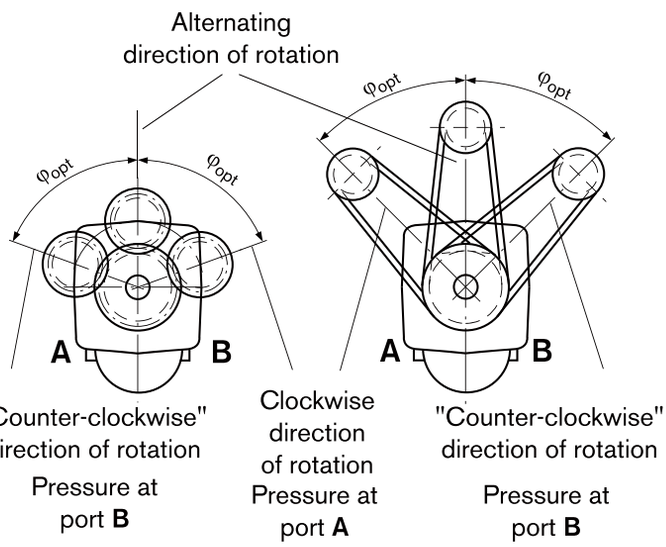
Size	NG		80	80	90	107	107	125	160	160	180
Drive shaft	ø	mm	35	40	40	40	45	45	45	50	50
Maximum radial force at distance a (from shaft collar) 	$F_{q\ max}$	kN	11.1	11.4	11.4	13.6	14.1	14.1	18.1	18.3	18.3
	a	mm	20	20	20	20	20	20	25	25	25
with permissible torque	T_{max}	Nm	488	512	573	679	679	796	1021	1021	1146
≙ permissible pressure Δp	Δp_{perm}	bar	380	400	400	400	400	400	400	400	400
Maximum axial force 	$+F_{ax\ max}$	N	1000	1000	1000	1250	1250	1250	1600	1600	1600
	$-F_{ax\ max}$	N	0	0	0	0	0	0	0	0	0
Permissible axial force per bar operating pressure	$\pm F_{ax\ perm/bar}$	N/bar	10.6	10.6	10.6	12.9	12.9	12.9	16.7	16.7	16.7

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:

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



Determining the operating characteristics

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

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

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

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

V_g = Displacement per revolution in cm^3

Δp = Differential pressure in bar

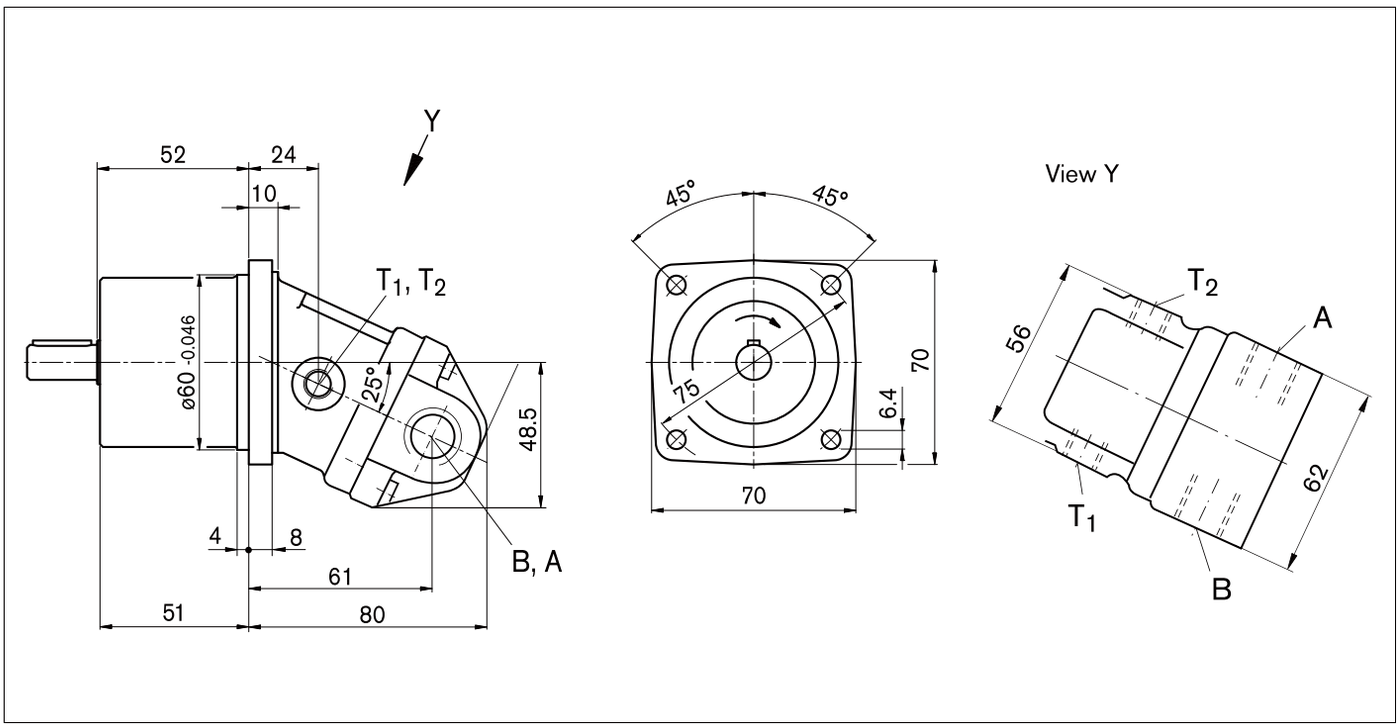
n = Speed in rpm

η_v = Volumetric efficiency

η_{mh} = Mechanical-hydraulic efficiency

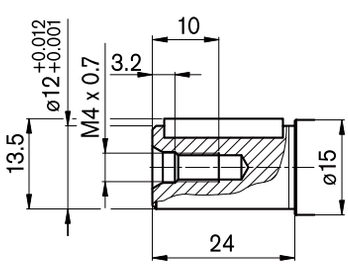
η_t = Total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Unit Dimensions Size 5

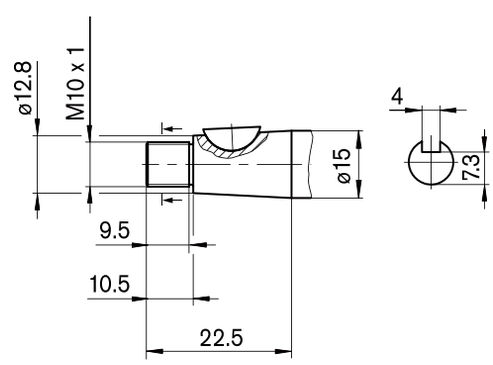


Drive shafts

B Parallel keyed shaft
DIN 6885, A4x4x20



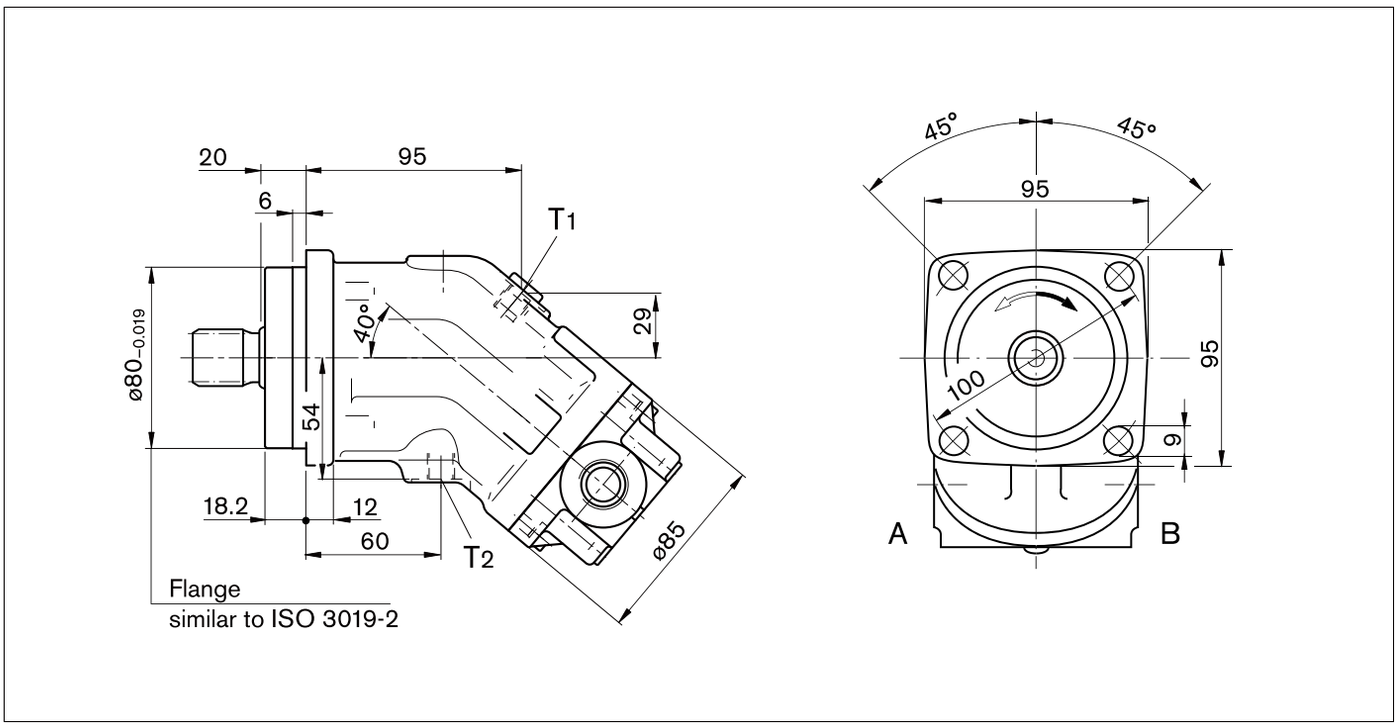
C Conical shaft with threaded pin and woodruff key, 3x5
(DIN 6888), (tapering 1:10)



Ports

Designation	Port for	Standard[6)]	Size[3)]	Maximum pressure [bar]	State
A, B	Service line	DIN 3852	M18 x 1.5; 12 deep	350	O
T_1	Drain line	DIN 3852	M10 x 1; 8 deep	3	O
T_2	Drain line	DIN 3852	M10 x 1; 8 deep	3	O

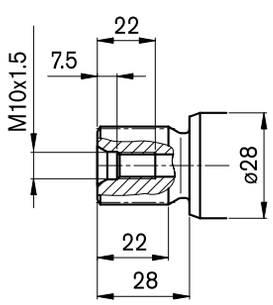
Unit Dimensions Size 10, 12, 16



Drive shafts

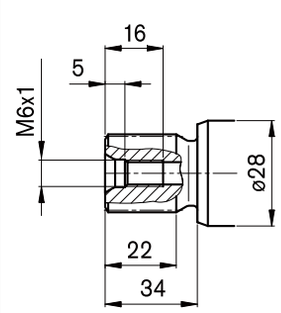
Sizes 10, 12, 16

A Splined shaft DIN 5480 W25x1.25x18x9g



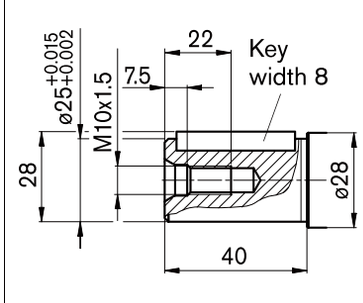
Sizes 10, 12

Z Splined shaft DIN 5480 W20x1.25x14x9g



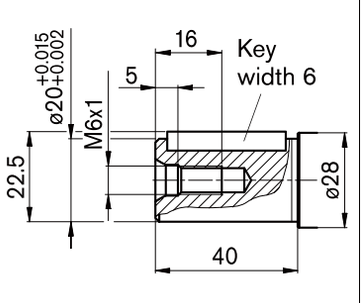
Sizes 10, 12, 16

B Parallel keyed shaft DIN 6885, AS8x7x32



Sizes 10, 12

P Parallel keyed shaft DIN 6885, AS6x6x32



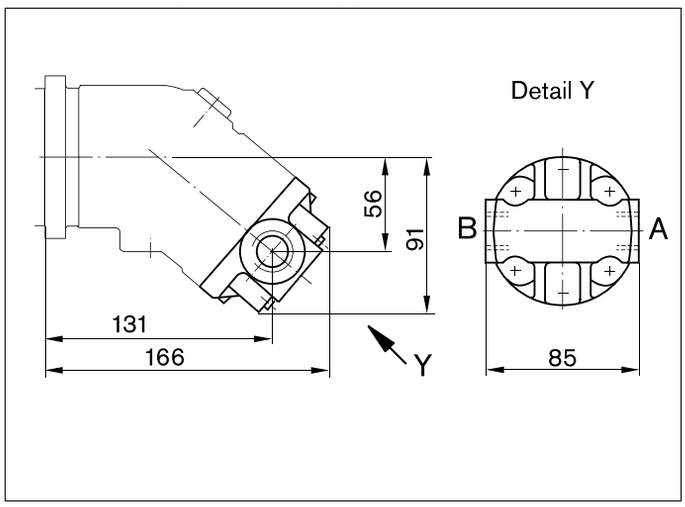
Ports

Designation	Port for	Standard	Size	Maximum pressure [bar]	State
A, B	Service line (see port plates)			450	
T_1	Drain line	DIN 3852	M12 x 1.5; 12 deep	3	X
T_2	Drain line	DIN 3852	M12 x 1.5; 12 deep	3	O

