LENNTECH
WATER TREATMENT SOLUTIONS

KSB Megachem

Process pumps for Chemical and Industrial Application

LINE :	**Mega**
STANDARD :	**ISO 2858**

1. Aplication

The KSB Megachem centrifugal pump is recommended for handling chemical products, aggressive organic and inorganic liquids, oil, water, condensate and other liquids mainly used in the following applications:
-Chemical and petrochemical;
- Sugar and alcohol industry;
- Boiler feed;
- Aux. circuits in refineries;
- Aux. circuits in the industry (paper, food, synthetic fibers, others);
- Water supply;
- Irrigation;
- Air conditioning;
- Fire-fighting;
- Drainage;
- Circulation of heat transfer oil.

2. Design

Horizontal, single- stage end suction and top centerline discharge. The “back-pull-out” design allows maintenance and repair services through the back side, without dismantling piping supports.
Dimensionally built to ISO 2858 / DIN 24256 and mechanically to ANSI B 73.1.

3. Designation

KSB	Megachem	80 - 160
Trade mark		
	Model / Type	
		Discharge nozzle diameter (mm)
		Nominal impeller diameter (mm)

4. Operation data

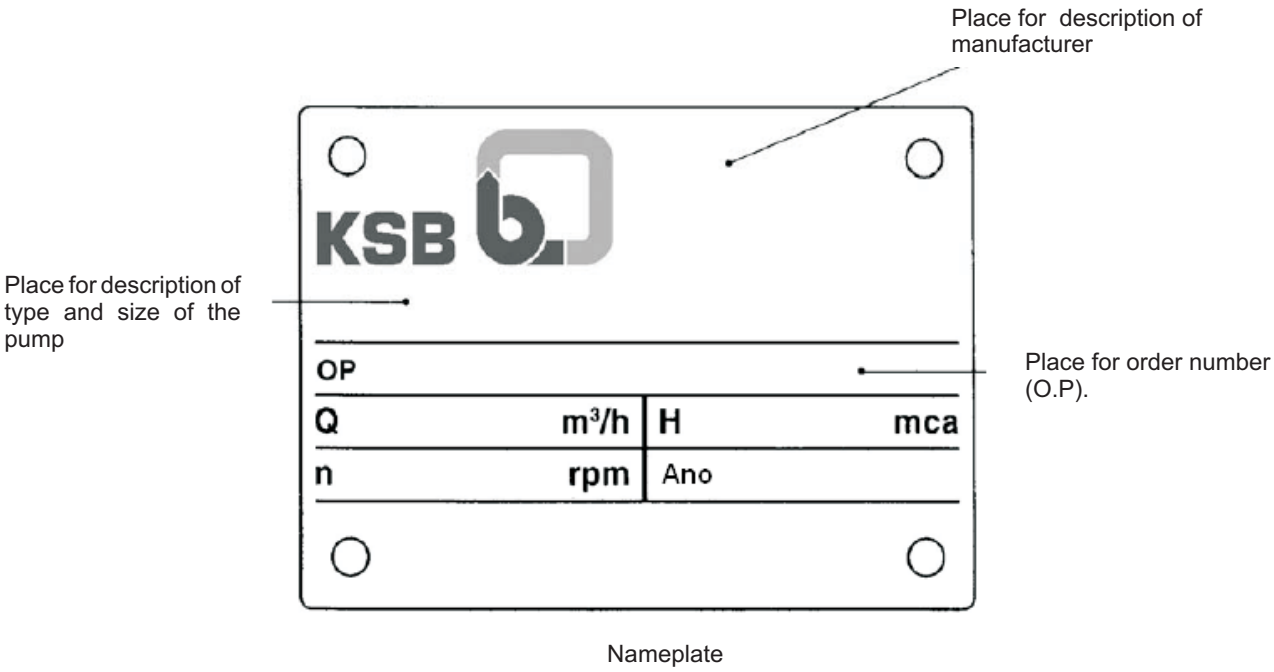
Sizes	- DN 32 up to 150 (1 ¼” to 6”)
Flow	- to 3,082 gpm (700 m/h)
Head	- to 460 ft (140 m)
Temperature	- to 662ºF (350ºC)
Max. suction pressure	- to 145 psi (10 bar)
Max.operating pressure	- 348 psi (24 bar)
Max. speed	- 3,500 rpm

KSB

5. Introduction

KSB has supplied you, an equipment that has been designed and manufactured with the latest technology.
Due to its simple and tough construction will need few maintenance. With 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 user about construction and operation of our pumps, describing the proper procedures for handling and maintenance.
We recommend that this manual should be handed it over the maintenance supervision.
The equipment must be used at operation conditions for which it has been selected, such as: flow rate, total head, rotative speed, voltage, frequency and temperature of pumped liquid.



Nameplate

For request about the equipment, or when ordering spare parts, please mention the type of pump and the manufacturing order number. This information can be obtained from the Nameplate of each pump. If the nameplate is not available, the order number is stamped in low relief on the suction flange and on the discharge flange you may find the impeller diameter.

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

Index

6. Technical data

Technical data \ Pump sizes			Units.	32-125.1	32-125	32-160.1	32-160	32.200.1	32-200	40-125	40-160	40-200	50-125	50-160	50-200	65-125	32-250.1	32-250	40-250	50-250	65-160	65-200	80-160	40-315	50-315	65-250	80-200	80-250	100-160	100-200	65-315	80-315	80-400	100-250	100-315	100-400	125-200	125-250	125-315	125-400	150-200	150-250	150-315	150-400
Bearing bracket			--	A 30													A 40														A 50												A 60
With of impeller passage			mm	7	9	5	5	6	6	14	12	9	20	16	11	25	8	8	8	12	21	17	31	9	9	13	23	19	36	32	13	16	13	27	23	17	40	37	30	25	59	48	39	33
GD² with water			Kg.m²	0,0140	0,0142	0,0224	0,0238	0,0760	0,0786	0,0144	0,0336	0,0640	0,0189	0,0394	0,0750	0,0263	0,1800	0,1820	0,1880	0,1920	0,0521	0,0985	0,0641	0,4396	0,4800	0,2232	0,1568	0,2904	0,1040	0,1800	0,5120	0,5696	1,2788	0,3172	0,6100	1,3832	0,2230	0,4100	0,7740	1,6912	0,2918	0,4656	0,8680	1,9600
Maximum rot. Speed (1)			rpm	3500																										1750													
Max. Suction pressure			bar	10																																							
Max. Discharge pressure x temp. (2)			bar	See fig. 01, 02, 03 and 04																																							
Max. / Min. temp without colling		W/ packing	°C	- 50 / 105																																							
		W/ mec. Seal		According to manufacturer recommendations																																							
Max. temp. With cooling		W/ packing	°C	350 (See fig. 01 and 02)																																							
		W/ mec. Seal		According to manufacturer recommendations																																							
Coolant flow as function of pumping temperature (3)		140 °C	l / min.	1,2													2,3														3,0												3,8	
		160 °C		1,6													2,6														3,4												4,5	
		200 °C		2,2													3,3														4,4												5,7	
		250 °C		3,0													4,0														5,7												7,2	
		350 °C		4,0													5,0														7,0												8,0	
Maximum cooling liq. Pressure			bar	7																																							
Sealing liquid flow		Sealing	l / min.	Approx. 1																																							
		Flushing		Approx. 3 to 5																																							
External sealing liquid pressure		Sealing	bar	$1+\frac{Pr}{2}$													1 + PS																											
		Flushing																																									
Axial thrust balancel			--	Nil	By bored holes on impeller																																							
Minimum / maximum flow			--	0,1 Qopt / 1,1 Qopt																											0,15 Qopt / 1,1 Qopt													
Rotation direction			--	Clockwise, seen from driver end																																							
Overmetal for corrosion			mm	3,3																																							
Flanges (4)	Iron / Bronze	Standard	--	ANSI B 16.1 125# FF / ANSI B 16.24 150#													●●			●		●●		●	●●	ANSI B 16.1 125# FF / ANSI B 16.24 150#																	
		Optional		--													●			●●		●		●●	●	ANSI B 16.1 250# FF / ANSI B 16.24 300#																	
	Steel	Standard		ANSI B 16.5 150# RF																																							
		Optional		--													ANSI B 16.5 300# RF																											
Hydrostatic test pressure			--	According to ANSI B 73.1 - 1991 (see table 1.2)																																							
Bearings	Ball bearings 2x		--	6306 C 3													6308 C 3														6310 C 3												6312 C 3	
	Lubrication			Oil																																							
Max. Permissible P/n (5)	SAE 1045		CV/rpm	0,0176													0,0458														0,100												0,158	
Stuffing box chamber	∅ Sleeve		mm	35													45														60												70	
	∅ Chamber			55													65														85												95	
	□ Packing			10													10														12,5												12,5	
	L Chamber			73													73														90,5												90,5	
Weight	Cast iron		Kg	34	35	34	34	42	44	38	38	49	40	42	47	49	68	68	73	72	70	61	89	104	108	89	92	106	105	108	126	132	162	132	142	178	136	157	156	193	183	192	246	280
	Others			36	37	36	36	44	46	40	40	51	42	44	49	51	71	71	76	75	73	63	92	106	112	92	96	110	109	112	130	136	167	136	147	184	141	162	161	199	189	198	254	289

Table 01

● 125 Lb FF ●● 250 Lb FF

Notes:

(1) Check peripheral speed always (see item 7.4) and the maximum discharge pressure (see diagram fig. 01 e 02).
(2) Pr = Ps + Pd, where: Ps = suction pressure, Pr = discharge pressure, Pd = differential pressure at Q = 0.
(3) The indicated values are based on a△t de 15ºC. The temperature at the outlet of cooling chamber must not exceed 50ºC.
(4) See diagrams on fig. 03 and 04.
(5) For pumps with CuSn10-C-GS impeller, observe values as follow:

Bearing bracket	Max. Allowed P/n [CV/rpm]
A 30	0,00708
A 40	0,02419
A 50	0,03630
A 60	0,05758

Tabela 1.1

Material	Flange [Psi]	Casing pressure [bar]	Hydrostatic test pressure [bar]
Cast Iron	125	12,5	19
	250	16	24
Bronze	150	10	15
	300	10	15
Steel	150	19,5	29
	300	24	36
Stainless Steel	150	16	24
	300	16	24

Tabela 1.2
Maximum hydrostatic test pressure [bar]

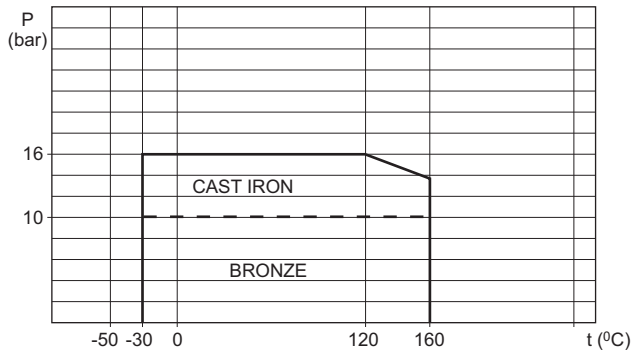


Fig. 01
Maximun discharge pressure as function of temperature for cast iron and bronze.

