Rexroth
Bosch Group

Axial Piston Fixed Motor A2FM

RE 91001/09.07 1/36
Replaces: 07.05

Technical data sheet

Series 6

Sizes	Nominal pressure/Peak pressure
5	315/350 bar
10 to 200	400/450 bar
250 to 1000	350/400 bar

Open and closed circuits

Contents

Features

- Fixed motor with axial tapered piston rotary group of bent axis design, for hydrostatic drives in open and closed circuits
- For use in mobile and stationary application areas
- The output speed is dependent on the flow of the pump and the displacement of the motor.
- The output torque increases with the pressure differential between the high and low pressure sides and with increasing displacement.
- Careful selection of the displacements offered, permit sizes to be matched to practically every application
- High power density
- Compact design
- High overall efficiency
- Good starting characteristics
- Economical conception
- One piece pistons with piston rings

A2FM56/61W-VBB040 90748640

Ordering Code / Standard Program (ordering code size 5 see page 8)

	A2F		M		/	6		W	–	V					
01	02	03	04	05		06	07	08		09	10	11	12	13	14

Hydraulic fluid

01	Mineral oil and HFD. HFD for sizes 250 to 1000 only in combination with long-life bearing "L" (no code)		
	HFB-, HFC hydraulic fluid	Sizes 10 to 200 (no code)	
		Sizes 250 to 1000 (only in combination with long-life bearing "L")	**E-**

Axial piston unit

02	Bent axis design, fixed	**A2F**

Drive shaft bearing

		10 to 200	250 to 500	710 to 1000	
03	Standard bearing (no code)	●	●	–	
	Long-life bearing	–	●	●	**L**

Operation mode

04	Motor (plug-in motor A2FE see RE 91008)	**M**

Size

05	≈ Displacement V_g (cm^3)																				
		10	**12**	**16**	**23**	**28**	**32**	**45**	**56**	**63**	**80**	**90**	**107**	**125**	**160**	**180**	**200**	**250**	**355**	**500**	**710**	**1000**

Series

06		**6**

Index

07		sizes 10 to 180	**1**
		size 200	**3**
		sizes 250 to 1000	**0**

Direction of rotation

08	Viewed from shaft end	alternating	**W**

Seals

09	FKM (fluor-caoutchouc)	**V**

Shaft end		**10**	**12**	**16**	**23**	**28**	**32**	**45**	**56**	**63**	**80**	**90**	**107**	**125**	**160**	**180**	**200**	**250**	**355**	**500**	**710**	**1000**	
10	Splined shaft DIN 5480	●	●	●	●	●	●	–	●	●	●	●	●	●	●	●	●	–	–	–	–	–	**A**
		●	●	–	●	●	–	●	●	–	●	–	●	–	●	–	–	●	●	●	●	●	**Z**
	Parallel keyed shaft, DIN 6885	●	●	●	●	●	●	–	●	●	●	●	●	●	●	●	●	–	–	–	–	–	**B**
		●	●	–	●	●	–	●	●	–	●	–	●	–	●	–	–	●	●	●	●	●	**P**

Mounting flange

		10 to 250	355 to 1000	
11	4-hole – ISO 3019-2	●	–	**B**
	8-hole – ISO 3019-2	–	●	**H**

Ordering Code / Standard Program (ordering code size 5 see page 8)

	A2F		M		/	6		W	–	V					
01	02	03	04	05		06	07	08		09	10	11	12	13	14

	Service line ports [1]		10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	200	250	355	500	710	1000	
12	SAE flange ports A and B, rear **01**	0	–	–	–	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	**010**
		7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	●	●	❍	❍	**017**
	SAE flange ports A and B, at side, opposite **02**	0	–	–	–	●	●	●	●	●	●	●	●	●	●	●	●	–	●	–	–	–	–	**020**
		7	–	–	–	–	–	–	●	●	●	●	●	●	●	●	●	–	●	–	–	–	–	**027**
	Threaded ports A and B, at side, opposite **03**	0	●	●	●	●	●	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**030**
	Threaded ports A and B, at side and rear [2] **04**	0	●	●	●	●	●	●	●	●	●	–	–	–	–	–	–	–	●	–	–	–	–	**040**
	SAE flange ports A and B, bottom (same side) **10**	0	–	–	–	–	●	●	●	●	●	●	●	●	●	●	●	–	–	●	–	–	–	**100**
	Port plate for mounting a counterbalance valve **18**	1	–	–	–	–	●	●	●	●	●	●	●	●	●	●	●	–	–	–	–	–	–	**181**
	Port plate with pressure relief valves **19**	1	–	–	–	–	●	●	●	●	●	●	●	●	●	●	●	–	–	–	–	–	–	**191**
		2	–	–	–	–	●	●	●	●	●	●	●	●	●	●	●	–	–	–	–	–	–	**192**

	Valves	
	Without valve	**0**
	With pressure relief valves (without pressure sequence range)	**1**
	With pressure relief valves (with pressure sequence range)	**2**
	With flush and boost pressure valve	**7**

	Speed measurement	10 to 16	23 to 180	200	250	355 to 1000	
13	Without speed measurement (no code)	●	●	●	●	●	
	Prepared for speed measurement (ID) [3]	–	●	–	–	–	**D**
	Prepared for speed measurement (HDD) [3]	–	●	●	●	❍	**F**

	Special design	
14	Standard version (no code)	
	Specific version for slew drive applications (standard for port plate 19)	**J**

[1] Fastening threads resp. threaded ports are metric
[2] At side (sizes 10 to 63) or rear (size 250) threaded ports plugged with locking screw
[3] Complete order recommended, speed sensor page 32

● = available ❍ = on request – = not available

▭ = preferred program

Technical Data

Hydraulic fluid

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

The fixed motor A2FM is unsuitable for operation with HFA. If HFB, HFC and HFD or environmentally acceptable hydraulic fluids are being used, the limitations regarding technical data and seals mentioned in RE 90221 and RE 90223 must be observed.

When ordering, please indicate the used hydraulic fluid.

Operating viscosity range

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

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

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

Limits of viscosity range

The limiting values for viscosity are as follows:

Sizes 5 to 200:

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

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

Sizes 250 to 1000:

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

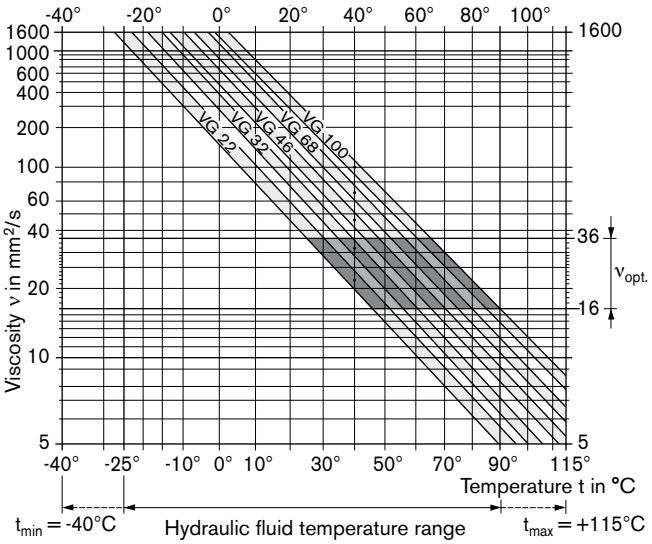
ν_{max} = 1000 mm²/s,
short-term (t < 3 min)
at cold start (p ≤ 30 bar, n ≤ 1000 rpm, t_{min} = -25°C).
Only for starting up without load. Optimum operating viscosity must be reached within approx. 15 minutes.

Note that the maximum hydraulic fluid temperature of 115°C (90°C at size 250 to 1000) must not be exceeded locally either (e.g. in the bearing area). The temperature in the bearing area is - depending on pressure and speed - up to 12 K higher than the average case drain temperature.

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

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

Selection diagram



Details regarding the choice of hydraulic fluid

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

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

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

Please note:
The case drain temperature, which is affected by pressure and speed, is always higher than the control temperature or tank temperature. At no point in the system may the temperature be higher than 115°C for sizes 5 to 200 or 90°C for sizes 250 to 1000.

If the above conditions cannot be maintained due to extreme operating parameters, we recommend flushing the case at port U (size 250 to 1000) or using a flush and boost pressure valve (see page 28).

Filtration

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

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

20/18/15 according to ISO 4406.

At very high hydraulic fluid temperatures (90°C to max. 115°C, not permitted for sizes 250 to 1000) at least cleanliness level

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

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

Technical Data

Operational pressure range

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

Size 5	Shaft end B	Shaft end C
Nominal pressure p_N	210 bar	315 bar
Peak pressure p_{max}	250 bar	350 bar
Total pressure (A + B)	630 bar	630 bar

Sizes 10 to 200	Shaft end A, Z	Shaft end B, P
Nominal pressure p_N	400 bar	350 bar
Peak pressure p_{max}	450 bar	400 bar
specified (A + B)	700 bar	700 bar

Sizes 250 to 1000	
Nominal pressure p_N	350 bar
Peak pressure p_{max}	400 bar
Total pressure (A + B)	700 bar

Please note:
Sizes 10 to 200: With shaft end Z and P, a nominal pressure of $p_N = 315$ bar ($p_{max} = 350$ bar) is permissible for drives with radial loading of the drive shaft (pinions, V-belts)!
Sizes 250 to 1000: Please contact us.

Size 56 with shaft end Z: $p_N = 350$ bar, $p_{max} = 400$ bar

In cases of pulsating loading above 315 bar, we recommend the version with splined shaft A (sizes 10 to 200) or with splined shaft Z (sizes 45, 250 to 1000).

Minimum inlet pressure, see page 7

Direction of flow

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

Speed range

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

Long-life bearing (sizes 250 to 1000)

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

Flushing volumes (recommended)

Size	**250**	**355**	**500**	**710**	**1000**
$q_{v\ flush}$ (L/min)	10	16	16	16	16

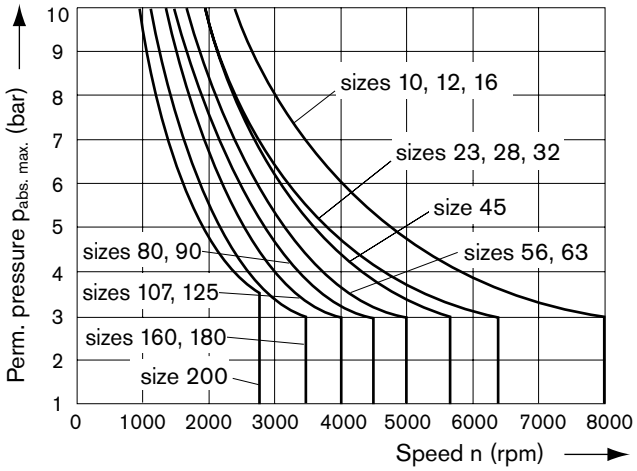
Shaft seal ring

Permissible pressure loading

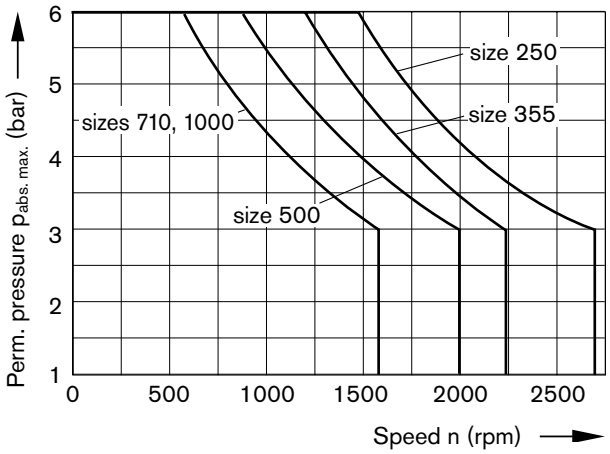
The service life of the shaft seal ring is affected by the speed of the motor and the case drain pressure. It is recommended that the average, continuous case drain pressure at operating temperature 3 bar absolute not be exceeded (max. permissible case drain pressure 6 bar absolute at reduced speed,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

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

Sizes 10 to 200



Sizes 250 to 1000



Temperature range

The FKM shaft seal ring is permissible for case temperatures of
-25°C to +115°C at sizes 5 to 200 and
-25°C to +90°C at sizes 250 to 1000

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

Technical Data

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

Size				5	10	12	16	23	28	32	45	56	63	80
Displacement		V_g	cm^3	4,93	10,3	12	16	22,9	28,1	32	45,6	56,1	63	80,4
Max. speed		n_{max}	rpm	10000	8000	8000	8000	6300	6300	6300	5600	5000	5000	4500
		$n_{max\ limit}$ [1]	rpm	11000	8800	8800	8800	6900	6900	6900	6200	5500	5500	5000
Max. flow		$q_{V\ max}$	L/min	49	82	96	128	144	176	201	255	280	315	360
Torque at	$\Delta p = 350$ bar	T	Nm	24,7 [2]	57	67	88	126	156	178	254	312	350	445
	$\Delta p = 400$ bar	T	Nm	–	65	76	100	144	178	204	290	356	400	508
Rotary stiffness		c	Nm/rad	625	922	1250	1590	2560	2930	3120	4180	5940	6250	8730
Moment of inertia for rotary group		J_{TW}	kgm^2	0,00006	0,0004	0,0004	0,0004	0,0012	0,0012	0,0012	0,0024	0,0042	0,0042	0,0072
Angular acceleration maximum		α	rad/s^2	5000	5000	5000	5000	6500	6500	6500	14600	7500	7500	6000
Filling capacity		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				90	107	125	160	180	200	250	355	500	710	1000
Displacement		V_g	cm^3	90	106,7	125	160,4	180	200	250	355	500	710	1000
Max. speed		n_{max}	rpm	4500	4000	4000	3600	3600	2750	2700	2240	2000	1600	1600
		$n_{max\ limit}$ [1]	rpm	5000	4400	4400	4000	4000	3000	–	–	–	–	–
Max. flow		$q_{V\ max}$	L/min	405	427	500	577	648	550	675	795	1000	1136	1600
Torque at	$\Delta p = 350$ bar	T	Nm	501	595	697	889	1001	1114	1393	1978	2785	3955	5570
	$\Delta p = 400$ bar	T	Nm	572	680	796	1016	1144	1272	–	–	–	–	–
Rotary stiffness		c	Nm/rad	9140	11200	11900	17400	18200	57300	73100	96100	144000	270000	324000
Moment of inertia for rotary group		J_{TW}	kgm^2	0,0072	0,0116	0,0116	0,0220	0,0220	0,0353	0,061	0,102	0,178	0,55	0,55
Angular acceleration maximum		α	rad/s^2	6000	4500	4500	3500	3500	11000	10000	8300	5500	4300	4000
Filling capacity		V	L	0,55	0,8	0,8	1,1	1,1	2,7	2,5	3,5	4,2	8	8
Mass (approx.)		m	kg	23	32	32	45	45	66	73	110	155	325	336

[1] Intermittent maximum speed: overspeed at discharge and over-running travel operations, $t < 5$ s and $\Delta p < 150$ bar
[2] Torque at $\Delta p = 315$ bar

Caution: Exceeding the permissible limit values may result in a loss of function, a reduction in service life or in the destruction of the axial piston unit.
Other permissible limit values with respect to speed variation, reduced angular accelaration as a function of the frequency and the permissible startup angular acceleration (lower than the maximum angular acceleration) can be found in data sheet RE 90261.

