

RE 91 001/09.00

replaces: 01.97

**Fixed Displacement Motor A2FM**

open and closed circuits

Sizes 5...1000

Series 6

Nom. Pressure up to 400 bar

Peak Pressure up to 450 bar



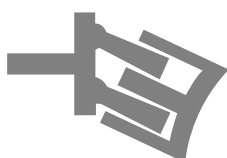
A2FM

Index

Features	1
Ordering Code / Standard Program	2
Technical Data	4...7
Ordering Code / Standard Program - Size 5	8
Unit Dimensions, Size 5	8
Unit Dimensions, Sizes 10, 12, 16	9
Unit Dimensions, Sizes 23, 28, 32	10...11
Unit Dimensions, Size 45	12...13
Preferred types	13
Unit Dimensions, Sizes 56, 63	14...15
Unit Dimensions, Sizes 80, 90	16
Unit Dimensions, Sizes 107, 125	17
Unit Dimensions, Sizes 160, 180	18
Unit Dimensions, Size 200	19
Unit Dimensions, Size 250	20
Unit Dimensions, Size 355	21
Unit Dimensions, Size 500	22
Unit Dimensions, Size 710	23
Unit Dimensions, Size 1000	24
Speed sensor	25
Flushing valves	25
Pressure relief valves	26
Motion Control Valve	27
Installation and Commissioning Guidelines	28

Features

- Fixed displacement motor A2FM of axial piston, bent axis design, suitable for hydrostatic drives in open and closed circuits
- Use in mobile and industrial applications
- Output speed is proportional to input flow and inversely proportional to displacement
- Drive torque increases with the pressure drop across the unit
- Careful selection of the displacements offered, permit sizes to be matched to practically every application
- Favourable power / weight ratio
- Compact design
- Optimum efficiency
- Economical conception
- One piece pistons with piston rings



Ordering Code / Standard Program

(Ordering code size 5 see page 8)

Hydraulic fluid

Mineral oil (no code)		
HFB-, HFC-, HFD- Hydraulic fluid	sizes 10...200 (no code) sizes 250...1000 (only in connection with drive shaft bearings "L")	E-

Axial piston unit

Bent axis design, fixed displacement	A2F
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Drive shaft bearings

	10...200	250...500	710...1000	
Mechanical bearings (no code)	●	●	—	
Long-Life bearings	—	●	●	L

Mode of operation

Motor (Plug-in motor A2FE see RE 91008)	M
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Size

≥ Displacement V_g (cm ³)																					
5	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	200	250	355	500	710	1000

Sizes 5...200: production Elchingen Plant; Sizes 250...1000: production Horb Plant

Series

	6
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Index

	sizes 10...180	1
	size 200	3
	sizes 250...1000	0

Direction of rotation

viewed on shaft end	alternating	W
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Seals

FKM (fluor-caoutchouc)	V
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Shaft end

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

Mounting flange

	10...250	355...1000	
ISO 4-hole	●	—	B
ISO 8-hole	—	●	H

● = available
— = not available

■ = preferred program (preferred types see page 13)

A2F M / 6 W - V

Hydraulic fluid

Axial piston unit

Drive shaft bearings

Mode of operation

Size

Series

Index

Direction of rotation

Seals

Shaft end

Mounting flange

Service line connections¹⁾

		10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	200	250	355	500	710	1000		
Ports A and B SAE, at rear end	01	0	-	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	010
		6	-	-	●	●	●	●	●	●	●	●	-	-	-	-	-	-	-	-	-	-	-	016
Ports A and B SAE, opposite side	02	0	-	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-	-	020
		6	-	-	●	●	●	●	●	●	●	●	-	-	-	-	-	-	-	-	-	-	-	026
		7	-	-	-	-	-	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-	027
Ports A and B threads, at side, opposite side	03	0	●	●	●	●	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	030
		6	-	-	●	●	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	036
Ports A and B threads, at side and rear end	04	0		●	●	●	●	●	●	●	-	-	-	-	-	-	-	● ²⁾	-	-	-	-	-	040
		6	-	-	●	●	●	●	●	●	-	-	-	-	-	-	-	-	-	-	-	-	-	046
Ports A and B SAE, at side, same side	10	0	-	-	-	●	●	●	●	●	●	●	●	●	●	●	●	●	-	-	●	-	-	100
		6	-	-	-	●	●	●	●	●	●	●	-	-	-	-	-	-	-	-	-	-	-	106
port plate with press. relief valve and built-on motion control valve	18	1	-	-	-	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-	-	-	181
Port plate with integrated pressure relief valves	19	1	-	-	-	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-	-	-	191
		2	-	-	-	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-	-	-	192

Valves

without valves	0
with pressure relief valves (<i>without pressure sequence range</i>)	1
with pressure relief valves (<i>with pressure sequence range</i>)	2
with integrated flushing valve	6
with built-on flushing and boost valve	7

Speed sensing control

	10...16	23...180	200	250...1000	
without speed sensing control (no code)	●	●	●	●	
prepared for speed sensing control	-	●	-	●	D

Special design

without special design (standard type, no code)	
special design for slew drive applications (standard for port plate 19)	J

¹⁾ Threads of fixing screws and service lines are metric

²⁾ ports at rear end are plugged

Technical Data

Fluid

To review the application of A2FM motors with the selected hydraulic fluid, detailed fluid compatibility and application data can be found in data sheets RE 90220 (mineral oil), RE 90221 (environmentally acceptable hydraulic fluids) and RE 90223 (fire resistant fluids, HF).

The fixed motor A2FM is not suitable for operation with HFA. When using HFB-, HFC-, HFD- or environmentally acceptable hydraulic fluids possible limitations for the technical data have to be taken into consideration. If necessary please consult our technical department (please indicate type of the hydraulic fluid used for your application on the order sheet).

Operating viscosity range

In order to obtain optimum efficiency and service life, we recommend that the operating viscosity (at operating temperature) be selected from within the range

$$v_{opt} = \text{opt. operating viscosity } 16...36 \text{ mm}^2/\text{s}$$

referred to the loop temperature (closed circuit) or tank temperature (open circuit).

Viscosity limits

The limiting values for viscosity are as follows:

sizes 5...200

$v_{min} = 5 \text{ mm}^2/\text{s}$, short term at a max. permissible temperature of $t_{max} = 115^\circ\text{C}$
 $v_{max} = 1600 \text{ mm}^2/\text{s}$, short term on cold start ($t_{min} = -40^\circ\text{C}$)

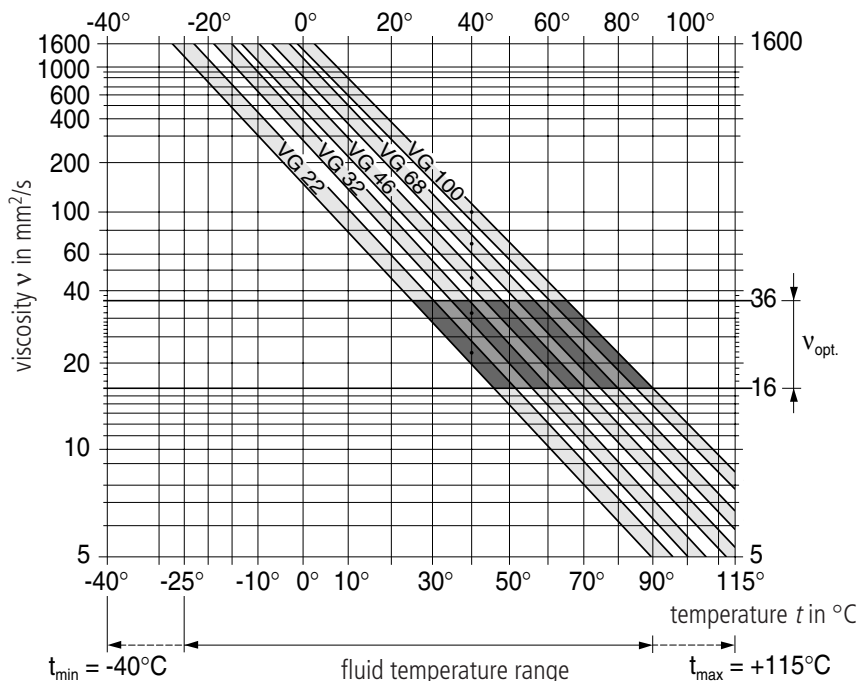
sizes 250...1000

$v_{min} = 10 \text{ mm}^2/\text{s}$, short term at a max. permissible leakage oil temp. of $t_{max} = 90^\circ\text{C}$
 $v_{max} = 1000 \text{ mm}^2/\text{s}$, short term on cold start ($t_{min} = -25^\circ\text{C}$)

Please note that the max. fluid temperature is also not exceeded in certain areas (for instance bearing area).

At temperatures of -25°C up to -40°C special measures may be required for certain installation positions. Please contact us for further information.

Selection diagram



Notes on the selection of the hydraulic fluid

In order to select the correct fluid, it is necessary to know the operating temperature in the loop (closed circuit) or the tank temperature (open circuit) in relation to the ambient temperature.

The hydraulic fluid should be selected so that within the operating temperature range, the operating viscosity lies within the optimum range (v_{opt}) (see shaded section of the selection diagram). We recommend that the highest possible viscosity range should be chosen in each case.

Example: At an ambient temperature of $X^\circ\text{C}$ the operating temperature (closed circuit: loop temperature; open circuit: tank temperature) is 60°C . Within the operating viscosity range (v_{opt} ; shaded area), this corresponds to viscosity ranges VG 46 or VG 68. VG 68 should be selected.

Important: The leakage oil (case drain oil) temperature is influenced by pressure and motor speed and is always higher than the circuit or tank temperature. However, at no point in the circuit may the temperature exceed 115°C for sizes 5...200 or 90°C for sizes 250...1000.

If it is not possible to comply with the above conditions because of extreme operating parameters or high ambient temperatures please consult us.

Filtration

The finer the filtration the better the achieved purity grade of the pressure fluid and the longer the life of the axial piston unit. To ensure the functioning of the axial piston unit a minimum purity grade of

9 to NAS 1638

18/15 to ISO/DIS 4406 is necessary.

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

8 to NAS 1638

17/14 to ISO/DIS 4406 is necessary.

If above mentioned grades cannot be maintained please consult us.

Technical Data

Working pressure range

maximum pressure at port A or B (Pressure data to 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

Size 10...200 ¹⁾	Shaft end A, Z ²⁾	Shaft end B, P
Nominal pressure p_N	400 bar	350 bar
Peak pressure p_{max}	450 bar	400 bar

¹⁾ Attention: shaft end Z and P with drives of radial force loads at the drive shaft necessitate reduction of the nominal pressure to $p_N = 315$ bar.

²⁾ Shaft end Z to size 56: $p_N = 350$ bar, $p_{max} = 400$ bar

Sizes 250...1000

Nominal pressure p_N	350 bar
Peak pressure p_{max}	400 bar

With pulsating loads above 315 bar we recommend using the model with splined shaft, standard version A (sizes 10...200) or with splined shaft Z (sizes 250...1000).

The summ of the pressures at ports A und B may not exceed 700 bar (630 bar, A2F 5).

Direction of flow

Clockwise rotation	Anti-clockwise rotation
A to B	B to A

Speed range

There is no limitation on minimum speed n_{min} . If uniformity of rotation is required, however, speed n_{min} should not be allowed to fall below 50 rpm. See table on page 6 for max. permissible speeds.

Long-Life bearings (L) (sizes 250...1000)

(for high life expectancy and use of HF-fluids)

The outer dimensions of the axial piston motors are identical to standard design (without long life bearings). The change from standard design to long life bearing system is possible.

We recommend to apply bearing flushing at port U.

Bearing flushing

For sizes 250...1000 bearing and housing flushing is possible through port U.

Flows (recommendation)

Sizes	250	355	500	710	1000
q_{flush} (L/min)	10	16	20	25	25

Case drain pressure

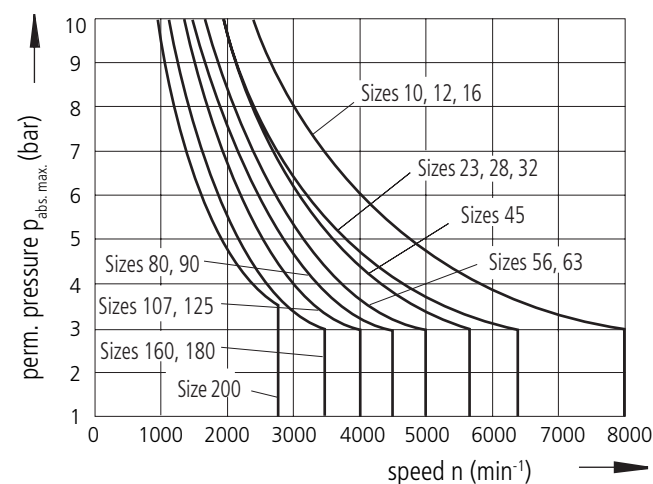
Shaft seal ring **FKM** (fluor-caoutchouc)

The lower the speed and the case drain pressure the higher the life expectation of the shaft seal ring. The values shown in the diagram are permissible loads of the seal ring and shall not be exceeded.

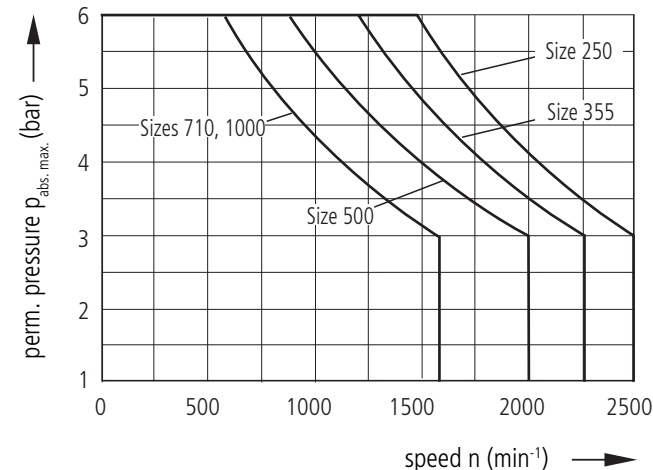
At stationary pressure loads in the range of the max. admissible leakage pressure a reduction of the life experience of the seal ring will result.

