ETS

TRANSLATION OF ORIGINAL INSTRUCTIONS
CAREFULLY READ THIS MANUAL BEFORE USING OR REPAIRING THIS PRODUCT

Magnetic drive metal centrifugal pump

Installation, Operating and Maintenance Manual

CDR Pumps UK Ltd | Making the right choice

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 C.D.R Pompe 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 C.D.R. Pompe 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.

C.D.R. Pompe 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.

C.D.R. Pompe 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 C.D.R. Pompe S.r.l. and cannot be reproduced in full or in part in any case without prior written authorization by C.D.R. Pompe S.r.l.

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

C.D.R. Pompe 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.

C.D.R. Pompe S.r.l.

Via R. Sanzio 57

20021 Bollate (Mi)

Italy

Tel. +39 02 990 1941 - Fax +39 02 998 0606

www.cdrpompe.com

1. Warranty

1.1 Warranty conditions

C.D.R. Pompe 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.

C.D.R. Pompe 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 C.D.R. Pompe 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 C.D.R. Pompe S.r.l.
- C.D.R. Pompe 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 C.D.R. Pompe 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 C.D.R. Pompe S.r.l.
- The buyer shall not be required to deliver a defective part to C.D.R. Pompe S.r.l. if:
  - · the part was destroyed as a result of its defect or of any defect covered by this warranty
  - · C.D.R. Pompe S.r.l. is reasonably satisfied that the product was defective at the time of sale.
- If both of these conditions are met, C.D.R. Pompe S.r.l. shall replace the part as established herein, as if the Buyer had delivered the defective part to C.D.R. Pompe 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 C.D.R. Pompe S.r.l. with the time and availability to perform repairs and/or replacements, as C.D.R. Pompe S.r.l. deems necessary.
- Interventions on the plant. If the product supplied cannot be removed from the related plant, C.D.R. Pompe 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, C.D.R. Pompe 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 Milan 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 C.D.R. Pompe S.r.l. The liability of the supplier 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.

C.D.R. Pompe 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:

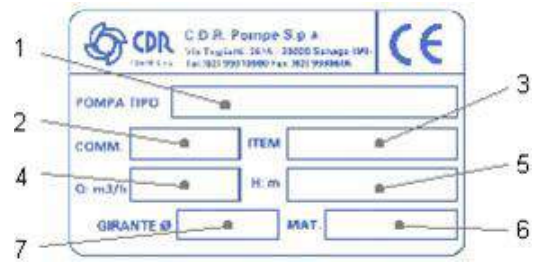

Fig. 1 *PUMP DATA PLATE*

1_Pump model
2_Serial no.
3_Item (when necessary)
4_Flow rate
5_Head
6_Material in contact with liquid
7_Impeller diameter

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).

EU SYMBOL: explosion protected devices intended for use in explosive atmospheres must be marked with this symbol.

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 C.D.R. Pompe 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 C.D.R. Pompe 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 C.D.R. Pompe 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, particularly when installed in environments with possible generation of explosive atmosphere. In this case, applying and respecting the technical and operational limits as well as application limits of the pump decreases the risk of generating ignition sources (see chapter "Safety in an explosive environment").

Always refer to the Directive 99/92/EC containing minimum regulations to improve health and safety of workers who may be exposed to explosive atmosphere hazards.

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).

With regards to centrifugal pumps with mechanical seal, always refer to the specific manual of the mechanical seal manufacturer for its correct operation.

In particular, check and compare accurately the operational temperature limits of the mechanical seal with those of the pumped liquid (also see the section "Temperature limits" of chapter "Factors to be taken into account for ATEX environment installations").

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.

Take particular care when the unit is installed in potentially explosive areas. Avoid any incorrect or improper operation!

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 C.D.R. Pompe 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 C.D.R. Pompe S.r.l.

Use only genuine spare parts or spare parts authorised by C.D.R. Pompe S.r.l. Any damage due to using non genuine spare parts voids any liability by C.D.R. Pompe 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").

2.7 Safety in an explosive environment

2.7.1 ATEX EC marking example (valid only for pumps compliant with the ATEX regulation)

The pump is compliant with the **ATEX Directive 2014/34/EU** group II category 2 GD.

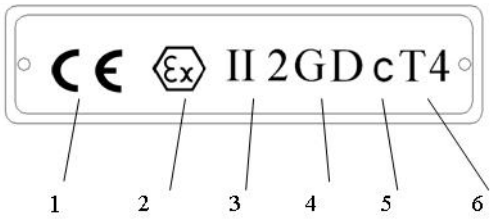

Fig. 7 *ATEX data plate.*

An additional data plate is applied to pumps installed in an explosive environment, with the following information:

1_EC symbol

2_Explosive protection symbol

3_Machine group and category

4_Type of explosive atmosphere G = Gas, Vapour, Mist D = Dust-air

5_"c" UNI EN 13463-5 construction safety

6_ "T4" temperature class

The data plate shows the pump marking (see "ATEX declaration" attached to this manual).

2.7.2 Protection in an explosive environment

If the pump is installed in potentially explosive environments, always follow the instructions in this section (in particular, see the chapters **"Intended use", "Safety information for the customer/operator", "Safety information for maintenance, inspection and installation"**).

Only pumps (or pump units) identified and compliant with the ATEX Directive 94/9/EC can be installed in environments with a risk of explosion.

Always refer and see the specific sections highlighted by the "Ex ATEX" symbols in this manual.

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 C.D.R. Pompe S.r.l. (see the "Intended use" chapter).

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.

Avoid any incorrect or improper operation!

2.7.3 Classification

If included in the supply, the specific conformity certificate of the motor must always be available

The following is an example of pump classification:

CE Ex II2G from T1 to T4

This means that the pump can be used in environments where the ignition temperature is higher, e.g. T4 > 135 °C.

In any case, the temperature class must always be assessed according to the highest ignition temperature of each individual element comprising the unit: pump, motor, etc.

Example:

Pump T4 > 135 °C

Motor T3 > 200 °C

The pump can be installed in environments classified as T3 > 200 °C.

The maximum temperature of the liquid to be pumped, according to the aforementioned data, is listed in the table under paragraph "d" below.

2.7.4 Factors to take into consideration for installations in ATEX environments.

a. Electrostatic charges

The user is responsible for the electrical connection and grounding of the machine.

The pump is provided with a threaded hole on the adaptor, or fastening screws on the pump feet (see section "Electrical connections" in chapter "Installation").]

The surfaces of coupled metallic parts are clean and degreased thus ensuring connection between the pump frame, motor frame, and support frame. The outer parts of the machine are made of conducting materials.

b. Dry running

Dry running will cause:

- an abrupt increase in temperature of the rotating parts
- pump failure
- danger for persons and the environment depending on the liquid being pumped.

c. Temperature limits

During normal pump operation the highest temperature can be found:

- on the surface of the volute casing
- on the surface of the isolation shell

Under critical operating conditions: temperature of the liquid > 120 °C, dry run, low flow rate and/or room temperature > 40 °C the temperature on the surface of the volute casing may exceed 130 °C.

During pump operation ensure the external surface is free from dust in order to prevent the pump surface from exceeding the allowed temperature.

The customer must ensure that the maximum temperature during pump operation is strictly complied with and, if in doubt, properly monitored (see chapter "Monitoring devices").

Temperature class pursuant to EN 13463-1	Motor flange	Motor shaft
T6 (85 °C)	70 °C	70 °C
T5 (100 °C)	70 °C	80°C
T4 (135 °C)	75°C	85°C
T3 (200 °C)	80°C	100°C
T2 (300 °C)	80°C	100°C
T1 (450 °C)	80°C	100°C

Room temperature must be between -20 °C and +40 °C, otherwise please contact C.D.R. Pompe S.r.l.

d. Allowed temperature for gas atmosphere (G)

The following table indicates the limit (theoretical) temperature value of the liquid, pursuant to EN 13463-1.

Temperature class pursuant to EN 13463-1	Process fluid temperature limit Pump material = AISI 316L
T6 (85 °C)	75°C
T5 (100 °C)	90°C
T4 (135 °C)	125°C
T3 (200 °C)	180°C
T2 (300 °C)	180°C
T1 (450 °C)	180°C

Room temperature must be between -20 °C/+40 °C, otherwise please contact C.D.R. Pompe S.r.l. **Warning!** The values above are applicable only in proper operation, lubrication and maintenance conditions.

e. Allowed temperature for dust atmosphere (D)

Tmax is determined as the minimum temperature deriving from the following equations:

- Tmax = temperature limit of the selected pump (see the temperature class table in the previous section)
- Tmax = T5mm-75 °C (where T5mm is the ignition temperature of a layer of dust 5 mm thick)
- Tmax = 2/3 x Tcl (where Tcl is the ignition temperature of a dust cloud)

T5mm and Tcl must be determined by the client/user in case of dust protection (D). Room temperature must be between –20 °C/+40 °C.

Warning! Keep the outer surface of the pump free from dust by means of antistatic clothes.

2.8 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.

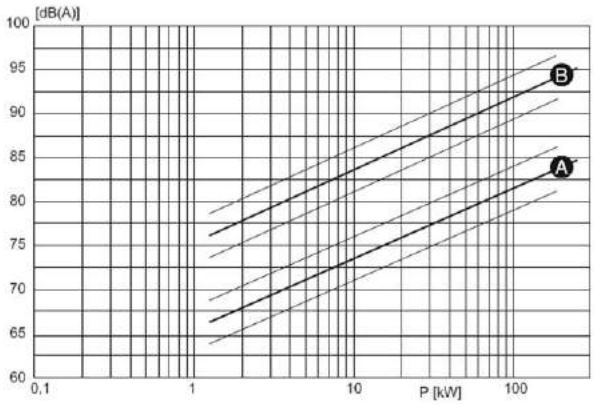

Fig. 8 *Noise chart in logarithmic scale.*

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 dependant 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).

