MAGNETIC DRIVE PLASTIC CENTRIFUGAL PUMP - KM70

Installation, Operating and Maintenance Manual

DEBEM SRL

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www.debem.com

MOM_KM70_REV.01A-EN

INDEX

Check receipt of goods

Upon receipt of the pump, please open the package and inspect the contents to check:

- the model and specifications listed on the data plate
- any accessories ordered
- the presence of accidental damages

For any inconsistencies between the delivered and ordered product please contact DEBEM S.r.l. or your authorized dealer.

For any future spare parts enquiry, assistance, or information about the pump delivered, it is important that you state the relevant **SERIAL NUMBER** (shown on the data plate fixed on the pump lantern).

This manual provides the users of the pump-motor unit of DEBEM S.r.l. with the information required for correct installation, operation and maintenance under safety conditions as established by EC standards.

Please read this manual carefully before installation and make it available at any time to anyone using the machine.

The user is liable for damage resulting from not observing the operation conditions agreed at Order confirmation.

The Purchaser has the responsibility to:

- Check that the pump-motor unit and any accessory are suitable for the working environment.
- Provide suitable personal protective equipment to the operators.
- Inform users of the allowed use.

DEBEM S.r.l. may update or edit this manual at any time and without previous notice to correct typos, inaccurate information or updated products.

These changes must be added to new editions of the manual.

DEBEM S.r.l. has no obligation to install any modification of design or improvement of the products to previously delivered units.

This manual contains technical information and drawing owned by DEBEM S.r.l. and cannot be re-produced in full or in part in any case without prior written authorization by DEBEM S.r.l.

Any use other than the operation described in the manual is considered improper use and therefore DEBEM S.r.l. will not be held responsible in this case.

DEBEM S.r.l. is a leader in designing, manufacturing, selling and servicing centrifugal pumps for the treatment of dangerous and corrosive liquids in the chemical and pharmaceutical industries and in other industrial processes.

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1. Warranty

1.1 Warranty conditions

DEBEM S.r.l. warrants that its products (pumps and spare parts) are free from flaws and/or defects in manufacturing and assembling for a period of 12 (twelve) months from the date of delivery (indicated on the delivery note).

The purchaser's warranty is limited to the free replacement of parts recognized as defective, excluding the buyer's right to request termination of the contract or price reduction, or other damages.

DEBEM S.r.l. warrants that the product sold is of good quality, material, and workmanship and agrees to, during the warranty period specified herein, repair or replace at its own expense in the shortest amount of time possible, those parts which due to poor quality of material or defect in workmanship or faulty assembly prove to be defective.

The warranty is understood ex warehouse from where the supply was carried out, including the return of defective parts.

The warranty validity period is:

12 months

from the date of delivery/shipment listed on the delivery note.

1.2 Warranty terms

For the warranty to remain fully valid throughout the period indicated in the warranty conditions it is necessary that:

- construction and/or material flaws are reported in writing within 8 days of receipt of the goods;
- all contractual obligations of the buyer have been fulfilled. Alleged or confirmed product defects do not justify non-fulfilment of contractual obligations;
- all installation operations, connection of the Product to energy networks (electric, water), use and maintenance are carried out in strict compliance with the instructions included in the Instruction Booklet or documentation provided with the product;
- all repairs are performed by personnel authorized by DEBEM S.r.l. and that all spare parts used must be original spare parts.

The warranty does not cover:

- damages occurring during shipping and handling carried out by the buyer;
- pumping fluids that due to the nature or content are not compatible with the construction materials and/or application limits prescribed in the order;
- incorrect selection caused by incorrect information provided by the buyer;
- incorrect or lack of maintenance;
- tampering, failed or improper execution of the prescribed requirements for putting into service;
- normal wear and tear related to the service conditions.

1.3 Exclusion Clause

- Repairs or replacements pursuant to this warranty shall not renew or extend the original warranty period
- The product shall not be considered defective in materials, design, or workmanship if they need to be adapted, changed, or adjusted to conform to local technical or safety standards in force in any Country other than that for which the product was originally designed and manufactured.
- This warranty will not reimburse for such modifications or attempted modifications, whether properly performed or not, nor any damage resulting from them.
- This warranty will not reimburse for any attempted modifications made to adapt the product for purposes other than those defined in the contractual phase without prior consent in writing by DEBEM S.r.l.
- DEBEM S.r.l. shall not be held liable in any way for indirect, incidental, or consequential damages suffered by customers or third parties, including loss of profits, resulting from any infringement of the contents of this document, or suffered by customers or third parties due to the impossibility to use the product.
- The terms of this warranty shall be considered void if the User uses the pump differently than as specified in the order or does not follow the instructions contained in this manual.

1.4 Warranty Implementation

- The parts replaced must be sent to the closest DEBEM S.r.l. office for review.
- WARRANTY ACCEPTANCE will not be granted unless the defective part is returned or appropriate photographs and a written report are provided.
- All defective parts replaced, as provided for in this document, become the property of DEBEM S.r.l.
- The buyer shall not be required to deliver a defective part to DEBEM S.r.l. if:
  - · the part was destroyed as a result of its defect or of any defect covered by this warranty
  - · DEBEM S.r.l. is reasonably satisfied that the product was defective at the time of sale.
- If both of these conditions are met, DEBEM S.r.l. shall replace the part as established herein, as if the Buyer had delivered the defective part to DEBEM S.r.l.
- Pumps containing process fluid or installations outside of the pumping unit shall not be taken into consideration.
- The buyer agrees to provide DEBEM S.r.l. with the time and availability to perform repairs and/or replacements, as DEBEM S.r.l. deems necessary.
- Interventions on the plant. If the product supplied cannot be removed from the related plant, DEBEM S.r.l. shall be responsible only for the explicit repair costs. Any other costs shall be the sole responsibility of the customer, based on A.N.I.M.A. (Italian Association of Mechanical and Engineering Industries) rates, including any civil works and/or defective designs.

Without prejudice to the foregoing, DEBEM S.r.l. liability to customers or third parties from any claim shall be limited to the total amount paid by the customer for the product that caused the damage.

This warranty shall be governed by the Italian law.
The Court of Busto Arsizio shall have sole jurisdiction over any dispute.

2. Safety

2.1 Introduction

This manual contains all the information needed for the correct installation, use, and maintenance of the pump. It should be read and understood by all the personnel involved in the installation, operation, and maintenance of the pump before it is put into service.

