Operation & Maintenance Manual

Model T270-6.00 IN

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

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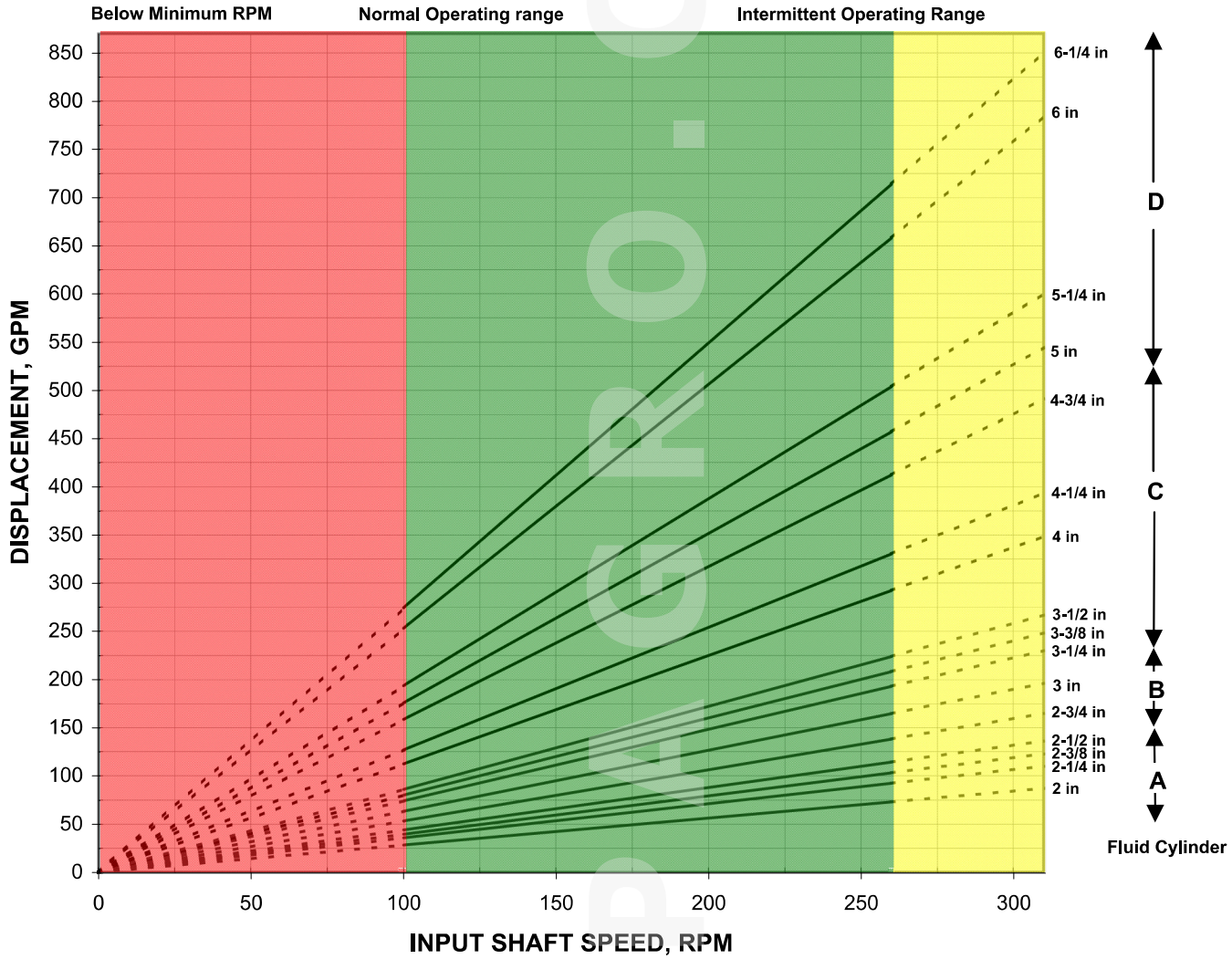
Model T270

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.