Unit Dimensions Size 10, 12, 16

Location of the service line ports on the port plates

03 – Threaded ports at side, opposite



04 – Threaded ports at side and rear

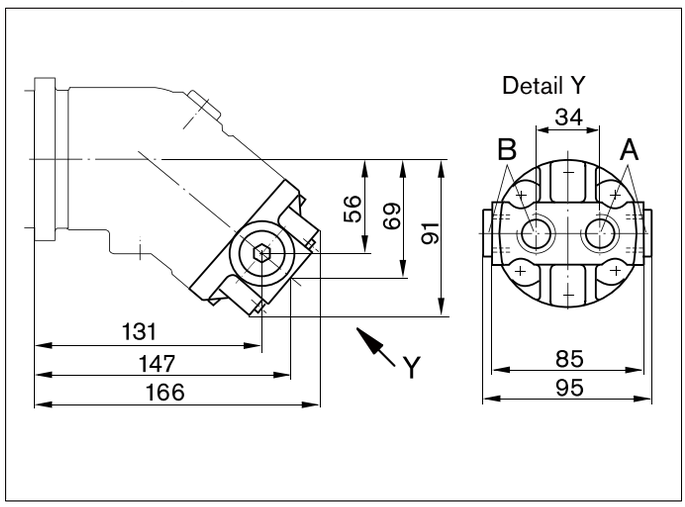
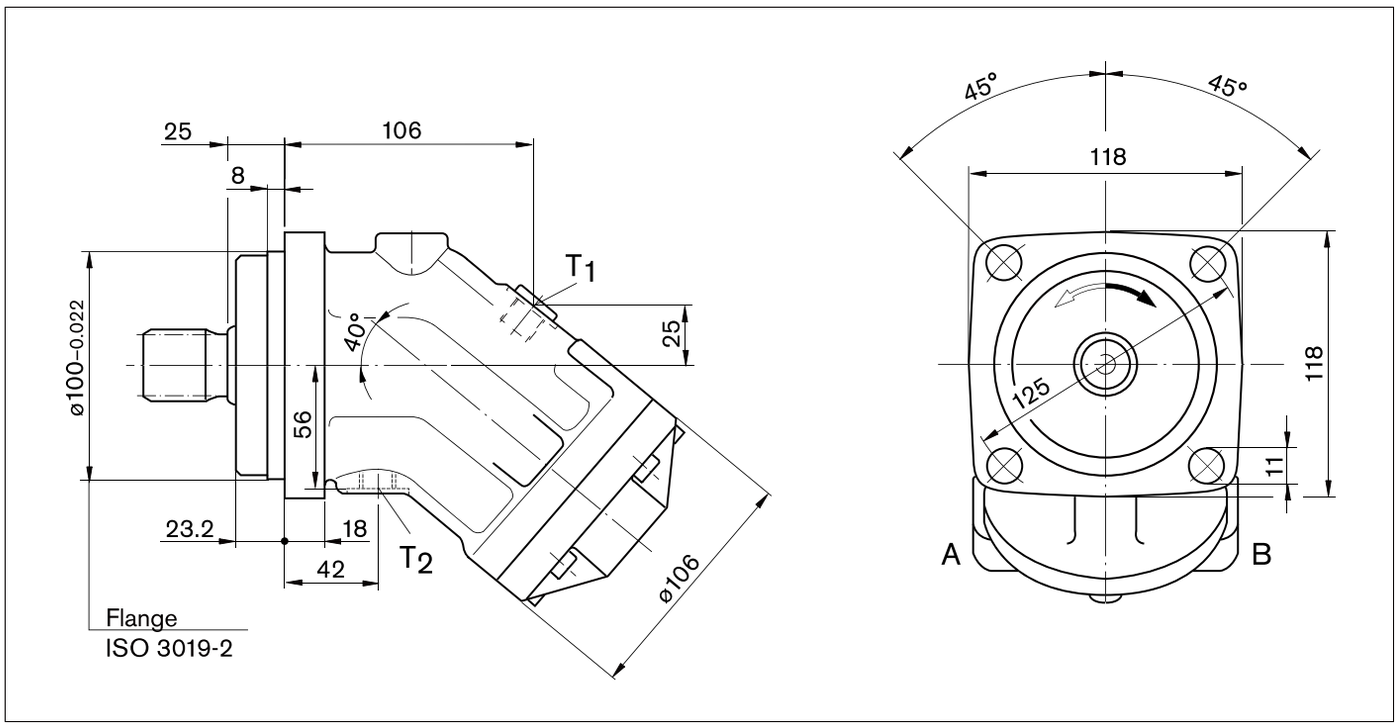


Plate	Designation	Port for	Standard	Size	Maximum pressure [bar]	State
03	A, B	Service line	DIN 3852	M22 x 1.5; 14 deep	450	O
04		Service line	DIN 3852	M22 x 1.5; 14 deep	450	1x O each

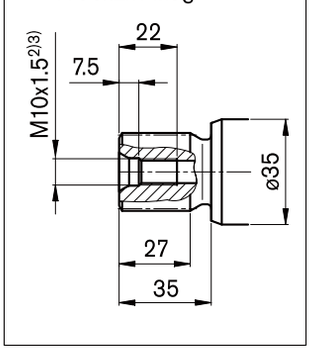
Unit Dimensions Size 23, 28, 32



Drive shafts

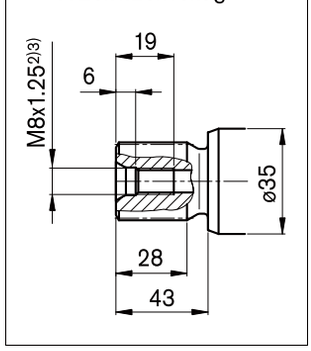
Sizes 23, 28, 32

A Splined shaft DIN 5480 W30x2x14x9g



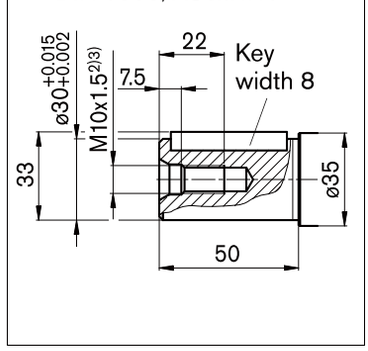
Sizes 23, 28

Z Splined shaft DIN 5480 W25x1.25x18x9g



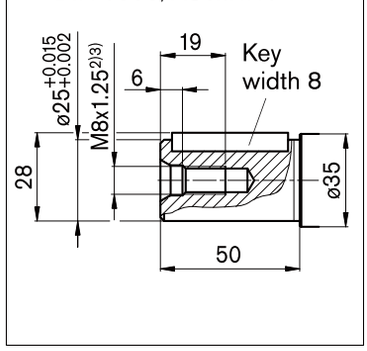
Sizes 23, 28, 32

B Parallel keyed shaft DIN 6885, AS8x7x40



Sizes 23, 28

P Parallel keyed shaft DIN 6885, AS8x7x40



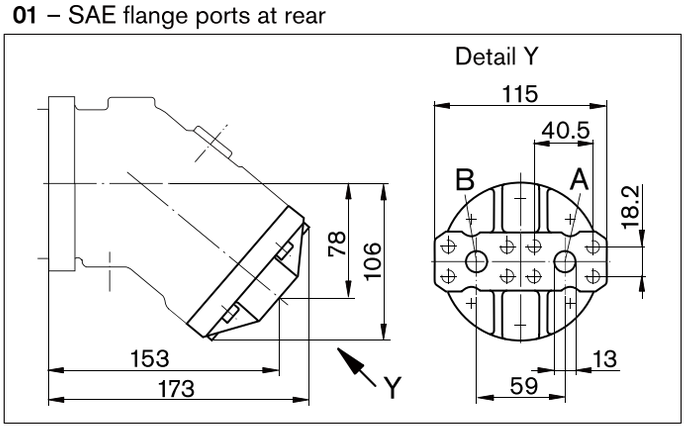
Ports

Designation	Port for	Standard	Size	Maximum pressure [bar]	State
A, B	Service line (see port plates)			450	
T_1	Drain line	DIN 3852	M16 x 1.5; 12 deep	3	X
T_2	Drain line	DIN 3852	M16 x 1.5; 12 deep	3	O

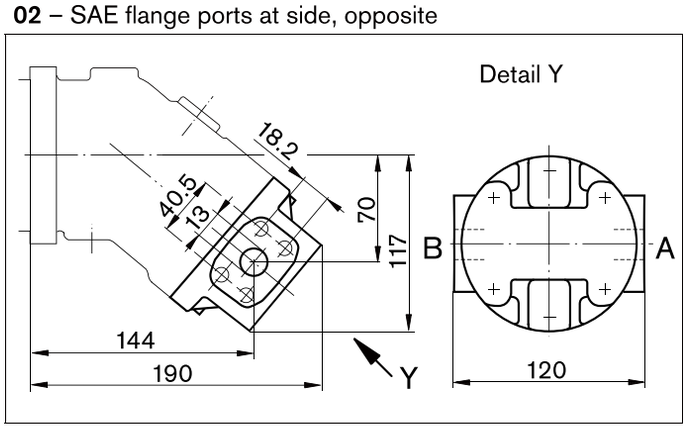
Unit Dimensions Size 23, 28, 32

Location of the service line ports on the port plates

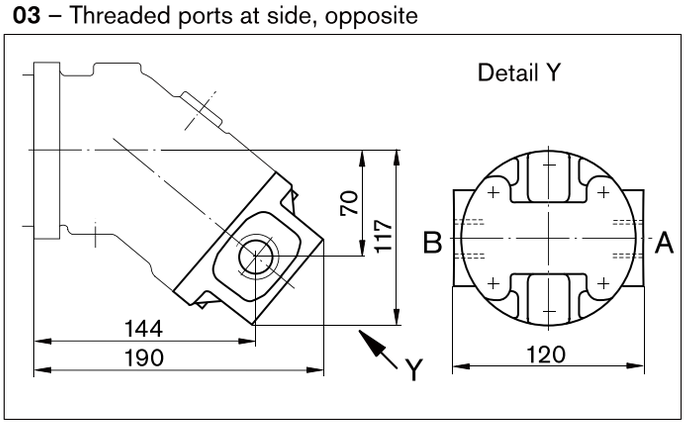
01 – SAE flange ports at rear



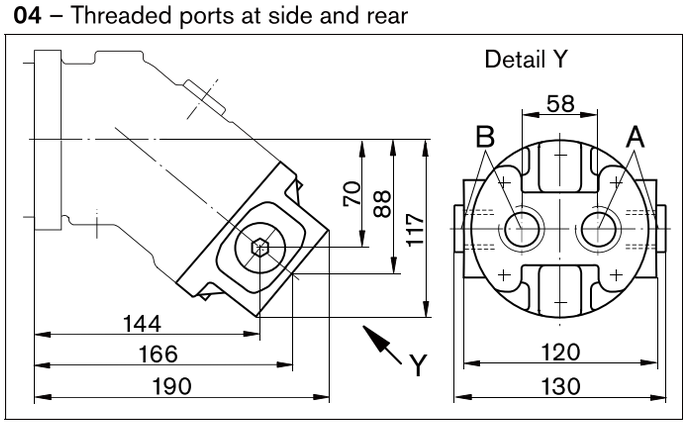
02 – SAE flange ports at side, opposite



03 – Threaded ports at side, opposite



04 – Threaded ports at side and rear



10 – SAE flange ports at bottom (same side)

