

Hydrostatic Pump Repair

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RA 91 001/08.97

MANNESMANN REXROTH	Fixed Displacement Motor AA2FM (A2FM)		RA 91 001/08.97
	Series 6, for Open and Closed Circuits Axial Piston, Bent Axis Design		
Brueninghaus Hydromatik	Sizes 5...1000	Nominal Pressure up to 5800 psi (400 bar) Peak Pressure up to 6500 psi (450 bar)	Replaces: RA 91001/07.95 RA 91003/05.95 RA 91025/05.95



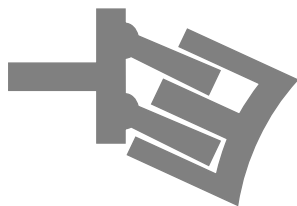
The fixed displacement motors AA2FM (A2FM) of axial piston, bent axis design is made suitable for hydrostatic drives in open and closed circuits.

Output speed is proportional to input flow and inversely proportional to displacement. Drive torque increases with the pressure drop across the unit.

The motor is suitable for use in mobile and industrial applications.

Careful selection of the displacements offered, permit sizes to be matched to practically every application.

- Favourable power / weight ratio
- Compact and economic design
- Optimum efficiency
- One piece pistons with piston rings
- Patented cylinder block drive system



Fixed Displacement Motor AA2FM (A2FM)

Ordering Code

(Ordering code size 5 see page ...)

Hydraulic Fluid

Petroleum oil (no code)	
HF-Fluids	E-
Sizes 10...200 (no code) Sizes 250...1000 (only in connection with drive shaft bearings "L")	

Axial piston unit

		10...180	200	250	355...1000	
Bent axis design, fixed displacement	Version SAE	●	-	●	-	AA2F
	Version ISO	-	●	-	●	A2F

Drive shaft bearings

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

Mode of operation

Motor	M
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Size

		10	12	16	23	28	32	45	56	63	80
Size Δ displacement	in ³ /rev	0.63	0.73	0.98	1.40	1.71	1.95	2.78	3.42	3.84	4.91
V _g cm ³ /rev.	in ³ /rev	5.49	6.51	7.63	10.98	12.20	15.25	21.66	30.51	43.33	61.02

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	bi-directional	W
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Seals

FPM - Phosphate ester fluid		10...1000	V
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Shaft end

		10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	250	
SAE Version (AA2F)	SAE Splined shaft	●	●	●	●	●	●	●	●	●	-	-	●	●	●	●	●	S
		-	-	-	-	-	-	-	●	●	-	-	-	-	-	-	-	T
		-	-	-	-	-	-	-	-	-	●	●	●	●	-	-	-	U
	Parallel shaft with key DIN 6885	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	SAE Parallel shaft with key	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●	B
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●	P
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●	K

ISO Version (A2F)

		200	355	500	710	1000	
Splined shaft DIN 5480		-	●	●	●	●	Z
Parallel shaft with key DIN 6885		●	-	-	-	-	A
		●	-	-	-	-	P
		●	-	-	-	-	B

Mounting flange

		10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	250	
SAE Version (AA2F)	SAE 2-bolt	●	●	●	-	-	-	-	-	-	-	-	-	-	-	-	-	C
	SAE 4-bolt	-	-	-	●	●	●	●	●	●	●	●	●	●	●	●	●	D
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DN

ISO Version (A2F)

		200	355	500	710	1000	
ISO 4-bolt		●	-	-	-	-	B
ISO 8-bolt		-	●	●	●	●	H

Hydraulic fluid

Axial piston unit

Drive shaft bearings

Mode of operation

Size

Series

Index

Direction of rotation

Seals

Shaft end

Mounting flange

Service ports

AA2F ¹⁾		10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	250	
Ports A and B SAE at rear	51	0	-	-	●	●	●	●	●	●	●	●	●	●	●	●	●	510
		6	-	-	●	●	●	●	●	●	●	●	-	-	-	-	-	516
Ports A and B SAE at side (opposite sides)	52	0	-	-	●	●	●	●	●	●	●	●	●	●	●	●	●	520
		6	-	-	●	●	●	●	●	●	●	●	-	-	-	-	-	526
		7	-	-	-	-	-	●	●	●	●	●	●	●	●	●	●	527
Ports A and B Threaded side (opposite sides)	53	0	●	●	○	○	●	-	-	-	-	-	-	-	-	-	-	530
		6	-	-	○	○	●	-	-	-	-	-	-	-	-	-	-	536
Ports A and B Threaded rear	54	0	-	-	○	●	●	-	-	-	-	-	-	-	-	-	-	540
A2F ²⁾		200		355		500		710		1000								
Ports A and B SAE, at rear	01	0	-	-	-	-	-	●	●	●	●	●	●	●	●	●	●	010

Valves

without valves (no code)	0
with integrated flushing valve	6
with built-on flushing and boost pressure relief valve	7

Speed sensor

		10...16	23	28	32	45	56	63	80	90	107	125	160	180	200...1000	
without speed sensor (no code)		●	●	●	●	●	●	●	●	●	●	●	●	●	●	
prepared for speed sensor		-	○	○	●	○	●	●	○	○	●	○	○	○	-	D

¹⁾ Threads of fixing screws and service lines are SAE (UN / UNF)

²⁾ Threads of fixing screws are metric

- = available
- = not available
- = in preparation (on request)

Fixed Displacement Motor AA2FM (A2FM)

Technical Data

Hydraulic fluid

We request that before starting a project detailed information about the choice of pressure fluids and application conditions are taken from our catalogue sheets RA 90220 (petroleum oil), RA 90221 (environmentally acceptable hydraulic fluids) and RA 90223 (fire resistance fluids, HF).

When using HF- or environmentally acceptable hydraulic fluids possible limitations for the technical data have to be taken into consideration. If necessary please consult us or your fluid supplier (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:

Optimum operating viscosity $v_{opt} = 80...170 \text{ SUS (16...36 mm}^2\text{/s)}$

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

Viscosity limits

The limiting values for viscosity are as follows:

Sizes 5...200

$v_{min} = 42 \text{ SUS (5 mm}^2\text{/s)}$
short term at a max. perm. temperature of $t_{max} = 240 \text{ }^\circ\text{F (115 }^\circ\text{C)}$

$v_{max} = 7400 \text{ SUS (1600 mm}^2\text{/s)}$
short term on cold start ($t_{min} = -40 \text{ }^\circ\text{F / }^\circ\text{C}$)

Sizes 250...1000

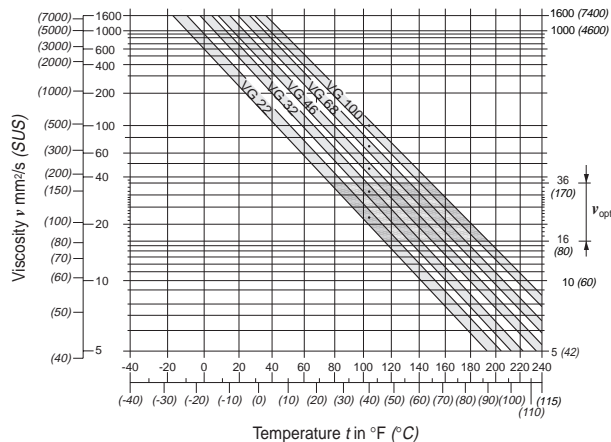
$v_{min} = 60 \text{ SUS (10 mm}^2\text{/s)}$
short term at a max. perm. leakage oil temp. of $t_{max} = 195 \text{ }^\circ\text{F (90 }^\circ\text{C)}$

$v_{max} = 4600 \text{ SUS (1000 mm}^2\text{/s)}$
short term on cold start ($t_{min} = -13 \text{ }^\circ\text{F / -25 }^\circ\text{C}$)

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

At temperatures of $-13 \text{ }^\circ\text{F}$ up to $-40 \text{ }^\circ\text{F (-25 }^\circ\text{C up to -40 }^\circ\text{C)}$ 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 reservoir 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° , the operating temperature (closed circuit: loop temperature; open circuit: reservoir temperature) is $140 \text{ }^\circ\text{F (60 }^\circ\text{C)}$. Within the optimum operating viscosity range (v_{opt} ; shaded area), this corresponds to viscosity grades 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 temperature or the reservoir temperature.

However, at no point in the system may the temperature exceed $240 \text{ }^\circ\text{F (115 }^\circ\text{C)}$ for sizes 5...200 or $195 \text{ }^\circ\text{F (90 }^\circ\text{C)}$ for sizes 250...1000.

If it is not possible to comply with the above conditions because of extreme operating parameters or high ambient temperature, 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
- 6 to SAE
- 18/15 to ISO/DIS 4406 is necessary.

At very high temperatures of the hydraulic fluid ($195 \text{ }^\circ\text{F}$ to max. $240 \text{ }^\circ\text{F / 90 }^\circ\text{C}$ to max. 115°C , not permissible for sizes 250...1000!) at least cleanliness class

- 8 to NAS 1638
- 5 to SAE
- 17/14 to ISO/DIS 4406 is necessary.

If above mentioned grades cannot be maintained please consult us.

Direction of flow

clockwise rotation	counter-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 7 for max. permissible speeds.

Installation position

Any installation position possible. The motor housing must be filled with fluid prior the commissioning, and must remain full whenever it is operating.

For extensive information on installation position, please consult our data sheet RA 90270 before completing your design work.

Symbol

- Connections**
- A, B Service line ports
 - T Drain port



Fixed Displacement Motor AA2FM (A2FM)

Technical Data

Case drain pressure

The lower the speed and the case drain pressure the higher the life expectation of the shaft seal ring.

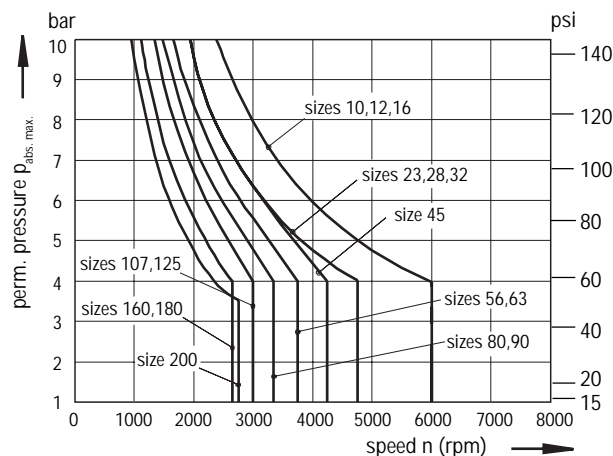
Shaft seal ring FPM (fluor-caoutchouc)

The values shown in the diagram are permissible loads of the seal ring and shall not be exceeded.