For a short period ($t < 5$ min.) are for the sizes 10...200 pressure loads up to 5 bar independent from rotational speeds are permissible.

Sizes 10...200



Sizes 250...1000



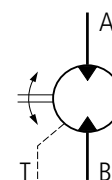
Note:

- max. permissible motor speeds are given in the table on page 6
- max. perm. housing pressure $p_{abs, max}$ _____ 10 bar (sizes 5...200)
_____ 6 bar (sizes 250...1000)
- the pressure in the housing must be the same as or greater than the external pressure on the shaft seal.

Symbol

Connections

A, B Service line ports
T Drain port



Technical Data

Table of values (theoretical values, without considering η_{mh} and η_v ; 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}	min ⁻¹	10 000	8000	8000	8000	6300	6300	6300	5600	5000	5000	4500	
	$n_{max\ intermit.}^{1)}$	min ⁻¹	11 000	8800	8800	8800	6900	6900	6900	6200	5500	5500	5000	
Max. flow	n_{max}	$q_{V\ max}$	L/min	49	82	96	128	144	176	201	255	280	315	360
Torque constants	T_K	Nm/bar	0,076	0,164	0,19	0,25	0,36	0,445	0,509	0,725	0,89	1,0	1,27	
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
Case volume		L		0,17	0,17	0,17	0,20	0,20	0,20	0,33	0,45	0,45	0,55	
Moment of inertia about drive axis	J	kgm ²	0,00008	0,0004	0,0004	0,0004	0,0012	0,0012	0,0012	0,0024	0,0042	0,0042	0,0072	
Weight (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}	min ⁻¹	4500	4000	4000	3600	3600	2750	2500	2240	2000	1600	1600	
	$n_{max\ intermit.}^{1)}$	min ⁻¹	5000	4400	4400	4000	4000	3000	–	–	–	–	–	
Max. flow	n_{max}	$q_{V\ max}$	L/min	405	427	500	577	648	550	625	795	1000	1136	1600
Torque constants	T_K	Nm/bar	1,43	1,70	1,99	2,54	2,86	3,18	3,98	5,65	7,96	11,3	15,9	
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	–	–	–	–	–
Case volume		L	0,55	0,8	0,8	1,1	1,1		2,5	3,5			7,8	
Moment of inertia about drive axis	J	kgm ²	0,0072	0,0116	0,0116	0,0220	0,0220	0,0378	0,061	0,102	0,178	0,55	0,55	
Weight (approx.)	m	kg	23	32	32	45	45	66	73	110	155	322	336	

¹⁾ Intermittent max. speed: overspeed at discharge and overtaking travel operations, $t < 5\ sek.$ and $\Delta p < 150\ bar$

²⁾ $\Delta p = 315\ bar$

Calculation of size

Flow	$q_v = \frac{V_g \cdot n}{1000 \cdot \eta_v}$	in L/min	$V_g =$ geometric displacement per rev.	in cm ³
Output speed	$n = \frac{q_v \cdot 1000 \cdot \eta_v}{V_g}$	in min ⁻¹	$T =$ torque	in Nm
			$\Delta p =$ pressure differential	in bar
Output torque	$T = \frac{V_g \cdot \Delta p \cdot \eta_{mh}}{20 \cdot \pi}$		$n =$ speed	in min ⁻¹
	or $T = T_K \cdot \Delta p \cdot \eta_{mh}$	in Nm	$T_K =$ torque constants	in Nm/bar
Output power	$P = \frac{2 \pi \cdot T \cdot n}{60 \cdot 1000} = \frac{T \cdot n}{9549}$		$\eta_v =$ volumetric efficiency	
	$= \frac{q_v \cdot \Delta p}{600} \cdot \eta_t$	in kW	$\eta_{mh} =$ mech.-hyd. efficiency	
			$\eta_t =$ overall efficiency	

Technical Data

Output drive

Permissible axial and radial loads on drive shaft

The values given are maximum values and do not apply to continuous operation

Size		5	10	12	16	23	28	32	45	56	63	80
a	mm	12	16	16	16	16	16	16	18	18	18	20
$F_{q \max}$	N	710	2350	2750	3700	4300	5400	6100	8150	9200	10300	11500
$\pm F_{ax \max}$	N	180	320	320	320	500	500	500	630	800	800	1000
$\pm F_{ax \text{ perm.}}/bar$	N/bar	1,5	3,0	3,0	3,0	5,2	5,2	5,2	7,0	8,7	8,7	10,6

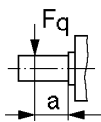
Size		90	107	125	160	180	200	250	355	500	710	1000
a	mm	20	20	20	25	25	25	41	52,5	52,5	67,5	67,5
$F_{q \max}$	N	12900	13600	15900	18400	20600	22900	1200 ¹⁾	1500 ¹⁾	1900 ¹⁾	3000 ¹⁾	2600 ¹⁾
$\pm F_{ax \max}$	$+F_{ax \max}$	1000	1250	1250	1600	1600	1600	4000	5000	6250	10000	10000
	$-F_{ax \max}$	1000	1250	1250	1600	1600	1600	1200	1500	1900	3000	2600
$\pm F_{ax \text{ perm.}}/bar$	N/bar	10,6	12,9	12,9	16,7	16,7	16,7	²⁾	²⁾	²⁾	²⁾	²⁾

¹⁾ Axial piston unit stationary or in bypass operation, please contact us when appearing higher forces!

²⁾ Please contact us!

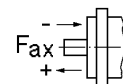
Code explanation

- a = distance of F_q from shaft shoulder
- $F_{q \max}$ = max. perm. radial force at distance a (at intermittent operation)
- $\pm F_{ax \max}$ = max. perm. axial force when stationary or when axial piston unit is running at zero pressure
- $\pm F_{ax \text{ perm.}}/bar$ = perm. axial force/bar operating pressure



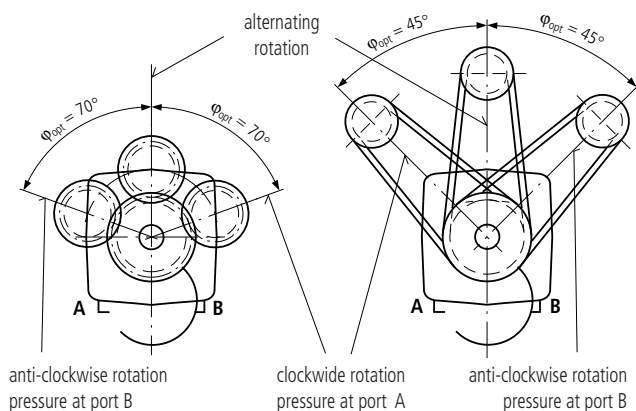
The direction of the max. perm. axial force must be noted by sizes 28...200:

- F_{ax} = increases bearing life
- + F_{ax} = reduces bearing life (avoid if possible)



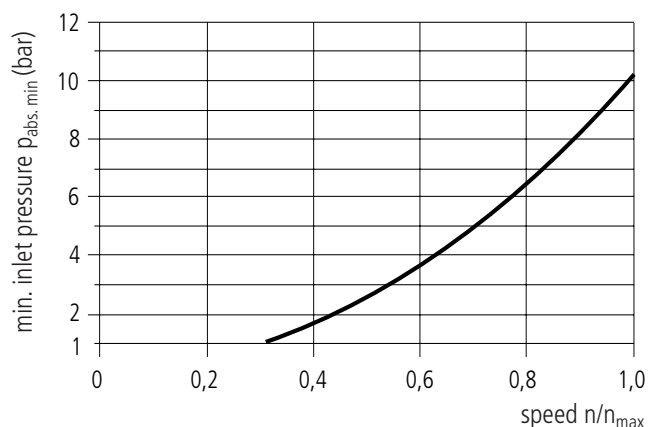
Optimal force direction of F_q (valid for sizes 10...180)

By means of appropriate force directions of F_q the bearing load caused by inside rotary group forces can be reduced. An optimal life expectation of the bearing can be reached.

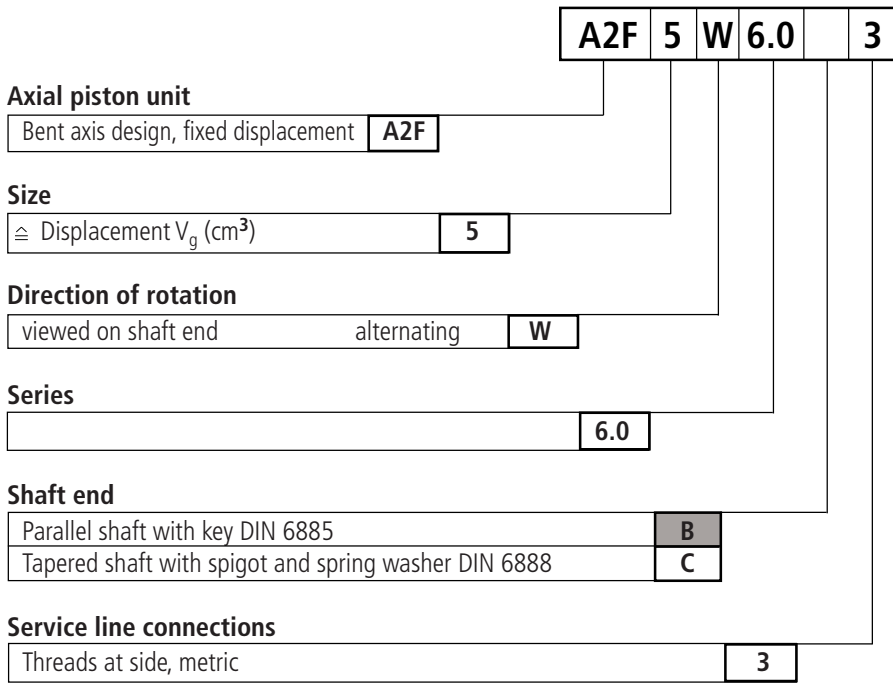


Minimum inlet pressure at port A (B)

In order to avoid damage of the variable motor a minimum inlet pressure at the inlet zone must be assured. The minimum inlet pressure is related to the rotational speed of the fixed motor.



Ordering Code / Standard Program - Size 5



Additional instructions in text form

Seals

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

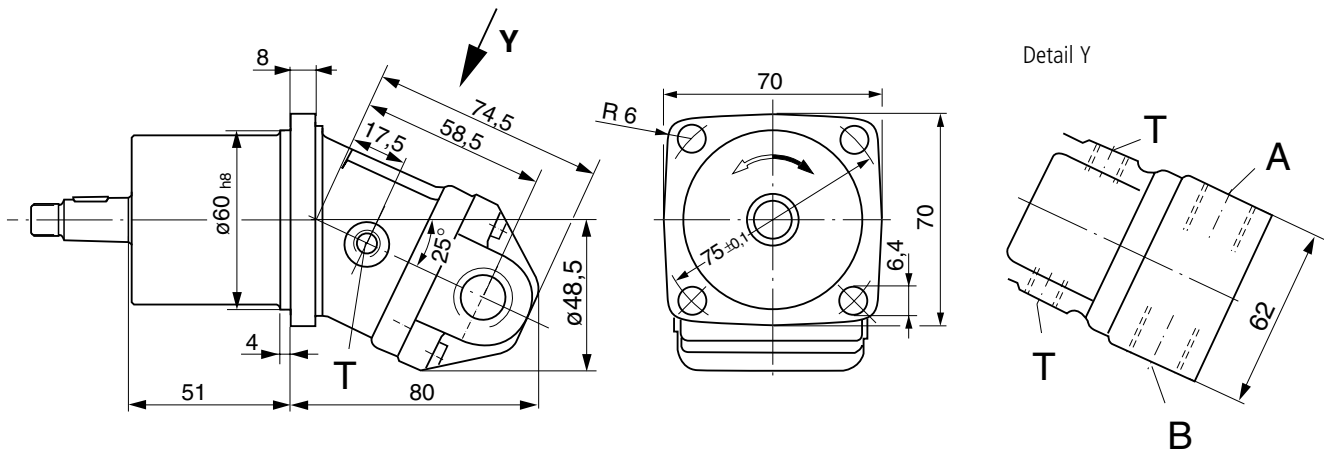
In case of need FKM- (fluor-caoutchouc) seals please indicate when ordering in clear text:

"with FKM-seals"



Unit Dimensions, Size 5

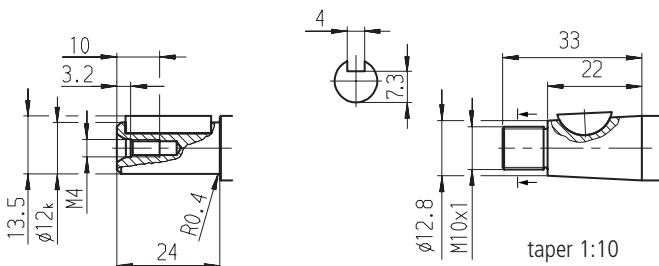
Before finalising your design, please request a certified drawing.



