

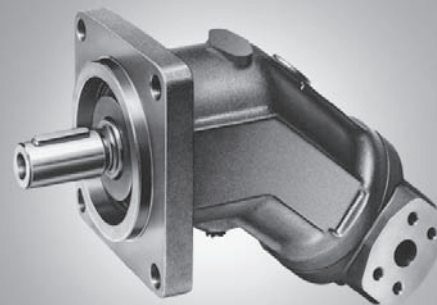
Axial Piston Fixed Displacement Pump AA2FO (A2FO)

RA 91 401/07.05 1/28
Replaces: 09.04

Technical data sheet

Series 6

Sizes	Nominal pressure/Peak pressure
5	4600/5100 psi (315/350 bar)
10...200	5800/6500 psi (400/450 bar)
250...1000	5100/5800 psi (350/400 bar)
open circuits	



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Features

- Fixed displacement pump AA2FO of axial piston, bent axis design, suitable for hydrostatic drives in open circuits
- Use in mobile and industrial applications
- Output flow is proportional to drive speed and displacement
- The drive shaft bearings are designed to give the service life expected in these areas of operation
- High power density
- Compact design
- High overall efficiency
- Cost effective concept
- One piece pistons with piston rings

Ordering Code / Standard Program (ordering code size 5 see page 10)

			O		/	6			-	V			
01	02	03	04	05		06	07	08		09	10	11	12

Hydraulic fluid

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

Axial piston unit

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

Drive shaft bearing

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

Mode of operation

04	Pump, open circuits											O
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Size

Size ≈ displacement V_g (cm ³)													
05	Size		10	12	16	23	28	32	45	56	63	80	
	in ³ /rev.		0.63	0.73	0.98	1.40	1.71	1.95	2.78	3.42	3.84	4.91	
	Size		90	107	125	160	180	200	250	355	500	710	1000
	in ³ /rev.		5.49	6.51	7.63	9.79	10.98	12.20	15.25	21.66	30.51	43.33	61.02

Series

06												6
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Index

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

Direction of rotation

08	Viewed on shaft end					clockwise					R
						counter-clockwise					L

Seals

09	FKM (flour-caoutchouc)											V
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Ordering Code / Standard Program (ordering code size 5 see page 10)

			O		/	6			-	V			
01	02	03	04	05		06	07	08		09	10	11	12

Shaft end		10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	250		
10	SAE Version (AA2F)	SAE Splined shaft	●	●	●	●	●	●	●	●	-	-	●	●	●	●	●	S	
			-	-	-	-	-	-	●	●	-	-	-	-	-	-	-	T	
			-	-	-	-	-	-	-	-	●	●	●	●	-	-	-	U	
			-	-	-	-	-	-	-	-	●	●	-	-	-	-	-	Q	
	Parallel keyed shaft DIN 6885	●	●	●	●	●	●	-	●	●	-	-	●	●	●	●	-	B	
		-	-	-	-	-	-	●	-	-	-	-	-	-	-	-	-	P	
	SAE parallel keyed shaft	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●	K
	200 355 500 710 1000																		
	ISO Version (A2F)	Splined shaft DIN 5480	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	A
			-	●	●	●	●	●	-	-	-	-	-	-	-	-	-	-	Z
Parallel keyed shaft DIN 6885		●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B	
		-	●	●	●	●	●	-	-	-	-	-	-	-	-	-	-	P	

Mounting flange		10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	250		
11	SAE Version (AA2F)	2-bolt – SAE	●	●	●	-	-	-	-	-	-	-	-	-	-	-	-	-	C
		4-bolt – SAE	-	-	-	●	●	●	●	●	●	-	-	●	●	●	●	●	D
			-	-	-	-	-	-	-	-	●	●	-	-	-	-	-	-	DN
	200 355 500 710 1000																		
	ISO Version (A2F)	4-bolt – ISO	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B
		8-bolt – ISO	-	●	●	●	●	●	-	-	-	-	-	-	-	-	-	-	H

Service line ports		10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	250		
12	AA2F ¹⁾																		
	SAE flange ports A and B, at side and SAE flange port S, rear	-	-	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	55
	Threaded ports A and B, at side and SAE flange port S, rear	●	●	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56
	200 355 500 710 1000																		
	A2F ²⁾																		
	SAE flange ports A and B, at side and SAE flange port S, rear	-	-	-	-	-	-	-	●	-	-	-	-	-	-	-	-	-	05
SAE flange ports A and B, rear and SAE flange port S, rear	-	-	-	-	-	-	-	-	●	●	●	●	●	●	●	●	●	11	

¹⁾ threads of fastening screws and service lines are SAE (UN/UNF)

²⁾ threads of fastening screws are metric

● = available - = not available

Technical Data

Hydraulic fluid

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

The AA2FO fixed displacement pump is not suitable for use with HFA. If HFB, HFC and HFD or environmentally acceptable hydraulic fluids are being used, the limitation regarding technical data and seals mentioned in RE 90221 and RE 90223 must be observed. When ordering please indicate hydraulic fluid used.

Viscosity range

We recommend that a viscosity (at operating temperature) for optimum efficiency and service life purposes of

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

selected, taken into consideration the tank temperature (open circuits).

Limits of viscosity range

The following values apply in extreme cases:

Sizes 5...200:

$$v_{\text{min}} = 42 \text{ SUS } (5 \text{ mm}^2/\text{s})$$

short term ($t < 3$ min) at max. permitted temperature of $t_{\text{max}} = +240^\circ\text{F}$ ($+115^\circ\text{C}$).

$$v_{\text{max}} = 7400 \text{ SUS } (1600 \text{ mm}^2/\text{s}),$$

short term ($t < 3$ min) with cold start ($p \leq 435 \text{ psi} / 30 \text{ bar}$, $n \leq 1000 \text{ rpm}$, $t_{\text{min}} = -40^\circ\text{F} / -40^\circ\text{C}$).

Sizes 250...1000:

$$v_{\text{min}} = 60 \text{ SUS } (10 \text{ mm}^2/\text{s}),$$

short term ($t < 3$ min) at max. permitted temperature of $t_{\text{max}} = +195^\circ\text{F}$ ($+90^\circ\text{C}$)

$$v_{\text{max}} = 4600 \text{ SUS } (1000 \text{ mm}^2/\text{s}),$$

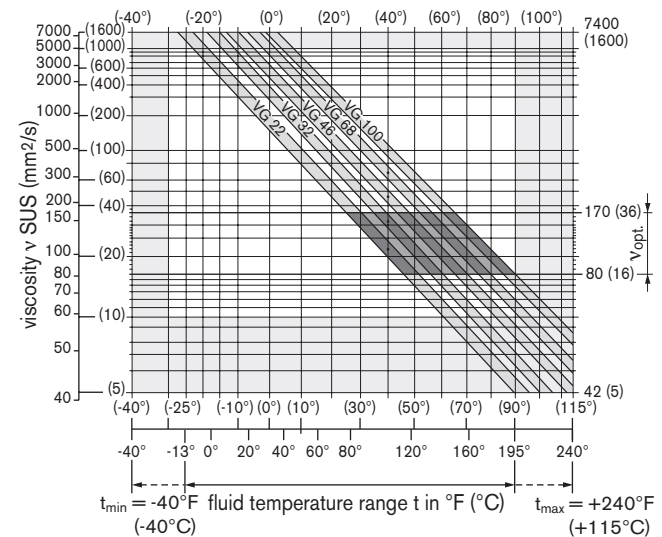
short term ($t < 3$ min) with cold start ($p \leq 435 \text{ psi} / 30 \text{ bar}$, $n \leq 1000 \text{ rpm}$, $t_{\text{min}} = -13^\circ\text{F} / -25^\circ\text{C}$).

Note that the maximum hydraulic fluid temperature must not be exceeded locally either (e.g. bearing area). The temperature in the bearing area is - depending on pressure and speed - up to 22°F (12 K) higher than the average case drain temperature.

Special measures are necessary at temperatures between -40°F and -13°F (-40°C and -25°C). Please contact us.

See RE 90300-03-B for detailed information about operation at low temperatures.

Selection diagram



Details regarding the choice of hydraulic fluid

To select the correct hydraulic fluid in open circuit applications, the temperature in the tank in relation to the ambient temperature must be considered.

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 selected in each case.

Example: At an ambient temperature of $X^\circ\text{F}$ ($X^\circ\text{C}$) an operating temperature of 140°F (60°C) is set in the circuit. In the optimum operating viscosity range (v_{opt} ; shaded area) this corresponds to the viscosity classes VG 46 or VG 68; to be selected: VG 68.

Please note: The leakage fluid temperature, which is affected by pressure and rotational speed, is always higher than the circuit temperature or tank temperature. At no point in the system may the temperature be higher than 240°F (115°C) for sizes 5 to 200 or 195°F (90°C) for sizes 250 to 1000.

If this cannot be achieved due to unusual operating parameters or high ambient temperatures, we recommend to apply bearing flushing at port U (sizes 250 ... 1000).

Filtration

The finer the filtration, the cleaner the fluid, the longer the service life of the axial piston unit.

To ensure proper function of the axial piston unit, the Hydraulic fluid must have a cleanliness level of at least

20/18/15 according to ISO 4406.

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

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

Please contact us if these cleanliness levels cannot be achieved.

Technical Data

Operational pressure range

Inlet

Minimum pressure at port S

The minimum inlet pressure depends on speed. The following limits must not be exceeded.

$p_{abs\ min}$ _____ 12 psi (0.8 bar)

$p_{abs\ max}$ _____ 435 psi (30 bar)

Outlet

Maximum pressure on port A or B (pressure data according 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)
	P								●									5100 psi (350 bar)	5800 psi (400 bar)
	K																	●	5100 psi (350 bar)
A2F	Sizes	5						200	355	500	710	1000	Nominal pressure	Peak pressure					
Shaft end:	Z							●	●	●	●		5100 psi (350 bar)	5800 psi (400 bar)					
	A							●					5800 psi (400 bar)	6500 psi (450 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)					

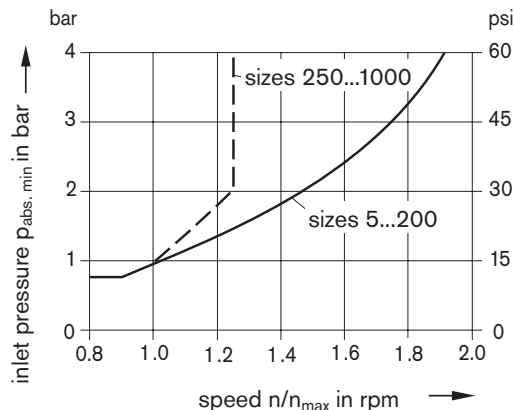
With pulsating loads over $p_N = 4600\ psi / 315\ bar$ ($p_{max} = 5100\ psi / 350\ bar$);

we recommend the use of a splined shaft (AA2FO 10...250: S, T or U / A2FO 200: A / A2FO 355...1000: Z)

Attention: sizes 10 to 200: shaft end with drives of radial force loads at the drive shaft (pinion, V-belt drives) necessitate reduction of the nominal pressure to $p_N = 4600\ psi (315\ bar)$! Sizes 250...1000 please contact us.

Minimum inlet pressure at suction port S with increased speed

In order to avoid damage of the pump a minimum inlet pressure at the suction port must be assured. The minimum inlet pressure is related to the rotational speed of the fixed pump.



Note:

- max. permissible speed $n_{max\ limit}$ (speed limit)
- min. permissible pressure at port S
- admissible values for the drive shaft seal (see next page).

Technical Data

Direction of flow

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

Long-life bearing (sizes 250...1000)

For long service life and use with HF hydraulic fluids. Same external dimensions as the pump with standard long-life bearing can be supplied. Flushing of bearing and case via the U-port is recommended.

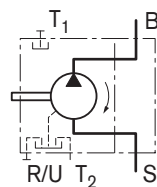
Flow (recommended)

Size	250	355	500	710	1000
Q _{v flow} gpm	2.6	4.2	4.2	4.2	4.2
L/min	10	16	16	16	16

Symbol

Connections

- A, B Service line port
- S Suction port
- T₁, T₂ Drain ports
- R/U Port for bearing flushing



Shaft seal ring

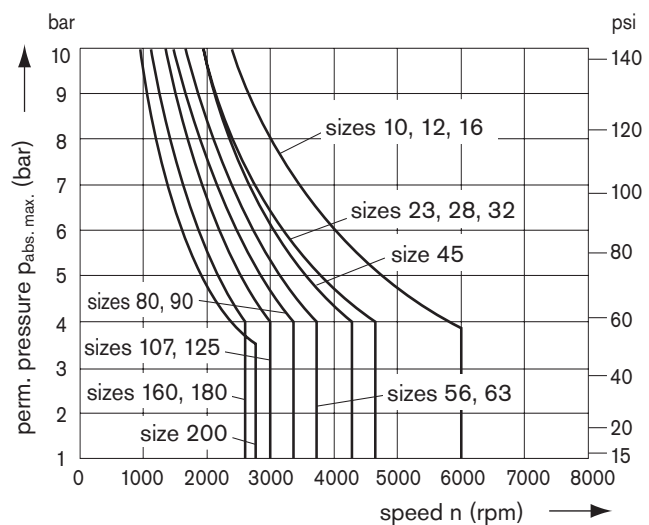
Permissible pressure load

The service life of the shaft seal ring is affected by the speed of the pump and the case drain pressure. The permitted loading with intermittent case drain pressure depends on the rotational speed (see chart). Short-term ($t < 5$ min) pressure spikes of up to 145 psi (10 bar) absolute are permitted.