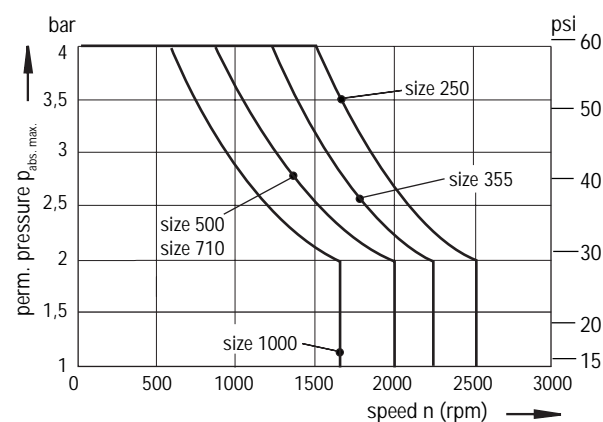
At stationary pressure loads in the range of the max. admissible leakage pressure a reduction of the life experience of the seal ring will result.

For a short period ($t < 5$ min.) are for the sizes 10...200 pressure loads up to 75 psi (5 bar) permissible, independent from rotational speeds.

Sizes 10...200



Sizes 250...1000



Special operation conditions may require limitations of these values.

Note:

- maximum permissible motor speeds are given in the table on page 7
- max. perm. housing pressure $p_{abs,max}$ 145 psi / 10bar (sizes 5...200)
60 psi / 4 bar (sizes 250...1000)
- the pressure in the housing must be the same as or greater than the external pressure on the shaft seal.

Flushing valve

In order to prevent excessive heat build-up in closed circuit operation, it is possible to fit a flushing valve (built into the port plate). Two such valves are available:

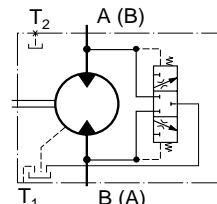
- an Integrated flushing valve (built into the port plate) (sizes 23...90)
- a built-on flushing and boost pressure relief valve (sizes 45...180, 250)

Integrated flushing valve (6)

- switching pressure $\Delta p \geq 115$ psi / 8 bar (this value is lower than the starting pressure of an unloaded motor).
- closed in centre position ($\Delta p < 115$ psi / 8 bar).

Sizes	23-32	45-63	80-90
Flushing gpm	0.66	0.82	1.1
volume L/min	2,5	3,1	4,1

Values given for low pressure $\Delta p = 365$ psi (25 bar)



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 52).

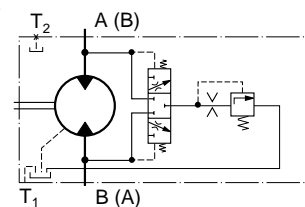
The flushing and boost pressure relief valve has a fixed setting of 230 psi / 16 bar (the setting of the primary boost pressure relief valve must be noted) and is used to safeguard the minimum boost pressure. A fixed flow of fluid is taken via an orifice from the low pressure side of the circuit and fed into the motor housing. This flow is then passed back to reservoir with the case drain fluid. Fluid thus removed from the closed circuit must be made up by means of the boost pump.

Different orifice sizes may be used to select varying flows of flushing fluid.

Flows (at low pressure $\Delta p = 365$ psi / 25 bar) *

Size	Flow	Orifice No.
45, 56, 63	0.93 gpm (3,5 L/min)	651766/503.12.01.01
80, 90	1.32 gpm (5 L/min)	419695/503.12.01.01
107, 125	2.11 gpm (8 L/min)	419696/503.12.01.01
160, 180	2.64 gpm (10 L/min)	419697/503.12.01.01
250	2.64 gpm (10 L/min)	

* Standard flushing volumes (for sizes 45...180 flushing volumes of 0.93-2.64 gpm / 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).



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.

Fixed Displacement Motor AA2FM (A2FM)

Technical Data

Operating pressure range

Maximum pressure at port A or B (Pressure data to DIN 24312)

AA2F	Sizes	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	250	Nominal Pressure	Peak Pressure	
Shaft end:	S	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	5800 psi (400 bar)	6500 psi (450 bar)	
	S								●	●							●	5100 psi (350 bar)	5800 psi (400 bar)	
	Q										●							4350 psi (300 bar)	5100 psi (350 bar)	
	Q											●						4000 psi (280 bar)	4600 psi (315 bar)	
	T									●	●							5800 psi (400 bar)	6500 psi (450 bar)	
	U									●	●	●	●	●	●	●	●		5800 psi (400 bar)	6500 psi (450 bar)
	B		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		5100 psi (350 bar)	5800 psi (400 bar)
A2F	P	●						●										5100 psi (350 bar) ¹⁾	5800 psi (400 bar)	
	K																●	5100 psi (350 bar)	5800 psi (400 bar)	
	Z																	5100 psi (350 bar)	5800 psi (400 bar)	
Shaft end:	A							●			●	●	●	●	●	●	●	5100 psi (350 bar)	5800 psi (400 bar)	
	P									●	●	●	●	●	●	●	●	5100 psi (350 bar)	5800 psi (400 bar)	
	B								●									5100 psi (350 bar)	5800 psi (400 bar)	
	B		●															3000 psi (210 bar)	3600 psi (250 bar)	
	C		●																4600 psi (315 bar)	5100 psi (350 bar)

With pulsating loads over 4600 psi (315 bar), we recommend the use of a splined shaft (AA2FM 10...250: S, T or U / A2FM 200: A / A2FM 250...1000: Z)
 The sum of the pressures at ports A and B may not exceed 10 000 psi / 700 bar (A2F5: 9000 psi / 630 bar)

1) Attention : shaft end with drives of radial force loads at the drive shaft (pinion, V-belt drives) necessitate reduction of the nominal pressure to $p_N = 4600$ psi (315 bar), please contact us.

Output Drive

Permissible axial and radial loading on drive shaft.

The values given are maximum values and not permissible for continuous operation.

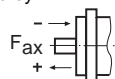
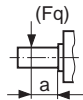
AA2F	Sizes	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	250
a	mm	16	16	16	16	16	16	18	18	18	20	20	20	20	25	25	41
	in	0.63	0.63	0.63	0.63	0.63	0.63	0.71	0.71	0.71	0.79	0.79	0.79	0.79	0.98	0.98	1.61
$F_{q \max}^1)$	N	2100	2500	3250	3850	4800	5400	7250	8150	9150	10250	11450	12100	14100	16300	18300	1200 ³⁾
	lbf	472	562	730	865	1079	1214	1630	1832	2057	2304	2574	2720	3170	3664	4114	270 ³⁾
$F_{q \max}^2)$	N	—	—	—	—	—	—	—	—	—	9000	9000	—	—	—	—	4000
	lbf	—	—	—	—	—	—	—	—	—	2023	2023	—	—	—	—	899
$\pm F_{ax \max}$	N	320	320	320	500	500	500	630	800	800	1000	1000	1250	1250	1600	1600	1200
	lbf	72	72	72	112	112	112	142	180	180	225	225	281	281	360	360	270
$\pm F_{ax \text{zul}} / \text{bar}$ lb/psi	N/bar	3,0	3,0	3,0	5,2	5,2	5,2	7,0	8,7	8,7	10,6	10,6	12,9	12,9	16,7	16,7	4)
	lb/psi	0,05	0,05	0,05	0,08	0,08	0,08	0,11	0,13	0,13	0,16	0,16	0,20	0,20	0,26	0,26	

A2F	Sizes	5	200	355	500	710	1000
a	mm	12	25	52,5	52,5	67,5	67,5
	in	0,47	0,98	2,07	2,07	2,66	2,66
$F_{q \max}$	N	710	22900	1500 ³⁾	1900 ³⁾	3000 ³⁾	2600 ³⁾
	lbf	160	5148	337 ³⁾	427 ³⁾	674 ³⁾	584 ³⁾
$+F_{qx \max}$	N	180	1600	5000	6250	10000	10000
	lbf	40	360	1124	1405	2248	2248
$-F_{ax \max}$	N	180	1600	1500	1900	3000	2600
	lbf	40	360	337	427	674	584
$\pm F_{ax \text{perm.}}$	N/bar	1,5	16,7	4)	4)	4)	4)
	lb/psi	0,023	0,26				

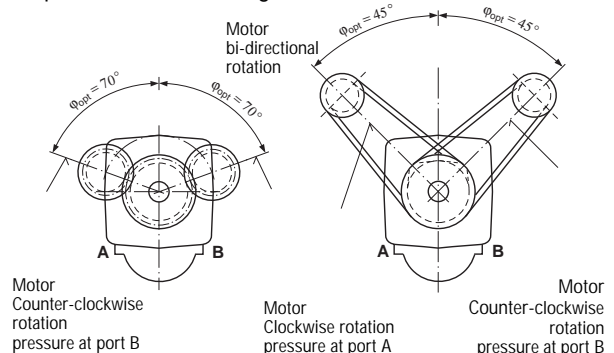
1) valid for all shafts except Q-shaft 2) valid for Q-shaft (size 80 and 90)
 3) Axial piston unit in stationary or in bypass operation, please contact us when appearing higher forces!
 4) Please contact us.

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
 - $\pm F_{ax \text{perm.}} / \text{psi (bar)}$ = perm. axial force/psi (bar) operating pressure
- The direction of the max. perm. axial force must be noted by sizes 5...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 optional life expectation of the bearing can be reached.



