

BEDU
≡ POMPEN ≡

Operating and maintenance manual

Gear pump
S, SK series



made for your process

1. GENERAL INFORMATION

1.1 SUPPLY CONDITIONS

According to agreements with the Customer, the pump can be supplied either as bare shaft or pump unit. By pump unit we mean the pump coupled with the motor, including reduction gears and/or speed variators, if any.




1.2 MANUFACTURER

The pump Manufacturer is Bedu pompen bv... You can apply for assistance by send-ing a request to the following address:

Bedu Pompen B.V.
Poort van midden Gelderland Rood 10
6666 LT Heteren, Nederland
+31 (0)88-4802900
www.bedu.eu
info@bedu.eu

1.3 USER MANUAL CONTENT

This user manual provides all the necessary information to ensure a safe and correct use of the machine. It was written – when applicable – according to point 1.7.4 of Directive 2006/42/EC, to point 6.4..5 of Standard EN ISO 12100 - Machinery Safety – and according to point 7.2 of Standard UNI EN 809 - Pumps and Pump Units for Liquids - Common Safety Requirements -. In this manual it is constantly referred to safety instructions. Such instructions are identified by the following symbols:

	It represents the safety instructions contained in this manual, whose non-observance may compromise safety.
	It is shown when electrical safety is essential to worker protection.
	It indicates the safety instructions which should be taken into account for the safe operation of either the pump, the pump unit or the pump or pump unit protection.

1.4 NAME, TYPE

The pump standard execution is that with cast iron body, gears and shafts in carbon steel, with self-lubricating bearings made of sintered bronze and P.T.F.E. and ceramics/graphite/F.P.M. mechanic seal; pumps type SK adopt bearings in carbon-graphite. The complete series covers different executions (body and gears in carbon steel, bronze or in AISI 316L stainless steel, with shafts in AISI 316L) and different capacities. Moreover, executions with pre-heating chambers and special mechanic seal are also provided. The pump identification is realized through an alphanumeric code (see the following example):

- 00SG015/WECD00 : pump type S, cast iron execution, rated capacity 15 l/min. at 1500 rpm, gears and shafts made of carbon steel, standard mechanic seal, equipped with brass safety valve, with bell housing for coupling with a Size 80 motor.

1.5 NOISE EMISSIONS

- Reference standard: EN ISO 2361 and UNI EN ISO 3744.
- Measured values:
 - 1 - Equivalent weighted continuous acoustic pressure level
Leq = 80 dB(A);
 - 2 - Maximum weighted instantaneous acoustic pressure
C (peak level) Lpc < 82 dB(C).
- Test conditions: When measuring noise, the pumped liquid (ref. to oil with 30 cP viscosity) must be introduced into the testing system at a speed of less than 0.8 m/s into pipes. It must however reach laminar flow regime (thus the speed must be related to the viscosity) and the conditions outlined in this manual must be respected.

1.6 APPLICATION FIELDS AND LIMITS. ALLOWED AND NOT ALLOWED USES

Each machine shall be used according to the type of application, operating conditions and liquid characteristics provided in contract specifications. Each variation which alters the intended use of the pump is forbidden and the User is fully responsible for it (e.g. the use of a liquid which is corrosive to pump materials rather than the recommended fluid, etc.). For variations in use within the application limits (e.g. fluid viscosity variations) it is advised to contact the Manufacturer in advance.

Max. working pressure, for pumps in standard execution, is 15 bar.

In any case, the use of "KK" or alike plastic gears to allow the pump to operate also with poorly lubricating fluids, requires greater attention to avoid excessive or unexpected pressure loads.

It is absolutely forbidden to use the machine in hazardous environments (explosive atmosphere, etc....), the use of hazardous substances (e.g. fluids with dangerous gases), in critical conditions (e.g. abnormal temperatures, etc....), which are not supplied with the pump.

For pumps and pump units intended to be used in potentially explosive environments, please read carefully "Additional instructions for the operation and management of pumps and pump units intended to be used in potentially explosive atmospheres (Directive 2014/34/EU)".

People with pacemakers must stand at least 2 meters far from magnetic couplings or from pumps with such couplings. It is a Customer's responsibility to keep an eye that this disposal is observed by all people working on pumps or near the pumps.



Bedu pompen bv. declines every responsibility for the consequences arising from an improper use of the machine which does not comply with what prescribed in this manual or specifically requested during the order.

2. TRANSPORT, HANDLING, PACKAGING, STORAGE

2.1 GENERAL

Bedu pompen bv sells "ex works". Consequently, transport from the manufacturing shop to the named place of destination is carried out by the Customer under his own responsibility. For each transport a suitable standard packaging is ensured or established based on Customer requirements who, in any case, must give information about the type of shipment to be performed (by land, air, "overseas").

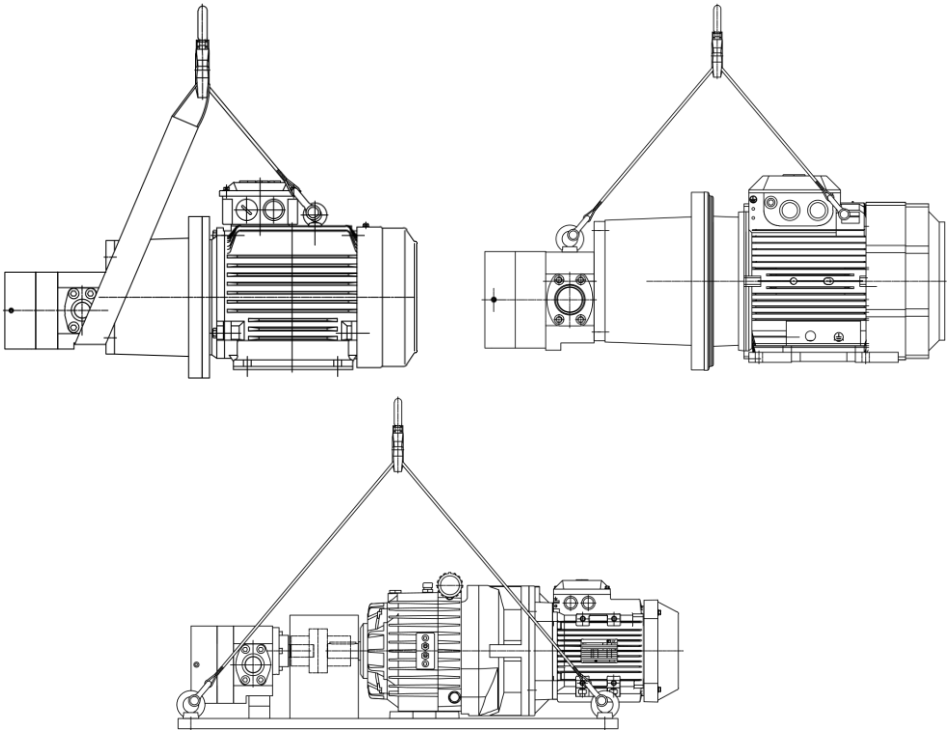
In case of long stationary periods under critical environmental conditions (such as: high humidity and/or salinity, etc.) the supply shall be stored in a protected environment.

2.2 MOVING AND LIFTING

For lifting or moving the pump units', preferentially use the eye bolts, if any always choose slings or lifting bands suitable for the weight of the equipment to more or to lift.

The weight of the units indicated on the package and on the transport document.

Please find here below, some sample pictures showing different ways for lashing the pump unit.



2.3 STORAGE FOR LONG PERIOD

As far as motors are concerned, please consult the operating and maintenance instructions of the Supplier.

Pumps must be stored indoors, in a clean, dry, moisture-free and vibration-less environment. Pump nozzles and other opening must be appropriately plugged and protected against dust entrance. Pumps must be emptied from the process liquid, eventually washed in case of aggressive fluids. Gears must be abundantly lubricated with glycerine oil (or other lubricant fluids, compatible with the pump materials). At lubricating interval and monthly, spin the pump shaft 2 turns, by hand. Before start-up, visually check for the pump unit integrity, verify the pump shaft turns freely by hand and check that all bolts and screws are correctly tightened.

3. DESCRIPTION OF THE PUMP AND THE PUMP UNIT

3.1 GENERAL DESCRIPTION OF THE MACHINE

Essentially the pump consists of two driven pinions which mesh one another inside a cast main body, thus creating a flow of liquid between the inlet and the outlet (*Fig.1*).

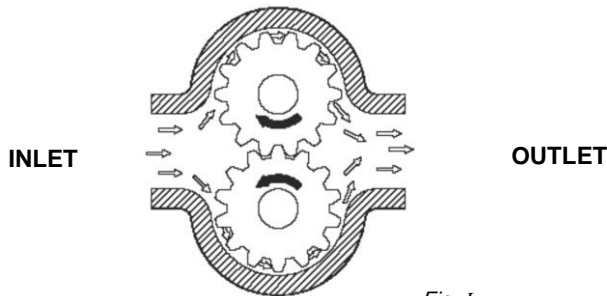


Fig. 1

The fluid containment inside the pump is ensured by a suitable seal part as defined in the order.

Pumps are usually connected to the electric motor (shape B34 or B35) by means of a flexible coupling or a magnetic coupling and a bellhousing, which also acts as safety coupling guard.

As an alternative pump is aligned with the motor (shape B3) on a common baseplate; the access to the coupling and the projecting segments of motor-side and pump-side shafts is prevented by a safety coupling guard.

The pump unit can be equipped with a mechanic reduction gear or an hydraulic speed variator for the adjustment of the rotation speed, EC approved.

3.2 WARNINGS

Standard construction pumps, as an indication, require a NPSH of approx. 0.4 bar. Always calculate the maximum available suction lift, in relation to fluid characteristics, suction circuit and operating conditions. Ensure that gears do not operate when dry. Before starting the pump for the first time or after long stationary periods, it is advisable to fill the gear spaces with oil or liquid being pumped through one of the nozzles and rotate the driving shaft by operating manually with a screwdriver on the motor cooling fan. This also makes it possible to check for even and smooth movement of rotary components and excessive friction. It is recommended that an overland cut-out set at approx. 10% above the motor current be installed in the control circuit.





In our pumps the direction of rotation is clearly shown by an arrow marking the right direction.

The pump operating temperature in normal working conditions is about 80°C. In special pump versions, working temperatures of 180°C and more may be achieved. To protect personnel from dangers due to the temperatures reached during the operation of the machine, in the event of accidental contact (burn), the User must reduce the external pump temperature by means of insulation plates, coatings, screens, barriers, etc. As limit reference temperature for the contact surface it is advisable to take 55°C. Below this value, for hot smooth surfaces in bare metal, there is no burn threshold. For a detailed knowledge of this problem in relation to different particular cases, the User can read the standard UNI EN ISO 13732-1, where burn thresholds are specified for several types of surface according to the "surface temperature - contact time" parameters.



