Deep Well Vertical Pumps

Original manual

This manual contains important instructions and warnings. You must read them before mounting, making the electrical connections and starting up. You must also comply with the instructions for the components related to this pump.

Please remember that this Manual must be kept close to the motor pump group.

KSB BOMBAS ITUR

Contents

1 General Items

Note This KSB ITUR pump has been developed in line with current technical levels, manufactured with great care and put through stringent Quality Control. The present Instructions Manual will provide you with knowledge of the pump and the ways it can be applied.

It contains important instructions to operate the pump appropriately and profitably. It is important to comply with the manual in order to guarantee reliability and a long useful life for the pump, whilst avoiding any possible risks.

This manual does not include any local regulations or any instructions with regards to assembly personnel, which the user shall be responsible for.

This group cannot be used in conditions in excess of those established in the technical documentation with regards to the liquid to be pumped, flow, speed (rpm), density, pressure and temperature, and also the motor power or anything else set out in the instructions manual and contractual documentation. Check with the manufacturer as appropriate.

The factory plate shows the model/size, the main service data and the manufacture number of the pump. Please include these data in any queries, subsequent orders or requests for spare parts.

Should you require further details or have a breakdown problem, please contact the nearest KSB ITUR service agent.

2 Safety

This instructions manual contains fundamental indications which must be complied with in assembly, service and maintenance. It must be read by assembly personnel, competent technical personnel and users before installing and starting up, and it must be available at all times at the place of location of the machine.

Proceed not only in line with this main safety chapter, but also observing the instructions described in other similarly important safety points.

2.1 Signalling of warnings in this manual

All instructions in this manual which may involve personal hazard if not complied with are indicated with a general hazard sign.

Safety instructions which may involve a hazard to people and facilities if not complied with in accordance with ISO 7000-0434.

Safety instructions to prevent electrical hazards in accordance with IEC 417-5036.

Note In Safety instructions which may affect the equipment and its operation if not complied with.

Safety instructions to prevent the risk of explosion. Only applicable to groups with ATEX plate, specially designed to satisfy Directive 94/9/EC on the prevention of the risk of explosion.

The details shown directly on the machine, such as:

- Rotation direction arrow
- Fluid connections identifications

These must be complied with, and conserved in a manner which ensures they are legible.

2.2 Personnel qualifications and instruction

All Service, Maintenance, Inspection and Assembly personnel must be duly qualified. The terms regarding responsibility, competence and supervision of personnel must be regulated by the user in an exact manner.

Any personnel lacking appropriate know-how must be duly instructed. This preparation can be obtained upon request by the machine user to the manufacturer or supplier of the machine.

Finally, the user must ensure that all personnel have fully understood the content of the instructions manual.

2.3 Risks of failing to comply with the safety instructions

Failure to comply with the safety instructions may lead to risks both for people, the environment and the machine, and may lead to the loss of any entitlement to claims.

In particular, failure to comply may cause the following hazards:

- Failure of important machine/facility functions.
- Failure of the prescribed maintenance and conservation methods.
- Personal hazard resulting from electrical, mechanical or chemical effects.
- Danger to the environment due to escaping noxious products.

2.4 Conscientious safety at work

The safety instructions contained in this Manual must be observed, as must international prescriptions on Health and Safety at Work and any possible Safety Regulations at the workplace of the user.

2.5 Safety instructions for users and service personnel

The operator is responsible for keeping the temperature of the fluid within the pump classification temperature limits.

- The installer must ensure that the parts of the machine which may create danger due to heat or cold are protected against accidental contact. The operator shall check as well that the coupling guard is in place and firmly secured.
- The contact protections of moving parts (e.g. couplings) must not be removed whilst the machine is in service.
- Provide the personnel with protective equipment and make sure it is used.
- Any possible leaks (e.g. through the shaft sealing) of hazardous products must be channelled in such a manner as they do not present any risk to people or the environment, in line with corresponding legislation.
- Follow safety instructions due to use of power. In this respect refer to the applicable national safety regulations and/or regulations issued by the energy supply comp

2.6 Safety instructions for maintenance, inspection and assembly work

The user must ensure that all maintenance, inspection and assembly tasks are carried out by authorised, qualified, specialised personnel who have been sufficiently informed through careful study of the instructions manual.

It is a fundamental principle that any work on the machine must be carried out whilst it is shutdown. It is essential to respect the pump shutdown procedure described in the instructions manual.

When the pump is stopped it is liable to remain under pressure. The pump frame must have returned to environmental temperature. Before dismantling it, is must be depressurised by making drain openings (or air vents) leading to a safe area.

All pumps or motor pumps which pump hazardous materials must be decontaminated.

Connect an earth conductor to the metal casing of the pump or baseplate if the fluid handled is electrostatically charged.

Never connect the earth of the electric welding equipment to pump or baseplate.

As soon as the work is complete, all safety and protection devices must be installed and put into operation.

Before starting up again, all that described in the First Start-Up section must be fulfilled.

Due to the fact that the unit contains small parts such as nuts, screws, etc., whose accidental contact may lead to small cuts on the hands, operators are recommended to use gloves when handling.

The following additional risk-prevention instructions shall be fulfilled:

The pumped liquid may cause injuries, burns, poisoning, etc. It is therefore necessary:

- To check the temperature and amount of leaks occurring at the mechanical seal or packing area. Conduct such leaks to a safe area through a controlled drainage system, specially indicated for the case of break of mechanical seal.
- To take appropriate measures to avoid direct contact with the pumped liquid when it is necessary to prime or fill the pump or unit.
- Before dismantling the pump, if the liquid is toxic or dangerous, it must be decontaminated. For this purpose the unit must be cleaned inside by introducing a cleaning liquid into the pump and emptying it subsequently through the drainage connection. The cleaning liquid must not create hazardous situations and must be compatible with the pump components (CONSULT)
- To take appropriate measures to avoid contact with the pump if liquids are pumped at temperatures over 40ºC.
- In the event of a liquid with high steam pressure being used, beware of the danger of explosion due to pressure confinement with the pump stopped. This confinement must be avoided by opening inlet or discharge valves, or by providing a properly conducted air-vent connection in the pump discharge for liquid evacuation.

For rotating parts:

- The pump should never work without its coupling guard in place and firmly secured.
- Do not wear loose or baggy clothing or wear long hair loose near rotation areas to avoid clothes or hair getting caught and causing serious accidents.
- Do not force jammed rotating parts manually when the pump is in operation.

When the pump is joined to considerably long piping, waterhammer may occur when it is stopped. Should this arise, appropriate anti-waterhammer elements must be put in place.

All the safety regulations indicated by the pump drive manufacturer must be observed and complied with.

Inappropriate installation may lead to the unit breaking and consequent risks to persons and/or the environment. It is therefore necessary to:

- Vent the pumps appropriately before operation, checking that the pump is full of liquid.
- Check that the pump discharge and suction valves are fully open and that there is no dirt or foreign bodies in the piping.

Regarding overload conditions:

- Do not exceed the maximum permitted values (temperature, suction pressure, discharge pressure, rpm.) indicated in this instructions manual, offer and technical catalogue.
- Do not exceed the maximum loads permitted on the suction and discharge connections.
- The pumps must only be used in the conditions and with the liquid indicated in the offer and/or order.

An unforeseen failure in the drive power may lead to danger due to spontaneous start-up of the unit; it is up to the customer to take the necessary steps to avoid this.

When the CONTROL SYSTEM is not supplied by KSB ITUR, the customer is responsible for the entire machine complying with the machine safety directive, including these controls

2.7 Modifications and arbitrary manufacture of spare parts

The machine must not be modified or changed without prior agreement from the manufacturer. Only original spare parts and accessories approved by the manufacturer can guarantee safety. The use of other parts invalidates any liability of KSB ITUR for consequential damage.

2.8 Unauthorised operation modes

The safe service of the supplied pump can only be guaranteed through correct use, in line with section 4 of the Instructions Manual. The operation limits established in the Datasheet must not be exceeded under any circumstance.

2.9 Warnings for equipment with marking

Reliability may be lost through incorrect use, poor connections or any modifications, however small.

It is necessary to take into account the rules on the connection and use of electrical devices in hazardous areas, in particular national regulations on installation. Only qualified personnel who are familiar with these rules should handle this type of machine.

KSB ITUR pumps marked with the ATEX plate are valid for group II category 2 and 3, zones 1, 21, 2 and 22 temperature class as shown on the plate and Conformity Certificate.

Any repair made by the end user, unless explicitly approved by KSB ITUR, shall release the manufacturer from any liability relating to Directive 94/9/EC.

Individual pieces supplied as spare parts must be originals, supplied and checked by KSB ITUR.

3 Transport and storage

3.1 Transport and handling

State of equipment as supplied

As a general rule the electric motor (if it is within scope of supply of the purchase order) is dispatched separately. For the rest:

If total length (without motor) is less than 6 m: The assembly of pump, filter, column, discharge head and coupling is generally sent mounted.

If total length (without motor) is more than 6 m: the equipment is generally sent dismounted in following sub-assemblies: pump with filter, column pipe/s, discharge head with coupling system.

The received material must be carefully inspected, with any failure or defect being made known to us. Also check that the axial clearance in the shaft coincide with the table below with a tolerance ± 1 mm. If not, check assembly according to point 5.2.2

Pump type	**6056**	**6685**	**8000**	**8050**	**8056**	**1063**	**1066**	**1226**
Set [mm]	9.5	7	11	14	14	14	14	14
Pump type	**1280**	**1286**	**1486**	**14**	**16**	**20**	**22**	**---**
Set [mm]	12.7	12.7	23	5	8	15	15	---

Transport and handling

Note Improper handling of equipment and / or its individual elements can severely damage the paint or protective coating of them, and can lead to premature oxidation of the surfaces and shorten the operating life of equipment.

The transport and handling of the equipment must be carried out using suitable means in line with the weight to be supported. The weight is generally shown on the delivery note or on the name plate; if it is not, and the equipment cannot be handled safely, please contact KSB ITUR.

Danger to life from falling parts! The pump (or parts) could slip out of the suspension arrangement. Stay at safety distance from the parts during transport.

Note The units supplied with the transport pallets should be transported and stored horizontally whenever possible. Do not remove them from their transport pallets until final installation is to take place.

Note Once disassembled, the equipment should be kept in a vertical position for transport, and never supported or hold by its ends.

When pumps are dismounted from their transport pallet, suitable means must be used to ensure the stability of the equpment, until it is finally secured at is definitive location.

Remember that the equipment must never be lifted using the eyebolts or lifting lugs of each element (e.g. by means of eyebolts of motor and pump) because they are designed for the individual transport of the element. Never lift or transport the pump or the equipment by the free end of the shaft. It is also important not to use the pump and pipe flanges either joining elements (e.g. couplings)

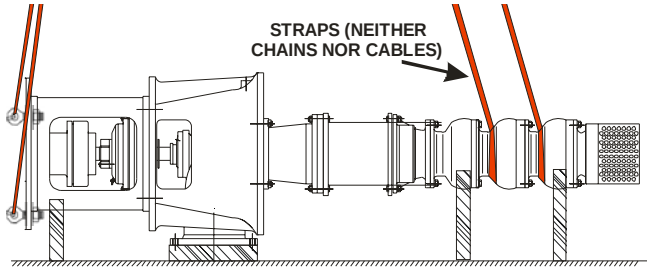
Note In line with previous recommendations, do not use transport elements or means that can damage paint or protective coating of the equipment and components. That it is not advised the use of chains and similar items to wrap pump, columns and other components. We also discourage the use of hooks. Appropriate and approved lifting tools should be used.

Examples for transport of elements

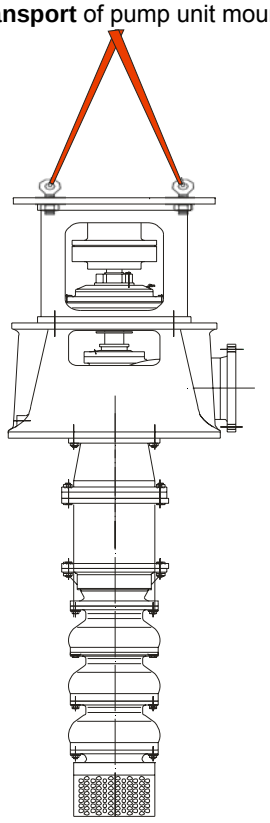
The examples shown in following sketches are just with illustrative purposes. The eyebolts of lifting lugs shown are not within the scope of supply. These must be adequate to weight of each item to be lifted.

Note To proceed with the lifting of the set (or of the individual pump) from its original horizontal position, it must be supported by at least two places. Prevent the filter from being loaded.