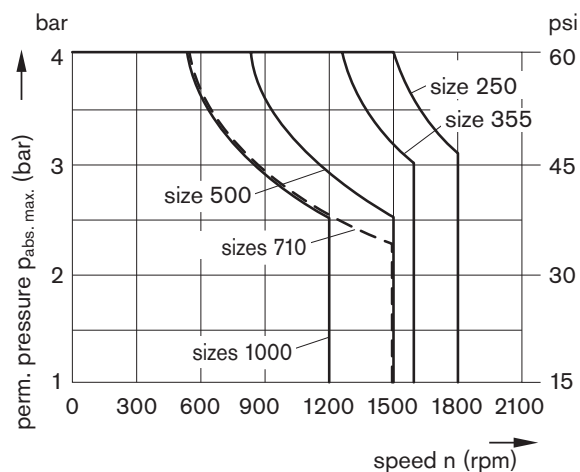
The average permanent case drain pressure must not exceed 43.5 psi (3 bar) absolute.

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

Sizes 10...200



Sizes 250...1000



Temperature range

The FKM shaft seal is admissible for a housing temperature range from

- 13°F to +240°F (-25°C to +115°C) at sizes 5...200 and
- 13°F to +195°F (-25°C to +90°C) at sizes 250...1000

Note:

For applications below -13°F (-25 °C) a Buna-N (NBR) shaft seal is necessary (admissible temperature range -40 °F to +195 °F / -40 °C to +90 °C). Please contact us.

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	16	22.9	28.1	32	45.6	56.1	63	80.4	
Speed max.	$n_{max}^{1)}$	rpm	5600	3150	3150	3150	2500	2500	2500	2240	2000	2000	1800	
		$n_{max\ limit}^{2)}$	rpm	8000	6000	6000	6000	4750	4750	4750	4250	3750	3750	3350
Flow max.	$q_{V\ max}$	gpm	7.3	8.6	10.0	13.2	15.1	18.5	21.1	27.0	29.6	33.3	38.0	
		L/min	27.6	32.4	37.8	50	57	70	80	102	112	126	144	
Power at	$\Delta p = 5100\ psi$	P_{max}	HP	19.5 ³⁾	25	30	39	44	55	63	80	88	99	113
			kW	14.5 ³⁾	18.9	22	29.2		41	47	59.5	65	73.5	84
			HP	–	30	34	45	51	63	71	91	100	113	129
			kW	–	22	25	34	38	47	53	68	75	84	96
Torque at	$\Delta p = 5100\ psi$	T	lb-ft	18 ³⁾	42	50	65	94	116	132	189	232	260	331
			Nm	24.7 ³⁾	57	67	88	126	156	178	254	312	350	445
			lb-ft	–	48	56	75	107	131	150	214	263	295	377
			Nm	–	65	76	101	145	178	203	290	356	400	511
Mass moment of inertia around output shaft	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	
Case fill capacity		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	
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	106.7	125	160.4	180	200	250	355	500	710	1000	
Speed max.	$n_{max}^{1)}$	rpm	1800	1600	1600	1450	1450	1550	1500	1320	1200	1200	950	
		$n_{max\ limit}^{2)}$	rpm	3350	3000	3000	2650	2650	2750	1800	1600	1500	1500	1200
Flow max.	$q_{V\ max}$	gpm	42.8	44.9	52.8	61.2	69.0	81.9	99.1	123.9	158.5	218.2	251.0	
		L/min	162	170	200	232	261	310	375	469	600	826	950	
Power at	$\Delta p = 5100\ psi$	P_{max}	HP	127	134	157	183	205	244	295	368	472	670	747
			kW	95	100	117	135	152	181	219	273	350	497	554
			HP	145	153	179	208	233	277	–	–	–	–	–
			kW	108	114	133	155	174	207	–	–	–	–	–
Torque at	$\Delta p = 5100\ psi$	T	lb-ft	372	442	517	664	746	828	1036	1470	2070	2940	4141
			Nm	501	594	696	893	1003	1114	1393	1978	2785	3955	5570
			lb-ft	422	500	586	752	845	938	–	–	–	–	–
			Nm	572	678	795	1020	1145	1272	–	–	–	–	–
Mass moment of inertia around output shaft	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	
Case fill capacity		gal	0.145	0.211	0.211	0.291	0.291	0.713	0.660	0.925	1.110	2.113	2.113	
		L	0.55	0.8	0.8	1.1	1.1	2.7	2.5	3.5	4.2	8	8	
Weight (approx.)	m	lbs	51	71	71	99	99	145	161	242	342	715	741	
		kg	23	32	32	45	45	66	73	110	155	325	336	

¹⁾ The values shown are valid for an absolute pressure (p_{abs}) of 14.5 psi (1 bar) at the suction inlet S and when operated on mineral oil (with a specific mass of 7.36 lbs/gal (0.88 kg/L)).

²⁾ By increase of the input pressure ($p_{abs} > 14.5\ psi / 1\ bar$) the rotational speeds can be increased to the max. admissible speeds $n_{max\ limit}$ (speed limits) (see diagram page 8).

³⁾ $\Delta p = 4600\ psi$ (315 bar)

Technical Data

Determining the size

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

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

$$\text{Input power} \quad P = \frac{2 \pi \cdot T \cdot n}{33\,000} = \frac{q_v \cdot \Delta p}{1714 \cdot \eta_t} \quad \text{HP} \quad \left(P = \frac{2 \pi \cdot T \cdot n}{60\,000} = \frac{q_v \cdot \Delta p}{600 \cdot \eta_t} \quad \text{kW} \right)$$

V_g = Displacement per revolution in in³ (cm³)

Δp = Differential pressure in psi (bar)

n = Speed in rpm

η_v = Volumetric efficiency



η_{mh} = Mechanical-hydraulic efficiency



η_t = Overall efficiency

Technical Data

Permissible radial and axial loading on the drive shaft

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

Size			5	10	12	16	23	28	32	45	56	63	80	
Radial force, max. ¹⁾ at distance a (from shaft collar)		$F_{q\ max}$	lbf	160	472	562	730	865	1079	1214	1630	1832	2057	2304 ²⁾
			N	710	2100	2500	3250	3850	4800	5400	7250	8150	9150	10250
	a		in	0.47	0.63	0.63	0.63	0.63	0.63	0.63	0.71	0.71	0.71	0.79
			mm	12	16	16	16	16	16	16	18	18	18	20
Axial force, max. ³⁾		$+F_{ax\ max}$	lbf	40	72	72	72	112	112	112	142	180	180	225
			N	180	320	320	320	500	500	500	630	800	800	1000
	$-F_{ax\ max}$		lbf	40	72	72	72	112	112	112	142	180	180	225
			N	180	320	320	320	500	500	500	630	800	800	1000
Permissible axial force/psi (bar) operating pressure	$\pm F_{ax\ per./psi}$ (bar)		lbf/psi	0.023	0.05	0.05	0.05	0.08	0.08	0.08	0.11	0.13	0.13	0.16
			N/bar	1.5	3.0	3.0	3.0	5.2	5.2	5.2	7.0	8.7	8.7	10.6

Size			90	107	125	160	180	200	250	355	500	710	1000	
Radial force, max. ¹⁾ at distance a (from shaft collar)		$F_{q\ max}$	lbf	2574 ²⁾	2720	3170	3664	4114	5148	270	337	427	674	584
			N	11450	12100	14100	16300	18300	22900	1200 ⁴⁾	1500 ⁴⁾	1900 ⁴⁾	3000 ⁴⁾	2600 ⁴⁾
	a		in	0.79	0.79	0.79	0.98	0.98	0.98	1.61	2.07	2.07	2.66	2.66
			mm	20	20	20	25	25	25	41	52.5	52.5	67.5	67.5
Axial force, max. ³⁾		$+F_{ax\ max}$	lbf	225	281	281	360	360	360	450	562	674	989	989
			N	1000	1250	1250	1600	1600	1600	2000	2500	3000	4400	4400
	$-F_{ax\ max}$		lbf	225	281	281	360	360	360	450	562	674	989	989
			N	1000	1250	1250	1600	1600	1600	2000	2500	3000	4400	4400
Permissible axial force/psi (bar) operating pressure	$\pm F_{ax\ per./psi}$ (bar)		lbf/psi	0.16	0.20	0.20	0.26	0.26	0.26	⁵⁾	⁵⁾	⁵⁾	⁵⁾	⁵⁾
			N/bar	10.6	12.9	12.9	16.7	16.7	16.7					

¹⁾ during intermittent operation (sizes 5...200)

²⁾ value for Q-shaft: $F_{q\ max} = 2023\ lbf\ (9000\ N)$

³⁾ max. permissible axial force when stopped or when axial piston unit working in zero pressure conditions.

⁴⁾ when stopped or when axial piston unit working in pressureless conditions. Higher forces are permitted when under pressure.

Please contact us.

⁵⁾ please contact us

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

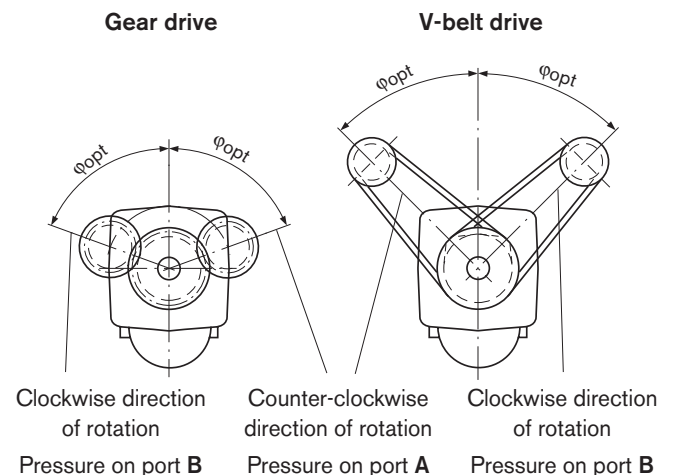
$-F_{ax\ max}$ = increase in service life of bearings

$+F_{ax\ max}$ = reduction in service life of bearings (avoid if at all possible)

Effect of radial force F_q on the service life of the bearings

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

	Gear drive	V-belt drive
Size	$\psi_{opt.}$	$\psi_{opt.}$
10-180	$\pm 70^\circ$	$\pm 45^\circ$
200-1000	$\pm 45^\circ$	$\pm 70^\circ$



Ordering Code / Standard Program – Size 5

A2F	5	/	60		-		7
01	02		03	04		05	06

Axial piston unit

01	Bent axis design, fixed displacement	A2F
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Size

02	Size	5
	≈ Displacement V_g	in ³ /rev. 0.30
		cm ³ /rev. 4.93

Series

03		60
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Direction of rotation

04	Viewed on shaft end	clockwise	R
		counter-clockwise	L

Shaft end

05	Parallel keyed shaft DIN 6885	B
	Tapered shaft with threaded end and woodruff key per DIN 6888	C

Service line ports

06	Threaded ports A und B at side, metric	7
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Additional instructions in text form

Seals

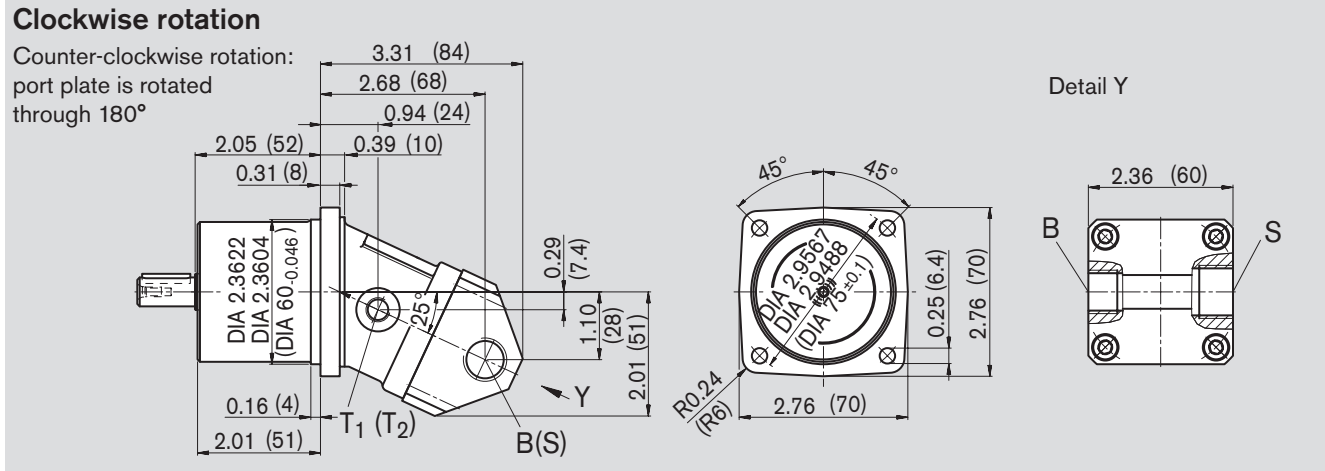
The fixed pump A2F5 is equipped with Buna-N (NBR) seals in standard design.