Determining the size

Flow $$q_v = \frac{V_g \cdot n}{1000 \cdot \eta_v} \quad \text{L/min}$$

Speed $$n = \frac{q_V \cdot 1000 \cdot \eta_v}{V_g} \quad \text{rpm}$$

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

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

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

Technical Data

Permissible radial and axial loading on the drive shaft

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

Size			5	10	12	16	23	28	32	45	56	63	80
Radial force, max. [1] at distance a (from shaft collar)	$F_{q\,max}$	N	710	2350	2750	3700	4300	5400	6100	8150[2]	9200[2]	10300	11500[2]
	a	mm	12	16	16	16	16	16	16	18	18	18	20
Axial force, max. [3]	$+F_{ax\,max}$	N	180	320	320	320	500	500	500	630	800	800	1000
	$-F_{ax\,max}$	N	180	320	320	320	500	500	500	630	800	800	1000
Permissible axial force/bar operating pressure	$\pm F_{ax\,per.}$/bar	N/bar	1,5	3,0	3,0	3,0	5,2	5,2	5,2	7,0	8,7	8,7	10,6

Size			90	107	125	160	180	200	250	355	500	710	1000
Radial force, max. [1] at distance a (from shaft collar)	$F_{q\,max}$	N	12900	13600	15900	18400	20600	22900	1200[4]	1500[4]	1900[4]	3000[4]	2600[4]
	a	mm	20	20	20	25	25	25	41	52,5	52,5	67,5	67,5
Axial force, max. [3]	$+F_{ax\,max}$	N	1000	1250	1250	1600	1600	1600	2000	2500	3000	4400	4400
	$-F_{ax\,max}$	N	1000	1250	1250	1600	1600	1600	2000	2500	3000	4400	4400
Permissible axial force/bar operating pressure	$\pm F_{ax\,per.}$/bar	N/bar	10,6	12,9	12,9	16,7	16,7	16,7	[5]	[5]	[5]	[5]	[5]

[1] During intermittent operation (sizes 5 to 200)
[2] Permissible max. radial force with shaft end Z: $F_{q\,max} = 6500$ N
[3] Max. permissible axial force when at a standstill or when axial piston unit working in pressureless conditions
[4] When at a standstill or when axial piston unit operating in depressurized condition. Higher forces are permissible when under pressure. Please contact us.
[5] Please contact us

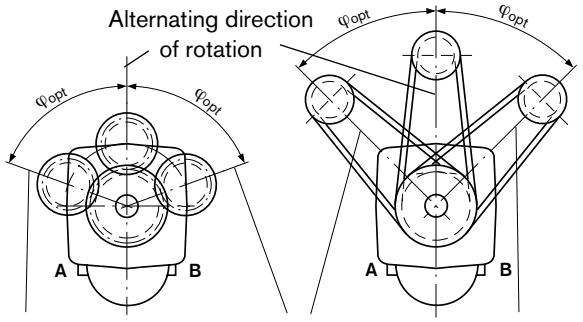
When considering the permissible axial force, the force-transfer direction must be taken into account:

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

Effect of radial force F_q on the service life of bearings

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

	Toothed gear drive	V-belt drive
Size	$\varphi_{opt.}$	$\varphi_{opt.}$
10 to 180	± 70°	± 45°
200 to 1000	± 45°	± 70°



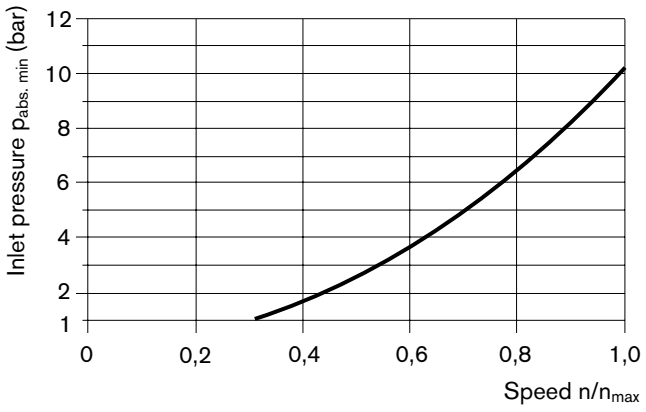
"Counter-clockwise" direction of rotation
Pressure on port **B**

"Clockwise" direction of rotation
Pressure on port **A**

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

Minimum inlet pressure on service line port A (B)

To prevent damage to the motor, there must be a minimum inlet pressure in the inlet area. The minimum inlet pressure is dependent on the speed of the fixed motor.



Please contact us if these conditions cannot be satisfied.

Ordering Code / Standard Program – Size 5

A2F	5	/	60	W	–		3
01	02		03	04		05	06

Axial piston unit

01	Bent axis design, fixed	**A2F**

Size

02	≈ Displacement V_g (cm^3)	**5**

Series

03		**60**

Direction of rotation

04	Viewed from shaft end	alternating	**W**

Shaft end

05	Parallel keyed shaft DIN 6885	**B**
	Tapered shaft with spigot and spring washer DIN 6888	**C**

Service line ports

06	Threaded ports A und B at side, metric	**3**

Additional instructions in text form

Seals

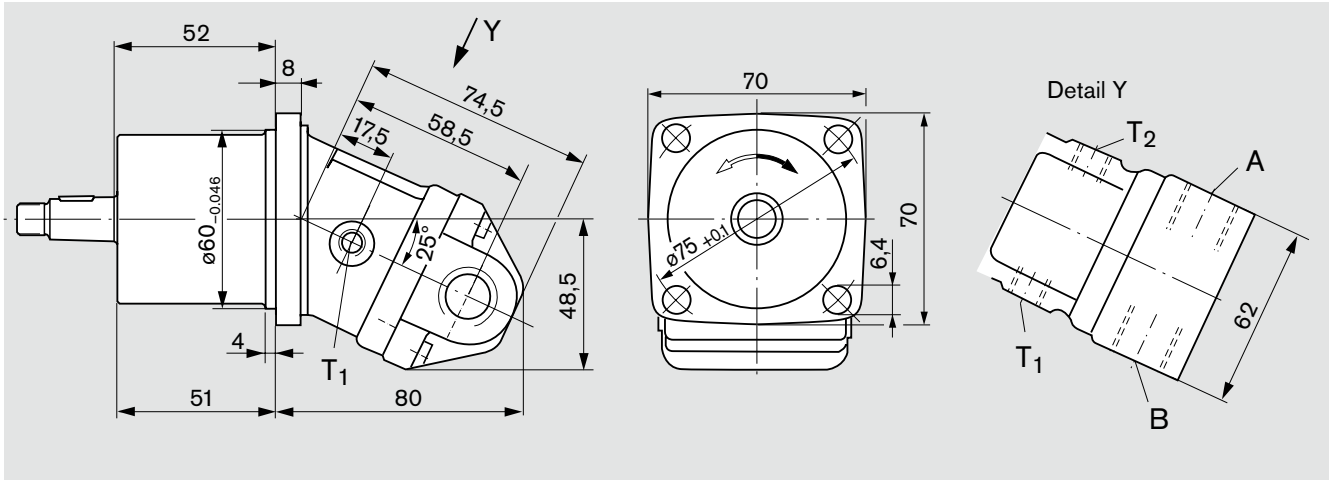
The fixed motor A2F5 is equipped with NBR- (nitril-caoutchouc) seals in standard design.

In case of need FKM- (fluor-caoutchouc) seals please indicate when ordering in plain text:

"*with FKM-seals*"

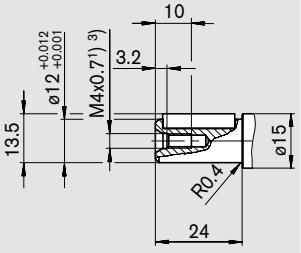
Unit Dimensions, Size 5

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

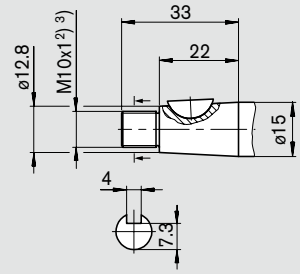


Shaft ends

B Parallel keyed shaft, DIN 6885, A4x4x20 $p_N = 210$ bar



C Tapered shaft with spigot and spring washer 3x5 DIN 6888, $p_N = 315$ bar (taper 1:10)



Ports

A, B	Service line ports DIN 3852	M18x1,5; 12 deep	140 Nm 3)
T_1, T_2	Case drain ports DIN 3852	M10x1; 8 deep	30 Nm 3)

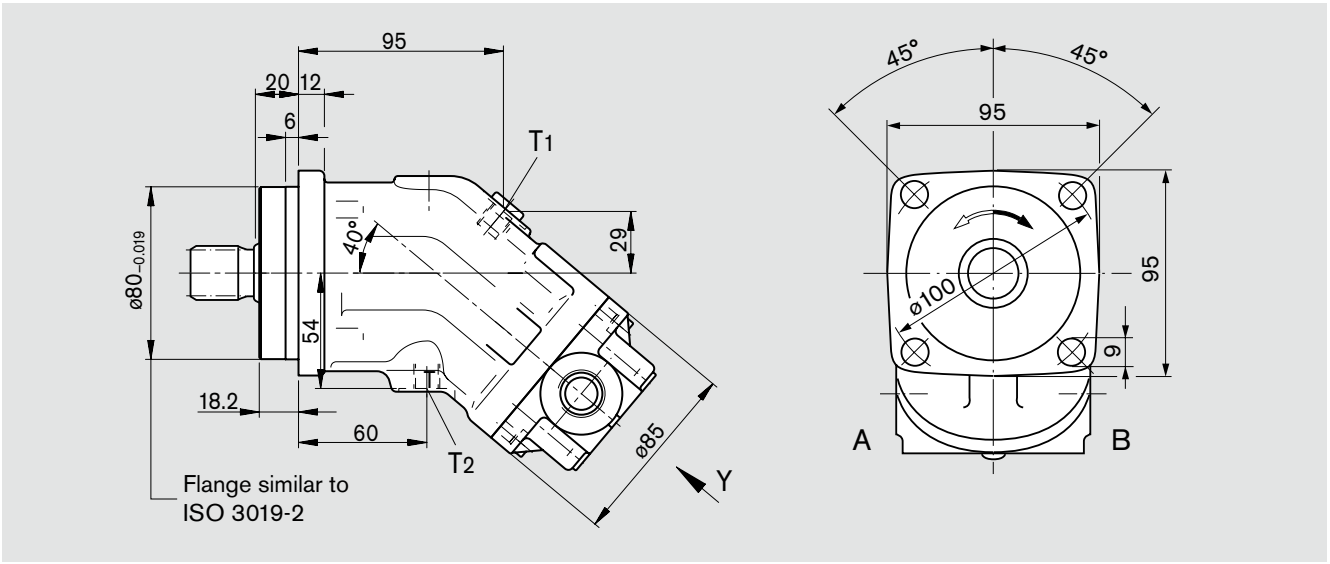
1) Center bore according to DIN 332 (thread according to DIN 13)

2) Thread according to DIN 3852, max. tightening torque: 30 Nm

3) Please observe the general notes for the max. tightening torques on page 36

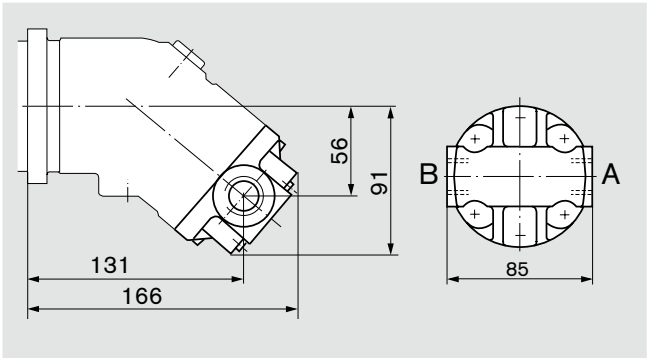
Unit Dimensions, Sizes 10, 12, 16

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

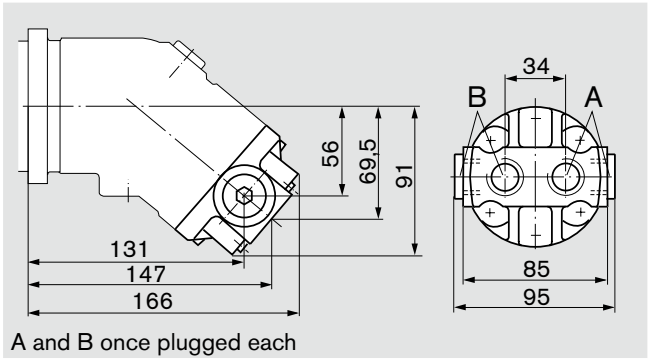


Port plates

03 Threaded ports, at side



04 Threaded ports, at side and rear

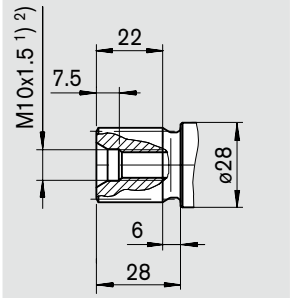


A and B once plugged each

Shaft ends

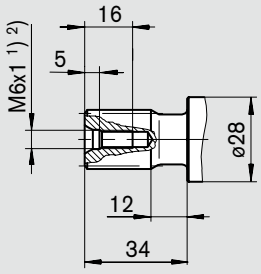
Sizes 10, 12, 16

A Splined shaft DIN 5480
W25x1,25x30x18x9g
p_N = 400 bar



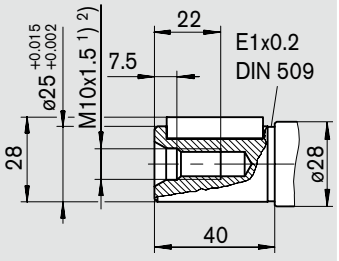
Sizes 10, 12

Z Splined shaft DIN 5480
W20x1,25x30x14x9g
p_N = 400 bar



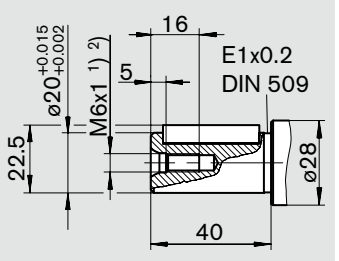
Sizes 10, 12, 16

B Parallel keyed shaft,
DIN 6885, AS8x7x32
p_N = 350 bar



Sizes 10, 12

P Parallel keyed shaft,
DIN 6885, A6x6x32
p_N = 350 bar



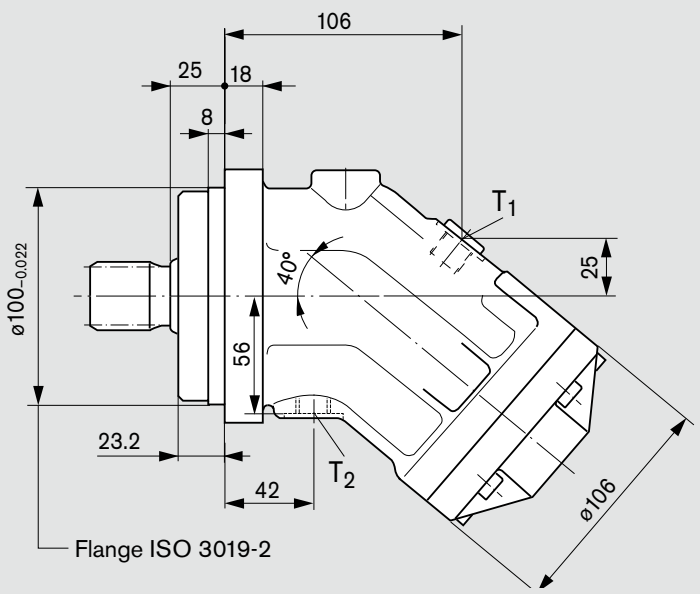
Ports

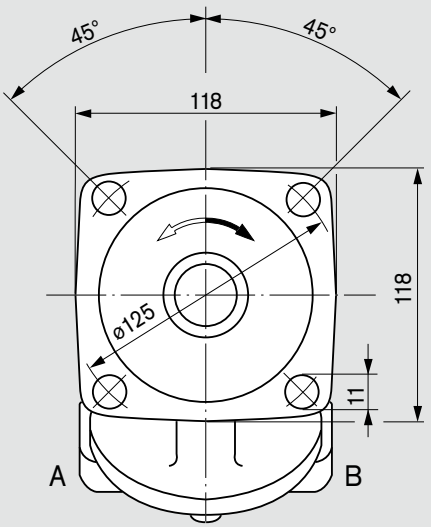
A, B	Service line ports	DIN 3852	M22x1,5; 14 deep	210 Nm 2)
T_1, T_2	Case drain ports (T_1 plugged)	DIN 3852	M12x1,5; 12 deep	50 Nm 2)

1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 36

Unit Dimensions, Sizes 23, 28, 32

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

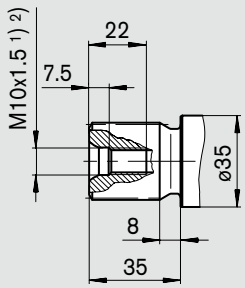




Shaft ends

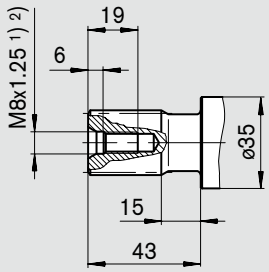
Sizes 23, 28, 32

A Splined shaft DIN 5480
W30x2x30x14x9g
p_N = 400 bar



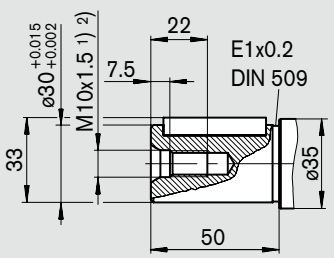
Sizes 23, 28

Z Splined shaft DIN 5480
W25x1,25x30x18x9g
p_N = 400 bar



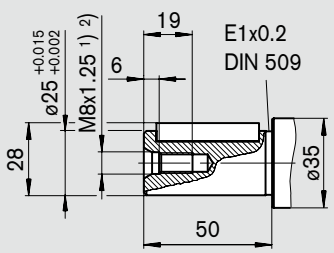
Sizes 23, 28, 32

B Parallel keyed shaft,
DIN 6885, AS8x7x40
p_N = 350 bar



Sizes 23, 28

P Parallel keyed shaft,
DIN 6885, AS8x7x40
p_N = 350 bar



Ports

A, B	Service line ports (see port plates)			
T_1, T_2	Case drain ports (T_1 plugged)	DIN 3852	M16x1,5; 12 deep	100 Nm 2)

