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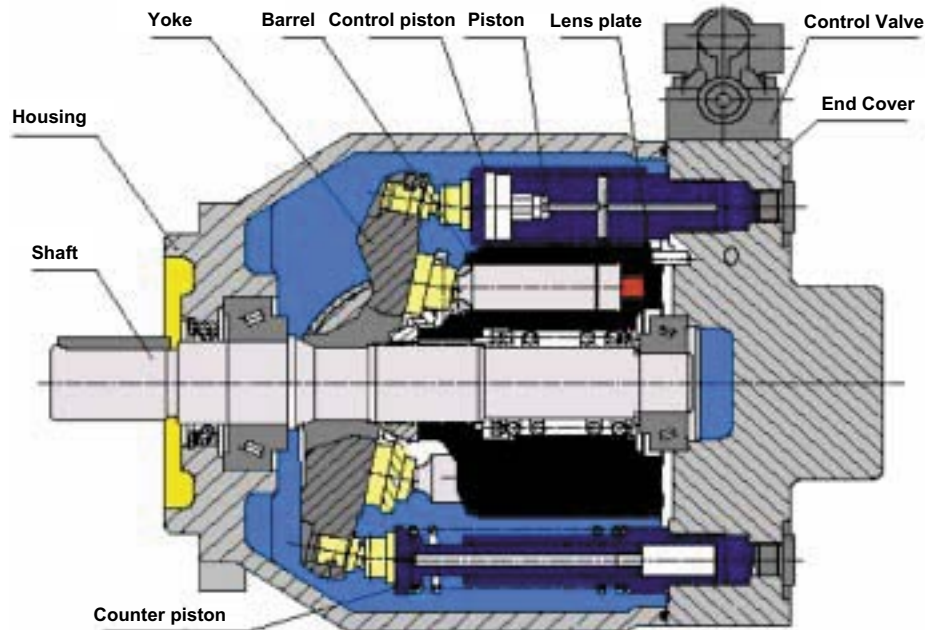
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OVERVIEW

STM A10V Series Open Loop Pump

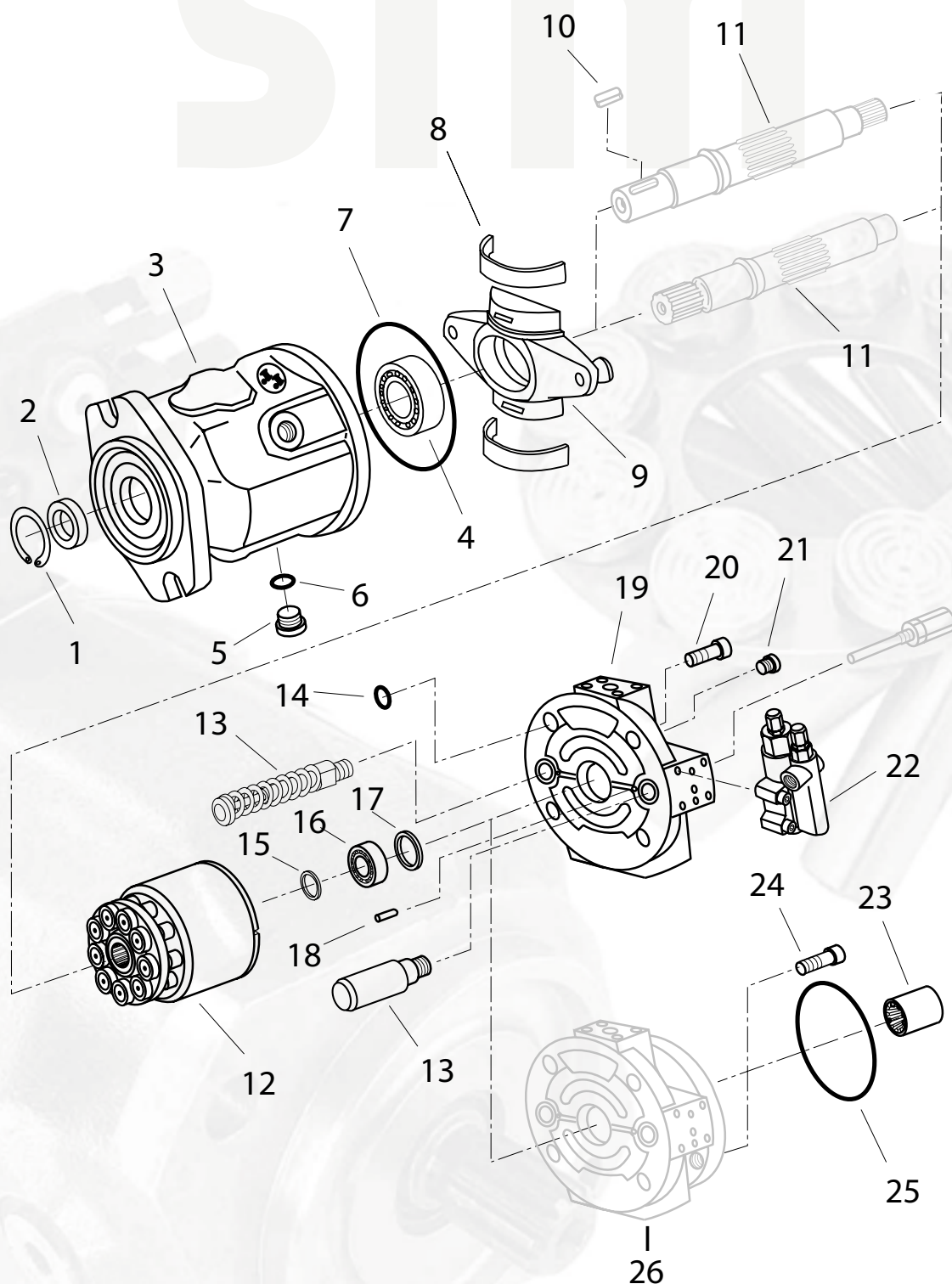


Characteristics

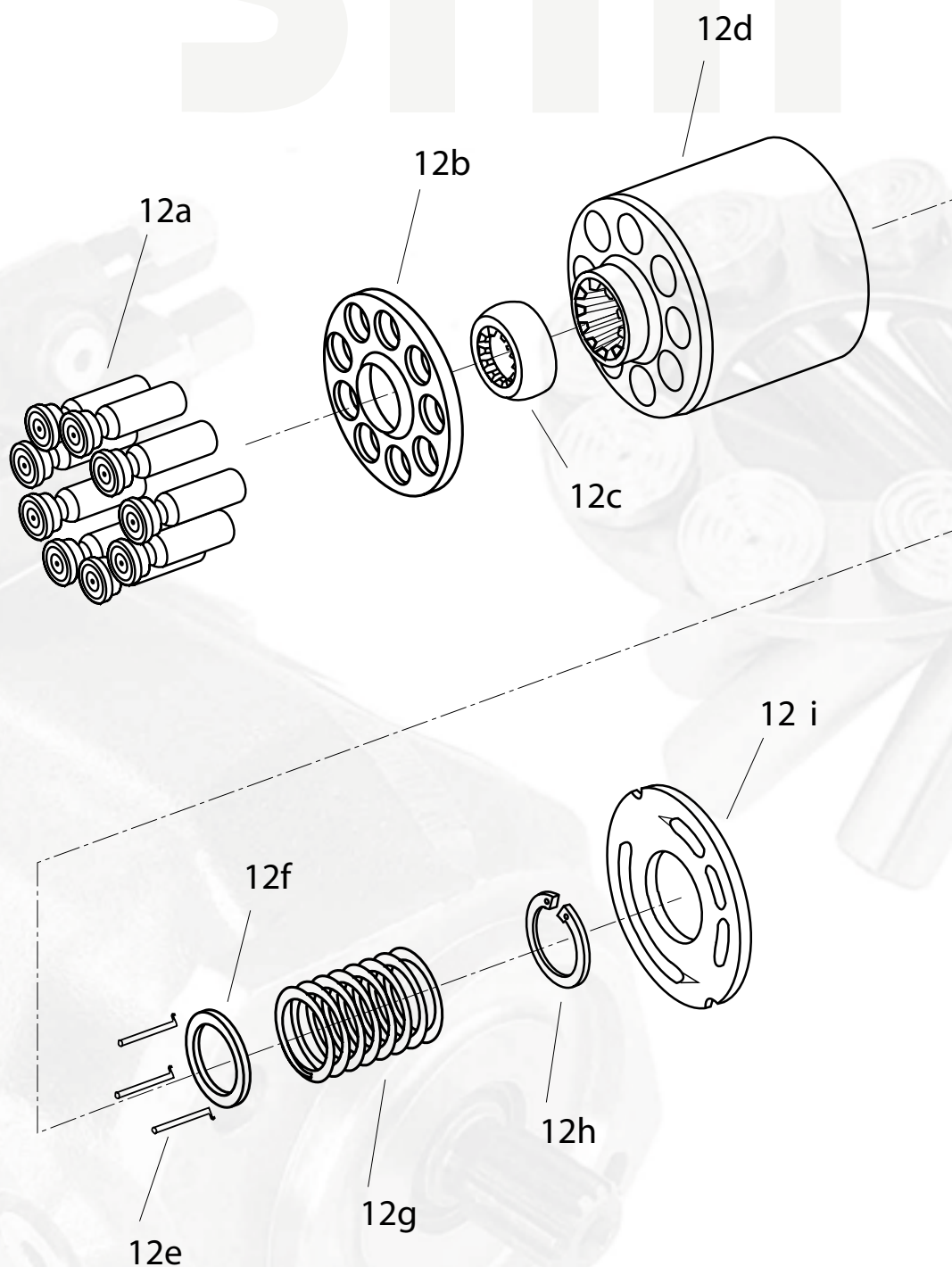
- * Axial piston pump, swash plate design
 - * Size 28 , 45 , 71 , and 100 cm³ (single pump)
 - * Compact design
- Optimized for:
- | | |
|---------------------|------------------------|
| * good self priming | * short response times |
| * high reliability | * low noise emission |
| * high durability | * high efficiency |
- * S.A.E. two bolt mounting
 - * S.A.E. rear flange for through drive (optional)
 - * Axial and radial load on input shaft possible
 - * Different types of tandem configuration (optional)

The Medium Duty Pumps STM A10V are self priming pumps which are equipped with a load- sensing control (DFR)