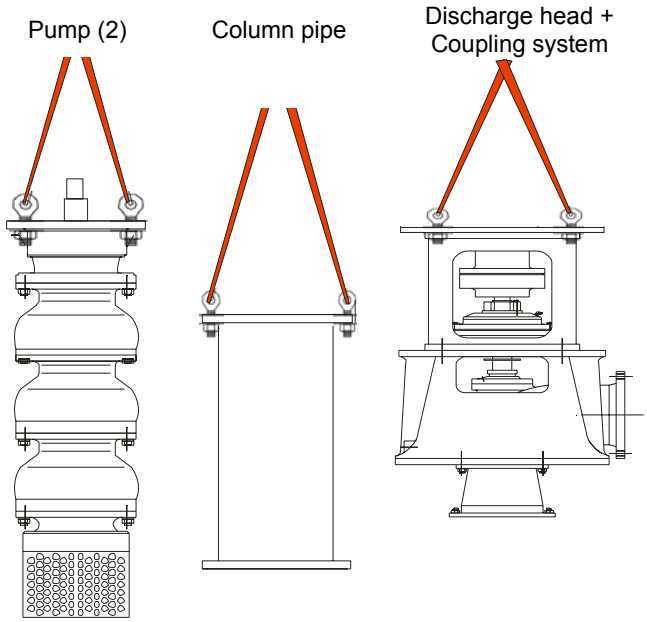
Example of **liting** pump unit mounted (L < 6 m)



Example of **transport** of pump unit mounted (L < 6 m)



Examples of items transported separately (1)



(1) Avoid the use of chains or cables that can damage the paint or protective coating of the element.
(2) When lifting pump from its horizontal position, pump must be supported by at least two sites. Prevent filter from being loaded.

3.2 Provisional storage/conservation

The equipment and its components must be stored indoors, in a clean, dry place, away from vibrations and where relative humidity is as constant as possible.

Note All caps or covers of piping connections must be installed to prevent dirt and other materials get into the equipment. Do not remove them until it is required during the installation of equipment!

The electric motor must be disconnected, the connection cables removed and the terminal box closed with its cover on. Switchboards must be in vertical position and disconnected.

If commissioning does not take place immediately after delivery, it is advisable to store equipment and its components taking following measures:

Short term storage (less than 6 months)

- Inspect the protective coating or painted surfaces. If any deficiency is to be seen, proceed to repair it. If repainting needed consult KSB ITUR for the characteristics of the paint.
- It is necessary to protect with preservation products the low alloy parts (e.g. grey casting, nodular casting, etc…) in contact with liquid. Preservation products available on the sector market can be used, in line with the manufacturer's instructions on application and disposal.
- The shiny (mechanised) parts and surfaces of the equipment and elements must be protected from corrosion using silicone-free grease or oil.
- Turn shaft by hand (at least once a month)

Long term storage (exceeding 6 months)

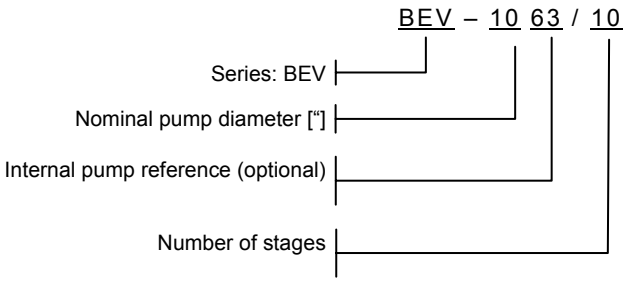
Consult KSB ITUR.

4 Group description

4.1 General description

Deep well vertical multistage centrifugal pump for clean liquids, without any abrasives or solid particles. Manufactured in nominal diameters of 6"-8"-10"-12"-14"-16"-20"-22".

4.2 Denomination



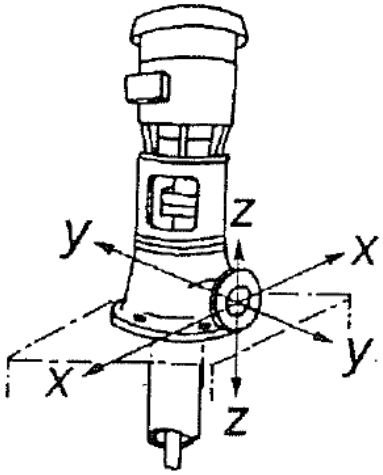
4.3 Form of construction

Pump: Radially-split vertical multistage pump casing. Impeller closed with diffuser. Filter in suction.

Bearings: The pump shaft and the intermediate transmission shafts rotate on friction bearing bushes lubricated by the pumped liquid. The electrical coupling shaft (in the case of electrical motor) and the gear head shafts (in the case of explosion motor) rotate on bearings lubricated with oil or grease.

Shaft sealing: Packing

4.4 Forces and moments permitted in the nozzles



		MAXIMUM STRAINS PERMITTED IN CASE OF DISCHARGE HEAD IN CAST IRON OR BRONZE (1)					
		FORCES [N]			MOMENTS [N.m]		
DN FLANGE DISCHARGE	DISCHARGE HEAD SIZE	**Fx**	**Fy**	**Fz**	**Mx**	**My**	**Mz**
80 - 3”	3/10	680	750	620	480	350	390
100 - 4”	4/10	900	1010	810	530	380	440
125 - 5”	5/12	1070	1190	960	630	450	570
150 - 6”	6/161/2	1350	1500	1220	750	530	620
200 - 8”	8/161/2	1800	2010	1620	980	690	800
250 - 10”	10/20	2240	2510	2030	1340	950	1100
300 - 12”	12/20	2690	3000	2420	1820	1290	1490
400 - 16”	16/24	3590	3990	3230	2910	2070	2390

(1) FOR STEEL OR STAINLESS STEEL HEAD, MULTIPLY THESE VALUES BY 2.0

5 Installation

Note The design of the pipe systems, anchorings and other installation areas corresponds to other parties. KSB ITUR only offers details and comments as a help, but does not assume any responsibility with regards to the design, assembly and operation of any installation. We recommend that customers should check with a specialist in the design of castings, pipes, wells, etc, to supplement and interpret the information provided by KSB ITUR and to ensure proper operation.

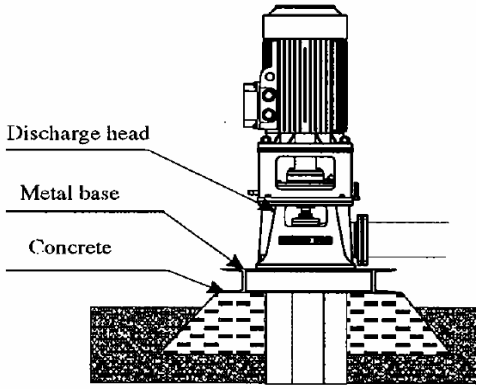
5.1 Check before assembly

Before positioning, check that the assembly base is in line with the dimensional plan of the equipment.

Note The equipment must be supported on an amply sized casting. This casting must be completely smooth and flat.

We recommend the use of a base underneath the head for the positioning of the equipment.

The attachment to the casting must not involve tension in the column pipe.



If the anchor pins are to be placed in existing holes, place the anchor pins in their orifices suspended from the pump.

Do not connect the suction nozzle until the equipment is completely installed on its base.

5.2 Group positioning

5.2.1 Location

This type of pumps is generally installed in two different ways:

1.- Perforation or deep well.

2.- Catchment from the channel, reservoir or similar.

Perforation or deep well

Before proceeding to install, check the following:

1- The depth of the well must be greater than the length of the equipment.

2- The well must be completely vertical and with sufficient effective interior diameter for the positioning of the equipment.

3- Gaging and cleaning of the well.

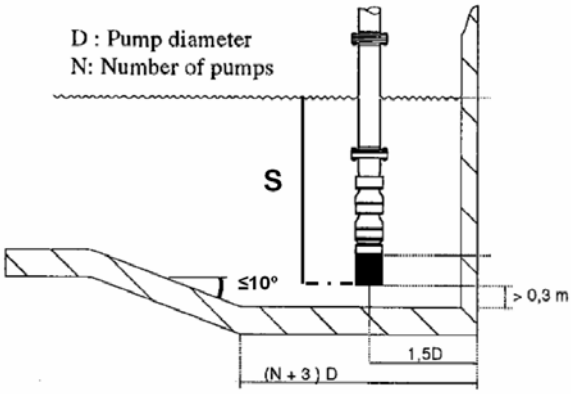
Gaging involves knowing the real flow of liquid which can be extracted, and the different levels established at different flows. When the level drops due to excess extracted flow, pressure oscillations will be produced in discharge as of a certain level, indicating that the extracted flow should be reduced.

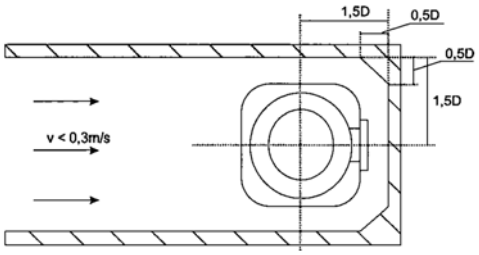
It is necessary to extract the sludge and sand produced during perforation in order to clean properly.

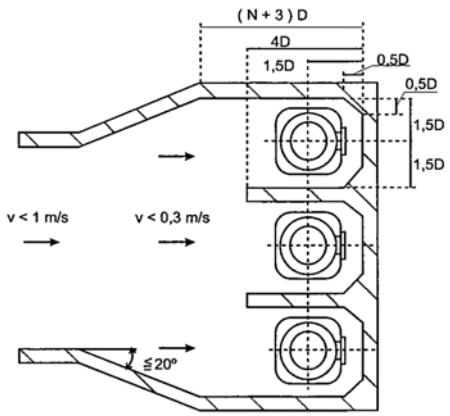
When capture is made, the minimum distance from the filter to the bottom must be at least 300 mm and the liquid level must not drop below the minimum submergence level (S) shown in the following chart.

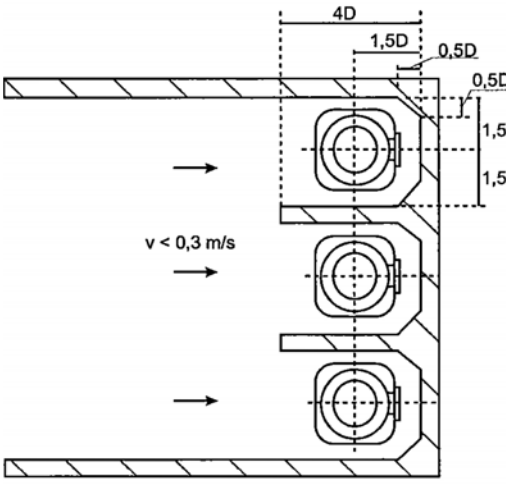
Pump type	**6056**	**6685**	**8000**	**8050**	**8056**
Minimum submergence [mm]	485	365	475	475	475
Pump type	**1063**	**1066**	**1226**	**1280**	**1286**
Minimum submergence [mm]	650	650	752	1040	1040
Pump type	**1486**	**14**	**16**	**20**	**22**
Minimum submergence [mm]	1170	900	950	1160	1000

Some diagrams of the layout of the pumps and the capture construction are indicated below.









5.2.2 Equipment installation

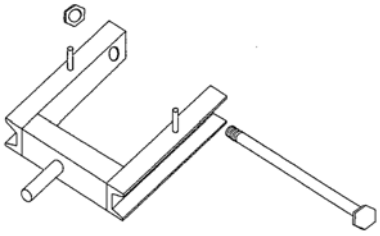
In order to prevent misalignment between the axes, it is necessary to correctly install, check and maintain the coupling. See the instructions manual for the coupling

The coupling may produce a source of ignition or high temperature in the event of incorrect operation. The coupling must be classified as non-electric equipment with at least the same type of area and temperature as the pump. It is necessary to follow the instructions in the coupling manual which is included with the pump

Tools

Apart from the usual tools, the following are necessary:

- Two lifting clamp bolts
- Equipment attachment element in the pipe during assembly



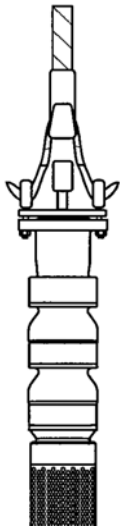
- Wooden plugs to support the pieces without them touching the floor.
- Wire brush, cleaning dissolvent and silicone for the pipe flanges.

Installation of pump and column

Proceed as follows to carry out the installation:

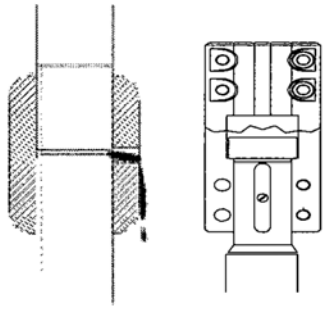
Suspend the pump with a crane, then introduce it in the catchment and support on the attachment element.

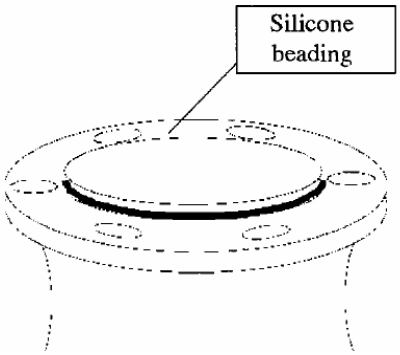
Similarly suspend the first column section and take it to the vertical section of the pump. Remember that the position of the column shaft must be such that the casing in one of the ends must be in the upper part and the protrusion of the shaft must be constant in all sections.



