

SP Non-clogging Self-priming Sewage Pump Operation Manual



ECNP

Nanfang Pump Industry Co., Ltd.

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Read this manual carefully before install, start the pump.

Standard:Q/HNB***(Non-clogging Self-priming Sewage Pump)

I. INTRODUCTION

Thank You for purchasing CNP pump. **Read this manual** carefully to learn how to safely install and operate your pump. Failure to do so could result in personal injury or damage to the pump.

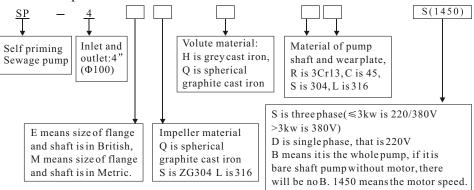
This operation manual is designed to help you achieve the expected performance and longest life from the CNP pump.

SP Non-clogging self priming sewage pump is suitable for the treatment project of municipal sewage and industrial sewage as well as stage treatment and concentrated treat -ment system of various sewages. It's known as "King of Self-priming Sewage Pump" and the most ideal new-generation sewage product.

1. Application

- Non flammable and non-explosive liquid;
- Rain water and common sewage;
- Municipal drainage project ,construction site, drainage station of people's air defense system;
- ullet Industrial sewage of light industry, paper mill, textile, food processing plant, chemical industry, electric utility, deep mines, etc;
 - Sewage discharge in the residential area;
 - Sewage and deposit of water purifying system;
 - Tanning industry, sewage of slaughter house, fish breeding in the river and pond;
 - Wine and sugar industry;
 - Discharge sewage of not strongly corrosive but seriously polluted.

2. Model Explanation



3. Operating condition

Liquid temperature: 0°C -40°C, medium density $\leq 1.2 \times 10^{3} \text{kg/m}^{3}$, pH5-9; Volume ratio of solids in the medium $\leq 2\%$;

Diameter of maximum grain: SP-2 38mm SP-3 63mm; SP-4/SP-6/SP-8 /SP-10 76mm

Ambient temperature: ≤40°C

Altitude:Max.1,000m;

II. STRUCTURE CHARACTERISTIC

1. Features

Stable performance, reliable operation;

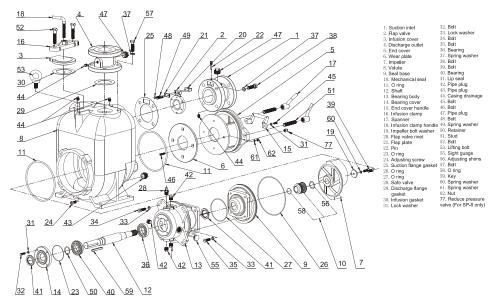
The motors clockwise rotation from drive; The pump shall be installed on the pedestal. axial suction and radial discharge;

Back-pull-out construction: Convenient for maintenance and troubleshoot -ing. Daily maintenance can be performed rapidly by common head tools, sav -ing time and labor;

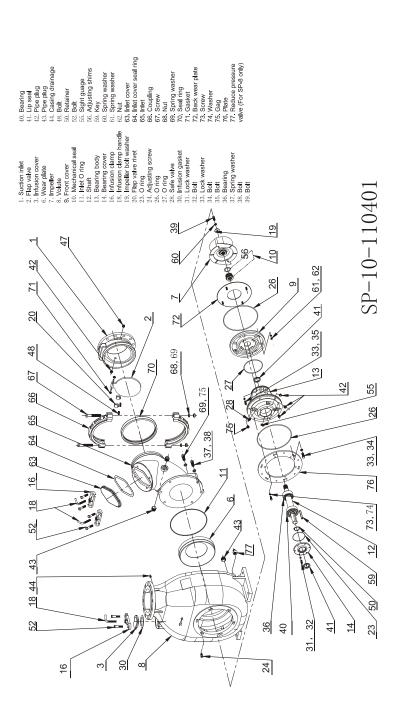
Open impeller structure and non-clogging design: Strong passing capacity. Convenient usage: The pump can be mounted high and dry at floor level. With only the suction line down in the liquid (the pump shall be filled with water for first start).

2. Pump structure (Figures 1)

SP Non-clogging Self-priming Sewage Pump



SP-2, 3, 4, 6, 8-110403



It is single-stage single suction cantilever pump. It is mainly composed of volute, impeller, wear plate, seal base, bearing body, etc;

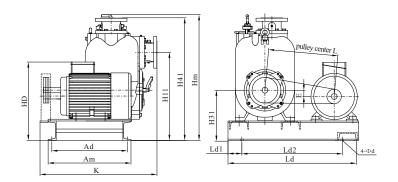
The main wet part is made of cast iron;

Pump shaft is supported by two high precision rolling bearing, bearing cabinet and seal cabinet is lubricated by thin oil;

Shaft seal is single face mechanical seal, wearing part is WC/WC. Oring is made by NBR.

Pump and pipelines is connected by flanges which comply to GB/T17241.6 standard.

3. Vbelt drive pump unit outline dimension figure



V belt drive pump unit outline and installation dimension

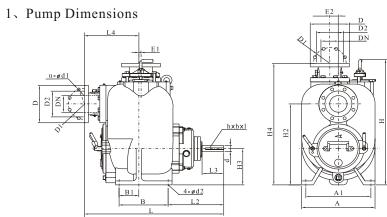
Model		Motor		i	nstall	atior	dim	ension				Ou	tline di	imensi	on	
Model	kW	Frame	Ad	Ld1	Ld2	d	H11	H31	H41	L	Ld	K	Hm	Am	HD	Е
SP-2(1150)	1.1	Y2-90S-4	375	100	515	20	438	271.5	622	350	715	655	672	423	375	72
SP-2(1750)	3	Y2-100L-2	359	100	550	20	438	271.5	622	375	750	655	672	407	410	62
SP-2(2050)	4	Y2-112M-2	352	100	560	20	438	271.5	622	363	760	655	672	400	432	50
SP-2(2350)	7.5	Y2-132S2-2	313	100	670	20	438	271.5	622	451	870	655	672	361	472	30
SP-2(2650)	7.5	Y2-132S2-2	313	100	650	20	438	271.5	622	433	850	655	672	361	472	30
SP-3(650)	0.75	Y2-80M2-4	467	100	609	20	552	310.5	772	428	808	752	818	514	355	121
SP-3(850)	1.5	Y2-90L-4	451	100	651	20	552	310.5	772	460	854	752	818	498	375	111
SP-3(1050)	3	Y2-100L2-4	435	100	662	20	552	310.5	772	459	866	752	818	482	410	101
SP-3(1150)	4	Y2-112M-4	428	100	767	20	552	310.5	772	540	967	752	818	475	432	89
SP-3(1250)	4	Y2-112M-4	428	100	774	20	552	310.5	772	548	974	752	818	475	432	89
SP-3(1350)	5.5	Y2-132S1-4	389	100	756	20	552	310.5	772	514	956	752	818	436	472	69
SP-3(1550)	7.5	Y2-132S2-2	389	100	675	20	552	310.5	772	434	875	752	818	436	472	69
SP-3(1650)	11	Y2-160M1-2	341	100	776	20	552	310.5	772	509	975	752	818	389	545	41
SP-3(1750)	11	Y2-160M1-2	341	100	786	20	552	310.5	772	519	986	752	818	389	545	41
SP-3(1850)	15	Y2-160M2-2	341	100	781	20	552	310.5	772	514	981	752	818	389	545	41
SP-3(1950)	15	Y2-160M2-2	341	100	803	20	552	310.5	772	536	1003	752	818	389	545	41
SP-3(2050)	18.5	Y2-160L-2	341	100	744	20	552	310.5	772	477	944	752	818	389	545	41
SP-3(2150)	18.5	Y2-160L-2	341	100	753	20	552	310.5	772	486	953	752	818	389	545	41

