KSB Meganorm

Centrifugal pump for general use

LINE EXTENSION OF : **Mega**

1. Application

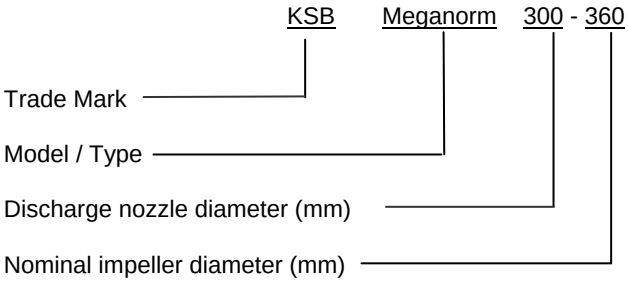
KSB Meganorm centrifugal pump is suitable for pumping water, clean or turbid liquids, in the following applications:

- Water supply
- Drainage
- Irrigation
- General Industry
- Fire fighting

2. Design

Horizontal, single-stage, end suction with top centerline discharge. The “back-pull-out” design allows maintenance and repair services through the backside, without dismantling piping supports.
Dimensionally built acc. to KSB design.

3. Designation



4. Operating data

Sizes	- DN 150 up to 400 (6” up to 16”)
Flow	- up to 3700 m^3/h
Head	- up to 130 m
Temperature	- up to 105°C
Speed	- up to 1750 rpm

5. Introduction

KSB has supplied you with equipment that has been designed and manufactured with the latest technology.
Due to its simple and tough construction it will not need much maintenance. With the aim to provide our clients with a satisfactory, trouble free operation, we recommend to install and care our equipment according to the instructions contained in this service manual.
This manual has been prepared to inform the end user about construction and operation of our pumps, describing the proper procedures for handling and maintenance. We recommend that this manual should be handled by the maintenance supervision.
This equipment must be used at operational conditions for which it has been selected, such as: flow rate, total head, speed, voltage, frequency and temperature of pumped liquid.

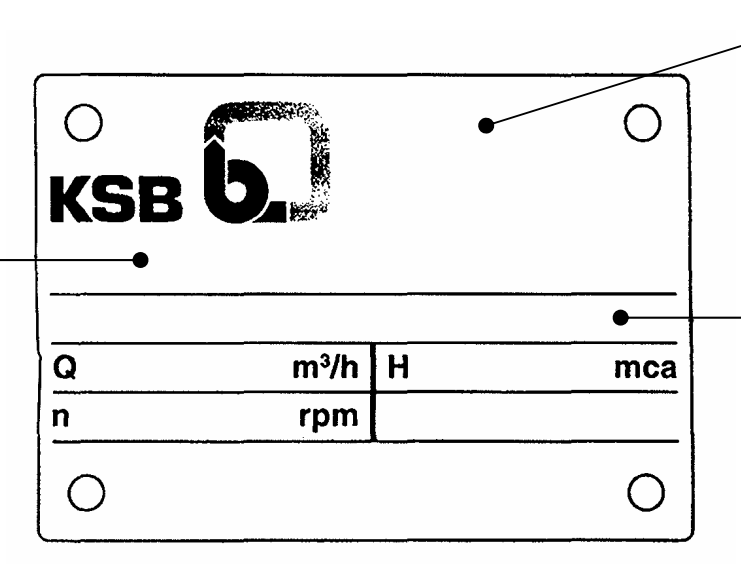


Fig. 1 - Plate

For requests about the equipment, or when ordering spare parts, please mention the type of pump and the Production Order number (serial nº). This information can be obtained from the nameplate on the actual pump. If the nameplate is not available, the OP number is engraved in low relief on the suction flange, and on the discharge flange you may find the impeller diameter.

Attention: This manual contains very important recommendations and instructions. Must be carefully read before installation, electrical connection, first start up and maintenance.

Contents

6. Technical data

Technical data \ Sizes		Unit	200-250	150-500	200-315	200-400	250-300	250-315	250-400	300-340	300-360	300-400	200-500	250-500	350-370A	350-370B	350-400A	350-400B	400-440A	400-440B	400-540A	400-540B
Bearing bracket			A 60	A 75									A 90									
Width of impeller passage		mm	57	20	50	40	67	74	63	75	78	65	32	43	75	50	50	45	85	55	65	60
GD^2 with water		$Kg.m^2$	0,6	3	1,1	2,15	1,4	1,25	2,4	1,88	2,2	3,76	4,6	5,1	0,7	0,7	5,0	5,0	5,0	5,0	17,0	17,0
Maximum suction pressure		bar	3																			
Maximum discharge pressure		bar	10	12	16	16	10	16	16	10	10	10	16	16	5	5	8,3	8,3	5	5	8,3	8,3
Maximum hydrostatic test pressure		bar	12,5	15	20	20	12,5	20	20	12,5	12.5	12,5	20	20	8	8	10	10	6	6	10	10
Maximum speed		rpm	1750																1160			
Axial thrust balance		-	Balance holes / wear ring																			
Maximum / minimum flow		-	Consult characteristic curves																			
Vibration		-	According to Hydraulic Institute																			
Speed direction		-	Clockwise, seen from driver end																			
Standard flanges (1)		-	*			**	*	**		*			**	AISI B 16.1 125 lb FF								
Minimum bearing basic rating life L_{10h}		h	17.500																			
Bearings	Pump side	-	6312/C3	6315/C3									7218 BE									
	Motor side	-	6312/C3	6315/C3									6218/C3									
	Lubrication	-	Oil																			
Maximum permissible P/n	SAE 1045	HP/rpm	0,140	0,291	0,145	0,145	0,291	0,145	0,291	0,291	0,291	0,291	0,291	0,400	0,291	0,291	0,400	0,400	0,400	0,400	0,513	0,513
Estimated weight		Kg	350	430	365	385	405	510	540	600	650	705	600	700	720	720	770	770	800	800	1250	1250

Table 1

* ANSI B 16.1 125 lb FF ** ANSI B 16.1 250 lb RF

(1) Other flange standards, consult KSB.