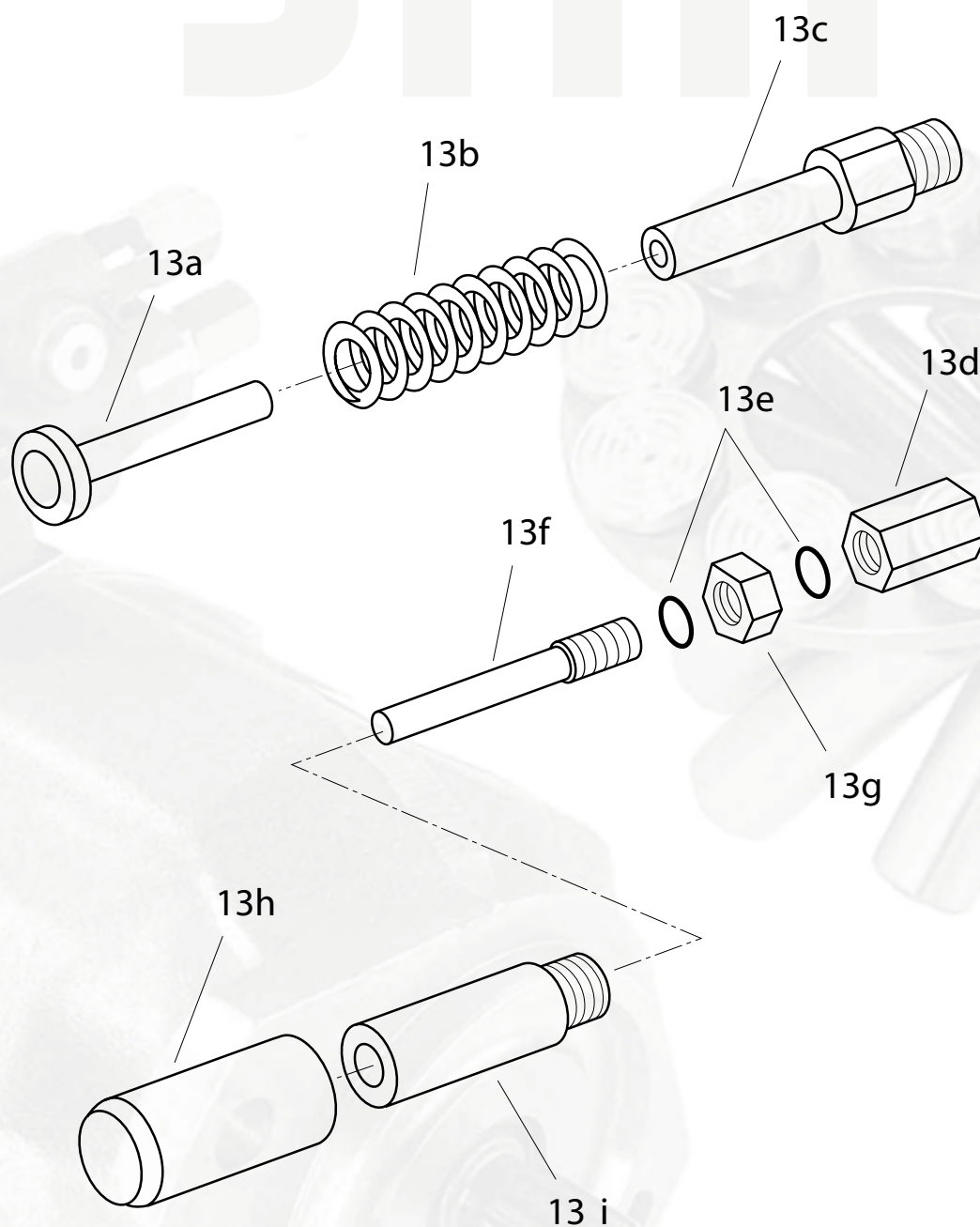
STM A10VSO*** 31 Pump Assembly



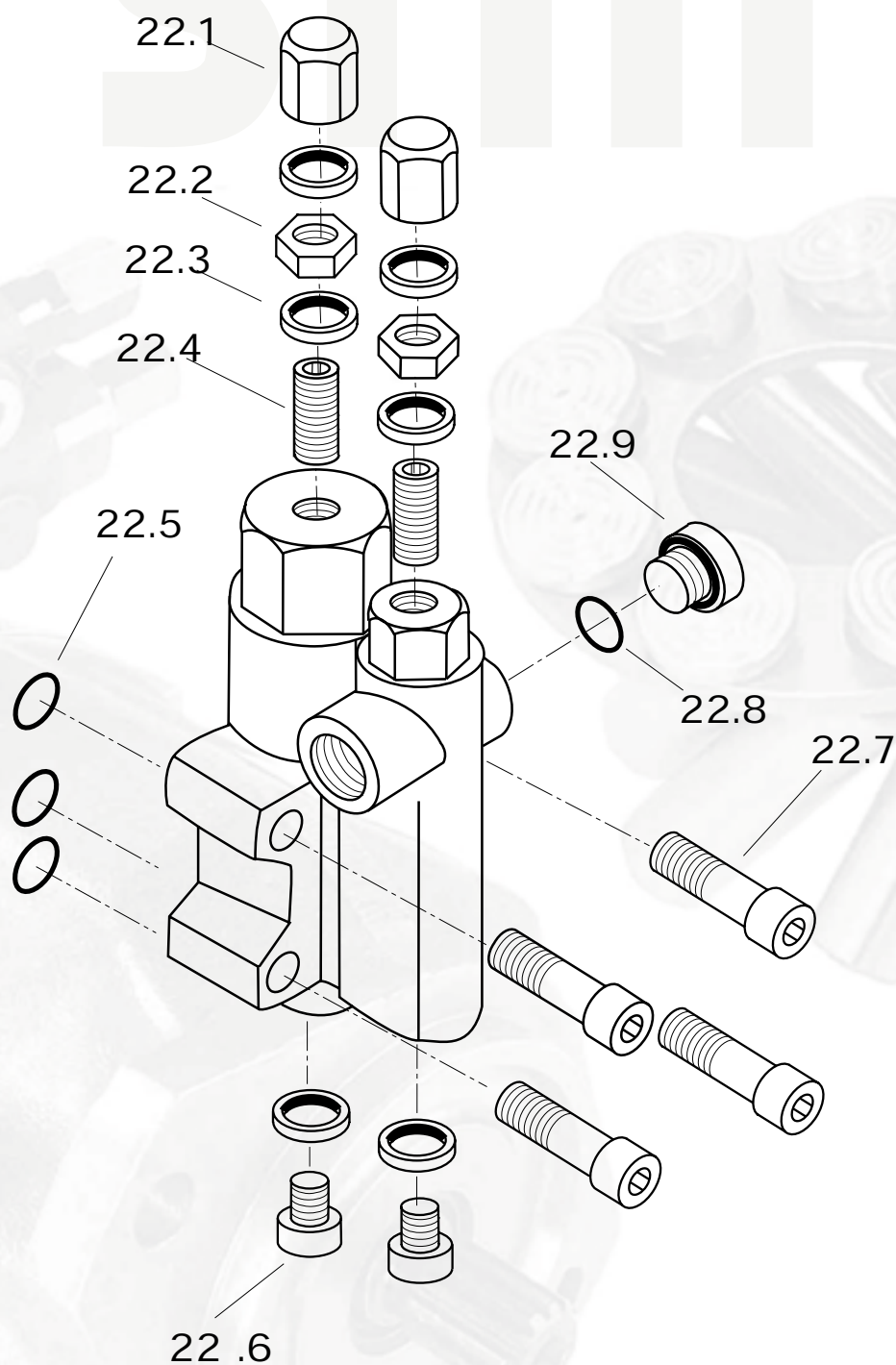
STM A10V Rotating Group



STM A10VSO Control Piston Assembly



STM A10VSO Control Piston Assembly



PARTS LISTING

piston parts

	DESCRIPTION	STM A10VSO28/31	STM A10VSO45/31	STM A10VSO45/52	STM A10VSO71/31	STM A10VSO100/31
1	Shaft seal retainer	791407	776939	776939	941918	941919
2	Shaft seal	794325	793671	793671	764701	113174
3	Main body housing	915773	915778		915775	906803
4	Input shaft bearing	70109-001	70109-004	70109-004	70109-007	906908
5	Case drain plug	76107-008	76107-010		76107-010	932795
6	Case drain plug seal	68105-908	68105-910		68105-910	
7	Main body housing "O"ring seal	68111-041	68111-035		68111-033	906911
8	Yoke bearings (2 req.)	902778	900198	933793	902777	906881
9	YOKE L/H	960999	947791	929316	904689	906886
9	YOKE R/H	960813	947790	928665	903881	961050
10	Shaft key (SAE)	751138	749265	749265	749273	935395
11a	SHAFT KEYED (K)	926330	923308	947788	926333	948600
11b	SHAFT KEYED METRIC (P)	947819	947820	947820	947821	948599
11c	SHAFT SPLINED 14Tooth (S)	N/A	N/A	N/A	947796	987698
11d	THROUGH DRIVE SHAFT SPLINED 14Tooth (R)	N/A	N/A	N/A	923471	993523
11e	SHAFT SPLINED (15T)	947780	923309	947729	N/A	N/A
11f	SHAFT SPLINED 13Tooth	923789	926325	987649	N/A	N/A
11g	THROUGH DRIVE SHAFT SPLINED 13Tooth	926327	926326	N/A	N/A	N/A
11h	SHAFT SPLINED (CAT) 15T EXTRA LONG (C)	N/A	N/A	N/A	6E6163	N/A
11i	THROUGH DRIVE SHAFT keyed	926328	926335	N/A	987670	924552
11j	THROUGH DRIVE SHAFT SPLINED (15T)	N/A	923743	N/A	N/A	N/A
11k	THROUGH DRIVE SHAFT keyed METRIC		925275			
12	ROTATING GROUP R/H	947781	947730	947730	947801	906871
12	ROTATING GROUP L/H	947782	947789	947789	947802	907681
12a	PISTON (9 REQ.)	925459	2400814	925460	924554	925463
12b	RETAINER PLATE	942514	978872	943627	941714	978875
12c	RETAINER BALL	944743	914318	914318	939847	944744
12d	BARREL	907125	907001	907001	907126	O2407207
12e	BARREL PRESSURE PIN (3 REQ.)	785407	941277	941277	785423	906879
12f	BARREL RETAINING RING (thrust ring)	918933	939056	939056	919038	906880
12g	BARREL SPRING	924891	O71772	71072	720178	906894
12h	BARREL RETAINING CLIP	939048	912520	912520	720186	791555
12i	LENS PLATE R/H	936648	936645	936645	936641	936661
12i	LENS PLATE L/H	936647	936644	936644	936640	936639
13	Control piston assembly	911164	910850		910870	913748
13a	Counter piston	908999	909054		908935	906705
13b	Spring	799041	790079	928606	790052	906703
13c	Counter piston guide	737283	737291		737305	906704
13d	Acorn nut	904041	903349		903389	903327
13e	"O"ring seal (2 req)	68101-013	68104-015		68104-016	827916
13f	Adjusting screw	904676	904626		904681	906702
13g	Jam nut	904042	903390		903387	
13h	Control piston	910645	910596		910642	913788
13i	Control piston guide	911166	910981		911035	933707
14	Port block seal "O"ring (4 req.)	68111-040	68111-013		68112-001	919497
15	Input shaft adjusting shim	as req.	as reg.	as reg.	as req.	as reg.

