Drilling fluid sand pump

Operation Manual

XI’an HL Petroleum Equipment Co.,Ltd.

Instruction on operation

★ All persons concerned must read through this manual and relevant instructions for operation and use carefully.

★ Designate the trained personnel as safety managers of the centrifuge pump.

★ Make sure all operators are educated on relevant safety precautions.

★ Only the trained personnel designated are allowed for operation and maintenance.

★ Electrical and mechanical maintenance must be performed by professional engineers under the guide of relevant documentations or other means.

★ Adjustment of electrical system parameters must be authorized by the manufacturer and performed by electrical engineers.

★ It is recommended that guides of safe operation and equipment maintenance be hung on the site.

★ It is recommended that an equipment use record and a maintenance record be created.

★ Sufficient light should be provided for night work.

★ No access to the equipment is allowed for any person not concerned.

1.Summary

1.1. Pump introduction

The pumps is designed for pumping drilling fluid or industrial suspension (slurry), the use of advanced design theory can be pumping abrasive, liquid viscosity (resistance) and corrosion. Compared with an ordinary pump, excellent flow, high temperature, long life, easy maintenance, high reliability, significant energy saving effect and so on, now widely used around the world on land and offshore drilling. We will provide users with the best products to meet the needs of the different working conditions.

1.2. Applications

Drilling applications:

Mud mixing and shearing operations, demanding and delisting, degassing, supercharging, centrifugal feed, mud cooling towers, and wash down.

Others:

Chemical, petroleum (refining), industrial, construction and agricultural applications.

Working conditions

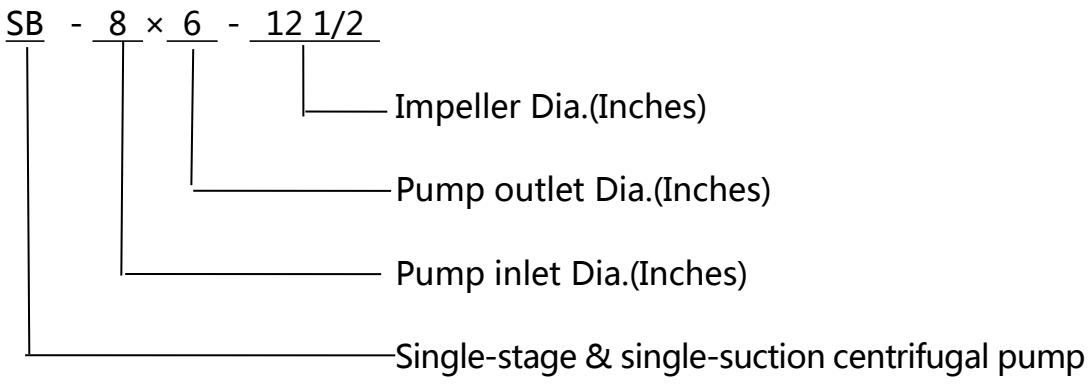
Outlet：DN=2″～6″　　Flow：Q=20～400m^3/h

Head：H=12～62m

Working temperature：T=-40℃～60℃

Please contact with us to meet you various demands.

1.3. Explanation of model



2.Technical parameters 380V/50HZ

Model	Capacity	Head	Efficiency	Speed	[NPSH]	Power	
	(m^3/h)	(m)	(%)	(rpm)	r(m)	Shaft (KW)	Motor (KW)
SB8×6×14	320	40	65	1480	4.0	53.63	75
SB8×6×12 1/2	290	30	64	1480	4.5	40.7	55
SB8×6×12	270	28	64	1480	4.5	32	45
SB6×5×14	200	40	62	1480	3.2	35.1	55
SB6×5×13	180	34	60	1480	3.0	27.8	45
SB6×5×12	160	30	60	1470	3.0	22	30
SB6×5×11	200	21	62	1470	2.5	18.5	30
SB6×5×9	160	12	58	1460	3.0	9.02	15
SB5×4×14	120	40	56	1460	4.6	23.3	37
SB5×4×13	90	40	56	1460	4.5	17.5	30
SB5×4×12	90	30	56	1460	4.5	13.1	22
SB5×4×11	90	24	56	1460	4.5	10.5	18.5
SB5×4×10	85	20	56	1460	4.2	8.4	15
SB5×4×9	80	19.5	54	1460	4.5	7.9	15