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

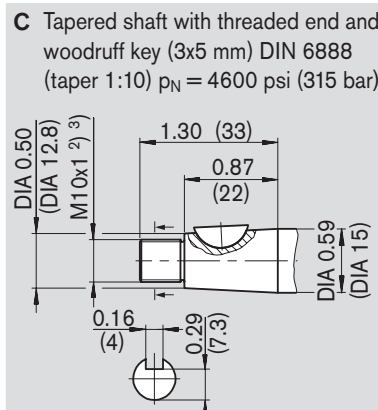
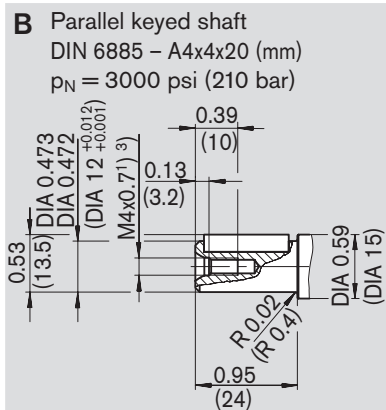
"with FKM-seals"

Unit Dimensions, Size 5 – ISO Design

Please request a certified installation drawing before finalizing your design. Dimensions in inches and (millimeters)



Shaft ends



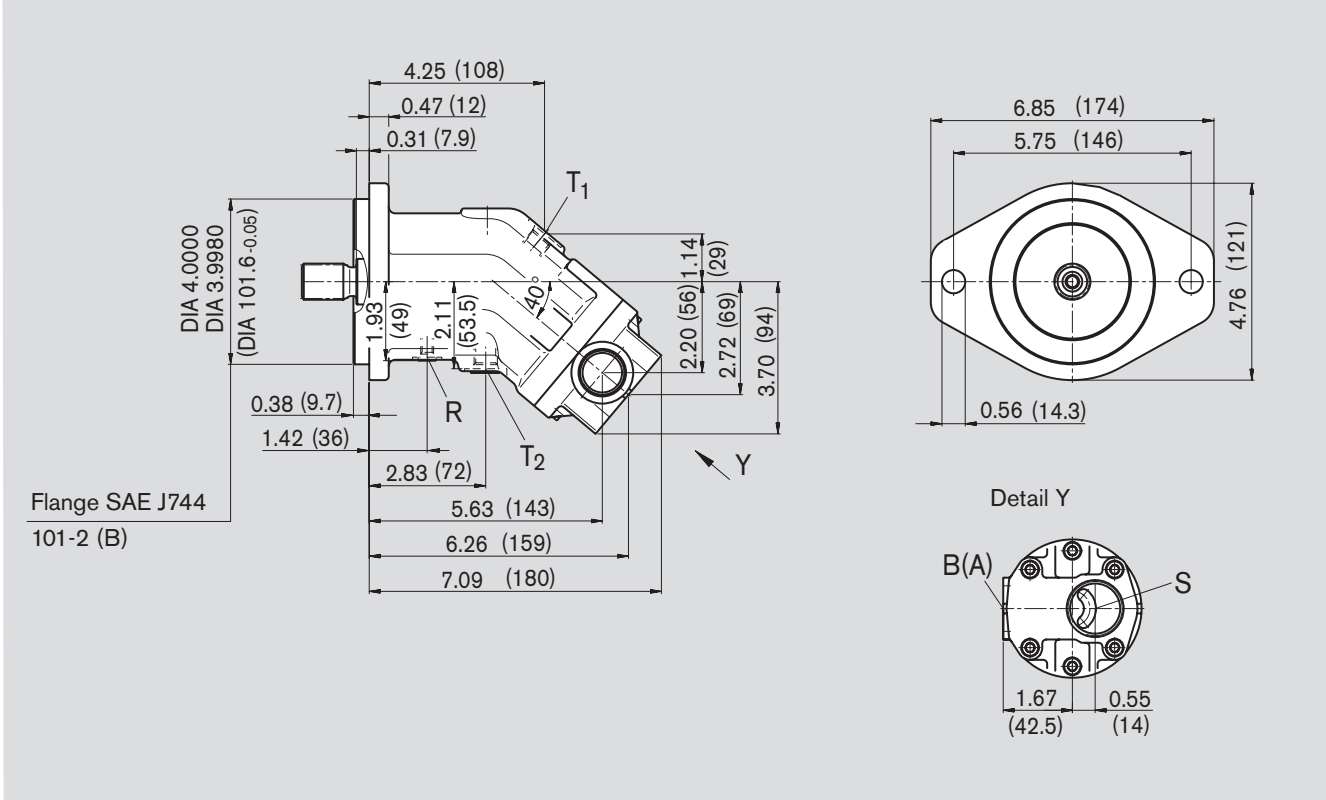
Ports

- B (A) Service line port M18x1.5; 100 lb-ft³
DIN 3852 0.47 (12) deep (140 Nm)
 - S Suction port M22x1.5; 155 lb-ft³
DIN 3852 0.55 (14) deep (210 Nm)
 - T₁, T₂ Case drain ports M10x1; 20 lb-ft³
DIN 3852 0.31 (8) deep (30 Nm)
- 1) centering bore according to DIN 332 (thread according to DIN 13), tightening torque see safety instructions
2) thread according to DIN 3852, max. tightening torque: 20 lb-ft (30 Nm)
3) please observe the general notes for the max.tightening torques on page 28

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

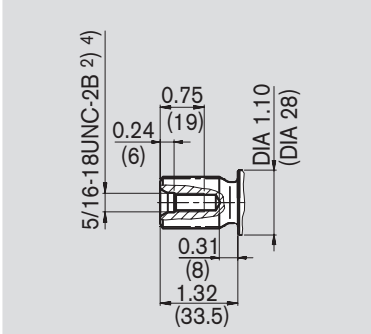
Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)

Clockwise rotation Counter-clockwise rotation: port plate is rotated through 180°

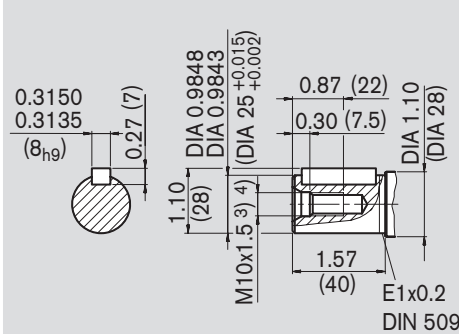


Shaft ends

S Splined shaft 7/8 in 13T 16/32 DP ¹⁾
(SAE J744 – 22-4 (B))
 $p_N = 5800 \text{ psi (400 bar)}$



B Parallel keyed shaft
DIN 6885 – AS8x7x32 (mm)
 $p_N = 5100 \text{ psi (350 bar)}$



Ports

B (A)	Service line port	ISO 11926	1 1/16 in -12 UN-2B; 0.79 (20) deep	265 lb-ft (360 Nm) ⁴⁾
S	Suction port	ISO 11926	1 5/16 in -12 UN-2B; 0.79 (20) deep	400 lb-ft (540 Nm) ⁴⁾
T ₁ , T ₂	Case drain ports (T ₂ plugged)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ⁴⁾
R	Air bleed, Oil drain (plugged)	ISO 11926	5/16 in -24 UNF-2B; 0.93 (10) deep	7 lb-ft (10 Nm) ⁴⁾

¹⁾ ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

²⁾ thread according to ISO 68

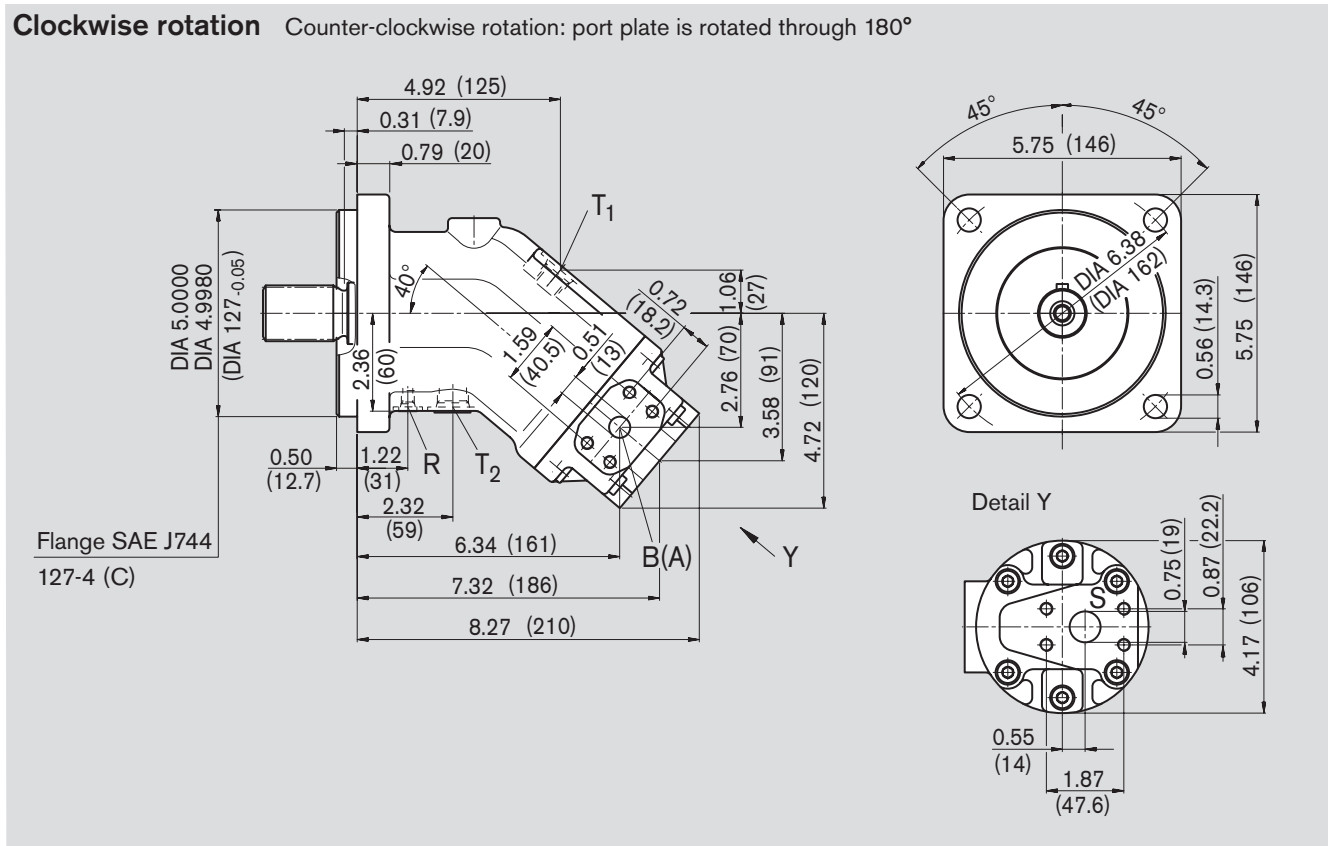
³⁾ centering bore according to DIN 332 (thread according to DIN 13)

⁴⁾ please observe the general notes for the max. tightening torques on page 28

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

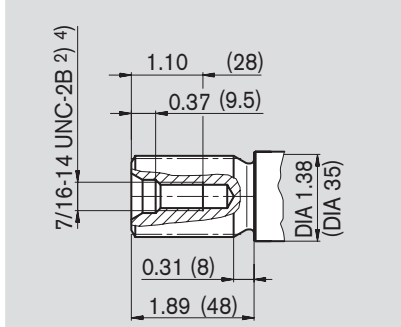
Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)

Clockwise rotation Counter-clockwise rotation: port plate is rotated through 180°

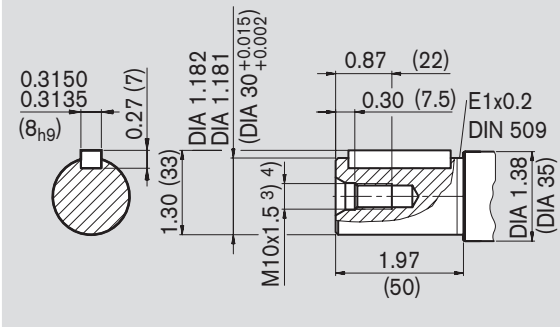


Shaft ends

S Splined shaft 1 1/4 in 14T 12/24 DP ¹⁾
(SAE J744 – 32-4 (C))
p_N = 5800 psi (400 bar)



B Parallel keyed shaft
DIN 6885 – AS8x7x40 (mm)
p_N = 5100 psi (350 bar)



Ports

Port	Description	Standard	Size	Depth	Torque
B (A)	Service line port (high pressure series) Fastening threads B/A	SAE J518 ISO 68	1/2 in 5/16 in-18 UNC-2B	0.71 (18) deep	– see safety instructions
S	Suction port (standard pressure series) Fastening threads S	SAE J518 ISO 68	3/4 in 3/8 in-16 UNC-2B	0.79 (20) deep	– see safety instructions
T ₁ , T ₂	Case drain ports (T ₂ plugged)	ISO 11926	3/4 in-16 UNF-2B	0.59 (15) deep	120 lb-ft (160 Nm) ⁴⁾
R	Air bleed, Oil drain (plugged)	ISO 11926	5/16 in-24 UNF-2B	0.39 (10) deep	7 lb-ft (10 Nm) ⁴⁾