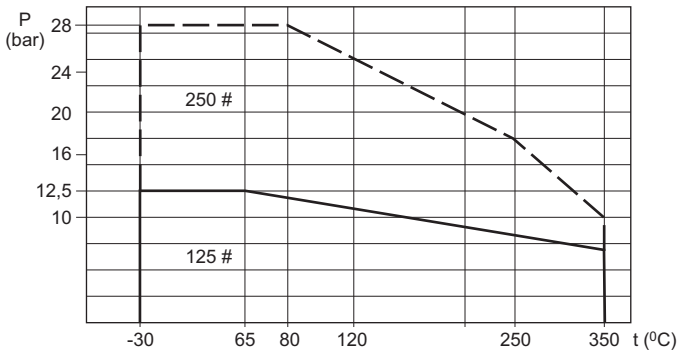


Fig. 03
Permissible pressure on ANSI B.16.1 flanges, as function of temperature.

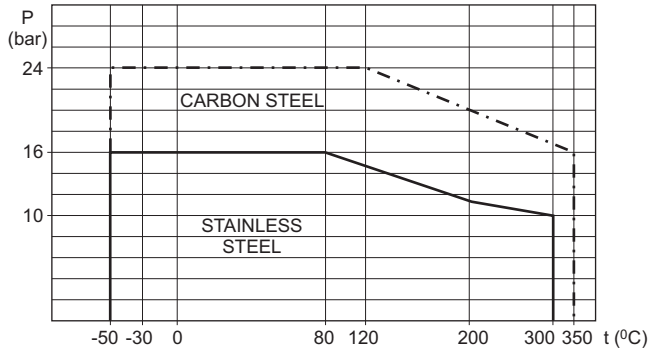


Fig. 02
Maximun discharge pressure as function of Temperature, for carbon steel and stainless steel.

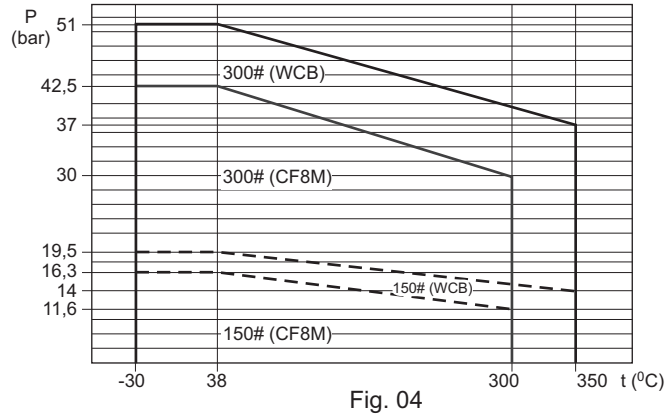


Fig. 04
Permissible pressure on ANSI B.16.5 Flanges, as function of temperature.

7. Design

Horizontal, single stage, end suction and top centerline discharge.
Due to its “back-pull-out” design, it allows maintenance and repair services through the backside without dismantling the piping or affecting its alignment.
Depending on the liquid temperature it is equipped with cooling chamber.
Designed according to DIN 24256 / ISO 2858 and mechanically according to ANSI B 73.1

7.1 Casing

Horizontal volute casing, one piece cast foot mounted.
The casing is provided with a wear ring on the suction side and the impeller is provided with a wear ring on the discharge side.

7.2 Shaft

The shaft is dry type, protected by a shaft protecting sleeve easily renewable on the sealing area.

7.3 Shaft sealing

The passage of the shaft through the pump is sealed by gland packing (standard) or optionally by mechanical seal.
Lubrication and sealing are done through the liquid being pumped, except in those cases in which the fluid is inadequate for these functions.

7.3.1 Packing

Normally, sealing is performed by means of gland packing.
The position of neck bush (456), neck ring (457), lantern ring (458) and the packing rings are shown on fig.05. The stuffing box chamber dimensions and the packing gauges are found in table 01. The liquid circulation reaching the lantern ring through holes in the discharge cover will:

a) Lubrify and cool the packing.
b) Seal the packing against penetration of abrasive solid particles.
c) Prevent the leakage of poisonous gas or unpleasant smells.
d) Prevent the leakage of liquids that would gasify in contact with the atmosphere.
e) Seal the stuffing box chamber against air penetration.

If the liquid being pumped contains abrasive particles the sealing liquid should come from an external source, it should be clean and compatible with the liquid being pumped.The pressure and flow needed from this external source are indicated on table 01. The versions indicated by codes 1, 2 and 3 on fig.05 can only be applied on pumps without cooling chamber.

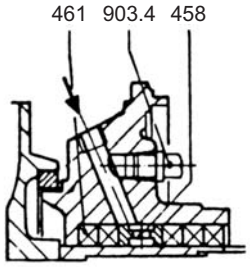
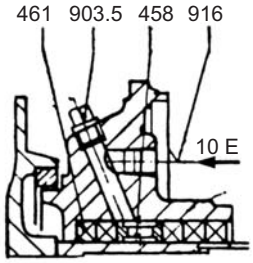
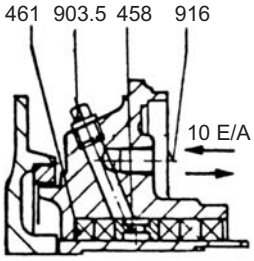
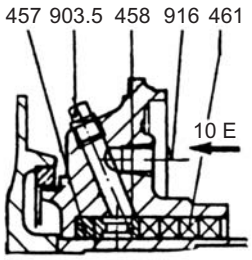
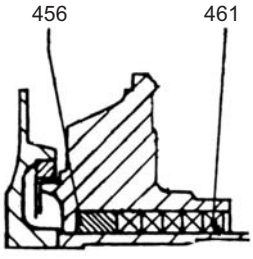
Code	Packing	Application
0		Clean, non aggressive liquids. Temperature up to 320ºF (160ºC). Internal sealing.
1		Toxic, aggressive and /or bad smelling liquids. Also for pumps with suction from vacuum tank. Sealing with clean liquid from external source. Max.temp.221ºF (105ºC)
2		Liquids with particles in suspension or when a major contamination from the external source is to be prevented. Lubrication / external source sealing Max .temp.221ºF (105ºC)
3		Liquids with abrasive particles in suspension or with tendency to crystallizing. Flushing with clean liquid from external source. Max. Temp.221ºF (105ºC)
4		Heat transfer liquids with temperature above 392ºF(200ºC) (ROTHATERM).
9	Mechanical seals Standardized API sealing plans: 11,12,13,61 and 62 For others plans, refer to KSB	

Fig. 05
Shaft sealing

7.3.2 Mechanical seal

Several conditions may recommend a mechanical seal:
liquids which are flammable, explosive, toxic, costly or when the cost studies, results in favorable conditions to justify a mechanical seal application. When the mechanical seal has been selected properly and installed correctly, it saves service time if compared to packing seals. After a short setting time in operation, there will be no more dripping. The mechanical seal is formed basically by two rings. The first one is fixed and the second one turns, sliding against the fixed one. Their contact smooth surfaces are held against each other by a spring pressure. The sealing of the turning ring on the shaft and of the fixed ring on the seal cover are made by proper materials which are adequate on the type of liquid being pumped. Two conditions are necessary for a long and safe operation of the mechanical seal. A film of liquids should be formed between the sliding surfaces and the heat generated by their friction should be adequately absorbed by the circulation of liquids. Depending on the pumping conditions, this circulation may be provided from the liquid being pumped or from an external source.
Mechanical seal are manufactured with a large variety of materials and assemblies, covering all the range of chemical and physical characteristics of the liquids to be pumped.
When the supply specifies a mechanical seal for the shaft, complementary instructions and/or the manufacturer manual will be sent together with the supply documents.

7.4 Peripheral speed

After determination of operation pump rotative speed and checking its maximum discharge pressure, verify always if the impeller material is suitable with regards to its peripheral speed, taking care to don't exceed the following values:

- A48 CL30 ..... up to 131 ft/s (40 m/s)
- CuSn10-C-GS ..... Up to 197 ft/s (60 m/s)
- A743 CF8M ..... up to 262 ft/s (80 m/s)

8. Transportation

The transportation of the motor-pump assembly or only of the pump should be performed with skill and good sense, observing safety regulations. The electric motor lifting must be used only to lift the motor and never to lift the motor-pump assembly.

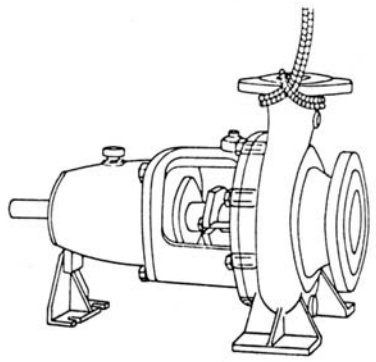


Fig. 06
Transportation of the pump through the discharge flange

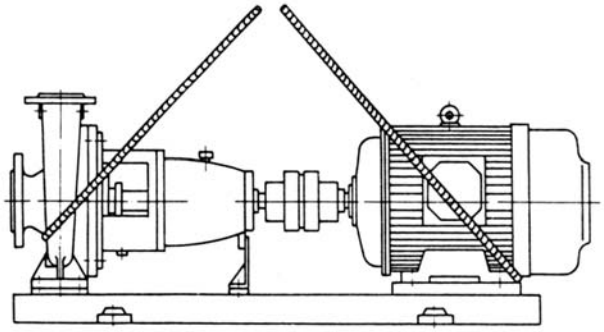


Fig. 07
Transportation of the motor pump assembly

Note: Be sure that the coupling guard and the anchoring bolts are not lost or damaged during transportation.

