

# External centrifugal pumps «FL EX» series

**Groups:**

FL EX Lnnn-n

FL EX Mnnn-n

FL EX Nnnn-n

FL EX LVnnn-n

FL EX MVnnn-n

FL EX NVnnn-n



- User

**Documento di  
costruzione**Eventuali modifiche devono essere approvate  
dalla "Persona Autorizzata EX - progettazione"

Fascicolo tecnico n°

**2018/01.00 EX - rev.1**

trasmesso a

**0722**

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(translation of the official version)

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## 0. INDEX AND DESCRIPTION OF MODIFICATIONS

| No revision | date       | description of modifications |
|-------------|------------|------------------------------|
| 0           | 2018.11.12 | first issue                  |
| 1           | 2019.07.22 | addition N and NV models     |
| 2           | 2024.09.26 | materials and models update  |

### 1.1 Scope

This handbook has been written by the manufacturer and is an integral part of the equipment. This handbook defines the scope for which the equipment has been designed and manufactured and contains all the information necessary in order to guarantee its correct use.

Following this handbook will ensure personal safety and the longevity of the equipment.

The information in the manual covers the following areas:

- transport, handling, unpacking;
- preparation of the site;
- installation;
- use;
- maintenance.

This handbook must be stored carefully and retained at all times for future references. It must be protected from humidity, sunlight and anything that might damage it.

For quick searching, please see index on previous pages.

Warning symbols have been used to illustrate important parts of the text.

### 1.2 Explanation of symbols

The following symbols indicate the potential risk arising from ignoring the warnings to which they have been applied as shown below.



#### General danger

This indicates that the lack of observation of the instructions risks harm to persons, animals and other items.



#### Danger – hot surface

This indicates that a lack of observation of the instructions risks burns.



#### Danger – moving parts

This indicates that a lack of observation of the instructions risks harm to persons. In this instance immediately disconnect the pump from the electrical mains.



#### Danger – manual handling

This indicates that a lack of observation of the instructions risks back injury.



#### Mandatory - reading of the handbook

The user is required to read the handbook (“instructions for use”) before installing the equipment.



#### Obligation – manual handling of equipment with two persons

This indicates that two people should handle the equipment.



#### Obligation - handling of the object with mechanical means

This indicates that the equipment should be handled by mechanical means.



#### Recycling

This indicates that the materials can be recycled according to local regulations.



Useful and/or necessary information to comply with Directive 2014/34/UE “ATEX 114”

### 1.3 General warnings

The manufacturer declines all responsibility for damages caused to the electric pump or to the things in the following cases:

- improper use;
- employment of unauthorised personnel;
- incorrect assembly and installation;
- defects in the system;
- unauthorised modification or operation of the electrical pump;
- use of non original spare parts;
- non-compliance with the rules outlined in this handbook;
- exceptional events.

Any operation carried out that is not outlined in this handbook or authorized by the manufacturer invalidates the guarantee, and is entirely the responsibility of the person performing the operation.

### 1.4 Residual risks

The equipment has been designed and manufactured according to the standards mentioned in following paragraph "2.4 - declaration of conformity".

The application of these standards has helped to reduce the risks inherent to the type of equipment to a level deemed acceptable. So, following the residual risks are indicated to which the user must take in to account.



The pump or motor may be hot when running. For maintenance, switch off the electrical current and allow to cool before directly contacting with the body.



Not following the instructions risks personal injury.



Not following the instructions risks damage to the back.



Not following the instructions for selection, installation, inspection & maintenance of the equipment in hazardous areas increases the risk of explosion.

