KSB MEGAFLOW

Pumps for Sewage, Effluents and Mixtures

LINE: **Mega**

1. Application

The KSB MEGAFLOW centrifugal pump is recommended for industrial and municipal waste water, as well as all kinds of pulps not liable to plait, sewage water, chemical effluents.

- Municipal and industrial waste-water treatment
- Drainage
- Pulp and paper
- Food processing
- Sugar and alcohol
- Mining and manufacturing
- Civil construction

2. Design

Horizontal, single-stage, simple horizontal suction and vertical upwards discharge. The “back-pull-out” design allows maintenance and repair services through the back side, without dismantling piping and alignment.
The available hydraulics and impeller types allow proper selection for the handled liquid and required application.

3. Designation

KSB **Megaflow** **50** - **160** **K**

- Trade Mark
- Model / Type
- Discharge Nozzle Diameter (mm)
- Nominal Impeller Diameter (mm)
- Rotor

4. Operating Data

Sizes	- DN 50 up to 350 (2 ½” to 14”)
Flow	- to 11,000 gpm (2,500 m^3/h)
Head	- to 328 ft (100m)
Temperature	- to 221° F (105° C)
Max. Suction pressure	- to 43 psi (3 bar)
Speed	- to 3,500 rpm

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Megaflow Operating Instructions Manual

Subject to technical modification without prior notice.

Content

5. Introduction

KSB has supplied you with an equipment that has been designed and manufactured with a must advanced technology. Due to its simple and tough construction it will not need much maintenance. With the aim of providing our clients with a satisfactory, trouble free operation, we recommend to install and care our equipment according to the instructions contained in this operating instructions.

This manual has been prepared to inform the user about the construction and operation of our pumps, describing the adequate procedures for handling and maintenance. We recommend that this manual should be handled by the maintenance supervision.

This equipment should be used in the operational conditions for which it was selected as to: rate of flow, total head, speed, voltage, frequency, temperature of pumped liquid.

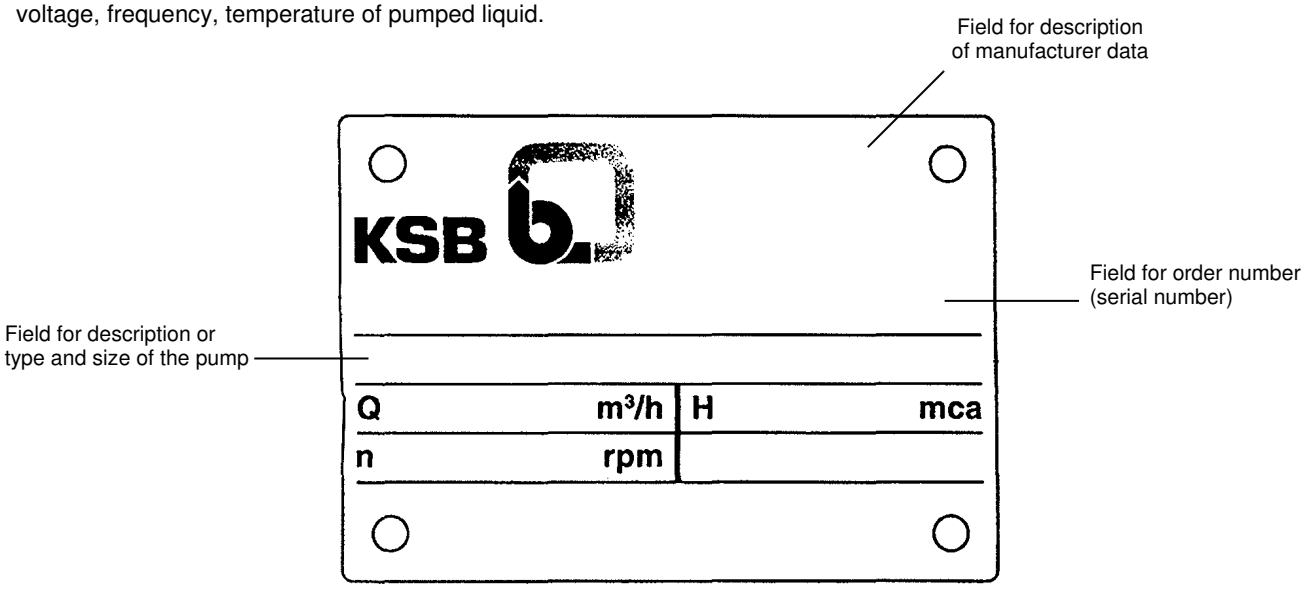


Fig. 1 - Nameplate

For requests about the product, or when ordering spare parts, please indicate the type of pump and manufacturing order nº (serial nº). This information can be obtained from the nameplate on the actual pump. If the nameplate is not available, the OP nº. 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 instructions and advice. Its careful reading it is an obligation before installation, electrical connections, first starting and maintenance.

Contents

6. Technical Data

Technical Data		Unity	Sizes																				
			50-160	50-200	65-200	80-200	80-250	65-315	100-250	100-315	80-400	100-400	125-315	150-315	200-315	125-500	150-400	150-500	200-400	200-500	250-500	300-500
Bearing Bracket			CS40	CS50(K) A40K (O)	CS50	A40K		A50K			A60K					P65/160X					P80/200S	
Impeller	K		x	x	x	-	x	x	x	x	x	x	-	x	x	x	-	x	x	-	x	x
	O		-	x	-	-	x	x	x	-	x	x	-	x	-	-	-	x	x	-	-	-
	E		-	-	-	x	-	-	x	-	-	-	x	-	-	-	x	-	-	x	-	-
Max. allowed solid diameter	K	mm	34	30	30	-	50	35	54	47	40	45	-	85	80	50	-	60	80	-	75	95
	O		-	25	-	-	35	18	44	-	22	30	-	60	-	-	-	85	80	-	-	-
	E		-	-	-	55	-	-	70	-	-	-	90	-	-	-	(1)	-	-	150	-	-
GD^2 Rotating element with water		Kgm^2	0,031	0,064	0,095	0,200	0,215	0,418	(5)	0,598	1.100	1.230	1.246	0,720	0,867	2.620	2.734	2.850	2.060	8.240	4.750	5.900
Hydrostatic test pressure		-	(2)			(3)	(2)		(4)	(2)			(3)	(2)			(3)	(2)		(3)	(2)	
Max. suction pressure		bar	3																			
Max. discharge pressure			10																			
Temperature	Minimum	ºC	-30																			
	Max. Liquid Abrasive without washing		90																			
	Max. Liquid Not abrasive		105																			
	Max. Liquid Abrasive with washing		105																			
Axial Thrust Balancing		-	Back vanes																			
Min./Max. Flow		-	0,1 .Qopt. / see characteristic curve																			
Rotation side		-	Clockwise, seen from the drive side																			
Maximum rotation		-	See table 2																			
Lubricating		-	Oil, though the automatic resupply glass																			
Flanges	Cast iron	-	ANSI B16.1 125lb FF																			
	Stainless steel	-	ANSI B16.5 150lb RF																			
Sealing Chamber	Sleeve ∅	mm	35	45				60			70					80					100	
	Chamber ∅		55	65				85			95					105					132	
	Gasket		10	10				12,5			12,5					12,5					16	
	Chamber Comp.		60	60				73			73					87					103	
Weight	Cast iron	Kg	45	68	78	95	104	150	136	159	237	243	220	231	224	370	380	385	375	400	740	840
	Steel		47	72	82	100	110	159	143	168	251	257	232	245	237	392	402	407	395	423	783	890

Table 1

Notes:

(1) ∅115 for impeller ∅ ≤ 335; ∅130 for impeller ∅ >335 up to ∅400
(2) According to Hydraulic Institute, max. = 15bar
(3) According to Hydraulic Institute, max. = 6 bar
(4) According to Hydraulic Institute, for impellers K/O max. = 15 bar; for impeller E max. = 6 bar
(5) Pump with impeller K/O, GD^2 = 0,270 $Kg.m^2$; with impeller E, GD^2 = 0,640 $Kg.m^2$

6.1 Bearings

Pump size	Impeller	Max. allowable solid diameter (mm)	Bearing bracket	Bearings		Max. allowable p/n (CV/rpm)
				NDE	DE	
50-160	K	34	CS40	6208C3	6208C3	0,0180
50-200	K	30	CS50	6310C3	6310C3	0,0500
	O	25	A40K	NU308	6308C3	0,0458
65-200	K	30	CS50	6310C3	6310C3	0,0500
80-200	E	55	A40K	NU308	6308C3	0,0458
80-250	K	50	A40K	NU308	6308C3	0,0458
	O	35	A40K	NU308	6308C3	0,0458
65-315	K	35	A50K	NU310	6310C3	0,100
	O	18				
100-250	K	54				
	O	44				
	E	70				
100-315	K	47				
80-400	K	40	A60K (1)	NU312	6312C3	0,158
	O	22				
100-400	K	45	A60K (1)(2)			
	O	30				
125-315	E	90	A60K			
150-315	K	85				
	O	60				
200-315	K	80				
125-500	K	50	P65/160X	NU413	2x 7313BUA	0,310
150-400	E	(3)				
150-500	K	60				
	O	85				
200-400	K	80				
	O	80				
200-500	E	150				
250-500	K	75	P80/200S	NU419	2x 7319BUA	0,422
	O	(3)				
300-500	K	95				
350-400	K	(2)	(3)	(3)		
350-500	K	(2)				
350-630	K	(2)				

Table 2

Notes: (1) For size 100-400 “K” at 1450 and 1750 rpm – bearing bracket P55/140s. Please consult KSB.
(2) For size 100-400 “O” at 1450 and 1750 rpm – bearing bracket P65/160ax. Please consult KSB.
(3) Note: Consult KSB for pump sizes 350-400, 350-500 and 350-630.

6.2 Maximum speed

Pump size	Impeller type	Speed (rpm)	γ = 1,0 kgf/dm^3	γ = 1,2 kgf/dm^3	γ = 1,4 kgf/dm^3
			Maximum Impeller Diameter (mm)		
50-160	K/O	1750	169	169	169
		2900	169	165	160
		3500	160	150	145
50-200	K/O	1750	209	209	209
		2900	209	209	209
		3500	209	209	200
65-200	K	1750	209	209	209
		2900	209	209	200
		3500	200	190	- -
65-315	K/O	1450	320	320	320
		1750	320	320	320
		2900	260	255	245
80-200	E	up to 2000	205	205	205
80-250	K/O	1450	260	260	260
		1750	260	260	260
		2900	230	220	210
80-400	K/O	1450	404	404	404
		1750	404	380	370
100-250	K/O	1450	260	260	260
		1750	260	260	260
		2900	230	215	205
100-250	E	up to 1450	255	255	255
		1750	255	255	235
		2000	255	235	215
100-315	K/O	1450	320	320	320
		1750	320	320	310
100-400	K/O	1450	404	404	404
		1750	404	380	360
125-315	E	up to 1160	315	315	315
		1450	315	300	270
		1750	270	240	240
125-500	K/O	1160	504	504	504
		1450	504	490	465
		1750	450	400	- -
150-315	K/O	1160	320	320	320
		1450	320	310	300
		1750	300	290	275
150-400	E	725	400	400	400
		875	400	400	388
		960	400	388	370
		1160	400	370	348
		1300	400	348	--
		1450	370	--	--

Table 3

6.2 Maximum speed

Pump size	Impeller type	Speed (rpm)	γ = 1,0 kgf/dm^3	γ = 1,2 kgf/dm^3	γ = 1,4 kgf/dm^3
			Maximum Impeller Diameter (mm)		
150-500	K/O	960	504	504	504
		1160	504	500	--
		1450	504	460	--
200-315	K/O	1160	320	320	320
		1450	320	305	295
		1750	300	280	270
200-400	K/O	1160	404	404	404
		1450	404	404	380
		1750	360	330	--
200-500	E	480	500	500	500
		580	500	500	500
		725	500	480	420
		875	500	450	420
		960	500	450	420
250-500	K/O	725	504	504	504
		960	475	450	430
		1160	430	400	--
300-500	K/O	725	504	500	475
		960	460	430	410
		1160	405	--	--
350-400	K	1160	408	408	408
350-500	K	1160	--	--	--
350-630	K	875	630	630	630

Table 3

7. Constructive Details

7.1 Casing

Ample clearance volute, one piece casting including support feet. Radially split with discharge cover. Replaceable wear plate on suction side.

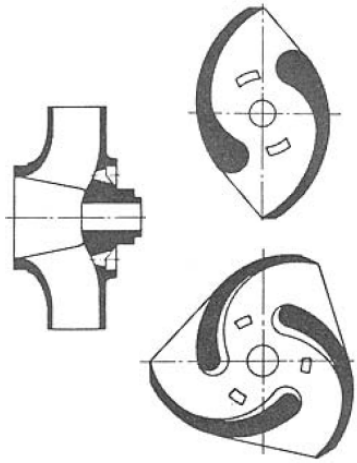
7.2. Nozzle Layout

Axial, horizontal suction and radial vertical discharge. Optionally an intermediate suction piece with clean out and inspection manhole can be offered.

7.3 Impeller

Three types of impellers are available: K, O e E.

a) Impeller type K :
Closed with two or three channels, they are specially recommended for pumping dirty or muddy liquids with no gases and without the tendency to form long fiber plaits. Also adequate for paper and cellulose pulp with a mass concentration up to 3% .



Pumps with 3 channels impellers K (200-315, 150-500, 125-500, 200-400 e 250-500).

Fig.2

b) Impeller Type O:
Multiple vane open impeller. Recommended for liquids containing air, as for example, sugar plants residues without cane trash, cellulose and paper pulp with a mass concentration up to 6 %.

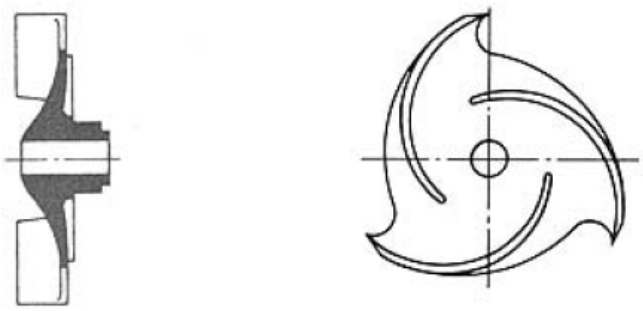


Fig.3

c) Impeller type E:
Single vane closed impeller, recommended for liquids containing solids in suspension, as for example, sewage, long fibers, sludge with air concentration, fruits, vegetables, fish, sugar cane, residues in the food industry, rags, wood pieces, bones, etc.