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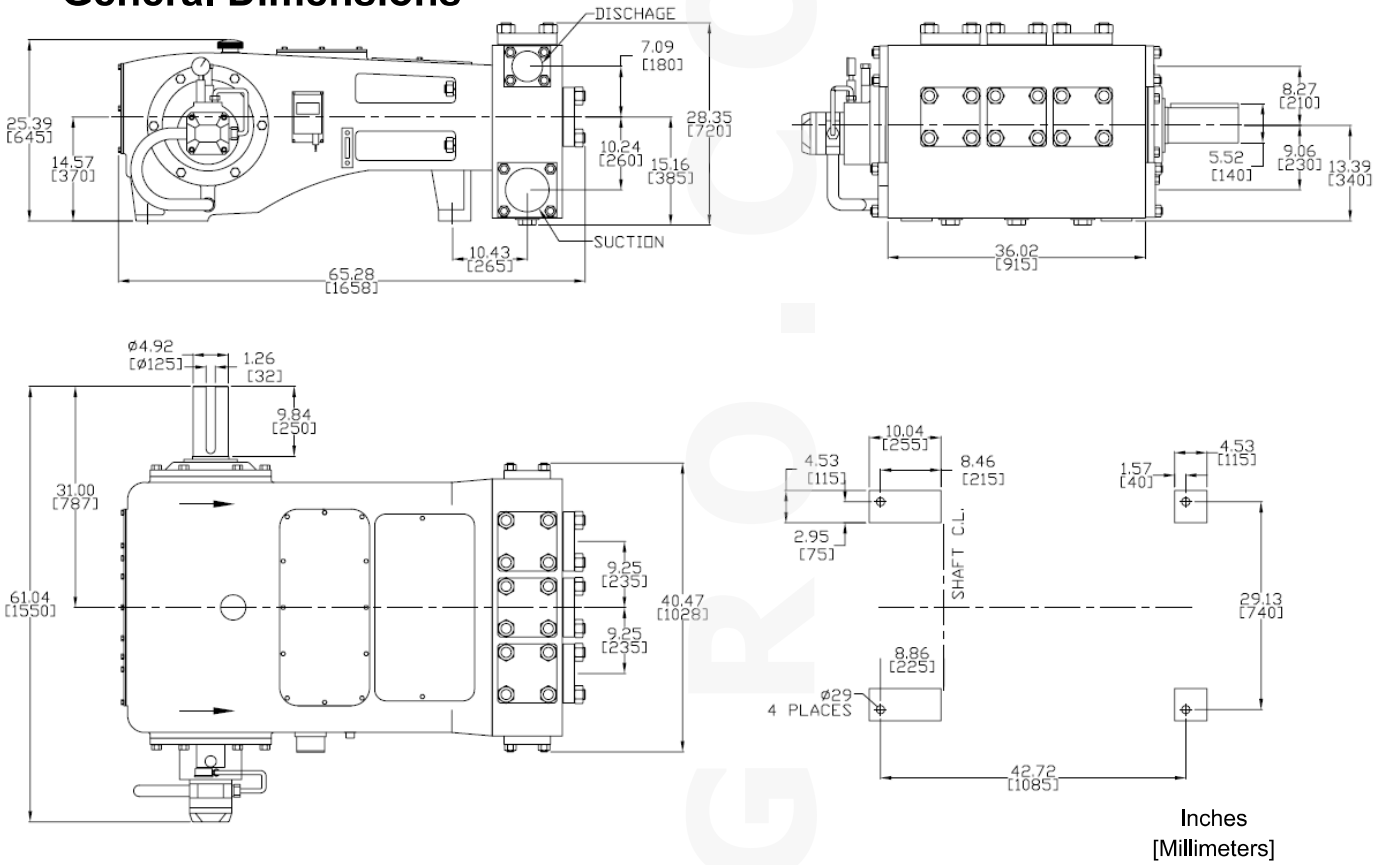
Model T270

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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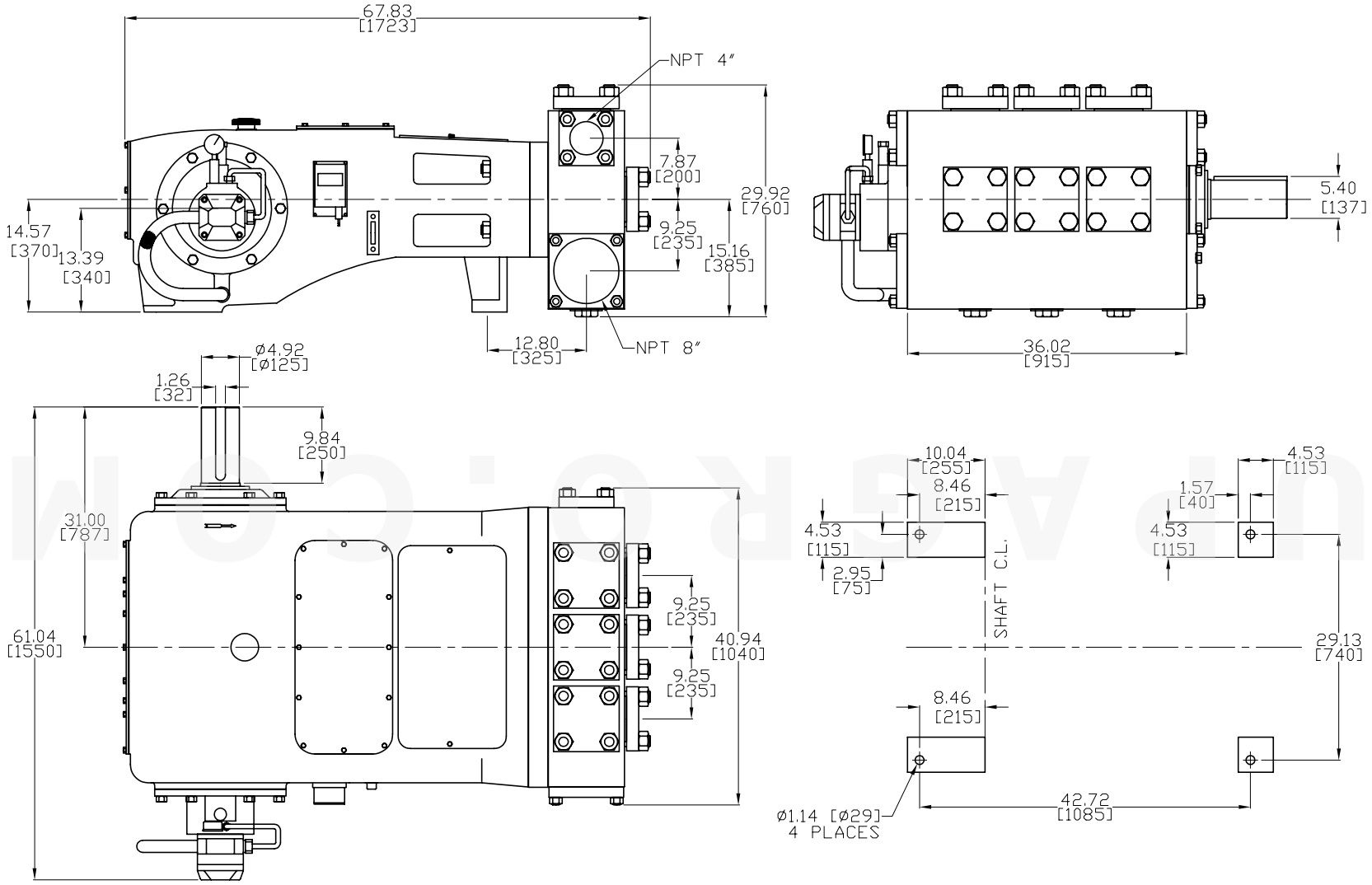