## 2. IDENTIFICATION

### 2.1 Product brand and type designation



External centrifugal pumps, "FL EX" series

FL = it indicates the series name of the pump  
 EX = it indicates the conformity to Directive 2014/34/UE "ATEX 114"  
 Annn-n = it indicates the pump groups  
 i.e: FL EX A160-4

### 2.2 Document edition

This handbook is identified in following way

| Identification | Revision | Date       |
|----------------|----------|------------|
| FL EX IU       | 2        | 2024.09.26 |

### 2.3 Manufacturer name and address

**Officine di Trevi S.a.s.**

S.S. n° 3 "Flaminia", km 145

I- 06039 Trevi (PG)

Italia

Tel.: 0742 381616

Fax: 0742 78792

<http://www.officineditrevi.com>

[info@officineditrevi.com](mailto:info@officineditrevi.com)



The manufacturer works with a Quality Management System conforms to ISO 9001:2015 standard, certified by accredited body IMQ/CSQ with no. 9105.OFTR.

## 2.4 Declaration of conformity

We Officine di Trevi declare under our exclusive responsibility that the products:

**external centrifugal pumps  
FL EX Annn-n, series n. nnn**

to which this declaration refers, is according to the following Directives:

2014/34/UE ATEX

2006/42/UE ATEX

and to the following normatives:

EN 80079-36:2016-04 "Non-electrical equipment for explosive atmospheres - Part 1: Basic method and requirements"

EN 80079-37:2016-04 "Non-electrical equipment for explosive atmospheres - Part 5: Type of protection constructional safety "c"

EN 12100:2010-11 "Safety of machinery - General principles for design - Risk assessment and risk reduction"

EN 9906:2012-05 "Rotodynamic pumps - Hydraulic performance acceptance tests"

The technical dossier is deposited with:

CESI - Centro Elettrotecnico Sperimentale Italiano "G. Motta" S.p.A.

via R. Rubattino, 54

I-20134 Milano (MI)

Italia

Trevi, nn/nn/nnnn

Legal representative

Andrea Fioretti



## 3. SPECIFICATION OF PRODUCT

### 3.1 General functions and range of applications, intended use

The instruction manual refers to the hydraulica part FL EX series supplied without motor. To have the complete motor and hydraulic part in conformity with ATEX directive it is necessary that all the components are individually certified in accordance with the above mentioned directive. Otherwise, the complete pump must be installed in area with lower risk of explosion for which even only one component are certified.

External centrifugal pumps "FL EX" series can be used for the following purposes:

- emptying rainwater wells collection and infiltration;
- draining of flooded areas;
- raising of water from deep wells, bathtubs and tanks of first collection;
- waterworks of raising for industrial uses.

The liquids handled can contain max 250 g/m<sup>3</sup> of sand

If the diameter of the solid particles is more than 0,5 mm, it is necessary to install a filter to protect the pump.

Aromatic hydrocarbons and chemical substances can be handled in accordance with the construction materials of the pump, verified in advance.

The external centrifugal pumps series "FL EX" are intended for use on the surface (group II), in areas in which, during the normal activities, explosive atmosphere caused by gases, vapours, mists (G) are likely to occur (category 2)

The external centrifugal pumps series "FL EX" has been designed to be capable of functioning in conformity with the operational parameters established by Officine di Trevi sas and of ensuring a high level of protection.



An incorrect installation can caused serious risks, therefore the assembly and maintenance personnel must be necessarily instructed and trained about potentially explosive atmospheres.

**3.2 Technical data**

**3.2.1 Materials in contact with liquids**

| <b>Pump details</b> | <i>Groups L – M</i>     | <i>Group N</i>          | <i>Groups LV – MV</i>   | <i>Group N</i>          |
|---------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Seals               | FKM                     | FKM                     | FKM                     | FKM                     |
| Impellers           | AISI 304 (X5CrNi 18-10) | AISI 304 (X5CrNi 18-10) | AISI 304 (X5CrNi 18-10) | AISI 304 (X5 CrNi 1810) |
| Front conveyor      | AISI 304 (X5CrNi 18-10) | AISI 304 (X5CrNi 18-10) | AISI 304 (X5CrNi 18-10) | AISI 304 (X5 CrNi 1810) |
| Back conveyor       | AISI 304 (X5CrNi 18-10) | Polymer                 | AISI 304 (X5CrNi 18-10) | Polymer                 |
| Screws              | AISI 304 (X5CrNi 18-10) |

| <b>Mechanical seals details</b> | <i>FP model</i>         | <i>DR1 model</i>               |
|---------------------------------|-------------------------|--------------------------------|
| Elastomers                      | NBR                     | Fluoroelastomer ( FKM - Viton) |
| Fixed part                      | Aluminum oxid           | Silicon carbide                |
| Mobile part                     | Sintered coal           | Sintered coal                  |
| Metallic parts                  | AISI 304 (X5CrNi 18-10) | AISI 304 (X5CrNi 18-10)        |