2.9 Monitoring devices

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

If the running system cannot ensure these limits are respected, continuous monitoring devices must be used.

Check if monitoring devices are required in order to ensure the pump-motor unit works correctly.

The following accessories can be supplied by C.D.R. Pompe S.r.l. upon request:

- temperature probes
- pressure sensors
- flow sensors
- vibration sensors
- electrical protection equipment

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:

2.9.1 Interruption of the cooling flushing

In the standard version 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 increase in temperature.

2.9.2 Loss of synchrony between inner and outer magnet.

Overloading, overheating or non compliance with design data can cause a lack of synchronisation 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.

2.9.3 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).

2.10 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 C.D.R. Pompe 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

C.D.R. Pompe 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.

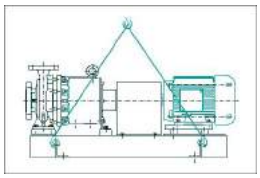

Fig. 9 *End-suction execution.*

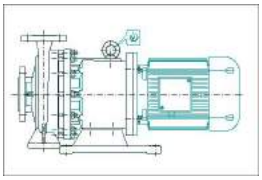

Fig. 10 *Close coupled execution.*

Fig. 11 *Handling.*

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

Fig. 12 *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 C.D.R. Pompe 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 C.D.R. Pompe 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 C.D.R. Pompe 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 C.D.R. Pompe 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

C.D.R. Pompe 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:

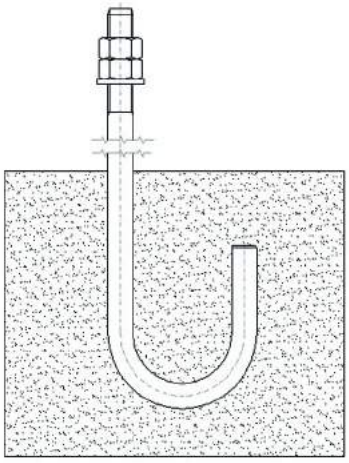

Fig. 13 *Foundations for fixing of pump-motor unit.*

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

The pumps or pumping units running in potentially explosive areas must be in compliance with standards on explosion protection (see section "Safety in explosive environments" in chapter "Safety").

For pumping flammable fluids provide for, in any event, especially in ATEX environments, proper grounding of the pump as static currents may cause sparks and explosions (see section "Electrical connections").

Whenever there is a danger of explosion, you must comply with the regulations concerning ATEX protection and those of the test certificate, kept where the machine is used.

4.4 Pump installation diagram

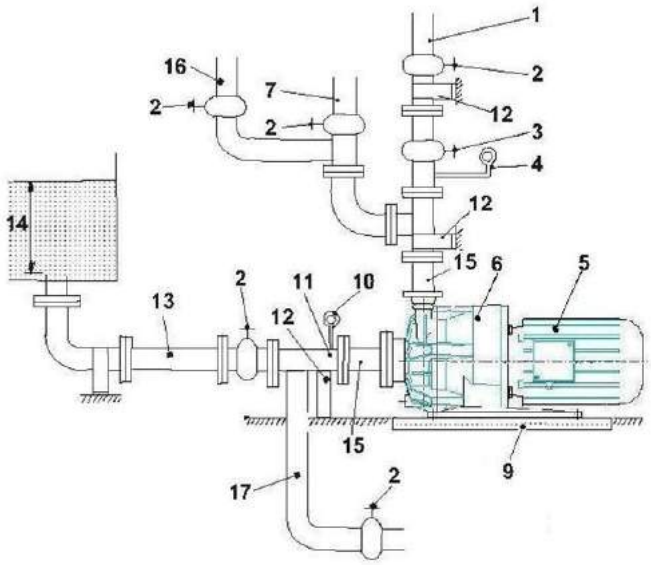

Fig. 14 *Pump installation diagram*

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

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
- 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 Npshd (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

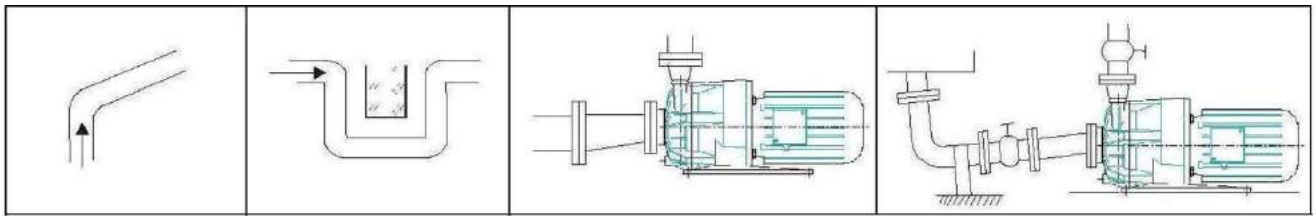

Fig. 15 *Recommended installation of suction piping.*

AVOID:

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

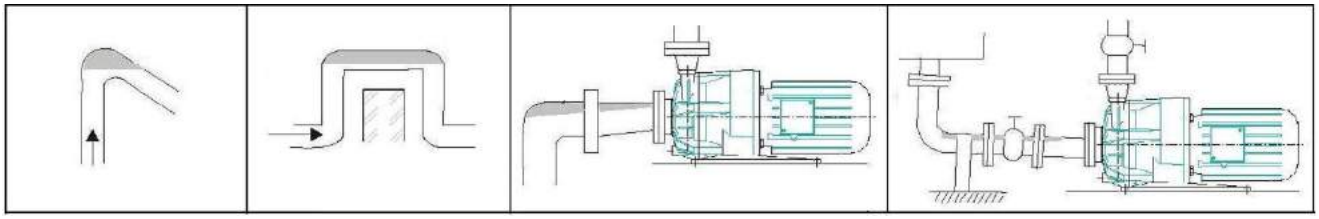

Fig. 16 *Not recommended installation of suction piping.*

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 ensure reasonable control of the performance and conditions of the pump installed it is advisable to use the following instruments:

- a compound gauge on the suction line
- 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 further information please contact C.D.R. Pompe S.r.l..'s technical service).

If the temperature of the pumped liquid is a critical element you should install a thermometer (preferably on suction).

The instruments must be in conformity with applicable safety requirements and regulations on explosion protection systems.

4.6 Pump-motor unit alignment

4.6.1 General information

Correct alignment between the pump and motor is essential both for proper operation and for a satisfactory service life.

Close coupled execution

In the event the pump is supplied without a motor, carefully follow the instructions included in the chapter "Pump assembly" in order to assemble the motor correctly.

End-suction execution

The joints provided are generally a flexible type to compensate for minor misalignments due to assembly, or due to possible thermal expansion. The flexible joint is protected by a special non-sparking coupling guard, to prevent accidental contacts while the pump is running.

You should not rely on the flexibility of the joints to compensate for misalignments exceeding the limits specified below.

General information is reported below concerning the joints and coupling between the pump and motor; for further details please refer to the joint manufacturer's manual.

4.6.2 Checking alignment

1) You must check the alignment before commissioning (i.e. after tightening the nuts of the foundation bolts and the tightening of the port flanges), or after performing maintenance, or when pumps supplied on a base are delivered.
2) Warning: checking, and if necessary, correcting the alignment must always be performed with the motor stopped and in safety.
3) The tools needed to align these joints are a cutting ruler, a wedge type feeler gauge or a series of thickness probes.
4) It is advisable to leave the pump in its position and only move the motor.
   4.1) For motors fixed directly to the base, loosen the bolts of the motor feet.
   4.2) For motors fixed on an adjustable plate, loosen the bolts securing the motor plate to the respective threaded columns.
   4.3) Height adjustments can be made by inserting or removing thin metal sheets under the feet of the motor or by adjusting the threaded screws, while horizontal adjustments can be made with lateral movements. Once the alignment is satisfactory, the motor must be blocked by once again tightening the bolts that secure it to the base.
5) The pump-motor unit must be aligned in all directions

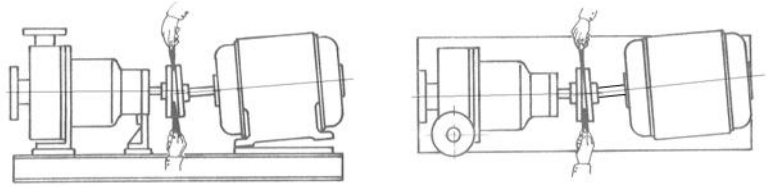

Fig. 17 *Angular: the maximum misalignment allowed is 0.8 mm (for a joint that has a 96 millimetre diameter).*

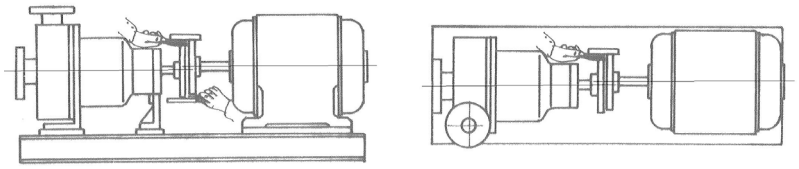

Fig. 18 *Lateral: a slight parallel misalignment, no greater than 0.2 mm, can be tolerated with this type of joint.*

4.7 Electrical connections

WARNING! Electrical installations in hazardous areas (ATEX classified) must comply with the requirements of IEC 60079-14.

