



宝鸡市盟泰石油机械有限公司

BAOJI MENGTAI PETROLEUM MACHINERY CO.,LTD

F-500/800/1000 Drilling Pump

Operation & Maintenance Manual

Model: F-500/800/1000 Mud Pump

BAOJI MENGTAI PETROLEUM MACHINERY CO.,LTD

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PREFACE

Thanks for use F series mud pumps.

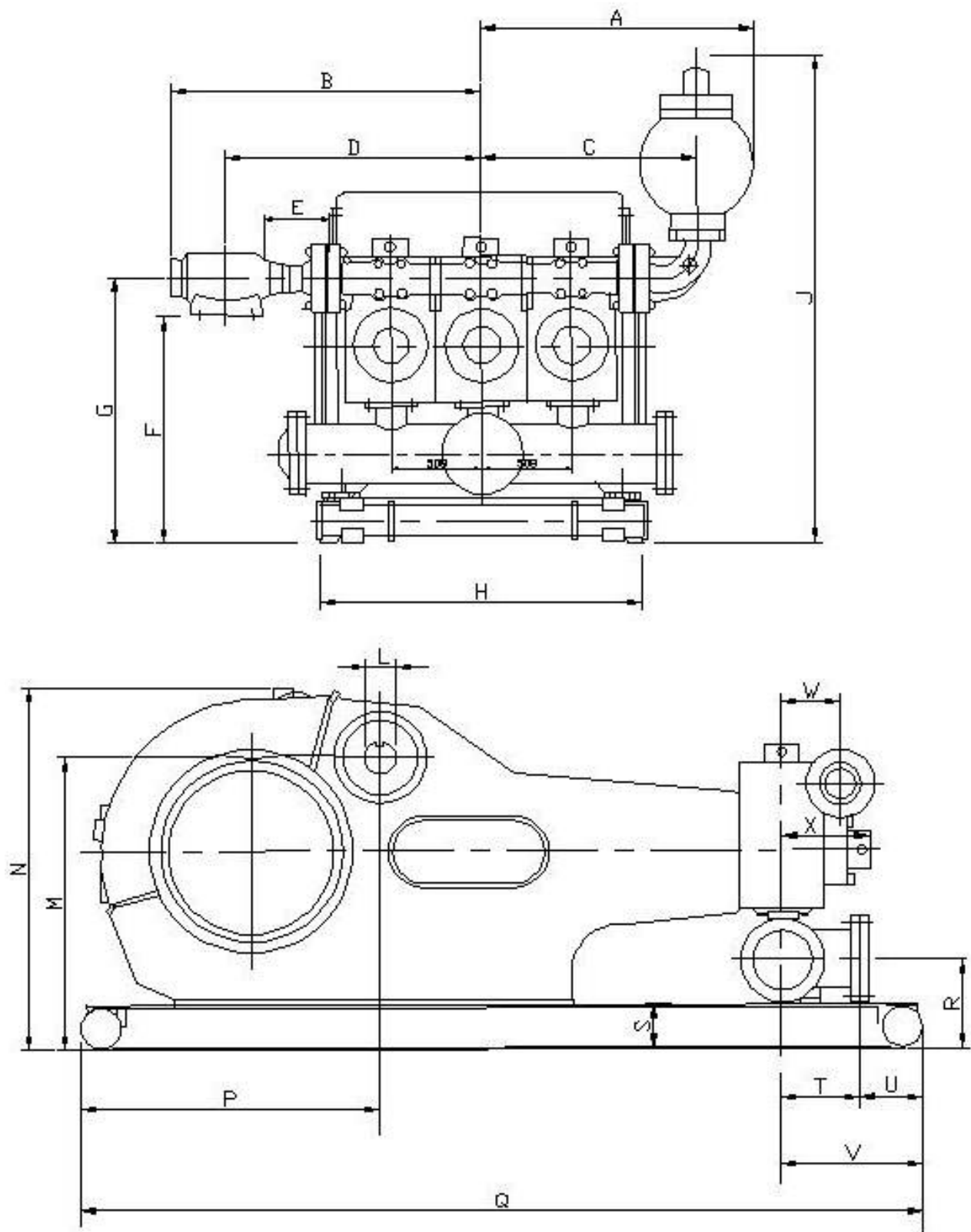
This manual is provided for guidance of those who wish to install, repair , maintain ,or adjust the RL equipment covered herein. This information has been prepared with a basic viewpoint to give accurate and concise data needed to perform minor adjustments as well as major overhauls.

This information is not elementary, as it is intended for operators and servicemen who are familiar with drilling equipment in general. It is neither intended, nor would it be possible in such limited space, to cover every possible condition which may be encountered. Always use good, sound mechanical practices and safety precautions.

All specifications and data are in accordance with engineering designs to in all repairs. Operation and maintenance information on equipment other than RL is taken in part from the various manufacturers' manuals.

Our company reserves the right to discontinue models at any time, or change specifications or design of any model without notice and without incurring any obligation.

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1.1 General dimensions

	F-500	F-800	F-1000
A	1257.5	1489	1489
B	1452	1673	1673
C	990.5	1173	1173
D	1198.5	1375	1375
E	254	340	340
F	940	1144	1144
G	1130	1347	1347
H	1447	1625	1625
J	2197	2571	2571
L(Dia)	139.7	196.85	196.85
(Keyway)	31.75x15.875	50.8x25.4	50.8x25.4
M	1194	1464.5	1464.5
N	1543	1805	1805
P	1305	1703	1703
Q	3658	4267	4267
R	389	487	487
S	254	300	300
T	305	330	330
U	628	364	364
V	933	694	694
W	251	273	273
X		450	450

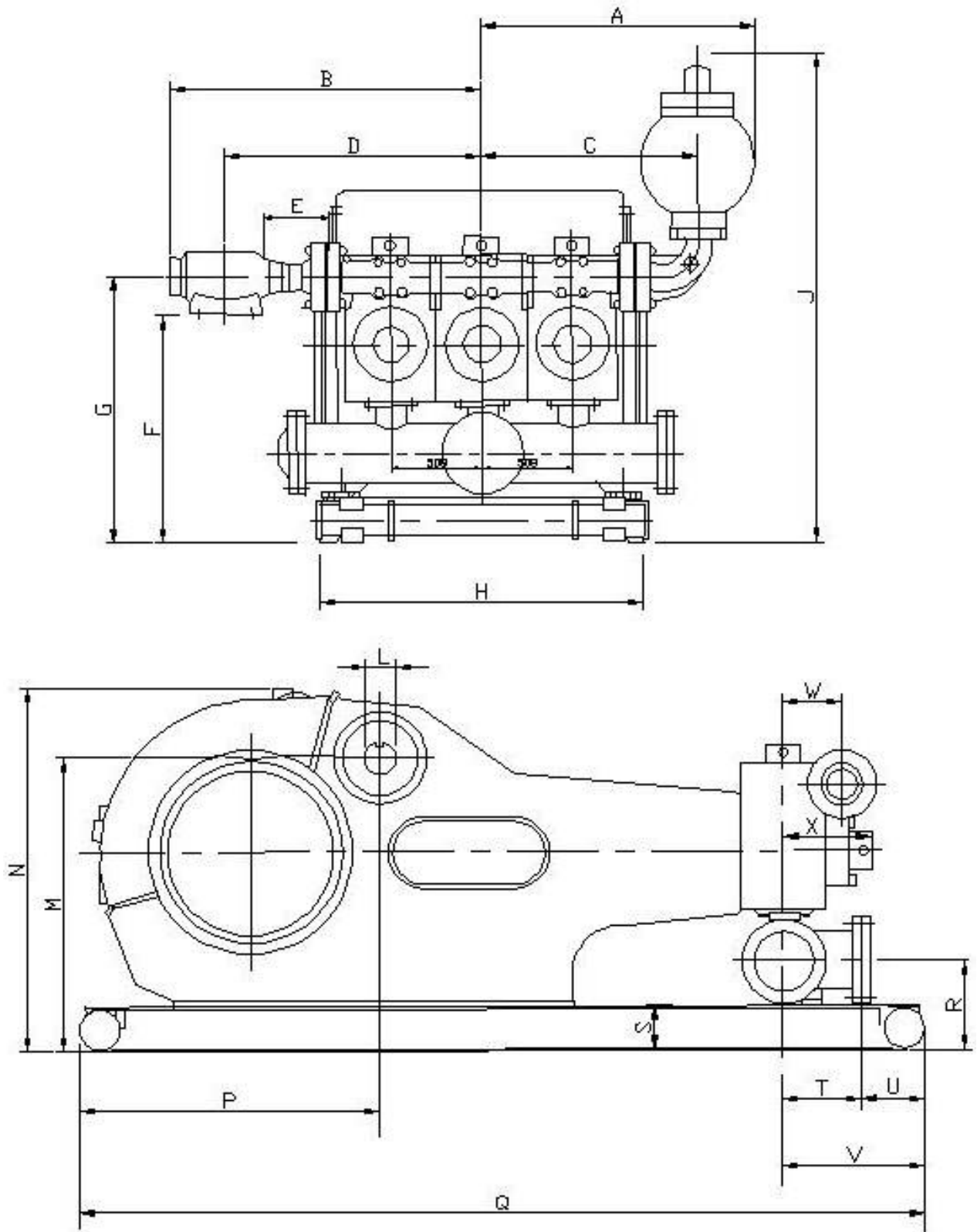


Fig.1

1.2 Specification

Model	F-500	F-800	F-1000
Type	Triplex single acting piston pump	Triplex single acting piston pump	Triplex single acting piston pump
Size,Maximum Bore X Stroke	170X191MM (6.6930"X7.5")	170X254MM (6.6930"X10")	170X254MM (6.6930"X10")
Speed Rating	165SPM	140SPM	140SPM
House Power Rating	370KW(500HP)	735KW(1000HP)	735KW(1000)HP
Type Geae	Herringbone	Herringbone	Herringbone
Gear Rating	4.286:1	4.207:1	4.207:1
Lubrication	Pressure & Splash	Pressure & Splash	Pressure & Splash
Suction Inlet	8" Flang (203mm Approx)	12" Flang (305mm Approx)	12" Flang (305mm Approx)
Discharge Outlet	103mm,35mpa 4"Flang,1500ANSI 5000API	130mm,35mpa 5"Flang,1500ANSI 5000API	130mm,35mpa 5"Flang,1500ANSI 5000API
Pinion Shaft Size	139.7mm(5 1/2")	196.9mm(7 3/4")	196.9mm(7 3/4")
Keys	31.75x31.75mm (1 1/4"x1 1/4")	50.8x50.8mm (2"x2")	50.8x50.8mm (2"x2")
Valve Pots	Valve Over Valve API 5#	Valve Over Valve API 6#	Valve Over Valve API 6#
Valve Cover	Screw Type	Screw Type	Screw Type
Cylinder Head	Screw Type	Screw Type	Screw Type
Liner Lock	Screw Type,Metal-Tometal	Screw Type,Metal-Tometal	Screw Type,Metal-Tometal
Weights kg	9770kg	18790kg	18790kg

a) Performance Data

Performance Data F-500 Pump

STROKE PER MINUTE	HORSEPOWER		LINER SIZE(mm) AND PRESSURE RATING (Mpa.kgf/cm ²)							
	RATING		170	160	150	140	130	120	110	100
	Mpa		9.2	10.4	11.8	13.6	15.8	18.6	22.1	26.2
	KW	HP	VOLUME-LITERS PER SECOND							
175	392	530	37.8	33.5	29.4	25.7	22.1	18.8	15.8	13.0
165	370	500	35.6	31.6	27.7	24.2	20.8	17.7	14.9	12.3
150	336	455	32.7	28.7	25.2	22.0	18.9	16.1	13.5	11.2
140	314	424	30.2	26.8	23.5	20.5	17.6	15.0	12.6	10.4
120	269	364	25.9	23.0	20.1	17.6	15.1	12.9	10.8	8.9
100	224	303	21.6	19.2	16.8	14.7	12.6	10.7	9.0	7.5
1			0.216	0.192	0.168	0.147	0.126	0.107	0.09	0.075

Performance Data F-800 Pump

STROKE PER MINUTE	HORSEPOWER RATING Mpa		LINER SIZE(mm) AND PRESSURE RATING (Mpa.kgf/cm ²)				
			φ 170	φ 160	φ 150	φ 140	φ 130
	KW	HP	VOLUME-LITERS PER SECOND				
150	621	845	43.26	38.30	33.62	29.33	25.25
140	590	800	40.39	35.76	31.39	27.39	23.58
130	549	743	37.52	33.22	29.16	25.45	21.91
120	517	700	35.34	31.29	27.47	23.97	20.63
110	464	629	31.75	28.11	24.67	21.53	18.53
100	422	571	28.84	25.53	22.41	19.56	16.84

Performance Data F-1000 Pump

STROK E PER MINUT E	HORSEPOWE R Mpa		LINER SIZE(mm) AND PRESSURE RATING (Mpa.kgf/cm ²)				
			170	160	150	140	130
			16.46	18.59	21.18	24.27	28.19
	KW	HP	VOLUME-LITERS PER SECOND				
150	791	1070	43.26	38.30	33.62	29.33	25.25
140	738	1000	40.39	35.76	31.39	27.39	23.58
130	686	929	37.52	33.22	29.16	25.45	21.91
120	646	875	35.34	31.29	27.47	23.97	20.63
110	580	786	31.75	28.11	24.67	21.53	18.53
100	527	714	28.84	25.53	22.41	19.56	16.84
1			0.2884	0.2553	0.2241	0.1956	0.1684

7) INSTALLATION OF NEW PUMP

Your RLF-series pumps has been completely assembled and test operated under pressure before being shipped to the field. Unless otherwise instructed, the lubrication is drained form the power end. Before putting the pump into service, the following precautions and operations must be performed or checked.

In order to prevent personal injury during the performance of any maintenance or inspection procedures, this equipment **MUST BE SHUT DOWN AND NOT OPERATION**, and all safety devices on prime movers, drives, etc., **MUST BE IN THE SAFE POSITION**.

2.1 Setting The Pump

The skid under the pumps manufactured by our company is suitable for most any type of installation . It should be noted , however, that the box type construction of the power frame has high resistance to bending but relatively less resistance against twist. Therefore, the support under the pump must be level and adequate to support the weight and operating forces exerted by the pump.

2.2 Land Installations

In land installations, a mat of 76mmx 305mm boards laid side crosswise to the pump skids for the entire length, or at a minimum, at the points indicated in Fig.2, is usually sufficient. The boards should be a few feet wider than the width of the pump skid runners. Wet or marshy locations may require a more stable foundation.

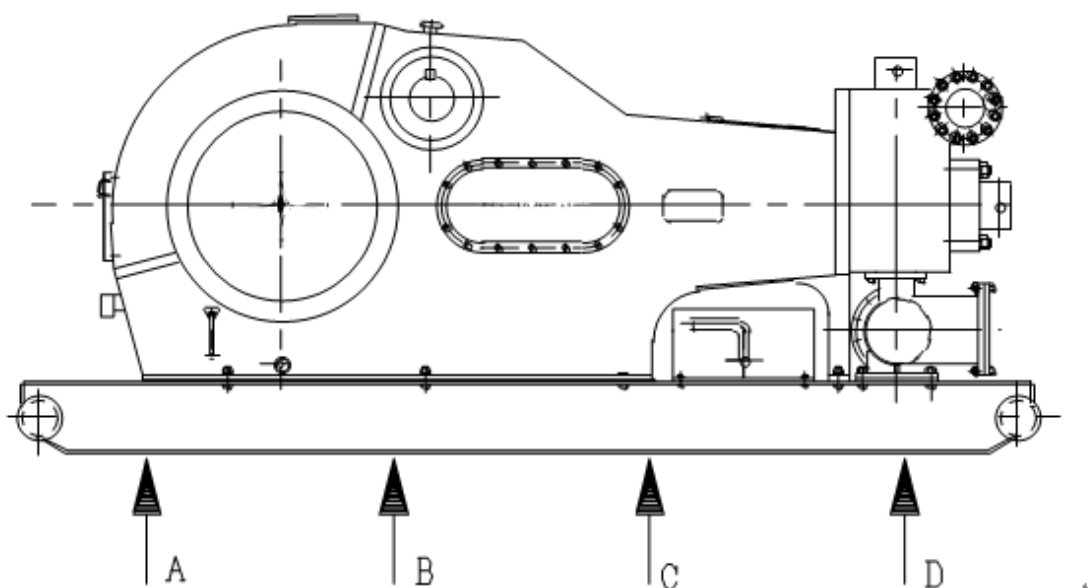


Fig. 2

2.3 Permanent Installations

On permanent installations such as barge, platform, structural base, or concrete slab, where pump skids are bolted down, it is essential that the skids be properly shimmed to prevent possibility of twisting or distorting the power frame. The pump skids must sit solid on all shim points with bolts loose.

On barge installations, the pump skids are generally bolted down to T-beams running parallel and in line with the pump skids. Install shims at points shown in Fig. 2 and 3 and observe caution of proper shimming to prevent twist or distortion.

The shims on all installations should extend the full width of the skid beam flanges and have a minimum length of 12" (305mm).

On installations where the power unit or electric motor is mounted integrally with the pump skids, the preferred installation would be to set the pump package on the T-beam skids and provide retention blocks rather than bolts to hold it in place. This will allow the pump to "float" and minimize the transfer of barge deck or platform distortion into the frame.

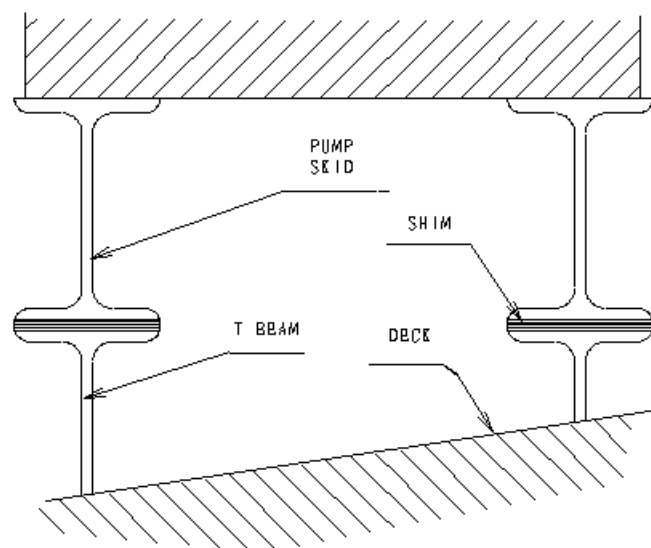


Fig. 3

a) Installation of The Drive

The drive between the mud pumps and the power source, whether V-belts or multiwidth chains, should be installed with the greatest care to assure maximum operating life with minimum of unexpected shutdowns due to drive failures.

When installing the drive sheave or sprocket, make sure all grease or rust preventative is removed from the shaft and the bore of the drive. Remove all burrs or rough spots from the shaft, key, and keyway. Fit key to the keyways in both the shaft and drive and install key into shaft keyway.

Coat pinion shaft with a light coating of anti-adhesive compound or light oil and install the drive sheave or sprocket hub. Tighten hub bolts as indicated below:

When a wrench or length of pipe is used to increase leverage in tightening draw-up bolts, it is imperative to adhere to the wrench torque values given in the chart below. This adherence is important, because in mounting the hub, the tightening force on the bolts is multiplied many times by the wedging action of the tapered surface. This action compresses the hub for a snug fit on the shaft. If the bolt-tightening forces are extreme, bursting pressure is created in the hub of the mounted pulley, this pressure may cause the pulley to crack. The hub bolts should always be tightened alternately and progressively.

Pump Type	QD Hub *	Wrench Torque N.m	Wrench Length mm	Wrench pull N
F-500	N	406	760	534
F-800G	P	813	900	900
F-1000	W	813	900	900

***Refer To Eaton Transmission Products Catalog For QD Busing Size**

i. V-Belt Drives

8) Check sheave groove condition

Before installing the v-belts, check sheave grooves for wear, worn or rounded grooves will destroy V-belts rapidly. The side walls must be straight. In sheave grooves must be free of dirt, rust or other extrusions, which could damage the V-belts.

9) check sheave alignment

The final alignment of the V-belt sheaves should be checked after the V-belts have been installed and adjusted to their operating tension. If the sides of the sheaves are of equal distance from the centerline 1 of the groove, check alignment by stretching TWO strings (fish line or piano wire preferred) along one side of the two sheaves, one above and one below the centerline, and moving one of the sheaves until the strings touch four points on the side of the sheave rims. This will determine that the centerline of the drives are parallel and the faces of the sheaves are square.

10) Adjust V-belt for previous tension

Adjust the belt tension by moving the sheaves apart until all of the sag has just been eliminated from the tight side of the belt and some of the belts on the slack side. Then increase the centers approximately 13mm(1/2”) for each 2540mm(100”) Center distance. Example: On 3180mm(150”) center, move pump and additional 19.5mm(3/4”)

DO NOT OBTAIN BELT TENSION BY PICKING UP END OF PUMP AND ALLOWING BELTS TO TIGHTEN UNDER WEIGHT OF PUMP AS END IS BEING LOWERED TO THE GROUND.

i. Chain Drives

a) Installation

Proper installation and maintenance of the sprocket and chain drives are essential if good service life is to be obtained. Since many factors, such as chain width, center distances, speeds, and loads must be considered when determining the allowable tolerance for sprocket alignment; no good “rule of thumb” can be applied. The chain alignment must simply be held as nearly perfect as possible. A more precise alignment can be made by stretching two steel wires (piano wire) along one face of the two sprockets, one above and one below the centerline, and moving one of the sprockets until the wires touch at four points. This will determine that the centerlines of the drives are parallel and the faces of the sprockets are square.

b) Drive chain lubrication

The pump drive chain lubrication system on the majority of RLF series of pumps is an

independent system having its own oil pump, reservoir and drive. Fill chain case to the indicated level with a non-detergent oil as follows:

Ambient temperature above 32° F(0°C) SAE-30

Ambient temperature below 32° F(0°C) SAE-20

For temperatures below 0°F, consult a reputable lubrication dealer for recommendations.

REFER TO GENERAL LUBRICATION BULLETIN for approved lubricants and additional specifications. If any discrepancy exists between the recommendations in this manual and the General Lubrication Bulletin, those in the Lubrication Bulletin will take precedence.

Since this is an independent system, it will require the same maintenance or service attention employed on any other piece of machinery, including:

- 11) Daily check of oil level.
- 12) Daily check on condition of oil.
- 13) Frequent Check on oil pressure. (5-15psi) (0.352-1.06kg.cm²).
- 14) Volume of oil being applied to chain.
- 15) Condition of nozzles in spray tube.
- 16) Condition of oil pump drive (V-belts or chain)

NOTE:

1. Oil pressure may be adjusted with the pressure relief adjusting screw on the rear of the pump housing.

2. Pressure drops may also indicate suction and discharge filter screens need cleaning.

a) Suction System Requirements

Individual installation conditions will dictate the design of the suction system. The suction of the RLF-series pumps must have a positive head (pressure) for satisfactory performance. The optimum suction manifold pressure is 20-30 psi (0.14-0.21Mpa) for maximum volumetric efficiency and expendable parts life. This head pressure is best supplied by a 5x6 centrifugal pump with 40h.p 1150 rpm electric motor. This type of drive requires a device to automatically start and stop the centrifugal pump motor simultaneously with the triplex pump. On DC electric powered a signal can usually be supplied from the DC control panel to energize a magnetic starter when the mud pump clutch air line will provide a set of contacts for energizing the magnetic starter when clutch is engaged.

The charging pump can also be belt driven from the triplex pinion shaft charging type of drive is not as efficient at slow speeds with viscous fluids.

Under some conditions the RLF-Series pumps may be operated without a charging pump, provided the fluid level in mud pits is higher than the top of the liners, fluid being pumped is low viscosity and suction line must be short, straight and of at least the same diameter as suction manifold inlet.

The suction lines should be piped with valve arrangements so the charging pump

can be by-passed so operation can be continued in event of charging pump failure or for maintenance. Operation without a charging pump can be improved by replacing the suction valve spring with a weaker spring.

Suction dampener is a very effective aid for complete filling of the liners and dampening pulsations in the suction line, which results in a smoother flow in the discharge line.