Liquids to be pumped must not contain abrasive or solid suspension as this will greatly reduce the pump life. At this purpose we recommend the installation of a properly sized filter on the suction line if solids may be present.



When pumps are installed in parallel, the suction lines should be adequately separated to prevent unnecessary turbulence.

3.3 PROTECTION DEVICE



The bellhousing installed by the Manufacturer is made of an aluminium die-casting, fastened to the motor by screws, duly shaped to prevent fingers from coming into contact with moving parts. It can be removed only by using a proper tool. In case of alignment of pump with motor on a baseplate, a coupling guard is installed; it is made of a strong metal plate and fastened to the baseplate by screws. Both solutions prevent fingers from coming into contact with moving parts and can be removed only by using a proper tool.

3.4 ADDITIONAL DESCRIPTION OF ACCESSORIES

3.4.1 Seal parts

The pump is usually supplied equipped with mechanical seal. If the Customer requires a particular type of seal, Bedu pompen bv installs the desired seal after verifying if its dimensions are compatible with those of the pump. In case the Customer requires only the seal mark, the Company leaves the Manufacturer to select the type of seal, by giving information about the pumped liquid.

Among the seals used we can mention the following:

- Single mechanical seal
- Double tandem mechanical seals with tank and pressureless flowing liquid
- Double opposed mechanical seals with external pressurized flowing liquid

These last must be installed when the pumped product has characteristics which prevent it from being used as flowing source or for greater safety (visual inspection).

The tank for tandem mechanical seals is not pressurized and it is used to avoid dry operation of the external seal and visually detect any possible leakage of the internal mechanical seal.



For magnetic drive pumps sealing is only ensured by static gaskets, since the pump shaft is completely enclosed within the pump body.

3.4.2 Safety valve

The pump can be equipped with a safety valve, with adjustable calibration, installed on the rear cover.



After reaching the calibration pressure, prevailing on the contrast spring reaction, the valve starts opening by connecting the outlet side and the inlet side of the pump.

The valve function is just to protect the pump from accidental pressure peaks. Its prolonged opening may imply the pump damaging.

4. INSTALLATION, ASSEMBLY

4.1 SPECIAL ASSEMBLY TOOLS

To assemble the pump you do not need special tools, except for seal extractors (see Maintenance).

4.2 INSTALLATION SITE INFORMATION

4.2.1 Space requirements for operation and installation

The space destined by the Customer to the installation of the machine should be enough to gain access to, install and maintain the pump unit.

4.2.2 Inspection before starting installation

Before installation, the Customer must ensure that the environmental conditions of the selected site comply with requirements specified under the contract.

In particular, unless expressly required and accepted in the order, the installation site should not be exposed to the following environmental conditions:

- abnormal temperature;
- high humidity;
- corrosive atmosphere;
- explosion and/or fire hazard areas;
- dust, sandstorms;
- earthquakes and other similar external conditions;
- high level of vibrations;
- high altitude;
- flood hazard areas.



4.2.3 Foundation details



The metal baseplate shall be of sufficient size and strength to support induced stress.

When the pump unit is installed, it shall be firmly fixed in place by fastening bolts or by using other securing methods.

Ground fastening bolts or other securing methods shall be of sufficient strength to prevent the pump unit from moving accidentally.

4.2.4 Alignment requirements



The alignment operation must not submit the pump unit to axial and radial stress, therefore the offset must always be lower than the tolerance limits expected for the coupling.

Great care shall be taken to align pump units equipped with magnetic drive coupling.

4.2.5 Suction lift



The suction lift, that is the vertical distance between the pump inlet mid-point and the free surface of the tank to which the pump is attached, must not exceed 7 m to allow pump priming and avoid cavitation phenomena (*Fig.II*).

Otherwise, contact our Technical Department.

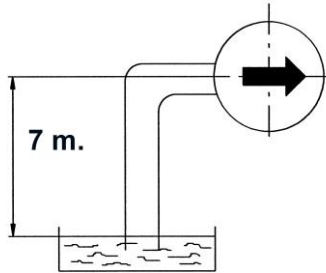


Fig.II

Each pump must have its own suction pipe; the installation of two or more pumps with a common suction pipe length causes the pump to work less efficiently (Fig.III).



The length of the suction pipe must be reduced as much as possible to minimize pressure losses in such segment; higher pressure losses in the discharge line do not adversely affect the correct operation of the pump (if they do not exceed the delivery limits stamped on rating plate).

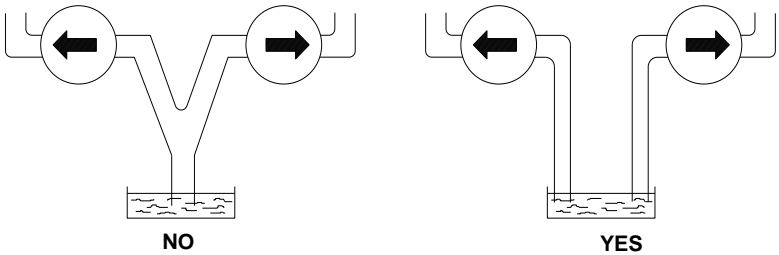


Fig.III



Furthermore, it is necessary to check that siphons are not created in the suction pipe, since the formation of air pockets generates vibrations and stresses which are not compatible with the correct operation of the pump and may obstruct the pump priming at startup (Fig.IV).

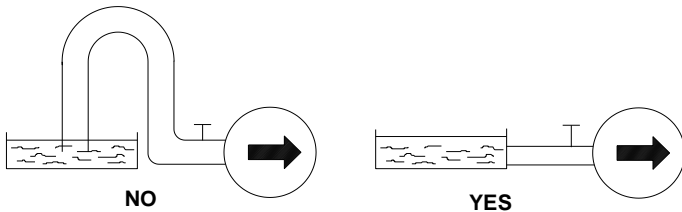


Fig.IV



In case of installation below head, the pump does not ensure to be able to intercept the flow of fluid as a shut-off cock or a proper stop valve.

4.3 INITIAL INSTALLATION

According to the conditions of supply, the pump can be delivered as follows:

4.3.1 Complete Pump Unit



In this case the Customer must stiffly fasten the pump unit (or the baseplate) in order to ensure the correct axis alignment in all operating conditions.

We recommend the use of vibration dampers below the pump foot and vibration damping sections on pipes near pump nozzles.

Once the pump unit has been positioned, proceed as described below:

- g) connect suction and discharge pipes respectively to the pump inlet and outlet;
- h) power the motor, by carefully controlling the compatibility of motor voltage and frequency with those of the system;
- i) open the intake and discharge pipe valves, if any;
- j) run the motor for a while to verify that the pump rotates in the direction indicated by the arrow stamped on the pump.

4.3.2 Bare shaft pump

In this case, before following the steps described at Paragraph 4.3.1, choose the type of motor and align it to the pump.



The motor must be selected by the Customer depending on the type of operation for which it is specifically requested (continuous operation, discontinuous operation, repeated startups, indoor or outdoor installation, explosive atmosphere, critical environmental conditions, altitude, etc.) with power compatible with that required by the pump.

Motor and pump shafts are coupled by flexible coupling or by magnetic coupling.

In case of pump with bellhousing, its centering both on pump and motor, guarantees a correct alignment (avoid instructions from a) to f) of the following two points).

To align the *flexible coupling* make the following basic operations:

- k) accurately measure the height of the pump axis (h) and the height of the motor axis (H);
- l) calculate the difference $D = h - H$ (Fig. V);

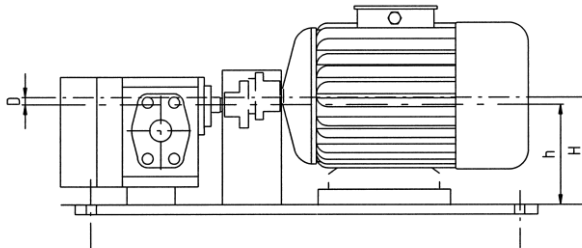


Fig. V

- m) prepare some aluminium (or steel) shims with height D ;
- n) place motor and pump on a single plane (verify their flatness), by placing shims where necessary (or under the motor feet or the pump feet);
- o) verify that the axes of the two shafts coincide, by measuring the two diameters by difference, that is, by accurately measuring R , $D1 = 2R + d$ (Fig. VI). If this equality is not verified, properly place calibrated shims so as to align perfectly the pump unit;

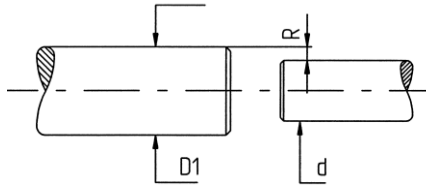



Fig. VI

-  p) check that the pump axis and the motor are perfectly coaxial, since an offset would cause aradial force whose strength may reduce the life of the pump or motor (Fig. VII).

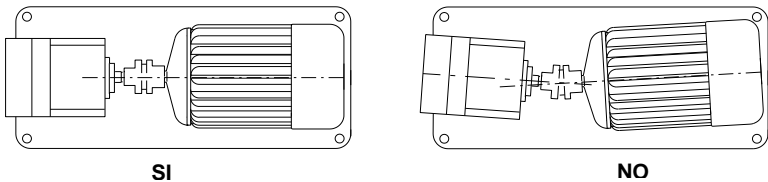




Fig. VII

 **Do not move the pump side coupling; operate on the motor side coupling only.**


 **Leave an axial clearance of approximately 2 - 3 mm between the 2 couplings, so as to avoid stresses induced by axial forces and thermal expansions.**

In case of connection by magnetic coupling, proceed as follows:

- a), b), c), d) proceed as in the case of the flexible coupling;
- q) verify the coaxiality between the inner magnet cover and the outer magnet cover, by accurately measuring R , difference between the outer cover diameter d and the external outer magnet diameter $D1$. This measurement should be made on at least 4 points at 90° ; if different values are found in various measurement points, properly place calibrated shims so as to perfectly align the pump unit;
-  r) the non-perfect coaxiality causes differences in the air gap which induce variations of the magnetic pull force on the inner magnet with consequent radial forces on the shaft and wear of bushes;

It is also essential to avoid generating axial stress on the inner magnet, which would cause the consequent premature deterioration of bushes, by leaving the outer magnet free to position itself axially. After positioning the pump and the motor, it is therefore necessary to unscrew the coupling fastening grub screw on the motor shaft and retighten it after the magnet has moved to its balance position.

Verify that the end of the motor shaft is at a distance of at least 2 - 3 mm (axially) from the inner magnet cover.

 It is advisable to mark by two dowel pins the position of the pump on the baseplate, so as to make the assembly easier after maintenance operations.