Failure to comply with these safety instructions can be a source of danger for people, the environment and the machine, and voids any right to make claims against DEBEM S.r.l. The liability of the sup- plier is ensured only if the pump is used in accordance with the contents of this manual. The limit values indicated in this manual or in any other documentation concerning the pump must never be exceeded. Personnel involved in the installation, operation, and maintenance of our pumps must be properly qualified to perform the operations described in this manual.

DEBEM S.r.l. shall not be held liable for the training level of personnel and for the fact that they are not fully aware of the contents of this manual.

2.2 Symbols

Each pump is provided with the following plates:

1_Pump model
2_Year of manufacture
3_Serial no.
4_Flow rate
5_Head
6_Material in contact with liquid
7_Impeller diameter

Fig. 1 *PUMP DATA PLATE.*

ARROW INDICATING THE PUMP'S DIRECTION OF ROTATION

GROUNDING

MAGNETIC FIELD HAZARD (only for magnetic drive pumps)

The following symbols are used in this manual:

WARNING: indicates that the pump and its operation may be at risk.

ELECTRICAL HAZARD: indicates a hazard caused by electronic equipment.

MAGNETIC FIELD HAZARD: indicates the presence of a hazard caused by magnetic fields.

GENERAL HAZARD: indicates the presence of a hazard for persons working on the pump unit.

PROHIBITED: persons with pacemakers must not go near strong magnetic fields (magnetic drive pumps).

2.3 Safety instructions and precautions

2.3.1 Personal Protective Equipment (PPE)

Fig. 2 *Suitable gloves to prevent contact with hazardous substances.*

Fig. 3 *Mask to avoid breathing toxic or harmful substances.*

Fig. 4 *Goggles for eye protection.*

Fig. 5 *Accident prevention shoes to protect feet from any accidental falls.*

Fig. 6 *Protective clothing for the body.*

Prior to carrying out any work on the pump make sure to use adequate protective equipment.

Pumps must be drained and flushed before servicing!

The corrosive and hazardous liquids contained in the pump may pose serious health and environmental hazards.

Avoid pumping, even at different times, liquids that may cause chemical reactions, without first draining and flushing the pump.

After servicing, start the pump again following all the safety instructions described in chapter "Starting and stopping".

Do not run the pump dry.

Start the pump only when it is completely filled and the delivery valve is almost completely closed, limiting this condition to the time that is strictly necessary to start the pump.

In the event dirty liquids are to be pumped, if this was not indicated at the time of ordering, please contact DEBEM S.r.l.'s technical service beforehand.

2.3.2 Electricity

Do not perform any operation on the pump when it is running or before disconnecting it from the electrical system.

Any hazard caused by electricity must be avoided (refer to applicable regulations for further details).

Do not perform running tests before filling the pump with liquid. Check that the electrical data shown on the motor plate match the electrical specification of the system to which the pump will be connected.

2.3.3 Magnetic fields

Persons with pacemakers must stay at least 50 cm away from magnetic parts/ components.

The strong magnetic fields present may cause heart rhythm disturbances, affect magnetic media and all metal instruments in general. See recommendations during disassembly/assembly in the corresponding chapters.

2.3.4 Hot surfaces

Hot and cold parts of the pump unit must be protected to prevent accidental contact. Do not subject the pumps to sudden changes in temperature.

Please remember that the maximum surface temperature mainly depends on the operating conditions of the fluid processed by the user (UNI EN 13463-1 art. 6.1.3).

2.3.5 Moving parts

Do not tamper with the guards of rotating parts. Do not touch or go near rotating parts when in motion.

2.4 Expected use

Safety of operation of the supplied product can be ensured only if the instructions of this manual or of the contractual documentation are strictly followed; if further clarifications are needed, please contact DEBEM S.r.l.

The pump (or pump unit) and any configuration variation must be run according to the limits listed and/ or described in the relevant contractual documentation provided with the pump.

Contact DEBEM S.r.l. if the pump must be used in ways or for purposes other than those shown in the data sheet and/or contractual documentation.

The pump must **NEVER** operate beyond the values of the data sheet, such as pumped fluid (type, density, viscosity, etc.), temperature, flow rate, speed, head and shaft power.

The pump must be in perfect technical conditions before operation.

The pump must never run dry and/or with a percentage of gas over 2% in volume!

Always check that the pump is filled with liquid during operation.

Applying and observing the technical and operational limits of the pump is necessary to ensure correct and safe pump operation.

Always check the limits of **minimum flow rate** as shown in the contractual documentation. This is necessary to prevent damage due to overheating, excessive axial thrust, damage of the bearings, high wear of rotating parts, etc. (see the section "Minimum and maximum flow" of chapter "Technical characteristics").

Always check the limits of **maximum flow rate** as shown in the contractual documentation. This is necessary to prevent damage due to vibrations, cavitation, damage of the bearings, overheating, etc. (see the section "Minimum and maximum flow" of chapter "Technical characteristics").

To adjust flow rate or head never operate by closing the suction valve but always operate on the delivery valve.

Improper use (not consistent with the instructions in this manual or with best practices in the operation of centrifugal pumps), even if for very short periods, may cause serious and extensive damage to the unit (pump or pump unit).

In particular, check and accurately compare the operating temperature limits of the mechanical parts with those of the pumped liquid

2.5 Safety information for the customer/operator

The operator must always use Personal Protective Equipment (PPE) as required by the current safety regulations for work environments, with regards to the time and location of the work.

Please **ALWAYS**:

- strictly observe the instructions of this manual and of the contractual documentation;
- respect current safety prevention regulations;
- respect safety measures and regulations of the system and/or customer;
- never disable safety and protections devices when the pump is operating;
- protect hot and/or cold parts of the machine so that it is not possible to touch them;
- the personnel must always wear suitable Personal Protective Equipment when working on hot, cold and/o moving parts, as well as checking that the devices are active and are operating correctly;
- in the event of treatment of dangerous liquids (e.g. explosive, toxic, harmful, hot liquids), stop, limit and remove any leaks in order to avoid risks to people and the environment. Take care to always follow regulations!
- avoid any electrical hazard. Please refer to applicable national safety regulations and/or regulations issued by local power companies.

2.6 Safety information for maintenance, inspection and installation

The instructions of this manual or of the contractual documentation must be strictly followed; if further clarifications are needed, please contact DEBEM S.r.l.

Always purge the pump when used to pump harmful liquids (see section "Return to supplier" in the chapter "Handling and storage").

