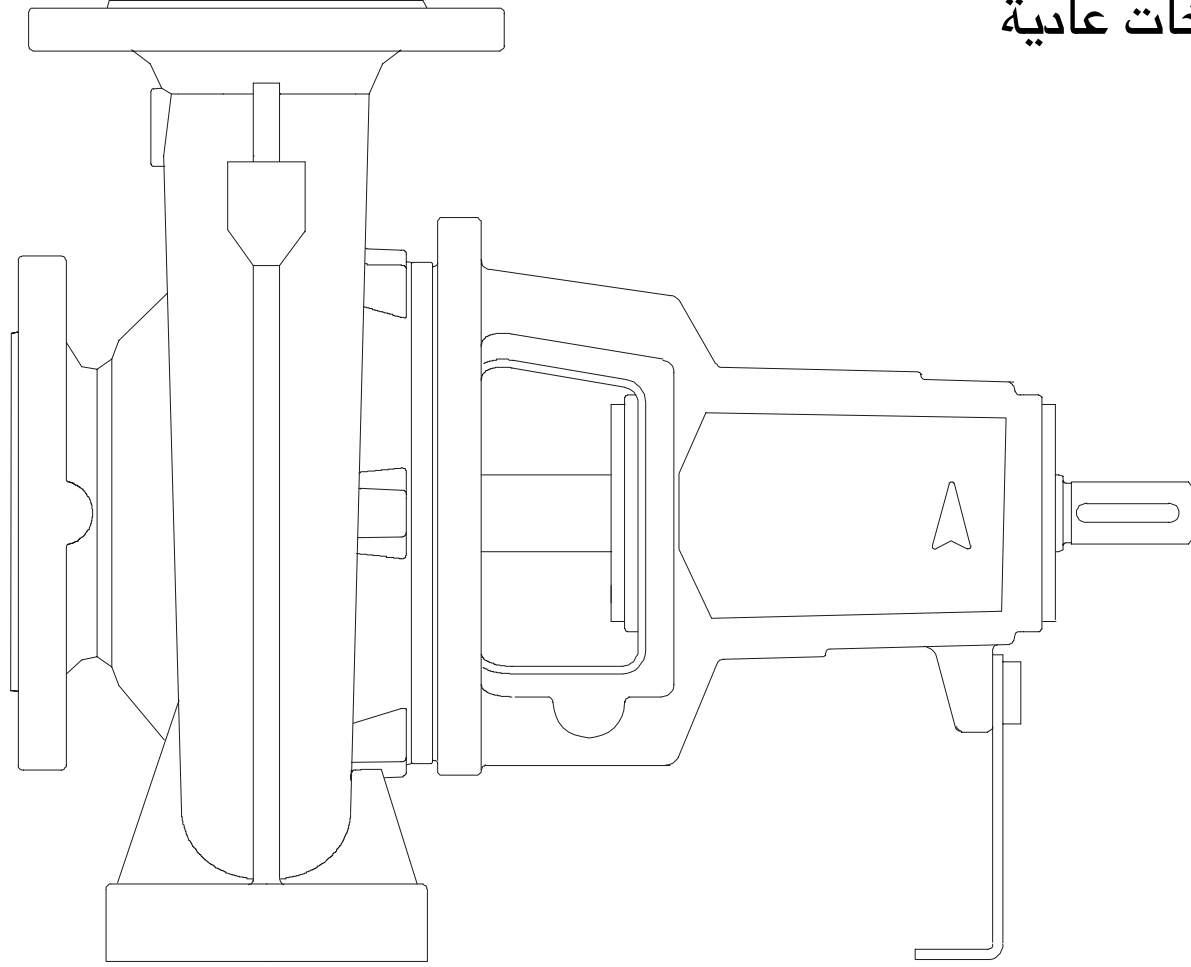


ISTRUZIONI PER L'INSTALLAZIONE E LA MANUTENZIONE
INSTRUCTIONS DE MISE EN SERVICE ET D'ENTRETIEN
INSTRUCTIONS FOR INSTALLATION AND MAINTENANCE
ANLEITUNGEN FÜR INSTALLATION UND WARTUNG
INSTRUCTIES VOOR INGEBRUIKNAME EN ONDERHOUD
INSTRUCCIONES PARA LA INSTALACION Y EL MANTENIMIENTO
INSTALLATIONS - OCH UNDERHÅLLSANVISNING
РУКОВОДСТВО ПО МОНТАЖУ И ТЕХНИЧЕСКОМУ ОБСЛУЖИВАНИЮ
إرشادات للتركيب والعناية.

POMPE NORMALIZZATE
POMPES NORMALISÉES
STANDARDIZED PUMPS
GENORMTE PUMPEN
GENORMALISEERDE POMPEN
BOMBAS NORMALIZADAS
TYPGODKÄNDA PUMPAR
НОРМАЛИЗОВАННЫЕ НАСОСЫ

مضخات عادية



**KDN 32-125.1; KDN 32-125; KDN 32-160.1; KDN 32-160; KDN 32-200.1;
KDN 32-200;**

KDN 40-125; KDN 40-160; KDN 40-200; KDN 40-250;

KDN 50-125; KDN 50-160; KDN 50-200; KDN 50-250;

KDN 65-125; KDN 65-160; KDN 65-200; KDN 65-250; KDN 65-315;

KDN 80-160; KDN 80-200; KDN 80-250; KDN 80-315; KDN 80-400;

KDN 100-200; KDN 100-250; KDN 100-315; KDN 100-400;

KDN 125-250; KDN 125-315; KDN 125-400;

KDN 150-200; KDN 150-315; KDN 150-320; KDN 150-400;

KDN 200-400; KDN 200-500;

KDN 250-310; KDN 250-330; KDN 250-400; KDN 250-500;

KDN 300-360;

DICHIARAZIONE DI CONFORMITÀ

La Ditta DAB PUMPS s.p.a. - Via M. Polo,14 - Mestrino (PD) - ITALY - sotto la propria esclusiva responsabilità dichiara che i prodotti summenzionati sono conformi a:

- Direttiva del Consiglio n° 98/37/CE concernente il riavvicinamento delle legislazioni degli Stati membri CEE relative alle macchine e successive modifiche.
- Direttiva della Compatibilità elettromagnetica 89/336 e successive modifiche.
- Direttiva Bassa Tensione 73/23 e successive modifiche.

