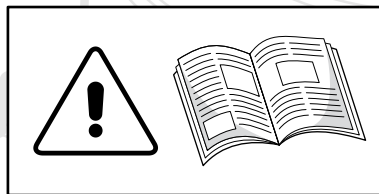
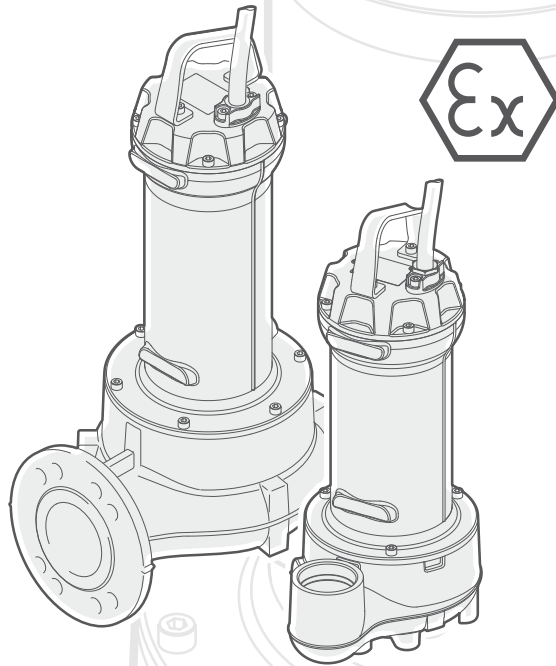




A  **TSURUMI PUMP** COMPANY

series Grey



Elettropompe sommergibili
Submersible electric pumps
Électropompes submersibles
Tauchmotorpumpen
Electrobombas sumergibles
Погружные электронасосы
潜水电动泵

- IT** Manuale per installazione e uso sicuro
- EN** Safety, Installation and Operations Manual
- FR** Manuel d'installation et d'utilisation en toute sécurité
- DE** Handbuch für die Installation und den sicheren Betrieb

- ES** Manual de instalación y uso seguro
- RU** Руководство по установке и безопасной эксплуатации
- CN** 安全规范, 安装与操作手册



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EN



For correct installation and safe use of the product, read this manual carefully and keep it safe in a clean, easily accessible place for future reference.

Misuse of the product may cause even serious injury and damage, cause malfunctions and lead to loss of warranty cover.

1. GENERAL INFORMATION

1.1 Manufacturer's address

ZENIT Italia s.r.l. - via dell'Industria, 11 - 41018 S.Cesario sul Panaro (MO) – Italy

1.2 Key to the symbols used in the manual



Warning - Hazard for operators and pump



Warning - Electrical risk



Warning - Very hot surfaces with burn hazard



Warning - These instructions must be observed on "ATEX and IECEx" models (-Ex acronym). Failure to comply with these instructions may cause the danger of an explosion. It is recommended to follow these instructions also for standard pump.

CAUTION

Important information to be read with special care



1.3 General safety regulations

- This product is intended for professional users. It's not suitable for unskilled and/or incompetent persons; keep out of reach of children.
- Installation operations must be carried out by skilled technical staff capable of understanding the contents of the manual: the staff assigned to install and maintain the product must be trained in the inevitable residual risks related to electrical equipment.
- People and animals must not enter or come into contact with the liquid until the equipment has been removed from the tank.
- Make sure that persons cannot accidentally fall into the tank, e.g. by installing a cover or railing.
- Pay attention to the risks presented by gas and vapors in the work area.
- Do not swallow or inhale any component of the equipment.
- Do not allow the free end of the electric cable to come into contact with liquids of any kind.
- Before connecting the electricity supply, ensure that the equipment has been installed correctly and retire to a safe distance.
- Do not use the equipment for purposes other than those for which it was designed and constructed, since the manufacturer does not accept liability for injury or damage caused by the equipment if used in contravention of the instructions in the manual, or in the event of non-compliance with the maintenance and safety recommendations; for aggressive chemical environment, contact the manufacturer before use to check whether the materials are compatible with the environment concerned.
- Do not modify the equipment or any of its parts (connections, holes, finishes, etc.) for any reason.
- The user must comply with the relevant safety regulations in the country of use, as well as common-sense safety precautions, and ensure that regular cleaning and maintenance operations are carried out correctly.
- The installer is responsible for ensuring that the ambient conditions of use are suitable, to ensure health and safety.
- The customer is responsible for the staff authorised to use the equipment: failure to comply with this requirement may put users at risk and lead to loss of warranty rights.

1.4 Training of installation and maintenance staff

The staff assigned to install and maintain the product must be capable of reading and understanding the contents of the technical documentation supplied with the product, especially the electrical wiring diagrams.

They must also be trained in the inevitable residual risks related to electrical equipment operating in contact with biological liquids.

1.5 Personal protective equipment (PPE) to be used

Handle the electric pump while wearing individual protection devices in conformity with the law.

Use is compulsory of protective gloves, safety footwear, protective goggles with the sides closed and leather aprons.

1.6 Residual risks

The product is designed and manufactured to ensure safe, reliable use.

However, since it is intended for use with liquids that constitute a health hazard, the installation and maintenance staff must take great care and always wear regulation personal protection equipment.

During all work on the product, users must take care not to drop the pump and must not underestimate the risks of burns, electrocution, drowning and suffocation or poisoning due to the inhalation of toxic gases.



The user is responsible for installing any appropriate lightning protection measures to reduce electrocution risks.



Any intervention which modifies the pump components can create a DANGER of EXPLOSION. The pumps MUST be used ONLY in areas compatible with the characteristics recorded on the label.



During handling, installation or disinstallation operations the pump must be disconnected from the power supply panel.

1.7 Warranty coverage

ZENIT undertakes to repair or replace the product if failures are due to design, manufacturing and assembly defects and are reported to ZENIT during the warranty period.

The warranty does not cover failures due to:

- normal wear and tear.
- improper handling, installation and use.
- use with incorrectly connected control systems.
- work done by unskilled staff.
- use of non-genuine spare parts.

CAUTION Any modifications made to the product without the manufacturer's authorization may cause hazards and lead to a deterioration in performance and loss of warranty coverage.

CAUTION Running the pump with the thermal and/or leakage detector disconnected will invalidate related warranty claims.