PARTS LISTING

	DESCRIPTION	STM A10VSO28/31	STM A10VSO45/31	STM A10VSO45/52	STM A10VSO71/31	STM A10VSO100/31
16	Rear port cover bearing	70109-002	70109-005	704954	70109-008	906909
17	Bearing spacer (washer)	744158	743879	743879	744131	
18	6 x 18mm Dowel pin	69116-004	69116-004	707481	69116-004	707481
19a	Rear port block 61N00 L/H	5120-542-008	5130-542-001		5140-542-016	919367
19b	Rear port block 62N00 L/H	5120-542-001	5130-542-004		5140-542-014	906801
19c	Rear port block 61N00 R/H	5120-542-007	5130-542-005		5140-542-015	
19d	Rear port block 62N00 R/H	5120-542-004	5130-542-008		5140-542-013	906800
20	Body bolt (4 req.)	60119-110	60119-038	110248	60119-160	389714
21	Rear port cover plug	76116-004	76116-004		76123-002	76116-004
22a	CONTROL VALVE (DFR)	907094	907094	907094	907094	907094
22b	CONTROL VALVE (DRG)	907093	907093	907093	907093	907093
22c	CONTROL VALVE (DR)	907095	907095	907095	907095	907095
22d	CONTROL VALVE (DFR1)	907096	907096	907096	907096	907096
22e	CONTROL VALVE (DFLR) kit	K361218	K361218	N/A	K361218	K361218
22.1	Acorn nut (2 req.)	913805	913805	913805	913805	913805
22.2	Jam nut (2 req.)	913806	913806	913806	913806	913806
22.3	Seal ring (6 req.)	114774	114774	114774	114774	114774
22.4	Adjusting screw (2 req.)	913807	913807	913807	913807	913807
22.5	Seal "O"ring (3 req.) 90D PRP 011	68104-011	68104-011	68104-011	68104-011	68104-011
22.6	Plug (2 req.)	76118-009	76118-009	76118-009	76118-009	76118-009
22.7	Screws (4 req.) M6 x 30 DIN 912-10.9	60119-058	60119-058	60119-058	60119-058	60119-058
22.8	Seal "O"ring 90D PRP-904	68105-904	68105-904	68105-904	68105-904	68105-904
22.9	Plug (7/16 -20) C/W seal	76107-004	76107-004	76107-004	76107-004	76107-004
23a	Secondary pump drive coupling K01	943539	943529	N/A	943545	943560
23b	Secondary pump drive coupling K02	943542	943531	N/A	943547	943562
23c	Secondary pump drive coupling K03	764981	763764	N/A	795682	N/A
23d	Secondary pump drive coupling K04	N/A	738476	N/A	943548	943563
23e	Secondary pump drive coupling K05	N/A	766933	N/A	764906	943566
23f	Secondary pump drive coupling K07	N/A	N/A	N/A	943549	943564
23g	Secondary pump drive coupling K08	N/A	N/A	N/A	766895	943569
23h	Secondary pump drive coupling K01	N/A	N/A	N/A	N/A	943560
23i	Secondary pump drive coupling K52	N/A	N/A	N/A	N/A	943561
24	Secondary pump mounting bolts	as req.	as req.	N/A	as req.	as req.
25a	Secondary pump mounting seal Oring K01	68111-042	68111-042	N/A	68111-042	68111-042
25b	Secondary pump mounting seal Oring K02,K03,K04	68111-208	68111-208	N/A	68111-208	68111-208
25c	Secondary pump mounting seal Oring K07,K08	N/A	N/A	N/A	68111-212	68111-212
26a	Rear port block 62KO1 L/H	5120-542-002	5130-542-002	N/A	5140-542-018	910729
26b	Rear port block through drive 62KO2 ,K03,k04 L/H	5120-542-003	5130-542-003	N/A	5140-542-020	910730
26c	Rear port block through drive 62KO7 ,K08 L/H	N/A	N/A	N/A	5140-542-022	910728
26d	Rear port block 62KO1 R/H	5120-542-005	5130-542-006	N/A	5140-542-017	910375
26e	Rear port block through drive 62KO2 ,K03,K04 R/H	5120-542-006	5130-542-007	N/A	5140-542-019	910369
26f	Rear port block through drive 62KO7 ,K08 , R/H	N/A	N/A	N/A	5140-542-021	910371
	A10V seal kit for single pumps	915845	925885	963478	915846	915847
	Shaft Shim Kit	28475	45475	45475	71475	100475

HYDRAULIC FLUID

Hydraulic fluid

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 range

Optimum viscosity (v_{opt}) 80...170 SUS (16...36 mm²/s)
referred to tank temperature (open loop circuit).

Limits of viscosity range

The following values are valid for extreme operating conditions:

$v_{min} = 60$ SUS (10 mm²/s)

for short periods at max. leakage oil temperature of
195°F (90°C)

$v_{max} = 4600$ SUS (1000 mm²/s)

for short periods upon cold start.

Temperature Range (see selection diagram)

$t_{min} = -13^{\circ}\text{F}$ (-25°C)

$t_{max} = +195^{\circ}\text{F}$ ($+90^{\circ}\text{C}$)

Notes on hydraulic selection

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

The hydraulic fluid should be selected so that within the operating temperature range, the operating viscosity is within the optimum range (v_{opt}) (see shaded area of the selection diagram). We recommend that the higher viscosity grade is selected in each case.

Example: At an ambient temperature of X°F (°C), the operating temperature in the tank is 140°F (60°C). Within the 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 temperature is influenced by pressure and speed and is always higher than the tank temperature.

However, at no point in the system may the temperature exceed 195°F (90°C).

Filtration of fluid

In order to ensure correct functioning of the unit, a minimum level of cleanliness

to NAS 1638 class 9,

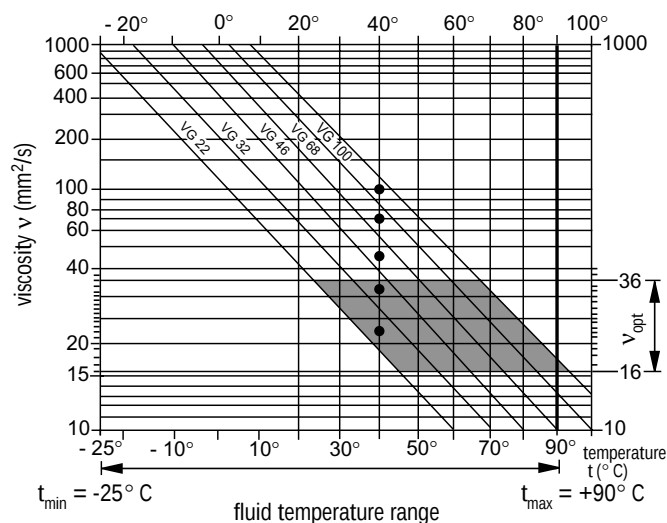
to SAE class 6 or

to ISO/DIS 4406 class 18/15 is required

This may be achieved with the correct filter elements

Hence the following degree of separation is produced

$$B_{20} \leq 100.$$



TECHNICAL DATA

Input operating pressure range

Absolute pressure at port S

P_{abs min} _____ 12 psi (0.8 bar)

P_{abs max} _____ 43,5 psi (30 bar)

Operating pressure range

Pressure at port B

Nominal pressure p_N _____ 4000 psi (280 bar)

Peak pressure p_{max} _____ 5100 psi (350 bar)

(Pressure data to DIN 24312)

Intermittent operating pressures up to 4600 psi (31,5 bar) are possible at 10% duty cycle.

Case drain pressure

Maximum pressure of leakage fluid (at port L, L₁):

Maximum 7 psi (0,5 bar) higher than input pressure at port S, but not higher than 30 psi (2 bar) absolute.

Direction of through flow

S to B.

Determination of inlet pressure p_{abs} at suction port S or reduction of displacement for increasing speed.

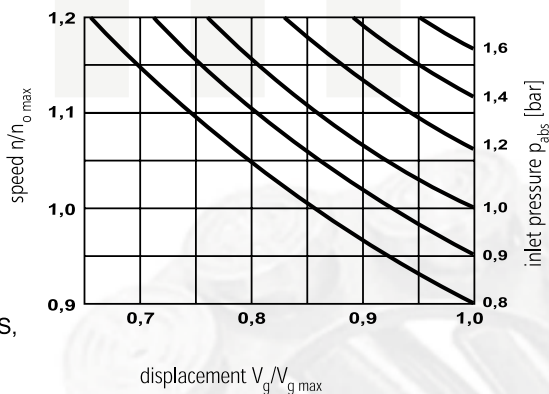


Table of values (theoretical values, without taking into account η_{mh} and η_v ; values rounded off)

Pump size		28	45	71	100
Displacement	cm ³ / rev.	28	45	71	100
	in ³ / rev.	1.71	2.75	4.33	6.1
Nominal pressure	bar	280	280	280	280
Peak pressure	bar	350	350	350	350
Max. speed (rpm)	rpm	3000	2600	2200	2000
Max. flow	L/min	81	113	152	194
	gpm	21.5	30	40	51
Max. power	KW	39	55	73	93
	hp	52	72	96	123
Max torque	lb-ft	91	146	230	324
	Nm	125	200	316	445
Moment of inertia at drive axis	lb-ft	0.04	0.078	0.197	0.396
	Kgm ²	0.0017	0.0033	0.0083	0.0167
Filling volume (case)	gal.	0.2	0.25	0.4	0.6
	L	0.7	1	1.6	2.2
Weight (without fluid)	lbs.	33	46	73	99
	kG	15	21	33	45
Permissible loading of shaft					
Max. axle force	lbf	225	340	540	900
	N	1000	1500	2400	4000
Max. radial force	lbf	540	810	1350	2250
	N	2400	3600	6000	10,000

Operating inlet pressure range

P_{abs min} .8 bar

P_{abs max} 30 bar

Operating outlet pressure range

normal 280 bar

peak 350 bar

Case drain pressure

2 bar max

Determination of displacement

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

$$\text{Torque } T = \frac{1,59 \cdot V_g \cdot \Delta p}{100 \cdot \eta_{mh}} = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}} \quad [\text{Nm}]$$

$$\text{Power } P = \frac{T \cdot n}{9549} = \frac{2 \pi \cdot T \cdot n}{60 \cdot 1000} = \frac{q_v \cdot \Delta p}{600 \cdot \eta_t} \quad [\text{kW}]$$

V_g = displacement [cm³] per revolution

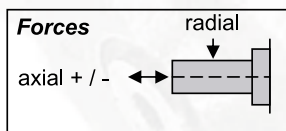
Δp = pressure differential [bar]

n = speed [rpm]

η_v = volumetric efficiency

η_{mh} = mechanical-hydraulic efficiency

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



1) These values are valid for an absolute pressure of 1 bar at the suction port S. By reducing the displacement or increasing the input pressure the speed can be increased as shown in the diagram.