¹⁾ ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

²⁾ thread according to ISO 68

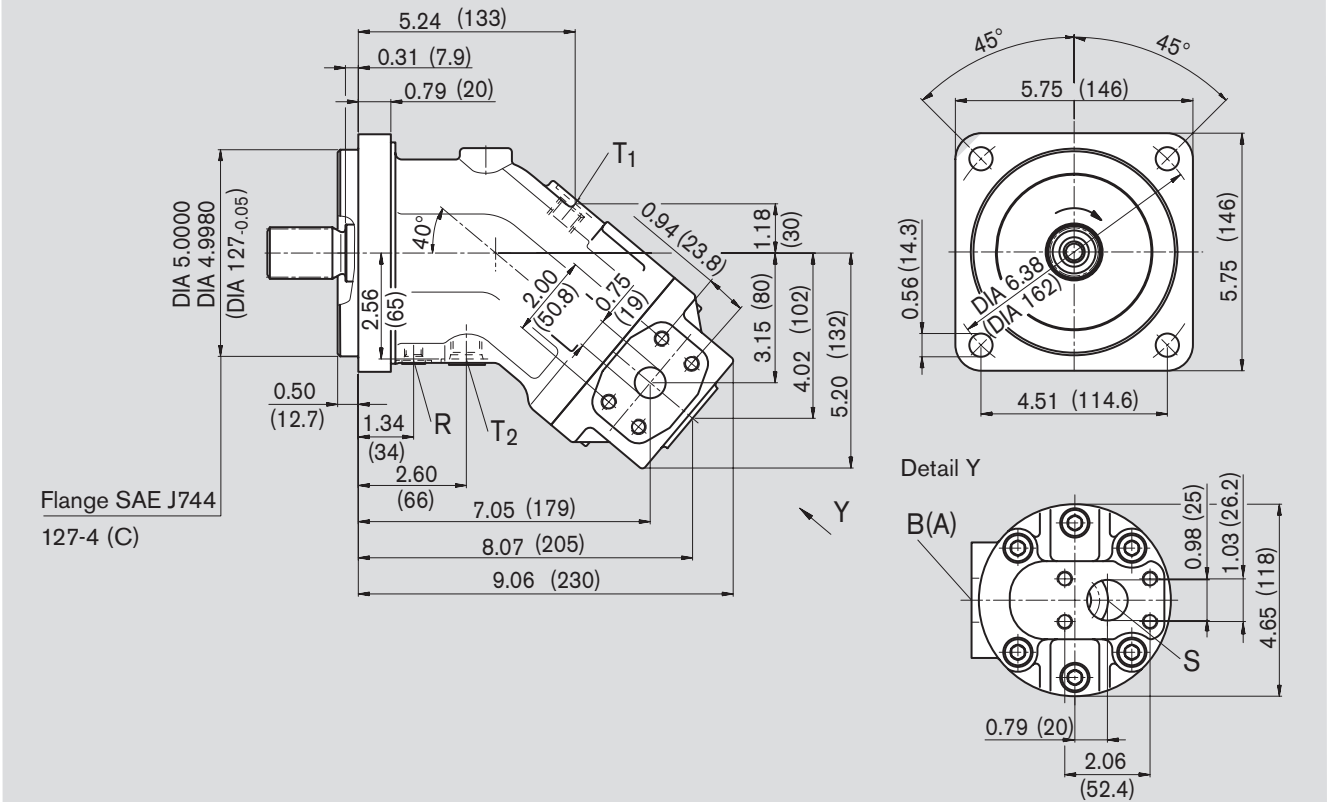
³⁾ centering bore according to DIN 332 (thread according to DIN 13)

⁴⁾ please observe the general notes for the max. tightening torques on page 28

Unit Dimensions, Size 45 – SAE Design

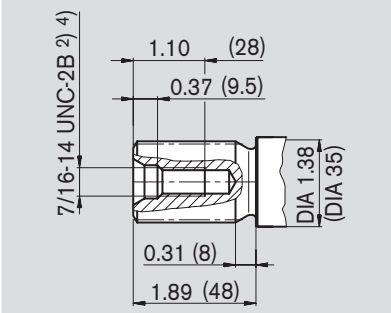
Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)

Clockwise rotation Counter-clockwise rotation: port plate is rotated through 180°

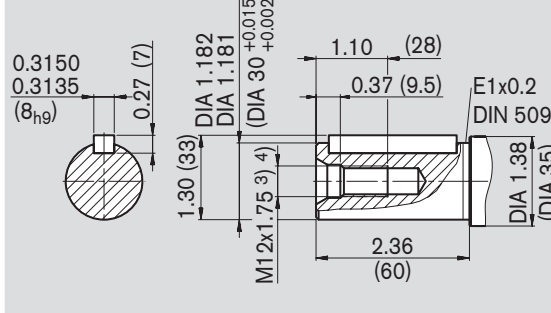


Shaft ends

S Splined shaft 1 1/4 in 14T 12/24 DP ¹⁾
(SAE J744 – 32-4 (C))
p_N = 5800 psi (400 bar)



P Parallel keyed shaft
DIN 6885 – AS8x7x50 (mm)
p_N = 5100 psi (350 bar)



Ports

B (A)	Service line port (high pressure series) Fastening threads B/A	SAE J518 ISO 68	3/4 in 3/8 in-16 UNC-2B; 0.82 (21) deep	– see safety instructions
S	Suction port (standard pressure series) Fastening threads S	SAE J518 ISO 68	1 in 3/8 in-16 UNC-2B; 0.79 (20) deep	– see safety instructions
T ₁ , T ₂	Case drain ports (T ₂ plugged)	ISO 11926	3/4 in-16 UNF-2B; 0.59 (15) deep	120 lb-ft (160 Nm) ⁴⁾
R	Air bleed, Oil drain (plugged)	ISO 11926	7/16 in-20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ⁴⁾

¹⁾ ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

²⁾ thread according to ISO 68

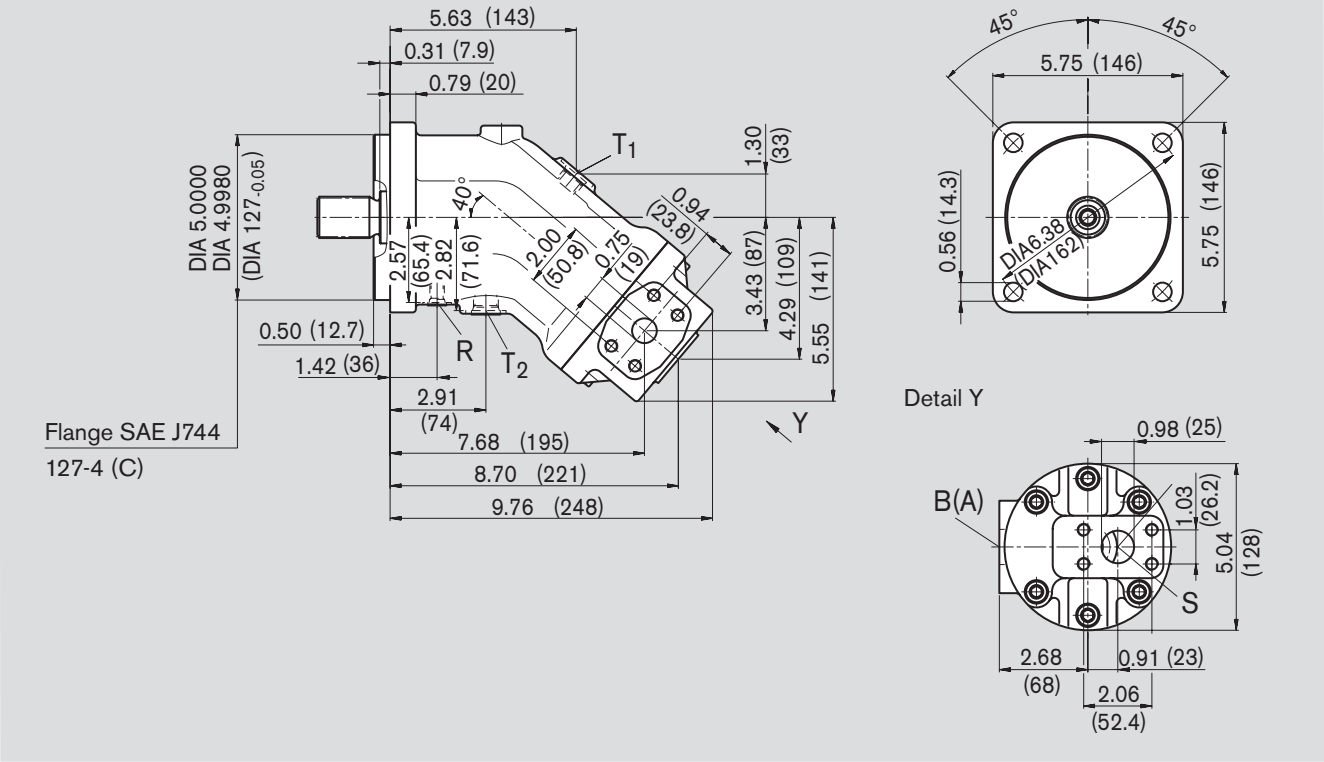
³⁾ centering bore according to DIN 332 (thread according to DIN 13)

⁴⁾ please observe the general notes for the max. tightening torques on page 28

Unit Dimensions, Sizes 56, 63 – SAE Design

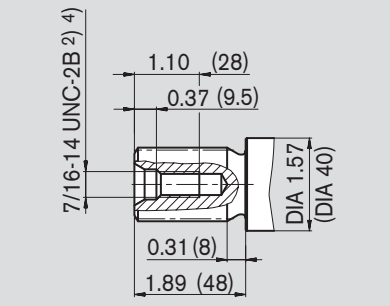
Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)

Clockwise rotation Counter-clockwise rotation: port plate is rotated through 180°

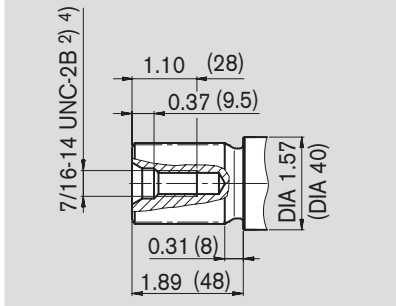


Shaft ends

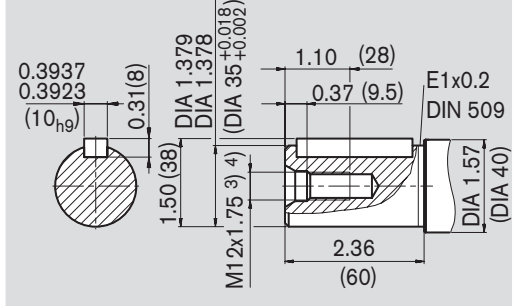
S Splined shaft 1 1/4 in 14T 12/24 DP ¹⁾
(SAE J744 – 32-4 (C))
 $p_N = 5100 \text{ psi (350 bar)}$



T Splined shaft 1 3/8 in 21T 16/32 DP ¹⁾
 $p_N = 5800 \text{ psi (400 bar)}$



B Parallel keyed shaft
DIN 6885 – AS10x8x50 (mm)
 $p_N = 5100 \text{ psi (350 bar)}$



Ports

B (A)	Service line port (high pressure series) Fastening threads B/A	SAE J518 ISO 68	3/4 in 3/8 in-16 UNC-2B;	0.82 (21) deep	– see safety instructions
S	Suction port (standard pressure series) Fastening threads S	SAE J518 ISO 68	1 in 3/8 in-16 UNC-2B;	0.79 (20) deep	– see safety instructions
T ₁ , T ₂	Case drain ports (T ₂ plugged)	ISO 11926	3/4 in-16 UNF-2B;	0.59 (15) deep	120 lb-ft (160 Nm) ⁴⁾
R	Air bleed, Oil drain (plugged)	ISO 11926	7/16 in-20 UNF-2B;	0.47 (12) deep	30 lb-ft (40 Nm) ⁴⁾

¹⁾ ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

²⁾ thread according to ISO 68

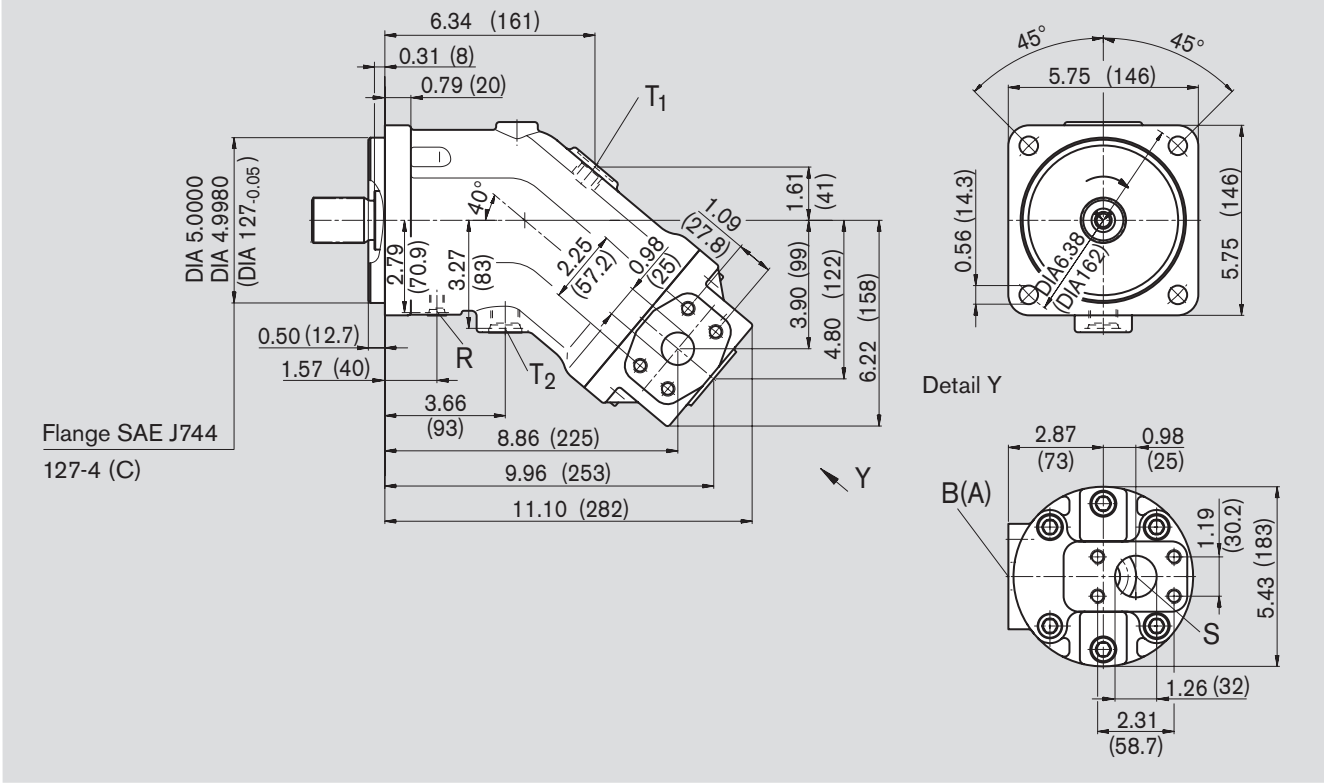
³⁾ centering bore according to DIN 332 (thread according to DIN 13)