Shaft ends

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

C Tapered shaft with spigot and spring washer 3x5 DIN 6888, $p_N = 315$ bar

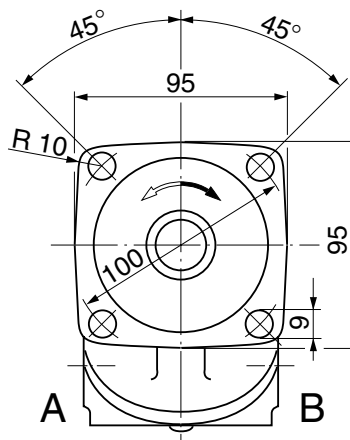
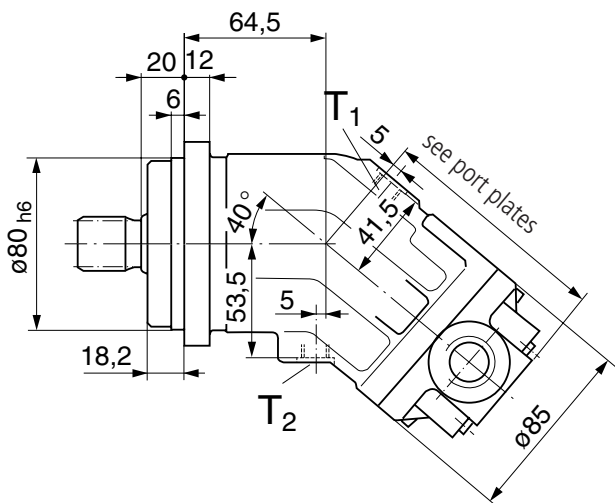


Connections

B, (A) Service line ports M 18x1,5
T Drain port M 10x1, both sides

Unit Dimensions, Sizes 10,12,16

Before finalising your design, please request a certified drawing.



Connections

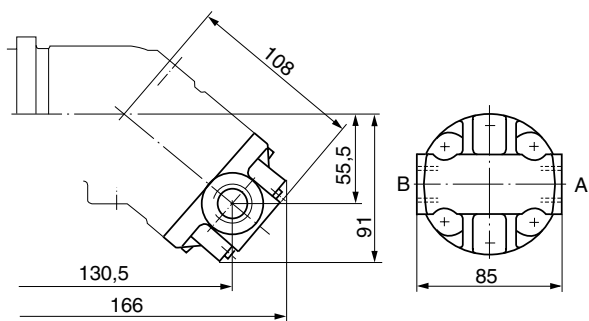
A, B Service line ports (see port plates)

T₁, T₂ Drain ports (1 port plugged)

M 12x1,5

Port plates

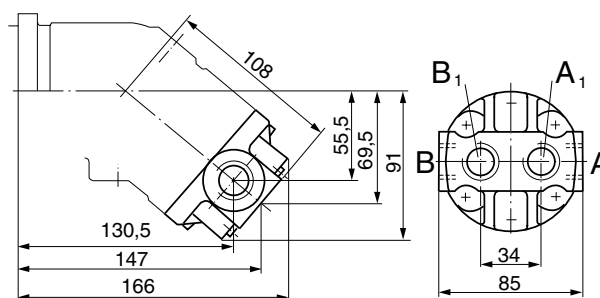
03 Threaded ports, at side



A, B Service line ports

M 22x1,5

04 Threaded ports, at side and rear end



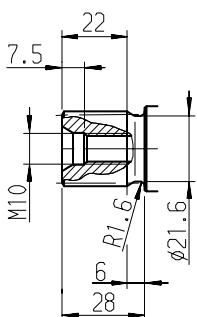
A, B, A₁, B₁ Service line ports

M 22x1,5

Shaft ends

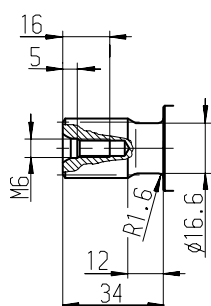
Sizes 10, 12, 16

A Splined shaft, DIN 5480
W 25x1,25x30x18x9g
p_N = 400 bar



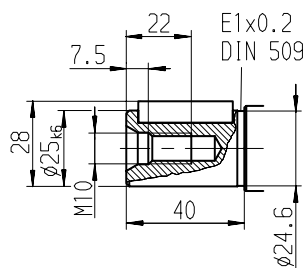
Sizes 10, 12

Z Splined shaft, DIN 5480
W 20x1,25x30x14x9g
p_N = 400 bar



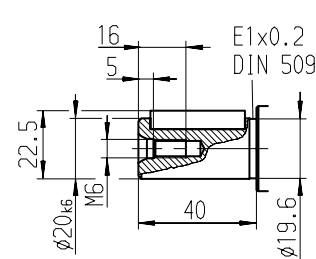
Sizes 10, 12, 16

B Parallel shaft with key,
DIN 6885, AS 8x7x32
p_N = 350 bar



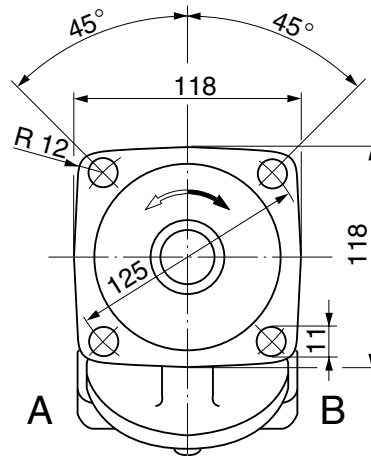
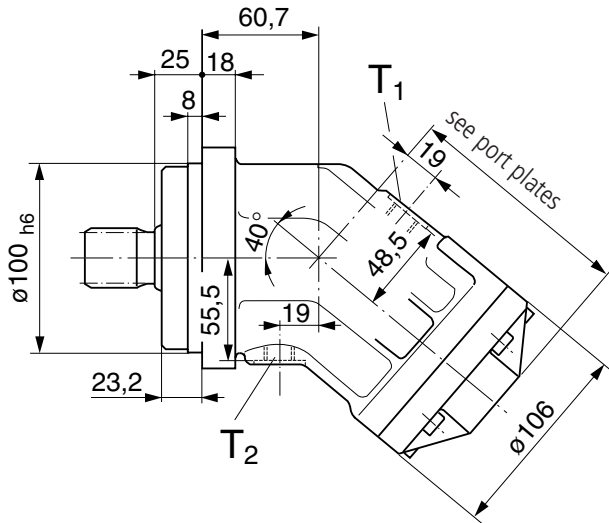
Sizes 10, 12

P Parallel shaft with key,
DIN 6885, AS 6x6x32
p_N = 350 bar



Unit Dimensions, Sizes 23, 28, 32

Before finalising your design, please request a certified drawing.



Connections

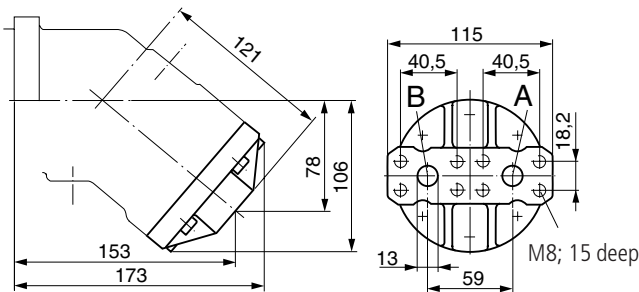
A, B Service line ports (see port plates)

T₁, T₂ Drain ports (1 port plugged)

M 16x1,5

Port plates

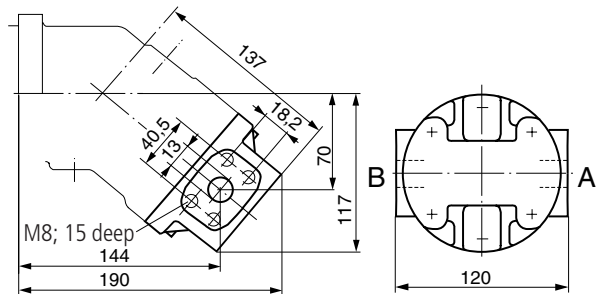
01 SAE-ports, at rear end



A, B Service line ports
420 bar (6000 psi) high pressure series

SAE 1/2"

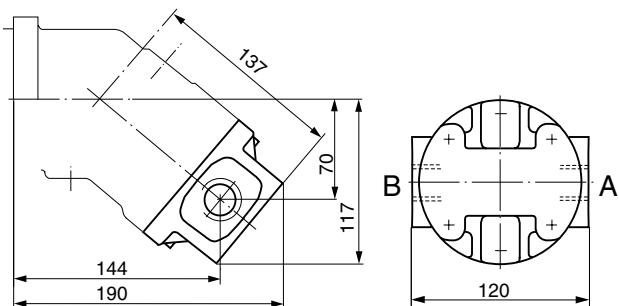
02 SAE-ports, at side



A, B Service line ports
420 bar (6000 psi) high pressure series

SAE 1/2"

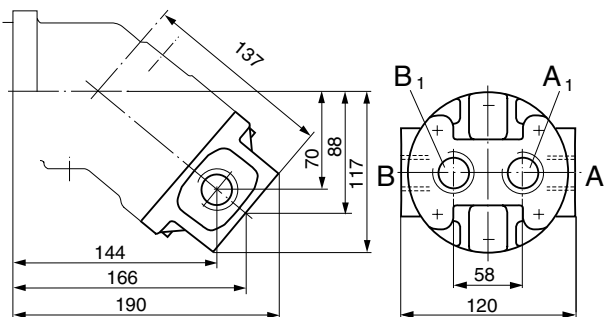
03 Threaded ports, at side



A, B Service line ports

M 27x2

04 Threaded ports, at side and rear end



A, B, A₁, B₁ Service line ports

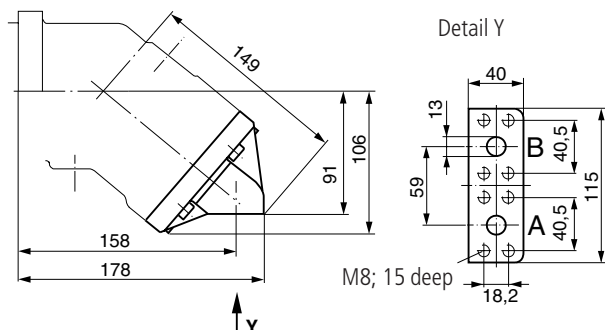
M 27x2

Unit Dimensions, Sizes 23, 28, 32

Before finalising your design, please request a certified drawing.

Port plates

10 SAE-ports, at side, same side



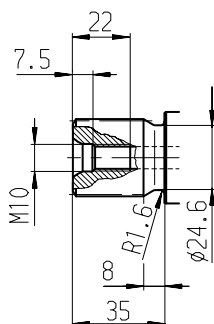
A, B Service line ports
420 bar (6000 psi) high pressure series

SAE 1/2"

Shaft ends

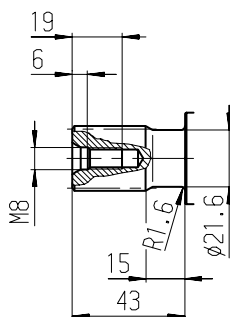
Sizes 23, 28, 32

A Splined shaft, DIN 5480
W 30x2x30x14x9g
 $p_N = 400$ bar



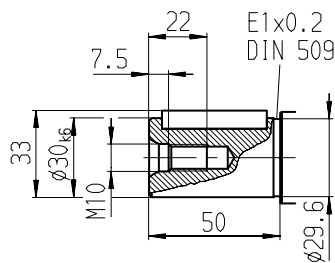
Sizes 23, 28

Z Splined shaft, DIN 5480
W 25x1,25x30x18x9g
 $p_N = 400$ bar



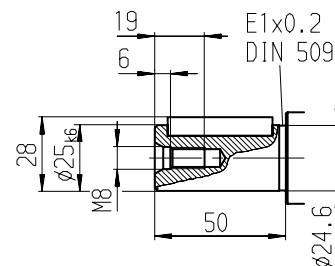
Sizes 23, 28, 32

B Parallel shaft with key,
DIN 6885, AS 8x7x40
 $p_N = 350$ bar



Sizes 23, 28

P Parallel shaft with key,
DIN 6885, AS 8x7x40
 $p_N = 350$ bar

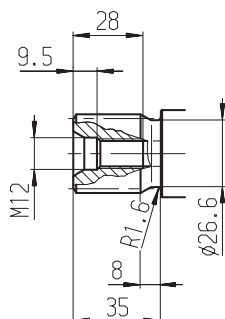


Unit Dimensions, Size 45

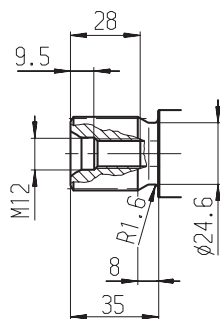
Before finalising your design, please request a certified drawing.