Fixed Displacement Motor AA2FM (A2FM)

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	in ³	0.30	0.63	0.73	0.98	1.40	1.71	1.95	2.78	3.42	3.84	4.91	
		cm ³	4.93	10.3	12.0	16.0	22.9	28.1	32.0	45.6	56.1	63.0	80.4	
Max. speed	n_{max}	rpm	10000	8000	8000	8000	6300	6300	6300	5600	5000	5000	4500	
		$n_{max\ interm.}^{1)}$ rpm	11000	8800	8800	8800	6900	6900	6900	6200	5500	5500	5000	
Max. flow	$q_{v\ max}$	gpm	13	21.8	25.3	33.9	38.2	46.6	52.2	67.4	74.0	83.1	95.6	
		L/min	49	82	96	128	144	176	201	255	280	315	360	
Torque constants	T_c	lb-ft/psi	0.004	0.0084	0.0097	0.013	0.019	0.023	0.026	0.037	0.045	0.051	0.065	
		Nm/bar	0.078	0.164	0.191	0.254	0.364	0.447	0.509	0.725	0.892	1.002	1.278	
Torque at	T	$\Delta p = 5100\ psi$	lb-ft	18 ²⁾	42	49	66	94	115	132	188	231	259	332
		$\Delta p = 350\ bar$	Nm	24.7 ²⁾	57	67	88	126	156	178	254	312	350	445
		$\Delta p = 5800\ psi$	lb-ft	-	48	56	75	107	131	150	213	263	295	377
		$\Delta p = 400\ bar$	Nm	-	65	76	100	144	178	204	290	356	400	508
Case volume	J	gal		0.045	0.045	0.045	0.053	0.053	0.053	0.087	0.119	0.119	0.145	
		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	lbs-ft ²	0.0019	0.0095	0.0095	0.0095	0.0285	0.0285	0.0285	0.0569	0.0997	0.0997	0.1708	
		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	lbs	5.5	12	12	12	21	21	21	30	40	40	51	
		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	in ³	5.49	6.51	7.63	9.79	10.98	12.20	15.25	21.66	30.51	43.33	61.02	
		cm ³	90.0	106.7	125.0	160.4	180	200	250	355	500	710	1000	
Max. speed	n_{max}	rpm	4500	4000	4000	3600	3600	2750	2500	2240	2000	1600	1600	
		$n_{max\ interm.}^{1)}$ rpm	5000	4400	4400	4000	4000	3000	-	-	-	-	-	
Max. flow	$q_{v\ max}$	gpm	106.9	112.7	132.1	152.5	171.1	145.2	165	210	264	300	422	
		L/min	405	427	500	577	648	550	625	795	1000	1136	1600	
Torque constants	T_c	lb-ft/psi	0.073	0.086	0.101	0.130	0.146	0.162	0.202	0.287	0.405	0.575	0.809	
		Nm/bar	1.43	1.70	1.99	2.55	2.86	3.18	3.98	5.64	7.95	11.29	15.9	
Torque at	T	$\Delta p = 5100\ psi$	lb-ft	371	440	516	662	742	825	1031	1465	2063	2930	4127
		$\Delta p = 350\ psi$	Nm	501	595	697	889	1001	1114	1391	1979	2785	3955	5570
		$\Delta p = 5800\ psi$	lb-ft	422	500	587	753	844	938	-	-	-	-	-
		$\Delta p = 400\ psi$	Nm	572	680	796	1016	1144	1272	-	-	-	-	-
Case volume	J	gal	0.145	0.21	0.21	0.29	0.29		0.66	0.92			2.06	
		L	0.55	0.8	0.8	1.1	1.1		2.5	3.5			7.8	
Moment of inertia about drive axis	J	lbs-ft ²	0.1708	0.2753	0.2753	0.5221	0.5221	0.8970	1.4475	2.4205	4.2240	13.052	13.052	
		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	lbs	51	71	71	99	99	145	161	242	342	710	741	
		kg	23	32	32	45	45	66	73	110	155	322	336	

¹⁾ Intermittent max. speed: overspeed at discharge and overtaking travel operations, $t < 5\ sec.$ and $\Delta p < 2200\ psi$ (150 bar).

²⁾ $\Delta p = 4600\ psi$ (315 bar)

Calculation of size

Flow $q_v = \frac{V_g \cdot n}{231 \cdot \eta_v}$ gpm $\left(q_v = \frac{V_g \cdot n}{1000 \cdot \eta_v} \right)$ L/min

Output speed $n = \frac{q_v \cdot 231 \cdot \eta_v}{V_g}$ rpm $\left(n = \frac{q_v \cdot 1000 \cdot \eta_v}{V_g} \right)$ rpm

Output torque $T = \frac{V_g \cdot \Delta p \cdot \eta_{mh}}{24 \cdot \pi}$ lb-ft $\left(T = \frac{V_g \cdot \Delta p \cdot \eta_{mh}}{20 \cdot \pi} \right)$ Nm

Output power $P = \frac{T \cdot n}{5252} = \frac{q_v \cdot \Delta p \cdot \eta_t}{1714}$ HP $\left(P = \frac{T \cdot n}{9549} = \frac{q_v \cdot \Delta p \cdot \eta_t}{600} \right)$ kW

- V_g = Geometric displacement per revolution - in³ (cm³)
- Δp = Differential pressure - psi (bar)
- T = Torque - lb-ft (Nm)
- q_v = Flow - gpm (L/min)
- P = Power - HP (kW)
- n = Speed - rpm
- η_v = Volumetric efficiency
- η_{mh} = Mechanical hydraulic efficiency
- η_t = Total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Speed sensor (D) (sizes 23...180)

Version AA2FM...D ("prepared for speed sensor") includes gearing on the rotary group and in addition the port M 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.

The speed sensor can be screwed into port M (thread metric M18x1,5).

Sizes	23...32	45	56...63	80...90	107...125	160...180
No. of teeth	38	45	47	53	59	67
length of thread	inches	0,5	0,44	0,58	0,58	0,58
	mm	12,7	11,2	14,7	14,7	14,7

The speed sensor is not included in standard supply.

Suitable sensor (order separately):

- Inductive impulse detector ID (see RA 95038)
- Hall effect speed sensor HD (see RA 95042)

Ordering Code, Size 5

A2F	5	W	6.0	3
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Additional instructions in text form

Axial piston unit

Bent axis design, fixed displacement	A2F
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Size

Size	5
Displacement Vg	in ³ / rev. 0,30 cm ³ / rev. 4,93

Direction of rotation

Viewed on shaft end	bi-directional	W
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Series

	6.0
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Shaft end

Parallel shaft with key DIN 6885	B
Tapered shaft with spigot and spring washer DIN 6888	C

Service ports

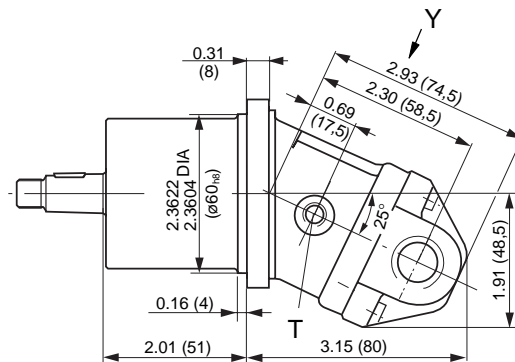
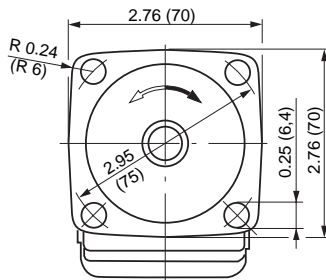
Threaded at side, metric (opposite side)	3
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Seals

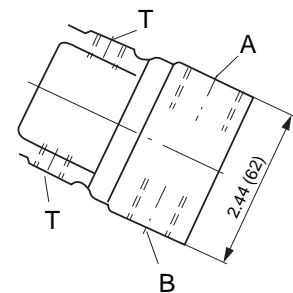
The fixed Motor A2F 5 is equipped with NBR (Nitrilcaoutchouc) seals in standard design. In cse of need FPM- (fluor-caoutchouc) seals please indicate when ordering in clear text:

"with FPM-seals"

**Unit Dimensions, Size 5
ISO Design**

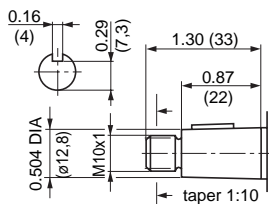


View Y



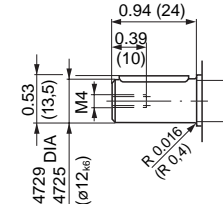
Shaft ends

"C" Tapered shaft with spigot and spring washer 3x5(mm) DIN 6888



Nominal pressure
p_N = 4600 psi (315 bar)

"B" Parallel shaft with key A4x4x20(mm) DIN 6885

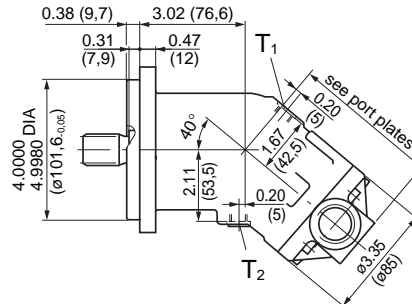
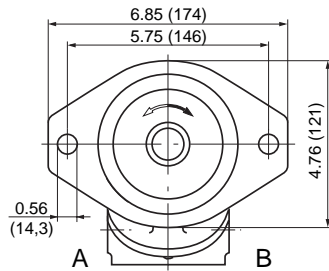


Nominal pressure
p_N = 3000 psi (210 bar)

Connections

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

**Unit Dimensions, Sizes 10, 12, 16
SAE Design**

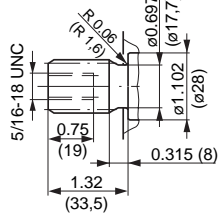


Connections

A, B Service line ports (see port plates)
T₁, T₂ Drain ports (1 port plugged) SAE-6; 9/16" - 18 UNF-2B

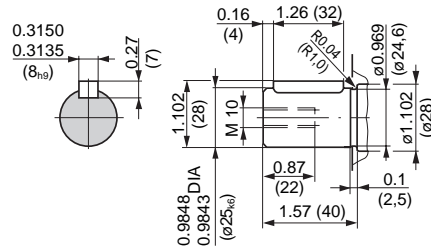
Shaft ends

Sizes 10, 12, 16
"S" Splined Shaft SAE 7/8",
13 Teeth, 16/32 Pitch
ANSI B 92.1a-1976



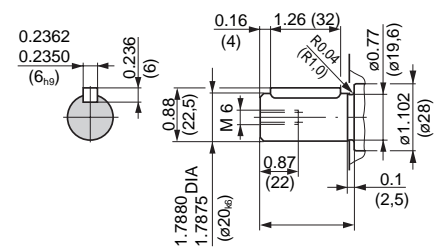
Nominal pressure
p_N = 5800 psi (400 bar)

Size 12, 16
"B" Parallel shaft with key,
AS 8x7x32mm, DIN 6885



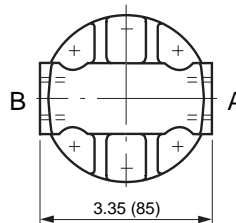
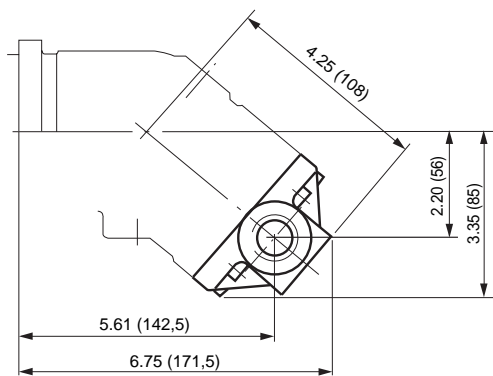
Nominal pressure
p_N = 5100 psi (350 bar)