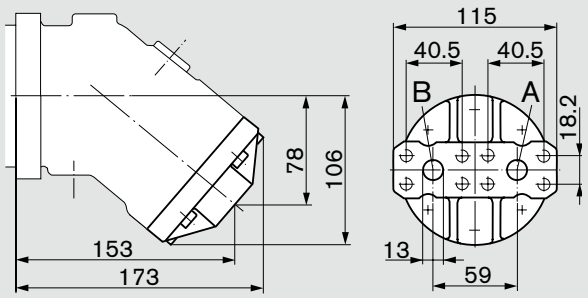
1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 36

Unit Dimensions, Sizes 23, 28, 32

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

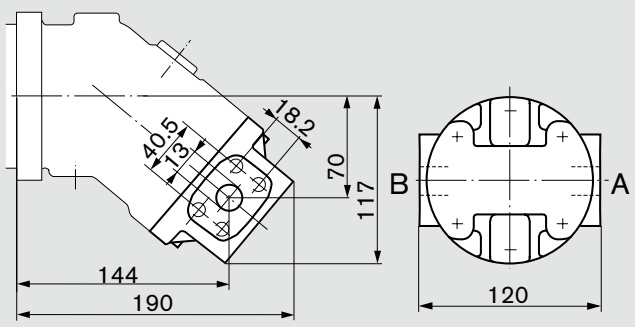
Port plates

01 SAE flange ports, rear



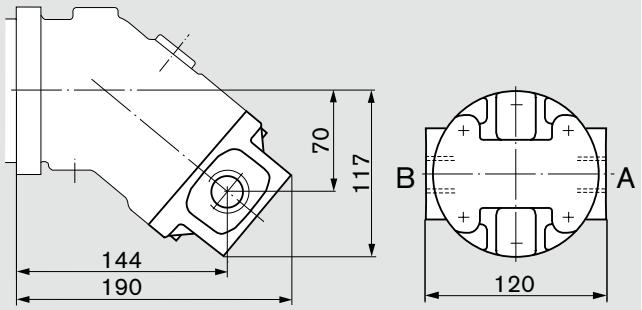
A, B	Service line ports (high pressure series)	SAE J518	1/2 in
	Fastening threads	DIN 13	M8x1,25; 15 deep [1]

02 SAE flange ports, at side



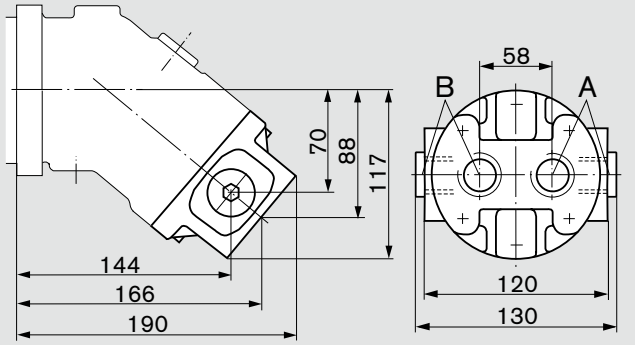
A, B	Service line ports (high pressure series)	SAE J518	1/2 in
	Fastening threads	DIN 13	M8x1,25; 15 deep [1]

03 Threaded ports, at side



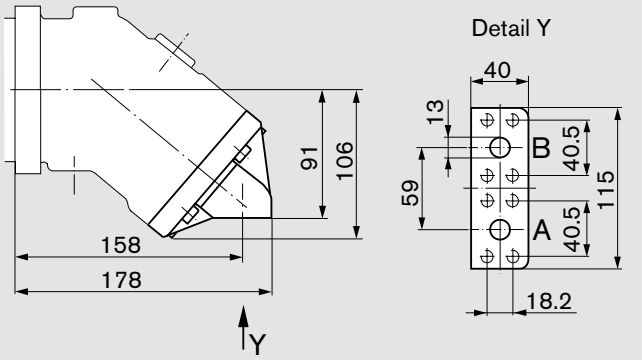
A, B	Service line ports DIN 3852	M27x2; 16 deep	330 Nm [1]

04 Threaded ports, at side and rear



A, B	Service line ports DIN 3852	M27x2; 16 deep once plugged each	330 Nm [1]

10 SAE flange ports, bottom [2]



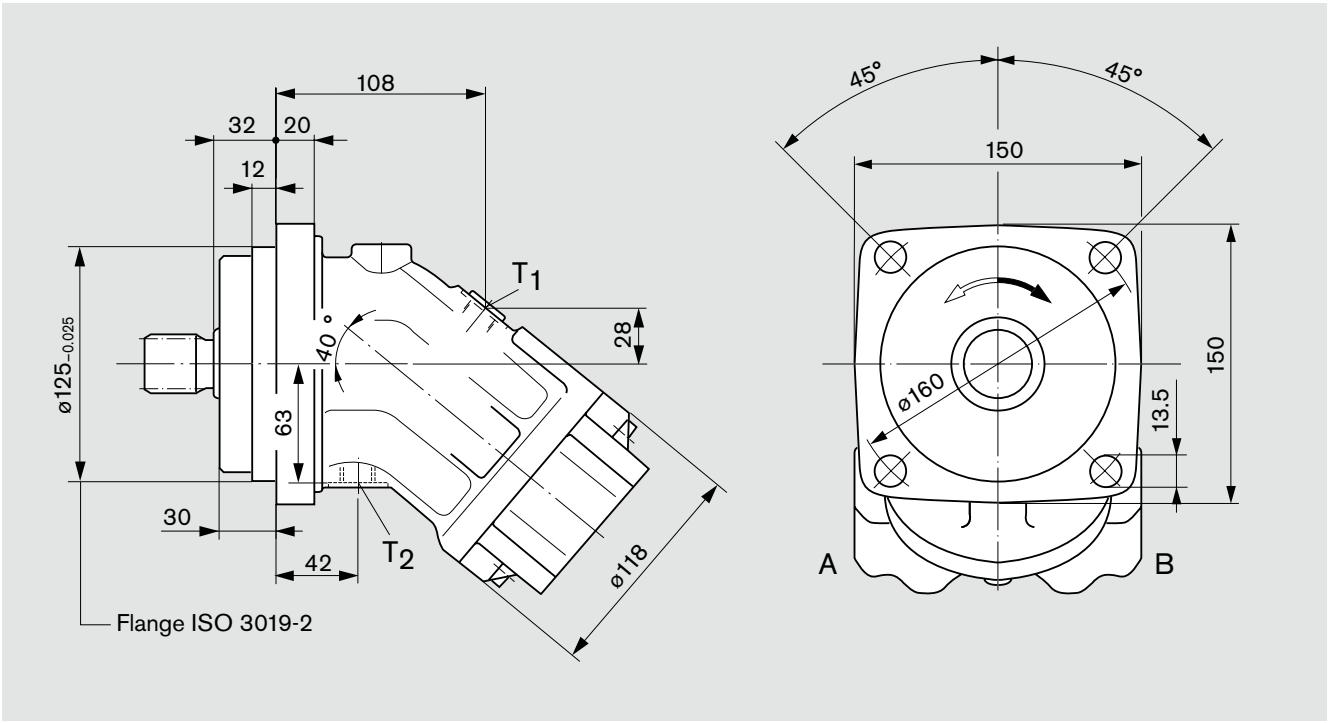
A, B	Service line ports (high pressure series)	SAE J518	1/2 in
	Fastening threads	DIN 13	M8x1,25; 15 deep [1]

Note: Port plates 18 and 19 see pages 29, 30

[1] Please observe the general notes for the max. tightening torques on page 36
[2] Only sizes 28 and 32

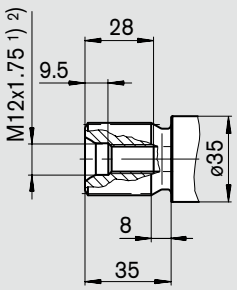
Unit Dimensions, Size 45

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

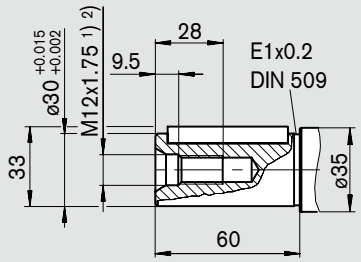


Shaft ends

Z Splined shaft DIN 5480
W30x2x30x14x9g
p_N = 400 bar



P Parallel keyed shaft,
DIN 6885, AS8x7x50
p_N = 350 bar



Ports

A, B	Service line ports (see port plates)			
T_1, T_2	Case drain ports (T_1 plugged)	DIN 3852	M18x1,5; 12 deep	140 Nm 2)

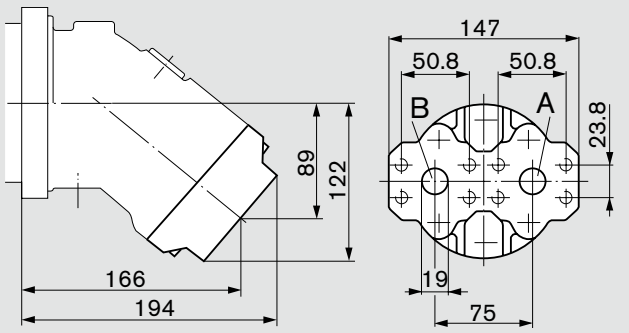
1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 36

Unit Dimensions, Size 45

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

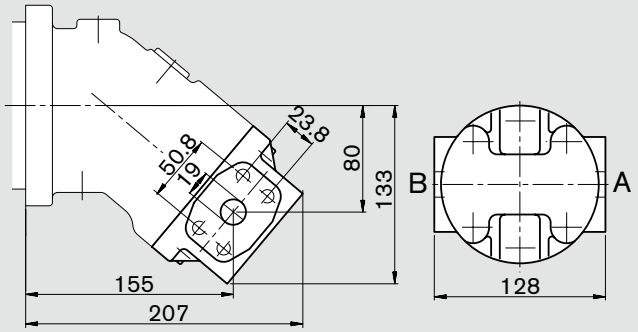
Port plates

01 SAE flange ports, rear



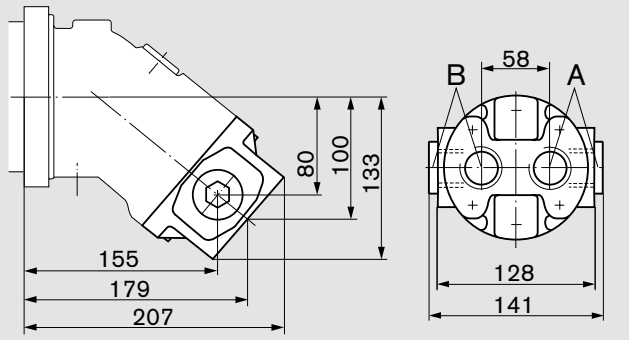
A, B	Service line ports (high pressure series)	SAE J518	3/4 in
	Fastening threads	DIN 13	M10x1,5; 17 deep [1]

02 SAE flange ports, at side



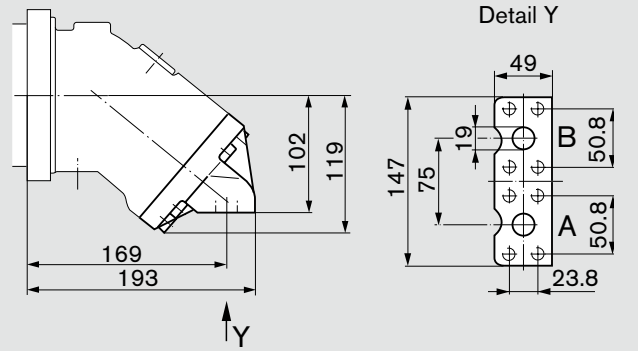
A, B	Service line ports (high pressure series)	SAE J518	3/4 in
	Fastening threads	DIN 13	M10x1,5; 17 deep [1]

04 Threaded ports, at side and rear



A, B	Service line ports DIN 3852	M33x2; 18 deep once plugged each	540 Nm [1]

10 SAE flange ports, bottom



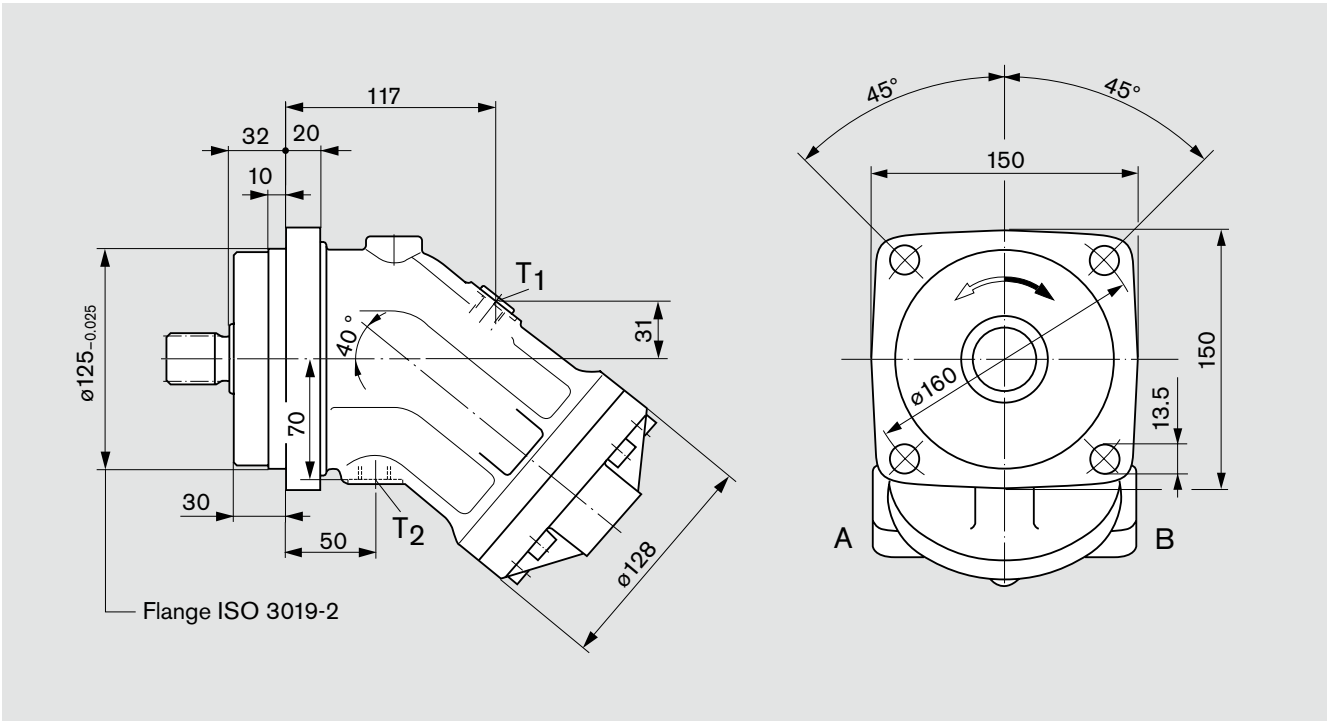
A, B	Service line ports (high pressure series)	SAE J518	3/4 in
	Fastening threads	DIN 13	M10x1,5; 17 deep [1]

[1]) Please observe the general notes for the max. tightening torques on page 36

Note: Port plates 18 and 19 see pages 29, 30

Unit Dimensions, Sizes 56, 63

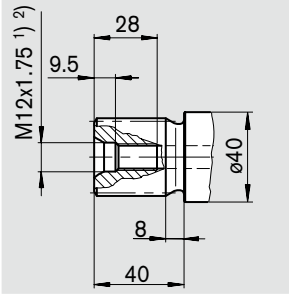
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.