Shaft ends

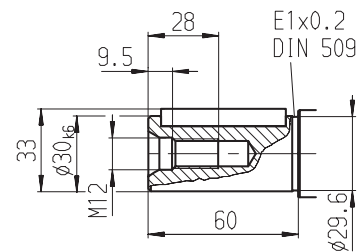
A Splined shaft, DIN 5480
W 32x2x30x14x9g
 $p_N = 400$ bar



Z Splined shaft, DIN 5480
W 30x2x30x14x9g
 $p_N = 400$ bar



P Parallel shaft with key,
DIN 6885, AS 8x7x50
 $p_N = 350$ bar

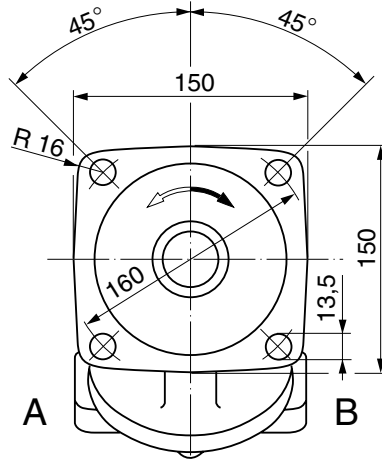
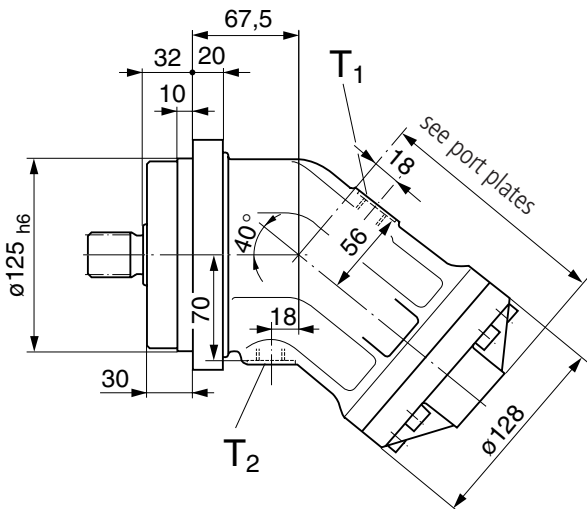


Preferred types (please state type and ident-no. when ordering)

Type	Ident-No.	Type	Ident-No.
A2F5W6.0B3	9404451	A2FM80/61W-VAB010	9422638
A2FM10/61W-VAB030	9423386	A2FM80/61W-VAB020	9422089
A2FM10/61W-VBB030	9610656	A2FM80/61W-VBB010	9610666
		A2FM80/61W-VBB020	9610667
A2FM12/61W-VAB030	9424240	A2FM90/61W-VAB010	9408463
A2FM12/61W-VBB030	9610657	A2FM90/61W-VAB020	9408464
A2FM16/61W-VAB030	9411111	A2FM90/61W-VBB010	9408468
A2FM16/61W-VBB030	9411119	A2FM90/61W-VBB020	9408469
A2FM23/61W-VAB010	9427351	A2FM107/61W-VAB010	9424300
A2FM23/61W-VAB020	9422092	A2FM107/61W-VAB020	9424093
A2FM23/61W-VAB040	9428415	A2FM107/61W-VBB010	9610668
A2FM23/61W-VBB010	9610658	A2FM107/61W-VBB020	9610669
A2FM23/61W-VBB020	9610659		
A2FM23/61W-VBB040	9610660	A2FM125/61W-VAB010	9409630
		A2FM125/61W-VAB020	9409634
A2FM28/61W-VAB010	9424853	A2FM125/61W-VBB010	9409637
A2FM28/61W-VAB020	9422548	A2FM125/61W-VBB020	9409638
A2FM28/61W-VAB040	9421629		
A2FM28/61W-VBB010	9610661	A2FM160/61W-VAB010	9425163
A2FM28/61W-VBB020	9610662	A2FM160/61W-VAB020	9424094
A2FM28/61W-VBB040	9610663	A2FM160/61W-VBB010	9610670
		A2FM160/61W-VBB020	9610671
A2FM32/61W-VAB010	9410189		
A2FM32/61W-VAB020	9410190	A2FM180/61W-VAB010	9409189
A2FM32/61W-VAB040	9410192	A2FM180/61W-VAB020	9409190
A2FM32/61W-VBB010	9410194	A2FM180/61W-VBB010	9409372
A2FM32/61W-VBB020	9410195	A2FM180/61W-VBB020	9409373
A2FM32/61W-VBB040	9410197	A2FM200/63W-VAB010	2011528
A2FM45/61W-VZB010	9411581	A2FM250/60W-VZB010	915383
A2FM45/61W-VZB020	9411582	A2FM250/60W-VZB020	910653
A2FM45/61W-VZB040	9411584		
		A2FM355/60W-VZH010	920780
A2FM56/61W-VAB010	9424905		
A2FM56/61W-VAB020	9422129	A2FM500/60W-VPH010	943251
A2FM56/61W-VAB040	9429251	A2FM500/60W-VZH010	968982
A2FM56/61W-VBB010	9610664		
A2FM56/61W-VBB020	9610665	A2FLM710/60W-VPH010	969815
A2FM56/61W-VBB040	9605544	A2FLM710/60W-VZH010	965974
A2FM63/61W-VAB010	9408523	A2FM1000/60W-VPH010	949444
A2FM63/61W-VAB020	9408524	A2FM1000/60W-VZH010	944773
A2FM63/61W-VAB040	9408526		
A2FM63/61W-VBB010	9408514		
A2FM63/61W-VBB020	9408549		
A2FM63/61W-VBB040	9408551		

Unit Dimensions, Sizes 56, 63

Before finalising your design, please request a certified drawing.



Connections

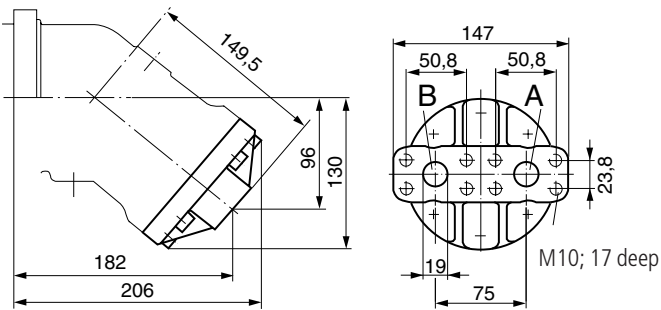
A, B Service line ports (see port plates)

T₁, T₂ Drain ports (1 port plugged)

M 18x1,5

Port plates

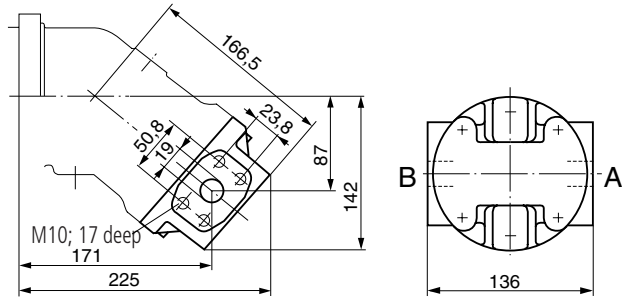
01 SAE-ports, at rear end



A, B Service line ports
420 bar (6000 psi) high pressure series

SAE 3/4"

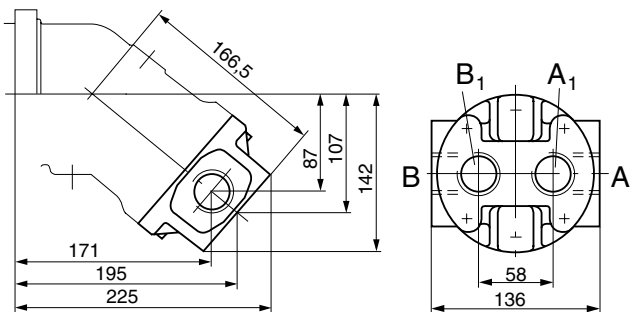
02 SAE-ports, at side



A, B Service line ports
420 bar (6000 psi) high pressure series

SAE 3/4"

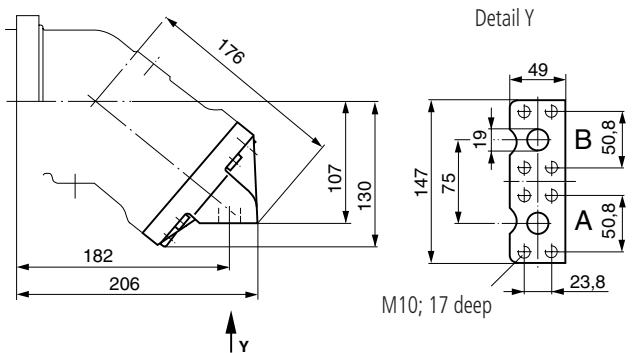
04 Threaded ports, at side and rear end



A, B, A₁, B₁ Service line ports

M 33x2

10 SAE-ports, at side, same side



A, B Service line ports
420 bar (6000 psi) high pressure series

SAE 3/4"

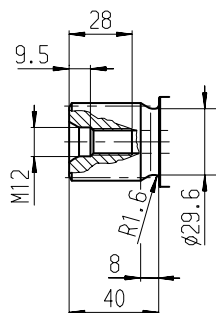
Unit Dimensions, Sizes 56, 63

Before finalising your design, please request a certified drawing.

Shaft ends

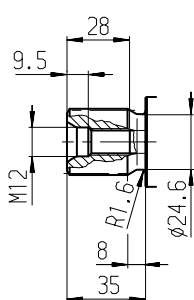
Sizes 56, 63

- A** Splined shaft, DIN 5480
W 35x2x30x16x9g
 $p_N = 400$ bar



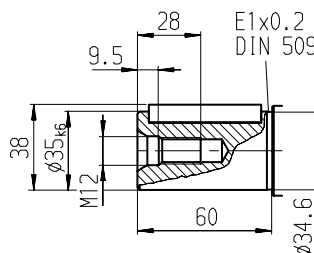
Size 56

- Z** Splined shaft, DIN 5480
W 30x2x30x14x9g
 $p_N = 350$ bar



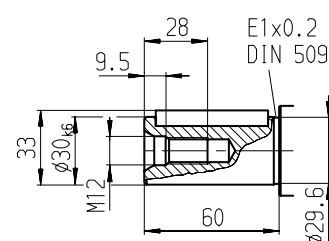
Sizes 56, 63

- B** Parallel shaft with key,
DIN 6885, AS 10x8x50
 $p_N = 350$ bar



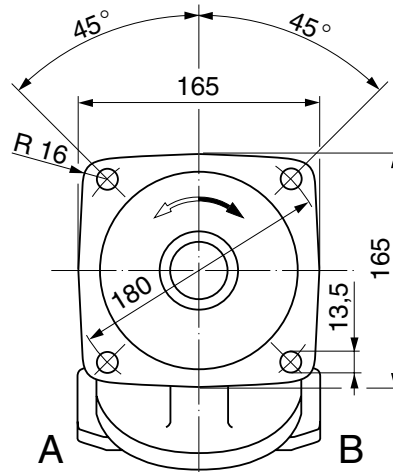
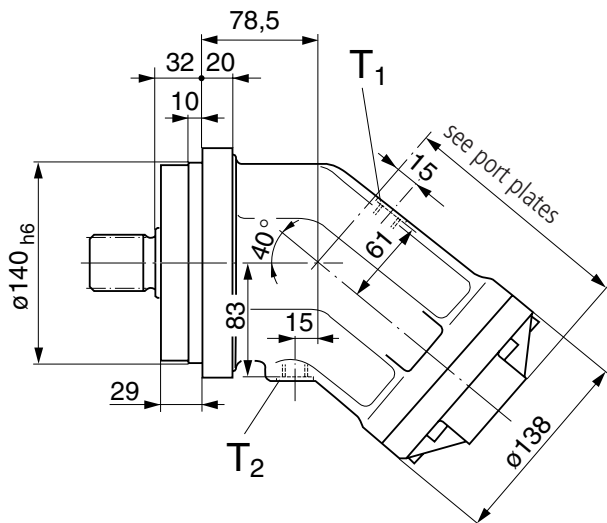
Size 56

- P** Parallel shaft with key,
DIN 6885, AS 8x7x50
 $p_N = 350$ bar



Unit Dimensions, Sizes 80, 90

Before finalising your design, please request a certified drawing.



Connections

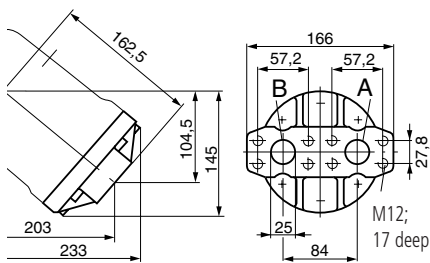
A, B Service line ports (see port plates)

T₁, T₂ Drain ports (1 port plugged)

M 18x1,5

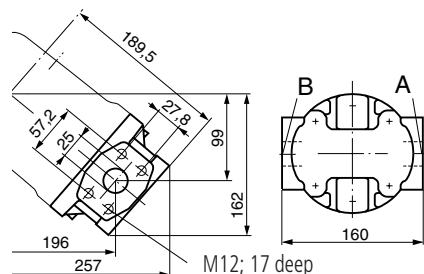
Port plates

01 SAE-ports, at rear end



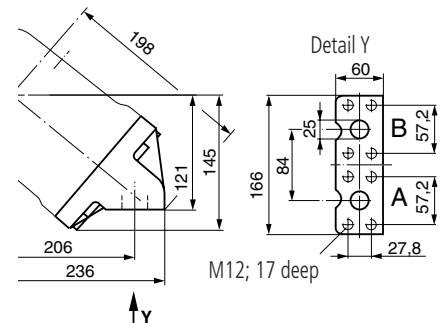
A, B Service line ports SAE 1" 420 bar (6000 psi) high pressure series