When centering the outer magnet, pay particular attention to the effects of the magnetic pull force; in particular pay attention to your fingers (always use safety gloves) and not to damage magnets with accidental shocks. We recommend to use tools in non-magnetic material.



The User shall place a rigid coupling guard on the flexible or magnetic coupling; it shall be machined so as to prevent access to moving parts. Such coupling guard shall be firmly secured to the baseplate.



People with pacemakers must stand at least 2 meters far from magnetic couplings or from pumps with such couplings. It is a Customer's responsibility to keep an eye that this disposal is observed by all people working on pumps or near the pumps.

4.4 DRIVE UNIT AND ACCESSORY ASSEMBLY

4.4.1 Motor



The Company installs EC approved electric motors, of power compatible with that required by the pump, selected according to the desired operating conditions and environmental characteristics. In particular if the pump unit is required to operate in explosive atmosphere, the motor is chosen in explosion-proof execution (**we remind that, to be used within the European Union, also the execution of the pump and the relevant fittings must comply with directive 2014/34/EU**).

4.4.2 Installation of safety and control devices

If specifically requested in the order form, the Company provides the relief valve, which must be calibrated to protect the pump from damage. Once it has been properly calibrated, the valve must not be tampered with in any way, since volumetric pumps can reach quickly, with the delivery closed, extremely high pressure values, with consequent very serious danger.



Any pressure adjustment shall be compulsorily made with the pump stopped and depressurized.



The User shall install a pressure gauge in the pump outlet; it is advisable to install a vacuum gauge near the pump inlet.



In case also a regulating valve is installed on the system, make sure that the calibration pressure differs considerably from the safety pressure not to generate dangerous resonance phenomena (pipe and/or valve break).

4.5 ELECTRICAL CONNECTIONS, CONNECTION CABLES



The machine shall be connected to the external ground protection system by the appropriate terminal, which must be identified by the PE letter. Connection cables shall be properly sized and insulated. Before energizing the machine, always verify that the mains voltage and frequency are compatible with those of the motor.

4.6 PIPING

4.6.1 General



Pipes shall have a suitable diameter to allow a regular flow with low pressure losses. Therefore, we recommend to use, at least for the suction line, pipes with inner diameter equal to or greater than that of the pump inlet, mostly when the viscosity level becomes considerable. To minimize pressure losses in the circuit, we recommend to avoid, as much as possible, abrupt variations of section and direction (curves) along the pipe run, particularly in the suction line.

4.6.2 Forces and moments which operate on suction and delivery flanges.



As general rule it would be necessary to interpose flexible vibration damping sections between the pump and the system piping; therefore, we recommend to verify that the flanges of the connection pipes are always placed, in free position, with the planes parallel to those of the flanges of the suction and delivery nozzles to avoid that, after fastening them, forces and moments of excessive value are generated.

In any case, the User shall make sure that the loads induced on the pump flanges, under the most critical operating conditions, do not exceed the values prescribed by Standards UNI EN ISO 14847.

4.6.3 Fastening screw torques

The fastening torque for the screws of our pumps shall be:



- for M6 screws 11-12 Nm
- for M8 screws 20-22 Nm
- for M10 screws 38-40 Nm

For more detailed information, contact our Technical Department.

5. COMMISSIONING, OPERATION, SHUTDOWN

5.1 DOCUMENTATION

Operating and maintenance manual

5.2 PUMP PREPARATION FOR STARTUP

5.2.1 Filling / discharge

To prevent gears from running dry, before starting the pump for the first time or after long stationary periods it is advisable to fill the gear spaces with oil or liquid being pumped through one of the nozzles and rotate the driving shaft by operating manually with a screw-driver on the motor cooling fan. This also makes it possible to check for even and smooth movement of rotary components and excessive friction.



The pump discharge, in case of toxic, noxious or, in any case, dangerous fluid, shall take place according to all the necessary cautions. In particular, the pump body shall be emptied according to proper operating maneuvers.



5.2.2 Electrical connections

It is necessary to choose wires which satisfy the operating conditions required by the Customer (e.g. voltage, current, electric shock protection, bundle of cables) and can support external influences (e.g. ambient temperature, presence of water or corrosive substances, mechanical stresses, fire hazards). Moreover, we remind that wires must be properly sized to ensure the voltage drop from the power supply inlet to the point of load application does not exceed 4%.



5.2.3 Verifying the direction of rotation

Open the intake and discharge valves. To verify the direction of rotation run the motor for a while only to check that the pump rotates in the direction marked by the arrows.



5.3 SAFETY DEVICES

5.3.1 Mechanical safety devices (guards for rotating parts)

The hazardous area, represented by the projecting sections of pump side and motor side shafts and the coupling, shall be protected against accidental contact using bellhousing, which must be firmly secured both to the motor and to the pump or using a duly shaped strong metal coupling guard, which must be firmly secured to the baseplate.



5.3.2 Acoustic insulation



Sound emission values are specified in this manual. The User should always verify if the regulations of his own country prescribe, in relation to the frequency of exposure to emission values, the use of **individual protection devices**. If it is, he must comply with the requirements contained in the above-mentioned regulations to protect the operator's health and safety.

5.3.3 Splash-proof cover



In the event the liquid being pumped is dangerous, the operator must be in any case protected against the risk of any accidental contact with jets of liquid by wearing appropriate **individual protection devices**.

5.3.4 Regulation on the electric components



We remind that in accordance with Standard IEC 60204-1 Ed. 2000-05, as power disconnecting switch, a plug/socket combination is allowed for a machine with rated power **equal to or lower than 16 A** and a total power **equal to or lower than 3 kW**.

5.4 COMMISSIONING

5.4.1 Initial commissioning



- Ensure that the pump unit is properly earthed.
- In case the pump is equipped with heating jacket, it is necessary to operate this last up to reach the normal operating temperature and gradually start the liquid pumping up to reach the operating conditions in thermal equilibrium.



- Verify that suction pipes are properly joined one another to avoid air infiltrations which would prevent the pump from priming.



- Check that siphons are not created in the suction pipes so that pump can completely remove the air. In this case, if the air is not completely removed then the flow rate may decrease and the noise level may increase although the pump has taken in the liquid, with consequent premature deterioration of bearing bushes and moving parts.

- Where applicable, verify that the pipes for the external flow of mechanical seal are properly connected.

- Verify the proper operation of the relief valve; to do so it is necessary to gradually increase pressure, by acting on the valve located on the discharge pipe, up to reach the expected calibration value. Now, after a further rotation of the valve, the discharge pressure shall remain lower than the calibration value. Otherwise, **after stopping the machine and depressurizing the pump**, it is necessary to disassemble the valve cap ①, remove the gasket below ③, loosen the nut ④ and rotate counterclockwise the pre-load adjusting screw ② (clockwise to increase the pre-load of the spring ⑤). Retighten the lock nut ④, interpose the gasket ③ and rescrew the protection cap ①. **The adjusting screw ② is not equipped with retainer, therefore it is necessary to pay attention, when unscrewing it, not to cause a leakage of the fluid being pumped.**



5.4.2 Startup after shutdowns



The most common case in which the pump may stop working - apart from the power supply failure (black out) - is when the electric motor overcharge protection comes into operation. In this case, before starting the pump examine the causes which triggered the activation of the protection and remove them.



In magnetic drive pumps, it may happen that, once the maximum transmissible torque value has been exceeded, the pump stops while the motor is idling. In this case, it is necessary to stop immediately the motor, wait until the inner magnet cover (which became hot as a result of eddy currents) is cooled and restart the motor after troubleshooting

5.4.3 Pump system requirements



In volumetric pumps, pressure is not related to flow rate and/or rotation speed; therefore, avoid installing shut-off valves on the discharge pipe and, in any case, if not incorporated with the pump, a relief valve must always be installed between the pump and the stop valve.

5.4.4 Startup/shutdown frequency

Pumps which are expressly requested by the Customer to start frequently and repeatedly do not show any problems for this kind of operation.

5.4.5 Operation and startup with closed valve



It is forbidden to start the pump with the discharge valve closed: such mistake would cause an abrupt pressure rise above the limit values with consequent seizing.

5.5 SHUTDOWN

5.5.1 Decommissioning



In case of decommissioning of the pump unit, it is necessary to disconnect the power supply to make unexpected and accidental startups impossible.

5.5.2 Emptying



A pump or a pump unit which operates with a flammable, toxic, corrosive or, in any way, hazardous fluid, or with a liquid at a temperature higher than 55°C, shall be equipped with a device such as a connection pipe, **to be provided by the User**, to collect and dispose the liquid drained or coming from any possible leakage from the shaft seal or discharged by a pressure relief valve.

6. MAINTENANCE AND INSPECTION



Maintenance operations and pump disassembly must be performed only by authorized and specifically trained people.



People with pacemakers must stand at least 2 meters far from magnetic couplings or from pumps with such couplings. It is a Customer's responsibility to keep an eye that this disposal is observed by all people working on pumps or near the pumps.

6.1 USE PRECAUTIONS

Before performing any maintenance operation, please observe the following safety precautions:







- **Never** execute maintenance operations with the pump running.
- Cut the power supply to the pump unit.
- Wear gloves, glasses, shoes and protective suits adequate to the characteristics of the liquid being pumped.



- Wait until the pump is cooled.
- **Never** open the pump unit and/or the relief valve when the pump is pressurized.
- Close suction and discharge pipe valves, if any.



- Disconnect the pump from suction and discharge pipes, by paying attention to put a collecting basin for the pipe liquid.

- In case externally flowed mechanical seals are used, disconnect the relevant pipes.
- Cut the power supply to the motor and disconnect the earth cable.
- Disconnect the pump from the motor, **leaving the bellhousing connected to the pump.**
-  - As an alternative, disassemble the coupling guard and disconnect the pump from the motor and from the baseplate.
-  - **If necessary, pay particular attention to the effects of the magnetic pull force; in particular pay attention to your fingers (always wear safety gloves) and not to damage magnets by accidental shocks. We recommend to use tools in non-magnetic material**
- Place a collecting basin for the pump liquid.
- Perform the maintenance operation.
- Carry out the pump with bellhousing-motor coupling carefully.
- As an alternative carefully align pump with motor on the baseplate, fasten the pump, couple it with the motor and fasten the coupling guard.
- Connect the pump to suction and discharge pipes.
- Reconnect the power supply to the motor and the earth cable.
-  - Open suction and discharge pipe valves, if any.
-  - Reconnect the power supply to the pump unit.

6.2 WEARABLE MATERIALS

The normal wear parts, included as spares in the 2-year warranty are the following:

- bearing bushes;
- seal parts (mechanical seal, gaskets);
- gears;
- shafts.