**3.2.2 Nominal data**

Rated power see table "Instruction use - Technical specifications"  
 Rated speed 2850 rpm 1400 rpm  
 Liquid temperature Groups L - M - LV - MV = 120°C  
 Groups N – NV = + 70°C  
 Liquid density < 1200 kg/m³  
 Hydraulic parts see table "Instruction use - Technical specifications"  
 Hydraulic power see table "Instruction use - Technical specifications"

**3.2.3 Emission of noise**

Acoustic pressure level: <70 dB(A)

**3.3 Label position and information**

|  |   |
|--|---|
| manufacturer information                     |  <b>1</b> OFFICINE DI TREVÌ<br>Trevi (Perugia) ITALY www.officineditrevi.com   |
| equipment identifications and hydraulic data | type <input type="text" value="2"/> kg <input type="text" value="3"/> year <input type="text" value="4"/> s/n <input type="text" value="5"/> rpm <input type="text" value="6"/><br>Q <input type="text" value="7"/> H <input type="text" value="8"/> Seal <input type="text" value="9"/> T <sub>i</sub> <input type="text" value="10"/> d <sub>i</sub> <input type="text" value="11"/>  |
| ATEX data                                    |   II 2G Ex h IIC TX Gb <span style="margin-left: 100px;">II 2D Ex h IIIC TX Db</span><br>F. T. 2018/01.00 EX <span style="margin-left: 100px;">CESI</span>  FL EX IU rev.2 |

|    |   |
|----|---|
| 1  | Brand, name and address of the manufacturer   |
| 2  | Equipment identification  |
| 3  | Weight  |
| 4  | Manufacturing year  |
| 5  | Serial number   |
| 6  | Rotation speed  |
| 7  | Hydraulic part  |
| 8  | Head  |
| 9  | Seal model  |
| 10 | Maximum temperature of pumped liquid  |
| 11 | Maximum density of pumped liquid  |
| 12 | CE marking<br> CE graphic symbol to indicate that one or more Directives are applied |

|    |   |
|----|---|
| 13 | <p>ATEX marking Gas</p>  Community trade mark specific for protection against explosions<br>II: group of apparatus - equipment suitable to be installed in surface places<br>2G: category - equipment compatible to be installed in potentially explosive atmospheres with gas, steams and vapors (area 1); this equipment is suitable for area 1 and area 2.<br>Ex: protection against explosions.<br>h: Type of protection applied to hydraulic part –constructional safety “c” – ignition protection where constructional measures are applied so as to protect against the possibility of ignition from hot surfaces sparks and adiabatic compression generated by moving parts.<br>IIC: subgroup of gas: equipment compatible to be installed with all combustible gas<br>T: class temperature - maximum temperature of the equipment<br>T3 = 200 °C<br>T4 = 125 °C<br>T5 = 90 °C<br>Gb: Equipment for use in explosive atmospheres due to the presence of gas, with a 'high' level of protection that is not the source of ignition in normal operation or when subject to expected malfunctions, although not on a regular basis. |
| 14 | <p>ATEX marking Dust</p>  : Community trade mark specific for protection against explosions<br>II: group of apparatus - equipment suitable to be installed in surface places<br>2G: category - equipment compatible to be installed in potentially explosive atmospheres with dust (area 1); this equipment is suitable for area 1 and area 2.<br>Ex: protection against explosions.<br>h: Type of protection applied to hydraulic part – constructional safety “c” – ignition protection where constructional measures are applied so as to protect against the possibility of ignition from hot surfaces sparks and adiabatic compression generated by moving parts.<br>IIIC: equipment compatible to be installed in surface places - subgroup IIC conductive powders<br>T: class temperature - maximum temperature of the equipment<br>T3 = 200 °C<br>T4 = 125 °C<br>T5 = 90 °C<br>Db: Equipment for use in explosive atmospheres due to the presence of dust, with a 'high' level of protection that is not the source of ignition in normal operation or when subject to expected malfunctions, although not on a regular basis.   |
| 15 | Technical file number   |
| 16 | Instruction use reference   |