Continued V belt drive pump unit outline and installation

N 11		Motor			iı	ıstal	llation	dime	nsion		C	utline	dimen	sion		
Model	kW	Frame	Ad	Ld1	Ld2	d	H11	H31	H41	L	Ld	K	Hm	Am	HD	Е
SP-4(650)	1.5	Y2-90L-4	545	100	722	20	635.3	362.2	875	499	922	855	900	600	395	142.2
SP-4(850)	2.2	Y2-100L1-4	529	100	761	20	635.3	362.2	875	525	961	855	900	584	430	132.2
SP-4(1050)	5.5	Y2-132S-4	483	100	818	20	635.3	362.2	875	543	1018	855	900	538	492	100.2
SP-4(1150)	5.5	Y2-132S-4	483	100	830	20	635.3	362.2	875	555	1030	855	900	538	492	100.2
SP-4(1250)	7.5	Y2-132M-4	483	100	840	20	635.3	362.2	875	565	1040	855	900	538	492	100.2
SP-4(1350)	11	Y2-160M-4	436	100	818	20	635.3	362.2	875	521	1018	855	900	491	565	72.2
SP-4(1550)	15	Y2-160M2-2	436	100	876	20	635.3	362.2	875	567	1076	855	900	491	565	72.2
SP-4(1650)	18.5	Y2-160L-2	436	100	959	20	635.3	362.2	875	649	1159	855	900	491	565	72.2
SP-4(1750)	22	Y2-180M-2	423	100	922	20	635.3	362.2	875	599	1122	855	900	478	610	52.2
SP-4(1850)	30	Y2-200L1-2	413	100	900	20	635.3	362.2	875	547	1100	855	900	468	655	32.2
SP-4(1950)	30	Y2-200L1-2	413	100	870	20	635.3	362.2	875	526	1070	855	900	468	655	32.2
SP-6(650)	3	Y2-100L2-4	497	100	886	20	714.3	397.2	1027.7	562	1096	947	1030	552	462	135.2
SP-6(850)	7.5	Y2-132M-4	451	100	970	20	714.3	397.2	1027.7	618	1180	947	1030	506	492	135.2
SP-6(1050)	11	Y2-160M-4	404	100	1045	20	714.3	397.2	1027.7	659	1255	947	1030	459	565	107.2
SP-6(1150)	15	Y2-160L-4	404	100	1061	20	714.3	397.2	1027.7	675	1271	947	1030	459	565	107.2
SP-6(1250)	22	Y2-180L-4	391	100	1013	20	714.3	397.2	1027.7	596	1223	947	1030	446	610	87.2
SP-6(1350)	30	Y2-200L-4	381	100	1130	20	714.3	397.2	1027.7	692	1340	947	1030	436	655	67.2
SP-6(1550)	37	Y2-225S-4	335	100	1127	20	714.3	397.2	1027.7	662	1337	947	1030	390	710	42.2
SP-8(650)	7.5	Y2-160M-6	614	150	1060	24	924	530.2	1269.3	733	1375	1043	1270	675	615	170.2
SP-8(850)	15	Y2-180L-6	599	150	1000	24	924	530.2	1269.3	642	1315	1043	1270	660	660	150.2
SP-8(1050)	30	Y2-200L-4	599	150	1200	24	924	530.2	1269.3	792	1515	1054	1270	660	705	130.2
SP-8(1150)	37	Y2-225S-4	549	150	1130	24	924	530.2	1269.3	712	1445	1054	1270	610	760	105.2
SP-8(1250)	55	Y2-250M-4	549	150	1150	24	924	530.2	1269.3	735	1465	1054	1270	610	820	80.2
SP-8(1350)	75	Y2-280S-4	514	150	1260	24	924	530.2	1269.3	792	1575	1095	1270	575	890	50.2
SP-10(650)	11	Y2-160L-6	529	150	1040	24	839.8	555.6	1247.8	704	1375	1270	1248	590	615	195.6
SP-10(850)	22	Y2-200L2-6	509	150	1100	24	839.8	555.6	1247.8	725	1435	1280	1248	570	705	155.6
SP-10(1050)	45	Y2-225M-4	459	150	1180	24	839.8	555.6	1247.8	743	1515	1280	1248	520	760	130.6
SP-10(1150)	55	Y2-250M-4	489	150	1280	24	839.8	555.6	1247.8	798	1615	1280	1248	550	820	105.6
SP-10(1250)	75	Y2-280S-4	539	150	1280	24	839.8	555.6	1247.8	738	1615	1320	1248	600	890	75.6
SP-10(1350)	90	Y2-280M-4	554	150	1280	24	839.8	555.6	1247.8	792	1615	1320	1248	615	890	75.6

6.

III、OUTLINE DRAWING



Figures 3 Pump Dimensions

Table 3 Pump dimensions

Ιtε	m	SP-2	SP-3	SP-4	SP-6	SP-8	SP-10
	PN PN0.6MPa		6MPa		PN1.0MPa		PN1.6MPa
Dimension	DN	50	80	100	150	200	250
of Inlet &	D	140	190	220	285	340	405
Outlet	D1	110	150	180	240	295	355
Flange	D2	90	128	158	214	266	320
(mm)	n-d1	4-φ14	4- φ 19	8- φ 19	8- Φ23	8-ф23	12- φ 26
	Н2	318	431.8	495.3	574.3	723.8	639.8
-	A	308	377	428	580.0	716.0	705.0
•	A1	281	328	373	527.0	635.0	635.0
	В	163.2	228.6	279.4	279.4	304.8	304.80
Installation	В1	54	76.2	110	77.8	101.6	101.6
Dimension	L2	274.8	285	326	294.0	407.1	320.6
(mm)	d2	ф 14	ф18	ф18	ф18	ф24	ф 24
	Н3	151.5	190.5	222.2	257.2	330.2	355.6
Ī	L3	104	102	127	127.0	170.0	123
Ī	d	Ф38	ф38	ф38	ф38	Ф 48	Ф48
Ī	$h \times b \times 1$	10×5×95	10×5×80	10×5×90	10×5×90	14×5.5×127	14×5.5×120
	Н	552	697.5	760	875	989.0	1017
•	Am	321	389	429	580.0	716.0	786.0
Profile	H4	502	652	735	887.7	1069.3	1047.8
Dimension (mm)	L	615	712.2	813.5	906.6	1023.0	1244.7
	L4	233	277	318	411	412.8	720.9
Ī	E1	27.5	15	13	0	0	0
ļ	E2	70	50	50	50	0	0
Wt	. (kg)	99	190	275	438	655	705