6.3 SURVEILLANCE DURING OPERATION

The pump unit does not need the presence of an Operator during the work cycle. It is up to the User to provide or not a periodic surveillance depending on the importance and seriousness of the operation. The relevant checks shall be aimed to detect abnormal noise, vibration, temperature levels and/or some dripping from the mechanical seals, variations of pressure and/or flow rate, etc.

6.4 PREVENTIVE MAINTENANCE

It is always advisable, for a reliable and cost-effective operation, to adopt a policy of preventive maintenance. The service time specified for wearable component parts in this manual can be used as reference for the first period of operation. Later the user will be able to improve the MTBM (Mean Time Between Maintenance) as a result of the acquired experience.



6.5 PUMP DISASSEMBLY AND REASSEMBLY

6.5.1 Tools

No special tools are requested, except for seal extractors.

6.5.2 Disassembly/reassembly procedure

Before disassembling the pump, it is necessary to perform the operations mentioned at point 6.1 "MAINTENANCE AND INSPECTION".



Refer to the drawings and nomenclature attached at the end of the manual.




After assembly, for the pumps provided with thrust bearing, it is necessary to pressurize the pump up to 5 ÷ 6 bar (alternatively, apply a traction of approx. 110 N to the drive shaft), put the pump side coupling near the bearing (if necessary, interposing the specific ring) and fasten it with the grub screw.




Before starting the pump maintenance operations it is necessary, if any, to dismantle the bellhousing and the pump centering ring ⑳, fastened with the screws ⑰A.

1) Single seal (see Figure 1)


a) Access to the mechanical seal

 After removing the feather key (23) from its seat, loosen socket screws (16) of the seal cover (1) and extract it, but paying attention not to damage the seal static part (10A), housed in the cover. It is thus possible to check the state of wear and tear of the seal contact surfaces. On reassembly, pay attention not to pinch the sealing O-ring (26) housed in the seal cover.

b) Replacing static seal

 To remove the static part of the seal (10A) from the seal cover (1), it is necessary to extract, by using special pliers, the seeger ring (13) housed in the cover, if any, and remove the ball bearing (14) (if any); then exert a pressure upon the external side of the seal. After placing the seal cover on a plane and greasing the walls to make assembly easier, insert the new static seal (10A) with the relevant O-ring; use a pad interposed with a soft bearing to exert the force perpendicularly to the cover.


c) Replacing dynamic seal


 To remove the dynamic part of the seal (10B) it is advisable to use an iron wire bent at 90° at one end to hook the first or the second coil of the seal spring. Exert a traction force parallel to the shaft (5), by paying attention not to scratch this last. After greasing the shaft to make assembly easier, insert the new mechanical seal (10B) by rotating the spring in the direction opposite to that of the coil; use a pad interposed with soft bearing to press the seal up to make the spring rest on the seeger (25B) provided on the shaft.

N.B. In some special (bidirectional) mechanical seals, the rotating seal is fastened to the shaft by means of two (or more) grub screws; so, for disassembling, first you must loosen the grub screws. To perform such operation, you must insert an Allen wrench through the hole made on the top of the front cover of the pump (2), closed by a threaded plug, and rotate the shaft. The reverse operation must be followed for assembling.


2) Double back-to-back seal (see Fig. 2)


a) Access to the outer mechanical seal

 Place an adequately sized basin under the seal-packer (34) and depressurise the circuit by loosening the nut (53A) and empty the circuit

 After having taken the tab (23) out of its seat, unscrew the hex head screws (56) of the outer seal-packer lid (34) and remove it, being careful not to ruin the static part of the outer seal (10A), housed in the lid itself. It is thereby possible to check the wear conditions of the outer seal's contact surfaces. When putting it back in, be careful not to pinch the sealing O-ring (57) housed in the lid.

b) Replacement of static seals

 To extract the static part of the seal (10A) from the seal-packer lid (34), use special clamps to remove the seeger ring (13) housed in the lid, extract the ball bearing (14) and apply pressure on the outer part of the seal. When you have positioned the seal-packer lid on a flat surface, after greasing its walls to facilitate assembly, insert the new static seal with relative O-ring; use a pad with a soft cushion placed in between to press perpendicularly on the lid.

 To access the static part inside the seal, proceed as specified in points c), e). Operating from the rear of the front body, insert the tip of a screwdriver into the groove between the shank of the internal mechanical seal (37A) and the bushing that houses it (38A) (the latter is assembled forcefully into the body and cannot be disassembled). Hitting the outer part lightly, it is possible to extract the fixed seat (37A) of the internal mechanical seal.

On assembly, after re-assembling the gears and shafts as described in point e), place the pump on a surface, cover the walls of the bushing (38A) with grease to facilitate assembly, insert the new static seal with relative O-ring, being careful to align any grooves with the anti-rotation pin, if applicable. Use a pad with a soft cushion placed in between to press perpendicularly on the lid.

c) Replacement of dynamic seals

To extract the dynamic part of the outer seal ⑩B, it is advisable to hold the spring the mechanical seal and, rotating in the direction of its spirals, pull parallel to the axis of the shaft ⑤D, being careful not to scratch it. After greasing the shaft to facilitate assembly, put in the new mechanical seal by turning the spring in the opposite direction of the spiral; use a pad with a soft cushion placed in between to press the seal until the spring touches the stop ring ③5A on the shaft.



To replace the dynamic part ③7B of the internal seal, you must remove the intermediate flange ①A, and relative fastening screws ①6A and O-ring ②6 and ③7. Then remove the ring ③5A, secured to the shaft with threaded nuts ③6. **It is important to mark the precise position of the ring on the shaft before removing it. This will then ensure correct pre-loading on the seals.** To take out the dynamic part of the internal seal ③7B, it is a good idea to use an iron wire bent by 90° on one end to hook onto the first or second spiral of the seal spring. Pull parallel to the axis of the shaft ⑤D, being careful not to scratch it. Make sure the nuts ③6 did not mark the shaft ⑤D.



After greasing the shaft to facilitate assembly, put in the new mechanical seal by turning the spring in the opposite direction of the spiral; use a pad with a soft cushion placed in between to press the seal until the it matches the fixed part ③7A. Secure the ring ③5A in its primitive position and lock it onto the shaft ⑤D with the nuts ③6.

During this operation, be careful not to invert the seals and relative springs.



3) Double seal in tandem (see Fig. 3)

a) Access to the outer mechanical seal

Place an adequately sized basin under the seal-packer ③4B, loosen the nut ③4A and empty the tank ③3.

After having taken the tab ②3 out of its seat, unscrew the hex head screws ③6 of the outer seal-packer lid ③4B and remove it, being careful not to ruin the static part ⑩A of the outer seal, housed in the lid itself. It is thereby possible to check the wear conditions of the outer seal's contact surfaces. When putting it back in, be careful not to pinch the sealing O-ring ③7 housed in the lid. Tighten the nut ③4A again and fill the tank ③3 with the selected fluid.



b) Replacement of static seals

To extract the static part ⑩A of the outer seal from the seal-packer lid ③4B, use special clamps to remove the seeger ring ⑬ housed in the lid, extract the ball bearing ⑭ and apply pressure on the outer side of the seal. After placing the seal-packer lid on a surface and applying grease on the walls to facilitate assembly, insert the new static seal with relative O-ring. Use a pad with a soft cushion placed in between to press perpendicularly on the lid.

To access the static part of the internal seal, proceed as described in point c), without removing the dynamic part ③7B of the internal seal. Applying pressure on the outer part of the seal, extract the fixed seat ③7A of the internal mechanical seal from the intermediate flange ①B. After placing it on a surface and applying grease on the walls to facilitate assembly, insert the new static seal with relative O-ring. Use a pad with a soft cushion placed in between to press perpendicularly on the lid. When putting it back in, be careful not to pinch the sealing O-ring ②6 housed in the flange ①B.



c) Replacement of dynamic seals

To extract the dynamic part ⑩B of the outer seal, it is advisable to hold the spring and, rotating in the direction of its spirals, pull parallel to the axis of the shaft ⑤D, being careful not to scratch it. After greasing the shaft to facilitate assembly, put in the new mechanical seal by turning the spring in the opposite direction of the spiral; use a pad with a soft cushion placed in between to press the seal until the spring touches the outer stop ring ③5 on the shaft.

To replace the dynamic part ③7B of the internal seal, remove the outer ring ③5, which is secured to the shaft with threaded nuts ③6. **It is important to mark the precise position of the ring on the shaft before removing it. This will then ensure correct pre-loading on**



the seals. Remove the hex head screws ⑩A and remove the intermediate flange ①B (with the static part of the internal mechanical seal) and O-ring ②6. To take out the dynamic part ③7B of the internal seal, it is a good idea to use an iron wire bent by 90° on one end to hook onto the first or second spiral of the seal spring. Pull parallel to the axis of the shaft ⑤D, being careful not to scratch it. Make sure the nuts ③6 did not mark the shaft ⑤D.

After greasing the shaft to facilitate assembly, put in the new mechanical seal by turning the spring in the opposite direction of the spiral; use a pad with a soft cushion placed in between to press on the seal until the spring is touching the seeger ②9B (or ring or edge) of the shaft.

4) Magnetic drive coupling (see Figure 4)

a) Access to inner magnet

Place a basin of suitable size and capacity under the inner magnet cover; loosen the hexagonal head screws ④7 and disassemble the cover ④1 and the O-ring ④8. Unscrew the screw ④6, remove the washer ④5 and disassemble the inner magnet ④2. Now it is possible to loosen the screws ①6 and to disassemble the centering flange ④0 (or ④0A) and the O-ring ②6 (in pumps S100/200 and SK100/200 there is also the auxiliary flange ③9 and its O-ring ②6A). On reassembly, pay attention not to pinch the sealing O-ring ④8 housed in the cover ④1. **We recommend the use of tools in non-magnetic material.**

5) Packing ring (see Figure 5)

a) Replacement of the packing ring

After removing the feather key ②3 from its seat, unscrew the nuts ④4 (or, in case, the hexagonal head screws) with the washers ④5 and remove the stuffing box ④0. With the aid of a screwdriver, remove the packing ring ④2 from its seat ④1. Verify that the shaft ⑤ is not scratched near the sliding zone. After lubricating that zone, fit new packing ring ④2 taking care to offset by 90° the cut of each ring; after inserting each ring, press the packing with a plug. Refit the stuffing box ④0 and press the packing ring ④2 operating, alternately and at the same way, on the nuts ④4 (or, in case, the hexagonal head screws) with washers ④5.