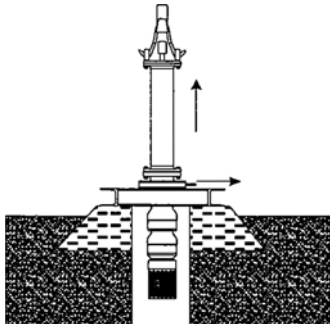
Join the column shafts and pump using the corresponding sleeve or coupling. It is important that the ends of both shafts are tight and that the joint is in the centre of the sleeve, thus preventing pockets of air, dirt and grease from becoming formed.

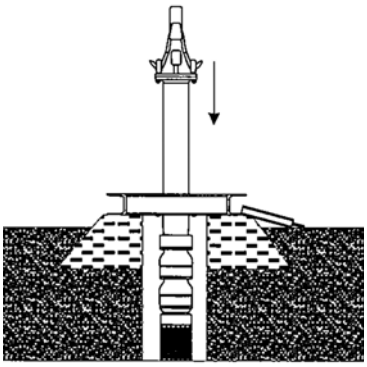
Position a silicone cord around the rim of the flange, and, once the previous seals have been removed, join both seals, position the screws and nuts and tighten them.

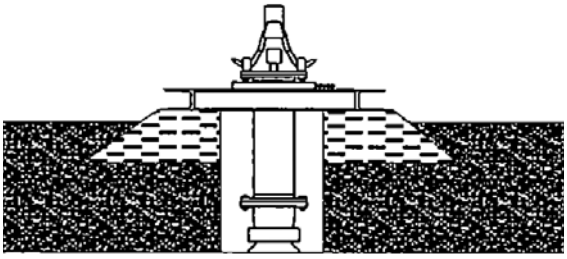




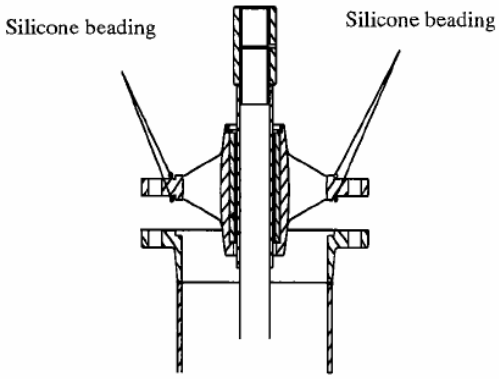
Suspend the equipment, remove the attachment element, lower and replace the attachment element.







Suspend the next column section. Before joining the shafts and flanges, position the bush bearing support in its housing, with the corresponding silicone cords.



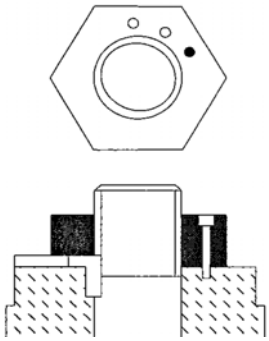
Join the column shafts using the sleeve.

Repeat the process with the other column sections.

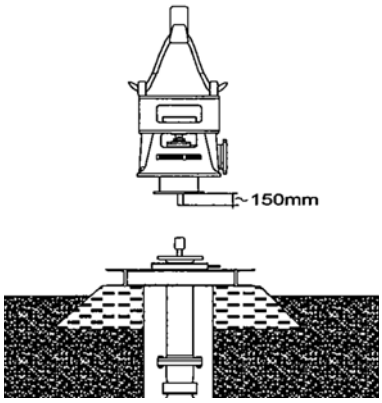
Installation of the discharge head

If the coupling is of pulleys or gears, or the motor is a hollow shaft, we should dismount the upper cover to expose the regulation nut.

This nut has three boreholes, one of which has an Allen screw which must be released, followed by the nut.



The key in the bracket to be removed can now be seen. At this moment the shaft is free to move in vertical direction. Bring the shaft down until it protrudes around 150 mm below the head.



Couple the column shaft, bring down the head and join the flanges.

Adjustment of impellers

So far we have all these joint shafts forming a compact piece of equipment, as if it were a single shaft, which protrudes through the top of the coupling. At this moment each impeller stops against its cell in the lower part. If we mount the key and the regulation nut and tighten it, we will see that the shaft comes down a few mm to a maximum point, i.e. each impeller stops against its cell in the upper part.

The height in mm which the shaft ascends is known as "**AXIAL CLEARANCE**". This set must coincide (± 1 mm) with that shown in section 3. To the contrary, we will probably have one or several pairs of shafts which are not properly tightened. In this case, check the installation and tighten the shafts.

The impeller adjustment R is the height in mm which the shaft must be raised (and consequently the impellers) with regards to the lowest position.

This height is: R = E (extension) + B (adjustment)

Extension $E(mm) = 0{,}49 \cdot \dfrac{K \cdot H \cdot L}{S \cdot 1000}$

- H is the pressure or manometric height which the pump will elevate
- L is the total length of the column in metres.
- S is the column shaft section in $cm^{2,}$ as indicated in the chart.

Ø Column shaft	7/8"	1"	1 1/4"	1 1/2"	1 11/16"
Section [cm2]	3.88	5.07	7.92	11.4	14.43
Ø Column shaft	1 15/16"	50 mm	60 mm	63 mm	
Section [cm2]	19.02	28.2	28.3	31.2	

- K is the thrust factor, which depends on the size of the pump and is indicated in the chart.

Pump type	6056	6685	8000	8050	8056
K [kg/m]	5.4	5.5	4.5	5.7	7
Pump type	1063	1066	1226	1280	1286
K [kg/m]	12.4	12.4	8.9	23.1	20.1
Pump type	1486	14	16	20	22
K [kg/m]	23.8	26	34	41	52

Adjustment B must be at least 1 mm, and, if the axial clearance so allows, the desirable value that shown in mm in the chart for each pump size.

Pump type	6056	6685	8000	8050	8056
B desirable [mm]	3	13	5	3	3
Pump type	1063	1066	1226	1280	1286
B desirable [mm]	6	6	3	3	3
Pump type	1486	14	16	20	22
B desirable [mm]	3	2	2	4	4

EXAMPLE: In a BEV-1226/6 pump, for 200 m3/h at 90 wcm., with 20 column sections of 8" x 1 ½" x 3 m (total 60 metres), the adjustment height will be:

$$E(mm) = 0{,}49 \cdot \frac{8{,}9 \cdot 90 \cdot 60}{11{,}4 \cdot 1000} = 2.066mm$$

B = desirable 3 mm

R = E + B = 2.066 + 3 = 5 mm (approx.)

As R = 5 mm is within the maximum axial clearance allowed for this pump (14 mm), it is taken as correct.

Once adjusted, slowly turn the regulation nut, searching for a position close to the result of the adjustment, until one of the boreholes of the nut is opposite one of the base, in order to introduce the Allen screw which will secure this nut.

Adjusting without due care and leaving it halfway up the axial clearance IS NOT CORRECT. The pump will work optimally if adjusted in line with the foregoing instructions.

Once the equipment is regulated, lift with the crane, remove the attachment pin, bring down and join to its casting.

Installation of the drive element

Electrical motor

In the case of an electrical motor, whether solid or hollow, we recommend checking the rotation direction of the motor before definitively mounting. The correct rotation direction in the motor is clockwise from the coupling or pump side. The electrical couplings have a ratchet which locks the rotor in the event of reverse rotation. In order to change the rotation direction, simply interchange two of the phases in the connections box (three-phase motor).

Once the rotation direction has been checked, place the motor in its housing, making the two halves of the coupling coincide in the case of a solid shaft motor.

Explosion motor and gear head

The transmission between the motor (or tractor power take-off) and the gear head must be carried out by way of cardan transmission. Should the rotation speed of this element be greater than 600 rpm, the cardan must be balanced ("industrial cardan")

It is important to achieve the maximum alignment possible, since this will lead to improved performance and a longer useful life of the equipment. Excessive misalignment will produce vibrations.

Note The power take-offs and the cardan must be protected by way of a cover screwed onto fixed parts, robust and without any sharp edges, in order to prevent accidental contact.

5.2.3 Levelling

Use a spirit level to level the equipment. Use wedges to alter the height at different points. The maximum deviation permitted is 0.2 mm/m.

5.3 Pipe joint

In no case can the pump be used as a fixed point for the pipes.

The pipe system must at no time exercise force in excess of the values shown in the chart in point 4.4 (due to connection, thermal variation, etc) in the pump.

The pipes must be anchored immediately before and after the pump, coupling to it without any tension.

The short pipes must be of at least the diameter of the pump connections. The diameter of long pipes is, in some cases, determined by economic criteria.

Transition pieces at larger diameters must have an extension angle of around 8°, in order to prevent pressure drops.

The suitability of installing retention and/or cut-off valves will depend on the type of installation.

The thermal expansions of the pipes must be compensated with suitable measures, in order not to exceed the maximum strains permitted on the pump.

The diameters of the pipes, valves and accessories must be calculated in line with the load losses envisaged in the installation, meaning the fluid speeds will be 2 to 3 m/s in the suction pipe.

Exceeding the admitted strains of the pipes may lead to leaks in the pump and to the fluid escaping. Hazard of death with hot liquids!

The suction and discharge nozzle covers of the pump must be removed before connecting the pipes.

Before starting up a new installation, it is necessary to thoroughly clean the tanks, pipes and accessories by brushing and blowing. Welding material, scales and other impurities are often cast off some time after.

Note In order to prevent the rotation of the pumps in inverse direction (danger of damage in the machine), a retention valve must be placed in the impulsion pipe.

An insufficient liquid submergence level may lead to dry operation of the parts of the pump, which in turn leads to the heating of the parts in contact. This circumstance should be avoided, with plant operators manually checking or equipment halt devices ensuring that the liquid level in the suction well is never lower than the indicated submergence level.

High suction pressure may overload the bearings and lead to their overheating. This circumstance must be avoided, to which end the suction pressure must not exceed that shown in the data sheet, either through manual control by the operators or through devices which shut down the equipment in the event of excessive pressure.

The pump must not work without liquid under any circumstance. If this condition may come about, the installation must be fitted with safety devices which prevent the operation of the pump without liquid inside, or have automatic devices to discharge the minimum flow of the pump. See the section on minimum flow

5.3.1 Auxiliary connections

The equipment is normally delivered mounted and ready for immediate operation, with only the hydraulic and exterior electrical connections being necessary.

When atmospheric temperature water is pumped, the cooling of the electrical coupling or of the gear head is by way of the recirculation of the pumping liquid, without any external supply of water being necessary.

Note Should liquid with little cooling capacity be pumped (oil, diesel, etc), external cooling may be necessary, see 7.2.2.

If the pumping liquid is inflammable and the leak can lead to ignition, this contingency should be avoided through constant control of the seal tightness of the auxiliary pipe joints by the plant operator.

Auxiliary pipes are designed exclusively to support internal stresses due to the pressure of the circulating fluid, to which end it is forbidden to subject them to additional exterior stresses (e.g. for support, etc.)

5.4 Electrical connection:

The electrical connection must be carried out by a specialist electrician. Applicable regulations must be complied with.

Check the mains voltage available against the factory plate data and choose the appropriate connection.

The technical connection conditions and the conditions of the local energy supply company must be observed when carrying out the connections.

We strongly recommend the use of a safety circuit breaker for the motor and a thermistor associated to a trigger device.

These instructions apply to asynchronous three-phase standard electric motors with a squirrel cage both in horizontal and vertical execution, in IP-23, IP-54 and IP-55 protection grades, with frame sizes of between 56L and 355S, both inclusive, with voltages of 200 to 500 V between phases.

The electric motor as well as whole electric installation shall accomplish with all safety norms that may be applied to it.

Earthing

Before starting up the pump, the earth of the pump, the baseplate or the motor must be connected to an effective earthed point of the installation.

5.4.1 Motor connection

Whilst connecting the cables, ensure it is not possible for voltage to appear.

Check that the earth connection is in line with local regulations.

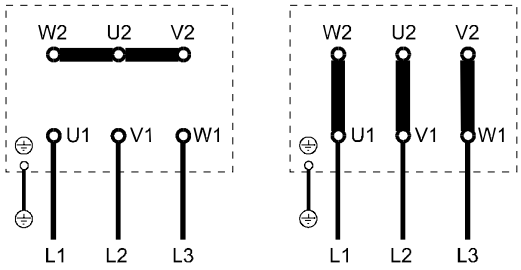
The coupling may produce a source of ignition or high temperature in the event of incorrect operation. For this reason, the motor must be classified with at least the same type of zone and temperature as the pump. It is necessary to follow the instructions in the coupling manual which is included with the pump.

Connection in single speed motors

Direct start-up:

In direct start-up the motor can be used in two different connections:

The voltage and the connection, e.g. 400 VY, 240 VD is stamped on the motor plate. This means that the motor can connect at 400 volts in star connection (Y) or at 240 volts in delta connection (D).

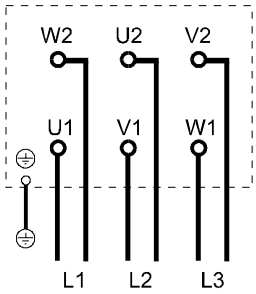


Star connection **Delta connection**

Star-delta start-up:

In star-delta start-up, the line voltage must coincide with the voltage shown on the motor for delta start up (D). The six terminals indicated in the following diagram will be connected:

Connection to the star-delta contactor



5.4.2 Timer relay adjustment

In the star-delta start-up of three-phase motors, it is necessary to ensure that the passage from star to delta takes place quickly. Prolonged time will cause damage to the pump.