Drive connection

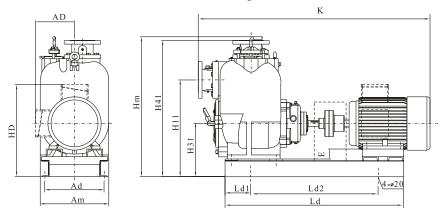
Drive connection has direct coupling connection and V belt variable speed drive. Parameters for V belt drive as below.

		Motor	Motor e	nd pully	Pump en	d pulley		V belt	
Model	kW	Frame	Туре	Pulley OD mm	Туре	Pulley OD mm	Туре	Nominal length	Belt Nos.
SP-2(1150)	1.1	Y2-90S-4	VA2-85	90.5	VA2-100	105.5	A	990	2
SP-2(1750)	3	Y2-100L-2	VA4-85	90.5	VA4-132	137.5	A	1100	4
SP-2(2050)	4	Y2-112M-2	VA3-100	105.5	VA3-132	137.5	A	1100	3
SP-2(2350)	7.5	Y2-132S2-2	VA4-100	105.5	VA4-120	125.5	A	1250	4
SP-2(2650)	7.5	Y2-132S2-2	VA3-118	123.5	VA3-125	130.5	A	1250	3
SP-3(650)	0.75	Y2-80M2-4	VA2-80	85.5	VA2-160	165.5	A	1250	2
SP-3(850)	1.5	Y2-90L-4	VA2-80	85.5	VA2-125	130.5	A	1250	2
SP-3(1050)	3	Y2-100L-6	VA3-90	95.5	VA3-120	125.5	A	1250	3
SP-3(1150)	4	Y2-112M-4	VA3-100	105.5	VA3-120	125.5	A	1430	3
SP-3(1250)	4	Y2-112M-4	VA3-100	105.5	VA3-112	117.5	A	1430	3
SP-3(1350)	5.5	Y2-132S1-4	VA4-125	130.5	VA4-130	135.5	A	1430	4
SP-3(1550)	7.5	Y2-132S2-2	VA3-125	130.5	VA3-224	229.5	A	1430	3
SP-3(1650)	11	Y2-160M1-2	VA4-125	130.5	VA4-212	217.5	A	1560	4
SP-3(1750)	11	Y2-160M1-2	VA4-125	130.5	VA4-200	205.5	A	1560	4
SP-3(1850)	15	Y2-160M2-2	VB4-132	139	VB4-200	207	В	1560	4
SP-3(1950)	15	Y2-160M2-2	VB4-125	132	VB4-180	187	В	1560	4
SP-3(2050)	18.5	Y2-160L-2	VB4-160	167	VB4-224	231	В	1560	4
SP-3(2150)	18.5	Y2-160L-2	VB4-160	167	VB4-212	219	В	1560	4
SP-4(650)	1.5	Y2-90L-4	VA2-85	90.5	VA2-180	185.5	A	1430	2
SP-4(850)	2.2	Y2-100L1-4	VA3-90	95.5	VA2-150	155.5	A	1430	2
SP-4(1050)	5.5	Y2-132S-4	VA3-125	130.5	VA3-160	165.5	A	1550	3
SP-4(1150)	5.5	Y2-132S-4	VA3-125	130.5	VA3-150	155.5	A	1550	3
SP-4(1250)	7.5	Y2-132M-4	VA4-125	130.5	VA4-140	145.5	A	1550	4
SP-4(1350)	11	Y2-160M-4	VB4-160	167	VB4-170	177	В	1560	4
SP-4(1550)	15	Y2-160M2-2	VB3-180	187	VB3-315	322	В	1950	3
SP-4(1650)	18.5	Y2-160L-2	VB4-150	157	VB4-250	257	В	1950	4

Continued V belt drive parameters

	Motor		Motor e	nd pully	Pump en	d pulley		V belt	
Model	kW	Frame	Туре	Pulley OD mm	Туре	Pulley OD mm	Type	Nominal length	Belt Nos.
SP-4(1750)	22	Y2-180M-2	VB4-180	187	VB4-280	287	В	1950	4
SP-4(1850)	30	Y2-200L1-2	VC4-212	209.6	VC4-315	324.6	С	1950	4
SP-4(1950)	30	Y2-200L1-2	VC4-230	239.6	VC4-355	364.6	С	1950	4
SP-6(650)	3	Y2-100L2-4	VA2-85	91	VA2-180	186	A	1550	2
SP-6(850)	7.5	Y2-132M-4	VB4-125	132	VB4-200	207	В	1760	4
SP-6(1050)	11	Y2-160M-4	VB3-170	177	VB3-224	231	В	1950	3
SP-6(1150)	15	Y2-160L-4	VB4-170	177	VB4-200	207	В	1950	4
SP-6(1250)	22	Y2-180L-4	VC4-224	234	VC4-250	260	С	1950	4
SP-6(1350)	30	Y2-200L-4	VC4-250	260	VC4-265	275	С	2195	4
SP-6(1550)	37	Y2-225S-4	VC4-300	310	VC4-280	290	С	2195	4
SP-8(650)	7.5	Y2-160M-6	VB3-125	132	VB3-180	187	В	1950	3
SP-8(850)	15	Y2-180L-6	VB4-200	207	VB4-224	231	В	1950	4
SP-8(1050)	30	Y2-200L-4	VC4-224	233.6	VC4-315	324.6	С	2420	4
SP-8(1150)	37	Y2-225S-4	VC4-280	289.6	VC4-355	364.6	С	2420	4
SP-8(1250)	55	Y2-250M-4	VC4-280	289.6	VC4-315	324.6	С	2420	4
SP-8(1350)	75	Y2-280S-4	VD4-355	371.2	VD4-375	391.2	D	2740	4
SP-10(650)	11	Y2-160L-6	VB4-140	147	VB4-200	207	В	1950	4
SP-10(850)	22	Y2-200L2-6	VC4-224	233.6	VC4-250	259.6	С	2195	4
SP-10(1050)	45	Y2-225M-4	VC4-250	259.6	VC4-355	364.6	С	2420	4
SP-10(1150)	55	Y2-250M-4	VC4-315	324.6	VC4-400	409.6	С	2715	4
SP-10(1250)	75	Y2-280S-4	VD4-355	371.2	VD4-425	441.2	D	2740	4
SP-10(1350) 90 Y2-280M-4 VD4-355 371.2 VC4-375 391.2 D 2740 4									
Pulley in accor	rdance w	ith GB/T10412,an	d V belt in acc	cordance wit	h GB/T1154	standard.			