Shaft ends

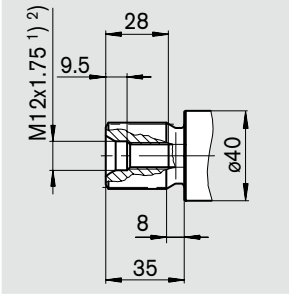
Sizes 56, 63

A Splined shaft DIN 5480
W35x2x30x16x9g
p_N = 400 bar



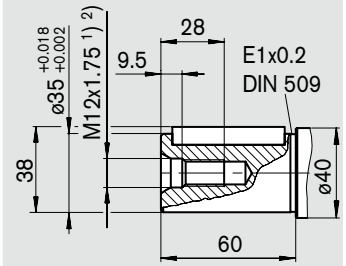
Size 56

Z Splined shaft DIN 5480
W30x2x30x14x9g
p_N = 350 bar



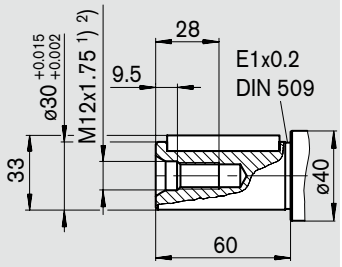
Sizes 56, 63

B Parallel keyed shaft,
DIN 6885, AS10x8x50
p_N = 350 bar



Size 56

P Parallel keyed shaft,
DIN 6885, AS8x7x50
p_N = 350 bar



Ports

A, B	Service line ports (see port plates)			
T_1, T_2	Case drain ports (T_1 plugged)	DIN 3852	M18x1,5; 12 deep	140 Nm 2)

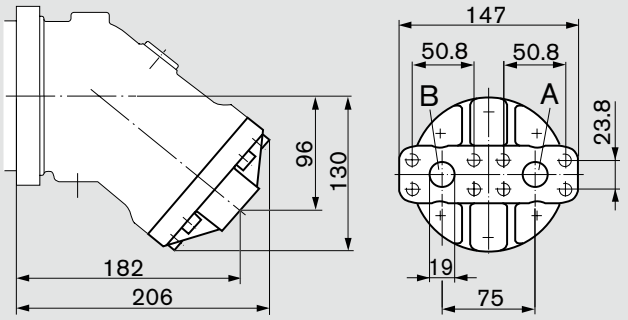
1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 36

Unit Dimensions, Sizes 56, 63

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

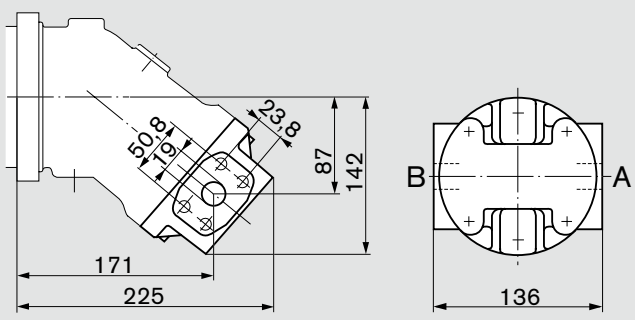
Port plates

01 SAE flange ports, rear



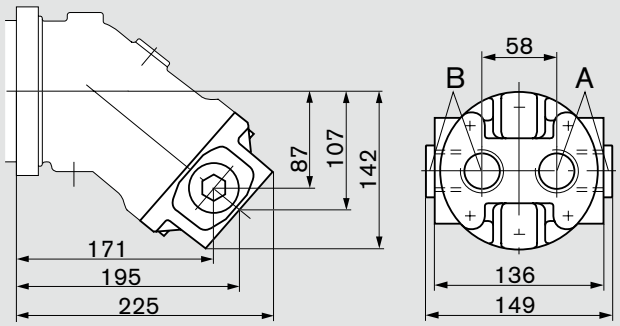
A, B	Service line ports (high pressure series)	SAE J518	3/4 in
	Fastening threads	DIN 13	M10x1,5; 17 deep [1]

02 SAE flange ports, at side



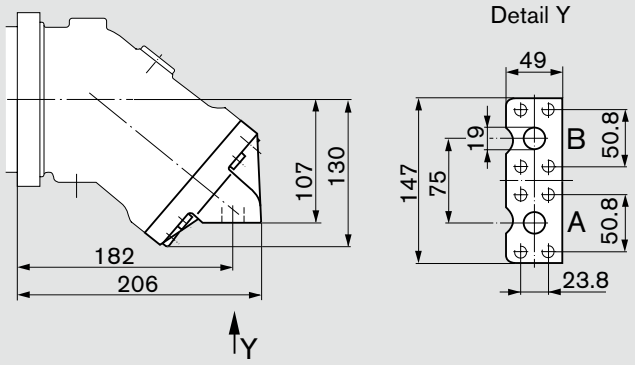
A, B	Service line ports (high pressure series)	SAE J518	3/4 in
	Fastening threads	DIN 13	M10x1,5; 17 deep [1]

04 Threaded ports, at side and rear



A, B	Service line ports DIN 3852	M33x2; 18 deep once plugged each	540 Nm [1]

10 SAE flange ports, bottom



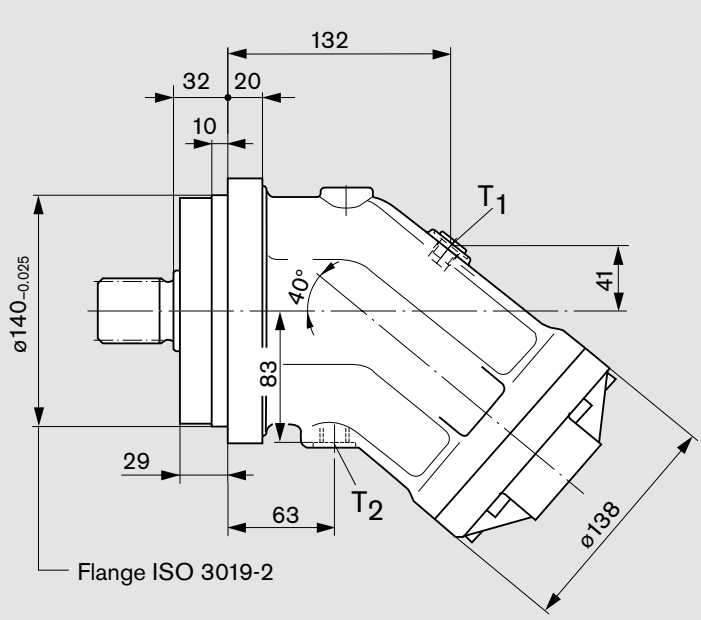
A, B	Service line ports (high pressure series)	SAE J518	3/4 in
	Fastening threads	DIN 13	M10x1,5; 17 deep [1]

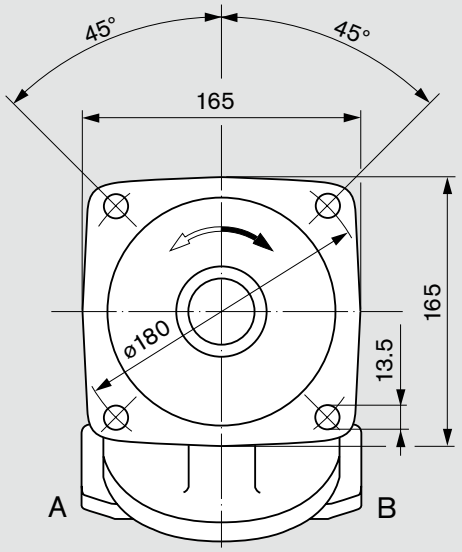
[1]) Please observe the general notes for the max. tightening torques on page 36

Note: Port plates 18 and 19 see pages 29, 30

Unit Dimensions, Sizes 80, 90

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

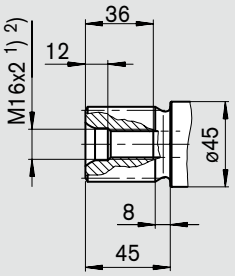




Shaft ends

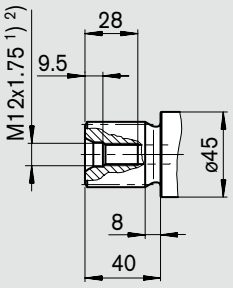
Sizes 80, 90

A Splined shaft DIN 5480
W40x2x30x18x9g
p_N = 400 bar



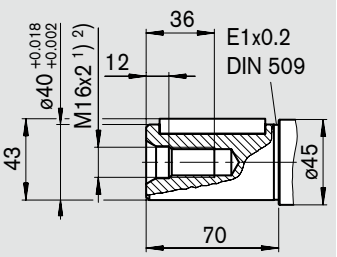
Size 80

Z Splined shaft DIN 5480
W35x2x30x16x9g
p_N = 400 bar



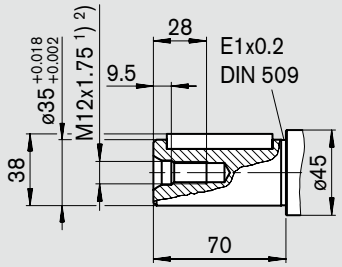
Sizes 80, 90

B Parallel keyed shaft,
DIN 6885, AS12x8x56
p_N = 350 bar



Size 80

P Parallel keyed shaft,
DIN 6885, AS10x8x56
p_N = 350 bar



Ports

A, B	Service line ports (see port plates)			
T_1, T_2	Case drain ports (T_1 plugged)	DIN 3852	M18x1,5; 12 deep	140 Nm 2)

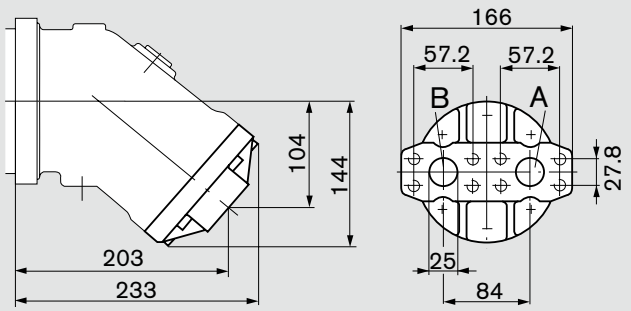
1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 36

Unit Dimensions, Sizes 80, 90

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

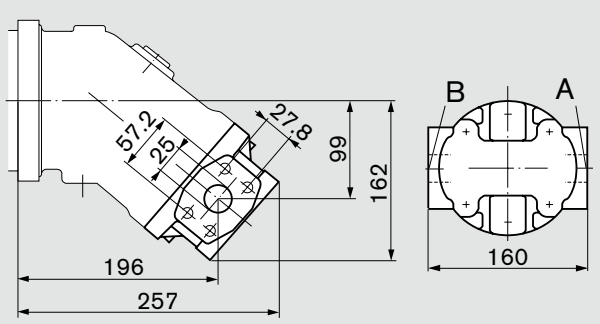
Port plates

01 SAE flange ports, rear



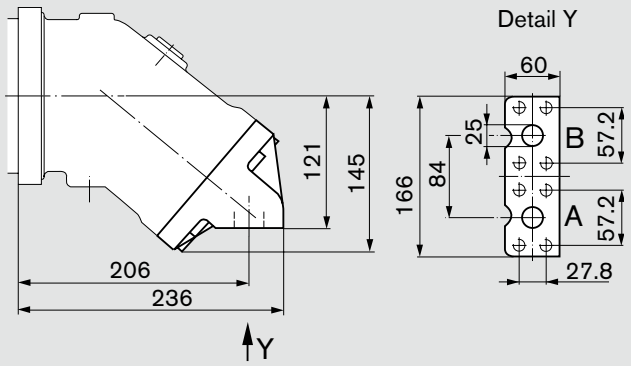
A, B	Service line ports (high pressure series)	SAE J518	1 in
	Fastening threads	DIN 13	M12x1,75; 17 deep [1]

02 SAE flange ports, at side



A, B	Service line ports (high pressure series)	SAE J518	1 in
	Fastening threads	DIN 13	M12x1,75; 17 deep [1]

10 SAE flange ports, bottom



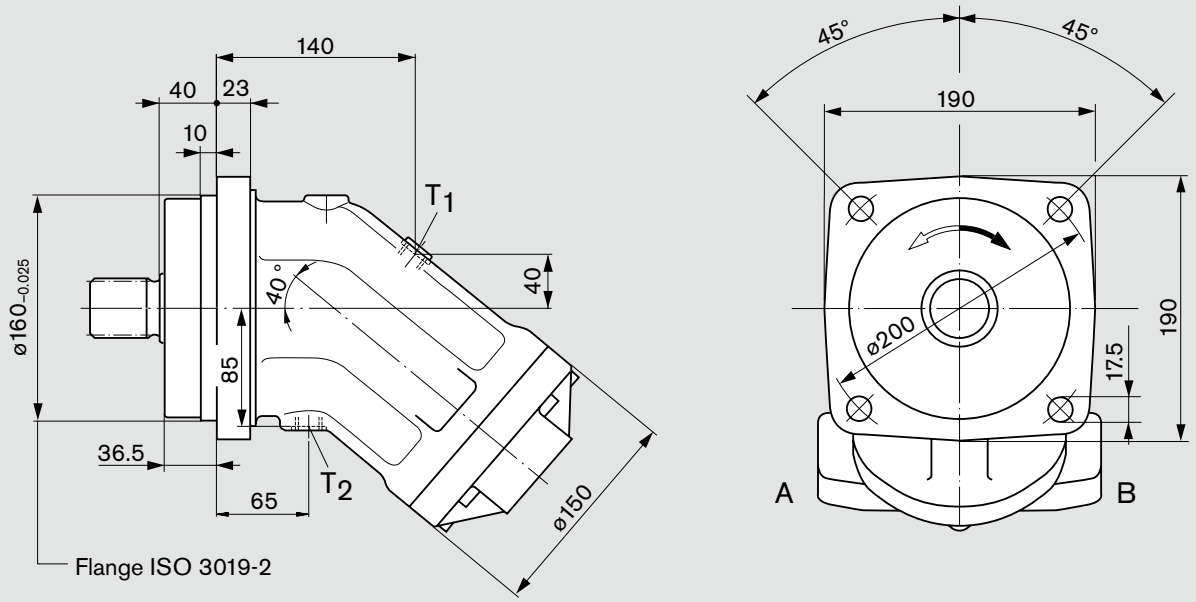
A, B	Service line ports (high pressure series)	SAE J518	1 in
	Fastening threads	DIN 13	M12x1,75; 17 deep [1]

[1] Please observe the general notes for the max. tightening torques on page 36

Note: Port plates 18 and 19 see pages 29, 30

Unit Dimensions, Sizes 107, 125

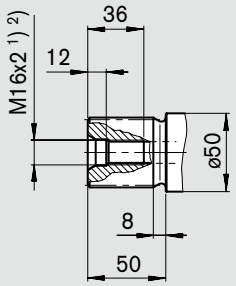
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.



Shaft ends

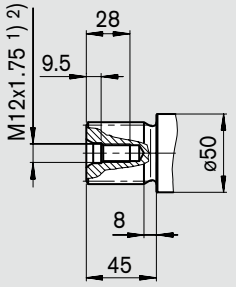
Sizes 107, 125

A Splined shaft DIN 5480
W45x2x30x21x9g
p_N = 400 bar



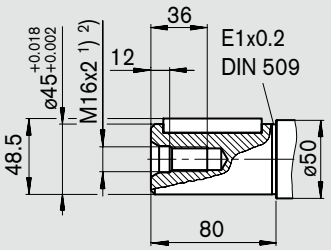
Size 107

Z Splined shaft DIN 5480
W40x2x30x18x9g
p_N = 400 bar



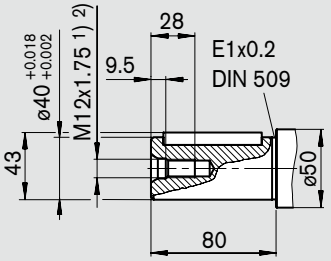
Sizes 107, 125

B Parallel keyed shaft,
DIN 6885, AS14x9x63
p_N = 350 bar



Size 107

P Parallel keyed shaft,
DIN 6885, AS12x8x63
p_N = 350 bar



Ports

A, B	Service line ports (see port plates)			
T_1, T_2	Case drain ports (T_1 plugged)	DIN 3852	M18x1,5; 12 deep	140 Nm 2)

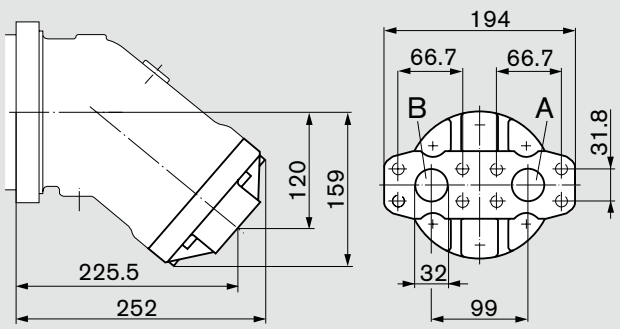
1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 36

Unit Dimensions, Sizes 107, 125

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

Port plates

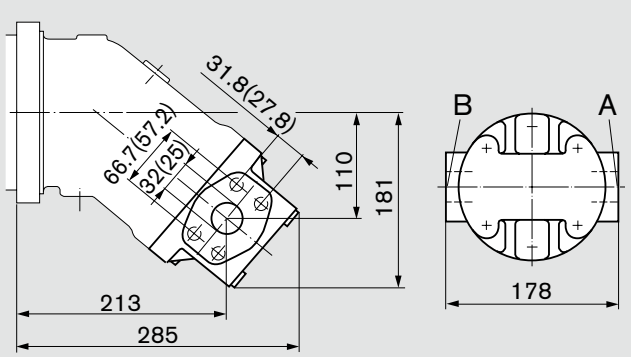
01 SAE flange ports, rear



A, B	Service line ports (high pressure series)	SAE J518	1 1/4 in
	Fastening threads	DIN 13	M14x2; 19 deep [1]