Timer relay adjustment in the star-delta connection:

Motor power	Time adjustment -Y
≤ 30 kW	< 3 sec.
> 30 kW	< 5 sec.

5.4.3 Rotation direction. Check

Note Check the motor rotation direction by starting up and immediately shutting down. The rotation direction must correspond with that shown by the pump arrow located on the pump casing or support. If the rotation direction is not correct, any two phases L1, L2 or L3 of the power cable must be inverted in the motor terminal box.

The incorrect rotation of the pump may lead to the incorrect operation of the seal and the heating of its faces. For this reason, correct rotation direction must be ensured using the arrow shown on the pump, with the pump completely filled with liquid and properly vented.

5.5 Non electric motors

Shall fulfil all that may be applicable to non electric material and follow the instructions stated in their specific instructions manual.

Likewise in the case of internal combustion engine refer to the instructions of the engine manual for recommendations for safe gas exhaust and air supply required in the installation

6 Start-up

Start-up shall be carried out when all the necessary mechanical, hydraulic, electrical and pneumatic connections are complete. The coupling guard must as well be in place and firmly secured. The process is as follows:

If the impeller is half-open, after regulating the clearance between the impeller and the wear plate, check that the consumed power is in no case greater than the nominal operation power.

Checks in electric motor

When making the electrical connection, ensure the type of current and nominal voltage shown on the motor's factory plate concur with the type of current and the mains voltage in the place of installation.

Follow the indications described in the motor manual.

6.1 First start-up

The pump cannot operate with a closed discharge valve, as this may lead to overheating of the pumped liquid.

If it is necessary to work with the discharge valve closed, a minimum flow relief device is required at the output. This device does not form part of the pump and will be separate from the pump's discharge flange.

Other recommended devices include the constant output orifice plates, constant bypass valves and automatic recirculation valves. If you require further details, please check with KSB ITUR

The pump cannot work in closed suction valve conditions. If this condition may come about, the plant operator must use a device which detects this condition and forces the pump to halt when it occurs.

6.1.1 Lubricant

BEARINGS:

Lubricated with grease. PUMP WITH GREASE NIPPLES: The pump leaves the factory with the bearings greased for approximately 1000 hours of operation. See lubricant in section 7.2.2.

Note

Pumps lubricated with oil: The pump leaves the factory without oil in the bearings support. Once installed, proceed to fill it. See lubricant in section 7.2.2.

FRICTION BEARING BUSHES:

Lubricated with pumping fluid: If the pumped fluid is clean (without particles in suspension) and non-aggressive, the friction bearings are lubricated with the pumped fluid. Lubricant is not required.

The bearings must be lubricated with oil/grease in a good state, to which end it is essential to follow the lubrication instructions indicated in the pump manual.

If the bearings support suffers impediments which prevent correct air-cooling, the resulting excess temperature may be excessive for the classification temperature class. For this reason, the support must be kept free of obstacles, thus facilitating natural air cooling.

6.1.2 Pre-lubrication of the pump

The equipment must be pre-lubricated before starting up for the first time or following a long period of inactivity. In order to check the lubrication in the bearings of the electrical couplings, gear heads, etc, proceed as shown in the chapter 7.2.2 “lubrication” of this manual.

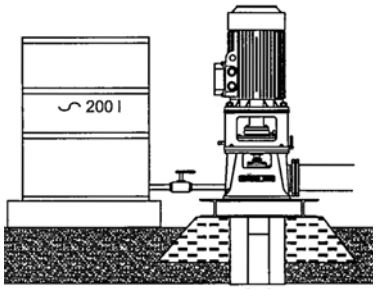
There are different procedures to pre-lubricate the column bearings for the first time, or in subsequent start-ups if there is no retention valve in suction, of which the most simple is as follows:

We will need a tank of around 200 litres, a ball gate valve of ¾”, and a pipe section (rigid or flexible) of ¾”.

This operation must be carried out once the pump is installed in the well. The installation diagram is shown in the figure.

Operation is as follows:

- Fill the water tank for the first time.
- Open the ¾” valve and leave the tank empty.
- Immediately after starting up the pump. Keep the ¾” valve open, and the pumping water will refill the tank. When it is full, close the ¾” valve.



We do not want to fill the column pipe with water, but simply to wet the bearings before starting up. If the pump has a foot valve, once water enters for the first time, it will remain retained in the column after pumping.

Filling (priming) of the pump

- Check that the level of liquid in the well is sufficient.
- Turn the pump shaft by hand in order to break any adherence.

Shaft sealing

Packing: The gland nuts must be gently tightened (by hand). The gland must form a right angle to the shaft.

6.1.3 Final control

Make the final check of the group alignment in accordance with 5.2.1.The coupling/shaft must allow easy manual rotation.

Note

Check all the auxiliary connections are correct and functioning.

According to the **rules on the prevention of accidents at work**, equipment cannot be started up without protection for the coupling. If the buyer has expressly requested that this guard be excluded from supply, it must be provided by the user.

Before and during the operation of the pump, the coupling guard must be in place and firmly secured. Regularly check this state in order to prevent problems resulting from incorrect positioning or deficient attachment. The coupling guard must be free of any foreign elements.

6.1.4 Start-up

Before starting up the group, check all the sections with regards to chapter 6.

The start-up must be carried out with the suction valve (where fitted) completely open and the discharge valve partially closed. Once the pump has reached its service speed and the suction air has been eliminated, regulate the operation point using the discharge valve.

During the priming stage, check that all the suction pipe air is perfectly discharged.

If the electric motor guard is triggered when starting up, close the discharge valve more until the equipment starts up normally.

The pump must NEVER work with zero flow or flow which is less than the operating minimum, as internal recirculation will cause the fluid to heat up quickly, leading to hazards (including explosion) as a result of the high pressures reached within the frame. Check the minimum flow in the operation curves.

Minimum flow necessary for the pump

The pumps cannot work below the minimum flow specified in the datasheets.

If this condition may come about, the installation must be fitted with safety devices which prevent the operation of the pump without liquid inside, or have automatic devices to discharge the minimum necessary flow of the pump.

For liquids other than water, the minimum flow is determined by the following formula:

$$Qmin = \frac{3.600.000 \times Pa}{Pe \times Ce}$$

In which

Qmin: Minimum flow in m^3/h.

Pa: Power absorbed by the pump in kW at closed valve.

Ce: Specific heat of the fluid in J/kg*ºC.

Pe: Specific weight of the fluid in kg/m^3.

Maximum flow permitted by the pump

Unless indicated in another datasheet, the maximum flow permitted is 1.1x optimum flow of the pump with the supplied impeller diameter.

6.1.5 Shutdown

Close the discharge pipe valve.

If there is anti-return valve in discharge with counterpressure, leave the discharge valve open.

- Shut down the motor. Check that shutdown is normal.
- In prolonged periods of non-operation, close the suction pipe valve (where fitted) and the auxiliary connection valves.
- The pump must be protected from freezing whenever this risk exists, and must be emptied in prolonged periods of non-operation.

If, whilst the pump is shut down, it must remain on standby for service, start up at regular intervals for around 5 minutes (see also 7.2.1)

- Fire pumps: 1x/month, at minimum.
- Drink-safe water pumps: 1x/48 hours, at minimum.
- Reserve pumps: 1x/week, at minimum.

  (It is best to change the operating pump every day).

The seal tightness and function of the auxiliary connections must be examined during these start-ups.

6.2 Service limits

6.2.1 Switching frequency

In order to prevent abnormally high temperatures and overloading of the motor, pump, coupling, seals, etc, the switching frequencies indicated below must not be exceeded:

MOTOR POWER	MAX. SWITCHING/HOUR
Up to 3 kW	20
From 4 to 11 kW	15
From 11 to 45 kW	10
From 45 kW	5

6.2.2 Temperature of the liquid to be pumped

The permitted operation temperature is indicated in the order and in the ATEX conformity declaration. If the pump is to work at a higher temperature, please ask KSB ITUR.

6.2.3 Density of the liquid to be pumped

The power absorbed by the pump increases in direct proportion to the density of the impelled liquid. In order to prevent overloading in the motor, pump and coupling, this density must not exceed that shown in the order and in the ATEX declaration of conformity.

6.2.4 Viscosity of the liquid to be pumped

The power absorbed by the pump increases with the viscosity of the impelled liquid. In order to prevent overloading in the motor, pump and coupling, this viscosity must not exceed that shown in the order and in the ATEX declaration of conformity.

6.2.5 Maximum pump speed

In order to protect the pump from over speed, the maximum rotation speed shall be that shown on the name plate engraved in the pump- If the speed shall not be indicated in the name plate it is necessary to consult with KSB ITUR.

If eventually it would be wished to perform the pump at higher speed, it is necessary to consult with KSB ITUR.

6.3 Starting up after storage

If the storage and/or shutting down of the pump has been for a prolonged period of time (over 6 months), it is necessary to:

- Check the state of the joints.
- Check the levelling.
- Check all the auxiliary connections.
- Renew the lubrication of the bearings (where fitted).
- Change the packing (when fitted).
- After a short storage period, simply turn the pump shaft manually to unlock the rotor equipment.
- Follow the specific post-storage instructions in the motor manuals and other items.
- Observe all the steps shown in the "Start-up" section.

Note If the equipment is to be shutdown for a certain period of time and there is the possibility of freezing temperatures, it is necessary to completely drain the pump in order to prevent any deterioration from the freezing of the contained fluid.

7 Maintenance/Conservation

7.1 General instructions

Before dismounting, ensure that:

The motor must not be started up involuntarily, and so must be disconnected from the grid (e.g. removing cut-outs, unplugging, disconnecting the automatic circuit breaker, etc.) or the start-up batteries (disconnect operating energy).

The pump is free of pumped fluid, cleaning it internally with appropriate liquid whenever it is a hazardous fluid (hot, contaminant, inflammable…)

It is necessary to uninstall the equipment before dismounting the pump, column sections, etc. To do this, proceed in reverse order to that described in point 5.2.2 of this manual.

7.2 Maintenance/inspection

7.2.1 Checking instructions

During the first minutes of operation:

In cases of mechanical seal

- There may be a brief large leak during start up. Should this leak persist, shut down the group and determine the cause. The causes may be, amongst others, dirt in the pumped area or dry operation due to incomplete discharge of the pumped air.

In cases of packing seal:

- There is no leak; immediately loosen the gland to obtain small dripping.
- Excessive fluid leak; leave to settle for 10 minutes; tighten the gland by turning 1/6th and leave for 5 minutes. Repeat the process until between 20 and 60 drops per minute are achieved.

After a few hours operation:

Note Check the bearing temperature at the point in the bearing location area. Normal temperature can reach up to 40°C above environmental temperature, but must never exceed 90°C.

Observe the possible anomalies shown in point 8 of this manual

The reserve pumps should be started up and shutdown once a week, in order to ensure they are always in service conditions.

The failure of one or both sides of the seal may lead to excess heating. This can be corrected by following the instructions of the seal manufacturer, both with regards to its assembly and the maintenance of the auxiliary seal devices, where appropriate. Alternatively, the pump may be fitted with a monitoring device if the purchaser has so specified.

7.2.2 Lubrication

Before lubricating the pump, ensure that:

The pump is shutdown and cannot be started up accidentally.

The bearing support temperature is less than 40ºC, in order to prevent burns to the hands. To do this, measure the temperature with a thermocouple.

Depending on the type of operation, etc, the BEV series pumps can have different types of lubrication.

FRICTION BUSH BEARINGS

The friction bearings are found in the intermediate couplings of the intermediate pipes in the cover of the pump (always) and also in the case of double/triple intermediate pipe pumps. These bearings must always be lubricated and cooled.

Lubricated with pumping fluid: If the pumped fluid is clean (without particles in suspension) and non-aggressive, the friction bearings are lubricated with the pumped fluid. Lubricant is not required.

Excessive wear of the bearings may cause friction of the metal parts, thus locally increasing the temperature. The pump shall have forced refrigeration from the pumping fluid if it is clean, or with exterior lubrication of clean liquid if the pumping fluid is dirty. In the latter case, the plant operator must maintain a permanent input of clean liquid to ensure the correct maintenance of the bearing refrigeration fluid and conducts.

The absence of oil/grease in the bearing support may lead to a lack of lubrication of the lip seals, which will come into dry contact with the shaft. This contact may lead to a high shaft temperature which might cause ignition. To prevent this, regularly check the oil/grease level in the bearings support.

COUPLING FOR PUMP DRIVEN BY ELECTRIC MOTOR

Depending on the type of coupling and the work conditions, lubrication can be with oil or grease.

Lubricated with grease. PUMP WITH GREASE NIPPLES:

1st re-lubrication

The pump leaves the factory with the bearings greased for approximately 1000 hours of operation. After this time (or one year, whatever may occur first) proceed to first re-lubrication. Check re-lubrication quantity in each greaser in the attached chart

Subsequent re-lubrications

The periodicity for subsequent re-lubrications should be 1500 hours of operation or once a year (whatever may occur first). Check re-lubrication quantity in each greaser in the attached chart

Grease change (re-filling)

Change grease after approx. 6000 hours of operation or once every two years (whatever may occur first).