2. Profile & Installation Dimension of Pump Unit With Motor



Figures 4 Installation Dimension of Pump Unit With Motor

Table 4 Installation Dimension of Pump Unit With Motor

Model	Speed	N	Aotor		In	stallati	on D	imensi	on			Pr	ofile D	imensio	n	
Model	RPM	kW	Frame	Ad	Ld1	Ld2	d	H11	H31	H41	K	Am	Hm	HD	Е	Ld
SP-2	1450	1.5	Y2-90L-4	300	77.5	617	20	428	261.5	612	986	341	662	416.5	61.5	772
31 -2	2900	9.2	Y2-132S-2	300	77.5	695	20	428	261.5	612	1110	341	662	471.5	19.5	850
	750	1.5	Y2-112M-8	330	120	621	20	541.8	300.5	762.2	1134	370	800	490.5	78.5	861
SP-3	950	1.5	Y2-100L-6	330	120	614	20	541.8	300.5	762.2	1119	370	800	480.5	90.5	854
	1450	5.5	Y2-132S1-4	330	120	660	20	541.8	300.5	762.2	1204	370	800	510.5	58.5	900
	750	1.5	Y2-112M-8	370	150	663	20	605.3	332.2	843.6	1236	430	887.3	522.2	110.2	963
SP-4	950	3	Y2-132S-6	370	150	702	20	605.3	332.2	843.6	1306	430	887.3	542.2	90.2	1002
	1450	11	Y2-160M-4	370	150	821	20	605.3	332.2	843.6	1451	430	887.3	587.2	62.2	1121
	750	4	Y2-160M1-8	510	150	784	20	710.3	393.2	1023.7	1544	590	1024	648.2	97.2	1084
SP-6	950	7.5	Y2-160M-6	510	150	784	20	710.3	393.2	1023.7	1544	590	1024	648.2	97.2	1084
	1450	30	Y2-200L-4	510	150	905	20	710.3	393.2	1023.7	1705	590	1024	698.2	57.2	1205
	750	11	Y2-180L-8	640	150	1050	24	904	510.2	1250	1767	716	1250	790	150.2	1350
SP-8	950	22	Y2-200L2-6	640	150	1085	24	904	510.2	1250	1769	716	1250	815	130.2	1385
	1450	75	Y2-280S-4	640	150	1264	24	904	510.2	1250	2012	716	1250	1020	50.2	1564
	750	15	Y2-200L-8	640	150	1050	24	820	535.6	1227.8	2020	786	1228	880.6	155.6	1350
SP-10	950	30	Y2-225M-6	640	150	1050	24	820	535.6	1227.8	2095	786	1228	865.6	130.6	1350
	1450	90	Y2-280M-4	640	150	1240	24	820	535.6	1227.8	2285	786	1228	935.6	75.6	1540

IV, INSTALLATION

1. Preinstall Inspection

The pump assembly was inspected and tested before shipment from the factory. Before installation, inspect the pump for damage which may have occurred during shipment. Check as follows:

Inspect the pump for cracks, dents, damaged threads, and other obvious damage,

Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.

Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated.

Check levels and lubricate as necessary.

If the pump and engine have been stored for more than 12 months, some of the components or lubricants may have exceeded their maximum shelf life. These must be inspected or replaced to ensure maximum pump service.

2. Positioning Pump(Figure 5)

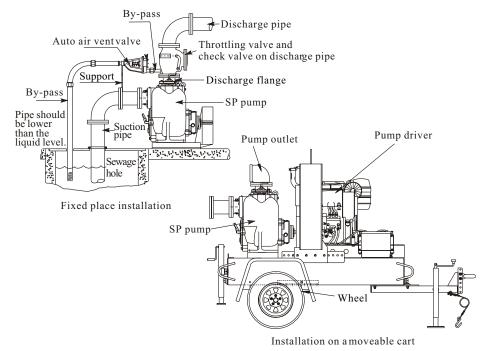


Figure 5 (Pump installation sketch figure)

Locate the pump in an accessible place as close as practical to the liquid being pumped. Level mounting is essential for proper operation.

The pump may have to be supported or shimmed to provide for level operation or to eliminate vibration, or shimmed by rubber cushion when necessary.

If the pump has been mounted on a moveable base, make certain the base is stationary by setting the brake and blocking the wheels before attempting to operate the pump.

Do not position the pump and engine more than 15° off horizontal for continu -ous operation.

If installed in a flooded suction application where the liquid is supplied to the pump under pressure. Since the pressure supplied to the pump is critical to perfor -mance and safety, be sure to limit the incoming pressure to 50% of the maximum permissible operating pressure as shown on the pump performance curve.

Clearance

When positioning the pump, allow a minimum clearance of 500 mm in front of the end cover to permit removal of the cover and easy access to the pump interior.

Suction And Discharge Piping

Pump performance is adversely effected by increased suction lift, discharge elevation, and friction losses. See the performance curve and notes on Page E-1 to be sure your overall application allows pump to operate within the safe operation range.

Materials

Either pipe or hose maybe used for suction and discharge lines; however, the materials must be compatible with the liquid being pumped. If hose is used in suction lines, it must be the rigid-wall, reinforced type to prevent collapse under suction. Using piping couplings in suction lines is not recommended.

3. Line Configuration

Keep suction and discharge lines as straight as possible to minimize friction losses. make minimum use of elbows and fittings, which substantially increase friction loss. If elbows are necessary, use the long-radius type to minimize friction loss.

Connections to Pump

Before tightening a connecting flange, align it exactly with the pump port. Never pull a pipe line into place by tightening the flange bolts and/or couplings.

Lines near the pump must be independently supported to avoid strain on the pump which could cause excessive vibration, decreased bearing life, and increased shaft and seal wear. If hose-type lines are used, they should have adequate support to secure them when filled with liquid and under pressure.

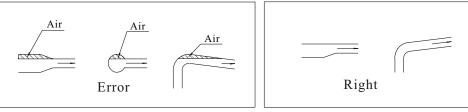
Gauges

Most pumps are drilled and tapped for installing discharge pressure and vacuum suction gauges. If these gauges are desired for pumps that are not tapped, drill and tap the suction and discharge lines not less than 18 inches (460 mm) from the suction

and discharge ports and install the lines. Installation closer to the pump may result in erratic readings.