CAUTION:

Do not pipe the return line from the shear relief valve back into the suction system as a relief valve operation will cause a sudden pressure rise in the system vastly greater than the system pressure ratings, resulting in damage to manifold, suction desurger and centrifugal pump.

b) Power End

Your pump has been completely assembled and test operated before being shipped to the field. Unless otherwise instructed, the lubrication is drained from the power end, and the expendables are removed from the fluid end for storage protection. Before operating the pump, the following must be performed or checked.

i. Power End Lubrication

Before installing lubricant, open inspection door in cover and check oil reservoir for possible accumulation of condensation ,etc, and drain and flush by removing the pipe plugs on each side of the pump. Refer Item 2.Fig.7.

Add the proper type and quantity of lubrication in the power end. Refer to lubrication plate on pump frame for type and quantity required.

Recheck oil level after pump has operated for a period of 15 minutes. Shut pump down and allow approximately five minutes for the oil level to equalize, Check at oil level gauge, (Item 1, Fig 7).It is usually necessary for a few more gallons of oil to be added due to a certain amount being retained in the crosshead area and frame cavities.

ii. Installation of Crosshead Extension Rods and Diaphragm Stuffing Box Seals. for F-500 pump

With reference to Figure 4A,remove the diaphragm stuffing box and plate(1) and rotate pump so that crosshead is at the front of the stroke, Thoroughly clean the front of the crosshead and the face of the crosshead extension rod. Insert alignment boss on crosshead extension rod into the crosshead bore and tighten the retainer bolts (2) to the following torque, 67.5-81 N.m (50-60ft.lbs) Safety wire bolt heads.

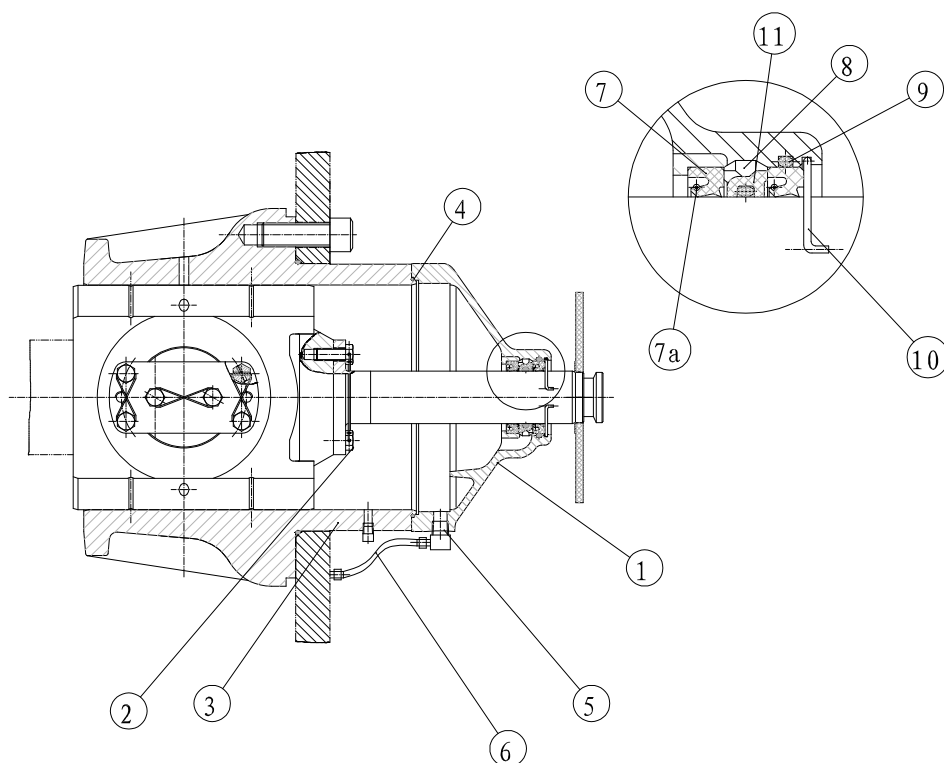


Fig. 4A

Thoroughly clean face of crosshead guide (3) and diaphragm stuffing box(1). Install O-ring seal(4). Fit connection(5) on diaphragm stuffing box(1), Install diaphragm stuffing box and tighten cap screws to the following torque:

16-19 N.m (12-14 ft.1bs)

Fit oil pipe(6)

The diaphragm stuffing box packing assembly consists of two double lip Oil Seal(7)a Oil Seal ring(8) an O-ring(9) a lock spring(10), and a O-ring(1) Install the assembly as follows:

- 17) Remove pressure spring(7a) from double lip oil seal(7) and place seal in the inner(power end) position on the crosshead extension rod, with lip toward power end, Replace the pressure spring in the seal lip and slide the seal into position in the stuffing box.
- 18) Insert the Oil Seal ring(8) and O-ring(11) over rod and slide it into stuffing box bore.
- 19) Insert the O-ring(9) in groove in stuffing box bore.
- 20) Install the lock spring(10).

Note: CAUTION must be exercised to assure the pressure spring(7a) does not slip out of the groove in the oil seal lip, as severe scoring of the crosshead extension rod can occur. Coat extension rod with a light oil to facilitate installation of the packing assembly.

- i. Installation of Crosshead Extension Rods and Diaphragm Stuffing Box Seals For F-800, F-1000.

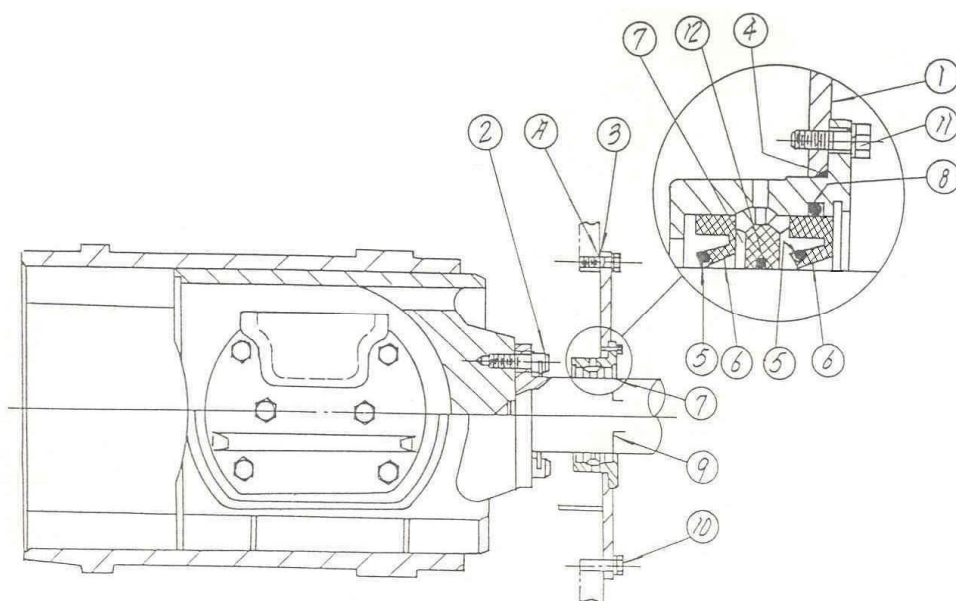


Fig.4B

With reference to Fig.4B, remove the diaphragm stuffing box and plate(1) and rotate pump so that crosshead is at the front of the stroke. Thoroughly clean the front of the crosshead and the face of the crosshead extension rod. Insert alignment boss on crosshead extension rod into the crosshead bore and tighten the retainer bolts(2) to the following torque. Safety wire bolt heads.

F-800 475~500 N.m (350~370ft.1bs)

F-1000 475~500 N.m (350~370ft.1bs)

Thoroughly clean face of power frame and diaphragm stuffing box plate at position "A". Install gasket(3) and cap screws(10). Tighten cap screws as follows:

F-800 16~24 N.m (12~18 ft.1bs)

F-1000 16~24 N.m (12~18 ft.1bs)

Clean bore and face of diaphragm stuffing box plate. Clean OD and flange of diaphragm stuffing box. Coat OD of diaphragm stuffing box with light oil and install O-ring seal (4). Inset diaphragm stuffing box in plate bore and tighten cap screws to the following torque:

F-800 16~24 N.m (12~18 ft.1bs)

F-1000 16~24 N.m (12~18 ft.1bs)

The diaphragm stuffing box packing assembly consists of two double lip oil seal(6), a oil seal ring(7), a O-ring(12) O-ring(8) and a lock spring(9). Install the assembly as follows:

- 21) Remove left pressure spring(5) from double lip oil seal(6) and place seal in the inner (power end) position on the crosshead extension rod, with lip toward power end. Replace the pressure spring in the seal lip and slide the seal into position in

the stuffing box.

SEE NOTE BELOW

- 22) Install the O-ring(12) into Oil Seal ring(7). Insert O-ring(12) and oil seal ring(7) over rod and slide it into stuffing box bore.
- 23) Install the O-ring(8) in groove in stuffing box bore.
- 24) Remove right pressure spring(5) from double lip oil seal(6) and place seal in the outer position on the crosshead extension rod with main lip toward power end. Replace the pressure spring in the seal lip and slide the seal into position in the stuffing box.

SEE NOTE BELOW

CAUTION: The double lip seal can be used in the inner, or power end, power end, position to replace the single lip seal, but DO NOT use the single lip seal in the outer position.

- 25) Install the lock spring(9)

NOTE: CAUTION must be taken to assure the pressure spring(5) does not slip out of the groove in the oil seal lip, as severe scoring of the crosshead extension rod can occur. Coat extension rod with a light oil to facilitate installation of the packing assembly.

a) Piston And Liner Cooling System

Proper attention must be paid at all times to assure adequate cooling fluid is being applied to the piston and liner assembly. Stoppage of the cooling fluid will result in almost instant failure of the piston rubbers and possibly extensive damage to the liner bore.

Stationary spray type have been used on RLF-series pumps Ref. Fig 5. It consists of a fixture (1), a pipe (2) and a spray nozzle (3), which applies cooling fluid in the form of a spray to the piston and liner area. Adjust cooling water supply to the manifold so that a spray approximately 305mm long is being discharged from each spray nozzle. Inspect spray nozzle operation very often making sure the nozzle is pointed directly at the piston.

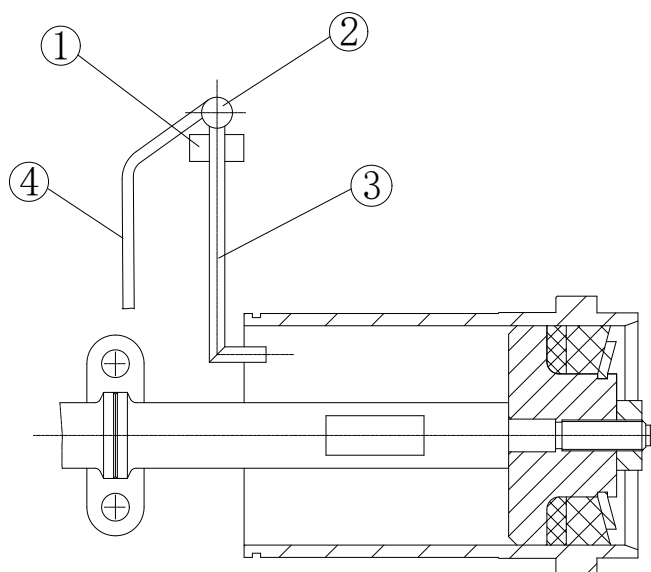


Fig. 5

(1) Fixing frame (2) Steel pipe (3) Spray Nozzle (4) Soft pipe

Cooling fluid be transfused from pump (Item 3 Fig .6) and Water tank (Item 5. Fig. 6) to the manifold on the frame. Adjust regulating valve (Item 4 Fig .6) to apply as much water as possible to the liners without splashing back on the crosshead extension rods and diaphragm stuffing box plate. 40L (10-gallons) per minute per liner is the preferred flow rate. If water is allowed to splash on the crosshead extension rods, some of the water will work back into the power end to contaminate the lubrication oil.

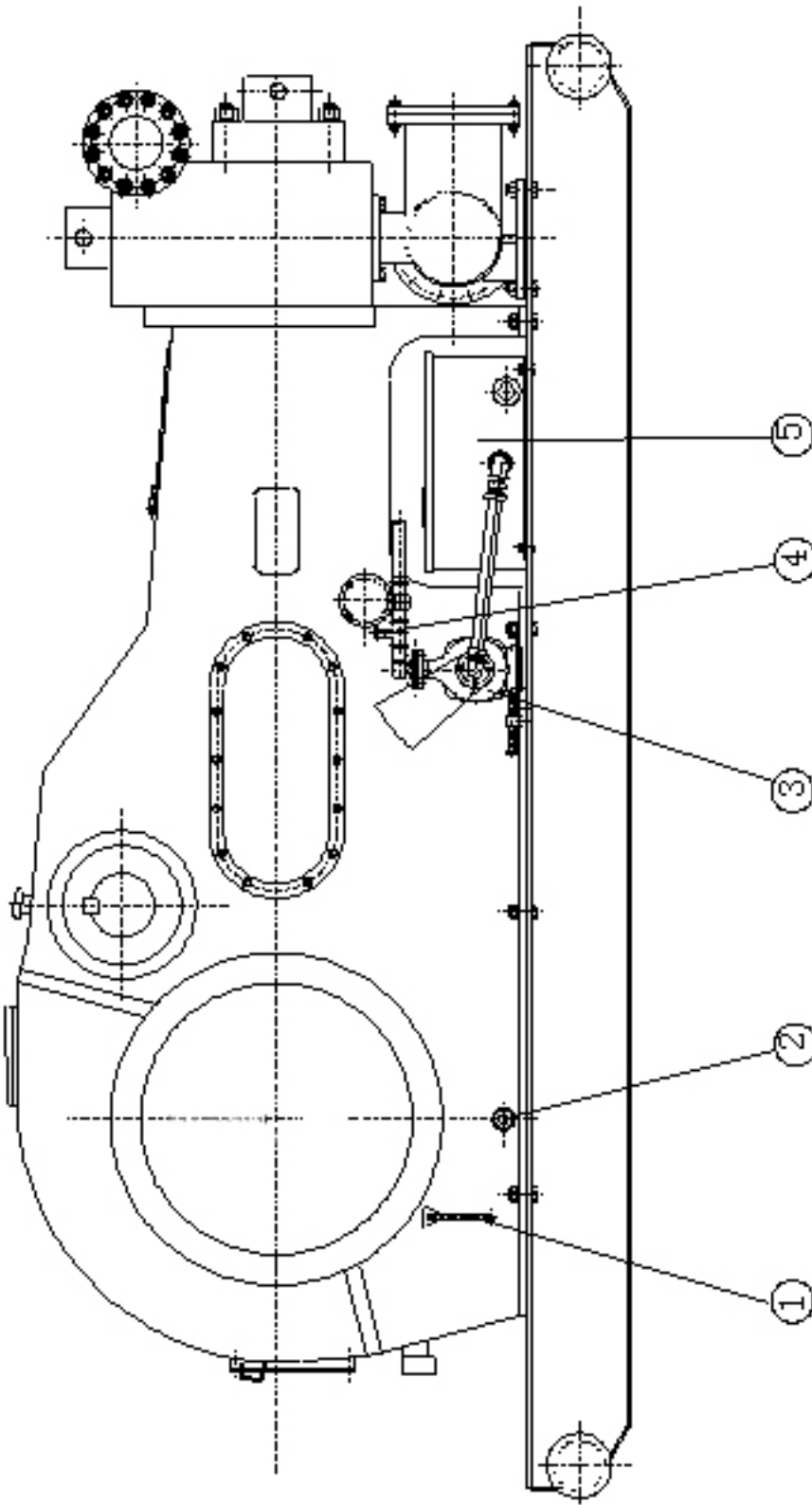


Fig. 6

(1)Oil level indicator (2)Plug (3)Spray pump (4)Regulating valve (5)Water tank

The cooling fluid is returned from the crosshead extension rod compartment to the setting chamber, and as the fluid overflows through the filter screen between the two sections of the tank, the solids are allowed to settle out. The filter screen will catch much of the foreign material floating in the fluid. With reference to Fig .7

Check condition of the cooling fluid at frequent intervals and CLEAN and FLUSH reservoir as required. Contaminated fluid will cause premature liner and piston wear from abrasion or stoppage of the spray nozzle or spray tube.

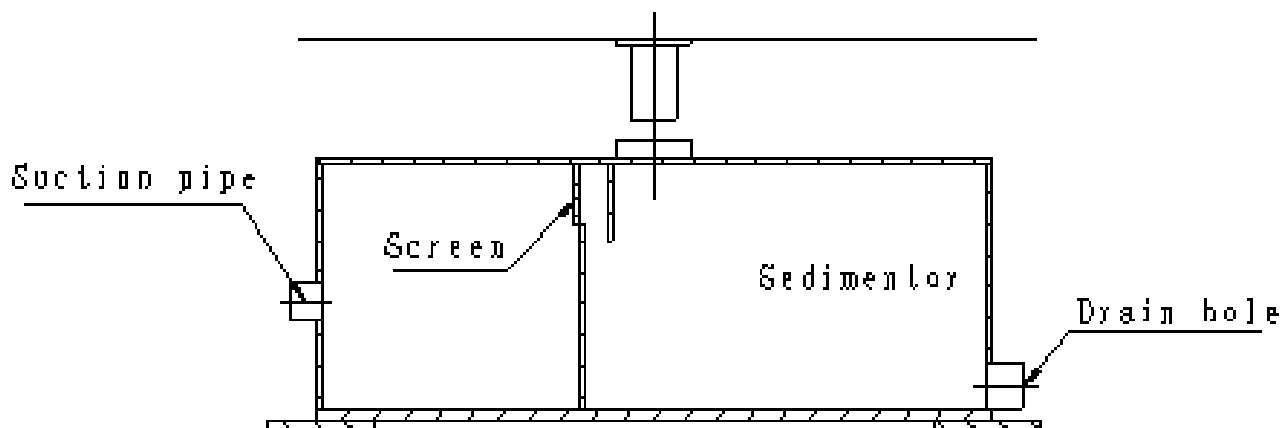


Fig. 7

2.8 Fluid End Assembly

2.8.1 Valves and Seats

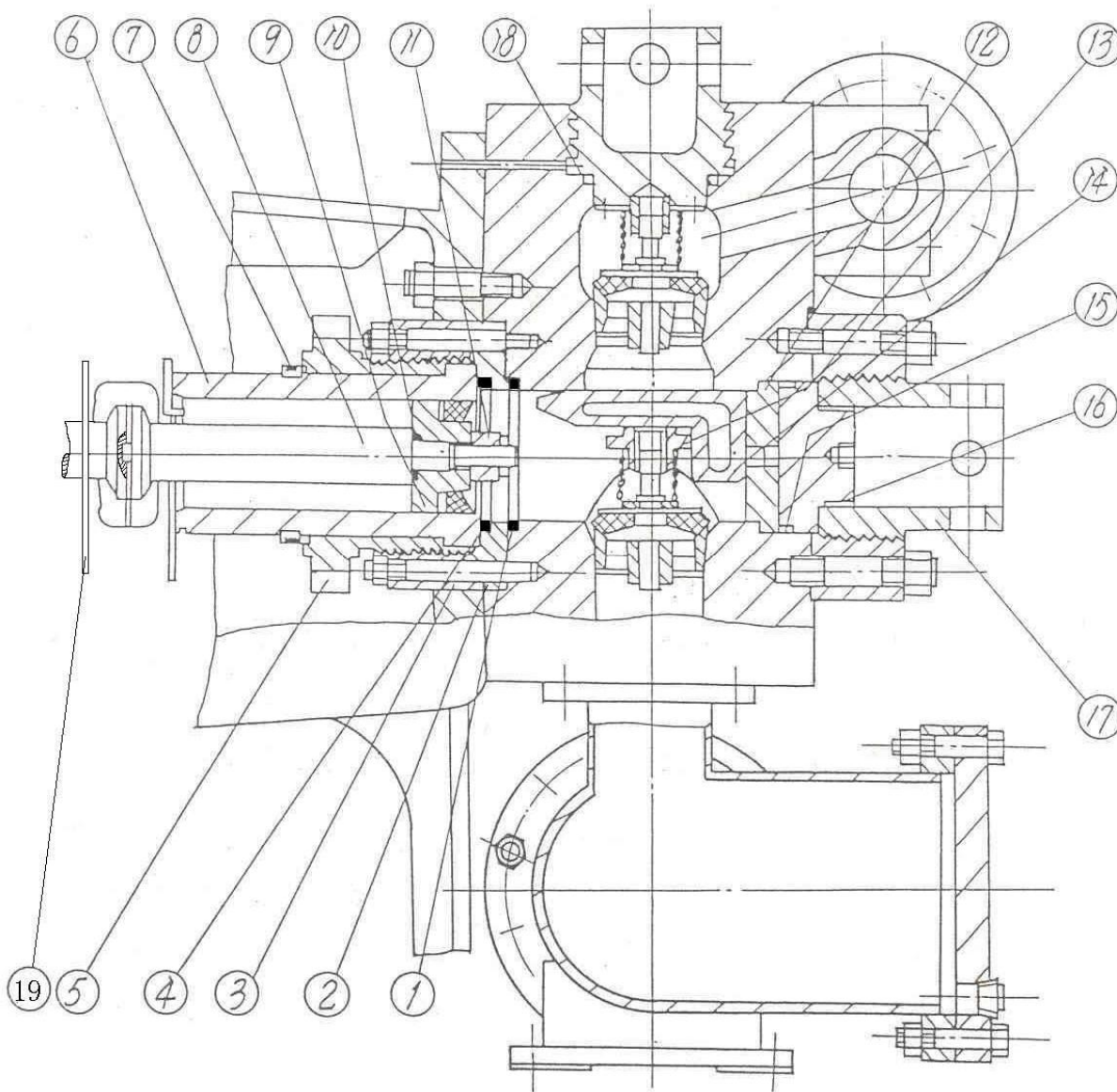
Remove all three discharge valve pot covers (1), and the three cylinder heads (2) and plugs (10), and thoroughly clean all machined surfaces in the fluid end with a good cleaning solvent.

Make sure all valve seat bores are VERY CLEAN AND DRY (free of dirt, grease, anti-rust compound, etc) and remove all burrs or nicks with a fine emery cloth, using circular motion around seat surfaces.

THOROUGHLY CLEAN AND DRY the valve seats and install suction and discharge valve seats into the valve pot bores. Drive seats firmly into place with a bar and hammer . Install valves and springs and the other parts.

2.8.2 Install fluid baffle (11) fig 8.8A on end of crosshead extension rod.

F-500, F-800G, F-1000 ASSEMBLY OF FLUID END PARTS



A cross-section through the fluid end for F-500, F-800G, and F-1000 is shown in Fig.8. With reference to Fig 8, clean and assemble the fluid end parts in the following manner:

Liners

Inspect liner bore again to make sure it is clean and free of foreign particles to assure metal contact between the liner and fluid end. Foreign particles can cause the liner to make up in a "cocked" position resulting in premature wear on liners and pistons.

Apply a light coat of grease or oil to the liner bore of the fluid end. A heavy coat of grease will cause a hydrostatic lock which will prevent the liner from seating in its proper position. Push liner through liner bore until it seats metal to metal against the fluid end shoulder.

2.8.3 Piston Rod

Clean piston and piston rod, making sure they are free of nicks and burrs. Install "O" ring seal (20) in groove in piston head. Slide piston head on rod while observing that "O" ring does not fall out of groove. Tighten piston rod nut(21) to the following torque.

F-500	500 N.m	(368 ft.1bs)
F-800/1000	1625-2165 N.m	(1200-1600ft.1bs)

Coat liner I.D. and piston O.D. with grease. Check ends of piston rod and extension rod to be sure they are clean and free of burrs. Insert piston rod through liner holding piston rod centered at the rear of the liner. Drive the piston into the liner with a driving tool or a piece of hardwood and sledge hammer. Use caution as the piston rod approaches the crosshead extension rod that the dowel on the end of the piston rod is not damaged. The piston rod must be supported and the dowel guided into the pilot bore.

2.8.4 Piston Rod Clamps

The piston rod clamps are machined as one piece and then cut in half, the two pieces are stenciled with matching numbers on each half and have a chain link connecting them together. The two pieces with the same matching numbers should always be kept together as a set.