Perform maintenance only when the pump is:

- stopped and in safety conditions (see the "Stop sequence" section in the chapter "Starting and stopping")
- cooled to room temperature
- not under pressure

The pump maintenance, inspection and installation personnel must be specialised and qualified, as well as informed of the content of this manual.

Any modification to the pump is allowed only after prior authorisation by DEBEM S.r.l.

Use only genuine spare parts or spare parts authorised by DEBEM S.r.l. Any damage due to using non genuine spare parts voids any liability by DEBEM S.r.l.

Immediately after maintenance all safety and protection devices must be reassembled and activated (see the sections "Pre-start checklist" and "Start sequence" in the chapter "Starting and stopping").

AVOID ANY INCORRECT OR IMPROPER ACTION

2.7 Noise

The noise levels shown in the following chart refer to pump (A) operation in normal working conditions coupled with an electric motor (B) at a speed of 2900 rpm.

The values of the graph, as per ISO 3744 and EN 12639, are valid for operating range Q/Q_{opt}= 0.8-1.1 without cavitation. Add an allowance of 3 dB to allow for the tolerance of measuring tools.

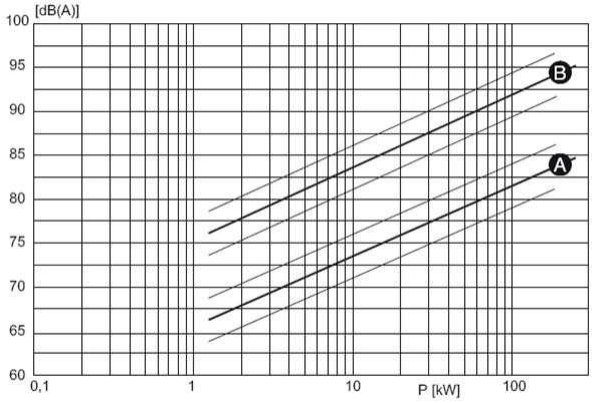

Fig. 7 *Noise chart in logarithmic scale.*

The major sources of noise are not connected with the pump.

We would like to remind you that the most frequent sources include:

- liquid turbulence in the plant
- cavitation (not dependent on the manufacturer)

The user must provide adequate protective equipment if the sources of noise generate a noise level harmful for operators and for the environment (in accordance with current regulations).

2.8 Monitoring devices

The motor-pump unit must be operated only within the limits specified in the data sheet and on the plate.

If the operating system is unable to guarantee compliance with the parameters shown on the data sheet, continuous monitoring devices must be used on the pump.

It is good to check if monitoring devices are required to ensure that the pump - motor unit is working properly.

All electrically actuated accessories must be in conformity with applicable safety requirements and regulations on explosion protection systems.

Take into consideration the following risks when choosing suitable monitoring equipment:

2.8.1 Interruption of the cooling flushing

The inner magnet is cooled by the process fluid through flushing holes located on the bushings support. Due to some characteristics of the transported liquid, e.g. the high viscosity, flushing could be interrupted, causing a dangerous in- crease in temperature.

2.8.2 Loss of synchrony between inner and outer magnet.

Overloading, overheating or non-compliance with design data can cause a lack of synchronization of the inner and outer magnets. The thermal energy generated inside the isolation shell or outer magnet can also cause a dangerous increase in temperature.

2.8.3 Liquid leaks

Liquid leaks (dangerous, toxic, harmful liquids) can also pose a danger to the personnel and the environment. Therefore monitor any leak continuously and equip the pump with containment systems if necessary.

Presence of magnetic fields near the magnets.

The minimum safety distance from components containing permanent magnets or from permanent magnets not assembled on the pump must be at least 35 cm, for the following reasons:

- Danger of death for people having a pacemaker!
- Interference with electronic devices!
- Magnets generate strong attraction that interacts with objects, part and components that are sensitive to magnetic forces!

When the pump is completely assembled the intensity of the magnetic field generated by permanent magnets contained in the cores is completely shielded, therefore there is no danger due to the magnetic fields, whether the pump is running or not.

In any case we discourage any people wearing a pacemaker from coming close to the area near the external magnet, marked by the relevant symbol, in particular for pumps equipped with very powerful magnets (where the coupled electric motor is very powerful).

2.9 Operating range

The pump (or pump unit) operating ranges for pressure, temperature, flow rate, speed and power are listed in the Data Sheets and/or in the contractual documentation and must be strictly observed.

These values always refer to liquids similar to water; if fluids with chemical and physical characteristics different from water are pumped, the above limits may vary and this variation must be taken into account. If in doubt, contact DEBEM S.r.l.

The aforementioned caution is extremely important, in particular for those fluids having a specific heat that could considerably increase the process temperature, which in turn can increase the temperature of the pump surface.

3. Handling and storage

3.1 Packaging

DEBEM S.r.l. pumps or pumping units are normally packed in either cartons or secured on pallets. In case of pumps ordered without an electric motor, they are packed with the external magnetic core loose, which is kept in the package, yet separate from the pump, and protected against possible impacts due to handling the package.

The strong magnetic fields present (only for mag drive pumps) may cause heart rhythm disturbances, affect magnetic media and all metal instruments in general.

Persons with pacemakers must not, under no circumstances whatsoever, go near magnetic parts and components. The strong magnetic fields can cause heart rhythm disturbances.

3.2 Handling

To move crates, cages, cartons, or pallets weighing more than 20Kg, use proper equipment suitable for the weight indicated on the shipping document. When lifting freely suspended loads, harness the crate as illustrated below.

Fig. 8 *Monobloc execution.*

Fig. 9 *Handling.*

To ensure correct handling and lifting of crates, cages, cartons, or pallets, refer to the specific symbols shown on the packaging.

Fig. 10 *Symbols on the packaging.*

3.3 Shipping

The goods we deliver are subject to a verification procedure and approved prior to being released. At any rate, you should follow these instructions. The contents of each package are described in the packing list or delivery note. They must be carefully checked upon receipt. Upon receipt, and with the driver present if possible, check that the material and packaging are not damaged. Any claim must be reported immediately to the shipping company, with the claim signed by the driver. Furthermore, check that the goods delivered match the purchase order (quantity and type of material).

3.4 Receiving

See instructions for inspection at the reception given at the beginning of the manual.

3.5 Storage

In case of storage, the pump must be stored in a covered and dry location, and kept in its original packaging.

The protection caps and lids of the flanges must remain on the pump until it is time for installation. If the pump will be stored for a long period of time, or stored in particularly severe weather and environmental conditions, the use of hygroscopic substances (silica gel) or sealing of the package is recommended.