DECLARATION OF CONFORMITY

The Company DAB PUMPS s.p.a. - Via M. Polo,14 - Mestrino (PD) - ITALY - declares under its own responsibility that the above-mentioned products comply with:

- Council Directive no. 98/37/CE concerning the reconciliation of the legislations of EEC Member Countries with relation to machines and subsequent modifications.
- Directive on electromagnetic compatibility no. 89/336 and subsequent modifications.
- Directive on low voltage no. 73/23 and subsequent modifications.

CONFORMITEITSVERKLARING

De firma DAB PUMPS s.p.a. - Via M. Polo, 14 Mestrino (PD) - Italië, verklaart hierbij onder haar verantwoording dat hierbovengenoemde producten conform zijn aan:

- de Richtlijn van de Raad nr. 98/37/CE betreffende harmonisatie van de wetgeving in de EEG-lidstaten t.a.v. machines en daaropvolgende wijzigingen.
- De richtlijnen van de elektromagnetische overeenstemming 89/336 en latere veranderingen.
- De richtlijnen voor lage druk 73/23 en latere veranderingen.

FÖRSÄKRAN OM ÖVERENSSTÄMMELSE

Bolaget DAB PUMPS s.p.a. - Via M. Polo,14 - Mestrino (PD) - ITALIEN - intygar på eget ansvar att ovanstående produkter är i enlighet med:

- Rådets direktiv nr. 98/37/CE och efterföljande ändringar som innehåller en jämkning av EU-ländernas lagstiftning beträffande maskiner.
- EMC-direktivet nr. 89/336 och efterföljande ändringar.
- Lågspänningsdirektiv nr. 73/23 och efterföljande ändringar.



DAB PUMPS S.p.A. الشركة

VIA M. POLO 14

MESTRINO (PD)

ITALY

تحت مسؤوليتها الخاصة تشهد بأن المنتجات المذكورة أعلاه صنعت مطابقة إلى:

- قانون مجلس الوزراء المؤرخ رقم 98/37/CE وما لحقه من تغييرات.
- القانون الخاص بالمطابقة الإلكترونية ومغناطيسية 89/336 وما لحقه من تغييرات.
- القانون الخاص بالجهد المنخفض 73/23 وما لحقه من تغييرات.

DÈCLARATION DE CONFORMITÈ

L'entreprise DAB PUMPS s.p.a. - Via M. Polo,14 - Mestrino (PD) - ITALIE - déclare sous sa responsabilité exclusive que les produits susmentionnés sont conformes à:

- la Directive du Conseil n° 98/37/CE concernant l'harmonisation des législations des Etats membres de la CEE relatives aux machines et ses modifications successives.
- la Directive de la compatibilité électromagnétique 89/336 et ses modifications successives.
- la Directive basse tension 73/23 et ses modifications successives.

KONFORMITÄTSEKTLÄRUNG

Die Firma DAB PUMPS s.p.a. - Via M. Polo,14 - Mestrino (PD) - ITALY - erklärt unter ihrer eigenen, ausschließlichen Verantwortung, daß die genannten Produkte den folgenden Verordnungen entsprechen:

- Ratsverordnung Nr. 98/37/CE über die Angleichung der Gesetzgebung der CEE-Staaten über Maschinen und folgende Abänderungen.
- Verordnung über die elektromagnetische Kompatibilität 89/336 und folgende Abänderungen.
- Verordnung über Schwachstrom 73/23 und folgende Abänderungen.

DECLARACION DE CONFORMIDAD

La Empresa DAB PUMPS s.p.a. - Via M. Polo,14 - Mestrino (PD) - ITALY - bajo su propia y exclusiva responsabilidad declara que los productos anteriormente mencionados respetan:

- Las Directrices del Consejo n° 98/37/CE referentes a la homogeneización de las legislaciones de los Estados miembros de la CEE relativas a las máquinas y sucesivas modificaciones.
- Directriz de la Compatibilidad electromagnética 89/336 y sucesivas modificaciones.
- Directriz Baja Tensión 73/23 y sucesivas modificaciones.

ЗАЯВЛЕНИЕ О СООТВЕТСТВИИ

Фирма DAB PUMPS s.p.a. - Via Marco Polo, 14 Mestrino (PD) ИТАЛИЯ- под собственную исключительную ответственность заявляет, что вышеуказанные агрегаты соответствуют:

- Директиве Совета n° 98/37/CE касательно сближения законодательств Государств членов ЕЭС в области агрегатов и последующим поправкам.
- Директиве об Электромагнитной совместимости 89/336 и последующим поправкам.
- Директиве о низком напряжении 73/23 и последующим поправкам.

Mestrino (PD), 07 Gennaio 1998

Attilio Conca

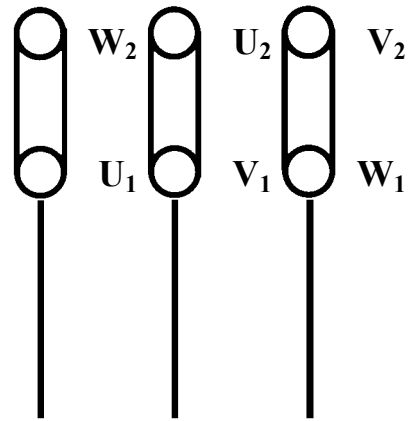
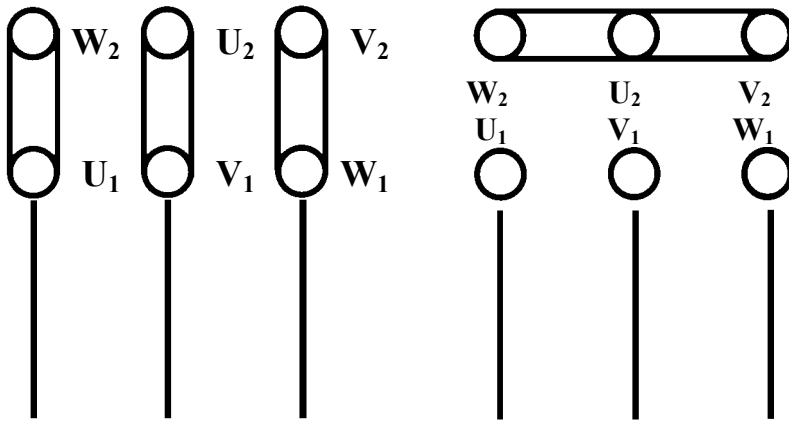
Legale Rappresentante
Legal Representative