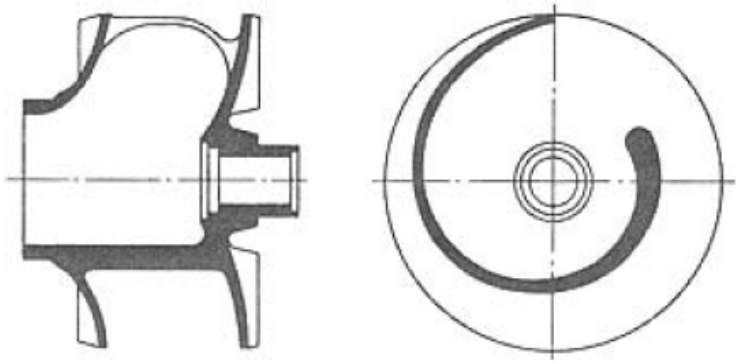


Fig.4

The impellers are not directly interchangeable due to their different wear plates (impeller types K and O) or due to the different casing construction (impeller type E).

7.4 Shaft

The shaft design is a dry type, completely isolated from the pumped liquid, provided with shaft protecting sleeve in the sealing area and equipped with gasket on impeller nut (or screw) and protecting sleeve region.

7.5 Axial Thrust Balancing

The axial thrust is balancing by back vanes in the impeller, which assuagen essentially the pressure in the chamber and prevent the deposit of solids in the back side. The remaining thrust is absorbed by the bearings.

7.6 Shaft seal

Gland packing (standard) or optionally by means of a single or double mechanical seal. The shaft seal selection depends on the handled liquid and required application.
When the shaft seal is made with gland packing, the position of the neck ring (457), neck bush (456), lantern ring (458) and of the gasket rings are represented in the sectional drawing. The dimensions of chamber and sizes of the gland packing are mentioned at table 1. The circulation of the liquid, which reaches the lantern ring through holes in the pressure cover has the function of:

a) lubricate and take off the packing
b) seal the packing against the penetration of abrasive solid particles
c) avoid the outlet of poisonous gases or bad smell
d) avoid the outlet of liquids which transform into gas in contact with the atmosphere
e) seal the gasket chamber against air inlet

If the pumped liquid have abrasive particle, the feed source should be external and by means of clean liquids that can be mixed to the pumped one. The necessary pressures and flows in the external source are indicated in the Fig. 5 and 6.

8. Shaft seal Selection

Code	Application
0	For liquids containing solids in suspension with low abrasivity. Sealing with clean liquid of external source with pressure of 0,5 up to 1 bar over the pressure pw (see Type series booklet)
1	Same execution as code 0, however applicable when sealing liquid should not be in contact to the pumped liquid.
2	For liquids containing abrasive solids in suspension. Washing with clean liquid of external source with pressure of 0,1 and 0,2 over the pressure pw (see Type series booklet).
3	For liquids free of solids in suspension and positive suction. Seal though the pumped liquid.
9	Single or double Mechanical Seals

Table 4

Notes: The codes indicated in the Table 3, comply with the seal executions indicated in the Cross Sectional Drawing according to chapter 17.

8.1 Pressure of seal liquid / Wash for pumps with impellers type K / O / E.

Seal code	Pressure (bar)		ΔP Seal (bar)	ΔP Wash (bar)
	Seal	Wash		
0 e 1	Pw + AP	-	0,1 a 1	-
2	-	Pw + AP	-	0,1 a 0,2

Table 5

8.2 Sealing Flow / Wash

8.2.1 Pumps with Impellers type K e O

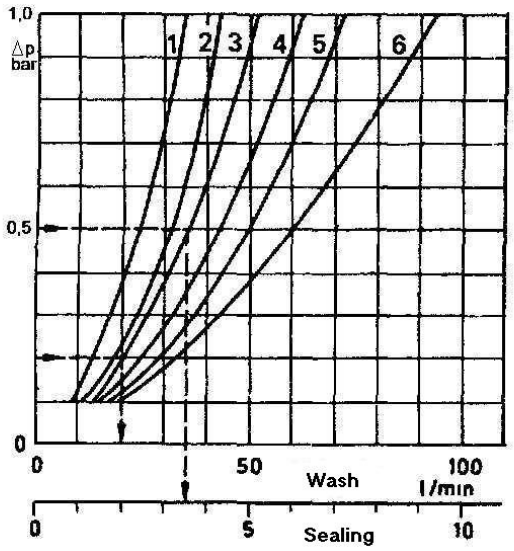


Fig.5

Legend

1	2	3	4	5	6
50-160	50-200	65-315	80-400	125-500	250-500
	65-200	100-250	100-400	150-500	300-500
	80-250	100-315	150-315	200-400	
			200-315		

Table 6

Notes: For pump size 350, please consult KSB.

8.2.2. Pump with Impeller type E

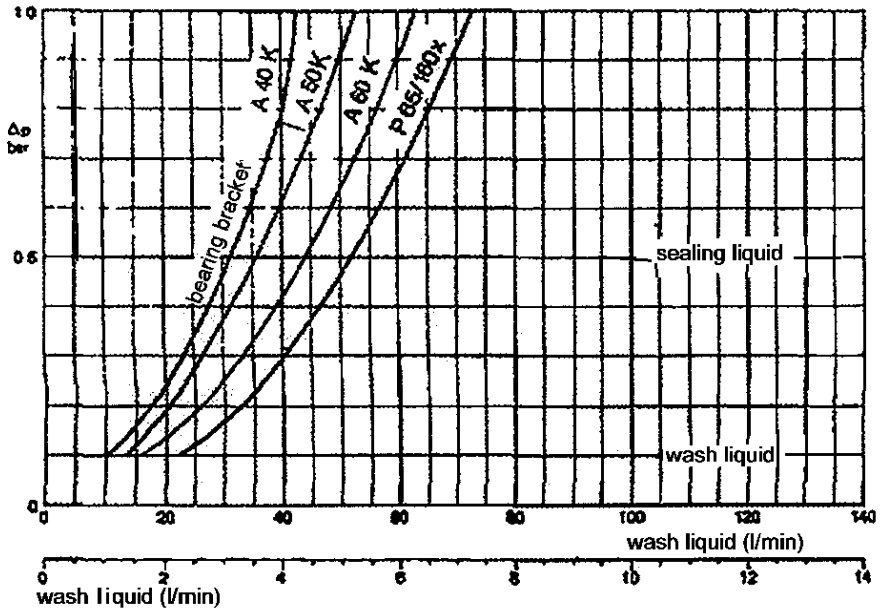


Fig.6

Notes: To calculate pressure PW, please consult the Type series booklet.

9. Mechanical Seal

If the pumped liquid is inflammable, explosive, toxic, of high cost, or when after an accurate cost analyze the result is benefic, we recommend the use of Mechanical Seal. The Mechanical Seal when correctly selected and installed presents advantage in the maintenance frequency comparing it with gasket. After a short period of adaptation during the operation there is no more liquid dropping.
The Mechanical Seal consists basically of a fixed ring and one rotating sliding over the fixed one, of which polished surface remains jointed by means of pressure by spring. The sealing of the rotative ring over the shaft and the sealing of the fixed ring in the gland, are of appropriate material to the pumped liquid. For a safe and of long duration operation it is important that the liquid film between the slide surfaces is formed and the consequent heat is properly absorbed by liquid circulation. Depending on the pumping conditions, this circulation can be expected from the pumped liquid or from external separate source.
Mechanical Seals are built in many different materials and assemblies, attending all the different chemical and physical characteristics of the liquids to be pumped.
In the case of supply of Shaft Seal by Mechanical Seal, we will send complementary information.

10. Transportation

The transportation of the pump and motor assembly or only the pump should be done in accordance to the safety standards. On lifting, the motor slug should be used to carry the motor only and never the pump-motor assembly.

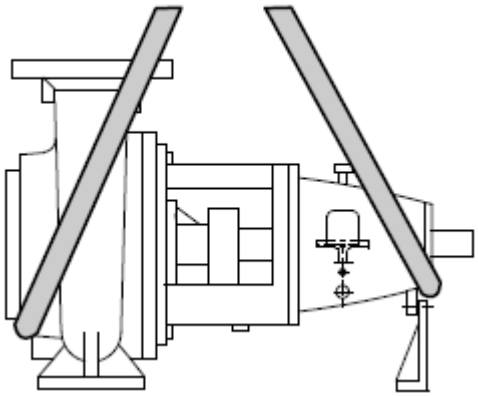


Fig. 7 – Transportation of the pump through the discharge flange

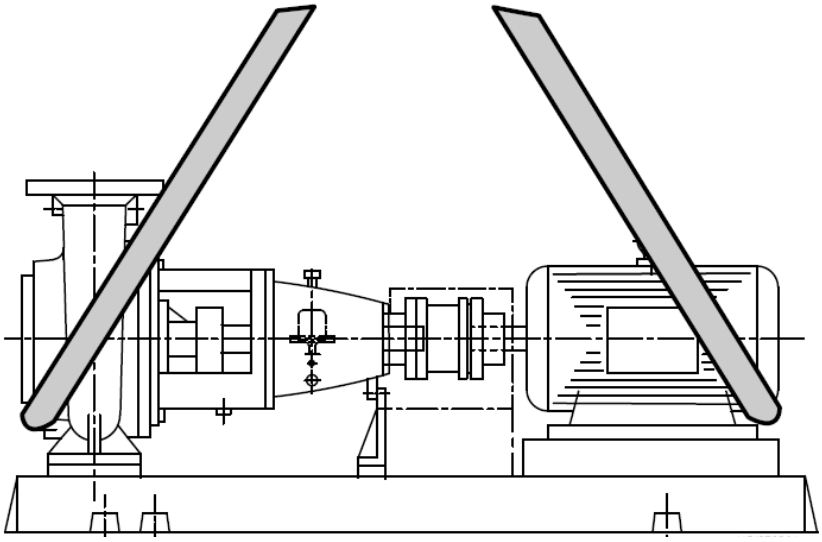


Fig.8 – Transportation of the pump-motor assembly

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

11. Service / Storage

The following procedures of service and storage are performed by KSB and by DEALER NETWORK up to effective delivery of the pump. It is the responsibility of the client to continue with this procedure after receiving the pump. When the pump is not subjected to a performance test after is sale, the areas in contact with the pumped liquid which are not painted as: stuffing box housing, wear rings, flange sealing areas, etc, receive an application of RUSTILO DW-301 by brush.

When the pump is equipped with packing and is subjected to a performance test, it is drained after the test without disassembling it, and then filled with RUSTILO application, after which the pump is drained.
Shaft exposed area as: shaft end, area between the gland cover and the bearing bracket receive a brush application of TECTYL 506.

Bearing installed on brackets of oil lubricated pumps receive an application of a sprayed layer of MOBILARMA 524.

11.1 Additional procedures of Service and Storage

- Pumps stored for periods exceeding one year should be serviced every 12 months. They should be disassembled, cleaned and the whole process described in the item 11 should be repeated.
- Pumps equipped with PACKING should have their packing removed before storage.
- MECHANICAL SEALS should be cleaned with dry compressed air. **No other liquid or material** should be applied to them in order to prevent damage to the secondary sealing as o-rings and 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.
- Wash the surfaces with gasoline or kerosene before applying the protecting liquids.
- Characteristics of the protecting liquids:

Protecting Liquid	Thickness of the applied Layer (µm)	Drying time	Removal	Manufacturer
TECTYL 506	From 80 to 100	1/2 up to 1 hour	Gasoline, benzene, diesel oil	BRASCOLA
RUSTILO DW301	From 6 to 10	1 up to 2 hours	Gasoline, benzene	CASTROL
MOBILARMA 524	≤ 6	Does not dry	Not necessary	MOBIL OIL

Table 7 – Protecting Liquids

12. Installation

Our pumps should be installed, leveled and aligned by trained personnel. When this service is done incorrectly it will originate operational troubles, premature wear and damage beyond repair.

12.1 Base Grouting

Place the foundation bolts in the holes or slots of the foundation block according to boring design: Foundation Drawing. Between the base and the foundation block and beside the foundation bolts, metallic chocks of the same height should be fixed with grout together with the foundation bolts, to serve as support for the base.

In order to adhere perfectly to the grout, the chock blocks and foundation 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. 9.

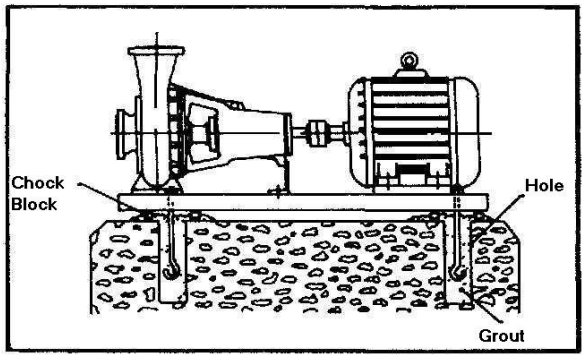


Fig. 9 – Base grouting

12.2 Base Leveling

Check if the base plate is equally resting on its chock blocks. If it is OK, place and tighten uniformly the nuts on the foundation bolts. With the help of a precision level, check the leveling of the base longitudinally and transversally.
If the base is out of level, loosen the foundation bolts nuts and insert shims, as necessary, between the metallic chock block and the base, so as to correct the leveling. See fig. 10.

