Operation & Maintenance Manual

Model T270A-5.25 IN (4140)

Weatherford®

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Weatherford

Model T270

Triplex Power Pump

The Weatherford Model T270 is a single acting triplex plunger pump rated at 271 HP in continuous duty services and up to 324 HP in intermittent duty. This versatile pump is offered with a variety of material and design options that make is ideal for general industrial, reverse osmosis, and typical applications involved in the production of oil and natural gas.

Specifications

	Continuous	Intermittent
Rated Power	271 HP	324 HP
Maximum Speed	260 RPM	310 RPM
Minimum Speed	75 RPM	50 RPM

	US Customary	Metric
Stroke Length	6.890 IN	175 MM
Rated Rod Load	18,000 LB	8,180 KG
Pump Weight	6,400 LB	2,910 KG
Oil Capacity	19 GAL	71 L
Maximum Fluid Temp.	180°F	82°C
Mechanical Efficiency	90%	

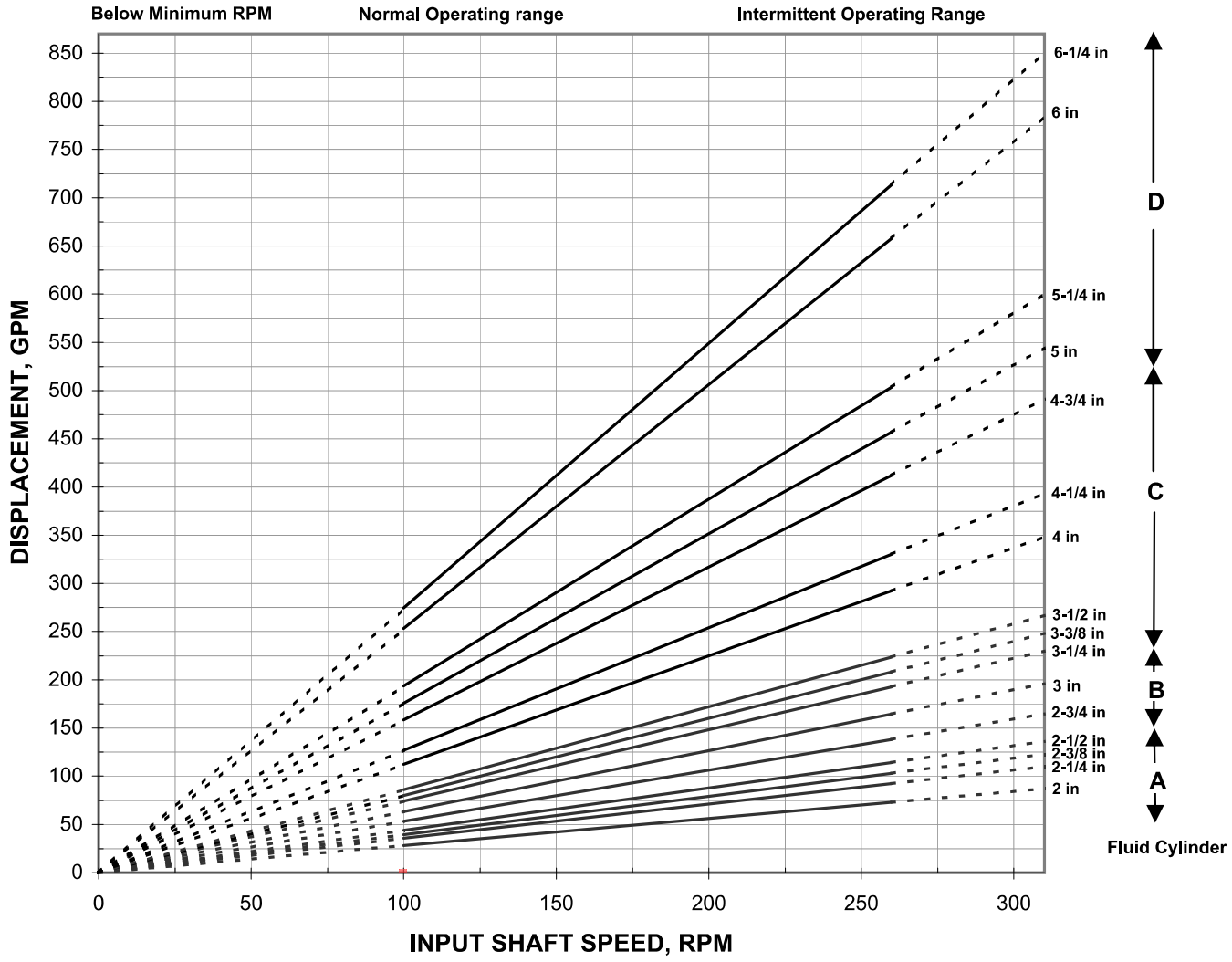
Performance Ratings

Pump Model	Plunger Size (IN)	Displacement (Gal/Rev)	Rated Pressure (PSI)	Rated Capacity (GPM)			Fluid Cylinder	Standard Connections	
				Minimum	Continuous	Intermittent		Inlet	Discharge
T270-2.000IN	2	0.2811	5,730	28.1	73.1	87.1	A	4" NPT	2" NPT
T270-2.250IN	2.25	0.3558	4,530	35.6	92.5	110.3	A	4" NPT	2" NPT
T270-2.375IN	2.375	0.3964	4,060	39.6	103.1	122.9	A	4" NPT	2" NPT
T270-2.500IN	2.5	0.4392	3,670	43.9	114.2	136.2	A	4" NPT	2" NPT
T270-2.750IN	2.75	0.5315	3,030	53.1	138.2	164.8	B	6" CL150 RF	3" NPT
T270-3.000IN	3	0.6325	2,550	63.2	164.4	196.1	B	6" CL150 RF	3" NPT
T270-3.250IN	3.25	0.7423	2,170	74.2	193.0	230.1	B	6" CL150 RF	3" NPT
T270-3.375IN	3.375	0.8005	2,010	80.0	208.1	248.1	C	8" CL150 RF	4" NPT
T270-3.500IN	3.5	0.8609	1,870	86.1	223.8	266.9	C	8" CL150 RF	4" NPT
T270-4.000IN	4	1.1244	1,430	112.4	292.3	348.6	C	8" CL150 RF	4" NPT
T270-4.250IN	4.25	1.2693	1,270	126.9	330.0	393.5	C	8" CL150 RF	4" NPT
T270-4.750IN	4.75	1.5856	1,020	158.6	412.3	491.5	C	8" CL150 RF	4" NPT
T270-5.000IN	5	1.7569	920	175.7	456.8	544.6	D	10" CL150 RF	6" CL600 RF
T270-5.250IN	5.25	1.9370	830	193.7	503.6	600.5	D	10" CL150 RF	6" CL600 RF
T270-6.000IN	6	2.5299	640	253.0	657.8	784.3	D	10" CL150 RF	6" CL600 RF
T270-6.250IN	6.25	2.7451	590	274.5	713.7	851.0	D	10" CL150 RF	6" CL600 RF

Weatherford Pumping Solutions
E-mail: pumps@weatherford.com

T270 Selection Graph

6.890" STROKE, MAXIMUM ROD LOAD 18,000 LBS.