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)

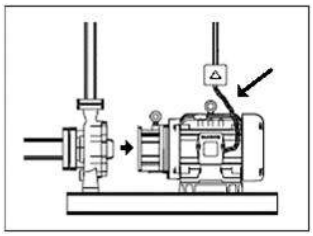

Fig. 19 *Lantern/motor unit "sliding".*

- 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).

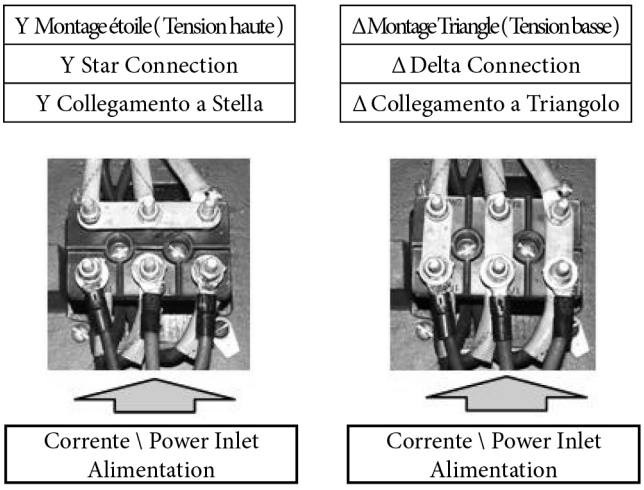

Fig. 20 *Electrical connections of the motor.*

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 C.D.R. Pompe 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

· the flexible joint for pumps with bearing bracket

- 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 (see chapter 11 auxiliary connections, where provided):

  · heating jackets

  · inert gas flushing of the lantern: Please note: check that all threaded holes of the lantern are plugged, especially the lower one near the pump stand

  · if the pump is supplied sealed with external flushing, the flushing liquid pressure must be in compliance with the seal manual

check the level of oil:

· for pumps provided with oil lubricated bearing bracket, fill it before starting the pump (see details in section "Maintenance").

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
12 - 100	10
>100	5

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 C.D.R. Pompe 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:

- bushings for accidental dry running made of Graphite LF or Run Safe SiC
- temperature probes
- pressure sensors
- flow sensors
- vibration sensors
- electrical protection equipment

C.D.R. Pompe 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".

If electrically charged liquids were used in the pump, fill it with inert gas when draining to prevent the formation of an explosive atmosphere.

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;
- check the conditions of the bearing lubricant (1)
- check the mechanical seal (see the mechanical seal manual) (2)

BEYOND ONE YEAR (in addition to the above):

- replace the bearings (1)
- check the magnetic field of the inner and outer magnet (3)

(1) applicable only for pumps equipped with bearing bracket

(2) applicable only for pumps with mechanical seal

(3) applicable only for magnetic drive pumps

6. Pump characteristics

6.1 Description and operation of the pump

The **ETS** 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 to pump fluids in small systems, where the reduced hydraulic needs allow for 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	2014/34/EU
In accordance with	Sub-ISO 2858	DIN EN ISO UNI 15783
Flanges	UNI 1092-1 PN16RF	
	or slotted holes 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	Single stage horizontal centrifugal pump with magnetic drive - Structure: single block
Performance 2900 rpm	Q max = 35 m3/h -> H max = 65 mcl
Drives	0.75 kW (size 80) -> 7.5 kW (size 132)
Operating temperature limits	-30°C -> +140°C (option -60°C -> +180°C)
Viscosity limits	0.5 - 60 cSt max

7.2 Operating temperature/pressure limit chart

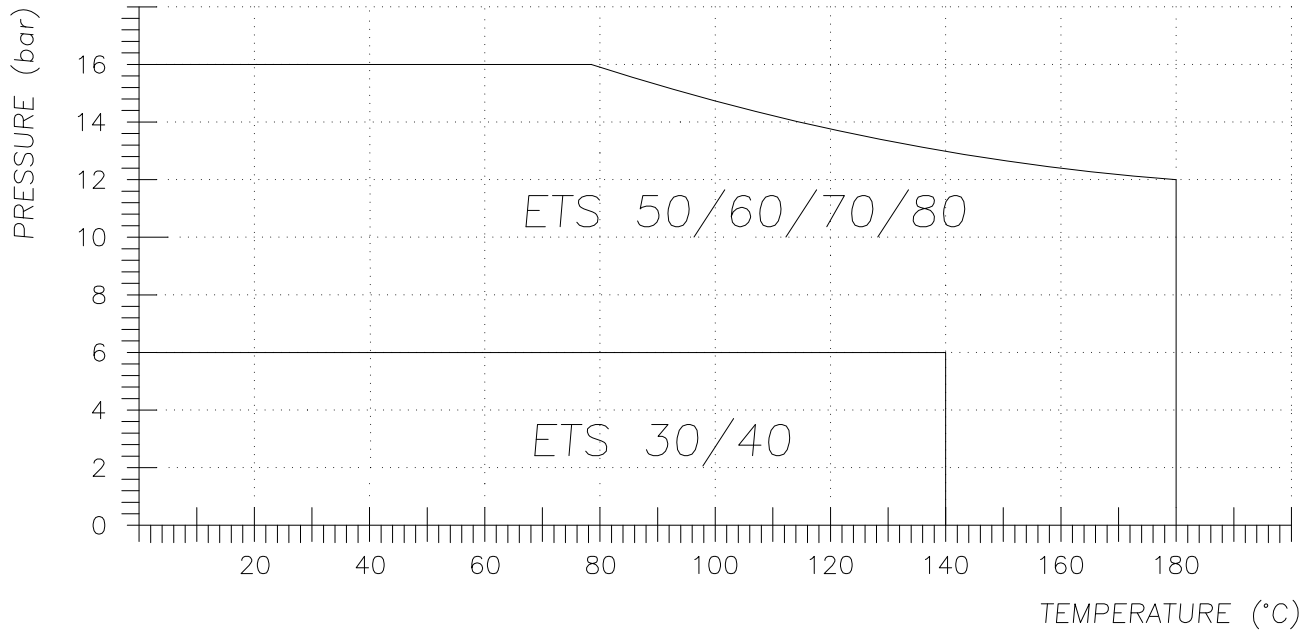

Fig. 21 *Graph ETS 30/40 and ETS 50/70.*

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.

7.3 Materials constituting the pump

DIN code	COMPONENT	MATERIAL
102	Casing	AISI 316L (CF3M) (1.4409)
157	Isolation shell	Hastelloy C + 316L
211	Shaft	AISI 316 (1.4401)
230	Impeller	AISI 316 (CF8M) (1.4408)
240	Impeller assembly	AISI 316L (CF3M) (1.4409)
344	Lantern	GS400 (C40*- SS*) * special structure
350	Bushings support	AISI 316L (CF3M) (1.4409)
411.x	Casing gasket	PTFE / Armored Grafoil
504.x	Spacer ring	PTFE / Armored Grafoil
510	Thrust bearings	SiC
529	Bearing sleeves	SiC
545	Bearing bushes	SiC/PEEK/Graphite
855	Inner magnet	AISI 316L (1.4404)
856	Outer magnet	GS400