9. Service and storage of idle pumps

Following procedures of preservation and storage are made by KSB and its Dealer Network and protect the equipment up to 6 months in an indoor environment. It is client responsibility to keep these procedures after receiving the pump. When the pump is not subjected to a performance test after its sale, the areas in contact with the pumped liquid which are not painted (i.e, stuffing box housing, wear rings, flange sealing areas, etc) receive an application of RUSTILO DW-301 by brush.
Exposed shaft areas (i.e. Shaft end, area between the gland cover and the bearing bracket) receive a brush application of TECTYL 506.
On oil lubricated bearing brackets, the bearings receive a layer of MOBILARMA 524 by spray.
The pump must be protected against material damage,humidity, dust and aggressive environment in an indoor place.

9.1 Additional procedures of preservation and storage of idle pumps

- Pumps stored for periods exceeding one year should be serviced every 12 months. They should be disassembled, cleaned and the whole preservation process described below should be repeated.
- Mechanical seal should be cleaned by compressed air. No other liquid or material should be applied to them, in order to prevent damage to the secondary sealings as to O-rings gaskets.
- All connections as inlets for liquids from external sources, priming, draining, flushing and cooling should be closed. Suction and discharge flanges should be covered to prevent the entry of strange bodies.
- Assembled pumps waiting to be installed or to start operation should be turned manually every 15 days. If it is difficult to move them by hand, use a box spanner, protecting the shaft surface at the point of application.
- Before conservation liquids application, areas should be washed with gasoline or kerosene until they are completely cleaned.

Characteristics of the protecting liquids used for pump preservation purposes:

Protecting liquid	Thickness of the applied layer (μm)	Drying time	Removal	Manufacturer
TECTYL 506	From 80 up to 100	1/2 up to 1 hour	Gasoline, benzene, diesel oil	BRASCOLA
RUSTILO DW 301	From 6 up to 10	1up to 2 hour	Gasoline, benzene	CASTROL
MOBILARMA 524	< 6	Does not dry	Not necessary	MOBIL OIL

Table 02 - Protecting liquids

10.Installation

Our pumps should be installed, leveled and aligned by trained personnel. If this work is done incorrectly it will cause operational troubles, premature wear and damages beyond repair.

10.1 Base grouting

Place the anchoring bolts in the holes or slots in the foundation block according to boring design: Foundation plan drawing.
Between the base and the foundation block and beside the anchoring bolts, metallic chocks of the same height should be fixed with mortar. The anchor bolts are fixed with adequate grout, using a pattern according the foundation plan drawing to place them.
In order to obtain a perfect adherence of the grout, the chock blocks and the anchor bolts should be free of any grease or oil residues. After the grout set is completed, place the base on the foundation block. (See fig.08).

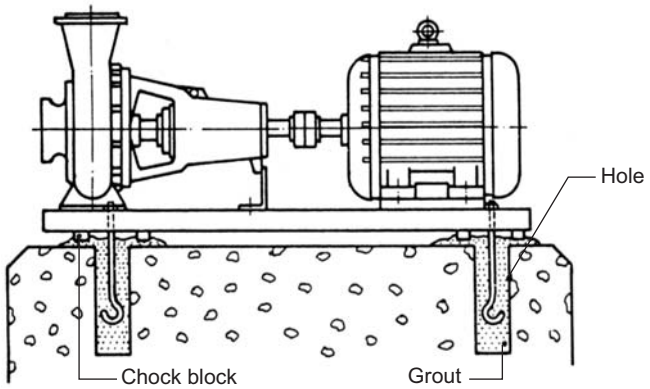


Fig.08 -Base grouting

10.2 Base levelling

Check if the baseplate is equally resting on its chock blocks, if it is, place and tighten uniformly the nuts on the anchoring bolts. Using a precision level, check the leveling of the base longitudinally and transversally.(0.1/m)
If the base is unleveled, loosen the anchor bolts nuts and insert shims as necessary, between the metallic chock block and the base, so as to correct the leveling. (See fig. 09).

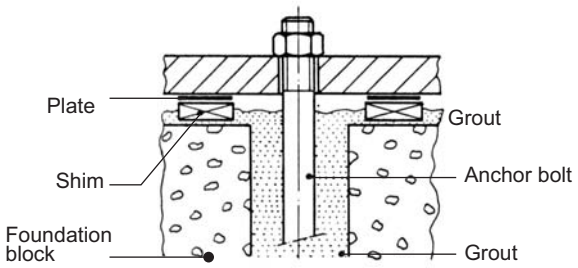


Fig. 09 - Base levelling

Note: After leveling the base and before concrete fulfill, the motor-pump set must be pre-aligned according to the instructions of item 10.4.

10.3 Grouting

In order to obtain a good fixation and vibration free operation, the inner side of the base should be filled with grout.
This grout should be prepared with specific products available in the civil construction market so as to prevent contraction during the hardening process and provide sufficient fluidity to fill the base and prevent from cavities formation. (See fig.10).

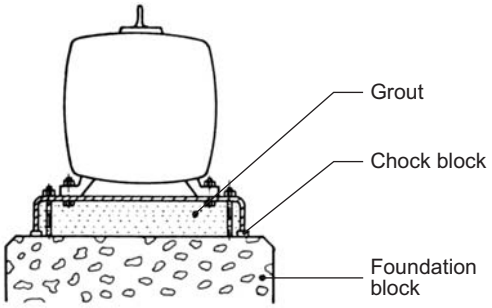


Fig. 10 -Filling the base with grout

10.3.1 Design with adjustment shims

When used adjustment shims in motor side the region of screw thread must be free of grout, pipe protectors should be used, so as not detrimental future adjustments in the aligment. (See fig. 10B).

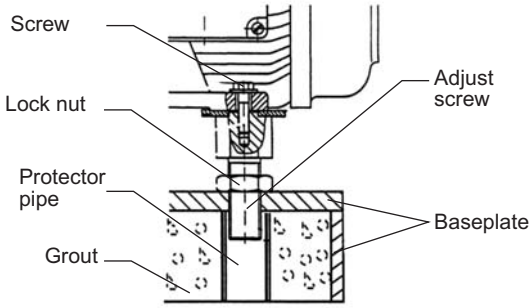


Fig. 10B - Filling the base with grouting

10.4 Coupling alignment

The useful life of the rotor assembly and its operation free of irregular vibrations will rely on the perfect alignment between the pump and the driver.
The alignment performed at the factory must be rechecked due to the fact that during transportation and handling, the motor-pump assembly is subjected to deformations, which may affect the initial alignment.
After the complete set of the grout, perform the alignment, if possible, with the suction and discharge pipe lines already connected.
This alignment should be performed with the help of a dial indicator for the control of the radial and axial displacements.
Fix the bottom of the instrument to the periphery of one of the coupling halves, adjust the position of the feeler perpendicular to the periphery of the another half of the coupling. Move the dial to zero and move by hand the coupling half in which the instrument buttom is fixed making the dial indicator to complete a 360º turn. (See fig.12).
The same procedure should be performed to control the axial displacement. (See fig.13).

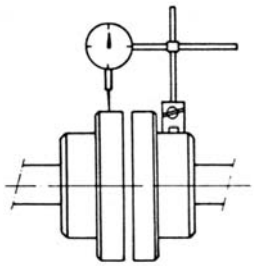


Fig. 12
Radial control

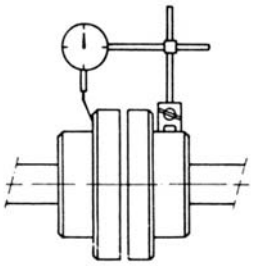


Fig. 13
Axial control

To correct the alignment, loosen the driver bolts and move driver laterally or insert shims to adjust height as required.
Axial and radial alignments should remaim within a tolerance of 0.1 mm (0.0039 inch) with the pump and driver set screws tighten securely.
If there is no dial indicator available, use a straight edge placed across the two rims of the sleeve coupling. To control axially use a feeler gauge.Please, see fig. 14.
Observe the sleeve coupling hub clearance specified by manufacturer.

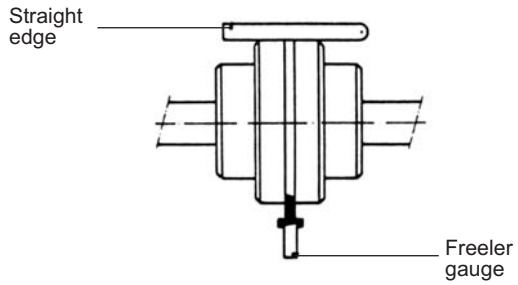


Fig. 13
Alignment with straight edge and feeler gauge

10.4.1 Motor without adjustment screw

For correction of alignment, loosen the screws on the trigger repositioning it laterally or enter buddies calibrated to correct height according to need.

10.4.2 Motor with adjustment screw

To realigment the couplins, first release the 4 motor screw, and the lock nut turn the adjustment screw by hand or using a tool unit the aligment will be right. Retighten the 4 adjust screw and the lock nut. (See fig. 11).

10.5 Suction pipe line - Recommendations

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, saving pressure losses, and totally air tight, preventing any air penetration.

c) In order to be free of air pockets, the horizontal section of the suction piping, when negative, should be installed with a gradual rise slope to the pump.When positive, the horizontal section of the pipe line 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 established between 1 and 2 m/s (3.281 and 6.562 ft/s).

e) If it were necessary to use a reduction, it should be eccentric, mounted with its taper looking downwards, so that the reduction upper generatrix stays in the horizontal position coincident with the pump's generatrix, such a way to prevent air pockets.

f) Curves and accessories, when needed, should be designed and installed reducing pressure losses to the minimum. Ex: prefer always long or medium radius curves.

g) The suction line flange should fit to pumps suction flange without any stress or tension and avoiding to apply any kind of force to the casing. The pump should never be an anchor point for the suction pipe line. If this condition is not attend 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 suction pipe line. Normally, a suction strainer with a free passage area 3 to 4 times larger than the cross sectional area of the suction pipe line should be coupled to the foot valve.