Displacements shown based on 100% volumetric efficiency Actual volumetric efficiency will be lower based on discharge pressure and fluid compressibility. Consult Weatherford if suction pressure greater than 5% of the rated pump discharge pressure.

General Dimensions

Inches
[Millimeters]

Power Required: $HP = \frac{GPM \times PSI}{1543}$

Note:

1. Capacities shown based on 100% volumetric efficiency. Actual capacities will be lower based on discharge pressures and fluid properties.
2. Maximum continuous and intermittent duty speeds are based on pumping fluids with viscosities similar to water. Consult Weatherford for speed de-rating guidelines for higher viscosity fluids.
3. Drawings shown are typical and should not be used for fabrication purposes.
4. Special designs and materials available for higher temperature operation.
5. Standard models shown. Other sizes and configurations may be available on request. Not all plunger sizes may be available in all materials. Consult Weatherford for more details.

Weatherford

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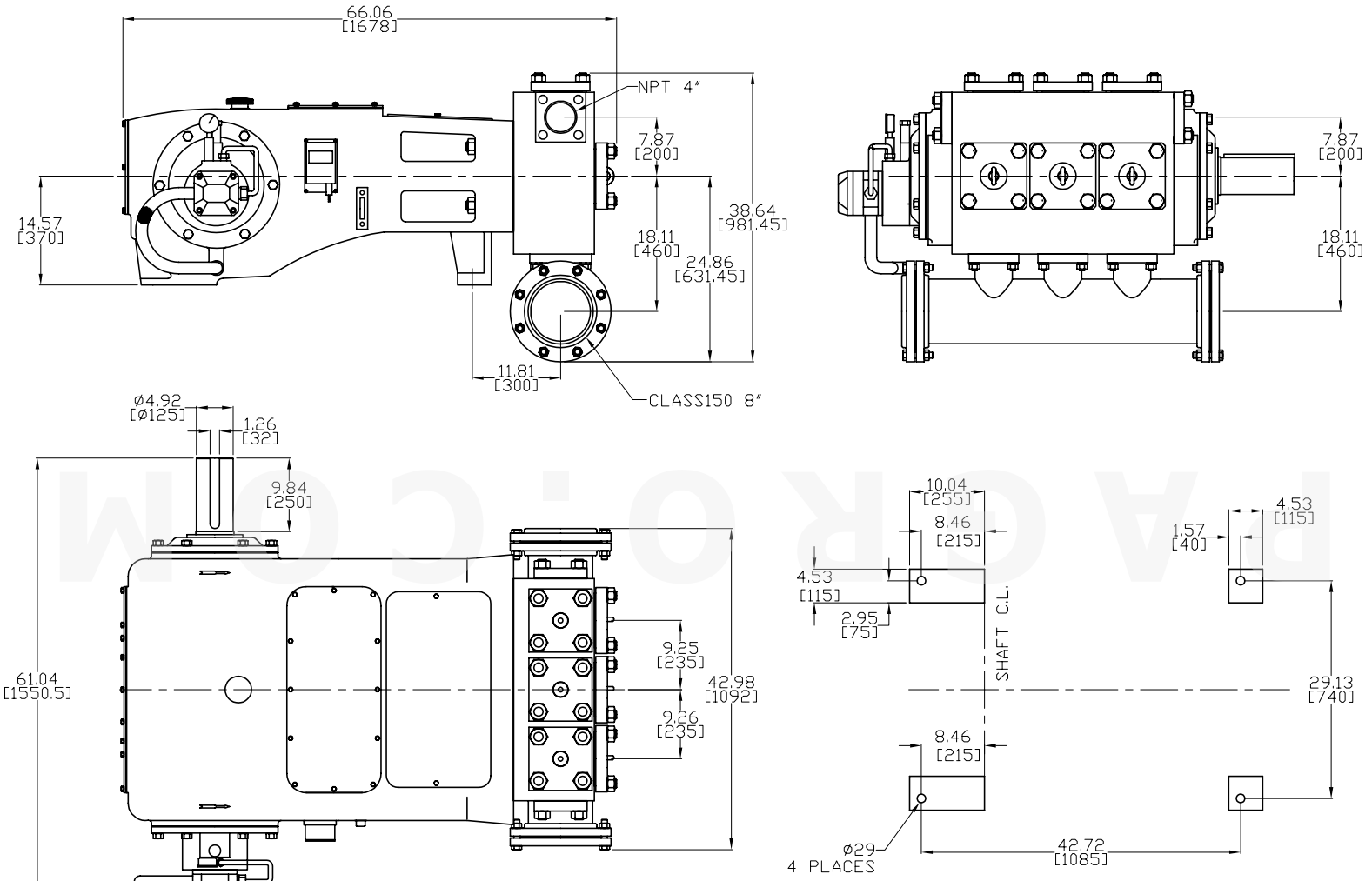


DESCRIPTION	Rev Chg By / Rev Date	Rev Chk By / Check Date

REVISIONS

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

BREAK SHARP CORNERS	.015	[.381]
FILLET RADII	.030 ±.005	[.762] ±[.127]
CONCENTRICITY	.010 FIM	[.254] FIM
SQUARENESS	.010 IN 10"	[.254] IN [254]
PARALLELISM	.010 IN 10"	[.254] IN [254]

RFS EXCEPT WHEN (M) MODIFIED

DIMENSIONAL TOL

FRACTIONS	± 1/16	[1.59]
X.X	± .1	[± 2.54]
X.XX	± .015	[± .381]
X.XXX	± .005	[± .127]
ANGLE	± 1/2°	± 1/2°
SURFACE RMS 125		[3.2]