2. PRODUCT DESCRIPTION

2.1 Product description - Intended use

These products are intended for use in residential, industrial and municipal sewage treatment plants and lifting stations. They are designed to lift and pump slurries, faecal material, clean water, waste water or water soiled with solid or fibrous materials.



They may not be used with liquids for human consumption or in potentially explosive atmospheres (except for models with -Ex certification).



Explosion proof models, identifiable by the -Ex acronym, are certified according to the explosion protection mode recorded on the nameplate (See Points 2.4, 2.4.1).

Grey pumps must under no circumstances be used to pump explosive, flammable or combustible liquids.

Grey submersible pumps are classified depending on the hydraulic type.

- DGG Grey series: electric pumps with set-back vortex impeller which allows ample free passages.
Applications: biological liquids and wastewater civil and industrial lifting, wastewater treatment plants and livestock farms;
- DRG Grey series: electric pumps with channel impeller.
Applications: recirculation of industrial and process waters, civil lifting, drainage and lifting of water from first rainfall tanks;
- GRG Grey series: electric pumps with multi-channel open impeller with a grinding system.
Applications: lifting of liquids containing fibres and filaments, professional and industrial applications, livestock farms;
- APG Grey series: electric pumps with high-head immersed multi-channel open impeller.
Applications: lifting of clean liquids or liquids with small solids or sand, slightly sandy seepage waters.
- CPG, CTG Grey series: electric pumps with multi channel impeller and chopper system.
Applications: lifting of unstrained sewage sludge and wastewater containing various solid including fibrous materials.



This electric pump is a fixed appliance intended to be used while fastened to a support or while secured in a specific location. This appliance is not intended to be held in the hand during normal use.

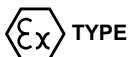
To shut down the power supply in case of motor overheating, the equipment is provided, as standard, with thermal protectors into the stator winding (See Point 5.5).

Grey pumps are equipped with a leakage detector to detect the entrance of water in the mechanical seals oil chamber (See Point 5.6).

2.1.1 Product's name description

The pump can be identified by the "TYPE" and the "VERSION" designations stated on the nameplate (see point 2.4).

Example:



TYPE

DGG 300/2/G65V C0ET5

① ② ③ (A) (B) (C) ⑤ ⑥ ⑦ ⑧ ⑨

④

① Type of impeller

DG = Vortex
DR = Channels
GR = Grinder
AP = High head
CP = Chopper (CP type)
CT = Chopper (CT type)

② Series

G = Grey

③ Motor power P2 (HPx100) / motor poles

④ Pump outlet

(A) TYPE (GAS thread/Flanged)

(B) DIAMETER (mm)

(C) V = vertical, H = horizontal

⑤ Hydraulic variant

⑥ Hydraulic version

⑦ Motor size

⑧ Motor phases

M = Single-phase, T = Three-phase

⑨ Frequency

5 = 50Hz, 6 = 60Hz

VERSION

TS 10 400 D EX NN GG

⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯

⑩ Electrical variant

⑪ Cable length

⑫ Rated voltage code

⑬ Starting type

D = DOL

Y = star/delta

⑭ Certification

NN = standard

EX = ATEX, ATEX + IECEx

CX = IECEx

⑮ Customization

⑯ Impeller material

2.2 Technical data

The product's technical data and characteristics are provided in the technical data sheet.
The following tables show the type of motor enclosure in relation to the electric motor sizes

SINGLE PHASE version			THREE PHASE version			THREE PHASE version		
Enclosure type	Description _ ② ③ _ ⑦ ⑧ _	P2 (kW)/ poles	Enclosure type	Description _ ② ③ _ ⑦ ⑧ _	P2 (kW)/ Poles	Enclosure type	Description _ ② ③ _ ⑦ ⑧ _	P2 (kW)/ Poles
G05M	_G 75/2_AM_	0.55/2	G05M	_G 75/2_AT_	0.55/2	G08L	_G 1200/2_GT_	9/2
	_G 100/2_AM_	0.75/2		_G 100/2_AT_	0.75/2		_G 1500/2_GT_	11/2
G05L	_G 150/2_AM_	1.1/2	G05L	_G 150/2_AT_	1.1/2		_G 1750/2_GT_	13/2
	_G 200/2_AM_	1.5/2		_G 200/2_AT_	1.5/2		_G 1000/4_GT_	7.5/4
G06L	_G 250/2_EM_	1.8/2		_G 250/2_AT_	1.8/2	G10S	_G 2000/2_HT_	15/2
	_G 300/2_EM_	2.2/2		_G 100/4_AT_	0.75/4		_G 1200/4_HT_	9/4
	_G 400/2_EM_	3/2	_G 150/4_AT_	1.1/4	_G 1500/4_HT_		11/4	
G07S	_G 550/2_FM_	4/2	_G 200/4_AT_	1.5/4	_G 1000/6_HT_	7.5/6		
G07L	_G 750/2_FM_	5.5/2	G06S	_G 300/2_ET_	2.2/2	G10L	_G 2500/2_HT_	18.5/2
G08L	_G 1000/2_GM_	7.5/2		_G 200/4_ET_	1.5/4		_G 2000/4_HT_	15/4
	G06L			_G 400/2_ET_	3/2		_G 1200/6_HT_	9/6
_G 250/4_ET_				1.8/4	_G 1500/6_HT_		11/6	
_G 300/4_ET_				2.2/4	_G 1750/6_HT_	13/6		
_G 400/4_ET_				3/4	M08S	_G 400/6_GT_	3/6	
G07S			G07S	_G 550/2_FT_	4/2	M08L	_G 550/6_GT_	4/6
			_G 750/2_FT_	5.5/2	_G 750/6_GT_		5.5/6	
G07L			G07L	_G 1000/2_FT_	7.5/2			
				_G 550/4_FT_	4/4			
				_G 750/4_FT_	5.5/4			

2.3 Operating limits

For correct use, comply with the following operating conditions:



- Liquid/Ambient temperature: 0 ÷ 40°C

- Duty service: Single-phase models: S1 - fully submerged pump (Fig. 1)

Three-phases models: S1 - fully submerged pump (Fig. 1)

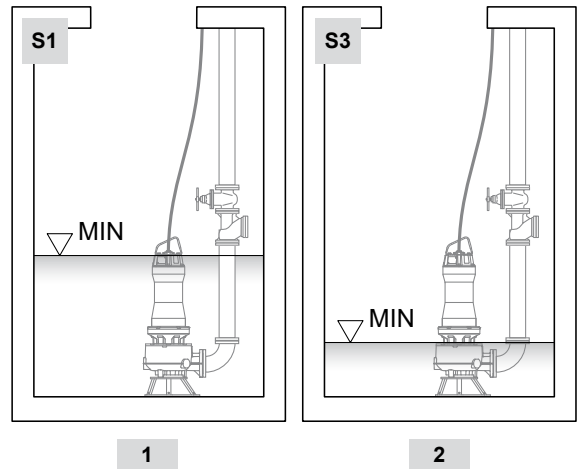
S3 - fully submerged pump casing or filled pump casing (Fig. 2) according to S3% value marked on the nameplate, as for chart.