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Collegamento TRIFASE per motori
Branchement TRIPHASE pour moteurs
THREE-PHASE motor connection
Aansluiting TRIPLEFASE voor motoren
DREIPHASIGER Anschluß für Motoren
Conexión TRIFASICA para motores
TREFAS elanslutning för motorer
ТРЕХФАЗНОЕ соединение двигателей
LEB) (Z) (S) (M) (B) (G)

3 ~ 230/400 V

3 ~ 400 Δ V



230V

Linea - Ligne

400V

Linea - Ligne

Line - Lijn

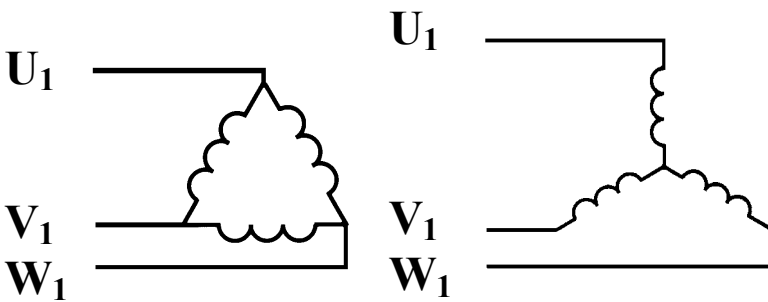
Line - Lijn

Linie - Línea - Ledning

Linie - Línea - Ledning

Линия 230В 400 В - خط ٢٣٠ و٤٠٠

Линия - خط



Collegamento a TRIANGOLO

Collegamento a STELLA

Branchement TRIANGLE

Branchement ETOILE

DELTA starting

STAR starting

Driehoekaansluiting

Steraansluiting

DREIECK-Schaltung

STERN-Schaltung

Conexión de TRIÁNGULO

Conexión de ESTRELLA

DELTA-anslutning

Y-anslutning

Соединение на ТРЕУГОЛНИК

Соединение на ЗВЕЗДУ

الإيصال بمثلث

الإيصال بنجمة

Collegamento a TRIANGOLO

Branchement TRIANGLE

DELTA starting

Driehoekaansluiting

DREIECK-Schaltung

Conexión de TRIÁNGULO

DELTA-anslutning

Соединение на ТРЕУГОЛНИК

الإيصال بمثلث

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1. GENERAL



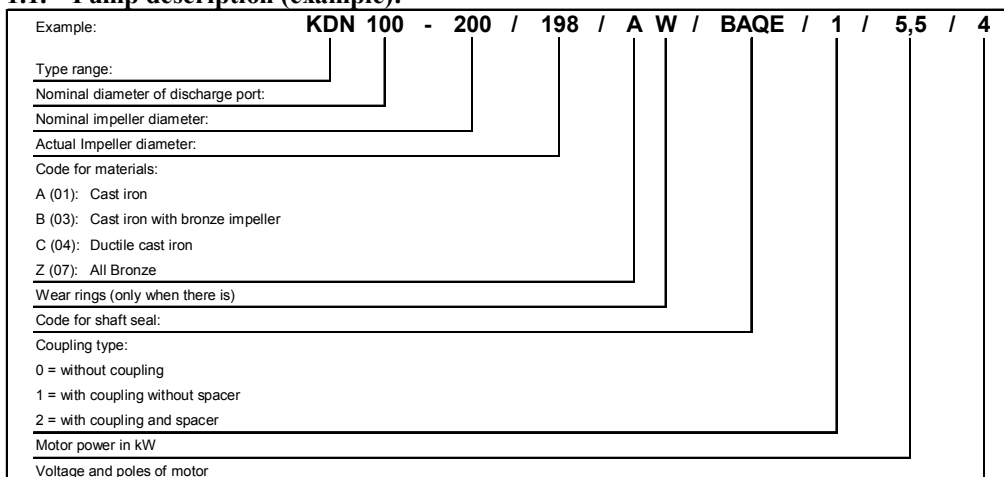
Read this documentation carefully before installation. It contains fundamental instructions to help you get to know the pump so that you can make the best use of its various possibilities of application. Observing these indications will ensure long life of the pump parts and avoid risks. The manual must always be kept within reach in the place where the machine is to be used.

Installation and functioning must comply with the safety regulations in force in the country in which the product is installed. The entire operation must be carried out in a workmanlike manner, exclusively by skilled personnel (paragraph 6.1), in possession of the technical qualifications indicated by the standards in force. Failure to comply with the safety regulations not only causes risk to personal safety and damage to the equipment, but invalidates every right to assistance under guarantee. **The pump may be installed in either horizontal or vertical position, as long as the motor is always above the pump.**

The supply may be made in one of the following configurations:

- KDN Standardized Pumps with a bare axis (without motor);
- KDN Standardized Electropumps on a base complete with electric motor (to be chosen to suit the fluid that is to be pumped), coupling, base and coupling cover, all preassembled.