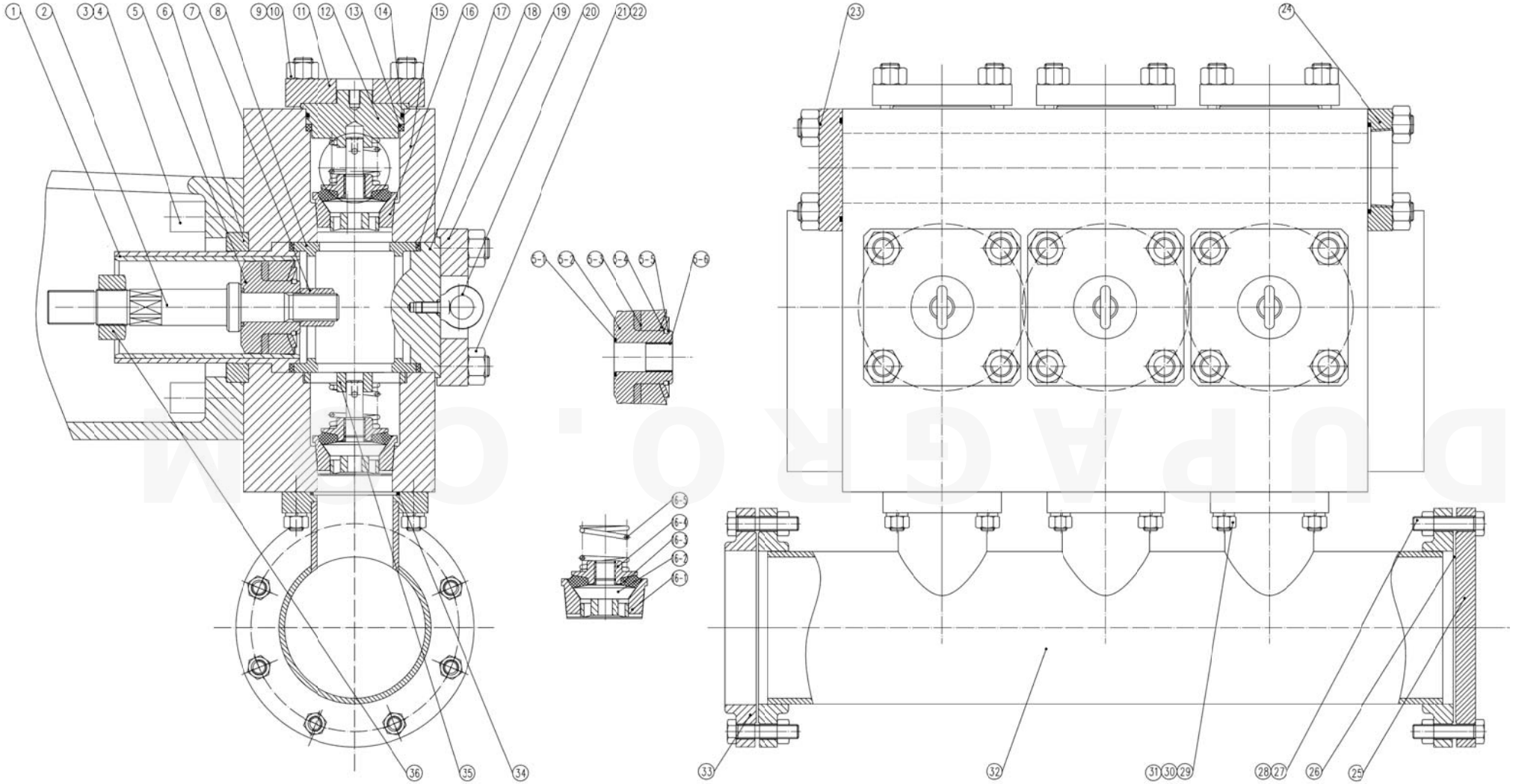
DRAWN BY: BINGO FU	DATE 13/FEB/07	DESIGNED BY:	DATE
CHECKED BY: ERICA XUE	DATE 13/FEB/07	APPROVED BY:	DATE
MATERIAL SPEC:		OTHER SPECS 1:	OTHER SPECS 2:
MATERIAL HEAT TREAT SPEC:		SCALE:	SHT# 1 OF 3

Weatherford

TITLE

GENERAL ARRANGEMENT T270A 5.25" PISTON

FOLDER NO.	PART NO.	REV:
	951082	0



DESCRIPTION	Rev Chg By Rev Date	Rev Chk By Check Date
L		

REVISIONS

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

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FILLET RADII	.030 ±.005	[.762] ±[.127]
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X.X	± .1	[± 2.54]
X.XX	± .015	[± .381]
X.XXX	± .005	[± .127]
ANGLE	± 1/2°	± 1/2°
SURFACE RMS	125	[3.2]

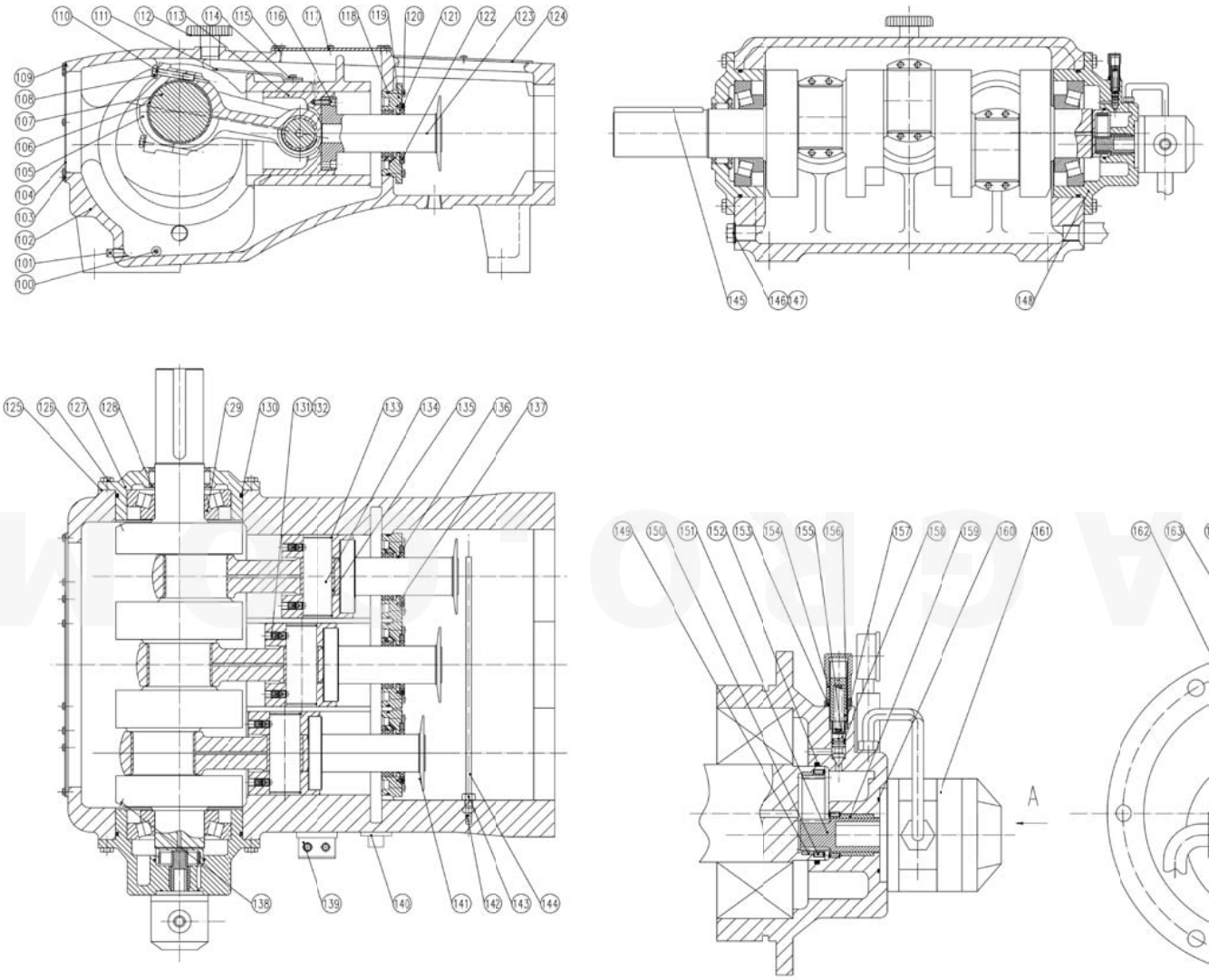
DRAWN BY: BINGO FU	DATE 13/FEB/07	DESIGNED BY:	DATE
CHECKED BY: ERICA XUE	DATE 13/FEB/07	APPROVED BY:	DATE
MATERIAL SPEC:		OTHER SPECS 1:	OTHER SPECS 2:
MATERIAL HEAT TREAT SPEC:		SCALE:	SHT# 2 OF 3