7. Transportation

The transport of motor-pump set or only pump should be made with ability and sound sense, according to safety standards. By the motor eyebolt should only lift it, never the motor-pump set.

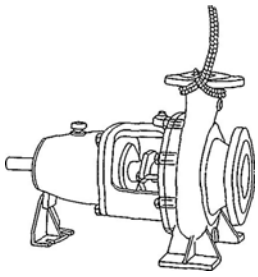


Fig.2. Pump transport through discharge flange

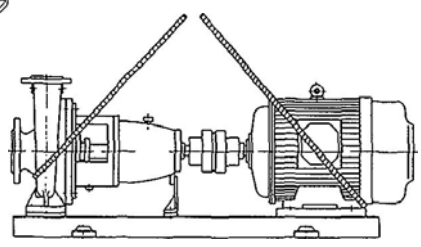


Fig.3. Transport of motor-pump set

8. Preservation and storage

KSB standard storage and preservation procedures maintain the pump protected for a maximum period of 6 months in an indoor installation. It is client responsibility to keep these procedures after receiving the pump.The unit / pump should be stored in a dry room where the atmospheric humidity is as constant as possible.

After sale, if performance test is not executed, the areas that have contact with the pumped liquid and are not painted, for example, stuffing box, wear rings, flanges sealing area, etc., receive an application of RUSTILO DW 301, by brush.

When the pump contain packing and performance test is executed, after test, the pump is drained without disassemble. Afterwards the pump is fulfilled with RUSTILO DW 301, moving the rotor to optimize the application. Thereafter the RUSTILO is drained. The shaft exposed areas (end and region between gland cover and bearing bracket) receive an application of TECTYL 506, by brush.

Bearings in the bearing brackets lubricated with oil receive one charge of spray MOBILARMA 524.

The pump must be protected against physical damage, humidity, dust and aggressive ambient, indoor.

8.1 Preservation and storage additional procedures

- Pumps stored for periods over 1 year must have the preservative process done each 12 month. The pumps must be disassembled, cleaned and the storage process must be done again.
- For pumps assembled with packing, they must be removed from the equipment before storage.
- Mechanical seals must be cleaned with dry air. Do not apply liquids or other preservative materials in order to not damage the secondary sealings (O´rings and flat gaskets).
- All the existent connections, like: plugs for liquids of external source, vent, drainage, etc., should be properly closed.
- The pump suction and discharge nozzles are properly closed with tape, in order to avoid strange bodies inside the pump.
- Assembled pumps waiting for start up or installation should have their rotor manually rotated each 15 days. In case of difficulty, use a box spanner, protecting the motor shaft surface at the point of application.
- Before conservation liquids application, areas should be washed with gasoline or kerosene until they are completely cleaned.
- The main characteristics of preservative liquids mentioned in this manual are:

Protecting liquid	Applied layer thickness (μm)	Drying time	Removal	Manufacturer
TECTYL 506	from 80 up to 100	½ up to 1 hour	Gasoline, Benzol, Diesel oil	BRASCOLA
RUSTILO DW 301	from 6 up to 10	1 up to 2 hours	Gasolina, Benzol	CASTROL
MOBILARMA 524	≤ 6	Stays liquid	Not necessary	MOBIL OIL

Table 2 – Preservative liquids

9. Installation

Pumps should be installed, leveled and aligned by qualified people. When this service is inappropriate executed, it can have as consequence, operational troubles, premature wear and irreparable damage.

9.1 Baseplate grouting

Place the anchor bolts in the holes of foundation block according to the drawing dimensions. Between the base and foundation block must be placed besides the anchor bolts, metallic chocks of same height for base support. The chock blocks must be set with grout. The anchor bolts are set with concrete of appropriate feature, using for positioning a mould with holes according to Foundation plan. For perfect adherency, the anchor bolts and metallic chocks must be free of any residue of grease or oil.

The base should be placed over the foundation block after grout and concrete cure.

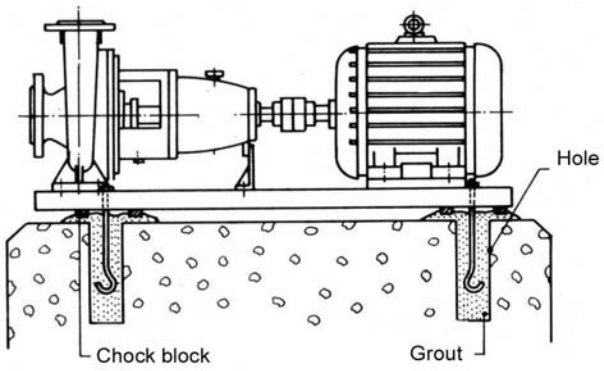


Fig.4. Baseplate grouting

9.2 Baseplate leveling

Check if baseplate is equally resting in all chock blocks. If positive, place and tighten uniformly the nuts in the anchor bolts. With the auxiliary of a spirit level, check the base leveling in the transversal and longitudinal direction.
In case of uneveness, loose the nuts from anchor bolts and introduce shims to correct the leveling between the metallic chock block and the baseplate.