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 pipe line 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 stand totally open. A suction piping 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 angles changes smaller than 45º. In all these cases, the gate valves should have their valve spindle installed either horizontally or vertically downwards.

k) To prevent turbulence, penetration of air, sand or mud in the pump suction, all recommendations of the HYDRAULIC INSTITUTE referred to these type of installations 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 pipe line.

m) To facilitate the mounting of the suction pipe line and the fitting of the parts, install, as necessary, flexible joints type Dresser, common or special with tié bolts.

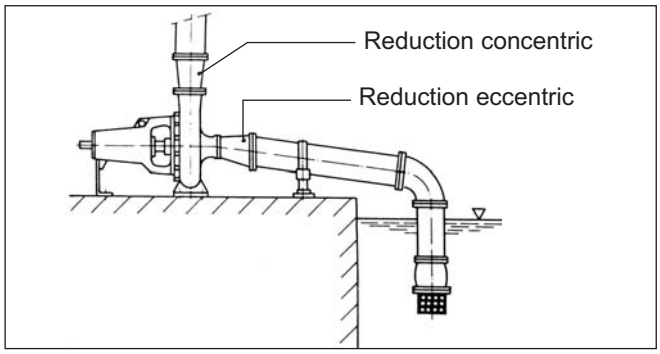


Fig. 15 - Negative suction

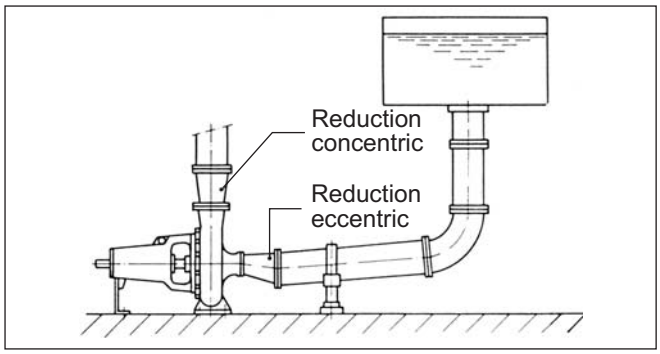


Fig. 16 - Positive suction

10.6 Discharge pipe line recommendations

To install the discharge pipe line follow these instructions:

a) If the overpressures originated cause of the liquid returning in case of long pipe lines , exceed the limits specified for the pipe line and/or the pump, water hammer control devices should be installed on the discharge pipe line.

b) When the diameter of the pump and pipe line flanges are differents, the connection should be done through a concentric reduction.

c) On the places where it is necessary to bleed the air in the pipe line, vent valves should be installed.

d) Install a discharge valve, if possible immediately after the discharge nozzle of the pump, such away to control adequately the flow rate and pressure or prevent driver overloads.

e) When a non return valve is installed, it should be mounted between the pump and the discharge valve, prevaling 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 others operational valves not included up to now, should be installed as necessary for adequate operation of the pipe line.

h) The recommendations for the suction pipe line described on itens a, b, f, g, i and m are also valid for the discharge pipe line.

10.7 Auxiliary piping and connections

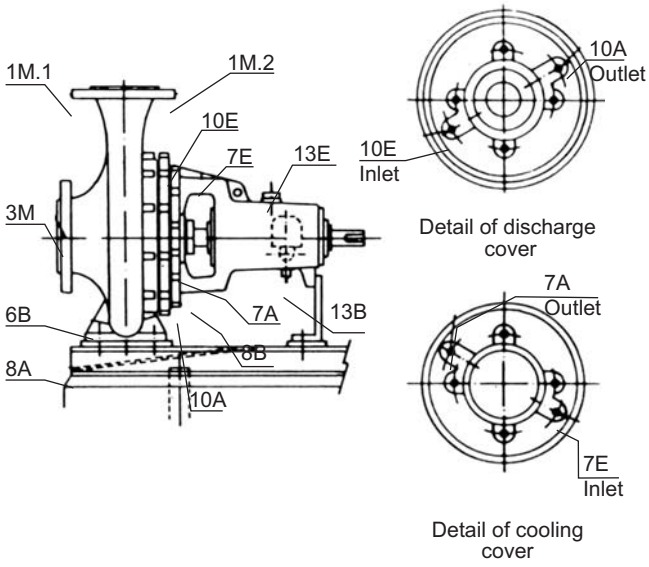


Fig. 17 - Auxiliary piping and connections

Connection	Designation	Dimensions - NPT thread			
		A 30	A 40	A 50	A 60
1M.1	Manometer	3/8	3/8	1/2	1/2
1M.2	Manometer	3/8	3/8	1/2	1/2
3M	Vac-press.gauge	3/8	3/8	1/2	1/2
6B	Drain	3/8	3/8	1/2	1/2
7E	Cooling inlet	1/2	1/2	1/2	1/2
7A	Cooling outlet	1/2	1/2	1/2	1/2
8B	Dripping	1/2	1/2	3/4	3/4
8A	Dripping	1	1	1	1
10E	Inlet external seal	1/2	1/2	1/2	1/2
10A	Outlet external seal	1/2	1/2	1/2	1/2
13E	Lubrifcation	∅ 20 mm			
13B	Drain	1/4	1/4	1/4	1/4

Table 03 - Conections

KSB Megachem		
Without cooling	**With cooling**	**For heat transfer oil**
1M.1	1M.1	7E
1M.2	1M.2	7A
3M	3M	8B
6B	6B	8A
8B	7E	13E
8A	7A	13B
10E	8E	
10A	8A	
13E	13E	
13B	13B	

Table 04 - Standard connections

Note:

1. The piping for the inlet and/or outlet of the external source liquid should be provided with a valve and sight glass to control the flow and observe the liquid condition.

2. In case of pumps with mechanical seals, others connections may be installed at the seal cover. If the pump is equipped with mechanical seal, specific complementary instructions will be sent.

10.8 Accessories

10.8.1 Coupling sleeve

KSB standard and others manufacturers, with or without spacer.

10.8.2 Base

KSB standard made of bend steel plate up to 75 hp and welded structural steel with drip pan for drivers larger than 75 hp.

10.8.3 Coupling guard

For increased safety in operation and to comply with the safety regulations, a coupling guard must be installed. They are standard, made of steel or brass and fixed to the base.
Check that the coupling guard is not in touch with rotating parts.

11. Operation

11.1 First start up procedure

Instructions for first start up

a) Fix firmly the pump and its driver to the base.

b) Fix firmly the suction and discharge pipe lines.

c) Connect and put in operation the auxiliary piping and connections (if any).

d) Connect the electrical wiring, checking that all motor protection devices are working and correctly set.

e) Check the bearings for cleanliness and humidity. Fill the bearing bracket with the proper quantity and quality of oil according specified on chapter 12.1.

f) Check the driver rotation direction without coupling the pump to prevent dry operation.

g) Check by hand that the rotor assembly move freely.

h) Check that the coupling alignment was performed according chapter 10.4. When pumping liquids at temperatures above 221ºF (105ºC), the alignment must be done at operation temperature.

i) Install the coupling guard.

j) Prime the pump, that is, fill the pump and the suction pipe with water or with the liquid to be pumped, at operation temperature, bleeding simultaneously the air from the pipe line and pump.

k) Check that the gland cover nuts are just fitted, without tightening.

l) Open the suction valve totally (if any) and close the discharge valve.

11.2 Immediate steps after first start up

Once the pump has started and is already in operation follow these instructions:

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 volyage 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 the bearing temperature that may reach 122ºF (50ºC) over ambient temperature. However the sum of bearing temperature and ambient temperature should not exceed 194ºF (90ºC).

Remarks: The pump that will operate with liquids above 221ºF (105º C) must be rechecked for misalignment after 30 minutes operating.
If during this period any abnormalities were found consult item13 - Operational abnormalities and troubleshooting.

Note:

1. The pumps that will operate with liquids above 221ºF (105ºC) must be rechecked for misalignment after 30 minutes operating.

2. If during this period any abnormalities were found consult chapter 13 - Operational abnormalities and troubleshooting.

11.3 Operational supervision

Depending on the disponibility of personnel and the importance of the pump, we recommend the following supervision. In case of any abnormality, the maintenance supervisor must be called immediately.

11.3.1 Weekly supervision

Check:

a) Operation point of the pump.

b) Electric motor current consumption and network voltage.

c) Suction pressure.

d) Vibrations and abnormal noises.

e) Oil level.

f) Gland packing leakage.

11.3.2 Monthly supervision

Check:

a) Oil change interval. Consult chapter 12.1.

b) Bearings temperature.

11.3.3 Semestral supervision

Check:

a) Fixing bolts on the pump, driver and base.

b) Alignment of the motor-pump assembly.

c) Coupling lubrication (if any).

d) Replace gland packing if necessary.

11.3.4 Annual supervision

Disassemble the pump for maintenance. After cleaning, inspect (very carefully) the condition of bearings, radial shaft seal rings, gaskets, O-rings, impellers, internal areas of the volute casing (check also thickness), wear areas and coupling.

11.4 Shutdown procedure

For shutdown, follow in sequence these instructions:

a) Close the discharge valve.

b) Switch off the driver and observe the assembly stopping gradually and smooth.

c) Close the suction valve (if any).

d) Close the auxiliary pipe lines (if there is no counter indication).

12. Maintenance

12.1 Bearings maintenances

The purpose of this maintenance is to extend as much as possible the useful life of the bearings system. While the pump is in operation, maintenance consists in controlling the bearings temperature and the bearing bracket oil level.
The pumps are delivered from our factory without any oil in the bearing bracket. After checking that the bearing bracket is free from dirt or moisture, the Constant-level-oiler should be filled up as follows:

a) Remove the venting device and pour oil into the bearing bracket through the fitting orifice for the venting device until the oil level reaches half of the height of the fitting orifice for the Constant-level-oiler on the bearing bracket, (the oil will appear at the bottom of the fitting connection on the bracket).

b) Lower completely the transparent reservoir of the oiler and fill it through the immersion tube.

c) Return the transparent reservoir to its original position.