Weatherford

TITLE

FLUID END DETAIL VIEW T270A, 5.25" PISTON

FOLDER NO.	PART NO.	REV:
	951082	0



DESCRIPTION	Rev Chg By Rev Date	Rev Chk By Check Date

REVISIONS

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

BREAK SHARP CORNERS	.015	[.381]
FILLET RADII	.030 ±.005	[.762] ±[.127]
CONCENTRICITY	.010 FIM	[.254] FIM
SQUARENESS	.010 IN 10"	[.254] IN [254]
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RFS EXCEPT WHEN (M) MODIFIED

DIMENSIONAL TOL

FRACTIONS	± 1/16	[1.59]
X.X	± .1	[± 2.54]
X.XX	± .015	[± .381]
X.XXX	± .005	[± .127]
ANGLE	± 1/2°	± 1/2°
SURFACE RMS	125	[3.2]

DRAWN BY: BINGO FU	DATE 12/DEC/06	DESIGNED BY:	DATE
CHECKED BY: ERICA XUE	DATE 12/DEC/06	APPROVED BY:	DATE
MATERIAL SPEC:		OTHER SPECS 1:	OTHER SPECS 2:
MATERIAL HEAT TREAT SPEC:		SCALE:	SHT# 3 OF 3

Weatherford

TITLE

POWER END DETAIL VIEW T270A, 5.25" PISTON

FOLDER NO.	PART NO.	REV:
	951082	0

Weatherford®

PARTS LIST

Weatherford T270 - 5.25IN Pump

Part Number 951082

Revision Level A

Item	Part Number	Parts Description	Material	Torque Ft-Lb	Quantity
1	1144249	LINER, 5.25IN, T270A WFT	-	-	3
2	710689	ROD, PISTON, T270 WFT	-	-	3
3	1132250	STUD, M30 X 85, NICKEL COATED	-	-	12
4	1125867	NUT, ROUND, M30, NICKEL COATED	-	-	12
5	1144245	ASSEMBLY, PISTON, 5.25IN, T270A WFT	-	-	3
5-1	1132251	ORING, 55 X 3.5. HNBR	-	-	3
5-2	1150084	HUB, PISTON, 5.25IN, T270 WFT	-	-	3
5-3	1150094	RUBBER, SEAL, PISTON, T270 WFT	-	-	3
5-4	1132252	PLATE, RETAINING, PISTON, T270 WFT	-	-	3
5-5	1150095	RING, SNAP, 5.25IN PISTON, T270 WFT	-	-	3
5-6	1132253	BUSHING, PISTON HUB, 1-1/2 TO 1-5/8, TEFLON	-	-	3
6	1132254	SLEEVE, ALIGNMENT, LINER, T270 WFT, 1045	-	-	3
7	1132256	NUT, LOCKING, PISTON ROD, T270 WFT	-	-	3
8	1132258	RETAINER, SLEEVE, LINER, T270 WFT	-	-	3
9	1132259	STUD, M27 X 65, NICKEL COATED	-	-	20
10	1132262	NUT, HEX, M27, NICKEL COATED	-	674	20
11	1132263	COVER, PLATE, TOP, T270 WFT, 1045	-	-	3
12	1132458	COVER, TOP, T270 WFT, 420	-	-	3
13	1144545	SEAL, SQUARE, 142 x 126 x 10, POLYURETHANE	-	-	3
14	1132462	ORING, 140 X 5.7, HNBR	-	-	3
15	1132662	CYLINDER, FLUID, T270 WFT, 4140	-	-	1
16	1132465	ASSEMBLY, VALVE, API #4	-	-	6
16-1	1132466	SEAT, VALVE, API #4	-	-	6
16-2	1132467	DISC, VALVE, API #4	-	-	6
16-3	1132469	SEAL, VALVE, API #4, RUBBER	-	-	6
16-4	1132472	NUT, RETAINING, VALVE, API #4, 1045	-	-	6
16-5	1132483	SPRING, VALVE, API #4	-	-	6
17	1132664	SEAL, SQUARE, 186.69 X 161.29 X 6.35, RUBBER	-	-	6
18	1132490	COVER, TOP, T270 WFT, 420	-	-	3
19	1132491	COVER, PLATE, FRONT, T270 WFT, 1045	-	-	3
20	912476	BOLT, EYE, M16, WFT, 1045	-	-	3
21	1132492	STUD, M30 X 75, NICKEL COATED	-	-	12
22	912232	NUT, HEX, M30, NICKEL COATED	-	779	12
23	1132499	FLANGE, BLIND, DISCHARGE, T270 WFT, 1045	-	-	1
24	1132665	FLANGE, DISCHARGE, THROUGH, T270 WFT, 1045	-	-	1
25	1132500	FLANGE, BLIND, SUCTION, T270 WFT, 1045	-	-	1
26	1132667	GASKET, 278, 218.95, 4.5, TEFLON	-	-	2
27	1132501	BOLT, HEX, M20 X 85, NICKEL COATED	-	-	16
28	1126860	NUT, HEX, M20, NICKEL COATED	-	160	16
29	1132502	STUD, M20 X 65, NICKEL COATED	-	-	12
30	1126880	NUT, HEX, M20, NICKEL COATED	-	160	12
31	914850	WASHER, LOCK, M20	-	-	12
32	1132671	MANIFOLD, SUCTION, T270 WFT	-	-	1
33	1132672	FLANGE, SUCTION, THROUGH, T270 WFT, 1045	-	-	1
34	1132503	ORING, 130 X 5.7, HNBR	-	-	5
35	1132505	GUIDE, SUCTION VALVE, T270 WFT	-	-	3
36	1132506	NUT, JAM, PISTON ROD, T270 WFT, 1045	-	-	3
100	1114881	ROD, MAGNETIC, POWER END, T270, WFT	-	-	1
101	202006	PLUG, DRAIN, POWER END, T270 WFT	-	-	1
102	710771	FRAME, POWER, T270 WFT	-	-	1
103	885599	BOLT, HEX, M10 X 20	-	16	32