2) Please consult us for higher radial forces.

INSTALLATION

Installation Information

Optional installation position. The pump housing must be filled with fluid during commissioning and remain full when operating. In order to attain the lowest noise level, all connections (suction, pressure, case drain ports) must be linked by flexible couplings to tank.

1. Vertical installation (shaft end upwards)

The following installation conditions must be taken into account:

1.1. Arrangement in the reservoir

Before installation fill pump housing, keeping it in a horizontal position.

- If the minimum fluid level is equal to or above the pump mounting face close port "L" plugged, leave ports "L₁" and "S" open; L₁ piped and recommendation S piped (see Fig. 1).
- If the minimum fluid level is below the pump mounting face pipe port "L₁" and "S" according to Fig. 2.

Close port "L" with respect taking into consideration conditions in 1.2.1.

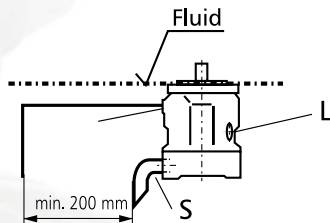


Fig. 1

1.2. Arrangement outside the reservoir

Before installation fill the pump housing, keeping it in a horizontal position. For mounting above reservoir see Fig. 2.

Limiting condition:

1.2.1. Minimum pump inlet pressure $p_{abs\ min} = 0.8$ bar under both static and dynamic conditions.

Note: Avoid mounting above reservoir wherever possible in order to achieve a low noise level.

The permissible suction height h comes from the overall pressure loss, but may not be bigger than $h_{max} = 800$ mm (immersion depth $h_{t\ min} = 200$ mm).

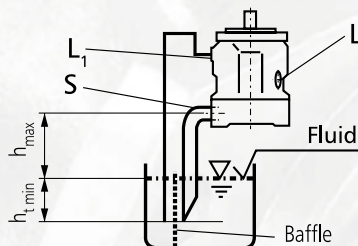


Fig. 2

Overall pressure loss $\Delta p_{tot} = \Delta p_1 + \Delta p_2 + \Delta p_3 \leq (1 - p_{abs\ min}) = 0.2$ bar

Δp_1 : Pressure loss in pipe due to accelerating column of fluid

$$\Delta p_1 = \frac{\rho \cdot l \cdot dv}{dt} \cdot 10^{-5} \text{ (bar)}$$

ρ = density (kg/m³)
 l = pipe length (m)
 dv/dt = rate of change in fluid velocity (m/s²)

Δp_2 : Pressure loss due to static head

$$\Delta p_2 = h \cdot \rho \cdot g \cdot 10^{-5} \text{ (bar)}$$

h = height (m)
 ρ = density (kg/m³)

Δp_3 : Line losses (elbows etc.)

$$g = \text{gravity} = 9.81 \text{ m/s}^2$$

2. Horizontal installation

The pump must be installed, so that "L" or "L₁" is at the top.

2.1. Arrangement in the reservoir

- If the minimum fluid level is above the top of the pump, port "L₁" closed, "L" and "S" should remain open, L piped and recommendation S piped (see Fig. 3)
- If the minimum fluid level is equal to or below the top of the pump, pipe ports "L" and possibly "S" as Fig. 4.; close port "L₁". The conditions according to item 1.2.1.

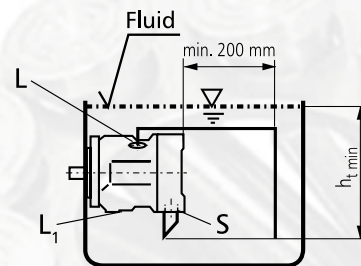


Fig. 3

2.2. Installation outside the reservoir

Fill the pump housing before commissioning.

Pipe ports "S" and the higher port "L" or "L₁".

- When mounting above the reservoir, see Fig. 4.

Conditions according to 1.2.1.

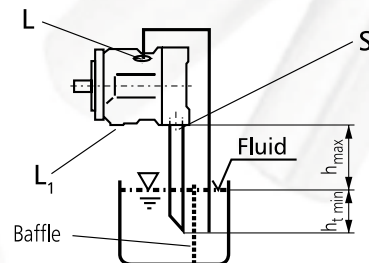


Fig. 4

- Mounting below the reservoir

Pipe ports "L₁" and "S" according to Fig. 5, close port "L".

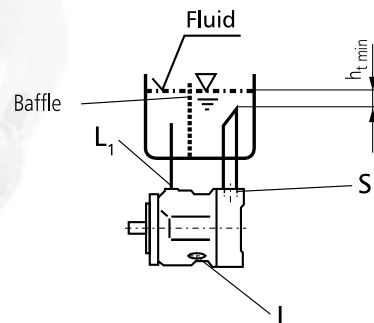


Fig. 5

OPERATING SPECIFICATIONS

Operating curves for pump with pressure control DR

Noise characteristic

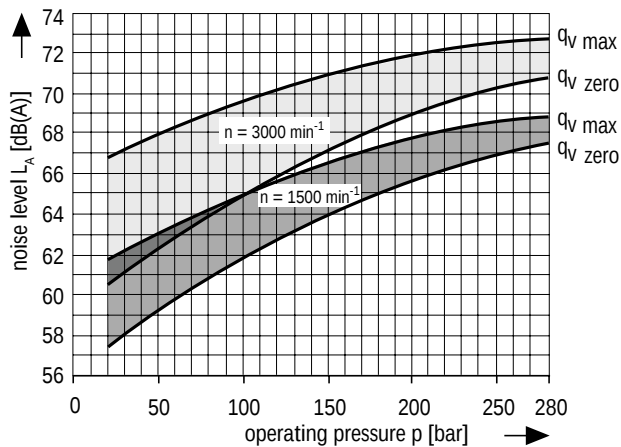
Measured in an anechoic chamber

Distance from microphone to pump = 3.3 ft (1m)

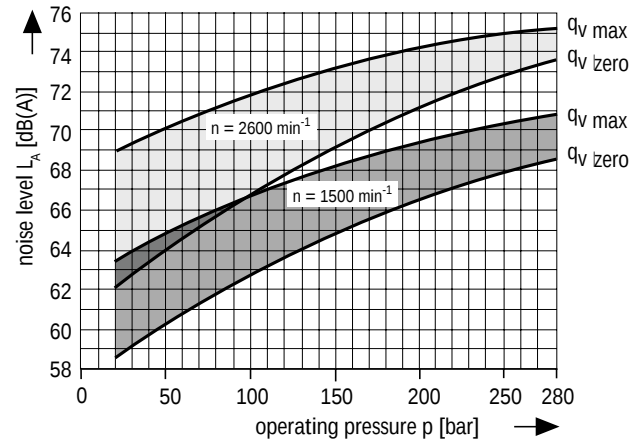
Measurement tolerance: ± 2 dB (A)

Fluid: hydraulic oil to ISO VG 46 DIN 51519, $t = 122^\circ \text{ F}$ (50° C)

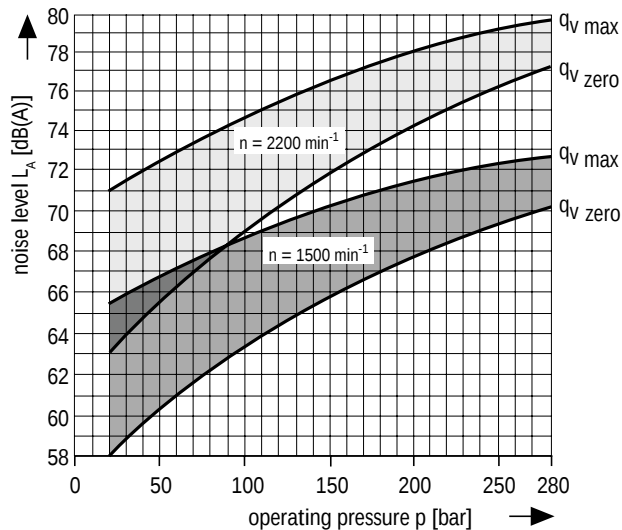
Size 28



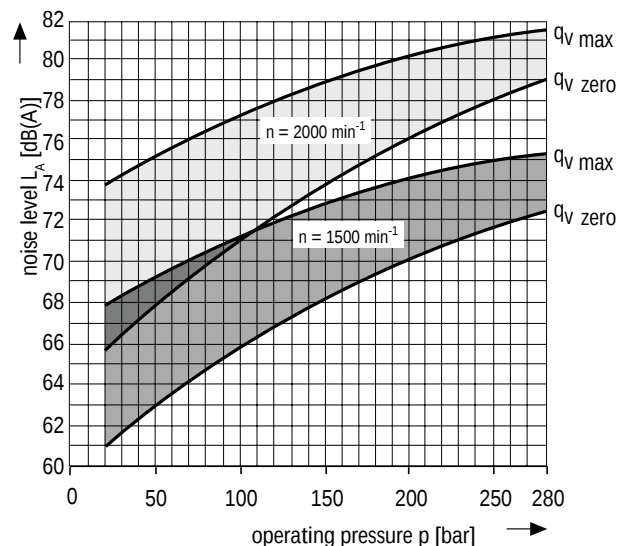
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Size 71



Size 100

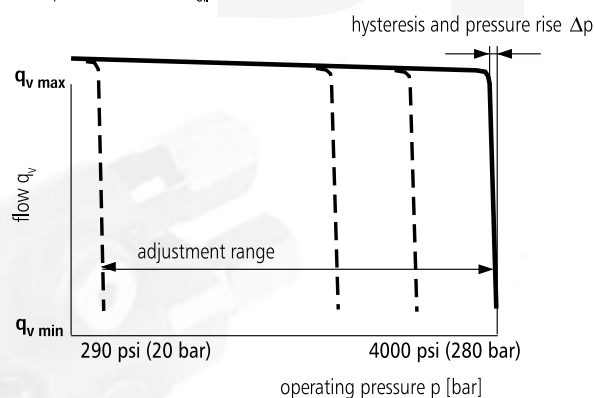


DR PRESSURE CONTROL

The pressure controller serves to maintain a constant pressure in a hydraulic system within the control range of the pump. The pump therefore supplies only the amount of hydraulic fluid required by the system. Pressure may be steplessly set at the control valve.