1.1. Pump description (example):



2. APPLICATIONS

Single-stage standardized centrifugal pumps with a spiral body, dimensions in accordance with DIN 24255 - EN 733 and flanged DIN 2533 (DIN 2532 per DN 200). Designed and built with advanced characteristics, they are outstanding for their particular performances which ensure maximum yield while guaranteeing absolute reliability and sturdy construction. They cover a wide range of applications, such as water supply, circulation of hot and cold water in heating, air-conditioning and refrigerating systems, transfer of liquids in agriculture, market gardening and industry. Also suitable for use in fire-fighting sets.

3. PUMPED FLUIDS



The machine has been designed and built for pumping clean, pure and aggressive fluids, on condition that in the latter case the compatibility of the pump construction materials is checked and that the motor used has sufficient power for the specific gravity and the viscosity of the fluid.

4. TECHNICAL DATA AND RANGE OF USE

Pump

- Liquid temperature range:	from -10°C to +140°C
- Rotation speed:	1450-2900 1/min
- Flow rate:	from 1 m ³ /h to 2000 m ³ /h depending on the model
- Head:	up to 150 m
- Maximum environment temperature:	+40°C
- Storage temperature:	-10°C +40°C
- Relative humidity of the air:	max 95%
- Maximum working pressure (including any pressure at intake):	16 Bar - 1600 kPa (for DN 200 max 10 Bar-1000 kPa)
- Weight:	See plate on package
- Dimensions:	see table on page 99-103 / 106-111
Motor	
- Supply voltage:	3 x 230-400 V 50/60Hz up to 4 KW inclusive 3 x 400 V Δ 50/60Hz over 4 KW
- Degree of motor protection :	IP55
- Thermal class :	F
- Absorbed power :	see electric data plate
- Motor construction :	in conformity with Standards CEI 2 - 3
- Class AM line fuses: see table 4.1. page 97	



If a fuse trips which protects a three-phase motor, it is recommended to change the other two fuses as well, not only the one that is burnt-out.

5. MANAGEMENT

5.1. Storage

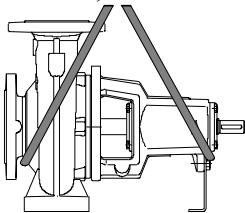
All the pumps/electropumps must be stored indoors, in a dry, vibration-free and dust-free environment, possibly with constant air humidity. They are supplied in their original packaging and must remain there until the time of installation, with the intake and delivery mouths closed with the special adhesive disc supplied. In the case of long storage, or if the pump is stored after a certain period of operation, only the parts made of low-percentage alloy materials, such as cast iron GG-25, GGG-40 which have been wet with the pumped fluid, should be kept in the special preserving mediums available on the market.

5.2. Transport

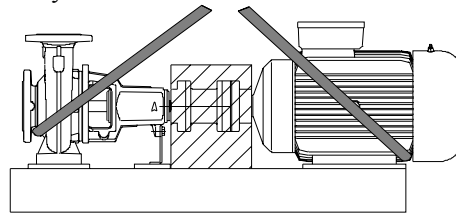
Avoid subjecting the products to needless jolts or collisions.

To lift and transport the unit, use lifting equipment and the pallet supplied standard (if applicable).

Use suitable hemp or synthetic ropes only if the part can be easily slung, as indicated in fig.5.2. (A o B). If an eyebolt is provided on the motor, it must not be used for lifting the whole assembly.



(A) - Transporting the pump



(B) - Transporting the whole assembly

(fig.5.2.)

5.3. Dimensions and weights

The adhesive label on the package indicates the total weight of the electropump. The dimensions are given on page 99-103 / 106-111

6. WARNINGS

6.1. Skilled technical personnel



It is advisable that installation be carried out by skilled personnel in possession of the technical qualifications required by the specific legislation in force.

The term **skilled personnel** means persons whose training, experience and instruction, as well as their knowledge of the respective standards and requirements for accident prevention and working conditions, have been approved by the person in charge of plant safety, authorizing them to perform all the necessary activities, during which they are able to recognize and avoid all dangers. (Definition for technical personnel IEC 364).

6.2. Safety

6.2.1. Use is allowed only if the electric system is in possession of safety precautions in accordance with the regulations in force in the country where the product is installed (for Italy, CEI 64/2).

6.3. Checking pump/motor shaft rotation

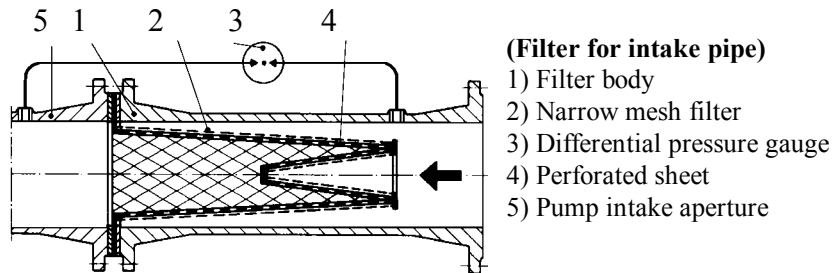
Before installing the pump, it is advisable to check that the pump and/or motor shaft turns freely. To do this, in the case of pumps supplied with a bare axis, check by turning the end of the pump shaft by hand. In the case of the electropump assembly on a base, remove the coupling cover and check by turning the coupling by hand. When you have finished checking, return the coupling cover to its original position.



Do not force the shaft or the fan of the motor (if supplied) with pliers or other tools to try to free the pump, but look for the cause of the blockage.

6.4. New systems

Before running new systems the valves, pipes, tanks and couplings must be cleaned accurately. Often welding waste, flakes of oxide or other impurities fall off after only a certain period of time. To prevent them from getting into the pump they must be caught by suitable filters. The free surface of the filter must have a section at least 3 times larger than the section of the pipe on which the filter is fitted, so as not to create excessive load losses. We recommend the use of TRUNCATED CONICAL filters made of corrosion-resistant materials (SEE DIN 4181):



6.5. Responsibility



The Manufacturer does not vouch for correct operation of the pumps if they are tampered with or modified, run outside the recommended work range or in contrast with the other instructions given in this manual.