Wait approximately 10 minutes until part of the oil go down automatically from the reservoir to the bracket, completing the necessary level, which is stated at the central line of the bearing lowest ball, as shown on fig.18.
During pump operation, if the level is checked to be at 1/3 of the height of the transparent reservoir, the oiler should be refilled as indicate d on item `”b`”. We advice that an insufficient lubrication can be so dangerous as an excessive one, both producing damages to the equipment.

Note: Quantity of oil to be used on the KSB Megachem pumps bearing bracket:

Bearing bracket	Quantity of oil ml (in m^3)
A 30	100
A 40	170
A 50	200
A 60	480

Table 05

Remark: Volume of Constant-level-oiler = 140 ml (8.54 in ^{3}).

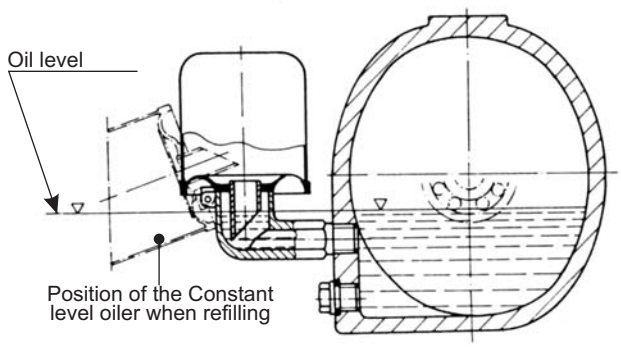


Fig. 18 - Constant level-oiler

Note: The standard supply is with oil-level pointer. The constant level oiler is optional.

12.1.1 Lubrication intervals and oil specification

The lubricating properties of oil are lost due to aging and mechanical work. Besides, all lubricants are contaminated during their working period, reason why should be completed and changed on regular intervals.
The fist change should be done after the first 200 or 300 hours of work. The next one, after 1.500 to 2.000 hours.
These changes prevent the particles which have not been eliminated by the cleaning and are mixed with the oil for damaging the bearings. From then on, change every 8.000 hours of effective work or at least once a year (the one that comes first).
The bearings must be washed, as a minimum, every two years.

Manufacturer	Up to 3,000 rpm	Exceeding 3.000 rpm
ATLANTIC	EUREKA - 68	EUREKA - 46
CASTROL	HYS PIN AWS - 68	HYS PIN AWS - 46
ESSO	Oil for Turbine - 68	Oil for Turbine - 46
MOBIL OIL	DTE - 26	DTE - 24
IPIRANGA	IPITUR AW - 68	IPITUR AW - 46
PETROBRÁS	MARBRAX TR - 68	MARBRAX TR - 46
SHELL	TELLUS - 68	TELLUS - 46
TEXACO	REGAL R&O - 68	REGAL R&O - 46
Promax BARDHAL	MAXLUB MA - 20	MAXLUB MA - 15

Table 06 - Lubricant oil specification

12.2 Shaft seal maintenance

12.2.1 Mechanical seal maintenance

If the pump is equipped with mechanical seal, complementary instructions from the seal manufacturer will be sent attached.

12.2.2 Gland packing maintenance

If the gland packing has already been pressed equivalent to one packing ring thickness and even thus the leaking still excessive, it will need maintenance according to the following instruction:

- Shutdown the pump.
- Loosen the gland cover and remove it. To remove it, as it is split, is enough to push it in the direction of the bearing cover, and then pull half of the gland cover to the right and the other half to the left.
- Remove with a flexible rod all the packing rings and the lantern ring.
- Clean the stuffing box chamber.
- Check the conditions of the shaft protecting sleeve. If it is rough or has grooves that could damage the packing rings, the sleeve may be remachined on its diameter up to maximum 1 mm (0039”), or replaced by a new one.
- Cut the new packing rings, if possible with slanted ends (see fig. 18). To facilitate this cutting operation a very simple device may be constructed as shown in fig.19.

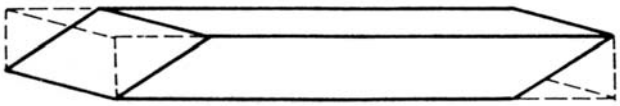


Fig. 19 - Slanted cut of the packing rings

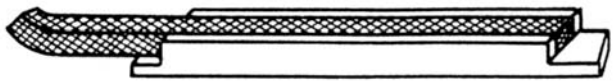


Fig. 20 - Packing rings cutting device

- Anoint the inner diameter of each packing ring with grease or solid vaseline.
- Anoint the outer diameters of the lantern ring, the neck bush and the neck ring (if any) with Molykote G Paste.
- Proceed to the assembly in the inverse sequence of the disassembly, introducing each part into the stuffing box chamber with the help of the gland cover. The packing rings should be mounted with their ends 90º from each other. (see fig.21).

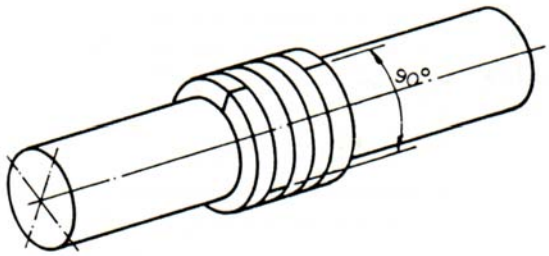


Fig. 21 - Rings position with ends 90º from each other.

After all the parts have been mounted in the stuffing box chamber, 3 mm (0.12”) should remain free as a guide for the gland cover.

12.3 Wear areas maintenance

When the pump shows wear between the casing wear ring and the external diameter of the suction side of the impeller hub and/or between the discharge cover and the impeller wear ring on its discharge side and both, casing and impeller are in good conditions, the wear rings must be replaced.
KSB and its Dealers Network supply wear rings for repair or as spare parts for the KSB Megachem pumps.
These wear rings are supplied with their external finished diameter within the proper tolerance and their internal diameter with 2 mm (0.079") overmetal.

12.3.1 When to replace

The wear rings replacement should take place when the clearance between the wear ring and the impeller or between the wear ring and the discharge cover has reached three times the maximum clearance indicated on table 07 or when the pump shows an appreciable loss in efficiency.

Pump	Stainless steel				Cast iron / bronze			
	Wear ring X impeller		Wear ring x cover		Wear ring X impeller		Wear ring X cover	
	Max.	Mín.	Max.	Mín.	Max.	Mín.	Max.	Mín.
32-125.1	0,620	0,450	0,660	0,470	0,346	0,250	0,354	0,250
32-160.1								
32-200.1								
32-125								
32-160								
32-200								
32-250			0,620	0,450				
32-250.1								
40-125	0,660	0,470	0,660	0,470	0,354			
40-160								
40-200	0,620	0,450			0,346			
40-250	0,660	0,470	0,620	0,470	0,354			
40-315			0,627	0,490				
50-125			0,660	0,470				
50-160								
50-200								
50-250			0,620	0,450				
50-315	0,627	0,490	0,627	0,490				
65-125			0,660	0,470				
65-160			0,627	0,490			0,363	
65-200								
65-250			0,660	0,510				
65-315			0,643	0,530				
80-160	0,660	0,510	0,627	0,490	0,363			
80-200			0,643	0,530				
80-250			0,660	0,510				
80-315			0,643	0,530				
80-400	0,643	0,530					0,372	
100-160							0,363	
100-200								
100-250			0,673	0,560			0,372	
100-315			0,643	0,530			0,363	
100-400			0,673	0,560			0,372	
125-200	0,673	0,560						
125-250								
125-315			0,643	0,530			0,363	
125-400			0,673	0,560	0,372		0,372	
150-200	0,655	0,490						
150-250	0,675	0,510						
150-315								
150-400								

Table 07 - Original clearance on diameter (mm).

12.3.2 Replacement of the casing wear ring

Centralize the impeller through the internal hole of the shaft passage (use mandrel).
Machine the worn out area of the impeller (suction side of the hub) until you obtain an uniform surface (maximum machining allowance 2mm (0.079") on diameter). Check the diameter measurement after machining.
Machine then, the internal diameter of the wear ring according to that measurement on the impeller and observing the clearances established on table 06. Remove the damaged ring from the casing and fit the spare wear ring under pressure with a piece of lead or wood.

12.3.3 Replacement of the impeller wear ring

Centralize the discharge cover fixing it by the diameter through which it is fitted to the bearing bracket, machining the worn area until you obtain an uniform surface (maximum machining allowance: 2mm =0.079" on diameter).
Check the diameter measurement after machining. Machine then, the internal diameter of the wear ring according with that measurement and observing the clearances established on table 07. Remove the damaged ring from the impeller and fit the spare wear ring under pressure with a piece of lead or wood.

Note:

1. The tolerance for the radial and axial warping for chapter 12.3.2 and 12.3.3 is specified at a maximum of 0.05 mm (0.00197 in).

2. If the client judges it necessary, auxiliary lockings may be used such as: chemical (Loctite) or even threaded pin.

12.4 Disassembly instructions

Numbers indicated in brackets after each part name are referred to the part list, the sectional drawing on chapter 14 and the exploded view (chapter 12.6).
Due to its modern design, the KSB Megachem pump offers maintenance vantages as the back-pull-out system that allows the disassembly of the whole rotor assembly through its back: bracket, discharge cover and impeller, while the casing (102) and the suction and discharge pipe lines remain in their place. When the coupling sleeve is equipped with spacer, the driver also stays in its location during the maintenance of the pump.

12.4.1 Sequence for the pump disassembly when equipped with gland packing

01. Close the suction valve (if there is any) and the discharge valve. Remove the threaded plug (903.3) and drain the pump.

02. Close the valves and disconnect the auxiliary piping (if any).

03. Remove the coupling guard.

04. Remove the venting plug (639). Remove the threaded plug (903.6) and drain the oil from the bearing bracket.

05. Remove the constant-level-oiler (638) from the bearing bracket.

06. If the coupling sleeve is equipped with spacer, remove it. If it does not have spacer, disconnect the sleeve, displacing the driver.

07. Remove the coupling sleeve from the pump shaft with a puller, loosening first the socket head cap screw that fixes the sleeve.