Enclosure type	Description _ ② ③ _ ⑦ ⑧ _	P2 (kW)/ Poles	Duty service	Enclosure type	Description _ ② ③ _ ⑦ ⑧ _	P2 (kW)/ Poles	Duty service
G05M	_G 75/2_AT_	0.55/2	50%	G08L	_G 1200/2_GT_	9/2	15%
	_G 100/2_AT_	0.75/2	50%		_G 1500/2_GT_	11/2	15%
G05L	_G 150/2_AT_	1.1/2	30%		_G 1750/2_GT_	13/2	10%
	_G 200/2_AT_	1.5/2	30%		_G 1000/4_GT_	7.5/4	15%
	_G 250/2_AT_	1.8/2	20%	G10S	_G 2000/2_HT_	15/2	10%
	_G 100/4_AT_	0.75/4	15%		_G 1200/4_HT_	9/4	15%
_G 150/4_AT_	1.1/4	15%	_G 1500/4_HT_		11/4	10%	
G06S	_G 200/4_AT_	1.5/4	15%	_G 1000/6_HT_	7.5/6	10%	
	_G 300/2_ET_	2.2/2	20%	G10L	_G 2500/2_HT_	18.5/2	15%
_G 200/4_ET_	1.5/4	20%	_G 2000/4_HT_		15/4	15%	
G06L	_G 400/2_ET_	3/2	20%		_G 1200/6_HT_	9/6	15%
	_G 250/4_ET_	1.8/4	20%		_G 1500/6_HT_	11/6	15%
	_G 300/4_ET_	2.2/4	20%	_G 1750/6_HT_	13/6	15%	
	_G 400/4_ET_	3/4	15%	M08S	_G 400/6_GT_	3/6	20%
G07S	_G 550/2_FT_	4/2	20%	M08L	_G 550/6_GT_	4/6	20%
	_G 750/2_FT_	5.5/2	15%		_G 750/6_GT_	5.5/6	20%
G07L	_G 1000/2_FT_	7.5/2	10%				
	_G 550/4_FT_	4/4	15%				
	_G 750/4_FT_	5.5/4	15%				

The pump can operate in continuous duty service (S1) only when it is completely submerged.
 In dry applications, the pump must only be powered in intermittent periodic service (S3).
 Level switches must be installed in such a way that the correct minimum liquid level is guaranteed (See Point 4.10).

- Immersion depth: max 20m
- Starts per hour (equally distributed): maximum 20 for motor with rated power P2 up to 10 kW, 15 for P2 over 10 kW
- pH value: 6 ÷ 14
- Minimum liquid level (See Point 4.10)
- Operation by variable frequency drive (VFD) (See Point 5.3)
- Thermal protection (See Point. 5.5)
- Leakage detector (See Point 5.6)

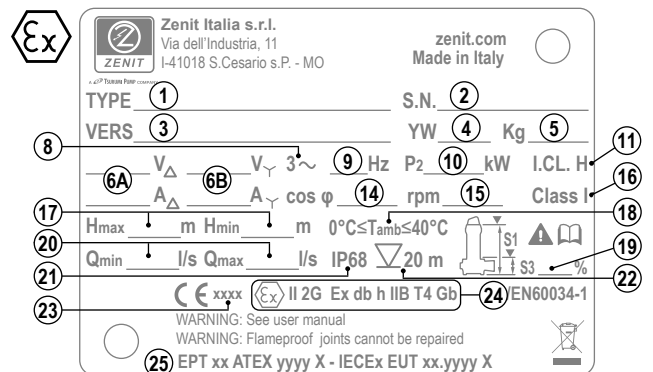
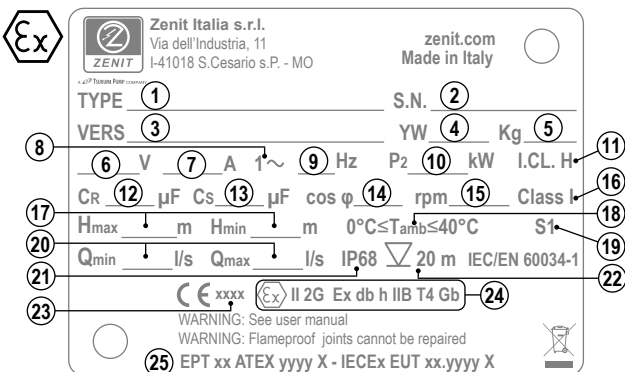
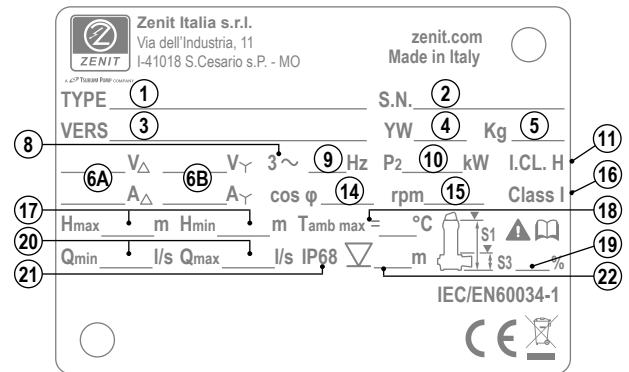
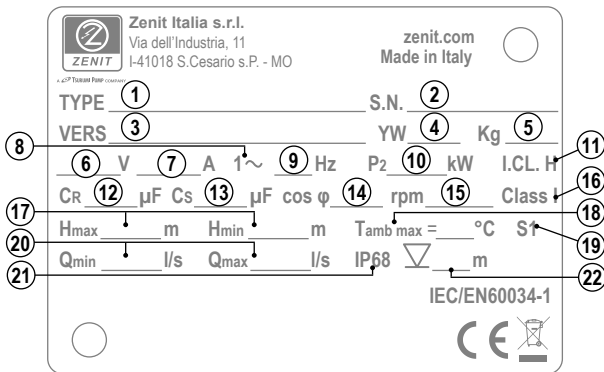


2.4 Nameplate

On the motor cover you find a metal plate which states the operating data and approvals applying to the pumps.