Tighten cap screws to the following torque values.

F-500	135	N.m	(100 ft.1bs)
F-800	2155	N.m	(160 ft.1bs)
F-1000	215	N.m	(160ft.1bs)

When rods and rod clamps are new a gap in excess of 5.5 mm could be present between the two halves of the clamp. This is satisfactory provided the faces of the rods are seating metal to metal.

As wear occurs, the halves will pull closer together. Clamping action will be lost when a gap no longer exist. At this time clamps must be replaced.

2.8.5 Liner Cage and Lower Valve Guide

Install rear liner seal (5) and push into position against liner shoulder. Ref. Fig.8. Slide liner cage (6) into fluid end, align one hole in the cage with lower valve pot bore. Set lower valve guide(8) over valve stem through lower hole in cage with the wings on the guide turned crosswise to the pump. Press down on the guide, compressing the valve spring(7) until the guide can be rotated 1/4 turn and seat into place underneath the cage. Insert the lower valve guide locking clip(9) through the pad eyes on the lower valve guide and rotate clip to the right to lock the valve guide tight against the OD of the liner cage. It may sometimes be necessary to put more of less bend in the center of the clip to make it retain the guide tightly while the clip handle snaps into position on the right hand side.

2.8.6 Cylinder Head

Insert the outer seal (5) in the fluid end bore against the liner cage. Slide the cylinder head plug(10) into fluid end. Apply a liberal coat of grease to both mating thread surfaces of the cylinder head(2) Screw cylinder head in and tighten with wrench furnished with pump and sledge hammer.

Fluid leakage through the weep hole will indicate a defective seal or loose cylinder head. DO NOT plug weep holes as this can result in severe damage to cylinder head threads, thread rings, etc, in event of a liner seal failure.

2.8.7 Discharge Valve Pot Covers

Install discharge valve pot gasket(3) into bore, and after liberal application of grease or tool joint compound to the gasket and thread area, tighten the discharge valve pot covers into place, using a sledge hammer and bar.

2.8.8 Discharge Manifold all Models

A flange(4" for F-500, 5" for F-800G/1000) connection is provided on the discharge manifold. Remove flange and protect gasket area before welding (customer' option) to the discharge piping. Tighten discharge flange connection bolts to 1625-2165 N.m (1200-1600ft.1bs.) torque. To insure uniform make-up of the ring joint connection, tighten flange bolt nuts in a cross-cross order. If a blind flange is installed on the opposite end of the discharge manifold, check flange bolts and tighten to same specification as noted above.

i. Suction Flange

The suction flange has a standard thread connection (8"NPT for F-500, 10"NPT for F-800,12"NPT for F-1000) and is custom made to match the companion flange on the pump suction manifold. The connection is sealed off by an O-ring seal.

Note: Thoroughly clean O-ring groove and face of flanges before making up connection. Tighten flange bolts to 490~665 N.m.

b) Accessory Manifold

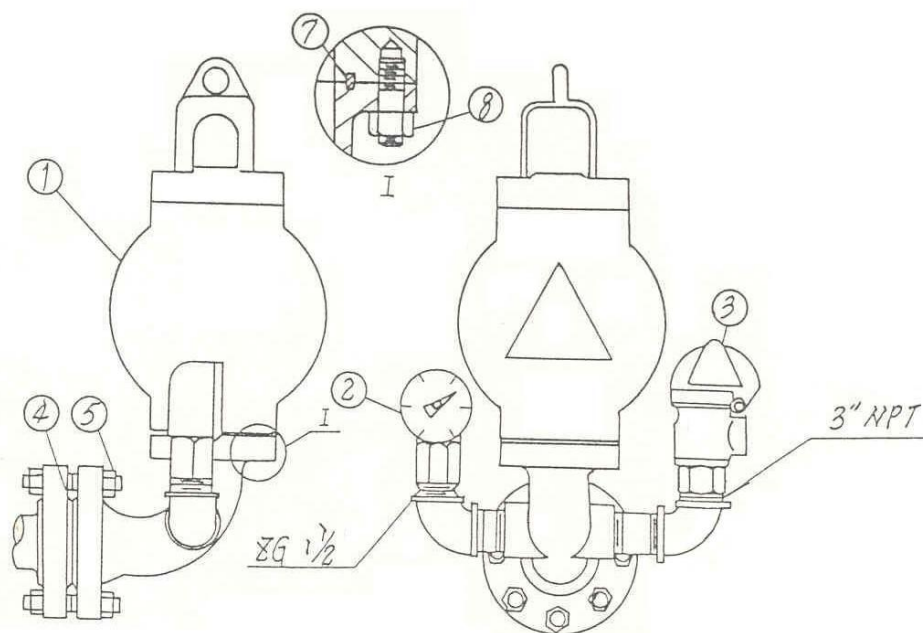


Fig.9

An accessory manifold Fig.9 is available for installation on the discharge manifold opposite the discharge end, The manifold will accommodate a Rongli pulsation dampener (1)(KB-45 for F-500/800G,KB-75 for F-1000 and others) and provides a 3"NPT and a ZG 1-1/2" side outlet connections for such items as a shear relief valve(3) and a pressure gauge (2) when manifold is used, install and maintain as follows:

Thoroughly clean ring joint groove, install ring (4) and tighten the flange bolts(5) to 1625N.m.torque. To assure uniform make-up of the ring joint connection ,tighten the nuts in a cross-cross order.

The shear relief valve(3) is installed on the discharge manifold for the purpose of protecting the pump from excessively high pressure overloads. The relief valve must be installed so that is will be directly exposed to the mud. **DO NOT PUT ANY TYPE OF SHUT OFF VALAE** between the relief valve and the manifold. Pipe the discharge side of the relief valve directly into the mud pit with as few turns in the line as possible. **IT IS NOT RECOMMENDED** for the discharge side of the vale to be piped into the suction line of the pump.

The relief valve setting should be just above the maximum pressure rating of the particular liner size being used. **CHANGE SETTINGS** with each liner size change. **DO NOT USE ALLEN WRENCHES, WELDING RODS.** Or material other than that called for by the manufacturer of the relief valves, as this will affect the rating of the relief valve.

The mounting for KB-75 and KB-45 pulsation dampener(1) is a flange with R-39

ring gasket. Before installing dampener, thoroughly clean ring groove and ring, and after setting dampener into place, tighten the nut(8) to 1020 N.m torque. To insure uniform make-up, tighten nuts in a cross-cross order.

Precharge dampener before starting up pump. Precharge pressure should not be more than 2/3 of the pump discharge pressure, or a maximum of 4.5Mpa.

CAUTION: Use only compressed nitrogen or air. Do not charge with oxygen.

3.LUBRICATION

Proper lubrication of the moving parts in any piece of machinery is the most important single factor affecting its ultimate life. To obtain maximum trouble-free service life from the power end of the AH pump, it is necessary to perform routine maintenance care and inspections to insure the proper amount of CLEAN lubricant is being provided.

The F-Series pumps utilize the controlled flow oil bath splash and pressure system to lubricate the entire power end. The type of pressure system provided in each individual pump will govern the minimum SPM at which the pump can be operated, i.e. pumps which have pressure lubrication only to the main and pinion bearings, have a minimum rated speed of 40 SPM. Pumps in which pressure lubrication is provided to the main, pinion, and crosshead bearings and crosshead compartments may be operated at a minimum speed of 25 SPM. Provided there is a minimum of 0.035Mpa(5PSI) oil pressure.

F-series pump have the total pressure lubrication system, and which can be operated at 25 SPM (at pressure of 0.035Mpa)

CAUTION: The pressure lubricating can be provided with an externally mounted oil pump driven through V-belts or internally mounted oil pump driven from the main gear. When an internally mounted oil pump is used, the direction of rotation of the pinion shaft must be as shown in Fig.10

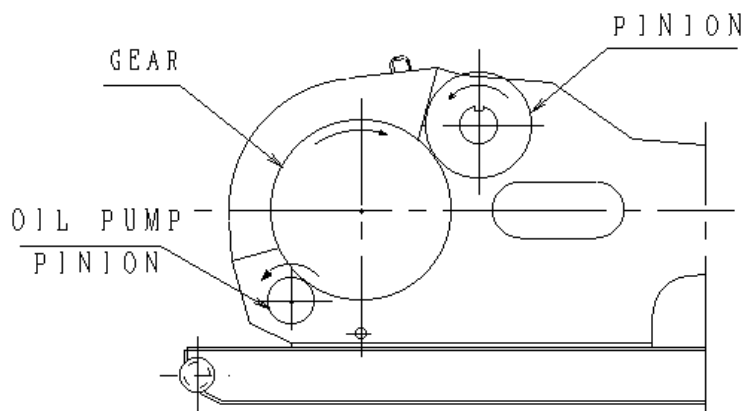


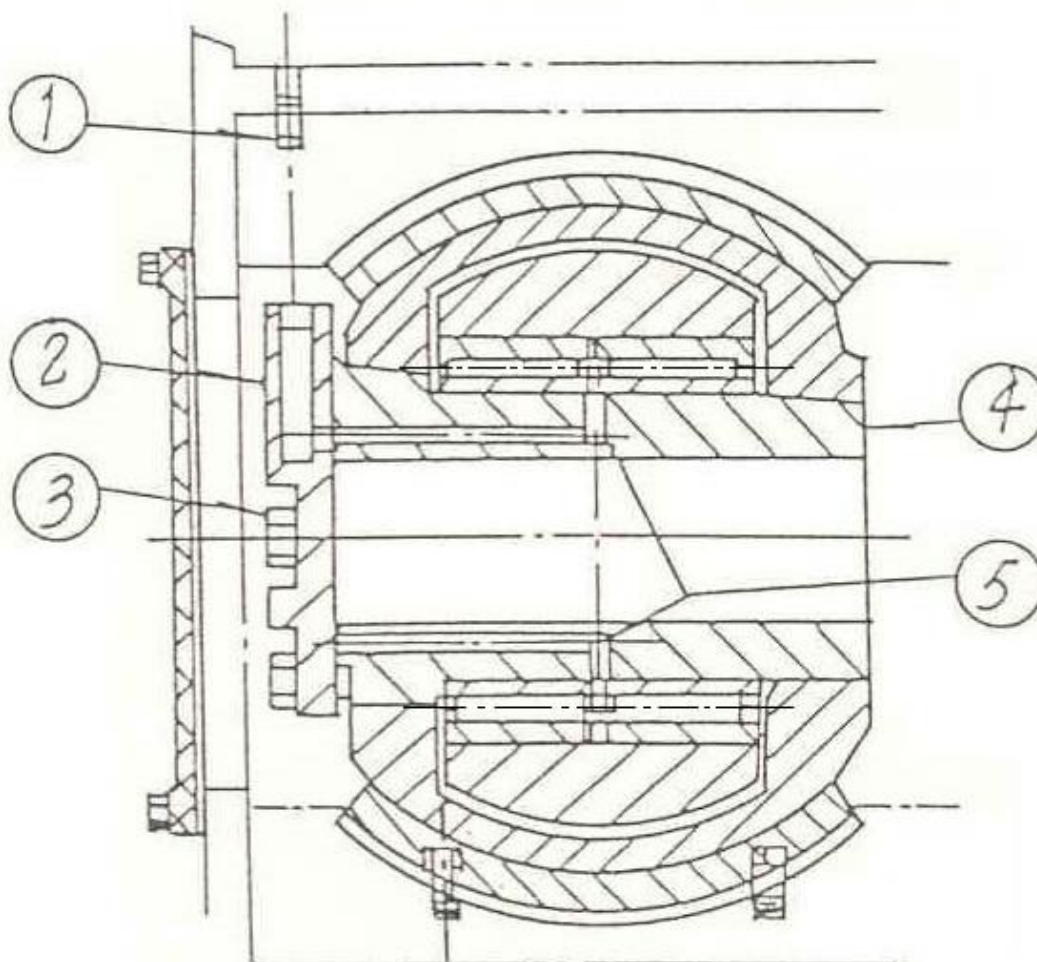
Fig.10

3.2 Controlled Flow Splash System

The controlled flow splash lubrication system is the same for all RLF-Series pumps, regardless of the type of oil pump drive provided for the pressure system. In the controlled flow splash system, the main gear picks oil up from the reservoir, and when the teeth mesh with the pinion, the oil is displaced into various troughs and compartments in the frame. With reference to Figure 15, the oil thrown into oil trough (7) is directed through the oil tube (8) to the two pinion bearings.

Oil passage from the of the crosshead guide compartment to the crosshead bearing is shown in Figure 11, Oil accumulates in the compartment over the crossheads. The oil runs through the nipple(1) into the crosshead retainer to the oil passages (5) and on to the crosshead pin bearing. As noted, the duplicate set of passageways (5) in the crosshead pin permits the crosshead pins to be rotated without having to give attention to hole alignment. This permits the installation of crosshead pins from either direction.

For F-500 pump. Oil passage from the top of the crosshead guide compartment to the crosshead bearing is shown in Fig. 11A. Oil accumulates in the compartment over the crossheads. The oil runs through the oil passage, (1) (2) and crosshead pins oil passage (3) ,and on to the crosshead pin bearing. As noted, the duplicate set of passageways (3) in the crosshead pin permits the



crosshead pins to be rotated without having to give attention to hole alignment. This permits the installation of crosshead pins from either direction.

Fig. 11

(1) Nipple (2) retainer (3) bolt (4) crosshead pin (5) oil passage

3.3 Total Pressure Lubrication System

The total pressure lubrication system, incorporating the oil pump for the F-series pumps, is shown in Figure 12.

In this system, filtered oil is supplied to the pump through the suction filter (1) and is discharged from the pump into the manifold block (2). Oil is distributed from the manifold block to the pinion shaft bearing oil line (3) and spray nozzle (3A), and to the main bearing oil line (4) and the crosshead compartment manifold block (4A) located above the crosshead compartment. The crosshead compartment manifold block (4A) distributes oil to the crosshead, crosshead bearings, and extension rods.

A pressure gauge (5) is mounted to the back wall of the frame to show oil pressure being maintained in the manifold block. The oil pressure will, of course, vary with the speed of the main pump, however if a sudden pressure drop or increase occurs, refer to the section on maintenance of lubrication system for possible cause.

A pressure relief valve (6) is mounted to the manifold block (2) to keep excess pressure from damaging oil pump and drive. The relief valve is preset at 0.27 Mpa (40 PSI) and must not be tampered with.

When installing the internally mounted oil pump (9 Fig.12), position pump so that the back face of the drive gear is flush and parallel with the edge of the main gear, and gear teeth have 0.60~0.90mm backlash.

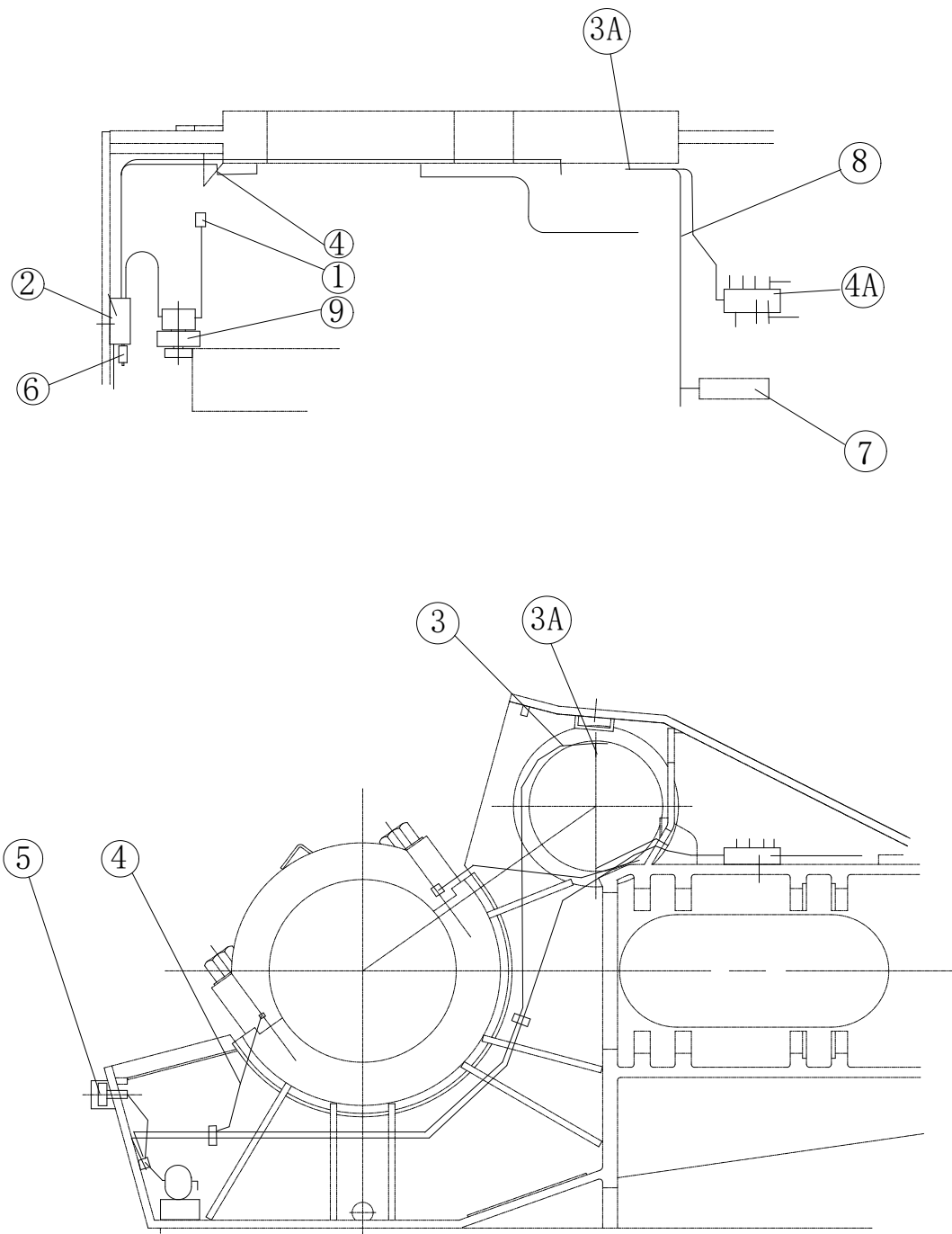


Fig. 12

- 26) Filter (2) manifold block (3) oil line (3A) spray nozzle
(4) main bearing oil line (4A) Manifold block (5) pressure gauge (6) relief
valve (7) oil trough (8) oil tube (9) Lubrication pump

A typical layout for the pinion shaft driven oil pump is shown in Fig. 13. The oil pump (1) is piped into the oil system through the suction and pressure connections on the bottom inside wall of the power frame.

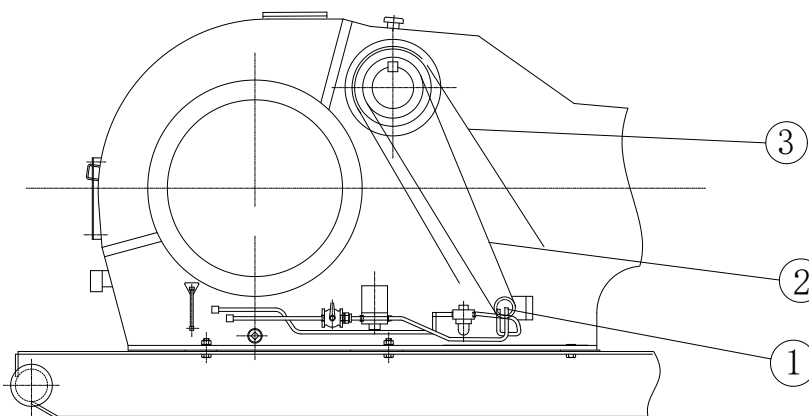


Fig. 13

(1) Oil pump (2) V-belt (3) guard

Ref. Fig.13. Adjust the V-belt drive (2) to a point where the two halves of the belt can almost be “pinched” together between the thumb and fingers at the center of the drive. Over tightening can cause premature failure of the pump.

To prevent possible injury, always install guard (3 Fig.13) over V-belts before putting pump into service.

3.4 Maintenance of The Lubrication

Adequate lubrication of the moving parts is, as stated, the most important single factor affecting the ultimate service life of the pump, CARE AND MAINTENANCE of the system is the sole responsibility of the operator or crew to which it has been assigned, and the extent to which this is applied will determine the amount of trouble – free service life that will be obtained.

The lubricant recommendations shown below, on the name plate on the side of the pump, are the result of extensive field tests. Substitutions should be made only in extreme emergencies.

Lubrication specifications:

Use **Extreme Pressure** (EP) non-corrosive, anti- foaming gear lubricant as follows:

Temperatures +30° F ~ +155° F (-1°C ~ +68°C) AGMA 6# EP

Temperatures + 0° F ~ + 80° F (-18°C ~ +27°C) AGMA 4# EP

Temperatures -20° F ~ + 40° F (-29°C ~ + 4°C) AGMA 1# EP

Oil reservoir capacity

F-500 246 liters (65 US.Gal)

F-800 284 liters (75 US.Gal)

F-1000 284 liters (75 US.Gal)

ONCE EACH TOUR, check and maintain oil level at the FULL mark on the bayonet gauge. PUMP MUST BE SHUT DOWN and allowed to stand idle for approximately five minutes to allow oil level to equalize.

ONCE EACH SIX MONTHS, or more often if oil becomes contaminated with abrasive particles or corrosive compounds, drain and flush the oil reservoir new lubricant. Oil drains are located on either side of the pump frame.

During the flushing procedure, thoroughly clean the oil troughs and the compartment in top of the crosshead guide. Also clean or replace the filter element in the air breather cap and clean suction screen. Remove covers from settling chamber and purge out contaminants before adding new oil.

Routine inspection on condition of oil should be made as condensation of moisture in the air, intrusion of mud, water or dirt, can necessitate a more frequent oil change.

A settling chamber is located in the forward area of the power end floor, Contamination in the oil splashed into this area is allowed to settle out and should be drained out of the pump through the clean out covers located on the frame wall underneath the crosshead inspection doors.

Once each month, remove clean out covers on both sides of pump to drain contaminated oil from setting chamber. Approximately 15-gallons of oil be lost; replenish the main reservoir to compensate for the amount drained out.

Once each week, remove one of the lower 1/2" capscrews that secure the clean out cover to the frame to drain off water condensate.

ONCE EACH TOUR, check oil level in main reservoir. Maintain at full mark on dipstick to the manifold block. If loss of pressure occurs, check for:

- 27) Clogged suction screen
- 28) Low oil level
- 29) Slipping V-belt drive
- 30) Broken or loose connections
- 31) Damaged or worn oil pump

32) Defective Relief valve

For an abnormal increase in oil pressure, check for:

33) Plugged oil lines

34) Contamination causing oil to be viscous

35) Relief valve inoperative

36) Defective pressure gauge

37) Other conditions

a) Maintenance

b) Power End

Routine inspection of the power end is the most important form of preventive maintenance and will result in considerable savings by detecting any major trouble that might be developing and allowing the necessary repairs to be made on a planned or transport rig-down time.

- i. Check tightness of the main bearing bolts. Bolts must be tightened to the following torque:

F-500 4065 N.m (3000ft.lbs)

F-800 11920 N.m (8800ft.1bs)

F-1000 11920 N.m (8800ft.1bs)

- ii. Safety wires

Check safety wires on all bolts including the main bearing hold-down bolts and eccentric bearing retainer bolts. Replace any broken wires after retightening the bolts. Refer to crankshaft assembly section for bolt requirements.

- iii. Oil lines

Check all oil lines to insure they are intact and free of obstructions. Check oil pump suction hose for damage or flat areas.

- iv. Suction filter

Check condition of suction filter. Clean and replace as required.