⁴⁾ please observe the general notes for the max. tightening torques on page 28

Unit Dimensions, Sizes 80, 90 – SAE Design

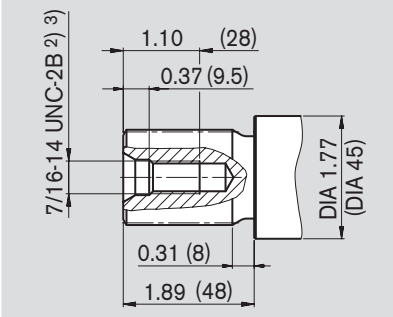
Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)

Clockwise rotation Counter-clockwise rotation: port plate is rotated through 180°

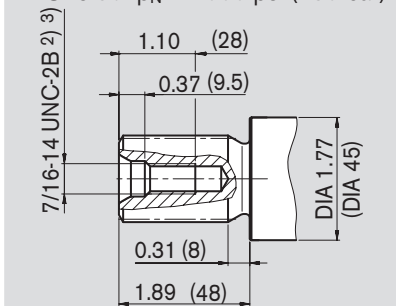


Shaft ends

U Splined shaft 1 3/8 in 21T 16/32 DP ¹⁾
p_N = 5800 psi (400 bar)



Q Splined shaft 1 1/4 in 14T 12/24 DP ¹⁾
(SAE J744 – 32-4 (C))
Size 80: p_N = 4350 psi (300 bar)
Size 90: p_N = 4000 psi (280 bar)



Ports

B (A)	Service line port (high pressure series) Fastening threads B/A	SAE J518 ISO 68	1 in 7/16 in-14 UNC-2B; 0.87 (22) deep	– see safety instructions
S	Suction port (standard pressure series) Fastening threads S	SAE J518 ISO 68	1 1/4 in 7/16 in-14 UNC-2B; 1.02 (26) deep	– see safety instructions
T ₁ , T ₂	Case drain ports (T ₂ plugged)	ISO 11926	7/8 in-14 UNF-2B; 0.67 (17) deep	180 lb-ft (240 Nm) ³⁾
R	Air bleed, Oil drain (plugged)	ISO 11926	7/16 in-20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ³⁾

¹⁾ ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

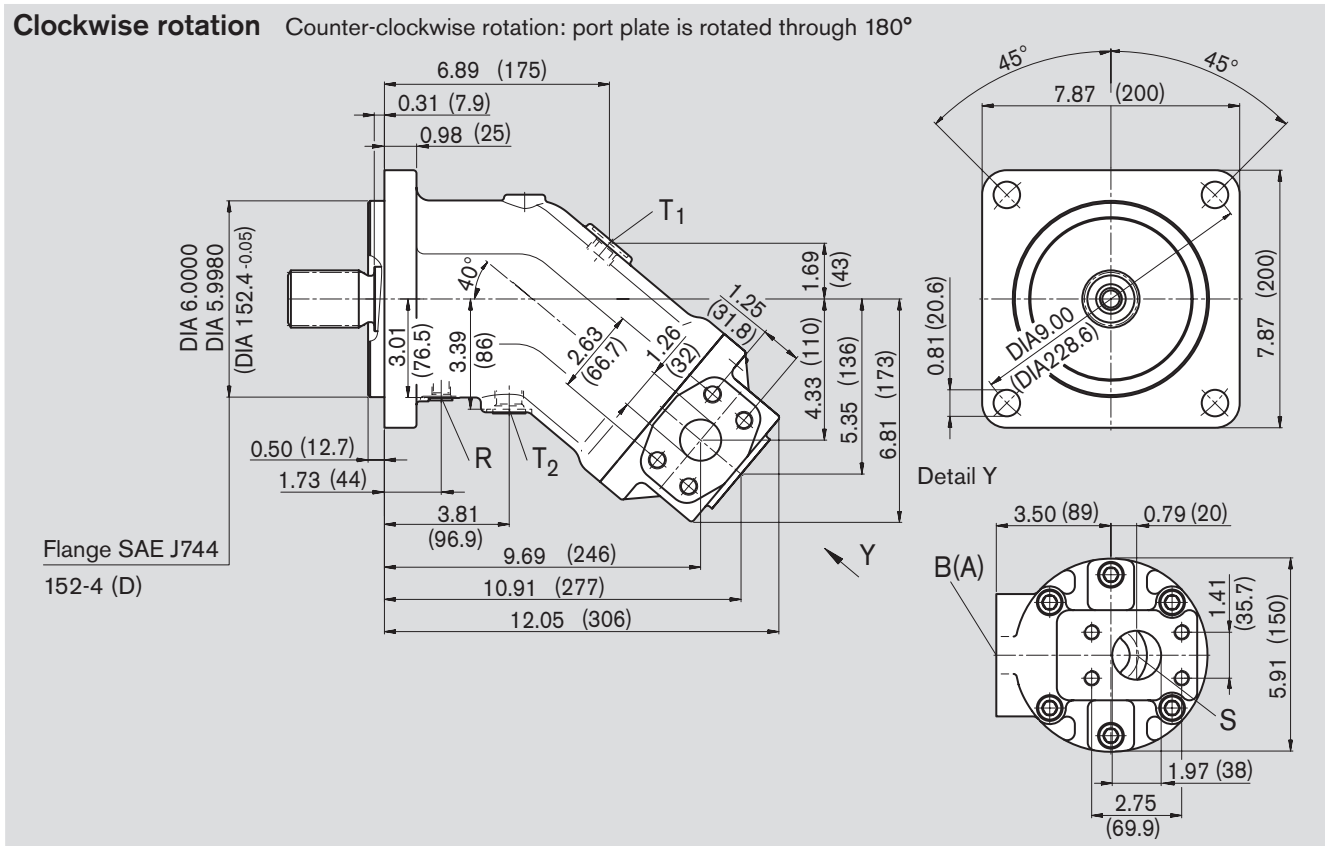
²⁾ thread according to ISO 68

³⁾ please observe the general notes for the max. tightening torques on page 28

Unit Dimensions, Sizes 107, 125 – SAE Design

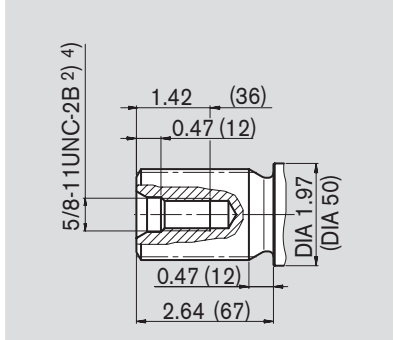
Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)

Clockwise rotation Counter-clockwise rotation: port plate is rotated through 180°

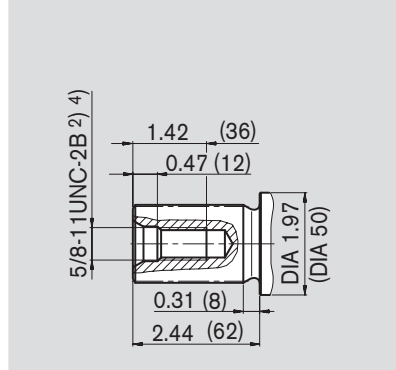


Shaft ends

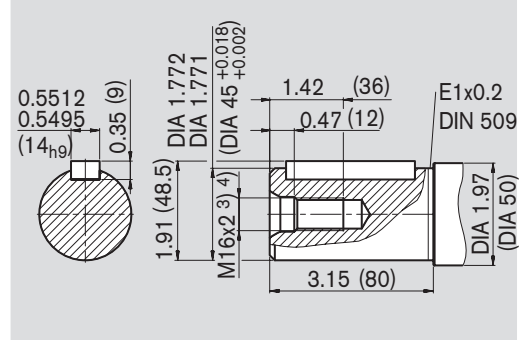
S Splined shaft 1 3/4 in 13T 8/16 DP ¹⁾
(SAE J744 – 44-4 (D))
 $p_N = 5800$ psi (400 bar)



U Splined shaft 1 1/2 in 23T 16/32 DP ¹⁾
 $p_N = 5800$ psi (400 bar)



B Parallel keyed shaft
DIN 6885 – AS14x9x63 (mm)
 $p_N = 5100$ psi (350 bar)



Ports

B (A)	Service line port (high pressure series) Fastening threads B/A	SAE J518 ISO 68	1 1/4 in 1/2 in -13 UNC-2B; 0.75 (19) deep	– see safety instructions
S	Suction port (standard pressure series) Fastening threads S	SAE J518 ISO 68	1 1/2 in 1/2 in -13 UNC-2B; 0.95 (24) deep	– see safety instructions
T ₁ , T ₂	Case drain ports (T ₂ plugged)	ISO 11926	7/8 in -14 UNF-2B; 0.67 (17) deep	180 lb-ft (240 Nm) ⁴⁾
R	Air bleed, Oil drain (plugged)	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ⁴⁾

¹⁾ ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

²⁾ thread according to ISO 68

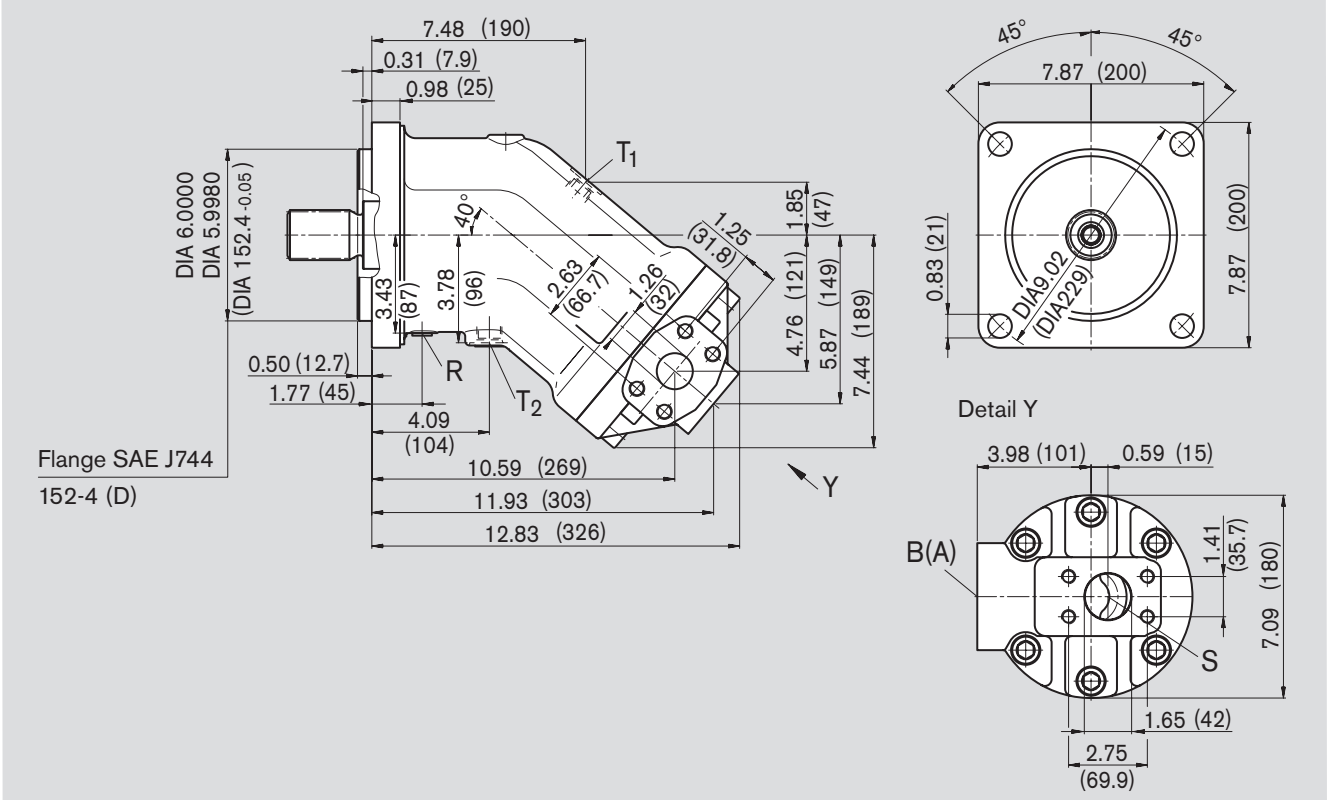
³⁾ centering bore according to DIN 332 (thread according to DIN 13)

⁴⁾ please observe the general notes for the max. tightening torques on page 28

Unit Dimensions, Sizes 160, 180 – SAE Design

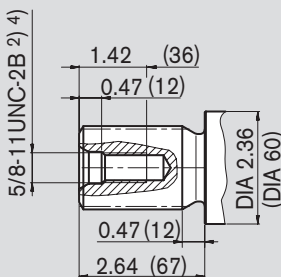
Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)

Clockwise rotation Counter-clockwise rotation: port plate is rotated through 180°

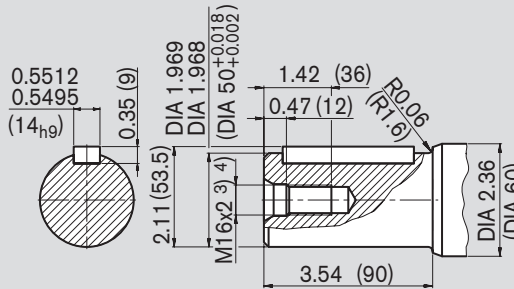


Shaft ends

S Splined shaft 1 3/4 in 13T 8/16 DP ¹⁾
(SAE J744 – 44-4 (D))
p_N = 5800 psi (400 bar)



B Parallel keyed shaft
DIN 6885 – AS14x9x70 (mm)
p_N = 5100 psi (350 bar)