Single phase

Three phase



- Product type
- Serial number
- Product version
- Year and week of production
- Weight
- Rated voltage
- Rated current
- Phases number
- Frequency
- Motor output power P2
- Motor insulation class
- Run capacitor
- Start capacitor
- Power factor
- Speed (revolutions per minute)
- IEC protection class against electric shock
- Maximum and minimum head
- Ambient/liquid temperature
- Duty type
- Minimum and maximum flow-rate
- IP code (degree of protection provided by enclosure)
- Maximum immersion depth
- ATEX quality and assurance certification body number
- Ex marking string (-Ex version only)
- ATEX / IECEx certification number (-Ex version only)

2.5 -Ex marking string (potentially explosive atmospheres)

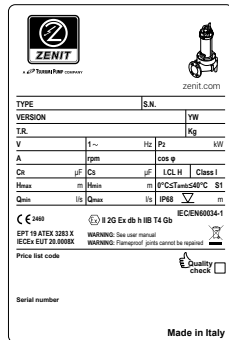
XXXX II 2G **Ex db h IIB T4 Gb**
(ATEX only)

Symbol	Meaning
XXXX	CE marking of conformity according to the ATEX directive 2014/34/EU XXXX stand for the number of the notified body which has certified the quality system for ATEX
	The specific marking of explosion protection given in the Annex II of the Directive 2014/34/EU
II	Group of the equipment. Group II: electrical equipment for use in places with an explosive gas atmosphere other than mines
2G	Category of the equipment subject of certification, in presence of potentially explosive atmospheres of Gas, Vapors and Mist (G). The equipment can be installed in ZONE 1.
Ex db h IIB	The type of electrical protection for the equipment is a flameproof enclosure “db”, suitable for gas Group IIB and IIA. The type of mechanical protection for the equipment is through liquid immersion “k” and constructional safety “c”, suitable for gas Group IIB and IIA.
T4	Temperature Class of the equipment (maximum surface temperature 135°C)
Gb	Equipment with “high” level of protection (EPL Gb), suitable for use in ZONE 1.

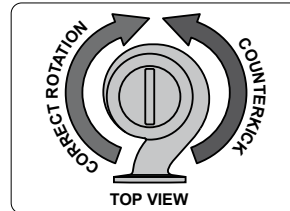
2.6 Decals



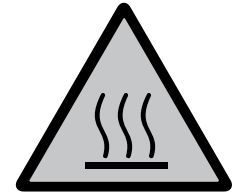
Silver sticker.
Reproduces the pump nameplate.



Sticker on product package.



Correct impeller rotation
Direction viewed from above
(three-phase models only).



Surfaces with high temperature risk.

3. TRANSPORT AND STORAGE

3.1 Receiving the product

The equipment is delivered suitably packaged. Make a visual inspection of the packaging for damage. Carefully remove the packaging materials and inspect the product to ensure that there are no damaged or missing parts. If any parts are damaged or missing, contact ZENIT (or its dealer) or the forwarders. Record any significant damage to the product in the transport documents.

CAUTION Check that the data on the nameplate are the same as those of the product required.

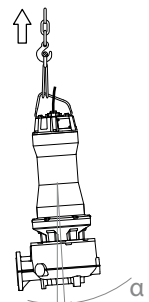
CAUTION Keep the packaging materials for future use. If damaged, dispose of it as required by law.

Take special care not to injure yourself with sharp tools and not to damage to the product, especially the electric cable.

3.2 Handling and lifting

Before lifting, make a note of the weight of the product stated on the nameplate and use certified slings, chains and hooks of suitable load capacity.

The pump must be lifted and handled using a chain or sling secured to the handle on top, with suitable machinery (crane, hoist, etc.).
Observe any local regulations that set limits for the weight to be lifted manually by individuals, i.e. handled without the use of lifting equipment.
NEVER handle the pump by electric cables.
Do not stand close to the pump during handling.
Always wear personal protection equipment.



Ensure that the pump is firmly secured and cannot fall, rotate or swing.
The handle on top is designed to ensure that the pump will be balanced during lifting; however, it may swing when lifted off the ground.

3.3 Storage

During storage, the electric pump must be kept in a suitable place, out of the reach of children or those with diminished responsibility, suitably secured against falling and protected from damp, vibrations, dust and extreme temperatures (below $-20^{\circ}\text{C}/-4^{\circ}\text{F}$ and above $+60^{\circ}\text{C}/140^{\circ}\text{F}$). The condition of the mechanical seal oil should be checked before using the product if it has been exposed to low temperatures.

CAUTION If the pump should freeze, do not use flames to remove the ice; immerse it in the liquid in which it is to be installed until it thaws out.

CAUTION Turn the impeller at least every 2 months through the outlet or intake, to prevent the mechanical seals from sticking together.



Do not turn the impeller by hand. Always use an appropriate tool.

4. INSTALLATION

4.1 General safety precautions

Observe all safety regulations at the installation site. The classification of the installation site must be defined by the owner. Fence off the working area by appropriate means and wear personal protection equipment. Make sure there is adequate fresh air supply in the tank.



Before beginning installation procedures, make sure that the atmosphere in the tank is not potentially explosive. Persons must not enter the installation area when the atmosphere is explosive.



The shock from built up electrostatic charges on isolated components could cause an explosion.



-Ex pumps do not have isolated components that are electrostatically chargeable and they are all equipped with an external earthing (grounding) screw for the connection of an equipotential bonding conductor (see Point 5.4). In accordance with EN 1127-1:2019 Point 6.4.7, equipotential bonding and earthing of all the conductive parts that could become hazardously charged is required. Check the suitability for use in potentially explosive atmospheres of each additional component installed in the hazardous area.

CAUTION Prior to installation, make sure the tank bottom is even.

CAUTION To prevent the cavitation problems caused if the pump draws in air, ensure that the liquids do not flow into the tank near to or towards the pump.

The size of the tank in which the pump is installed must be such that:

- any level float switches are able to move freely.
- the number of pump switch on/switch off cycles does not exceed the permitted number (See Point 2.3).