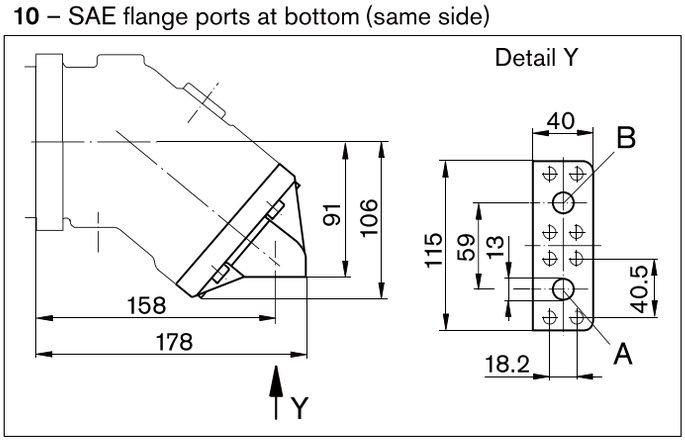
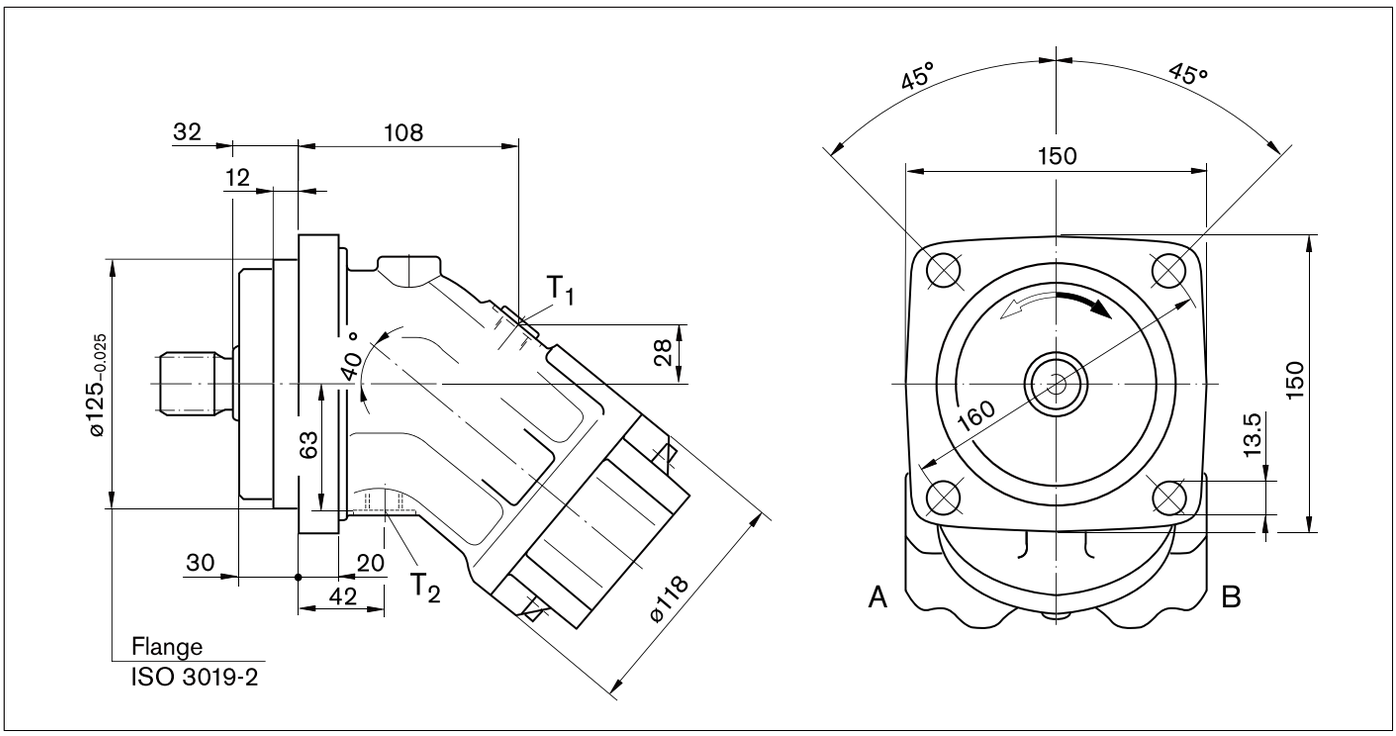


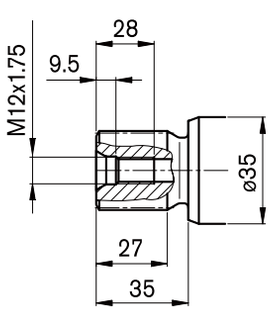
Plate	Designation	Port for	Standard	Size	Maximum pressure [bar]	State
01, 02, 10	A, B	Service line Fastening thread A/B	SAE J518 DIN 13	1/2 in M8 x 1.25; 15 deep	450	O
03		Service line	DIN 3852	M27 x 2; 16 deep	450	O
04		Service line	DIN 3852	M27 x 2; 16 deep	450	1x O each

Unit Dimensions Size 45

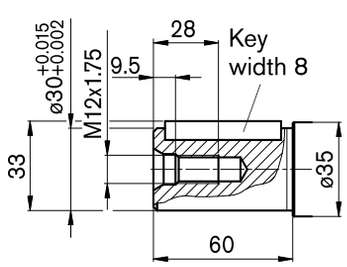


Drive shafts

Z Splined shaft DIN 5480
W30x2x14x9g



P Parallel keyed shaft
DIN 6885, AS8x7x50



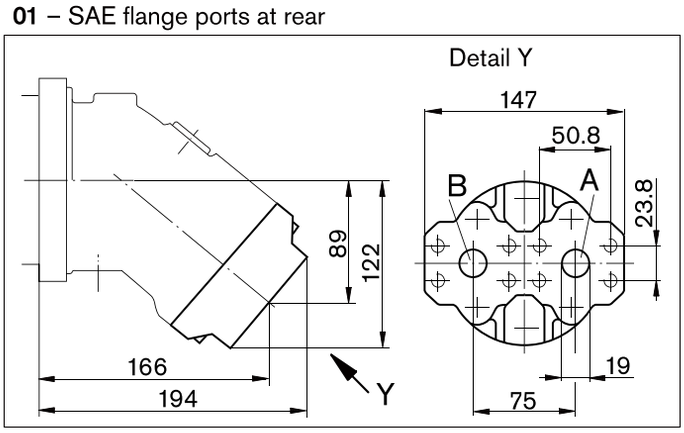
Ports

Designation	Port for	Standard	Size	Maximum pressure [bar]	State
A, B	Service line (see port plates)			450	
T_1	Drain line	DIN 3852	M18 x 1.5; 12 deep	3	X
T_2	Drain line	DIN 3852	M18 x 1.5; 12 deep	3	O

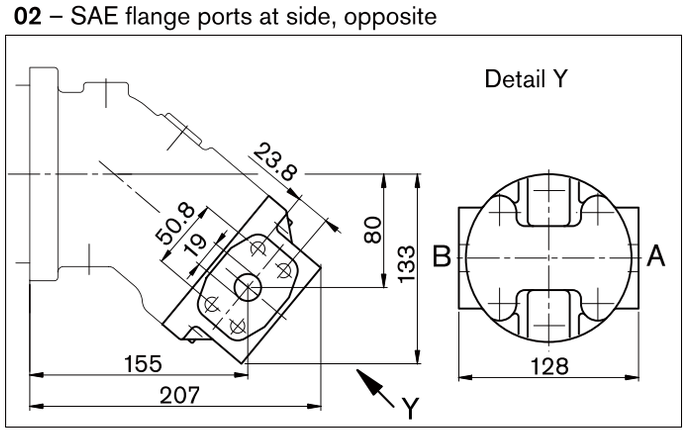
Unit Dimensions Size 45

Location of the service line ports on the port plates

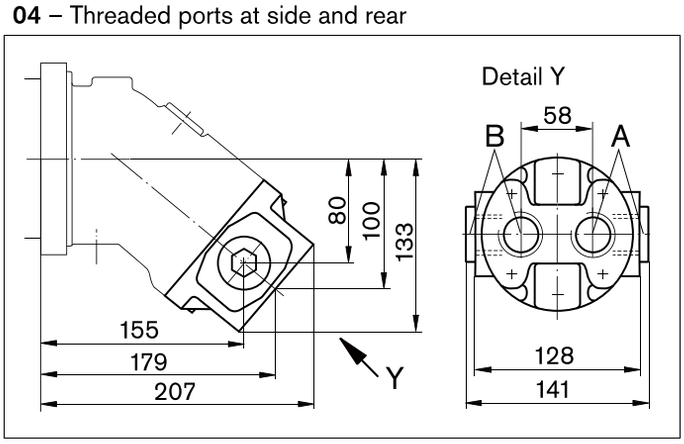
01 – SAE flange ports at rear



02 – SAE flange ports at side, opposite



04 – Threaded ports at side and rear



10 – SAE flange ports at bottom (same side)

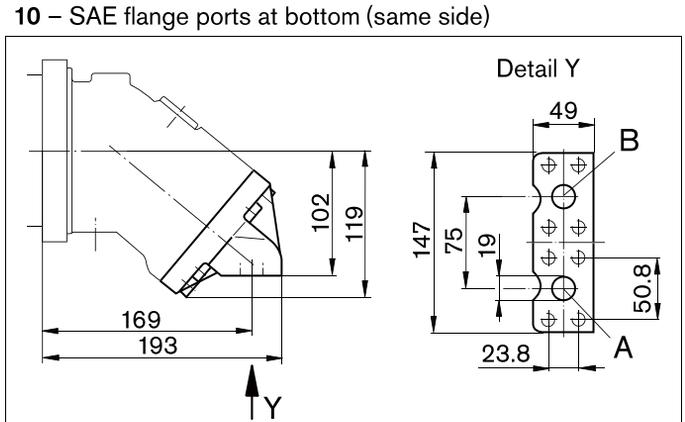
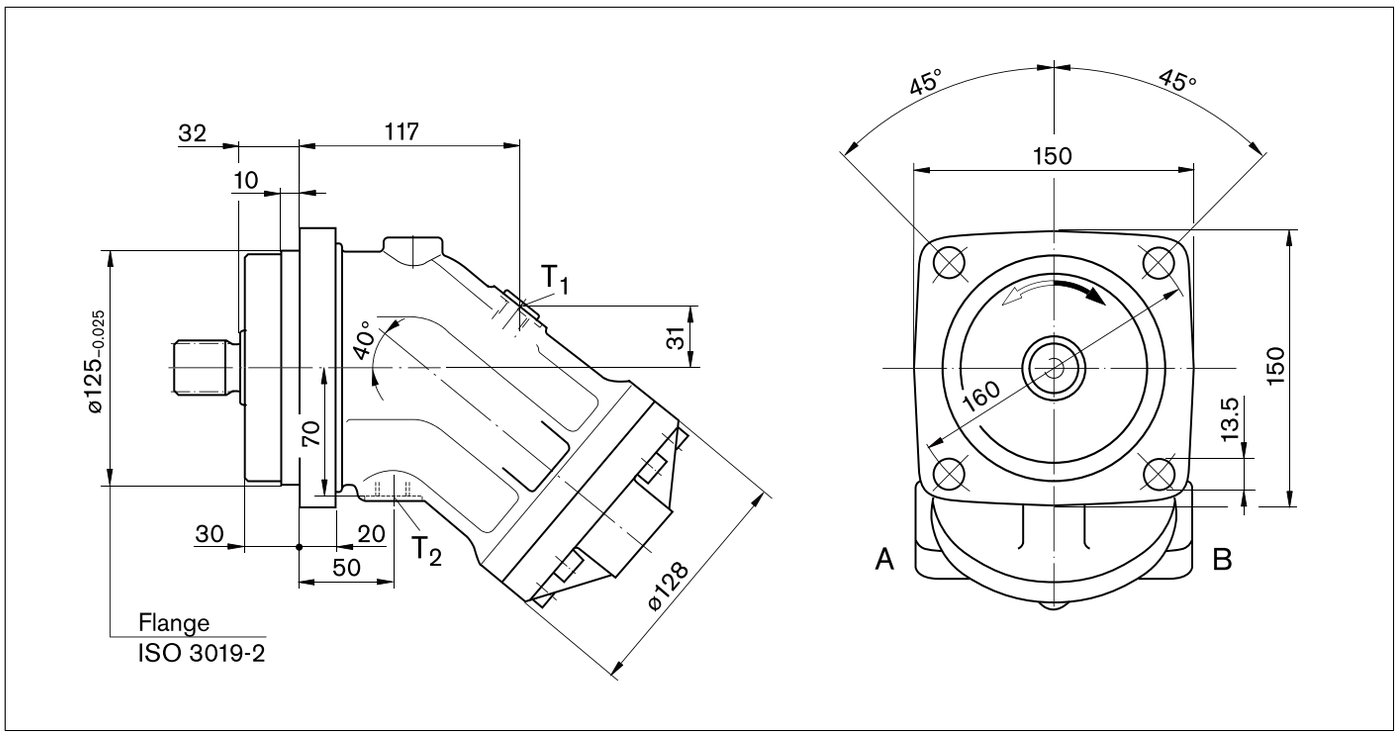