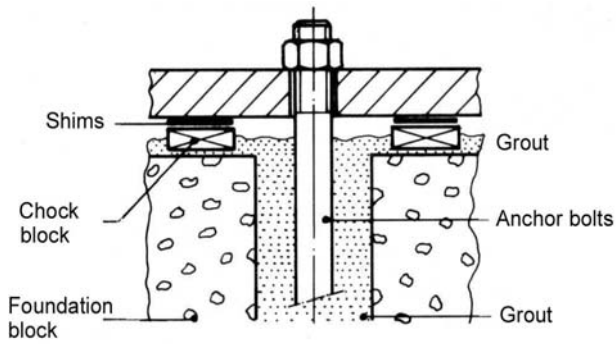


Fig.5. Baseplate leveling

Note.: After leveling the base and before concrete fulfill, the motor-pump set must be pre-aligned according to the instructions of item 9.4.

9.3 Grouting

For a solid settle and operation free of vibrations, the base interior must be fullfilled with appropriate concrete. The concrete preparation must be done with specific products available in the civil construction market, which avoid shrinkage during the cure process, as well as provide appropriate fluidity for the complete fulfill of base interior preventing gaps (Fig.6).

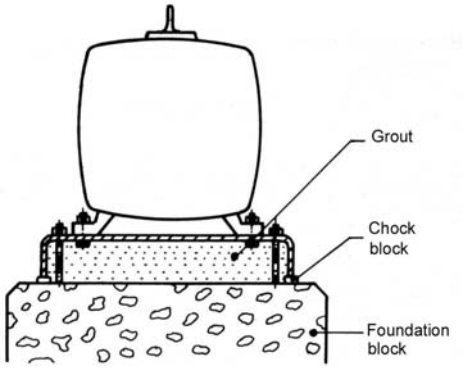


Fig.6. Base fulfill with grout

9.4 Coupling alignment

The perfect alignment between the pump and the drive will affect the rotor useful life and equipament functioning free of abnormal vibrations.
The alignment performed at the factory must be rechecked, since during transport and handling the set is subjected to distortions that affect the initial alignment.

After concrete cure, perform the alignment with suction and discharge piping already connected.
The alignment must be executed with dial indicator for radial and axial dislocating control.
Settle the instrument base in the peripherical part of one of the coupling halves, and adjust the dial indicator positioning the feeler perpendicular to the peripheric of other coupling half.
Zero the clock and move by hand the coupling side where the instrument base is set with the dial indicator and completing 360º turn (Fig. 7). The same procedure must be adopted for the axial control (Fig. 8).

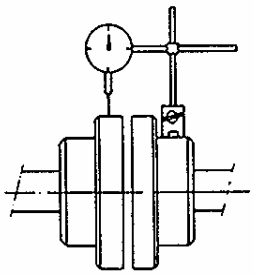


Fig.7. Radial control

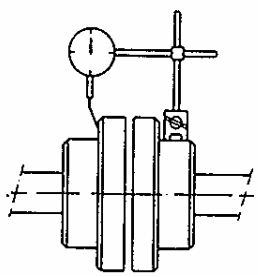


Fig.8. Axial control

For the alignment correction, loosen the bolts from the drive replacing them laterally, or insert shims to correct the height as required.

The axial and radial alignment must remain in the allowance of 0,1 mm with pump and drive bolts definitely tightened.
If it is not possible to use a dial indicator, use the straight edge leaned in the longitudinal direction in both parts of coupling sleeve. The control must be executed for horizontal and vertical plans. For control in the axial direction, use gauge. The clearance between the coupling sleeve hubs, specified by the manufacturer must be applied.

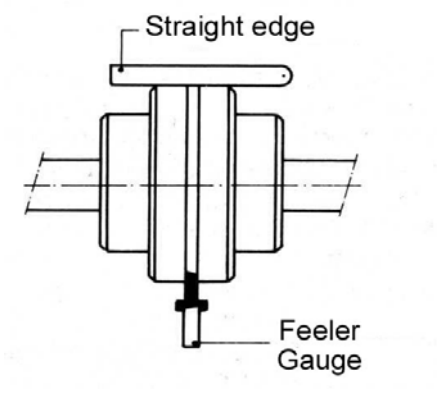


Fig.9. Alignment with metallic ruler and gauge

9.5 Recommendation for suction piping

To install the suction piping follow these instructions:

A. Connect the suction piping to the pump only after the complete hardening of the grout in the base plate.

B. The suction piping should be as straight and short as possible – reducing pressure losses - and totally air tight, preventing any air leaks.

C. In order to be free of air pockets, the horizontal section of the suction piping, when negative, should be installed with gradual rise slope. When positive, the horizontal section of the pipeline should be installed with a gradual rise slope to the suction tank.

D. The nominal diameter of the pump suction flange does not determine the suction pipe nominal diameter. To calculate the ideal diameter as a reference, the liquid velocity can be defined between 3.2 ft/s and 6.5 ft/s (1 and 2 m/s).