For complete grease change it is necessary first to dismantle the bearings and carefully clean their positions in the support in order to remove old grease.

Afterwards proceed to re-filling of grease up to approx. 75% of the free space in the bearing and approx 40% of the free space at bearing cover.

Type of grease:

We recommend using lytic-based lubrication grease with antioxidant additives, of consistency 2, in line with DIN-51502 K2K.

Coupling	Grease quantity [g]	1st Re-lubrication [h] (1)	Periodicity subsequent re-lubrication [h] (2)	Periodicity re-filling [h] (3)
AE-370	52	1000	1500	6000
AE-400	166			

(1) Or a year, whatever may occur first
(2) Or once a year, whatever may occur first
(3) Or once every two years, whatever may occur first

Pumps lubricated with oil

The pump leaves the factory without oil in the bearings support. Once installed, proceed to fill it.

Oil filling

- Release the support upper cap
- Pour oil through this orifice until the level is between the minimum and maximum marks of the control rod.
- Replace the upper cap (other pumps)

Oil change

Proceed to first oil change after 300 hours of operation. For subsequent changes oil should be changed every 6000 hours of operation (or once every year, whatever may occur first). If the environment is dusty, humid or aggressive, this change should be carried out more often.

- Before changing the oil, start up the pump in order to fluidify it.
- Release the upper filling cap and the lower drainage cap.
- Empty the support oil and let it drain off.
- Replace the lower cap and proceed to fill as indicated in the preceding section.

Oil chart

Oil recommended for normal use (bearing temperature up to +70ºC), in line with the operation revolutions and the size of the pump (ISO-VG oil grade is shown). Only join transmission oils with oxidation and mold inhibitors.

Coupling	0-1500 [rpm]	1500-2000 [rpm]	2000-3000 [rpm]	3000-3600 [rpm]
10 E-10 L2	100	68	68	46
10 E-40 H	100	68	68	46
16 1/2 E 125	68	46	46	---
20 E-300H/4	68	46	---	---

The oil change regularity and the respective amounts are as follows:

Coupling	Oil quantity [l]	1st change [h]	Subsequent changes [h] (1)
10 E-10 L2	0,2	300	6000
10 E-40 H	0,25	300	6000
16 1/2 E 125	0,3	300	6000
20 E-300H/4	0,5	300	6000

(1) Or once a year, whatever may occur first

The lubrication oil must always be clean and at its appropriate level, in order to avoid high temperatures on the bearings support. To this end, it is essential to follow the instructions on oil change and regular checks of the oil level.

Check with your supplier when a temperature outside of the indicated margins is reached, or when the environmental temperature is going to be less than -5°C.

GEAR HEAD (diesel motor)

Lubrication of bearings and gears in gear heads is carried out with oil.

Oil filling

- Release the upper cover of the two which are located below the identification plate of the head.
- Pour oil through this orifice until the level is at the mark seen through the level sight. If there is no sight, fill up to 10 mm below the filling orifice. Check the necessary volume of oil in the Oil Chart section.
- Replace the upper cap.

Oil change

The oil should be changed every 1500 hours of operation, at least once a year. In dusty, humid or aggressive environments, or if the operation temperature exceeds 82ºC, reduce this period to 700 hours.

- Before changing the oil, start up the pump in order to fluidify it.
- Release the upper filling cap and the lower drainage cap.
- Empty the support oil and let it drain off.

Replace the lower cap and proceed to fill as indicated in the preceding section.

Oil chart

Oil recommended for normal use (bearing temperature up to +82ºC), in line with the head model (ISO-VG oil grade is shown). Only join transmission oils with oxidation and mold inhibitors.

		ISO VG OIL GRADE for environmental temperature:	
MODEL	Volume of oil [litres]	-9ºC to 16ºC	10º to 52ºC
30	1.5	68	100-150
40	4	68	100-150
60A, 80A, 100A, 125A, 150A	8.5	68	100-150
200A	15	68	100-150
250	15	150	220
300, 350	17	150	220
450A, 500A, 600A	42	150	220
750A	45	150	220
1000A	57	150	220
1000G	64	150	220

If the oil temperature exceeds 82ºC, or if the equipment is to be used for a period of 8 hours a day or more, use fresh water at environmental temperature for cooling. The chart below indicates the cooling flow recommended for normal working conditions.

MODEL	[l/min]
40A, 60A, 80A	4
100A	6
125A	8
150A	10
200A	12
250, 300	15
350	21

MODEL	[l/min]
450A	25
500A	35
600A	36
750A, 1000	42
1200	46
1500	50

The lubrication oil must always be clean and at its appropriate level, in order to avoid high temperatures on the bearings support. To this end, it is essential to follow the instructions on oil change and regular checks of the oil level.

7.3 Emptying/Drainage

The emptying and drainage of pumps used to expel liquids which are a health hazard must be carried out in such a way as there is no risk to people or to the environment, in line with legislation. If necessary, use protective clothing and mask.

7.4 Dismounting

7.4.1 Fundamental instructions/observations

Note Before dismounting, ensure the pump cannot be started up.

The suction and discharge valves must be closed.

The pump frame must have returned to environmental temperature.

The pump frame must be depressurised and emptied.

Comply with all safety measures in accordance with 7.1. When working on the motor, also take into account the rules and instructions of the manufacturer.

7.4.2 Coupling

Only with solid shaft electrical motors.

1.- Release the motor from the pump, loosening the motor attachment bolts, and remove the motor along with the male coupling.

2.- If you need to release the coupling, use an extractor. Never bang in order to extract, as this may cause serious damage to the bearings.

7.4.3 Packing

- Release the gland.
- Extract the seal. If the lantern ring is also extracted, note down the order.

7.4.4 Pump

Failure of the bearings may cause ignition through increased heat on the surface of the bearings. This can be avoided by using officially approved quality bearings, which are supplied as original spare parts.

It is necessary to dismount almost he entire pump in order to extract the bearings, shaft, etc.

To do this, observe the attached sectional plan.

Before dismounting, mark the stages with their order number within the pump, and mark their relative position by way of a vertical mark in the contact zone. The dismounting process depends on the type of pump:

Pumps type 1

Sizes 6056, 6356, 6456, 6685, 8000, 8050, 8056, 8300, 8400, 1063, 1066, 1226, 1280, 1286 and 1486 correspond to this type. To dismount this type, proceed as follows:

- Remove the upper side conical bushing, releasing the threaded setscrew. Then dismount the discharge casing, either by unthreading it or by releasing the attachment screws with the first stage. The first bearing bush will be extracted with the discharge casing.
- Dismount the first stage with its bearing bush.
- Bang the rear part of the impeller with a plastic hammer until it slides along the interior bearing bush. Once separated, both can be extracted backwards.
- Repeat the steps above until all the stages are dismounted with their corresponding impellers.
- Extract the suction casing with the bearing bush.

NEVER REMOVE THE SUCTION SIDE CONICAL BEARING BUSH, since this marks the position of the shaft with regards to the other pieces when assembling. If it is necessary to remove it, clearly mark its position on the shaft before removing.

Pumps type 2

Sizes 14, 16, 20 and 22 correspond to this type.

To dismount this type of pump, proceed as follows:

- Remove the attachment nuts from the suction casing and pull to extract with the bearing bush.
- Unthread the setscrew and extract the bearing cover mounted on the shaft .
- Unthread the two nuts which secure the impellers and sleeves, extracting the first impeller and the sleeve which is behind it.
- Unthread the attachment nuts between the stages and extract the first one with its bearing bush and wear ring.
- Repeat the steps above until all the stages are dismounted with their corresponding impellers.
- Extract the discharge casing with the corresponding bearing bush.

7.5 Assembly

7.5.1 Coupling

To do this, proceed in reverse order to that described for dismounting.

7.5.2 Packing

- Cut the new packing, forming as many rings as required. The cuts, seen from above, may be straight or inclined at 45º. (see figure)
- We recommend leaving a small clearance of 0.5 mm in the packing cut.
- Position the rings one by one, pushing on them but without excessive force. The rings shall be introduced with the cut ends alternated 90°.
- Take care to introduce the lantern ring in the same order as before.
- Once the packing has been introduced, check that the shaft rotates freely without any stiff points.
- The gland must not penetrate the entire free length. If necessary, introduce more rings.
- Gently tighten the gland nuts.
- In order to determine the appropriate torque of the packing, precede as indicated in point 7.2.1 of this manual.

7.5.3 Pump

Note Check the correct positioning of pieces, especially impellers and casings.

The pump materials have been selected in accordance with the process fluid indicated in the datasheets. If this fluid is modified, check with KSB ITUR that the new fluid is suitable for the pump.

Pumps type 1

Proceed as follows to mount these pumps:

- Introduce the suction casing bearing bush in its housing and position the shaft, until it comes to a stop.
- Position the impeller by pushing its suction inlet against the casing, positioning the attachment bush and banging it (or tightening with a press) until it becomes locked against the shaft.

The shaft, bearing bush and impeller must have contact surfaces which are perfectly clean and free of grease.

- Position the corresponding stage, making the vertical marks coincide. This coinciding is not essential in pumps with threaded joints in the stages.
- Repeat the process with the other stages until assembly is complete.

Pumps type 2

In order to mount this type of pump, proceed in reverse order to that described, taking the precaution to not attach the cover of the suction casing bearing bush until all the impellers and casings have been dismounted.

Once the pump is fully assembled, check regulation in accordance with point 5.2.3.

Additional observations:

- All the joints intervening in the dismounting of the pump must be renewed.
- Use the bearings indicated.

Note

- Check the correct location of pieces, especially the seals and impellers, and tighten the impeller nuts as shown in the chart in point 7.5.4.

- Do not forget to position all the safety and protection elements, such as coupling guards, before starting up the equipment.

7.5.4 Tightening torque of the screws/nuts

	Steel	Stainless steel
ISO Metric thread	**Tightening Torque in [N·m] (for non-lubricated thread)**	
M4	3.1	2.15
M5	6.1	4.25
M6	10.4	7.3
M8	25.2	17.7
M10	49.5	34.8
M12	85.2	59.9
M16	211	148
M20	412	290
M24	710	276
M27	1050	409
M30	1420	554

7.6 Recommended spare parts

Piece denomination	Reference No.	Recommended spare parts for (1)		
		Start-up	2 years	5 years
Joints (set)	---	1	2	5
Packing	461	1	2	5
Bearing (set)	320		1	2
Wear ring	502		1	2
Deflector protection	507		1	2
Impeller nut	922		1	2
Circlip (set)	932		1	2
Keys (set)	940		1	2
Pump shaft	211			1
Intermediate drive shaft (set)	212			1
Impeller	230			1

(1) Amounts recommended for a continuous service pump

7.7 Preventative maintenance

Nº	DESCRIPTION OF THE OPERATION TO BE CARRIED OUT	PROCEDURE	REGULARITY	CONSEQUENCE
1	Check for packing leaks	Visual inspection	Weekly	7
2	Check for oil leaks	Visual inspection	Weekly	11.16
3	Check for leaks between flanges	Visual inspection	Monthly	17
4	Check for grease or oil leaks	Visual inspection	Monthly	10,11,16
5	Check for heating of the bearings	With thermocouple	Quarterly	6.10 Dismount the support
6	Check tightness of connecting bolts for motor, frame, pump, support, etc.…	Dismount casing, visual inspection	Twice a year	7
7	Verification of transmission elements	Manually	Twice a year and every time they are dismounted	
8	COMPLETE PUMP CHECK	Check and dismount the pump. See point 7 of the manual	Yearly	2, 3, 4, 6, 9, 11, 12, 13, 14, 15, 16, 17
9	Check for wear of the impeller and rings	Dismount casing, visual inspection	Yearly	
10	Check for wear of the shaft and bush bearings	Dismount, Visual inspection	Yearly	
11	Check for wear of bearings	Visual inspection	Yearly	
12	Change the rubber coupling plugs	Manually	Yearly	
13	Check functional characteristics loss	Instrument reading	In accordance with use	Check the installation, 8
14	Refill the oil or grease of the bearings	See point 7.2.2 of the manual	See point 7.2.2	
15	Change the oil or grease of the bearings	See point 7.2.2 of the manual	See point 7.2.2	
16	Change the joints	Manually	Every time they are removed	
17	Change the packing	See point 7.4.3	every 4000 hours	