The Manufacturer declines all responsibility for possible errors in this instructions manual, if due to misprints or errors in copying. The company reserves the right to make any modifications to products that it may consider necessary or useful, without affecting the essential characteristics.

6.6. Protections

6.6.1. Moving parts

In accordance with accident-prevention regulations, all moving parts (fans, couplings, etc.) must be accurately protected with special devices (fan covers, coupling covers) before operating the pump.



During pump operation, keep well away from the moving parts (shaft, fan, etc.) unless it is absolutely necessary, and only then wearing suitable clothing as required by law, to avoid being caught.

6.6.2. Noise level

The noise levels of pumps with standard supply motors are indicated in table 6.6.2 on page 98. Remember that, in cases where the LpA noise levels exceed 85 dB(A), suitable HEARING PROTECTION must be used in the place of installation, as required by the regulations in force.

6.6.3. Hot and cold parts



As well as being at high temperature and high pressure, the fluid in the system may also be in the form of steam! DANGER OF BURNING !!!

It may be dangerous even to touch the pump or parts of the system.

If the hot or cold parts are a source of danger, they must be accurately protected to avoid contact with them.

6.6.4. Any leaks of dangerous or harmful liquids (for example, from the shaft seal) must be conveyed and disposed of in accordance with the regulations in force so as not to cause a risk or damage to persons and to the environment.

7. INSTALLATION

The electropump must be fitted in a well ventilated place, with an environment temperature not exceeding 40°C. As they have degree of protection IP55, the electropumps may be installed in dusty and damp environments. If installed in the open, generally it is not necessary to take any particular steps to protect them against unfavourable weather conditions.

If the unit is installed in a location where there is a risk of explosion, the local regulations on "Ex" protection must be respected, using only suitable motors.

7.1. Foundation

The buyer is fully responsible for preparing the foundation which must be made in conformity with the dimensions shown on page 99-103 / 106-111 . Metal foundations must be painted to avoid corrosion; they must be level and sufficiently rigid to withstand any stress. Their dimensions must be calculated to avoid the occurrence of vibrations due to resonance.

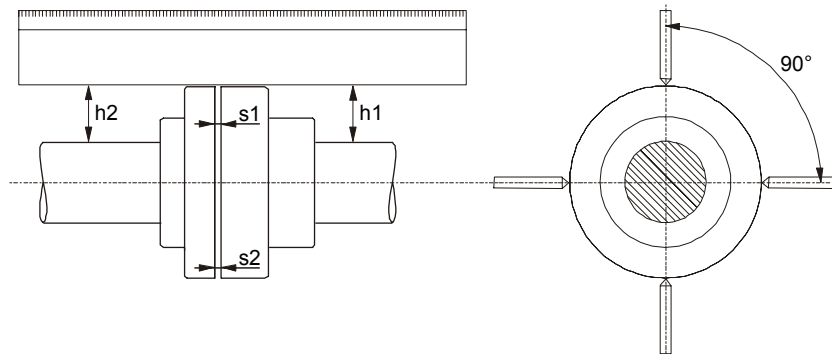
With concrete foundations, care must be taken to ensure that the concrete has set firmly and is completely dry before placing the unit on it. The surface that it sits on must be perfectly flat and horizontal. After the pump has been positioned on the foundation, check with a spirit level to ensure that it is sitting perfectly level. If not, suitable shims must be inserted between the base and the foundation in the immediate vicinity of the anchoring bolts. For bases on which the distance between the anchoring bolts is >800 mm, shims must also be inserted in the centre point to avoid bending. A firm anchoring of the feet of the pump/motor assembly on the base helps absorb any vibrations created by pump operation. All the anchoring bolts must be tightened fully and uniformly.

7.2. Pump/motor alignment

After having proceeded as described in the previous paragraph, to guarantee correct and lasting operation of the unit, you must scrupulously check the alignment of the motor shaft and the pump shaft, even in the case of electropumps already assembled on the base and complete with motor.

The unit is correctly aligned when a ruler placed axially across the two semi-couplings (fig. 7.2.1) measures a constant distance (± 0.01 mm) between the ruler and the shaft (motor-h1 or pump-h2) on the whole circumference of the semi-couplings. You must also check, with a caliper or a thickness gauge, that the distance between the semi-coupling and the spacer coupling is constant (± 0.01 mm) on the whole circumference ($s1 = s2$).

If correction is necessary due to radial or angular shifting, align by fitting/removing discs under the feet of the pump housing or the motor



(fig.7.2.1)

7.3. Connecting the pipes

Ensure that the metal pipes do not transmit excess force to the pump apertures, so as to avoid causing deformations or breakages. Any expansion due to the heat of the pipes must be compensated with suitable precautions to avoid weighing down on the pump. The counterflanges of the pipes must be parallel to the flanges of the pump.

To reduce noise to a minimum it is advisable to fit vibration-damping couplings on the intake and delivery pipes.



On completing assembly, before connecting the pump to the electricity mains, it is advisable to check the coupling alignment again.

It is always good practice to place the pump as close as possible to the liquid to be pumped. It is advisable to use a suction pipe with a diameter larger than that of the intake aperture of the electropump. If the head at intake is negative, it is indispensable to fit a foot valve with suitable characteristics at intake. Irregular passages between the diameters of the pipes and tight curves considerably increase load losses. Any passage from a pipe with a small diameter to one with a larger diameter must be gradual. Usually the length of the passage cone must be 5 to 7 times the difference in diameter.

Check accurately to ensure that the joins in the intake pipe do not allow air infiltrations. Ensure that the gaskets between flanges and counterflanges are well centred so as not to create resistances to the flow in the pipes. To prevent the formation of air pockets, the intake pipe must slope slightly upwards towards the pump.

If more than one pump is installed, each pump must have its own intake pipe. The only exception is the reserve pump (if envisaged) which, as it starts up only in the case of breakdown of the main pump, ensures the operation of only one pump for each intake pipe.

Interception valves must be fitted upstream and downstream from the pump so as to avoid having to drain the system when carrying out pump maintenance.