E. If it were necessary to use a reduction, it should be eccentric, mounted with its taper facing downwards, so that the reduction upper generatrix stays in a horizontal position coincident with the pump generatrix, so as to prevent air pockets.

F. Curves and accessories, when needed should be designed and installed reducing pressure losses to a minimum, i.e. always prefer long or medium radius curves.

G. The suction line flange should fit to the pump suction flange without any stress or tension and without applying any kind of force to the casing. **The pump should never be an anchor point for the suction pipeline.** If this condition is not observed a misalignment may happen, originating cracks on pump parts and/or other severe damages.

H. On installations equipped with foot valve, observe that the free passage area should be 1.5 times the cross sectional area of the suction pipeline. Normally coupled to the foot valve there should be a suction strainer with a free passage area 3 to 4 times larger than the cross sectional area of the suction pipeline.

I. When the liquid being pumped has large temperature variations, expansion joints should be installed preventing the effects of contractions and expansions of the suction pipeline on the pump.

J. With positive suction, it is advisable to install an inlet valve to close the flow to the pump when necessary. During the pump operation it should stay totally open. A suction with a common header for several pumps should have an inlet valve for each pump and the connection between the header and each suction line should be made with line angle changes less than 45 degrees. In all these applications of gate valves, the valve stems should be directed either horizontally or vertically downwards.

K. To prevent turbulence, leakage of air, sand or mud at the pump suction, all recommendations of the HYDRAULIC INSTITUTE referred to the these types of installation should be strictly observed.

L. Even if the coupling alignment has been checked before tightening, it has to be repeated after the final tightening of the suction pipeline.

M. To facilitate the mounting of the suction pipeline and the fitting of the parts, install as necessary, flexible joints of the following types: Dresser, common or special with tie bolts.

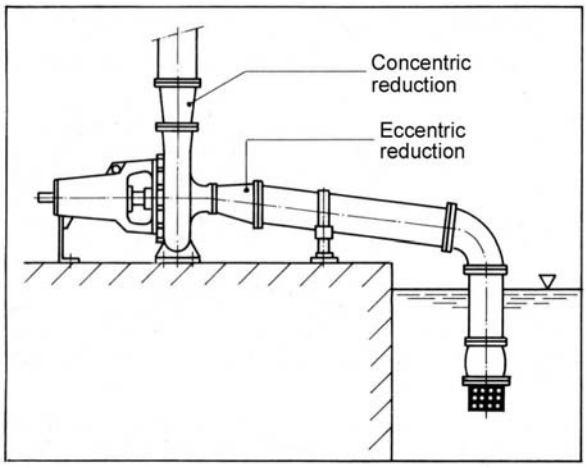


Fig. 10 – Negative suction

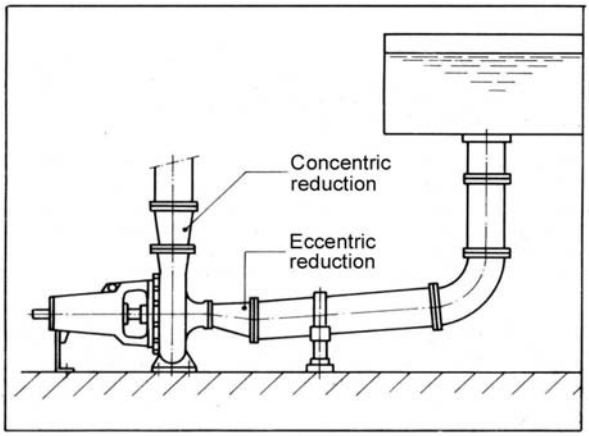


Fig. 11 – Positive suction

9.6 Recommendations for discharge piping

To install the discharge pipeline, please follow the instructions below:

A. If the overpressures caused by the returning of the liquid in long pipe lines, exceed the limits specified for the line and the pump, water hammer control devices should be installed on the discharge pipe line.

B. When the diameters of the pump and pipeline flanges are different, the connections should be done through a concentric reduction.

C. On the points where it is necessary to bleed the air in the pipeline, vent valves should be installed.

D. Install a discharge valve, if possible immediately after the discharge nozzle of the pump in order to properly control the flow rate and pressure or to prevent driver overloads.

E. When a non-return valve is installed, it should be mounted between the pump and the discharge valve, prevailing this condition over item D.

F. Tie mounting joints should be installed to absorb the system reaction forces, originated on the applied loads.

G. Safety valves, pressure relief devices and other operational valves not included up to now, should be installed as necessary for adequate operation of the pipeline.