02 SAE-ports, at side



A, B Service line ports SAE 1" 420 bar (6000 psi) high pressure series

10 SAE-ports, at side, same side

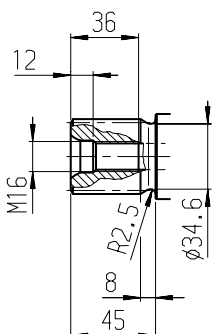


A, B Service line ports SAE 1" 420 bar (6000 psi) high pressure series

Shaft ends

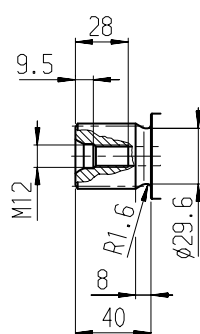
Sizes **80, 90**

A Splined shaft, DIN 5480
W 40x2x30x18x9g
p_N = 400 bar



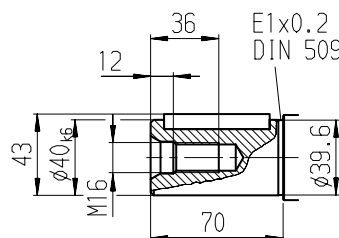
Size **80**

Z Splined shaft, DIN 5480
W 35x2x30x16x9g
p_N = 400 bar



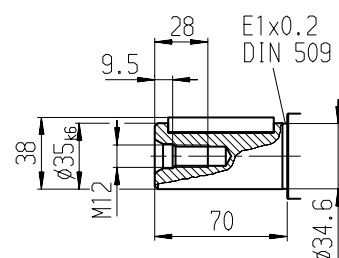
Sizes **80, 90**

B Parallel shaft with key,
DIN 6885, AS 12x8x56
p_N = 350 bar



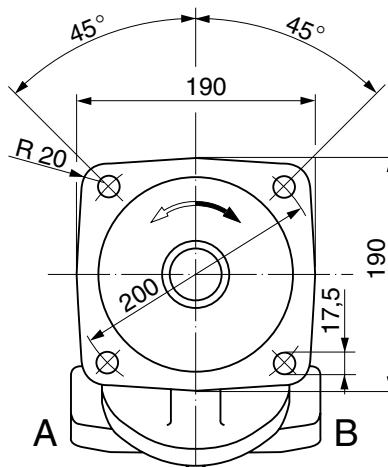
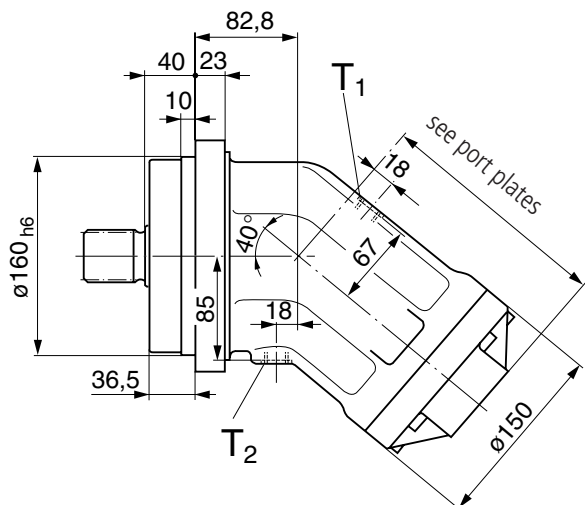
Size **80**

P Parallel shaft with key,
DIN 6885, AS 10x8x56
p_N = 350 bar



Unit Dimensions, Sizes 107, 125

Before finalising your design, please request a certified drawing.

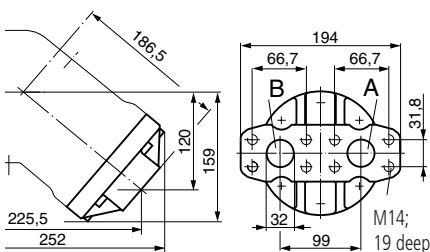


Connections

- A, B Service line ports (see port plates)
- T₁, T₂ Drain ports (1 port plugged) M 18x1,5

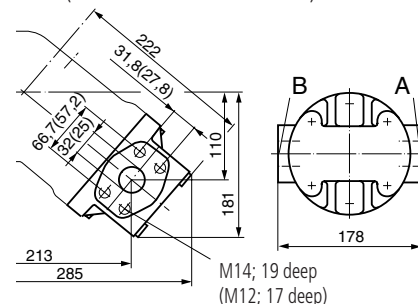
Port plates

01 SAE-ports, at rear end



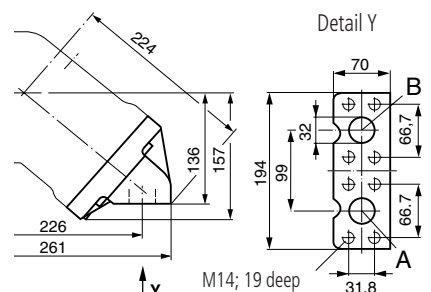
A, B Service line ports SAE 1 1/4" 420 bar (6000 psi) high pressure series

02 SAE-ports, at side (Klammermaße für NG 107!)



A, B Service line ports SAE 1 1/4"(1") 420 bar (6000 psi) high pressure series

10 SAE-ports, at side, same side

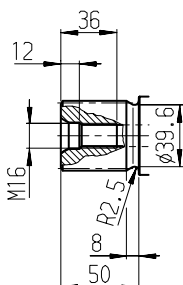


A, B Service line ports SAE 1 1/4" 420 bar (6000 psi) high pressure series

Shaft ends

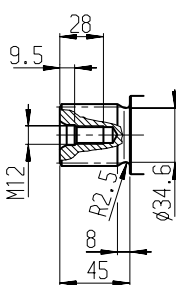
Sizes 107, 125

A Splined shaft, DIN 5480
W 45x2x30x21x9g
p_N = 400 bar



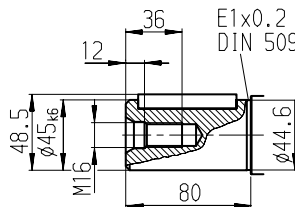
Size 107

Z Splined shaft, DIN 5480
W 40x2x30x18x9g
p_N = 400 bar



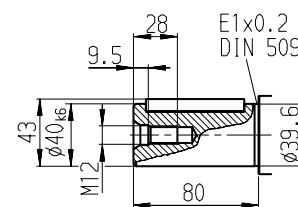
Sizes 107, 125

B Parallel shaft with key,
DIN 6885, AS 14x9x63
p_N = 350 bar



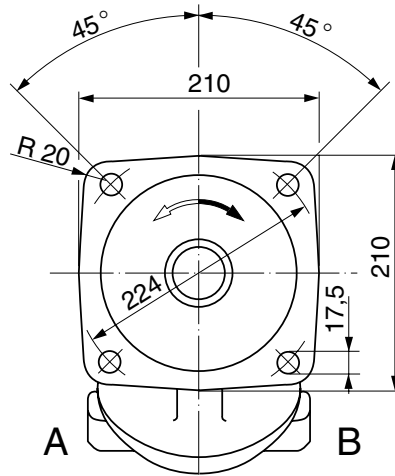
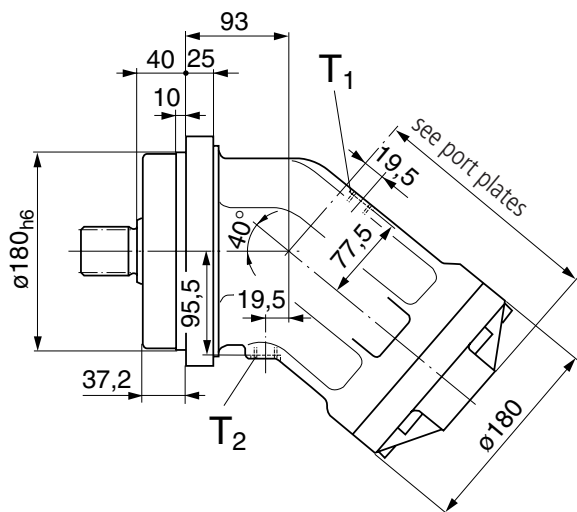
Size 107

P Parallel shaft with key,
DIN 6885, AS 12x8x63
p_N = 350 bar



Unit Dimensions, Sizes 160, 180

Before finalising your design, please request a certified drawing.



Connections

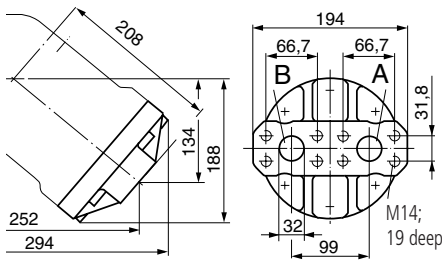
A, B Service line ports (see port plates)

T₁, T₂ Drain ports (1 port plugged)

M 22x1,5

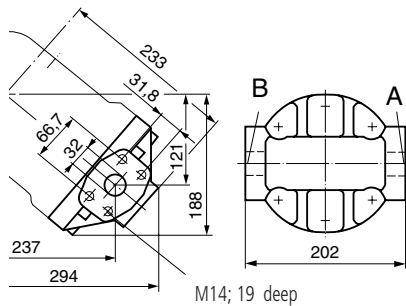
Port plates

01 SAE-ports, at rear end



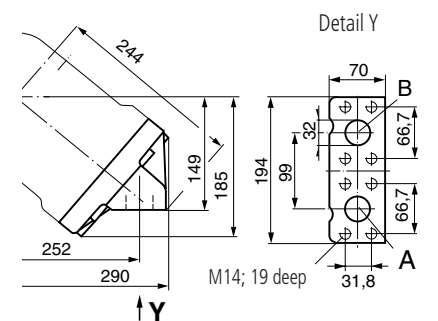
A, B Service line ports SAE 1 1/4" 420 bar (6000 psi) high pressure series

02 SAE-ports, at side



A, B Service line ports SAE 1 1/4" 420 bar (6000 psi) high pressure series

10 SAE-ports, at side, same side

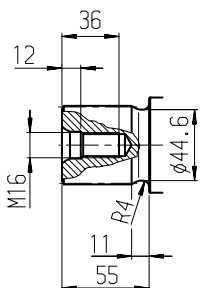


A, B Service line ports SAE 1 1/4" 420 bar (6000 psi) high pressure series

Shaft ends

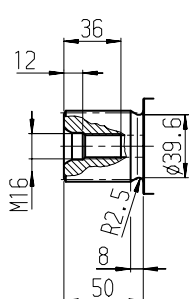
Sizes 160, 180

A Splined shaft, DIN 5480
W 50x2x30x24x9g
p_N = 400 bar



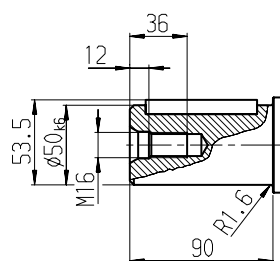
Size 160

Z Splined shaft, DIN 5480
W 45x2x30x21x9g
p_N = 400 bar



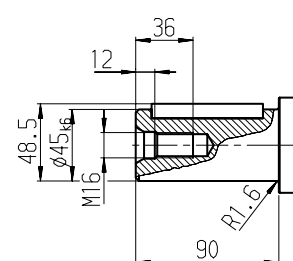
Sizes 160, 180

B Parallel shaft with key,
DIN 6885, AS 14x9x70
p_N = 350 bar



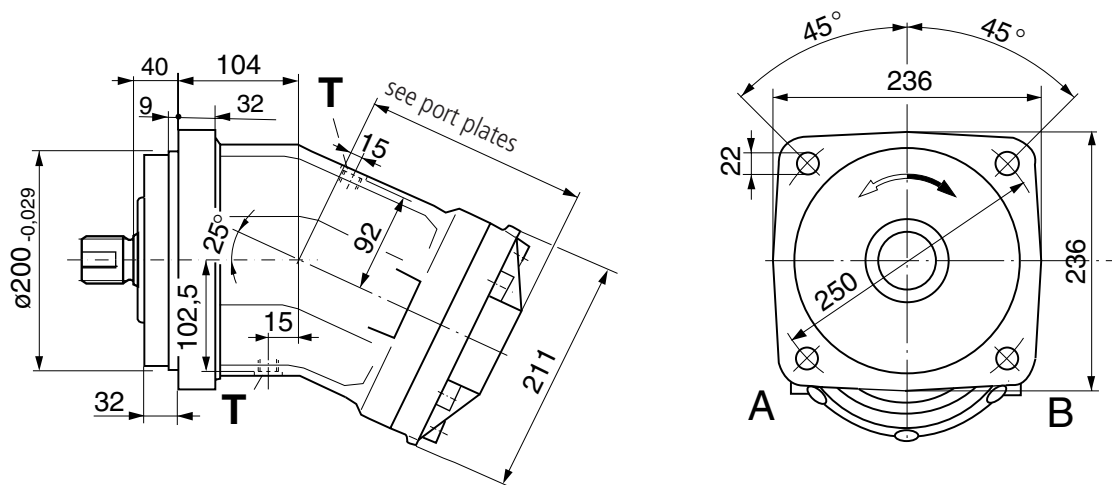
Size 160

P Parallel shaft with key,
DIN 6885, AS 14x9x70
p_N = 350 bar



Unit Dimensions, Size 200

Before finalising your design, please request a certified drawing.

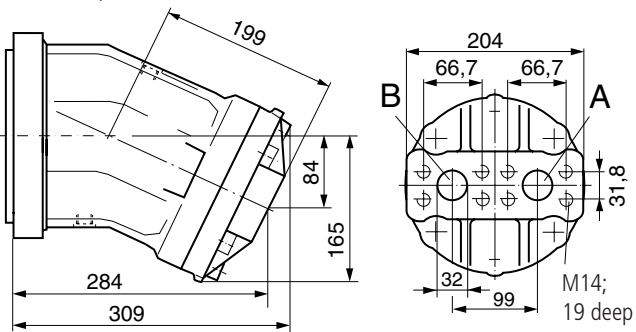


Connections

- A, B Service line ports (see port plates)
- T₁, T₂ Drain ports (1 port plugged) M 22x1,5

Port plates

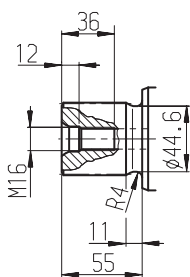
01 SAE-ports, at rear end



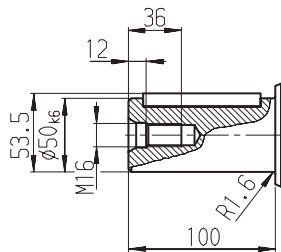
- A, B Service line ports SAE 1 1/4"
- 420 bar (6000 psi) high pressure series

Shaft ends

A Splined shaft, DIN 5480
W 50x2x30x24x9g
 $p_N = 400$ bar

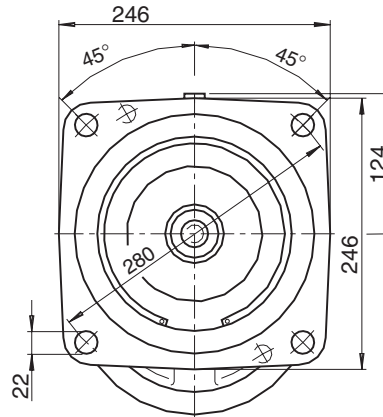
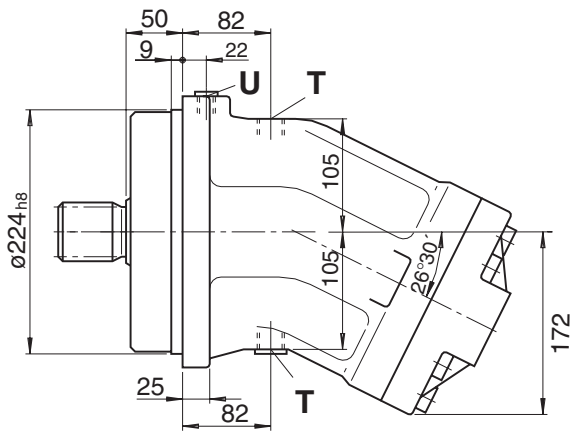


B Parallel shaft with key, DIN 6885, AS 14x9x80
 $p_N = 350$ bar



Unit Dimensions, Size 250

Before finalising your design, please request a certified drawing.