SB4×3×13	50	40	48	1460	4.5	11.3	18.5
SB4×3×12	45	30	47	1460	4	7.8	15
SB4×3×11	45	24	46	1460	4	6.4	11
SB3×2×13	25	35	40	1460	3	5.9	11
SB3×2×12	23	29	39	1450	3	5.1	7.5
SB3×2×11	20	23	39	1440	3	3.2	5.5

3. Explanation of sectional

The SB series concentric pump housings are heavier and stronger to outlast conventional pumps. The housings are thicker for extra strength and extended service life. The concentric design allows the distance between the impeller and the housing to be the same at all points. The concentric housing eliminates turbulence and cavitations within the pump. It also reduces the radial load on the bearings. Reasonable diameter of the pump inlet. The housing gasket is recessed to protect it from fluid leaving the impeller.

The SB series open-vane impeller eliminates recirculation that occurs in closed impellers. The impeller is designed to reduce turbulence, lower radial and thrust loads, and provides a smooth flow of fluid through the pump. Housing wear is reduced by eliminating the high scrubbing action that occurs on conventional pumps. The SB series impeller is designed to allow fluid leaving the impeller to blend with recirculation fluid to reduce abrasive wear of the casing. The open-vane impeller has no exposed impeller nuts or shaft threads. The impeller is screwed on and the threads are protected by anon-ring. The SB series pump and impeller are designed to increase service life many times over that of conventional pumps.

The SB series shaft has a greater diameter to provide heavy-duty performance with minimal shaft deflection. The replaceable shaft sleeve allows the wear from the packing to be renewed without replacing the entire shaft. The shaft sleeve

and mechanical seal can be replaced without removing the shaft from the pump.

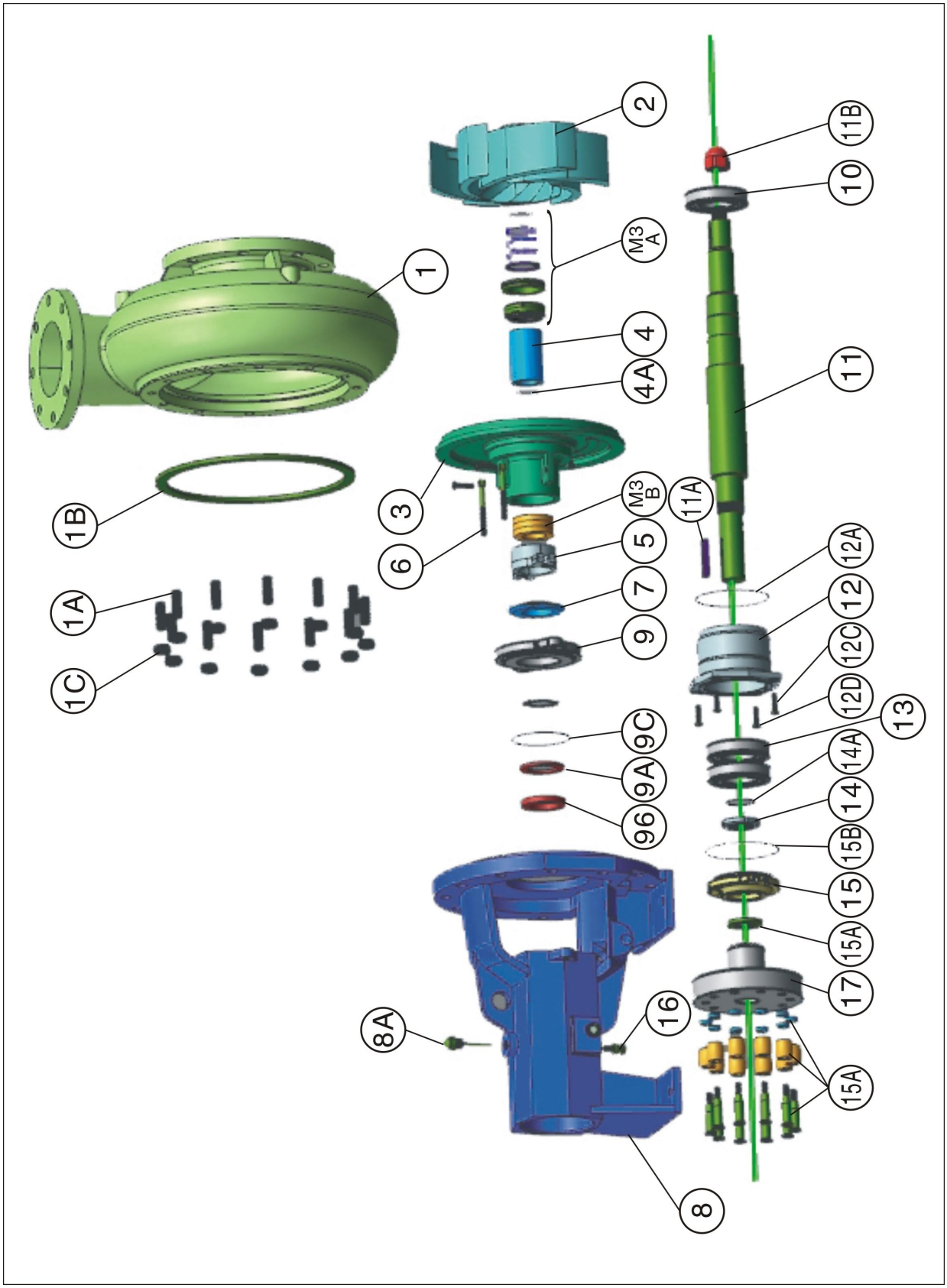
The SB series bearings are designed for easy maintenance. The outboard bearing assembly is comprised of two angular contact bearings with high thrust load ratings and zero end play. The inboard bearing is a heavy-duty, double row ball bearing with high radial load capacity to compensate for the larger impeller sizes and heavy-duty applications. The SB series only uses the best bearings available.