**4. PREPARING THE PRODUCT FOR USE**

**4.1 Trasportand storage**

The drainage electric submersible pumps “FL EX”series are supplied in carton packs having various dimensions depending on electric pump; for the transport, packing is arranged in horizontal position. For storage, it must be protected rain - sunlight - humidity and the following conditions must be applied:  
 arranged in horizontal position - ambient temperature from 0 to +40°C - avoid stocking of packs.

**4.2 Handling**

 The electric pumps have different weights depending on their type. Before handling the pack, verify the weight indicated on pack or on the electric pump label (see par. 3.3 point 3 of identification label).  
 In the event of the weight exceeding the limits prescribed, it is compulsory that the handling is carried out by two persons or through the suitable means.  
 It is recommend that all equipment handling is carried out with due observance of general manual handling rules.

**4.3 Safety precautions before use**

 In the event of installation in places where stray electric currents may be present (i.e.: electric railway networks, works, welding areas, electric systems with high currents and radio frequencies, etc.), adequate precautions must be taken to avoid danger.  
 Check that the electric pump model written on the nameplate corresponds to that required.

 General safety rule. The electric supply system must be isolated before working on any of the electrical or mechanical parts, or on the system.

**4.4 Installation**

The pump is not provided of suction filter, so it is necessary to set up control system that prevent the aspiration of solid particles which can damage the internal parts of the pump.

It is necessary to install control system that guarantee the correct working of the pump. In case the pumps are used in area 1, the control systems must be SIL level or similar.

Check that the cooling fan rotation corresponds to the direction of the arrow on the pump body. If not, modify the electric connection of the pump.

**4.4.1 Liquid level control**

It is very important to ensure that the pump is always full of pumped liquid. This check may be carried out with different systems, such as float switches which guarantee under the head position (fig.1) or conductive sensors (fig.2).

The pumps are not self-priming and the pump must not be started unless it is completely full of water.

Fig. 1

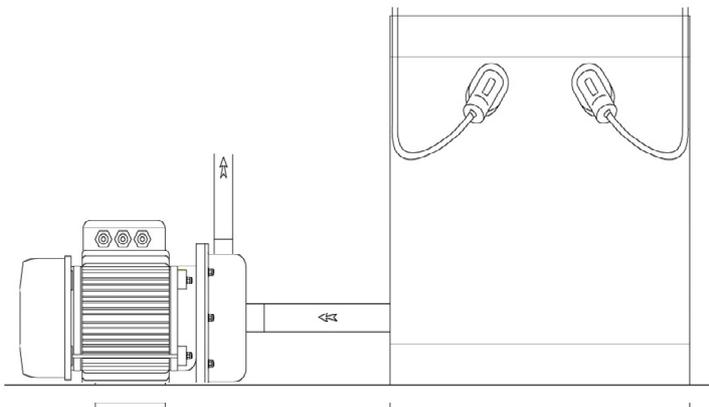
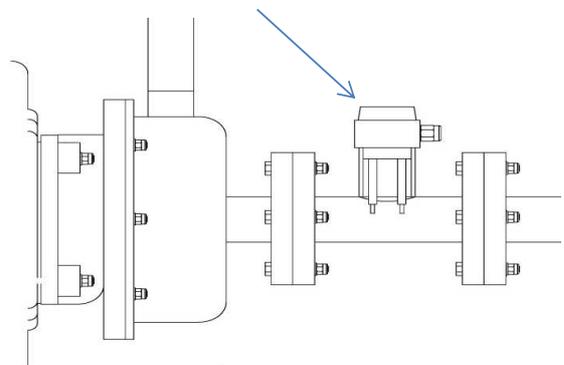