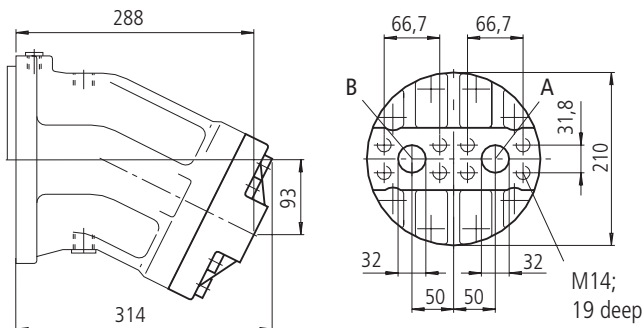


Connections

- A, B Service line ports (see port plates)
- T₁, T₂ Drain ports (1 port plugged) M 22x1,5
- U Port for bearing flushing (plugged) M 14x1,5

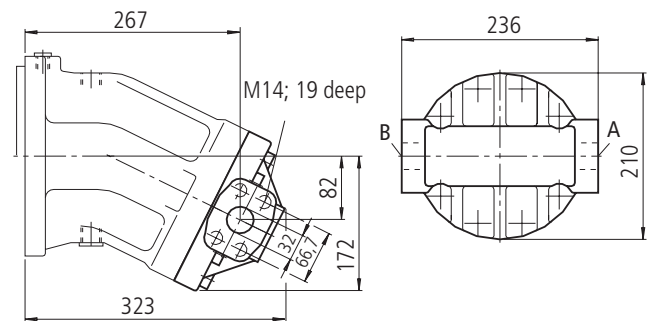
Port plates

01 SAE-ports, at rear end



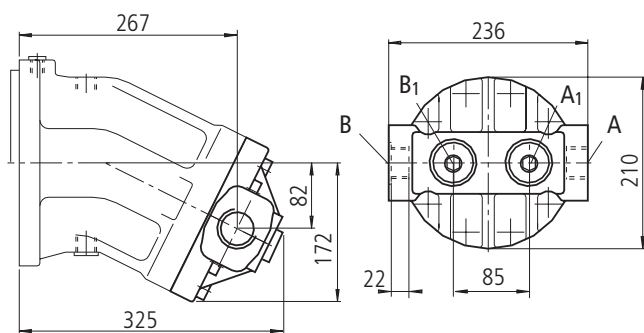
A, B Service line ports high pressure series SAE 1 1/4"

02 SAE-ports, at side



A, B Service line ports high pressure series SAE 1 1/4"

04 Threaded ports, at side and rear end

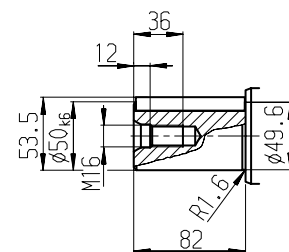
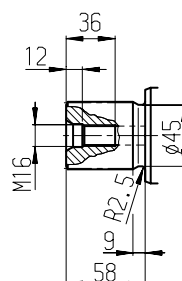


A, B Service line ports M 48x2
A₁, B₁ Service line ports (plugged) M 48x2

Shaft ends

Z Splined shaft, DIN 5480
W 50x2x30x24x9g
p_N = 350 bar

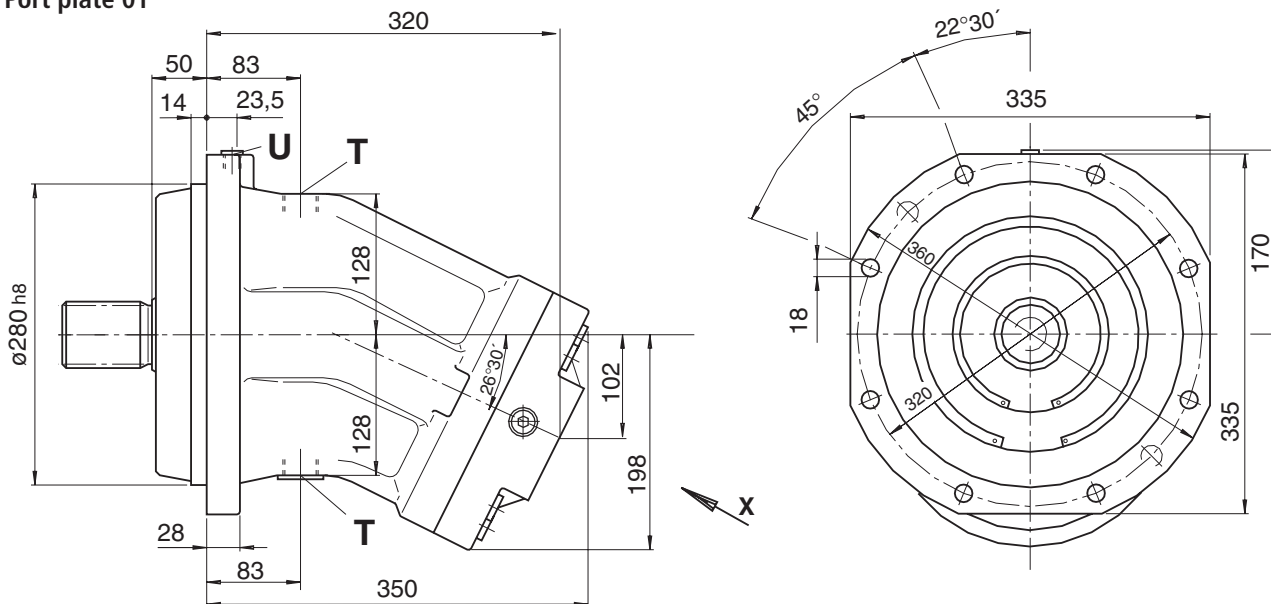
P Parallel shaft with key,
DIN 6885, AS 14x9x80
p_N = 350 bar



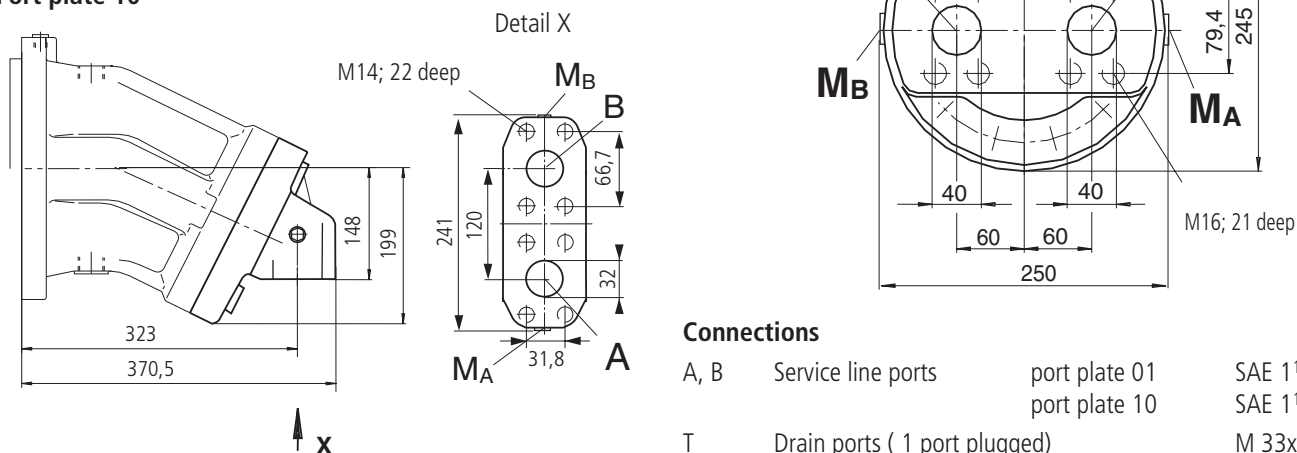
Unit Dimensions, Size 355

Before finalising your design, please request a certified drawing.

Port plate 01



Port plate 10



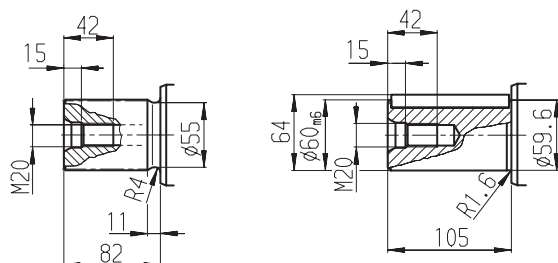
Connections

A, B	Service line ports	port plate 01	SAE 1 1/2"
		port plate 10	SAE 1 1/4"
T	Drain ports (1 port plugged)		M 33x2
U	Port for bearing flushing (plugged)		M 14x1,5
M _A , M _B	Test ports operating pressure (plugged)		M 14x1,5

Shaft ends

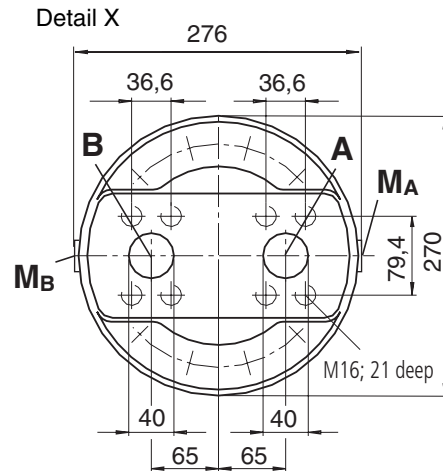
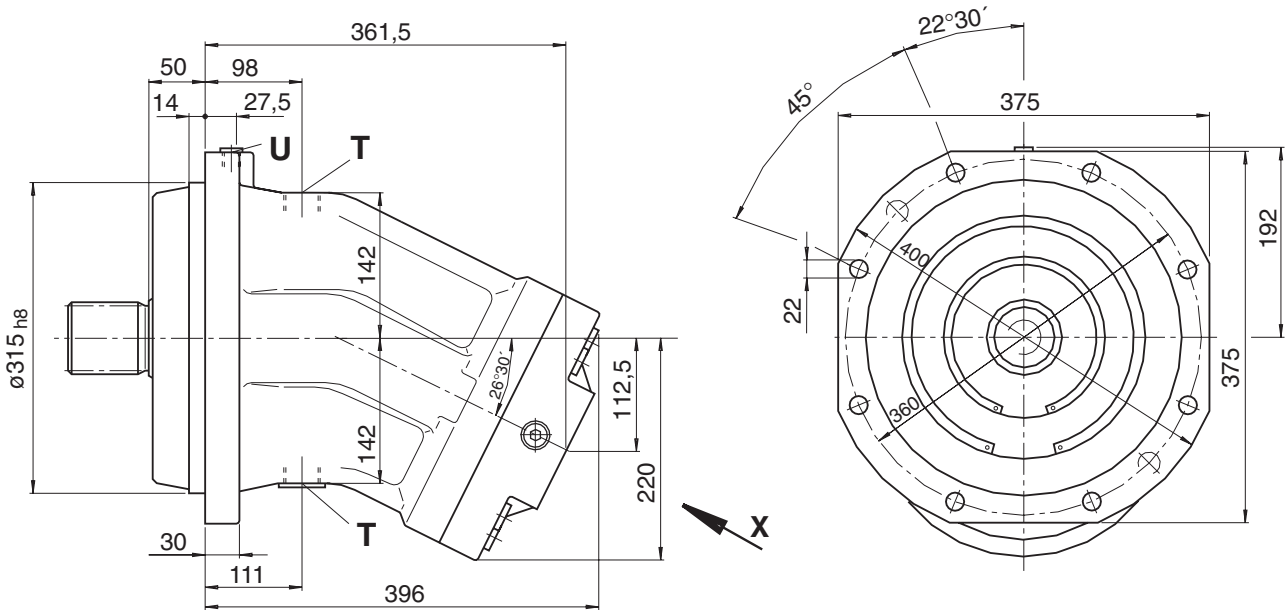
Z Splined shaft, DIN 5480
W 60x2x30x28x9g
 $p_N = 350$ bar

P Parallel shaft with key,
DIN 6885, AS 18x11x100
 $p_N = 350$ bar



Unit Dimensions, Size 500

Before finalising your design, please request a certified drawing.