8 Operation anomalies

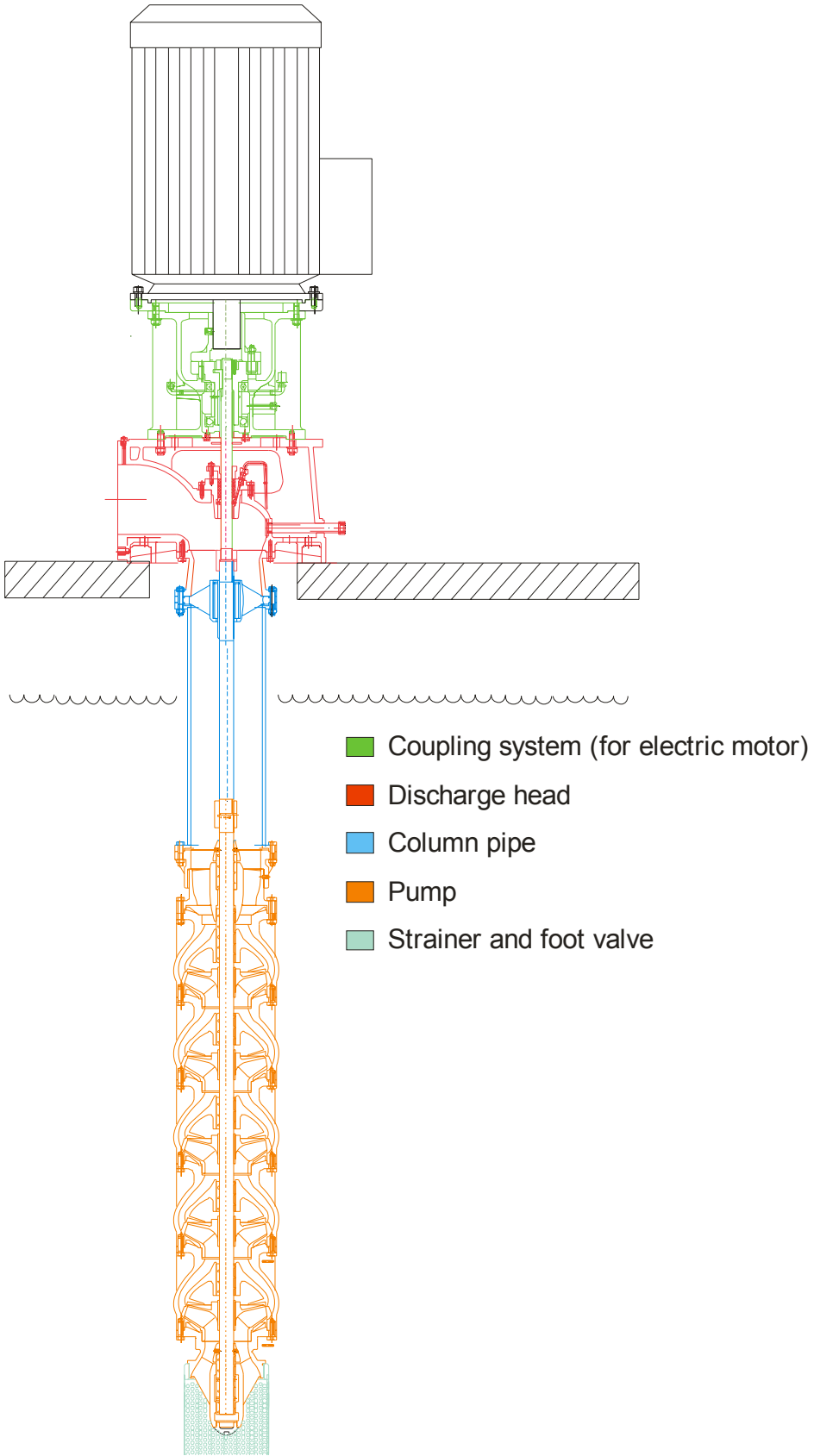
The pump does not move the fluid
| Insufficient pressure or flow
| | Excessive absorbed power
| | | Excessive vibrations and noise
| | | | Excessive bearing temperature
| | | | | The pump does not start up

						Cause	Solution
x	x					Discharge valve closed or poorly regulated	Open it or regulate it correctly
x						Incorrect pump rotation direction	Change the motor connections
x						Air comes in through the suction pipe	Check gaging
x	x					Maximum height generated by the pump lower than that required by the installation or counter pressure too high.	Increase the rotation speed. If this is not possible, a larger impeller or larger pump needs to be assembled. Please ask
x						Sieve filter obstructed	Clean it
	x					Rotation speed incorrect	Measure the speed, check the motor drive power supply voltage
	x		x			Impeller obstructed, deteriorated or imbalanced	Dismount the impeller, and inspect, balance or change it.
	x					Wear rings deteriorated or incorrectly assembled	Dismount the rings and change them
	x					Sieve filter obstructed	Clean it
	x					Pipe obstruction	Clean the pipes
	x		x			Incorrect axial regulation	Correct it
		x				Liquid viscosity or density greater than normal.	Reduce the design point or change the motor
		x				Obstruction inside the pump, impeller or nozzles	Dismount the pump and clean
		x				The real height to be generated by the pump is lower than that of the design point, meaning the flow and power are greater	Partially close the discharge valve
		x	x	x		Ball bearings, bush bearings or gears deteriorated, expanded, poorly assembled or poorly lubricated	Change them, check the assembly or lubricate them
		x				Excessive contact in rotating parts	Dismount the pump and check its elements are correctly assembled
		x				Excess solids and sand in the fluid	Clean the well or filter the fluid
		x	x	x		Poor group alignment	Check and realign
			x			Misaligned or deformed shaft	Dismount it and replace it
			x	x		Pipe tensions on the pump	Reinforce the pipes and level the equipment
			x			Lack of rigidity in the foundations or anchor bolts loose	Make new foundations or tighten the bolts
			x	x		Pump with cavitation or incoming air.	Improve the suction. Consult KSB ITUR.
			x			Insufficient pipe diameters	Larger diameter pipes, whenever possible
			x			Twisted well	Correct it
				x		Transmission poorly mounted	Check transmission
					x	Impellers in contact	Correct axial regulation
					x	Low tension or absence of phase	Change the motor connections
					x	Forced pump in twisted well	Check and repair the well

9 Annexes

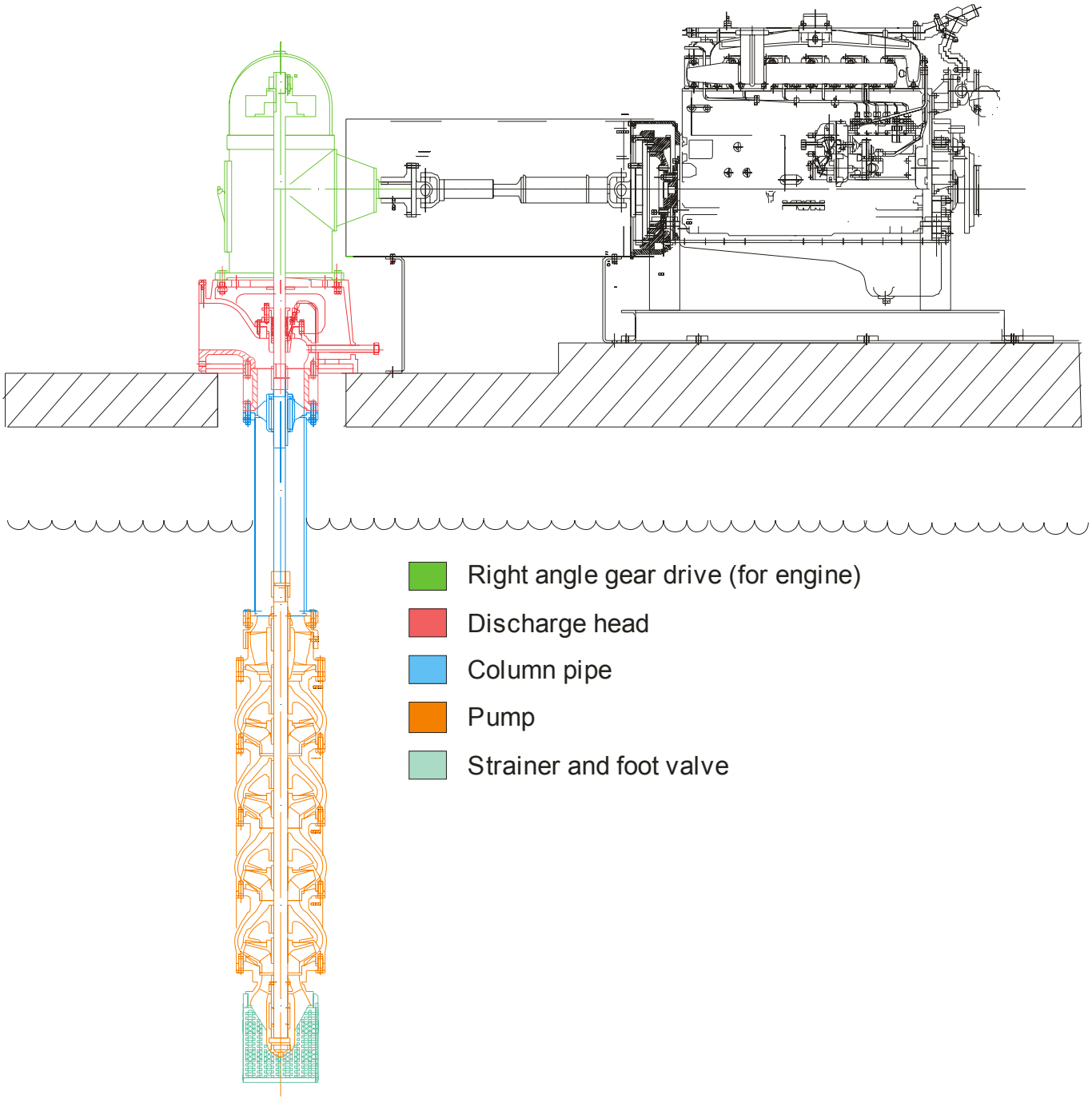
9.1 Sectional plans

Electric motor driven pump (1)



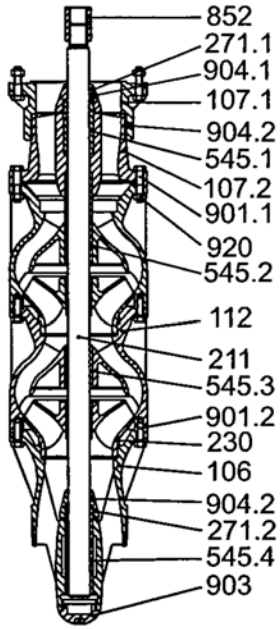
(1) This assembly is merely informative. It does not necessarily reflect the specifications of the pump you have purchased.

Engine driven pump (1)

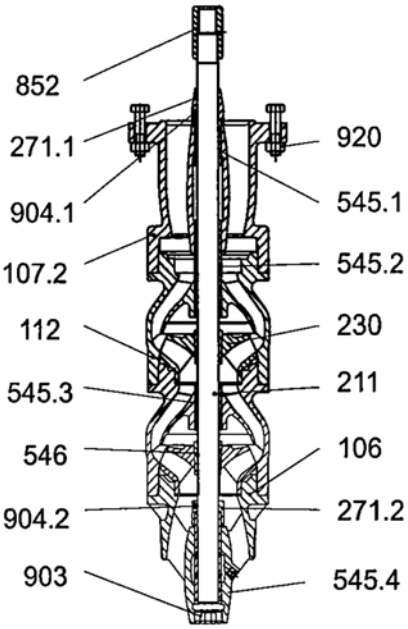


(1) This assembly is merely informative. It does not necessarily reflect the specifications of the pump you have purchased.

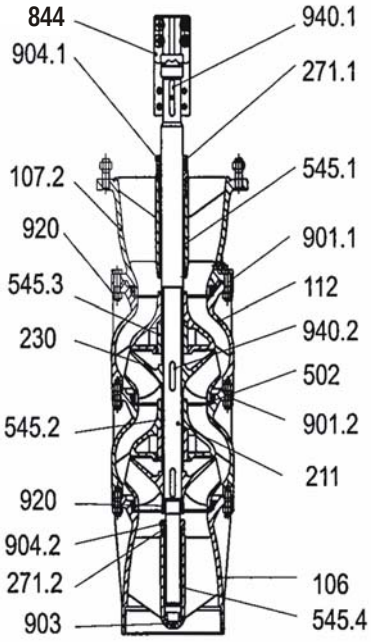
9.1.1 Pump



PUMPS SIZE
8000
1063, 1066
1226, 1280, 1286
1486

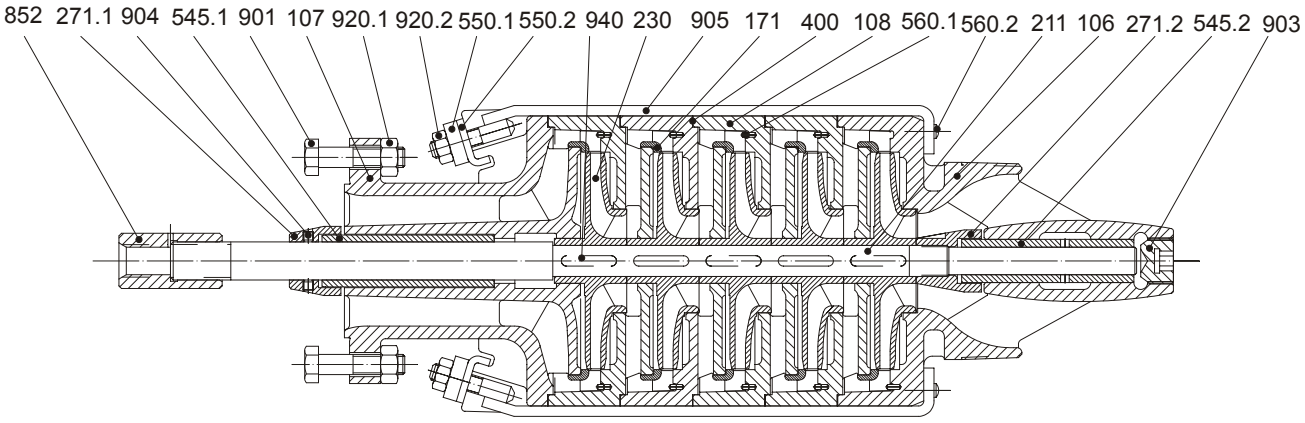


PUMPS SIZE
6056
8050, 8056



PUMPS SIZE
14
16
20
22

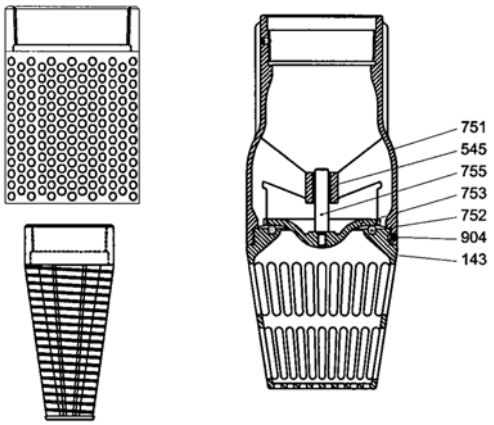
6685 PUMP SIZE



Ref.	Denomination
106	Suction casing
107	Discharge casing
108	Stage casing
112	Pump bowl
171	Diffuser
211	Pump shaft
230	Impeller
271	Sand guard
400	Gasket
502	Wear ring
545	Friction bearing bush