Ports

B (A)	Service line port (high pressure series) Fastening threads B/A	SAE J518 ISO 68	1 1/4 in 1/2 in-13 UNC-2B;	0.75 (19) deep	– see safety instructions
S	Suction port (standard pressure series) Fastening threads S	SAE J518 ISO 68	1 1/2 in 1/2 in-13 UNC-2B;	0.95 (24) deep	– see safety instructions
T ₁ , T ₂	Case drain ports (T ₂ plugged)	ISO 11926	7/8 in-14 UNF-2B;	0.67 (17) deep	180 lb-ft (240 Nm) ⁴⁾
R	Air bleed, Oil drain (plugged)	ISO 11926	9/16 in-20 UNF-2B;	0.51 (13) deep	60 lb-ft (80 Nm) ⁴⁾

¹⁾ ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

²⁾ thread according to ISO 68

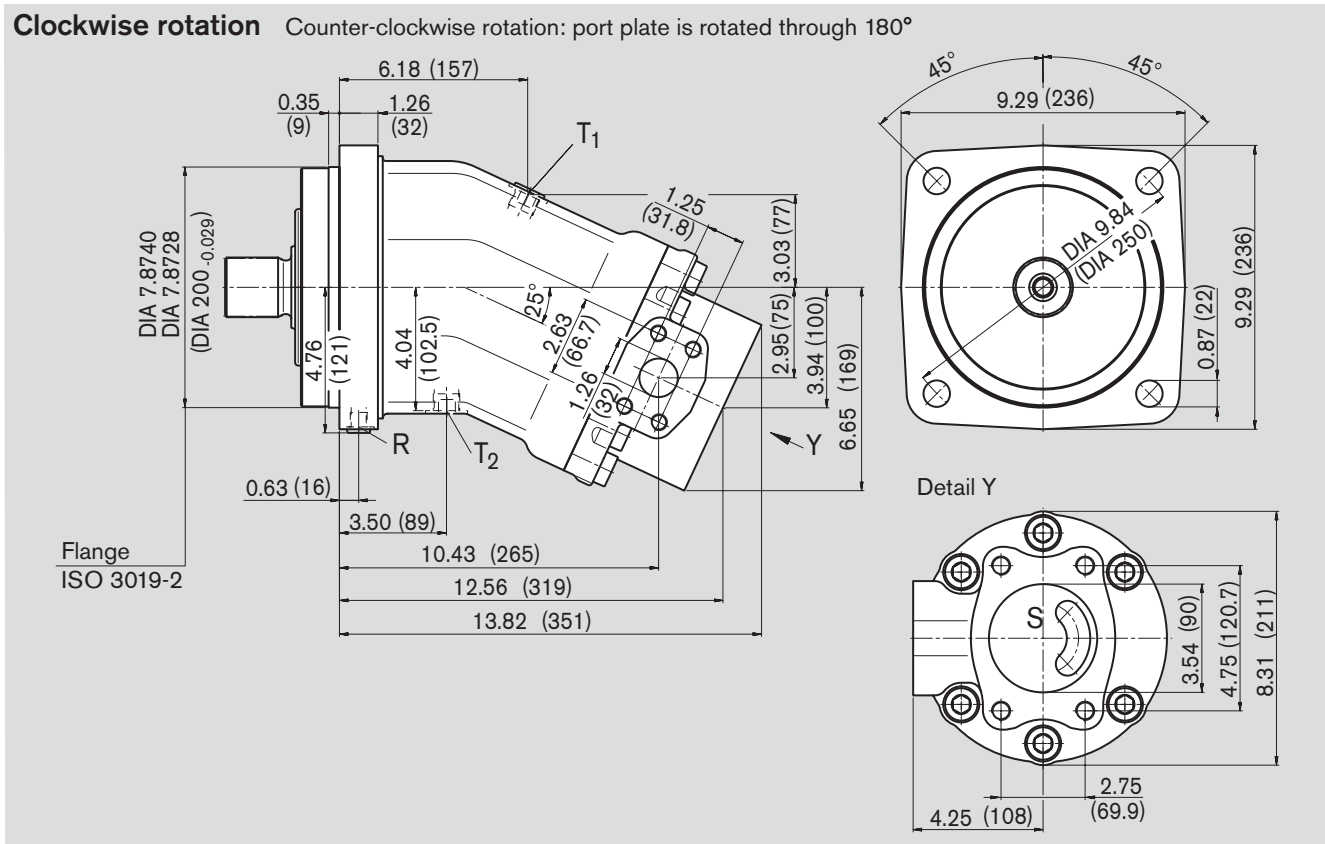
³⁾ centering bore according to DIN 332 (thread according to DIN 13)

⁴⁾ please observe the general notes for the max. tightening torques on page 28

Unit Dimensions, Size 200 – ISO Design

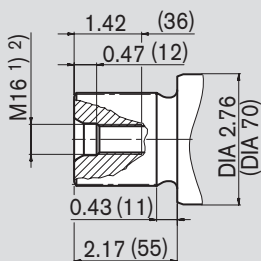
Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)

Clockwise rotation Counter-clockwise rotation: port plate is rotated through 180°

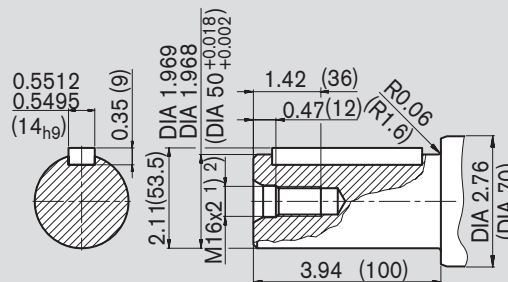


Shaft ends

A Splined shaft DIN 5480
W50x2x30x24x9g
 $p_N = 5800 \text{ psi (400 bar)}$



B Parallel keyed shaft
DIN 6885 – AS14x9x80 (mm)
 $p_N = 5100 \text{ psi (350 bar)}$



Ports

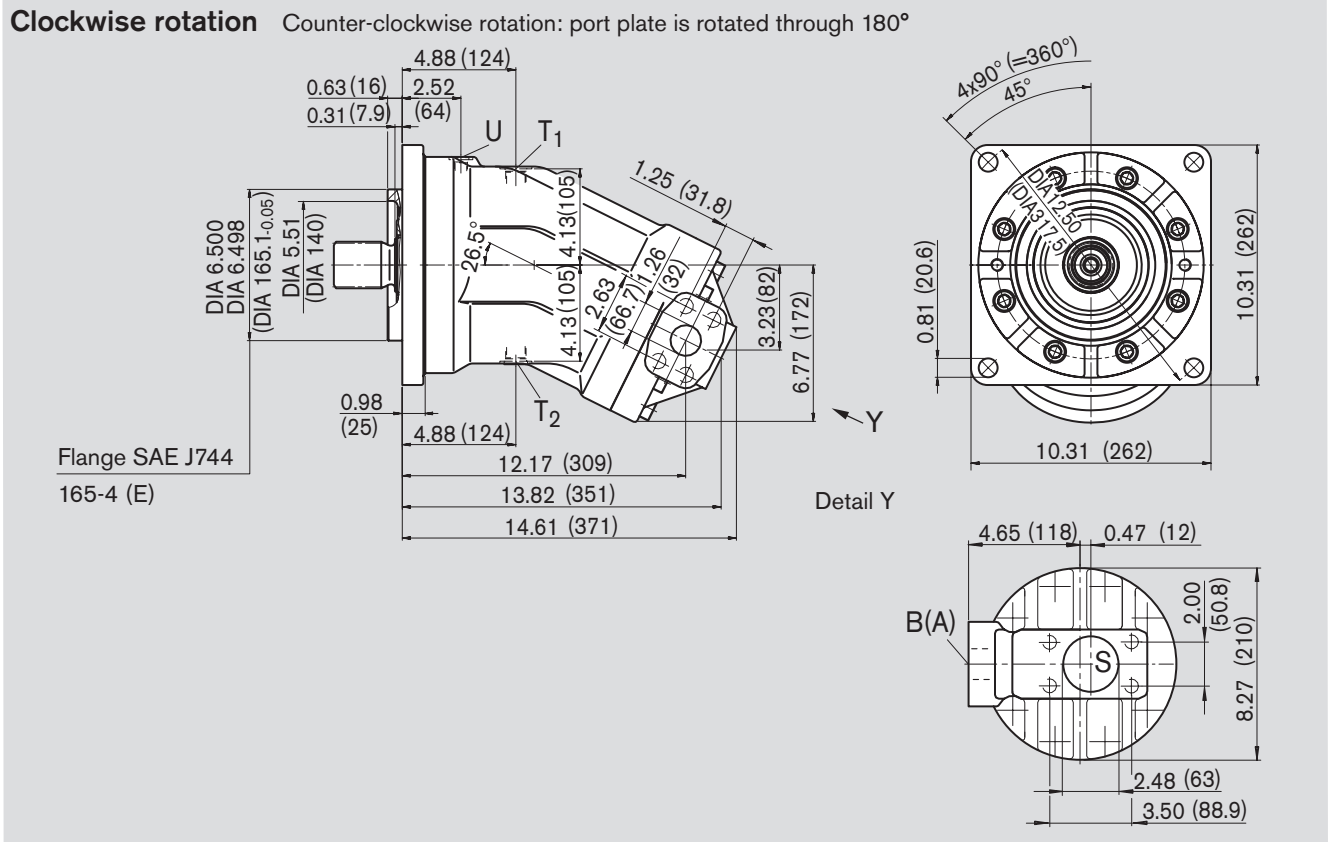
B (A)	Service line port (high pressure series) Fastening threads B/A	SAE J518 DIN13	1 1/4 in M14x2; 0.75 (19) deep	– see safety instructions
S	Suction port (standard pressure series) Fastening threads S	SAE J518 DIN13	3 1/2 in M16x2; 0.95 (24) deep	– see safety instructions
T ₁ , T ₂	Case drain ports (T ₁ plugged)	DIN 3852	M22x1.5; 0.55 (14) deep	155 lb-ft (210 Nm) ²⁾
R	Air bleed, Oil drain (plugged)	DIN 3852	M14x1.5; 0.47 (12) deep	60 lb-ft (80 Nm) ²⁾

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

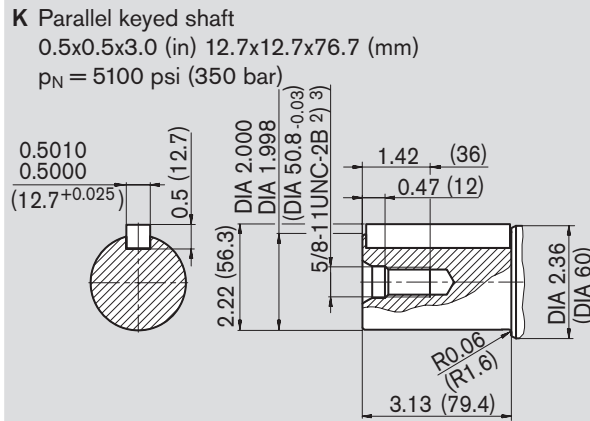
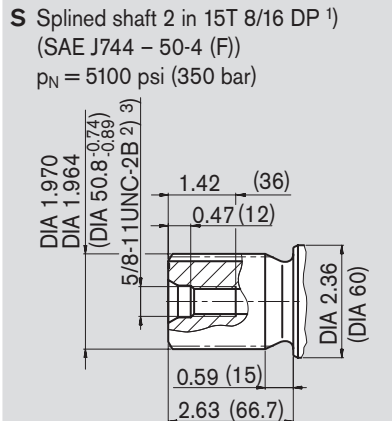
2) please observe the general notes for the max. tightening torques on page 28

Unit Dimensions, Size 250 – SAE Design

Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)



Shaft ends



Ports

Port	Description	SAE J518	ISO 68	ISO 11926	ISO 11926	Notes
B (A)	Service line port (high pressure series) Fastening threads B/A	1 1/4 in	1/2 in -13 UNC-2B; 0.79 (20) deep			– see safety instructions
S	Suction port (standard pressure series) Fastening threads S	2 1/2 in	1/2 in -13 UNC-2B; 0.79 (20) deep			– see safety instructions
T ₁ , T ₂	Case drain ports (T ₂ plugged)	7/8 in	7/8 in -14 UNF-2B; 0.67 (17) deep			180 lb-ft (240 Nm) ³⁾
U	Port for bearing flushing (plugged)	9/16 in	9/16 in -18 UNF-2B; 0.51 (13) deep			60 lb-ft (80 Nm) ³⁾