We remind that, during standard operation, a slight dripping of the packing ring must occur.

d) Replacing bearing bushes (see Figure 1)

Proceed as described at points a), b), c), e).

d1) To replace the self-lubricating supporting bushes ⑨, bend them with a chisel or similar, paying attention not to damage the diameter of the bushing seats and remove them. Before inserting the new bushings, clean accurately the seat with alcohol to remove all impurities and wipe them very well. Insert the new bushings ⑨, which have to be slightly forced into their seats, to the stop beat.

d2) To replace the graphite bearing bushes ⑨A, it is necessary to break them with a chisel or other convenient tool, by paying great attention not to damage the seat diameter of bushes and their base plane. Before inserting new bushes ⑨A, clean very carefully bush seats with alcohol in order to remove all impurities and dry well. Fit new bushes by spreading a layer of glue of "LOCTITE 648" type over their outer diameter, by paying attention that the bushes match perfectly each other. Then, let glue dry for about 10÷15 minutes.

For assembly, follow the instructions at points e), c), b), a).

e) Replacing gears and shafts (see Figure 1)

Carry out the same operations as indicated in items a), b), c). Loosen the socket screws ①5 which fasten the rear cover ④ and remove this last, by keeping into account that the operation may become difficult for the accuracy of shafts and dowel pins ①7. Draw a reference mark on the main body ③ to avoid reversing base planes on reassembly and remove it together with the 2 O-rings ②9; the operation may become difficult for the accuracy of shafts

and dowel pins ⑰. Remove the driven shaft ⑥ and then, after removing the seeger ring ⑳B, remove the driving shaft ⑤. Extract the gears ⑦ and ⑧ from shafts, remove the feather keys ㉑ and the locking spring clips ㉒, if any (only for S50/70 and SK50/70; on reassembly, pay attention not to modify the position of the helicoidal tooth gears, in order not to reverse the axial thrust direction).

On reassembly, reverse the procedure, by taking as reference the position of covers with respect to the main body, the position of dowel pins and internal drain lines holes. Tighten the screws ⑮ which fasten covers in a cross-wise way, by rotating at the same time the motor shaft, so as to avoid differentiated pressures on gears, which might increase frictions. With regard to tightening torques, please refer to point **4.6.3**. Then proceed as described at points c), a).



f) Safety valve replacement (see Figure 6)

Unscrew the cap ⑥① and remove the external sealing washer ⑥③. Move the nut ⑥④ and unscrew completely the adjusting screw ⑥②, paying attention to the thrust exerted by the spring ⑥⑤; disassemble the internal sealing washer ⑥③.



Remove the spring ⑥⑤ with the shutter assembled ⑥⑥.

During re-assembly check the correct coupling between the shutter ⑥⑥ and the seat obtained in the rear cover ⑥⑦ of the pump and replace both sealing washers ⑥③.



7. FAULTS: CAUSES AND SOLUTIONS



Here below the most common causes of malfunctions in the operation of pumps are shortly listed together with the possible solutions.

FAULT		ORIGIN		CAUSE		SOLUTION	
The pump does not start	Electrical	The motor is not powered	Verify electrical connections and thermal protections				
	Electrical	Incorrect supply voltage	Verify rating and type of (star - delta) motor connection				
	Electrical	Excessive power consumption	Reduce the inverter start ramp				
	Mechanical	Mechanical lock of motor and/or pump shafts	Verify that shafts rotate freely				
	Mechanical	Magnetic coupling detachment	Verify that the pump shaft rotates freely				
The pump does not suck liquid at startup	Electrical	Direction of rotation reversed	Reverse electric motor connections				
	Hydraulic	Valves on suction and/or discharge pipes closed	Open valves				
	Hydraulic	Suction filter clogged	Disassemble and clean the filter				
	Hydraulic	Presence of air in the suction pipe	Drain pipes. Remove siphons. Tighten fittings and flanges				
	Hydraulic	High pressure losses in the suction line	Increase the pipe diameter. Remove abrupt variations of section and direction				
Pressure and/or flow rate pulses in the discharge line	Hydraulic	Fluid too viscous	Preheat the fluid. Decrease the speed of rotation.				
	Electrical	Overvoltage and/or overcurrent	Stabilize the mains voltage				
	Electrical	Feedback electric circuit too sensitive	Stabilize the electric circuit				
	Hydraulic	Feedback hydraulic circuit too sensitive	Increase the inertia of the hydraulic circuit				
	Hydraulic	Presence of air in pipes	Drain pipes. Remove siphons. Tighten fittings and flanges				
	Hydraulic	Intermittent opening of the by-pass valve	Increase the valve operating pressure				
	Hydraulic	Foot valve not working properly or of the type with plate and spring	Replace with free ball foot valve				

FAULT		ORIGIN		CAUSE		SOLUTION	
The pump is noisy and vibrates	Hydraulic	Presence of air in pipes			Drain pipes. Remove siphons. Tighten fittings and flanges		
	Hydraulic	Cavitation			Decrease pressure losses in the suction line. Reduce the speed of rotation. Change fluid temperature		
	Mechanical	Ball bearing and/or bush failure			Replace ball bearing and/or bushes		
	Hydraulic	Pump saturation			Decrease pressure losses in pipes. Reduce fluid viscosity		
	Hydraulic	Excessive speed of rotation in relation to the fluid viscosity			Decrease the speed of rotation or increase the fluid temperature		
	Hydraulic	By-pass valve opening			Increase by-pass valve spring pre-load		
	Hydraulic	Cavitation			Decrease pressure losses in the suction line. Change fluid temperature. Decrease speed of rotation.		
	Hydraulic	By-pass valve opening			Increase by-pass valve spring pre-load		
	Mechanical	Friction increase by thermal effect			Cool the fluid		
	Mechanical	Gear shim adjustment to a given clearance gear or deterioration bush shims (SK pumps)			Grind rear cover or replace bushes (SK pumps)		
Progressive reduction of the discharge flow rate and/or pressure, with constant speed of rotation	Hydraulic	Decrease in viscosity due to the temperature increase			Decrease the fluid temperature		

8. WARRANTY CONDITIONS

Bedu pompen bv guarantees that pumps and pump units are free from defects in material, construction, workmanship and assembly for a period of 12 (twelve) months from the delivery date (specified on the D.D.T.).

The Purchaser's warranty is limited to the free replacement of parts, which are recognized faulty, by excluding the purchaser's right of requiring the contract cancellation or the price reduction or other damages.



Warranty is void in case of misuse or improper use of the pump by the User. The pump shall be used according to what expressly requested in the order or based on the instructions contained in this manual.

Any damages resulting from shocks and/or tampering are not covered by this warranty.

Warranty does not apply to normal wear parts and damages due to negligence and poor maintenance.

For the application of the warranty it is necessary that:

- the Customers immediately notifies Bedu pompen bv the trouble he imputes to the pump;
- the pump was not tampered with;
- the pump is returned to Bedu pompen bv clean, after removing any trace of the process fluid and in a proper packaging;
- the pump is equipped with its nameplate;
- a short description of the fault is provided in writing together with the operating parameters of the pump or the pump unit;
- if required, a chemical analysis or a sample of the process fluid is provided.



Pumps which have not been emptied of the process fluid or installations outside the pump unit will not be taken into account.

In the event Bedu pompen bv acknowledges the defect under warranty, no charge will be made to the Customer both for the replaced material and the workmanship.

The forwarding charges from the Customer to Bedu pompen bv remain to the Sender's (Customer) account.

9. ALLEGATI/ANNEXES



Le operazioni di manutenzione e lo smontaggio della pompa vanno effettuate unicamente da personale autorizzato e specificamente addestrato.



I portatori di pacemaker devono stare ad almeno 2 metri di distanza dai giunti magnetici o dalle pompe con tale tipo di giunto. E' responsabilità del Cliente vigilare affinché questa disposizione sia rispettata da tutto il personale che opera sulla pompa o nelle sue vicinanze.



Maintenance operations and pump disassembly must be performed only by authorized and specifically trained people.



People with pacemakers must stand at least 2 meters far from magnetic couplings or from pumps with such couplings. It is a Customer's responsibility to keep an eye that this disposal is observed by all people working on pumps or near the pumps.

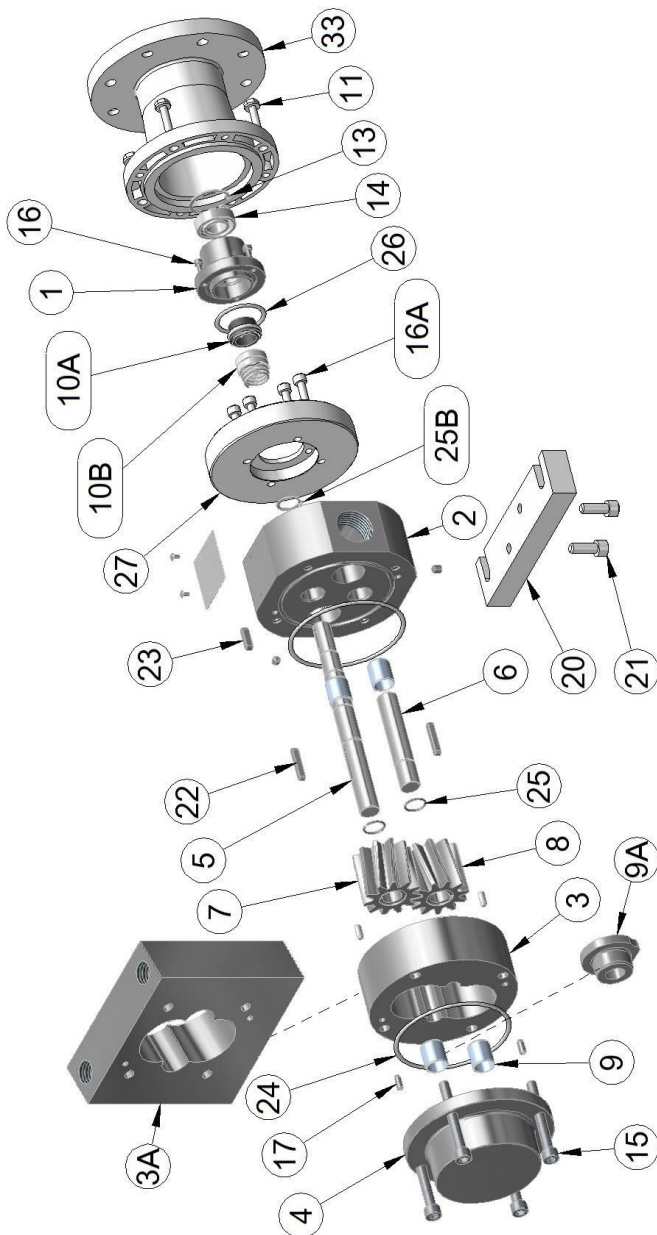


Figura 1 - Tenuta meccanica singola
 Figure 1 – Single Mechanical Seal

PART LIST – Single mechanical seal			
ITEM	Q.TY	DESCRIZIONE	DESCRIPTION
1	1	Coperchio tenuta	Seal cover
2	1	Coperchio anteriore	Front cover
3	1	Corpo centrale	Main body
3A	1	Corpo centrale con camera di preriscaldamento	Main body with heating jacket
4	1	Coperchio posteriore senza valvola	Back cover without valve
5	1	Albero conduttore	Driving shaft
6	1	Albero condotto	Driven shaft
7	1	Ingranaggio conduttore	Driving gear
8	1	Ingranaggio condotto	Driven gear
9	4	Boccola	Bush
9A***	4	Boccola in grafite	Carbon bush
10A	1	Tenuta meccanica - Anello fisso	Mechanical seal - Seat
10B	1	Tenuta meccanica - Anello rotante	Mechanical seal - Rotating ring
11*	4	Vite TE	Hexagonal head screw
13**	1	Anello elastico per fori	Internal retaining ring
14**	1	Cuscinetto a sfere	Ball bearing
15	4 (6)	Vite TCEI	Socket head screw
16	2 (3)	Vite TCEI	Socket head screw
16A	4	Vite TCEI	Socket head screw
17	4	Spina di riferimento	Dowel pin
20*	1	Piede	Foot
21*	2	Vite TCEI	Socket head screw
22	2	Linguetta ingranaggio	Gear feather key
23	1	Linguetta	Feather key
24	2	O-ring	
25**	2	Anello di ritegno	Retaining ring
25B	1	Anello elastico per alberi	External retaining ring
26	1	O-ring	
27*	1	Flangia di adattamento lanterna	Centering flange
33*	1	Lanterna	Bellhousing