Ref.	Denomination
546	Conical sleeve
550	Washer
560	Pin
852	Threaded coupling
901	Hexagonal head screw
903	Plug
904	Setscrew
905	Tie bolt
920	Nut
940	Key

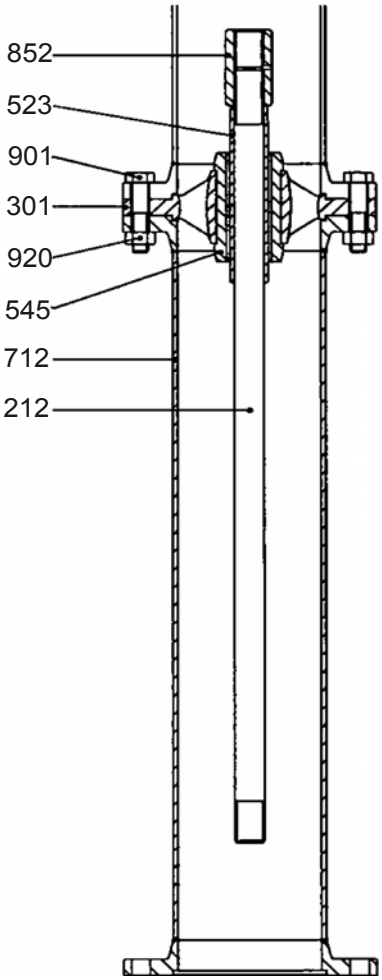
9.1.2 Filter and foot valve



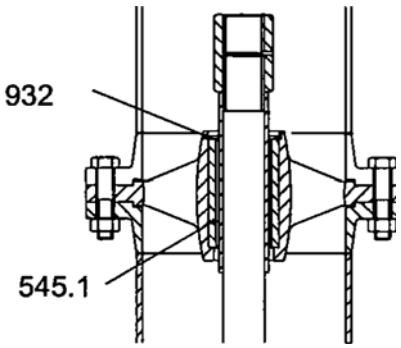
Ref.	Denomination
143	Suction filter
545	Friction bearing bush
751	Valve body
752	Valve seat
753	Valve shutter
755	Valve pin
904	Setscrew

9.1.3 Column pipe

Ø shaft ≤ 1”

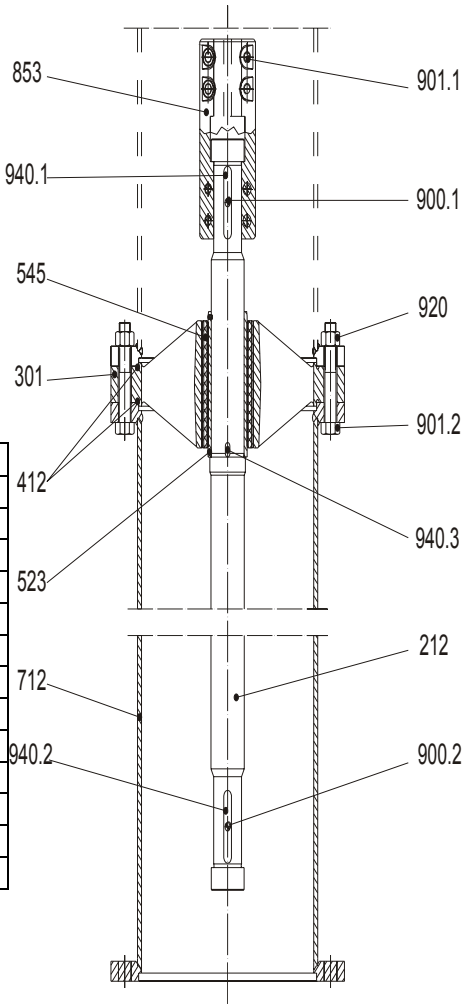


1” < Ø shaft ≤ 1.15/16”

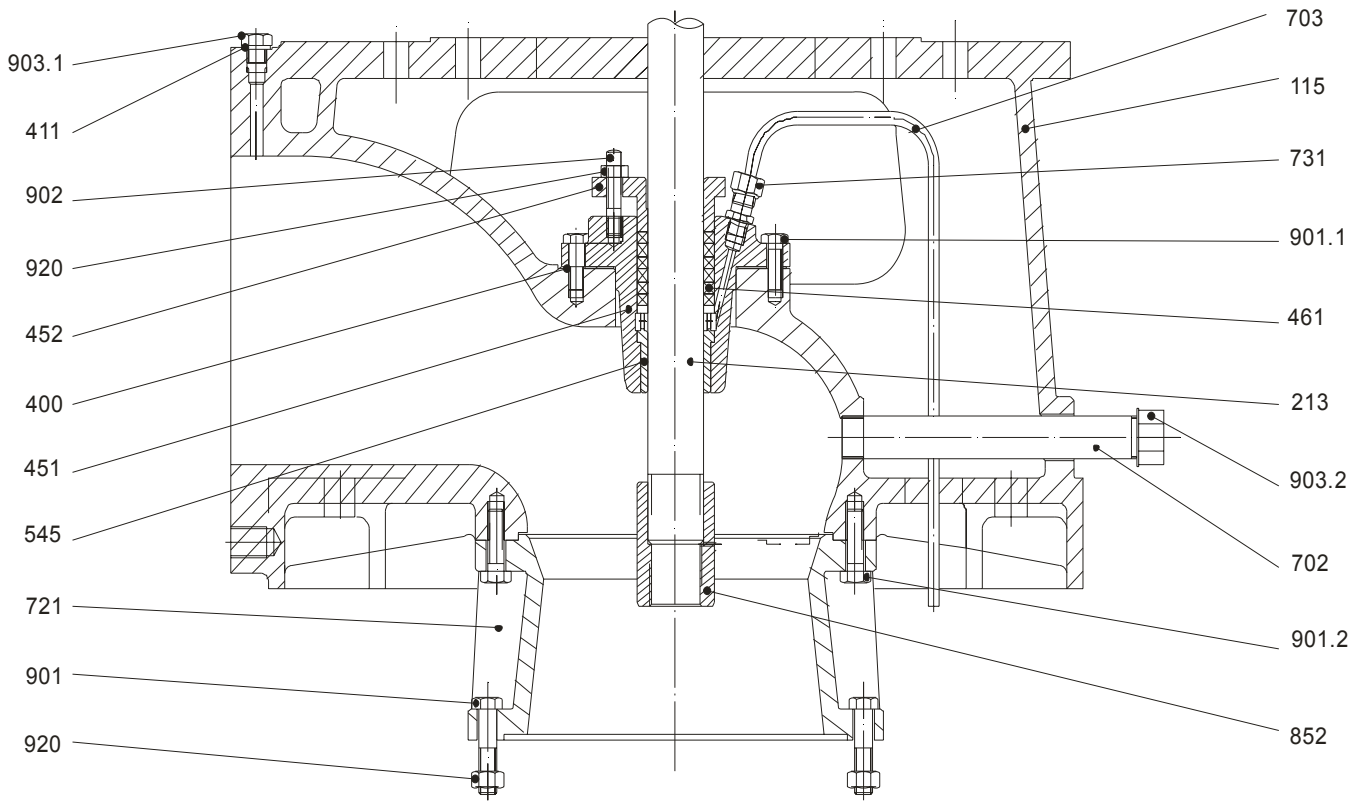


Ref.	Denomination
212	Intermediate drive shaft
301	Intermediate bearing support
412	O-ring
523	Shaft wearing sleeve
545	Friction bearing bush
712	Intermediate pipe
852	Threaded coupling
853	Axial split coupling
900	Screw
901	Hexagonal head screw
920	Nut
932	Circlilp
940	Key

1.15/16” < Ø shaft



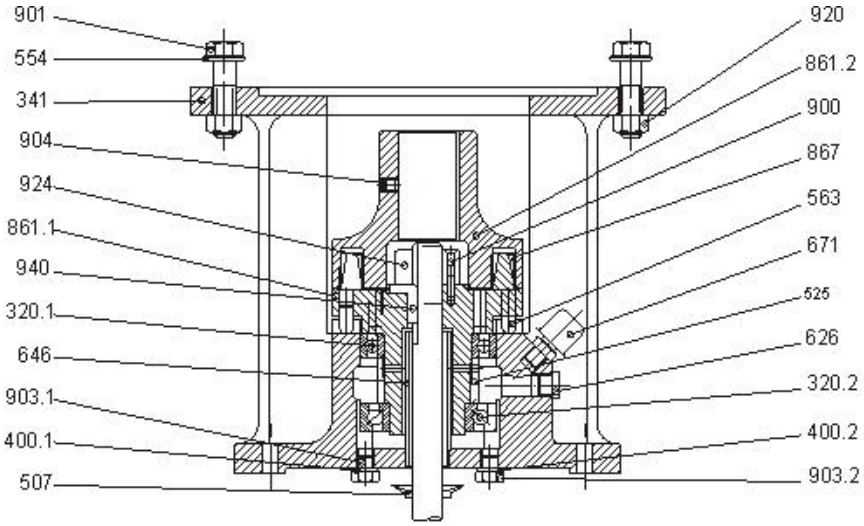
9.1.4 Discharge head



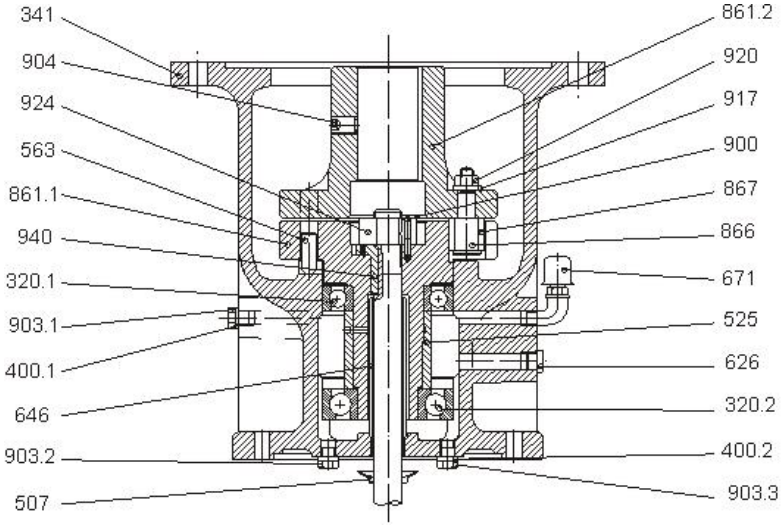
Ref.	Denomination
115	Discharge head
213	Drive shaft
400	O-ring
411	Circular gasket
451	Packing box
452	Packing gland
461	Packing
545	Friction bearing bush
702	Priming pipe
703	Cooling pipe
721	Adapter piece
731	Racord
852	Threaded coupling
901	Hexagonal head screw
902	Bolt
903	Plug
904	Setscrew
920	Nut