DESCRIPTION	Rev Chg By / Rev Date	Rev Chk By / Check Date

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]

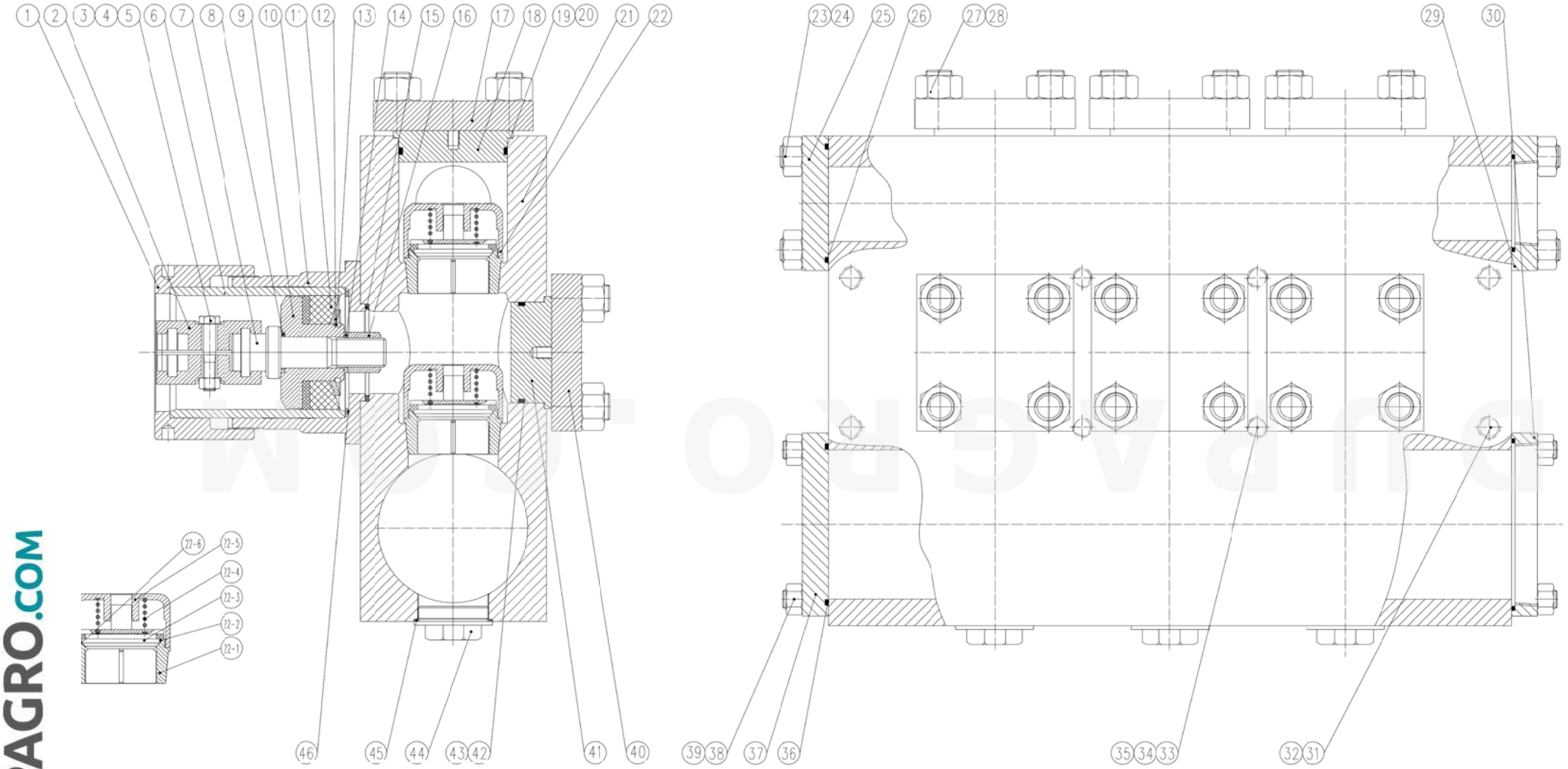
DRAWN BY: BINGO FU	DATE 16/AUG/06	DESIGNED BY:	DATE
CHECKED BY: ERICA XUE	DATE 16/AUG/06	APPROVED BY:	DATE
MATERIAL SPEC:		OTHER SPECS 1:	OTHER SPECS 2:
MATERIAL HEAT TREAT SPEC:		SCALE:	SHT# 1 OF 3