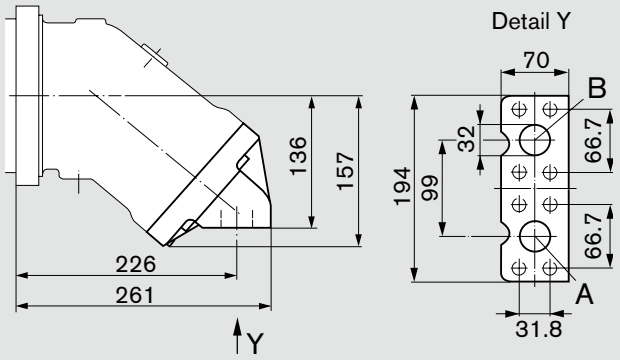
02 SAE flange ports, at side

(dimensions for size 107 in bracket)



A, B	Service line ports (high pressure series)	SAE J518	1 in (size 107) 1 1/4 in (size 125)
	Fastening threads	DIN 13	M12x1,75; 17 deep [1] (size 107) M14x2; 19 deep [1] (size 125)

10 SAE flange ports, bottom



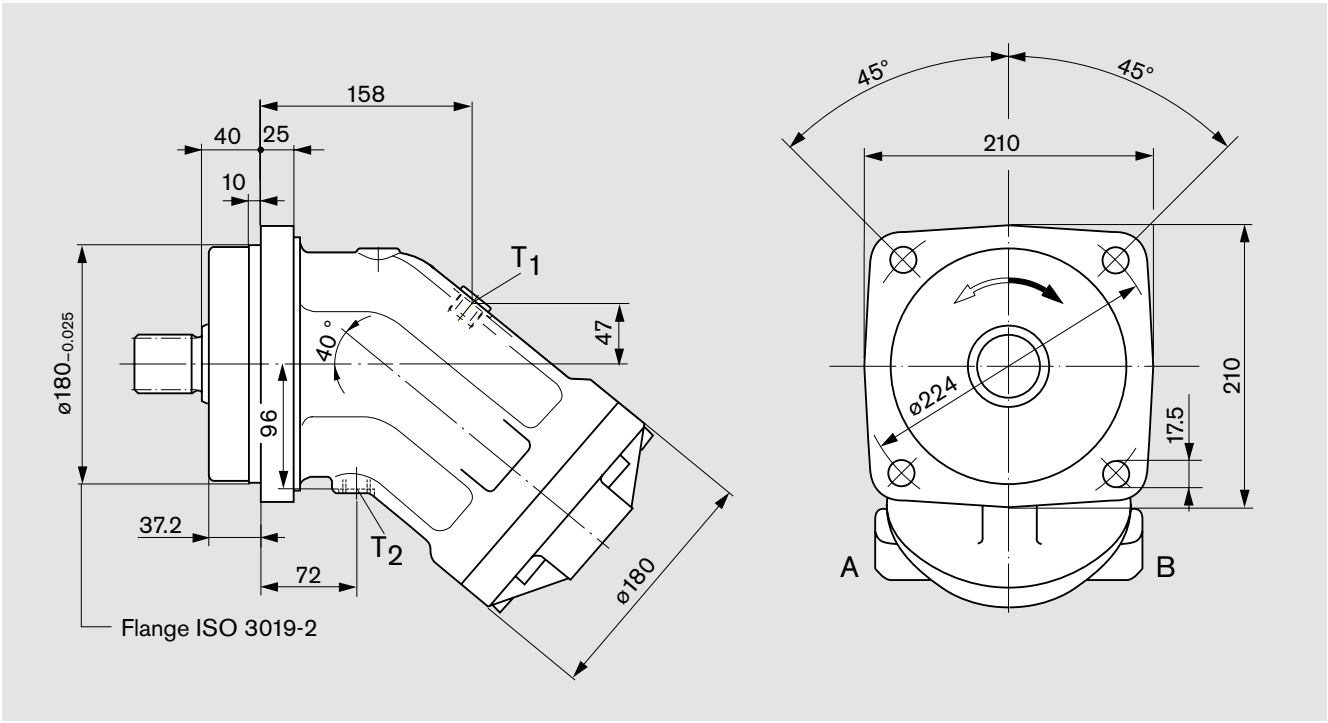
A, B	Service line ports (high pressure series)	SAE J518	1 1/4 in
	Fastening threads	DIN 13	M14x2; 19 deep [1]

[1]) Please observe the general notes for the max. tightening torques on page 36

Note: Port plates 18 and 19 see pages 29, 30

Unit Dimensions, Sizes 160, 180

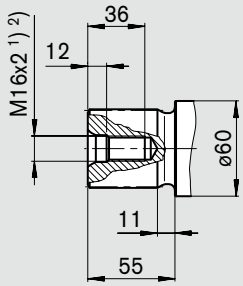
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.



Shaft ends

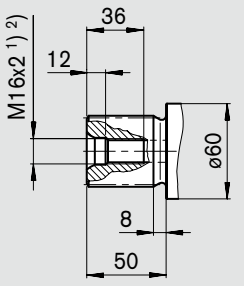
Sizes 160, 180

A Splined shaft DIN 5480
W50x2x30x24x9g
p_N = 400 bar



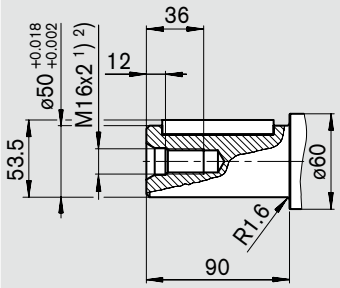
Size 160

Z Splined shaft DIN 5480
W45x2x30x21x9g
p_N = 400 bar



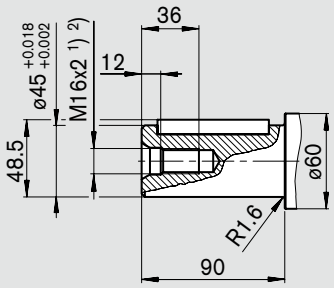
Sizes 160, 180

B Parallel keyed shaft,
DIN 6885, AS14x9x70
p_N = 350 bar



Size 160

P Parallel keyed shaft,
DIN 6885, AS14x9x70
p_N = 350 bar



Ports

A, B	Service line ports (see port plates)			
T_1, T_2	Case drain ports (T_1 plugged)	DIN 3852	M22x1,5; 14 deep	210 Nm 2)

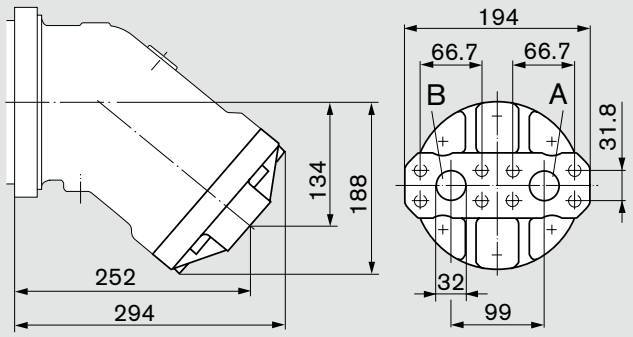
1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 36

Unit Dimensions, Sizes 160, 180

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

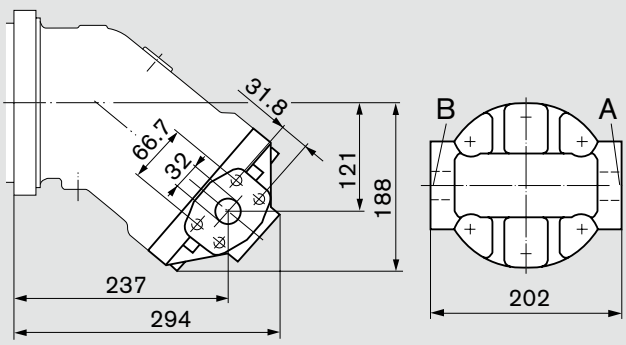
Port plates

01 SAE flange ports, rear



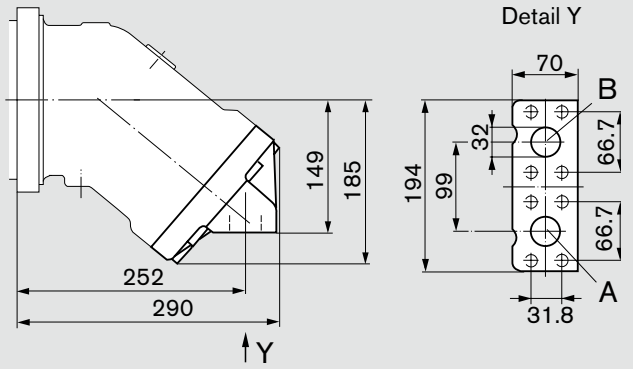
A, B	Service line ports (high pressure series)	SAE J518	1 1/4 in
	Fastening threads	DIN 13	M14x2; 19 deep [1]

02 SAE flange ports, at side



A, B	Service line ports (high pressure series)	SAE J518	1 1/4 in
	Fastening threads	DIN 13	M14x2; 19 deep [1]

10 SAE flange ports, bottom



A, B	Service line ports (high pressure series)	SAE J518	1 1/4 in
	Fastening threads	DIN 13	M14x2; 19 deep [1]

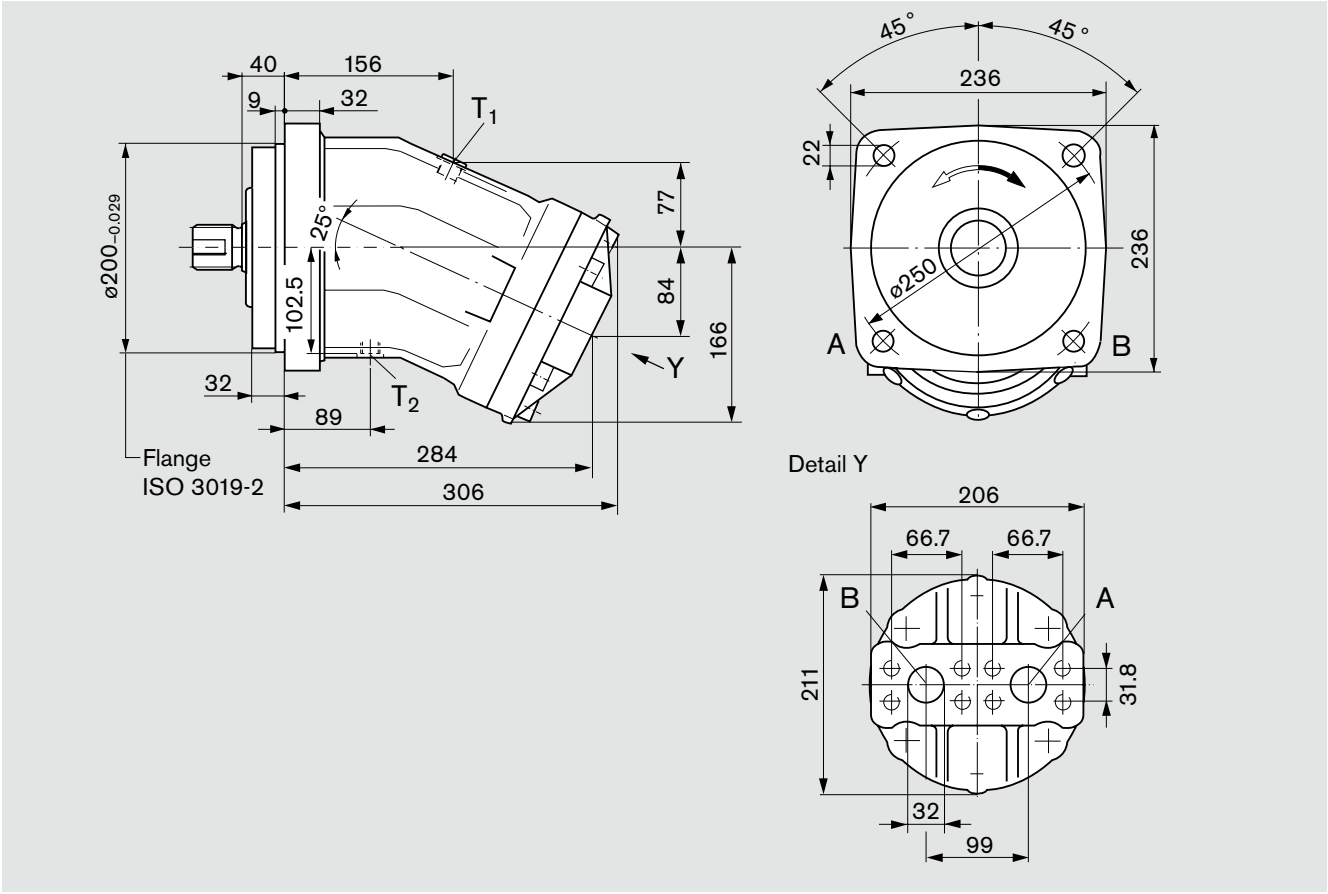
[1] Please observe the general notes for the max. tightening torques on page 36

Note: Port plates 18 and 19 see pages 29, 30

Unit Dimensions, Size 200

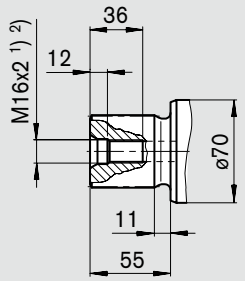
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Port plate 01: SAE flange ports, rear

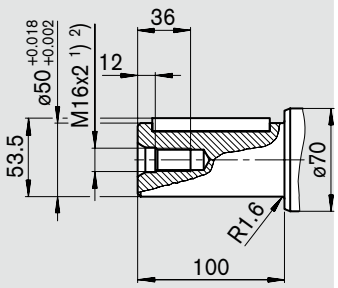


Shaft ends

A Splined shaft DIN 5480
W50x2x30x24x9g
p_N = 400 bar



B Parallel keyed shaft,
DIN 6885, AS14x9x80
p_N = 350 bar



Ports

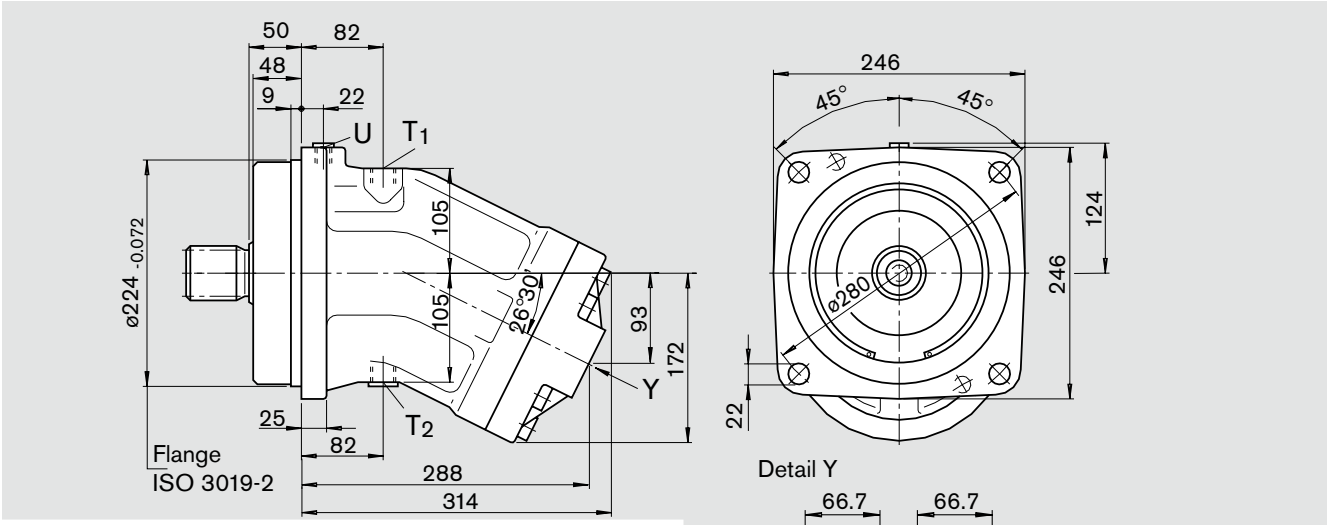
A, B	Service line ports (high pressure series) Fastening threads	SAE J518 DIN 13	1 1/4 in M14x2; 19 deep 2)	
T_1, T_2	Case drain ports (T_1 plugged)	DIN 3852	M22x1,5; 14 deep	210 Nm 2)