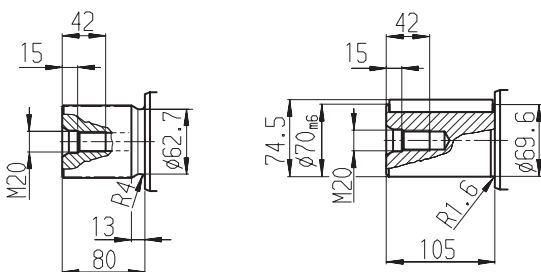


Connections

A, B	Service line ports high pressure series	SAE 1 1/2"
T	Drain ports (1 port plugged)	M 33x2
U	Port for bearing flushing (plugged)	M 18x1,5
MA, MB	Test ports operating pressure (plugged)	M 14x1,5

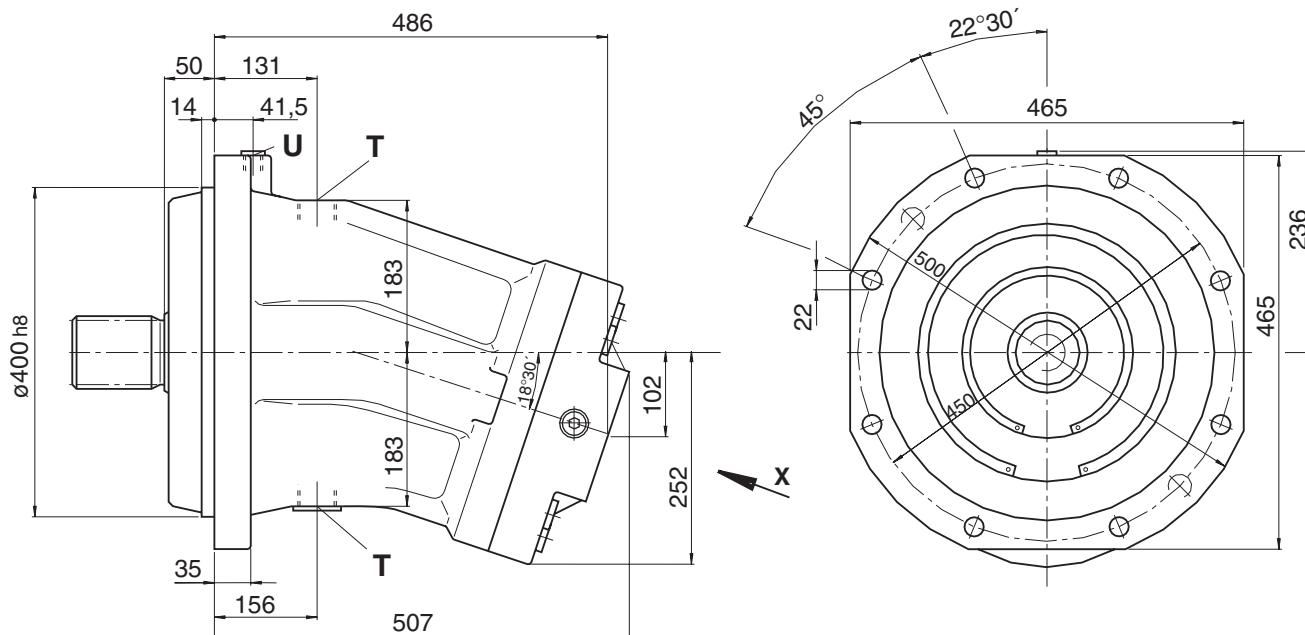
Shaft ends

- Z** Splined shaft, DIN 5480
W 70x3x30x22x9g
 $p_N = 350$ bar
- P** Parallel shaft with key,
DIN 6885, AS 20x12x100
 $p_N = 350$ bar

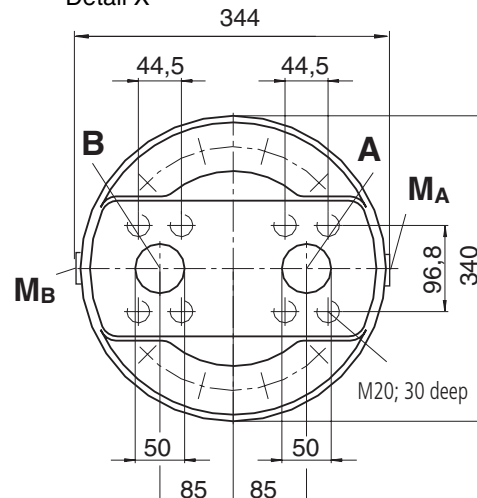


Unit Dimensions, Size 710

Before finalising your design, please request a certified drawing.



Detail X



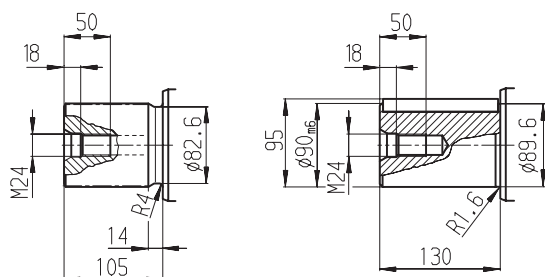
Connections

A, B	Service line ports High pressure series	SAE 2"
T	Drain port (plugged)	M 42x2
U	Port for bearing flushing (plugged)	M 18x1,5
M _A , M _B	Test ports operating pressure (plugged)	M 14x1,5

Shaft ends

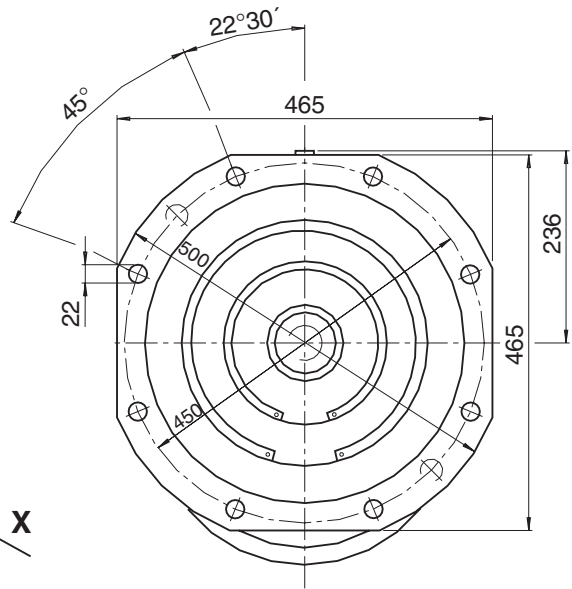
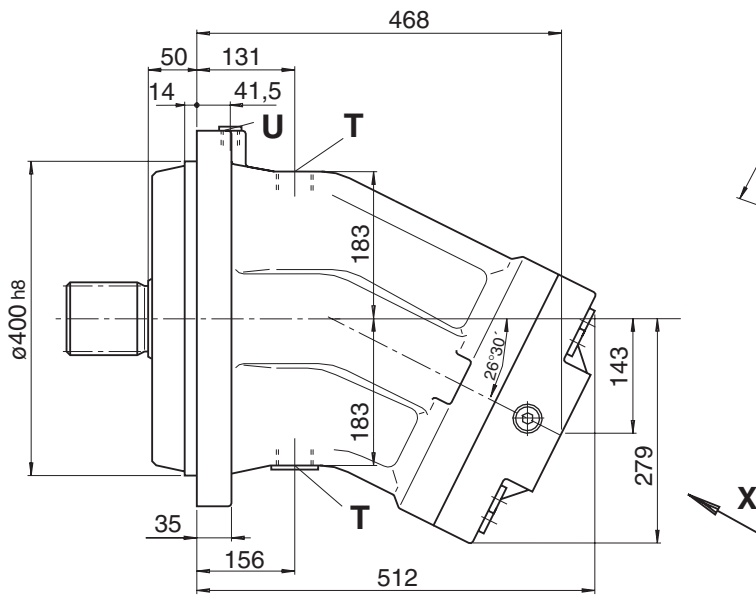
Z Splined shaft, DIN 5480
W 90x3x30x28x9g
 $p_N = 350$ bar

P Parallel shaft with key,
DIN 6885, AS 25x14x125
 $p_N = 350$ bar

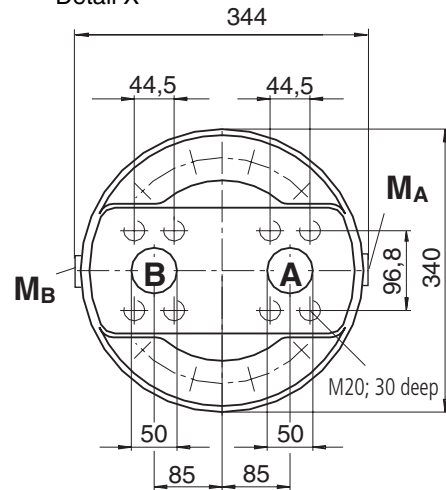


Unit Dimensions, Size 1000

Before finalising your design, please request a certified drawing.



Detail X



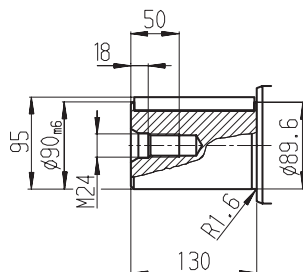
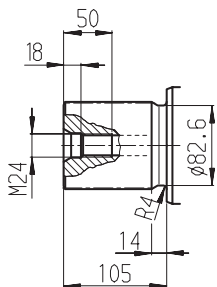
Connections

- A, B Service line ports high pressure series SAE 2"
- T Drain ports (1 port plugged) M 42x2
- U Port for bearing flushing (plugged) M 18x1,5
- MA, MB Test ports operating pressure (plugged) M 14x1,5

Shaft ends

Z Splined shaft, DIN 5480
W 90x3x30x28x9g
 $p_N = 350$ bar

P Parallel shaft with key,
DIN 6885, AS 25x14x125
 $p_N = 350$ bar



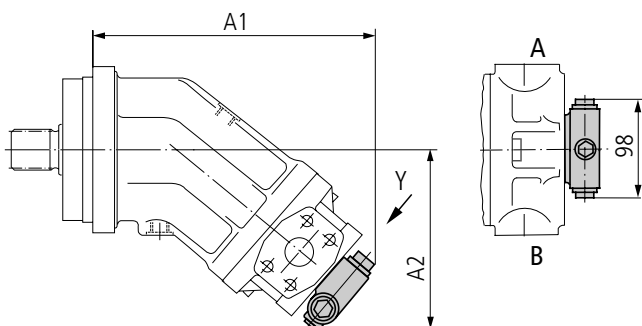
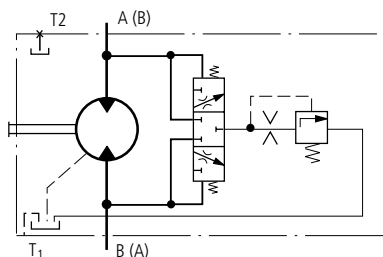
Flushing valves

Built-on flushing and boost pressure relief valve (7)

This valve is built on to the fixed displacement motor. It must then be noted that only a port plate with ports at side is then available (port plate 02).

The flushing and boost pressure relief valve has a fixed setting of 16 bar (the setting of the primary boost pressure relief valve must be noted) and is used to safeguard the minimum boost pressure. A fixed

flow of fluid is taken via an orifice from the low pressure side of the circuit and fed into the motor housing. This flow is then passed back to tank with the case drain fluid. Fluid thus removed from the closed circuit must be made up by means of the boost pump.



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

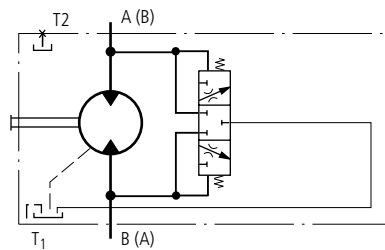
Size	Flushing flow (at low pressure $\Delta p = 25$ bar) *	
45, 56, 63	3,5 L/min	Orifice-No.: 651766/503.12.01.01
80, 90	5 L/min	Orifice-No.: 419695/503.12.01.01
107, 125	8 L/min	Orifice-No.: 419696/503.12.01.01
160, 180	10 L/min	Orifice-No.: 419697/503.12.01.01
250	10 L/min	

* Standard flushing volumes

(for sizes 45...180 flushing volumes of 3,5 - 10 L/min can be supplied. If a flushing volume different from the standard flushing volume is required, please indicate the requested orifice in clear text when ordering).

Integrated flushing valve (6) (Size 23...90)

The valve is integrated into the port plate.



- switching pressure $\Delta p \geq 8$ bar (this value is lower than the starting pressure of an unloaded motor).
- closed in centre position ($\Delta p < 8$ bar).

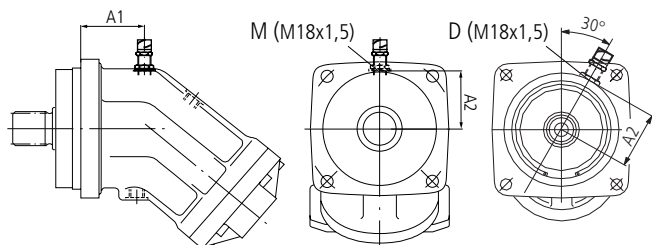
Size	Flushing flow (at low pressure $\Delta p = 25$ bar)	
23, 32	2,5 L/min	
45, 56, 63	3,1 L/min	
80, 90	4,1 L/min	

Speed sensor

Version A2FM...D ("suitable for fitting speed sensor") includes gearing on the rotary group and in addition the port M or D (M18x1,5), in which a speed sensor is screwed in.

A speed-proportional signal is produced by means of the rotating, splined rotary group which can be picked up by a suitable sensor and fed back for evaluation.

Sizes 23...180 Sizes 250...1000



Sizes	NO. of teeth	length of thread	A1	A2
23, 28, 32	38	12,7	58,7	50
45	45	11,2	54,8	54,5
56, 63	47	14,7	61,5	60
80, 90	53	14,7	72,5	65,8
107, 125	59	14,7	74,8	75
160, 180	67	14,7	91	83
250	78	variable	82	103
355	90	variable	93	128
500	99	variable	110	140
710...1000	126	variable	160	163

The speed sensor is not included in standard supply.