Weatherford

TITLE

GENERAL ARRANGEMENT T270

FOLDER NO.	PART NO.	REV:
	202891	A



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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]

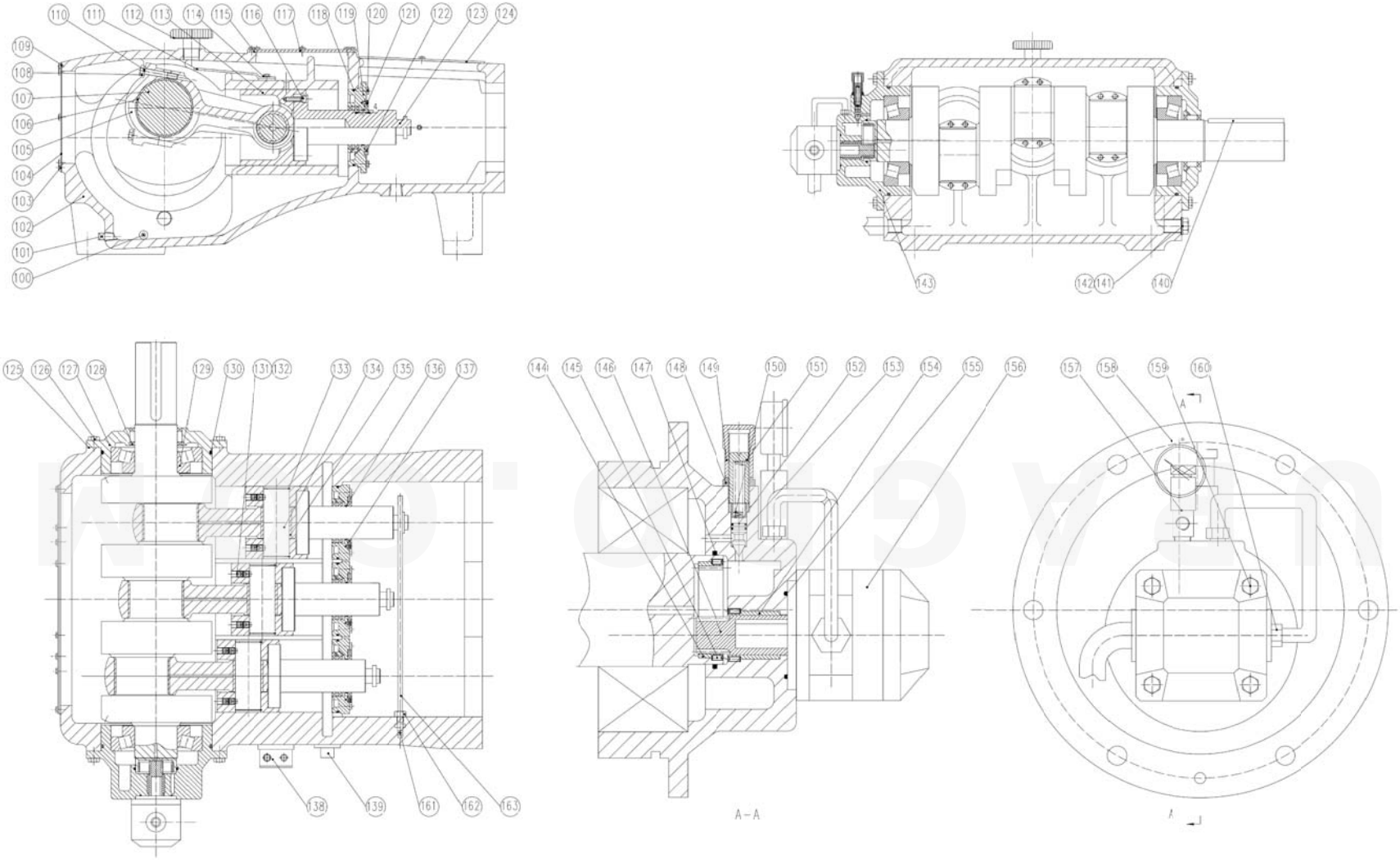
DRAWN BY: BINGO FU	DATE 16/AUG/06	DESIGNED BY:	DATE
CHECKED BY: ERICA XUE	DATE 16/AUG/06	APPROVED BY:	DATE
MATERIAL SPEC:		OTHER SPECS 1:	OTHER SPECS 2:
MATERIAL HEAT TREAT SPEC:		SCALE:	SHT# 2 OF 3