The pump must not be operated with the interception valves closed, as in these conditions there would be an increase in the temperature of the liquid and the formation of vapour bubbles inside the pump, leading to mechanical damage. If there is any possibility of the pump operating with the interception valves closed, provide a by-pass circuit or a drain leading to a liquid recovery tank (following the requirements of local legislation concerning toxic fluids).

7.4. Calculating the NPSH

To guarantee good operation and maximum performance of the electropump, it is necessary to know the level of the N.P.S.H. (Net Positive Suction Head) of the pump concerned, so as to determine the suction level Z1. The curves for the N.P.S.H. of the various pumps may be found in the technical catalogue.

This calculation is important because it ensures that the pump can operate correctly without cavitation phenomena which occur when, at the impeller intake, the absolute pressure falls to values that allow the formation of vapour bubbles in the fluid, so that the pump works irregularly with a fall in head. The pump must not cavitate because, as well as producing considerable noise similar to metallic hammering, it would cause irreparable damage to the impeller.

To determine the suction level Z1, the following formula must be applied:

$$Z1 = pb - rqd. N.P.S.H. - Hr - \text{correct } pV$$

where:

- Z1** = difference in level in metres between the axis of the pump and the free surface of the liquid to be pumped
- pb** = barometric pressure in mcw of the place of installation (**fig. 6 on page 105**)
- NPSH** = net load at intake of the place of work (**see characteristic curves in the catalogue**)
- Hr** = load loss in metres on the whole intake duct (pipe - curves - foot valves)
- pV** = vapour tension in metres of the liquid in relation to the temperature expressed in °C
(**see fig. 7 on page 105**)

Example 1: installation at sea level and fluid at t = 20°C

required N.P.S.H. :	3.25 m
pb :	10.33 mcw
Hr:	2.04 m
t:	20°C
pV:	0.22 m
Z1	10.33 - 3.25 - 2.04 - 0.22 = 4.82 approx.

Example 2: installation at a height of 1500 m and fluid at t = 50°C

required N.P.S.H. :	3.25 m
pb :	8.6 mcw
Hr:	2.04 m
t:	50°C
pV:	1.147 m
Z1	8.6 - 3.25 - 2.04 - 1.147 = 2.16 approx.

Example 3: installation at sea level and fluid at t = 90°C

required N.P.S.H. :	3.25 m
pb :	10.33 mcw
Hr:	2.04 m
t:	90°C
pV:	7.035 m
Z1	10.33 - 3.25 - 2.04 - 7.035 = -1.99 approx.

In the last case, in order to operate correctly the pump must be fed with a positive head of 1.99 - 2 m, that is the free surface of the water must be 2 m higher than the axis of the pump.



N.B.: it is always good practice to leave a safety margin (0.5 m in the case of cold water) to allow for errors or unexpected variations in the estimated data. This margin becomes especially important with liquids at a temperature close to boiling point, because slight temperature variations cause considerable differences in the working conditions. For example in the third case, if instead of 90°C the water temperature reaches 95°C at any time, the head required by the pump would no longer be 1.99 but 3.51 metres.

7.5. Connecting auxiliary systems and measuring instruments.

The realization and connection of any auxiliary systems (washing liquid, seal cooling fluid, dripping liquid) must be considered when designing the system. These connections are necessary for better and longer lasting pump operation.

In order to ensure continuous monitoring of the pump functions, it is recommended to install a vacuum pressure gauge on the intake side and a pressure gauge on the delivery side. To check the motor load the installation of an ammeter is advised.

8. ELECTRICAL CONNECTION

Caution: always follow the safety regulations!



Scrupulously follow the wiring diagrams inside the terminal board box and those on page 3 of this manual.

8.1. The electrical connections must be made exclusively by skilled personnel (see paragraph 6.1) as required by the safety regulations in force.

The requirements of the electric energy supply company must be scrupulously complied with.

In the case of three-phase motors with star-delta start, ensure that the switch-over time from star to delta is as short as possible and that it falls within table 8.1 on page 98

8.2. Before opening the terminal board and working on the pump, ensure that the power has been switched off.

8.3. Check the mains voltage before making any connection. If it is the same as the voltage on the data plate, proceed to connect the wires to the terminal board, giving priority to the earth lead.

8.4. ENSURE THAT THE EARTH SYSTEM IS EFFICIENT AND THAT THERE IS THE POSSIBILITY OF MAKING A GOOD CONNECTION.

8.5. The pumps must always be connected to an external switch.

8.6. The motors must be protected with special remote-control motor-protectors calibrated for the current shown on the plate.

9. STARTING UP

9.1. Before starting the pump, check that:



- the pump has been properly primed, filling the pump body completely. This ensures that the pump immediately starts to work regularly and that the seal (mechanical seal or stuffing box seal) is well lubricated. **Dry operation causes irreparable damage to the mechanical seal and the stuffing box seal.**

- the auxiliary circuits have been correctly connected;
- all the moving parts have been protected with suitable safety systems;
- the electrical connection has been made as indicated previously;
- pump-motor alignment has been correctly performed.

10. STARTING/STOPPING

10.1. STARTING

10.1.1. Fully open the gate valve on intake and keep the one on delivery almost closed.

10.1.2. Switch on the power and check that the motor is turning in the right direction, that is clockwise when viewed from the fan side. This check must also be performed after having fed the pump, activating the main switch with a fast start-stop sequence. If the motor is turning in the wrong direction, invert any two phase leads, after having disconnected the pump from the mains.

10.1.3. Once the hydraulic circuit has been completely filled with liquid, gradually open the delivery gate valve until its maximum allowed opening. The motor's energy consumption must be checked and compared with the value shown on the data plate, especially in cases where the pump has intentionally been given a reduced power motor (check the design characteristics).

10.1.4. With the pump running, check the supply voltage at the motor terminals, which must not differ from the rated value by +/- 5%

10.2. STOPPING

Close the interception device on the delivery pipe. If there is a check device on the delivery pipe, the interception valve on the delivery side may remain open as long as there is back pressure downstream from the pipe.