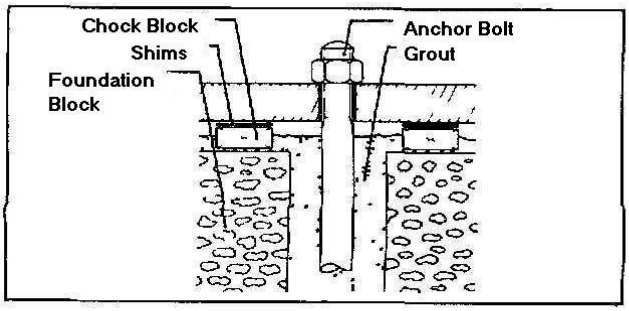


Fig. 10 – Base Leveling

12.3 Grouting

For secure and fastening vibration-free, the pump base must be filled.
Grout should be composed of specific compounds available in the construction appliance market which prevent shrinkage through grout setting as well as full base filling and do not allow blanks or gapes. See fig. 11.

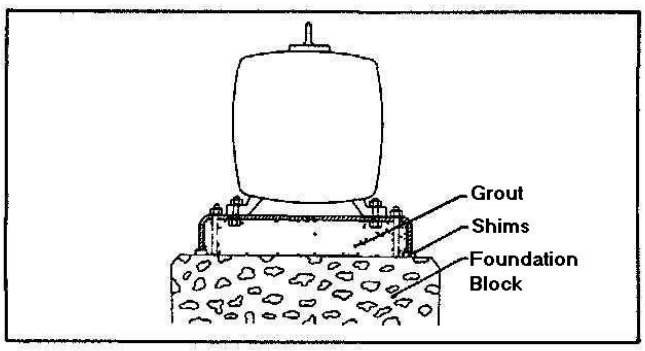


Fig.11 – Filling of the base with grout

12.4 Coupling alignment

The useful lift of the turning 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 remade because during transportation and handling, the motor-pump assembly is subjected to deformations, which 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 the coupling halves, adjust the position of the feeler perpendicular to the periphery of the other half of the coupling. Move the dial to zero and move manually the coupling half in which the instrument basis is fixed, making the dial complete a 360 degrees turn. See Fig. 12. The same procedure should be performed to control the axial displacement.

See fig. 13.

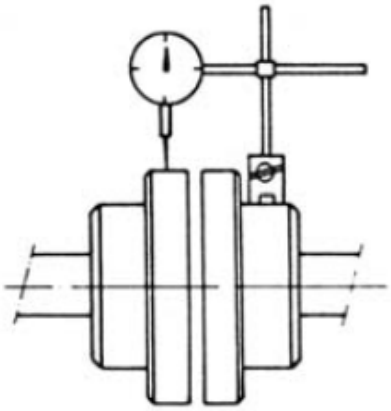


Fig. 12 – Radial Control

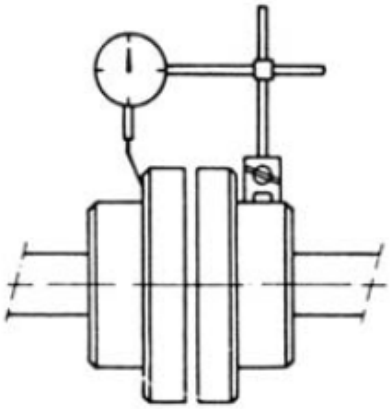


Fig.13 – Axial Control

To correct the alignment, loosen the driver bolts and replace driver over the side face or insert shim to adjust height as required. Axial and radial alignments should remain with a tolerance of 0.1 mm 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. See fig. 14. Observe the sleeve coupling hub clearance specified by the manufacturer.

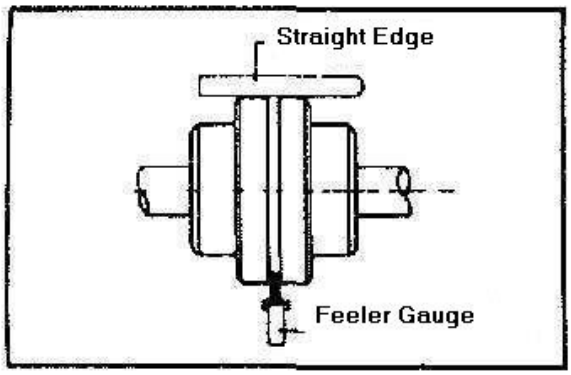


Fig.14 – Alignment with straight edge and feeler gauge

12.5 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 grout initial base.

b) The suction piping should be as straight and short as possible, saving 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 1 and 2 m/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 a horizontal position coincident with the pump's generatrix, so as to prevent air pockets.

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

g) The suction line flange should fit to the pump suction flange without any stress or tension 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 cracked parts 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 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 opened. 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 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 pipe line.

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.

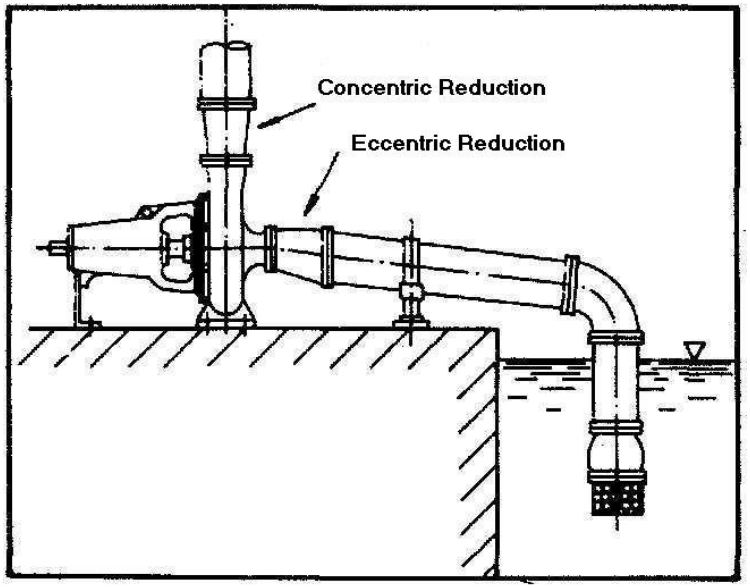


Fig.15 – Negative suction

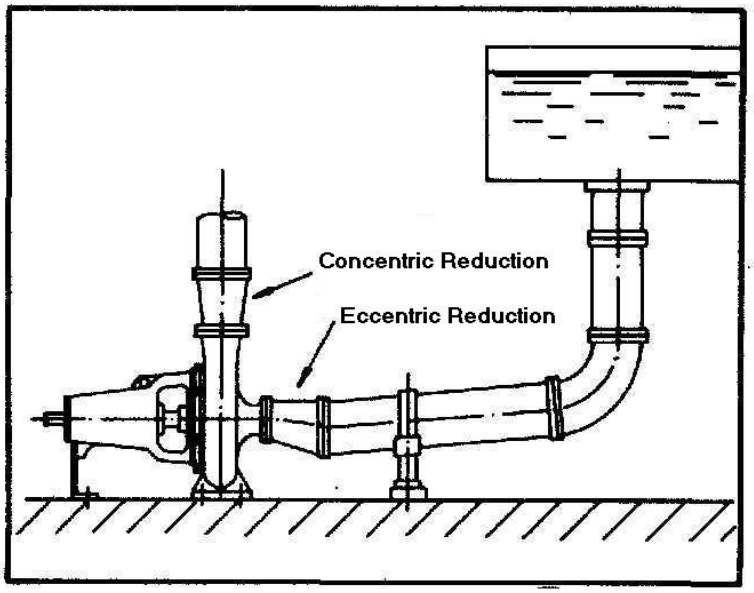


Fig. 16 – Positive suction

12.6 Discharge Pipeline - recommendations

To install the discharge pipeline follow these instructions:

a) if the overpressures originated in liquid returning on long 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 connection 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 valve, if possible immediately after the discharge nozzle of the pump, so as 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 valve, prevailing this condition over item d.

f) Tie band 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 pipe line described on items a, b, f, g, i, l and m are also valid for the discharge pipe line.

12.7 Auxiliary piping and connections

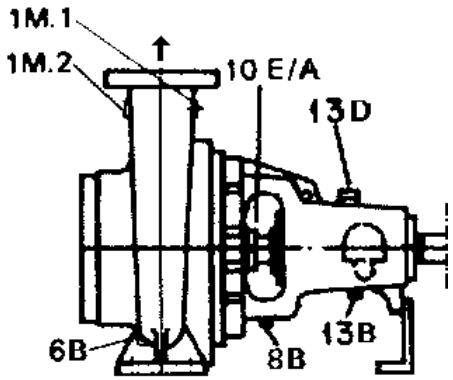


Fig. 17 – Auxiliary piping and connections

Connections	Denomination	NPT Thread
1M.1	Manometer	½”
1M.2	Manometer	½”
6B	Drain	¾”
6D	Priming ↑	1”
8B	Dripping	½”
10E	Inlet Ext. Sealing	¼”←
10A	Outlet Ext. Sealing	¼”←
13D	Lubrication	-
13B	Drain	½”

NOTES: ← for bearing brackets A50K e A60K = 3/8’
↑ 6D only for sizes 250-500 e 300-500

Table 8 – Connections

Note:

1) Inlet and outlet piping of external source liquid, should be provided with register and visor, in order to control the flow and observe the priming.

2) For pumps with Mechanical Seals it is possible to have another connections installed in the gland. In case of supply with Mechanical seals, additional instructions will follow.

13. Accessories (Optionals)

13.1 Coupling

KSB standard or from other manufacturers with or without spacer.

13.2 Electrical Motor, Turbine, Diesel Motor, etc.

13.3 KSB standard of structural welded steel with under drain channel.

13.4 Coupling Guard

KSB Standard, belts and pulley in accordance to its manufacturers. Intermediate part KSB standard. See Technical manual.

14. Operation

14.1 First start-up procedure

The following items must be provided for pump first starting:

a) Pump and its driver must be securely fastened to the base.

b) Fix firmly the suction and discharge pipelines.

c) Connect and run auxiliary pipelines and connection (if any).

d) Wiring should be done upon assuring all motor thermal overload protection is securely and adequately connected and set.

e) Check bearing for cleanliness and damp environment. Fill bearing bracket with oil in quantity and quality as specified in chapter 9.1.

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

g) Manually check for the free running of the moving parts.

h) Check that the proper coupling alignment has been done according to chapter 12.4.

i) Mount coupling guard (if any).

j) Prime pump, that is, fill the pump 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.

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

14.2 Immediate steps after first start-up

Once started-up and with the pump running 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 voltage value.

c) Assure that suction pressure value corresponds to the designed one.

d) Assure that pump runs vibration-free and without unusual noise.

e) Control bearing temperature which may reach 50° C over ambient temperature and summation should not exceed 90° C.

f) Set packing by tightening gland cover nuts about 1/6 turn. Since every just performed packing requires a certain period to set, this packing should be followed within the first 5 to 8 hours of operation and in the event of excessive leakage, the gland cover nuts should be tightened about 1/6 turn again. During normal operation, every packing should drip. When gaskets reach the set stage, a semestral check should be enough.
Check listing 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.
If there is any abnormality during this phase, please consult chapter 16 – Operational Problems, probable causes and solutions.

14.3 Operation supervision

Depending on the disposability of personnel and on the importance of the pump, we recommend the following supervision. **In case of any irregularity, the maintenance supervisor should be called immediately.**

14.3.1 Weekly supervision

Check:

a) Operating point of the pump
b) Electric motor consumed current and network voltage
c) Suction pressure
d) Vibrations and irregular noises
e) Oil level
f) Packing leakage

14.3.2. Monthly supervision

Check:

a) Oil change interval. Consult chapter 15.2

14.3.3. Semestral supervision

Check:

a) Fixing bolts on pump, driver and base
b) Alignment of the motor-pump assembly
c) Coupling lubrication (if any)

14.3.4 Annual supervision

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

14.4 Shutdown procedure

Follow in sequence these instructions:

a) Shut off pump discharge valve

b) Turn off the driver and observe the pump assembly stop, gradual and smoothly

c) Close the suction valve (if any)

d) Close the auxiliary pipe lines (if there is no contraindication of the mechanical seal manufacturer)

15. Maintenance

15.1 Bearing Maintenance

a) Remove vent plug. Tilt the reservoir down. Pour oil through the hole left by the vent plug until oil appears in the vertical section of the elbow connecting bearing bracket and reservoir.

b) Fill up the reservoir

c) Snap the reservoir back into position. After 10 minutes, check wether the oil level in the reservoir has dropped into the support, completing this way the necessary level, which is the centerline of the inferior ball bearing indicated in the Fig. 18.

During the pump operation, if oil level reduce to approximately 1/3 of the reservoir capacity, it must be filled up according to the instructions mentioned in this item.
Attention: A defective lubrication or an excessive one may cause damage.

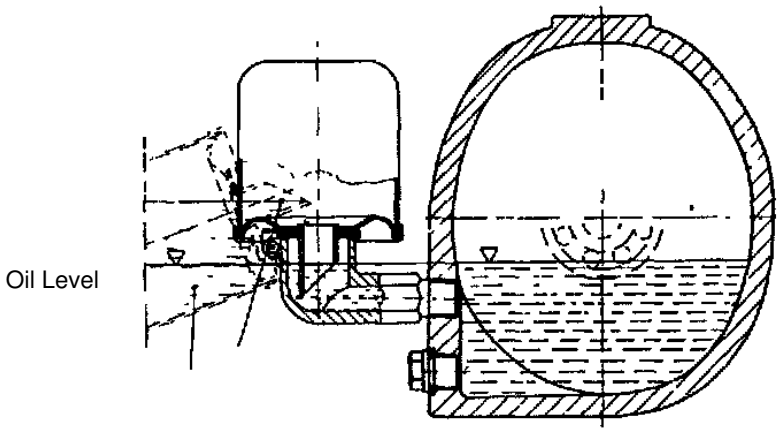


Fig.18 – Constant-Level-Oiler

15.2 Lubrication intervals and oil specifications

The first oil change should be made after the first 200 or 300 working hours. The next oil change should be made after 1500 or 2000 service hours. This will avoid dirt particles, which have not been eliminated by cleaning, to contaminate oil and damage bearings.
Then, oil change should be made every 8000 effective working hours or at least once a year (the one becomes first).
Bearings should be washed every 2 years (as a minimum).