3.6 Return to supplier

Before returning pumps to DEBEM S.r.l., you must ensure the following:

- pump not pressurized,
- pump completely empty,
- electrical connections isolated and motor secured against switch-on,
- pump cooled down,
- auxiliary systems shut down, not pressurized and emptied,
- manometer lines, manometer and fixtures dismounted.

Pumps that have been used for handling toxic or corrosive fluids must be flushed and cleaned before being returned to the manufacturer.

Always complete and enclose a truthful and full certificate of decontamination when returning to DEBEM S.r.l. the pump-motor unit or individual parts (see form at the end of manual).

Always indicate any purging and safety measure observed.

Order a safety certificate from DEBEM S.r.l. if necessary.

Take necessary measures, depending on the required repair work, as listed in the table below when returning the pump to the DEBEM S.r.l.:

Repair carried out	Measure for return
...at the customer's premises	Return the defective component to the manufacturer.
...at the manufacturer's premises	Flush the pump and decontaminate it if it was used to pump hazardous media. Return the complete pump (not disassembled) to the manufacturer.
...at the manufacturer's premises for warranty repairs	Only in the event of hazardous pumped media: flush and decontaminate the pump. Return the complete pump (not disassembled) to the manufacturer.

4. Installation

4.1 General instructions

DEBEM S.r.l. shall not be held liable for any damage to property or injury to persons caused by incorrect assembly or assembly performed by unauthorized persons and/or any person who has not received specific training on the above operations.

4.2 Foundations

Do not start the pump until it has been secured to the ground.

The pump-motor unit must be set on and secured to a structure strong enough to support the entire perimeter of the base of the unit. The support surface of the foundation must be flat and level. Concrete foundations on a firm ground are the most satisfactory type. Comply with the requirements of standard DIN 1045 on handling concrete. Provide for foundation bolts as shown in the illustration:

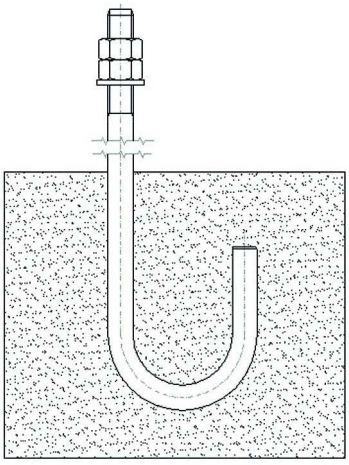

Fig. 11 *Foundations for fixing of pump-motor unit.*

Once the pump-motor unit is in position, level it using metal shims placed between the feet and the surface on which it stands.

The shims must be placed right next to the foundation bolts and they must be sufficiently wide to cover the largest possible surface.

Check that each foot of the pump-motor unit stands steady on each of these.

Under no circumstances should this position be obtained by excessive tightening of the foundation bolt nuts.

For bases that have windows, fill them with mortar that doesn't shrink.

If the unit is installed on a steel structure, make sure that it is supported so that the feet do not warp.

In any case, we recommend that you place appropriate rubber vibration dampers between the pump and civil works.

4.3 Correct installation

The pump should be installed in a location where, if possible, it is easy to perform maintenance tasks.

Therefore enough space must be provided around the pump in order to facilitate:

- maintenance operations
- ventilation for the electric motor

4.4 Pump installation diagram

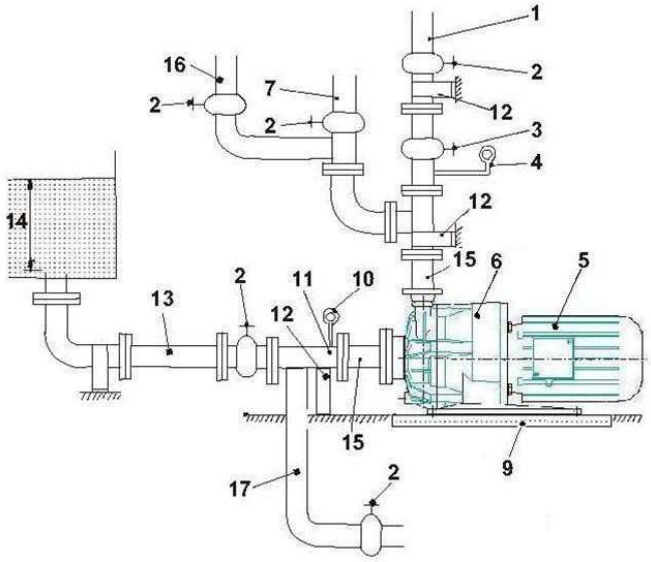

Fig. 12 *Pump installation diagram.*

1_Delivery pipe

2_Valve

3_Check valve

4_Pressure gauge

5_Motor

6_Pump

7_Breather hose

9_Leak collection

10_Compound gauge

11_Pump connection reducer

12_Base (refer to allowable forces and moments tables)

13_Suction pipe (length equal to at least 10 times the suction Ø)

14_Minimum level equal to at least 3÷5 times the diameter of suction

15_Compensation coupling

16_Cleaning piping (delivery side)

17_Cleaning piping (suction side)

The check valve protects the pump from possible water hammering.

The shut-off/regulation valve excludes the pump from the line and also adjusts the flow.

If there is a foot valve do not install a delivery check valve because the closing of the foot valve before the check valve would cause water hammer which harms pump performance.

4.4.1 General information

Before connection, remove the pump suction and delivery port protection caps.

A pump is generally part of a piping system that can include a number of components such as valves, fittings, filters, expansion joints, instruments, etc. The piping layout and the position of these components have an important influence on the operation and service life of a pump.

The pump must never be used as a support for the components connected to it.

The thermal expansion of pipes must be compensated for using appropriate expansion compensators. The pump-piping connection flanges must be centred and aligned before tightening the related bolts. Do not, under any circumstances, attempt to pull or straighten the pipes by tightening the bolts of the flanges or threaded fittings.

The suction and delivery lines and the installed valves or filters must be supported and anchored next to but not on the pump so that no strain is transmitted to the body of the pump.

The forces and moments transmitted to the pump by the piping system must not exceed the allowable forces and moments (see relevant section in the chapter "Technical Data").

The piping must remain clean and free of debris (welding slag, small chips, etc.).

Remove the temporary filters specially provided after commissioning/testing the plant.

The liquid flow should be as straight as possible.

To the extent possible, elbows, tight bends, or radical reductions in diameters should be avoided as they may cause head loss s in the plant.