7.4 Allowed forces and moments

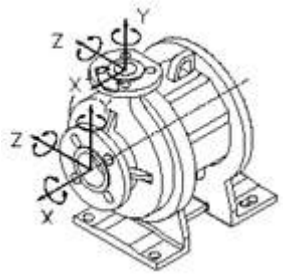

Fig. 22 *Forces and moments*

	FORCES (N)	
Z	X	Y
350	450	400

	MOMENTS (Nm)	
Z	X	Y
150	350	250

7.5 Component/material details and drawing

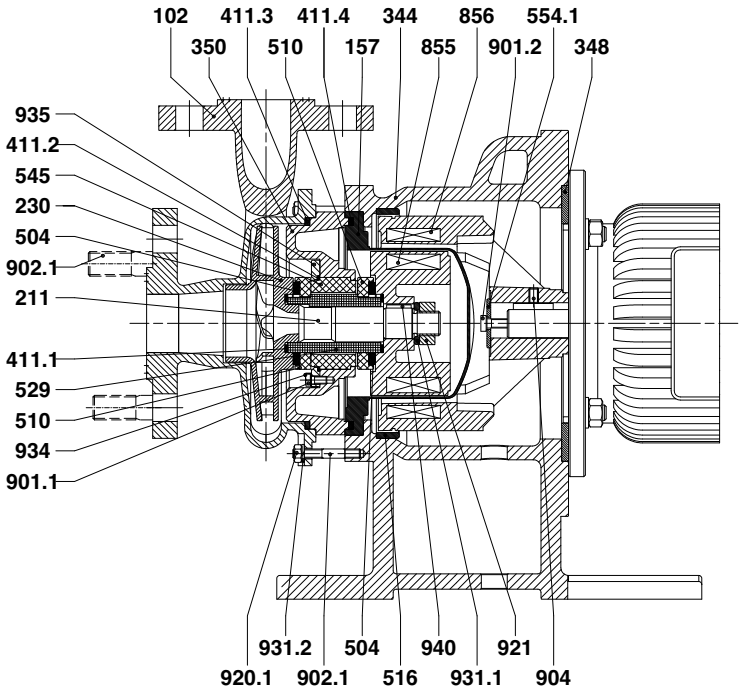

Fig. 23 *Cross-section ETS 30/40 with motor size 80/90.*

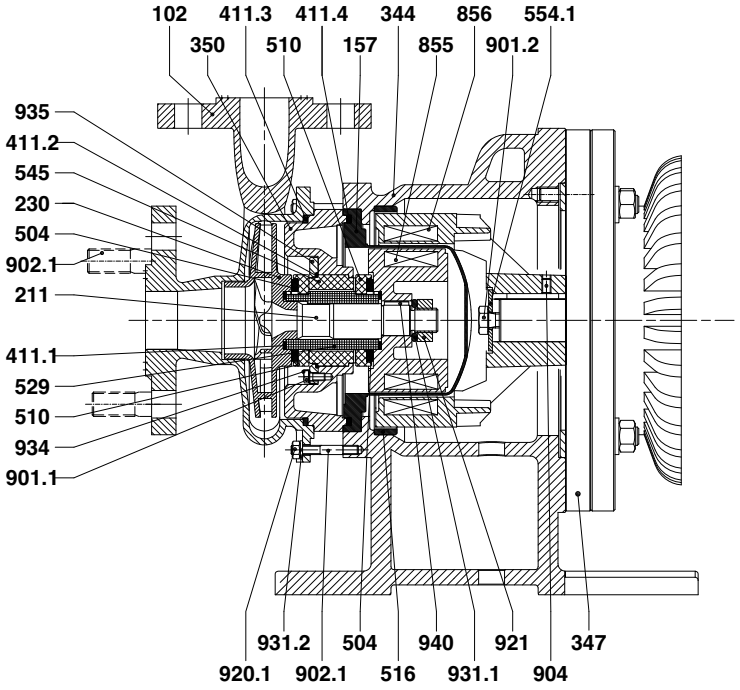

Fig. 24 *Cross-section ETS 30/40 with motor size 100/112.*

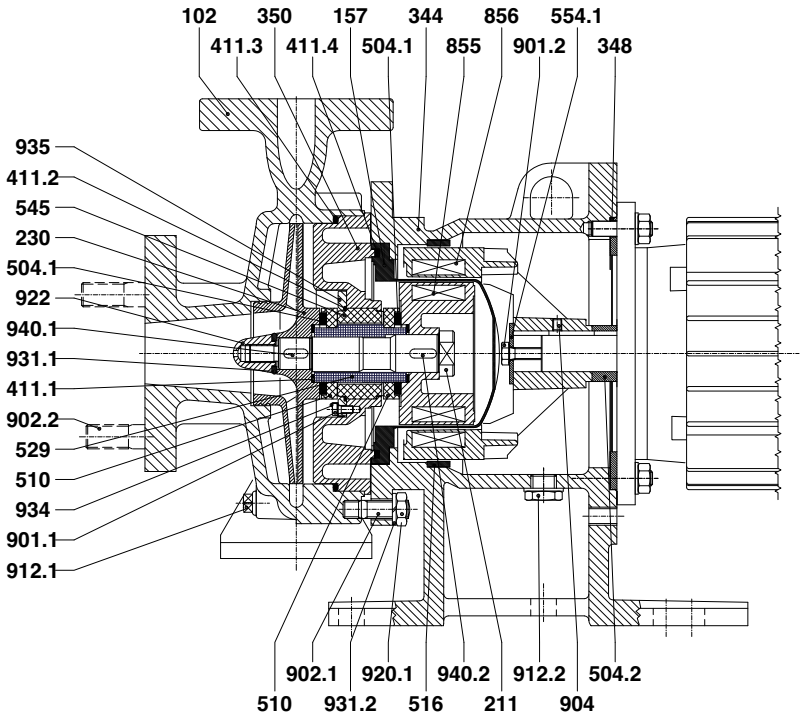

Fig. 25 *Cross-section ETS 50/80 with motor size 80/90.*

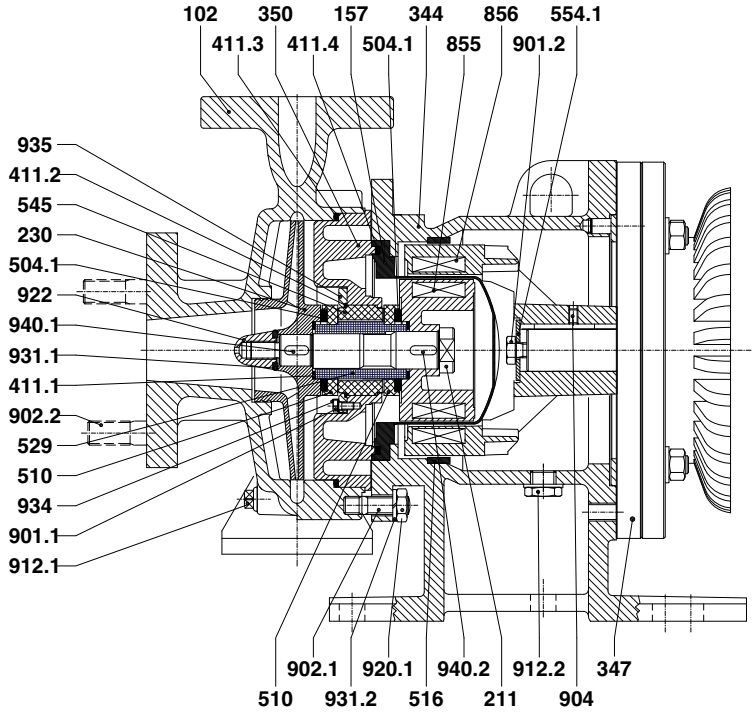

Fig. 26 *Cross-section ETS 50/80 with motor size 100/112.*

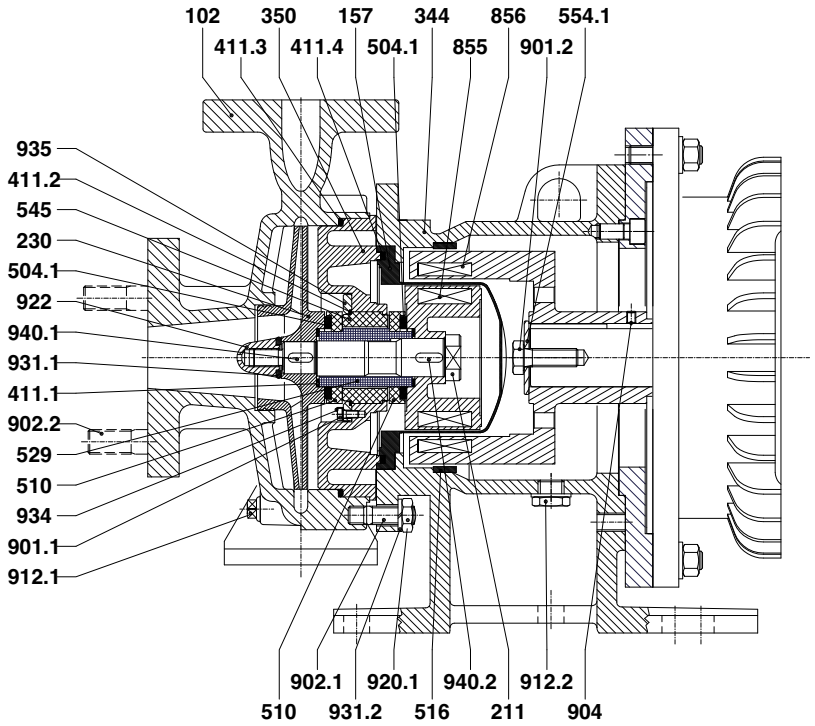

Fig. 27 *Cross-section ETS 50/80 with motor size 132.*

DIN code	Description
102	Volute casing
157	Isolation shell
211	Shaft
230	Impeller
240	Impeller assembly
344	Lantern
347	Motor flange
348	Lantern spacer
350	Bushings support
411.x	Gasket
504.x	Spacer ring
510	Thrust bearing
516	Antispark ring
529	Bearing sleeve
545	Bearing bush
554.1	Washer
855	Inner magnet
856	Outer magnet
901.x	Hexagon head bolt
902.1	Stud
904	Grub screw
912	Draining plug
920.x	Nut
921	Shaft nut
922	Impeller nut
931.x	Locking washer
934	Locking washer device
935	Locking ring
940.x	Tab
931.1	Lockwasher
931.2	Lockwasher
934	Locking Device
935	Locking Setting Ring
940.1	Key
940.2	Key

8. Disassembly

8.1 General information

During the warranty period no work must be performed by personnel not authorised by C.D.R. Pompe S.r.l. All stages described in this chapter must be performed by qualified personnel.

Prior to carrying out any work on the pump ensure the following recommendations are observed:

use proper Personal Protective Equipment.

clean the outer surface of the pump only with antistatic solutions and clothes.

disconnect all electrical contacts so that the machine cannot start inadvertently.

empty and purge the pump to service the parts in contact with the pumped liquid.

Warning! During assembly/disassembly, strong magnetic fields are present near the magnetic parts/components. Bring metal tools at a safe distance so that they are not pulled suddenly. Furthermore, we recommend to keep electrical data or magnetic strip supports and watches at least 15 cm away.

People with pacemakers must remain at least 50 cm away.

Ceramic and silicon carbide parts are very brittle, therefore they must be handled with care.