Manufacturer	Up to 3.000 rpm	Over 3.000 rpm
ATLANTIC	EUREKA – 68	EUREKA-68
CASTROL	-	-
ESSO	Turbine Oil 68	Turbine Oil 46
MOBIL OIL	DTE 26	DTE 24
IPIRANGA	IPITUR AW-68	IPITUR AW-46
PETROBRÁS	MARBRAX TR-68	MARBRAX TR-46
TEXACO	REGAL R & O - 68	REGAL R & O – 46

Table 9 – Oil specifications

15.3 Oil Quantity

Oil quantity for KSB Megaflow bearing brackets.

Bearing bracket	Oil volume (ml)
CS40	200
CS50	400
A30K	100
A40K	170
A50K	200
A60K	480
P55/140s	1500
P65/160X	1800
P65/160ax	1500
P80/200S	4500

Table 10

15.4 Shaft Sealing Maintenance

15.3.1. Mechanical Seal Maintenance

In case of pump supply with mechanical seal, additional instructions of the seal manufacturer will follow attached to this manual.

15.3.2 Gasket Maintenance

If the packing has already been pressed an equivalent of one packing ring thickness and even so the leaking is excessive, it will need maintenance according to the following instructions:

- Stop the pump
- Loosen the gland cover nut and remove it. To remove it, as it is split, 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 the help of a flexible rod, all the packing rings and the lantern ring
- Clean the stuffing box chamber
- Check the condition of the shaft protecting sleeve. If it is rough air has grove that could damage the packing, the sleeve may be remachined on its diameter up to a maximum of 1 mm, or changed by a new one.
- Cut new packing rings, if possible with slanted ends (see Fig. 19). To facilitate this cutting operation a very simple device may be constructed as shown (see Fig.20).

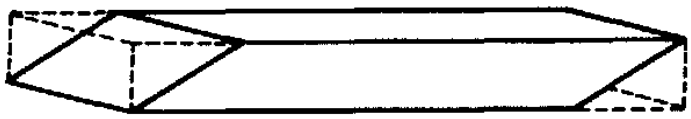


Fig. 19 – Slanted cut of the gasket

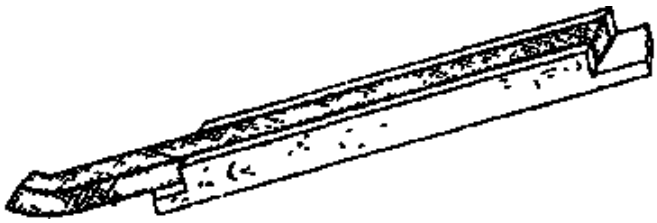


Fig. 20 – Gasket rings cutting device

- anoint the inner diameter of each packing ring with grease
- anoint the outer diameters of the lantern ring, of the gland bush and of the gland 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 end 90° from each other (See Fig. 21).

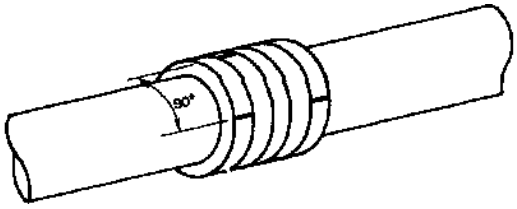


Fig. 21 – Ring position with ends 90° from each other.

After all parts have been installed in the stuffing box chamber, 3 mm should remain as a guide for the gland cover.

15.5 Wear Parts Maintenance

When the pump presents wear between the wear plate of the volute casing and the outlet diameter of the impeller hub suction side and if the casing and the impeller are in good conditions, the wear plate should be replaced.
KSB and Dealer Network supply wear plate for repair or as spare parts, to be applied in the KSB Megaflow pumps, K/O/E types.
They are supplied with the groove outlet diameter in the appropriate tolerance, and the inlet diameter with 2 mm (0,079") overmetal.

15.4.1 When replacement is necessary

The replace of the wear plate must be done when the clearance between the plate and the impeller presents wear value 3 times over the maximum clearance shown on tables 9 and 10 or when the pump presents outstanding power failure.

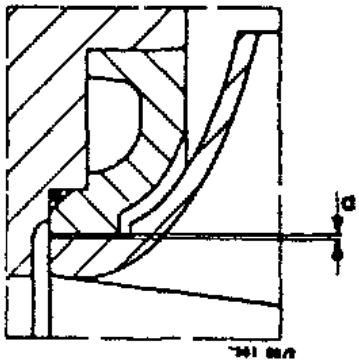


Fig.22 – Clearance, Impeller type K

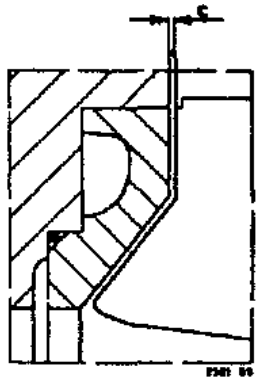


Fig.23 – Clearance, Impeller type O

Size	Clearance		
	Impeller K (a)		Impeller O (c)
	Iron	Steel	
50-160; 50-200; 65-200;65-315; 80-250; 80-400; 100-250; 100-315; 100-400; 125-500; 150-315	0,2 + 0,05	0,3 + 0,05	0,5
150-500; 200-315; 200-400; 250-500	0,3 + 0,05	0,35 + 0,05	
300-500	0,4 + 0,05	0,45 + 0,05	

Table 11 – Sealing Clearances (mm) for Impellers K and O

Note: For pump size 350, please consult KSB

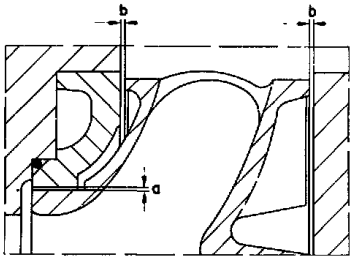


Fig.24 – Clearance Impeller type E

Pump Size	Clearance (mm)	
	a	b
80-200 100-250	0,25 + 0,05	1,0
125-315 150-400 200-500	0,45 + 0,05	1,0

Table 12 – Clearances for Impeller type E

15.4.2 Replace of the Volute Casing Wear Plate

Center the impeller through the inner passage hole of the shaft (use cutter block), machining the wear region of the impeller (hub suction side) until it becomes uniform (machining limit 2 mm of diameter). Measure it after machining.
Then remachine the plate inner diameter according to the impeller measure and following the clearances mentioned at tables 9 and 10. Extract the damaged plate from the volute casing and set the spare plate with the flat gasket and the o-ring fixing them in the casing, with screws. (901.2).

Note: The tolerance for radial and axial run out should be at maximum 0,05 mm.

15.6 Dismantling instructions

The numbers indicated in parenthesis, after the name of each part, refer to the part list and to the sectional drawing of chapter 17.
Due to this modern project, the Megaflow pumps offer maintenance advantages. They can be disassembled from the rear end, taking out the bearing bracket, discharge cover and impeller without disconnecting the volute casing (102) from the piping system. In case a spacer coupling type is used, even the drive can be kept in its place during the maintenance works.

15.5.1 Pump with packing: Bearing Brackets CS40, CS50, A30K, A40K, A50K and A60K

Close suction and discharge valves (if any). Drain the pump by removing the threaded plug (903.2)
Disconnect and remove any auxiliary connections. (if any). Remove coupling guard (if fitted). Remove the venting (672). Remove the threaded plug (903.4) and drain oil from support. Remove the constant level oiler (638) from the support.
If the coupling sleeve has spacer, remove it.
In case there is no spacer, remove the coupling sleeve by moving the drive backwards.
Take the coupling from the pump shaft. Loosen the pump foot fasteners, that fix it to the baseplate. If necessary, undo the hexagonal head bolts (901.3 or 901.6)
Tight the extractor bolts and all set will be pulled out of the casing. Pressure covers fixed with studs between casing pump and the bearing bracket do not have extractor bolts.
Set the extractor bolts to their original positions so they do not cause any problem to the assembly.
Edge the set with wood in the balance region.
Lock the shaft by means of using a device put in the region of the shaft key (904.1). Loosen and remove the impeller nut (922) and the gasket (400.3) Do not damage the gasket.
Take out the impeller (230), the shaft key (940.2) and the gasket (400.1). Undo the hexagonal head bolts (901.6) if existing. Loosen the nuts (920) and remove the gland cover (452). Extract the discharge cover (163) and the gasket (400.1). Then, remove the shaft protecting sleeve (524). Remove the thrower (507) and the key (940.1). Loosen the hexagonal head bolt (901.4), setting free the pump foot (183). By loosening the bolts (901.5), remove the bearing covers (360) and the gaskets (400.4).

Carefully, remove the shaft (210) from the casing pump side to drive end side. The shaft with the bearing (321) and the inner ring of the other bearing (322) will be released from the bearing bracket (330). Then, remove the parts located in the sealing chamber as packing rings (461), lantern ring (458), neck bush (456).
After this procedure, all parts will be available to analysis and maintenance.

15.5.2 Pump with packing: Bearing Brackets P65/160X and P60/200S

Close suction and discharge valves (if existing). Drain the pump by removing the threaded plug (903.1). Disconnect and remove any auxiliary connections. (if existing). Remove the venting (672). Remove the threaded plug (903.5) and drain the oil from the bearing bracket. Remove the constant level oiler (638) from it.

In case of spacer coupling type, take the spacer out.
In case there is no spacer, remove the coupling sleeve by moving the drive backwards. Take the coupling sleeve from the shaft pump, loosening before, the Allen bolt. Loosen the pump foot fasteners that fix it to the baseplate.
Loosen the nuts (920.1).
Fast the extractor bolts and all set will be pulled out of the casing.
Put back the extractor bolts (901.1) to their original positions so they can not upset the assembly later.
Wedge with wood, the set in the balancing region.
Lock the shaft by means of using a device put in the region of the coupling sleeve key (940.2)
Loosen and remove the impeller nut (922) and the gasket (400.3).
Loosen the nuts (920.2) and remove the gland cover (452).
Extract the pressure cover (163) and the flat gasket (400). Extract the shaft protecting sleeve (524). Remove the thrower (507) and the key (940.2). Loosen the bolt (901.1) and set free the pump foot (183). Loosen the bolts (901.2) and (920.6).
Extract the bearing covers (360) and flat gaskets (400.2). Take care not to damage the radial seal ring (421), liberated together with the bearing covers. Remove the shaft (210) from the pump side to the motor side, making the bearing (320) to slip out of the bearing bracket (330). Extract the parts located in the sealing chamber, as packing rings (461), lantern ring (458), neck ring (457), neck bush (456). After this procedure, all parts will be available for analysis and maintenance.

Bearing Bracket P65/160X

Since it has bearing casing (382), loosen the bolts (901.6) and remove the shaft (210) from the pump side to the motor side, making the bearing casing (382) to slip out of the bearing bracket (330). Extract the circlip (932.2) and the washer (551) from the bearing casing. Rely the bearing casing on a piping of the same diameter and with a piece of lead strike against the shaft (210) in order to extract the bearing casing (382).

15.5.3 Pumps Disassembly Sequence with Mechanical Seal

Loosen the auxiliary pipings (if any) and the gasket. Follow the other instructions of the Instructions Manual of the Mechanical Seal, which will follow with the pump in case of seal supply.

15.7 Assembly Instructions

All the parts must be cleaned and deburred before Assembly.

15.7.1 Bearing Brackets CS40 and CS50

The individual parts have been placed in a clean and level assembly area. All dismantled parts have been cleaned and checked for wear. Any damaged or worn parts have been replaced by original spare parts. The sealing surfaces have been cleaned.

Warning: Hot surfaces due to heating of components for assembly/dismantling
Risk of burns!
▷ Wear heat-resistant protective gloves.
▷ Remove flammable substances from the danger zone.

Heat up deep groove ball bearing (321.01/.02) in an oil bath to approx. 80°C and slide it onto shaft (210) until it will not go any further.Carefully slide pre-assembled shaft (210) with deep groove ball bearing (321.01/.02) into bearing bracket (330). Fit pump-end bearing cover (360.01) with joint ring (400.01); take care not to damage lip seal 421.(02). Fit drive-end bearing cover (360.02) with joint ring (400.02); take care not to damage lip seal (421.02). Fit throwers (507.01) and (507.02), if any, and align flush with the shaft shoulder. Fit keys (940.02). Pull the coupling hub onto the shaft end. Secure the coupling hub with a set screw.

15.7.2 Bearing Brackets A30K, A40K, A50K and A60K

Before the assembly in the shaft, the bearing is heated in the furnace or in an oil bath up to a maximum temperature of 80 to 90ºC above the shaft temperature, observing the maximum limit of 125ºC.

Mount the bearing (320) and the bearing inner ring (322) in the shaft. With a piece of lead, mount the shaft in the support, from the suction side, making the external side of the bearing slide into the support until they reach the same measures in both sides of the support for setting the bearing covers. Mount the radial seal ring (421) in the bearing covers (360). Mount the covers, carefully, in order not to damage the radial seal rings with the flat gasket (400.4). Fasten the bolt (901.5). Fit the support feet (183) and fasten the bolt (901.4) with the washer (554.2).
Edge with wood the bearing bracket (330) in the part in balance. Introduce the thrower in the shaft, however do not lean it against the bearing cover.
Mount the studs (902) in the discharge cover. Make the assembly of the seal rings in the sealing chamber according to the instructions of chapter 15.3.2. Mount the gland cover (452), leaning the nuts (920). Mount the protective sleeve (524) in the shaft, anointing the inner diameter with molykote G: guide the flat gasket (400.2) in the discharge cover: insert the discharge cover (163) in the bearing bracket (330) and fix it with bolts (901.6) (crossed and uniform scrape) if any; mount the flat gasket (400.3); the key (940.2); the impeller (230), (anoint the inner diameter with molykote G); the flat gasket (400.3) and the impeller nut (922). Mount the drive side key (940.1); lock the shaft with disposal and tight firmly the impeller nut. Introduce all the set in the volute casing (102) guiding the assembly through the skew notch diameter of the discharge cover. Mount the bolts (901.3) with the washers (554.3), tightening them crossed and uniform. Mount the lubricate glass (638) in the support, using teflon tape in the glass thread. Be sure, manually, that the rotor rotates free.