Prior to installation, check the oil level in the mechanical seals oil chamber.



Once the unit has been installed in a closed tank, the tank access point must be closed so that people cannot fall in. Never leave the tank access point uncovered or unprotected.

4.2 Checking the impeller rotation direction

CAUTION When three phase pumps are being commissioned for the first time, and also when used on a new site, the direction of rotation of the impeller must be checked by a qualified technician.

The pump carries a decal which indicates the correct impeller rotation direction (green arrow) and the relative kickback direction (red arrow). When the pump is viewed from above (motor cover), the impeller must rotate CLOCKWISE.



All of the following operations should be carried out in a secure place, in absence of potentially explosive atmospheres.

Proceed as follows:

1. Take the safety precautions detailed in the manual.
2. Place the pump vertical on its feet or base.
3. Secure the pump by tying a suitably sized chain or sling to the handle on the top to prevent it from falling over after the kickback.



The kickback may be very strong. Do not stand close to the pump during the procedure.

4. Establish equipotential bonding before commissioning. Temporarily connect the yellow-green conductor (PE) to the earthing (grounding) system and then connect the power supply conductors to the relative terminals in the electrical panel, according to the connection diagram.

5. Make sure there are no people or objects within a distance of at least 2 metres of the pump.

6. Operate the start switch, power up the pump for a few seconds and then shut off the power by flicking the stop switch.

7. Check that the rotation direction is correct.

If the pump is rotating in the wrong direction, invert two of the pump's three power supply phases and try again, repeating the procedure described. Once the connection which provides the correct rotation direction has been obtained, DISCONNECT the power supply conductors from the pump and proceed with installation.

CAUTION If more than one pump is connected to a single control panel, the rotation direction must be checked individually for each unit installed.

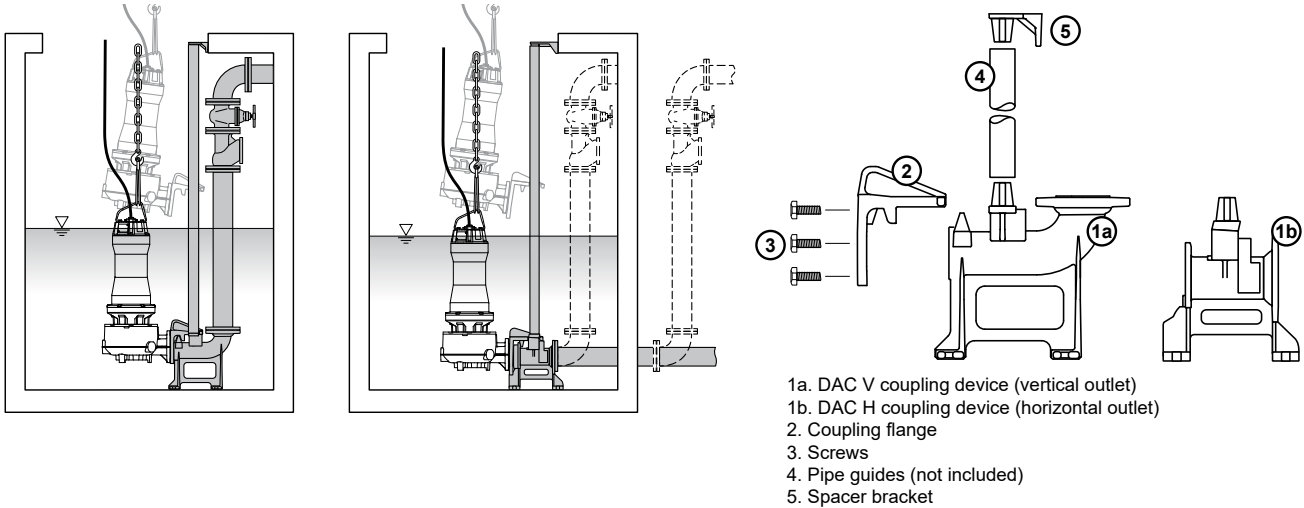
4.3 Permitted installation types



Make sure that the atmosphere in the working area is not potentially explosive.

4.3.1 Installation with DAC coupling device

With this type of installation, the pump can be removed from and replaced in the tank quickly without any work on the system.



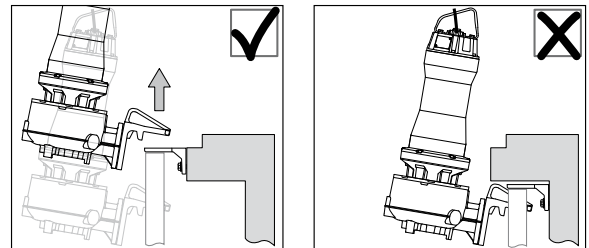
- 1a. DAC V coupling device (vertical outlet)
- 1b. DAC H coupling device (horizontal outlet)
- 2. Coupling flange
- 3. Screws
- 4. Pipe guides (not included)
- 5. Spacer bracket

Installation procedure (See APPENDIX 1 page 136)

1. Check that the pump is disconnected from the power supply panel and the impeller turns in the correct direction.
2. Fix the flange to the pump's outlet with the screws provided. For models with hooks, fix the hook to the pump casing using the screws provided.
3. Place the coupling device on the bottom of the tank and mark the position of the holes required to fix it.
4. Make holes of suitable diameter for the coupling device fixing slots
5. Secure it firmly to the bottom of the tank using chemical or expansion plugs. Use stainless steel metal fasteners or protect the screws and nuts with a suitable product to prevent corrosion.
6. Connect the outlet pipeline to the coupling device. A shut-off valve and a ball type check valve with full free passage should be installed using a connection pipe with length equal to at least 5 times the diameter of the outlet.
7. Fit the pipe guides, cut to the correct length, to the coupling device. Galvanised steel pipes, or preferably stainless steel pipes, of suitable diameter can be used (see technical information).
8. Connect the spacer bracket to the top end of the pipe guide and mark the positions of the holes required to fix it to one of the sides of the tank; make sure that the pipe guides are perfectly vertical with the aid of a plumb-line or a spirit-level.

CAUTION Before connecting the bracket spacer check, by lifting the pump up, if it is possible to extract the coupling flange from the pipe guides.