Plate	Designation	Port for	Standard	Size	Maximum pressure [bar]	State
01, 02, 10	A, B	Service line Fastening thread A/B	SAE J518 DIN 13	3/4 in M10 x 1.5; 17 deep	450	O
04		Service line	DIN 3852	M33 x 2; 18 deep	450	1x O each

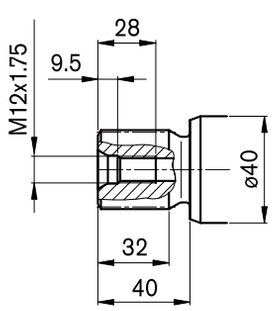
Unit Dimensions Size 56, 63



Drive shafts

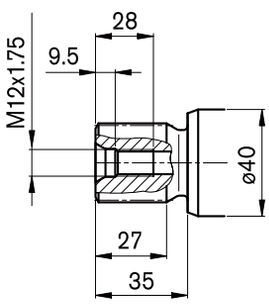
NG56, 63

A Splined shaft DIN 5480
W35x2x16x9g



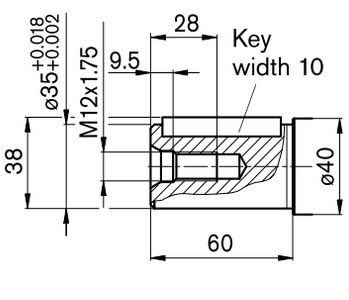
NG56

Z Splined shaft DIN 5480
W30x2x14x9g



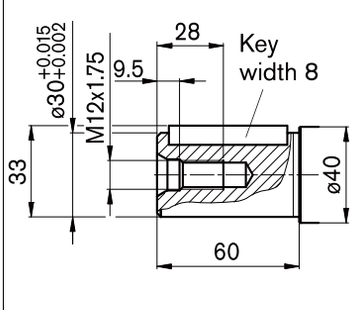
NG56, 63

B Parallel keyed shaft
DIN 6885, AS10x8x50



NG56

P Parallel keyed shaft
DIN 6885, AS8x7x50



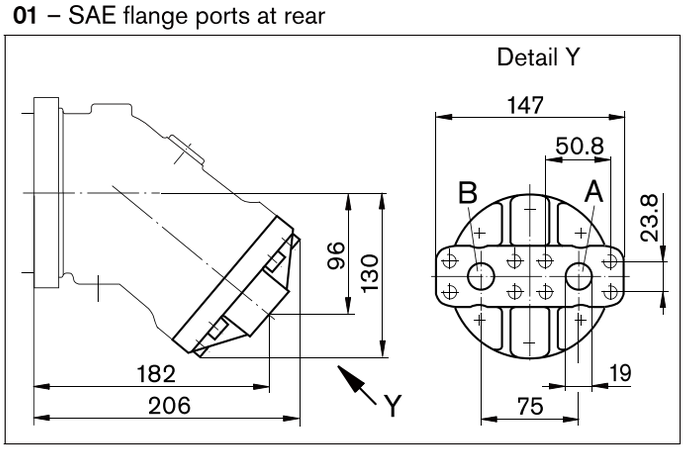
Ports

Designation	Port for	Standard	Size	Maximum pressure [bar]	State
A, B	Service line (see port plates)			450	
T_1	Drain line	DIN 3852	M18 x 1.5; 12 deep	3	X
T_2	Drain line	DIN 3852	M18 x 1.5; 12 deep	3	O

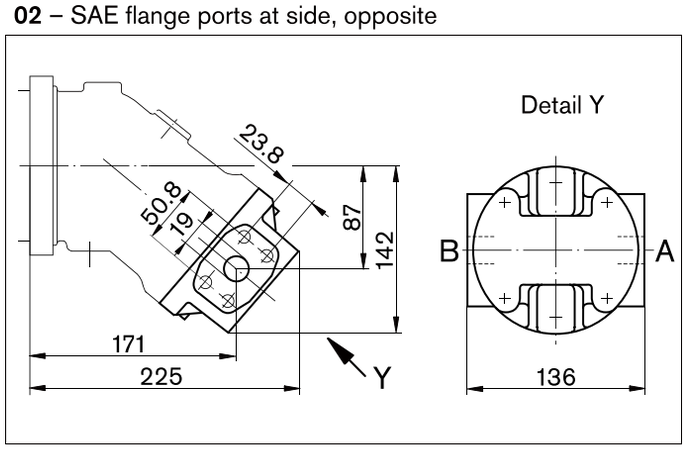
Unit Dimensions Size 56, 63

Location of the service line ports on the port plates

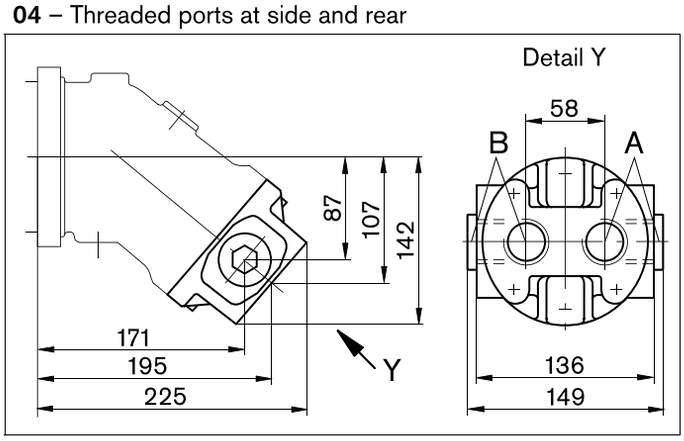
01 – SAE flange ports at rear



02 – SAE flange ports at side, opposite



04 – Threaded ports at side and rear



10 – SAE flange ports at bottom (same side)

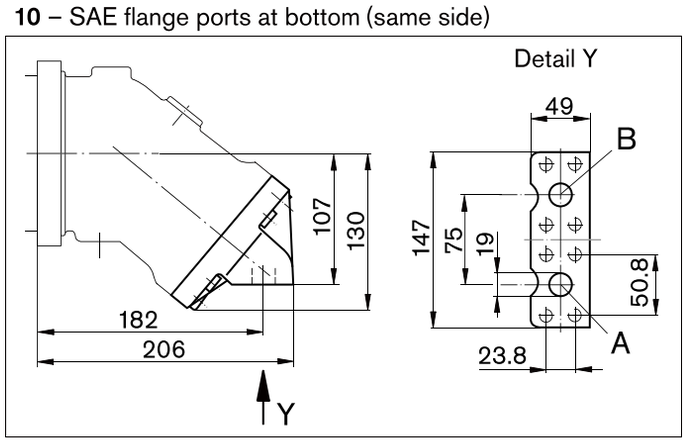
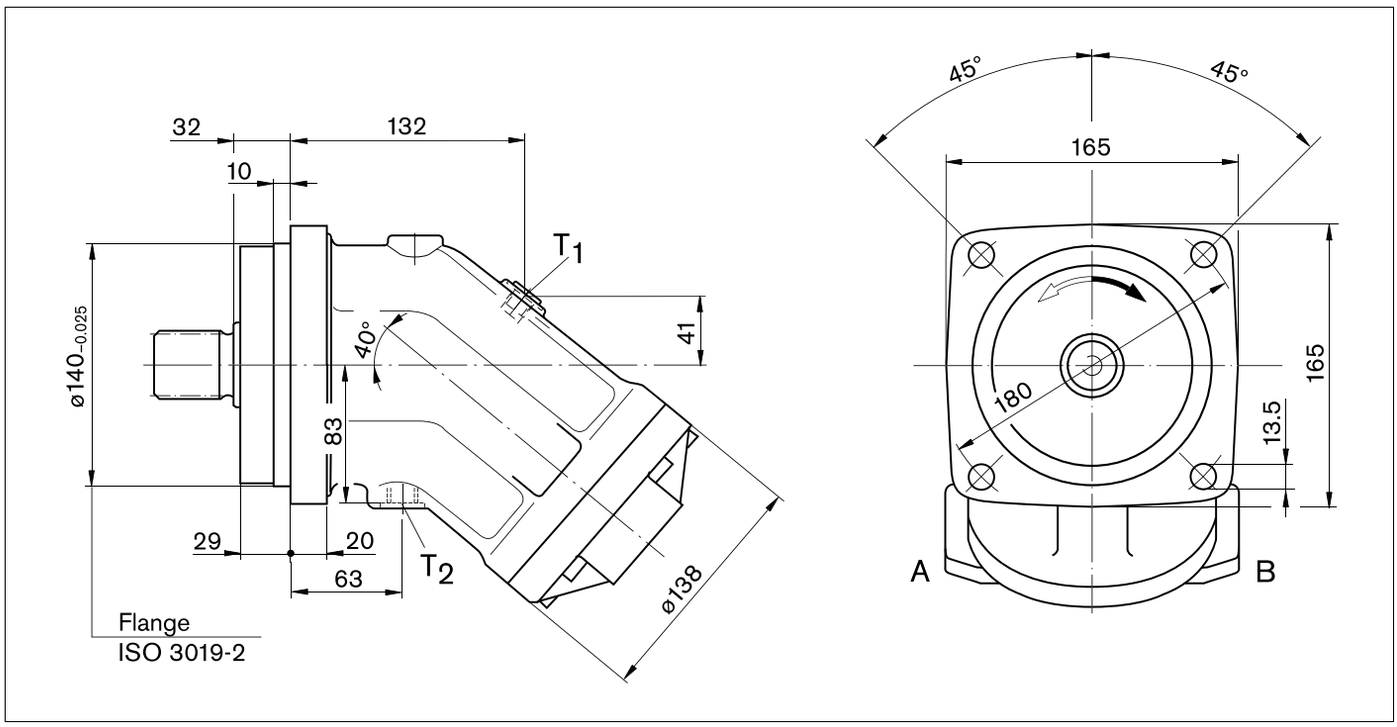


Plate	Designation	Port for	Standard	Size	Maximum pressure [bar]	State
01, 02, 10	A, B	Service line Fastening thread A/B	SAE J518 DIN 13	3/4 in M10 x 1.5; 17 deep	450	O
04		Service line	DIN 3852	M33 x 2; 18 deep	450	1x O each

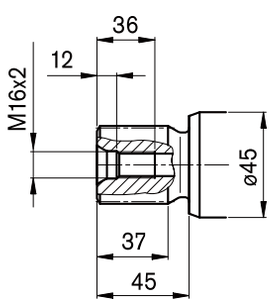
Unit Dimensions Size 80, 90



Drive shafts

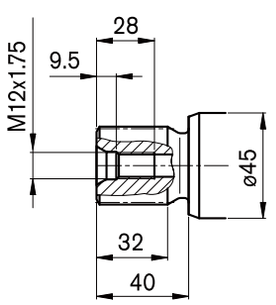
NG80, 90

A Splined shaft DIN 5480
W40x2x18x9g



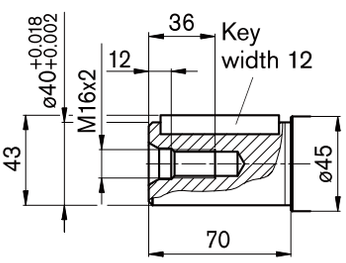
NG80

Z Splined shaft DIN 5480
W35x2x16x9g



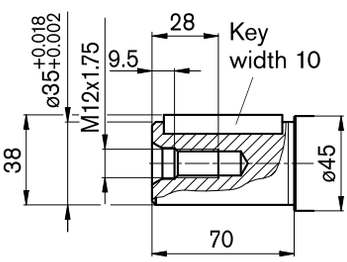
NG80, 90

B Parallel keyed shaft
DIN 6885, AS12x8x56



NG80

P Parallel keyed shaft
DIN 6885, AS10x8x56



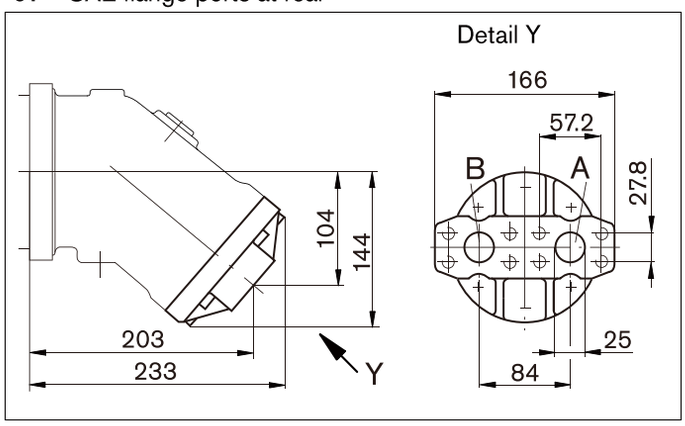
Ports

Designation	Port for	Standard	Size	Maximum pressure [bar]	State
A, B	Service line (see port plates)			450	
T_1	Drain line	DIN 3852	M18 x 1.5; 12 deep	3	X
T_2	Drain line	DIN 3852	M18 x 1.5; 12 deep	3	O