15.6.2 Pump with packing – Bearing Brackets: P65/160 X and P80/200S

Before the assembly in the shaft the bearing is heated in the furnace or in an oil bath up to a maximum temperature of 80 to 90ºC above the shaft temperature, observing the maximum limit of 125ºC. Mount the bearing (320) and the bearing inner ring (322) in the shaft. With a piece of lead, mount the shaft in the support, from the motor side, making the external side of the bearing slide into the support until it reaches the ring (932.2). Mount the radial seal ring (421) in the bearing covers (360). Mount the covers, carefully, in order not to damage the radial seal ring and the flat gaskets (400.2). Fix the bolts (901.2). Fit the support feet (183) and fix the bolt (901.3) with the washer (554.2). Edge with wood the bearing bracket (330) in the part in balance. Introduce the thrower in the shaft, however do not lean against the bearing cover.
Mount the studs in the discharge cover (902.2). Make the assembly of the seal rings in the sealing chamber according to the instructions of chapter 15.3.2. Mount the gland cover (452), leaning the nuts (920). Mount the protective sleeve (524) in the shaft, anointing the inner diameter with molykote G: guide the flat gasket (400.1) in the discharge cover: insert the discharge cover (163) in the bearing bracket (330), mount the flat gasket (400.3), the key (940.1), the impeller (230), (anoint the diameter with molykote G), the flat gasket (400.3) and the impeller nut (922).
Mount the drive side key (940.2), lock the shaft with disposal and tight firmly the impeller nut. Introduce all the set in the volute casing (102) guiding the assembly through the skew notch diameter of the discharge cover. Mount the nuts (920.1), tightening them crossed and uniform. Mount the lubricate glass (638) in the support, using teflon tape in the glass thread. Be sure, manually, that the rotating element rotates free.

Bearing Bracket: P65/160X

Since it has bearing case (382), mount the bearings (320) in the shaft (210) and put the bearing case (382) in the bearings (320) until it reaches the basis, mount the ring spacer (551) and the lock ring (932.2). Put o-ring (412.3) and mount the shaft in the bearing bracket (330).

15.6.3 Sequence of Pump Assembly with Mechanical Seal

See Instruction Manual, which will follow with the pump in case of supply.

16. Operational Problems, Probable Causes and Solutions

Operational Problems	Probable Causes and Solutions
Insufficient Flow Drive Overload	1, 2, 3, 4, 5, 6, 8, 9, 10, 11 12, 13, 14, 15, 28
Pump final pressure excessively high	15
Bearings Overheating	22, 23, 25, 26, 31, 34
Pump leakage	16
Excessive leakage at the shaft sealing	17, 18, 22, 23
Irregular pump operation, presents noise	3, 6, 11, 15, 21, 22, 23, 25, 30, 31, 32
Excessive heating of the pump casing	3, 6, 21, 32

Table 13

1- The pump is treading with an excessively high pressure on.
- Adjust the pump to the operational point.

2- Total height of installation (counter pressure), higher than the pump nominal height
- install an impeller with bigger diameter.
- increase the rotation (if turbine or combustion engine).

3- Pump and or suction piping are not totally full of liquid to be pumped or sealed.
- fill up the pump and the suction piping with the liquid to be pumped and / or seal both.

4- Suction piping and / or impeller are obstructed.
- remove the obstructions from the piping and / or impeller.

5- Air pocket formation in the piping.
- Change the piping layout.
- if necessary install venting valve.

6- Available NPSH too low (installation with negative suction).
- check and if necessary correct the level of pumped liquid.
- install the pump in a level lower than the suction reservoir.
- open completely the register of suction piping.
- change the suction piping in order to decrease load loss, if any excessive loss.

8- Air inlet in the sealing chamber.
- clear the channel that supplies liquid for lubrication/ sealing of the sealing chamber.
- maintenance of the gasket or mechanical seal.

9- Incorrect rotation direction.
- reverse one of the phases of the motor cable.

10- Low rotation.
- increase rotation.

11- Wear of the pump intern parts.
- change the wasted parts.

12- Installation total height (counter-pressure), inferior to the specified in the order.
- adjust the pump to the operation point.
- in case the overloads continues, low the impeller.

13- Density or viscosity of the pumped liquid is higher than the specified in the order.

14- The gland cover is incorrect tighten.
- correct it.

15- Too high rotation.
- reduce it.

16- The flat gasket between the volute casing and discharge cover is defective.
- change it.

17- Shaft sealing is not enough (wasted).
- change the sealing.
- check if the pressure of lubricating liquid / chamber sealing is not excessively high.

18- Excessive grooving, score marks or roughness on shaft protect sleeve. Gasket between impeller and sleeve is defective.
- Change protecting sleeve or gasket.

21- Pump presents excessive noise during operation.
- Correct suction condition.
- Increase pressure at the pump suction nozzle.

22- Pump set misaligned.
- align the set.

23- Pump parts are out of specified radial and axial run out. Suction and discharge pipings carry mechanical tension out.
- correct radial and axial run out of the parts or change them.
- eliminate the existing tension fixing the piping appropriately or if necessary install compensation gaskets.

25- Too much, too little or unsuitable bearing lubricant.
- reduce, complete or use an appropriate oil.

26- The clearance of the coupling sleeve is not being followed.
- use the correct clearance.

28- Motor is operating with only two phases.
- change the defective fuse.
- check, deburr and balance the impeller.

31- Defective bearings.
- change them.

32- Insufficient flow.
- increase the minimum flow.

33- Defect in the feet of the sealing liquid of the sealing chamber.
- decrease the pressure of the sealing liquid.

34- Friction of the rotating and stationary elements.
- control, adjust or change parts.

17. Cross Sectional Drawing / Parts List / Materials

17.1 Execution with K Impeller – Bearing Brackets CS40 and CS50

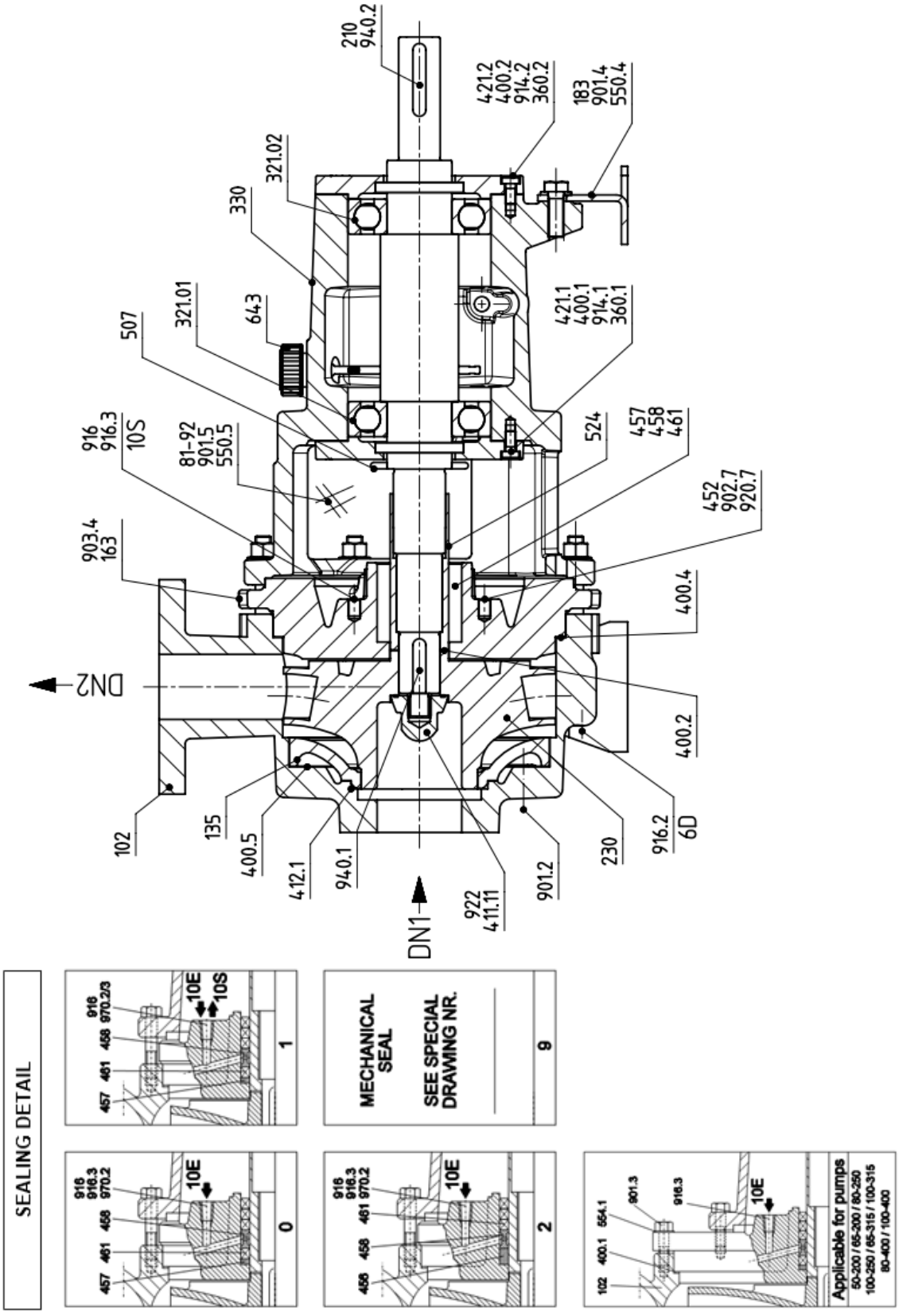


Figure 25

17.2 Parts List – K Impeller – Bearing Brackets CS40 and CS50

Description	Part Nº	Qty.
Volute casing	102	1
Wear plate	135	1
Discharge cover	163	1
Support foot	183	1
Shaft	210	1
Impeller	230	1
Bearing	321	1
Bearing bracket	330	1
Bearing cover	360.1	1
Bearing cover	360.2	1
Flat gasket	400.1	1
Flat gasket	400.2	1
Flat gasket	400.3	1
Flat gasket	400.4	1
Flat gasket	400.5	1
Joint ring	411	1
O´Ring	412.1	1
Radial seal ring	421.1	1
Radial seal ring	421.2	1
Gland cover	452	1
Neck ring	457	1
Lantern ring	458	1
Packing (2)	461	(3)
Thrower	507	1
Shaft protection sleeve	524	1
Washer	550.1	8
Washer	550.4	1
Washer	550.5	8
Constant level oiler	638	1
Oil dipstick	643	1
Hexagonal head bolt	901.2	4
Hexagonal head bolt	901.3	1
Hexagonal head bolt	901.4	1
Hexagonal head bolt	901.5	8
Hexagonal head bolt	901.31	2
Stud	902.1	8
Threaded plug	903.1	2
Hexagonal head bolt	914.1	3
Hexagonal head bolt	914.2	3
Threaded insert	915	1
Threaded plug	916.1	3
Threaded plug	916.2	1
Threaded plug	916.7	1
Nut	920.1	8
Nut	920.7	2
Impeller nut	922	1
Key	940.1	1
Key	940.2	1
Nameplate	970.1	1
Nameplate (8)	970.2	1
Nameplate (9)	970.3	1
Cover plate	81-92	2

Notes:	
(1)	Applicable only for sealing code 2
(2)	Anti-friction graphite asbestos
(3)	Quantity: 04 for sealing 0 and 1 Quantity: 03 for sealing 2
(4)	Used only on sealing 0, 1 and 2
(5)	Used only on sealing 2