9. Make holes of suitable diameter for the spacer bracket fixing slots and secure it firmly using chemical or expansion plugs. Protect the screws and nuts with a suitable product to prevent corrosion.
10. Clean the tank to remove any remaining debris and waste.
11. Secure a chain or sling of suitable size to the handle and lower the pump into the tank, sliding the flange along the pipe guides until it reaches the coupling device.
12. Secure the electric cables so that they cannot be twisted or torn or drawn in by the pump.
13. Bring the cables out of the tank through a clean, smooth duct. Do not lay cables with tight bends or in positions with risk of crushing or damage.
14. Connect the electric cables to the control panel (**Chapter 5. "Electrical connections"**).

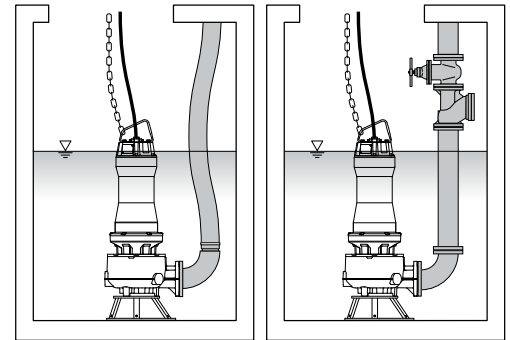
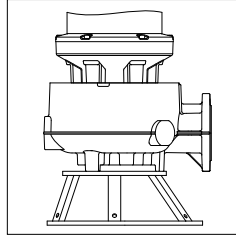


4.3.2 Mobile installation

In mobile installation the pump is mounted on a specific base (KBS) which keeps it vertically on the bottom of the tank and ensures that the intake is at the correct height.

Installation procedure (See APPENDIX 2 page 137)

1. Check that the pump is disconnected from the power supply panel and the impeller turns in the correct direction.
2. Lower the pump onto the base using a chain or sling of suitable strength secured to the handle. Ensure that it cannot fall and/or swing.
3. Secure the pump to the base with the screws provided.
4. Connect the outlet to the piping using the standardised flange. Use stainless steel metal fasteners or protect the screws and nuts with a suitable product to prevent corrosion. A shut-off valve and a ball type check valve with full free passage should be installed using a connection pipe with length equal to at least 5 times the diameter of the outlet. If a hose is used, fit a flanged hose connector.



- A hose with reinforcing coil or semi-rigid hose is recommended to ensure that the free passage remains constant even at bends in the hose or points where it changes direction. Secure the hose to the union by means of a metal band clamp.
5. Lower the pump into the tank until it rests firmly on the bottom using a chain or sling of suitable strength secured to the handle. Ensure that the pump cannot fall and/or swing.
 6. Secure the electric cables so that they cannot be twisted or torn or drawn in by the pump.
 7. Bring the cables out of the tank through a clean, smooth duct. Do not lay cables with tight bends or in positions with risk of crushing or damage.
 8. Connect the electric cables to the control panel (**Chapter 5. "Electrical connections"**).

4.4 Level switches

The level of pumped liquid must be controlled by at least two level switches connected to the motor control circuit.

Level switches allow one or more pumps to be started and stopped in response to the level of liquid in the tank.

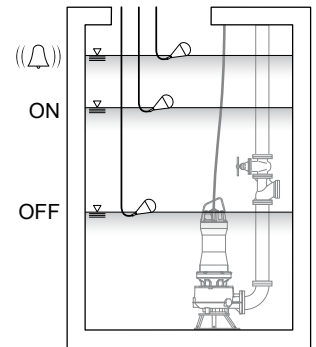
They can also be connected to alarm devices to prevent operational problems (overflow or dry running).

They must be installed well away from turbulence or inflows of water.

In the event of strong turbulence, level switches should be installed on a rigid rod mounted inside the pit.

Make sure that there are no items which may obstruct movement of the level switches and that the wires do not interfere with each other, and cannot become tangled or trapped on projections inside the tank.

Level switches must be installed in such a way that the correct minimum liquid level is guaranteed.



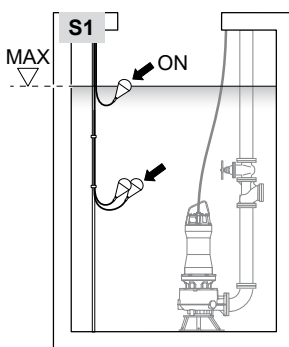
Ex The user must ensure that the pump operates always with two level switches (in redundancy) to shut down the power supply when the liquid to be pumped belows the minimum level. If installed in a hazardous area, the level switch must be certified for potentially explosive atmospheres. In this instance, the connection to the electric control panel must be carried out using an Intrinsic Safety interface such as a Zener safety barrier or a galvanic isolation barrier.

Minimum liquid level

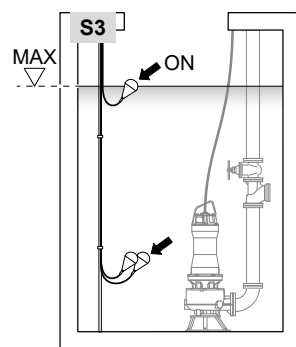
- Continuous duty service (S1): fully submerged pump (Fig. A2). The liquid in the tank must never drop below the motor cover in order to ensure that the pump is cooled effectively.
- Intermittent periodic service (S3): fully submerged pump casing (Fig. B2)

Ensure that the switch **from shut down to start-up** occurs only if the level switches find themselves in the position shown in Fig. A1 - B1.

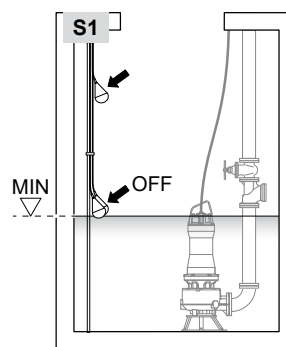
Ensure that the switch **from start-up to shut down** occurs only if the level switches find themselves in the position shown in Fig. A2 - B2.



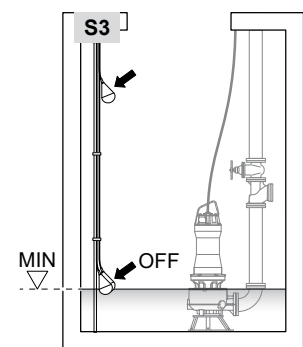
A1



B1



A2



B2

CAUTION A check should always be performed to ensure that the pump operates correctly with the minimum liquid level.