Static operating curve

(at $n_1 = 1500$ rpm; $t_{oil} = 122^\circ \text{ F } (50^\circ \text{ C})$)



Dynamic operating curves

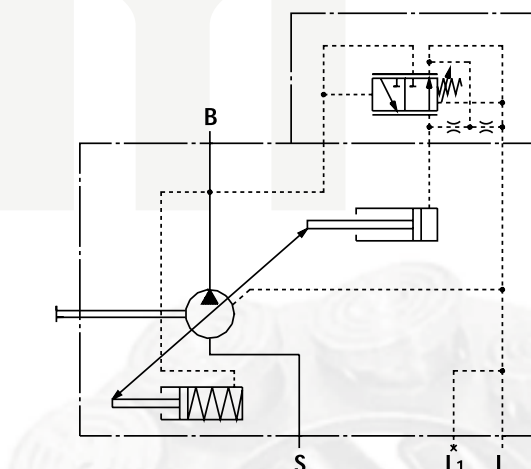
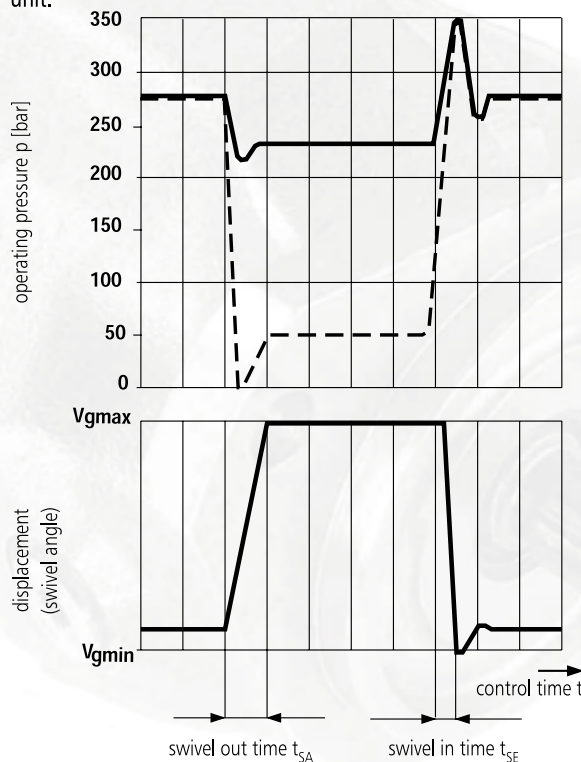
The curves show average measured values under test conditions, with the unit within the tank.

Conditions: $n = 1500$ rpm

$t_{oil} = 122^\circ \text{ F } (50^\circ \text{ C})$

Pressure cut-off at 5100 psi (350 bar)

Stepped loading by suddenly opening or closing the pressure line using a pressure relief valve set at 3.3 ft (1m) from the axial piston unit.



Ports

B Pressure port

S Suction port

L, L1 Case drain ports (L1 plugged)

Control data

Hysteresis and repetitive accuracy Δp _____ max. 45 psi (3 bar)

Max. Pressure rise

Size	28	45	71	100	140
Δp bar	4	6	8	10	12

Pilot oil requirement _____ max. approx 0.8 gpm (3 L/min)

Control times

Size	t_{SA} (ms) against 50 bar	t_{SA} (ms) against 220 bar	t_{SE} (ms) stalled at 280 bar
28	60	30	20
45	80	40	20
71	100	50	25
100	125	90	30
140	130	110	30

DRG Pressure control remotely controlled

Port connections

B	Pressure port
S	Suction port
L & L1	Case drain ports (L plugged)
X	Pilot pressure port

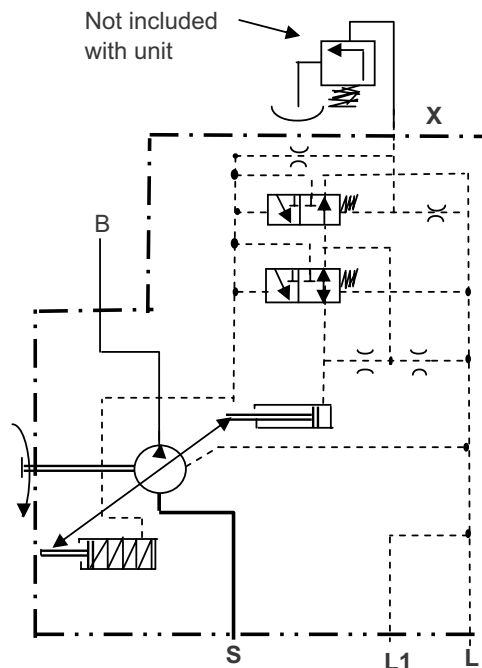
Control data

Hysteresis and repetition accuracy	max. .45psi (3 bar)
------------------------------------	-----------------------

Max pressure increase

size	28	45	71	100
Δp psi	60	90	115	145
bar	4	6	8	10

pilot oil consumption approx. 1.2 gpm (4.5 L/min)



DRG Pressure / flow control

In addition to the pressure control function, the pump flow maybe varied by means of a differential pressure at the actuator (orifice) In the DFR1 the X orifice is plugged

Port connections

B	Pressure port
S	Suction port
L & L1	Case drain ports (L plugged)
X	Pilot pressure port

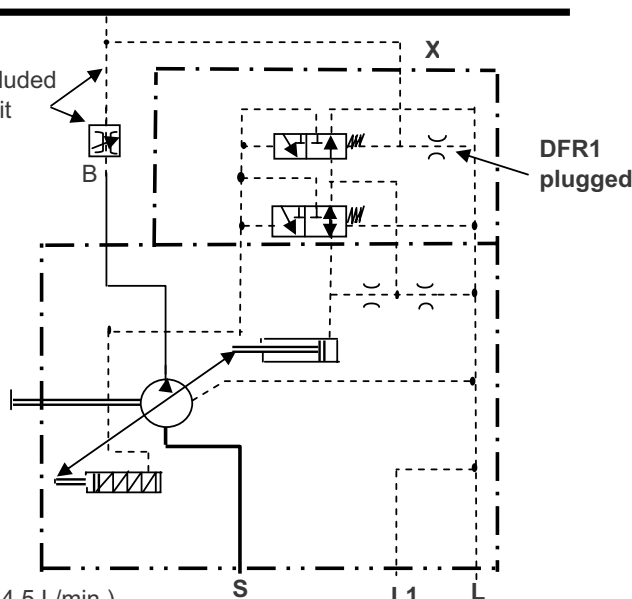
Control data

Max. flow deviation (Hysteresis and increase)
measured at drive speed n = 1500 rpm

size	28	45	71	100
$\Delta q_{\max}$ gpm	0.26	0.5	0.75	1
L/min	1	1.8	2.8	4

Pilot oil consumption DFR max approx. .08 --- 1.2 gpm (3--- 4.5 L/min)

Pilot oil consumption DFR1 max approx. .08 gpm (3 L/min)

Flow control-differential pressure Δp :

Variable between 145 and 320 psi (10 and 22 bar) Standard setting 200 psi (14 bar)

When X port is unloaded to tank a zero stroke pressure of approx 260 psi (plus or minus 30 psi results (stand by)

CONTROLLER OPTIONS

DFLR Pressure / Flow power control

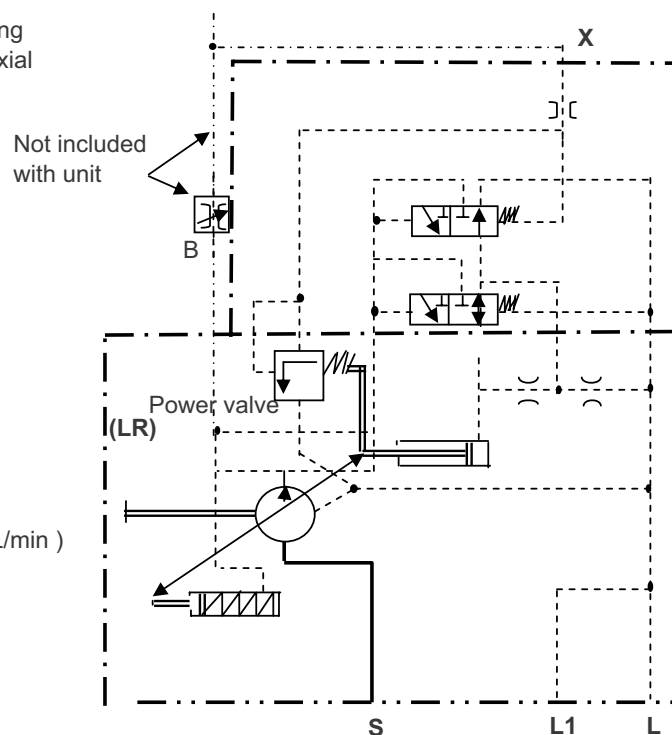
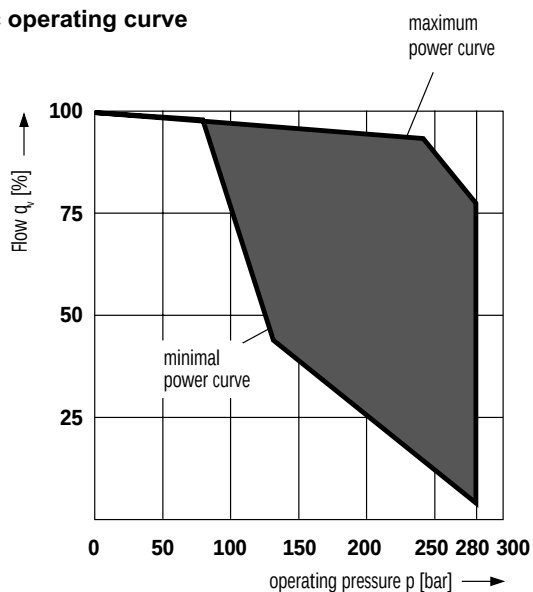
In order to achieve a constant drive torque with varying operating pressure, the swivel angle and with it the output flow from the axial piston unit is varied so that the flow and the pressure remains constant.