8.2 Disassembly of pump ETS 30/40

Fig. 28 *For convenient disassembly, position the pump vertically. Disassemble the volute casing (102) from the lantern (344) by unscrewing the relevant nuts (920.1).*

Fig. 29 *Slide out the gasket (411.3) from the bearings (350).*

Fig. 30 *Separate the bushings support (350), impeller (230) and inner magnet (855) assembly from the isolation shell (157).*

Fig. 31 *After turning the support upside down, undo and pull put the left threaded nut (921) from the impeller shaft (240).*

Fig. 32 *Remove the inner magnet (855) from the impeller shaft (240).*

Fig. 33 *Pull out the tab (940) from the impeller shaft (240) and the compensation ring (504.1) from the rear bearing (510).*

Fig. 34 *Pull out the bearings (350) from the bearing sleeve (529) set onto the impeller shaft (240).*

Fig. 35 *Pull out the bearing sleeve (529) and the front bearing (510) from the impeller shaft (240).*

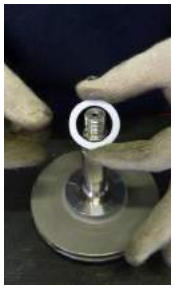

Fig. 36 *Remove the gasket of the bearing sleeve (411.1) from the impeller (230).*

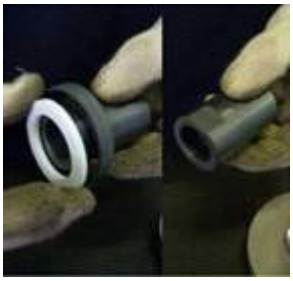

Fig. 37 *Pull out the compensation ring (504.1) from the front bearing (510) and the front bearing from the bearing sleeve(529).*

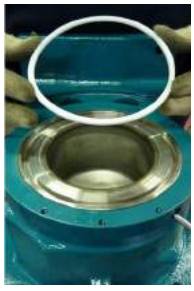

Fig. 38 *Pull out the isolation shell gasket(411.40) from the isolation shell (157).*

Fig. 39 *Pull out the isolation shell (157) from the lantern (344).*

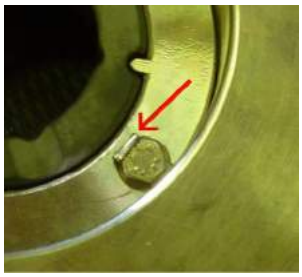

Fig. 40 *On the bearings (350), disengage the safety washers (934) from the hex head screws (901.1) as shown by the arrow.*

Fig. 41 *Undo the hex head screws (901.1) from the bushing locking flange (935).*

Fig. 42 *Pull out the bushing locking flange (935) from the bearings (350).*

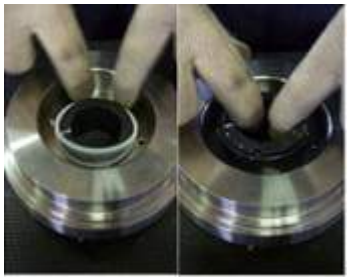

Fig. 43 *Pull out the gasket (411.2) followed by the bearing bush (545).*

Fig. 44 *Remove the gasket of the bearing sleeve (411.1) from the inner magnet (855).*

Fig. 45 *Undo and pull out the nuts (920.2) and separate the lantern (344) from the electric motor.*

Fig. 46 *Undo the grub screw (904) and screw (901.2) from the electric motor shaft.*

Fig. 47 *Pull out the outer magnet (856) from the electric motor shaft.*

8.3 Disassembly of pump ETS 50/80

Fig. 48 *For convenient disassembly, position the pump vertically. Disassemble the volute casing (102) from the lantern (344) by unscrewing the relevant nuts (920).*

Fig. 49 *Slide out the gasket (411.4) from the bearings (350).*

Fig. 50 *Separate the bushings support (350), impeller (230) and inner magnet (855) assembly from the isolation shell (157).*

Fig. 51 *Keep the impeller locked inserting a spanner in the vane compartment and unscrew the impeller nut (922). Pull out the impeller nut (922) from the shaft (211).*

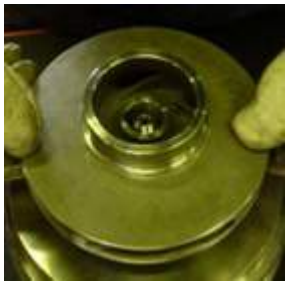

Fig. 52 *Pull out the impeller (230).*

Fig. 53 *Turn the impeller upside down (230) and pull out the bearing sleeve gasket (411.1).*

Fig. 54 *Pull out the front tab (940.1) from the shaft (211).*

Fig. 55 *Pull out the compensation ring (504.1) and the front bearing (510).*

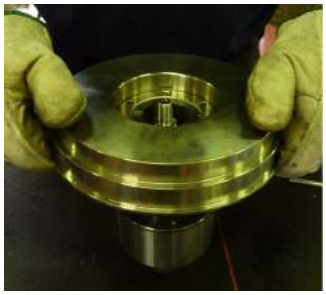

Fig. 56 *Pull out the bearings (350) from the bearing sleeve (529).*

Fig. 57 *Pull out the bearing sleeve (529) and the rear bearing (510), then the inner magnet (855) from the impeller shaft (211).*

Proceed as shown in the figure from stage 37 to stage 47.

9. Maintenance

9.1 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.

The inspection/maintenance intervals may vary according to the working point of the pump referred to the characteristic curve.

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

9.2 Parts to be checked

1) OUTER MAGNET (Code 856)

DETAILS	ACTIONS
Are there any abrasions on the magnet housings?	Contact C.D.R. Pompe 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 C.D.R. Pompe 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 (Code 230)/INNER MAGNET (Code 855)

DETAILS	ACTIONS
Is there any breakage?	Contact C.D.R. Pompe 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 C.D.R. Pompe 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 C.D.R. Pompe S.r.l.

5) SHAFT (Code 211) / BUSHINGS (Code 529 - 545)

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

9.3 Replacing wear parts

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

- casing and isolation shell gaskets (411.3411.4)
- gaskets of bearing sleeves (411.1) and gasket of the bushing locking flange (411.2), compensation rings (504.1)
- bearing sleeve (529), bearing bush (545) and thrust bearings (510) (The 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**.

Description	DIN code	Ref.	Rated value (mm)	Limit value (mm)
Thrust bearings	510	A	10.3	10.2
		Ø F	38.1	38.7
Bearing sleeve	529	B	60.7	60.9/61.1
		Ø E	38	37.95/37.97
Bearing bush	545	C	30.5	30.45
		Ø D	38	38.02/38.07

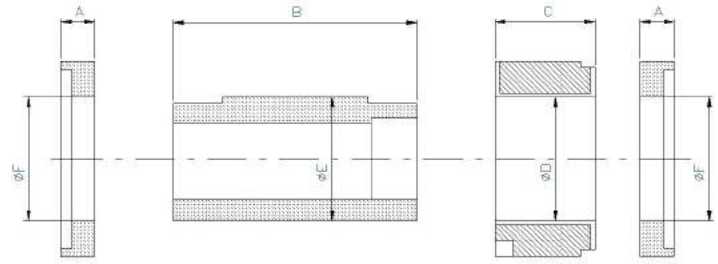

Fig. 58 *Thrust bearings, bearing sleeve and shaft are wear parts.*

10. Assembly

10.1 General information

Before any assembly operation see the recommendations in the "Disassembly" chapter.

10.2 Screw tightening torque

DIN code	Description	Thread	Tightening torque (Nm)
901.x	Hexagon head bolt	M5	4
		M6	9
		M8	12
		M10	20
		M12	30
921	Impeller shaft nut	M10	20
920.x	Volute casing nuts	M6	10
		M10	20
		M12	30
922	Impeller nut	M12	30

10.3 Assembly of pump ETS 30/40

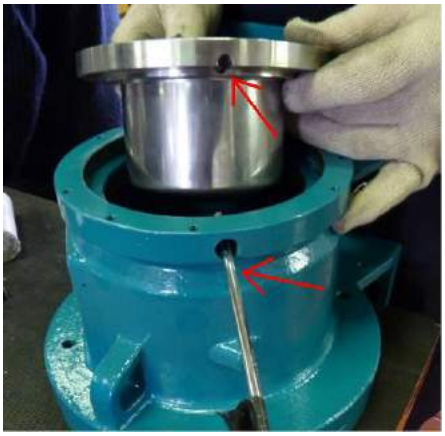

Fig. 59 *Position the lantern (344) in vertical position, insert the isolation shell (157), checking that the hole on the isolation shell flange is matching the hole of the temperature probe socket on the lantern. Use a spanner as position reference, leaving it inserted until assembly is completed.*

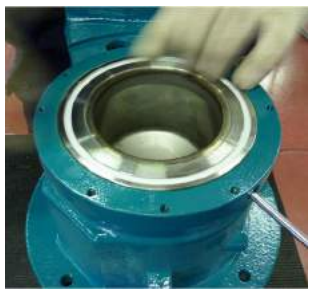

Fig. 60 *Insert the isolation shell gasket (411.3) in the relevant seat on the isolation shell (157).*

Fig. 61 *Screw in the studs (902) on the lantern (344), letting the longer threaded end protrude.*

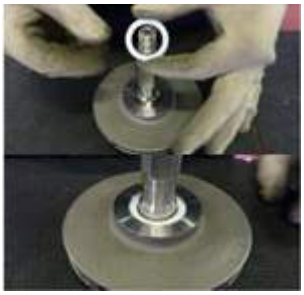

Fig. 62 *Insert the gasket of the bearing sleeve (411.1) into the relevant seat of the impeller (230).*

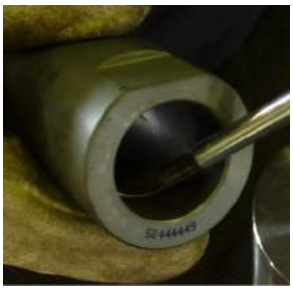

Fig. 63 *Warning! Fit the bearing sleeve (529) with the discharge facing the impeller side (230).*