¹⁾ ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

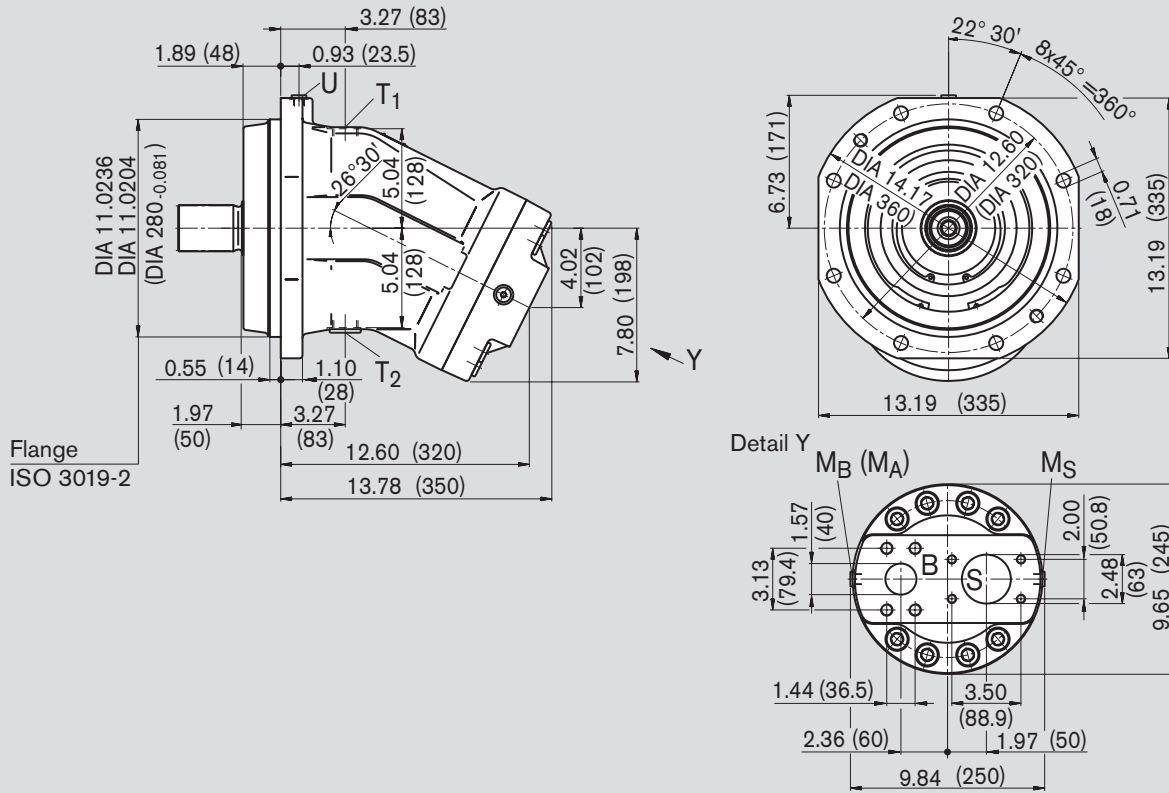
²⁾ thread according to ISO 68

³⁾ please observe the general notes for the max. tightening torques on page 28

Unit Dimensions, Size 355 – ISO Design

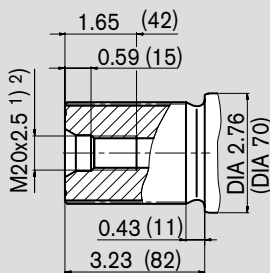
Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)

Clockwise rotation Counter-clockwise rotation: port plate is rotated through 180°

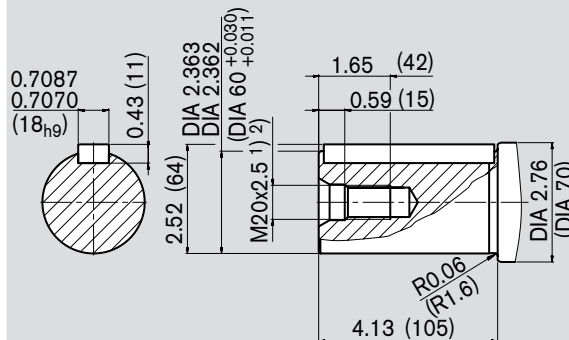


Shaft ends

Z Splined shaft DIN 5480
W60x2x30x28x9g
 $p_N = 5100 \text{ psi (350 bar)}$



P Parallel keyed shaft
DIN 6885 – AS18x11x100 (mm)
 $p_N = 5100 \text{ psi (350 bar)}$



Ports

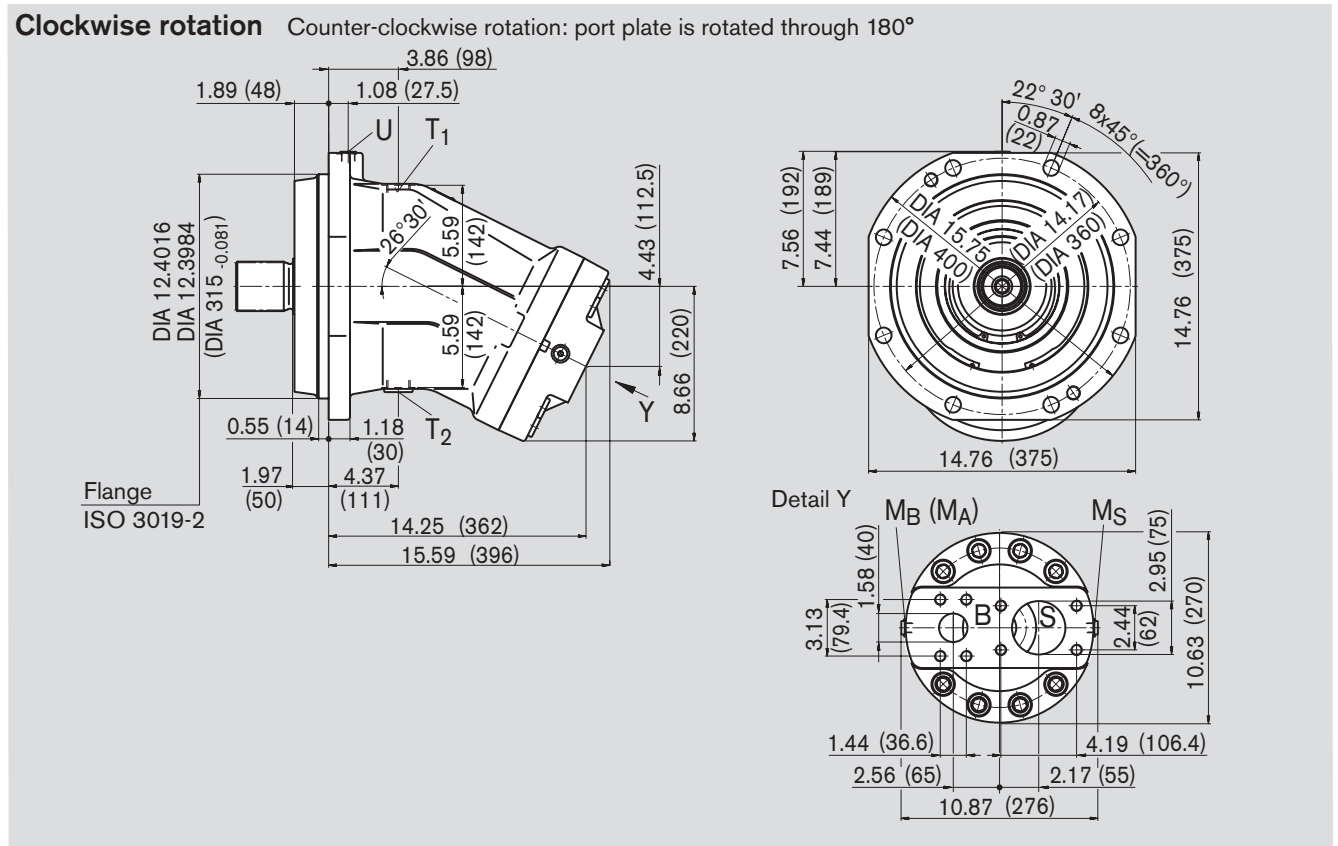
Port Label	Description	Standard	Size	Depth	Notes
B (A)	Service line port (high pressure series) Fastening threads B/A	SAE J518 DIN13	1 1/2 in M16x2;	0.83 (21) deep	– see safety instructions
S	Suction port (standard pressure series) Fastening threads S	SAE J518 DIN13	2 1/2 in M12x1.75;	0.67 (17) deep	– see safety instructions
T ₁ , T ₂	Case drain ports (T ₂ plugged)	DIN 3852	M33x2;	0.71 (18) deep	400 lb-ft (540 Nm) ²⁾
U	Port for bearing flushing (plugged)	DIN 3852	M14x1.5;	0.47 (12) deep	60 lb-ft (80 Nm) ²⁾
M _A , M _B	Measuring ports operating pressure A, B (plugged)	DIN 3852	M14x1.5;	0.47 (12) deep	60 lb-ft (80 Nm) ²⁾
M _S	Measuring port suction pressure (plugged)	DIN 3852	M14x1.5;	0.47 (12) deep	60 lb-ft (80 Nm) ²⁾

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

²⁾ please observe the general notes for the max. tightening torques on page 28

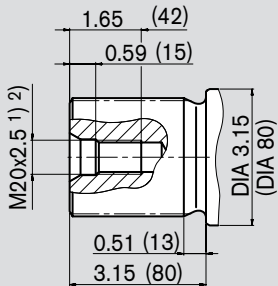
Unit Dimensions, Size 500 – ISO Design

Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)

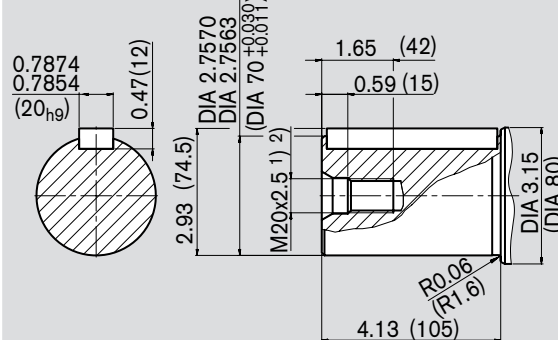


Shaft ends

Z Splined shaft DIN 5480
W70x3x30x22x9g
p_N = 5100 psi (350 bar)



P Parallel keyed shaft
DIN 6885 – AS20x12x100 (mm)
p_N = 5100 psi (350 bar)



Ports

B (A)	Service line port (high pressure series) Fastening threads B/A	SAE J518 DIN13	1 1/2 in M16x2;	0.95 (24) deep	– see safety instructions
S	Suction port (standard pressure series) Fastening threads S	SAE J518 DIN13	3 in M16x2;	0.95 (24) deep	– see safety instructions
T ₁ , T ₂	Case drain ports (T ₂ plugged)	DIN 3852	M33x2;	0.71 (18) deep	400 lb-ft (540 Nm) ²⁾
U	Port for bearing flushing (plugged)	DIN 3852	M18x1.5;	0.47 (12) deep	100 lb-ft (140 Nm) ²⁾
M _A , M _B	Measuring ports operating pressure A, B (plugged)	DIN 3852	M14x1.5;	0.47 (12) deep	60 lb-ft (80 Nm) ²⁾
M _S	Measuring port suction pressure (plugged)	DIN 3852	M14x1.5;	0.47 (12) deep	60 lb-ft (80 Nm) ²⁾

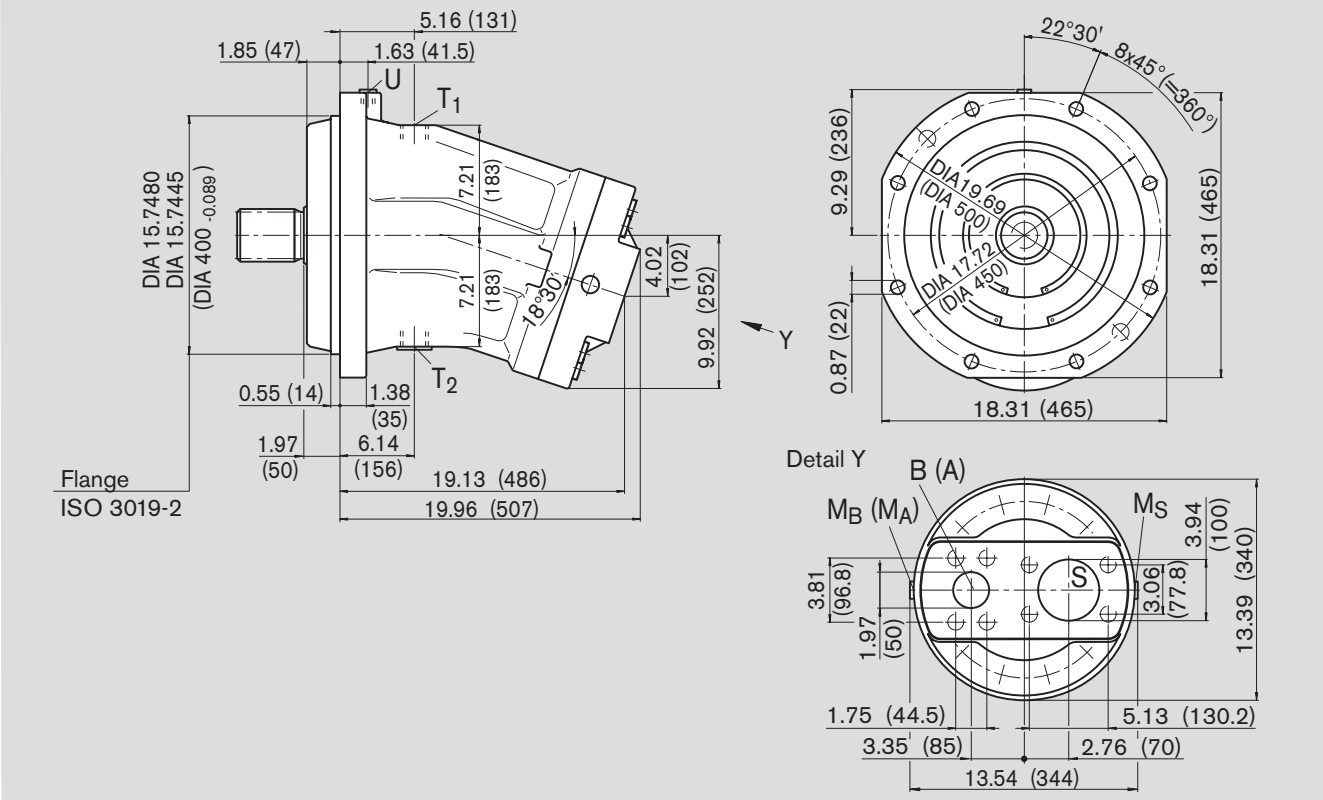
¹⁾ centering bore according to DIN 332 (thread according to DIN 13)