Table 14

17.3 Execution with K Impeller – AK Bearing Bracket

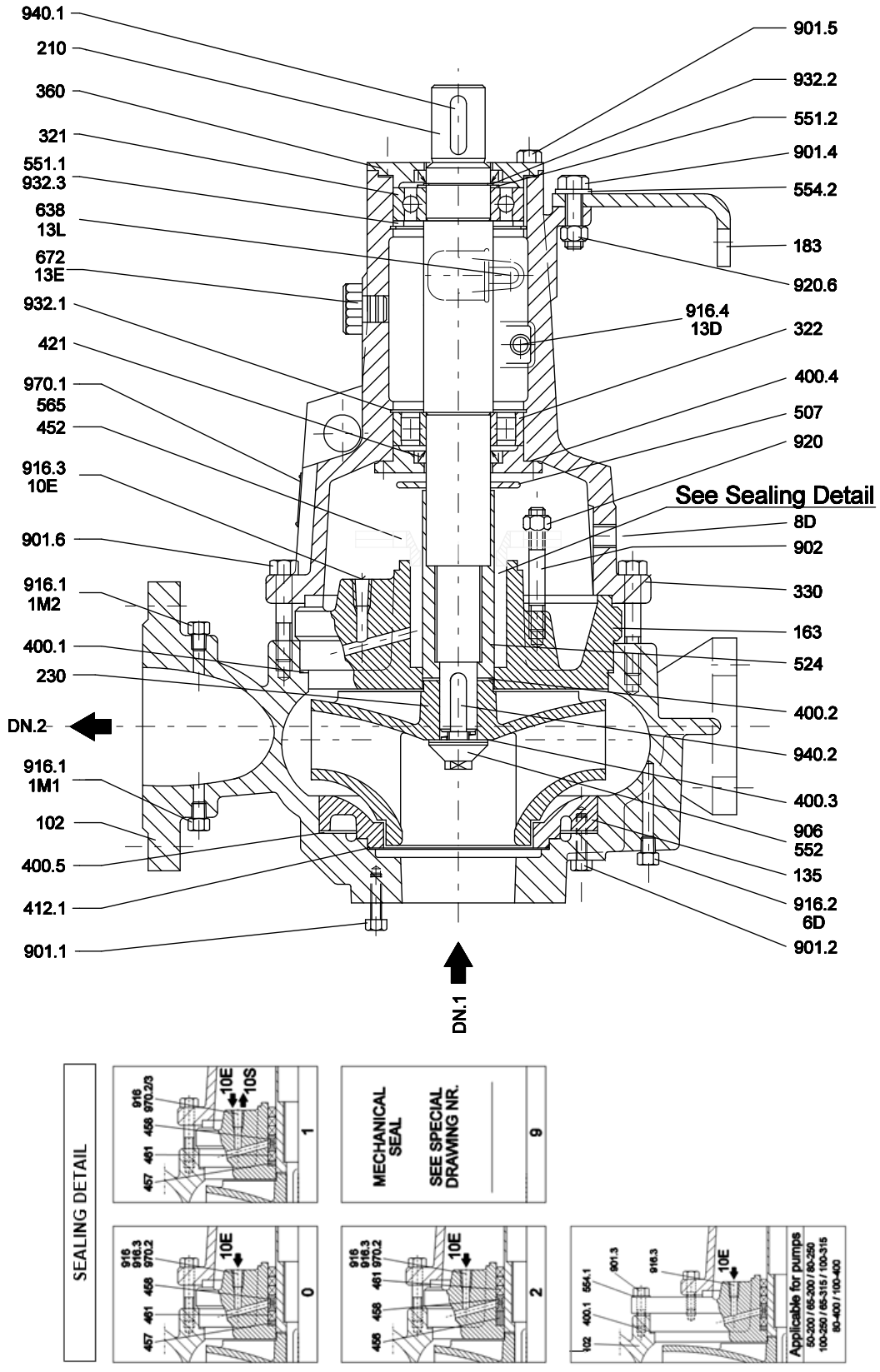


Figure 26

17.4 Execution with O Impeller – AK Bearing Bracket

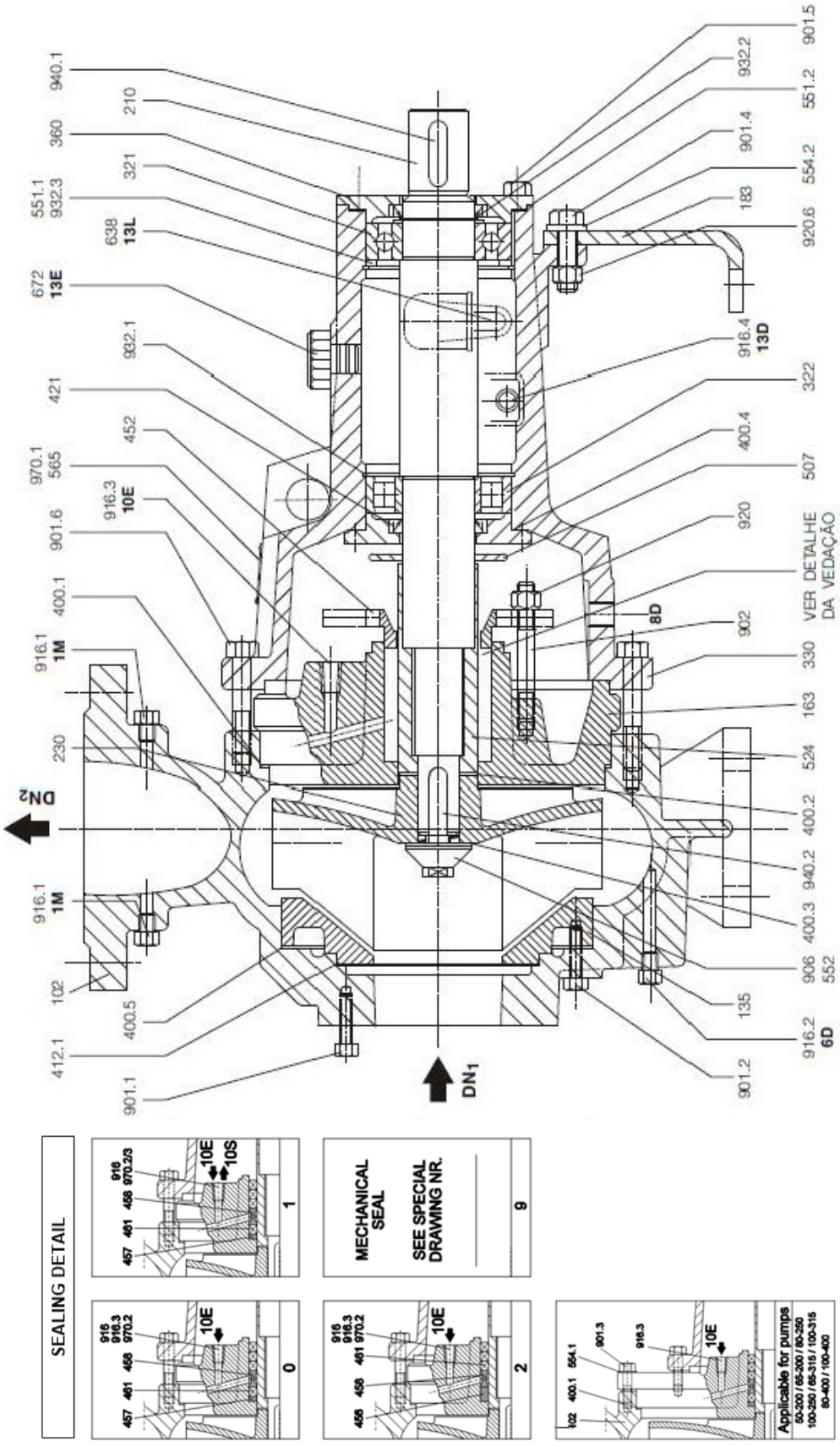


Figure 27

17.5 Parts List – K/O Impeller – AK Bearing Bracket

Denomination	Part nº	Qtty
Volute casing	102	1
Wear plate	135	1
Discharge cover	163	1
Support foot	183	1
Shaft	210	1
Impeller	230	1
Bearing (2)	321	1
Bearing (2)	322	1
Bearing bracket	330	1
Bearing cover	360	2
Flat gasket	400.1	1
Flat gasket	400.2	1
Flat gasket	400.3	1
Flat gasket	400.4	2
Flat gasket	400.5	1
O'Ring	412.1	1
Radial seal ring	421	2
Gland cover	452	1
Neck bush (3)	456	1
Neck ring	457	1
Lantern ring	458	1
Gland packing (4)	461	(5)
Thrower	507	1
Shaft protecting sleeve	524	1
Washer	551.1	1
Washer	551.2	1
Locking disc	552	1
Washer	554.1	(6)
Washer	554.2	1
Rivet	565	(8)
Constant-level-oiler	638	1
Venting	672	1
Hexagonal head bolt	901.1	(9)
Hexagonal head bolt	901.2	(7)
Hexagonal head bolt	901.3	(6)
Hexagonal head bolt	901.4	1
Hexagonal head bolt	901.5	8
Hexagonal head bolt	901.6	(10)
Stud	902	2
Impeller screw	906	1
Plug	916	(12)
Threaded plug	916.1	2
Threaded plug	916.2	1
Threaded plug	916.3	(11)
Threaded plug	916.4	1
Nut	920	2
Nut	920.6	1
Circlip	932.1	2
Circlip	932.2/3	1
Key	940.1	1
Key	940.2	1
Plate	970.1	1
Plate (13)	970.2	1
Plate (14)	970.3	1

Note:

(2) For bearing bracket A30 K part 321 bearing motor side = 6306 C3
For bearing bracket A30 K part 322 bearing pump side = NU 306 C3
For bearing bracket A40 K part 321 bearing motor side= 6308 C3
For bearing bracket A40 K part 322 bearing pump side = NU 308 C3
For bearing bracket A50 K part 321 bearing motor side = 6310 C3
For bearing bracket A50 K part 322 bearing pump side = NU 310 C3
For bearing bracket A60 K part 321 bearing motor side = 6312 C3
For bearing bracket A60 K part 322 bearing pump side = NU 312 C3

(3) Applicable only for sealing code 2

(4) Anti-friction graphite
(5) Quantity: 4 for sealing 0 and 1
Quantity: 3 for sealing 2

(6) Quantity: 8 for pumps 50-200/65-200
Quantity 12 for pumps 80-250/100-250/65-315/100-315
Quantity: 16 for pumps 80-400/100-400

(7) Quantity: 4 for pumps 50-160/50-200/65-200/80-250/100-250

Quantity: 8 for pumps 65-315/100-315/150-315/200-315/
80-400/100-400

(8) Quantity: 6 for sealing 9
Quantity: 8 for sealing 0 and 2
Quantity: 10 for sealing 1

(9) Quantity: 4 for pumps 50-160/50-200/65-200/65-315
Quantity: 8 for pumps 80-250/80-400/100-250/100-315
100-400/130-315/200-315

(10) Quantity: 6 for pumps 50-160/50-200/65-200/80-250
Quantity: 8 for pumps 65-315/100-315/100-250
Quantity: 12 for pumps 150-315/200-315/80-400/100-400

(11) Quantity: 1 for sealing 0 and 2
Quantity: 2 for sealing 9
Not used in the sealing 1

(12) Quantity: 1 for sealing 0 and 2
Quantity: 2 for sealing 1
Not used in the sealing 9

(13) Used only in the sealing 0, 1 and 2

(14) Used only in the sealing 1

Table 15

17.6 Execution with Impeller K/O Bearing Bracket P65/160

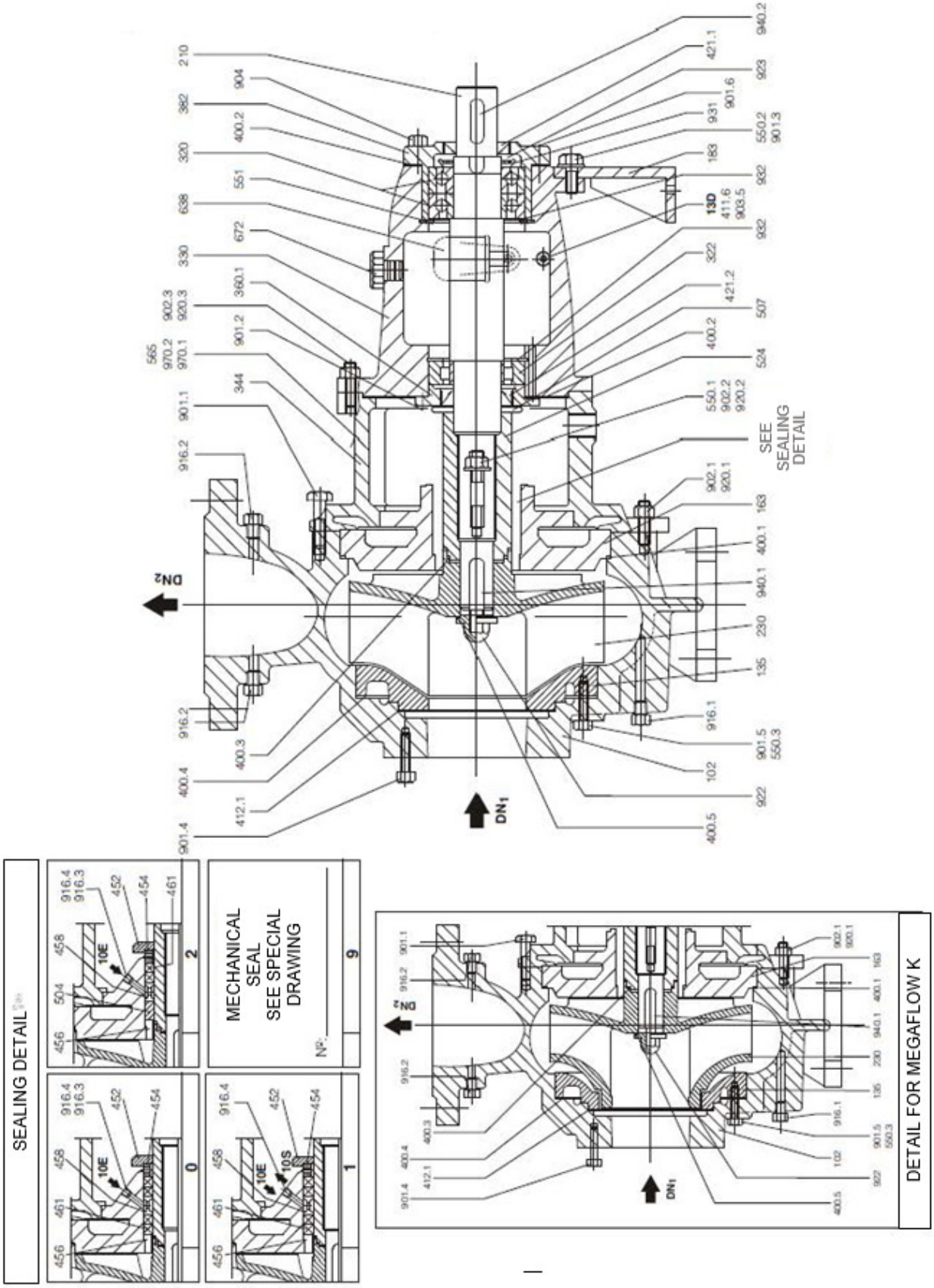


Figure 27

17.7 Parts List – K/O Impellers – Bearing Bracket P 65/160 X

Denomination	Part №	Qtty
Volute casing	102	1
Wear plate	135	1
Discharge cover	163	1
Support foot	183	1
Shaft	210	1
Impeller	230	1
Bearing (1)	320	2
Bearing (1)	322	1
Bearing bracket	330	1
Bearing bracket lantern	344	1
Bearing cover	360.1	1
Bearing casing	382	1
Flat gasket	400.1	1
Flat gasket	400.2	2
Flat gasket	400.3	1
Flat gasket	400.4	1
Flat gasket	400.5	1
Gasket	411.6	1
O'Ring	412.1	1
O'Ring	412.3	1
Radial seal ring	421.1/.2	1
Gland cover	452	1
Gland cover ring	454	1
Neck bush	456	1
Lantern ring	458	1
Gland packing (3)	461	(2)
Spacer ring	504	(4)
Thrower	507	1
Shaft protecting sleeve	524	1
Washer (5)	550.1	13
Washer	550.2	1
Washer	550.3	11
Spacer disc	551	1
Locking disc	552	1
Rivet	565	(14)
Constant-level-oiler	638	1
Venting	672	1
Hexagonal head bolt	901.1	(9)
Hexagonal head bolt	901.2	(4)
Hexagonal head bolt	901.3	1
Hexagonal head bolt	901.4	(10)
Hexagonal head bolt	901.5	(11)
Hexagonal head bolt	901.6	(4)
Stud	902.1	(12)
Stud	902.2	(13)
Stud	902.3	4
Threaded plug	903.5	1
Threaded pin	904	3
Plug	916	(8)
Threaded plug	916.1	1
Threaded plug	916.2	2
Threaded plug	916.3	(7)
Nut	920.1	(12)
Nut	920.2	(13)
Nut	920.3	4
Impeller nut	922	1
Bearing nut	923	1
Lock washer	931	1
Circlip	932	2
Key	940.1	1
Key	940.2	1
Plate	970.1/2	1
Plate (15)	970.3	1
Plate	970.4	1