08. Loosen the bolts that are fixing the support foot (183) to the base.

09. Loosen the screws (901.2), or the screws (901.5) which one is the case.

10. Tighten uniformly all extractor bolts (901.3) and the whole assembly will be pulled out.

11. The discharge covers that are fixed by studs between the bearing bracket and the casing are not equipped with extractor bolts.

12. Drive back the extractor bolts (901.3) to their original positions such away to not interfere later on during the assembly.

13. Prop up the rotor with a piece of Wood where it overhangs. Lock the shaft through a proper device placed at the region on the coupling sleeve key (940.2).

14. Loosen and remove the impeller screw (906) and the gasket (400.4).

15. Remove impeller (230); Key (940.1) and gasket (400.1).

16. Loosen screws (901.4) (if any). Loosen nuts (920) and pull out the gland cover (452).

17. Remove the discharge cover (163) and the gasket (400.2).

18. Remove the shaft protecting sleeve (524). Take out the thrower (507) and the key (940.2).

19. Loose the screw (901.6) and release the support foot (183).

20. Loosen screws (901.5) and pull out the bearing covers (360) and the gaskets (400.3). Take care to don't damage the shaft radial seal ring (421) that come out together with the bearing covers.

21. With a piece of lead, strike the shaft end (210) suction side making the bearings outer race (321) slide inside the bearing bracket (330) until their complete removal.

22. Remove the parts from the stuffing box chamber as: packing ring (461), lantern ring (458), neck bush (456) or neck ring (457). After that, the whole assembly will be accessible for analisys and maintenance.

12.4.2 Sequence for pump disassembly when equipped with mechanical seal

Loosen the auxiliary pipings (if any) and the seal cover.
Follow the instructions contained in the mechanical seal manufacturer instructions manual that will be supplied with the pump.

12.4.3 Sequence for disassembly of cooled pumps

01. Loosen the inlet and outlet auxiliary pipings, keeping in place those curves (which fits on connections 7E and 7A, see fig. 17) on the cooling chamber cover for its handling further on.

02. Remove the nuts (920) and the gland cover (452).

03. After releasing the discharge cover (163) from the bearing bracket (330), remove the cooling cover (165) handling it by its curves.

04. Remove the O-rings (412.2 and 412.1).

12.5 Assembly instructions

All parts should be cleaned and debarred before assembly.

12.5.1 Modification unauthorized manufacturing and production of spare parts

Modification or changes to the machine are only allowed in consultation with the manufacturer. Spare parts and accessories authorized by the original manufacturer guarantee safety. The user of other parts can invalidate any manufacturer's liability damage resulting.

12.5.2 Sequence for pump assembly when equipped with packing

01. Before mounting the bearings on the shaft, they should be heated in an oven or oil bath to a temperature of 176ºF to194ºF (80º to 90º C) above the shaft temperature during 30 minutes , observing as maximum limit 257ºF (125ºC).

02. Mount the bearings (321) on the shaft.

03. With a piece of lead install the shaft in the bearing bracket from the suction side. The outer bearing race should slide into the bearing bracket until the distance on both sides of the bracket are equal, to fit the bearing covers.

04. Mount the radial shaft seal ring (421) on the bearing covers (360).

05. Mount the covers, carefully to don't damage the shaft seal ring, together with the gaskets (400.3).

06. Fix the screws (901.5).

07. Fix the support foot (183) and fix the screw (901.6) together with the washer (554.3).

08. Prop up with a piece of wood the bearing bracket (330) on its overhanging side.

09. Introduce the thrower on the shaft but do not place it against the bearing cover.

10. Mount the studs (902) on the discharge cover. Mount the gland packing in the stuffing box chamber according to fig.05 and instructions on chapter 12.2.2.

.11. Install the gland cover (452) and place the nuts (920) against it without tightening.

12. Install the protecting sleeve (524) on the shaft, after anoint with Molykote G Paste its internal diameter.

13. Guide the gasket (400.2) on the discharge cover; fit the discharge cover (163) on the bearing bracket (330) and fix it with the screws (901.4) (tighten crosswise and uniformly) (if any).

14. Mount the gasket (400.1), the key (940.1), the impeller (230) (anoint its internal diameter with Molykote G Paste), the gasket (400.4) and impeller screw (906).

15. Mount the driver side key (940.2).

16. Lock the shaft with an adequate device and tighten firmly the impeller screw.

17. Introduce the whole assembly into the casing (102) guiding the installation through the discharge cover fitting diameter.

18. Mount screws (901.2) together with the washers (554.1) tightening it crosswise and uniformly.

19. Install the constant-level-oiler (638) (if any) on the bearing bracket, using teflon tape on the oiler thread.

20. Check by hand that the rotor turns freely.

12.5.3 Sequence for pump assembly when equipped with mechanical seal

See instruction manual from the manufacturer supplied together with the pump.

12.5.4 Sequence for pump assembly of cooled pump

01. Mount the O-ring (412.2) on the channel of the stuffing box external hub.

02. Mount O-ring (412.1) preferably placing it with 4 glue spots as for example IS-12 from Loctite, on the discharge cover (163).

03. Install the cooling chamber cover (165) guiding it through its internal and external diameters which should be anointed with Molykote G Paste.

04. Care must be taken to locate the cooling cover with its stud holes centered, referred to the vertical and horizontal axis.

12.6 Exploded view

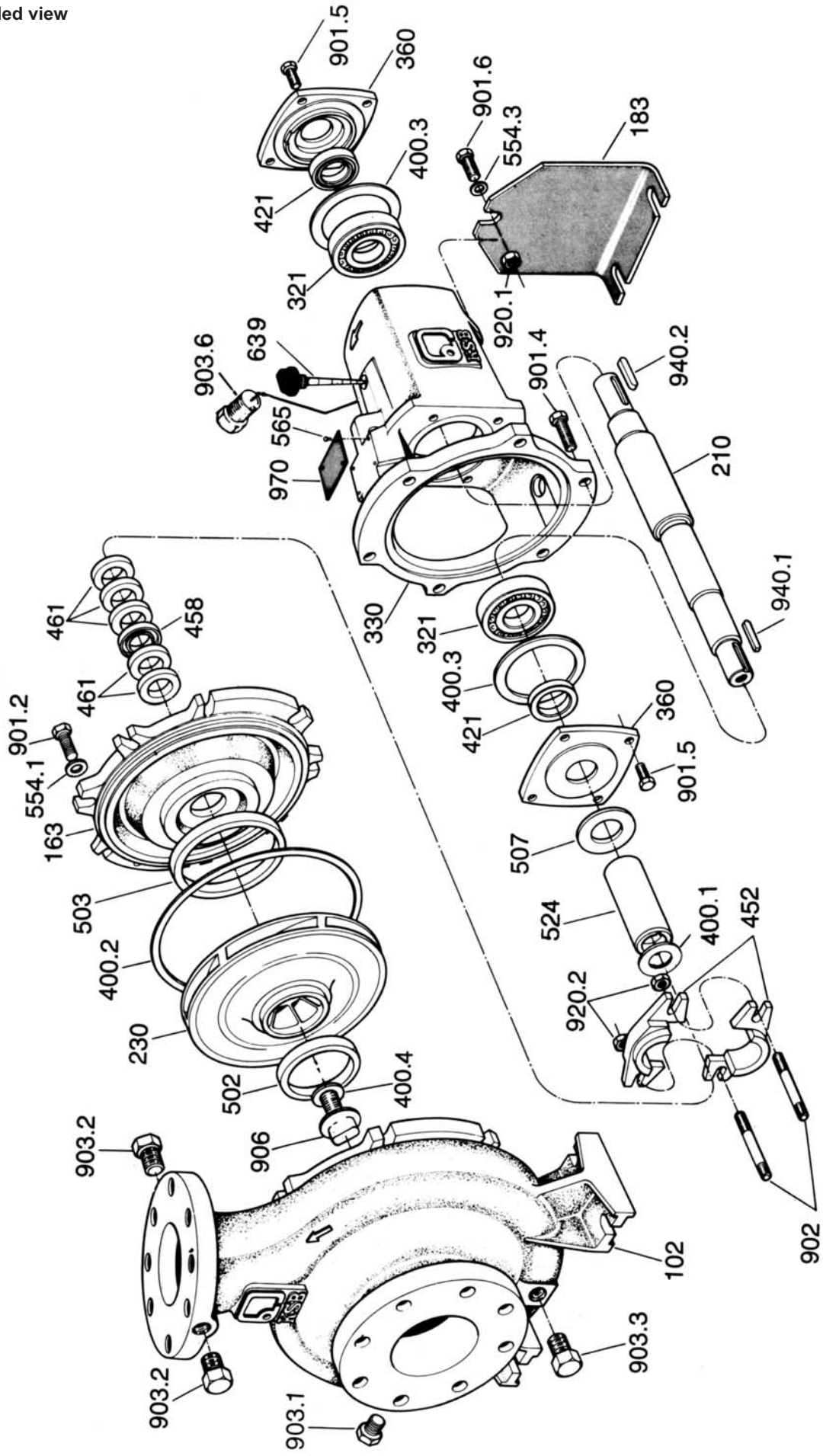


Fig. 22

12.7 Assembly and service instructions for pure graphite packing

A new type of graphite structure makes possible to manufacture pure graphite packing rings, split or in one piece.
An example of this type of packing is the ROTATHERM, wich is the result of a very precise process and requires a very carefull assembly procedure.

a) Assembly
Locate the packing rings according to its cutting marks displaced 90º from each other. The packing rings should be pressed into the stuffing box by means of a pressure ring or by the gland cover.
The rings should be mounted into the stuffing box chamber without any clearance between the internal diameter of the stuffing box and the external diameter of the rings.
Between the shaft protecting sleeve and the internal diameter of the packing rings there should always be a clearance of 0.012" (0.3 mm) on diameter (the device used for pressing the rings should take into account this clearance.

b) Operation
Before start up the pump, the nuts of the gland cover should be tightened slightly by hand. Check the perpendicularity and concentricity of the gland cover to the shaft and control the clearance by means of a feeler gauge.

Attention:
Fill up the pump!
There should be a leaking throught the packing!

Start up the pump and check the leaking through the packing. This leak may be reduced after 5 minutes of pump operation. The gland cover nuts may be tightened 1/6 of a turn and then the liquid leak should be observed during more 5 minutes. As long as the leak is excessive, this process is to be repeated up to the point in which is reached a minimum leak.