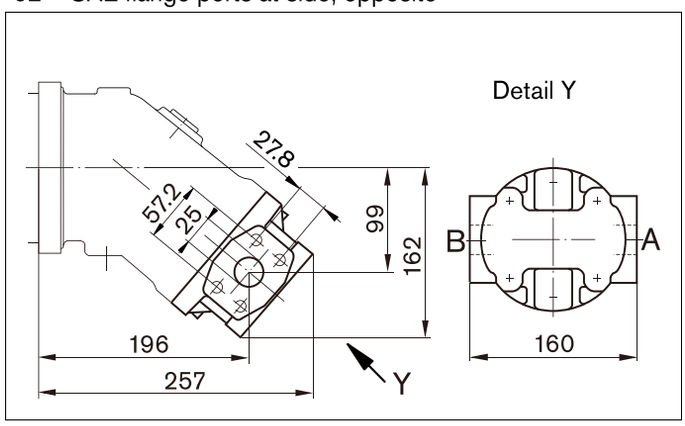
Unit Dimensions Size 80, 90

Location of the service line ports on the port plates

01 – SAE flange ports at rear



02 – SAE flange ports at side, opposite



10 – SAE flange ports at bottom (same side)

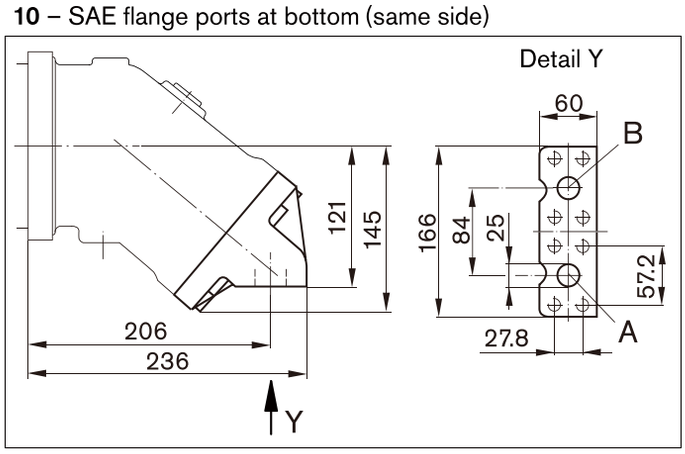
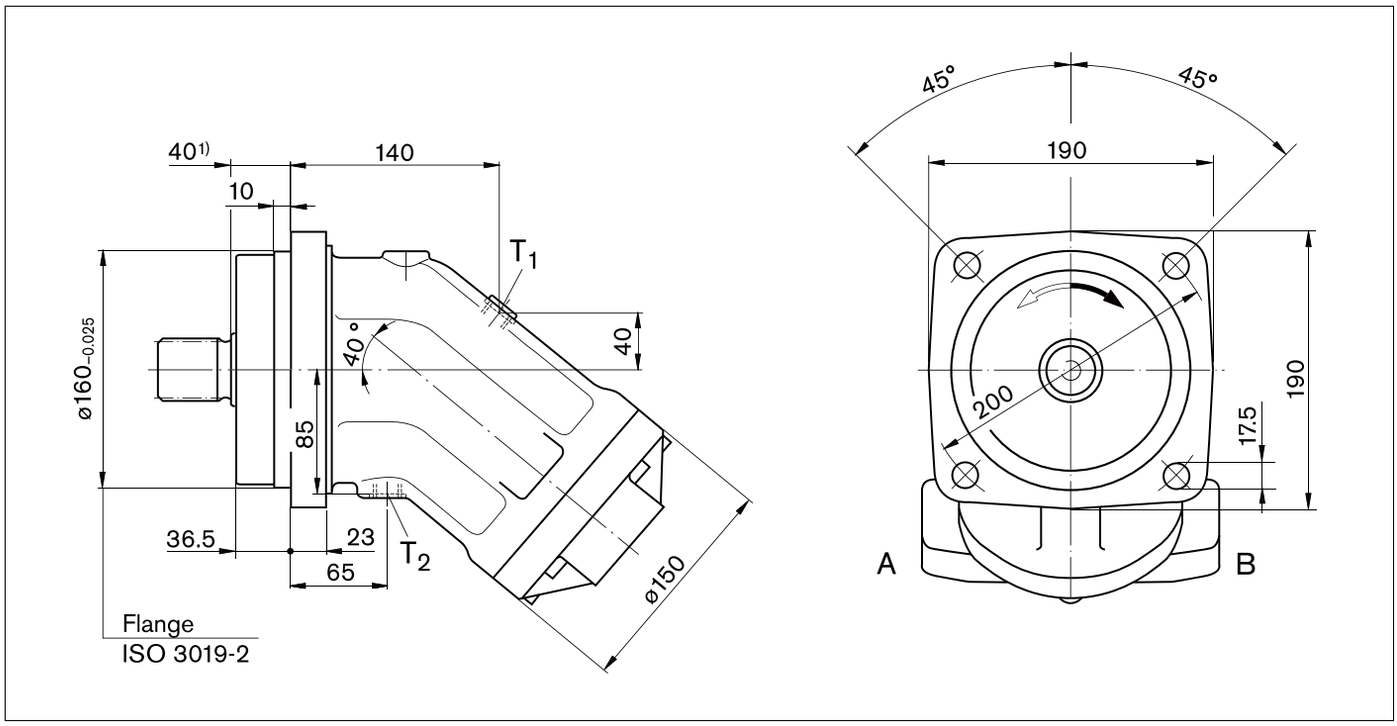


Plate	Designation	Port for	Standard	Size	Maximum pressure [bar]	State
01, 02, 10	A, B	Service line Fastening thread A/B	SAE J518 DIN 13	1 in M12 x 1.75; 17 deep	450	O

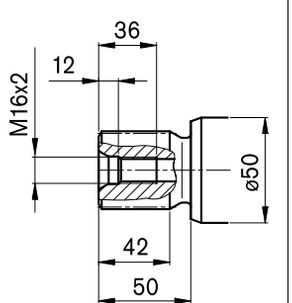
Unit Dimensions Size 107, 125



Drive shafts

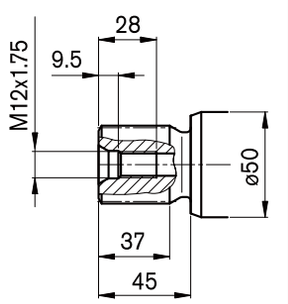
NG107, 125

A Splined shaft DIN 5480 W45x2x21x9g



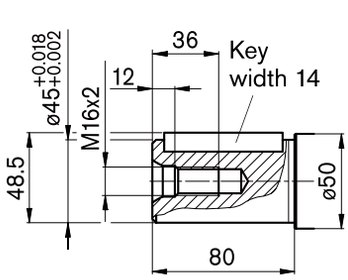
NG107

Z Splined shaft DIN 5480 W40x2x18x9g



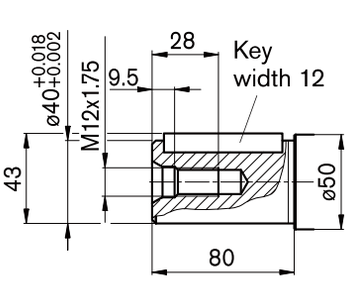
NG107, 125

B Parallel keyed shaft DIN 6885, AS14x9x63



NG107

P Parallel keyed shaft DIN 6885, AS12x8x63



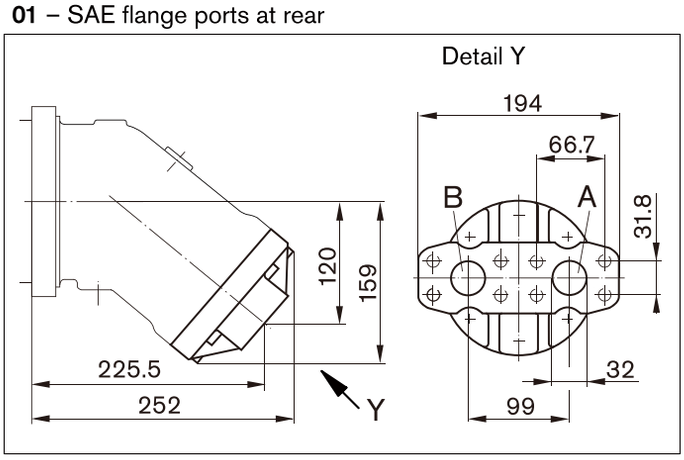
Ports

Designation	Port for	Standard	Size	Maximum pressure [bar]	State
A, B	Service line (see port plates)			450	
T_1	Drain line	DIN 3852	M18 x 1.5; 12 deep	3	X
T_2	Drain line	DIN 3852	M18 x 1.5; 12 deep	3	O

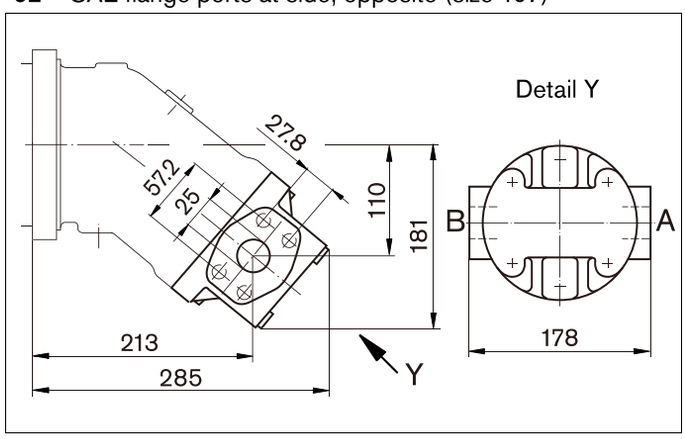
Unit Dimensions Size 107, 125

Location of the service line ports on the port plates

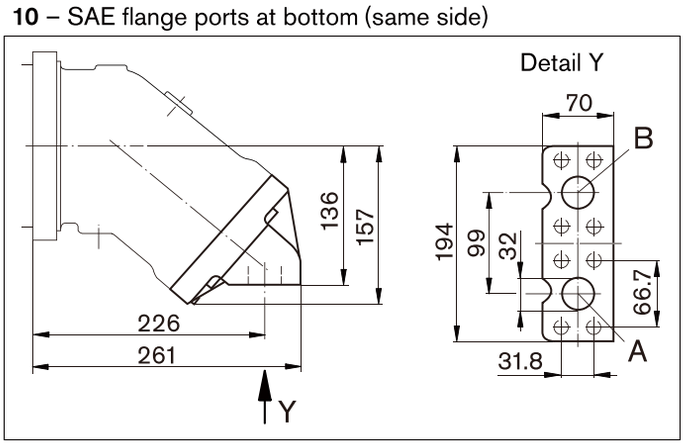
01 – SAE flange ports at rear



02 – SAE flange ports at side, opposite (size 107)



10 – SAE flange ports at bottom (same side)



02 – SAE flange ports at side, opposite (size 125)