Notes:

(1) For bearing bracket P65/160X part 322 bearing pump side = NU 413

(2) Quantity 4 for sealings 0 and 1
Quantity 3 for sealing 2

(3) Anti-friction graphite

(4) Used only for sealing

(5) Not used for sealing 9

(7) Quantity: 1 for sealing 0 and 2
Quantity: 2 for sealing 9. Not used in sealing 1

(8) Quantity 1 for sealing 0 and 2
Quantity 2 for sealing1. Not used in sealing 9

(9) Quantity: 2 for pumps with impellers ∅ 200
Quantity: 3 for pumps with impellers ∅ 250
Quantity: 4 for pumps with impellers ∅ 315/400/500

(10) Quantity: 4 for pumps with suction ∅ 100/125/150/200
Quantity: 8 for pumps with suction ∅ 100/125/150/200
Quantity: 12 for pumps with suction ∅ 200/250

(11) Quantity: 4 for pumps with impellers ∅ 200/250
Quantity: 8 for pumps with impellers ∅ 315/400/500

(12) Quantity: 8 for pumps with impellers ∅ 200
Quantity: 12 for pumps with impellers ∅ 250/315
Quantity: 16 for pumps with impellers ∅ 400
Quantity: 20 for pumps with impellers ∅ 500

(13) Quantity: 2 parts for pumps with gasket
Quantity: 4 parts for pumps with mechanical seal

(14) Quantity: 6 for sealings 9
10 for sealing 1

(15) Not used for sealing 9

(16) Only used in sealing 1

Table 16

17.8. Execution with Impeller K and Bearing Bracket P80/200S

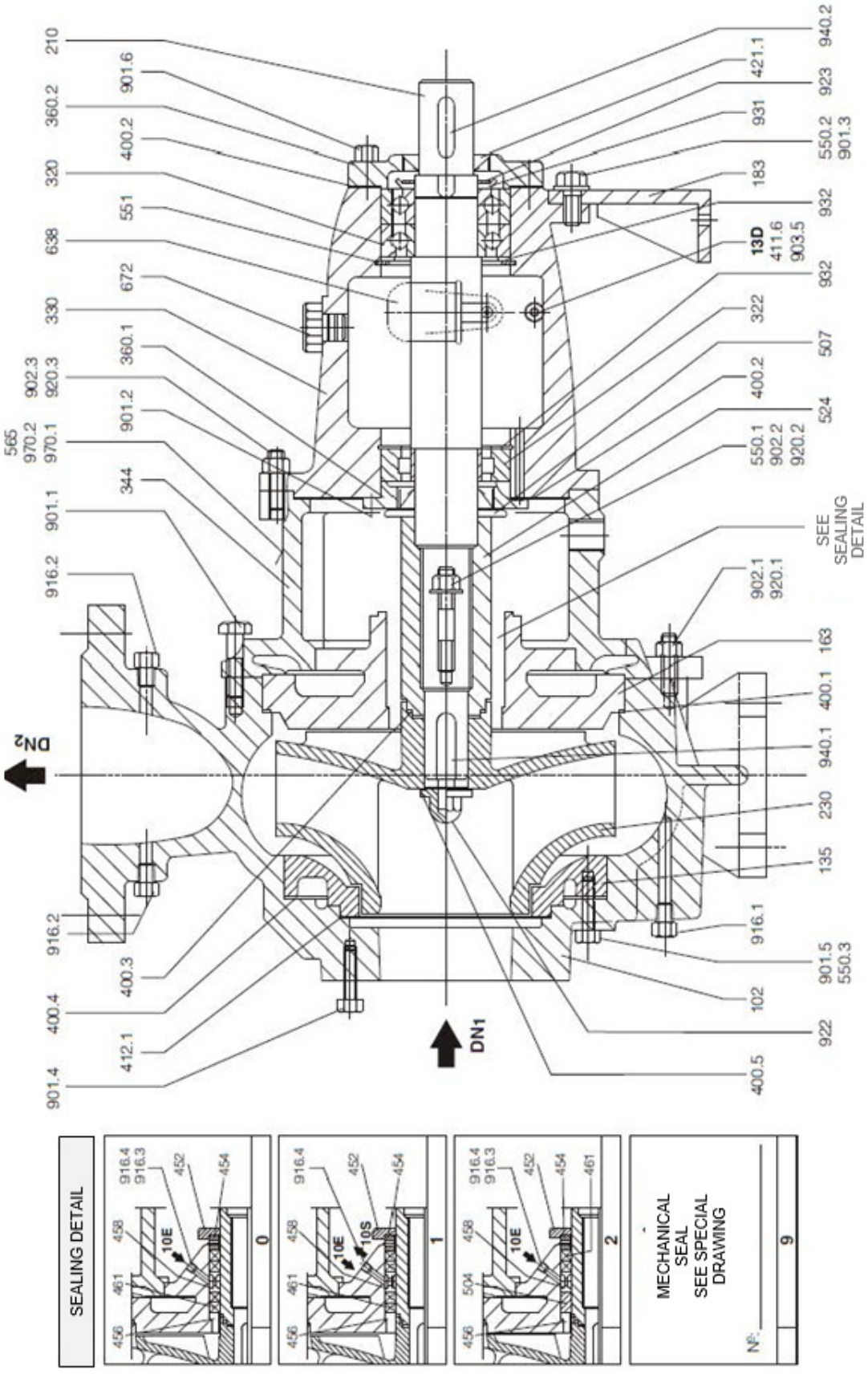


Figure 28

17.9 Parts List - K Impeller – Bearing bracket P 80/200S

Denomination	Part Nº	Qtty
Volute casing	102	1
Wear plate	135	1
Discharge cover	163	1
Support foot	183	1
Shaft	210	1
Impeller	230	1
Bearing (1)	320	2
Bearing (1)	322	1
Bearing bracket	330	1
Bearing bracket lantern	344	1
Bearing cover	360.1	1
Bearing casing	360.2	1
Flat gasket	400.1	1
Flat gasket	400.2	2
Flat gasket	400.3	2
Flat gasket	400.4	1
Flat gasket	400.5	1
Gasket	411.6	1
O'Ring	412.1	1
Radial seal ring	421.1	1
Radial seal ring	421.2	1
Gland cover	452	1
Gland cover ring	454	1
Neck bush	456	1
Lantern ring	458	1
Gland packing (3)	461	(2)
Spacer ring	504	(4)
Thrower	507	1
Shaft protecting sleeve	524	1
Washer (6)	550.1	2
Washer	550.2	1
Washer	550.3	(12)
Spacer disc	551	1
Locking disc	552	1
Rivet	565	(7)
Constant-level-oiler	638	1
Venting	672	1
Hexagonal head bolt	901.1	(10)
Hexagonal head bolt	901.2	(12)
Hexagonal head bolt	901.3	1
Hexagonal head bolt	901.4	(11)
Hexagonal head bolt	901.5	(12)
Hexagonal head bolt	901.6	(12)
Stud	902.1	(13)
Stud	902.2	(14)
Stud	902.3	4
Threaded plug	903.5	1
Plug	916	(9)
Threaded plug	916.1	1
Threaded plug	916.2	2
Threaded plug	916.3	(8)
Nut	920.1	(13)
Nut	920.2	(14)
Nut	920.3	4
Impeller nut	922	1
Bearing nut	923	1
Lock washer	931	1
Circlip	932	2
Key	940.1	1
Key	940.2	1
Plate	970.1/2	1
Plate (15)	970.3	1
Plate (16)	970.4	1

Notes:

(1) For bearing bracket P80/200S part 322 bearing motor side = 7319 BUA
For bearing bracket P80/200S part 322 bearing pump side = NU 416

(2) Quantity 4 for sealings 0 and 1
Quantity 3 for sealing 2

(3) Anti-friction graphite

(4) Used only for sealing 2

(6) Not used for sealing 9

(7) Quantity: 6 for sealing 9
8 for sealing 0 and 2
10 for sealing 1

(8) Quantity 1 for sealing 0 and 2
Quantity 2 for sealing 9. Not used for sealing 1

(9) Quantity: 1 for sealings 0 and 2
Quantity: 2 for sealing 1
Not used in sealing 9

(10) Quantity: 2 for pumps with impellers ∅ 160-200
Quantity: 3 for pumps with impellers ∅ 250
Quantity: 4 for pumps with impellers ∅ 315/400/500

(11) Quantity: 4 for pumps with suction ∅ 65/80

Quantity: 8 for pumps with suction ∅ 100/125/150/2000

Quantity: 12 for pumps with suction ∅ 250/300

(12) Quantity: 4 for pumps with impellers ∅ 160/200/250
Quantity: 8 for pumps with impellers ∅ 315/400/500

(13) Quantity: 8 for pumps with impellers ∅ 160/200
Quantity: 12 for pumps with impellers ∅ 250/315
Quantity: 20 for pumps with impellers ∅ 500

(14) Quantity: 2 parts for pumps with gasket
Quantity: 4 parts for pumps with mechanical seal
Not used in the version 9. Only for sealing 1

Table 17

17.10 Execution with Impeller E – Bearing Bracket AK

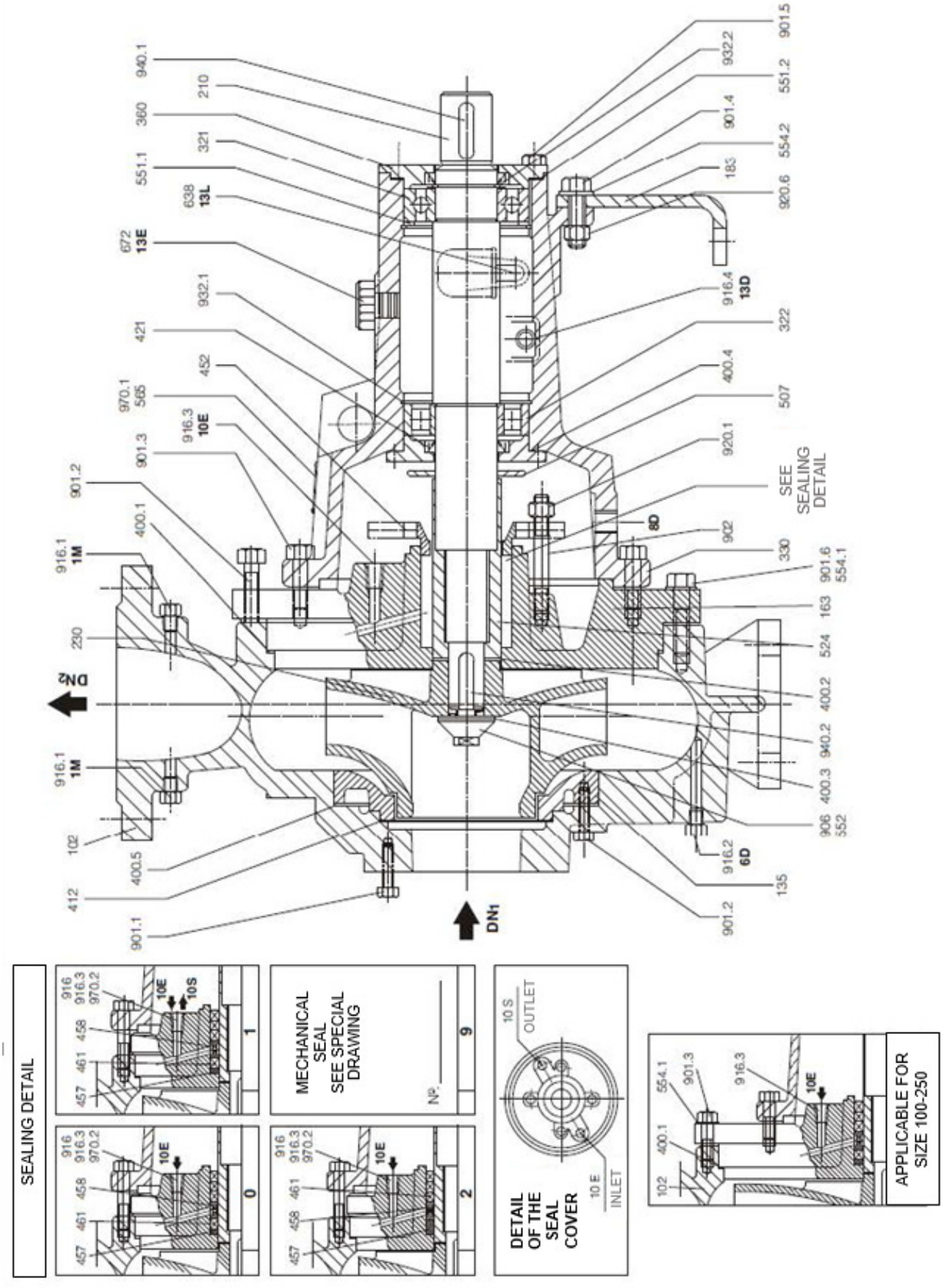


Figure 29

17.11 Parts List - E Impeller – Bearing Bracket AK

Denomination	Part Nº	Qtty
Volute casing	102	1
Wear plate	135	1
Discharge cover	163	1
Support foot	183	1
Shaft	210	1
Impeller	230	1
Bearing (2)	321	1
Bearing (2)	322	1
Bearing bracket	330	1
Bearing cover	360	2
Flat gasket	400.1/2/3/5	1
Flat gasket	400.4	2
O'ring	412	1
Radial seal ring	421	2
Gland cover	452	1
Neck bush (3)	456	1
Neck ring	457	1
Lantern ring	458	1
Gland packing	461	(4)
Thrower	507	1
Shaft protecting sleeve	524	1
Washer	551.1	1
Washer	551.2	1
Locking disc	552	1
Washer	554.1	(5)
Washer	554.2	1
Rivet	565	(6)
Constant-level-oiler	638	1
Venting	672	1
Hexagonal head bolt	901.1	(9)
Hexagonal head bolt	901.2	2
Hexagonal head bolt	901.3	(7)
Hexagonal head bolt	901.4	1
Hexagonal head bolt	901.5	8
Hexagonal head bolt	901.6	(5)
Stud	902	2
Impeller screw	906	1
Plug	916	(10)
Threaded plug	916.1	2
Threaded plug	916.2	1
Threaded plug	916.3	(8)
Threaded plug	916.4	1
Nut	920.1	2
Nut	920.6	1
Circlip	932.1	2
Circlip	932.2	1
Circlip	932.3	1
Key	940.1	1
Key	940.2	1
Plate	970.1	1
Plate (11)	970.2	1
Plate (12)	970.3	1