H. The recommendations for the suction pipeline described on items A, B, F, G are also valid for the discharge pipeline.

9.7 Auxiliary piping and connections

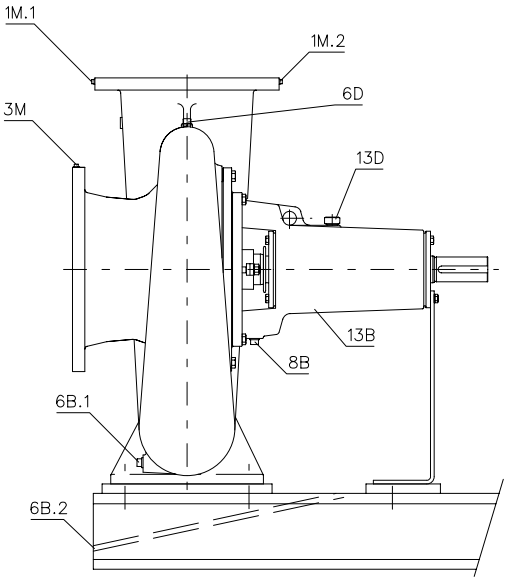


Fig. 12 – Auxiliary piping and connection

Connections table		
Connection	Designation	NPT
1M.1	Manometer	1 / 4
1M.2	Manometer	1 / 4
3M	Vaccum pressure gauge	1 / 4
6B.1	Pump drainage	3 / 4
6B.2	Base drainage	1
6D	Vent	3 / 4
8B	Dripping	3 / 4
13B	Drainage	1 / 2
13D	Lubrication	∅ 20 mm

Table 3

9.8 Coupling guard

For security in the operation, a coupling guard should be installed. They are made according to standard, of steel or brass, and are fixed to the base.
The coupling guard can not be in contact with rotating parts.

9.9 Instruments

It is recommended to use pressure gauge and vaccum meter in the discharge and suction piping respectively, for a better pump operation control. The scales must correspond approximately to 150% of highest pump pressure. The instruments must have valves.
When pumping chemical aggressive liquids, instruments and also valves must be made of appropriate material. When the liquids have suspensions or solid particles, use separators or membrane instruments. For instruments longer useful life, the auxiliary valves must be generally closed, opening them only to read the instruments.

10. Operation

10.1 First starting procedure

The following items must be provided for pump first startup:

A. Pump and its driver must be securely fastened to the base plate;

B. Fix firmly the suction and discharge pipelines;

C. Connect and run auxiliary pipelines and connections (if any).

D. Wiring should be done upon assuring that all motor thermal overload protections are securely and adequately connected and set.

E. Check bearings for cleanliness and dampness. Fill bearing bracket with oil in quantity and quality as specified in item 11.

F. Check the rotation direction of driver without coupling the pump to avoid dry operation.

G. Manually check for the free running of the moving parts.

H. Check that the proper coupling alignment according to item 9.4 has been performed.

I. Mount coupling guard (if any).

J. Prime pump by filling it and suction pipeline with water or with the liquid to be pumped, bleeding internal air simultaneously.

K. Check that the gland cover nuts are just fitted, without tightening them (pumps with packing).

L. Fully open suction valve (if any) and close discharge valve.

10.2 Immediate steps after 1st start up

Once the pump has started and is already in normal operation, please follow the instructions below:

A. Adjust pump to its operation point (pressure and flow) by opening slowly the discharge valve shortly after pump drive has reached its nominal speed.

B. Motor current consumption (amperage) must be controlled as well as network voltage value.

C. Assure that suction pressure value corresponds to the designed one.

D. Assure that pump runs vibration-free and without unusual noises. Vibration criteria in accordance to Hydraulic Institute.

E. Check bearing temperature that may reach 122ºF (50ºC) over ambient temperature. However the sum of bearing temperature and ambient temperature should not exceed 197ºF (90ºC).

F. Adjust the packing by tightening gland cover nuts about 1/6 turn. Like any new packing, it is required a certain period to set. The new packing should be checked during the first 5 to 8 hours of operation and in the event of leakage in excess, the gland cover nuts should be tightened about 1/6 turn again. During normal operation, packing should drip. When packing reach the set stage, a weekly inspection should be enough. The procedure mentioned above should be practiced every 15 minutes over the first 2 hours of operation. If all tests pass, new checking should be carried out every hour, until the first 5 to 8 running hours (pumps with packing).

At the operation beginning, the pump with mechanical seal may have a little leakage through that. This leakage must stop after sealing faces accomodation.

10.3 Supervision during operation

Depending on the labor availability and responsibility of installed pump, we recommend the following supervisions. In case of any irregularity the maintenance supervisor must be immediately called.

10.3.1 Weekly supervision

Check:

A) Pump duty point;
B) Motor consumed current and value of network voltage;
C) Suction pressure;
D) Vibrations and irregular noises;
E) Oil level;
F) Packing leakage.

10.3.2 Monthly supervision

Check:

A) Oil change interval. Consult chapter 11;
B) Bearings temperature.

10.3.3 Semestral supervision

Check:

A) Pump, drive and baseplate fixing bolts;
B) Pump-drive set alignment;
C) Coupling lubrication (if any);
D) Replace packing if necessary.

10.3.4 Annual supervision

Disassemble the pump for maintenance. After cleaning, inspect carefully the bearings, radial seal ring, gaskets, O´Rings, impellers situation and internal area of volute casing (control also the thickness), wear areas and coupling.

10.4 Shutdown procedure

When stopping the pump observe the following steps.

A) Close the discharge valve;
B) Turn the driver off and observe the gradual and smooth pump set stop;.
C) Close the suction valve (if any);
D) Close the auxiliary pipings (if there is no restriction).

11. Maintenance

11.1 Bearings maintenance

The objective of maintenance, in this case, is to increase the useful life of bearings system. When the pump is in operation the maintenance includes the control in the bearings temperature and bearing bracket oil level.

Pumps are delivered without oil in the bearing bracket

Note: Table of oil quantity to fill KSB Meganorm pumps bearing bracket.