Weatherford

TITLE

FLUID END DETAIL VIEW T270, 6" PISTON

FOLDER NO.	PART NO.	REV:
	202891	A



REVISIONS		
DESCRIPTION	Rev Chg By Rev Date	Rev Chk By Check Date

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 16/AUG/06	DESIGNED BY:	DATE
CHECKED BY: ERICA XUE	DATE 16/AUG/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 T270, 6" PISTON

FOLDER NO.	PART NO.	REV:
	202891	A

PARTS LIST

Weatherford T270 - 6.00IN Pump

Part Number 202891

Revision Level A

Item	Part Number	Parts Description	Material	Torque Ft-Lb	Quantity
1	887652	NUT, RETAINING, LINER, WFT T270 PISTON PUMP	-	-	3
2	896502	SET, CLAMP HALVES (2 MATCH-MARKED), PISTON ROD, T270 PUMP	-	-	6
3	1126067	NUT, HEX, M20	-	-	3
4	1174487	BOLT, HEX, M20 X 100, NI COATED	-	133	3
5	1158940	WASHER, LOCK M20	-	-	3
6	823930	LINER, 6.00IN, WFT T270	-	-	3
7	710689	PISTON ROD, 2350HDD PISTON PUMP, FLUID END	-	-	3
8	823933	ASSEMBLY, PISTON, 6", WFT T270	-	-	3
8-1	710698	SEAL, PISTON, 55 X 45 X 5.5, 2350 HDD WFT, RUBBER	-	-	3
8-2	1174531	HUB, PISTON, 6.00IN, WFT T270	-	-	3
8-3	1150094	RUBBER, SEAL, PISTON, T270 WFT	-	-	3
8-4	1132252	PLATE, RETAINING, PISTON, T270 WFT	-	-	3
8-5	1150095	RING, SNAP, 5.25IN PISTON, T270 WFT	-	-	3
9	887653	HOLDER, LINER, WFT T270 PISTON PUMP, 177MM LENGTH	-	-	3
10	876651	WASHER, PISTON ROD, FLAT FOR T270 WEATHERFORD PUMP	-	-	3
11	782600	GASKET, 130 X 115 X 6 MM	-	-	3
12	1132256	NUT, LOCKING, PISTON ROD, WFT T270	-	-	3
13	710877	TOP VALVE COVER PLATE, 2350HDD PISTON PUMP, FLUID END	-	-	3
14	715447	TOP VALVE COVER CAP, 2350HDD PISTON PUMP, FLUID END	-	-	3
15	1127139	ORING, 145 X 5.7, HNBR	-	-	3
16	900267	GASKET, 145 X 135 X 2	-	-	3
17	710871	FLUID CYLINDER, CARBON STEEL, 2350HDD PISTON PUMP, FLUID END	-	-	1
18	782486	ASSEMBLY, 2350 SUCT/DISC VALVE	-	-	6
18-1	821694	SEAT, ARN108-1 SUCT. & DISC. VALVE	-	-	6
18-2	821695	SEAL, ARN108-2 ELASTOMER VALVE	-	-	6
18-3	821702	BODY, ARN108-3 WING GUIDED VALVE	-	-	6
18-4	821705	SPRING, ARN108-4 SUCT & DISC VALVE	-	-	6
18-5	821706	CAGE, ARN108-5 SUCT & DISC VALVE	-	-	6
18-6	1136602	ORING, 115 X 3.1, HNBR	-	-	6
19	912232	NUT, HEX, M30, NI COATED	-	376	12
20	1174488	STUD, M30 X 65, NI COATED	-	-	8
21	715452	DISCHARGE FLANGE COVER PLATE, 2350HDD PISTON PUMP	-	-	1
22	788843	O-RING, 130 X 5.7 MM	-	-	2
23	951703	NUT, HEX, M36-3, NICKLE COATED	-	-	24
24	1134961	STUD, M36 X 80	-	733	24
25	715469	DISCHARGE FLANGE, 2350HDD PISTON PUMP	-	-	1
26	715470	SUCTION FLANGE, 2350HDD PISTON PUMP	-	-	1
27	1174489	STUD, M30 X 215, NI COATED	-	442	4
28	1126036	WASHER, LOCK, M30	-	-	4
29	1174490	STUD, M27 X 145, NI COATED	-	332	4
30	1138209	NUT, ROUND, M27, NICKEL COATED	-	-	4
31	886544	WASHER, FLAT, M27	-	-	4
32	889648	O-RING, 230 X 5.7 MM	-	-	2
33	715466	SUCTION FLANGE COVER PLATE, 2350HDD PISTON PUMP, FLUID END	-	-	1
34	912237	NUT, HEX, M24, NI COATED	-	-	8
35	912260	STUD, M24 X 60, NI COATED	-	228	8
36	715465	PLATE, COVER, VALVE, FRONT, 2350 HDD WFT	-	-	3
37	715460	COVER, VALVE, FRONT, 2350 HDD WFT, FOR 135 X 5.7 ORING	-	-	3
38	902355	ORING, 135 X 5.7	-	-	3
39	886658	GASKET, 135 X 125 X 2, TEFLON	-	-	3