Fig. 2



**4.4.2 Temperature control**

To respect the temperature class (T3 – T4 – T5) it is necessary that the maximum temperature of pumped liquid is not higher than the specified as below:

| Class of temperature | Max surface temperature of the pump | Max temperature of pumped liquid |
|----------------------|-------------------------------------|----------------------------------|
| T3                   | 200 °C                              | 120 °C (1)                       |
| T4                   | 125 °C                              | 100 °C                           |
| T5                   | 90 °C                               | 65 °C                            |

To guarantee the maximum liquid temperature, it is important installed a control device to switch off the pump in case of exceeding the established limits. This control system avoid that the pump works wrongly with closed outlet or obstructed suction. For this reason the control must be as close as possible to the pump body. If this operation is not possible, it is necessary to install a flow meter which stop the electric pump if the liquid flow is less than 5% of the head of the pump.

1)T3 goup: limit 120 °C given by maximum tolerable temperature of the pump components

In pump model with DR1D mechanical seals (double) a thermal protector is installed to avoid the exceeding the liquid temperature in case of loss of coolant.

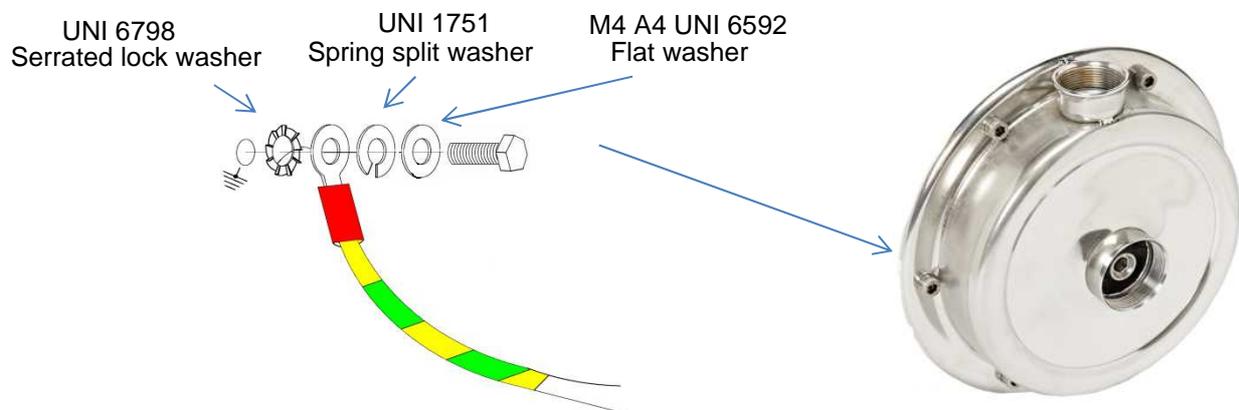
Thermal switch is normally closed, it opens when it reaches the following limits:

| Class of temperature | Max temperature of seal |
|----------------------|-------------------------|
| T3                   | 180 °C                  |
| T4                   | 115 °C                  |
| T5                   | 80 °C                   |

Thermal switch must be connected to an intrinsically safe barrier. If the alarm signal starts, the pump must be immediately stops and controls must be done.

#### 4.4.3 Grounding connection

The electrical continuity of metal parts are guaranteed by the connection between screw in fig.3 and earthing system, respecting the order of components as below:



#### 4.5 General warnings

The purchased goods must be used in accordance with directives and limits of certification. The manufacturer is exempt from components choice for system requirements or for area of use and ambient conditions.

The manufacturer declines all responsibility for direct or indirect damages caused by improper use of the product by the user and/or non-compliance with the rules outlined in this handbook.