Sizes 10
"P" Parallel shaft with key,
AS 6x6x32mm, DIN 6885



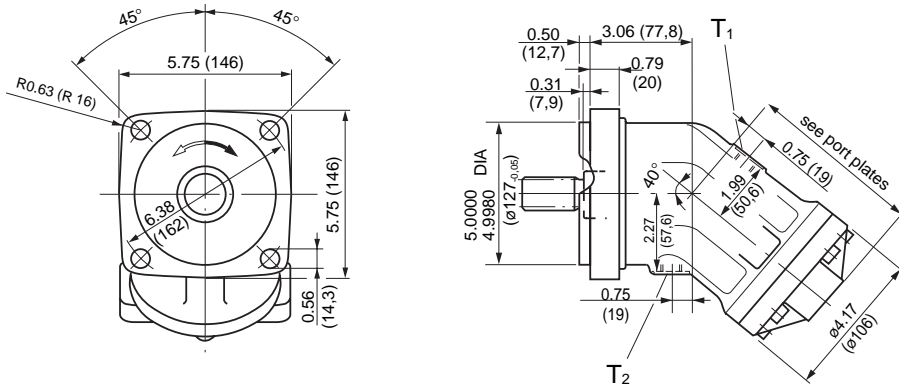
Nominal pressure
p_N = 5100 psi (350 bar)

Port plate 53



A, B Service line ports
SAE-12; 1 1/16" - 12 UN-2B; 0.79 (20) deep

**Unit Dimensions, Sizes 23, 28, 32
SAE Design**



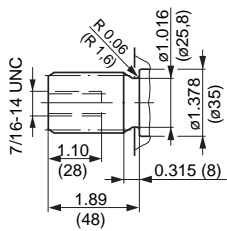
Connections

T₁, T₂ Drain ports (1 port plugged) SAE-10; 7/8" - 16 UNF - 2B
0.67 (17) Deep

Shaft ends

Sizes 23, 28, 32

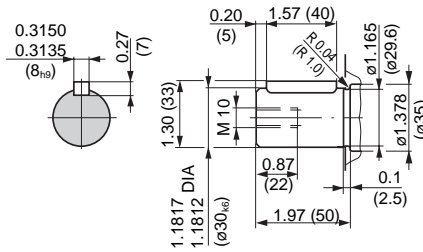
"S" Splined Shaft SAE 1 1/4",
14 Teeth, 12/24 Pitch
ANSI B 92.1a-1976



Nominal pressure
p_N = 5800 psi (400 bar)

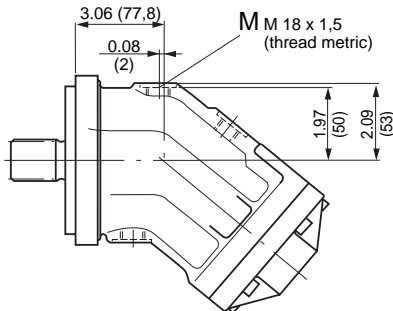
Size 23, 28, 32

"B" Parallel shaft with key
AS 8x7x40mm, DIN 6885



Nominal pressure
p_N = 5100 psi (350 bar)

Prepared for speed sensor (D), with port M
(inductive impulse detector ID see RA 95038
hall effect speed sensor HD see RA 95042,
to be ordered separately!)

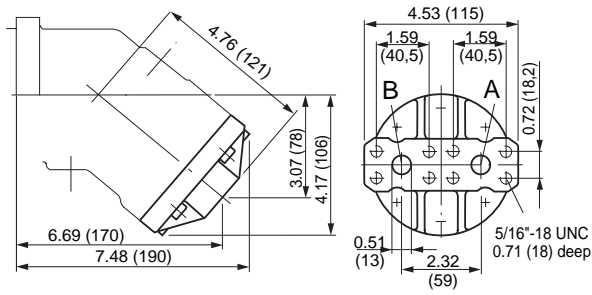


Size 32 : available
Sizes 23, 28 : in preparation (on request)

Unit Dimensions, Sizes 23, 28, 32

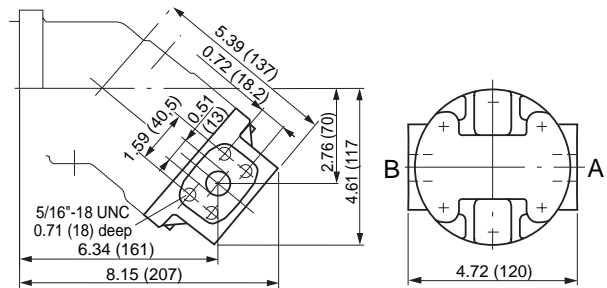
Port plates

51



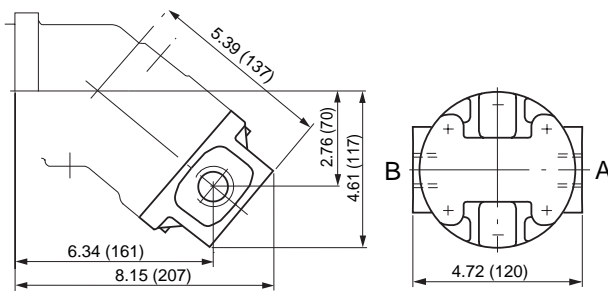
A, B Service line ports
SAE 1/2"; 6000 psi (420bar) high pressure series

52



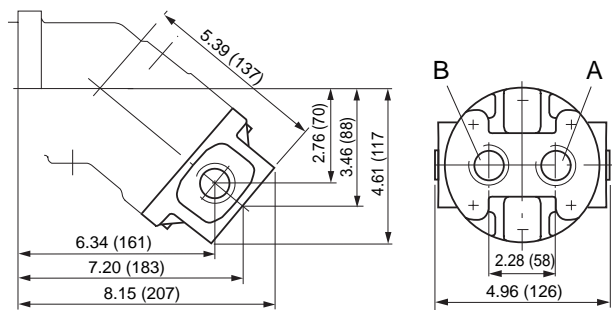
A, B Service line ports
SAE 1/2"; 6000 psi (420bar) high pressure series

53



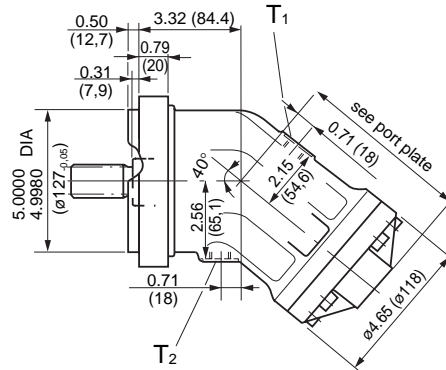
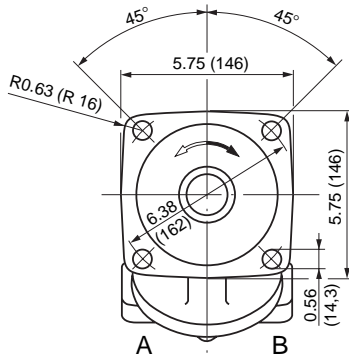
A, B Service line ports
SAE-16; 1 5/16" - 12 UN-2B; 0.79 (20) deep

54



A, B Service line ports
SAE-16; 1 5/16" - 12 UN-2B; 0.79 (20) deep

**Unit Dimensions, Size 45
SAE Design**



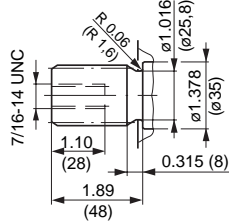
Connections

A, B Service line ports (see port plates)
T₁, T₂ Drain ports (1 port plugged) SAE-8; 3/4" - 16 UNF-2B

Shaft ends

Size 45

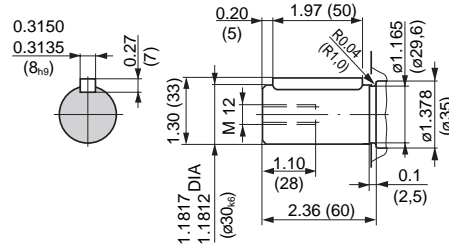
"S" Splined Shaft SAE 1 1/4",
14 Teeth, 12/24 Pitch
ANSI B 92.1a-1976



Nominal pressure
p_N = 5800 psi (400 bar)

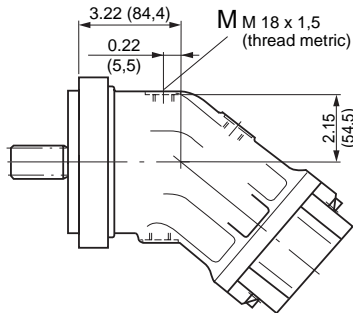
Size 45

"P" Parallel shaft with key
AS 8x7x50mm, DIN 6885



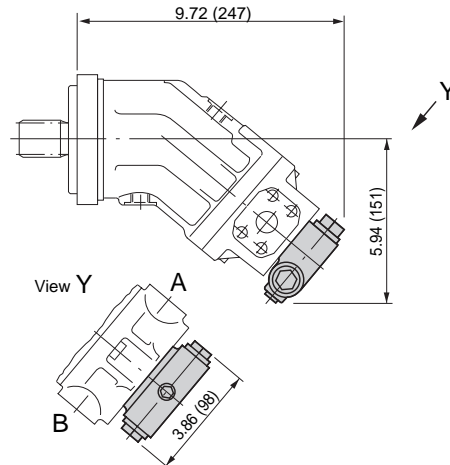
Nominal pressure
p_N = 5100 psi (350 bar)

Prepared for speed sensor (D), with port M
(inductive impulse detector ID see RA 95038
hall effect speed sensor HD see RA 95042,
to be ordered separately!)



in preparation (on request)

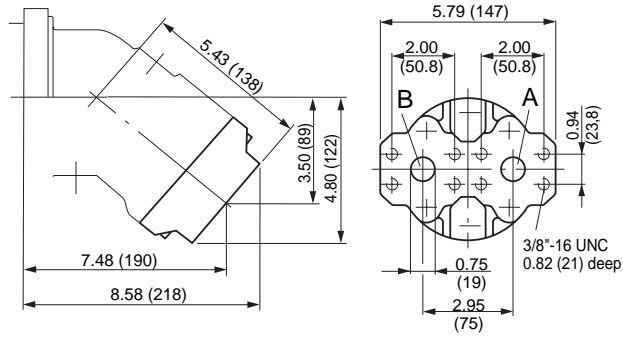
With built-on flushing & boost pressure relief valve (7)