Item	Part Number	Parts Description	Material	Torque Ft-Lb	Quantity
104	762070	PLATE, COVER, REAR, POWER END, T270 WFT	-	-	1
105	710748	ROD, CONNECTING, T270 WFT	-	-	3
106	762078	BEARING, INSERT, T270 WFT	-	-	3 sets
107	710740	CRANKSHAFT, T270 WFT	-	-	1
108	762076	BOLT, CONNECTING ROD, M16 X 105	-	-	12
109	887325	GASKET, PLATE, COVER, REAR, POWER END, T270 WFT	-	-	1
110	885571	WASHER, LOCK, M16	-	-	12
111	1132507	TROUGH, OIL, POWER END, T270 WFT	-	-	2
112	886899	CAP, BREATHER, T270 WFT	-	-	1
113	762079	CROSSHEAD, T270, WFT	-	-	3
114	908040	WASHER, FLAT, M10	-	-	4
115	887325	GASKET, PLATE, COVER, TOP, POWER END, T270 WFT	-	-	1
116	885585	CAPSCREW, SOCKETHEAD, M12 X 40	-	-	18
117	710704	PLATE, COVER, TOP, POWER END, T270 WFT	-	-	1
118	795186	ORING, 220 X 5.7, HNBR	-	-	3
119	881591	RETAINER, INTERMEDIATE ROD, INNER, T270 WFT	-	-	3
120	1132510	BOLT, HEX, M12 X 35	-	45	12
121	1132513	SOCKET HEAD, CAPSCREW, M6 X 16	-	-	9
122	881595	RETAINER, INTERMEDIATE ROD, OUTER, T270 WFT	-	-	3
123	1132514	ROD, INTERMEDIATE, T270 WFT	-	-	3
124	762100	PLATE, COVER, PLUNGER CHAMBER, POWER END, T270, WFT	-	-	1
125	762104	GASKET, RETAINER, BEARING THROUGH HOUSING, 430 X 340.5, T270 WFT, MYLA	-	-	2
126	912265	BOLT, HEX, M20 X 50	-	160	12
127	762110	RETAINER, BEARING, THROUGH HOUSING, T270 WFT	-	-	1
128	341223	SEAL, OIL, 130 X 160 X 15	-	-	2
129	763448	BEARING, CRANKSHAFT, T270 WFT, 7626	-	-	2
130	763445	ORING, 340 X 8.6, HNBR	-	-	2
131	1132673	SCREW, SET, M20 X 20	-	-	6
132	1132674	SCREW, SET, M20 X 25	-	-	6
133	755332	RING, SNAP, M80	-	-	6
134	762095	PIN, COROSSHEAD, T270 WFT	-	-	3
135	762080	BUSHING, CONNECTING ROD, WRIST PIN, T270, WFT	-	-	3
136	1132676	ORING, 100 X 3.1, HNBR	-	-	3
137	357414	SEAL, OIL, 100 X 125 X 12	-	-	9
138	1132678	SCREW, SET, 1/4IN, 1045	-	-	3
139	1132679	SWITCH, PRESSURE, POWER END LUBE, HIGH LOW, T270 WFT	-	-	1
140	891685	GAUGE, PRESSURE, POWER END LUBE PUMP, T270 WFT	-	-	1
141	1132516	BAFFLE, INTERMEDIATE ROD, T270, WFT	-	-	3
142	885142	FITTING, LINER WASH TUBE, T270 WFT	-	-	1
143	885143	NUT, HEX, M20	-	160	1
144	885145	TUBE, LINER WASH, T270 WFT	-	-	1
145	763453	KEY, 32 X 18 X 240, 1045	-	-	1
146	1132517	PLUG, DRAIN, POWER END, M42, 1035	-	-	1
147	1132518	GASKET, RETAINER, BEARING, THROUGH HOUSING, T270 WFT	-	-	1
148	1114877	RETAINER, BEARING, HOUSING, DIR DRIVE LUBE PUMP, T270 WFT	-	-	1
149	1132521	GEAR, INNER, POWER FRAME LUBE, T270 WFT	-	-	1
150	888764	CAPSCREW, SOCKETHEAD, M6 X 15	-	-	8
151	1132522	GEAR, OUTER, POWER FRAME LUBE, T270 WFT	-	-	1
152	1144546	ORING, 135 X 5.7, VITON	-	-	1
153	891696	NUT, LOCK, PWER END LUBE, T270 WFT	-	-	1
154	891700	CAP, POWER END LUBE PUMP, T270 WFT	-	-	1
155	891703	SPRING,POWER END LUBE PUMP, T270 WFT	-	-	1
156	891701	SCREW, SET, POWER END LUBE, T270 WFT	-	-	1
157	891714	POPPET, POWER END LUBE, T270 WFT	-	-	1
158	1132524	ORING, 18 X 2.4, FLUORINE	-	-	2
159	1132526	BUSHING, SHAFT, POWER END LUBE PUMP, T270 WFT	-	-	1
160	891718	ORING, 100 X 3.5, HNBR	-	-	1

Item	Part Number	Parts Description	Material	Torque Ft-Lb	Quantity
161	795992	PUMP, POWER END LUBE, T270 WFT	-	-	1
162	1132527	FITTING, TEE, POWER END LUBE PUMP, T270 WFT	-	-	1
163	891685	GAUGE, PRESSURE, LIQUID FILLED, 0 - 300 PSI, BOTTOM MOUNT	-	-	1
164	891687	BOLT, HEX, M12 X 25	-	45	4
165	1132685	FITTING, DISCHARGE, CONNECTION, POWER END LUBE PUMP, T270 WFT	-	-	1
Item	Part Number	Spare Kit Description	Material	Torque Ft-Lb	Quantity
1	1132465	ASSEMBLY, VALVE, API #4	-	-	6
1-1	1132466	SEAT, VALVE, API #4	-	-	6
1-2	1132467	DISC, VALVE, API #4	-	-	6
1-3	1132469	SEAL, VALVE, API #4, RUBBER	-	-	6
1-4	1132472	NUT, RETAINING, VALVE, API #4, 1045	-	-	6
1-5	1132483	SPRING, VALVE, API #4	-	-	6
2	1144245	ASSEMBLY, PISTON, 5.25IN, T270A WFT	-	-	3
2-1	1132251	ORING, 55 X 3.5. HNBR	-	-	3
2-2	1150084	HUB, PISTON, 5.25IN, T270 WFT	-	-	3
2-3	1150094	RUBBER, SEAL, PISTON, T270 WFT	-	-	3
2-4	1132252	PLATE, RETAINING, PISTON, T270 WFT	-	-	3
2-5	1150095	RING, SNAP, 5.25IN PISTON, T270 WFT	-	-	3
2-6	1132253	BUSHING, PISTON HUB, 1-1/2 TO 1-5/8, TEFLON	-	-	3
3	762078	BEARING, INSERT, T270 WFT	-	-	3 sets
4	1144545	SEAL, SQUARE, 142 x 126 x 10, POLYURETHANE	-	-	3
5	1132664	SEAL, SQUARE, 186.69 X 161.29 X 6.35, RUBBER	-	-	6
6	357414	SEAL, OIL, 100 X 125 X 12	-	-	9
7	341223	SEAL, OIL, 130 X 160 X 15	-	-	2
8	1132524	ORING, 18 X 2.4, FLUORINE	-	-	2
9	1132676	ORING, 100 X 3.1, HNBR	-	-	3
10	891718	ORING, 100 X 3.5, HNBR	-	-	1
11	1132503	ORING, 130 X 5.7, HNBR	-	-	5
12	1132462	ORING, 140 X 5.7, HNBR	-	-	3
13	795186	ORING, 220 X 5.7, HNBR	-	-	3
14	763445	ORING, 340 X 8.6, HNBR	-	-	2
Item	Part Number	Tool Kit Description	Material	Torque Ft-Lb	Quantity
1	1213052	Tool, Hook, Short, M16x200	-	-	1
2	1213053	Tool, Spanner, Inner Hex, S:22	-	-	1
3	1198968	TOOL, SLEEVE, DISASSEMBLY, NUT, 4IN, WFT, T70	-	-	1
4	905645	TOOL, SLEEVE, VALVE SEAT REMOVAL	-	-	1
5	1213054	Tool, Sleeve	-	-	1
6	1213055	Tool, Wrench, Solid	-	-	1
7	888887	Cylinder, Oil, Tool for TW350	-	-	1
8	1213057	Tool, Block, Valve Seat, Disassembly	-	-	1
9	1199279	ROD, PULLING,VALVE, DISASSEMBLY, M36X380,	-	-	1
10	1213058	TOOL, ROD, PULLING, M36X725	-	-	1
11	1198961	NUT	-	-	1
12	1199054	ROD, PULLING, WFT,T125	-	-	1
13	888885	Pump, Oil, Manually Operated, Tool for TW350	-	-	1
14	888896	Gun, Oil, Motor, Tool, TW350	-	-	1
15	888900	Wrench, Hex, Socket, #4, Tool, TW350	-	-	1
16	888899	Wrench, Hex, Socket, #3, Tool, TW350	-	-	1
17	1158925	Grip, sliding	-	-	1