Leaking	Minimum 10 cm^3/min. (0.610 in^3/min)
Values	Minimum 20 cm^3/min. (1.220 in^3/min)

If the leaking value is reduced to less than 0.610 in^3/min (10 cm^3/min.) the gland cover nuts should be loosened a little bit.
If there is no leaking at all, proceed to:

1- Stop the pump immediately.
2- Loosen the gland cover and repeat the whole process of operation and adjustment.
Two hour after the adjustment of the leak, it must be checked again.
It should be also checked if there is sufficient leaking even if

c) Maintenance of the pure graphite packing
If the leaking increase after a certain period of the pump operation and exceeds the maximum value, the gland cover nuts should be tightened uniformly another 1/6 a turn and then the leaking value should be checked again. If it is impossible to adjust any more the gland cover, a new packing ring should be installed. Normally it would not be necessary to replace the whole package of packing rings.

13. Operational abnormalities and troubleshooting

Abnormalities	Probable causes
- Insufficient rate of flow Driver overload	01 - 02 - 03 - 04 - 05 - 06 - 07 - 08 - 09 - 10 11 - 12 - 13 - 14 - 24
- The pump final pressure is too high	14
- Bearings overheating	19 - 20 - 21 - 22 - 23 - 26 - 29
- Pump leaking	15
- Excessive leaking at the shaft seal	16 - 17 - 19 - 28
- Irregular operation of the pump, abnormal noises	03 - 06 - 10 - 14 - 18 - 19 - 20 - 22 - 25 - 26 - 27
- Excessive heating of the pump casing	03 - 06 - 18 - 27

Tale 08 -Abnormalities and causes

Probable causes - Suggestions

01. The pump is discharging at na excessive pressure.
    - Adjust the operational point of the pump.

02. Total head (counterpressure) higher than the pump's nominal head.
    - Install na impeller with larger diameter.
    - Increase driver speed (if turbine or internal combustion engine).

03. Pump and / or suction pipe are not totally full of liquid or are not air tight.
    - Fill the pump and suction pipe with liquid to be pumped and / or seal both.

04. Suction pipe and / or impeller clogged.
    - Remove obstructions at suction pipe and / or impeller.

05. Air pockets in the pipe line.
    - Modify piping lay-out.
    - If necessary, install a venting valve.

06. NPSH available too low (negative suction installation).
    - Check if it is necessary to correct the level of the liquid being pumped.
    - Install the pump at a lower level referred to the suction tank.
    - Open the suction pipe line valve totally.
    - In case the suction pipe line has an excessive pressure loss, modify the pipe line to reduce it.

07. Air penetrating into the stuffing box chamber.
    - Clear out the line that supplies liquid for lubrication / sealing of the stuffing box chamber.
    - If necessary feed with liquid from a external source.
    - Increase the pressure of lubrication / sealing liquid of the stuffing box chamber.
    - Service the packing or the mechanical seal.

08. Wrong rotation direction.
    - Change one of the electric motor phase cables.

09. Slow speed.
    - Increase speed.

10. Wear of the inner parts of the pump.
    - Replace worn parts.

11. Total head (counterpressure) lower than specified when the pump was purchased.
    - Adjust operational point of the pump
    - If the overloads continues, trim the impeller.

12. The specific weight or viscosity of the liquid being pumped is higher than the one specified when the pump was purchased.

13. Wrong tightening of the gland cover.
    - Correct tightening.

14. High speed.
    - Reduce speed.

15. Defective gasket between the volute casing and the discharge cover.
    - Replace it.

16. Inefficient (worn out) shaft sealing
    - Replace it.
    - Check if the sealing / lubrication liquid pressure is not too high.

17. Scratches, grooves and excessive roughness on the shaft protecting sleeve. Defective gasket between impeller and sleeve.
    - Replace protecting sleeve or gasket.

18. Pump operation excessively noisy.
    - Correct the suction conditions.
    - Increase pressure at the pump suction.

19. The motor-pump assembly is misaligned.
    - Align the motor-pump.

20. The parts of the pump have their radial and axial warp, out of specification. Suction and discharge pipe lines exerting mechanical strengths.
    - Adjust the axial and radial warping of those parts or replace them.
    - Eliminate those stresses, fixing properly the suction and discharge pipe lines or install flexible joints, if necessary.

21. Excessive axial thrust.
    - Clear ou the balance holes on the impeller.
    - Replace the wear rings (impeller x casing and impeller x discharge cover).

22. Bearing oil excess, lacking or inadequate.
    - Reduce, refill or use the adequate oil, according specifications.

23. Incorrect clearance at the coupling sleeve.
    - Adjust to the correct clearance.

24. The electric motor is working with two phases.
    - Replace the defective fuse.
    - Check electrical connections.

25. Unbalanced impeller.
    - Clean, deburr and balance the impeller.

26. Defective bearings.
    - Replace them.

27. Insufficient rate of flow.
    - Increase minimum flow.

28. Defective supply of stuffing box chamber sealing liquid.
    - Decrease sealing liquid pressure.

29. Friction of the stationary and turning parts.
    - Check, adjust or replace the parts.

14. Sectional drawing and parts list

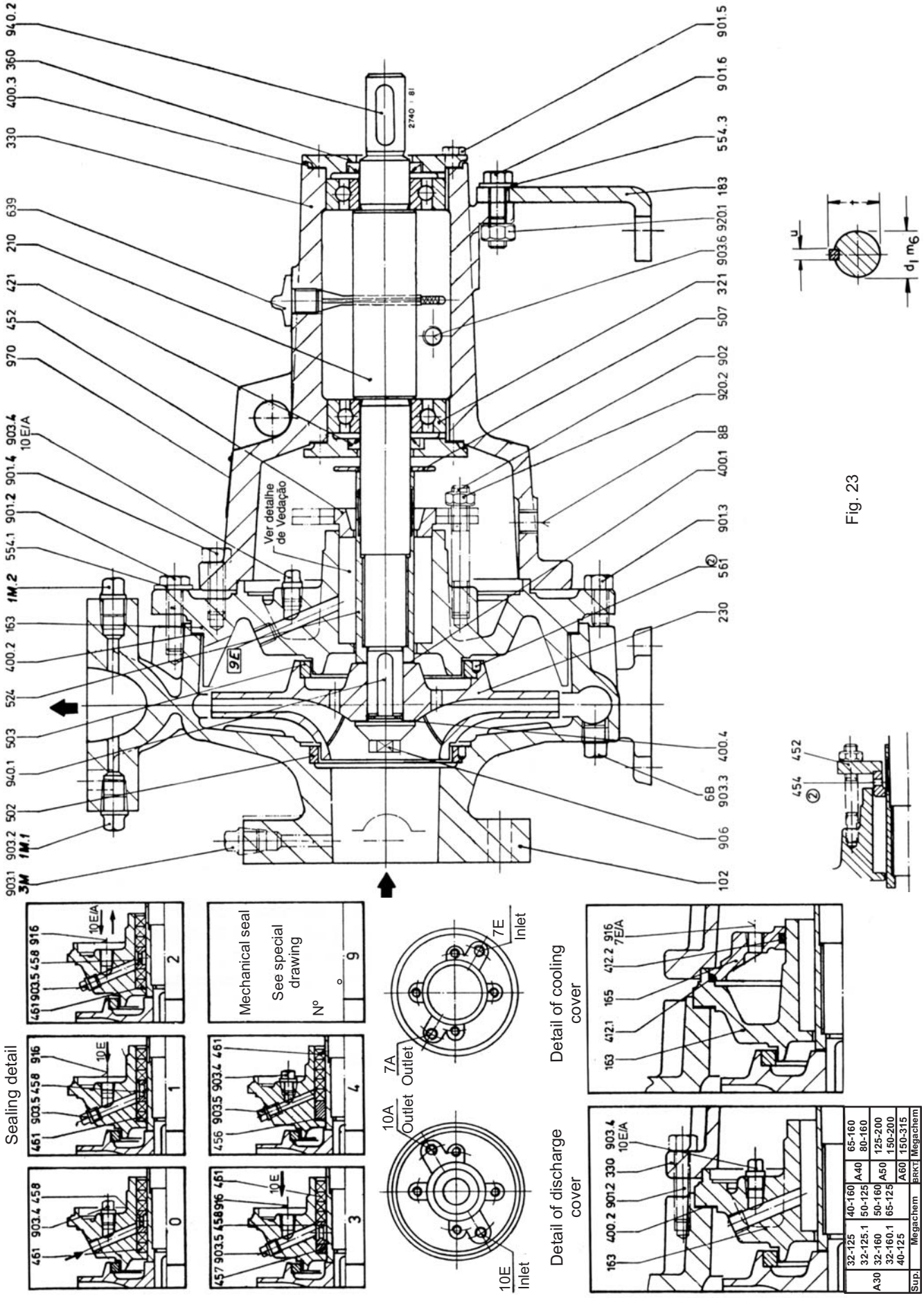


Fig. 23

Designation	Part nº	Qty.
Volute casing	102	1
Discharge cover	163	1
Cooling chamber cover (4)	165	1
Support foot	183	1
Shaft	210	1
Impeller	230	1
Radial ball bearing	321	2
Bearing bracket	330	1
Bearing cover	360	2
Flat gasket	400.1/2/4	1/1/1
Flat gasket	400.3	2
O'Ring (4)	412.1/2	1/1
Radial shaft seal ring	421	2
Gland cover	452	1
Stuffing box ring (2)	454	1
Neck bush (5)	456	1
Neck ring (1)	457	1
Lantern ring (6)	458	1
Gland packing (7)	461	
Casing wear ring	502	1
Impeller wear ring	503	1
Thower	507	1
Shaft protecting sleeve	524	1
Washer	554.1	(8)
Washer	554.3	1
Grooved pin (3)	561	2
Constant level oiler (optional)	638	1
Oil level pointer	639	1
Venting (optional)	672	1
Hexagon head bolt	901.2	(8)
Hexagon head bolt	901.3	2
Hexagon head bolt	901.4	(9)
Hexagon head bolt	901.5/6	8/1
Stud	902	2
Threaded plug	903.1/2/3	1/2/1
Threaded plug	903.4	2
Threaded plug	903.5	2
Threaded plug	903.6	1
Impeller screw	906	1
Plug	916	2
Nut	920.1/2	2
Key	940.1	1
Key	940.2	1
Nameplate	970	1

Table 09

Shaft end dimensions - inches (mm)

Bearing bracket	d_1 m_6	u	t
A 30	0.945 (24)	0.315 (8)	1.163 (27)
A 40	1.260 (32)	0.394 (10)	1.378 (35)
A 50	1.654 (42)	0.472 (12)	1.772 (45)
A 60	1.690 (48)	0.551 (14)	2.020 (51,5)

Table 10

Remarks:

(1) - Aplicable only for sealing Code 4.