Bearing bracket	Oil quantity (ml)
A60	480
A75	2500
A90	4400

Table 4

11.2 Lubrication intervals and oil specification

The first change must be done after the first 200 to 300 working hours. The next change must be done after 1.500 or 2.000 working hours. This will prevent dirt particles not eliminated during cleanness and which contaminate the oil and damage the bearings.

After that, change must be done every 8.000 effective working hours or at least once a year (what comes first). Bearings must be washed each 2 years.

Manufacturer	Type
ATLANTIC	EUREKA-68
CASTROL	HYS PIN AWS-68
ESSO	Óleo p/ Turbina-68
MOBIL OIL	Dte-26
IPIRANGA	IPITUR AW-68
PETROBRAS	MARBRAX TR-68
SHELL	TELLUS-68
TEXACO	REGAL R&O-68
Promax BARDHAL	MAXLUB MA-20

Table 5 – Oil specification

11.3 Packing maintenance

If the packing has already been pressed an equivalent of one packing ring thickness and even so presents excessive leakage, maintenance must be done according to below:

- Stop the pump.
- Loosen the gland cover nuts and remove the gland cover, which is split. Push it in the bearing cover direction, and then pull half of the gland cover to the right and the other half to the left.
- Remove, with help of a flexible rod all the packing rings and lantern ring.
- Clean the stuffing box chamber.
- Check the surface of the shaft protecting sleeve. In case of rugosity or grooves that will damage the packing, it will need to be re-machined in the diameter of 1 mm, or replaced by a new one.
- Cut new packing rings possibly with oblique edges (Fig.13). To facilitate this cutting operation it can be used a very simple device (fig.14).

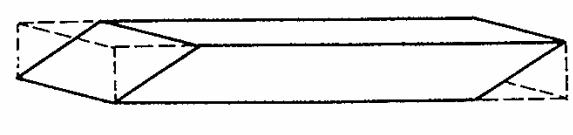


Fig. 13. Slanted cut of the packing

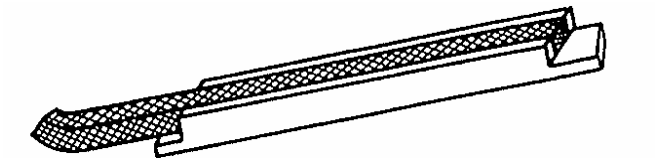


Fig.14. Packing rings cutting device

- Lubricate internal diameter of each gasket ring with grease.
- Lubricate the external diameter of lantern ring with Molykote G.
- Proceed the assembly in the reverse sequence of disassembly, introducing each part inside the chamber with the help of the gland cover. The packing rings must be assembled with their ends positioned 90º from each other (Fig.15).

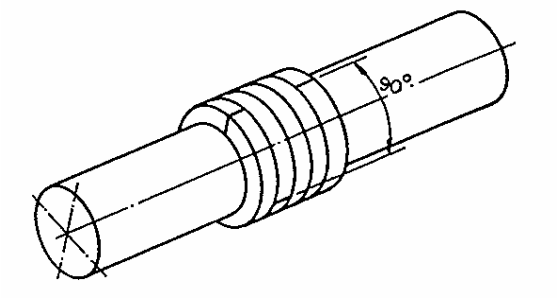


Fig. 15. Position of rings with ends poisoned 90º from each other

After all parts in the chamber, a gap of 3 mm should remain as a guide for the gland cover.

11.4 Dismantling instructions

The numbers indicated between parenthesis just after the name of each part refers to the parts list and drawing (Chapter 14).
Due to its modern design the KSB Meganorm pump have maintenance advantages, since set can be totally disassembled through the back side of the pump: support, pressure cover and impeller. Spiral casing (102) and suction and discharge pipings remain in their places. In case of installation with coupling sleeve with spacer, drive remains in place during pump maintenance.

11.4.1 Dismantling sequence of the pump with gland packing

1) Close the suction valves (if any) and discharge ones. Drain the pump removing threaded plug (916.3);
2) Close the valve and disconnect the auxiliary pipings (if any);
3) Remove coupling guard;
4) Remove the vent (639), threaded plug (916.5) and drain the oil from the bearing bracket;
5) If the coupling has a spacer, remove it. If doesn´t have it, disconnect the sleeve removing it from the driver;
6) Remove the coupling from the pump shaft, loosening first the fixing Allen bolt;
7) Loosen the bolts that fasten the support foot (183) to the baseplate;
8) Loosen the bolts (901.2), or bolts (901.4) when necessary;
9) Remove all the set;
10) Support with woody the set in the overhang side. Lock the shaft through a device placed in the region of coupling sleeve key (940.2);
11) Loosen and extract the impeller bolt (901.5), flat gasket (400.4) and washer (550.5);
12) Extract the impeller (230), the key (940.1) and gasket (400.1);
13) Loosen the bolts (901.4), if any. Loosen the nuts (920.4) and extract the gland cover (452). Extract the casing cover (163) and the flat gasket (400.2). Extract shaft protecting sleeve (524);
14) Extract the thrower (507) and the key (940.2);
15) Loose the bolt (901.1) and release the support foot (183);
16) Loose the bolts (901.3), extract the bearing covers (360) and the flat gaskets (400 3). Take care not to damage the radial seal rings (421) which are together with the bearing covers;

17) With a piece of lead, strike against the shaft end (210) suction side, making the external surface of the bearings (321) run inside the bearing bracket (330) up to the complete extraction;

18) Extract parts from inside the sealing chamber, gland packing rings (461) and lantern ring (458). After that, all the set will be available for checking and maintenance.