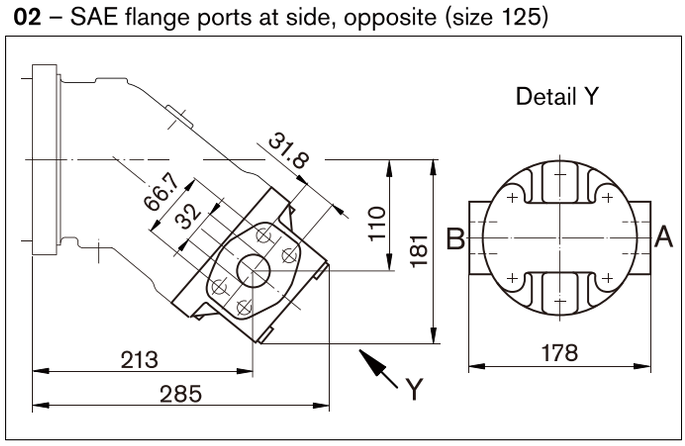
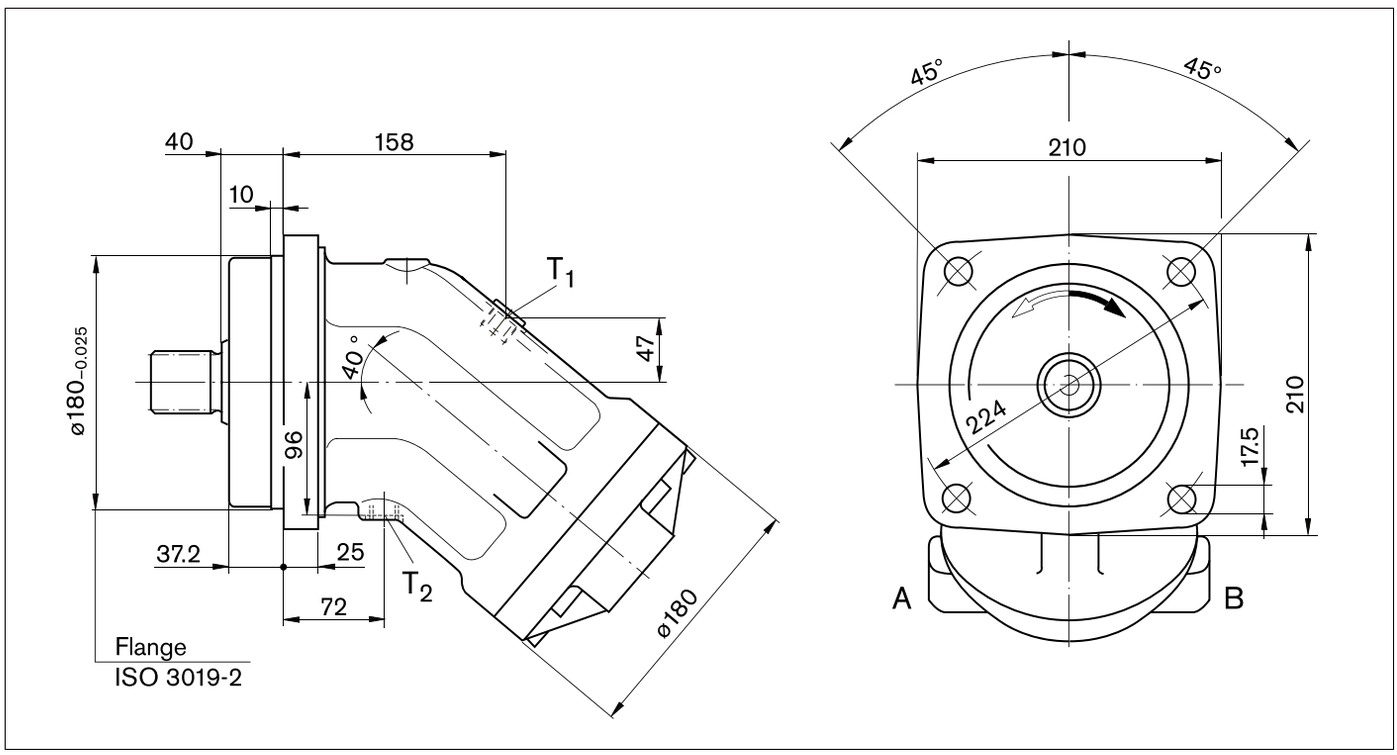


Plate	Designation	Port for	Standard	Size	Maximum pressure [bar]	State
01, 10	A, B	Service line Fastening thread A/B	SAE J518 DIN 13	1 1/4 in M14 x 2; 19 deep	450	O
02 (size 107)		Service line Fastening thread A/B	SAE J518 DIN 13	1 in M12 x 1.75; 17 deep	450	O
02 (size 125)		Service line Fastening thread A/B	SAE J518 DIN 13	1 1/4 in M14 x 2; 19 deep	450	O

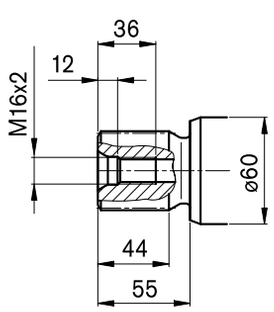
Unit Dimensions Size 160, 180



Drive shafts

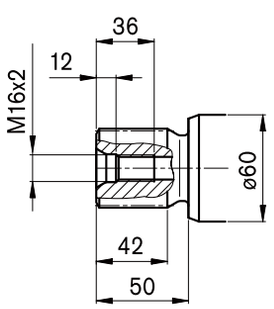
NG160, 180

A Splined shaft DIN 5480 W50x2x24x9g



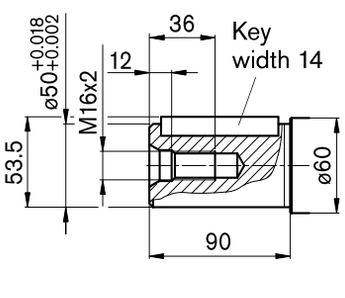
NG160

Z Splined shaft DIN 5480 W45x2x21x9g



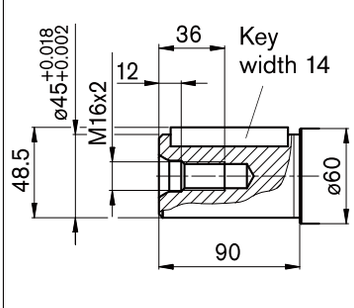
NG160, 180

B Parallel keyed shaft DIN 6885, AS14x9x70



NG160

P Parallel keyed shaft DIN 6885, AS14x9x70



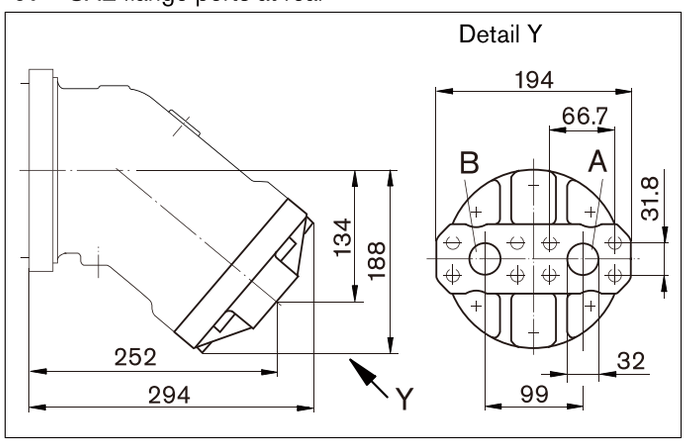
Ports

Designation	Port for	Standard	Size	Maximum pressure [bar]	State
A, B	Service line (see port plates)			450	
T_1	Drain line	DIN 3852	M22 x 1.5; 14 deep	3	X
T_2	Drain line	DIN 3852	M22 x 1.5; 14 deep	3	O

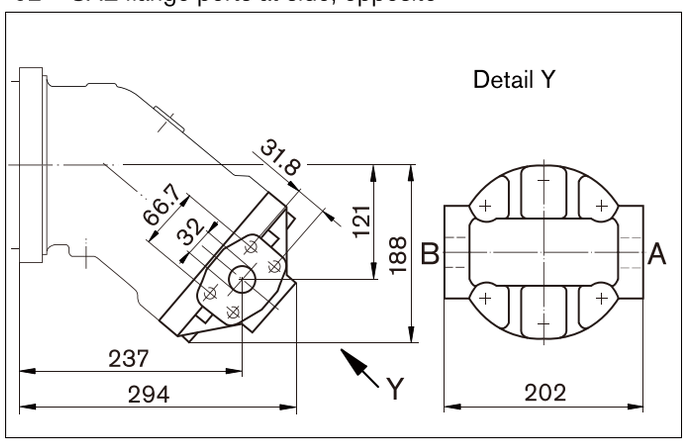
Unit Dimensions Size 160, 180

Location of the service line ports on the port plates

01 – SAE flange ports at rear



02 – SAE flange ports at side, opposite



10 – SAE flange ports at bottom (same side)

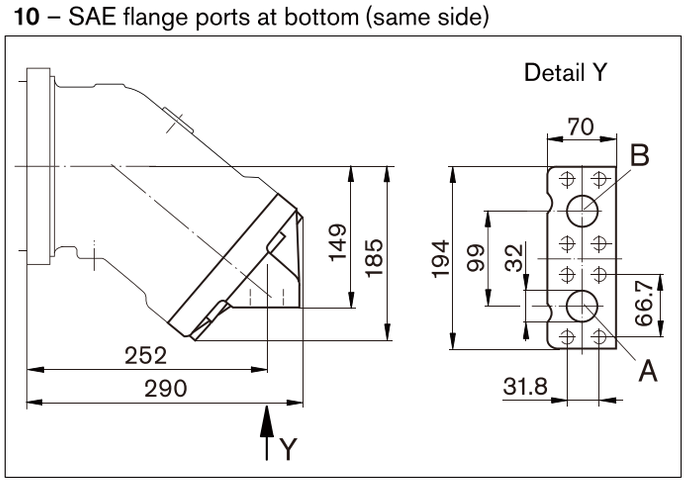


Plate	Designation	Port for	Standard	Size	Maximum pressure [bar]	State
01, 02, 10	A, B	Service line Fastening thread A/B	SAE J518 DIN 13	1 1/4 in M14 x 2; 19 deep	450	O

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, the valve is mounted directly on the fixed motor (sizes 45 to 180)

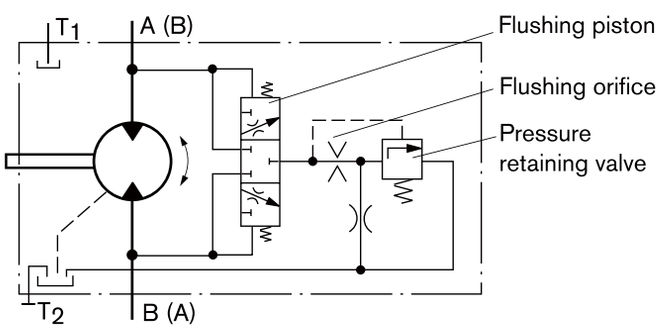
Cracking pressure of pressure retaining valve
(observe when setting the primary valve)
Sizes 45 to 180 , fixed setting_____16 bar

Switching pressure of flushing piston Δp
Sizes 45 to 180 _____ 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)

Schematic



Standard flushing flows

Flushing and boost pressure valve

Size	Flushing flow q_v [L/min]	ø [mm]
45	3.5	1.2
107, 125	8	1.8
160, 180	10	2.0

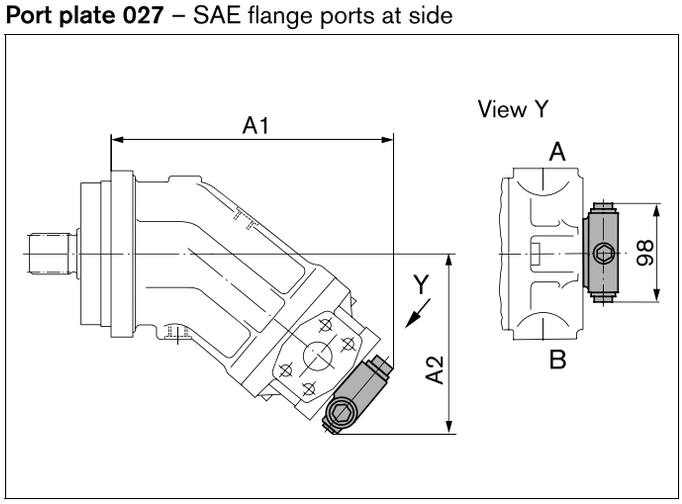
With sizes 45 to 180, orifices can be supplied for flushing flows from 3.5 to 10 L/min. For other flushing flows, please state the required flushing flow when ordering. The flushing flow without orifice is approx. 12 to 14 L at low pressure $\Delta p_{ND} = 25$ bar.