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Item	Part Number	Parts Description	Material	Torque Ft-Lb	Quantity
40	715468	PLUG, SUCTION MANIFOLD, 2350 HDD WFT	-	-	3
41	760092	GASKET, SUCTION MANIFOLD PLUG, 2350 HDD WFT, TEFLON	-	-	3
42	710746	SEAL, SQUARE, 170 X 158 X 6, RUBBER	-	-	3
100	1114881	ROD, MAGNETIC, POWER END, 2350 HDD WFT	-	-	1
101	202006	PLUG, DRAIN, POWER END, 1.00IN, 2350 HDD WFT	-	-	1
102	710771	FRAME, POWER, 2350 HDD WFT	-	-	1
103	885599	BOLT, HEX, M10 X 20	-	33	32
104	762070	PLATE, COVER, REAR, POWER END, 2350 HDD WFT	-	-	1
105	710748	ROD, CONNECTING, 2350 HDD WFT	-	-	3
106	762078	BEARING, INSERT, 2350 HDD WFT	-	-	6
107	710740	CRANKSHAFT, 2350 HDD WFT	-	-	1
108	762076	BOLT, CONNECTING ROD, M16 X 105, T270 WFT	-	-	12
109	762072	GASKET, PLATE, COVER, REAR, POWER END, 2350 HDD WFT	-	-	1
110	763328	WASHER, LOCK, M16	-	-	12
111	1132507	TROUGH, OIL, POWER END, 2350 HDD WFT	-	-	2
112	908474	CAP, BREATHER, 2350 HDD WFT	-	-	1
113	762079	CROSSHEAD, 2350 HDD WFT	-	-	3
114	908040	WASHER, FLAT, M10	-	-	4
115	887325	GASKET, PLATE, COVER, REAR, POWER END, 2350 HDD WFT	-	-	1
116	885585	CAPSCREW, SOCKETHEAD, M12 X 40	-	33	18
117	710704	PLATE, COVER, TOP, POWER END, 2350 HDD WFT	-	-	1
118	792186	ORING, 220 X 5.7	-	-	3
119	881591	RETAINER, INTERMEDIATE ROD, INNER, 2350 HDD WFT	-	-	3
120	1132510	BOLT, M12 X 35, SS	-	33	12
121	1132513	SOCKET HEAD, CAPSCREW, M6 X 16	-	-	9
122	881595	RETAINER, INTERMEDIATE ROD, OUTER, 2350 HDD WFT	-	-	3
123	710733	ROD, INTERMEDIATE, 2350 HDD WFT	-	-	3
124	762100	PLATE, COVER, PLUNGER CHAMBER, POWER END, 2350 HDD WFT	-	-	1
125	762104	GASKET, RETAINER, BEARING THROUGH HOUSING, 430 X 340.5, T270 WFT, MYLAR	-	-	2
126	882466	BOLT, HEX, M20 X 50	-	133	12
127	762110	RETAINER, BEARING, THROUGH HOUSING, 2350 HDD WFT	-	-	1
128	341223	SEAL, OIL, 130 X 160 X 15	-	-	2
129	763448	BEARING, CRANKSHAFT, 2350 HDD WFT, 7626	-	-	2
130	763445	ORING, 340 X 8.6	-	-	2
131	1132674	SCREW, SET, M20 X 25	-	-	6
132	1132673	SCREW, SET, M20 X 20	-	-	6
133	755332	RING, SNAP, M80	-	-	6
134	762095	PIN, COROSSHEAD, 2350 HDD WFT	-	-	3
135	762080	BUSHING, CONNECTING ROD, WRIST PIN, 2350, WFT	-	-	3
136	782595	ORING, 105 X 3.1	-	-	3
137	357414	SEAL, OIL, 100 X 125 X 12	-	-	9
138	1132679	SWITCH, PRESSURE, POWER END LUBE, HIGH LOW, 2350 HDD WFT	-	-	1
139	882470	GAUGE, PRESSURE, POWER END LUBE PUMP, 2350 HDD WFT	-	-	1
140	763453	KEY, 32 X 18 X 240, 1045	-	-	1
141	1132517	PLUG, DRAIN, POWER END, M42, 1035	-	-	1
142	1136608	GASKET, 54 X 42.5 X 3, TEFLON	-	-	1
143	826825	RETAINER, BEARING, HOUSING, DIR DRIVE LUBE PUMP, 2350 HDD WFT	-	-	1
144	1132521	GEAR, INNER, POWER FRAME LUBE, 2350 HDD WFT	-	-	1
145	888764	BOLT, HEX, M6 X 16, CLASS 4.8	-	81	8
146	1132522	GEAR, OUTER, POWER FRAME LUBE, 2350 HDD WFT	-	-	1
147	1144546	ORING, 135 X 5.7, VITON	-	-	1
148	891696	NUT, LOCK, PWER END LUBE, 2350 HDD WFT	-	-	1
149	891700	CAP, POWER END LUBE PUMP, 2350 HDD WFT	-	-	1
150	891703	SPRING,POWER END LUBE PUMP, 2350 HDD WFT	-	-	1
151	891701	SCREW, SET, POWER END LUBE, 2350 HDD WFT	-	-	1