If hot water is to be pumped, arrange that the pump can be stopped only after having excluded the source of heat and let sufficient time elapse to allow the liquid temperature to drop to acceptable values, so as not to create excessive temperature increases inside the pump body.

For a long period of inactivity, close the interception device on the intake pipe and, if supplied, all the auxiliary control connections. To guarantee maximum system functionality it will be necessary to arrange for brief running periods (5 - 10 min) at intervals of 1 to 3 months.

If the pump is removed from the system and stored, proceed as indicated in par.5.1

11. PRECAUTIONS

11.1. The electropump should not be started an excessive number of times in one hour. The maximum admissible value is as follows:

TYPE OF PUMP	MAXIMUM NUMBER OF STARTS PER HOUR
THREE-PHASE MOTORS UP TO AND INCLUDING 4 kW	100
THREE-PHASE MOTORS OVER 4 kW	20

- 11.2. **DANGER OF FROST:** When the pump remains inactive for a long time at temperatures of less than 0°C, the pump body must be completely emptied through the drain cap (26), to prevent possible cracking of the hydraulic components.



Check that the leakage of liquid does not damage persons or things, especially in plants that use hot water.

Do not close the drainage cap until the pump is to be used again.

When restarting after long periods of inactivity it is necessary to repeat the operations described above in the paragraphs "WARNINGS" and "STARTING UP".

- 11.3. To avoid needless motor overloads, accurately check that the density of the pumped liquid corresponds to that used in the design phase: **remember that the power absorbed by the pump increases in proportion to the density of the liquid carried.**

12. MAINTENANCE AND CLEANING



The electropump can only be dismantled by competent skilled personnel, in possession of the qualifications required by the legislation in force. In any case, all repair and maintenance jobs must be carried out only after having disconnected the pump from the power mains. Ensure that it cannot be switched on accidentally.



If the liquid has to be drained to carry out maintenance, ensure that the liquid coming out cannot harm persons or things, especially in systems using hot water. The legal requirements on the disposal of any harmful fluids must also be complied with.

After a long period of operation there may be difficulties in removing the parts in contact with water: to do this, use a special solvent available on the market and, where possible, use a suitable extractor.

Do not force the parts with unsuitable tools.

12.1. Periodic checks

In normal operation, the pump does not require any kind of maintenance. However, from time to time it is advisable to check current absorption, the manometric head with the aperture closed and the maximum flow rate, which will enable you to have advance warning of any faults or wear. If possible, arrange for programmed maintenance so that problem-free operation may be ensured with minimum expense and reduced machine down times, thus avoiding long and costly repairs.

12.2. Greasing the bearings

12.2.1 Standard version: greased-for-life bearings

The size of the bearings has been calculated to guarantee about 20,000 working hours and they do not require any maintenance.

12.3. Shaft seal

The seal on the shaft may be a mechanical seal or a stuffing box seal.

12.3.1. Mechanical seal

Normally no checking is required. Just ensure that there are no leaks of any kind. If leaks are present, change the seal as described in par.12.4.2.

12.3.2. Stuffing box seal.

Before starting, check that the follower nuts are resting on the follower so that there will be abundant leaks after the pump has been filled. The follower must always be perfectly parallel to the surfaces of the cover that holds the seal (use a thickness gauge to check this).

Switch on the power and start the pump. After it has been running for about 5 minutes, the leaks must be reduced, tightening the nuts on the follower by about 1/6 of a turn. Check the leaks again after another 5 minutes. If the leaks are still excessive, the operation must be repeated until the leaks reach a minimum value of **10 to 20 cm³/min.**

If the leaks are too small, slightly slacken the nuts on the follower. **If there is no leak at all, the pump must be stopped immediately; slacken the nuts on the follower and repeat the starting operations described above in this paragraph.**

After the follower has been regulated, observe the leaks for about 2 hours, at the maximum temperature of the pumped fluid (MAX. 140°C) and at minimum working pressure, so as to ensure that the leaks are still efficient.

If operating below head with a pressure of >0.5 Bar at intake, the hydraulic ring (part 141 on the parts diagram) is no longer necessary, in place of which another packing ring must be provided.

ATTENTION: If the leaks are not reduced when the follower nuts are tightened, the seals must be replaced as indicated in par.12.4.3.

12.4. Changing the seal**12.4.1. Preparing disassembly**

1. Switch off the electric power supply and ensure that it cannot be switched on accidentally.
2. Close the interception devices on intake and delivery.
3. If hot liquids have been pumped, wait until the pump body returns to room temperature.
4. Empty the pump body by means of the drainage caps, taking particular care if harmful fluids have been pumped (observe the legal requirements in force).
5. Dismantle any auxiliary connections provided.

12.4.2. Changing the mechanical seal

To change the mechanical seal you must dismantle the pump. To do this, slacken and remove all the nuts (190) from the stud bolts (189) that join the pump body (1) and the support (3) (these may be on the external rim if there is also an internal one). Block the end of the pump shaft (7A) and unscrew the locking nut (18), slip the spring washer (43), the spacing washer (44) and the impeller (4) off the pump shaft (7A), levering if necessary with two screwdrivers or levers between the shaft and the support (3). Retrieve the key (17) and slip off the spacer (31). Use two screwdrivers to force the seal spring to dislodge it from the bush (58) and then force the rotating part of the mechanical seal near the metal seat until it can be slipped off completely. The fixed part of the mechanical seal is extracted from the support (3) by pressing on the seal ring from the support side, after having removed the seal cover (36) from its seat, unscrewing the nuts (190) from the stud bolts (189) on the internal rim, if fitted.

Before fitting the seal, check the bush (58) to see if there is any scoring which must be eliminated with emery cloth. If the scoring is still visible the bush must be replaced, using original spare parts.

Reassemble proceeding in inverse order and ensuring particularly that:

- the fittings of the individual parts must be free from residue and spread with suitable lubricants;
- all the O-Rings must be perfectly whole. If not, replace them.