Port connections

B	Pressure port
S	Suction port
L & L1	Case drain ports (L plugged)
X	Pilot pressure port

Control start _____ from 1160 psi (80 bar)
Pilot oil consumption DFLR _____ max approx. 1.45 gpm (5.5 L/min)

Static operating curve



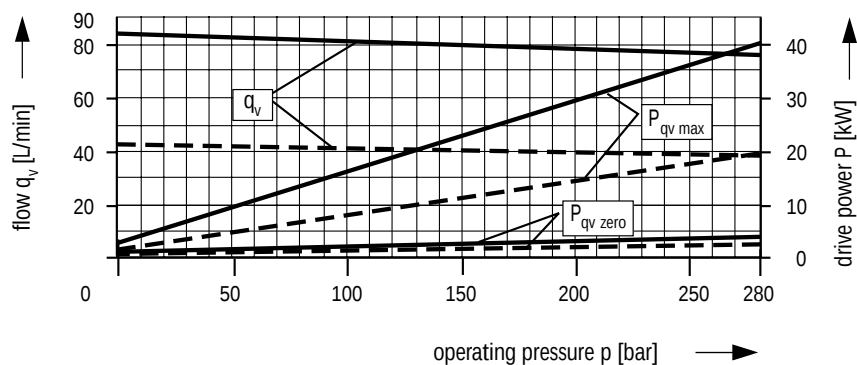
SPECIFICATION CHARTS

Drive Power and Output Flow

Fluid: hydraulic oil ISO VG 46 DIN 51519, $t = 122^{\circ}\text{F}$ (50°C)

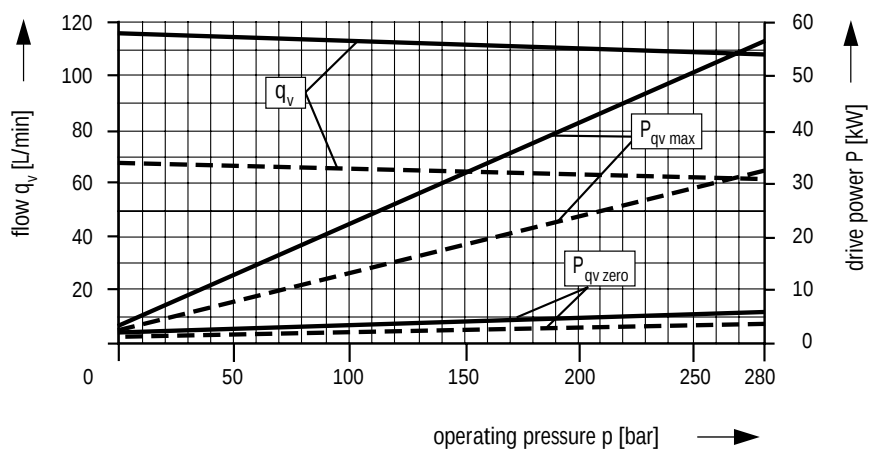
Size 28

----- $n = 1800$ rpm
 ----- $n = 3000$ rpm



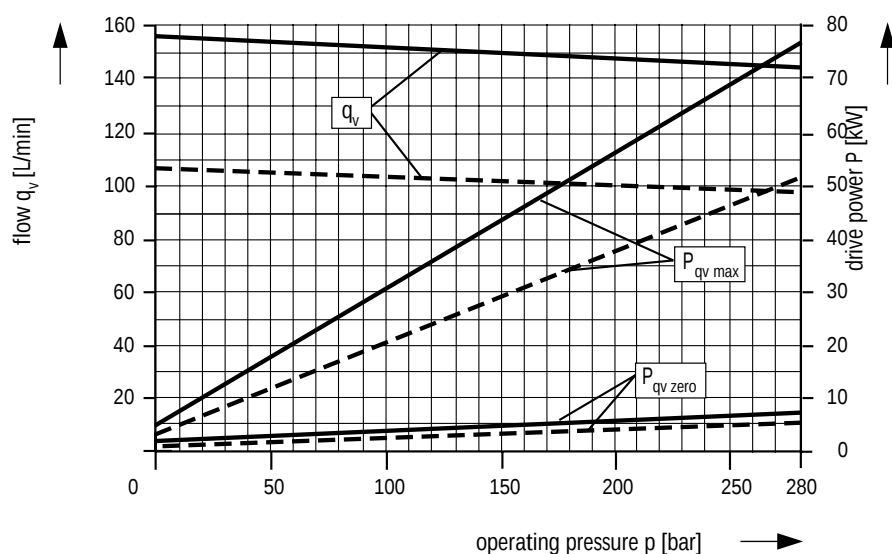
Size 45

----- $n = 1800$ rpm
 ----- $n = 2600$ rpm

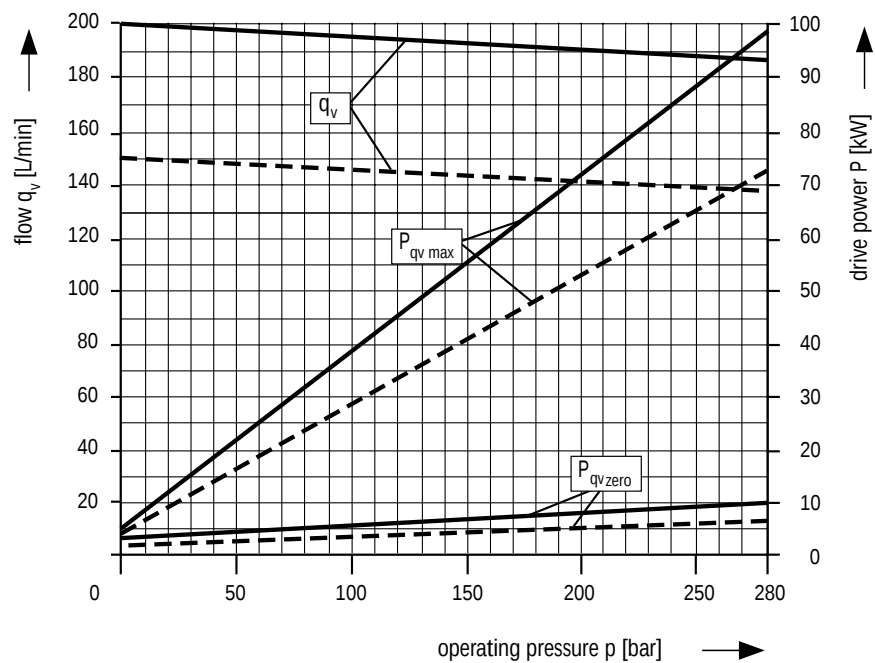


Size 71

----- $n = 1800$ rpm
 ----- $n = 2200$ rpm



SPECIFICATION CHARTS

Size 100----- $n = 1800$ rpm————— $n = 2000$ rpm

DIMENSIONAL INFO

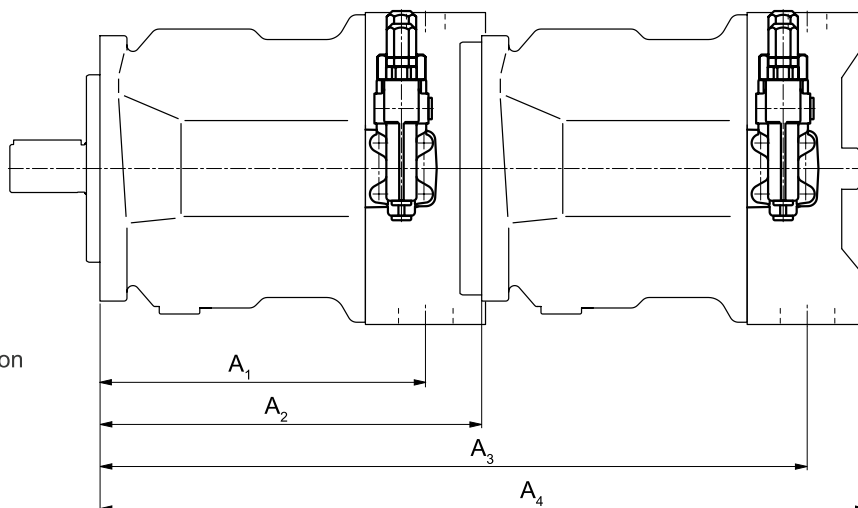
A10VSO + A10VSO

Through Drive

Axial piston unit STM A10VO may be supplied with a through drive. The type of through drive is determined by the code in the model number (eg. K01, K02 , K07) If no additional pumps are to be installed by the factory the simple model code is sufficient.

Combination pumps;

Independent circuits can be made available by mounting additional pumps. By using combination units only one drive is required.