Unit Dimensions, Size 45

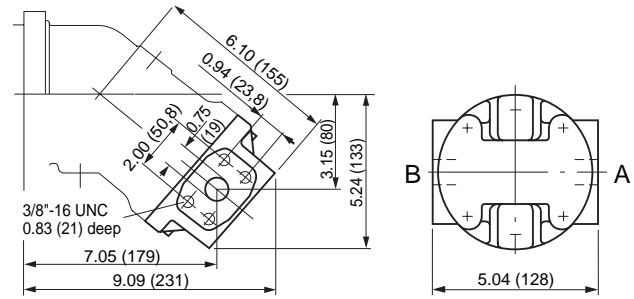
Port plates

51



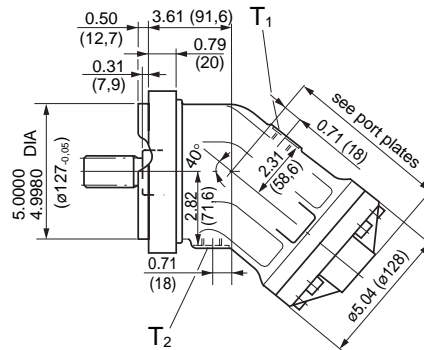
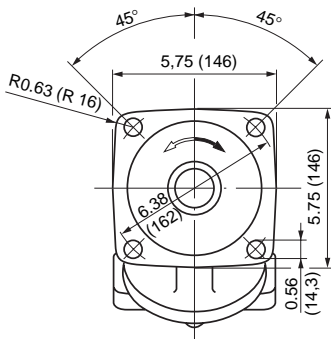
A, B Service line ports
SAE 3/4"; 6000 psi (420bar) high pressure series

52



A, B Service line ports
SAE 3/4"; 6000 psi (420bar) high pressure series

Unit Dimensions, Sizes 56, 63
SAE Design



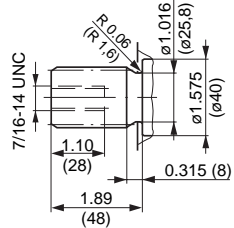
Connections

A, B Service line ports (see port plates)
T₁, T₂ Drain ports (1 port plugged) SAE-8; 3/4" - 16 UNF-2B

Shaft ends

Sizes 56, 63

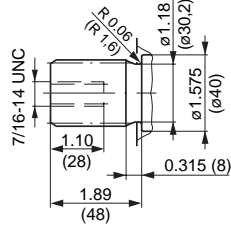
"S" Splined Shaft SAE 1 1/4",
14 T, 12/24 Pitch
ANSI B 92.1a-1976



Nominal pressure
p_N = 5100 psi (350 bar)

Sizes 56, 63

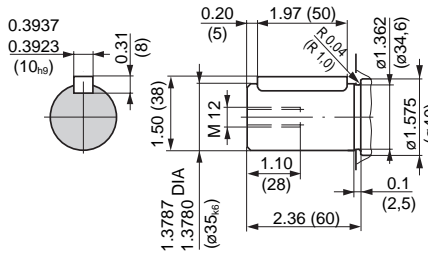
"T" Splined Shaft SAE 1 3/8",
21 T, 16/32 Pitch
ANSI B 92.1a-1976



Nominal pressure
p_N = 5800 psi (400 bar)

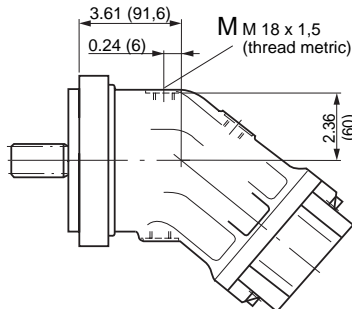
Size 56, 63

"B" Parallel shaft with key
AS 10x8x50mm, DIN 6885

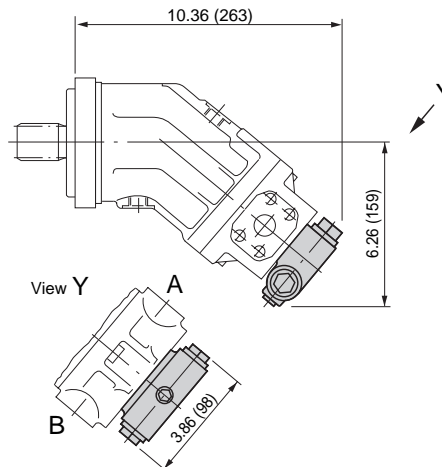


Nominal pressure
p_N = 5100 psi (350 bar)

Prepared for speed sensor (D), with port M
(inductive impulse detector ID see RA 95038
hall effect speed sensor HD see RA 95042,
to be ordered separately!)



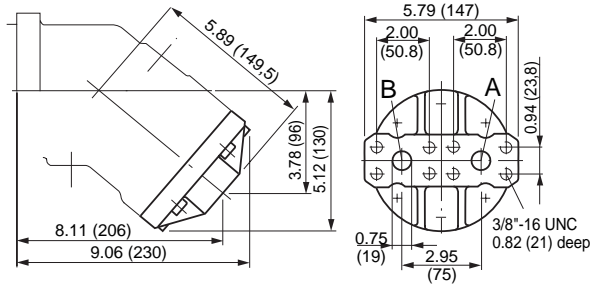
With built-on flushing & boost pressure relief valve (7)



Unit Dimensions, Sizes 56, 63

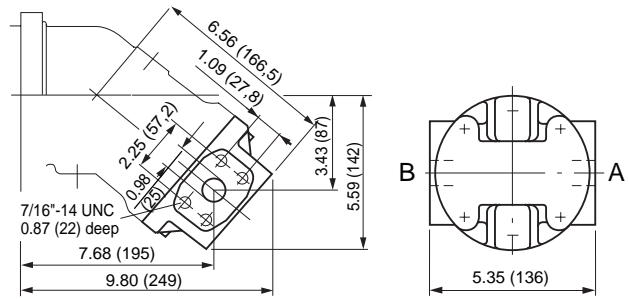
Port plates

51



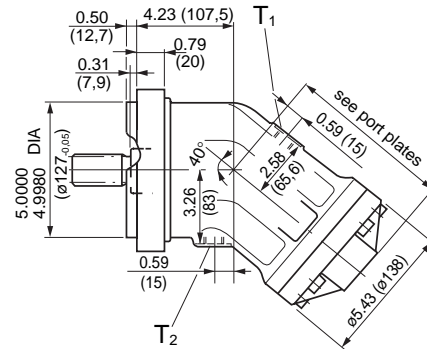
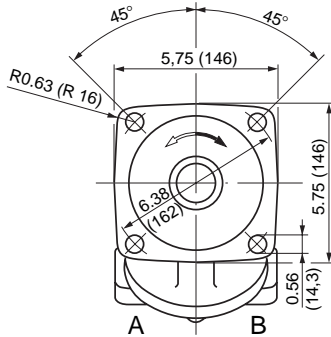
A, B Service line ports
SAE 3/4"; 6000 psi (420 bar) high pressure series

52



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

**Unit Dimensions, Sizes 80, 90
SAE Design**



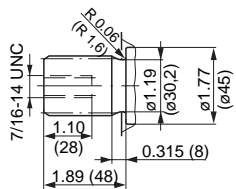
Connections

A, B service line ports
T₁, T₂ drain port (1 port plugged) SAE-10; 7/8" - 14 UNF-2B

Shaft ends

Sizes 80, 90

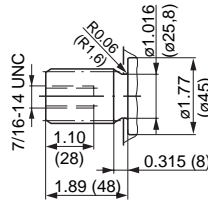
"U" Splined Shaft SAE 1 3/8",
21 Teeth, 16/32 Pitch
ANSI B 92.1a-1976



Nominal pressure
 $p_N = 5800 \text{ psi (400 bar)}$

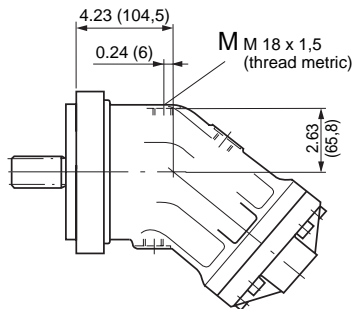
Sizes 80, 90

"Q" Splined Shaft SAE 1 1/4",
14 T, 12/24 Pitch
ANSI B 92.1a-1976



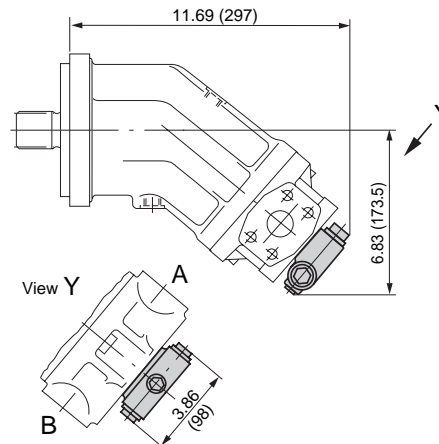
Nominal pressure
Size 80: $p_N = 4350 \text{ psi (300 bar)}$
Size 90: $p_N = 4000 \text{ psi (280 bar)}$

Prepared for speed sensor (D), with port M
(inductive impulse detector ID see RA 95038
hall effect speed sensor HD see RA 95042,
to be ordered separately!)



in preparation (on request)

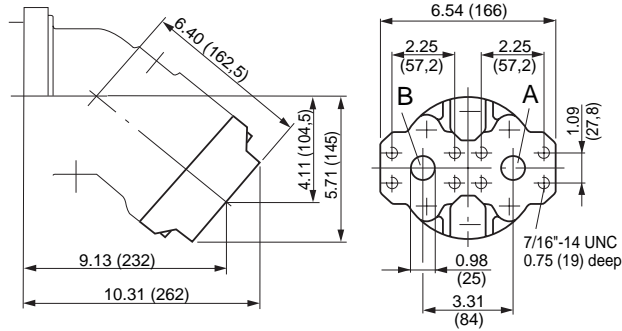
With built-on flushing & boost pressure relief valve (7)



Unit Dimensions, Sizes 80, 90

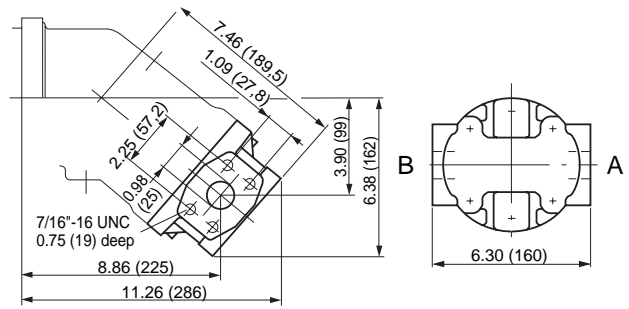
Port plates

51



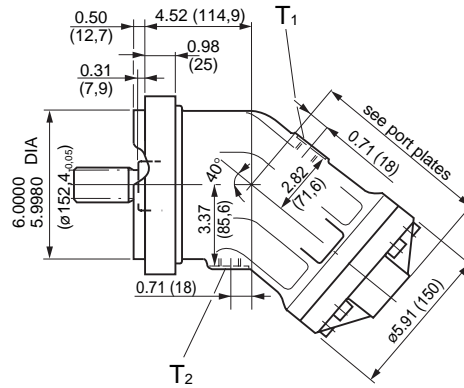
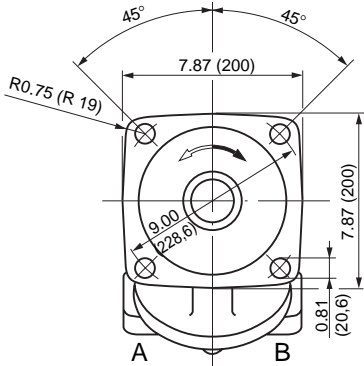
A, B Service line ports
SAE 1"; 6000 psi (420bar) high pressure series