Suction Lines

1)To avoid air pockets which could affect pump priming, the suction line must be as short and direct as possible. When operation involves a suction lift, the line must always slope upward to the pump from the source of the liquid being pumped; if the line slopes down to the pump at any point along the suction run, air pockets will be created.



Figures 6

2)Suction lines should be the same size as the pump inlet. If reducers are used in suction lines, they should be the eccentric type, and should be installed with the flat part of the reducers uppermost to avoid creating air pockets. Valves are not normally used in suction lines, but if a valve is used, install it with the stem horizontal to avoid air pockets.

3)If a single suction line is installed in a sump, it should be positioned away from the wall of the sump at a distance equal to 1.5 times the diameter of the suction line.

4)If two suction lines are installed in a single sump, the flow paths may interact, reducing the efficiency of one or both pumps. To avoid this, position the suction inlets so that they are separated by a distance equal to at least 3 times the diameter of the suction pipe.

5)Suction Line Positioning

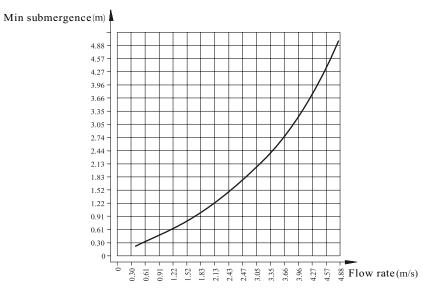
The depth of submergence of the suction line is critical to efficient pump operation. (Figure 7) shows recommended minimum submergence vs. flow rate.

6)Strainers

If a strainer is furnished with the pump, be certain to use it; any spherical solids which pass through a strainer furnished with the pump will also pass through the pump itself.

7)Sealing

Since even a slight leak will affect priming, head, and capacity, especially when operating with a high suction lift, all connections in the suction line should be sealed with pipe dope to ensure an airtight seal. Follow the sealant manufacturer's recom-mendations when selecting and applying the pipe dope. The pipe dope should be compatible with the liquid being pumped.



Figures 7 Flow rate and submergence

Discharge Lines

(a)Valves

With high discharge heads, it is recommended that a throttling valve and a sys-tem check valve be installed in the discharge line to protect the pump from excessive shock pressure and reverse rotation when it is stopped. The valve shall be as large as the largest pipe to minimize friction losses. Never install a throttling valve in a suction line.

ACAUTION

If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

(b)Bypass Lines

Self-priming pumps are not air compressors. During the priming cycle, air from the suction line must be vented to atmosphere on the discharge side. If the discharge line is open, this air will be vented through the discharge. However, if a check valve has been installed in the discharge line, the discharge side of the pump must be opened to atmospheric pressure through a bypass line installed between the pump discharge and the check valve. A self-priming centrifugal pump will not prime if there is sufficient static liquid head to hold the discharge check valve closed.

It is also recommended that pipe unions be installed at each 90° elbow in a by pass line to ease disassembly and maintenance.

The bypass line should be sized so that it does not affect pump discharge capacity; however, the bypass line should be at least 25 mm in diameter to minimize the chance of plugging.

In low discharge head applications less than 10 m, it is recommended that the bypass line be run back to the wet well, and located under 150 mm below the water level or cut-off point of the low level pump. In some installations, this bypass outline may be terminated with a six-to eight foot length (2 to 2,5 m)of 30 mm I.D. smoothbore hose; air and liquid vented during the priming process will then agitate the hose and break up any solids, grease, or other substances likely to cause clogging.

In high discharge head applications (more than 10 meters), an excessive amount of liquid may be bypassed and forced back to the wet well under the full working pressure of the pump; this will reduce overall pumping efficiency. Therefore, it is recommended that a Automatic Air Release Valve be installed in the bypass line.

Automatic Air Release Valve: When properly installed and correctly adjusted to the specific hydraulic operating conditions of the application, the Automatic Air Release Valve will permit air to escape through the bypass line, and then close auto matically when the pump is fully primed and pumping at full capacity.

About installation and working principle of Automatic Air Release Valve , related user manuals of these products can be referred.

Horizontal adjustment

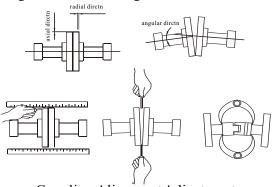
The alignment of pump shaft and motor shaft is very important to ensure pump work well without failure. Put some washer on the footer of pump and motor.

4. Drive Connection Installation

Drive connection ways include coupling drive and V belt drive.

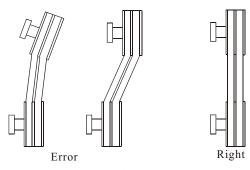
SP-2,3,4,6 use insert type claw couplings,SP-8,10 use elastic sleeve pin coupling. Other types of flexibility coupling are also optional as per actual situation. It is very important to make the coupling correctly fixed and aligned. Coupling must be aligned properly after installation ,so as to make the motor shaft and pump shaft at high coaxiality.

To measure the amount of misalignment by using a feeler gauge between the coup-ling and the straightedge, at least 4 points along circumference, and the amount shall be within the range as in the following table.



Coupling Alignment Adjustment
Coupling Allowed Coupling Alignment Adjustment Misalignment Value

Coupling Type	Aliowed misalignment Value								
Coupling Type	axial direction * mm	radial direction	angular direction						
insert type claw coupling	1.5~2	0.5	1° 0'						
elastic sleeve pin type couping	2.5~3.5	0.2	0° 30'						
• the axial misalignment value difference between max.and min, shall shall be not more than 02.mm									



Figures 9

When using V-belt drives, the power source and the pump must be parallel. Use a straightedge along the sides of the pulleys to ensure that the pulleys are properly aligned (see Figure 11).

In drive systems using two or more belts, make certain that the belts are a matched set; unmatched sets will cause accelerated belt wear.

Select pulleys that will match the proper speed ratio; over speeding the pump may damage both pump and power source.

! DANGER!

Do not operate the pump without the guard in place over the rotating parts. exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

5, Electrical Connections

Electirc wiring shall be effected by a qualified electircan.

Make sure the electric motor and power source are compatible, and motor wire shall be connected as per the wire chart on back of the terminal box cover.

Motor shall be connected with a sensitive and effective electrical control apparatus, to prevent from damage caused by phase lack, voltage imbalance overload. Reliable earthed system is required.

! WARNING!

Disconnect power source before taking apart terminal box cover and disasse -mbling pump.

V START-UP

<u>M</u>WARNING!

This pump is designed to handle sewage containing large entrained solids. Do not attempt to pump volatile, corrosive, or flammable liquids which may damage the pump or endanger personnel as a result of pump failure.

ACAUTION

Choose the suitable motor for the pump according to the application. Never increase the operating speed which will cost more input power of pump.

1. Prestart operation

Install the pump and piping as described in INSTALLATION. Make sure that the piping connections are tight, and that the pump is securely mounted. Check that the pump is properly lubricated.

The pump is being put into service for the first time.

The pump has not been used for a considerable length of time.

The liquid in the pump volute has evaporated.

Add liquid to the pump volute:

Shut off all the outlet valves, open the infusion cover, plug, add clean water in it, then fit back the infusion cover and plug.

! WARNING!

After filling the pump volute, reinstall and tighten the fill plug. Do not attempt to operate the pump unless all connecting piping is securely installed. Otherwise, liquid in the pump forced out under pressure could cause injury to personnel.

2. Starting

Starting procedures will vary slightly depending on the pump application, type of priming device, and type of drive.

If the pump is driven by an electric motor, check the voltage of the powr source before attempting to start the motor.

Lines Without a Bypass

Partially open outlet valve before start the pump, so the air can be vented out by outlet pipe and ensure the pump run without full load. Priming is indicated by a positive reading on the discharge pressure gauge or by a quieter operation. The pump may not prime immediately because the suction line must first fill with liquid. If the pump fails to prime within five minutes, stop it and check the suction line for leaks.

Lines With a Bypass

Bypass line is open

In low discharge head applications less than 10 m,, If the bypass line is open, air from the suction line will be discharged through the bypass line back to the wet well during the priming cycle. Liquid will then continue to circulate through the bypass line while the pump is in operation.

Bypass line with manual valve

Open manual valve on bypass before starting, when self priming, air will go to sewage hole through bypass and manual valve. After self priming, close manual valve by hand. Reopen manual valve when self priming next time.

Bypass line with automatic air release valve: the valve will automatically open to allow the pump to prime, and automatically close after priming is complete.

Rotation direction: Clockwise, when seen from the driving end to pump end. CAUTION: NO Contrarotation.

After the pump has been primed, partially close the discharge line throttling valve in order to fill the line slowly and guard against excessive shock pressure which could damage pipe ends, gaskets, sprinkler heads, and any other fixtures connected to the line. When the discharge line is completely filled, adjust the throttling valve to the required flow rate.

↑ WARNING!

Do not run pump exceed the range as the performance curve indicated.

After pump running for 3 to 4 hours, do a final check, if it works well, we think the installation is successful. When commissioning, check bearing body. The max tempe -rature near bearing body end should not exceed 70° C.

3. Operation

No leakage should be visible at pump mating surfaces, or at pump connections or fittings. Keep all line connections and fittings tight to maintain maximum pump efficiency.

Liquid Temperature And Overheating

The maximum liquid temperature for this pump is 70°C. Do not apply it at a higher operating temperature.

Overheating can occur if operated with the valves in the suction or discharge lines closed. Operating against closed valves could bring the liquid to a boil, build pressure, and cause the pump to rupture or explode. If overheating occurs, stop the pump and allow it to cool before servicing it. Refill the pump volute with cool liquid.

ACAUTION

Allow an over-heated pump to completely cool before servicing.Do not open infusion cover, pressure gauge, pipes before cool. Vent water in volute by opening the water vent screw.

Strainer Check

If a suction strainer has been shipped with the pump or installed by the user, check the strainer regularly, and clean it as necessary. The strainer should also be checked if pump flow rate begins to drop. If a vacuum suction gauge has been installed, monitor and record the readings regularly to detect strainer blockage.

Never introduce air or steam pressure into the pump volute or piping to remove a blockage. This could result in personal injury or damage to the equipment. If back flushing is absolutely necessary, liquid pressure must be limited to 50% of the maximum permissible operating pressure shown on the pump performance curve.

Bearing Temperature Check

Bearings normally run at higher than ambient temperatures because of heat generated by friction. Bearings can operate safely to at least 80° C.

Checking bearing temperatures by hand is inaccurate. Bearing temperatures can be measured accurately by placing a contact-type thermometer against the housing. Record this temperature for future reference. If bearing temperature is risen quickly, it indicates there may be something wrong with the bearing. Check the density of bearing lubricate and the lubricate level. The overheat of the bearing may also be caused by misalignment shaft or extreme vibration.

When the pump just started, the bearing temperatures will rise. When running stable, bearing temperature will go to normal

Pump Running Control

Do not start pump too frequently.

Run it at the real working condition and at chosen rotating speed and in allowed range. Do not speed up pump randomly or increase pump flow when running, or it will cost more input power of pump.

When running, note if there is noise. If find out something wrong, stop it and check it.

4. Stopping

Never halt the flow of liquid suddenly. If the liquid being pumped is stopped abruptly, damaging shock waves can be transmitted to the pump and piping system. Close all connecting valves slowly.

On engine driven pumps, reduce the throttle speed slowly and allow the engine to idle briefly before stopping.

Cold Weather Preservation

In below freezing conditions, drain the pump to prevent damage from freezing. Also, clean out any solids by flushing with a hose. Operate the pump for approximately one minute; this will remove any remaining liquid that could freeze the pump rotating parts.

CAUTION

If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

VI. MAINTENANCE

Since pump applications are seldom identical, and pump wear is directly affected by such things as the abrasive qualities, pressure and temperature of the liquid being pumped, this section is intended only to provide general recommendations and practices for preventive maintenance. Regardless of the application however, following a routine preventive maintenance schedule will help assure trouble-free performance and long life from your pump

For new applications, a first inspection of wearing parts at 250 hours will give insight into the wear rate for your particular application. Subsequent inspections should be performed at the intervals shown on the chart below. Critical applications should be inspected more frequently.

Preventive Maint	enance S	chedule					
	Service Interval*						
Item	Daily	Weekly	Monthly	Semi- Annually	Annually		
General Condition (Temperature, unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I						
Pump Performance (Gauges, Speed, Flow)	I						
Bearing Lubrication		I			R		
Seal Lubrication (And Packing Adjustment, If So Equipped)		I			R		
V-Belts (If So Equipped)			I				
Air Release Valve Plunger Rod (If So Equipped)			I	С			
Front Impeller Clearance (Wear Plate)				I			
Rear Impeller Clearance (Seal Plate)				I			
Check Valve					I		
Pump and Driver Alignment					I		
Shaft Deflection					I		
Bearings					I		
Bearing Housing					I		
Piping					I		
Driver Lubrication . See operation manual							

Remark:

I = Inspect, Clean, Adjust, Repair or Replace as Necessary

C = Clean

R = Replace

* Service interval based on an intermittent duty cycle equal to approximately 4000 hours annually. Adjust schedule as required for lower or higher duty cycles or extreme operating conditions.

VII. PUMP SERVICE, DISASSEMBLY AND REASSEMBLY

This pump requires little service due to its rugged, minimum-maintenance design. Normally, only need to clean the sewage. The service need not to disassemble the pipes or pump. Only remove the end cover with normal tool.

Sewage checking

Drain the volute through casing drainage plug, unscrew the bolt of end cover, pull out the end cover and wear plate with the handle. Then clean it.