1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 36

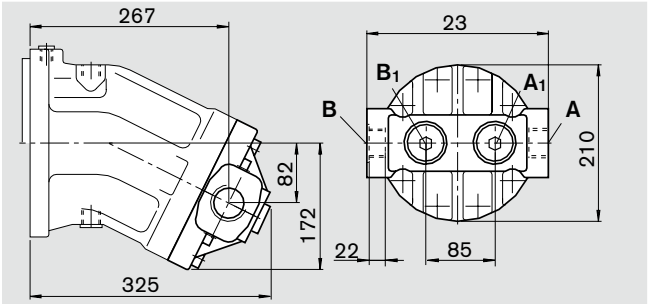
Unit Dimensions, Size 250

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

Port plate 01: SAE flange ports, rear

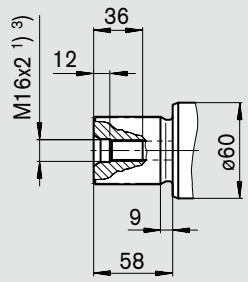


Port plate 04: Threaded ports, at side and rear

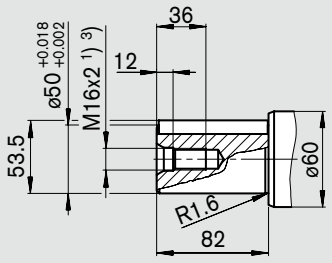


Shaft ends

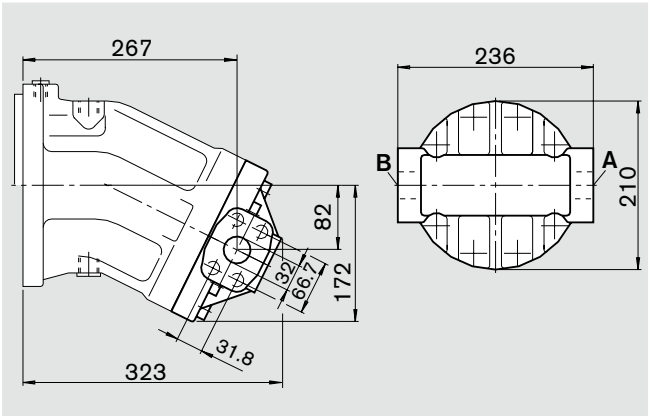
Z Splined shaft DIN 5480
W50x2x30x24x9g
$p_N = 350$ bar



P Parallel keyed shaft,
DIN 6885, AS14x9x80
$p_N = 350$ bar



Port plate 02: SAE flange ports, at side



Ports

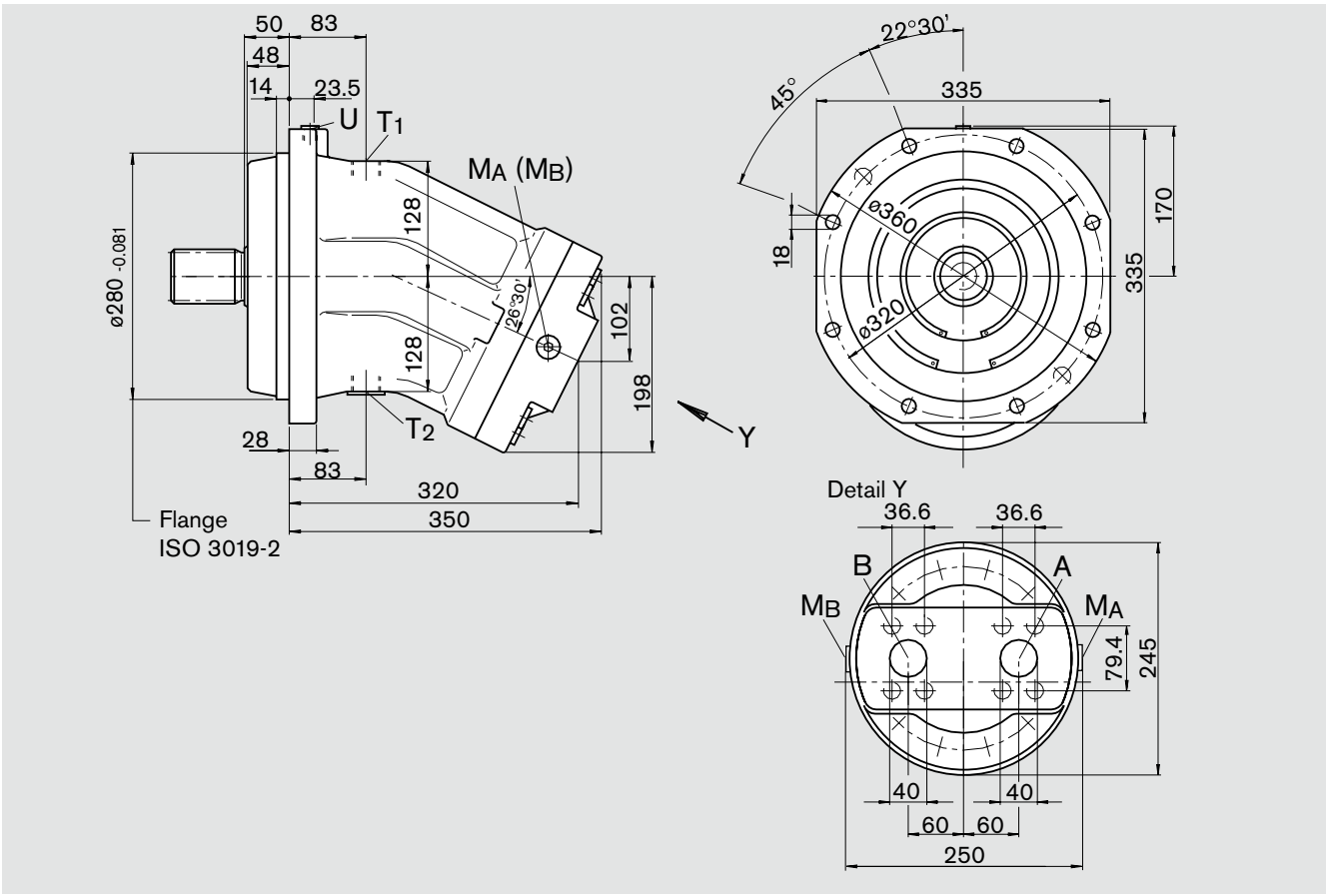
		Port plate 01/02:		Port plate 04:		
A, B	Service line ports (high pressure series)	SAE J518	1 1/4 in	DIN 3852	M48x2 [2]	960 Nm [3]
	Fastening threads	DIN 13	M14x2; 19 deep [3]			
T_1, T_2	Case drain ports (T_2 plugged)	DIN 3852	M22x1,5; 14 deep			210 Nm [3]
U	Port for bearing flushing (plugged)	DIN 3852	M14x1,5; 12 deep			80 Nm [3]

[1]) Center bore according to DIN 332 (thread according to DIN 13)
[2]) Service line ports A_1 and A_2 with locking screw plugged
[3]) Please observe the general notes for the max. tightening torques on page 36

Unit Dimensions, Size 355

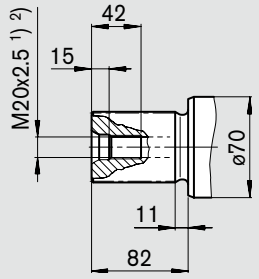
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Port plate 01: SAE flange ports, rear

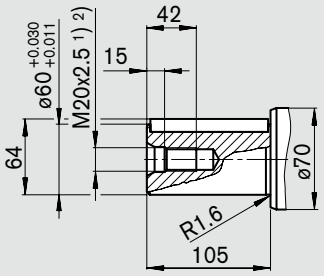


Shaft ends

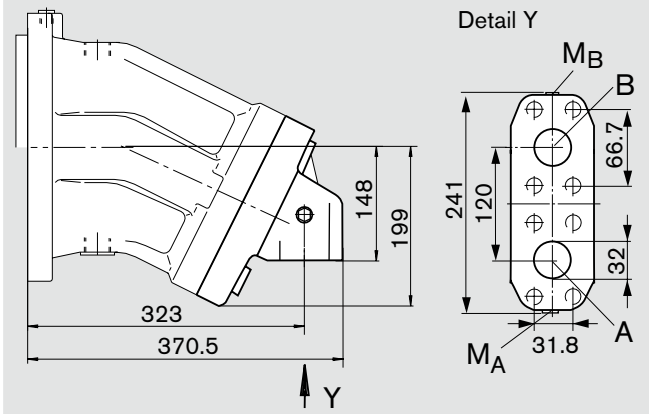
Z Splined shaft DIN 5480
W60x2x30x28x9g
p_N = 350 bar



P Parallel keyed shaft,
DIN 6885, AS18x11x100
p_N = 350 bar



Port plate 10: SAE flange ports, bottom



Ports

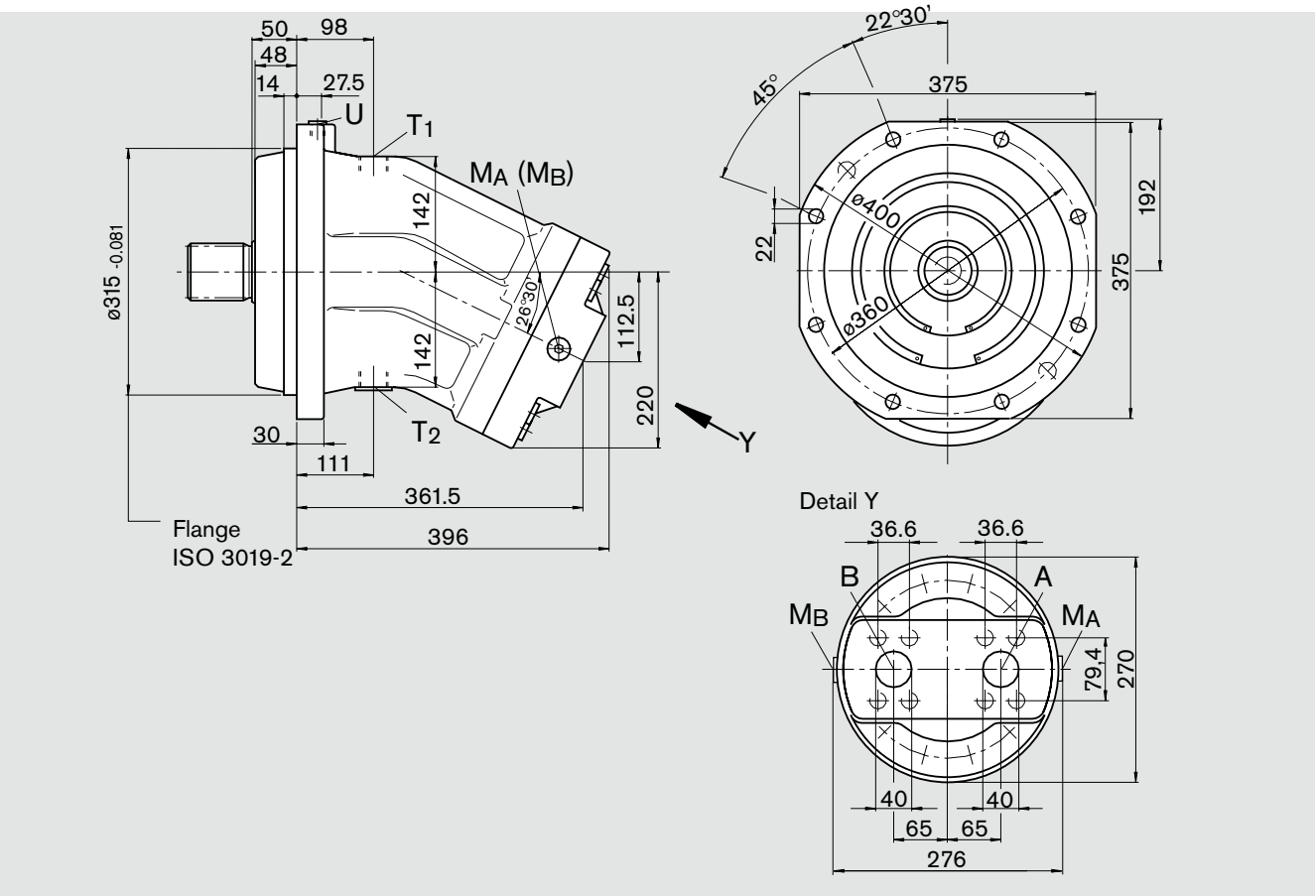
			Port plate 01:	Port plate 10:	
A, B	Service line ports (high pressure series) Fastening threads	SAE J518 DIN 13	1 1/2 in M16x2; 21 deep 2)	1 1/4 in M14x2; 22 deep 2)	
T_1, T_2	Case drain ports (T_2 plugged)	DIN 3852	M33x2; 18 deep		540 Nm 2)
U	Port for bearing flushing (plugged)	DIN 3852	M14x1,5; 12 deep		80 Nm 2)
M_A, M_B	Gauge ports operating pressure (plugged)	DIN 3852	M14x1,5; 12 deep		80 Nm 2)

1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 36

Unit Dimensions, Size 500

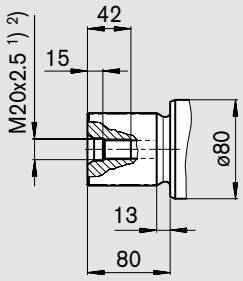
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Port plate 01: SAE flange ports, rear

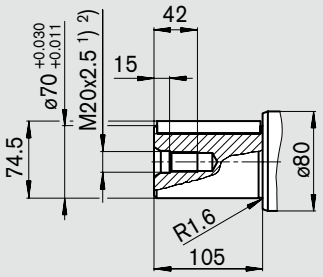


Shaft ends

Z Splined shaft DIN 5480
W70x3x30x22x9g
p_N = 350 bar



P Parallel keyed shaft,
DIN 6885, AS20x12x100
p_N = 350 bar



Ports

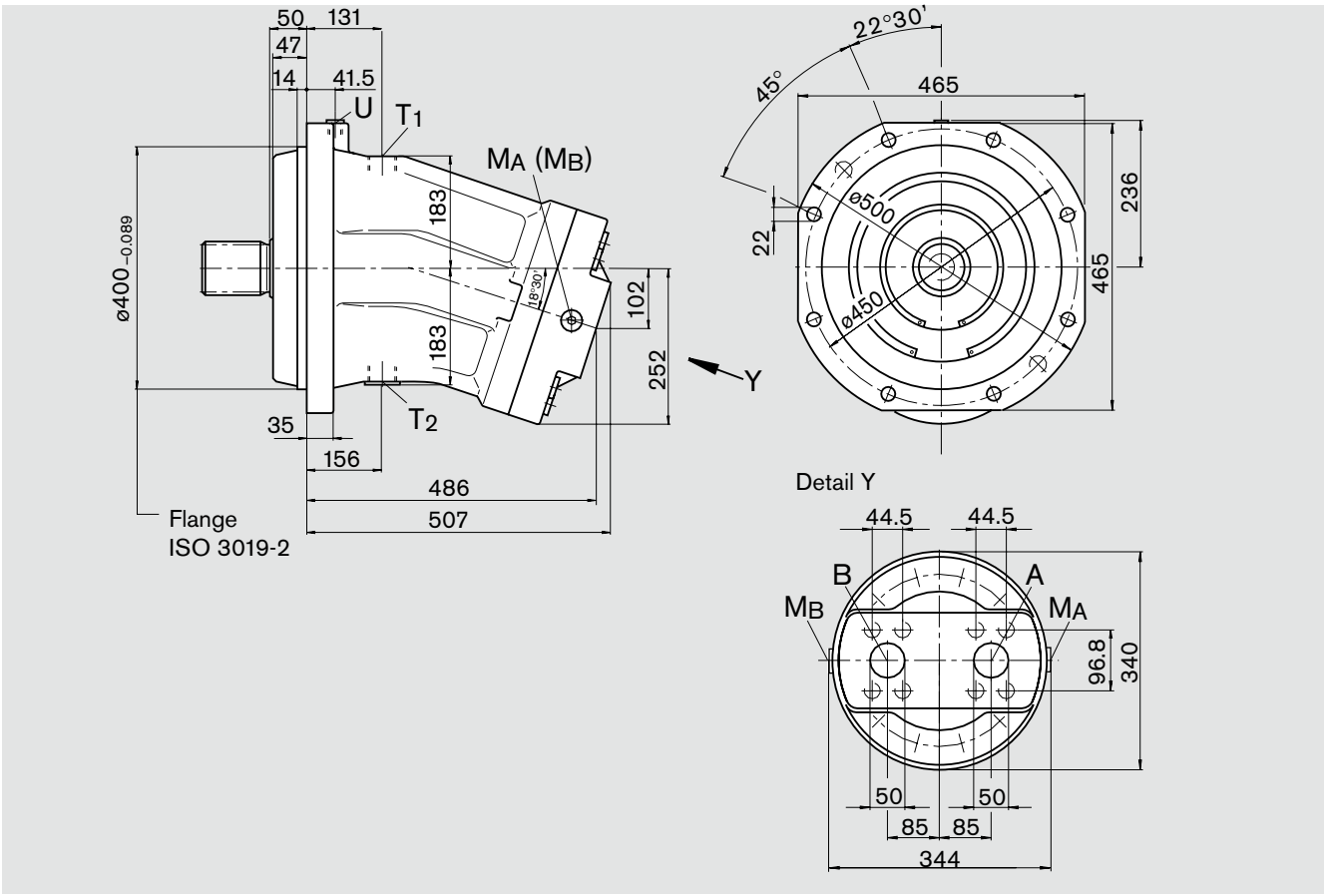
A, B	Service line ports (high pressure series) Fastening threads	SAE J518 DIN 13	1 1/2 in M16x2; 21 deep 2)	
T_1, T_2	Case drain ports (T_2 plugged)	DIN 3852	M33x2; 18 deep	540 Nm 2)
U	Port for bearing flushing (plugged)	DIN 3852	M18x1,5; 12 deep	140 Nm 2)
M_A, M_B	Gauge ports operating pressure (plugged)	DIN 3852	M14x1,5; 12 deep	80 Nm 2)