- v. Main bearing cover

Remove the main bearing cover and check tightness of main bearing retainer bolts, condition of the bearing rollers, etc. Clean and remove any sludge or foreign substance that might have accumulated at the bottom of the bearing area.

vi. Main gear and pinion teeth

Inspect the condition of the main gear teeth and pinion gear teeth for any indications of abnormal wear. During the initial break-in period there will be some pitting on the face of the gear teeth. This is referred to as "initial pitting" and is not harmful to the life of the gear. However, if routine inspection indicates the degree of pitting continues to increase, immediately contact the pump manufacturer for a more thorough inspection of the gear.

vii. Crosshead pin bolts and crosshead guides

Remove cover and check condition of the crosshead pin bolts and safety wires. (Center crosshead pin bolts can be reached by removing back cover and placing eccentric on outer top dead center). Tighten crosshead bolts (Item 4 Fig .18) to the following torque:

F-500	120-135 N.m (90-100ft.lbs)
F-800	225-240 N.m (165-175ft.1bs)
F-1000	225-240 N.m (165-175ft.1bs)

DO NOT EXCEED THESE VALUES. USE TORQUE WRENCH

If the crosshead or guide shows abnormal wear or scoring, replace immediately as the metal particles can cause damage to the bearings, etc; Excess wear can also cause rapid wear to the piston and liner.

viii. Oil and oil reservoir

Check condition of the oil and cleanliness of the oil reservoir. Service oil system as described in the Lubrication Section of this manual.

c) Roller Bearings

Although the basic construction of the various sizes of RLF-series pumps varies somewhat, they all have one very important detail in common roller bearings. A roller bearing is a precisely built machine within itself; therefore, careful handling is required in order to obtain the long service life and high load carrying characteristics associated with anti-friction bearings.

The main bearings are self-aligning spherical roller bearings. The pinion shaft is mounted on straight roller bearings. The eccentric bearings are straight roller with thrust plates on each side to keep the eccentric straps in line, and the crosshead pin bearings are straight needle roller bearings.

None of the bearings require special adjustments.

All inner and outer races are assembled by means of very accurate fits. This accuracy is necessary; therefore, if the bearings are to be used again, the inner and outer races and the roller assemblies of each bearing must be kept together, and reinstalled exactly as they came off.

It is always necessary to completely replace any roller bearing that fails, even though only one part of the bearing shows damage. Since the running clearances of these bearings are extremely small, excessive clearances, worn or grooved raceways, and any pitting or flaking of the parts is indication of failure and the entire bearing should be changed as soon as possible.

All roller bearings are assembled to their shafts by means of shrink fits. (Ref. bearing fit data under each shaft assembly.) Damaged or worn bearings and raceways can be removed by driving them off the shaft with a bar and hammer. They also can be cut off from the shaft with a burning torch, but care must be taken not to burn into the shaft. Bearings should always be heated in an oil bath, the temperature of which should not exceed 149°C (300°F). Be certain that both the oil and the container are very clean. If the oil container is in direct contact with the fire, place a rack into the container so that the bearings will not rest on the bottom. Do not leave the bearings in the oil bath longer than three minutes.

Do not heat the bearings with a torch unless it is the only possible means available. When it is necessary to use a torch, it should be used only by an experienced welder or mechanic. Hold the torch at least 150mm (6 inches) away from the bearing and keep the torch moving at all times. Heat the bearing only until it is hot to the touch. Use a Tempil stick. **DO NOT OVERHEAT THE BEARING.** Overheating draws the temper of the metal and soften bearing.

Once the heated bearing is in place on the shaft, hold it in place until it cools. **NEVER USE WATER OR ANY OTHER LIQUID TO COOL A HOT BEARING.** Rapid cooling will cause the surfaces of the races and rollers to “check” or crack and the bearing will fail immediately.

Never strike a roller bearing with a steel hammer. If the bearing must be driven into position, use wood or a soft hammer and strike lightly.

Always coat the shaft or housing with grease before installing the bearing. Clean white lead, that is an anti-seize compound, is the best lubricant for this purpose.

Do not remove a new bearing from the box or wrapping until it is to be installed. Protect it from dirt and other foreign matter at all times. If a bearing must be cleaned, use clean kerosene or other solvent.

4.3 Pinion Shaft Assembly

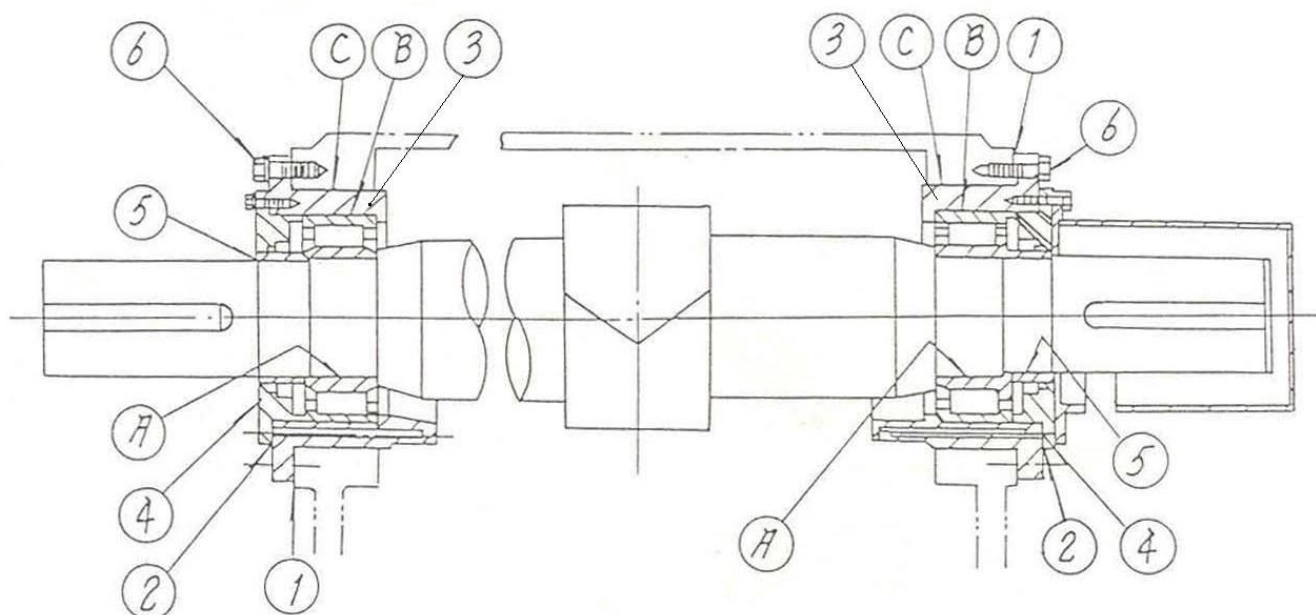


Fig.14

GHART 1

mm

Description	position	F-500	F-800G	F-1000
Inner Race to Shaft	A	T0.030~T0.081	T0.050~T0.109	T0.050~T0.109
Outer Race to Bore	B	L0.068~T0.018	L0.0105~L0.015	L0.0105~L0.015
Carrier to frame Bore	C	L0.203~L0.076	L0.203~L0.076	L0.203~L0.076

Inches

Description	Position	F-500	F-800G	F-1000
Inner Race to Shaft	A	T0.0012 ~T0.0032	T0.002 ~T0.0041	T0.002 ~T0.0041
Outer Race to Bore	B	L0.0015 ~T0.0005	L0.0041 ~L0.0006	L0.0041 ~L0.0006
Carrier to frame Bore	C	L0.008 ~L0.003	L0.008 ~L0.003	L0.008 ~L0.003

The pinion is an integral part of the shaft leaving only the installation of the

bearings and oil seal Spacer to complete the assembly.

The running clearances of the bearings are predetermined by their precision fit to the shaft and the bearing carrier. When performing maintenance or overhaul, make sure the fits show in chart I are obtained.

When installing the pinion shaft assembly in the pump observe the following precautions:

- a. Insure pinion bearing carrier gasket(1) and oil seal carrier gasket(2) are in place and in good condition.
- b. When installing the pinion bearing carrier(3) and the oil seal carrier MAKE SURE THE CARRIERS ARE INSTALLED WITH DRAIN HOLES AT THE TOP to correctly position oil troughs and align drain holes.
- c. Remove burrs, dents or gouges from the OD of the oil seal spacer(5) before sliding oil seal carrier(4) into place. Exercise care when sliding lip of seal over end of shaft to prevent it from being damaged by the sharp edge of the keyway. Also pay particular attention to insure oil seal lip IS NOT TURNED UNDER by edge of spacer when sliding seal onto the spacer.
- d. Tighten pinion bearing carrier bolts (6) to the approximate torque shown below.

F-500 135~170N.m (100-125ft • lbs)

F-800 190~225N.m (140-165ft • lbs)

F-1000 190~225N. m (140-165ft • lbs)

- e. Check condition of the pinion bearing inner and outer race and rollers. If there is any indication of galling, flaking or grooving, or if diametral clearance exceeds 0.20 ~ 0.25mm, it is recommended the entire bearing be replaced.

d) Crankshaft Assembly(Fig.15)

The crankshaft assembly consists of the crankshaft, eccentric ring gear, eccentric strap with bearings, and the main bearings.

The running clearances of the bearings are predetermined by their precision fit to the shaft and their respective bores, when performing any maintenance or overhaul, make sure the fit. shown in chart II are obtained.

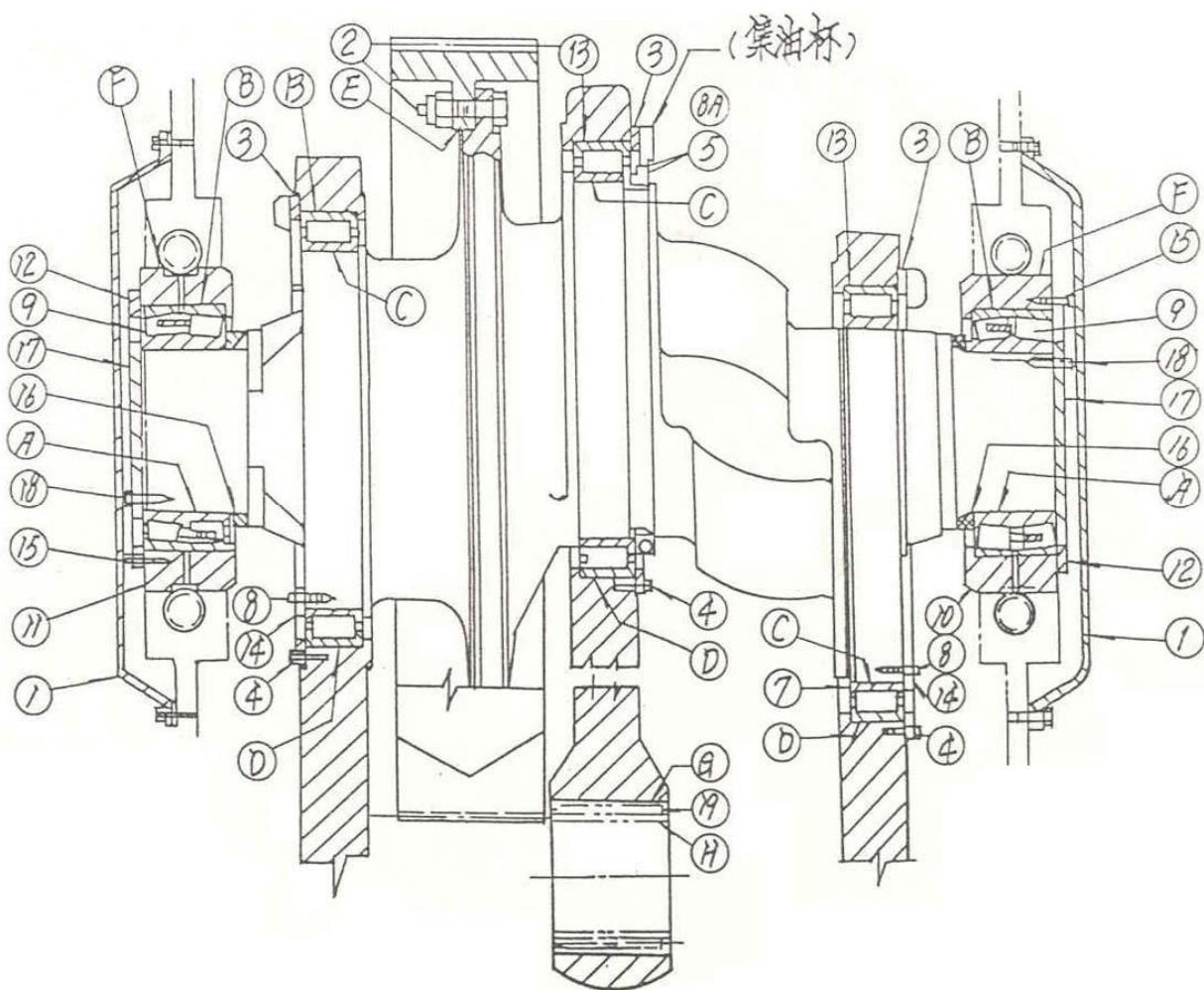


Fig.15

CHART II

mm

Description	position	F-500	F-800	F-1000
Inner Race to Shaft	A	T0.050~T0.109	T0.06~T0.121	T0.060~T0.121
Outer Race to Bore	B	L0.080~0	L0.095~ 0	L0.095~0

Inner Race to Shaft	C	T0.076~T0.172	T0.127~T0.228	T0.127~T0.228
Outer Race to Bore	D	T0.100~0	T0.100~L0.025	T0.100~L0.025
Gear to Flange	E	T0.025~T0.127	T0.025~T0.127	T0.025~T0.127
Carrier to Frame Bore	F	L0.050~T0.025	L0.051~T0.051	L0.051~T0.051
Outer Race to Bore	G	0~T0.050	T0.012~T0.079	T0.012~T0.079
Inner Race to Pin	H	0~T0.045	T0.025~T0.075	T0.025~T0.075

Inches

Description	position	F-500	F-800	F-1000
Inner Race to Shaft	A	T0.0020~T0.0043	T0.0024~T0.0048	T0.0024~T0.0048
Outer Race to Bore	B	L0.0031~0	L0.0037~ 0	L0.0037~0
Inner Race to Shaft	C	T0.0030~T0.0068	T0.005~T0.009	T0.005~T0.009
Outer Race to Bore	D	T0.0039~0	T0.0039~L0.0010	T0.0039~L0.0010
Gear to Flange	E	T0.001~T0.005	T0.001~T0.005	T0.001~T0.005
Carrier to Frame Bore	F	L0.0020~T0.001	L0.002~T0.002	L0.002~T0.002
Outer Race to Bore	G	0~T0.002	T0.0005~T0.0031	T0.0005~T0.0031
Inner Race to Pin	H	0~T0.0018	T0.001~T0.0030	T0.001~T0.0030

Assemble the crankshaft in the following manner: (Refer to Fig.15)

a. Mount gear on flange

Thoroughly clean mating faces of ting gear and flange and bolt flange into position. Tighten flange bolts(2) to the following torque:

- F-500 400N.m (295ft • lbs)
- F-800 1055N.m (778ft • lbs)
- F-1000 1055N.m (778ft • lbs)

Set crankshaft on a set of rollers(at main bearing position) and check runout on face of gear with a dial indicator. If total indicator runout exceeds 0.15mm, remove gear and gear and determine cause of misalignment.

NOTE: If runout on face of gear is checked while crankshaft is mounted in the

pump frame, the running clearance in main bearings will require that a simultaneous set of dial indicator readings be taken at the end of the shaft and the face of the gear; the actual face runout at any point being the difference between these readings.

b. Install the outer races of the eccentric bearings(13) and the outer race retainer ring(3) in the three eccentric straps. Outer race retainer ring must be positioned so that oil scoop is at the bottom when pump is at mid-stroke. Tighten retainer bolts(4) to the following torque: safety wire heads.

F-500 60~90N.m (40~66ft • lbs)

F-800 60~90N.m (40~66ft • lbs)

F-1000 60~90N.m (40~66ft • lbs)

NOTE: The inner and outer races of the eccentric bearings are matched and must not be intermixed.

c. Install the outer race of the crosshead bearings (19) in the three eccentric straps. It is preferred that the outer race assembly be "passed" into position of frozen in "dry ice" or a deep freeze until it can be inserted into the bore. Under emergency circumstances, the outer race assembly can be installed by using a large torch and hearing the eye of the eccentric strap. DO NOT EXCEED 149°C (300°F) (Use Tempil-Stik) and DO NOT USE WATER to cool the strap.

NOTE: The inner and outer races of the crosshead bearings are matched and should not be intermixed.

d. Install the inner race of the crosshead bearing on the crosshead pin and mark according to their respective eccentric strap positions. Remove all nicks and burrs before shrinking race into place. Refer to bearing fit Position H Chart II.

e. Install inner race of the center eccentric bearing on the shaft, slide center strap into position and install inner race clamp(5). Tighten socket head screws(8A) in clamp to the following torque.

F-500 24~36N.m (18~26ft • lbs)

F-800 60~90N.m (44~66ft • lbs)

F-1000 60~90N.m (44~66ft • lbs)

- f. Install snap ring (7) in the groove on RH eccentric and shrink inner race of eccentric bearing on shaft. After sliding the RH eccentric strap into position, install inner bearing retainer (14).

Tighten inner race retainer bolts(8) to the following torque

F-500 60~90N.m (44~66ft • lbs)

F-800 60~90N.m (44~66ft • lbs)

F-1000 60~90N. m (44~66ft • lbs)

- g. Install the LH eccentric bearing (other than for snap ring) and eccentric strap under the same procedure outlined in step(f) above.
- h. Place main bearings (9) in the main bearing carries (10 RH and 11LH) and install outer race retainer (12) and retainer bolts (15). Tighten bolts to the following torque:

F-500 24~36N.m (18~26ft • lbs)

F-800 60~90N.m (44~66ft • lbs)

F-1000 60~90N.m (44~66ft • lbs)

NOTE: Even though the main bearing carriers (10 RH and 11LH) have different configurations on the OD, they are interchangeable and will fit into the pump frame on either side. The purpose of the shoulders on the OD of one of the carriers is to locate and retain the crankshaft in its respective position in the frame.

- i. After installing the two main bearing spacers (16), shrink main bearings (9) on each end of the shaft. Install inner race retainers(17) and retainer bolts(18). Tighten retainer bolts to the following torque:

F-500 24~36N.m (18~26ft • lbs)

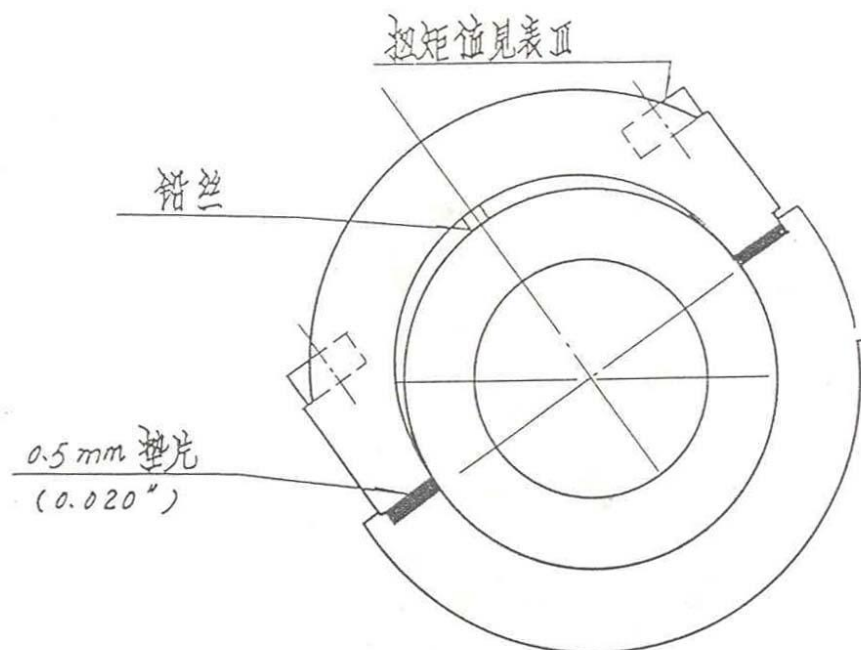
F-800 60~90N.m (44~66ft • lbs)

F-1000 60~90N.m (44~66ft • lbs)

4.5 Installing Crankshaft Assembly In Frame

In order to obtain a more precise fit between the main bearing housing and the frame bore on BS RLF-Series pumps, the installation procedures outlined below are to be followed (Refer to Fig.16)

Fig.16



- i. Place piece of wood between eye of eccentric strap and crosshead guide(as shown in Fig.17、 17A) to protect guide from scoring or gouging as the straps are sliding into position.
 - ii. Rotate the main bearing carrier so that two flat spots(180° apart) are parallel with the main bearing bolt holes, and slowly lower the crankshaft into position.(The flat spot provides clearance for the main bearing bolts.)
 - iii. After placing crankshaft in the frame, and before installing the main bearing caps, check the rollers in the main bearings to assure that each row of rollers in each bearing is equally loaded. Equal loading is obtained by positioning the floating bearing carrier so that the same number of inner and outer rollers supporting the weight of the crankshaft in each bearing are tight. Because of tolerances, etc., the total number of tight rollers could vary slightly between individual bearings.
 - iv. Install and shim main bearing caps to obtain 0.10mm(0.004 ") clamp or preload on the main bearing carrier is obtained by placing the correct amount of shims under the main bearing cap. The required amount of shims is determined as follows: Fig.16
- 38) Install 0.50mm (0.02 ") shims under both ends of the main bearing cap.
- 39) Place a piece of lead wire (approximately 0.8mm diameter) or Plastigage between OD of bearing carrier and ID of bearing cap, as near center of

- bearing cap as can be determined , and tighten main bearing cap bolts to torque values shown in Chart III.
- 40) Remove main bearing cap and determine clearance between bore of cap and OD of bearing carrier by either mikeing thickness of lead of measuring compressed dimension of plastigege.
 - 41) Using this dimension, calculate the required thickness of shims as follows: Subtract thickness of compressed lead or Plastigage form the original 0.50mm shim thickness. Then subtract 0.1mm for preload. The result is the correct shim thickness required.

Example:

	0.50mm Original shims	0.002"
Less	0.13mm Lead Thickness	Less 0.005"
	0.37mm	0.015"
Less	0.10mm Clamp Fit	Less 0.004"
	0.37mm Correct Shim Thickness	0.015"

NOTE: Machining tolerances make it necessary to determine individual shim requirements for each (right hand and left hand) main bearing cap.

- 42) Install main bearing caps with the correct amount of shims as determined above, and tighten main bearing bolts to torque values shown in chart III.
- 43) Again check inner and outer row of rollers on each bearing as previously outlined to assure equal loading is still present on each bearing.

CHART III

	Torque		Thread Size	Wrench Size	
	N.m	ft. lbs		mm	in
F-500	4065	3000	1 3/4" - 8UN	55	
F-800	11920	8800	2 1/2" - 8UN	76.2	3"
F-1000	11920	8800	2 1/2" - 8UN	82.5	3 1/4"

a) Installation Of Crosshead Guides For F-800G/1000

When installing crosshead guides observe the following procedures and precautions:

- i. Thoroughly clean all dirt or contamination and remove all burrs or tough edges from both sides of the guides and the frame bore where the guides fit.
- ii. If old guides are to be reused, inspect the wearing surfaces for wear and scoring streaks.

NOTE: For F-800G, F-1000, upper and lower crosshead guides are NOT interchangeable. In these pumps, the guide are machined so that the lower guide places the crosshead on frame centerline, and upper guides are machined to afford proper crosshead to guide clearance.

- iii. Install upper and lower guides, Torque guide screws to 200~270 N.m (150~200ft • lbs).

- iv. Check between frame and guides at points A, Fig.18, with 0.05mm(0.002") feeler gauge to make sure gauge to make sure guides fit into bore.

b) Installing Crosshead Guide For F-500

When crosshead guides become worn or damaged, they should be replaced, observing the following precautions. (Note: The crankshaft must be pulled to allow clearance for removal and installation of the guides.)