The SB series stuffing box cover combine the functions of wear plate and stuffing box into a one-piece replacement unit. One bolt holds the slip fitted stuffing box in place. The SB series stuffing box is available for packing or mechanical seal operation. The slip fit design allows easy access to the shaft sleeve.

The SB mechanical seal this top quality seal is manufactured from the finest materials available today. This seal delivers superior performance due to superior design. Our seal distributes drive torque over 10 drive tabs, which are 25-50% thicker than others on the market, therefore reducing stress on the outer retainer. All metal parts are manufactured or 316 stainless steel. Eastover’ s are manufactured from viton. Both rotating and stationary seal faces are tungsten carbide.

The life SB fluid end is now offering "SB" extended life fluid ends that include the stuffing box, impeller, and housing assembly. These parts are poured from the highest grade of ductile iron, and then finished to exacting specifications. After machining and inspection, these parts are processed through a quench and temper heat treating process to fully harden the parts throughout. During this process the parts are hardened to 40-44 ROCKWELL-C scale, this gives the "SB" parts the hardness to withstand the harshest pumping conditions. Look to the pumps for extended pump life.

4.Explosive view &Parts List Explosive view



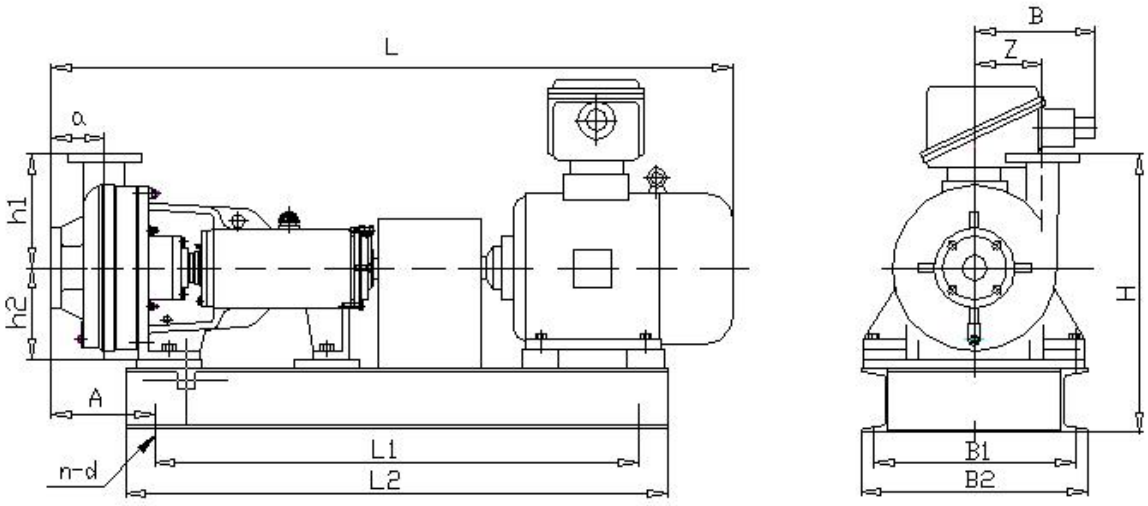
Parts List

Item	Nos	Description
1	1	Housing
1B	2	Gasket, housing
1A	12	Stud, housing
1C	12	Nut, housing
2	1	Impeller
3	1	Stuffing box-mechanical seal
M3A	1	Mechanical seal assembly
M3B	1	Back-Up packing
4	1	Shaft sleeve
4A	1	Seal, shaft sleeve
5	1	Packing gland
6	2	Gland bolt assembly
7	1	Deflector
8	1	Pedestal
9	1	Cover, inboard bearing
9A	1	Seal, inboard bearing exclusion
9B	1	Seal, inboard bearing cover
9C	1	Within the bearing cap seals
10	1	Bearing inboard

11	1	Shaft
11A	1	Key, shaft
11B	1	Impeller nut
12	1	Housing, outboard bearing
12A	1	Seal, outboard bearing housing
12D	2	Bolt, adjustment, outboard brng. HSG.
12C	2	Outer bearing fastening bolts
13	2	Bearing, outboard
14	1	Nut, bearing
14A	1	Lock washer, bearing nut
15	1	Cover, outboard bearing