Main Pump

STM A10VO28

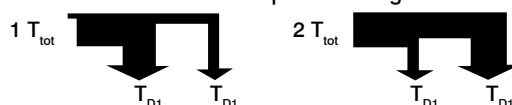
STM A10VO45

STM A10VO71

STM A10VO100

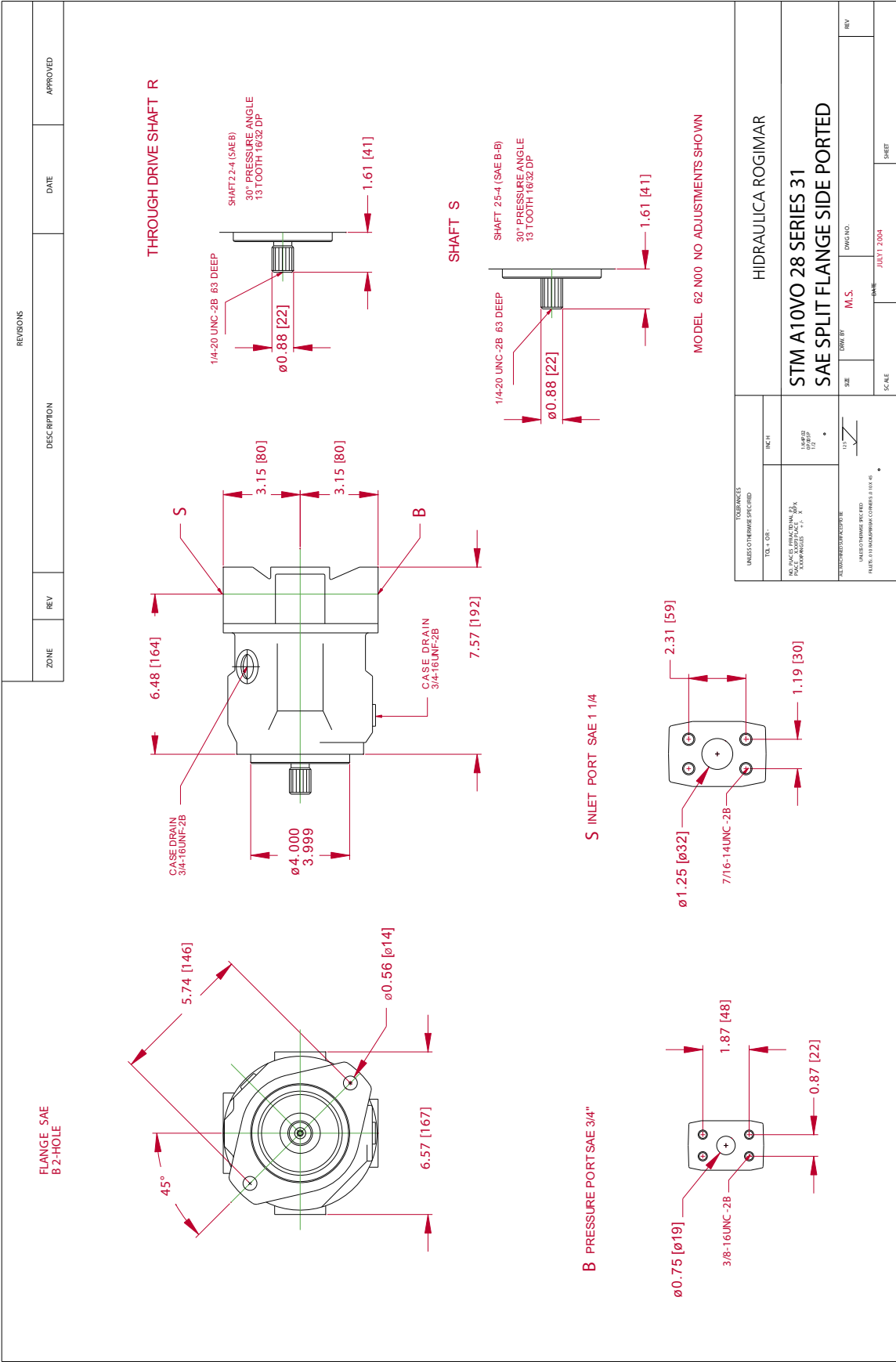
	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4
STM A10VO28	6.5	8.03	14.5	15.7	7.24	9.02	15.5	16.7	8.54	10.5	17	18.2	10.8	13.3	19.8	20.9
	165	204	369	398	184	229	394	423	217	267	432	461	275	338	503	532
STM A10VO45	*	*	*	*	7.24	9.02	16.3	17.6	8.54	10.5	17.8	19.4	10.8	13.3	20.6	21.9
	*	*	*	*	184	229	413	448	217	267	451	485	275	338	522	557
STM A10VO71	*	*	*	*	*	*	*	*	8.54	10.5	19.1	20.6	10.8	13.3	21.9	23.4
	*	*	*	*	*	*	*	*	217	267	484	524	275	338	555	595
STM A10VO100	*	*	*	*	*	*	*	*	*	*	*	*	10.8	14	24.8	26.5
	*	*	*	*	*	*	*	*	*	*	*	*	275	356	631	673

Permissible torque on through drive



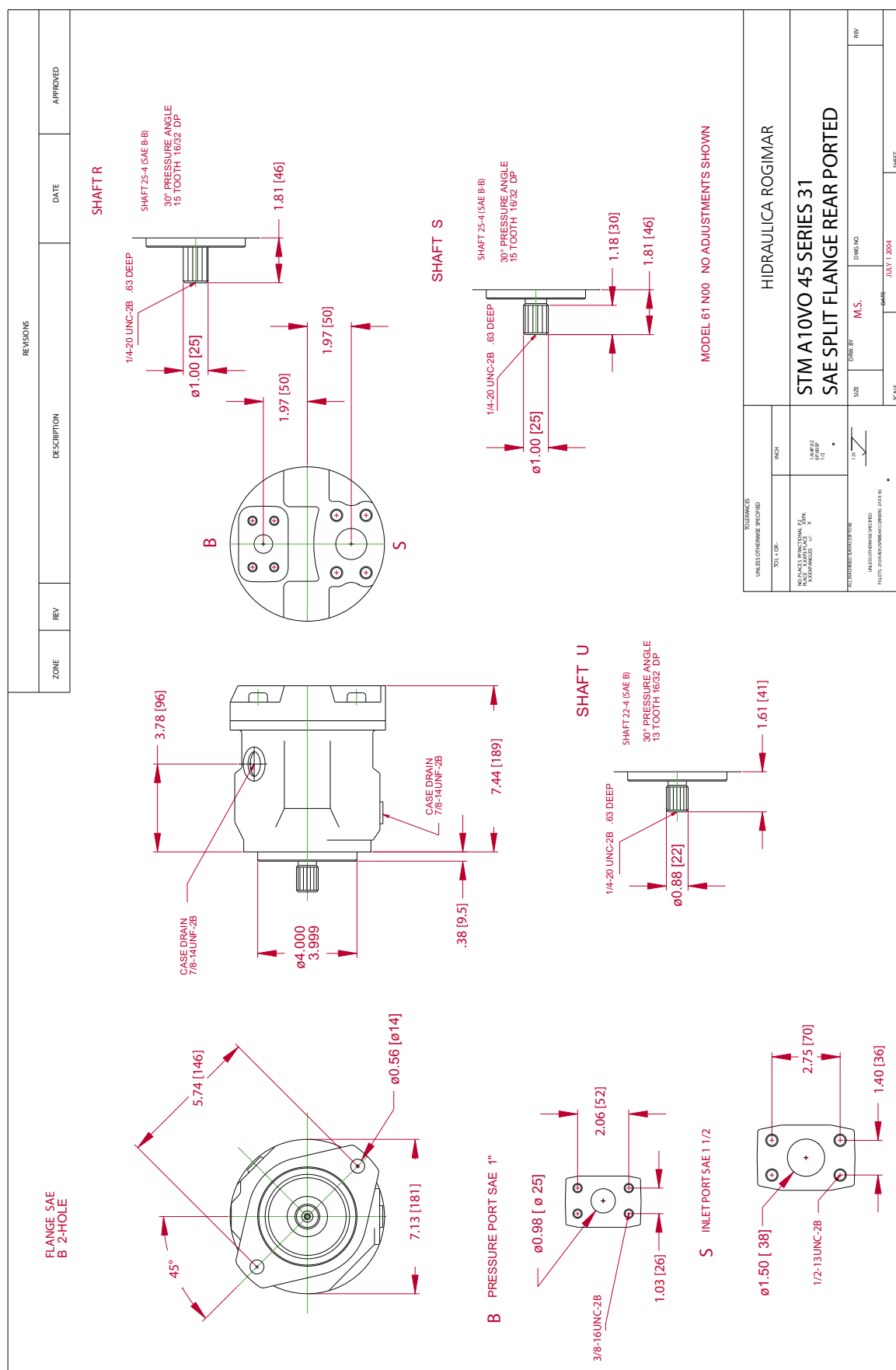
Size	28	45	71	100
Max. perm. torque on through drive, shaft "S", pump 1 (pump 1 + pump 2) T _{tot. max.}	lb-ft 133	221	369	656
	Nm 180	300	500	890
1 Perm. torque on on through drive T _{D1max}	lb-ft 92	147	233	328
	Nm 125	200	316	445
T _{D2max}	lb-ft 41	74	136	328
	Nm 55	100	184	445
2 Perm. torque on on through drive T _{D1max}	lb-ft 41	74	136	328
	Nm 55	100	184	445
T _{D2max}	lb-ft 92	147	233	328
	Nm 125	200	316	445

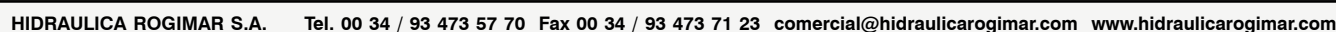
Size	28	45	71	100
Max. perm. torque on through drive, shaft "R", pump 1 (pump 1 + pump 2) T _{tot. max.}	lb-ft 164	294	466	-
	Nm 233	400	632	-
T _{D1max}	lb-ft 92	147	233	-
	Nm 125	200	316	-
1 Perm. torque on on through drive T _{D2max}	lb-ft 72	147	233	-
	Nm 98	200	316	-
T _{D1max}	lb-ft 72	147	233	-
	Nm 98	200	316	-
2 Perm. torque on on through drive T _{D2max}	lb-ft 92	147	233	-
	Nm 125	200	316	-