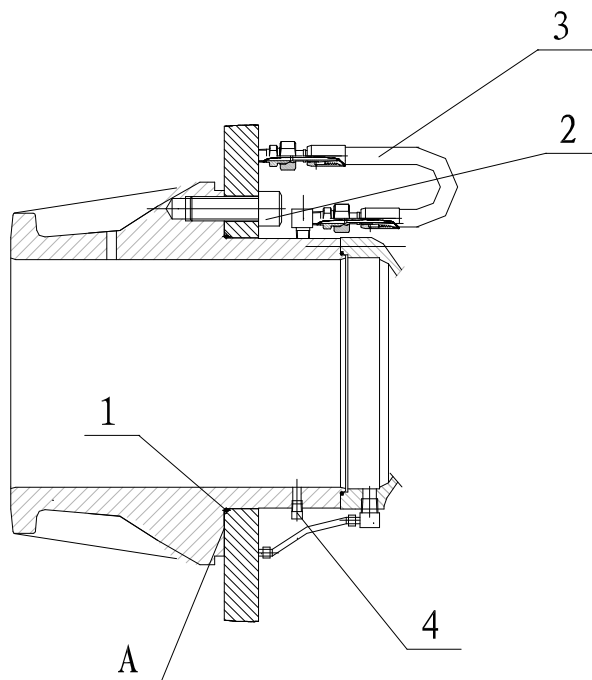


Fig.16B

- i. Remove worn or damaged guides.
- ii. Thoroughly clean the frame bore and the mating surfaces of the frame wall and crosshead guide (Position A) These surfaces **MUST BE ABSOLUTELY FREE OF DIRT OR FOREIGN MATERIAL** in order for crosshead guide to give proper alignment between the power end fluid end parts.
- iii. Slide O-ring seal (1) over end of crosshead guide. Coat with light oil or anti-seize compound, and position guide into frame bore. Use caution to prevent damage to the O-ring seal. The crosshead guide is symmetrical and can be rotated top to bottom. The fit between OD of crosshead guide and frame bore (Position B) is shown below:
 $L 0.102\text{mm} - L 0.203\text{mm} (L 0.004'' - L 0.008'')$
- iv. Install crosshead guide retainer bolts (2) and tighten crosshead guide into place. Tighten bolts to the torque shown below:
 $675 \sim 1012 \text{ N.m} (500 \sim 750 \text{ft} \cdot \text{lbs})$.
 For more uniform make-up, tighten bolts in a cross-cross procedure.
- v. Check mating surfaces (position A) for metal-to-metal make-up by Attempting to insert a 0.025mm-0.050mm feeler gauge between the two parts.

- vi. Install the two oil lines(3 and 4).

NOTE: The crosshead guides are symmetrical and can be rotated from top to bottom. In emergencies where bottom surface of guide becomes damaged and time does not permit a new part to be obtained, the damaged guide can be rotated 180 ° to allow the crosshead to run on a new surface. It will be necessary to pull crankshaft for clearance to rotate the guide. The damaged can then be replaced at a more convenient time.

c) Installation Of Crossheads

The crossheads in the pumps can be installed through the front (fluid end) or back end of the crosshead guide.

Reference Fig.18.18A. When installing crossheads, observe the following precautions:

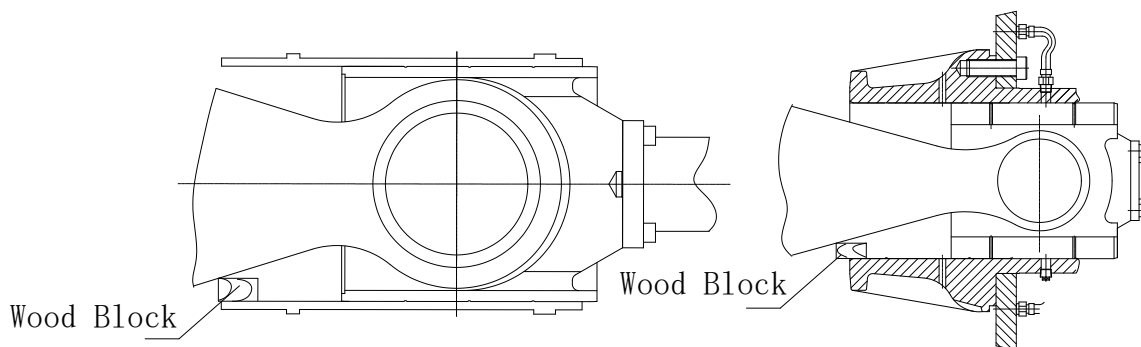


Fig.17

Fig.17A

- i. Thoroughly clean all dirt or contamination and remove all burrs or rough edges from OD of the crosshead, crosshead pin bores, and inner bore of crosshead guide. Dry crosshead pin bore so taper bore connection will make metal to metal See Note.
- ii. Position " eye" of eccentric at the opening in the side of the crosshead guide. Block eccentric strap so that crosshead will clear the "eye" as it is sliding into position to where the crosshead pin holes are in alignment. Fig 17. 17A
- iii. Install the left hand crosshead first, Rotate eccentric assembly to move "eye" into center crosshead and right hand eccentric strap "eye" back, affording clearance to install center pin through right hand crosshead inspection door. Remove diaphragm stuffing box plate (1, Fig.18) and install right hand crosshead through this bore. Slide into place and install crosshead pin.
- iv. Install crosshead pin retainer (2) and retainer bolts (3) and rotate pin until the four crosshead retainer to crosshead bolt holes (4) are in alignment. Install the crosshead retainer to crosshead bolts and

make up hand tight. Ref. Fig 18.18A

Fig.18

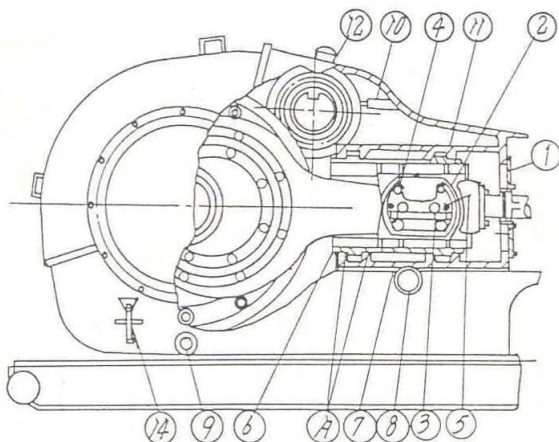
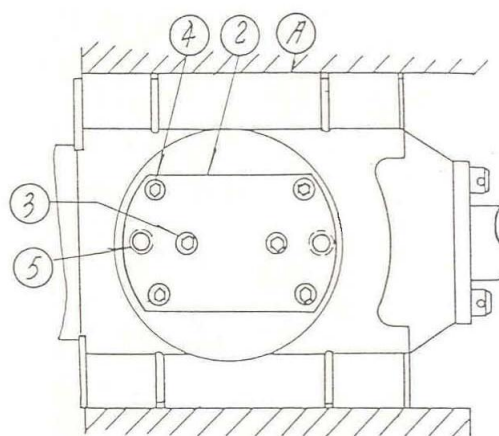


Fig.18A



Referring back to fig.11.11A crosshead pin (4) can be installed without regard to oil holes (5) . Two holes are provided so the pin can be rotated 180° in relation to pin to retainer plate screws (3).

Seat crosshead pin in tapered bore by bumping large end with a light blow. Tighten retainer bolts(3 and 4, Fig.18) to the following torque and safety wire:

F-500	120~135N.m (90~100ft • lbs)
F-800	225~240N.m (165~175ft • lbs)
F-1000	225~240N.m (165~175ft • lbs)

DO NOT EXCEED THESE VALUES. USE TORQUE WRENCH.

NOTE: To pull the crosshead pin, remove the four crosshead retainer to crosshead bolts (4) and screw two of the bolts into the “jack screw” holes (5). Tighten the two jack screw bolts until the pin breaks loose. Complete removal of crosshead pin retainer plate (2) and slide pin out of bore.

- v. Check running clearance of crosshead by sliding long “feeler” gauges between top of crosshead guide bore. The clearance should not be less than 0.508mm(0.020”). Check with long feeler gauge over entire surface of crosshead.

NOTE: Less running clearance at center of crosshead can be caused by “swelling” from overtightening the crosshead pin retainer bolts (4). If present, loosen pin and retighten into place by using the make-up torques shown in paragraph 4.

- vi. For F-500

Install the center crosshead first. Crosshead pin is installed through the top of the pump by removing the inspection cover. Slide crosshead pin into bore but do not seat taper until the crosshead pin retainer (2) Fig.18A has been installed.

NOTE: If old crossheads are to be reused, inspect the sliding surfaces for wear

or scoring. If necessary, the crosshead may be switched to opposite sides of the pump and rotated 180° to provide a smooth surface for the bottom of the crosshead.

The center crosshead can be rotated 180° and the crosshead pin installed from the opposite side of pump.

4.9 Checking Crosshead Alignment

In order for the pistons to run true in the liners, the crosshead must travel in a straight line along the horizontal centerline of the frame bore. to check and adjust crosshead alignment, proceed as follows:

4.9.1 Remove diaphragm stuffing box from the diaphragm plate, (Fig.18). Do not remove the plate,

- vii. Position crosshead at the extreme front of its stroke. With inside calipers or telescoping gauges, accurately measure the distance from the diaphragm plate bore to the crosshead extension rod at the top and bottom. Compare the two measurements to determine the position of the rod relative to the centerline of the bore.
- viii. Rotate pump to extreme rear of stroke and take measurement again at the same place. Compare these measurements to the ones taken at the front of the stroke to determine if crosshead is running horizontal.
- ix. If the centerline of the extension rod is more than 0.381mm (0.015") low in the diaphragm plate bore, shims should be inserted under the lower guide to bring the extension rod back to center, provided there is ample clearance between the top of crosshead and upper crosshead guide. It is normal for the lower guide to wear more at the rear due to heavier loading at this point because of the angle of the eccentric strap. It is permissible to shim the guides on a taper if is done accurately to provide firm support for the guide. Do not shim guides to less than 0.50mm (0.020") clearance. Large crosshead clearances are acceptable due to characteristiAH of triplex pump operation, the crosshead pressure is always on the lower guide.
- x. Cut shims from steel shim stock long enough to reach completely across the guides. Cut tabs on the side to bend down over frame supports to hold them in place. Refer to items 3 and 4 under Installation of Crosshead Guides.

4.10 Fluid End Maintenance

From many years, the fluid end of a pump was considered a non-wearing part which did not cause any concern other than possible infrequent repairs or replacements resulting from fluid cuts or washout. However, the higher pressures of the present-day drilling requirements have resulted in higher

stresses being imposed on the fluid end which, when combined with the corrosive characteristics of the drilling fluid, have resulted in the demand that more and better maintenance be given to the fluid end parts and pieces if a reasonable operating life is to be obtained. A few of the obvious points are as follows:

- 44) Make sure all valves on the discharge side of pump are opened before pump is put into operation. Kicking pump in against a closed valve can often be the start of a fatigue crack. An open crack may not necessarily occur at the precise moment, however a small crack could occur and start the process of "corrosion fatigue failure"
- 45) Do not engage pump clutch when prime mover is running at a high rate of speed. To do so can cause undesirable shock loads against both power end and fluid end.
- 46) Properly maintain pressure relief valve to assure it is set for the pressure rating on the liner size being used.
- 47) Do not operate the pump for an extended period of time if a severe fluid knock is present.
- 48) Properly prepare fluid end for storage. When pump is to be shut down or not operated for a period of ten days or more, it is recommended that the fluid end parts such as liners, pistons, rods, etc., be removed from the pump and the fluid end flushed out completely with fresh water, after a thorough flushing, apply grease or a rust preventative to all of the machined surfaces such as valve pot cover threads, valve pot cover gasket surfaces, valve seats, liner bores, etc. the parts removed from the pump including liner, piston rods, etc., should of course be protected from the elements. This will not only extend the life of the fluid end through resistance to corrosion, but will also protect the usable life still left in the expendable parts and maintain them in good condition for installation in the pump at the next start-up period,

Maintenance and repairs should be made on the fluid end assembly by observing the following precautions. Refer to figure 19.19A.19B.

The fluid end assembly for these triplex pumps consists of three forged cylinder blocks, complete with valve pot covers and cylinder heads, a suction manifold, and a discharge manifold.

4.10.1 Fluid Cylinder Blocks

The three separate fluid cylinder blocks (1) bolt metal-to-metal to the power end frame through retainer studs (2), Alignment with the power end frame bores is obtained through the "pilot" boss on fluid end.

However, to obtain accurate alignment, all nicks or burrs must be removed from "pilot" boss and frame bore and all dirt and foreign matter cleaned from the mating surfaces; otherwise cylinder blocks could make up in a

“cocked” or misaligned position.

The fit between “pilot” boss and frame bore (Position A) is as follows:
Install the three cylinder block nuts to the torque values shown in Chart V.

4.10.2 Suction Manifold

The suction manifold (3) bolts to each cylinder block and is sealed through the O-ring in the connection flange. Thoroughly clean O-ring groove, the O-ring sealing surface on bottom of the cylinder block, and replace O-ring seal before bolting manifold into position. The flange connection **MUST** make up metal-to-metal to retain the O-ring seal, therefore any nicks, grooves or washouts on the sealing surface must be repaired before installation. Ref. Welding and Repair Section in this manual for repair procedures.

Start all suction manifold bolts (5) in the three cylinder blocks before tightening. Tighten to torque values shown in Chart V.

4.10.3 Discharge Manifold

The discharge manifold bolts to each cylinder block and is sealed through the O-ring in the connection flange.

Thoroughly clean the O-ring groove, the O-ring sealing surface on face of the cylinder block before bolting the manifold back into position. The flange connection **MUST** make up metal-to-metal to retain the O-ring seal, therefore any nicks, grooves, or washouts on this sealing surface must be repaired before installation. Ref. Welding and Repair Section in this manual for repair procedures.

Start all discharge manifold bolts (8) in the three cylinder blocks before tightening. Tighten to torque values shown in Chart V. Tight cylinder block to power frame stud nuts to torque values shown in Chart V.

i. Cylinder Head Thread Ring

A replaceable cylinder head thread ring (9) is bolted on to the face of the cylinder blocks. The thread ring must make up metal-to-metal with face of cylinder blocks in order for the axis of the threads to be perfectly square with the cylinder. Block bore. Therefore, make sure all burrs, extrusions, or foreign matter is removed from the mating faces before making installation.

NOTE: Install thread ring so that the “bleed hole” is in the down position.
Tighten the cylinder head thread ring stud nuts (10) to the torque values shown in Chart V.

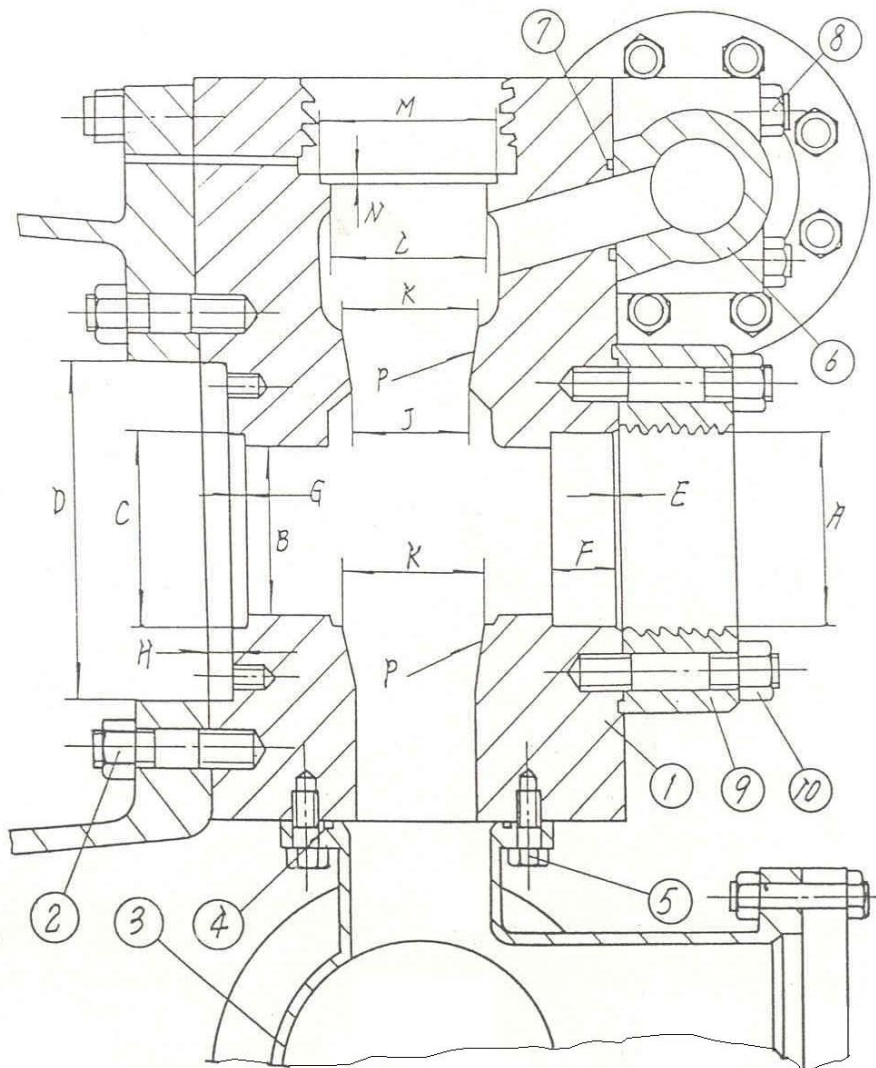


Fig.19

F-500/800G/1000

Chart V

POSITION		ITEM	TORQUE N.m	TORQUE Ft. lbs
CYL BLOCK TO POWER END	F-500/800G/1000	2	2170	1600
SUCTION MANIFOLD	F-500	5	200	150
	F-800、F-1000	5	325	240
DISCHARGE MANIFOLD	F-500	8	960	710
	F-800、F-1000	8	1355	1000
THREAD RING	F-500	10	960	710
	F-800、F-1000	10	1840	1360

CHART VI

POSITION	F-500	
	mm	in
A	216.03-216.15	8.505-8.510
B	190.63-190.70	7.505-7.508
C	317.5	12-1/2
D	155.58-155.70	6.125-6.130
E	136.53-136.65	5.375-5.380
F	126.87-127.00	4.995-5.000
G	135	5-5/16
H	231.8	9-1/8
J	203.2	8
K	63.5	2-1/2
L	76.2	3

CHART VII

POSITION	F-800G & RLF-1000	
	mm	in
A	222.38-222.50	8.755-8.760
B	197.05-197.25	7.758-7.766
C	339.7	13-3/8"
D	172.08-172.21	6.775-6.780
E	152.65-152.78	6.010-6.015
F	142.80-142.93	5.622-5.627
G	101.6	4"
H	114.3	4-1/2"

4.11 Welding And Repairs

On occasion where washouts or normal wear cause repairs to be made to the fluid end bores, the following welding procedures and precautions should be closely followed. Machine bore all dimensions to those shown in applicable chart VI, VII, VIII, and in all cases maintain the shoulders (where liners, covers, etc., seat) 90° to the axis of the bore.

Welding procedures:

Weld repairs can usually be separated into two categories:

b) Washes, and (2) Cracks. Listed below is the basis information for the repairs:

Washouts: -Weld as ' 30 carbon Steel

-Clean area by grinding or Arc-air

-Before starting any welding procedure, make sure the electrodes are dry of moisture, and if necessary, put in oven and bring up to temperature required to drive out moisture.

-Spot heat area to 250° -350°F (120° -180°C) out in all directions for a minimum of 75mm (3")

-Use AWS-ASTM E-60-7018 low hydrogen rods.

Example-Adam-Arc 7018.

-Temperatures should be brought back to 250° -350°F (120° -180°C) after each pass and maintained throughout the welding. After welding is completed and area cleaned, heat to 250° -350°F (120° -180°C) and allow to cool.

Cracks: -Grind out all of crack. Any attempt to burn out a crack will only result in the crack progressing faster than the material can be burned.

-Follow the same welding procedure as above.

Preheating:

-The purpose of preheating is to expand the area being repaired so that as the cooling process takes place, the welded area and the preheated area will cool more uniformly. Preheating also prevents hard spots from forming between the base metal and the welding by eliminating a thermal shock as the weld is being applied. This hard spot will, of course, be a good place for fatigue cracks to occur.

4.12 Repairs to Valve Pot Cover Bore

When making repairs to washouts in the valve pot cover bore, it is extremely important that the surface where the valve cover seats is either "machined" or "ground" perfectly flat and 90° to the axis of the threads. As shown in Fig.20, the valve pot cover gasket (1) seats into the counterbore at top of valve cover deck, and as the cover makes up metal to the valve deck, the gasket is confined within its counterbore. Obviously, any high spots on the valve cover deck from weld repairs. or any low spot from over-grinding of the repairs can result in a gap between top of the valve cover deck and bottom of the valve cover, through which the valve cover gasket can be extruded under pressure.

The high or low spot can also cause valve covers to make up in a "cocked" position and result in severe thread damage (cracks) due to the axis of the two mating threads being out of square.

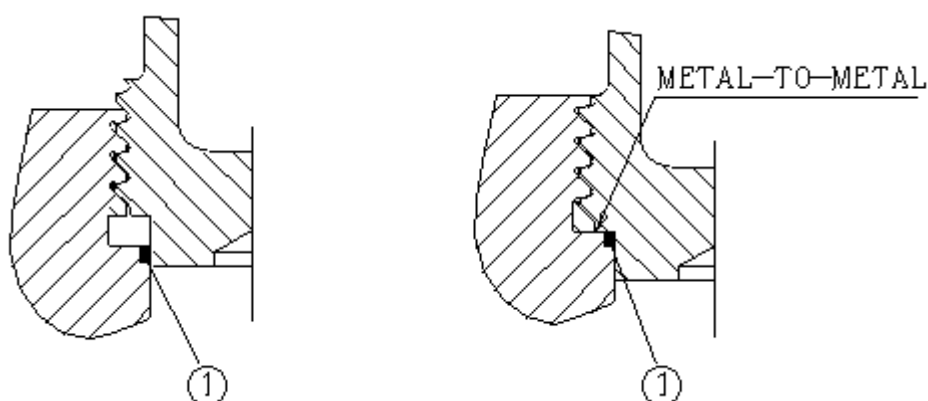


Fig. 20

4.13 Operating Maintenance

Proper maintenance of the pump in time is the necessary measure to assure the pump working and prolong the service life. For using any pump, maintenance should be paid more attention to.

4.13.1 Daily Maintenance

- 1) After stopping the pump, check the oil level of power end, at least once a day. If chain drive is used, the oil level of chain box should be checked.
- 2) Check the working situation of liner and piston, it's normal that a little mud is taken out with piston. If there is leakage, the piston should be changed. Check abrasion of liner inner bore, if the abrasion is severe, the liner should be changed in time.
- 3) Check the liner compartments of the frame. The mud and contamination should be cleaned.
- 4) Check the water tank of spray pump. The water or oil should be supplied if there is not enough. The polluted water should be changed and the water tank should be cleaned.
- 5) Check if the pressure of discharge pulsation dampener meets the requirements.
- 6) Check the reliability of relief valves, if necessary, they should be changed.
- 7) Check the lubricating oil pump for the variation of pressure gauge, if the pressure is very low (lower than 0.035Mpa) or no pressure, check if the suction and discharging filter screen are plugged.
- 8) Loose the coupling of piston rod every day, check if the pyramidal face of coupling and the junction face of piston rod and extension rod are clean, rotate the piston rod a quarter round and tighten. The purpose of doing that is to make the wearing face evenly and prolong the service life of liner and piston.
- 9) Before tightening the valve cover, the lubricating grease should be coated on the threads and be checked once four hours for loosing.
- 10) Check the alarm bore of valve covert seal and liner seal (including the seal between the wearing plate and cylinder), if the mud discharges, the relative seal ring should be changed.

4.13.2 Weekly Maintenance

- c) Disassemble the valve cover and clean them every week, meanwhile coat the molybdenum disulfide complex calcium base grease. Check the inner sleeve of valve guide, if there is sharp abrasion (that means the clearance between the valve guide pole and guide exceeded 3mm), it should be changed to avoid the guide failing to guide the valve motion in the right way and accelerating the abrasion of valve.
- d) Check the valve and valve seat, change the worn or pierced valve body, valve rubber and valve seat (when changing the valve seat, the valve body should be changed at the same time). Check the spring and change the broken or inelastic spring.

- e) Check the locknuts of piston. The corrosive or damaged locknuts should be changed. (The seal rings in the locknuts will fail after the locknuts are tightened three times.)
- f) Drain water one time from the plug of drain flange until oil comes out.
- g) Check and clean the filter screen in the lubricating oil line.