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Item	Part Number	Parts Description	Material	Torque Ft-Lb	Quantity
152	891714	POPPET, POWER END LUBE, 2350 HDD WFT	-	-	1
153	1132524	ORING, 18 X 2.4, FLUORINE	-	-	2
154	1132526	BUSHING, SHAFT, POWER END LUBE PUMP, 2350 HDD WFT	-	-	1
155	891718	ORING, 100 X 3.5	-	-	1
156	795992	PUMP, POWER END LUBE, 2350 HDD WFT	-	-	1
157	1132527	FITTING, TEE, POWER END LUBE PUMP, T270 WFT	-	-	1
158	1144218	MANOMETER ASSEMBLY	-	-	1
159	891687	BOLT, HEX, M12 X 25	-	41	4
160	1132685	FITTING, DISCHARGE, CONNECTION, POWER END LUBE PUMP, 2350 HDD WFT	-	-	1
161	885142	FITTING, LINER WASH TUBE, 2350 HDD WFT	-	-	1
162	885143	NUT, HEX, M20	-	-	1
163	885145	TUBE, LINER WASH, 2350 HDD WFT	-	-	1
164	1246489	Flange, cooling pipe, WFT T270, 2Cr13	-	-	1
165	1246491	Assembly, pressure balance, WFT T270, copper	-	-	1
Item	Part Number	Spare Kit Description	Material	Torque Ft-Lb	Quantity
1	821694	SEAT, ARN108-1 SUCT. & DISC. VALVE	-	-	6
2	821705	SPRING, ARN108-4 SUCT & DISC VALVE	-	-	6
3	823933	ASSEMBLY, PISTON, 6", WFT T270	-	-	3
4	710689	PISTON ROD, 2350HDD PISTON PUMP, FLUID END	-	-	3
5	762078	BEARING, INSERT, 2350 HDD WFT	-	-	6
6	357414	SEAL, OIL, 100 X 125 X 12	-	-	9
7	341223	SEAL, OIL, 130 X 160 X 15	-	-	2
8	891718	ORING, 100 X 3.5	-	-	1
9	782595	ORING, 105 X 3.1	-	-	3
10	1136602	ORING, 115 X 3.1, HNBR	-	-	6
11	1144546	ORING, 135 X 5.7, VITON	-	-	1
12	902355	ORING, 135 X 5.7	-	-	3
13	1127139	ORING, 145 X 5.7, HNBR	-	-	3
14	792186	ORING, 220 X 5.7	-	-	3
15	763445	ORING, 340 X 8.6	-	-	2
Item	Part Number	Tool Kit Description	Material	Torque Ft-Lb	Quantity
1	1158921	Hook, short			1
2	1212576	Tool, Rod, adjusting			1
3	1158992	Cylinder, oil 190mm x 38mm x 90mm			1
4	1212578	Tool, Rod, pulling M36 x 380			1
5	1158995	Rod, pulling M36 x 640			1
6	1158919	Tool, valve seat disassembly			1
7	1158918	Rod, pulling for Valve Seat 115mm x 92mm x 35mm			1
8	1198961	NUT			1
9	1158928	Rod, pulling M12 x 700			1
10	1158935	Spanner 16mm x 16mm			1
11	888885	Pump, Oil, Manually Operated, Tool for TW350			1
12	888896	Gun, Oil, Motor, Tool, TW350			1
13	888900	Wrench, Hex, Socket, #4, Tool, TW350			1
14	888899	Wrench, Hex, Socket, #3, Tool, TW350			1
15	1158938	Sleeve, S36			1
16	905645	TOOL, SLEEVE, VALVE SEAT REMOVAL			1
17	1212581	Tool, Wrench, Disassembly			1
18	1212583	Tool, Handle, Sliding			1
19	1158925	Grip, sliding			1
20	1198968	TOOL, SLEEVE, DISASSEMBLY, NUT, 4IN, WFT, T70			1

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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.