1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 36

Unit Dimensions, Size 710

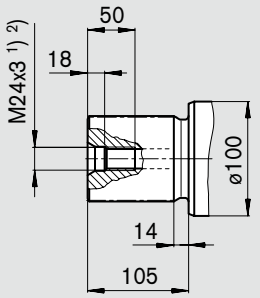
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Port plate 01: SAE flange ports, rear

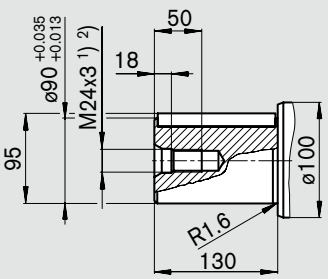


Shaft ends

Z Splined shaft DIN 5480
W90x3x30x28x9g
p_N = 350 bar



P Parallel keyed shaft,
DIN 6885, AS25x14x125
p_N = 350 bar



Ports

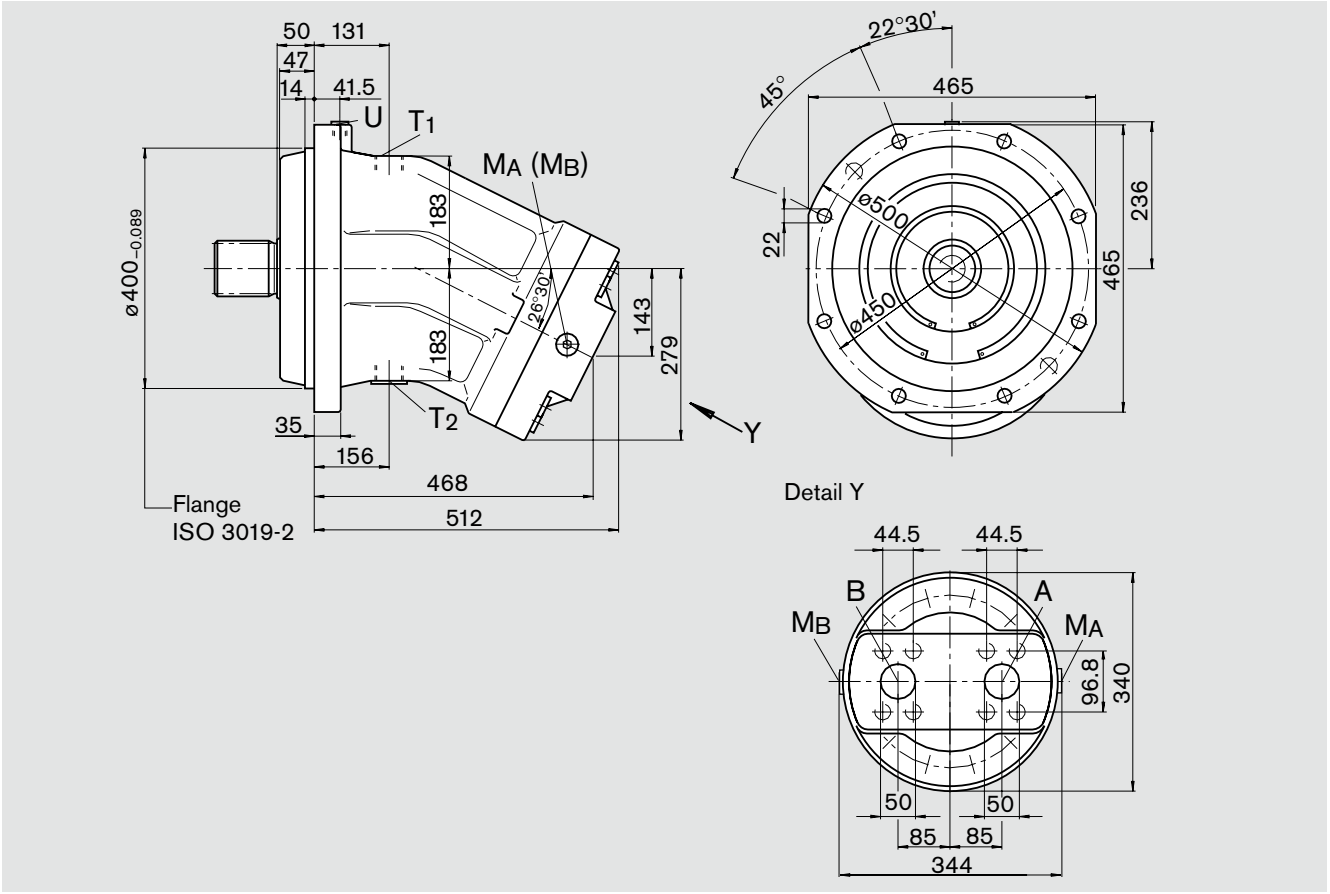
A, B	Service line ports (high pressure series) Fastening threads	SAE J518 DIN 13	2 in M20x2,5; 30 deep 2)	
T_1, T_2	Case drain ports (T_2 plugged)	DIN 3852	M42x2; 20 deep	720 Nm 2)
U	Port for bearing flushing (plugged)	DIN 3852	M18x1,5; 12 deep	140 Nm 2)
M_A, M_B	Gauge ports operating pressure (plugged)	DIN 3852	M14x1,5; 12 deep	80 Nm 2)

1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 36

Unit Dimensions, Size 1000

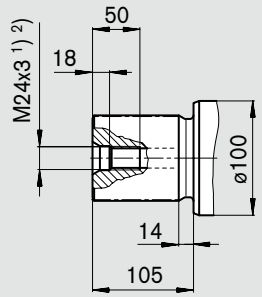
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Port plate 01: SAE flange ports, rear

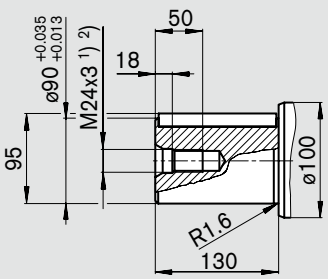


Shaft ends

Z Splined shaft DIN 5480
W90x3x30x28x9g
$p_N = 350$ bar



P Parallel keyed shaft,
DIN 6885, AS25x14x125
$p_N = 350$ bar



Ports

A, B	Service line ports (high pressure series) Fastening threads	SAE J518 DIN 13	2 in M20x2,5; 30 deep 2)	
T_1, T_2	Case drain ports (T_2 plugged)	DIN 3852	M42x2; 20 deep	720 Nm 2)
U	Port for bearing flushing (plugged)	DIN 3852	M18x1,5; 12 deep	140 Nm 2)
M_A, M_B	Gauge ports operating pressure (plugged)	DIN 3852	M14x1,5; 12 deep	80 Nm 2)

1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 36

Flush and Boost Pressure Valve

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

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

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

On port plate 027, the valve is fitted directly onto the fixed motor (size 45 to 180, 250), while on port plate 017 (size 355 and 500), it is fitted on a plate.

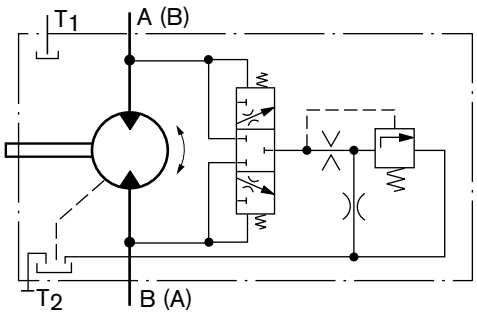
Orifices can be used to adjust the flushing volumes as required.

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

Size	Flushing volume	Mat. no. of the orifice.
45, 56, 63	3,5 L/min	R909651766
80, 90	5 L/min	R909419695
107, 125	8 L/min	R909419696
160, 180	10 L/min	R909419697
250	10 L/min	on request
355, 500	16 L/min	on request

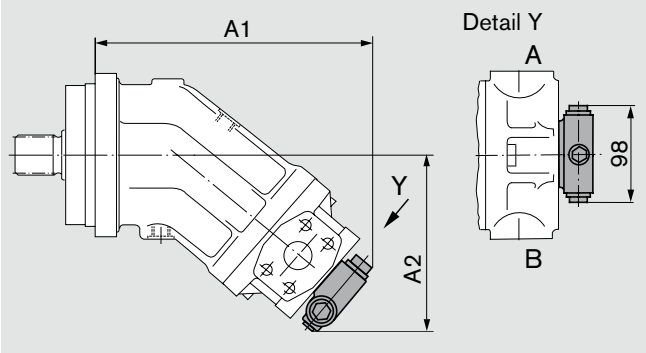
For sizes 45 to 180, orifices for flushing volumes of 3.5 -10 L/min can be supplied. In the case of non-standard flushing volumes, please specify the desired flushing volume when ordering. The flushing volume without orifice is approx. 12 to 14 L at low pressure $\Delta p_{LP} = 25$ bar.

Circuit diagram



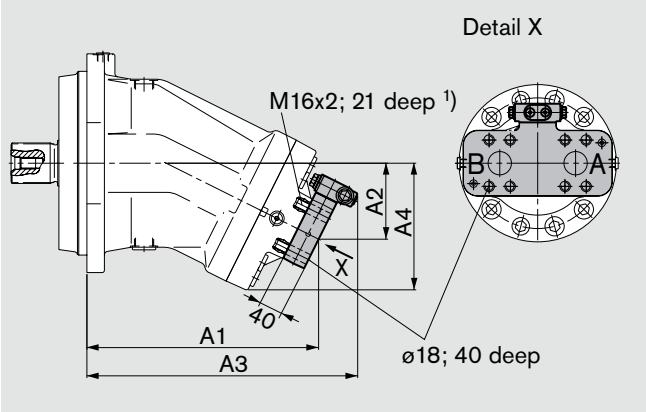
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Port plate 027: SAE flange ports, at side



Size	A1	A2
45	223	151
56, 63	239	159
80, 90	268	173,5
107, 125	294	192
160, 180	315	201
250	344	154

Port plate 017: SAE flange ports, rear



Size	A1	A2	A3	A4
355	356	120	421	198
500	397	130	464	220

Additional dimensions see page 24 (size 355) and page 25 (size 500).

1) DIN 13, please observe the general notes for the max. tightening torques on page 36

Pressure Relief Valves

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

The pressure relief valves MHDB (as to RE 64642) protect the motor from excess pressure. When the set opening pressure is reached the hydraulic fluid flows from the high pressure side to the low pressure side.

The pressure relief valves can only be supplied in conjunction with the port plates 181, 191 or 192 (counterbalance valve for fitting on port plate 181, see next page).

Setting range opening pressure _____ 50 – 420 bar

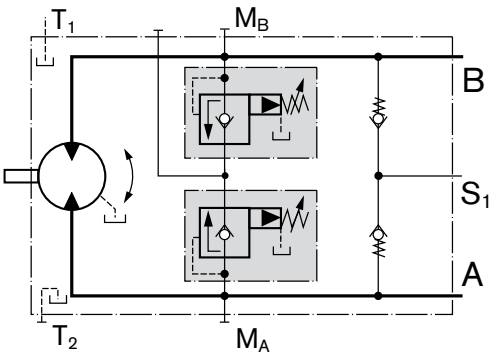
At design "with pressure sequence range" (192) a higher pressure setting can be realized by applying an external pilot pressure of 25 - 30 bar at port p_{St}.

Please indicate in clear text when ordering:

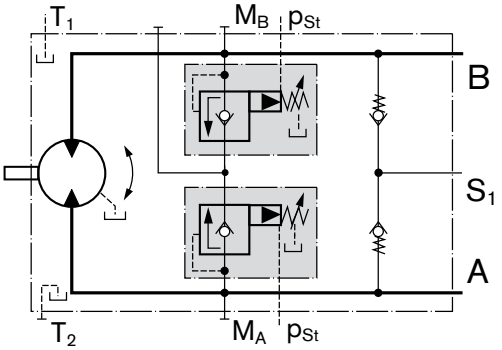
– opening pressure of the pressure relief valve

– opening pressure at pilot pressure applied at p_{St} (for design 192 only)

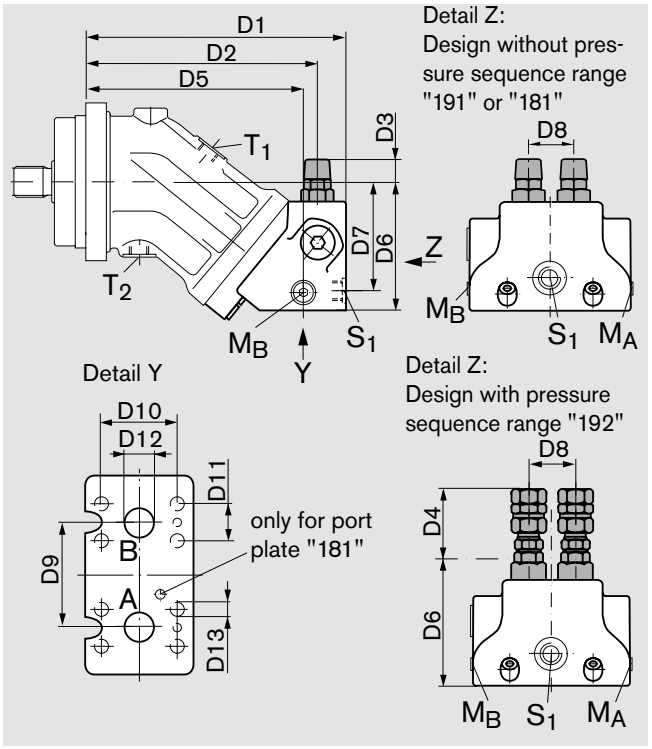
Design without pressure sequence range "191"



Design with pressure sequence range "192"



Unit dimensions



Ports

A, B	Service line ports SAE J518
S_1	Boosting (only for port plate 191/192)
M_A, M_B	Gauge ports (plugged)
p_{St}	Pilot pressure port (only for port plate 192)

Size	A, B [1]	S_1 [2]	M_A , M_B	p_{St} [3]
28, 32	SAE 3/4 in	M22x1,5; 14 deep	M20x1,5; 14 deep [2]	G 1/4
45	SAE 3/4 in	M22x1,5; 14 deep	M20x1,5; 14 deep [2]	G 1/4
56, 63	SAE 3/4 in	M26x1,5; 16 deep	M26x1,5; 16 deep [2]	G 1/4
80, 90	SAE 1 in	M26x1,5; 16 deep	M26x1,5; 16 deep [2]	G 1/4
107, 125	SAE 11/4 in	M26x1,5; 16 deep	M26x1,5; 16 deep [2]	G 1/4
160, 180	SAE 11/4 in	M26x1,5; 16 deep	M30x1,5; 16 deep	G 1/4

[1]) SAE J518 [2]) DIN 3852 [3]) DIN ISO 228

Size		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13 [4]
28, 32	MHDB.**16**	209	186	25	63	174	102	87	36	66	50,8	23,8	ø19	M10; 17 deep
45	MHDB.**16**	222	198	22	60	187	113	98	36	66	50,8	23,8	ø19	M10; 17 deep
56, 63	MHDB.**22**	250	222	19	57	208	124	105	42	75	50,8	23,8	ø19	M10; 13 deep
80, 90	MHDB.**22**	271	243,5	17,5	55	229	134	114	42	75	57,2	27,8	ø25	M12; 18 deep
107, 125	MHDB.**32**	298	267	10	48	251	149,5	130	53	84	66,7	31,8	ø32	M14; 19 deep
160, 180	MHDB.**32**	332	301	5	43	285	170	149	53	84	66,7	31,8	ø32	M14; 19 deep

[4]) DIN 13, please observe the general notes for the max. tightening torques on page 36

Assembly instructions for port plate with pressure sequence range “192”:
When fitting the hydraulic line on the p_{st} port, the lock nut must be held in place!

BVD Counterbalance Valve

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

Function

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

Please note

- The BVD counterbalance valve must be specified explicitly in the order. We recommend ordering the counterbalance valve and the motor as a set.
  Ordering example: A2FM80/61W–VAB**181** + BVD20F27S/41B–V03K16D0400S12
- The counterbalance valve does not replace the mechanical service brake and parking brake.
- Note the detailed information about the BVD counterbalance valve contained in RE 95522!