4.13.3 Monthly Maintenance

- 49) Check all the stud bolts and nuts of fluid end. For example: nuts among cylinders, nuts connecting the cylinder to frame, the bolts and nuts on the suction and discharge manifold. If they are loose, they should be tightened to the specified torque value.
- 50) Check the seal rings in the packing box of extension rod. The worn one should be changed. Usually, change it at least once every three months. Attention should be taken to the oil seal position when changing (the lip should be inward).

- 51) Remove and clean the filter installed in the discharge manifold.
Change the dirty oil in the oil pool of power end and the oil groove of crosshead every six months. Clean these oil grooves at the same time.

i. Yearly Maintenance

- 52) Check if the crosshead guide is loose, if the crosshead running clearance conforms to requirements. The clearance can be adjusted by adding shim under the guide or rotating the crosshead 180° .
- 53) Check the whole pump completely every two years or three years, check if the main bearing, connecting rod bearing, crosshead bearing, input shaft bearing are worn or outworn. They should be changed if they can't be used any more.
- 54) Check the wear of gears, if they are worn sharply, the drive shaft and the driven shaft should be turnaround installed to use the face that isn't worn. For the convenience of maintenance, checkpoints are listed in chart VII and Fig.24.

i. Cares should be taken for the following in maintenance

- 55) Before tightening the coupling connecting the extension rod and piston rod, the 25° taper face should be cleaned.
- 56) When changing the liner, the liner seal ring should be changed as well.
- 57) After stopping the pump in winter, the mud in the valve compartment and liner should be discharged and cleaned completely.
- 58) Cover each inspection hole to avoid the sand dropping into the lubricating oil.
- 59) The discharge pulsation dampener is only allowed to charge inert gas (such as nitrogen) or air.

No inflammable and explosive gases are allowed such as oxygen, hydrogen etc.

Chart VII Maintenance List

Interval	No.	Maintenance
Daily	1	Check the oil level after stopping the pump, if it is too low, it should be added to required level.
Daily	2	Check if the readings of pressure gauge of lubricating oil pump are normal. When the pressure is too low, the cause should be found at once.
Daily	3	Check if the dampener works normally
Daily	4	Fill the cooling lubricant up to the spray pump water tank when it's not enough. Change it when it deteriorates.
Daily	5	Check the liner compartments. Clean it when necessary.
Daily	6	Check if the plunger liner seal leaks, change it when necessary.
Daily	7	Check the piston and liner for leakage, change them when necessary.
Daily	8	Loose the coupling of piston rod one time daily, rotate the piston rod a quarter turn and then tighten the coupling back again.
Daily	9	Check if the valve bonnets are loose every four hours. Coat lubricant on the thread when tightening.
Daily	10	Check if the safety valves are reliable.
Daily	11	Check if the pre-charging pressure of discharge pulsation dampener is normal when stopping the pump.
Daily	12	Observe the alarm bore, if the mud is discharged, the related seal ring should be changed.
Weekly	13	Disassemble the valve cover and clean it, coat it with molybdenum disulfide complex calcium base grease.
Weekly	14	Check the inner sleeve of valve guide, if it's worn, it should be changed.
Weekly	15	Check the suction and discharge valve body, valve seat and valve rubber, change the damaged one.
Weekly	16	Check if the locknuts of piston are corrosive or damaged. Change if they are damaged (normally, change after using three times).
Weekly	17	Check the filter screen of lubricating system. Clean it if it is plugged.
Weekly	18	Loosen the plug of drain flange, discharge the dirt and water in the oil pool.
Monthly	19	Check the bolts of fluid end, the loose or damaged bolts should be tightened or changed.
Monthly	20	Check the seal ring in the packing box, the worn one should be changed at least once every six months.
Monthly	21	Check the filter in the discharge pipe. Clean it if it is plugged.
Monthly	22	Change the dirty oil in the oil pool of power end and crosshead oil groove and clean them every six months.
Yearly	23	Check the wear of crosshead, if necessary, use the crosshead after rotating 180°
Yearly	24	Check if the guide is loose, check if the crosshead clearance conforms to requirements, otherwise, they should be adjusted.
Yearly	25	Check the wear of tooth face of the pinion and the gear, if necessary, use them reverse face.
Yearly	26	Check if the pinion shaft and crankshaft are all right.

		Measures should be taken abnormal phenomena.
Yearly	27	Check the bearing of power end. The damaged one should be changed.
Yearly	28	Check the seal of rear cover and crank shaft end cover, if the seal is not good, it should be changed.

4.14 Troubleshooting

During the running of the pump, if there are troubles, the reason should be checked and the trouble should be solved, otherwise, they will affect the normal working of the pump.

4.14.1 Trouble of fluid end

Trouble	Cause	Troubleshooting
1. The ressure readings become low and the discharge reduces or no mud discharged.	1. The charging piping is not sealed off and the air gets into the pump. 2. The suction filter screen is plugged.	1. Tighte the flange bolts of charging piping or change the gasket. 2. Stop the pump and clean the suction filter screen.
2. Uneven discharge. The pressure gauge fluctuates. The charging piping has abnormal noise.	1. A piston of a valve is worn out or damaged. 2. There is air in the pump cylinder.	1. Change the damaged piston and check the valve to find if it's damaged or plugged. 2. Check if the charging piping and valve cap are sealed off.
3. There is severe slap in the liner.	1. The piston nuts are loose. 2. The liner cover is loose. 3. The suction is not good caused water dash.	1. Tighten the piston nuts. 2. Tighten the liner cover. 3. Check the reason of improper suction.
4. The mud leakage from the alarm bore of valve cap, cylinder and liner seal.	1. The valve cap is not tightened. 2. The seal ring is damaged.	1. Tighten the valve cap. 2. change the seal ring.
5. The discharge pulsation dampener can't be charged or it leaks after charging.	1. The charging connector is plugged. 2. The bladder of the pulsation dampener is broken. 3. The needle valve is not sealed.	1. Clean the connector. 2. Change the bladder. 3. Repair or change the needle valve.

6. The diesel is overloaded	The discharge filter drum is plugged.	Remove the filter screen and clean it.
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i. Trouble of power end

Trouble	Cause	Troubleshooting
1. Overhear of bearing	<ol style="list-style-type: none"> 1. The oil pipe or oil port is plugged. 2. The lubricating oil is too dirty or deteriorated. 3. The rolling bearing is worn or damaged. 4. The lubricating oil is too much or too little. 	<ol style="list-style-type: none"> 1. Clean the oil pipe or oil port. 2. Change oil. 3. Repair or change bearing. 4. add proper amount of oil.
2. There is slap on the power end.	<ol style="list-style-type: none"> 1. The crosshead guide is worn out sharply. 2. The bearing is worn out. 3. The guide is loose. 4. There is water hammer on the fluid end. 	<ol style="list-style-type: none"> 1. Adjust the clearance or change the worn guide. 2. Change the bearing. 3. Tighten the bolts of guide. 4. Improve the suction performance.

NOTE: Besides the above estimated trouble, if other adnormal phenomena are found.

The reasons should be gound according to the trouble spot after troubleshooting, the pump can run norm

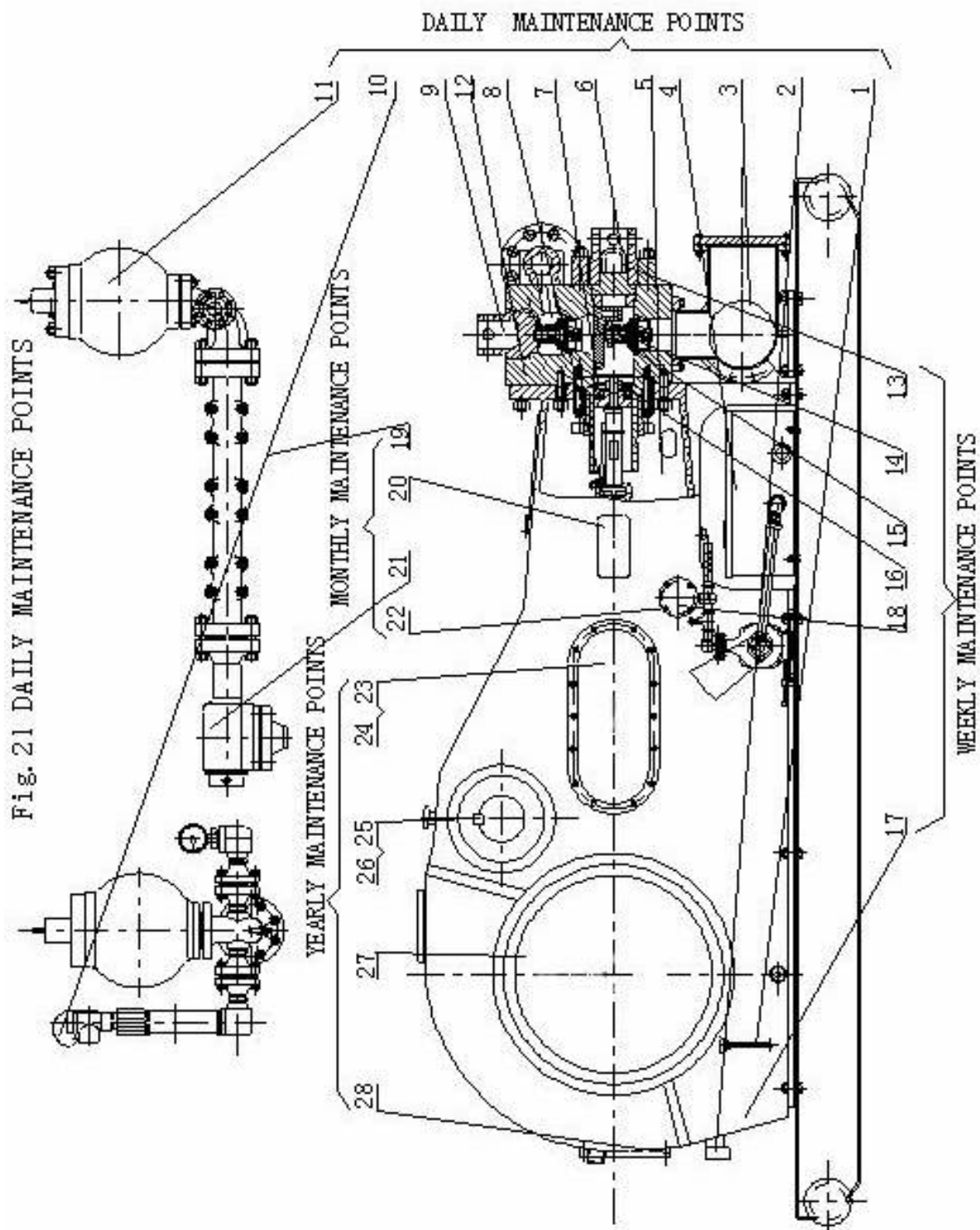


Fig. 21 DAILY MAINTENANCE POINTS

Fig.21

5. APPROXIMATE WEIGHTS OF PUMP ASSEMBLIES

	F-500		F-800		F-1000	
	lbs	kg	lbs	kg	lbs	kg
Pinion Shaft	1,062	482	1,709	775	1,709	775
Crankshaft Assy	4,526	2,055	10,479	4,744	10,479	4,744
Crosshead	115	52	363	165	363	165
Crosshead Pin & Retainer	31	14	177	80	177	80
Gear Case Cover	302	137	340	154	340	154
Suction Manifold	337	153	704	319	704	319
Discharge Manifold	663	301	717	325	717	325
One-third Fluid and Section-Studded	1,068	485	1,140	517	1,140	517

6. STORAGE

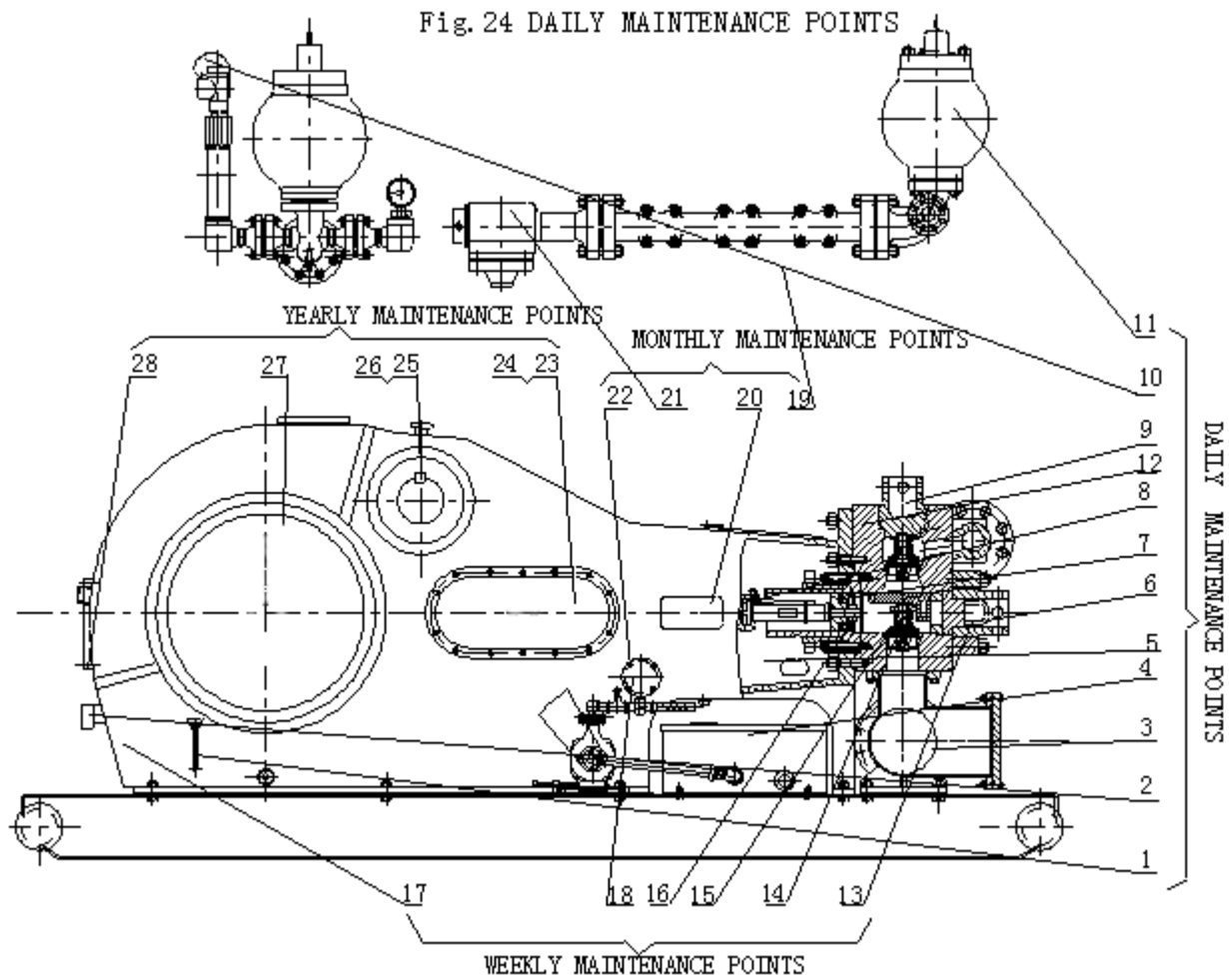
- 1). When the pumps are not used for a long time, they should be stored.
- 2). Before storing, clean it carefully, empty each part of fluid end and clean it with water.
- 3). Discharge the engine oil in the bottom of gear box of power end completely and remove the deposits.
- 4). Coat viscous lubricants on the finished surface of all bearings, crossheads, gears, piston rods, extension rods etc.
- 5). Coat grease on the machined surface of each parts of fluid end.
- 6). Cover the suction inlet and discharging outlet with blind flange.
- 7). The nose end cover, rear cover and the inspection hole cover of crosshead should be covered.

7. EXPLAINS FOR ORDER

7.1 Provided range of mud pump

- Completely MUD PUMP basic parts; spray pump; pulsation dampener; safety valve; tools; spare parts for one time change of rubber seals.
- Not including sprocket and big skid.
- If not be special required by users, spray pump is droved by belt and lubrication pump is inner droved style by bug gear.
- Normally, 170liners and pistons are assembled in the pump when it is transported to users.

7.2 RLF-series mud pumps divided into two basic styles, one is metric screws pump, the other is American style screws pump. Users choose it due to their own demands and declare when ordering.

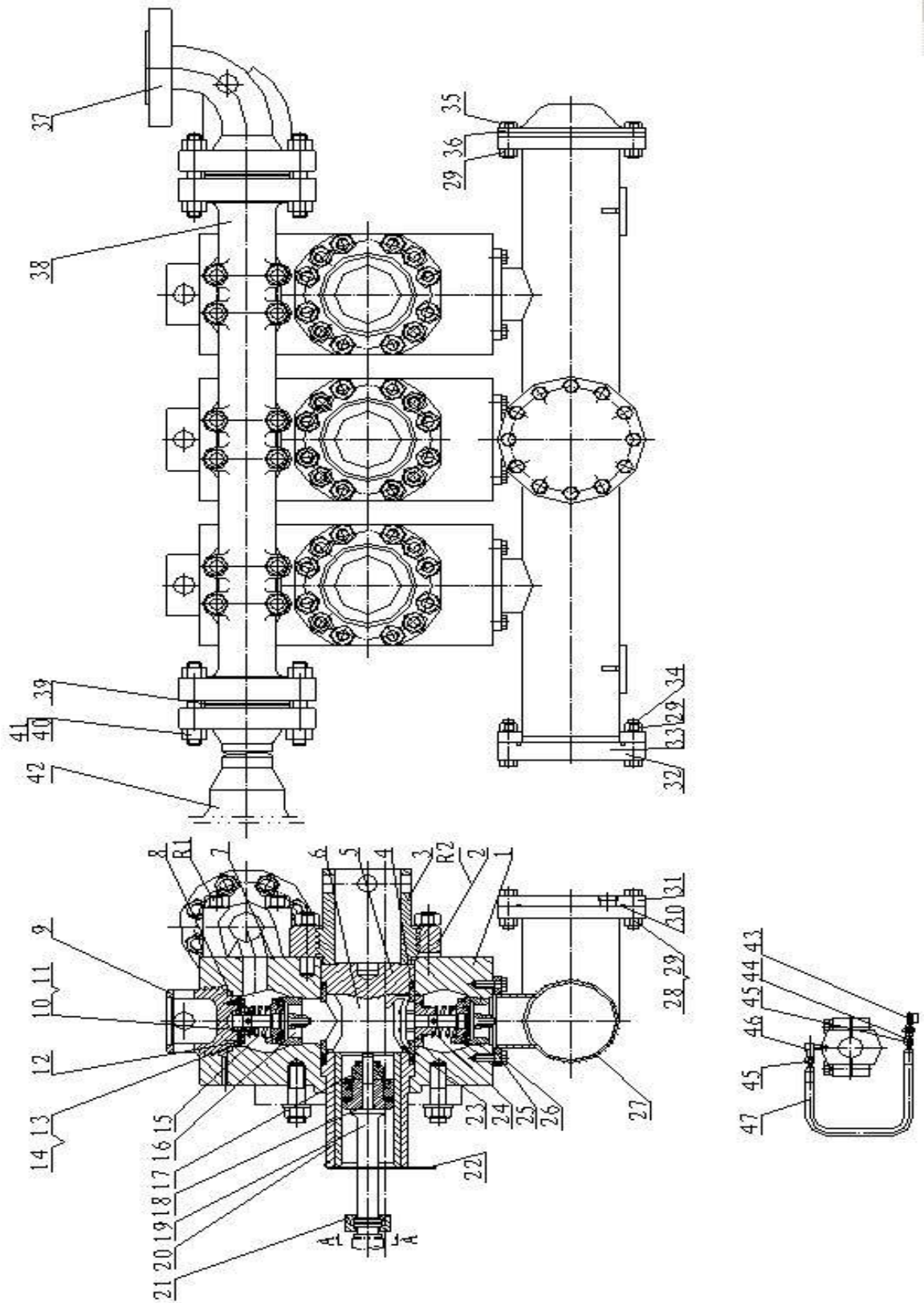


Chapter two

F-500/800G/1000 Mud Pump Parts Book

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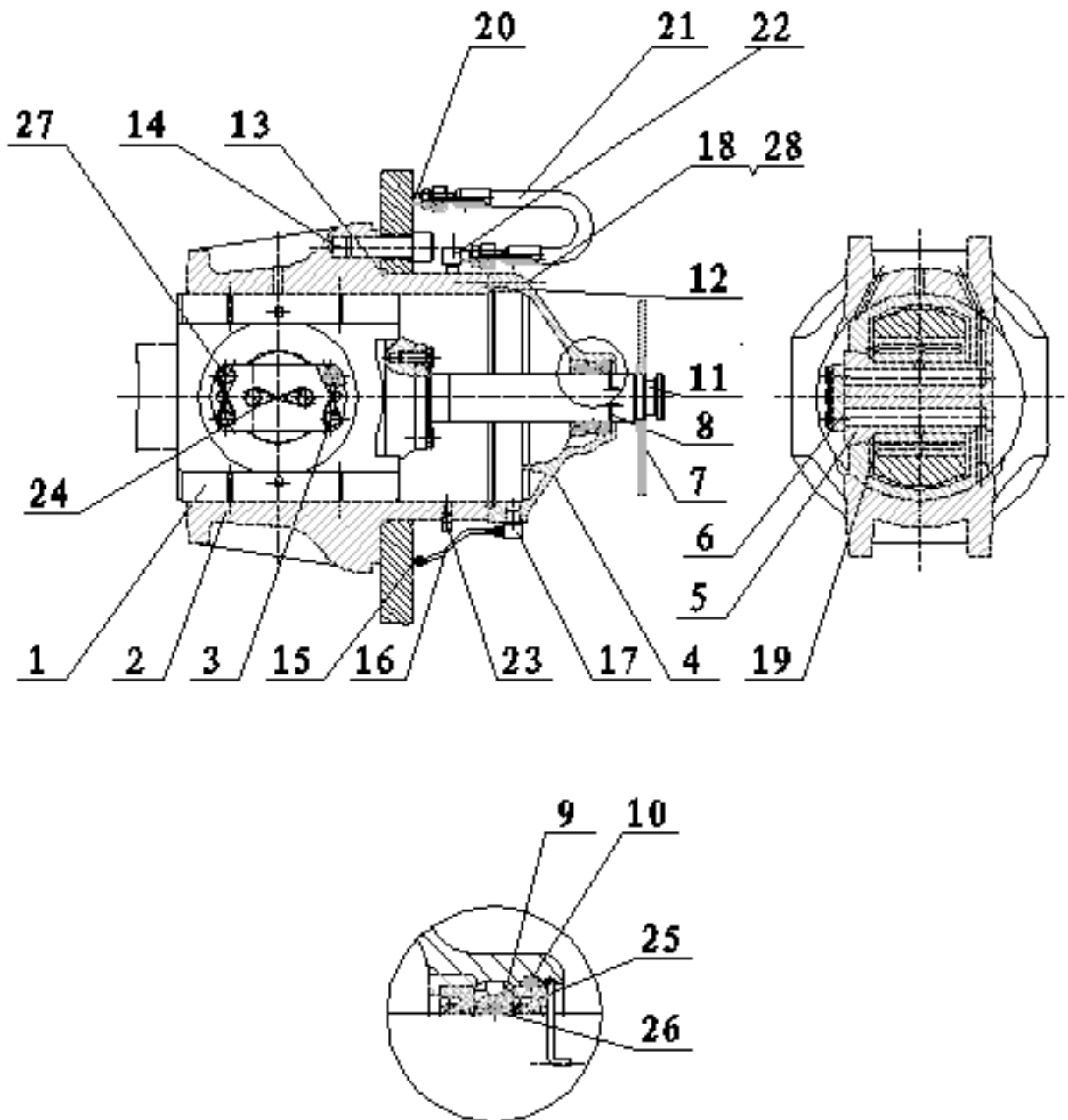
F-800/1000 Fluid End Assembly