9.1.5 Coupling system (for electric motor driven pumps)

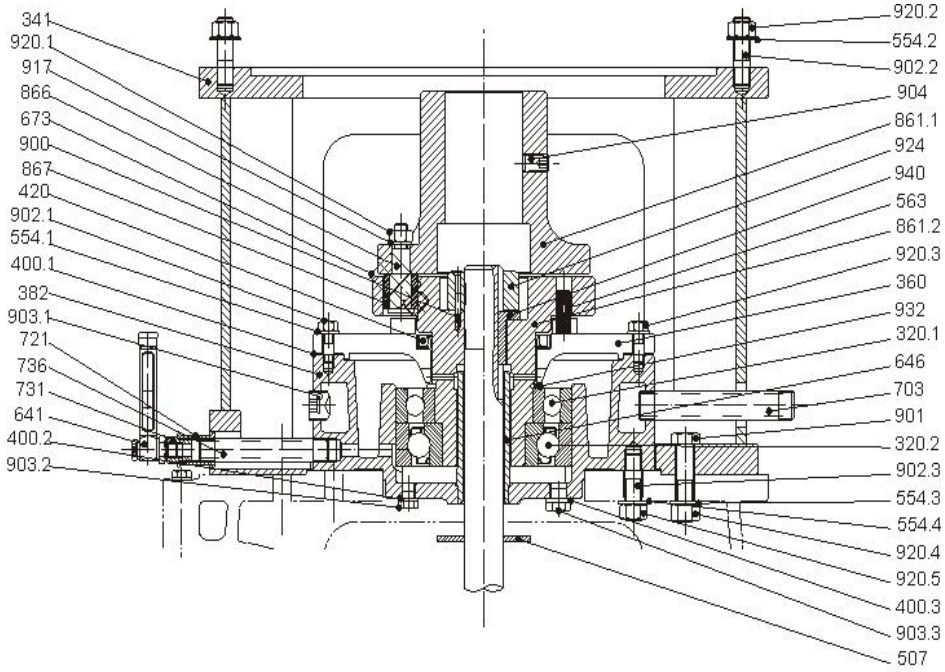
Coupling 10E-10L/2



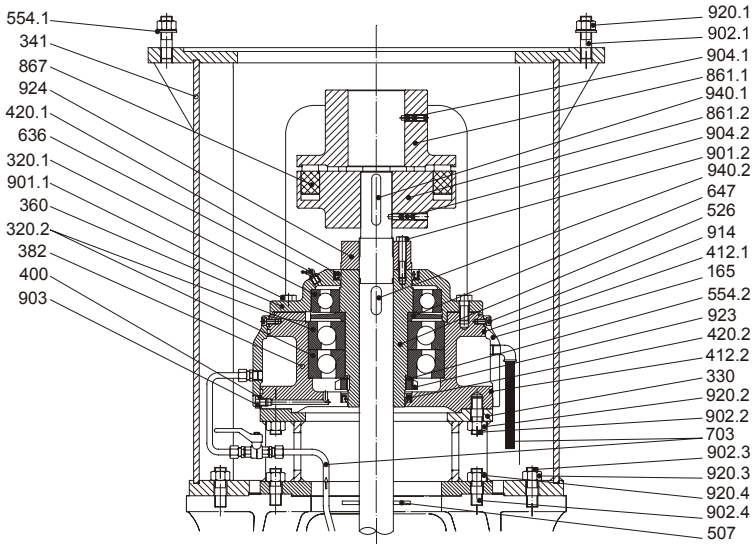
Coupling 10E - 40H/2



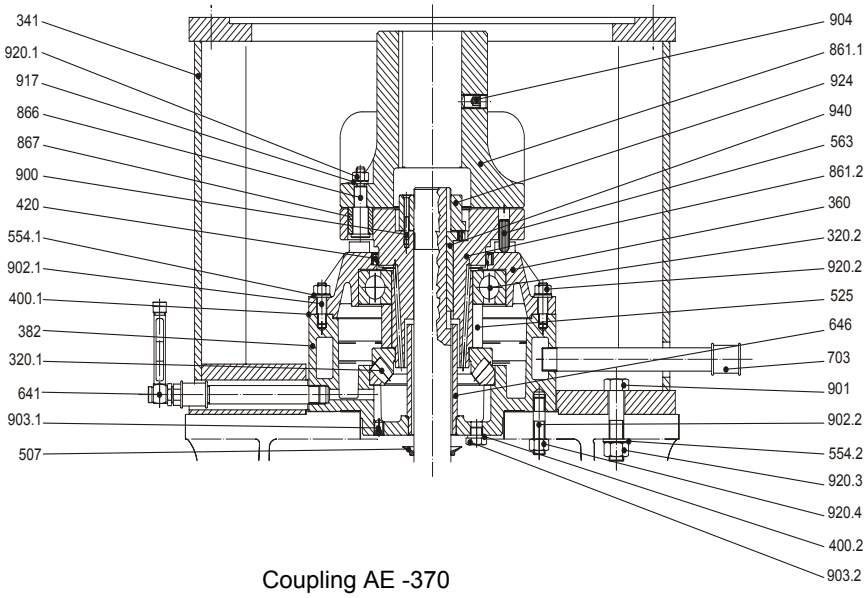
Coupling 16 ½ - 125H/2



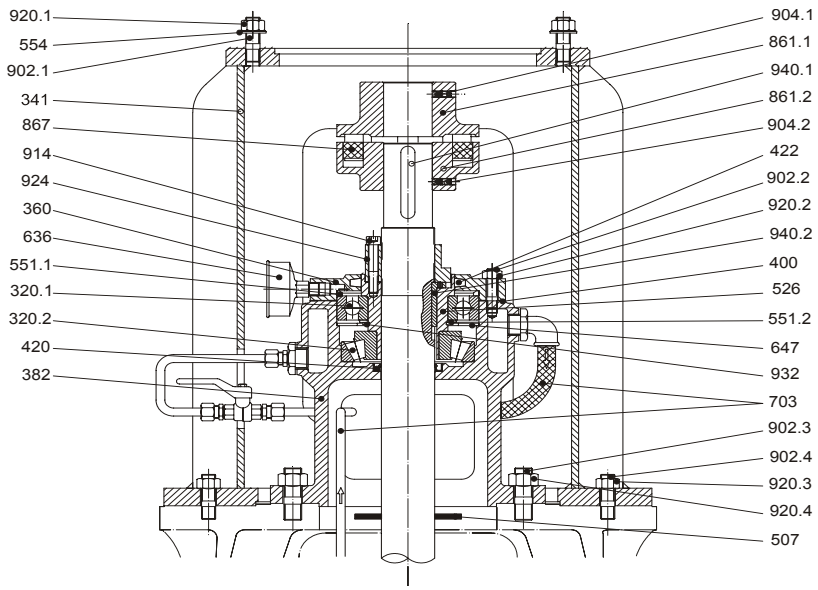
Coupling AE - 400



Coupling 20E - 300H/4

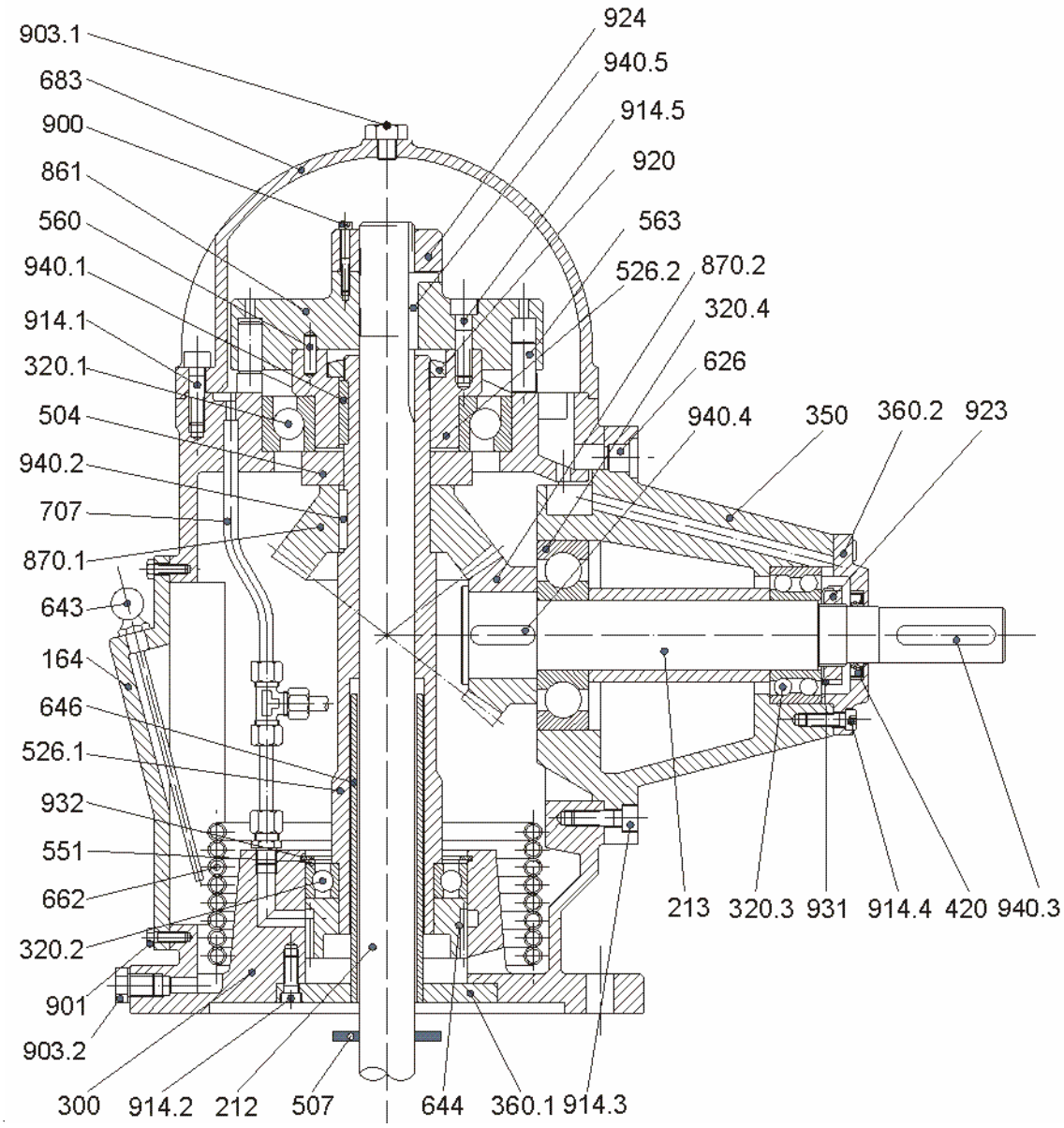


Coupling AE -370



Ref.	Denomination
165	Cooling chamber cover
320	Bearing
330	Support
341	Pedestal
360	Bearing cover
382	Bearing support
400	Gasket
412	O-ring
420	Lip seal
507	Deflector protection
525	Spacer sleeve
526	Centring sleeve
551	Spacer washer
554	Flat washer
563	Bolt
626	Sight
636	Grease nipple
641	Oil level tube
646	Oil retaining sleeve
647	Grease regulator
671	Vacuum breaker cup
673	Vent filter
703	Cooling pipe
721	Adapter piece
731	Racord
736	Lenghtening
861	Half coupling
866	Coupling pìn
867	Coupling flexible
900	Screw
901	Hexagonal head screw
902	Bolt
903	Plug
904	Setscrew
914	Allen screw
917	Grower washer
920	Nut
923	Bearing nut
924	Regulation nut
932	Circlip
940	Key

9.1.6 Right angle gear drive (for engine driven pumps)



Ref	Denomination
164	Inspection cover
212	Intermediate drive shaft
213	Drive shaft
300	Support
320	Bearing
350	Bearing housing
360	Bearing cover
420	Lip seal
504	Spacer ring
507	Deflector protection
526	Centring sleeve
551	Spacer washer
560	Pin
563	Bolt
626	Sight
643	Oil dipstick
644	Oil ring

Ref	Denomination
646	Oil retaining sleeve
662	Coil
683	Cap
707	Lubrication pipe
861	Half coupling
870	Gear
900	Screw
901	Hexagonal head screw
903	Plug
914	Allen screw
920	Nut
923	Bearing nut
924	Regulation nut
931	Safety washer
932	Circlip
940	Key

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WARRANTY

KSB ITUR Spain, S.A. undertakes:
To repair or replace at any of its ASSOCIATED TECHNICAL SERVICE CENTRES or at its factory in Zarautz, free of charge and for a period of 12 months as of the date of dispatch from our warehouses, any product which shows manufacture defects. This warranty will be reduced to 6 months for continuous or permanent service pumps.
KSB ITUR Spain, S.A. shall not be liable for any direct or indirect damage which the product suffers as a result of defective installation, lack of maintenance, negligent handling, handling by unauthorised personnel, overloading or deficient functions.
The responsibility of KSB ITUR Spain, S.A. is limited in all cases to the replacement, as speedily as possible, of the defective part, without it being in any way liable for other responsibilities or compensation.

EC DECLARATION OF CONFORMITY

(Directive 2006/42/EC ANNEX IIA)

KSB ITUR Spain, S.A., with address in footer

PUMP SERIES: BEV
S/N: 7432024-9200000

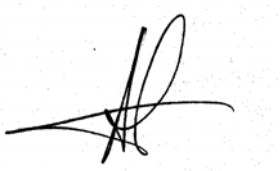
KSB ITUR hereby declares, under its responsibility, that its aforementioned machine, to which this Declaration refers, is in conformity with the applicable provisions of the following Directives:

Machinery: 2006/42/EC
Low voltage electrical equipment (if applicable): 2006/95/EC

Applied harmonised standards: EN 14121-1, EN 809

The collection of relevant technical documentation will be made in the address in the footer

Zarautz, 29.12.2009
Post Head of Engineering
Name Ángel Fernández



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