Suitable sensors (order separately!):

- Inductive impulse detector ID (see RE 95130) (only for sizes 23...180)
- Hall effect speed sensor HD (see RE 95134)

Pressure relief valves (for port plate 18 or 19 only)

Before finalising your design, please request a certified drawing.

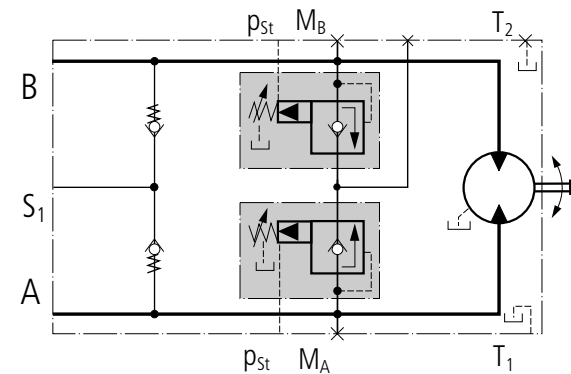
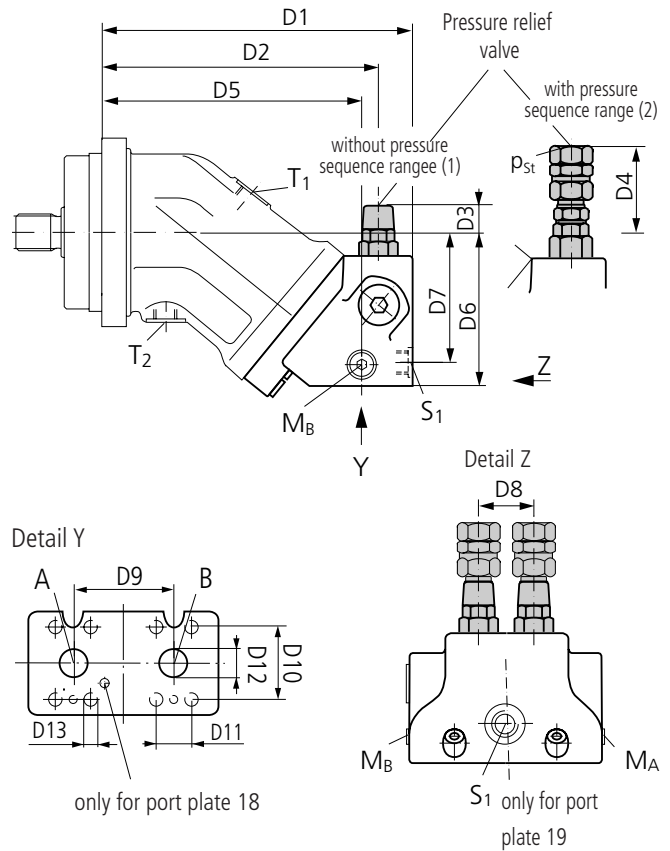
The pressure relief valves MHDB (as to RE 64642) are protecting the motor against overcharge. As soon as the set opening pressure is reached the oil is flowing from the high pressure side to the low pressure side.

Setting range opening pressure _____ 50 – 420 bar

At design "with pressure sequence range (2)" 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 when ordering :

- opening pressure of the pressure relief valve
- opening pressure at pilot pressure applied at p_{St} (for design 2 only)



Fixed Displacement Motor A2FM, with integrated pressure relief valve (with pressure sequence range)

Sizes	Ports	A, B	S ₁	M _A , M _B	p _{St}
28, 32		SAE 3/4"	M 22x1,5	M 20x1,5	G 1/4
45		SAE 3/4"	M 22x1,5	M 20x1,5	G 1/4
56, 63		SAE 3/4"	M 26x1,5	M 26x1,5	G 1/4
80, 90		SAE 1"	M 26x1,5	M 26x1,5	G 1/4
107, 125		SAE 1 1/4"	M 26x1,5	M 26x1,5	G 1/4
160, 180		SAE 1 1/4"	M 26x1,5	M 30x1,5	G 1/4

Connections

- A, B Service line ports SAE
- S₁ Boosting (only for port plate 19)
- M_A, M_B Test ports (plugged)
- p_{St} Pilot pressure port (only for design 2)

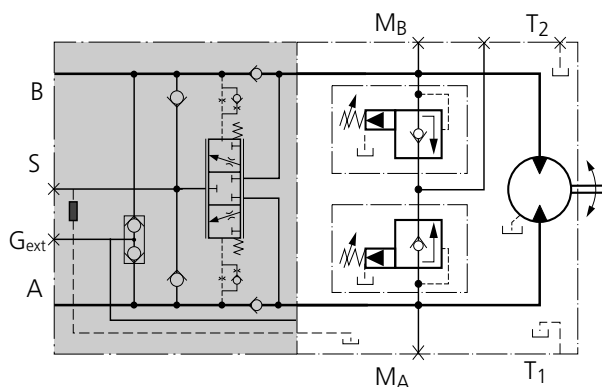
Sizes		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13
28, 32	MHDB.16	209	186	25	63	174	102	87	36	66	50,8	23,8	19	M10; 17 deep
45	MHDB.16	222	198	22	60	187	113	98	36	66	50,8	23,8	19	M10; 17 deep
56, 63	MHDB.22	250	222	19	57	208	124	105	42	75	50,8	23,8	19	M10; 13 deep
80, 90	MHDB.22	271	243,5	17,5	55	229	134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

Motion Control Valve (for port plate 18 only)

Before finalising your design, please request a certified drawing.

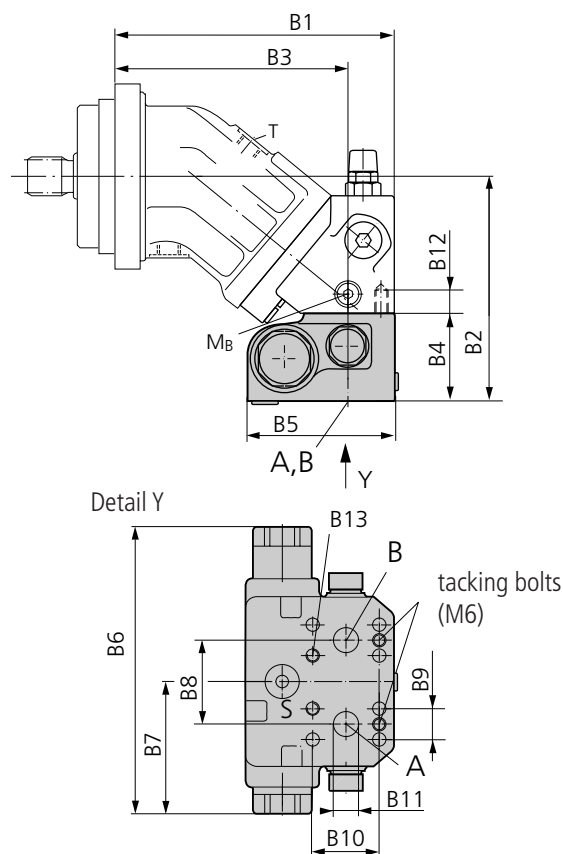
For hydro-motors operating in open loop the motion control valve BVD (as to RE 95522) is avoiding an overspeed and thus a lack of filling. A lack of filling occurs at the hydro-motors as soon as the speed of the drive from external is exceeding the speed corresponding to the added volume flow.

The motion control valve is not included in the type code of the A2FM motor and has to be indicated separately when ordering. At shipment it is fixed at the motor with 2 tacking bolts (do not remove the tacking bolts during fixing of the service lines). At separated shipment of motion control valve and motor the motion control valve has to be fixed in a first step with the added tacking bolts to the cover plate of the motor. The final fixing of the motion control valve at the motor is effected in both cases by fitting the service lines (observe screw-in depth B4 + B12 and B13)!



Fixed displacement motor A2FM, motion control valve BVD and integrated pressure relief valve

Sizes	ports	A, B	S	MA, MB
28, 32	BVD20..16	SAE 3/4"	M 22x1,5	M12x1,5
45	BVD20..16	SAE 3/4"	M 22x1,5	M12x1,5
56, 63	BVD20..17	SAE 3/4"	M 22x1,5	M12x1,5
80, 90	BVD20..27	SAE 1"	M 22x1,5	M12x1,5
107, 125	BVD25..38	SAE 1 1/4"	M 27x2	M12x1,5
160, 180	BVD25..38	SAE 1 1/4"	M 27x2	M12x1,5



Connections

- A, B Service line ports SAE
- S Boosting (plugged)
- MA, MB Test ports (plugged)

Sizes		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13
28, 32	BVD20..16	209	180	174	78 ¹⁾	137	235	96	66	23,8	50,8	19	M10; 17 deep	M10; 14 deep
45	BVD20..16	229	191	187	78 ¹⁾	137	235	96	66	23,8	50,8	19	M10; 17 deep	M10; 14 deep
56, 63	BVD20..17	250	192	208	68	137	235	96	75	23,8	50,8	19	M10; 17 deep	M10; 14 deep
80, 90	BVD20..27	271	202	229	68	137	235	96	75	27,8	57,2	25	M12; 18 deep	M12; 16 deep
107, 125	BVD25..38	298	234,5	251	85	151,5	286	120,5	84	31,8	66,7	32	M14; 19 deep	M14; 19 deep
160, 180	BVD25..38	332	255	285	85	151,5	286	120,5	84	31,8	66,7	32	M14; 19 deep	M14; 19 deep

¹⁾ with adapting plate

Installation and Commissioning Guidelines

General

At start-up and during operation the motor housing has imperatively to be filled up with hydraulic fluid (filling of the case chamber). Start-up has to be carried out at low speed and without load till the system is completely bled.

At a longer standstill the case may discharge via operating line. At new start-up a sufficient filling of the housing has to be granted.

The leakage oil in the housing has to be discharged to the tank via highest positioned case drain port.

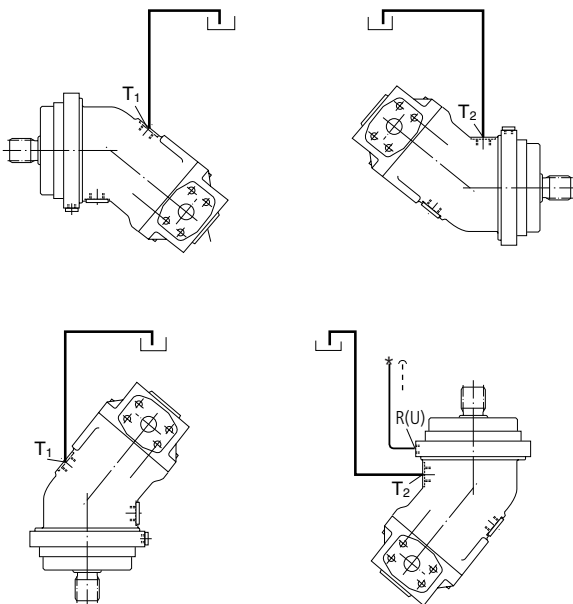
Installation position

Optional. At size 10 ... 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 series at size 250 ... 1000).

Installation below tank level

Motors below min. oil level in the tank (standard)

- Fill up axial piston motor before start-up via highest positioned case drain port
- Note for the "shaft on top" installation position: the motor case has to be filled up completely at start-up (bleeding at additional port R (size 10 ... 200) resp. U (size 250 ... 1000). An air pocket in the bearing area is leading to damage of the axial piston unit.
- Operate motor at low speed (igniton speed) till motor system is completely filled up
- Minimum immersion depth of the suction line or drain line in the tank: 200 mm (relative to the min. oil level in the tank).



Installation on top of tank level

Motor on top of min. oil level in the tank

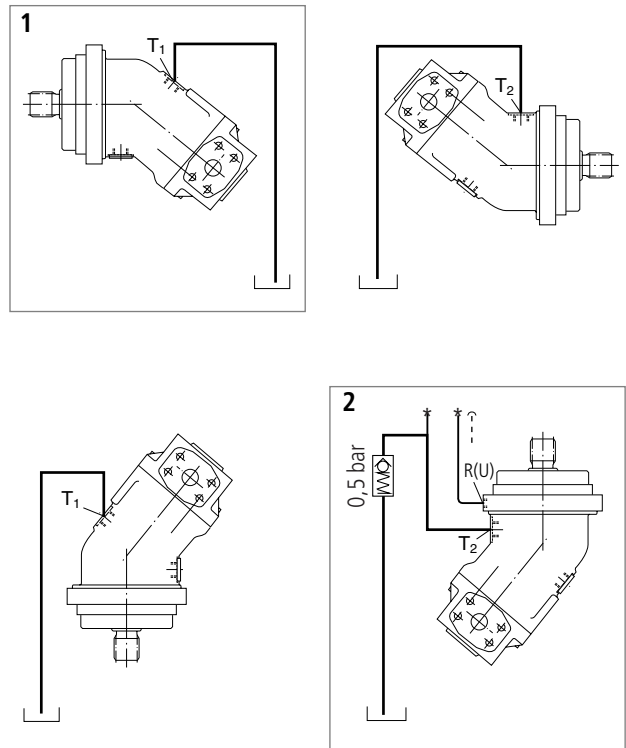
→ Actions as installation below tank level

→ Installation position 1 and 2:

If the motor is left at standstill for a long period, the oil in the housing chamber may fully drain out through the operating lines (air entering via the shaft seal). Consequently, on restarting, the bearings will be insufficiently lubricated. You should therefore refill the axial piston unit via the highest positioned drain port before restarting (Installation position 2: air bleed via port R or U).

→ Installation position 2 (shaft on top)

In this installation position, the bearings will be insufficiently lubricated even if the housing chamber is only partially drained. To prevent oil draining via the drain port, insert a check valve in the drain line (opening pressure 0.5 bar).



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