Fig. 64 *Inset the front bearing (510) and the axial play compensation ring (504.1) on the bearing sleeve (529). Insert everything on the impeller shaft (211).*

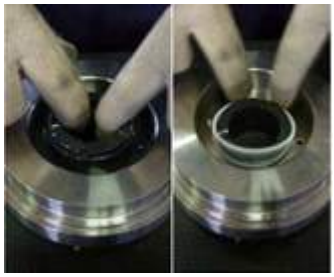

Fig. 65 *Warning! Position the rotation-prevention slot of the bearing bush (545) on the upper side. Seat the bearing bush (545) and gasket (411.2) in the bearings (350).*

Fig. 66 *Insert the hex head screws (901.1) and relevant safety washers (934) in three holes at 120° in the bushing locking flange (935). Bend the safety washers (934) onto the external edge of the bushing locking flange (935).*

Fig. 67 *Position the bushing locking flange (935) so that the rotation-prevention tooth matches with the slot of the bearing bush (545). Tighten screws (901.1).*

Fig. 68 *Lift and bend back the safety washers (934) flush with the screw head (901.1), taking care not to damage the bearing bush (545).*

Fig. 69 *Insert the bearings (350) on the bearing sleeve (529) engaged on the impeller shaft (211).*

Fig. 70 *Insert the rear bearing (510) with the relevant compensation ring (504.1) on the bearing sleeve (529). Fit the tab (940.2) into the slot of the impeller shaft (211).*

Fig. 71 *Fit the inner magnet (855) on the impeller shaft (211).*

Fig. 72 *Insert the spring washer and screw in the left threaded nut (921) on the impeller shaft (211).*

Fig. 73 *Insert the bushings support assembly (350), impeller (230) and inner magnet (855) into the isolation shell (157).*

Fig. 74 *Install the gasket (411.3) on the bearings (350).*

Fig. 75 *Assemble the volute casing (102) on the lantern (344) by screwing the relevant nuts (920.1).*

Fig. 76 *Insert the outer magnet (856) on the electric motor shaft.*

Fig. 77 *Lock the outer magnet (856) with screw (901.2). Ensure the seal with threadlocker type Loctite 243. Screw in the grub screw (904).*

Fig. 78 *Install the lantern (344) on the motor with the relevant nuts (920.2).*

10.4 Assembly of pump ETS 50/80

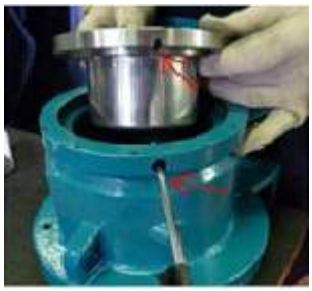

Fig. 79 *Position the lantern (344) in vertical position, insert the isolation shell (157), checking that the hole on the isolation shell flange is matching the hole of the temperature probe socket on the lantern. Use a spanner as position reference, leaving it inserted until assembly is completed.*

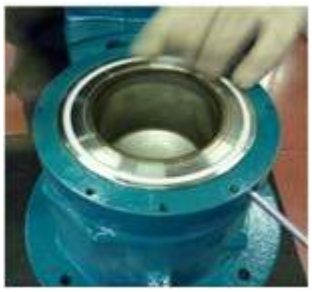

Fig. 80 *Insert the isolation shell gasket (411.3)in the relevant seat on the isolation shell (157).*

Fig. 81 *Screw in the studs (902.1) on the volute casing (102), letting the longer threaded end protrude.*

Fig. 82 *Insert the bearing sleeve gasket (411.1) in the seat of the inner magnet (855).*

Fig. 83 *Position the shaft (211) vertically on a cylindrical stand and insert the tab (940.1) into the relevant seat.*

Fig. 84 *Insert the inner magnet (855) so that it comes fully to the end of the shaft (211).*

Fig. 85 *Warning! Fit the bearing sleeve (529) with the discharge facing the inner magnet side (855).*

Fig. 86 *Inset the front bearing (510) and the axial play compensation ring (504.1) on the bearing sleeve (529). Insert everything on the impeller shaft (211).*

Fig. 87 *Insert the previously assembled bushing assembly onto the shaft (211).*

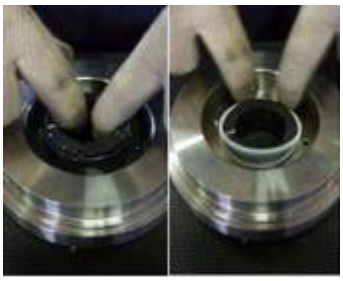

Fig. 88 *Warning! Position the rotation-prevention slot of the bearing bush (545) on the upper side. Seat the bearing bush (545) and gasket (411.2) in the bearings (350).*

Fig. 89 *Insert the hex head screws (901.1) and relevant safety washers (934) in three holes at 120° in the bushing locking flange (935). Bend the safety washers (934) onto the external edge of the bushing locking flange (935).*

Fig. 90 *Position the bushing locking flange (935) matching the rotation-prevention tooth with the slot of the bearing bush (545). Tighten screws (901.1).*

Fig. 91 *Lift and bend back the safety washers (934) flush with the screw head (901.1), taking care not to damage the bearing bush (545).*

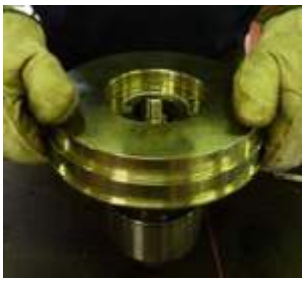

Fig. 92 *Insert the bearings (350) on the bearing sleeve (529) engaged on the shaft (211).*

Fig. 93 *Insert the front bearing (510) with the relevant compensation ring (504.1) in the bearing sleeve (529).*

Fig. 94 *Fit the tab (940.1) into the slot of the impeller shaft (211).*

Fig. 95 *Insert the gasket of the bearing sleeve (411.1) into the relevant seat of the impeller (230).*

Fig. 96 *Keep the impeller (230) locked inserting a spanner in the vane compartment and screw the impeller nut (922).*

Fig. 97 *Insert the bushings support (350), impeller (230) and inner magnet (855) assembly into the isolation shell (157).*

Fig. 98 *Install the gasket (411.4) on the bearings (350).*

Fig. 99 *Assemble the volute casing (102) on the lantern (344) by screwing the relevant nuts (920.1).*

10.5 Assembly check

After assembly, check the following:

- the impeller rotates freely, operating on the motor fan or the impeller vanes from the intake or delivery opening;
- the pump is sealed by means of air or water pressure at 6 bar;
- the screws of the casing are tightened according to the table in the "Screw tightening torque" paragraph.

Do not start the pump!

To check the motor's direction of rotation you must first FILL THE PUMP and follow the instructions in "Starting and stopping".

11. 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 626/94, 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.

11.1 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 C.D.R. Pompe 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	X	X	X		Misalignment of the pump/motor unit	Check the coupling and realign if necessary. Check the conditions of the seal for pumps with mechanical seal. Replace the coupling blocks if worn
		X		X		Poor lubrication (low oil level) or excessive lubrication (excessive oil in the bearing bracket) or wrong type of lubricant	Add, decrease or replace the lubricant
	X				X	Wrong tolerance of the bearing bracket housing/bearings	Contact C.D.R. Pompe S.r.l.
				X		The impeller is not properly balanced	Balance and/or clean the impeller
	X			X		Worn bearings	Replace bearings
			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 C.D.R. Pompe S.r.l.
			X			Use of unsuitable materials	Change the combination of materials. Contact C.D.R. Pompe S.r.l.
					X	No coolant or dirty flushing liquid	Increase flushing. Clean/purify the flushing liquid
			X			Disassemble the pump and find the source of leaks	Repair where necessary. Contact C.D.R. Pompe S.r.l.
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
X			X			Worn casing gaskets.	Change the gaskets.

11.2 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.

12. Weight and size

Bareshaft pump weight (without motor):