12.4.3. Changing the stuffing box seal

First of all, accurately clean the stuffing box chamber and the shaft protection bush (ensuring that this is not too worn, in which case it must be changed - see 12.4.2). Insert the first packing ring and push it into the stuffing box chamber by means of the follower. Insert the hydraulic ring. All the gaskets that follow must be pushed into the stuffing box chamber one by one with the follower, ensuring that the edge of each ring is at about 90° from the one before it. If possible, the last ring next to the follower should be fitted with the edge facing upwards. Sharp objects must absolutely not be used as they could damage both the rotor shaft and the seal.

The follower must be tightened evenly, ensuring that the rotor can be turned easily.

During starting, proceed as described in par. 12.3.2.

13. MODIFICATIONS AND SPARE PARTS

Any modification not authorized beforehand relieves the manufacturer of all responsibility.

All the spare parts used in repairs must be original ones and the accessories must be approved by the manufacturer so as to be able to guarantee maximum safety of persons and operators, and of the machines and systems in which they may be fitted.

14. TROUBLESHOOTING

FAULT	CHECK (possible cause)	REMEDY
1. The motor does not start and makes no noise.	A. Check the protection fuses. B. Check the electric connections. C. Check that the motor is live	A. If they are burnt-out, change them. – If the fault is repeated immediately this means that the motor is short circuiting..
2. The motor does not start but makes noise.	A. Ensure that the mains voltage corresponds to the voltage on the data plate. B. Check that the connections have been made correctly. C. Check that all the phases are present on the terminal board. D. The shaft is blocked. Look for possible obstructions in the pump or motor.	B. Correct any errors. C. If not, restore the missing phase. D. Remove the obstruction.
3. The motor turns with difficulty.	A. Check the supply voltage which may be insufficient. B. Check whether any moving parts are scraping against fixed parts. C. Check the state of the bearings.	B. Eliminate the cause of the scraping. C. Change any worn bearings.
4. The (external) motor protection trips immediately after starting.	A. Check that all the phases are present on the terminal board. B. Look for possible open or dirty contacts in the protection. C. Look for possible faulty insulation of the motor, checking the phase resistance and insulation to earth. D. The pump is functioning above the work point for which it was intended. E. The protection tripping values are wrong. F. The viscosity or density of the pumped fluid are different from those used in the design phase.	A. If not, restore the missing phase. B. Change or clean the component concerned. C. Look for possible faulty insulation of the motor, checking the phase resistance and insulation to earth. D. Set the work point to suit the pump characteristics. E. Check the set values on the motor protector: alter them or change the component if necessary. F. Reduce the flow rate with a shutter on the delivery side or install a larger motor.
5. The motor protection trips too frequently.	A. Ensure that the environment temperature is not too high. B. Check the calibration of the protection. C. Check the state of the bearings. D. Check the motor rotation speed.	A. Provide suitable ventilation in the environment where the pump is installed. B. Calibrate at a current value suitable for the motor absorption at full load. C. Change any worn bearings.
6. The pump does not deliver.	A. The pump has not been correctly primed. B. Check that the direction of rotation of the three-phase motors is correct. C. Difference in suction level too high. D. The diameter of the intake pipe is insufficient or the length is too long. E. Foot valve blocked.	A. Fill the pump and the intake pipe with water. Prime the pump. B. Invert the connection of two supply wires. C. See point 8 of the instructions on "Installation". D. Replace the intake pipe with one with a larger diameter. E. Clean the foot valve.
7. The pump does not prime.	A. The intake pipe or the foot valve is taking in air. B. The downward slope of the intake pipe favours the formation of air pockets.	A. Eliminate the phenomenon, checking the intake pipe accurately, and prime again. B. Correct the inclination of the intake pipe.

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FAULT	CHECK (possible cause)	REMEDY
8. The pump supplies insufficient flow.	A. Blocked foot valve. B. The impeller is worn or blocked. C. The diameter of the intake pipe is insufficient. D. Check that the direction of rotation is correct..	A. Clean the foot valve. B. Change the impeller or remove the obstruction. C. Replace the pipe with one with a larger diameter. D. Invert the connection of two supply wires.
9. Invert the connection of two supply wires.	A. Intake pressure too low. B. Intake pipe or pump partly blocked by impurities.	B. Clean the intake pipe and the pump.
10. The pump turns in the opposite direction when switching off.	A. Leakage in the intake pipe. B. Foot valve or check valve faulty or blocked in partly open position.	A. Eliminate the fault. B. Repair or replace the faulty valve.
11. The pump vibrates and operates noisily.	A. Check that the pump and/or the pipes are firmly anchored. B. There is cavitation in the pump (see point 8, paragraph on INSTALLATION). C. Presence of air in the pump or in the intake manifold. D. Pump-motor alignment incorrectly performed.	A. Fasten any loose parts. B. Reduce the intake height or check for load losses. Open the intake valve. C. Bleed the intake pipes and the pump. D. Repeat the procedure described in paragraph 7.2.
12. The stuffing box area gets too hot after a brief period of operation.	A. The follower has been gripped too tightly by the regulating screws. B. The follower is in an oblique position with respect to the pump shaft.	A. Stop the pump and slacken the follower, then proceed as in paragraph 12.3.1. B. Stop the pump and position the follower perpendicular to the pump shaft.
13. There is too much dripping from the stuffing box.	A. The follower has been incorrectly tightened or the stuffing box is not suitable or is fitted incorrectly. B. The shaft or the protection bush is damaged or worn. C. The packing rings are worn..	A. Check the follower and the type of stuffing box used. B. Check and/or change the shaft or the shaft protection bush.. C. Proceed as in paragraph 12.3.1.
14. The support temperature in the bearings area is too high.	A. Check motor and pump alignment. B. Increased axial thrust due to wear of the impeller pressure rings.	A. Proceed as in paragraph 7.2 B. Clean the balancing holes in the impeller, change the pressure rings.