52



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

Unit Dimensions, Sizes 107, 125
SAE Design

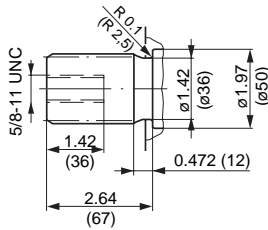


Connections

A, B Service line ports (see port plates)
T₁, T₂ Drain ports (1 port plugged) SAE-10; 7/8" - 14 UNF-2B

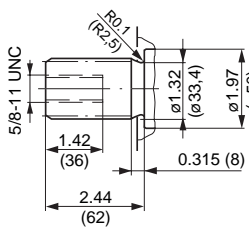
Shaft ends

Sizes 107, 125
"S" Splined Shaft SAE 1 3/4",
13 T, 8/16 Pitch
ANSI B 92.1a-1976



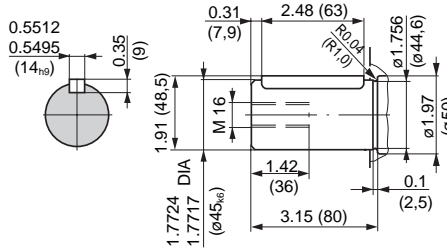
Nominal pressure
p_N = 5800 psi (400 bar)

Sizes 107, 125
"U" Splined Shaft SAE 1 1/2",
23 T, 16/32 Pitch
ANSI B 92.1a-1976



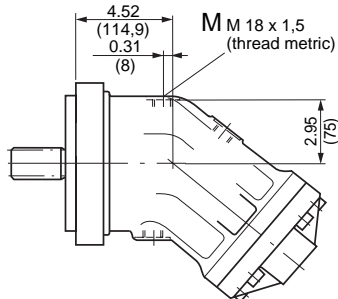
Nominal pressure
p_N = 5800 psi (400 bar)

Size 107, 125
"B" Parallel shaft with key
AS 14x9x63mm, DIN 6885



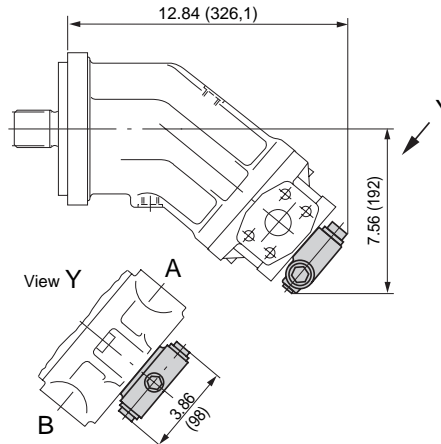
Nominal pressure
p_N = 5100 psi (350 bar)

Prepared for speed sensor (D), with port M
(inductive impulse detector ID see RA 95038
hall effect speed sensor HD see RA 95042,
to be ordered separately!)



Size 107 : available
Size 125 : in preparation (on request)

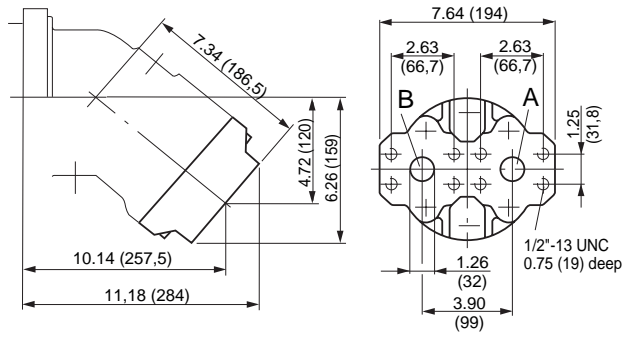
With built-on flushing & boost pressure relief valve (7)



Unit Dimensions, Sizes 107, 125

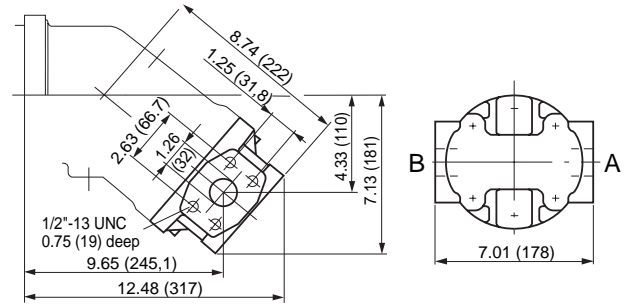
Port plates

51



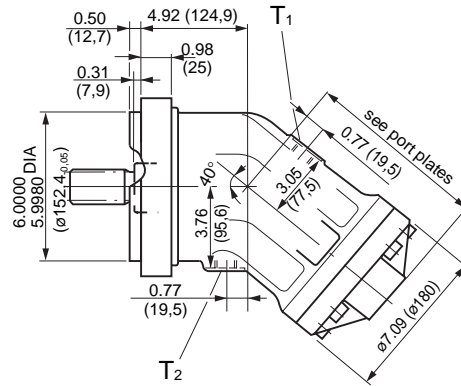
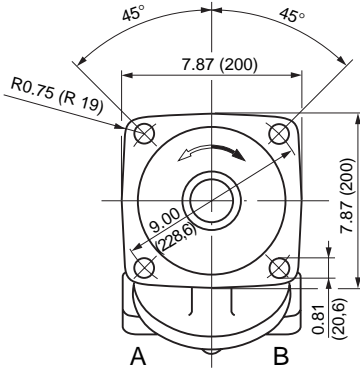
A, B Service line ports
SAE 1 1/4"; 6000 psi (420bar) high pressure series

52



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

**Unit Dimensions, Sizes 160, 180
SAE Design**



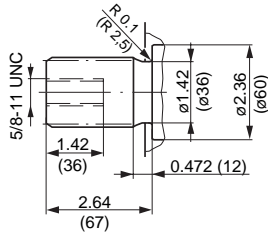
Connections

A, B Service line ports (see port plates)
T₁, T₂ Drain ports (1 port plugged) SAE-10; 7/8" - 14 UNF-2B

Shaft ends

Sizes 160, 180

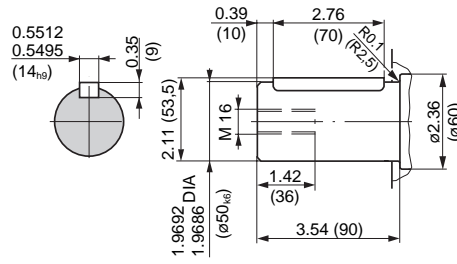
"S" Splined Shaft SAE 1 3/4",
13 Teeth, 8/16 Pitch
ANSI B 92.1a-1976



Nominal pressure
p_N = 5800 psi (400 bar)

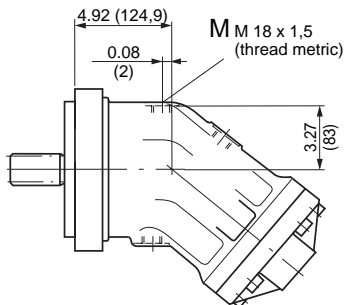
Size 160, 180

"B" Parallel shaft with key
AS 14x9x70mm DIN 6885



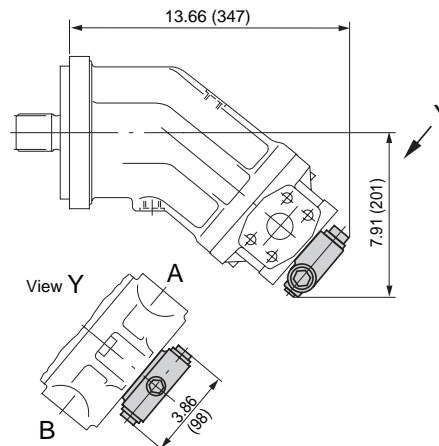
Nominal pressure
p_N = 5100 psi (350 bar)

Prepared for speed sensor (D), with port M
(inductive impulse detector ID see RA 95038
hall effect speed sensor HD see RA 95042,
to be ordered separately!)



in preparation (on request)

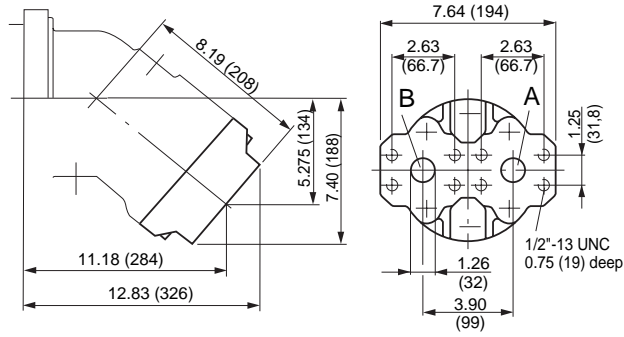
With built-on flushing & boost pressure relief valve (7)



Unit Dimensions, Sizes 160, 180

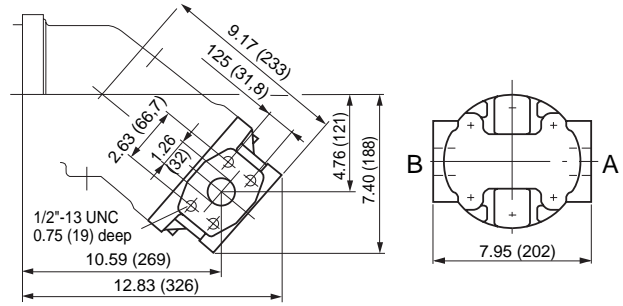
Port plates

51



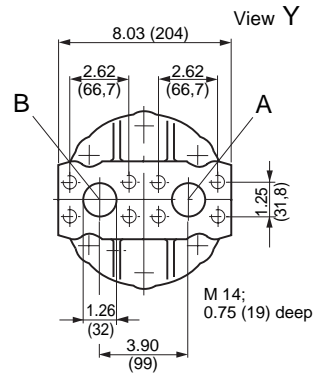
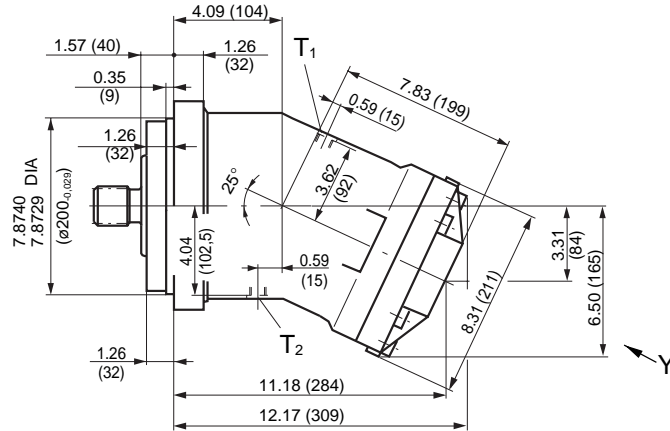
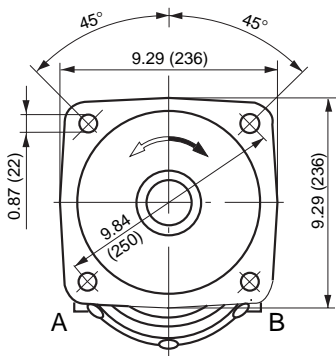
A, B Service line ports
SAE 1 1/4"; 6000 psi (420bar) high pressure series