11.4.2 Dismantling sequence of the pump with mechanical seal

Loosen the auxiliary pipings (if any) and the seal cover. Follow the instructions of Operating Manual of mechanical seal manufacturer that will be attached with the pump in case of seal supply.

11.5 Assembly instructions

All parts must be cleaned and deburred before assembly.

11.5.1 Assembling sequence for pumps with gland packing

Before the shaft assembly, bearings must be heated at a furnace or in an oil bath up to a maximum temperature of 80º to 90ºC above the shaft temperature during 30 minutes, observing the maximum limit of 125ºC.

1) Assemble the bearings (321/320) in the shaft. With a piece of lead assemble the shaft in the bearing bracket from the suction side, making the external track of bearings (321) slide inside the bearing bracket until reaching equal clearances at both sides of bearing bracket to allow grooving of the bearing covers.
   For pumps with bearing bracket A-90, should not exist clearance between bearing covers and bearings;

2) Assemble the radial shaft seal rings (421) in the bearing covers (360). Assemble the covers carefully not to damage the radial shaft seal rings and flat gaskets (400.3);

3) Fasten the bolts (901.3). Fit the support foot (183) and fasten the bolts (901.1) with the washer (550.1);

4) Support the overhung side of the bearing bracket (330) with a wood piece. Introduce the thrower at the shaft, without touching the bearing cover;

5) Assemble the studs (902) in the pressure cover. Assemble the packing in the sealing chamber;

6) Assemble the gland cover (452), leaning it against the nuts (920.4).

7) Assemble the shaft protecting sleeve (524) in the shaft, in the internal diameter with Molykote G. Guide the flat gasket (400.2) at the pressure cover, fit the pressure cover (163) in the bearing bracket (330) and fit it with bolts (901.4) (crossly and uniformly tightened) if any.

8) Assemble the flat gasket (400.1), the key (940.1), the impeller (230) (grease the internal diameter with Molykote G), the washer (550.5), the flat gasket (400.4), and the impeller bolt (901.5).

9) Assemble the key (940.2), lock the shaft with a device and tighten firmly the impeller bolt (901.5).

10) Introduce all set in the volute casing (102) guiding the set through the diameter of pressure cover. Asembly the bolts (901.2) tightening them crossed and uniform. Check by hand if the impeller turns round free.

11.5.2 Assembling sequence for pumps with mechanical seal

Consult Instructions manual that will be attached with the pump in case of mechanical seal supply.

12. Special recommendations

12.1 Machining of impeller external diameter

All stainless steel impellers that have been machined (trimmed) in its external diameter must be also adjusted, what means, vanes must be sharpened in the outlet region of pumped liquid as shown on Fig. 16.

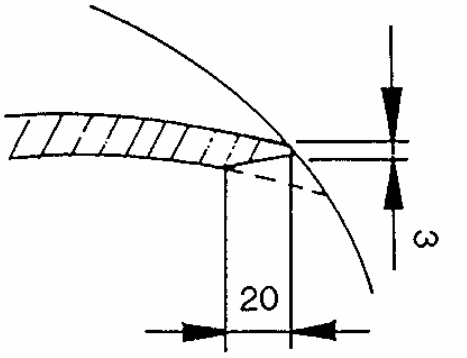


Fig. 16 – Impeller vanes adjusting

13. Pressure limits x maximum temperature

Temperature °C	Flange ANSI B 16.1 125#	Flange ANSI B 16.1 250#
	Pressure [bar]	Pressure [bar]
0 up to 65	12	16
66 up to 100	10	