Introduction

This manual is intended to guide users in the setup, operation, and maintenance of the Weatherford equipment covered herein. While comprehensive in scope, the manual is written for operators and mechanics that are already familiar with the unique characteristics of reciprocating pumps. If you do not fit in this category, or are unsure in any way how to setup, operate, or maintain the pump, Weatherford strongly recommends you consult Weatherford or one of our authorized distributors for assistance before attempting to install, operate, or maintain this equipment.

Always use safe and sound mechanical practices and safety precautions when operating or maintaining a Weatherford reciprocating pump. Weatherford pumps are positive displacement pumps that can develop extremely higher pressures. **Never operate the pump without a properly sized and set relief valve or other pressure relieving device installed directly on the discharge port of the pump.**

The manual and its contents are written based on typical pump configurations, however there may be differences in your particular pump based on your requirements of your application. For this reason, manuals are generic to a general pump model, however in all cases the specific construction details of your pump are always shown the Parts List, a separate document that is supplied with the pump at the time of shipment. The Parts List contains a General Arrangement Drawing, Cross Section Drawing, and Bill of Material for your exact pump based on the part number. The Bill of material contains Weatherford part numbers, required quantities, and List Prices for ordering replacement components as well as a list of the assembly torque required for all critical fasteners.

Refer to the pump Data Sheet for specific performance parameters of the pump that include maximum operating pressures and speeds. Contact Weatherford or the distributor that sold the pump for a copy of the specific pump Data Sheet for the model in question if you do not have one available.

Weatherford reserves the right to discontinue models or update the information contained in this manual and associated Parts Lists at any time without notice.

Installation

Weatherford pumps may be installed in either indoor or outdoor applications. If the pump is installed outdoors it is generally recommended that it be provided with a cover to protect it from the elements, however it is not required. Note that outdoor installations, particularly those in extremely wet, humid, or otherwise difficult locations may require maintenance cycles to be performed on a more frequent basis.

The pump should be installed on a rigid base and located on a flat, horizontal surface. If the pump base is not level, the level of oil in the crankcase will not be maintained at correct position. Moving parts could be starved of oil, or in other cases a high level of oil may damage the oil seals. If the pump base is not installed on a flat surface, or properly shimmed, this condition may put excessive stress on the pump components and lead to premature failures. Weatherford pumps may be driven using belt-sheave systems or directly coupled to the driver though a gearbox. When operating with belt-sheave systems, it is always desirable to mount the pump sheave as far inboard on the shaft as possible to minimize the moment arm and associated overhung loads that must be supported by the shaft and bearings.

Weatherford recommends a minimum of 3 feet be allocated on all four sides, and above the top of the pump to insure adequate clearance for monitoring, adjustment, and maintenance of the pump.

The pump crankshaft is designed so that the top of the shaft moves forward, toward the front or fluid cylinder end, of the pump during operation. This direction of rotation allows for the optimal distribution of oil to the crosshead and wrist pin areas of the pump as well as quieter, smoother general operation. This is very important to the service life of the pump. If unsure, the proper direction of rotation is shown graphically on the General Arrangement drawing provide in the Parts List of the pump.

Inlet Pressure Requirements

Insufficient inlet pressure to the pump is one of the most common problems observed in the field. With most common liquids, optimal performance is obtained with an inlet pressure of 20 PSI; however most pumps will perform properly with a flooded suction provided the inlet piping system is properly designed. Some fluids with high vapor pressures or high viscosities may require different inlet conditions for proper operation, so consult Weatherford before designing the system for recommendations.

Operation of the pump with insufficient inlet pressure can result in cavitation of the liquid as it enters the pumping chamber between the suction and discharge valve assemblies. In its most mild form, cavitation may only cause the pump to knock slightly and or vibrate more than normal. In other cases, it can cause premature damage to valves, plungers, packing or occasional air locking. In severe cases, cracking of the fluid cylinder or failure of the power end can occur, so it's very important to insure the pump receives adequate inlet pressure.

The maximum inlet pressure is 50 PSI unless specifically approved by Weatherford. In general, the inlet piping system should be as large, short, and direct as possible. The Hydraulic Institute publishes a very comprehensive list of guidelines for the design and implementation of a good pump inlet and discharge systems. Weatherford recommends these guidelines be followed whenever possible.

Lubrication Requirements

Weatherford pumps are shipped without oil in the crankcase and must be filled prior to startup. Suitable oils for normal operation are high quality, non-detergent gear oils with a viscosity that meets ISO-VG68. Viscosity is recommended to be 61.2~74.8 cSt @ 40C. Oils should include rust and oxidation inhibitors such as Texaco Regal R&O are preferred. The following is a chart for ISO-VG68.

Viscosity Value	cSt	Temperature
Min. Permissible	10	95ºC
Min. Optimum	16	78ºC
Opt. Bearing Life	25	65ºC
Max. Optimum	36	55ºC
Max. Permissible	1000	2ºC

The T270 pump has a nominal oil capacity of 19 gallons and is supplied with an oil level sight-gauge instead of a dipstick, the proper level of oil is at the center of the gauge when in operation.Recommended lube oil pressure is 20 - 40 PSI. Fill pump by removing Top Cover Plate (item #115). Drain Cradle Plug is located at center on bottom of the pump. (See diagram below)

The oil should be drained and flushed after the first 250 hours of operation. After the initial change, the oil should be changed every 1,500 hours of operation or 4 months of service, whichever comes first. If the oil becomes contaminated or dirty, it should be changed immediately even if the recommended service interval has not been reached.

Once in service, the oil temperature should be monitored periodically. The normal operating temperature depends on the pressure, speed, and ambient temperature, but is normally not above 150°F. The oil temperature should never exceed 175°F. If it does, shut down immediately to prevent serious damage the pump power end.