### 5 Maintaining and cleaning

#### 5.1 Safety precautions

The inspection and maintenance on the multistage centrifugal submersible electric pumps series "FL EX, must be carried out only from expert staff, whose training has included all the necessary instructions on the type of protection of the electric pump, on the installation methods, on the laws. Before carrying out whichever maintenance operation disconnect the electric pump from the electric system. During the normal working, the pump parts can reach high temperatures, so before any operation check that the temperature is below 40°C. Before any maintenance operations, check the compatibility between cleaning products and pumped liquids. For the maintenance, carefully follow the safety rules in accordance between the working environment.

#### 5.2 Ordinary maintenance

It is recommended to check periodically:

- the cleaning of the pump suction grid, suction filter, outlet filter
- the correct fixing of the visible bolts and screws

To verify that:

- there should not be corrosion marks on the electrical pump
- there should be no accumulation of dust
- daily check that there are no water leaks.

#### 5.3 Planned maintenance

The planned maintenance must be executed by staff authorized by Officine di Trevi. "FL EX" pumps not request special maintenance, except for mechanical seal and gasket which must be replaced every 20.000 operating hours to avoid dangerous liquid leaks.

#### 5.4 Authorized maintenance list

Officine di Trevi sas  
 ss. Flaminia km 145 I-06039 Trevi (PG) Italia  
 Tel 0742 381616 – Fax 0742 78792  
<http://www.officeditrevi.com>  
[info@officeditrevi.com](mailto:info@officeditrevi.com)

#### 5.5 Trouble-shooting and fault diagnosis

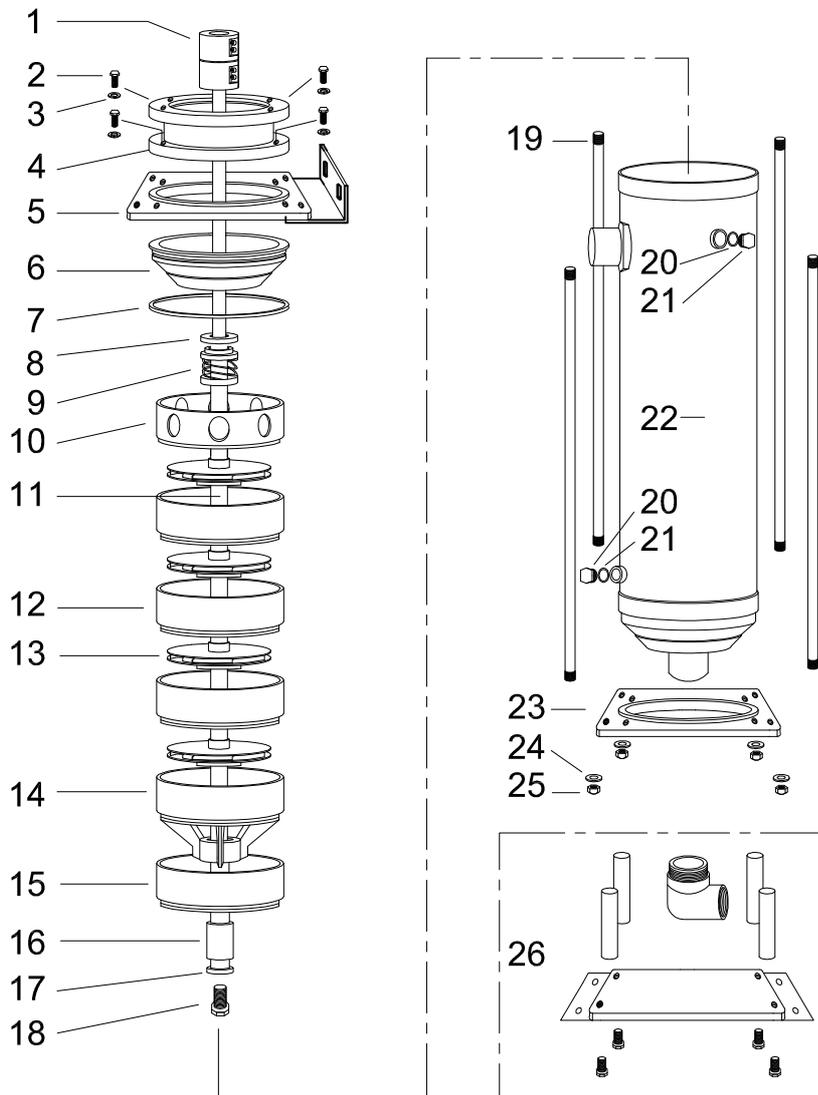
Important! Any intervention to determine suspected faults and to carry out work must always be completed by authorized specialized staff.