If you need to reduce the diameter you should use appropriate eccentric reducers on the suction flange (and concentric reducers on the delivery flange) at size changes, placed at a minimum distance from pump ports equal to ten (10) times the diameter of the pipe.

4.4.2 Suction piping

Suction piping plays a critical role in the correct operation of the pump-motor unit.

Suction piping must be:

- as short and direct as possible (length equal to at least 10 times the suction Ø)
- created according to best practices to prevent the possible formation of air pockets
- free from air inlets (critical points are the seals between the flanges and the seals of the valve stems)
- with the inside diameter equal to that of the suction side of the pump
- with the inside diameter one size greater than that on the suction side of the pump in case of longer pipes

The plant must have a Npsha (available) > Npshr (required)

The NPSHd value of the system must always be at least 0.5 m above the NPSHr of the pump (value referring to water at 20° C).

RECOMMENDED:

to eliminate air, set up the pipe as shown in the following diagram

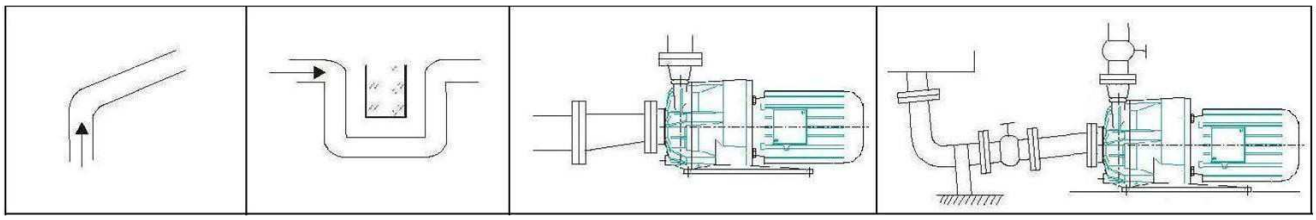

Fig. 13 *Recommended installation of suction piping.*

AVOID:

piping that can entrap or obstruct the evacuation of air as shown in the following diagram

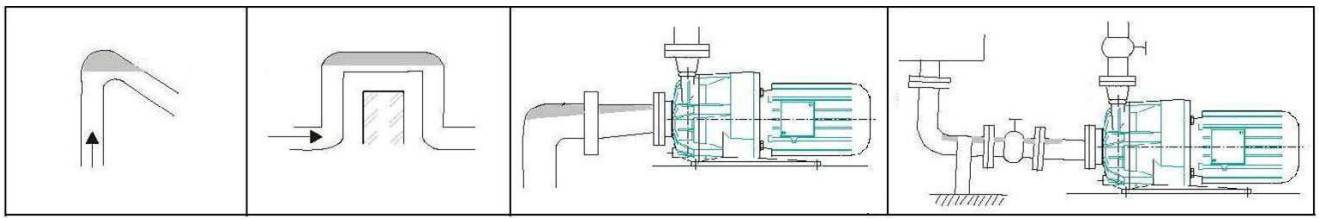

Fig. 14 *Not recommended installation of suction piping.*

Single-stage centrifugal pumps **not self-priming** always require that a suitable foot valve (check-valve) is installed in all cases where pumps are positioned above the level of the liquid.

Do not, under any circumstances, adjust the flow-rate using the valve on the suction pipe.

4.4.3 Delivery piping

The check valve protects the pump from possible water hammering.

The shut-off/regulation valve excludes the pump from the line and also adjusts the flow.

4.5 Instruments

In order to obtain a reasonable control of the performances, of the presence of liquid and of the conditions of the installed pump, at least one of the following instruments should be adopted:

- sensor to detect the presence of liquid on the suction or delivery piping, or else a vacuum gauge on the suction piping
- a pressure gauge on the delivery line

The pressure fittings must be installed on straight segments of pipe at least five diameters from the pump ports.

The pressure gauge on delivery must always be placed between the pump and the shut-off/regulation valve.

Flow rates can be deduced by reading the pressures, converted into meters and then compared with the characteristic curves. These optional instruments can signal different pump malfunctions, including: accidental valve closing, no liquid, overloads, etc. (for details relating to the positioning of the instruments and for further information pls contact DEBEM S.r.l.).

If the temperature of the pumped liquid represents a critical element, a thermometer should be installed (preferably in suction).

The instruments must comply with the requirements of the current safety standards.

4.6 Pump-motor unit alignment

4.6.1 General information

Execution: Single Block

In the event the pump is supplied without a motor, for any problem or information request, contact DEBEM S.r.l.

4.7 Electrical connections

4.7.1 Grounding

Make sure that the motor has suitable grounding and that it has been connected properly. The user is responsible for grounding the machine.

Use the threaded hole on the lantern, or the fastening screw on the foot of the pump marked with the following symbol. See section "Correct Installation".

4.7.2 Wire connections

Please keep in mind that:

- you must comply with the regulations of the local electricity distribution company
- do not, under any circumstances, connect the electrical motors directly to the mains, but install a suitable electrical panel equipped with a disconnector and suitable safety devices
- motors must be protected against overloads using adequate safety devices
- before turning the motor on, check that the motor cooling fan rotates freely
- to facilitate maintenance operations on the pump use flexible cables, allowing the lantern/motor unit to "slide" (see figure below)

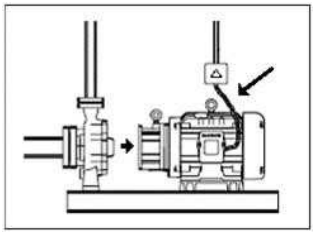

Fig. 15 *Lantern/motor unit "sliding".*

- the type of connection is specified on the motor data plate, which may be Y (star) or Δ (Delta), based on the power supply of the motor (see figure below).

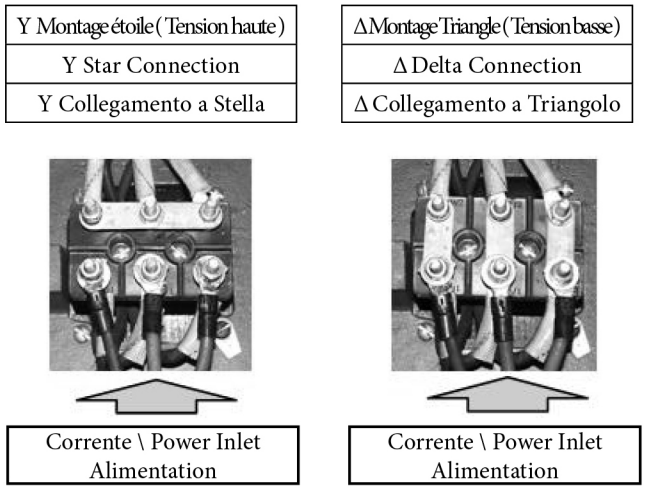

Fig. 16 *Electrical connections of the motor.*

WARNING!