Item No.	Qty	Description	Part No.		
			F-500	F-800	F-1000
1	3	Fluid end studded Assy	AH 35001-05.01	AH 33001-05.01	AH 33001-05.01
2	3	Thread ring	AH 35001-05.02	AH33001-05.02	AH33001-05.02
3	3	Cylinder head	AH35001-05.03	AH33001-05.03	AH33001-05.03
4	6	Head seal	AH35001-05.04	AH33001-05.04	AH33001-05.04
5	3	Cylinder head plug	AH35001-05.05	AH33001-05.05	AH33001-05.05
6	3	Liner cage	AH35001-05.06	AH33001-05.06	AH33001-05.06
7	3	O-ring	AH35001-05.07	AH33001-05.07	AH33001-05.07
8	3	Valve cover seal	AH35001-05.08	AH33001-05.08	AH33001-05.08
9	1	Valve pot cover	AH35001-05.09	AH33001-05.09	AH33001-05.09
10	6	Spring guide	AH33001-05.10	AH33001-05.10	AH33001-05.10
11	3	Valve guide upper)	AH35001-05.11	AH33001-05.11	AH33001-05.11
12	3	Valve guide retainer	AH35001-05.12	AH33001-05.12	AH33001-05.12
13	12	Bolt	AH35001-05.13	AH33001-05.13	AH33001-05.13
14		Stainless wireline			
15	6	Valve spring	AH35001-05.14	AH33001-05.14	AH33001-05.14
16	6	Valve Assy	AH36001-05.15	AH33001-05.15	AH33001-05.15
17	3	Piston nut	AH35001-05.16	AH33001-05.16	AH33001-05.16
18	3	O-ring	Ø41.2×3.55	AH33001-05.17	AH33001-05.17
19	3	Piston rod	AH35001-05.17	AH34001-05.18	AH33001-05.18
20	3	Bi-metal liner	AH35001-05.18	AH33001-05.19	AH33001-05.19
21	3	Piston rod clamp	AH35001-05.19	AH33001-05.20	AH33001-05.20
22	3	Liner end cover	AH35001-05.20	AH33001-05.21	AH33001-05.21
23	3	Fixing catch	AH35001-05.21	AH33001-05.22	AH33001-05.22
24	3	Valve guide lower)	AH35001-05.22	AH33001-05.23	AH33001-05.23

25	3	O-ring	Ø150×7	Ø185×7	Ø185×7
26	18	Bolt GB5780	3/4"-10UNC×2"	3/4"-10UNC×2"	3/4"-10UNC×2"
27	1	Suction manifold	AH35001-05.23. 00	AH33001-05.24. 00	AH33001-05.24. 00
28	12	Bolt	1"-8UNC×31/4"	7/8"-9UNC×100	7/8"-9UNC×100
29	12	Nut	1"-8UNC	7/8"-9UNC	7/8"-9UNC
30	2	Gasket	AH35001-05.24	AH33001-05.25	AH33001-05.25
31	1	Blind flange	AH35001-05.25	AH33001-05.26	AH33001-05.26
32	1	Suction flange	AH35001-05.26	AH33001-05.27	AH33001-05.27
33	1	Suction blind	AH35001-05.27	AH33001-05.28	AH33001-05.28
34	12	Bolt	1"-8UNC×41/2"	7/8"-9UNC×100	7/8"-9UNC×100
35	36	Nut	1"-8UNC	7/8"-9UNC	7/8"-9UNC
36	1	Suction desurger	AH35001-05.28. 00	AH33001-05.29. 00	AH33001-05.29. 00
37	1	Elbow Bend	AH35001-05.29. 00	AH33001-05.30	AH33001-05.30
38	1	Discharge manifold	AH35001-05.30	AH33001-05.31	AH33001-05.31
39	1	Discharge blind	AH35001-05.31	AH33001-05.32	AH33001-05.32
40	32	Stud	11/4"-8UNC×83/ 8"	11/2"-8UNC×26 0	11/2"-8UNC×26 0
41	64	Nut	11/4"-8UNC	11/2"-8UNC	11/2"-8UNC
42	1	Discharge strainer assy.	AH35001-05.32. 00	AH33001-05.33. 00	AH33001-05.33. 00
43	3	Angle coupling	AH35001-05.33	AH33001-05.34	AH33001-05.34
44	3	Male connector	AH35001-05.34	AH33001-05.35	AH33001-05.35
45	6	Connector	AH35001-05.35	AH33001-05.36	AH33001-05.36
46	3	Elbow	AH35001-05.36	AH33001-05.37	AH33001-05.37
47	3	Rubber hose			

F-500 Crosshead Assembly

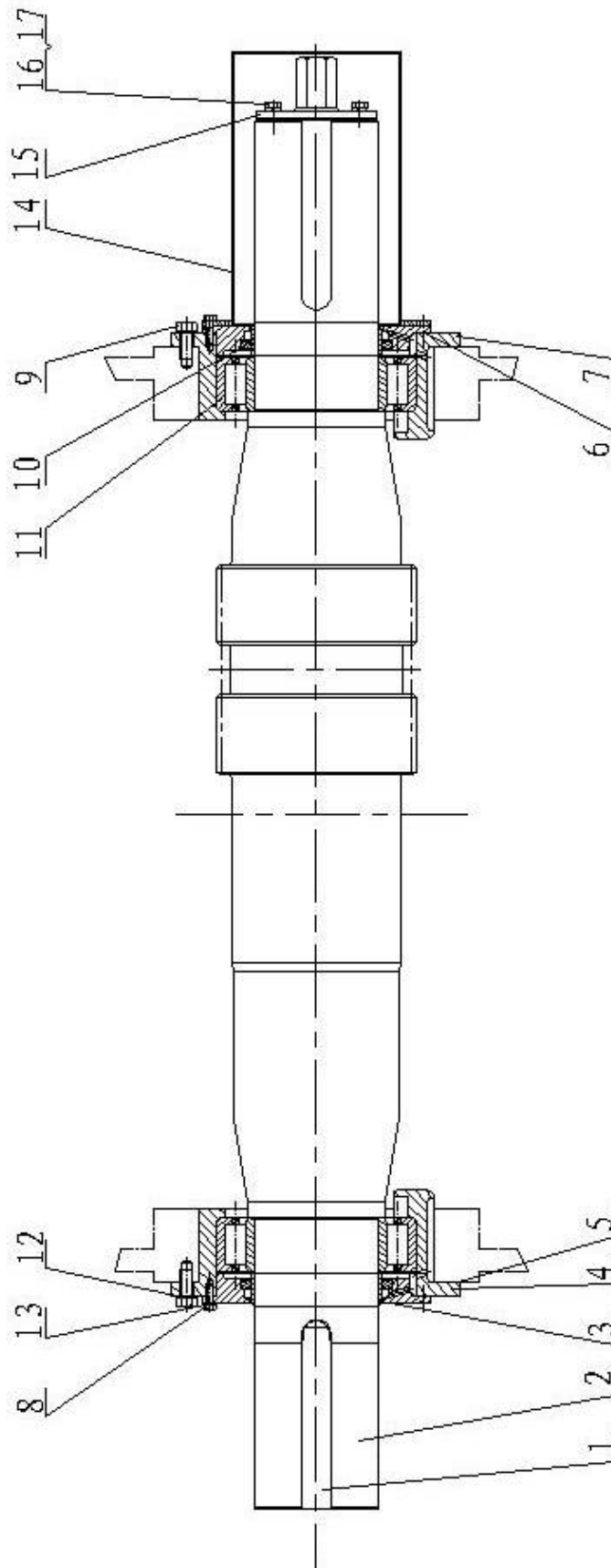


Item No.	Qty	Description	Part No.
1	1	Crosshead	AH35001-04.01
2	1	Director guide	AH35001-04.02
3	10	Cap screw 3/8"×11UNC×38.1	T50-2004K
4	1	Diaphragm stuffing box	AH35001-04.03
5	1	Crosshead pin	AH35001-04.04

6	1	Crosshead retainer	AH35001-04.05
7	1	Fluid baffle disk	AH35001-04.06
8	1	Lock spring	AH35001-04.07
9	1	Oil seal ring	AH35001-04.08
10	1	O-ring 95×5.3	GB3452.1-82
11	1	Crosshead extension	AH35001-04.09
12	1	O-ring 305×3.55	GB3452.1
13	1	O-ring 71×5.3	GB3452.1
14	8	Cap screw 11/4"×8UNC	T50-3005
15	1	Male connector	AH35001-04.10
16	1	Rubber hose	AH35001-04.11.00
17	1	Elbow	AH35001-04.12
18	6	Cap screw 3/8"×16UNC	T50-3002
19	1	Crosshead bearing	AH35001-04.13
20	1	Male connector	AH35001-04.14
21	1	Rubber hose	AH35001-04.15.00
22	1	Elbow	AH35001-04.16
23	1	Pipe plug	AH35001-04.17
24	4	Stainless steel wire	YB252-64
25	2	Double lip oil seal	AH35001-04.18
26	1	O-ring	GB3452.1
27		Loctite	242
28	6	Spring gasket 10	GB93-76

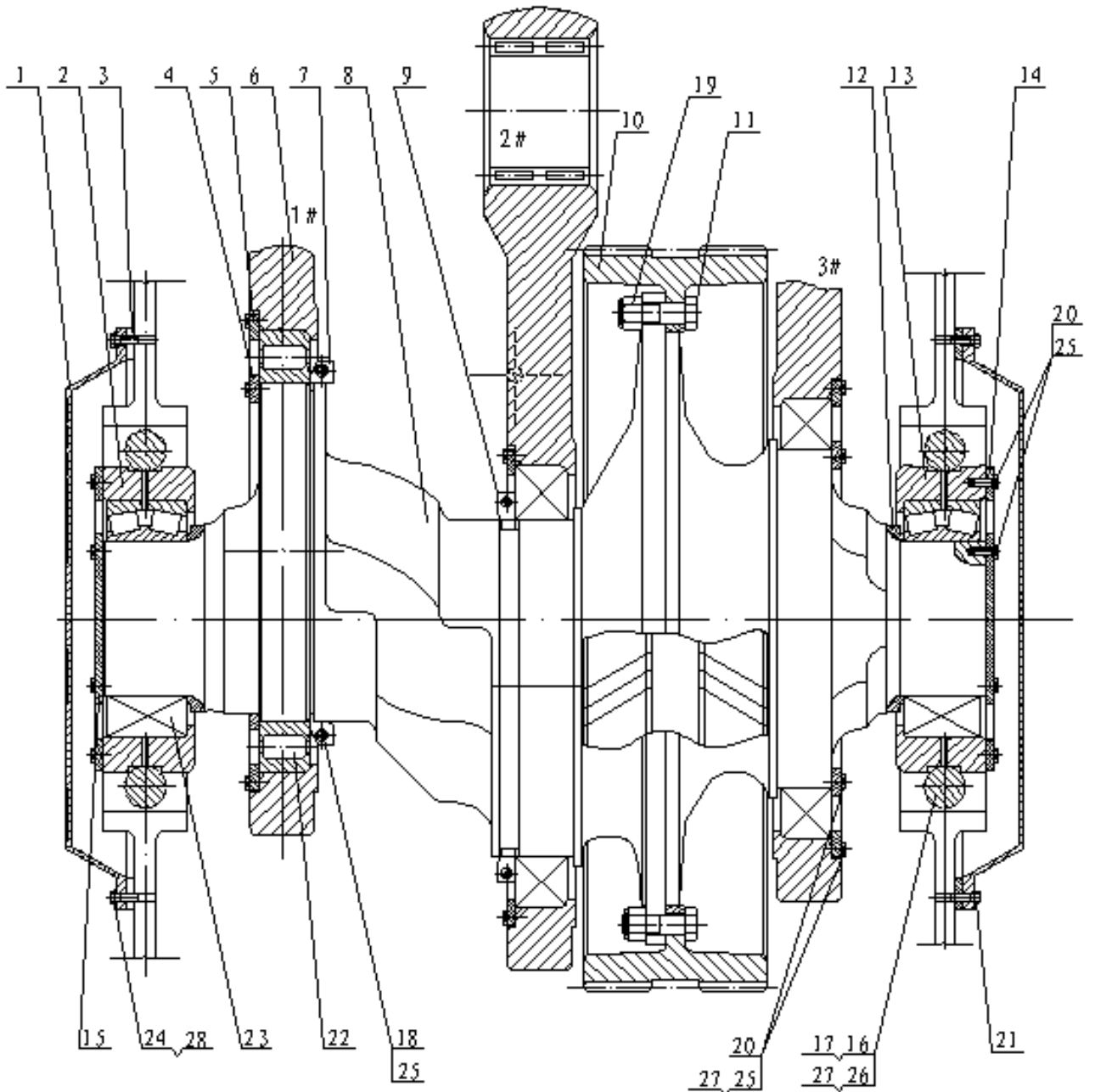
Item No.	Qty	Description	Part No.	
			F-800	F-100
1	1	Crosshead	AH33001-04.01	AH33001-04.01
2	1	Crosshead guide (upper)	AH33001-04.02	AH33001-04.02
3	2	Cap screw T52-7008K	1"X60	1"X60
4	1	Diaphragm stuffing box	AH33001-04.03	AH33001-04.03
5	1	O-ring GB3452.1	Ø128x7	Ø140X7
6	1	Oil seal ring	AH33001-04.05	AH33001-04.05
7	1	Fluid baffle disk	AH33001-04.07	AH33001-04.07
8	1	Crosshead extension	AH33001-04.08	AH33001-04.08
9	1	Crosshead pin	AH33001-04.09	AH33001-04.09
10	6	Cap screw T52-7009K	1"x70	1"x70
11	1	Crosshead guide (lower)	AH33001-04.10	AH33001-04.10
12	8	Locking plate	AH33001-04.11	AH33001-04.11
13	1	O-ring	Ø175X3.55	Ø175X3.55
14	4	Cap screw 3/8"x25	GB5780-86	GB5780-86
15	1	Locking spring	AH33001-04.12	AH33001-04.12
16	1	O-ring GB3452.1	Ø103x5.3	Ø125x7
17	8	Cap screw GB70-85	3/4"x65	3/4"x65
18	8	Shim set	AH33001-04.16.0 0	AH33001-04.16.0 0
19	1	Gasket	AH33001-04.13	AH33001-04.13
20	1	Crosshead pin retainer	AH33001-04.14	AH33001-04.14
21	1	Crosshead bearing	AH33001-04.15	AH33001-04.15
22	2	Male connector NPT3/8" x2	AH33001-04.06	AH33001-04.06
23	2	Double lip oil seal	AH33001-04.17 4.5" x5.5" 0.5"	AH33001-04.17 4.5" x5.5" x0.5"
24	8	Cap screw T52-6005K	1"x65	1"x65
25	按需	Safety wire Ø1.6	GB4240-84	GB4240-84
26	2	O-ring	AH33001-04.04	AH33001-04.04
27	4	Spring gasket 10	GB93-87	GB93-87
28	25ml	Loctite	242	242

F-800G/1000 Pinion Shaft Assembly



Item No.	Qty	Description	Part No.		
			F-500	F-800	F-1000
1	1	Key	AH35001-03.01	AH33001-03.01	AH33001-03.01
2	1	Pinion shaft	AH35001-03.02	AH33001-03.02	AH33001-03.02A
3	2	Oil seal wear ring	AH35001-03.03	AH33001-03.03	AH33001-03.03
4	2	Oil seal carrier	AH35001-03.04	AH33001-03.04	AH33001-03.04
5	2	Gasket	AH35001-03.05	AH33001-03.05	AH33001-03.05
6	2	Gasket	AH35001-03.06	AH33001-03.06	AH33001-03.06
7	2	Pinion bearing carrier	AH35001-03.07	AH33001-03.07	AH33001-03.07
8	12	Cap screw GB5782	1/2"×35	1/2"×35	1/2"×35
9	16	Cap screw GB5782	3/4"×50	7/8"×50	7/8"×50
10	2	Oil seal	AH35001-03.08 5.875" × 7.25" × 0.5251"	AH33001-03.08 8.5" × 10.5" × 0.625"	AH33001-03.08 8.5" × 10.5" × 0.625"
11	2	Bearing	AH35001-03.09	AH33001-03.09	AH33001-03.09
12	16	Locking washer GB93	20	22	22
13	12	Locking washer GB93	14	14	14
14	1	Axle-neck cover	AH35001-03.10. 00	AH33001-03.10.0 0	AH33001-03.10.0 0
15	1	Flange	AH35001-03.11. 00	AH33001-03.11.0 0	AH33001-03.11.0 0
16	3	Bolt GB5782	5/8"×45	M16×45	M16×45
17	3	Locking washer GB93	16	16	16

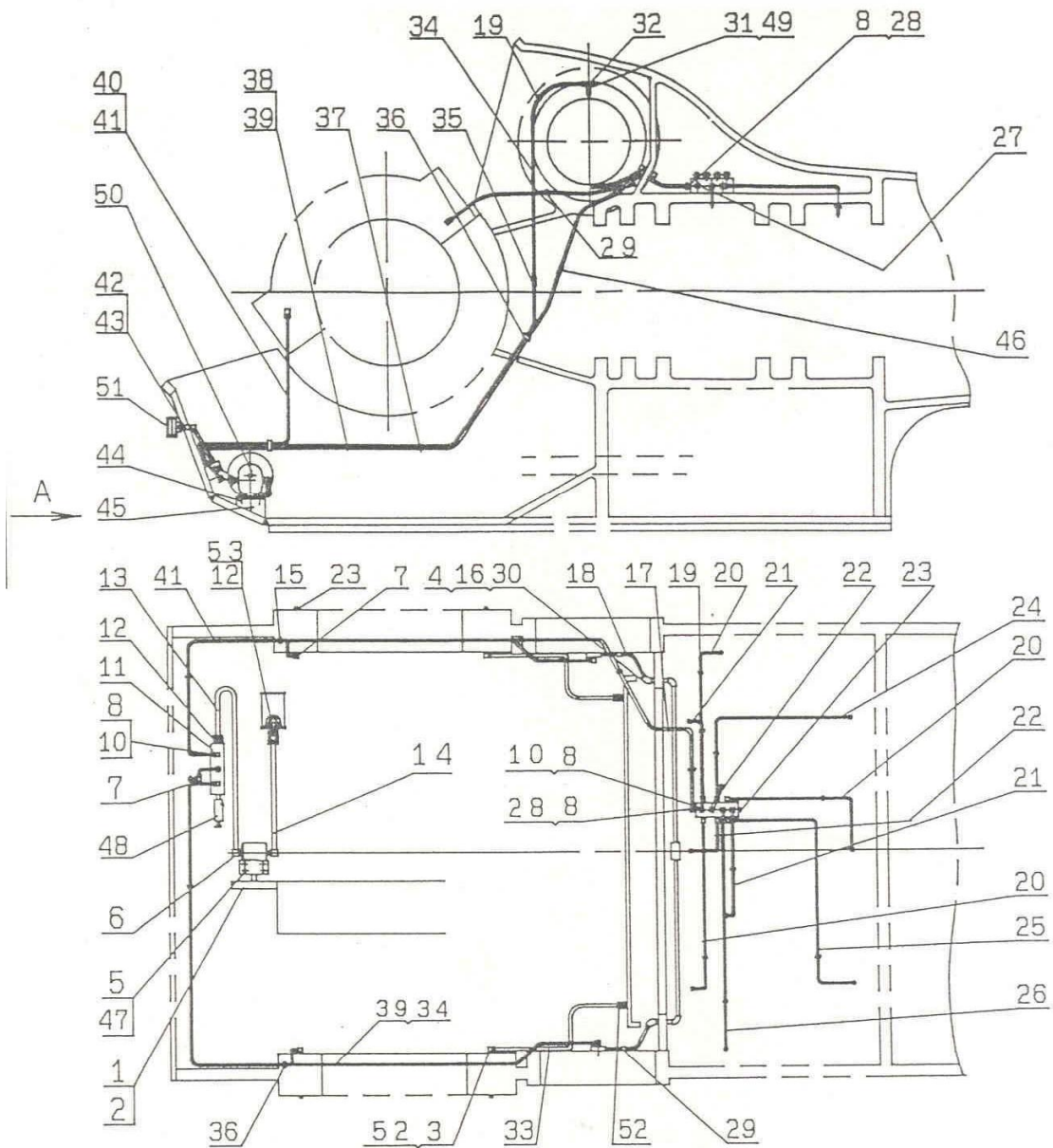
F-800/1000 Crankshaft Assembly



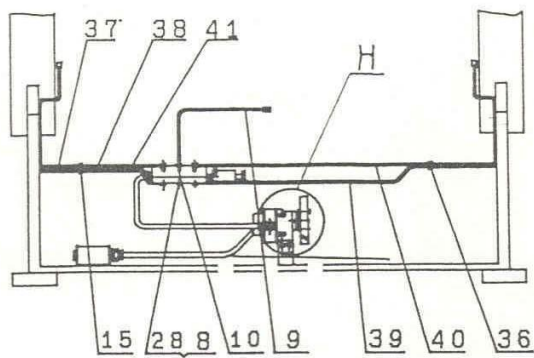
Item No.	Qty	Description	Part No.		
			F-500	F-800	F-1000
1	2	Main bearing cover	AH35001-02.01	AH33001-02.01	AH33001-02.01
2	1	Bearing carrier, left	AH35001-02.02	AH33001-02.02	AH33001-02.02
3	2	Gasket, main bearing cover	AH35001-02.03	AH33001-02.03	AH33001-02.03
4	2	Inner race retainer	AH35001-02.04	AH33001-02.04	AH33001-02.04
5	3	Outer race retainer	AH35001-02.05	AH33001-02.05	AH33001-02.05
6	3	Eccentric strap	AH35001-02.06	AH33001-02.06	AH33001-02.06
7	1	Inner race retainer(I)	AH35001-02.07	AH33001-02.07	AH33001-02.07
8	1	Crankshaft	AH35001-02.08.00	AH33001-02.08.00	AH33001-02.08.00
9	1	Inner race retainer(II)	AH35001-02.09	AH33001-02.09	AH33001-02.09
10	1	Eccentric ring gear	AH35001-02.10A	AH33001-02.10A	AH33001-02.10A
11	12	Cap screw	T50-2006	AH33001-02.15	AH33001-02.11
12	2	Spacer, main bearing	AH35001-02.12	AH33001-02.13	AH33001-02.13
13	1	Bearing carrier, right	AH35001-02.13	AH33001-02.14	AH33001-02.14
14	2	Outer race retainer	AH35001-02.14	-----	AH33001-02.15
		Press flange	-----	AH33001-02.11	-----
15	2	Outer race retainer	AH35001-02.15	AH33001-02.16	AH33001-02.16
16	4	Housing bolt, main bearing	AH35001-02.17	-----	AH33001-02.17
		Double bolt of main bearing	-----	AH33001-01.01.03	-----
17	If needed	Shim set	AH35001-02.18	AH33001-02.18	AH33001-02.18
18	4	Cap screw T50-1008K	5/8"×120	5/8"×120	5/8"×120

19	12	Locking nut	AH35001-05.11.0 0	AH33001-05.12.0 0	AH33001-05.12. 00
20	72	Cap screw T50-1008K	AH35001-02.16A	5/8"×40	5/8"×40
21	28	Cap screw T50-1008K		5/8"×45	5/8"×45
22	3	Eccentric bearing	AH35001-02.19.0 0	AH33001-02.19	AH33001-02.19
23	2	Bearing	AH35001-02.16.0 0	AH33001-02.20	AH33001-02.20
24	28	Washer GB848	16	16	16
25	28 m	Safety wire Ø1.5	GB343-82	GB343-82	GB343-82
26	40 m	Safety wireØ3	GB343-82	GB343-82	GB343-82
27	90	Loctite	242	242	242
28	28	Combination packing washer	JB982-77	JB982-77	JB982-77