PUMP TYPE	WEIGHT (kg)
ETS 30	35
ETS 40	38
ETS 50	45
ETS 60	50
ETS 70	45
ETS 80	45

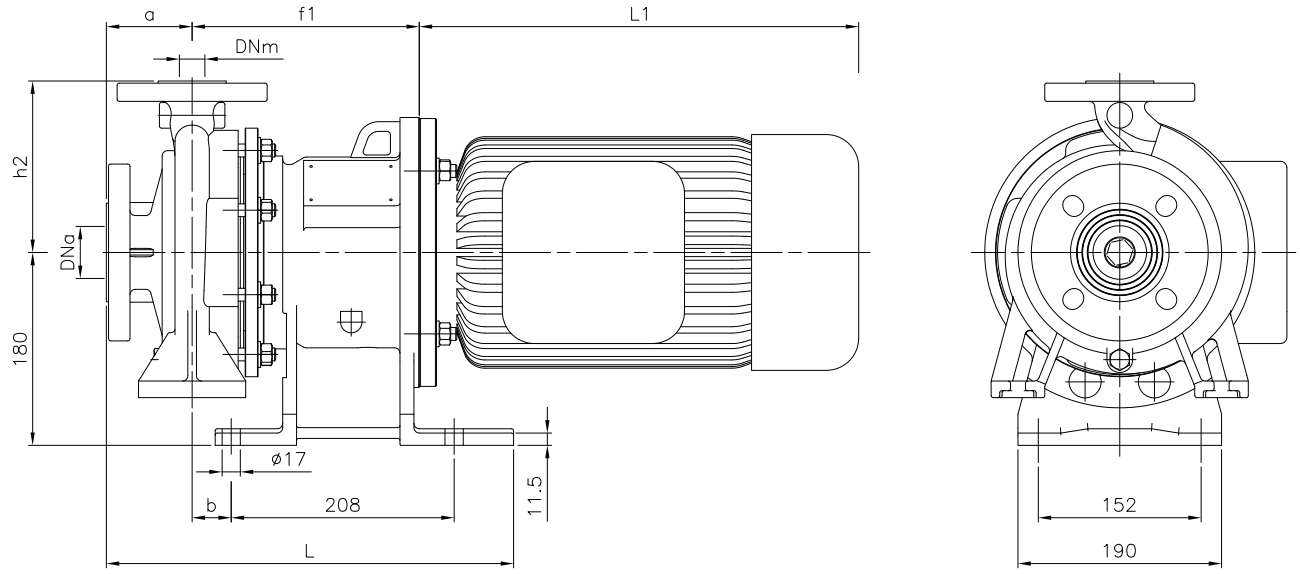

Fig. 100 *Size drawing (measurements in mm).*

PUMP VER-SION	DNa	DNm	a	b	h2	L
ETS 30	32	25	52*	20	121	335*
ETS 40	40	32	78	22	146	361
ETS 60	40	25	80	36.5	180	380
ETS 50	40	25	100	36.5	165	400
ETS 70	50	32	80	36.5	160	380
ETS 80	65	40	80	36.5	160	380

* +26 mm for pump ETS 30 with heated casing

PUMP VERSION	MOTOR SIZE SHAPE B5	f1
ETS 30	80/90	196
	100/112	212
ETS 40	80/90	198
	100/112	214
ETS 50/ETS 80	90	212
	100/112	212
	132	230

The size of flanges (DNa, DNm) follows the Sub-ISO 2858 standard.

The size of motor L1 changes according to the brand of installed motor.]

12.1 Details and drawing with ETS pump options

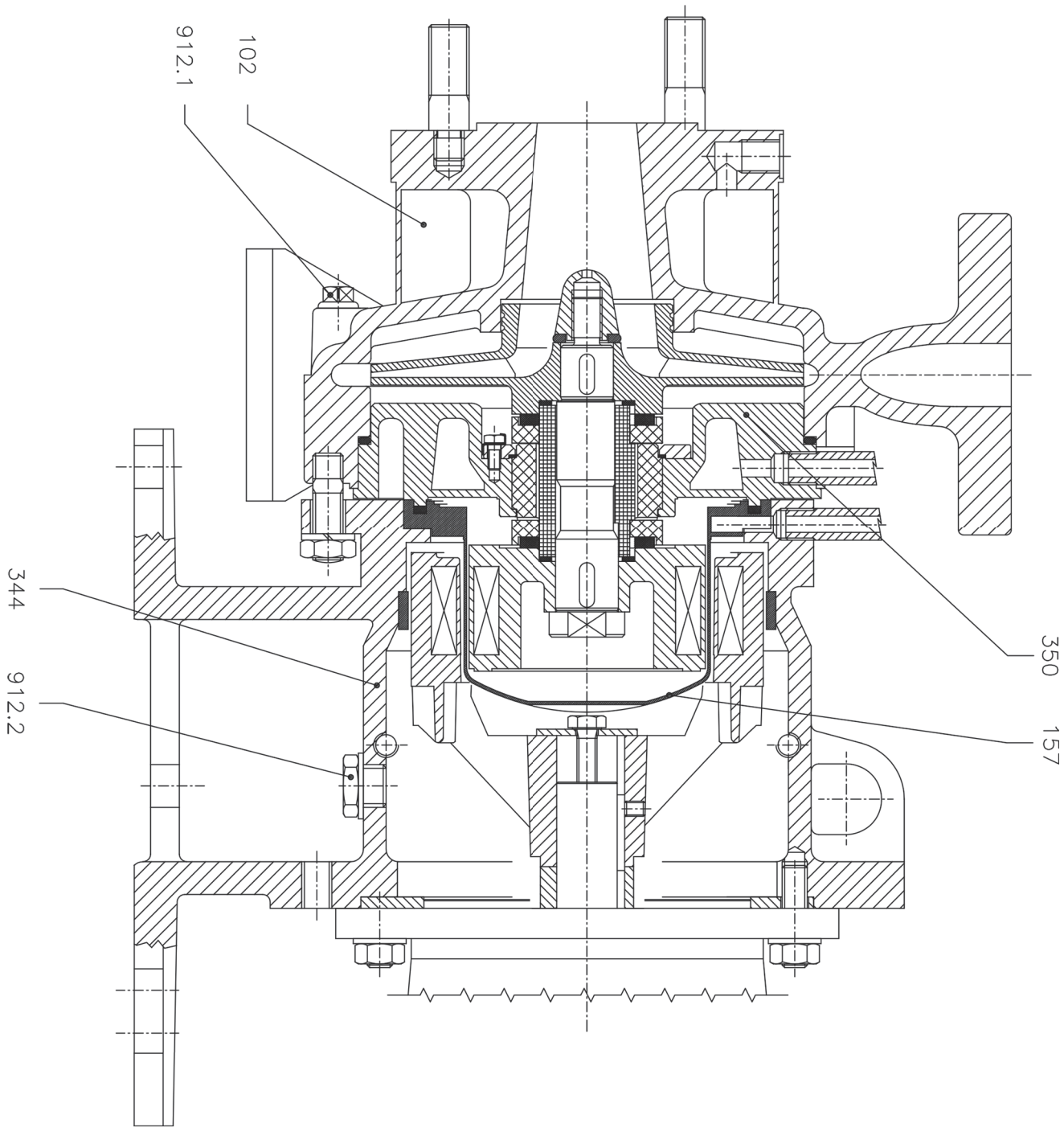

Fig. 101 *Typical section of ETS with drained casing, heated bearings and casing, temperature probe kit PT100 and special lantern.*

DIN code	Description
102	Heated volute casing
157	Isolation shell temperature probe kit
344	Lantern C40 / SS
350	Heated bushings support
912.x	Draining plug

13. Auxiliary connections

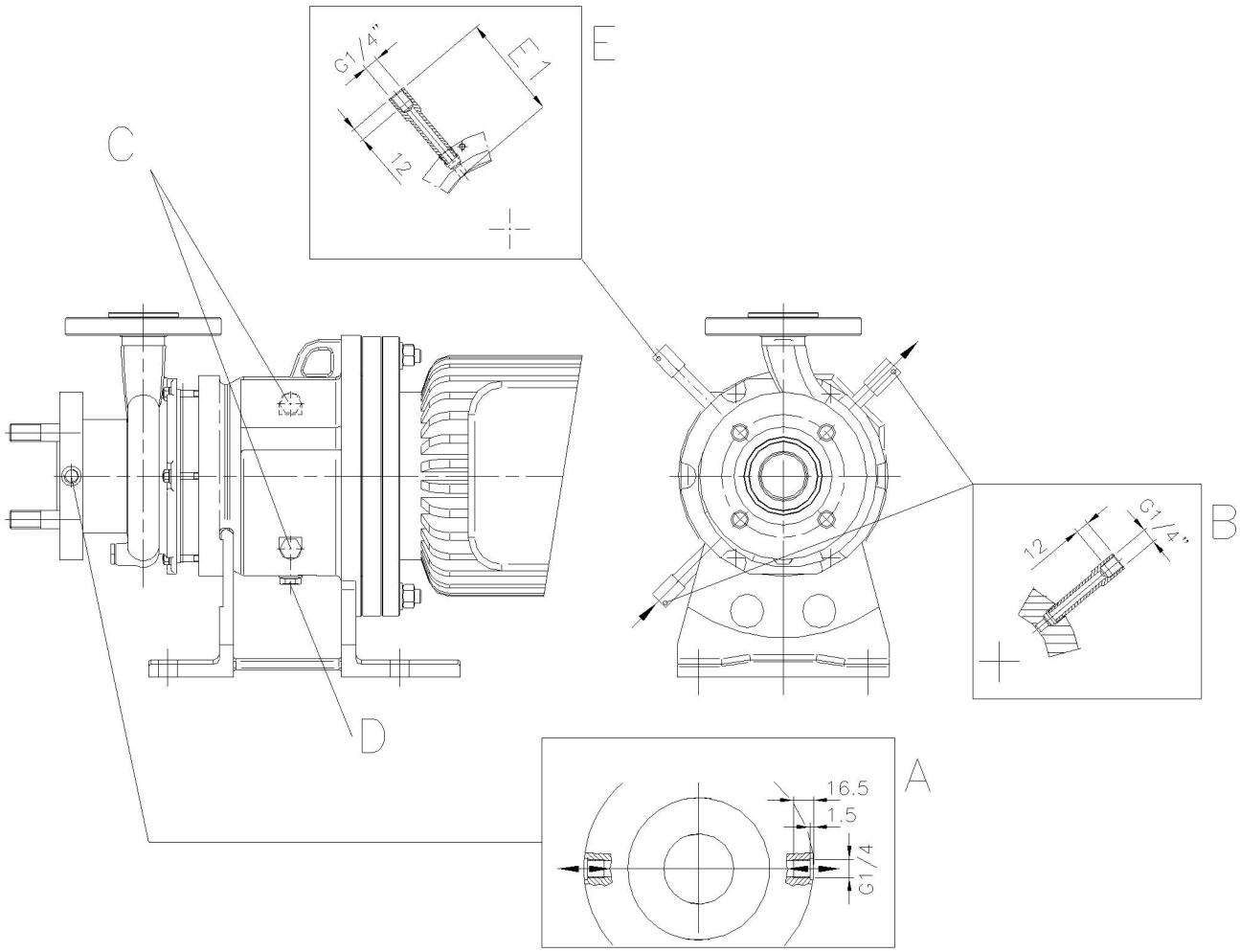

Fig. 102 *Gas threaded connections and remaining measurement in mm.*

Ref.	Connection	Fluid type	T max (°C)	P max (bar)
A	Heated volute casing	Overheated water/ saturated steam	183	10
B	Heated bearings	Overheated water/ saturated steam	183	10
C	1/4" holes, lantern flushing gas	Inert gas	Ambient	1
D	M20 x 1.5 hole, lantern draining/flushing	Inert gas	Ambient	1