(2) - Somente na execução em Inox.

(3) - Aplicable when impeller material is A743 CF8M and wear ring is AISI 316.

(4) - Only for cooled pumps.

(5) - Only for sealing - Code 3.

(6) - Not used for sealing - Code 4.

(7) - The following materials are used:

	Acrylic fiber.
	PTFE with graphite
	PTFE oiled
	Carbon wire
	Aramida wire with PTFE and graphite
	Pure graphite

(8) - Quantity: 8 for pumps:
32-200.1 / 32-200 / 40-200 / 50-200 / 65-200 / 80-200 / 100-160 / 100-200.

Quantity: 10 for pumps:
32-250.1 / 32-250 / 40-250 / 50-250 / 65-250 / 80-250 / 100-250 / 125-250 / 150-250.

Quantity: 12 for pumps:
40-315 / 50-315 / 65-315 / 80-315 / 100-315 / 125-315.

Quantity: 16 for pumps:
80-400 / 100-400 / 125-400 / 150-400.

(9) - Quantity: 6 for brackets A30 and A40
Quantity: 8 for brackets A50 and A60

15. Parts interchangeability table

Pump	Brackets	Designation	Volute casing	Discharge cover	Cooling chamber cover	Support foot	Shaft	Impeller	Radial ball bearing	Bearing bracket	Bearing cover	Flat gasket	Flat gasket	Flat gasket	Flat gasket	O'Ring	Radial shaft seal ring	Mechanical seal	Gland cover	Neck bush	Neck ring	Lantern ring	Gland packing	Casing wear ring	Impeller wear ring	Thrower	Shaft protecting sleeve	Constant level oiler	Vent ring plug	Impeller screw	Key	Key	Oil level pointer
		Part N°	102	163	165	183	210	230	321	330	360	400.1	400.2	400.3	400.4	412.1/2	421	433	452	456	457	458	461	502	503	507	524	638	672	906	940.1	940.2	639
32-125.1	A 30		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	13	1	1	1	1	1	1	1	1
32-125			2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	13	1	1	1	1	1	1	1	1
32-160.1			3	1	1	2	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	13	1	1	1	1	1	1	1	1
32-160			4	1	1	2	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	13	1	1	1	1	1	1	1	1
32-200.1			5	2	1	3	1	4	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	13	1	1	1	1	1	1	1	1
32-200			6	2	1	3	1	4	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	13	1	1	1	1	1	1	1	1
40-125			7	1	1	1	1	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	13	1	1	1	1	1	1	1	1
40-160			8	1	1	2	1	6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	13	1	1	1	1	1	1	1	1
40-200			9	2	1	3	1	7	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	3	13	1	1	1	1	1	1	1	1
50-125			10	1	1	2	1	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	13	1	1	1	1	1	1	1	1
50-160			11	1	1	3	1	9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	13	1	1	1	1	1	1	1	1
50-200			12	2	1	3	1	10	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	4	13	1	1	1	1	1	1	1	1
65-125			13	1	1	3	1	11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	13	1	1	1	1	1	1	1	1
32-250.1	A 40		14	3	2	4	2	12	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	1	3	2	2	1	1	2	2	2	2
32-250			15	3	2	4	2	12	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	1	3	2	2	1	1	2	2	2	2
40-250			16	3	2	4	2	13	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2	2	1	1	2	2	2	2
50-250			17	3	2	4	2	14	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	4	3	2	2	1	1	2	2	2	2
65-160			18	4	2	5	2	15	2	2	2	2	4	2	2	2	2	2	2	2	2	2	2	5	15	2	2	1	1	2	2	2	2
65-200			19	5	2	4	2	16	2	2	2	2	5	2	2	2	2	2	2	2	2	2	2	5	15	2	2	1	1	2	2	2	2
80-160			20	4	2	4	2	17	2	2	2	2	4	2	2	2	2	2	2	2	2	2	2	7	15	2	2	1	1	2	2	2	2
40-315			21	8	2	6	2	18	2	2	2	2	8	2	2	2	2	2	2	2	2	2	2	2	14	2	2	1	1	3	2	2	2
50-315			22	8	2	7	2	19	2	2	2	2	8	2	2	2	2	2	2	2	2	2	2	5	14	2	2	1	1	3	2	2	2
65-250			23	7	2	6	2	20	2	2	2	2	7	2	2	2	2	2	2	2	2	2	2	6	16	2	2	1	1	3	2	2	2
80-200			24	6	2	4	2	21	2	2	2	2	6	2	2	2	2	2	2	2	2	2	2	7	18	2	2	1	1	3	2	2	2
80-250			25	7	2	7	2	22	2	2	2	2	7	2	2	2	2	2	2	2	2	2	2	7	16	2	2	1	1	3	2	2	2
100-160			26	6	2	6	2	23	2	2	2	2	6	2	2	2	2	2	2	2	2	2	2	8	18	2	2	1	1	3	2	2	2
100-200			27	6	2	6	2	24	2	2	2	2	6	2	2	2	2	2	2	2	2	2	2	8	18	2	2	1	1	3	2	2	2
65-315	A 50		28	11	3	10	4	25	3	3	3	4	11	3	4	3	3	3	3	3	3	3	3	6	17	3	4	1	1	4	4	3	3
80-315			29	11	3	8	4	26	3	3	3	4	11	3	4	3	3	3	3	3	3	3	3	7	17	3	4	1	1	4	4	3	3
80-400			30	12	3	9	4	27	3	3	3	4	12	3	4	3	3	3	3	3	3	3	3	9	10	3	4	1	1	4	4	3	3
100-250			31	10	3	10	4	28	3	3	3	4	10	3	4	3	3	3	3	3	3	3	3	8	10	3	4	1	1	4	4	3	3
100-315			32	11	3	8	4	29	3	3	3	4	11	3	4	3	3	3	3	3	3	3	3	8	17	3	4	1	1	4	4	3	3
100-400			33	12	3	9	4	30	3	3	3	4	12	3	4	3	3	3	3	3	3	3	3	8	10	3	4	1	1	4	4	3	3
125-200			34	9	3	8	4	31	3	3	3	4	9	3	4	3	3	3	3	3	3	3	3	10	10	3	4	1	1	4	4	3	3
125-250			35	10	3	8	4	32	3	3	3	4	10	3	4	3	3	3	3	3	3	3	3	10	10	3	4	1	1	4	4	3	3
125-315			36	11	3	9	4	33	3	3	3	4	11	3	4	3	3	3	3	3	3	3	3	10	17	3	4	1	1	4	4	3	3
125-400			37	12	3	11	4	34	3	3	3	4	12	3	4	3	3	3	3	3	3	3	3	10	10	3	4	1	1	4	4	3	3
150-200			38	9	3	9	4	35	3	3	3	4	9	3	4	3	3	3	3	3	3	3	3	11	10	3	4	1	1	4	4	3	3
150-250			39	10	3	9	4	36	3	3	3	4	10	3	4	3	3	3	3	3	3	3	3	12	10	3	4	1	1	4	4	3	3
150-315	A 60		40	13	4	12	5	37	4	4	4	5	13	4	5	4	4	4	4	4	4	4	4	12	10	4	5	1	1	5	5	4	4
150-400			41	14	4	12	5	38	4	4	4	5	14	4	5	4	4	4	4	4	4	4	4	12	10	4	5	1	1	5	5	4	4

Table 11 - Part interchangeability

1 / 1	The same number (Interchangeable parts)
3 / 4	Different numbers (Not interchangeable parts)

16. Recommended spare parts

Spare parts recommended for a continuous DIN 24296.

Part Nº	Designation	Number of pumps (including stand-by)							
		1	2	3	4	5	6 e 7	8 and 9	10 or more
		Quantity of spares							
210	Shaft	1	1	1	2	2	2	3	30%
230	Impeller	1	1	1	2	2	2	3	30%
321	Bearing (pair)	1	1	1	2	2	2	4	50%
330	Bearing brackret	-	-	-	-	-	-	1	2 units
421	Rad. Shaft seal ring (pair)	1	2	3	4	5	6	8	50%
461	Gland packing (5 rings)	1	4	4	6	6	6	8	40%
502	Casing wear ring	1	2	2	2	3	3	4	50%
503	Impeller wear ring	1	2	2	2	3	3	4	50%
524	Shaft protecting sleeve	1	1	1	1	2	2	2	20%
--	Gasket repair set	4	4	6	8	8	9	12	150%
--	O'ring repair set	4	4	6	8	8	9	12	150%
Version with mechanical seal									
--	Gasket repair set	4	4	6	8	8	9	12	150%
--	O'ring repair set	4	4	6	8	8	9	12	150%
--	Complete Mec. Seal	2	2	2	3	3	3	4	20%

Table 12 - Recommended spare parts

17. Special recommendations

17.1 Machining of impeller external diameter

All impellers of stainless steed or bronze should have their vanes adjusted (sharpened) at the outlet of the liquid being pumped, according to ilustration on fig.24, when the impeller has trimmed is external diameter by machining.

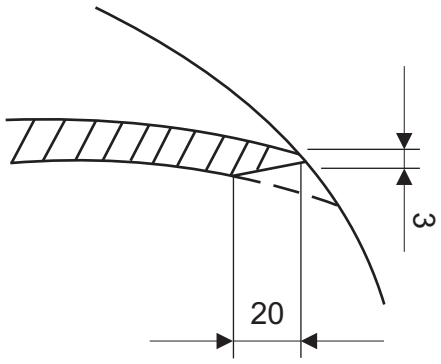


Fig. 24 - Adjusting the impeller vanes

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A2740.8P/3

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