15A	1	Seal, shaft, outboard bearing cover
15B	1	Seal, outboard bearing cover
8A	1	Breather
16	1	Oil drain plug
17	1	Coupling
17A	10	Coupling Pin

5. ■ Contour and installation dimensions

Installation dimensions



(1450r/min) Installation dimensions table1.

Pump model	Necessary motor		Contour Dimensions						Main Installation Dimensions						
	型号Model	KW	L	H	B	L2	h_1	h_2	a	A	L1	B1	B2	z	n-d
SB8×6-14	Y280S—4	75	1968	776	300	1458	356	227	173	550	940	457	500	214.3	4-—24
SB8×6-13	Y250M—4	55	1893	744	300	1389	356	227	173	431	1085	406	450	214.3	4-—24
SB8×6-12	Y225M—4	45	1850	721	250	1320	356	227	173	398	1085	356	400	214.3	4-—24
SB8×6-14I	Y250M—4	55	1893	744	300	1389	356	227	173	431	1085	406	450	214.3	4-—24
SB8×6-13I	Y225M—4	45	1850	721	250	1320	356	227	173	398	1085	356	400	214.3	4-—24
SB8×6-12I	Y200L—4	30	1763	721	250	1266	356	227	173	445	1020	318	360	214.3	4-—24
SB6×5-14	Y250M—4	55	1875	667	300	1389	280	227	146	404	1085	406	450	152.4	4-—24
SB6×5-13	Y225M—4	45	1820	640	290	1326	280	227	146	370	1085	360	400	152.4	4-—24
SB6×5-12	Y200L—4	30	1735	644	250	1266	280	227	146	418	1020	318	360	152.4	4-—24
SB6×5-11	Y200L—4	30	1731	644	250	1266	279	227	146	415	1020	318	360	152.4	4-—24
SB6×5-9	Y160L—4	15	1621	644	220	1181	279	227	146	428	800	284	330	152.4	4-—24

SB5×4-14	Y225S—4	37	1758	685	250	1295	320	227	125	334	1085	356	400	191	4-—24
SB5×4-13	Y200L—4	30	1698	685	250	1266	320	227	125	381	1020	318	360	191	4-—24
SB5×4-12	Y180L—4	22	1642	685	220	1225	320	227	125	445	800	279	325	191	4-—24
SB5×4-11	Y180M—4	18.5	1613	644	220	1187	279	227	125	436	800	279	325	160	4-—24
SB5×4-10	Y160L—4	15	1578	646	220	1181	279	227	125	385	800	284	330	160	4-—24
SB5×4-9	Y160L—4	15	1578	646	220	1181	279	227	125	385	800	284	330	160	4-—24
SB4×3-13	Y180M—4	18.5	1501	625	220	1187	260	227	108	413	800	279	325	171.5	4-—24
SB4×3-12	Y160L—4	15	1465	627	220	1181	260	227	108	362	800	284	330	171.5	4-—24
SB4×3-11	Y160M—4	11	1426	627	220	1137	260	227	108	362	800	284	330	171.5	4-—24
SB3×2-13	Y160M—4	11	1411	627	220	1137	260	227	95	347	800	284	330	177.8	4-—24
SB3×2-12	Y132M—4	7.5	1403	619	200	1070	260	227	95	341	800	274	314	178	4-—24
SB3×2-11	Y132S—4	5.5	1266	627	200	1017	260	227	95	347	800	270	314	177.8	4-—24
SB2×1 1/2-8	Y112M-4	4	1191	627	200	940	260	227	90	340	800	270	314	/	4-—24