Ref.	Connection	E1 socket depth (mm)
E	Temperature probe connection socket (temperature probe diameter = 6 mm)	108 (ETS 30/40/50/70/80)
E	Temperature probe connection socket (temperature probe diameter = 6 mm)	112 (ETS 60)

14. Annexes: CE / ATEX Declarations / Contamination Safety

The pages below list the following annexes:

- CE Declaration of conformity
- CE / ATEX Declaration of conformity
- Safety information / Declaration of contamination

CE

Dichiarazione di Conformità *secondo EN ISO/IEC 17050*
Declaration of Conformity *according to EN ISO/IEC 17050*

Prodotto *Product*	Pompe centrifughe a trascinamento magnetico per liquidi chimici come unità *Magnetic Drive Chemical Centrifugal Pump as unit*
Serie *Serie*	ETS, UTS, UTS-B
Direttiva UE *EU-Directive*	2006/42/CE – Direttiva Macchine *2006/42/EC- Machinery Directive*
Modulo *Modul*	Allegato II _ modulo A Attached II _ modul A
Norme armonizzate applicate *Applied harmonised Standards*	EN ISO 12100 EN 809 EN 60204-1
Marcatura *Marking*	2006/42/CE *2006/42/EC* CE

C.D.R. Pompe S.r.l., con la presente, conferma che le serie di pompe sopra citate soddisfano i requisiti essenziali delle direttive e norme indicate.
C.D.R. Pompe S.r.l. hereby certifies that the above mentioned pump series meet the essential requirements of the directives and standards listed.

Persona autorizzata alla compilazione dei fascicoli tecnici in accordo alla 2006/42/CE
Authorised person compiled the technical files according to 2006/42/EC

A. Cerizza
Resp. Area Tecnica
Tech. Dept. Resp.

Senago, 06.02.2017

M. Abordi
Amministratore Delegato
Chief Executive Officer

Compilato/Compiled:	A. Cerizza	il/on:	06.02.2017	Pagina/Page: 1
Approvato/Approved:	M. Abordi	il/on:	06.02.2017	di/of: 1

CE

Dichiarazione di Conformità *secondo EN ISO/IEC 17050*
Declaration of Conformity *according to EN ISO/IEC 17050*

Prodotto *Product*	Pompe centrifughe a trascinamento magnetico per liquidi chimici Asse nudo, monoblocco o come unità [1] *Magnetic Drive Chemical Centrifugal Pump* *Bare shaft, block version or as unit* [1]
Serie *Serie*	ETS, UTS, UTS-B
Numero di serie *Serial number*	dal 01.12.2017 *from*
Direttiva UE	2006/42/CE – Direttiva Macchine 2014/34/UE – Direttiva per atmosfere potenzialmente esplosive
EU-Directive	*2006/42/EC – Machinery Directive* *2014/34/EU – ATEX Equipment explosive atmosphere*
Modulo *Modul*	Allegato VIII modulo A articolo 13 1bii Attached VIII modul A article 13 1bii
Norme armonizzate applicate *Applied harmonised Standards*	EN ISO 12100 EN 809 EN 60204-1 EN 13463-1 EN 13463-5
Marcatura *Marking*	2006/42/CE *2006/42/EC* CE 2014/34/UE *2014/34/EU* Ex II 2 GD c TX X [1]

Il fascicolo tecnico è stato depositato presso il sottostante ente notificato secondo la Direttiva 2014/34/UE.
The technical documentation is filed by below mentioned notified body according to Directive 2014/34/EU.
BUREAU VERITAS ITALIA S.p.A. Viale Monza 261, 20126 Milano (Italia)

Serie *Series*	**N. Registrato** *Registered #*
ETS, UTS, UTS-B	BVI/ATEX/ITA/17/093

C.D.R. Pompe S.r.l., con la presente, conferma che le serie di pompe sopra citate soddisfano i requisiti essenziali delle direttive e norme indicate.
C.D.R. Pompe S.r.l. hereby certifies that the above mentioned pump series meet the essential requirements of the directives and standards listed.

Persona autorizzata alla compilazione dei fascicoli tecnici in accordo alla 2006/42/CE
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A. Cerizza
Resp. Area Tecnica
Tech. Dept. Resp.

1) Non applicabile all'unità in ottemperanza alla 2014/34/UE (Linee Guida ATEX, Nov. 2012, Paragrafo 3.7.5.2a)
1) Not valid for the unit according to 2014/34/EU (ATEX Guideline, Nov 2012, Paragraph 3.7.5.2a)

Senago, 30.10.2017

M. Abordi
Amministratore Delegato
Chief Executive Officer

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Safety information / Contamination declaration on CDR pumps and components

Dear Customer,

all industrial and commercial companies have a duty to protect their workers and the environment from harmful influences arising from the use and handling of hazardous materials in compliance with applicable legal regulations.

For the reasons detailed above, an inspection/repair of C.D.R. Pompe S.r.l. products or parts occurs only if they have been thoroughly cleaned up.

Before arranging for shipment of pumps or components, the operator must fill in the declaration on the next page and enclose it with the shipping documents.

Always observe the following requirements:

- ◊ **Drain process fluids**
- ◊ **Wash parts in contact with process fluid**
- ◊ **Hermetically seal all openings**
- ◊ **Package properly**
- ◊ **Send in a container / packaging suitable for transport**
- ◊ **Affix a copy of the contamination declaration on the outside of packaging**

Devices which have come into contact with radioactive substances are not accepted for any reason.

If, despite a thorough emptying and cleaning of equipment, additional security measures are necessary, these must be communicated to us.

Annex: The "Contamination declaration" is an integral part of the repair order.

This shall not however prejudice our right to refuse to accept the order for other reasons.

Sincerely,
C.D.R. Pompe S.r.l.

Senago, 23.03.2015

M. Abordi
Amministratore Delegato
Chief Executive Officer

CDR POMPE S.r.l.
R. Sanzio, 57
I-20021 Bollate, Mi
Tel.: +39 02 990 1941
Fax: +39 02 998 0606
www.cdrpompe.com
info@cdrpompe.com

CONTAMINATION DECLARATION OF C.D.R. PUMPS AND COMPONENTS

The repair and/or maintenance of pumps and components will be performed by C.D.R. Pompe S.r.l. after the Customer has sent this declaration, fully completed and signed by authorised personnel.
If that statement does not accompany the equipment to be repaired, the shipment will be rejected and sent back to the sender.
In addition, provide for a declaration for each individual pump or part contained.

Customer: _____
_____
Street: _____
Postcode, town: _____
Contact person: _____
Telephone: _____
Fax: _____

Final user:
_____
_____

Reason for sending, mark X in the related boxes:

Repair: ☐ under guarantee ☐ subject to fee

Replacement: ☐ under guarantee ☐ subject to fee

Return: ☐ rental ☐ on loan ☐ for credit

A _ Data regarding C.D.R. product:

Type: _____

Serial number: _____

Description of defect:
_____
_____
_____
_____

B _ C.D.R. product conditions:

Has part been used?

☐ **No** → pass to point **D**

☐ **Yes** → empty all liquids, hermetically seal all openings and thoroughly clean!

What cleaning method and what detergent was used? _____

C _ Data on transported fluids

What fluids has the aggregate been in contact with? →

Are they a health hazard? ☐ **No** ☐ **Yes**

Trade name:	Chemical name:

Do they give off dangerous products after thermal decomposition? ☐ **No** ☐ **Yes**

If yes, which? _____

Note: Aggregates contaminated with microbiological or potentially explosive materials are accepted by us only upon presentation of proof that have been subjected to cleaning in accordance with current regulations. Under no circumstances shall we accept aggregates contaminated by radioactive materials.

D _ Legally valid declaration: We ensure that the facts of this statement are true and complete and that I, as the undersigned, have the skills to judge as much. We are aware of our responsibility to CDR Pompe S.r.l. in case of damage incurred due to incomplete or erroneous information. We commit to exempting CDR Pompe S.r.l. from any claim for damages by third parties that have occurred due to incomplete or erroneous information. We are aware that, independently from this statement, we are directly accountable to third parties, particularly with respect to CDR Pompe S.r..l. personnel responsible for handling or repairing the product.

Name of authorised person
(please print): _____

Date _____ Signature: _____

Company stamp

Pumps UK Ltd | Making the right choice...

CDR Pumps (UK) Ltd

3 Morris Close, Park Farm Industrial Estate,
Wellingborough, Northants, NN8 6XF

01933 674777

sales@cdrpumps.co.uk

www.cdrpumps.co.uk

C.D.R. Pompe S.r.l.

Via R. Sanzio, 57, Bollate
20021 - Milano

www.cdrpompe.it