Always have the electrical connections installed by a trained electrician.

Compare the available mains voltage with the data plate on the motor and then select an appropriate connection.

Do not start the pump! Check the direction of rotation! To check the motor's direction of rotation you must first FILL THE PUMP and follow the safety rules contained in the section "Safety".

5. Starting and stopping

5.1 Pre-start checklist

Before starting the pump, check the following:

- the shut-off valve on suction (if provided) must always be completely open
- the shut-off/regulation valve on the delivery must be set to the minimum flow rate for the pump. If you don't know the minimum flow rate close completely the discharge valve and slowly re-open it to 1/3.
- make sure that the fluid flows regularly to the pump
- the pump and suction piping are completely full of liquid
- for starting on new or modified plants you should use suitable temporary filter socks installed on the suction line

in case of negative suction head, fill the suction pipe and check that the foot valve works properly to prevent back flow of liquid thus emptying the suction pipe with consequent disconnection of the pump

check the direction of rotation:

the motor must turn in the same direction as the arrow shown on the pump. Since all the DEBEM S.r.l. pumps turn clockwise, make sure that the motor fan turns clockwise too (view facing the motor fan).

check that the motor rotates freely by turning by hand:

· the motor cooling fan for close-coupled pumps

- If the liquid must be kept at a certain temperature to prevent crystallization or solidification, heat piping in accordance with installation requirements
- make sure that any auxiliary connections are connected and working.

5.2 Frequency of starts

ATTENTION to the excessive surface temperature of the motor!

It may cause danger of explosion and damage to the motor!

In case of ATEX motor installation, observe the frequency of starts specified in the manufacturer's manual.

The frequency of starts is usually determined by the maximum temperature increase of the motor. This largely depends on the power reserves of the motor in steady-state operation and on the starting conditions. If the start-ups are evenly spaced over the period indicated, the following limits can be used for orientation for start-up with the delivery-side gate valve slightly open:

Motor (kW)	Maximum number of start-ups (Start-up/ hour)
< 12	15

Do not re-start the pump/motor unit before the motor has stopped!

5.3 Start-up sequence

1) The delivery regulation/shut-off valve must be set so that the pump runs at minimum flow.
2) Make sure that the air or gas pockets have been thoroughly bleed.

   For mechanical seal pumps, only for the first start up or after long periods of downtime, rotate the pump manually 12 times through the motor fan (close-coupled pumps) or by the coupling (long coupled pumps). This in order to ensure the lubrication of the seal faces, avoiding the bonding and /or seizing up of the seal faces.

3) Start the electric motor.
4) Gradually open the delivery valve until reaching the desired output or at least one fourth of the total opening.
5) If the pressure shown on the delivery pressure gauge does not increase, turn the pump off immediately. Repeat the installation procedure.
6) The pump must not run more than two or three minutes with the delivery closed. Operating in these conditions for a longer period of time could cause serious damage to the pump.

Do not adjust the flow rate using the suction valve; see section "Intended Use" in the chapter "Safety".

Should dramatic changes in the flow rate, head, density, temperature, or viscosity of the liquid occur, stop the pump and contact DEBEM S.r.l.'s technical service.

5.4 Starting after power failure

In case of accidental stopping, make sure that the check valve has prevented backflow and check that the motor cooling fan is stopped.

Then restart the pump following the instructions in previous section "Start-up sequence".

If the pump is installed over the machine in level, it can unprime during the stop. Therefore, before starting, check again that the pump and the suction piping are full of liquid.

To ensure correct operation of the pump avoid:

- dry running, which could cause the rotating parts to seize
- operating with the delivery closed, which will not allow the heat generated by the pump to be dissipated, resulting in a sudden increase in temperature until the pumped liquid boils and the plastic parts deteriorate
- cavitation, which causes damage to the impeller
- water hammer, which can cause the internal ports and isolation shell to break
- abnormal vibrations, which can cause the screws to loosen and affect the durability of bearings
- unstable working points, which cause undue stress on the mechanical parts.

A series of accessories are available in order to ensure that the pump runs smoothly.

DEBEM S.r.l. is at your service to help you select the most appropriate accessory.

5.5 Stop sequence

A) gradually close the delivery regulation/shut-off valve until reaching the minimum flow rate
B) stop the motor making sure that the motor deceleration is steady
C) close all the other valves: if a suction shut-off valve is present, you should close it completely

The reverse sequence is not recommended, especially with larger pumps or with longer delivery piping, in order to prevent possible problems due to water hammer.

5.6 Measures to take for periods of long inactivity

The pump remains installed:

to prevent sediment from forming inside the pump, periodically start the pump for about five minutes (about once a month).

The pump is removed:

proceed as described in the previous section "Stop Sequence". Protect the ports (using the caps provided on delivery). When handling and storing the pump, follow the instructions in section "Storage".

To allow electrostatic charges to dissipate, wait at least one hour before removing the pump from the plant.

5.7 Running the pump after a long period of stop

It is always recommended to run the pump at least once a month or once every three months as a minimum, for approximately 5-10 mins.

This avoids the formation of sediments inside the pump, as well as preventing the elastomers from loosing their elasticity and the mechanical seal from hardening (if the pump is equipped with it).

To restart the pump after a period of inactivity, see the entire section "Starting and stopping" and the section "Maintenance".

We recommend following these suggestions:

UP TO ONE YEAR:

- replace all elastomers

BEYOND ONE YEAR (in addition to the above):

- check the magnetic field of the inner and outer magnet

6. Pump characteristics

6.1 Description and operation of the pump

The **KM70** series pumps are single-stage centrifugal pumps with magnetic drive, in a single block version.

The main feature of these pumps is the magnetic coupling drive.

These are sub-ISO pumps suitable for pumping liquids in small systems, where the contained hydraulic requirements allow to offer maximum efficiency and MTBPM (Mean Time Between Planned Maintenance).

The outer magnet is connected to the motor shaft and transfers the torque moment to the inner magnet and then to the impeller by means of a magnetic field.

The impeller is driven without physical contact between magnets.