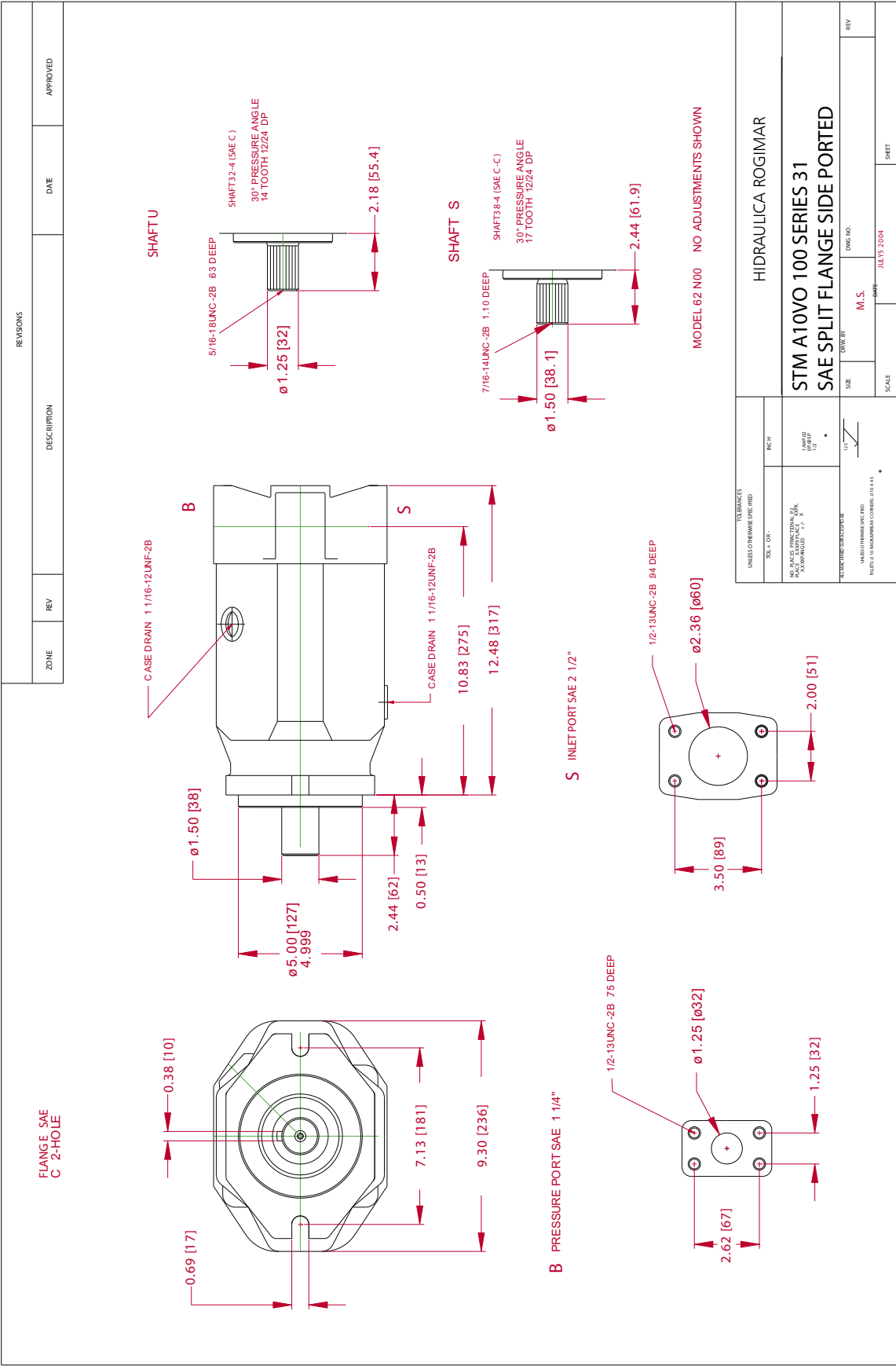


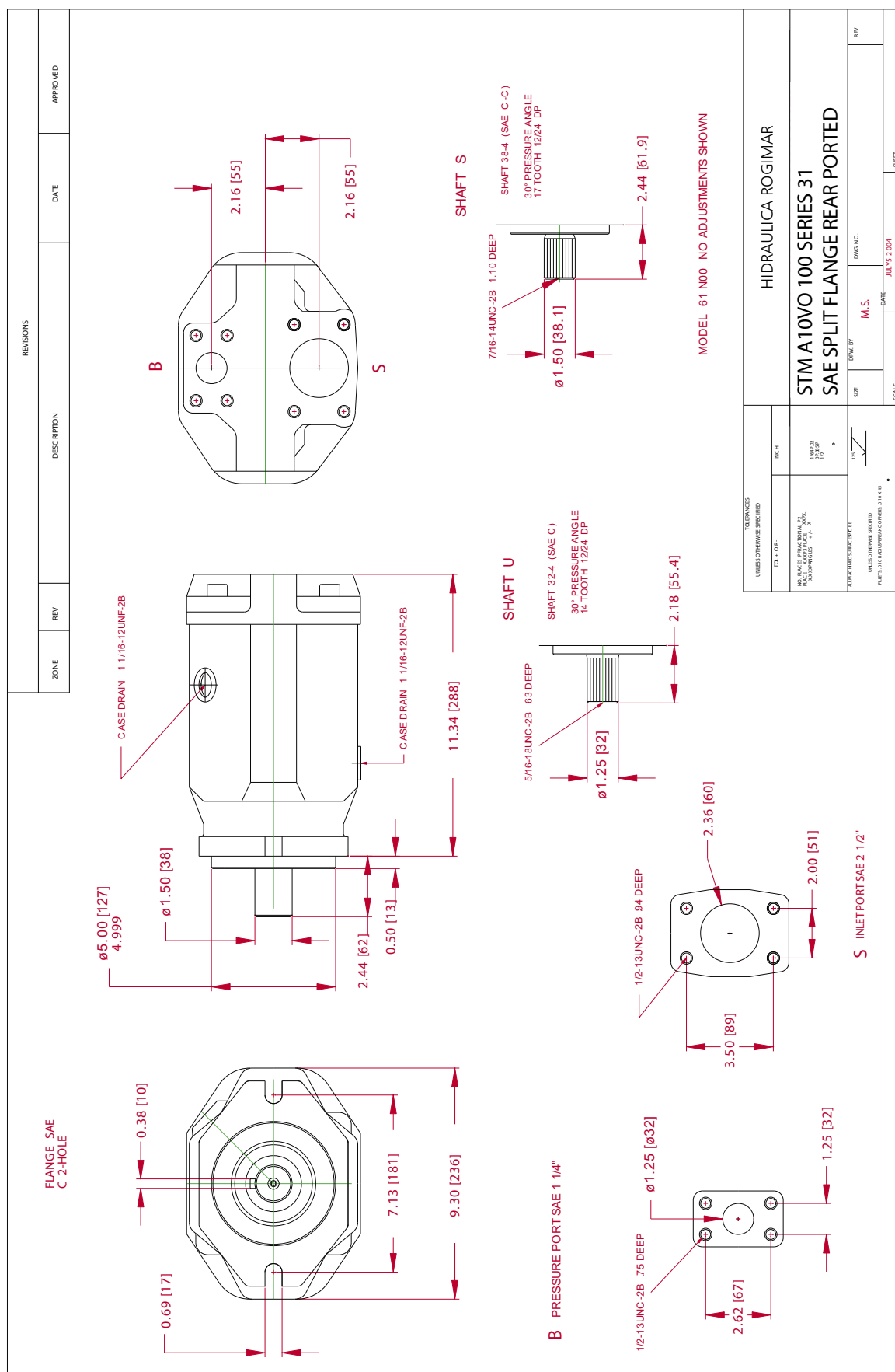


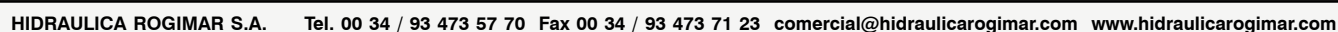


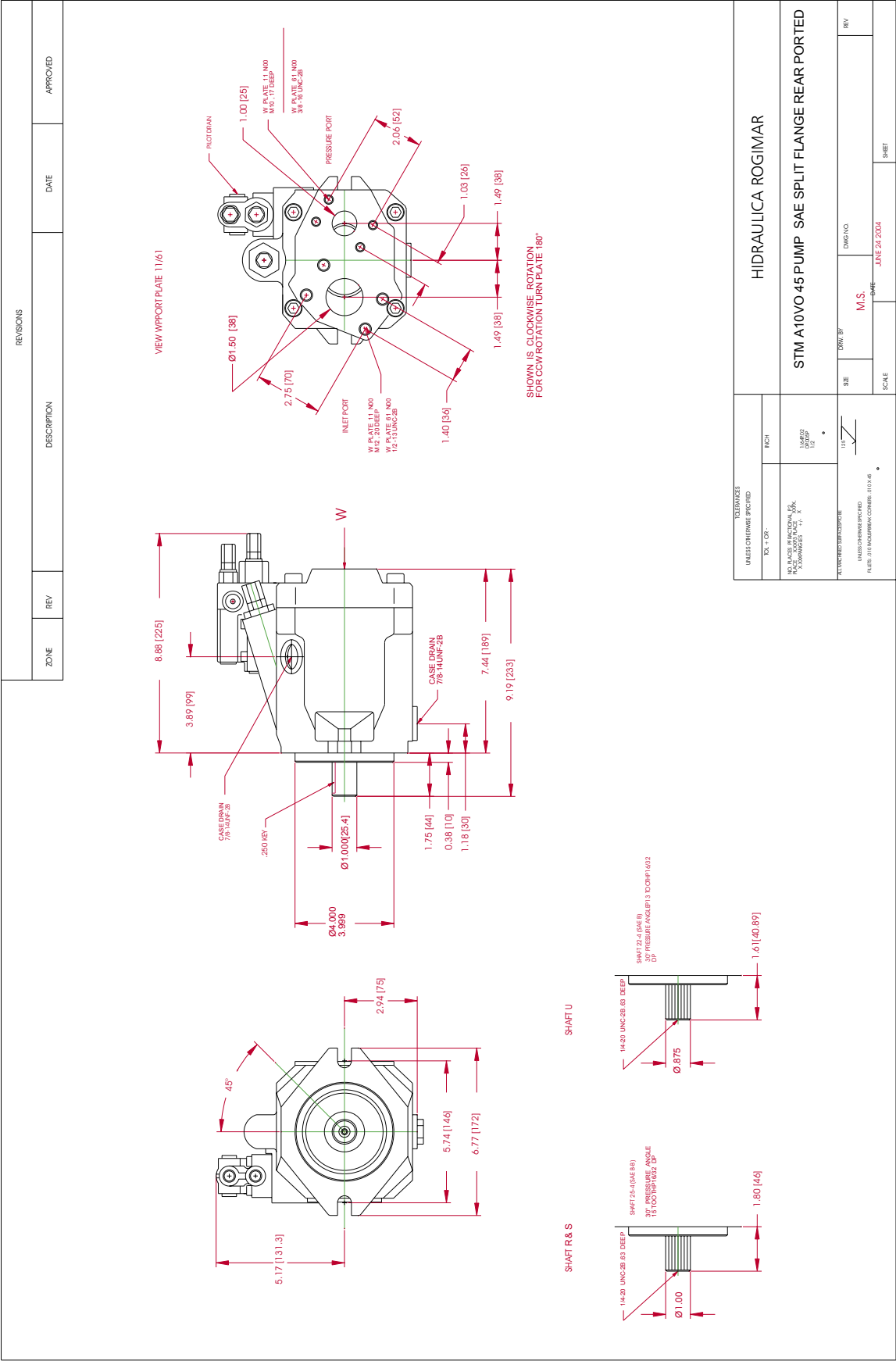


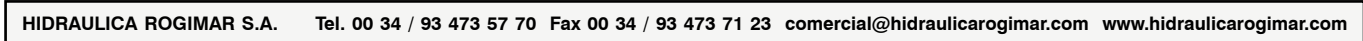












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