* Opzioni alternative - Alternative options
** Solo per SK50/70 e SK100/200 - Only for SK50/70 and SK100/200
*** Solo per serie SK - Only for SK series

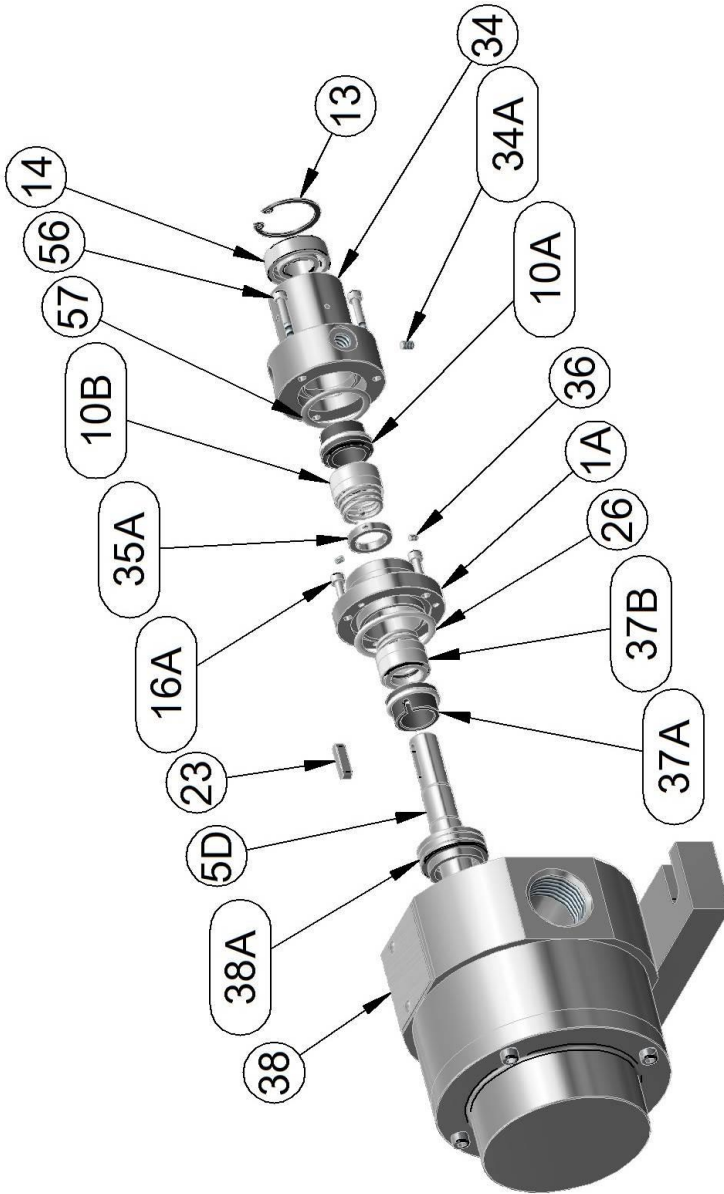


Figura 2 - Tenuta meccanica doppia back to back
Figure 2 - Double mechanical seal back to back

PART LIST FIG. 2

ITEM	Q.TY	DESCRIZIONE	DESCRIPTION
5D	1	Albero condut. tenuta mecc. doppia	Driving shaft for double mech. seal
10A	1	Tenuta mecc. esterna - anello fisso	External mechanical seal - seat
10B	1	Tenuta mecc. esterna- anello rotante	External mechanical seal - rotating ring
13	1	Anello elastico per fori	Internal retaining ring
14	1	Cuscinetto a sfere	Ball bearing
16A	3	Vite TCEI	Socket head screw
1A	1	Flangia intermedia	Intermediate flange
23	1	Linguetta	Feather key
34A	1	Grano	Grub screw
34	1	Coperchio tenuta	Seal cover
35A	1	Anello distanziale	Spacer
36	3	Grano	Grub screw
37A	1	Tenuta mecc. interna - anello fisso	Inner mechanical seal - seat
37B	1	Tenuta mecc. interna - anello rotante	Inner mechanical seal - rotating ring
38	1	Cop. anter. per tenuta mecc. doppia	Front cover for double mech. seal
38A	1	Sede riportata	Seat
56	3	Vite TCEI	Socket head screw
57	1	O-ring	

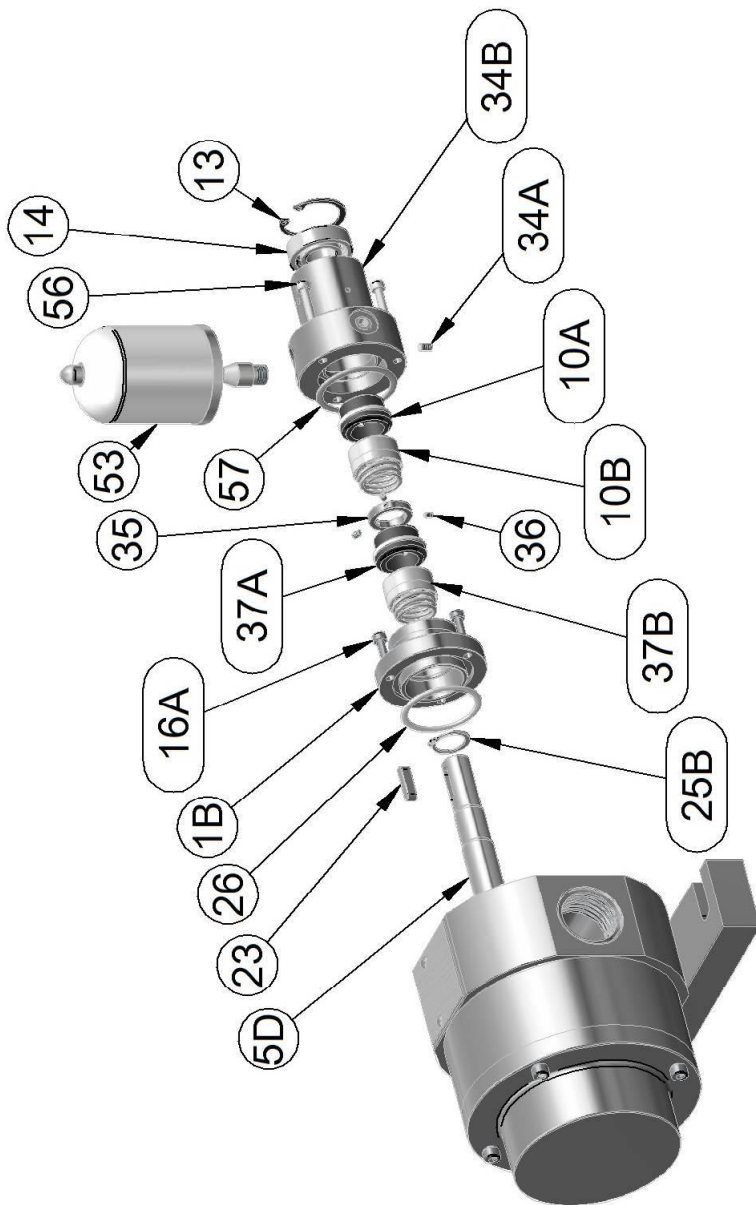


Figura 3 - Tenuta meccanica doppia tandem
Figure 3 - Double Mechanical seal tandem

PART LIST FIG. 3

ITEM	Q.TY	DESCRIZIONE	DESCRIPTION
1B	1	Coperchio tenuta interna	Inner seal cover
5D	1	Albero condut. tenuta mecc. doppia	Driving shaft for double mech. seal
10A	1	Tenuta mecc. esterna - anello fisso	External mechanical seal - seat
10B	1	Tenuta mecc. esterna -anello rotante	External mechanical seal - rotating ring
13	1	Anello elastico per fori	Internal retaining ring
14	1	Cuscinetto a sfere	Ball bearing
16A	3	Vite TCEI	Socket head screw
23	1	Linguetta	Feather key
25B	1	Anello elastico	External rotating ring
26	1	O-ring	
34A	1	Grano	Grub screw
34B	1	Coperchio tenuta esterna	External seal cover
35	1	Anello distanziale	Spacer
36	3	Grano	Grub screw
37A	1	Tenuta mecc. interna- anello fisso	Inner mechanical seal - seat
37B	1	Tenuta mecc. interna- anello rotante	Inner mech. seal - rotating ring
53	1	Barilotto trasparente	Transparent vessel
56	3	Vite TCEI	Socket head screw
57	1	O-ring	