Your T270 has been supplied with a piston lubrication system, no other lubrication or greasing is required. Consult Weatherford or your pump provider for details about the proper operation of the piston lubrication system.

Startup Checklist

Following is a simple checklist to review before starting the pump. Due to the wide range of possible systems configurations and operation requirements, it is not intended to be comprehensive or cover all possible issues:

1. Oil is clean and at the proper level
2. Shaft and cradle cover guards are in place
3. A relief valve is installed at the pump discharge and properly setup
4. A pressure gauge or transducer is installed at the pump discharge, and all personnel have been advised not to exceed the maximum operating pressure of the pump
5. Insure stuffing box adjusting nuts are secure but not over tight
6. All personnel are clear of moving parts and the discharge piping system is prepared to receive fluid under pressure
7. Inlet valves are open to the pump, and booster pumps are turned on (if applicable)
8. Pump input shaft is rotating in the proper direction

Note, if at all possible, allow the pump to start, reach operating speed and circulate the oil, before any discharge pressure is applied. Starting the pump under load, or, puts extra strain on the pump and cause a great deal of wear. A by-pass valve is often used in this situation to allow fluid to bypass back to the suction tank until during this startup procedure. Starting the pump under load also puts an extra strain on drive components and increases the starting torque required.

Once the pump has been running, insure that the power end oil has not overheated. The maximum oil temperature in most services is about 150°F, and it should never be allowed to exceed 175°F.

Operation

Once the pump is in operation, the only adjustment normally required is to the packing. On standard pumps with manually adjustable packing, leakage should be monitored periodically and adjusted as necessary to maintain a leakage rate of between 5-30 drips per minute from each cylinder. It is especially important to check the leakage rate and adjust the packing on the initial startup, and each time the packing is replaced. Packing will require frequent adjustment until it "seats" after 24-48 hours of operation under pressure.

Spring loaded packing is non-adjustable and does not require any maintenance to compensate for wear. Once the leakage rate exceeds 60 drops per minute, it is usually necessary to replace the packing and/or plungers.

On manually adjustable stuffing boxes, packing is adjusted by turning the adjusting nut clockwise to tighten the packing and reduce the leakage rate, or turning counter clockwise to loosen the packing and allow the packing to run cooler, although usually accompanied by an increased rate of packing leakage. In all cases, turn the adjusting nut no more than 1/8 of a turn at each adjustment interval. Allow 10 minutes between adjustments to allow the packing to seat and new leakage rate to stabilize.

Take care not to over-tighten the packing when adjusting. After adjustment, check to make sure the outside of the stuffing box is not getting hot, which can be a sign that the packing is too tight and generating excessive heat. At some point during the end of the usable life of the packing, it will not be possible to reduce leakage rate even with additional turns on the adjusting nut, and at this point it is time to replace the packing and/or plungers.

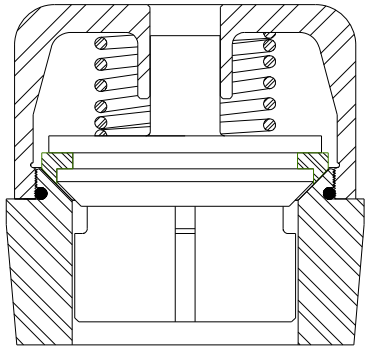
Note that operation of the pump with improperly adjusted packing can result in premature failures of both the plungers and packing.

Some pumps may be equipped with an optional lantern ring and lubricant injection port in the stuffing box. If your pump is equipped with this arrangement, injection of a suitable lubricant, such as a Rock Drill Oil, can prolong the normal service life of packing and plungers. If you are unsure of how to setup a packing lubrication system, consult your Weatherford representative for more details.

Valve Assemblies

The suction and discharge valve for the model T270 are installed and removed through the top and front access port. The drawing below shows the suction and discharge valve assembly (six per pump). On some models, the suction valve may be smaller than the discharge valve both valves can be removed through the top access cover.

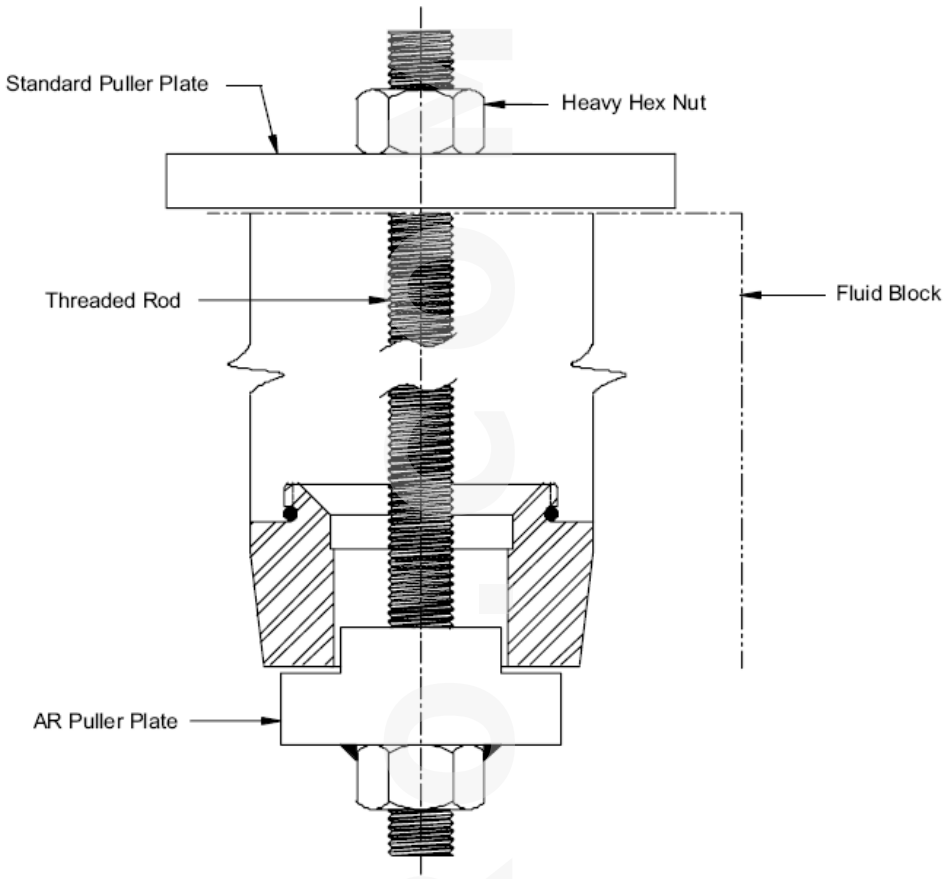
The standard valve tools furnished with the pump include removal tools for the standard disk type valves and the abrasive resistance valves, or “poppet” valves shown in the drawing below may require additional pulling hardware. See the diagram on the following page for the pulling arrangement.



ARN type suction and discharge valve assembly

Valve Disassembly

The extra valve pulling hardware for disassembly of the abrasive resistant valve seats includes a 30” long, 1-1/4” NC all-thread rod; a heavy duty hex nut; a 4-1/4” diameter puller plate. After removing the valve cage body, place the puller plate under the valve seat and tighten the hex nut until the seat pops loose. See diagram below.