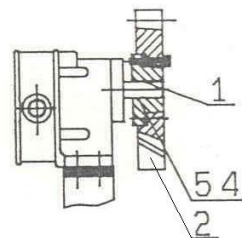
F-800/1000 Lubrication Assembly



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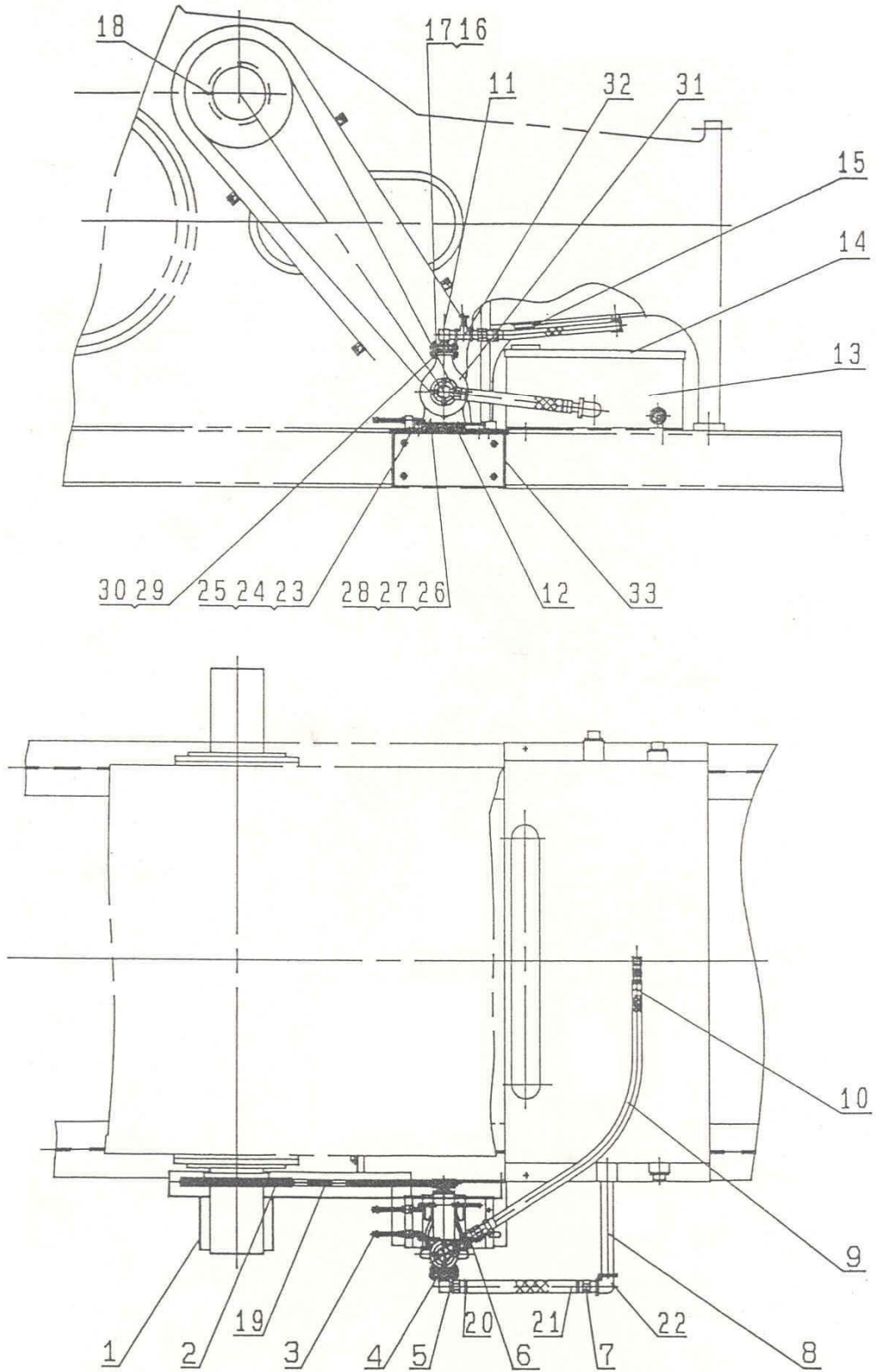
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Item No.	Qty	Description	Part No.
1	1	Key 3/16x3/16x1	T516-2001
2	1	Oil pump gear Assy	AH33001-06.20A.00
3	2	Connector elbow NPT1/4xPT3/8	T511-3002
4	2	Bolt A12	GB5650-85
5	4	Cap screw M8x40	GB70-85
6	2	Connector A16	JB/ZQ4410-86
7	3	Connector AB	JB/ZQ4410-86
8	14	Connector elbow NPT1/4xNPT1/4	T511-3001
9	1	Copper Tbg Assy Ø8x305	6B1527-87
10	17	Connector A8	JB/ZQ4408-86
11	1	Manifold (II)	AH33001-06.40
12	2	Connector A16	JB/ZQ4408-86
13	1	Copper Tbg Assy Ø16x686	GB1527-87
14	1	Copper Tbg Assy Ø16x686	GB1527-87
15	2	Tbg clamp (IV)	AH33001-06.35.00
16	2	Connector 45°	AH33001-06A.10
17	1	Copper Tbg Assy Ø10x838	GB1527-87
18	2	Copper Tbg Assy Ø12x305	GB1527-87
19	13	Tbg clamp Ø8	AH33001-06.13.00
20	3	Copper Tbg Assy Ø8x762	GB1527-87
21	2	Copper Tbg Assy Ø8x508	GB1527-87
22	2	Copper Tbg Assy Ø8x229	GB1527-87
23	5	Pipe plug NPT1/4"	T56-1002
24	1	Copper Tbg Assy Ø8x915	GB1527-87
25	1	Copper Tbg Assy Ø8x1194	GB1527-87
26	1	Copper Tbg Assy Ø8x1016	GB1527-87

27	1	Manifold (I)	AH33001-06A.11
28	2	Connector A10	JB/ZQ4408-86
29	4	Tbg clamp (I)	AH33001-06.01.00
30	2	Washer A12	GB5651-85
31	4	Bolt M6x12	GB5781-86
32	2	Oil jet	AH33001-06.10
33	2	Copper Tbg Assy Ø12x610	GB1527-87
34	2	Copper Tbg Assy Ø8x813	GB1527-87
35	2	Connector A8	GB5628.1.85
36	3	Tbg clamp-double Ø8	AH33001-06.04.00
37	1	Copper Tbg Assy Ø10x1956	GB1527-87
38	1	Copper Tbg Assy Ø8x1956	GB1527-87
39	1	Copper Tbg Assy Ø8x2311	GB1527-87
40	1	Copper Tbg Assy Ø8x1600	GB1527-87
41	1	Copper Tbg Assy Ø8x1245	GB1527-87
42	1	Connector NPT1/4x1/4x1.5	T513-1006
43	1	Copper washer 14	T514-1001
44	1	Shim set	AH33001-06.06.00
45	1	Oil pump Mtg plate	AH33001-06.19A
46	1	Connector A10	GB5628.1-85
47	4	Locking washer 8	GB93-87
48	1	Relief valve	YYFJ-L20
49	4	Locking washer 6	GB93-87
50	1	Oil pump, 2S	
51	1	Pressure gauge, M14x1.5 0-1.6MPa	Y-60Z
52	4	Connector A12	JB/ZQ440B-86
53	1	Oil filter Assy	AH33001-06A.33.00
54		Loctite	609 或 680

F-800/1000 Piston & Liner Wash



Item No.	Qty	Description	Part No.
1	1	Belt guard	AH33001-088.01.00 AH33001-088.01.00A
2	1	Sheave	AH33001-088.02
3	1	Support Assy	AH33001-088.03.00
4	1	Connector NPT1-G1	AH33001-088.02
5	1	Connector NPT1	AH33001-088.04
6	1	Connector G1-M33x2	AH33001-08.03
7	1	Connector ZG2-1/2	AH33001-08A.07
8	1	Connector ZG21/2-NPT21/2	AH33001-08C.04
9	1	Hose Ø22xØ37	L=1500
10	2	Connector Ø22xØ37	AH33001-08.18.00
11	2	Elbow 90° NPT1	AH33001-08.16
12	2	Connector plate	AH33001-088.06
13	1	Tank	AH33001-08C.01.00
14	1	Tank cover	AH33001-08C.02.00
15	1	Connector NPT21/2	AH34001-088.07
16	2	Washer	AH33001-088.09
17	2	Flange NPT1 "	AH33001-088.10
18	2	Locking capscrew M8x25	GB73-85
19	2	V-belt A3708	GB1171-74
20	2	Pipe clamp NO: 3	
21	1	Hose Ø38xØ53	L=750
22	1	Elbow 90° ZG21/2	
23	4	Capscrew M20x30	GB5780-86
24	4	Locking washer20	GB93-87
25	8	Locking washer 20	GB95-85
26	4	Capscrew M12x40	GB5780-86
27	12	Washer 12	GB93-87
28	4	Washer 12	GB96-85
29	8	Capscrew M12x60	GB5780-86
30	8	Nut M12	GB41-86
31	1	Spraying pump	AH33001-088.11.00
32	1	Globe valve G1	Q11F-16
33	1	Pump support	AH33001-08C.03.00

F-500/800/1000 Spare Parts List

(Base on the requirement of customer)

Item No.	Qty	Description	Part No.		
			F-500	F-800	F-1000
1	3	Valve cover seal	AH35001-05.08	AH33001-05.08	AH33001-05.08
2	3	Ring gasket R44	-----	T58-5002	T58-5002
3	2	Gasket	AH35001-09	AH33001-09	AH33001-09
4	1	Bladder	AH35001-5.35.02	AH33001-5.35.02	AH33001-5.35.02
5	1	Ring gasket R39	T5B-5001 (3)	T58-5001 (1)	T58-5001 (1)
6	1	Bumper	AH33003-06	AH33003-06	AH33003-06
7	1	Bladder	AH35002-03.00	AH33002-03.00	AH33002-03.00
8	6	Head seal	AH35001-05.04	AH33001-05.04	AH33001-05.04
9	3	Oil seal ring	AH35001-04.08	AH33001-04.05	AH33001-04.05
10	2	Oil seal	AH35001-03.08	AH33001-03.08	AH33001-03.08
11	6	Double oil seal	AH35001-04.18	AH33001-04.017	AH33001-04.017
12	3	Piston rubberØ170	AH35001-05.15.06.02	AH33001-05.15.06.02	AH33001-05.15.06.02
13	6	Valve rubber	AH35001-05.15.06	AH33001-05.15.06.02	AH33001-05.15.06.02
14	10	Shear pin	AH33003-11A	AH33003-11A	AH33003-11A
15	1	Plunger seal	AH33003-03.00	AH33003-03.00	AH33003-03.00
16	3	Piston seal	-----	AH33001-05.17	AH33001-05.17
		O-ring GB3452.1	Ø41.2×3.55	-----	-----
17	3	O-ring GB3452.1	Ø75×5.3	Ø97.5×3.55	Ø97.5×3.55
18	3	O-ring GB3452.1	Ø150×7	Ø185×7	Ø185×7
19	3	O-ring GB3452.1	Ø71 ×5.3	Ø125×5.3	Ø125×5.3
20	3	O-ring GB3452.1	Ø95×5.3	Ø140×7	Ø140×7
21	3	O-ring GB3452.1	-----	Ø175×3.55	Ø175×3.55
22	3	O-ring GB3452.1	Ø305×3.55	-----	-----
23	2	O-ring GB3452.1	Ø355×3.55	-----	-----

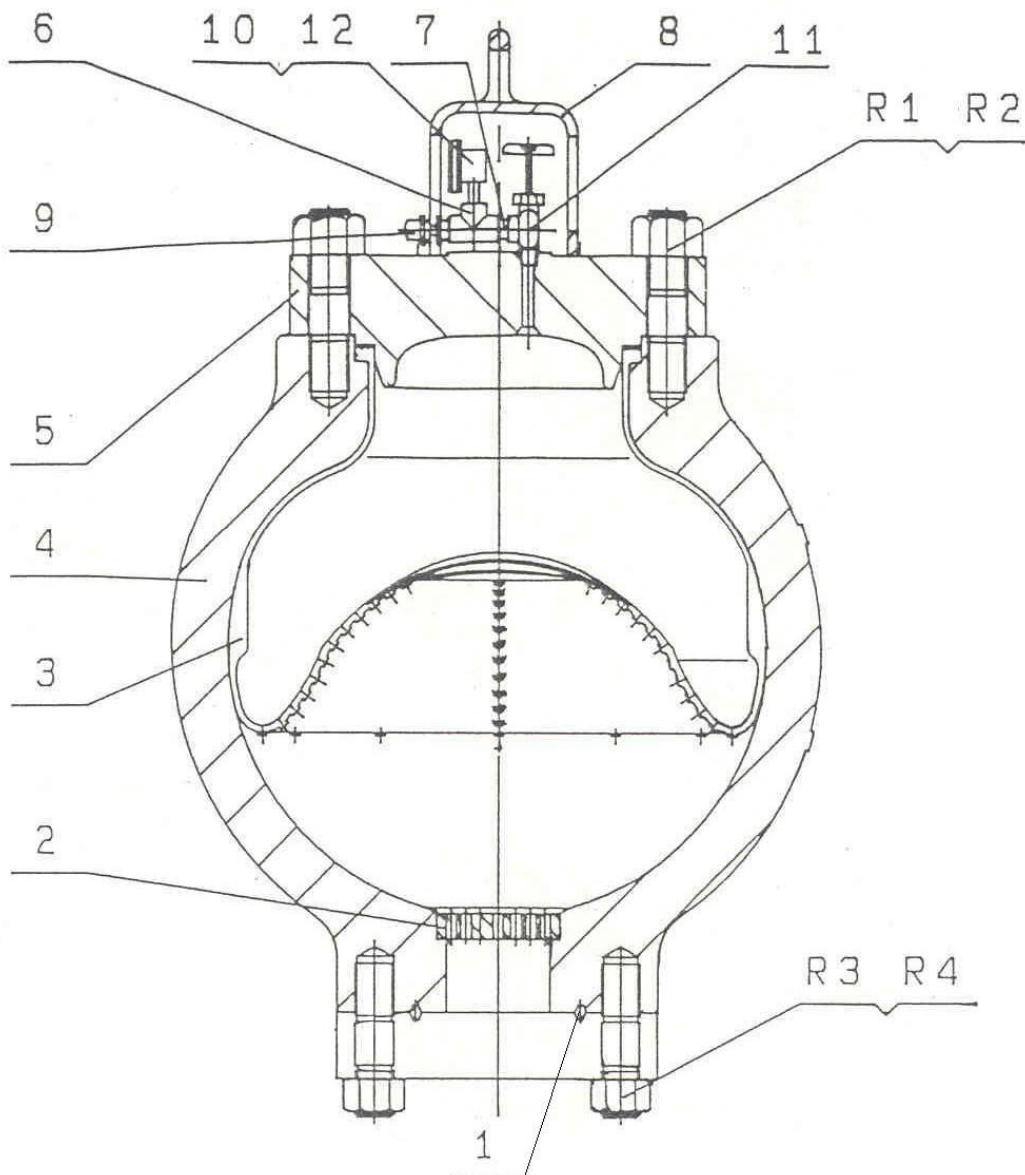
F-800G/1000 Tool List

Item No.	Description	Part NO.
1	Hydraulic valve seat puller	1set
1	Air dome gas-filled flexible pipe assembly	1
3	Allen wrench	1set
4	Open-ended spanner	2

KB-75 Pulsation Dampener List Part List

Description	Part No.	Page
KB-75 Pulsation Dampener	AH33002-00	73
Pulsation Dampener Charging Hose & Instruction		74

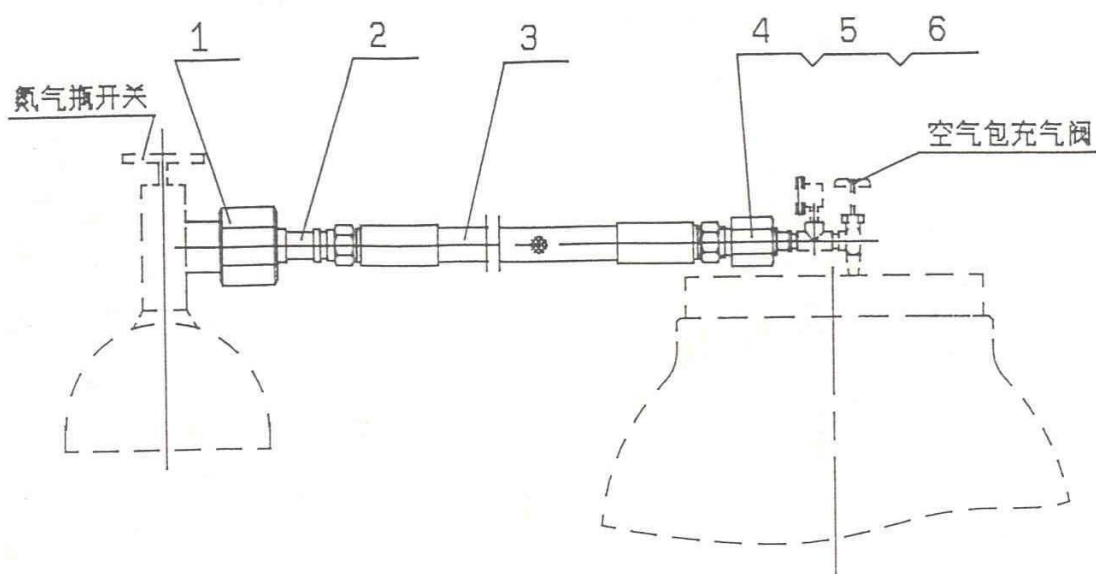
KB-75 Pulsation Dampener



Item No.	Qty	Description	Part No.
		General drawing	AH33002-00A
1	1	Sealing ring R39	T58-5001
2	1	Bottom plug	AH33002-02
3	1	Bladder	AH33002-03.00

4	1	Studded assembly	AH33002-04A.00
5	1	Head	AH33002-05A
6	1	Steel pipe tee NPT1/4	AH33002-06
7	1	Close nipple NPT1/4	AH33002-07
8	1	Gauge cover	AH33002-08.00
9	1	Purge valve	PJC1 -LB
10	1	Pressure gauge (0-25Mpa)	Y-60
11	1	Needle valve	JZR3-L8
12	1	Washer	T514-1001
R1	12	Stud	T53-4002(AM39x2-M39x3x130)
R2	12	Nut	T57-20011 (M39x3)
R3	8	Stud	T53-4002(AM33x2-M33x3x100)
R4	8	Nut M33x3	T57-2009

Pulsation Dampener Charging Hose & Instruction



Item	Qty	Description	Part No.
		Pulsation dampener charging hose	AH33001-31.10.00
1	1	Nut G5/8"	AH33001-31.10.01
2	1	Sealing connector	AH33001-31.10.02
3	1	Hose, C-type, M14x1.5	JB1887-77
4	1	Connector	AH33001-31.10.03
5	1	Gasket	AH33001-31.10.04
6	1	Pipe plug	AH33001-31.10.05

Instruction of filling air

1、Dismount the pressure gauge assy. from the pulsation dampener, turn the discharge valve lid 1/4-1/2 so as to discharge the air pressure in the area of pressure gauge.

2、Connect the hose to the nitrogen cyliner switch and the charging valve of pulsation dampener.

3、Open the charging valve of pulsation dampener.

4、Open the valve of Nitrogen cylinder slowly, adjust the air that flow into the pulsation dampener.

5、Turn off the Nitrogen switch when the pressure reach the required pressure.

6、Turn off the pulsation dampener valve.

7、lid, mount the discharge valve.

To get better effect, the filling air pressure should not exceed 2/3 of the discharge pressure, and the max. is 650PSI/4.5Mpa.

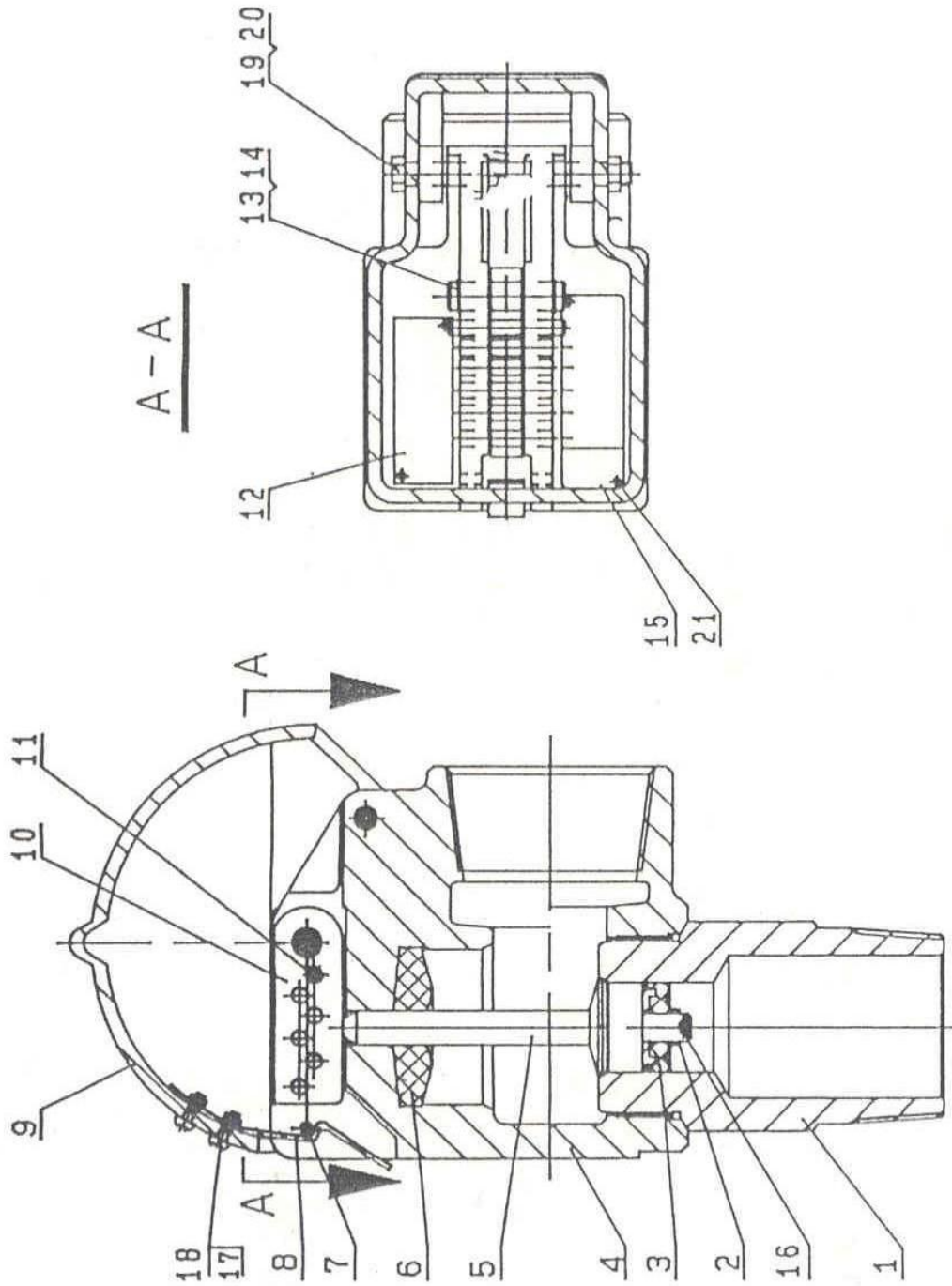
Warning: can only use compressed nitrogen or compressed air—can not use oxygen.

JA-3 Shear Relief Valve List

Part List

Description	Part No.	Page
JA-3 Shear Relief	AH33003-00	65

JA-3 Shear Relief Valve



Item No.	Qty	Description	Part No.
		JA-3 Shear relief valve	AH33003-00
1	1	Adapter bushing	AH33003-01
2	1	Plain washer	AH33003-02
3	1	Plunger seal	AH33003-03.00
4	1	Body	AH33003-04
5	1	Plunger stem	AH33003-05
6	1	Bumper	AH33003-06
7	1	Roll pin	AH33003-07
8	1	Cover spring	AH33003-08
9	1	Cover	AH33003-09
10	1	Shear bar	AH33003-10
11	1	Shear pin	AH33003-11A
12	1	Warning plate	AH33003-12
13	1	Shear bar pin	AH33003-13
14	2	Retainer ring	AH33003-14
15	1	Name plate	AH33003-15B
16	1	Cotter pin 4x26	GB91-86
17	2	Nut M4	GB41-86
18	2	Cap screw M4x16	GB67-86
19	1	Bolt M10x110	GB5780-86
20	1	Nut M10	GB41-86
21	4	Cap screw M3x8	GB67-86