Indications in the trouble shooting guide below do not authorise intervention where this could compromise safety. Indications assist qualified and authorised staff in fault finding.

| FAULT  | POSSIBLE CAUSES |  | POSSIBLE REMEDIES   |
|--|-----------------|--|---|
| Electric pump does not start                                   | a               | No power supply                        | Refer to the electric motor instruction manual                                  |
|  | b               | Impellers blocked by foreign matter    | Disassemble the hydraulic part and check that the impellers turn freely         |
|  | c               | Thermal protection action              | Refer to the electric motor instruction manual                                  |
| The electric pump turns, but it does not deliver water         | a               | Blocket suction strainer               | Clean the strainer  |
|  | b               | Blocked riser pipe                     | Disconnect the pipe and clean it  |
| The pump stops for intervention of thermal or level protection | a               | A solid body has blocked the pump      | Electrically disconnect the pump and remove the solid body                      |
|  | b               | The pump was pumping too hot water     | Wait for the pump to cool before starting it                                    |
|  |                 | The pump was working in dry conditions | Wait a few minutes and restore the correct water level before starting the pump |

## 6. SPARE PARTS LIST AND CONSUMABLES

### L - M - N- LV - MV - NV groups



- |     |                             |     |                            |
|-----|-----------------------------|-----|----------------------------|
| 1.  | Rigid coupling              | 14. | Support with bush          |
| 2.  | Screw TE UNI 5739           | 15. | Suction impeller           |
| 3.  | Spring lock washerUNI 1751  | 16. | Bush                       |
| 4.  | Motor flange                | 17. | Impeller locking washer    |
| 5.  | Hydraulic connection flange | 18. | Screw TSEI M6x15 UNI 5933  |
| 6.  | Seal support                | 19. | Tie rod                    |
| 7.  | O ring 126,67 x 2,62        | 20. | Plug gasket kit            |
| 8.  | Mechanical seal fixed part  | 21. | Plug G3/8                  |
| 9.  | Mechanical seal mobile part | 22. | External case              |
| 10. | Delivery impeller           | 23. | Sealing flange             |
| 11. | Shaft                       | 24. | Washer D6 UNI 6592         |
| 12. | Diffuser                    | 25. | Nut M6 UNI 7474            |
| 13. | Impeller                    | 26. | Base kit for vertical pump |

## 7 TAKING PRODUCT OUT OF OPERATION AND SCRAPPING

Disconnect electrically and hydraulically the electric pump, extract the electric pump from its housing and wash it with clean water.

The electric pump in this state can be stored or send back to a technical centre or to manufacturer for maintenance or send for scrap. It is recommended to refer to specialised companies authorized for the scrapping of the electric pump according to laws and standards in force.

## 8 GARANTEE

- ❶ The guarantee applies only to equipment judged by the manufacturer to have faulty materials or construction.
- ❷ It does not cover parts subject to wear and breakage due to misuse and non-compliance with the rules contained in this manual.
- ❸ According to the Directive 1999/43/EC of the European Parliament and the Council, the duration of the warranty is two years from the date of delivery.
- ❹ The use of spares that are not original Officine di Trevi parts invalidates the guarantee.
- ❺ Officine di Trevi is not liable for damage or inconvenience caused by the failure to comply with the rules contained in this handbook.
- ❻ The guarantee is made ex-works; the costs for transporting the equipment under warranty from the customer to the customer to the manufacturer and vice versa are not covered by the guarantee.

To the extent permitted by applicable laws, liability is precluded for direct and indirect damages to persons and/or things arising from consignee's inappropriate use of the product and/or in case of non compliance with rules expressed in operating instructions.