The isolation shell is located between the magnets; together with the casing and the gaskets, it seals the pumped liquid from atmosphere without the need of a mechanical seal.

6.2 Reference regulations

Compliant with	2006/42/EC	
According to	Sub-ISO 2858	
	Optional flanges	UNI 1092 PN16RF
		ANSI 150RF (optional)

6.3 Minimum and Maximum Flow

Unless specified otherwise in the characteristic curves or on the data sheets, the following applies:

Qmin = 0.1 x Qbep : SHORT OPERATION

Qmin = 0.3 x Qbep : CONTINUOUS OPERATION

Qmax = 1.1 x Qbep : 2-POLE OPERATION

Qmax = 1.25 x Qbep : 4-POLE OPERATION

Qmin = Minimum flow

Qmax = Maximum flow

Qbep = Flow at the best efficiency point

The data refer to water or other liquids similar to water. However, if the physical properties of the treated liquids are different from those of water, it is necessary to determine whether the additional heat generated can lead to an increase in temperature, such as to impair the operation of the pump. If necessary, the minimum flow rate must be increased.

7. Technical Data

7.1 Technical characteristics

SPECIFICATIONS	DESCRIPTION
Pump type	Magnetic drive horizontal single-stage centrifugal pump – Execution: Single Block
Performance (2900 rpm)	Flow rate max = 65 m3/h -> H max = 29 MWC
Motors	4 kW (size 112) -> 7,5 kW (size 132)
Operating temperature limits	PP: +3°C -> +65°C
	PVDF: +3°C -> +95°C
Viscosity limits	0.5 - 60 cSt max

Room temperature	0÷40 °C
Room humidity	35÷85% RH
Room pressure	0.8÷1.1 bar abs

In the event of high thermal excursion between the temperature of the pumped liquid and the room temperature, condensation may form inside the lantern.

When transferring high temperature liquids take into account the motor operating temperature limit.

When transferring low temperature liquids, condensation may form on the magnet and volute casing. In this case, de-humidify the area.

COMPONENT	MATERIAL
Casing	PP-GF / PVDF-CF
Isolation shell	PP-GF / ETFE coated PC-CF
Shaft	SiC / Al2O3 / RSSiC
Impeller assembly	PP / ETFE
Lantern	GS400
Casing gasket	EPDM / FPM
Bearings	SiC / Al2O3 /RSSiC
Bearing sleeves	SiC / PTFE-Al2O3 / PTFE-Carbone / Graphite / RSSiC
Outer magnet	GS400+Ryton

7.2 Component / material details and drawing

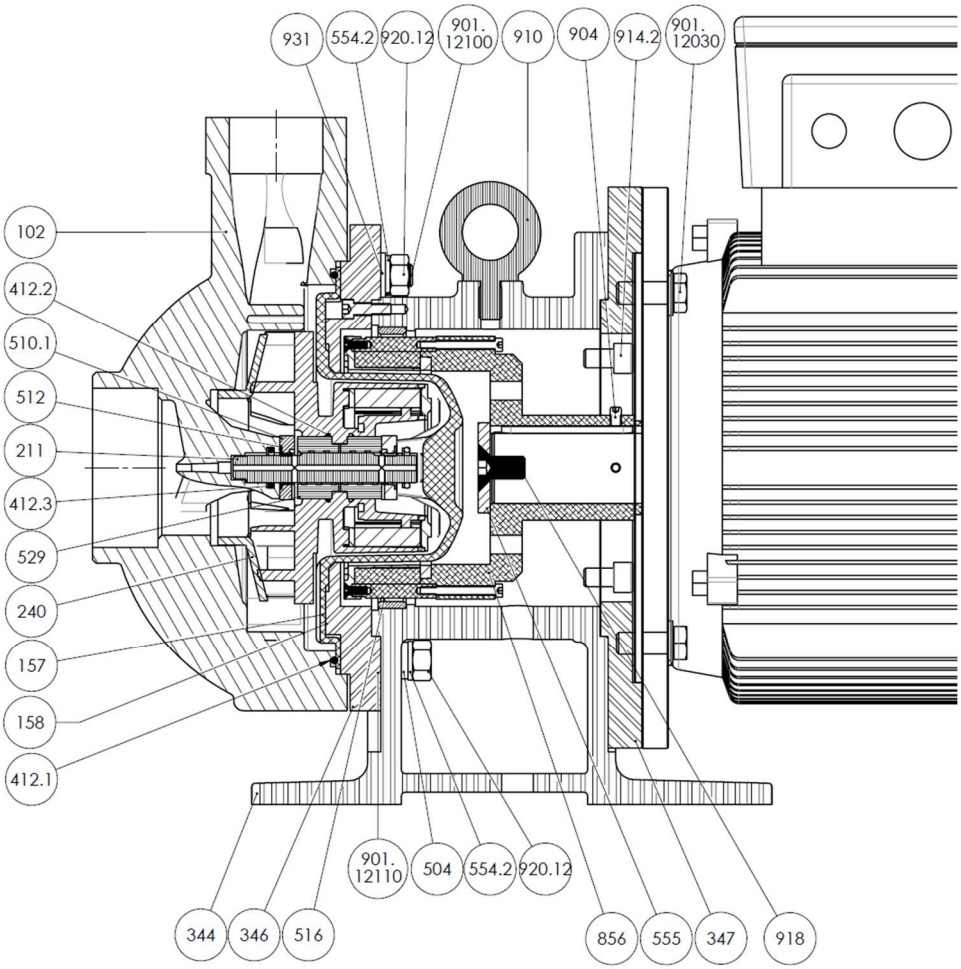

Fig. 17 *General cross section*

DIN Cod.	Description	DIN Cod.	Description
102	**Volute casing**	**412.1**	**OR 4800**
240	**Impeller assembly**	**412.3**	**OR 160**
529	Bearing sleeve	**910**	**Golfare UNI 2947 M12**
412.2	OR 2131	**931**	**Grower UNI 1751 Ø12**
344	**Lantern**	**554.2**	**Washer UNI 6592 Ø12**
516	Antispark ring	**920.12**	**Nut UNI 5588 M12**
346	Lantern flange	**914.2**	**Screw TCCE UNI 5931 M10x16**
347.x	Motor flange	**901.12030**	**Screw TE UNI 5739 M12x30**
211	**Pump shaft**	**901.12110**	**Screw TE UNI 5739 M12x110**
510.1	**Thrust bearing**	**504**	**Spacer**
512	Thrust bearing wear ring	**901.12100**	**Screw TE UNI 5739 M12x100**
157	**Isolation shell**		
158	Isolation shell cover		
856.x	**Outer magnet**		
904	Grub screw		
555.x	Countersunk washer		
918.x	Countersunk hex head screw		

8. Maintenance

8.1 Maintenance interval

To ensure reliable and safe operation the pump unit must undergo proper maintenance at regular intervals and must be kept in perfect technical conditions.