²⁾ please observe the general notes for the max. tightening torques on page 28

Unit Dimensions, Size 710 – ISO Design

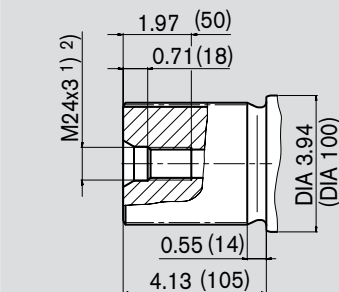
Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)

Clockwise rotation Counter-clockwise rotation: port plate is rotated through 180°

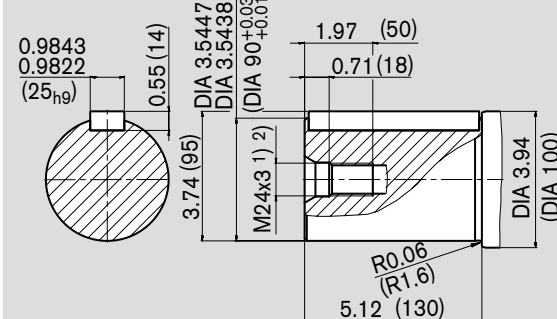


Shaft ends

Z Splined shaft DIN 5480
W90x3x30x28x9g
p_N = 5100 psi (350 bar)



P Parallel keyed shaft
DIN 6885 – AS25x14x125 (mm)
p_N = 5100 psi (350 bar)



Ports

Port	Description	Standard	Size	Depth	Notes
B (A)	Service line port (high pressure series) Fastening threads B/A	SAE J518 DIN13	2 in	M20x2.5; 1.18 (30) deep	– see safety instructions
S	Suction port (standard pressure series) Fastening threads S	SAE J518 DIN13	4 in	M16x2; 0.95 (24) deep	– see safety instructions
T ₁ , T ₂	Case drain ports (T ₂ plugged)	DIN 3852	M42x2;	0.79 (20) deep	530 lb-ft (720 Nm) ²⁾
U	Port for bearing flushing (plugged)	DIN 3852	M18x1.5;	0.47 (12) deep	100 lb-ft (140 Nm) ²⁾
M _A , M _B	Measuring ports operating pressure A, B (plugged)	DIN 3852	M14x1.5;	0.47 (12) deep	60 lb-ft (80 Nm) ²⁾
M _S	Measuring port suction pressure (plugged)	DIN 3852	M14x1.5;	0.47 (12) deep	60 lb-ft (80 Nm) ²⁾

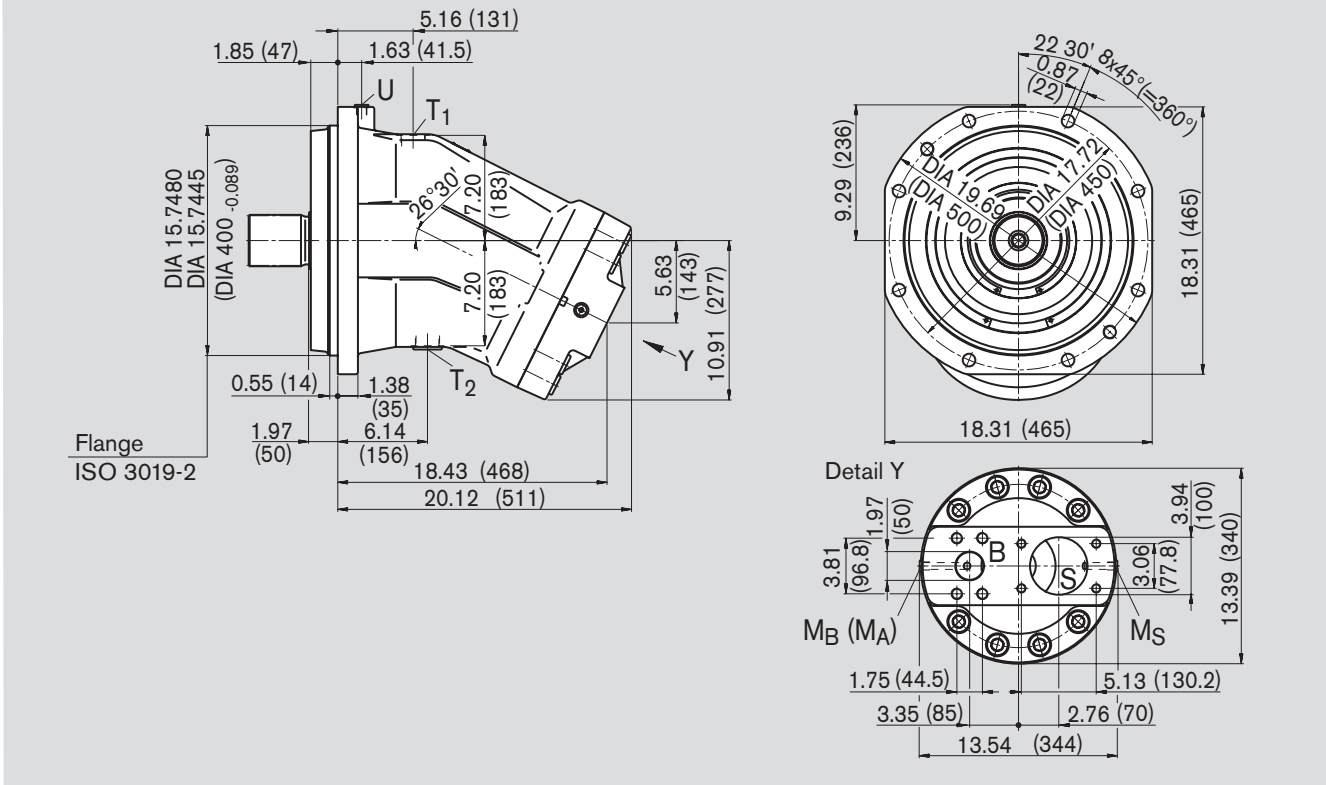
¹⁾ centering bore according to DIN 332 (thread according to DIN 13)

²⁾ please observe the general notes for the max. tightening torques on page 28

Unit Dimensions, Size 1000 – ISO Design

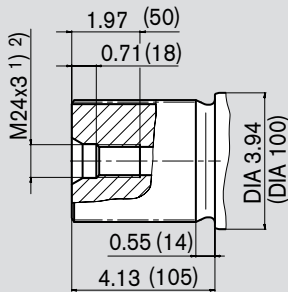
Please request a certified installation drawing before finalizing your design.
Dimensions in inches and (millimeters)

Clockwise rotation Counter-clockwise rotation: port plate is rotated through 180°

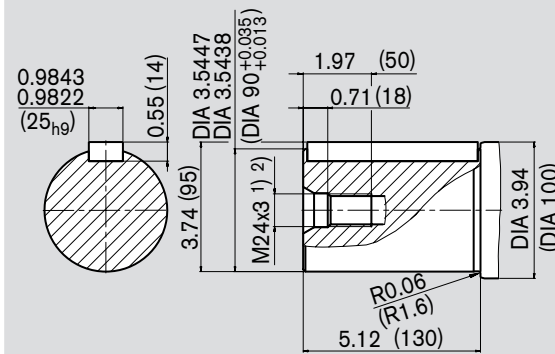


Shaft ends

Z Splined shaft DIN 5480
W90x3x30x28x9g
p_N = 5100 psi (350 bar)



P Parallel keyed shaft
DIN 6885 – AS25x14x125 (mm)
p_N = 5100 psi (350 bar)



Ports

B (A)	Service line port (high pressure series) Fastening threads B/A	SAE J518 DIN13	2 in M20x2.5; 1.18 (30) deep	– see safety instructions
S	Suction port (standard pressure series) Fastening threads S	SAE J518 DIN13	4 in M16x2; 0.95 (24) deep	– see safety instructions
T ₁ , T ₂	Case drain ports (T ₂ plugged)	DIN 3852	M42x2; 0.79 (20) deep	530 lb-ft (720 Nm) ²⁾
U	Port for bearing flushing (plugged)	DIN 3852	M18x1.5; 0.47 (12) deep	100 lb-ft (140 Nm) ²⁾
M _A , M _B	Measuring ports operating pressure A, B (plugged)	DIN 3852	M14x1.5; 0.47 (12) deep	60 lb-ft (80 Nm) ²⁾
M _S	Measuring port suction pressure (plugged)	DIN 3852	M14x1.5; 0.47 (12) deep	60 lb-ft (80 Nm) ²⁾

1) centering bore according to DIN 332 (thread according to DIN 13), tightening torque see safety instructions

2) please observe the general notes for the max. tightening torques on page 28

Installation and Commissioning Notes

General

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

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

The leakage fluid inside the case chamber must be drained off to the tank through the highest case drain port. The min. suction pressure at port S must not fall below 12 psi (0.8 bar) absolute (see page 5).

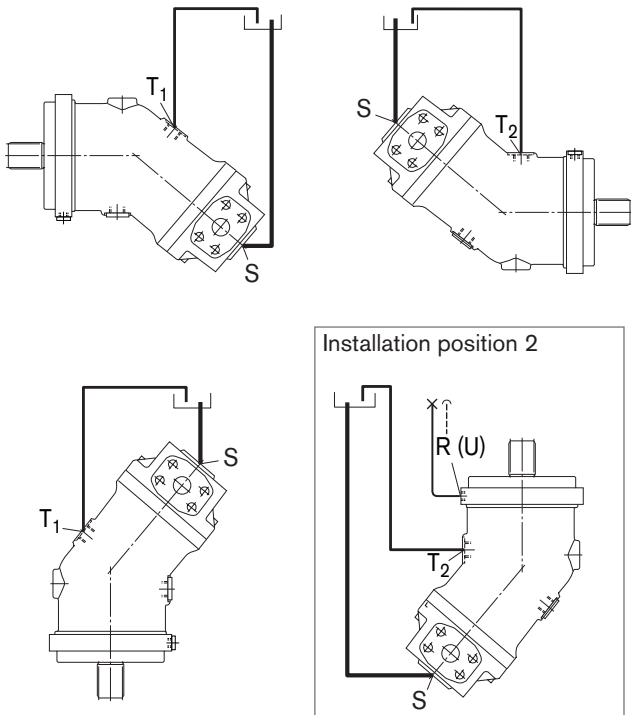
Installation position

Optional.

Installation below the tank

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

- Fill axial piston pump before startup via the highest case drain port
- Additional measures required for installation position 2 (shaft facing up): with installation position 2, make sure that the pump case is completely full before starting up. Bleed at port R (sizes 10...200) resp. U (sizes 250...1000). An air pocket in the bearing area can cause damage to the pump.
- Recommendation: Fill up suction lines
- Run the pump at low speed until the system is bled completely
- Minimum immersion depth of leakage line in tank: 7.9 in (200 mm) (relative to the min. fluid level in the tank)



Installation above the tank

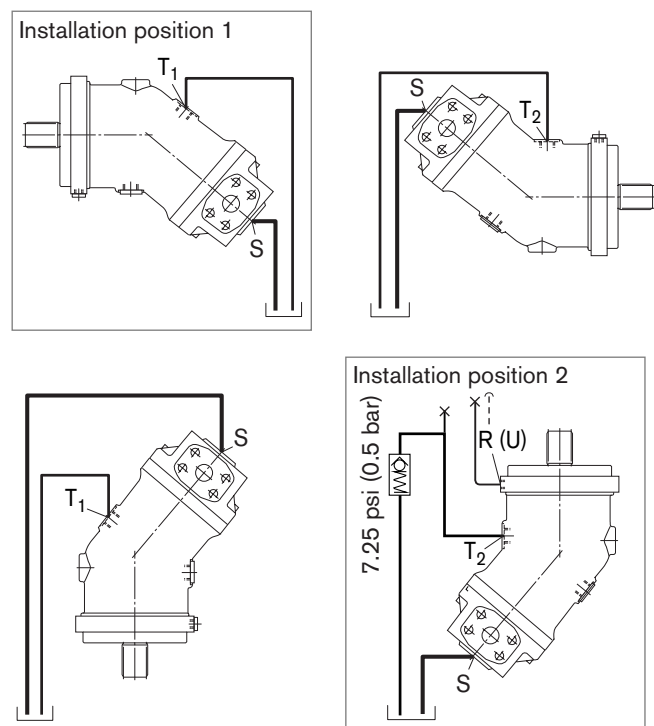
Pump above minimum fluid level in tank

- Proceed in same way as below the tank installation
- Additional measures for installation positions 1 and 2: If stopped for an extended period, fluid may drain out of the case chamber through the service lines (air enters through the shaft seal). The bearings will therefore not be properly lubricated when the pump is started up again. Fill the axial piston pump before restarting via the highest case drain port. Installation position 2: bleed at port R (sizes 10...200) resp. U (sizes 250...1000).

- Installation position 2 (shaft facing up)

In this installation position the bearings will not be properly lubricated, even if there is still some fluid in the case chamber. Putting a check valve (opening pressure 7.25 psi (0.5 bar)) in the leakage line can prevent the system emptying through the line.

- Note: min. admissible pressure at port S (min. suction pressure see page 5 and 8)



Notes

Notes

Notes

General Notes

- The AA2FO pump is designed to be used in open circuits.
- Project planning, assembly, and startup of the pump require the involvement of trained personnel.
- The working and functional ports are only designed to accommodate hydraulic piping.
- Suction lines may need to be sized bigger than the suction port provided, depending on operation conditions, as required by good design practices. A smooth transition is to be provided in these installation conditions.
- Tightening torques
 - The tightening torques specified in this data sheet are maximum values and may not be exceeded (maximum value for screw thread). Manufacturer specifications for the max. permissible tightening torques of the used fittings must be observed!
 - For ISO 68 / DIN 13 fastening screws we recommend checking the tightening torque individually according to VDI 2230 Edition 2003.
- The housing temperature rises during and shortly after operation. Take suitable safety precautions (e.g. wear protective clothing).
- The data and information contained herein must be adhered to.