6. Installation

Best installed near the pumps and pumping source, and to shorten the length of the inhalation segment, reducing the loss of the pump self-priming pump must be installed below the level of the pumping source.

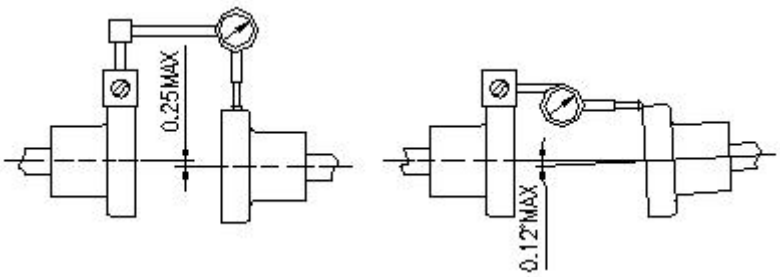
Firstly pour the concrete foundation, place "T" type channel iron when pouring, and install skid base after the concrete freezing. All the bases are required to be level in order to avoid the machine shaking.

6.1. Coupling installation

Coupling must be concentric with Shaft, the two axes must be aligned and its error limits: The value of parallel deviation cannot be over 0.25; the value of intersection angle error of the two axes cannot be over 0.12.

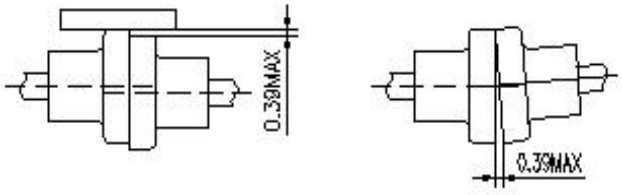
6.2. Check

Checking the two errors by percentage meter with pedestal (As fig. shown). Its two touches must keep close to the outside circle surface or face of the coupling and rotate slowly when checking. Take the max reading shown on the meter as error value.



6.3. Adjustment

It needs to be adjusted to the range of error if the checked result goes beyond. When adjusting axes, the two couplings must be aligned through pump, tightening or loosening the bolts on the motor and padding iron. Take clearance gauge to check when checking (As fig. shown) and require that the clearance value cannot be over 0.39.



6.4. Installation of the suction pipeline

A. Suction line cross-sectional area must be greater than or equal to pump flow off the area.

B. Not allowed to install the throttle valve in the suction pipe, but can installed

normally open valve to reduce the flow disorders, the valve to turn off only in the demolition of pump maintenance.

C. To avoid producing bubbles in the suction pipeline should transit gradually from high to low between the drawing resource and pump. Please take vacuum pump or foot valve to prime if you require the pump to work under the suction head condition.

D. The pipeline at the entrance of pump must be level and straight, its length is two times at least as much as the diameter of suction pipeline.

E. When the temporarily use of hoses for suction line, must ensure that the hose will not be compressed, which is higher than atmospheric pressure section of the suction pipe & down, the atmospheric pressure effect, reducing in compressed ,resulting in flow to reduce drying up even.

6.5. Installation of outlet pipeline

A. The outlet pipeline should be installed the opening valve that it is easy to pump' s overhaul.

N. All piping (including the inlet piping) must have its own support, will never allow the pipeline weight bearing by the pump.

C. A throttle valve must be installed along outlet pipeline when the conditions of work are not clear or stable, this can guarantee operation at the design point.

D. When pump' s outlet is connected with pressure equipments, sure to install a check valve between the throttle valve and pump' s outlet in order to prevent

from liquid back flowing, otherwise the back flowing liquid will result in loosening of impeller.

6.6. Mechanical seal

It is installed, adjusted and tested by manufacturer. Sure to draw cooling liquid and lubricating liquid into it as using, and guarantee the cool lubricating liquid to be drawn into the mechanical seal reliably before the pump operation, the used cooling lubricating liquid must be clean and clear.