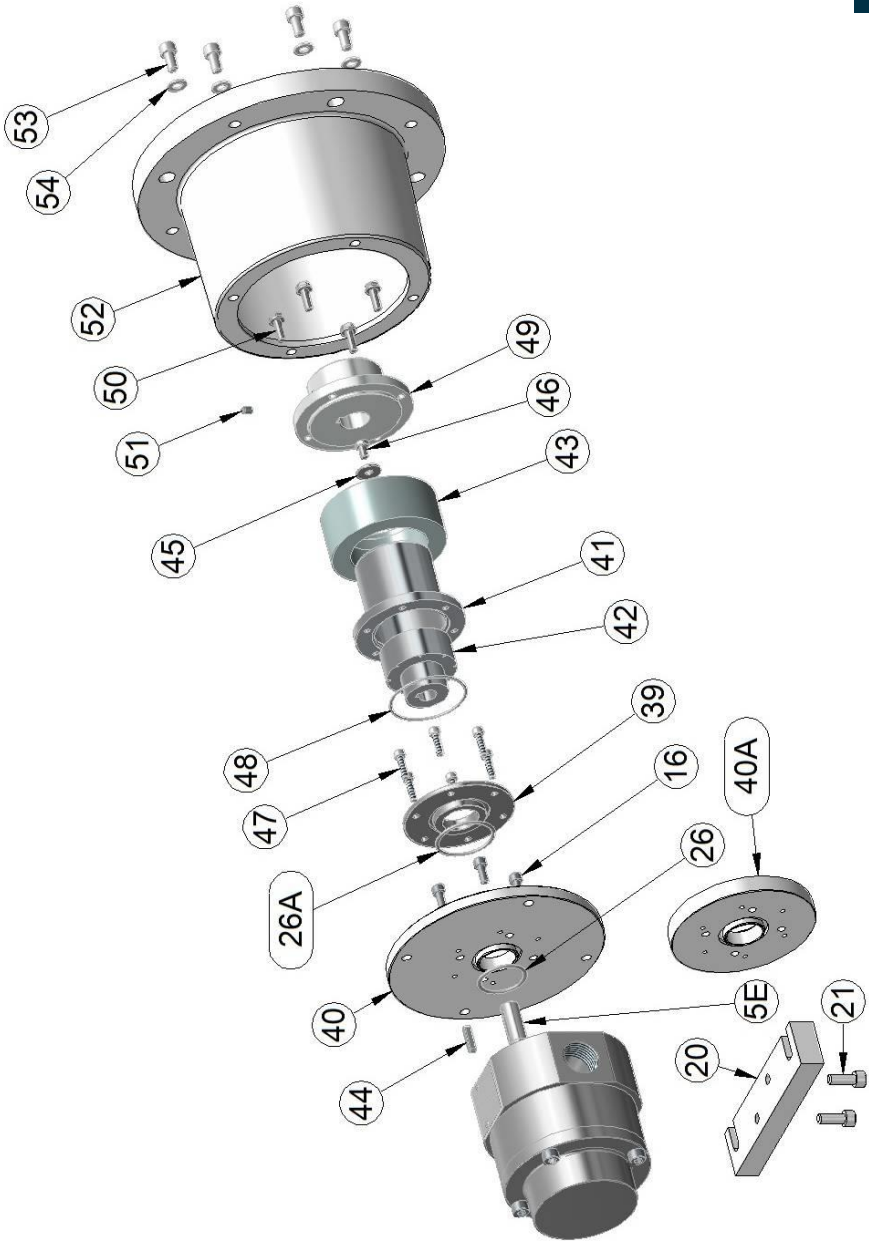


Figure 4 – Magnetic coupling

PART LIST – Magnetic Coupling			
ITEM	Q.TY	DESCRIZIONE	DESCRIPTION
5E	1	Albero conduttore	Driving shaft
16	6	Vite TCEI	Socket head screw
20*	1	Piede	Foot
21*	2	Vite TCEI	Socket head screw
26	1	O-ring	
26A**	1	O-ring	
40*	1	Flangia di centraggio	Centering flange
40A*	1	Flangia di centraggio	Centering flange
39**	1	Flangia ausiliaria	Auxiliary flange
41	1	Coperchio per trascinam. magnetico	Magnetic coupling cover
42	1	Magnete interno	Inner magnet
43	1	Magnete esterno	Outer magnet
44	1	Linguetta	Feather key
45	1	Rondella	Washer
46	1	Vite TE	Hexagonal head screw
47	6	Vite TCEI	Socket head screw
48	1	O-ring	
49	1	Giunto motore	Motor hub
50	4	Vite TE	Hexagonal head screw
51	1	Grano	Grub screw
52*	1	Lanterna	Bellhousing
53*	4	Vite TCEI	Socket head screw
54*	4	Rondella piana	Washer
* Alternative options			
** Only for S100/200 and SK100/200			

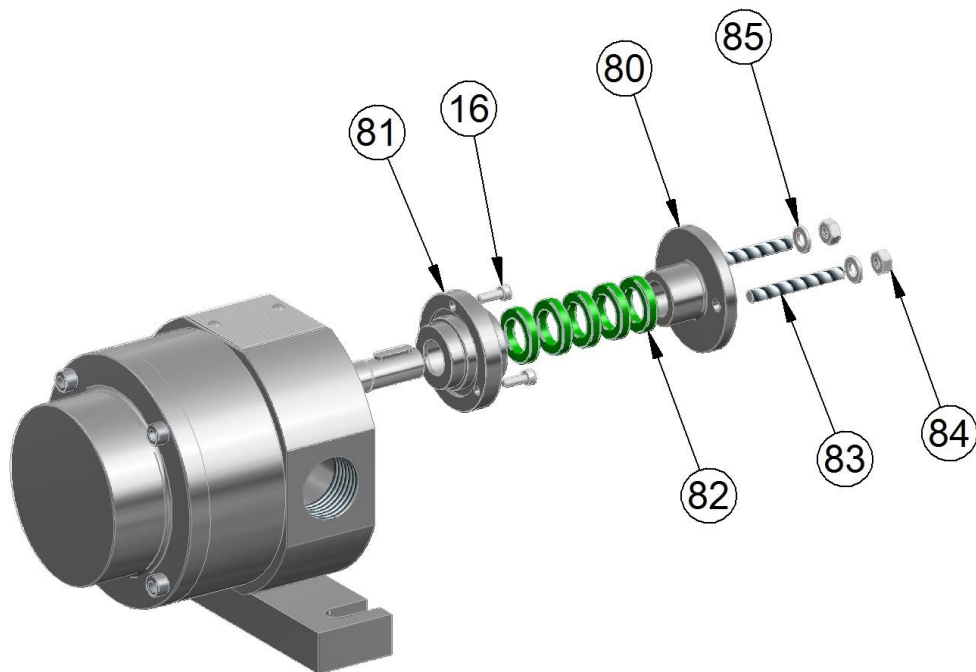


Figure 5 - Packing seal

PART LIST – Packing seal			
ITEM	Q.TY	DESCRIZIONE	DESCRIPTION
16	2 (4)	Vite TCEI	Socket head screw
80	1	Premitenuta	Seal cover
81	1	Cassastoppa	Stuffing box
82	5	Baderna	Packing seal
83	2	Prigioniero	Stud
84	2	Dado	Nut
85	2	Rondella	Washer

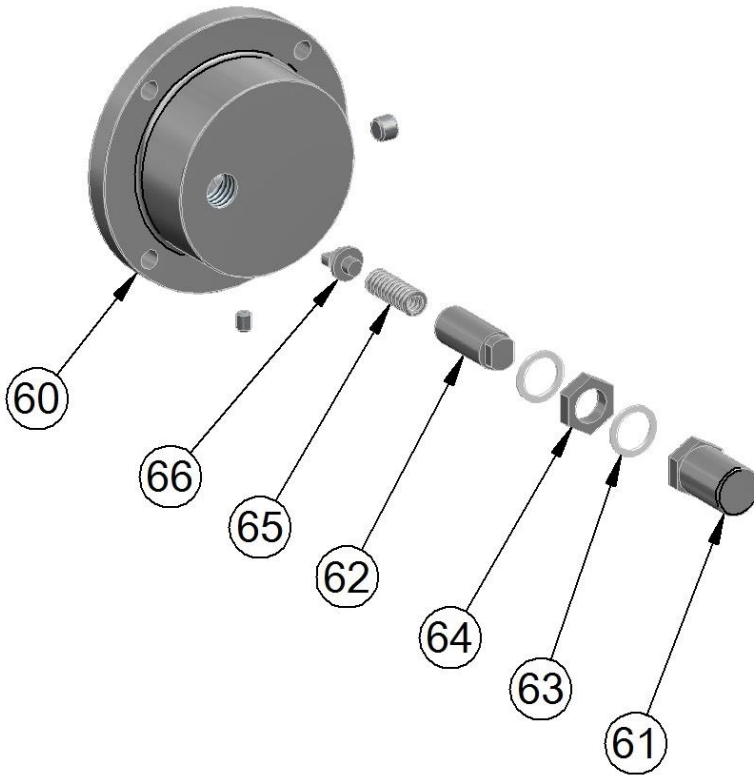


Figure 6 - Valve cover

PART LIST - Rear cover with valve			
ITEM	Q.TY	DESCRIZIONE	DESCRIPTION
60	1	Coperchio per valvola	Valve cover
61	1	Cappello	Cap
62	1	Ghiera di regolazione	Adjusting screw
63	2	Rondella	Washer
64	1	Dado	Nut
65	1	Molla	Spring
66	1	Otturatore	Shutter

Supplementary instructions for operation and maintenance of pumps and pumping sets which work in potentially explosive atmospheres (Directive 2014/34/EU)

Directive 2014/34/EU (that replaces Directive 94/9/EC, also known as ATEX), came into force on 30/04/2014 and concerns “equipment and protective systems intended for use in potentially explosive atmospheres”. Equipment and units intended for use in potentially explosive atmospheres are classified in groups and categories on the basis of the degree of safety they offer, so to their suitability to operate in locations with different classifications:

Group I (mines and related surface plants exposed to risk of release of firedamp and/or combustible dust)		Group II (other locations with potentially explosive atmospheres)					
Category M1 (very high protection level)	Category M2 (high protection level)	Category 1 (very high protection level)		Category 2 (high protection level)		Category 3 (normal protection level)	
		G (gas)	D (dust)	G (gas)	D (dust)	G (gas)	D (dust)
		Zone 0	Zone 20	Zone 1	Zone 21	Zone 2	Zone 22
		environments where explosive atmospheres are detected for long periods of time		environments where explosive atmospheres are probably detected		environments where explosive atmospheres are rarely detected and, however, for short periods of time	

For each zone, there are 6 classes of temperature, which have been stated depending on the minimum ignition temperature of the explosive mixture:

Temperature Class	Max. Surface Temperature
T1	450°C
T2	300°C
T3	200°C
T4	135°C
T5	100°C
T6	85°C

At the order, the Customer must define:

- working conditions of the pump (capacity, head, NPSH, local temperature,...);
- chemical and physical characteristics of fluid to be pumped;
- classification of dangerous area;
- temperature class.

Pumps cannot operate with working conditions different from the ones defined in the order, unless not expressly authorized and written by the Manufacturer.