52



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

**Unit Dimensions, Size 200
ISO Design**

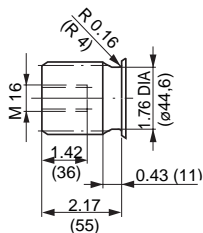


Connections

A, B Service line ports
SAE 1 1/4"; 6000 psi (420 bar) high pressure series
T₁, T₂ Drain port (1 port plugged) M 22x1,5 (thread metric)

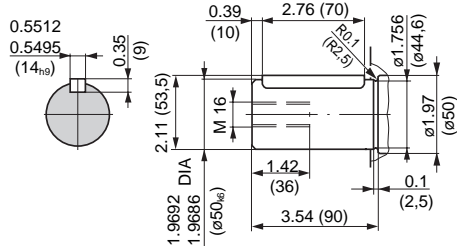
Shaft ends

"A" Splined Shaft, DIN 5480
W 50x2x30x24x9g



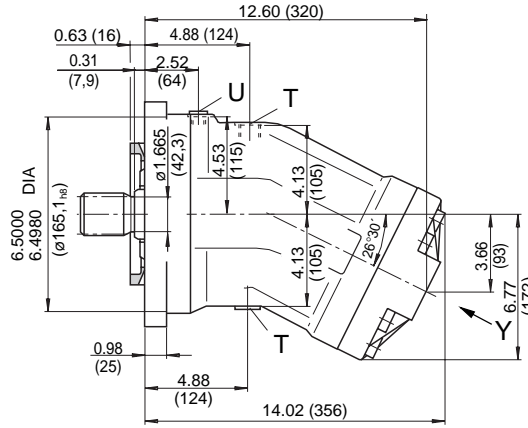
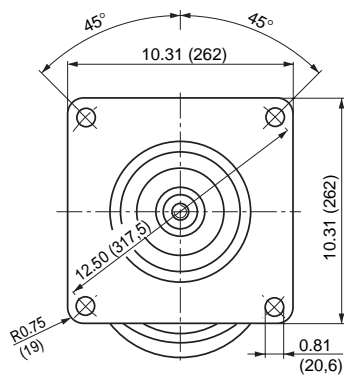
Nominal pressure
p_N = 5800 psi (400 bar)

"B" Parallel shaft with key
AS 14x9x63mm, DIN 6885



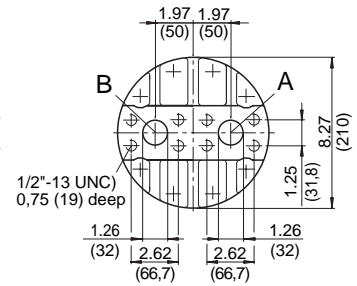
Nominal pressure
p_N = 5100 psi (350 bar)

**Unit Dimensions, Size 250
SAE Design**



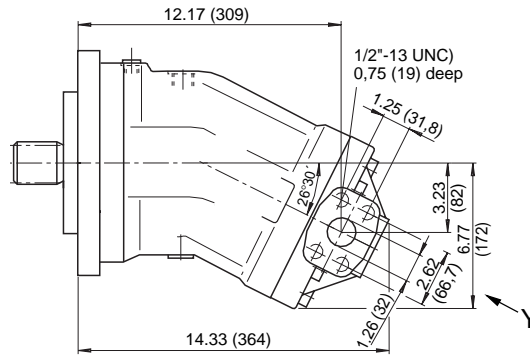
Port plate 51

View Y



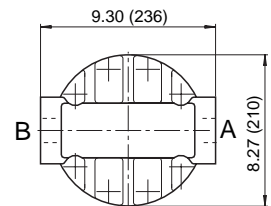
Connections

- A, B Service line ports SAE 1 1/4" 6000 psi (420 bar) high pressure series
- T Drain port (1 port plugged) 7/8 - 14 UNF - 2B
- U Port for bearing flushing (plugged) 9/16 - 18 UNF - 2B



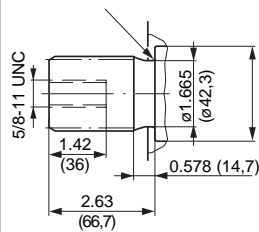
Port plate 52

View Y



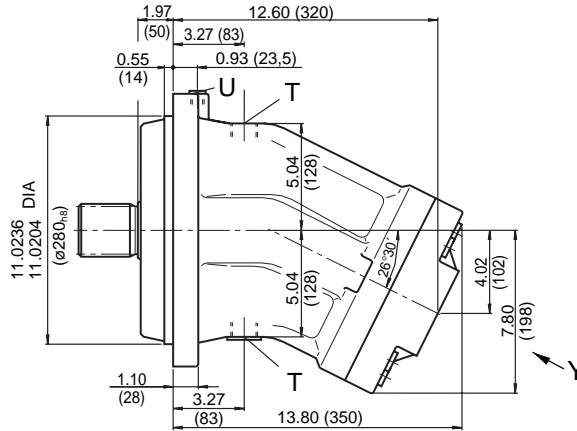
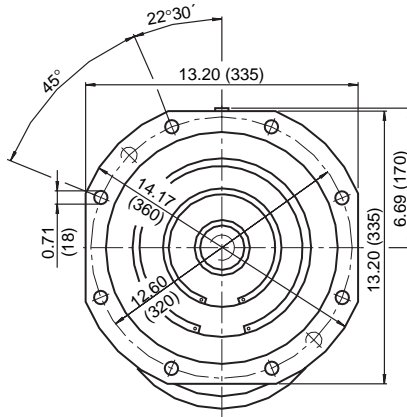
Shaft ends

"S" Splined Shaft SAE 2",
15 Teeth, 8/16 Pitch
ANSI B 92.1a-1976



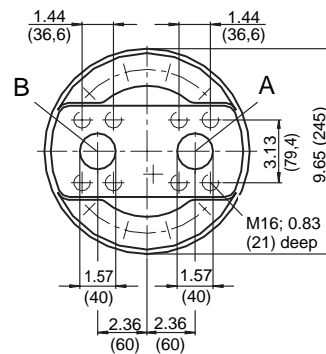
Nominal pressure
 $p_N = 5100 \text{ psi (350 bar)}$

Unit Dimensions, Size 355 ISO Design



Port plate 01

View Y

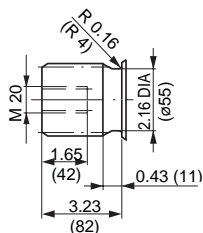


Connections

- | | | |
|------|---|--------------------------|
| A, B | Service line ports | SAE 1 1/2" |
| | 6000 psi (420 bar) high pressure series | |
| T | Drain port (1 port plugged) | M 33x2 (thread metric) |
| U | Port for bearing flushing (plugged) | M 14x1,5 (thread metric) |

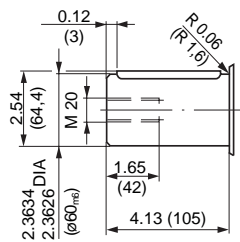
Shaft ends

"Z" Splined Shaft, DIN 5480
W 60x2x30x28x9g



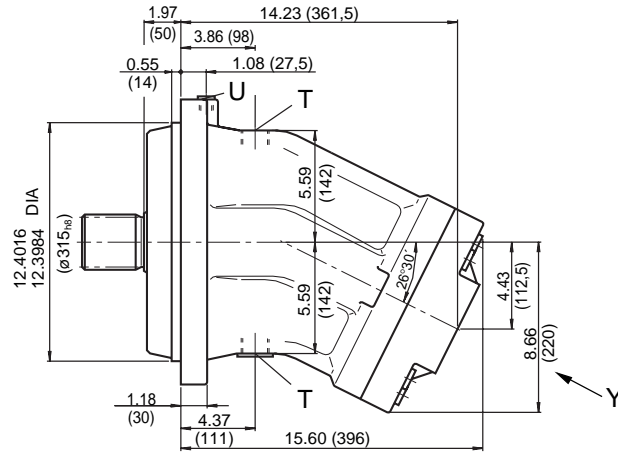
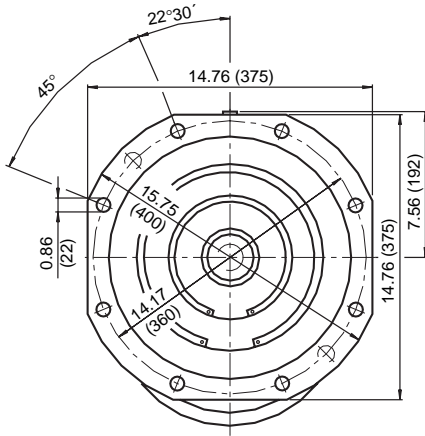
Nominal pressure
 $p_N = 5100 \text{ psi (350 bar)}$

"P" Parallel Shaft with key
AS 18x11x100mm, DIN 6885

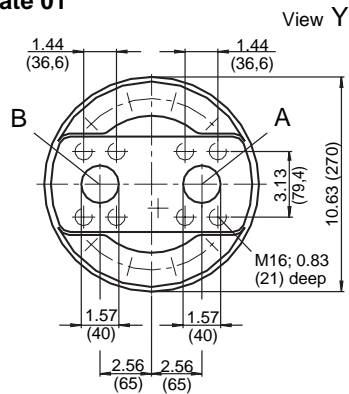


Nominal pressure
 $p_N = 5100 \text{ psi (350 bar)}$

**Unit Dimensions, Size 500
ISO Design**



Port plate 01

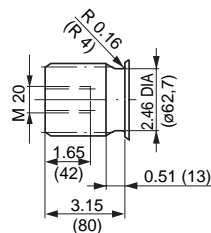


Connections

- A, B Service line ports SAE 1 1/2"
- 6000 psi (420 bar) high pressure series
- T Drain port (1 port plugged) M 33x2 (thread metric)
- U Port for bearing flushing (plugged) M 18x1,5 (htread metric)