Depending on the specific installation, additional measures may be necessary to ensure correct operating conditions for the pump in the suction.

! The electric connection of the level switches must be carried out in such a way that ensures the shutdown of the pump in cases of a malfunctioning float.

! Make sure that effective volume of the tank does not become so low that the number of starts per hour exceeds the maximum admitted (see Point 2.3).

5. ELECTRICAL CONNECTIONS



5.1 General safety precautions

Make sure that electrical protection measures have been adopted in accordance with all relevant local and/or national regulations, laws and standards and that the skilled electrician has certified that the system is operating correctly. Incorrect electrical connections may cause fires and an electrocution hazard, or the risk of damage to the product.

- Appliances without plug are intended to be permanently connected to fixed wiring; a switch that ensure the all-pole disconnection incorporated in the fixed wiring is to be provided. The switch shall be directly connected to the supply terminals and shall have a contact separation in all poles, providing full disconnection under overvoltage category III (4000V).
- To ensure safety the pump is to be supplied through a residual current device (RCD) having a rated residual operating current not exceeding 30 mA.
- The pump motor must be protected from overload by installing in the main control circuit or power line of pump an overload protection (motor protection breaker). The protection must be adequately dimensioned according to the rated pump data. The starting current in direct-on-line start can be up to six times higher than the rated current.
- Make sure that the electrical panel is disconnected from the power supply and that it cannot be accidentally energized.
- Check that the insulation resistance of the motor is 20 MΩ minimum (reference value based on new pump).
- Make sure that the power supply line voltage and frequency are as stated on the dataplate and that the rated current of the pump is below the maximum current the system is able to deliver.
- The maximum voltage variation allowed for rated value is $\pm 5\%$. Voltage imbalance between phases: max 2%.
- The electrical operation and safety of ZENIT pumps are guaranteed for the configuration supplied by the manufacturer: any changes (e.g. addition of extra lengths of cable to the original power lead) may cause a deterioration in the pump's characteristics.



5.2 Wiring

- To avoid short circuit, make sure that the electrical cables are not damaged in any way and the ends have not been exposed to dampness and/or immersed in water. Contact ZENIT or an authorized Service Center for replacement.
- Do not underestimate the problems caused by voltage drops.



Secure and mechanically protect the electric cables so that they cannot be twisted, torn and/or crushed.



The ends of the power supply cable must be connected to an electric panel certified for use in potentially explosive atmospheres if it is installed in a hazardous area.

5.3 Operation by variable frequency drive (VFD)

The three-phase motors may also be powered by a "PWM (Pulse Width Modulation) – Constant Torque (U/F=constant)" frequency inverter. Set the frequency converter U/f ratio according to the motor data.

Use input and output filters on the frequency converter. See data sheet for the frequency converter used.



Ex models may never, without exception, be operated using a frequency greater than the rated value indicated on the nameplate as this may cause motor overload. The lowest frequency must be set so that it does not fall below 30 Hz.



Make sure that the rated current specified on the nameplate is not exceeded after starting the motors. The maximum number of starts according to the technical data sheet of the motor must not be exceeded.



The thermal protection of the motor must be connected.

5.4 Earthing (grounding) connection

The pump must always be earthed (grounded) before commissioning. Make sure that the earthing (grounding) system and residual current device (RCD) are present and in good working order.

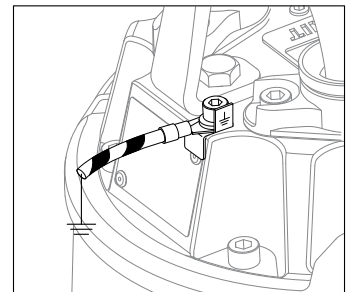
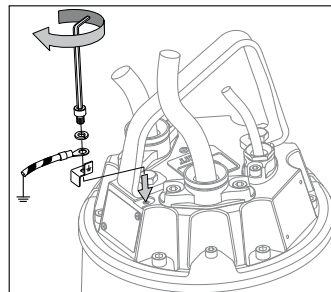
Check that the earth (ground) conductor is about 50 mm longer than the other conductors so that it will be the last to become disconnected from the panel in the event of accidental tugs.

The predisposition for the connection of the external equipotential bonding conductor is provided on the motor cover.



Connect an equipotential bonding conductor (yellow and green, with cross section at least of 4 mm²) to the external grounding screw (earthing), fitted on the motor cover, using a secure cable clamp.

Clean the surface of the external earth connection (ground) and mount the cable clamp.



5.5 Thermal protection

Models with thermal protectors are equipped with bimetal thermal switches (one for each phase, connected in series) built into the stator windings. It protects the motor from overheating and resets automatically once the motor has cooled down.

The thermal protection wires are marked with a label stating "TP" = THERMAL PROTECTION.

Technical characteristics:

Rated voltage: 250 V

Max. switching current: 2.5 A at $\cos \varphi = 1$

Nominal switching temperature (NST): 150°C (302°F)



The connection of the thermal protectors to a control panel is mandatory. The electrical panel must be predisposed to guarantee the shutdown of the motor when the thermal protection intervenes and to avoid the automatic start-up of the pump which must only be started manually with the intervention of a technician after having fixed the causes of the anomaly.

5.6 Leakage detector

The pump is equipped with a single-signal dual probe that, by means of a relay for conductive liquids, can detect the presence of water in the oil chamber of the mechanical seals and in the motor.

The leakage detector is of single electrode type and uses the earth (ground) conductor (PE) to close the circuit; the circuit must be supplied with power by means of an insulating transformer.

The signal cable is marked with a label with the letter "S".



In the case of detection (electric resistance less than 30 kΩ) take out of service the pump and proceed with maintenance.



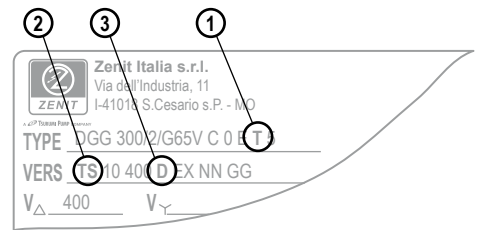
The connection of the leakage detector to the control panel must be carried out by inserting in safe area an intrinsic safety barrier with galvanic isolation. Local regulations/standards must be observed.