PUMPS TYPE SC, SX, SKX

The marking of the pumps intended for use in potentially explosive atmospheres is as follows:

ATTENTION

II 2G Ex h T4-T1 Gb X II 2G Ex h db IIB (or IIC) T4-T1 Gb X and	for base shaft pump for pumping unit
II 3G Ex h T4-T1 Gc X II 3G Ex h db IIB (or IIC) T4-T1 Gc X	for bare shaft pump for pumping unit

The first ones are classified as belonging to:

- **II 2G** → Group II, Category 2
- **h** → protection system used for pump
- **db** → protection system used for motor, if present
- **IIB (or IIC)** → depending by electrical motor class, if present
- **G** → for atmospheres with presence of gas, vapour or fog, **not dust**
- **b** → suitable to be used in zones 1 and 2
- **X** → with temperature class depending on the temperature of the pumped fluid (in any case not higher than T4).

The second ones are classified as belonging to:

- **II 3G** → Group II, Category 3
- **h** → protection system used for pump
- **db** → protection system used for motor, if present
- **IIB (or IIC)** → depending by electrical motor class, if present
- **G** → for atmospheres with presence of gas, vapour or fog, **not dust**
- **c** → suitable to be used in zone 2
- **X** → with temperature class depending on the temperature of the pumped fluid (in any case not higher than T4).

Due to the limited space available in tag plate, protection systems for pump and motor are omitted.

ATTENTION

Users must check the pump so that it always works within the foreseen operating parameters. Local temperature range for operation is from -20°C to $+40^{\circ}\text{C}$.

The symbol "TX" depending on the max temperature of the pumped fluid, indicates the Temperature Class, according to the following table:

ATTENTION

Max. Fluid Temperature	Temperature Class
80°C	T4
140°C	T3
230°C	T2
300°C	T1

For operating in a defined temperature class with fluids that have higher temperatures than the ones written in the table above, or however with dangerous fluids, pumps must necessarily be equipped with special devices for continuous checking of the surface temperatures near the mechanical seal chamber. **The outlet electric signals must be transmitted to a processing unit for continuous monitoring and for shutting off the pump with a safety margin of at least 20°C with respect to the max. surface temperature of the relevant temperature class.**



In standard executions, the max. differential pressure of the pumps is 10 bar; the max. outlet pressure is 12 bar. In particular conditions such limits can be raised up by the Manufacturer; however, such values are marked on the nameplate of the pumps.

The rotation speed of pumps shall not exceed the value stated in the order, unless not expressly authorized and written by the Manufacturer; in no case, however, it will exceed 1750 rpm.

ATTENTION

We remind you that every protection device, safety component and safety, control and regulating device installed by the Customer, must be in accordance with requirements of the directive 2014/34/EU(ATEX).

If you have any doubt concerning the operation limits of the pump, please contact:

Bedu pompen bv

ATTENTION

PRELIMINARY REMARK

Here below we will also briefly outline some advice which, even if it does not directly concern the pump and/or the pump unit, nevertheless can affect, sometimes significantly, its right operation.

It is clear that the Manufacturer neither can foresee the numberless possible applications in which pumps can be involved, nor can take into account, in particularly complicated installations, all the possible interactions that the malfunction of any component can have on the pump operation. The User, on the basis of the information given by the Manufacturers of the single components (or of the sub-assemblies) shall however carry out a careful assessment of the **plant risks** and take the proper further safety measures where they need.

ATTENTION

WARNINGS

All operations concerning installation, commissioning and maintenance must be done by expert personnel authorized by the Customer to work on such equipment.

It is Customer's care, on the basis of the process fluid characteristics, to adopt all the measures (including use of suitable PPE) so that maintenance operators can work in full safety conditions.

ATTENTION

Installation, commissioning, operation

Carefully check that marks stamped on the nameplates of electric motors, of pumps and, if any, of speed reducers or of hydraulic speed variators, correspond with the category and the temperature class required.

ATTENTION



Read carefully the instructions of the operating handbook of the pump, these supplementary instructions and further possible instructions provided by the Manufacturers of the mechanical seal or magnetic coupling, of the flexible coupling, of the electric motor, of the speed reducer or of the hydraulic speed variator.

Attend to the connection of motors and pumps to the earth circuit. In case, use the arrangements fitted on the motor frame and on the rear cover of the pump (yellow screw).

Check the right alignment between pump and electric motor, following the instructions of the operating handbook of the pump and the warnings of the Manufacturer of the flexible coupling or of the magnetic coupling.

ATTENTION

Be sure that pipes have proper inner diameters (on the suction side, in particular, inner diameter must not be less than the nominal value of the pump connection), there is no syphon in piping at suction side and there are not air admissions.

ATTENTION

Wherever foreseen, check the connection of the thermocouples and of their related accessories with detecting equipment and with alarm signal and stop device of the pump and of the motor. We remind you that every protection device, safety component and safety, control and regulating device installed by the Customer, must be in accordance with requirements of the directive 2014/34/EU (ATEX).



We remind you that continuous checking of the surface temperature, connected to an alarm system and to a stop device of the motor **with a safety margin of at least 20°C** with respect to the relevant temperature class, **is mandatory** in the following cases:

- pumps with magnetic couplings);
- pumps with packing rings;
- pumps with internal by-pass valve (if it is not excluded that the full flow by-pass can last more than 60 s.);
- fluids with higher temperature than the one shown in table at page 73.



Check that there are not solid particles in suspension in the fluid or welding wastes inside pipes (they must be flushed). In fact, if they enter the pump, they could seriously damage both bushings and gears; so it is mandatory to provide suction piping with a filter properly dimensioned, taking into account both the capacity of the pump and the head losses of the filter. Choosing the filter, evaluate also the risk due to the generation of electrostatic charges inside (see rule IEC CLC/TR 50404).



If the pump is equipped with a built-in safety valve, check periodically its calibration value. In case safety valve starts working, you must stop the pump as soon as possible (60s max.), and eliminate the anomaly which caused the valve operation, before starting the pump again. Continuous operation in such conditions could cause an unacceptable rising up of surface temperatures. An equipment for detecting outlet flow, joined to an alarm signal and a stop device of the pump, is recommended.

ATTENTION

We remind you that every protection device, safety component and safety, control and regulating device installed by the Customer, must be in accordance with requirements of the Directive 2014/34/EU

ATTENTION

Always provide pressure piping (upstream of the stopcock) with an external by-pass valve, joined to the upstream tank. If the pump is already provided with internal relief valve, check that it is calibrated at a pressure value at least 2 bar higher than the by-pass valve.

ATTENTION

Before starting the pump, be always sure that there are no gas or air bubble inside. For this purpose, fill in the pump with fluid, and vent the pump body and connected pipes. **Beware of performing this operation only when pump is stopped and depressurized.** It is a Customer's care, as he well knows the process fluid characteristics, to arrange suitable pipes and devices in order to perform the a.m operations in safety conditions.



Never start the pump when dry. Pumped liquid, other than lubricating gears, also acts as lubricating and cooling fluid for bushings and mechanical seal or the inner magnet and the "canister". Then, it is a good rule to locate pumps with a positive suction head. In case of negative suction head, whenever the pump starts on, check that it self-primers in 10s max., after that it must be stopped to avoid to damage mechanical parts and overheat bushings and mechanical seal.

This advice must be also adopted during the tests for checking the direction of rotation of the pump.



An equipment for detecting outlet flow, joined to an alarm signal and a stop device of the pump, is recommended.

Before starting on, be sure that both upstream and downstream stop cocks are open and filter is not stopped up. We recommend you to witness every start up.

ATTENTION

At every start, check the mechanical seal, that must not have any loss, check the right operation of thermal sensors and of alarm and stop devices. Verify that in no case the rotation speed exceed 1750 rpm (that is the rotation speed of a 4 poles motor at 60 Hz).

ATTENTION

At every start, check the packing ring, if any. We remind you that during normal operation a little leakage must occur (few drops for minute). Tighten the screws of the stuffing box, if necessary, and/or replace the packing rings.



Even when the check of the temperature is not mandatory, every half an hour during the commissioning and, then, every hour during normal operation, record both the surface temperatures near the bushings and the mechanical seal and the electric absorption of the motor. Shut off the pump as soon as a sudden change happens on the outline of the curve of the recorded values. Check also that the ambient temperature and the fluid temperature remain in the range indicated at pag. 73.

ATTENTION

In case double mechanical seals (in tandem or in back to back arrangement) are installed, it is a Customer's charge to provide for their flushing with a fluid compatible with the pumped liquid.

In back to back arrangement, flushing must be done at a higher pressure level than the process fluid, while in tandem arrangement the outer mechanical seal must be flushed by a pressureless fluid (or with a pressure level lower than the process fluid).

Maintenance

A correct and frequent maintenance is the basis for a right operation of the pump.

Maintenance must be done, whenever possible, in unclassified zones, or with no-sparking equipments and tools (see UNI EN 11271 – Annex 2).

Apart from carefully following the instructions supplied by the Manufacturers of the electric motor, of the speed reducer or hydraulic speed variator, the following operations of routine maintenance must be carried out:

- daily (or at every start up) check there are not losses of liquid from the static seals of the pump and of the valve;
- daily (or at every start up) check the tightness of the mechanical seal or of the stuffing box;
- monthly check the wear rate of the radial ball bearing;
- every 2 months check the wear rate on the packing rings;
- every 3 months check the wear rate of the supporting bushes and the gap between the gears and the body;
- every 4 months replace the packing rings;
- every 6 months check the wear rate of the flexible joint;
- every 6 months check the wear rate of the gears;
- every 24 months change the radial ball bearing;
- every 24 months change the supporting bushes;
- every 24 months change all the gaskets.

ATTENTION

Routine maintenance must be supported by extra maintenance to be done every time one detects there is something wrong with the pump (e.g. vibrations, overheating, too large clearances, loss of efficiency,...).



EC - Declaration of Conformity

Manufacturer Details

Tradename

Bedu Pompen BV

Address

Poort van Midden Gelderland Rood 10, 6666 LT, Heteren, Netherlands

Product Details

Product Name

Gear pumps

Model (+series) Name

S, SK

Applicable Standards Details

Directives

2006/42/EC (Machinery Directive)
2014/35/EU (Low Voltage Directive)
2014/30/EU (Electromagnetic compatibility)

Standards

EN-ISO 12100:2010
EN-IEC 60204-1:2006
EN 809+A1/C1

Additional information

No further details.

Declaration

We hereby declare under our sole responsibility that the product(s) mentioned above to which this declaration relates complies with the above mentioned standards and Directives.

Business Unit Manager: Issued Date:

01/10 2014

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Marco Breunissen

Signature of representative(s)

The logo for BEDU POMPEN is centered in a white square with a dark blue background. The word "BEDU" is in a large, bold, white sans-serif font. Below it, "POMPEN" is written in a smaller, white sans-serif font, flanked by two horizontal white lines on each side.

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