7. Use

7.1. Emphases

A. The pump is only used in the range of design.

B. Packing cannot be too tight, sure to guarantee some leakage for lubrication.

C. Sure to maintain the mechanical seal according to the guide.

7.2. Preparations

A. Check the rotating direction (The wrong rotating direction will result in impeller loosening and suffering heavy damage to pump).

B. Rotate the shaft, must ensure that the flexible operation.

C. Fully open the valve of inlet part.

D. Fully pour casing and inlet pipeline by liquid in order to eliminate air in them.

E. Open packing seal cavity and cooling water pipe of other positions.

F. Open the valve of outlet pipeline a little.

7.3. Operating

A. Start motor after finishing all the preparations.

B. Gradually open water throttle valve when the pump pressure is stable, if there is flow outflow close the outlet valve until the pressure is stable and then gradually open, until the flow is normal.

C. When using mechanical seal, don’ t close the inlet & outlet valves during normal operation, otherwise will result in damage on seal parts surface by pounding or overheating of flowing liquid.

8. Lubrication

8.1. Bearing lubrication

Grease lubrication

The pump bearings on the grease pump manufacturers have been required at low speed, low temperature(relative to the operating conditions of 120℃), the pump during use without the need on the grease. The high temperature in the high load (relative to the pump operating conditions of 120℃), the bearings must be regularly on the grease to ensure that its service life. Grease pump must be on a regular basis, must be selected and bearing the original varieties compatible with grease or lubrication affect the bearing life. Filling tool: standard manual filling gun. Filling cycle and raise the amount of day and night use of the pump a week filling time, five shots each each bearing Note, the pump on a work night and day 8 hours every three weeks filling time, every

time each bearing note five shots on the day and night to use the pump, can also be a monthly filling time, each bearing Note 20 gun.

8.2 Oil lubrication

A. check once every day and pour lubricating oil according to requirement when necessary.

B. Packing cavity lubrication

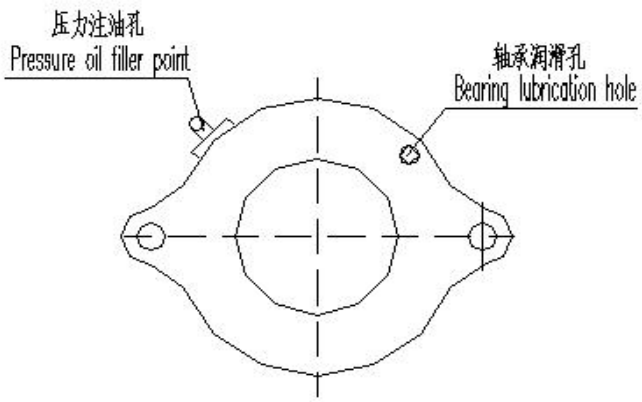
C. Packing cavity must be lubricated usually in order to prevent packing from damaging because of overheating, usually require once every day.

D. Sure to rotate the pump shaft when pouring lubricating grease, in order that the grease can get into packing cavity fully until have grease oozed out from gland.

E. Under the normal condition use general lubricating grease, you had best use heavy water lubricating grease for pump if too much leakage loss.

8.3. Inboard face seal lubrication

A. The position of pouring: The pressure oil filler point is at the left top corner of inboard bearing cover (see Fig.)



B. Grease: general or pump heavy water grease.

C. Pouring period and amount：Once and more per week, five guns every time.

D. If the grease piling up in seal cannot clear away automatically that it will result in reduction of lubricating effect, so you should guarantee the reliability of pressure oil device.

9. Maintenance

9.1. Dismantlement

A. Dismantle gland set

B. Dismantle casing

C. Dismantle impeller: If no impeller wrench, you must take the wooden cushion and hammer to strike the reinforcements at the back of impeller, and withdraw impeller from shaft in the counter clockwise direction (Looking from the front of impeller) when dismantling, you should firstly wedge shaft at coupling end in order to prevent from rotating.

D. Dismantle seal cover, strike the connected location of cover and frame by wooden hammer, and separate from (Note: Don’ t dismantle the mechanical seal stationary ring if the purpose of dismantlement isn’ t change of mechanical seal).