Flushing and boost pressure valve

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

Dimensions

Port plate 027 – SAE flange ports at side



Size	A1	A2
45	223	151
107, 125	294	192

Pressure Relief Valve

The MHDB pressure-relief valves protect the hydraulic motor from overload. As soon as the set cracking pressure is reached, the hydraulic fluid flows from the high-pressure 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).

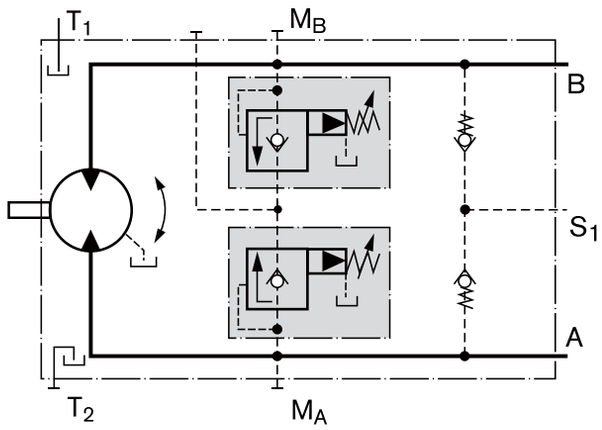
Cracking pressure setting range _____ 50 to 420 bar

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}.

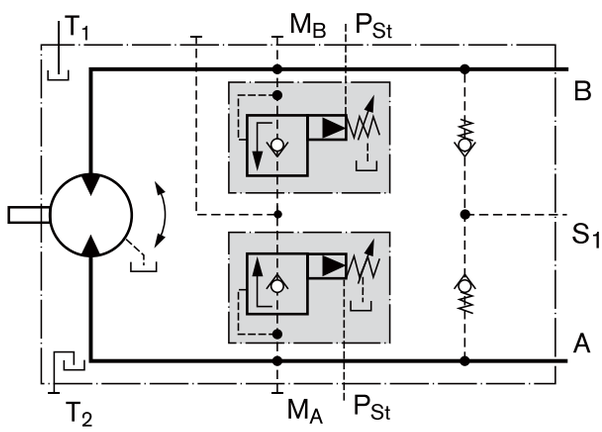
When ordering, please state in plain text:

- 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"

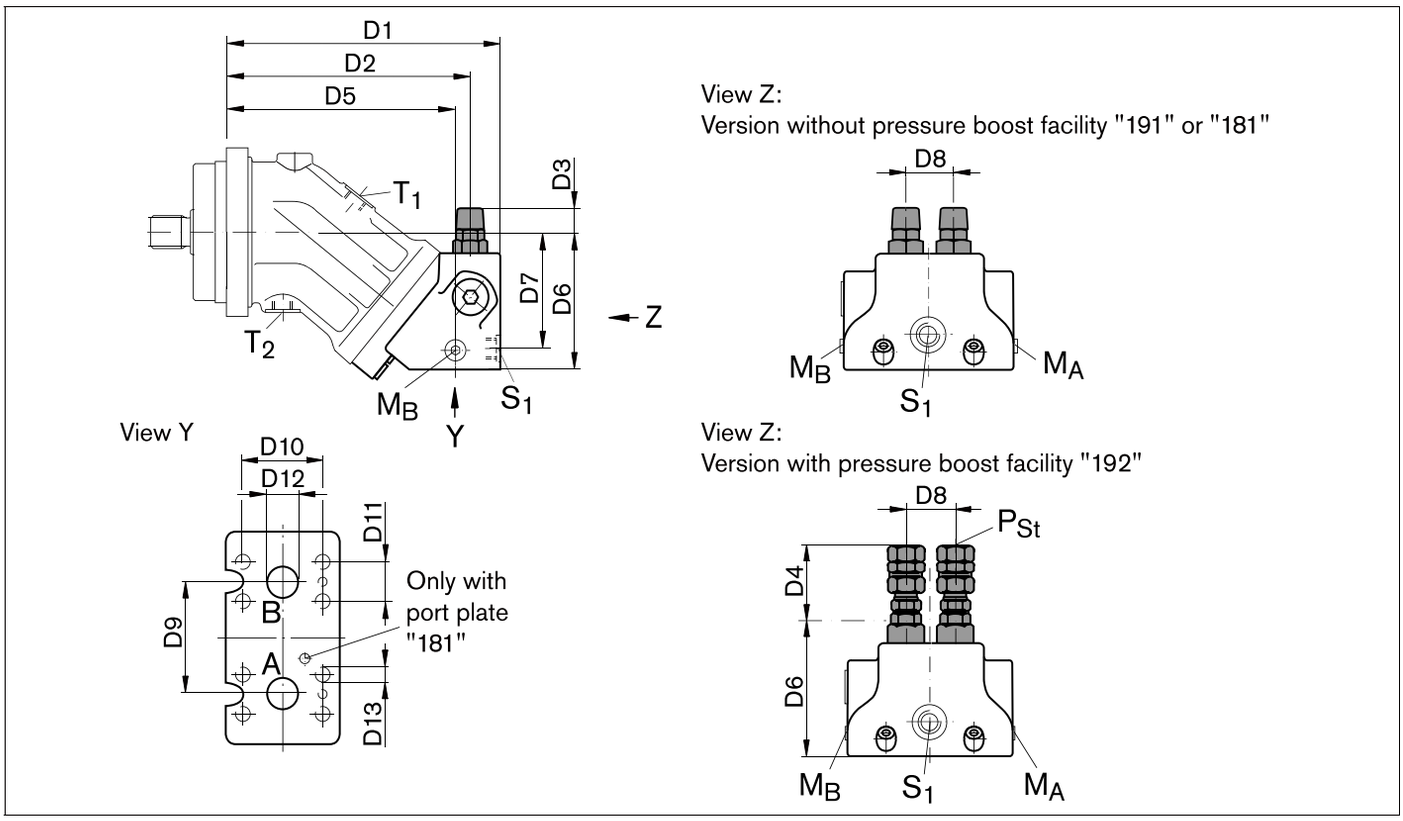


Version with pressure boost facility "192"



Pressure Relief Valve

Dimensions



Size		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13
28, 32	MHDB.**16**	209	186	25	68	174	102	87	36	66	50.8	23.8	ø19	M10; 17 deep
45	MHDB.**16**	222	198	22	65	187	113	98	36	66	50.8	23.8	ø19	M10; 17 deep
56, 63	MHDB.**22**	250	222	19	61	208	124	105	42	75	50.8	23.8	ø19	M10; 13 deep
80, 90	MHDB.**22**	271	243	17.5	59	229	134	114	42	75	57.2	27.8	ø25	M12; 18 deep
107, 125	MHDB.**32**	298	266	10	52	250	149.5	130	53	84	66.7	31.8	ø32	M14; 19 deep
160, 180	MHDB.**32**	332	301	5	47	285	170	149	53	84	66.7	31.8	ø32	M14; 19 deep

Size	A, B	S_1	M_A, M_B	P_{St}
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 instructions 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]	State
A, B	Service line	SAE J518	See above	450	O
S_1	Supply (only with port plate 191/192)	DIN 3852	See above	5	O
M_A, M_B	Measuring operating pressure	DIN 3852	See above	450	X
P_{St}	Pilot pressure (only with port plate 192)	DIN ISO 228	See above	30	O

Counterbalance valve BVD

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

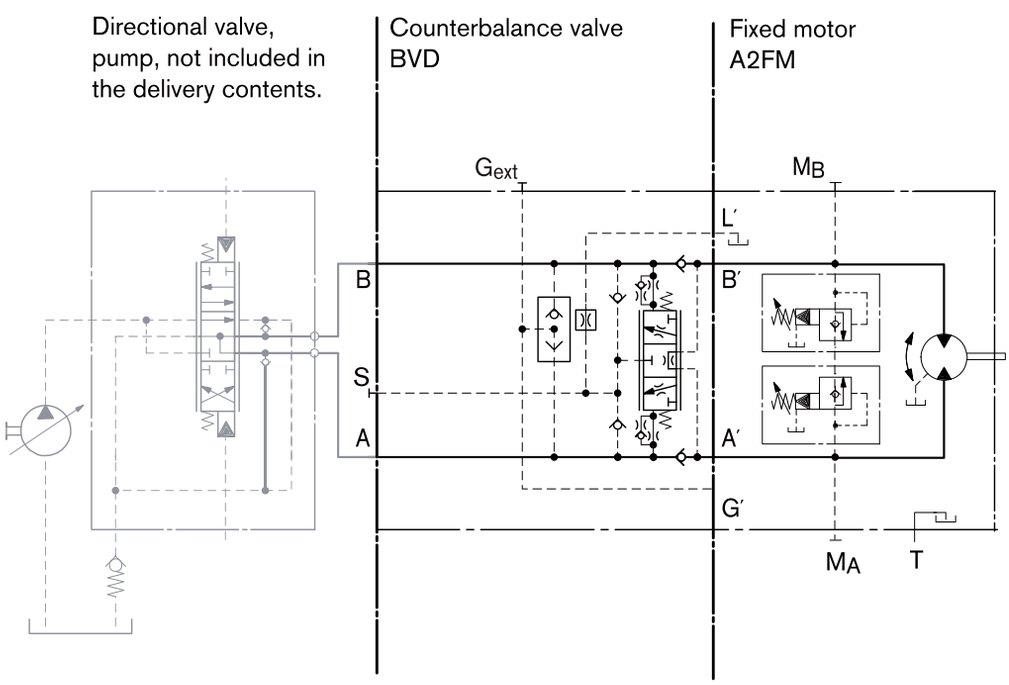
- BVD available for sizes 28 to 180 and BVE available for sizes 107 to 180.
- The counterbalance valve must be ordered additionally. We recommend ordering the counterbalance valve and the motor as a set. Ordering example: TS-A2FM90/61W-VAB**188**+BVD20F27S/41B-V03K16D0400S12
- The counterbalance valve does not replace the mechanical service brake and park brake.
- 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 mm^2/s)

Travel drive counterbalance valve BVD...F

Application option

- Travel drive on wheeled excavators

Example schematic for travel drive on wheeled excavators
TS-A2FM90/61W-VAB188+BVD20F27S/41B-V03K16D0400S12



Counterbalance valve BVD

Winch counterbalance valve BVD...W

Application options

- Winch drive in cranes (BVD)
- Track drive in excavator crawlers (BVD)

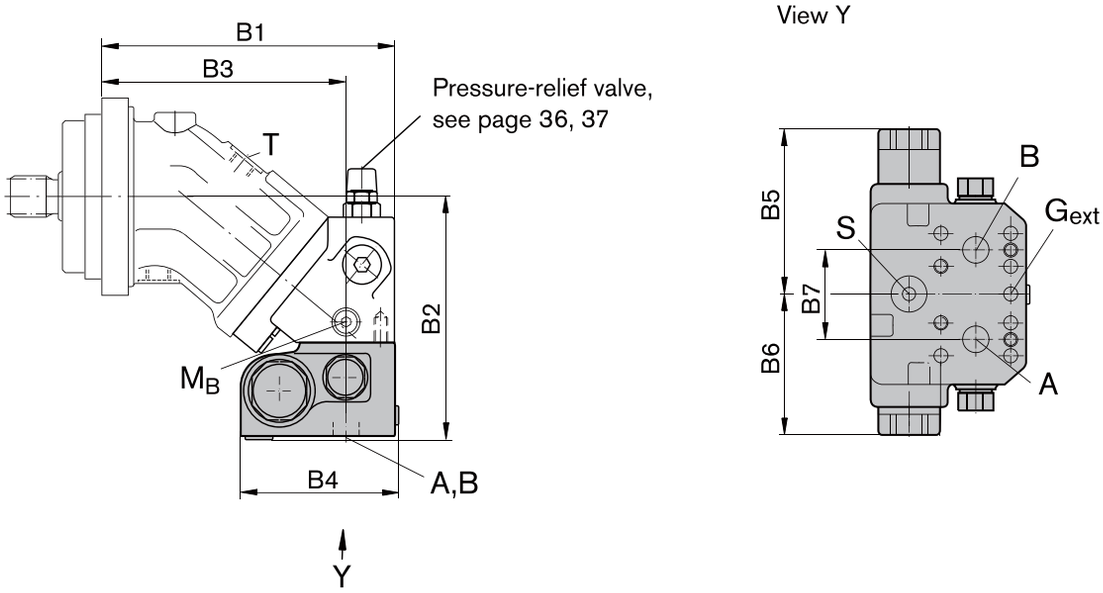
Permissible input flow or pressure in operation with DBD