Table 6

14. Sectional drawing

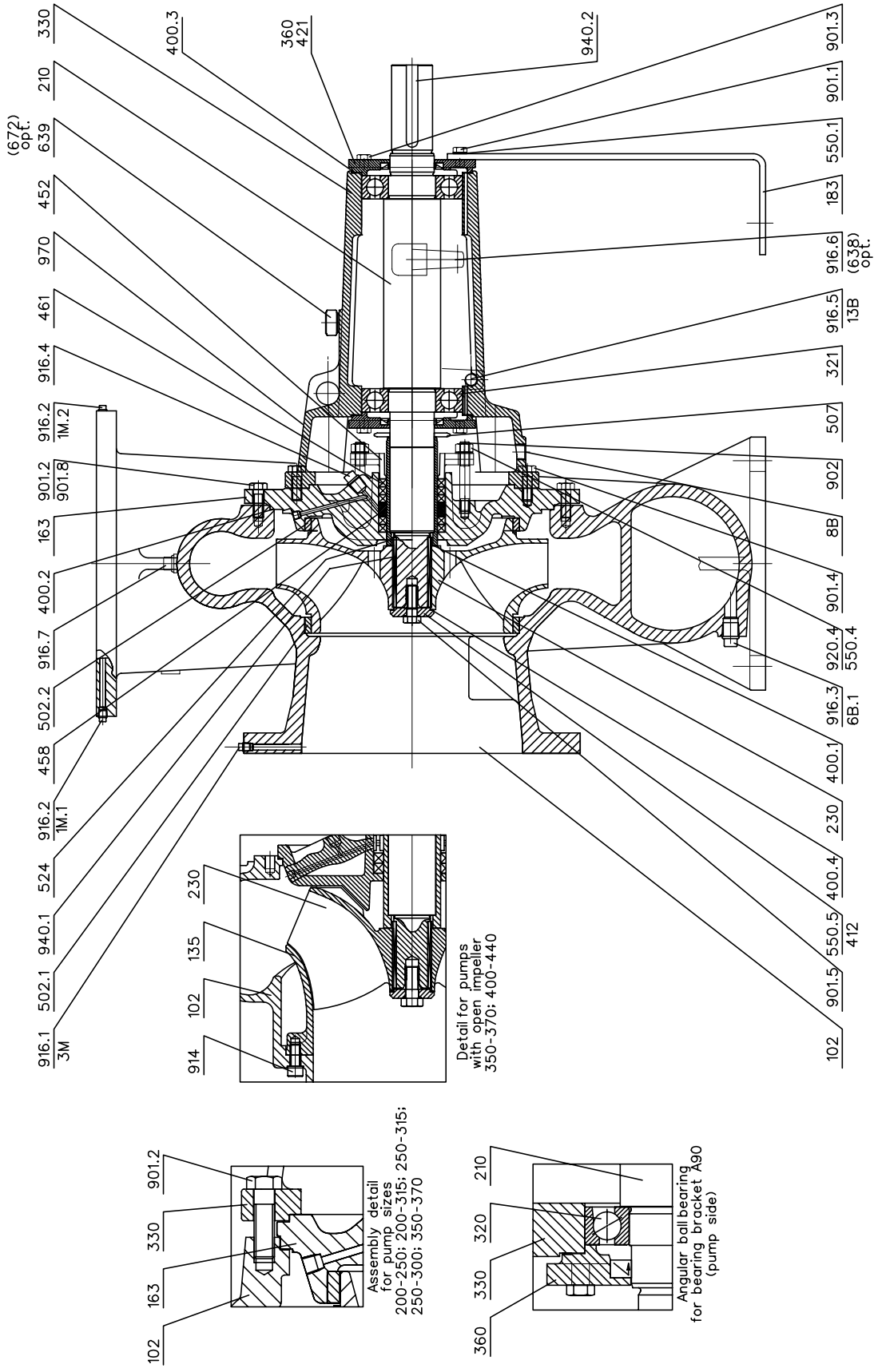


Fig. 17 – Sectional drawing

15. Parts list

Denomination	Part N.º	Denomination	Part N.º
Volute casing	102	Washer	550.4
Wear plate (4)	135	Washer	550.5
Pressure cover	163	Venting	672
Support foot	183	Constant level oiler	638
Shaft	210	Oil level pointer	639
Impeller	230	Hexagon head bolt	901.1
Angular ball bearing (1)	320	Hexagon head bolt	901.2
Ball bearing	321	Hexagon head bolt	901.3
Bearing bracket	330	Hexagon head bolt	901.4
Bearing cover	360	Hexagon head bolt	901.5
Flat gasket	400.1	Stud	902
Flat gasket	400.2	Bolt (4)	914
Flat gasket	400.3	Threaded plug	916.1
Flat gasket	400.4	Threaded plug	916.2
O-Ring	412	Threaded plug	916.3
Radial shaft seal ring	421	Threaded plug	916.4
Gland cover	452	Threaded plug	916.5
Lantern ring	458	Threaded plug (3)	916.6
Gland packing	461	Threaded plug	916.7
Wear ring (2)	502.1	Nut	920.4
Wear ring (2)	502.2	Key	940.1
Thrower	507	Key	940.2
Shaft protecting sleeve	524	Nameplate	970
Washer	550.1		

Table 7

16. Recommended spare parts

Recommended spare parts for a continuous work of 2 years, according to standard VDMA 24296.

Part N.º	Denomination	Number of pumps (including stand by ones)							
		1	2	3	4	5	6/7	8/9	≥ 10
		Spare parts quantity							
210	Shaft	1	1	1	2	2	2	3	30%
230	Impeller	1	1	1	2	2	2	3	30%
320	Angular ball bearing (1)	1	1	1	2	2	3	4	50%
321	Ball bearing	1	1	1	2	2	3	4	50%
330	Bearing bracket	-	-	-	-	-	-	-	2
400	Gasket set	4	4	6	8	8	9	12	150%
421	Radial shaft seal ring (pair)	1	2	3	4	5	6	8	50%
461	Gasket (5 rings)	1	4	4	6	6	6	8	40%
502.1	Wear ring (2)	1	2	2	2	3	3	4	50%
502.2	Wear ring (2)	1	2	2	2	3	3	4	50%
524	Shaft protecting sleeve	1	1	1	1	2	2	2	20%

Table 8

(1) Not applicable for bearing brackets A60 and A75.
(2) Not applicable for sizes 350-370A/B and 400-440A/B.
(3) Applicable for sizes 200-250, 250-300, 300-340, 300-360, 300-400, 350-370, 350-400, 400-440 and 400-540.
(4) Applicable for sizes 350-370 A/B and 400-440 A/B.

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KSB Bombas Hidráulicas SA
Rua José Rabello Portella, 400
Várzea Paulista SP 13220-540
Brazil http://www.ksb.com
phone.: 55 11 4596 8500 fax: 55 11 4596 8580
SAK – KSB Customer Service
e-mail: gqualidade@ksb.com.br
Fax: 55 11 4596 8656