Notes:

(1) A48 CL30 for size 125-315

(2) For bearing bracket A40k, part 321 bearing motor side = 6308 C3
For bearing bracket A40k, part 322 bearing pump side = NU 308 C3
For bearing bracket A50k, part 321 bearing motor side = 6310 C3
For bearing bracket A50k, part 322 bearing pump side = NU 310 C3
For bearing bracket A60k, part 321 bearing motor side = 6312 C3
For bearing bracket A60k, part 322 bearing pump side = NU 312 C3

(3) Applicable only for sealing code 2

(4) Quantity 4 for sealing 0 and 1
Quantity 3 for sealing 2

(5) Quantity 8 for size 80-200
Quantity 12 for size 100-250

(6) Quantity 6 for sealing 9
Quantity 8 for sealing 0 and 2
Quantity 10 for sealing 1

(7) Quantity 6 for size 80-200
Quantity 8 for size 100-250
Quantity 12 for size 125-315

(8) Quantity 1 for sealing 0 and 2
Quantity 2 for sealing 9
Not used for sealing 1

(9) Quantity 4 for sizes 80-200 and 100-250
Quantity 8 for size 125-315

(10) Quantity 1 for sealing 0 and 2
Quantity 2 for sealing 1
Not used in the sealing 9

(11) Only used in the sealing 0, 1 and 2

(12) Only used in the sealing 2

Table 18

17.12 Execution with Impeller E and Bearing Bracket P65/160X

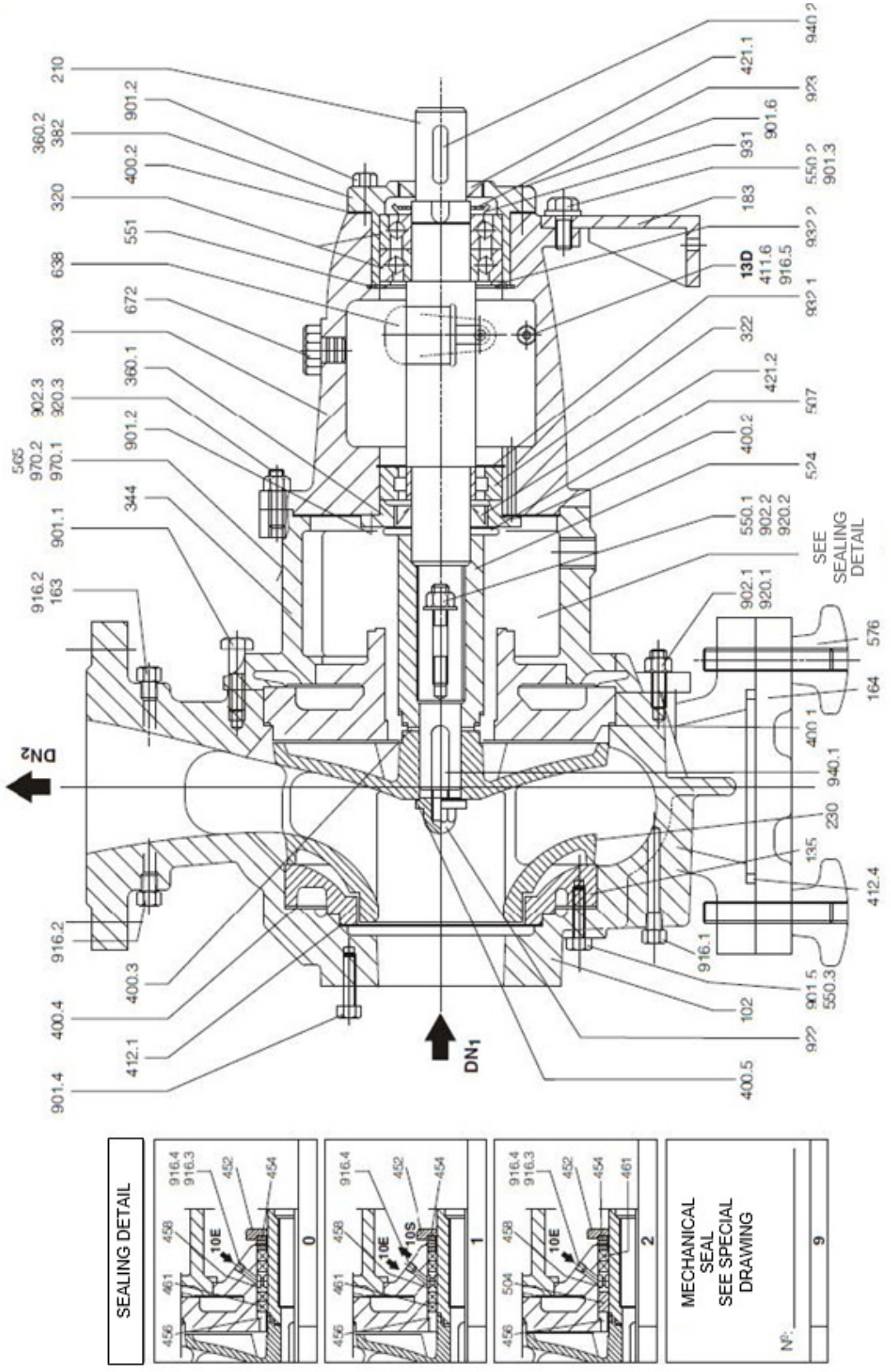


Figure 30

17.13 Parts List – Impeller E – Bearing Bracket P65/160X

Denomination	Part Nº	Qtty
Volute casing	102	1
Wear plate	135	1
Discharge cover	163	1
Inspection cover	164	1
Support foot	183	1
Shaft	210	1
Impeller	230	1
Bearing (1)	320	2
Bearing (1)	322	1
Bearing bracket	330	1
Bearing bracket lantern	344	1
Bearing cover	360.1	1
Bearing cover	360.2	1
Bearing body (2)	382	1
Flat gasket	400.1/.2/.3	1
Flat gasket	400.4	2
Flat gasket	400.5	1
Gasket	411	1
O'Ring	412.1	1
O'Ring (2)	412.3	1
O'Ring	412.4	1
Radial seal ring	421.1	1
Radial seal ring	421.2	1
Gland cover	452	1
Gland cover ring	454	1
Neck bush	456	1
Lantern ring	458	1
Gland packing (4)	461	(3)
Spacer ring (9)	504	1
Thrower	507	1
Shaft protecting sleeve	524	1
Washer (6)	550.1	2
Washer	550.2	1
Washer	550.3	2
Spacer disc	551	1
Rivet	565	(8)
Constant-level-oiler	638	1
Venting	672	1
Hexagonal head bolt	901.1	4
Hexagonal head bolt	901.2	8
Hexagonal head bolt	901.3	1
Hexagonal head bolt	901.4	8
Hexagonal head bolt	901.5	8
Hexagonal head bolt	901.6	2
Stud	902.1	(6)
Stud	902.2	(7)
Stud	902.3	4
Plug	916	(7)
Threaded plug	916.1	1
Threaded plug	916.2	2
Threaded plug	916.3	1
Threaded plug	916.5	1
Nut	920.1	(6)
Nut	920.2	(7)
Nut	920.3	4
Impeller nut	922	1
Bearing screw	923	1
Lock washer	931	1
Circlip	932.1/.2	2
Key	940.1	1
Key	940.2	1
Plate	970.1	1
Plate	970.2	1
Plate	970.3	1
Plate	970.4	1

Table 19

Notes:

(1) For bearing bracket P65/160X. Part 320 bearing motor side = 7313 BG
For bearing bracket P65/160X. Part 322 bearing pump side = NU413

(2) Used only in the sizes 150-400 and 200-500

(3) Quantity: 4 – For sealings 0 and 1
Quantity: 3 – For sealing 2

(4) Anti-friction graphite

(5) Not used in the execution with Mechanical seal

(6) Quantity: 16 parts for Impeller O 400
Quantity: 20 parts for Impeller O 500
Quantity: 2 parts for Pumps with Gasket
Quantity: 4 parts for Pumps with Mechanical Seal

(7) Quantity: 1 part for execution 0 and 9
Quantity: 2 parts for execution 1

(8) Quantity: 6 parts for execution 9

Quantity: 10 parts for execution 1

(9) Applicable only for sealing code 2

18. Parts Interchangeability

Part number	Denomination	Impeller type	K/O			E	K/O			E	K/O			E	K/O			E	K/O		E	K/O	
		Size	50-160	50-200	65-200	80-200	80-250	65-315	100-250	100-250	10-315	80-400	100-400	125-315	150-315	200-315	125-500	150-400	150-500	200-400	200-500	250-500	300-500
102	Volute casing		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
135	Wear plate		1	2	3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
163	Discharge cover		1	2	2	2	3	4	5	5	4	6	6	7	7	7	8	9	8	10	11	12	13
183	Support foot		1	2	3	3	4	5	5	5	6	7	7	8	8	9	10	11	12	10	13	13	14
210	Shaft		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	6	5	5	6	7	7
230	Impeller		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
320	Bearing		x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	1	1	1	2	2
321	Bearing		1	2	2	2	2	3	3	3	3	4	4	4	4	4	x	x	x	x	x	x	X
322	Bearing		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6
330	Bearing bracket		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6
344	Bearing bracket lantern		x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	1	1	1	2	2
360	Bearing cover		1	2	2	2	2	3	3	3	3	4	4	4	4	4	x	x	x	x	x	x	X
360.1	Bearing cover		x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	1	1	1	2	2
360.2	Bearing cover		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1
382	Bearing body		x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	1	1	1	x	X
400.1	Flat gasket		1	2	2	3	4	5	6	7	5	8	8	9	10	10	11	12	11	13	14	15	15
400.2	Flat gasket		1	2	2	3	3	4	4	4	4	5	5	4	5	5	6	6	6	6	6	7	7
400.3	Flat gasket		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6
400.4	Flat gasket		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6
400.5	Flat gasket		1	2	2	3	3	4	3	3	4	5	5	4	4	4	6	5	6	5	6	6	6
411.1	Gasket		x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	1	1	1	1	1
412.1	O'Ring		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6
412.3	O'Ring		x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	1	1	1	x	X
421	Radial seal ring		1	2	2	2	2	3	3	3	3	4	4	4	4	4	x	x	x	x	x	x	X
421.1/2	Radial seal ring		x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	1	1	1	2	2
452	Gland cover		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6
454	Gland cover ring		x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	1	1	1	2	2
456	Neck bush		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6
457	Neck ring		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6
458	Lantern ring		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6
461	Gland packing		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6
507	Thrower		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6
524	Shaft protective sleeve		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6
551	Spacer disc		x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	1	1	1	2	2
551.1	Spacer disc		1	2	2	2	2	3	3	3	3	4	4	4	4	4	x	x	x	x	x	x	x
551.2	Spacer disc		1	2	2	2	2	3	3	3	3	4	4	4	4	4	x	x	x	x	x	x	X
638	Constant-level-oiler		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
672	Venting		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
906	Impeller bolt		1	2	2	2	2	3	3	3	3	4	4	4	4	4	x	x	x	x	x	x	X
922	Impeller screw		x	x	x	x	x	x	x	x	x	x	x	x	x	x	5	5	5	5	5	6	6
923	Bearing screw		x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	1	1	1	2	2
931	Lock washer		x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	1	1	1	2	2
932	Circlip		x	x	x	x	x	x	x	x	x	x	x	x	x	x	1	1	1	1	1	2	2
932.1	Circlip		1	2	2	2	2	3	3	3	3	4	4	4	4	4	x	x	x	x	x	x	x
932.2	Circlip		1	2	2	2	2	3	3	3	3	4	4	4	4	4	x	x	x	x	x	x	x
932.3	Circlip		1	2	2	2	2	3	3	3	3	4	4	4	4	4	x	x	x	x	x	x	x
940.1	Key		x	x	x	x	x	x	x	x	x	x	x	x	x	x	5	5	5	5	5	6	6
940.2	Key		1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6

Table 20 – Parts interchangeability

1	1	Same numbers (interchangeable parts)
2	3	Different numbers (not interchangeable parts)
x		Not existing parts

19. Recommended Spare Parts

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

Part	Denomination	Pumps quantity (included spare pumps)							
		1	2	3	4	5	6 and 7	8 and 9	10 or more
		Spare parts quantity							
135	Wear plate	1	1	1	2	2	2	3	30%
210	Shaft	1	1	1	2	2	2	3	30%
230	Impeller	1	1	1	2	2	2	3	30%
320	Bearing	1	1	1	2	2	3	4	50%
321	Bearing	1	1	1	2	2	3	4	50%
322	Bearing	1	1	1	2	2	3	4	50%
330	Bearing bracket	-	-	-	-	-	-	1	2 unit.
421	Radial seal ring (pair)	1	2	3	4	5	6	8	50%
461	Gland Packing (load)	1	4	4	6	6	6	8	40%
524	Shaft protective sleeve	1	1	1	1	2	2	2	20%
	Gasket set	4	4	6	8	8	9	12	150%
	O'ring set	4	4	6	8	8	9	12	150%
Execution with mechanical seal									
	Gasket set	4	4	6	8	8	9	12	150%
	O'rings set	4	4	6	8	8	9	12	150%
	Complete mec. seal	2	2	2	3	3	3	4	20%

Table 21 – Recommended Spare Parts

04/04/2022

A2370.8E/2

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