Motor	Without valve		Restricted values in operation with DBV and BVD/BVE			
			BVD			
NG	p_{nom}/p_{max} [bar]	$q_{V\ max}$ [L/min]	NG	p_{nom}/p_{max} [bar]	q_V [L/min]	Code
28	400/450	176	20 (BVD)	350/420	100	188
32		201				
45		255				
56		280			220	
63		315				
80		360				
90		405				
107		427				178
125		500				
107		427	25 (BVD/BVE)		320	188
125		500				
160		577				
180		648				

BVD _____counterbalance valve, double-acting

Counterbalance valve BVD

Dimensions



A2FM 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	209	175	174	142	147	139	98	66
45	BVD**20**..16	3/4 in	222	196	187	142	147	139	98	66
56, 63	BVD**20**..17	3/4 in	250	197	208	142	147	139	98	75
80, 90	BVD**20**..27	1 in	271	207	229	142	147	139	98	75
107, 125	BVD**20**..28	1 in	298	238	251	142	147	139	98	84
107, 125	BVD**25**..38	$1^1/_4$ in	298	239	251	158	163	175	120.5	84
160, 180	BVD**25**..38	$1^1/_4$ in	332	260	285	158	163	175	120.5	84
107, 125	BVE**25**..38	$1^1/_4$ in	298	240	251	167	172	214	137	84
160, 180	BVE**25**..38	$1^1/_4$ in	332	260	285	167	172	214	137	84

Ports

Designation	Port for	Version	Standard	Size	Maximum pressure [bar]	State
A, B	Service line		SAE J518	see table above	420	O
S	Infeed	BVD20	DIN 3852	M22 x 1.5; 14 deep	30	X
		BVD25	DIN 3852	M27 x 2; 16 deep	30	X
Br	Brake release, reduced high pressure	L	DIN 3852	M12 x 1.5; 12.5 deep	30	O
G_{ext}	Brake release, high pressure	S	DIN 3852	M12 x 1.5; 12.5 deep	420	X
M_A, M_B	Measuring pressure A and B		ISO 6149	M12 x 1.5; 12 deep	420	X

Counterbalance valve BVD

Mounting the counterbalance valve

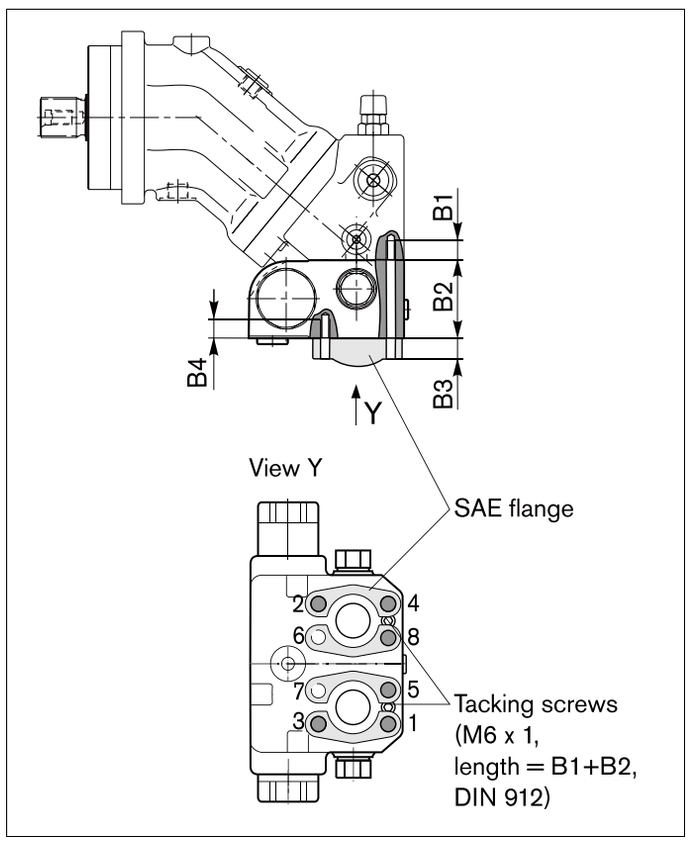
When delivered, the counterbalance valve is mounted to the motor with two tacking screws (transport protection). The tacking screws may not be removed while mounting the service lines. If the counterbalance valve and motor are delivered separately, the counterbalance valve must first be mounted to the 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

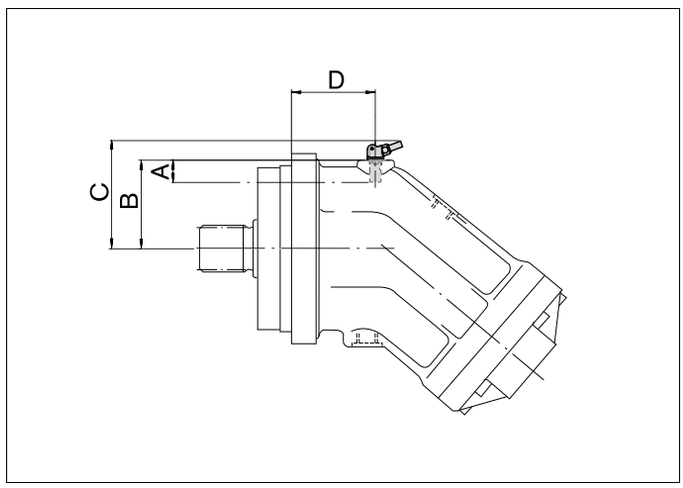


Size	28, 32, 45	56, 63	80, 90	107, 125, 160, 180	107, 125
Port plate	18				17
B1	M10 x 1.5; 17 deep	M10 x 1.5; 17 deep	M12 x 1.75; 18 deep	M14 x 2; 19 deep	M12 x 1.75; 17 deep
B2	78	68	68	85	68
B3	customer-specific				
B4	M10 x 1.5; 15 deep	M10 x 1.5; 15 deep	M12 x 1.75; 16 deep	M14 x 2; 19 deep	M12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

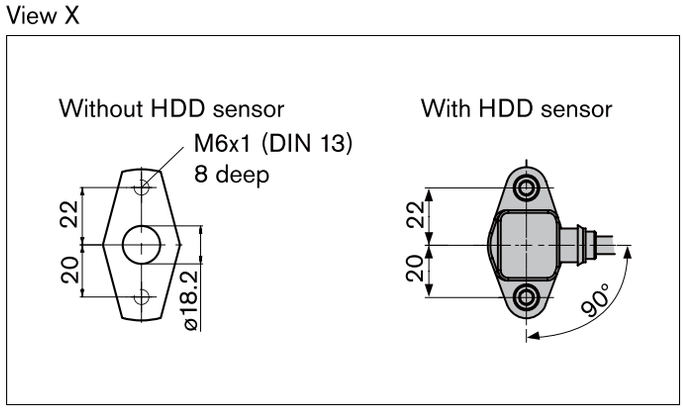
Speed Sensor

The versions TS-A2FM...U and TS-A2FM...F ("prepared for speed sensor", i.e. without sensor) is equipped with a toothed ring on the rotary group.
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.
Ordering code, technical data, dimensions and details on the connector, plus safety information about the sensor can be found in the relevant data sheet.
DSA
HDD
The sensor is mounted at the specially provided port D as fol-lows:
DSA_____with one mounting bolt
HDD_____with two mounting bolts
We recommend ordering the A2FM fixed motor complete with sensor mounted.

Version "V"
Sizes 23 to 200 with DSA sensor



View X



Size			23, 28, 32	45	56, 63	80, 90	107, 125
Number of teeth			38	45	47	53	59
DSA	A	Insertion depth (tolerance ± 0.1)	18.4	18.4	18.4	18.4	18.4
	B	Contact surface	57.9	64.9	69.9	74.9	79.9
	C		74.5	81.5	86.5	91.5	96.5
	D		54.7	54.3	61.5	72.5	76.8

Size			160, 180
Number of teeth			67
HDD	A	Insertion depth (tolerance ± 0.1)	–
	B	Contact surface	–
	C		–
	D		–
DSA	A	Insertion depth (tolerance ± 0.1)	18.4
	B	Contact surface	87.4
	C		104
	D		86.8

Installation Instructions

General

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

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

The case drain fluid in the motor housing must be directed to the reservoir via the highest available drain port (T_1, T_2).

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

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

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

Installation position

See the following examples 1 to 8.
Further installation positions are possible upon request.

Recommended installation positions: 1 and 2.

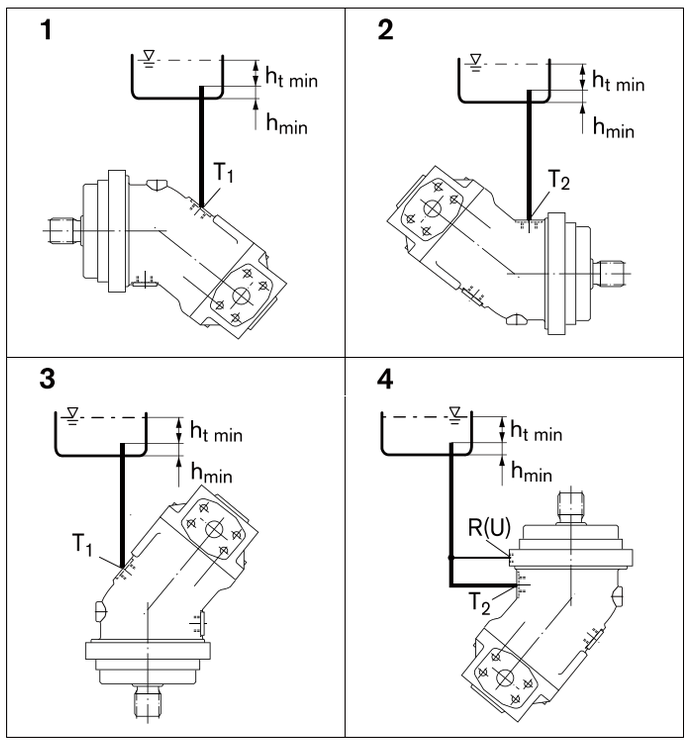
Note
With sizes 10 to 200 with installation position "shaft upward", an air-bleed port R is required (state in plain text when ordering - special version).

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

L_1	Filling / air bleed
R	Air bleed port (special version)
U	Bearing flushing / air bleed port
T_1, T_2	Drain port
$h_{t\,min}$	Minimum required immersion depth (200 mm)
h_{min}	Minimum required spacing to reservoir bottom (100 mm)

Below-reservoir installation (standard)

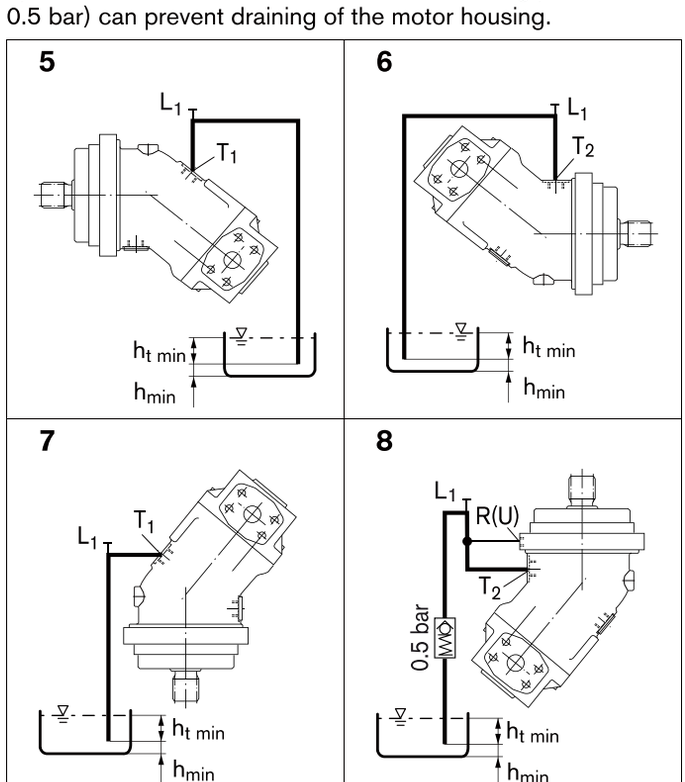
Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level.



Above-reservoir installation

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

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



The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract.

THM Huade Hydraulics Pvt Ltd
F-127, Phase-VIII, Focal Point,
Ludhiana-141010, Punjab (INDIA)
PH: 0161-2672777, 0161-2672778
E-mail: sales@thmhuade.com
Website: www.thmhuade.com

Follow us: