INSTRUCTIONS ON INSTALLATION, OPERATION AND MAINTENANACE FOR SAM TURBO PUMP TYPE "WP"

SAM TURBO INDUSTRY LIMITED

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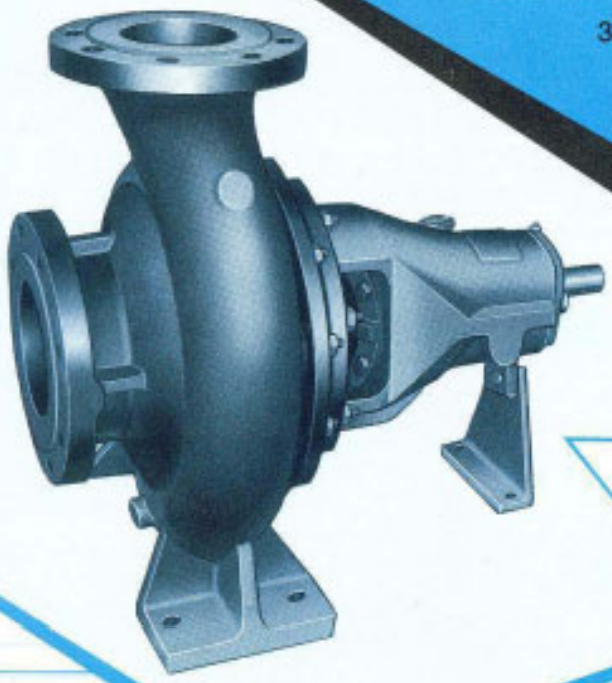
CENTRIFUGAL PUMPS

FOR LOW AND MEDIUM PRESSURE

32/130 ..... 150/400

TO DIN 24255



TYPE *'WP'*

TECHNICAL DATA

Capacity	• Upto - 550 M^3/hr.
Total head	• Upto - 100 Metres.
Speed	• Upto - 3600 rpm.
Temperature	• Upto - 160°C.
Casing Pressure	• Upto - 16 Bars

APPLICATION

SAM WP types are particularly noted for handling clean or slightly turbid, non-aggressive liquids. They are suitable for pumping condensate, including water upto 100°C, Irrigation, general water supply in agriculture, trade and industries with favourable NPSH conditions.

CONSTRUCTION FEATURES

Horizontal single stage volute casing pumps, dimension corresponds to DIN-24255 with end suction, top centre-line discharge. Back pull-out design, enables to remove the rotor assembly without disturbing the pipe lines. The support feet are integrally cast with volute casing.

The WP range comprises of 31 pump types with 3 shaft sizes which cover te entire range with maximum interchangeability. For pumps belonging to a particular shaft size, shaft, shaft sleeve, impeller nut and bearings are interchangeable. Impeller is hydraulically balanced by back vanes, and in the case of larger Impeller diameter by renewable wear ring and relief holes.

DIRECTION OF ROTATION

Clockwise from drive end.

SHAFT

Made of accurately grounded high tensile shaft supported with Conventional Oil lubricated two Deep Groove Ball Bearings. Grease lubrication will be an option.

FLANGES

Flange dimensions as per DIN 2532/2533 ANSI/BS will be an option.

CASING PRESSURE

16 Bars		10°C to 100°C (Subject to total head of 100 Metres)
8 Bars		100°C to 160°C
Casing Pressure	=	(Suction Pressure + Shut-off head)

SHAFT SEALING

Soft packed stuffing box or mechanical seal.

Designation 011 :	For temperature range — 10°C to 100°C self-flushing uncooled stuffing box.
Designation 012 :	For temperature range — 10°C to 100°C external flushing uncooled stuffing box.
Designation 013 :	For temperature range upto 160°C cooled stuffing box.
Designation 014 :	Mechanical seal, as optional

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WARRANTY

We warrant that the pump supplied by us is free from defective material and faulty workmanship. This warranty holds good for a period of 12 months from the date of commissioning of the equipment or 18 months from the date of despatch from our factory, whichever is earlier.

Our liability in respect of any complaint is limited to replacing part/parts free of charge ex-works or repairs of the defective part/parts only to the extent that such replacement / repairs are attributable to or arise solely from faulty workmanship or defective material.

We warrant the materials for the chemical composition and mechanical properties of the relevant standard only and not for corrosion and erosion.

The warranty holds good only for the products manufactured by us.

SAM TURBO INDUSTRY LIMITED

CONTENT

PLEASE FURNISH COMPLETE NAMEPLATE DETAILS, NAME OF THE PARTS, PART NOS AND MATERIAL OF CONSTRUCTION WHILE ORDERING SPARE PARTS FOR THE PUMP

1. GENERAL:

1.1 The booklet covers instructions for following models of WP pumps.

FRAME	WP Pump Models			
15	32/130, 40/130, 50/130, 65/130,	32/160, 40/160, 50/160, 65/160,	32/200, 40/200, 50/200, 65/200,	32/260, 40/260, 50/260, 80/160,
18	65/260, 80/320, 125/260,	40/320.65 /320, 100/260, 50/320	80/200, 100/260 100/200	80/260, 100/320,
22	100/400, 150/400	125/320,	125/400	150/320

1.2 Sam WP pumps are of back-pull-out design which enables to remove the rotating unit of pump for inspection and repairs without disturbing the pipe connections and motor by using spacer type coupling.

1.3 The complete range of WP pump is covered by three driving units thereby reducing inventory and achieving interchangeability of parts.

1.4 Pumps when properly installed and given due care in operation and maintenance should be inspected and located in dry place. The coupling should be rotated once in a month to prevent pitting of bearing surface.

1.5 When the pump is received, sometime before the actual use of pump, it should be inspected and located in dry place. The coupling should be rotated once in a month to prevent pitting of bearing surface.

2 INSTALLATION :

2.1 For location, preparing foundation, installations, alignment, general maintenance, trouble shooting etc., the instruction given in our publication **"General Instructions for Installation, Operation & Maintenance of Centrifugal Pumps**." Which is printed with this booklet must be followed carefully.

2.2 The external sealing connection to the pump, if applicable, must be made after installing and before commissioning the pump.

2.3 The vacuum equalizing connection should be made if the pump suction is under vacuum conditions.

3. 3.1 OPERATION:

Before starting the pump

3.1.1. Check the following:

3.1.2. The pump rotates freely by hand.

Sealing connection if any, is properly tightened and adjusted.

3.1.3. Fill in the grease for bearings, if not done earlier. The bearings are packed with grease initially at the factory. However, if the pump is stored for a longer time it is necessary to refill the grease in bearings.

3.1.4. The direction of rotation of motor corresponds to the direction of rotation of the pump.

3.1.5. The pump and suction pipe is fully primed with the liquid.

3.1.6. Valve on the delivery side is closed.

3.1.7. Stuffing box packing is properly tightened.

3.1.8. The cock for pressure gauge connection is closed.

3.2 Starting the pump

3.2.1 Start the pump. Let the prime mover pick - up its full speed.

3.2.2 Open the valve on delivery side slowly.

3.2.3 Open the cock for pressure gauge connection.

3.3 **During running the pump**

Check the following and regulate, if necessary.

3.3.1 The pump is running smooth.

3.3.2 The flow of sealing liquid (if external liquid is provided for sealing purpose) is uninterrupted.

3.3.3 Leakage through stuffing box is normal. There should be leakage is 60-80 drops per minute.

3.3.4 The bearings are not getting heated up excessively.

3.3.5 Head and capacity developed by the pump is as specified.

3.3.6 Power consumption is within the limit.

3.3.7 Ensure that there is no mechanical friction in the pump.

3.3.8 Stop the pump immediately, if any defects are noticed. Do not start the pump unless the defects are rectified. Report immediately to the supplier if it is not possible to rectify the defects.

3.4 During stopping the pump:

3.4.1 Close the valve on delivery side.

3.4.2 Stop the motor.

3.4.3 Close the external sealing liquid connection, if any.

3.4.4 If the pump is not required to be operated for a long time, then drain the casing completely.

4. TECHNICAL DATA:

4.1 Models

'WP' type of pumps are available in models as referred to in1.1.Only three bearing frames (driving units) are used for complete range of 'WP' pumps. The models covered under individual frames are given in interchangeability chart (4.2).

WP pumps are suitable for clean liquids having temp – 10 to + 100° C.

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4.2 **Interchangeability Chart**

INTERCHANGEABILITY CHART

TYPE : WP

DRG.NO: W40-05

PUMP PARTS				PUMP MODELS																															
				32/130	32/160	32/200	32/260	40/130	40/160	40/200	40/260	50/130	50/160	50/200	50/260	65/130	65/160	65/200	80/160	40/320	50/320	65/260	65/320	80/200	80/260	80/320	100/200	100/260	100/320	125/260	100/400	125/320	125/400	150/320	150/400
VOLUTE CASING		(11.4)	32	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
IMPELLER		(24.2)	32	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
WEAR RING (CASING)		(51.4)	10	1		2					3				4				5	3	4		5			6	7			8	7	8		9	10
AR RING (CASING COVER)		(51.23)		—																3	4	—	5	—		6	—		7	—	7	8		9	10
CASING COVER		(17.3)	7	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	2	5		6	7	8	6	7	8	9	7	9	10	11	10	17	10
GASKET (VOL.CASING/C.COVER)		(41.2)	6	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	2	5		4	5	3	4	5	3	4	5	4	6	5	6	5	6
FLAT GASKET (WASHER)		(41.03)	3	1																2											3				
SUPPORT FOOT		(19.6)	10	1	2	3	6	1	2	3	6	2	3		8	3		8		4		7	4	5	7	6	7	4	6		9		10	9	10
BEARING BED		(34.2)	4	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	3											4				
BEARING CAP		(37.2)	3	1																2											3				
KEY (COUPLING)		(95.2)	3	1																2											3				
KEY (IMPELLER)		(95.03)	3	1																2											3				
PUMP SHAFT		(22.3)	3	1																2											3				
SHAFT SLEEVE	MECH.SEAL	(53.5)	6	1																3											5				
	PACKING	(53.6)		2																4											6				
EARING		(33.3)	3	1																2											3				
IMPELLER NUT		(93.4)	3	1																2											3				
GLAND		(46.4)	3	1																2											3				
LANTERN RING		(46.10)	3	1																2											3				
PACKING RING		(47.3)	3	1																2											3				
DEFLECTOR		(51.9)	3	1																2											3				
OIL SEAL	PUMP SIDE	(43.13)	3	1																2											3				
	MOTOR SIDE	(43.3)																																	

NOTE :

UMBER IN A LINE REPRESENT THAT OF THE PUMP PART

AME NUMBER IN A VERTICAL COLUMN REPRESENT THE SAME PUMP PART

4.3 Direction of rotation

The direction of rotation is clockwise when viewed from driving end. Reverse rotation is not possible.

4.4 Rotation speed

All the models are suitable for speed of 1450 rpm.

Besides, following models are also suitable for speed of 2900 rpm.

32/130, 40/130, 50/130, 65/130, 32/160, 40/160, 50/160, 65/160, 80/160, 32/200, 40/200, 50/200, 65/200, 80/200, 100/200, 32/260, 40/260, 50/260, 65/260, 80/260, 100/260.

Please contact the supplier or manufacturer, if the pump is to be used for other speeds than specified above.

4.5 Bearings

The shaft is supplied with antifriction ball bearings at driving end and non- driving end. The bearing specifications are given below. The designation of bearings are as per SKF catalogue. However, equivalent bearings in type, capacity and dimensions are also used.

Sr.No.	Shaft Unit	Bearing no..	
		DE	NDE
1.	15	6305	6305
2.	18	6307	6307
3.	22	6309	6309

4.6 Lubrication

4.6.1 Bearings are greased lubricated.

4.6.2 Pumps are also supplied with oil lubricated bearings against specific orders.

4.6.3 Following grades of grease available in the market are suitable.

Name	1450 RPM	Grease Specification
		2900 RPM
INDIAN OIL	SERVOGEM – 3	SERVOGEM – 2
CALTEX	STARFAX – 3	STARFAX – 2
HINDUSTAN PETROLEUM	NATRA – 3 OR LITHON – 3	NATRA – 2 OR LITHON – 2

4.7 Stuffing box

4.7.1 Stuffing box sealing arrangement –

Self liquid sealing is standard supply. External liquid sealing arrangement can be provided on request.

4.7.2.1 Stuffing box packing specification – Champion Style 3116-Graphited cotton greasy packing is used in the pump as a standard supply. However, stuffing box packing suitable for liquid handled is supplied against specific requirements.

4.7.2.1.1 Stuffing box packing and Lantern ring – Please refer to the following chart for st. box packing size and position of lantern ring.

Frame size	St. box packing size mm (SQ)	Length of packing mm	Packing arrangement and Position of Lantern (L) from impeller side
15	8	510	1 + L + 3
18	10	650	1 + L + 3
22	10	840	1 + L + 3

5. MAINTENANCE:

Preventive maintenance schedule is the periodical checks and precautions by which possibilities of failure and breakdown are made very remote.

5.1 Daily Checks

5.1.1 Pressure gauge reading.

5.1.2 Bearing temperature.

5.1.3 Leakage through stuffing box.

5.1.4 Noise and vibration.

5.1.5 Voltage and current.

5.1.6 Constant flow of external sealing liquid if provided.

5.2 Periodical Maintenance

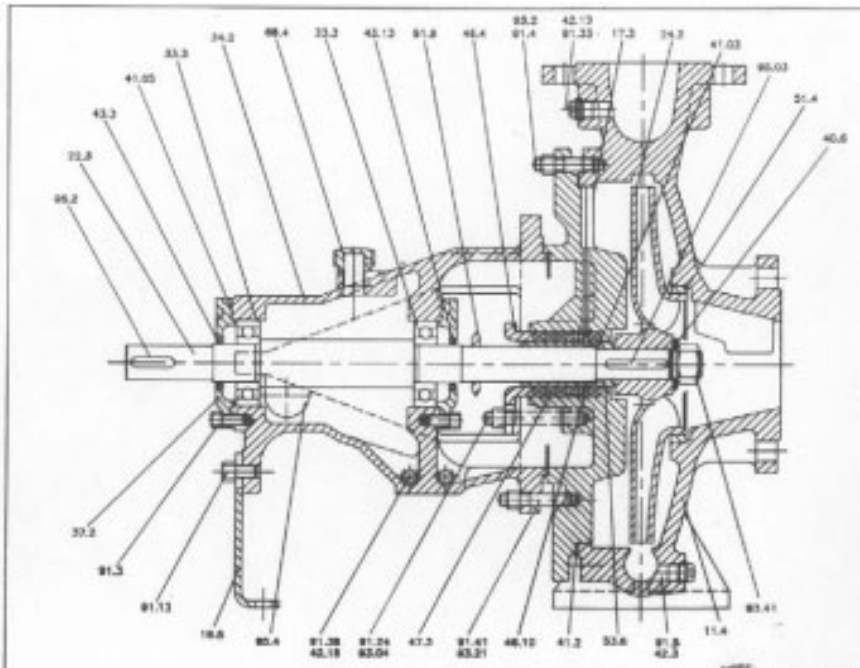
5.2.1 Replenish the grease.

5.2.2 Change the stuffing box packing.

5.2.3 Check the alignment of the pumpset.

5.2.4 Calibrate the measuring instruments.

5.2.5 Check the sealing connections for leakage etc.



CODE NO	PART NAME	MATERIAL	QTY
11.4	VOLUTE CASING	IS 210 FG 200	1
17.3	CASING COVER	IS 210 FG 200	1
19.5	SUPPORT FOOT	IS 226 C15	1
22.3	PUMP SHAFT		1
* 24.2	IMPELLER		1
33.3	BEARING(SINGLE GROOVE)	STEEL(EN8)	2
34.2	BEARING BED	IS 210 FG 200	1
37.2	BEARING CAP(INNER&OUTER)	IS 210 FG 200	2
* 41.03	FLAT GASKET (WASHER)	TEFLON	1
41.05	GASKET(BRG.CAP INN.&OUTER)	CAF-B	2
* 41.2	GASKET(CASING)	CAF-B	1
42.13	WASHER(FOR 91.33)	CAF-B	2
42.18	WASHER(OIL DRAIN)	CAF-B	2
42.3	WASHER(FOR 91.5)	CAF-B	1
* 43.3	OIL SEAL	SYNTHETIC RUBBER	1
* 46.10	LANTERN RING	BS 970 EN8	1
46.4	GLAND(FOR PACKING)	IS 210 FG 200	1
* 47.3	PACKING(CASING COVER)	TIGA	4
* 43.13	OIL SEAL	SYNTHETIC RUBBER	1
* 51.4	WEAR RING(CASING)		1
* 51.9	DEFLECTOR	PLASTIC	1
* 53.6	SHAFT SLEEVE(FOR PACKING)		1
65.4	OIL LEVEL SIGHT GLASS	STEEL	1
91.13	HEX SCREW(SUPPORT FOOT)	IS 1363 M5	1
* 91.24	STUD(GLAND)	BS 970 EN8	2
91.33	SCREW PLUG(DR.LINE.CONN)	BS 970 EN8	2
91.3	HEX SCREW(FOR 37.2)	IS 1363 M5	4+4
* 40.6	WASHER(IMPELLER NUT)	CAF-B	1
91.4	STUD(VOLUTE CASING)	BS 970 EN8	8/12
91.5	SCREW PLUG(CASING DRAIN)	BS 970 EN8	1
* 93.04	HEX NUT(GLAND)	IS 1363 M5	2
93.2	HEX NUT(VOLUTE CASING)	IS 1363 M5	8/12
* 93.41	HEX NUT(IMPELLER)	IS 1363 M5	1
* 95.03	KEY(IMPELLER)	BS 970 EN8	1
95.2	KEY(COUPLING)	BS 970 EN8	1
91.41	STUD(BRG.HSG./COVER)	BS 970 EN8	8
93.21	HEX NUT(BRG.HSG./COVER)	IS 1363 M5	8
68.4	VENT	PLASTIC	1
* 91.35	SCREW PLUG(OIL DRAIN)	BS 970 EN8	1

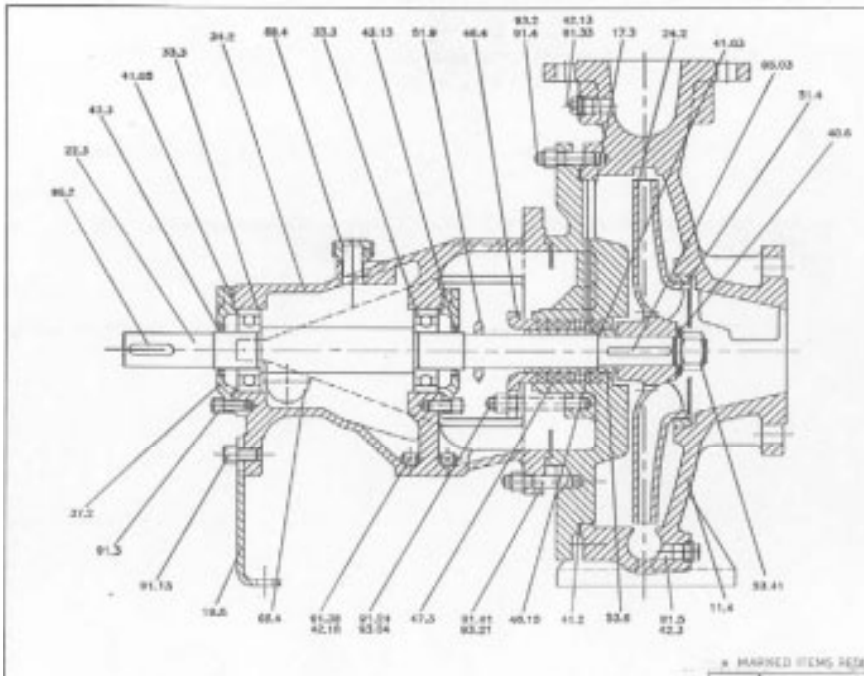
NOTE:
* MARKED ITEMS REQUIRE SPARES FOR TWO YEARS NORMAL OPERATION

PUMP TYPE :
SIZE :
QTY :
ORDER REF :
DIRECTION OF ROTATION : CLOCKWISE FROM DRIVE END

SAM TURBO INDUSTRY LIMITED

TITLE : SECTIONAL DRAWING WITH BILL OF MATERIAL

SUPPLIED THROUGH :
CUSTOMER :
PROJECT :
DRAWN/Dt. : CHECKED/Dt. : APPD./Dt. :
REV.No.: 0 1 2 3 4 DRAWING No.:
DATE : WJD-05-15/



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11.4	VOLUTE CASING	IS 210 FG 200	1
17.3	CASING COVER	IS 210 FG 200	1
19.5	SUPPORT FOOT	IS 226 C15	1
22.3	PUMP SHAFT		1
* 24.2	IMPELLER		1
33.3	BEARING(SINGLE GROOVE)	STEEL(EN8)	2
34.2	BEARING BED	IS 210 FG 200	1
37.2	BEARING CAP(INNER&OUTER)	IS 210 FG 200	2
* 41.03	FLAT GASKET (WASHER)	TEFLON	1
41.05	GASKET(BRG.CAP INN.&OUTER)	CAF-B	2
* 41.2	GASKET(CASING)	CAF-B	1
42.13	WASHER(FOR 91.33)	CAF-B	2
42.18	WASHER(OIL DRAIN)	CAF-B	2
42.3	WASHER(FOR 91.5)	CAF-B	1
* 43.3	OIL SEAL	SYNTHETIC RUBBER	1
* 46.10	LANTERN RING	BS 970 EN8	1
46.4	GLAND(FOR PACKING)	IS 210 FG 200	1
* 47.3	PACKING(CASING COVER)	TIGA	4
* 43.13	OIL SEAL	SYNTHETIC RUBBER	1
* 51.4	WEAR RING(CASING)		1
* 51.9	DEFLECTOR	PLASTIC	1
* 53.6	SHAFT SLEEVE(FOR PACKING)		1
65.4	OIL LEVEL SIGHT GLASS	STEEL	1
91.13	HEX SCREW(SUPPORT FOOT)	IS 1363 M5	1
* 91.24	STUD(GLAND)	BS 970 EN8	2
91.33	SCREW PLUG(DR.LINE.CONN)	BS 970 EN8	2
91.3	HEX SCREW(FOR 37.2)	IS 1363 M5	4+4
* 40.6	WASHER(IMPELLER NUT)	CAF-B	1
91.4	STUD(VOLUTE CASING)	BS 970 EN8	8/12
91.5	SCREW PLUG(CASING DRAIN)	BS 970 EN8	1
* 93.04	HEX NUT(GLAND)	IS 1363 M5	2
93.2	HEX NUT(VOLUTE CASING)	IS 1363 M5	8/12
* 93.41	HEX NUT(IMPELLER)	IS 1363 M5	1
* 95.03	KEY(IMPELLER)	BS 970 EN8	1
95.2	KEY(COUPLING)	BS 970 EN8	1
91.41	STUD(BRG.HSG./COVER)	BS 970 EN8	8
93.21	HEX NUT(BRG.HSG./COVER)	IS 1363 M5	8
68.4	VENT	PLASTIC	1
* 91.35	SCREW PLUG(OIL DRAIN)	BS 970 EN8	1

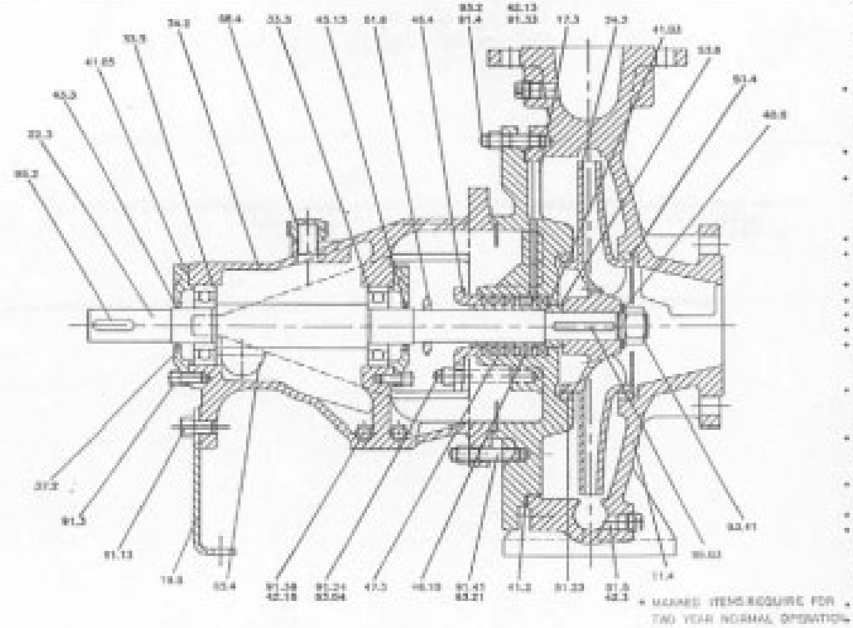
* MARKED ITEMS REQUIRE FOR TWO YEAR NORMAL OPERATION

PUMP TYPE : IMP
SIZE :
QTY :
ORDER REF :
DIRECTION OF ROTATION : CLOCKWISE FROM DRIVE END

SAM TURBO INDUSTRY LIMITED

TITLE : SECTIONAL DRAWING WITH BILL OF MATERIAL

SUPPLIED THROUGH :
CUSTOMER :
PROJECT :
DRAWN/Dt. : CHECKED/Dt. : APPD./Dt. :
REV.No.: 0 1 2 3 4 DRAWING No.:
DATE : WJD-05-15/



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11.4	VOLUTE CASING	IS 210 FG 200	1
17.3	CASING COVER	IS 210 FG 200	1
18.5	SUPPORT FOOT	IS 226 C15	1
22.3	PUMP SHAFT		1
* 24.2	IMPELLER		1
33.3	BEARING(S.R.DEEP GROOVE)	STEEL(6307)	2
34.2	BEARING BRG	IS 210 FG 200	1
37.2	BEARING CAP(INNER&OUTER)	IS 210 FG 200	2
* 41.03	FLAT GASKET (WASHER)	TEFLON	1
41.05	GASKET(BRG.CAP INN.&OUTER)	CAF-II	2
* 41.2	GASKET(CASING)	CAF-II	1
42.13	WASHER(FOR 81.33)	CAF-II	2
42.18	WASHER(OIL DRAIN)	CAF-II	2
42.3	WASHER(FOR 81.5)	CAF-II	1
* 43.8	OIL SEAL	SYNTHETIC RUBBER	1
* 46.10	LANTERN RING	BS 970 EN8	1
46.4	GLAND(FOR PACKING)	IS 210 FG 200	1
* 47.3	PACKING(CASING COVER)	TGA	4
* 43.13	OIL SEAL	SYNTHETIC RUBBER	1
* 51.4	WEAR RING (CASING)		1
* 51.8	DEFLECTOR	PLASTIC	1
* 53.6	SHAFT SLEEVE(FOR PACKING)		1
65.4	OIL LEVEL SIGHT GLASS	STEEL	1
81.13	HEX SCREW(SUPPORT FOOT)	IS 1363 MS	1
* 81.24	STUD(GLAND)	BS 970 EN8	2
81.33	SCREW PLUG(DRILLING.CONN)	BS 970 EN8	2
81.3	HEX SCREW(FOR 37.2)	IS 1363 MS	4+4
* 40.6	WASHER(IMPELLER NUT)	CAF-II	1
81.4	STUD(VOLUTE CASING)	BS 970 EN8	8/12
81.5	SCREW PLUG(CASING DRAIN)	BS 970 EN8	1
* 83.04	HEX NUT(GLAND)	IS 1363 MS	2
83.2	HEX NUT(VOLUTE CASING)	IS 1363 MS	8/12
* 83.41	HEX NUT(IMPELLER)	IS 1363 MS	1
* 85.03	KEY(IMPELLER)	BS 970 EN8	1
85.2	KEY(COUPLING)	BS 970 EN8	1
81.41	STUD(BRG.BED/C.COVER)	BS 970 EN8	8
83.21	HEX NUT(BRG.BED/C.COVER)	IS 1363 MS	8
68.4	VENT	PLASTIC	1
* 81.38	SCREW PLUG(OIL DRAIN)	BS 970 EN8	1
* 51.23	WEAR RING(CASING COVER)		1

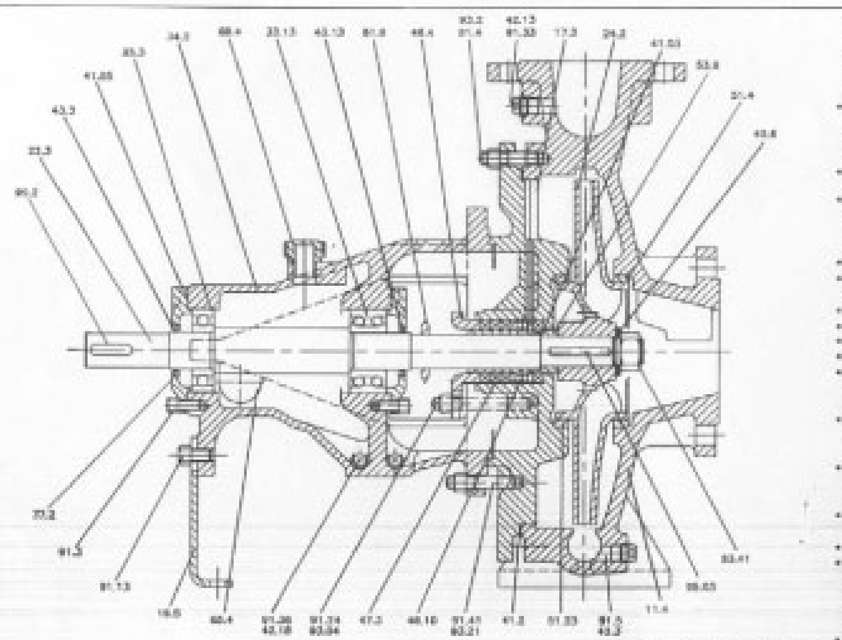
* MARKED ITEMS REQUIRE FOR TWO YEAR NORMAL OPERATION

SAM TURBO INDUSTRY LIMITED

TITLE : SECTIONAL DRAWING WITH BILL OF MATERIAL

SUPPLIED THROUGH :
CUSTOMER :
PROJECT :
DRAWN/DL. : CHECKED/DL. : APPD./DL. :
REV.No. : 0 1 2 3 4 DRAWING No.: W40-06-1B7/
DATE :

PUMP TYPE : SVP 65/320, 80/320, 65/320, 80/320 & 100/320
SIZE : 65×40 , 80×50 , 80×65 , 100×65 & 125×100
QTY :
ORDER REF :
DIRECTION OF ROTATION : CLOCKWISE FROM DRIVE END



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17.3	CASING COVER	IS 210 FG 200	1
18.5	SUPPORT FOOT	IS 226 C15	1
22.3	PUMP SHAFT		1
* 24.2	IMPELLER		1
33.3	BEARING(S.R.DEEP GROOVE)	STEEL(6300)	1
34.2	BEARING BED	IS 210 FG 200	1
37.2	BEARING CAP(INNER&OUTER)	IS 210 FG 200	2
* 41.03	FLAT GASKET (WASHER)	TEFLON	1
* 41.05	GASKET(BRG.CAP INN.&OUTER)	CAF-II	2
* 41.2	GASKET(CASING)	CAF-II	1
42.13	WASHER(FOR 81.33)	CAF-II	2
42.18	WASHER(OIL DRAIN)	CAF-II	2
42.3	WASHER(FOR 81.5)	CAF-II	1
* 43.3	OIL SEAL	SYNTHETIC RUBBER	1
* 46.10	LANTERN RING	BS 970 EN8	1
46.4	GLAND	IS 210 FG 200	1
* 47.3	PACKING(CASING COVER)	TGA	4
* 43.13	OIL SEAL	SYNTHETIC RUBBER	1
* 51.4	WEAR RING(CASING)		1
* 51.8	DEFLECTOR	PLASTIC	1
* 53.6	SHAFT SLEEVE(FOR PACKING)		1
65.4	OIL LEVEL SIGHT GLASS	STEEL	1
81.13	HEX SCREW(SUPPORT FOOT)	IS 1363 MS	1
* 81.24	STUD(GLAND)	BS 970 EN8	2
81.33	SCREW PLUG(OIL LINE.CONN)	BS 970 EN8	2
81.3	HEX SCREW(FOR 37.2)	IS 1363 MS	4+4
* 40.6	WASHER(IMPELLER NUT)	CAF-II	1
81.4	STUD(VOLUTE CASING)	BS 970 EN8	8/12
81.5	SCREW PLUG(CASING DRAIN)	BS 970 EN8	1
* 83.04	HEX NUT(GLAND)	IS 1363 MS	2
83.2	HEX NUT(VOLUTE CASING)	IS 1363 MS	8/12
* 83.41	HEX NUT(IMPELLER)	IS 1363 MS	1
* 85.03	KEY(IMPELLER)	BS 970 EN8	1
85.2	KEY(COUPLING)	BS 970 EN8	1
81.41	STUD(BRG.BED/C.COVER)	BS 970 EN8	8
83.21	HEX NUT(BRG.BED/C.COVER)	IS 1363 MS	8
68.4	VENT	PLASTIC	1
* 81.38	SCREW PLUG(OIL DRAIN)	BS 970 EN8	1
* 51.23	WEAR RING(CASING COVER)		1
33.13	BEARING(D.R.ANG.CONTACT)	STEEL(3306)	1

* MARKED ITEMS REQUIRE FOR TWO YEAR NORMAL OPERATION

SAM TURBO INDUSTRY LIMITED

TITLE : SECTIONAL DRAWING WITH BILL OF MATERIAL

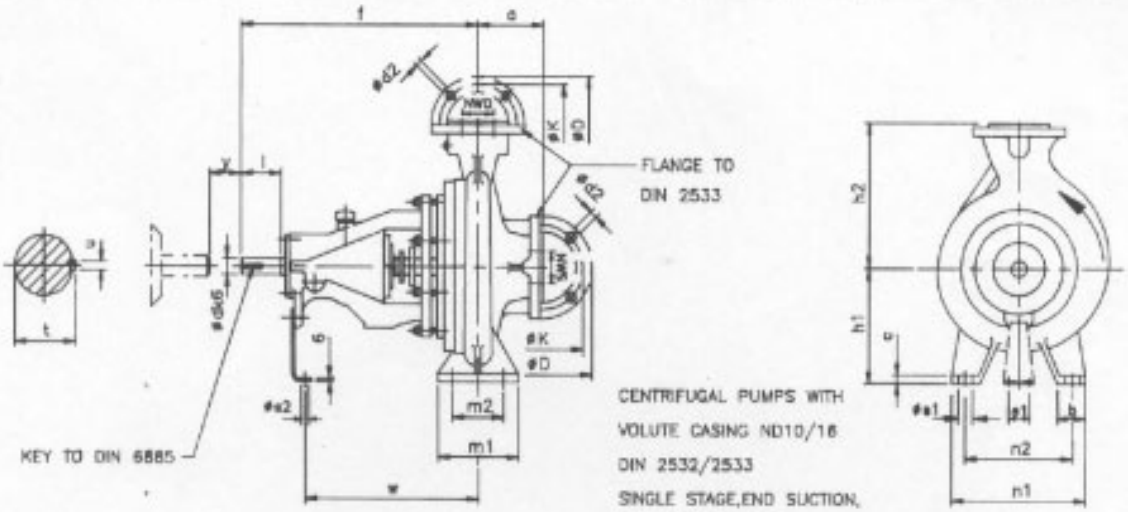
SUPPLIED THROUGH :
CUSTOMER :
PROJECT :
DRAWN/DL. : CHECKED/DL. : APPD./DL. :
REV.No. : 0 1 2 3 4 DRAWING No.: W40-06-23D/
DATE :

PUMP TYPE :
SIZE :
QTY :
ORDER REF :
DIRECTION OF ROTATION : CLOCKWISE FROM DRIVE END

OVERALL DIMENSIONAL DRAWING

TYPE : WP

DRG.NO: W40-07



PUMP MODELS	FRAME UNIT	PUMP DIMENSIONS						FOOT DIMENSIONS										SHAFT END				DISTANCE
		NWS	NWD	a	f	h1	h2	b	c	m1	m2	n1	n2	ø1	ø2	e1	w	ødk6	l	t	u	y *
32/130	15W	50	32	80	360	112	140	50	14	100	70	190	140	14	14	100	267	24	50	27.3	8	140
32/160				80	360	132	160	50	14	100	70	240	190	14	14	100	267	24	50	27.3	8	140
32/200				80	360	160	180	50	14	100	70	240	190	14	14	110	267	24	50	27.3	8	140
32/260				100	360	180	225	65	14	125	95	320	250	14	14	110	267	24	50	27.3	8	140
40/130		65	40	80	360	112	140	50	14	100	70	210	160	14	14	100	267	24	50	27.3	8	140
40/160				80	360	132	160	50	14	100	70	240	190	14	14	100	267	24	50	27.3	8	140
40/200				100	360	160	180	50	14	100	70	285	212	14	14	110	267	24	50	27.3	8	140
40/260				100	360	180	225	65	14	125	95	320	250	14	14	110	267	24	50	27.3	8	140
40/320	18W			125	470	200	250	65	14	125	95	345	280	14	14	110	342	32	80	35.3	10	140
50/130	15W	65	50	100	360	132	160	50	14	100	70	240	190	14	14	100	267	24	50	27.3	8	140
50/160				100	360	160	180	50	14	100	70	265	212	14	14	110	267	24	50	27.3	8	140
50/200				100	360	160	200	50	14	100	70	285	212	14	14	110	267	24	50	27.3	8	140
50/260				100	360	180	225	65	14	125	95	320	250	14	14	110	267	24	50	27.3	8	140
50/320	18W	80	50	125	470	225	280	65	14	125	95	345	280	14	14	110	342	32	80	35.3	10	140
65/130	15W	80	65	100	360	160	180	65	14	125	95	280	212	14	14	110	267	24	50	27.3	8	140
65/160				100	360	160	200	65	14	125	95	280	212	14	14	110	267	24	50	27.3	8	140
65/200				100	360	180	225	65	14	125	95	320	250	14	14	110	267	24	50	27.3	8	140
65/260	18W			100	470	200	250	80	16	160	120	380	280	18	14	110	342	32	80	35.3	10	140
65/320				125	470	225	280	80	16	160	120	400	315	18	14	110	342	32	80	35.3	10	140
80/160	15W	100	80	125	360	180	225	65	14	125	95	320	250	14	14	110	267	24	50	27.3	8	140
80/200	18W			125	470	180	250	65	14	125	95	345	280	14	14	110	342	32	80	35.3	10	140
80/260				125	470	200	280	80	16	160	120	400	315	18	14	110	342	32	80	35.3	10	140
80/320				125	470	250	315	80	16	160	120	400	315	18	14	110	342	32	80	35.3	10	140
100/200		125	100	125	470	200	280	80	16	160	120	380	280	18	14	110	342	32	80	35.3	10	140
100/260				140	470	225	280	80	16	160	120	400	315	18	14	110	342	32	80	35.3	10	140
100/320				140	470	250	315	80	16	160	120	400	315	18	14	110	342	32	80	35.3	10	140
100/400	22W			140	530	280	355	100	18	200	150	500	400	23	14	110	370	42	110	45.3	12	140
125/260	18W	150	125	140	470	250	355	80	16	160	120	400	315	18	14	110	342	32	80	35.3	10	140
125/320	22W			140	530	280	355	100	18	200	150	500	400	23	14	110	370	42	110	45.3	12	140
125/400				140	530	315	400	100	18	200	150	500	400	23	14	110	370	42	110	45.3	12	140
150/320		200	150	160	530	280	400	100	18	200	150	550	450	23	14	110	370	42	110	45.3	12	140
150/400				160	530	315	450	100	18	200	150	550	450	23	14	110	370	42	110	45.3	12	140

* BACK-PULL-OUT DISTANCE REQUIRED BETWEEN DRIVER SHAFT END AND PUMP SHAFT

DIRECTION OF ROTATION : CLOCKWISE FROM DRIVE END

DIMENSIONS OF FLANGE CONNECTIONS									
NWS/NWD	32	40	50	65	80	100	125	150	200
øD	140	150	165	185	200	220	250	285	340
øK	100	110	125	145	160	180	210	240	295
d2xNOS	18x4	18x4	18x4	18x4	18x8	18x8	18x8	22x8	22x12

SECTIONAL DRAWING SELECTION CHART

TYPE (WP)

PUMP TYPE	BED	BEARING USED		WEAR RINGS WILL COME AT	SECTIONAL DRAWING DRAWING NO.
		COUPLING END	PUMP END		
32 / 130	15	6305 - 1 NO	6305 - 1 NO	CASING	W40 - 06 - 15
32 / 160				"	
32 / 200				"	
32 / 260				"	
40 / 130				"	
40 / 160				"	
[illegible] / 200				"	
40 / 260				"	
40 / 320	18	6307 - 1 NO	6307 - 1 NO	CASING & CASING COVER	W40 - 06 - 18 D
50 / 130	15	6305 - 1 NO	6305 - 1 NO	CASING	W40 - 06 - 15
50 / 160				"	
50 / 200				"	
50 / 260				"	
50 / 320	18	6307 - 1 NO	6307 - 1 NO	CASING & CASING COVER	W40 - 06 - 18 D
65 / 130	15	6305 - 1 NO	6305 - 1 NO	CASING	W40 - 06 - 15
65 / 160				"	
65 / 200				"	
[illegible] / 260	18	6307 - 1 NO	6307 - 1 NO	"	W40 - 06 - 18
65 / 320				CASING & CASING COVER	W40 - 06 - 18 D
80 / 160	15	6305 - 1 NO	6305 - 1 NO	CASING	W40 - 06 - 15
80 / 200	18	6307 - 1 NO	6307 - 1 NO	"	W40 - 06 - 18
80 / 260				"	
80 / 320				CASING & CASING COVER	W40 - 06 - 18 D
100 / 200				CASING	W40 - 06 - 18
100 / 260				"	
100 / 320				CASING & CASING COVER	W40 - 06 - 18 D
100 / 400	22	6309 - 1 NO	3309 - 1 NO	"	W40 - 06 - 22
125 / 260	18	6307 - 1 NO	6307 - 1 NO	CASING	W40 - 06 - 18
125 / 320	22	6309 - 1 NO	3309 - 1 NO	CASING & CASING COVER	W40 - 06 - 22
125 / 400				"	
150 / 320				"	
150 / 400				"	

6. OVERHAULING:

With normal daily operating spell, the pump will be due for overhaul after about 5000 working hours. This work should be done by skilled personnel.

6.1 Dismantling

6.1.1 Remove the gland sealing connection and auxiliary piping, if any.

6.1.2 Remove the spacer of Love-Joy coupling in case of pumps fitted with spacer type coupling. Remove the prime-mover in case of pumps fitted with standard type of Love-Joy coupling. Remove the pump half of coupling from the pump shaft.

6.1.3 Drain the delivery casing by removing the drain plug (91.5). Remove support foot (19.5).

6.1.4 Unscrew the nuts (93.2) holding delivery casing 11.4) and casing cover (17.3) and bearing housing 34.2). Take out the sub-assembly of bearing housing with stuffing box and impeller etc.

6.1.6 Unscrew the impeller nut (93.41) and remove washer under it (40.8).

6.1.7 Remove the impeller (24.2) from the shaft.

6.1.8 Take out the impeller key (95.03).

6.1.9 separate the casing cover from the bearing housing.

6.1.10 Unscrew the gland nuts (91.24) and take out gland(46.4).

6.1.11 Remove stuffing box packings (47.3) alongwith Lantern ring (46.10) from the stuffing box housing.

6.1.12 Remove the shaft sleeve (53.6) and remove gasket for shaft sleeve .

6.1.13 Remove liquid deflector (51.9). Remove the bolts (91.3) holing bearing cover NDE and DE and remove bearing cover(37.2).

6.1.14 Take out the shaft (22.3) from the bearing housing alongwith bearing (33.3) by light hammering from driving end.

6.1.15 Remove the bearings from shaft with the help of puller. Do not hammer the bearings as hammering may spoil them.

6.2 Reassembly

Before assembling, all the parts should be thoroughly cleaned in Kerosene, Petrol or Benzene to remove the dirt rust etc. After cleaning, all the parts should be thoroughly checked for wear and replaced, if necessary. Replace all paper packings.

6.2.1 Mount the driving and non-driving end side bearings on the shaft. Use arbor press. Do not use hammer. Fill-up the bearings with grease.

6.2.2 Fit the NDE Bearing cover and tighten the bolts to hold it on bearing housing.

6.2.3 Insert the shaft alongwith bearings in bearing housing from DE side.

6.2.4 Fit the DE bearing cover and tighten the bolts to hold it on bearing housing.

6.2.5 Mount the liquid deflector on shaft on NDE side.

6.2.6 Fit the gasket for shaft sleeve on the shaft and fit the shaft sleeve.

6.2.7 Insert the gland over the shaft.

6.2.8 locate the stuffing box housing on bearing housing.

6.2.9 locate the stuffing box housing on bearing housing and tighten the nuts to hold them in position.

6.2.10 Insert the stuffing box packing rings alongwith lantern ring.

6.2.11 Tighten the gland nuts.

6.2.12 Fit the impeller key on shaft.

6.2.13 Fit the impeller on shaft.

6.2.14 Place the washer between the impeller and impeller nut and tighten the impeller nut.

6.2.15 Place the packing between delivery casing and stuffing box housing. In case of pumps covered under assembly , fit the sub-assembly of bearing housing, stuffing box housing and impeller etc. on the delivery casing and tighten the nuts holding delivery casing st. box housing and bearing housing.

6.2.16 Place the packing between delivery casing and stuffing box housing. In case of pumps covered under assembly , fit the sub-assembly of bearing housing, st. box housing and impeller etc. on the delivery casing and tighten the nuts holding delivery casing and st. box housing.

6.2.17 Fit the drain plug for delivery casing and other plugs, if any. Mount the foot support.

6.2.18 Fit the pump half of Love-Joy coupling on the pump shaft. For standard Love-Joy coupling, fit the prime mover in position. For spacer type Love-Joy coupling fit the spacer in position.

6.2.19 Fit the gland sealing and other auxiliary piping connections, if any.

:

GENERAL INFORMATION & SAFETY REQUIREMENTS

1.0 The products supplied by Sam Turbo have been designed with safety in mind. Where hazards cannot be eliminated, the risk has been minimised by the use of guards and other design features. Some hazards cannot be guarded against and the instructions below MUST BE COMPLIED WITH for safe operation. These instructions cannot cover all circumstances; YOU are responsible for using safe working practices at all times.

1.1 Sam Turbo products are designed for installation in designated area, which are to be kept clean and free of obstructions that may restrict safe access to the controls and maintenance access points.

A Pump Duty Nameplate is fitted to each unit and must not be removed. Loss of this plate could make identification impossible. This in turn could affect safety and cause difficulty in obtaining spare parts. If accidental loss or damage occur, contact Sam Turbo immediately.

1.2 Access to the equipment should be restricted to the personnel responsible for installation, operation and maintenance and they must be trained, adequately qualified and supplied with appropriate tools for their respective tasks.

1.3 Sam Turbo requires that, all personnel that are responsible for installation, operation or maintenance of the equipment, have access to and study the product instruction manual BEFORE any work is done and that they will comply with all local and industry based safety instructions and regulations.

1.4 Ear defenders should be worn where the specified equipment noise level exceeds locally defined safe levels. Safety glasses or goggles should be worn where working with pressurised systems and hazardous substances. Other personnel protection equipment must be worn where local rules apply.

1.5 Do not wear loose clothing or jewellery which could catch on the controls or become trapped in the equipment.

1.6 Read the instruction manual before installation, operation and maintenance of the equipment. Check and confirm that the manual is relevant copy by comparing pump type on the nameplate and with that on the manual.

1.7 Note the ‘Limits of product application – permissible use’ specified in the manual. Operation of the equipment beyond these limits will increase the risk from hazards noted below and may lead to premature and hazardous pump failure.

1.8 Clear and easy access to all controls, gauges and dials etc. must be maintained at all times. Hazardous or flammable materials must not be stored in pump rooms unless safe areas or racking and suitable containers have been provided.

1.9 IMPROPER INSTALLATION, OPERATION OR MAINTENANCE OF THIS SAM TURBO PRODUCT COULD RESULT IN INJURY OR DEATH.

2.0 SAFETY INSTRUCTIONS WHILE HANDLING AND STORAGE

When lifting the pump, use the lifting points specified on general arrangement drawing. Use lifting equipment having a safe working load rating suitable for the weight specified. Use suitable slings for lifting pump which is not provided with lifting points. The use of fork-lift truck and chain crane sling equipment is recommended but locally approved equipment of suitable rating may be used.

Do not place fingers or hands etc. into the suction or discharge pipe outlets and do not touch the impeller, if rotated this may cause severe injury. To prevent ingress of any objects, retain the protection covers or packaging in place until removal is necessary for installation. If the packaging or suction and discharge covers are removed for inspection purposes, replace afterwards to protect the pump and maintain safety.

3.0 SAFETY INSTRUCTIONS WHILE ASSEMBLY & INSTALLATION

Do not place fingers or hands etc. into the suction or discharge pipe outlets and do not touch the impeller, if rotated this may cause severe injury. To prevent ingress of any objects, retain the protection covers or packaging in place until removal is necessary for installation.

Do not touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed for maintenance they must be replaced before operating the equipment.

Shaft alignment must be checked again after the final positioning of the pump unit and connection to pipework as this may have disturbed the pump or motor mounting positions. If hot liquids (above 80°C) are being pumped, alignment should be checked and reset with the pump and motor at their normal operating temperature.

Failure to support suction and delivery pipework may result in distortion of the pump casing, with the possibility of early pump failure.

4.0 SAFETY INSTRUCTIONS WHILE COMMISSIONING & OPERATION.

Do not touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed for maintenance they must be replaced before operating the equipment.

Check that the pump is primed. Pump should never be run dry as the pumped liquid acts, as lubricant for the close running fits surrounding impeller and damage will be incurred.

Failure to supply the stuffing box or mechanical seal with cooling of flush water may result in damage and premature failure of the pump.

Do not touch surfaces which during normal running will be sufficiently hot to cause injury. Note that these surfaces will remain hot after the pump has stopped, allow sufficient time for cooling before maintenance. Be cautious and note that other parts of the pump may become hot if a fault is developing.

Do not operate water pumps in temperatures below freezing point, without first checking that the pumped fluid is not frozen and the pump is free to turn. Pumps in these environments should be drained down during inactivity and re-primed before starting.

In addition to local or site regulations for noise protection, SAM TURBO recommend the use of personal ear protection equipment in all enclosed pump rooms and particularly those containing diesel engines. Care must be taken to ensure that any audible alarm or warning signal can be heard with ear defenders worn.

Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of noxious and toxic gases, skin and eye contact or penetration. Obtain and understand the hazardous substance data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

5.0 SAFETY INSTRUCTIONS WHILE MAINTENANCE & SERVICING

Before attempting any maintenance on a pump particularly if it has been handling any form of hazardous liquid, it should be ensured that the unit is safe to work on. The pump must be flushed thoroughly with suitable cleaner to purge away any of the product left in the pump components. This should be carried out by the plant operator and a certificate of cleanliness obtained before starting work. To avoid any risk to health it is also advisable to wear protective clothing as recommended by the site safety officer especially when removing old packing which may be contaminated.

Check and ensure that the pump operates at below the maximum working pressure specified in the manual or on the pump nameplate and before maintenance, ensure that the pump is drained down.

Wear a suitable mask or respirator when working with packing and gasket components which contain fibrous material, as these can be hazardous when the fibrous dust is inhaled. Be cautious, if other supplier's components have been substituted for genuine KBL parts, these may then contain hazardous materials.

Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of noxious and toxic gases, skin and eye contact or penetration. Obtain and understand the hazardous substance data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

Isolate the equipment before any maintenance work is done. Switch off the mains supply, remove fuses, apply lock-outs where applicable and affix suitable isolation warning signs to prevent inadvertent reconnection. In order to avoid the possibility of maintenance personnel inhaling dangerous fumes or vapours, it is recommended that the maintenance work be carried out away from the pump locations by removal of bearing housing and shaft assembly to a suitable to a suitable maintenance area.

GENERAL INSTRUCTIONS FOR INSTALLATION, OPERATION & MAINTENANCE OF

SAM TURBO CENTRIFUGAL PUMPS

WARNING

The equipment supplied is designed for specific capacity, speed, pressure and temperature. Do not use the equipment beyond the capacities for which it is manufactured. The equipment manufactured is also shop tested for the satisfactory performance and if it is operated is excess of the conditions for which it is manufactured, the equipment will be subject to excessive stresses and strains.

LOCATION

The pump should be located as near the liquid source as possible. This will minimise the suction lift and pump will give better performance.

Ample space should be provided on all sides so that the pump can be inspected while in operation and can be serviced conveniently whenever required.

FOUNDATION

The foundation should be sufficiently substantial to absorb any vibration and to form a permanent rigid support for the base plate. This is important in maintaining the alignment of a direct connected unit. A concrete foundation on a solid base is advisable. Foundation bolts of the proper size should be embedded in the concrete located by a drawing or template. A pipe sleeve about two and one-half diameter larger that the bolt should be used to allow movement for the final position of the foundation bolts.

ALIGNMENT

Pumps and drivers that are supplied by the manufacturers, mounted on a common base plate are accurately aligned before despatch. However as the alignments are likely to be disturbed during transit to some extent and therefore must not be relied upon to maintain the factory alignment. Re-alignment is necessary after the complete unit has been levelled on the foundation and again after the grout has been set and foundation bolts have been tightened. The alignment must be checked after the unit is piped up and re-checked periodically.

FLEXIBLE COUPLING

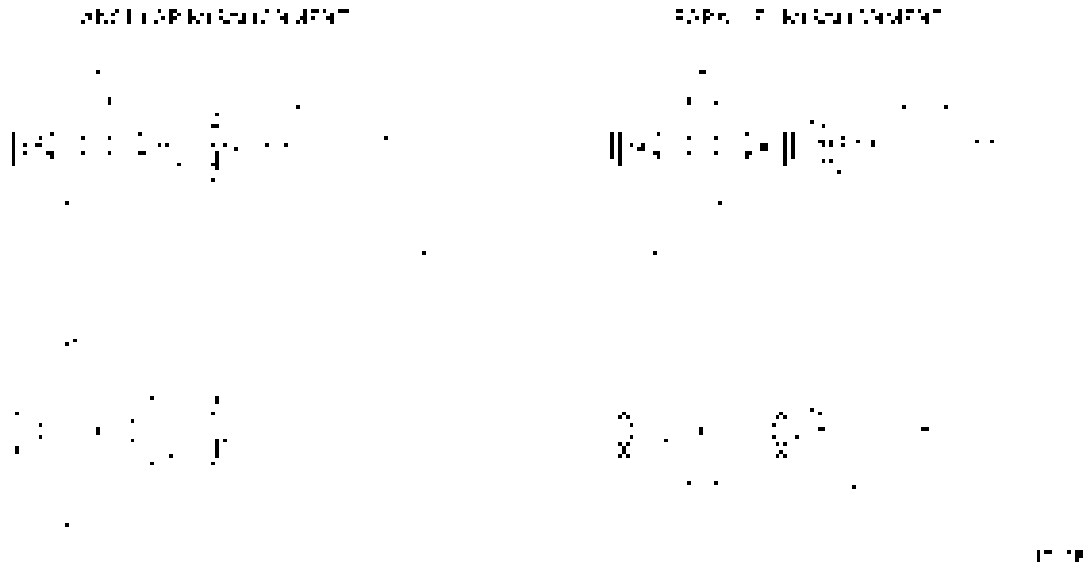
A flexible coupling will not compensate for misalignment of the pump and driver shafts. The purpose of the flexible coupling is to compensate for temperature changes and to permit the movement of the shafts without interference with each other while transmitting power from the driver to the pump.

TYPE OF MISALIGNMENT

There are two types of misalignment between the pump shaft and the driver shaft.

(a) Angular misalignment : Shafts with axis concentric but not parallel.

(b) Parallel misalignment : Shafts with axis Parallel but not concentric.



LEVELLING THE UNIT

When the unit is received with the pump and driver mounted on the base plate, it should be placed on the foundation and the coupling halves disconnected. The coupling should not be reconnected until all alignment operations have been completed. The base plate must be supported evenly on wedges inserted under the four corners so that it will not be distorted or sprung by the uneven distribution of the weight. Adjust the wedges until the shafts of the pump and driver are in level. Check the coupling faces, suction and discharge flanges for the horizontal or vertical position by means of spirit level. **FLEXIBLE COUPLING ALIGNMENT**

The two halves of the coupling should be at least 4 mm apart so that they cannot touch each other when the driver shaft is rotated. Necessary tools for approximately checking are straight-edge and on an outside caliper.

A check for parallel alignment is made by placing a straight-edge across both coupling periphery at the top, bottom and both the sides. The unit will be in parallel alignment when the straight-edge rests evenly on the coupling periphery at all positions. Care must be taken to have the straight-edge parallel to the axis of the shafts.

A check for angular alignment is made by using an outside caliper across the width of the coupling faces at various points.

Coupling alignment can be checked with dial gauge indicator .

GROUTING

When the alignment is correct, the foundation bolts should be tightened evenly but not too firmly. The unit can then be grouted by working soft concrete under the edges. Foundation bolts should not be fully tightened until the grout is hardened, usually 48 hours after poring.

FACTORS THAT MAY DISTURB ALIGNMENT

The unit should be periodically checked for alignment. If the unit does not stay in line after being properly installed, the following are possible causes:

(a) Setting, seasoning of the foundation

(b) Pipe strains distorting of shifting the machines

(c) Wear of the bearings

PIPING

Both suction and delivery pipes and accessories should be independently supported near the pump so that when the flanges bolts are tightened no strain will be transmitted to the pump casing. It is usually advisable to increase the size of both suction and delivery pipes at the pump nozzles in order to decrease the loss of head from friction and for the same reason piping should be arranged with as minimum bends as possible, as these should be made with along radius wherever possible. The pipe lines should be free from scales, welding residuals etc., and have to be mounted in such a way that they can be connected to suction and delivery flanges without any stress on the pump. Adequate supports should be given to pipe lines to that weight of the pipe lines does not fall on the pump. The use of minimum number of the bends and other fittings will minimise the frictional losses.

SUCTION PIPE

The suction pipe should be as short as possible. This can be achieved by placing the pump near the liquid to be pumped. The suction pipe must be kept free from air leaks. This is particularly important when the suction lift is high. A horizontal suction line must have a gradual rise to the pump. Any high point in the pipe will be filled with air and thus prevent proper operation of the pump. A concentric taper piece should not be used in a horizontal suction line as it forms an air pocket in the top of the reducer and the pipe. Use an eccentric piece instead.

The end of the suction pipe must be well submerged to avoid whirlpools and ingress of air but must be kept clear of nay deposits of mud, silt, grit etc. The pipe must be clear from any side of wall by at least 450 mm. The end of the suction pipe should be provided with a strainer of sufficient open area.

DELIVERY PIPE

A check (non-return) valve and a gate of sluice valve (regulating valve) should be installed in the discharge line. The check valve placed between the pump and the gate valve is to protect the pump from excessive pressure and to prevent water running back through the pump in case of failure of the driving machine. Discharge piping should be provided with a sluice valve adjacent to the delivery flange to control the discharge, if required.

VACUUM EQUALISING LINE (AND LIQUID LINE)

If the pump draws from a system under vacuum an equalising pipe must be carried from the highest point of the suction line, however, as close to the suction flange of the pump as possible, to the top of the feed tank to keep gas bubbles that might have been entrapped in the flow from entering the pump. The line should be fitted with an isolating valve which should be closed only for maintenance work on the pumpset.

Apply sealing liquid (external sealing) to the shaft seal cage to prevent entry of air in the case of pumps with packed stuffing box. It is convenient to tap the sealing liquid from the delivery line above the non-return valve.

FOOT VALVE

It is advisable to install a foot valve to facilitate priming. The foot valve should have sufficient clear passage for water. Care must be taken to prevent foreign matter from being drawn into the pump or choking the foot valve and for this purpose an efficient strainer should be provided.

STUFFING BOXES AND PACKING

Stuffing boxes should be carefully cleaned and the packing placed in them. Be sure that sufficient packing is placed at the back of the water seal cage. If the water to be pumped is dirty or gritty, sealing water should be piped to the stuffing boxes from clean outside source of supply in order to prevent damage to the packing and shaft. In placing the packing, each packing ring should be cut to the proper length so that ends come together but do not overlap. The succeeding rings of packing should not be pressed too tight as it may result in burning the packing and cutting the shaft. If stuffing box is not properly packed, friction in stuffing box prevents turning the rotor by hand. On starting the pump it is well to have the packing slightly loose without causing an air leak, and if it seems to leak, instead of putting too much pressure on the gland, put some heavy oil in the stuffing box until the pump works properly and then gradually tighten up the gland. The packing should be occasionally changed.

BALL BEARINGS

Correct maintenance of ball bearings is essential. The bearing manufacturers give the following as a guide to re lubrication periods under normal conditions.

Three monthly when on continuous duty.
Six monthly when on eight-hour per duty.
The bearings and housings should be completely cleaned and recharged with fresh grease after 2500 hours or the nearest pump overhaul time.

PRIMING

No pumping action occurs unless the pump casing is filled with liquid. Pump casing and suction pipe must therefore be completely filled with the liquid and thus all air removed before the pump is started. Several different priming methods can be used depending on the kind of installation and service involved.

(1) Liquid level above pump level

Pump is set below liquid level of source of supply so that liquid always flows to pump under positive head.

(2) Priming with foot valve

(a) When pump is installed on suction lift with foot valve at the end of suction line, fill pump with water from some outside source till all air is expelled and water flows through air vent.

(b) When there is liquid under some pressure in the discharge pipe, priming can be effected by bye passing the pressure liquid around the check and gate valve. Of course, the initial priming must be effected from some outside source.

NOTE: in this case, the foot valve must be capable of withstanding pump pressure and possible surge.

(3) Priming by ejector: An ejector operated by steam, compressed air or water under pressure and connected to air vent on top of casing can be used to remove air from and prime the pump on suction lift installations.

(4) Priming by dry vacuum pump : a hand or power pump sucks in all the air from the casing and the suction pipe, and thus primes the system.

STARTING

The pump must not be started without being primed. Be sure that the driver rotates in the proper direction as indicated by a direction arrow on the pump casing.

RUNNING

On account of its simple construction, the centrifugal pump requires practically no attention while running. Lubrication of the bearings and manipulation of the glands are the only things that need attention from the operator.

STOPPING

Before stopping the pump, close the gate valve. This will prevent water hammer on check valve.

STUFFING BOXES

Do not tighten the glands excessively. A slight dripping of water from the stuffing boxes when pump is running keeps packing in good condition.

CASING RINGS

Casing rings are fitted in the casing to reduce the quantity of water leaking back from the high pressure side to the suction side. These casing rings are fitted to maintain a small clearance and depend on the water in the pump for lubrication. When they are worn out, the clearance becomes greater and more water passes back into the suction. They must be replaced from time to time to restore the pump efficiency to its normal value.

SPARE PARTS

A set of ball bearings, a set of casing rings, and a set of gland packing rings must always be kept at hand to ensure uninterrupted service from the pump. While ordering for spare parts, always give type, size and serial number of the pumps as stamped on the name plate.

PUMP TROUBLE

When investigating trouble with Sam Turbo pumps, always remember that pumps have been tested at the factory and are mechanically correct when sent out. Discounting the possibility of damage during transit, most of the trouble in the field is due to faulty installation. Investigation shows that the majority of troubles with centrifugal pumps result from faulty conditions on the suction side.

BREAK DOWN-CAUSE-CHECK POINTS

In case of breakdown we recommend the location of the fault by using the following table.

BREAKDOWN	CHECK POINTS
Pump does not deliver	1 7 8 9 10 11 12 14 15 17 18 19 23 25 26 56 57 58
Pump delivers at reduced capacity	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 17 18 19 20 21 22 56 57 58
Delivery performance deteriorates	1 3 7 9 10 11 12 13 14 19 20 21 22 23 24 53 57 62
Pump delivers too much	16 56 57 58
Delivery is interrupted	1 3 6 7 8 9 10 11 12 13 14 15 16 19 22 23 25 26 56 57 58 62

After stopping pump runs in reverse direction	**52**
Very noisy	**1 2 5 6 7 8 11 12 13 15 19 20 22 54 55 56 57 62**
Unsteady running of pump	**19 20 22 31 32 33 35 36 37 38 39 40 43 44 47 48 49 50 51 54 55 58**
Stuffing box leaks excessively	**24 27 28 29 30 31 47 48 49 53**
Fumes from stuffing box	**22 23 24 25 26 27 28 29 30 41 42 43**
Pump rotor locked in standstill position	**22 45 46 50**
Pump is heating up and seizing	**23 24 25 26 27 28 29 30 40 41 42 45 47 48 49 50 54**
Bearing temperature increases	**19 20 21 22 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 51 54 55 58**
Motor will not start	**14 22 60**
Motor gets hot or burns out	**14 22 27 28 40 43 50 55 56 57 58 59 60 61**
Motor is difficult to start	**14 22 27 28 45 46 50 58 59 60**

CHECK POINTS

1. Suction pipe, foot valve choked.
2. Nominal diameter of suction line too small.
3. Suction pipe not sufficiently submerged.
4. Too many bends in the suction line.
5. Clearance around suction inlet not sufficient.
6. Shut off valve in the suction line in unfavourable position.
7. Incorrect layout of suction line (formation of air pockets).
8. Valve in the suction line not fully open.
9. Joints in the suction line not leak-proof.
10. Air leaking through the suction line and stuffing box etc.
11. Suction lift too high.
12. Suction head too low (difference between pressure at suction connection and vapour pressure too low).
13. Delivery liquid contains too much gas and/or air.
14. Delivery liquid too viscous.
15. Insufficient venting.
16. Number of revolutions too high.
17. Number of revolutions too low.
18. Incorrect direction of rotation (electric motor incorrectly connected, leads of phases on the terminal block interchanged).
19. Impeller clogged.
20. Impeller damaged.
21. Casing rings worn out.
22. Separation of crystals from the flow of pumping liquid (falling below the temperature limit/equilibrium temp).
23. Sealing liquid line obstructed.
24. Sealing liquid contaminated.
25. Lantern ring in the stuffing box is not positioned below the sealing liquid inlet.
26. Sealing liquid omitted.
27. Packing incorrectly fitted.
28. Gland tightened too much/slanted.

29. Packing not suitable for operating conditions.
30. Shaft sleeve worn in the region of the packing.
31. Bearing worn out.
32. Specified oil level not maintained.
33. Insufficient lubrication of bearings.
34. Ball bearings over-lubricated.
35. Oil/Grease quality unsuitable.
36. Ball bearing incorrectly fitted.
37. Axial stress on ball bearings (no axial clearance for rotor).
38. Bearings dirty.
39. Bearings rusty (corroded).
40. Axial thrust too great because of worn casing rings, relief holes obstructed.
41. Insufficient cooling water supply to stuffing box cooling.
42. Sediment in the cooling water chamber of the stuffing box cooling.
43. Alignment of coupling faulty or coupling loose.
44. Elastic element of coupling worn.
45. Pump casing under stress.
46. Pipeline under stress.
47. Shaft runs untrue.
48. Shaft bent.
49. Rotor parts insufficiently balanced.
50. Rotor parts touching the casing.
51. Vibration of pipe work.
52. Non-return valve gets caught.
53. Contaminated delivery liquid.
54. Obstruction in delivery line.
55. Delivery flow too great.
56. Pump unsuitable for parallel operation.
57. Type of pump unsuitable.
58. Incorrect choice of pump for existing operating conditions.
59. Voltage too low/power supply overloaded.
60. Short circuit in the motor.
61. Setting of starter of motor too high.
62. Temperature delivery liquid too high.