E. Withdraw from the packing ring from the paching cavity.

F. Exit sleeve, the sleeve is too tight, available wedge tapping its tail (axis at the shoulder) to make it loose. (Note: If the demolition is not intended to replace

the mechanical seal is not allowed to remove the mechanical seal rotating ring. Demolition sleeve can not damage the snap ring, remove the sole purpose of installation or replacement of mechanical seal and bushings, disassembly and end here.)

G. Exit slinger.

H. Exit shaft and a bearing assembly from the bearing body.

I. Remove the outer bearing end cap.

J. Loose lock washers at the demolition of the lock nut and lock washer

K. Dismantling frame and withdrawing outboard bearing (Pad a padding block and strike its axle center). Withdrawing inboard bearing (Take a 3″muff to align inside circle of bearing and strike another end of muff).

9.2 Checking

A. Impeller: Sure to change impeller if it has serious cavitations (main vanes in particular), over corrosion, wear and tear and breakage.

B. Shaft: When radial positive tolerance exceeds 0.55, bearing housing and the position of oil seal are scratched seriously and shaft surface is damaged, you are required to repair and maintain, but when no measures of doing it, you must change shaft.

C. Shaft sleeve: Sure to change sleeve when its surface is rough and damaged seriously.

D. Mechanical seal: seal face, gasket and shaft seal, etc parts must be

undamaged, otherwise will result in over leakage, sure to change parts with wear and tear or damage.

E. Ball bearing: For bearing that it is too wearing, and too tight, loose or with noise when operating, sure to change it (Note: New bearing packet is opened only when changing, the changed bearing must be the same model and size as original bearing).

F. O-Seal: general after the demolition of the O-shaped seal to replace all other sealing gaskets and other, as long as it is not broken, you can also reuse.

9.3. Assembly (see the sectional drawings & parts list)

A. All the parts and moveable ring of mechanical, O seal groove, thread, seal face, bearing and the lubricating location of bearing in particular must be cleaned before assembly. Also should polish the rough location by soft gauze.

B. When installing outboard bearing, two bearings should be back to back, sure to buckle the lock washer after screwing plug locknut and the Locking force of locknut is 346N.m.

C. Loaded sleeve on the shaft coated with a thin layer of antifriction agent.

D. The clearance value is 0.51 between the seal cover and the back of impeller.

E. The locking force of each bolt and nut is 195N.m.

F. Packing gland can’ t be screwed too tight, keep liquid leaking drop by drop, otherwise it maybe cause to packing burn down.

G. The assembly order is opposite to dismantlement, shaft should rotate easily

after assembly.

10. Breakdowns and elimination

10.1. When packing seal leaking, packing and sleeve surface are worn seriously.

A. Dismantle packing and take a crooked iron wire(90°)to move on the inside surface of sleeve, if too deep groove is checked out you must change sleeve, packing gland is too tight that it will result in wearing seriously.

10.2. Packing burn down

Elimination: Change packing

Reason: The packing is too tight, so that no normal leakage.

Appearance: The packing is hard and axial leakage increase rapidly.

10.3. Unusual rotation of impeller

Reason: The clearance between seal cavity and the back of impeller is too little.

Elimination: Adjust the clearance (see the preceding).

10.4. Breakdown of mechanical seal: Please contact manufacturer for solution.

10.5. The SB series mud pump general breakdowns reason list.

Reason	Noise or vibration	Cutting off flow	Capacity insufficiency	Pressure insufficiency	Too low efficiency(Power insufficiency)	Capacity instability	Short life of bearing
No pouring water to pump		×	×				
Too low speed			×	×			
Too high head		×	×				
[NPSH]r insufficiency	×	×	×			×	
Impeller jam		×	×			×	
Wrong rotating direction			×	×			
Inlet pipeline Jam	×	×	×				
Inlet pipeline or valve too low		×	×				

Impeller breakage		×	×	×			
Bad shaft seal			×	×			
Too small impeller diameter			×	×			
Too much air in liquid				×		×	×
Too high speed					×		×
Too low head					×		
Too big specific gravity of medium			×		×		×
Shaft crookedness	×				×		×
Wrong wiring of motor & unstable voltage					×		×
Rotor disturbance	×				×		×
Inlet pipeline of shaft seal leakage		×	×			×	
Axis is not aligned	×				×		×
Bearing is worn	×						×
Impeller disequilibria	×						×
Bad fixing of inlet & outlet pipeline	×						
Bad foundation	×						
Too big capacity	×			×	×	×	×
Bad lubrication & installation							×
Too big impeller clearance			×	×	×		

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