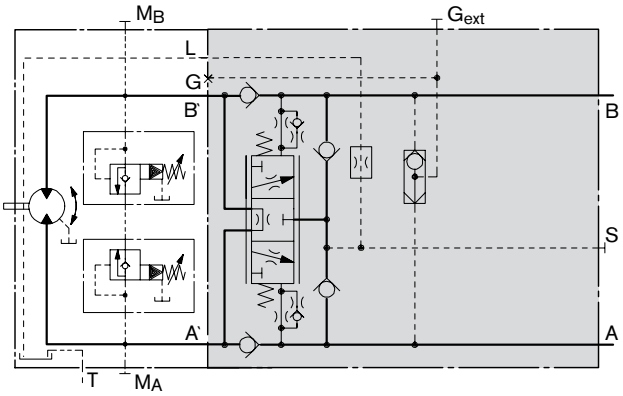
Application example for driving counterbalance valve BVD..F

- Travel drive of wheeled excavators

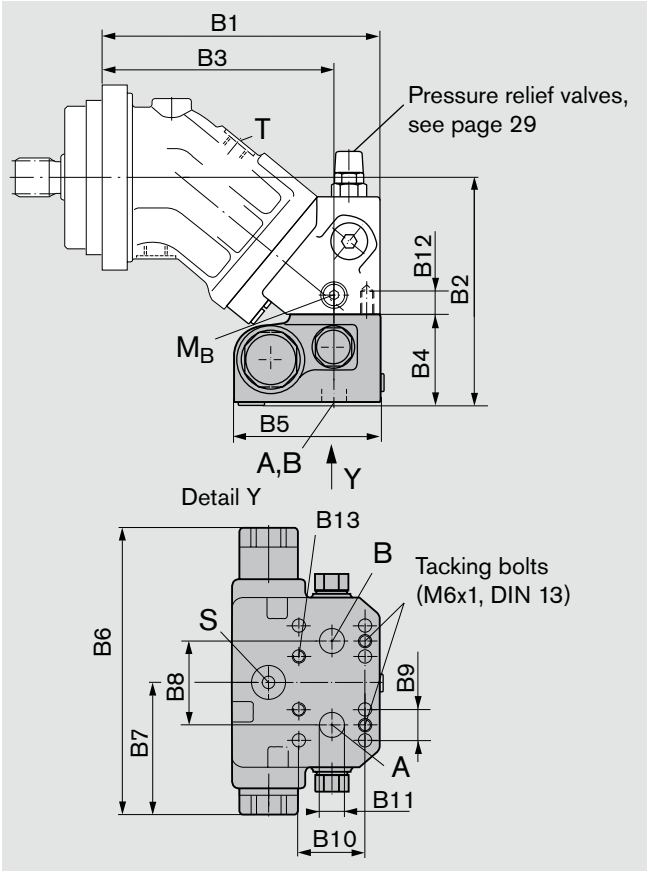
Application example for winch counterbalance valve BVD..W

- Winch drives in cranes
- Track drives in crawler excavator

Circuit diagram driving counterbalance valve BVD..F



Unit dimensions



Ports

A, B	Service line ports SAE J518
S	Boosting (plugged)
M_A, M_B	Gauge ports (plugged)

A2FM Size	Counter balance valve Type	A, B [1]	S [2]	M_A,M_B [2]
28, 32	BVD**20**..16	SAE 3/4 in	M 22x1,5	M12x1,5
45	BVD**20**..16	SAE 3/4 in	M 22x1,5	M12x1,5
56, 63	BVD**20**..17	SAE 3/4 in	M 22x1,5	M12x1,5
80, 90	BVD**20**..27	SAE 1 in	M 22x1,5	M12x1,5
107, 125	BVD**25**..38	SAE $1^1/_4$ in	M 27x2	M12x1,5
160, 180	BVD**25**..38	SAE $1^1/_4$ in	M 27x2	M12x1,5
250	on request			

Size		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12 [3]	B13 [3]
28, 32	BVD**20**..16	209	180	174	83 [4]	137	239	98	66	23,8	50,8	ø19	M10; 17 deep	M10; 14 deep
45	BVD**20**..16	229	191	187	83 [4]	137	239	98	66	23,8	50,8	ø19	M10; 17 deep	M10; 14 deep
56, 63	BVD**20**..17	250	192	208	73	137	239	98	75	23,8	50,8	ø19	M10; 17 deep	M10; 14 deep
80, 90	BVD**20**..27	271	202	229	73	137	239	98	75	27,8	57,2	ø25	M12; 18 deep	M12; 16 deep
107, 125	BVD**25**..38	298	238	251	90	151,5	292	120,5	84	31,8	66,7	ø32	M14; 19 deep	M14; 19 deep
160, 180	BVD**25**..38	332	255	285	90	151,5	292	120,5	84	31,8	66,7	ø32	M14; 19 deep	M14; 19 deep

[1]) SAE J518 [2]) DIN 3852 [3]) DIN 13, please observe the general notes for the max. tightening torques on page 36

[4]) With adapting plate

BVD Counterbalance Valve

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

Attaching the counterbalance valve

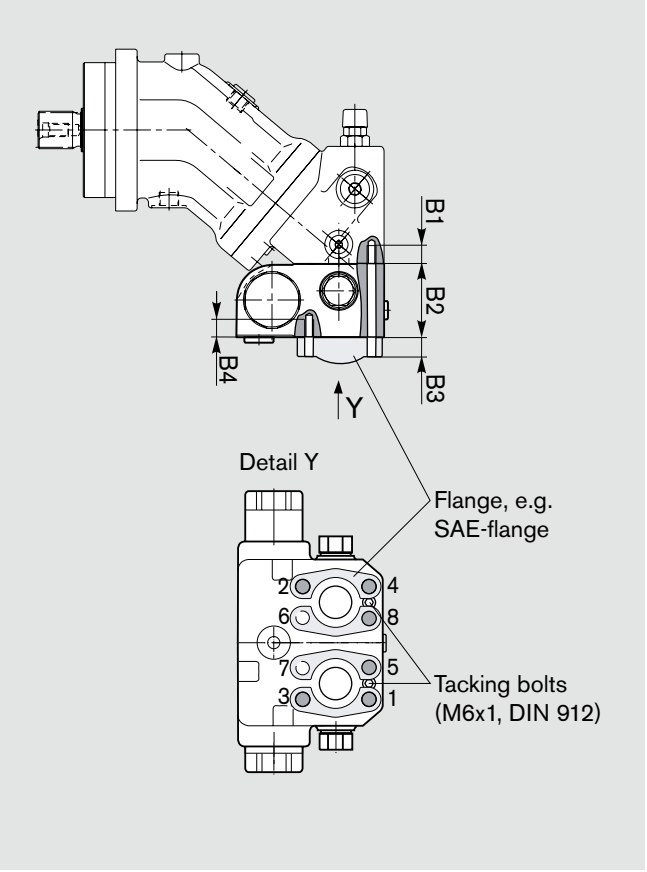
When delivered, the counterbalance valve is attached to the motor using 2 tacking screws. Do not remove the tacking screws when connecting the service lines. If the counterbalance valve and motor are delivered separately, the counterbalance valve must first be attached to the motor port plate using the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

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

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

Thread [1]	Property class	Tightening torque
M10x1,5	10.9	75 Nm
M12x1,75	10.9	130 Nm
M14x2	10.9	205 Nm

[1]) Fastening screws according to DIN 912



Size	28, 32, 45	56, 63	80, 90	107, 125, 160, 180
Dim. B1 [1]	M10x1,5 17 deep	M10x1,5 17 deep	M12x1,75 18 deep	M14x2 19 deep
Dim. B2	78 [2]	68	68	85
Dim. B3	customer-specific			
Dim. B4	M10x1,5 15 deep	M10x1,5 15 deep	M12x1,75 16 deep	M14x2 19 deep

Fastening threads according to DIN 13, please observe the general notes for the max. tightening torques on page 36

[1]) Minimum required reach 1 x DIA. thread
[2]) With adapting plate

Speed Measurement

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

The A2FM...D and A2FM...F ("prepared for speed measurement", i.e. without sensor) versions have teeth on the rotary group. The rotating, toothed rotary group generates a signal in proportion to the speed. The signal is picked up by a sensor and can be forwarded for evaluation.

The sensor is fitted to the special port D provided for this purpose. The following versions are available:

Version „D“ (sizes 23 to 180)

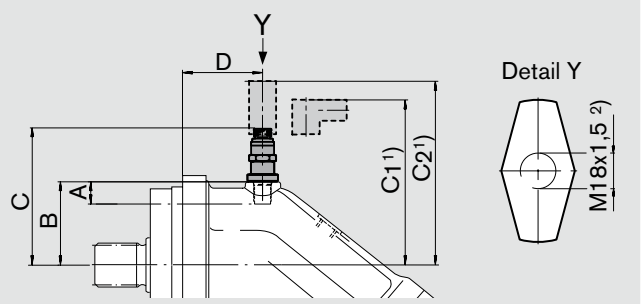
Suitable for mounting of inductive speed sensor ID (see RE 95130). The ID sensor is screwed into port D. The spacer ring required for the inductive speed sensor ID is included in the supply volume of the sensor (only when ordering, speed sensor with installation parts).

Version „F“ (sizes 23 to 250)

Suitable for mounting of HDD Hall effect speed sensor (see RE 95135). The HDD sensor is flange mounted with two fastening screws. In the standard version, the port is plugged with a pressure-resistant flange cover.

We recommend ordering the A2FM fixed motor complete with mounted sensor. Please specify the ordering code for the sensor separately.

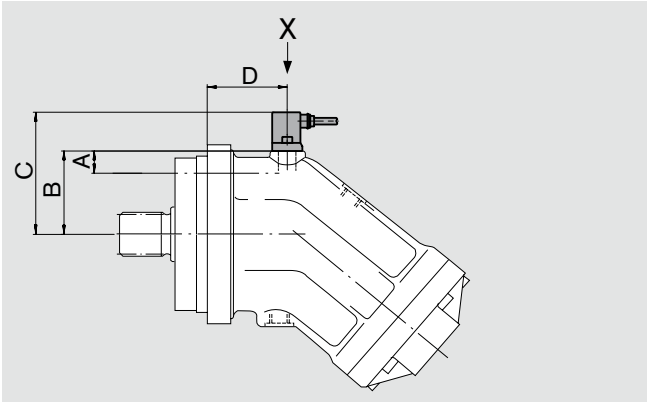
Version „D“ (sizes 23 to 180): with ID sensor



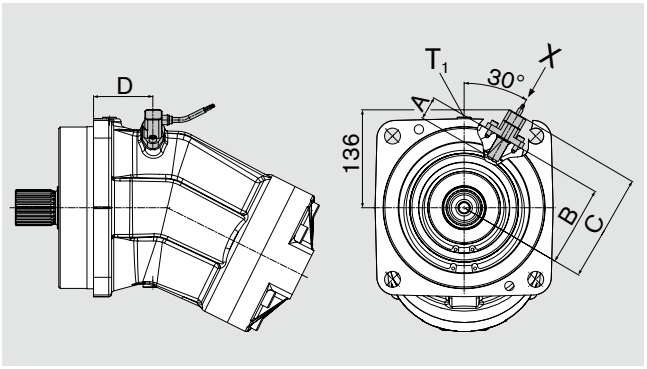
1) clearance required for attaching/detaching the mating connector: min 13 mm

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

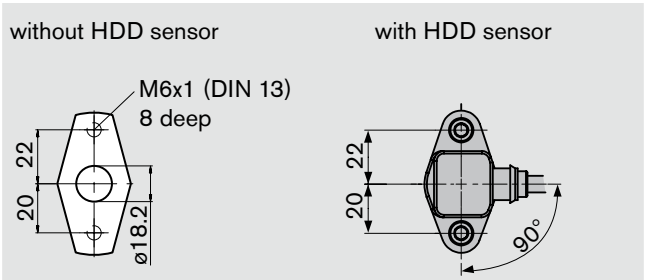
Version „F“ (sizes 23 to 200): with HDD sensor



Version „F“ (size 250): with HDD sensor



Detail X



Size			23,28,32	45	56,63	80, 90	107, 125	160, 180	200	250
Number of teeth			38	45	47	53	59	67	80	78
HDD 3)	A	Insertion depth (tolerance ± 0,1)	16	16	16	16	16	16	16	32
	B	Contact surface	55,5	62,5	67,5	72,5	77,5	85	98,8	110,5
	C		93,8	100,8	105,8	110,8	115,8	123,3	137	149
	D		54,7	54,3	61,5	72,5	76,8	86,8	97,5	82
ID 3)	A	Insertion depth (tolerance ± 0,1)	9,5	8,5	8,5	8,5	8,5	11	–	–
	B	Contact surface	49	55	60	65	70	80	–	–
	C	without mating connector	117,2	124,2	129,2	134,2	139,2	146,7	–	–
	C1	with 90° mating connector	150,7	157,7	162,7	167,5	172,5	180,2	–	–
	C2	with 180° mating connector	173,2	179,2	184,2	189,2	194,2	201,7	–	–
	D		54,7	54,3	61,5	72,5	76,8	86,8	–	–

3) Suitable speed sensor: sizes 23 to 200: HDD.L16../20 (see RE 95135) resp. IDR18/20–L250 (see RE 95130)
size 250: HDD.L32../20 (see RE 95135)

Installation Notes

General

The motor case must be completely filled up with hydraulic fluid during startup and during operation (filling the case chamber). The motor must be started up at low speed and no load until the system has been bled completely.

If stopped for an extended period, fluid may drain out of the case through the service lines. When restarting, make sure that the case contains sufficient fluid.

The leakage fluid inside the case chamber must be drained off to the tank through the highest case drain port.

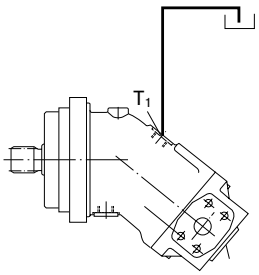
Installation position

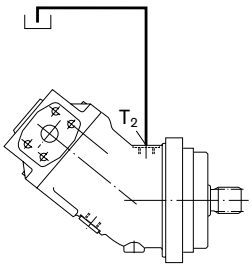
Optional. At size 10 to 200 with installation position “shaft to the top” use motor with bleeding port R (indicate in clear when ordering; the port U in the bearing section for bleeding is included in production with sizes 250 to 1000).

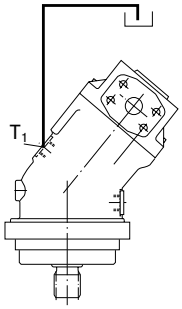
Installation below the tank

Motor below min. fluid level in the tank (standard)

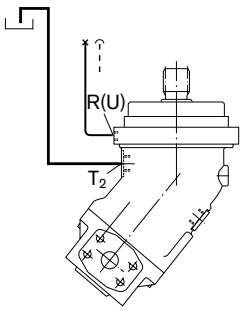
- Fill axial piston motor before startup via the highest case drain port
- Run the motor at low speed until the system is bled completely (bleed through service line port A, B if tubing is long)
- Minimum immersion depth of leakage line in tank: 200 mm (relative to the min. fluid level in the tank).
- Additional measures required for installation position 2 (shaft facing up): with installation position 2, make sure that the motor case is completely full before starting up. Bleed at port R (sizes 10 to 200) resp. U (sizes 250 to 1000). Order port R in clear text. An air pocket in the bearing area is leading to damage of the axial piston motor.







Installation position 2

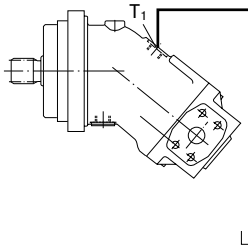


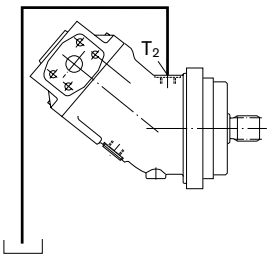
Installation above the tank

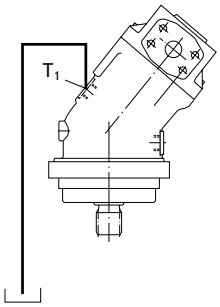
Motor above min. fluid level in tank

- Proceed in same way as below the tank installation
- Additional measures for installation positions 1 and 2:
  If stopped for an extended period, fluid may drain out of the case chamber through the service lines (air enters through the shaft seal). The bearings will therefore not be properly lubricated when the motor is started up again. Fill the axial piston motor before restarting via the highest case drain port. Installation position 2: bleed at port R (sizes 10 to 200) resp. U (sizes 250 to 1000). Order port R in clear text.
- Additional measures required for installation position 2 (shaft facing up):
  In this installation position the bearings will not be properly lubricated, even if there is still some fluid in the case chamber. Putting a non-return valve (opening pressure 0,5 bar) in the leakage line can prevent the system emptying through the line.

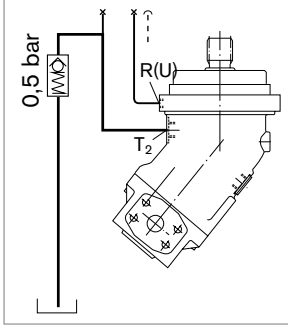
Installation position 1







Installation position 2



Notes

Notes

General Notes

– The A2FM motor is designed to be used in open and closed circuits.

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

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

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

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

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

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

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