Packing & Plunger Replacement Procedure

Packing and/or plungers require periodic replacement as a result of normal operational wear. Packing and/or plunger replacement is required when the packing leakage rate exceeds an acceptable limit. If your pump is equipped with manually adjustable packing, first attempt to adjust the packing to see if the leakage rate can be reduced before changing out packing.

Follow the steps listed below to replace packing or plungers in Weatherford T270 pumps. Illustrations represent typical packing arrangements; however the construction details of your specific pump may vary slightly. Refer to your Parts List for specific construction details on your pump.

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Replacing Piston Cup Seals and Liners

Pistons should be replaced whenever leakage increases to the point it becomes a steady stream, not individual drops. For maximum uptime between service, Weatherford always recommends that users replace all three pistons when service is required, not just the one that shows signs of leakage.

- Pump several gallons of clean water through the pump before service to remove the majority of mud or polymer from the fluid end components.
- Bleed of all pressure inside pump fluid end. Shut valve on inlet piping if provided to prevent flow of liquid into the pump during service.
- Remove cradle cover to expose the pistons and cylinder liners. If a liner wash system is installed on your pump, remove any piping or nozzles that might interfere with removal of the piston cylinders.
- Use a socket wrench to remove the front valve cover plate hex nuts , and then remove the front valve cover plate.
- Slowly rotate the pump crankshaft at least one complete revolution until one piston is fully forward in its cylinder/liner. Remove the piston rod clamp & nuts (not shown) from the intermediate rod. Rotate the pump crankshaft till the intermediate rod is fully back (towards the power end of the pump). This will provide working clearance for the removal of the piston seal assembly.
- First by hand, pull the piston rod and piston seal assembly back through the cylinder/liner, in the direction towards the power end. If the piston rod and piston seal assembly back out easily, remove the assemblies to a workbench for inspection and repair. If the piston rod and piston assembly can not be removed by hand, remove the piston hub nut from the piston seal assembly and back out the piston rod by hand or Insert a wooden dowel rod (or pipe with padded contact edge) through the front valve cover plate port and with a mallet and tap the piston rod through the cylinder/liner until it can be removed from the back of the cylinder/liner by hand. Then, Insert a wooden dowel rod (or pipe with padded contact edge) through the front valve cover plate port and with a mallet tap the piston seal assembly till the piston seal assembly falls out through the back of the cylinder/liner. Repeat this procedure to remove the remaining two piston assemblies.
- Inspect the ID of the cylinder/liner and make sure the surface is smooth and free of grooves or other defects caused by excessive wear. Replace the liner square seal and cylinder/liners if necessary. Take care to REPLACE all 3 piston seal assemblies and 3 piston rod seals, and any other components that are worn or damaged from excessive wear, to insure maximum service life of pump and pump expendables.
- When old and worn parts have been replaced, re-assemble new piston seal assembly onto the piston rod and tighten down the piston hub nut. Press piston rod w/ piston seal assembly into the loose cylinder/liner. Lubricating the piston seal will make the installation process easier.

Trouble-Shooting Guide

One of the most important parts of maintaining a pump is to establish a regular maintenance program. Programs will vary for each application due to the duty cycle, fluid, and pump selection.

Weatherford pumps are designed to minimize maintenance requirements and provide extended operational life between service intervals. All pumps will eventually require maintenance, and the following guide is intended to assist the operator in determining the likely cause of a variety of potential problems. Weatherford experts are also available to assist you in diagnosing a problem and getting you back in operation as soon as possible.

1. No flow from pump
    - Tank is empty
    - Inlet valve is closed
    - Inlet strainer is clogged with debris
    - Crankshaft is not turning
2. Insufficient pressure from pump ONLY
    - Pump speed is too slow
    - Relief valve improperly adjusted and bypassing fluid
    - Oversize or worn nozzle on equipment
    - Worn pump valves
    - Excessive leakage from pump seals
3. Insufficient flow from pump ONLY
    - Pump speed is too slow
    - Relief valve improperly adjusted and bypassing fluid
    - Worn pump valves
    - Excessive leakage from pump seals
4. Insufficient flow OR0 pressure AND rough operation
    - Valve Problem:
        - Pump valve stuck in open or closed position
        - Valve assembly is damaged or unseated
        - Valve seat is washed out
        - All pump cylinders not primed
        - Inlet strainer is clogged with debris
        - Excessive gas in liquid due to:
        - Air leaks in suction line or fittings
        - High spots in suction line that allow formation of gas pockets
        - Vortex in tank near inlet pipe opening

Pump is cavitating due to:
Insufficient NPSHa (tank head or charge pressure)
Fluid viscosity is too high
Inlet line is too long and/or too small diameter

5. Pump runs rough, knocks, or vibrates ONLY
   Valve assembly is damaged or has unseated
   Pump is cavitating due to:
   Insufficient NPSHa (tank head or charge pressure)
   Inlet line is too long and/or too small diameter
   Worn or damaged power frame components
   Pump is sucking air across worn seals on inlet stroke
6. Suction pressure fluctuates rapidly
   Pump is cavitating
   Fluid leaking from pump
   Packing is wearing and about to fail
   Fluid cylinder bolts are not properly tightened
   Fluid cylinder o-rings (or gaskets) are damaged
7. Short packing seal life
   High abrasive particle content in fluid
   Wrong style or type of packing for service
   Plunger is damaged
   Pump is cavitating (cylinders may run hot)
   Poor quality water used
   Pump is allowed to run dry for extended periods of time
8. Short valve life
   High abrasive particle content in fluid
   Valve assemblies only partially rebuilt during previous service
   Valve assemblies damaged do to improper installation techniques
   Poor quality water used
   Pump is cavitating
9. Cracked fluid cylinder
   Discharge pressure too high
   Pump exposed to freezing conditions without properly draining
   Hydraulic shock resulting from cavitation or entrained air
   Discharge valve is stuck shut
   Material or manufacturing defect
10. Crankshaft jerks or starts and stops rotation
    V-belts are loose and slipping (if equipped)
    Hydraulic system relief valve is chattering (if equipped):
    Attempting to operate pump at excessively high discharge pressure
    Discharge line is blocked or partially obstructed

11. Power end overheats (in excess of 175° F)
    - Discharge pressure too high
    - Low oil level
    - Improper oil viscosity
    - Contaminated power end oil
    - Pump speed is too fast
    - Pump is running backwards
    - Couplings are misaligned
    - V-belt drive tension is too tight
    - Pump located too close to heat source
    - Worn or damaged power frame bearings
12. Broken crankshaft or connecting rod
    - Pump exposed to freezing conditions without proper draining
    - Discharge pressure too high
    - Suction pressure too high
    - Hydraulic shock due to cavitation
    - Material or manufacturing defect
13. Broken Fluid End Bolts
    - Bolt or nut not properly torqued
    - Discharge pressure too high
    - Excessive piping loads on fluid end
14. Power end oil is contaminated
    - Pump has been operated with failed packing for extended periods of time
    - Use of high-pressure wash wand to clean near breather or oil seal areas
    - Deflector shields are missing or damaged
    - Crosshead extension oil seals are damaged or improperly installed

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