Before attempting to open or service the pump:

- --- Familiarize yourself with this manual.
- ---Close the suction and discharge valves.
- --- Vent the pump slowly and cautiously.
- --- Drain the pump.
- --- Switch off the engine ignition and remove the key to ensure that the pump will remain inoperative.
 - --- Allow the pump to completely cool if overheated.
 - --- Check the temperature before opening any covers, plates, or plugs.

(a) End cover removal

Loose the handle of end cover, pull the end cover and wear plate carefully with the handle. Inspect the wear plate and replace it if badly scored or worn.

Inspect the O ring on the seal face of the end cover, if worn out, replace with a new one.

Inspect the impeller and replace it if badly scored or worn. Before attempting to loosen the impeller, remove the seal cavity drain plug and drain the lubricant. This will prevent the oil from escaping as the impeller is removed. Clean and reinstall the drain plug.

Unscrew the impeller Bolt ,note the impeller is connected with pump shaft by dex -tral screw. As the shaft seal spring closely appress to the ipmeller, the impeller shall be dismantled gently to avoid spring flicking away.

Inspect the impeller and replace if cracked or badly worn. Slide the impeller adjusting shims off the impeller shaft. Tie and tag the shims or measure and record their thickness for ease of reassembly.

Take apart the whole pump and service.

The following operation is based on assuming part is fully taken apart.

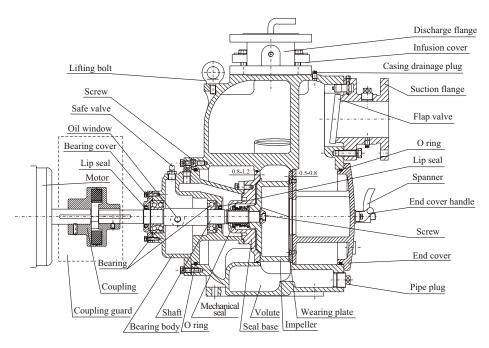


Figure 10 Pump service figure

(a) Flap Valve Removal

If the Flap Valve is to be serviced, remove the suction piping from the suction inlet flange;

Disengage the bolt and remove the suction flange, gasket and flap valve as an assembly.

(b) Separating Bearing Body and Drive Assembly From Engine

Further disassembly requires separating the pump end and drive assembly from the engine. Install a standard lifting eye in the tapped hole in the top of the pump volute. Be sure to screw the eye into the volute until fully engaged. Support the pump using a suitable hoist and the lifting eye. Disengage the hardware securing the drive flange to the engine bell housing, and remove the guards. Loose the footer screw, remove adjusting cushions, tag the adjusting cushions for case of reassembly. Separate the pump end and drive assembly from the engine by pulling the pump end straight away from the engine.

It is not necessary to remove the outer ring of the coupling from the engine fly wheel unless the coupling must be replaced. To remove the ring, disengage the hard -ware securing it to the flywheel.

As the assemblies separate, the flexible portion of the coupling assembly will remain on the shaft.

To remove the coupling from the shaft, unscrew the two head setscrews from the bushing. Screw one of the setscrews into the puller hole on the circumference of the bushing. As the coupling and bushing separate, remove the bushing, and slide the coupling off the shaft. Remove the shaft key Remove any leveling shims used under the volute mounting feet. Tie and tag the shims for ease of reassembly. Move the pump end to a clean, well equipped shop area for further disassembly.

Loose the connecting screws between bearing body and volute, unscrew the adjusting bolts by turns, pull the bearing body from volute slowly. Check the O ring of the seal face of bearing body. Replace it if worn.

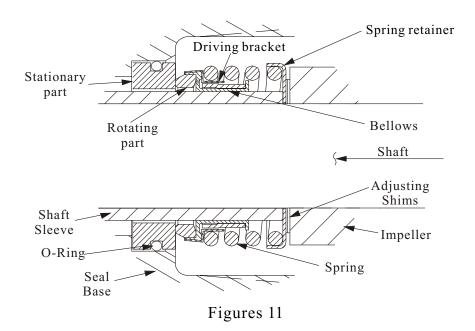
(c) Loosening Impeller and Impeller Removal

Before attempting to loosen the impeller, remove the seal cavity drain plug and drain the lubricant. This will prevent the oil from escaping as the impeller is removed. Clean and reinstall the drain plug. Remove impeller from the shaft with tool, use caution when removing the impeller; tension on the shaft seal spring will be released as the impeller is unscrewed. Inspect the impeller and replace if cracked or badly worn. Slide the impeller adjusting shims off the impeller shaft. Tie and tag the shims or measure and record their thickness for ease of reassembly. Shaft endplay should be between 0.8 mm to 1.2 mm. Add or remove adjusting shims as required to achieve the correct end-play.

(d) Cartridge Mechanical Seal Removal and Disassembly

Dissemble mechanical seal: From shaft, carefully remove adjusting shims, spring, cradle, shaft sleeve and seal ring. Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. Clean and polish the shaft sleeve.

If a replacement seal is being used, remove it from the container and inspect the precision finished faces to ensure that they are free of any foreign matter.



Reinstall mechanical seal: Clean the seal cavity and shaft with a cloth soaked in fresh cleaning solvent. Handle the seal parts with extreme care to prevent damage. Be careful not to contaminate precision finished faces.

To ease installation of the seal, lubricate the O-rings and bellows with water or a very small amount of oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure 11).

This seal is not designed for operation at temperatures above 70°C Do not use at higher operating temperatures.

(e) Oil Seal Removal and Disassembly

Cavity Oil Seal Removal :Inspect the oil seal, replace with a new one if worn out, reinstall, press it to the bearing body by the hand, see figure 12 for the lip position.

(f) Shaft and Bearing Removal and Disassembly

When the pump is properly operated and maintained, the bearing housing should not require disassembly. Disassemble the shaft and bearings only when there is evidence of wear or damage.

<u>A</u> CAUTION

Shaft and bearing disassembly in the field is not recommended. These operations should be performed only in a properly-equipped shop by qualified personnel.

Remove the Bearing Body drain plug and drain the lubricant. Clean and reinstall

the drain plug. Disengage the hardware and remove the Bearing Cover, gasket, outboard oil seal.

Press the oil seal from the Bearing Cover.

Place a block of wood against the impeller end of the shaft, and tap the shaft and assembled bearings from the intermediate. After removing the shaft and bearings, clean and inspect the bearings in place as follows.

Clean the bearings thoroughly in fresh cleaning solvent. Dry the bearings with filtered compressed air and coat with light oil.

ACAUTION

Bearing should be kept clean, or it can't be run longer. Bearing can't be run without liquid, if so, the bearing balls and outer race will be damaged.

Rotate the bearings by hand to check for roughness or binding and inspect the bearing balls. If rotation is rough or the bearing balls are discolored, replace the bearings.