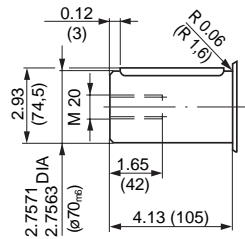
Shaft ends

"Z" Splined Shaft, DIN 5480
W 70x3x30x22x9g



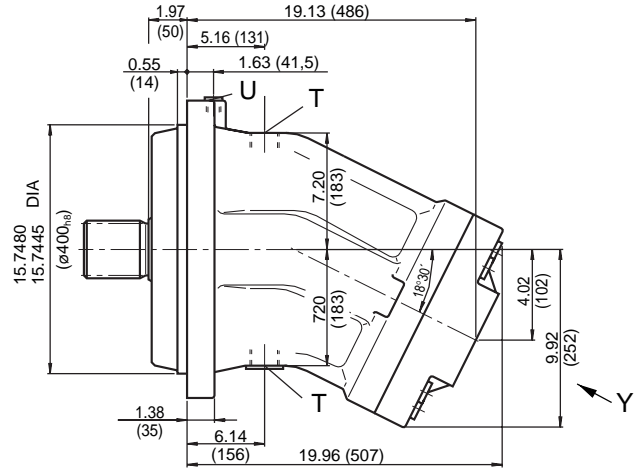
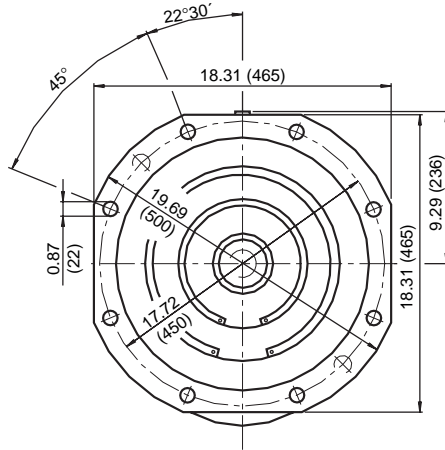
Nominal pressure
 $p_N = 5100 \text{ psi (350 bar)}$

"P" Parallel Shaft with key
AS 20x12x100mm, DIN 6885



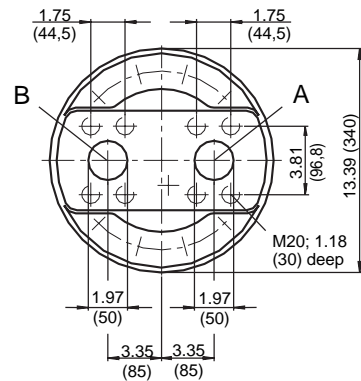
Nominal pressure
 $p_N = 5100 \text{ psi (350 bar)}$

**Unit Dimensions, Size 710
ISO Design**



Port plate 01

View Y

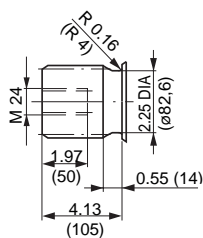


Connections

- A, B Service line ports SAE 2" 6000 psi (420 bar) high pressure series
- T Drain port (1 port plugged) M 42x2 (thread metric)
- U Port for bearing flushing (plugged) M 18x1,5 (thread metric)

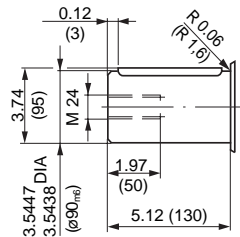
Shaft ends

"Z" Splined Shaft, DIN 5480
W 90x3x30x28x9g



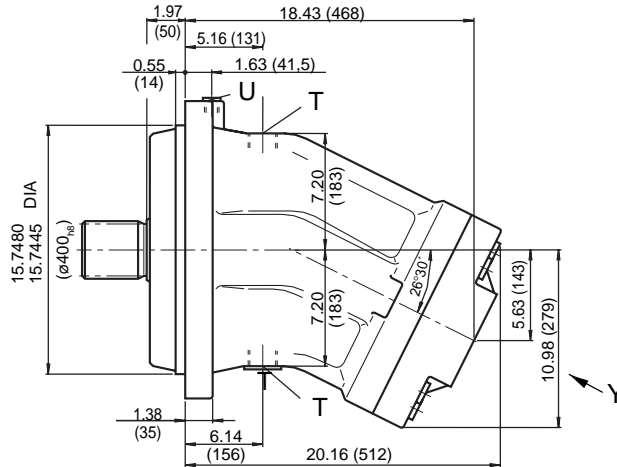
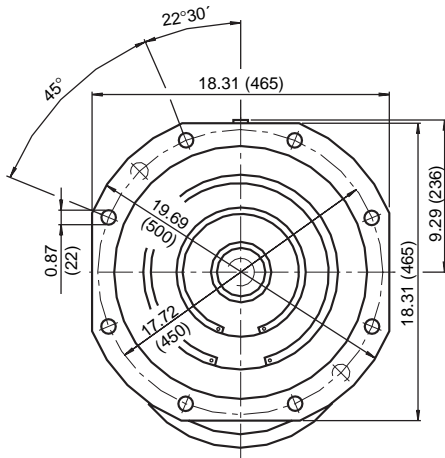
Nominal pressure
 $p_N = 5100 \text{ psi (350 bar)}$

"P" Parallel Shaft with key
AS 25x14x125mm, DIN 6885



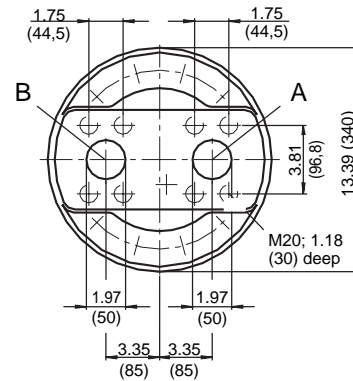
Nominal pressure
 $p_N = 5100 \text{ psi (350 bar)}$

**Unit Dimensions, Size 1000
ISO Design**



Port plate 01

View Y

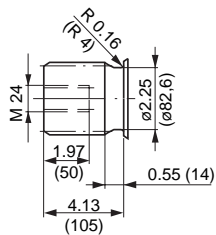


Connections

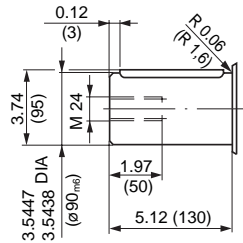
- A, B Service line ports SAE 2" 6000 psi (420 bar) high pressure series
- T Drain port (1 port plugged) M 42x2 (thread metric)
- U Port for bearing flushing (plugged) M 18x1,5 (thread metric)

Shaft ends

"Z" Splined Shaft, DIN 5480
W 90x3x30x28x9g

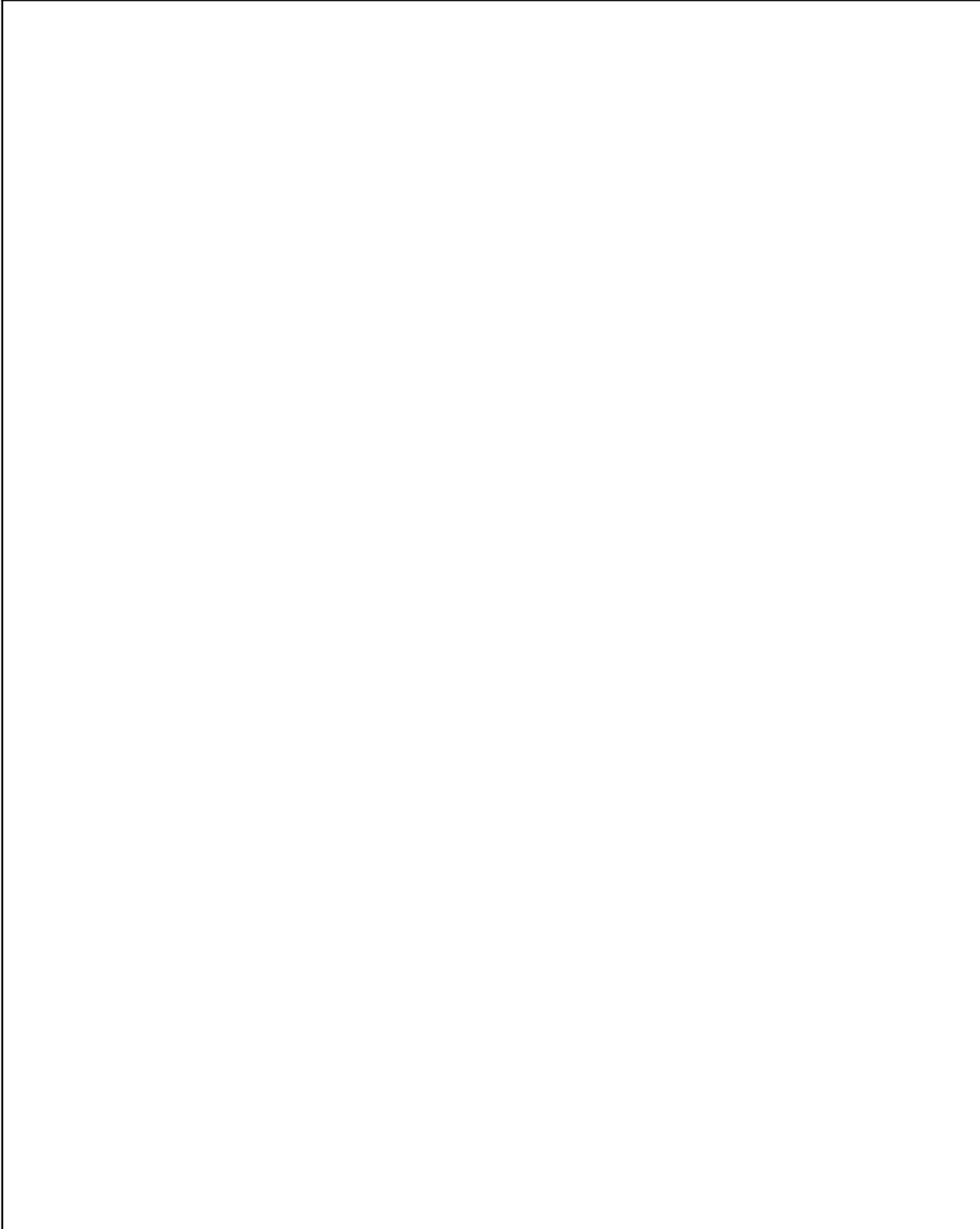


"P" Parallel Shaft with key
AS 25x14x125mm, DIN 6885



Nominal pressure
 $p_N = 5100 \text{ psi (350 bar)}$

Nominal pressure
 $p_N = 5100 \text{ psi (350 bar)}$



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Rexroth Hydraulics Div., Mobile, 1700 Old Mansfield Road, Wooster, OH 44691-0394 Tel. (330) 263-3400 Fax: (330) 263-3333