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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.

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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.

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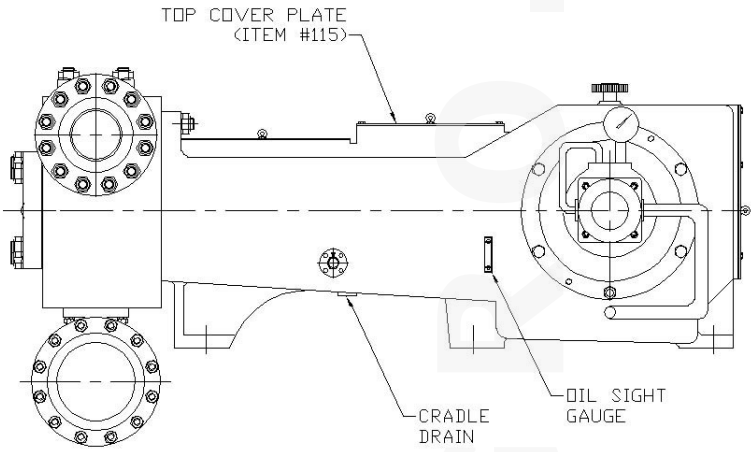
Lubrication Requirements

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	95°C
Min. Optimum	16	78°C
Opt. Bearing Life	25	65°C
Max. Optimum	36	55°C
Max. Permissible	1000	2°C

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.

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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.

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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.

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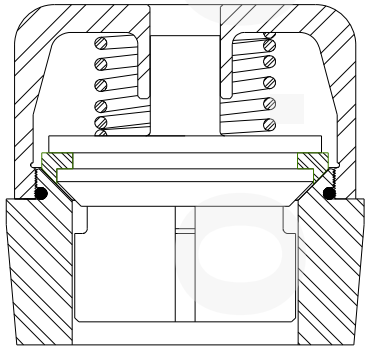
Valve Assemblies

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.

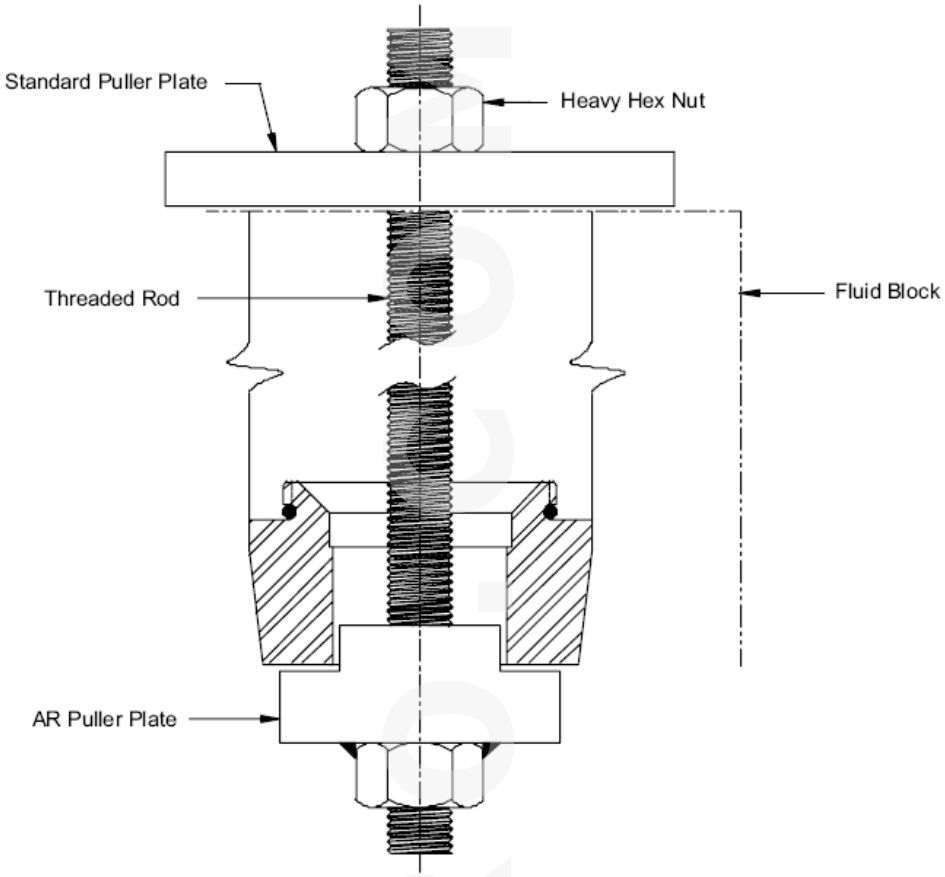
The standard valve tools furnished with the pump include removal tools for the standard disk type valves and the abrasive resistance valves, or “poppet” valves shown in the drawing below may require additional pulling hardware. See the diagram on the following page for the pulling arrangement.



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

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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

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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