If bearing replacement is required, use a bearing puller to remove the inboard and outboard bearings from the shaft.

(g) Shaft and Bearing Reassembly and Installation (See figure 10)

Inspect the shaft for distortion, nicks or scratches, or for thread damage on the impeller end.

Slide the bearings onto the shaft, until they are fully seated.

Slide the shaft and assembled bearings into the bearing body bore until the inboard bearing is fully seated against the bore shoulder.

Apply a light coating of oil to the lip of the outboard oil seal, and press it into the bearing cover with the lip positioned as shown in Figure 10. Position the oil seal in the center of the bearing cover. Install the bearing cover gasket, and secure the bearing cover to the bearing body with the hardware. Be careful not to damage the lip of the oil seal on the shaft keyway.

Unscrew the safe valve on the top of bearing body, add the required thin lubricate, the amount is: Can see the oil level from the oil window.

(h)Re-assemble and adjust coupling

Check the pump shaft coupling.

Align the keyway in the bushing with the shaft key, and slide it onto the shaft to the dimension Rotate the flexible portion of the coupling until the tapped holes for the two setscrews align with those in the bushing, align position of pump and motor, gradually fasten the motor base bolts, then fasten then coupling setscrews and align coupling.

(i)Fit Bearing Body In Volute

Fit O ring dismantled before on the flange of bearing body, brush thin oil on the O ring. Screw 4 adjusting screws on sunk-hole screw hole in volute. Let head of

adjusting screws be higher 2mm than surface of flange.

Fit bearing body in volute, surface of bearing body flange should be contacted flat with head surface of adjusting screws. Fix bearing body with bolts. Measure the distance from flange surface of volute end cover to end surface of vane of impeller. Then measure distance from wear plate to flange surface end cover. Make records.

(j)Refit End Cover, Adjust Clearance Between Impeller And Wear Plate

In order to keep the clearance from impeller to wear plate at 0.2 mm- 0.4mm. According to measure result, adjusting 4 adjusting screws: Loose connecting bolts for bearing body and pump, adjust 4 adjusting bolts equally. After adjusting, tighten connecting bolts.

Clean contact surface of volute to prevent from affecting seal of end cover. Refit O ring, paint thin oil on the surface of O ring. Paint thin oil on flange surface of end cover and volute. Press end cover and wear plate into volute. When pressing, keep axis of end cover and axis of volute combination at the same line, to prevent it from blocked. After fitting in place, press end cover tightly with screw wrench. Move coupling to move pump shaft, to make sure durable plate is not blocked with impeller. (k)Fit Suction Inlet, Flap Valve

Fit repaired or new suction inlet on volute as the inverted order of "a ".Push flap valve from suction inlet to make sure it fit in place and move freely.

(1)Finish repairing and assembling

Lift pump unit with lifting machine and fit it. Adjust horizontal place of it by adjusting washers on the pump footer.

Make sure pump unit and motor fit in place and suitable.

Fit inlet pipe and outlet pipe and open all valves. Make sure all pipes connect tightly, support suitably.

Make sure lubricant has been added.

Open infusion cover of upper pump, injecting clean liquid in pump unit and close infusion cover.

Refer to "START-UP" to restart pump.

<u>Marning!</u>

Do not lift the whole pump by lifting the lift screw, it need other supporting point to lift the whole pump.

VIII、TROUBLESHOOTING

<u>∧</u> DANGER!

Before attempting to open or service the pump, switch off engine ignition and disconnect the positive battery cable to ensure that the pump will remain inoperative.

Allow the pump to completely cool if overheated.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
	1.Not enough liquid in volute.	1.Add liquid to volute
	2.Suction strainer blocked or	2.Clean or replace strainer.
	damaged.	
	3.Air leak in suction line.	3.Correct leak.
PUMP FAILS	4.Lining of suction hose collapsed.	4.Replace suction hose.
TO PRIME	5.Leaking or worn seal or pump	5.Check pump vacuum. Replace leaking or
	gasket.	worn seal or gasket.
	6.Suction lift or discharge head too	6.Check piping installation and install
	high.	bypass line if needed.
	7.Strainer clogged	7. Check strainer and clean if necessary.
	1.Air leak in suction line.	1.Check suction line.
	2.Lining of suction hose collapsed.	2.Replace suction hose.
	3.Leaking or worn seal or pump	3.Check pump vacuum. Replace leaking
	gasket.	or worn seal or gasket.
PUMP STOPS	4.Strainer clogged.	4.Check strainer and clean if necessary.
OR FAILS TO	5. Suction intake not submerged at	5.Check installation and correct
DELIVER	proper level or sump too small.	submergence as needed.
RATED FLOW	6.Impeller or other wearing parts	6.Replace worn or damaged parts. Check
OR	worn or damaged.	that impeller is properly centered and
PRESSURE		rotates freely.
	7.Impeller clogged.	7.Free impeller of debris.
	8.Discharge head too high.	8.Install bypass line.
	9.Suction lift too high.	9.Measure lift w/vacuum gauge. Reduce
	10.7	lift and/or friction losses in suction line.
	10.Pump speed too slow.	10.Check engine output.
PUMP	1.Pump speed too high.	1.Check engine output.
REQUIRES	2.Discharge head too low.	2.Adjust discharge valve.
TOO MUCH POWER	3.Liquid solution too thick.	3.Dilute if possible.
POWER	4.Bearing(s) frozen	4.Disassemble pump and check bearing(s).
	1.Discharge flow too slow.	1.Open discharge valve fully to increase
		flow rate, and run engine at maximum
		governed speed.
PUMP CLOGS	2.Suction check valve or foot valve	2.Clean strainer.
FREQUENTLY	clogged or binding.	
	3.Liquid solution too thick.	3.Dilute if possible.
	4.Discharge line clogged or	4. Check discharge lines; straighten hose.
	restricted; hose kinked	

	1.Cavitations in pump.	1.Reduce suction lift and/or friction losses
		in suction line.
EXCESSIVE	2.Pumping entrained air.	2.Locate and eliminate source of air bubble.
NOISE	3.Pump or drive not securely	3.Secure mounting hardware.
	mounted.	
	4.Impeller clogged or damaged.	4.Clean out debris; replace damaged parts.
	1.Bearing temperature is high, but	1.Check bearing temperature regularly to
	within limits.	monitor any increase.
BEARINGS	2.Low or incorrect lubricant.	2.Check for proper type and level of
RUN TOO		lubricant.
HOT	3.Suction and discharge lines not	3.Check piping installation for proper
	properly supported.	support.
	4.Drive misaligned.	4.Align drive properly.

- IX. Important Notice
 1. Customers will not be advised if this manual is updated.
 2. Pump will be guaranteed for one year under normal operation with the correct model. Wearing part is not included.
 3. Users shall be responsible for the damage if they dissemble the pumps by themselves in guaranteed period.