Inspection/maintenance intervals may vary according to the operating point of the pump with regards to the characteristic curve.

Furthermore, intermittent operation, the characteristics of the pumped fluid and the installation in a system may impact the duration of wear parts.

8.2 Parts to be checked

1) OUTER MAGNET (Code 856)

DETAILS	ACTIONS
Are there any abrasions on the magnet housings?	Contact DEBEM S.r.l. in case of faults.
Is the magnet mounted properly? Are screws loose?	Check the coupling between motor and magnet and tighten the screws.
Is the internal diameter of the magnet turning concentrically to the drive shaft?	Check the magnet-motor coupling. Tighten or replace the fastening screws.
Is the magnet vibrating during operation?	Check balancing and magnet-motor coupling. Tighten or replace the screws.

2) ISOLATION SHELL (Code 157)

DETAILS	ACTIONS
Does the internal diameter of the isolation shell show signs of chemical aggression?	Contact DEBEM S.r.l. in case of faults.
Is the isolation shell visibly broken?	Stop the pump and replace the isolation shell.
Are there spots/stains on the outer surface of the isolation shell?	Clean the isolation shell thoroughly and check its seal.

3) IMPELLER/INNER MAGNET (Code 240)

DETAILS	ACTIONS
Is there any breakage?	Contact DEBEM S.r.l. in case of faults.
Is there any clogging in the space between the impeller vanes?	Eliminate any clogging and clean the impeller.
Does the capsule containing magnets show signs of chemical aggression?	Contact DEBEM S.r.l.

4) VOLUTE CASING (Code 102)

DETAILS	ACTIONS
Is there any breakage?	If anything unusual is observed, replace the casing.
Is the gasket swollen/worn?	Replace the gasket.
Does the internal surface show signs of chemical aggression?	Contact DEBEM S.r.l.

5) SHAFT (Code 211) / BUSHINGS (Code 529 - 510)

DETAILS	ACTIONS
Are the shaft and/or bushings worn out?	Check for wear according to the following table and replace worn components as necessary.

8.3 Replacing wear parts

The following components may impair the correct operation of the pump if not replaced regularly:

- the gasket of the isolation shell (412.1)
- the bushing locking O-rings (412.2)
- the bearing locking rings (512)
- the bearing sleeves (529), the static shaft (211) and the thrust bearings (510) (Limit size values are shown in the following table)

To order spare parts please specify the DIN code of the component and the **SERIAL NUMBER** of the pump.

9. Malfunctions and solutions

Prior to performing any operation on the pump disconnect the power.

Do not, in any case, operate on pumps or components that have not been fully purged.

In compliance with regulation 81/08, our technical assistance service cannot operate on pumps or components which have not been fully purged. Therefore we will be forced to return to sender all pumps we receive that have not been purged.

9.1 Malfunction table: possible causes and solutions

A	The pump delivers an insufficient flow rate
B	Motor overloading/overheating
C	Excessive increase of the bearing temperature (where present)
D	Leaks from the pump, the mechanical seal (when present) or connections
E	Vibrations during pump operation
F	Excessive increase of the temperature inside the pump

A	B	C	D	E	F	Possible cause	Solution
X						The pump is not primed correctly	Prime the pump and bleed any air in the pipes/volute casing.
X						High head loss.	Set the operation point in accordance with the pump characteristic curves. Check that the pumped liquid is free from impurities. Check the diameter of the impeller; it may be too small
X				X	X	Air in the pump or pumped liquid. The pump or piping are not fully bled/filled	Check the piping seal and the gaskets of the volute casing; replace them if necessary. Bleed and/or fill up
X						Intake manifold or impeller clogged and/or blocked	Remove any sediment from the pump or piping
X			X	X		Available NPSH too low (cavitation)	Check/increase the suction head. Open the suction cut-off valve. Check suction head loss. Check and clean any filter installed on suction
X						Wrong direction of rotation	Invert the two power supply phases of the motor (in case of three-phase power supply)
X						Speed is too low, wrong electrical connections (a phase is missing)	Check the electrical connections and correct them if necessary. Check and increase voltage/frequency within the allowed range if necessary
	X					Power voltage too low	Check electrical installation

A	B	C	D	E	F	Possible cause	Solution
X		X	X	X	X	Rotating parts worn (bearings/ seal faces/wear rings)	Replace worn parts with new parts
	X			X		Backflush pressure of the pump lower than the value in the data sheet. No head on delivery	Adjust the working point again. In case of permanent overload, decrease the impeller diameter.
X	X			X		Density and viscosity of the pumped liquid too high compared with the values in the data sheet	Contact DEBEM S.r.l.
X			X			Worn gaskets in the volute casing or flanges	Replace the gaskets of the volute casing or connections.
	X	X	X	X		Pipes cause mechanical stress on the pump, or vibrations in the pipes	Check the pump is installed correctly, so as not to be mechanically strained, and check the alignment. Support the pipes properly
				X		The impeller is not properly balanced	Balance and/or clean the impeller
			X			Loose connecting bolts and screws	Check the bolts and screws are tightened periodically
					X	Liquid temperature not compliant with data sheet or contractual documentation	Check the temperature of the pump/pumped liquid. Contact DEBEM S.r.l.
			X			Use of unsuitable materials	Change the combination of materials. Contact DEBEM S.r.l.
					X	No coolant or dirty flushing liquid	Increase flushing. Clean/purify the flushing liquid
X				X	X	Air in the pumped liquid due to a low level of liquid at suction	Increase the level of liquid at suction and keep it as constant as possible
X				X	X	Pump running without liquid (dry run)	Stop the pump and check the internal components are not damaged
	X			X		Foreign bodies in the pump	Check and clean the pump

9.2 Disposal

Parts of the pump may be contaminated by liquid that is harmful for people or the environment.

1) Wear protective clothing when operating on the pump.
2) Before disposing of the pump:
   - Collect any leaked fluids and dispose of them in compliance with current regulations.
   - Purge any residual fluids
3) Separate the materials of the pump (plastic, metal, etc.), disposing of them in compliance with current regulations.

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