Electrical safety data for intrinsically safe circuit:

<u>Leakage detector</u>	U _i : 30V; I _i : 120mA; P _i : 1.3W
	C _i : 0.3nF; L _i : ~ 0mH
<u>Cable</u>	C _c : 200pF/m; L _c : 1μH/m; L _c /R _c = 30μH/Ω

5.7 Electrical connection

- Read the pump configuration on the nameplate and identify:
 - number of motor phases (TYPE field): *M = Single-phase, T = Three-phase*
 - electrical variant (VERS field)
 - start type (VERS field): *D = DOL (direct), Y = star/delta*.
- Identify the type of each electrical cable according to the marking on the sheath.
For example: 4G2.5 + 3x1.
- Identify the corresponding wiring diagram.
- Firstly, connect the earth (ground) conductor to the relative terminal in the electrical panel, according to the wiring diagram.
- Connect the power conductors to the relative terminals in the electrical panel, according to the wiring diagram.
- Connect the conductors of the control devices to the terminals on the relative panel.



All unused conductors must be insulated and properly fixed in the electrical panel.

WIRING DIAGRAMS PAGE 129

CAUTION For non-standard sensors and protective devices, refer to the specific documentation supplied with the unit.

6. COMMISSIONING

6.1 General safety precautions



All operations must be carried out by skilled technical staff. Keep objects and people at a safe distance from the machines installed and do not allow people or animals to come into contact with the liquid in which they are immersed.



Before carrying out any operation, make sure that the pump and electrical panel are disconnected from the electrical mains and cannot be accidentally energized.

Before connecting the pump to the power supply panel:

- Check the level and the condition of the oil in oil chamber.
- Check that the impeller can turn freely.
- Check that the impeller turns in the correct direction (See Point 4.2).

6.2 Starting the pump



The pump must not be started if the atmosphere in the tank is potentially explosive.

Once installation is complete, the system should be tested to ensure that it is fully operational.

The pump must always be used with the safety devices installed and in good working order; make sure that all protective equipment has been connected correctly.

Check that the required gate valves (where fitted) are open.

Switch on the power supply and let the pump run briefly and:

- make sure that the pump does not operate off its characteristic curve.
- check that the input current is within the limit stated on the nameplate.
- check whether the monitoring units are operating satisfactorily (no alarms or warnings).
- check the setting of the level control system (minimum and maximum levels).

CAUTION The maximum permitted number of starts per hour must be complied with to prevent damage to the motor.



In case of abnormal noise or vibration from the pump, other pump failure, alarms or warnings, stop the pump immediately and do not restart it until the cause of the anomalies are found and fixed.

6.3 Acoustic pressure level

The pump's acoustic pressure level when in operation is below 70 dB.

However, in some systems and in some duty points on the performance curve this threshold may be exceeded.

Check the permitted acoustic pressure level in the environment where the product is installed to avoid breaching local legal requirements.



Use hearing protection when working nearby an installation in operation with a sound pressure level above 70 dB(A).

7. MAINTENANCE AND SERVICE

7.1 Introduction

Regular maintenance and inspections are indispensable to maintaining the pump's performance. For this reason, the complete unit should be cleaned thoroughly on a regular basis, maintained and inspected.

If the pump behaves differently from its normal operating condition, refer to section "9. Troubleshooting guide" of this manual and take appropriate measures at an early stage.



Do not use the pump if malfunctioning because sudden failure of the rotating parts may cause hazardous situations or damage to the motor.



Do not open the product while it is energized or in an explosive gas atmosphere.

CAUTION The instructions for inspection and maintenance of these pumps must never be viewed as "Do-it-Yourself" procedures; they require specific technical knowledge. The inspection and replacement of spare parts require specialized equipment. To have this operation performed, contact the dealer where this equipment was purchased, or the ZENIT sales office in your area.



Inspection and repairs of -Ex equipments shall be carried out in accordance with:

- EN 60079-17: Explosive atmospheres - Part 17: Electrical installations inspection and maintenance
- IEC 60034-23: Rotating electrical machines – Part 23: Repair, overhaul and reclamation
- EN 60079-19: Explosive atmospheres - Part 19: Equipment repair, overhaul and reclamation

Any interventions of the pump in -Ex versions must be carried out by an Ex-Certified Service Centre (according with international and/or local standards and rules) or by a ZENIT Service Centre by trained technicians using only original spare parts.

Failure to comply with this rule causes loss of -Ex approval.

Flameproof joint cannot be repaired.

A service and planned maintenance contract with the ZENIT Authorised Service Centre guarantees the best technical service.

The ZENIT warranty is only valid if repairs and reactive maintenance are performed by an Authorised Service Centre.

7.2 General safety precautions

Before starting any work on pumps used in liquids which could constitute a hazard to health, carry out thorough cleaning and venting of pump, tank, etc. according to local regulations.



Before cleaning and/or maintenance procedures, a skilled technician must disconnect the pump from the power supply and ensure that it cannot start up accidentally. Always disconnect the phase conductors first and then the yellow-green earth (ground) conductor.



Ensure that the pump cannot fall or roll, causing injury or damage.



After prolonged use, the surface of the pump may become very hot: allow it to cool sufficiently to avoid burns.

Always comply with the safety regulations in force in the place of installation, any local regulations and the dictates of common sense.

7.3 Planned maintenance

Maintenance intervals depend on the type of installation, the workload to which the pump is subjected and the type of liquid in which it is immersed. During planned maintenance or in any circumstances when the pump's performance deteriorates or its vibrations and noise level increase, the parts subject to wear and tear must be inspected; have this done by an Authorised Service Centre.



Schedule a maintenance plan with a maximum interval of 2 year or 9,000 hours continuous operation (whichever comes first) for electric pump re-conditioning, which includes changing the bearings and the mechanical seals.

A six-month control is also recommended to check the wear of the bearings, the mechanical seals and all other parts subject to wear, as particularly adverse or incorrect installation conditions can lead to explosion risk.

Interval	Inspection Item	
	Standard pump	-Ex pump
Weekly	Measuring the operating current: to be within the rated current.	
	Measuring the power supply voltage: within $\pm 5\%$ of the rated voltage.	
Monthly	Inspecting the pump: <ul style="list-style-type: none"> • If the pump's performance has diminished significantly, the impeller may be worn or clogged with debris. Remove any debris and replace the part if it is worn. • Inspecting cables. • Measuring the insulation resistance = 20 MΩ minimum (based on new motor). NOTE: The motor must be inspected if the insulation resistance is considerably lower than the last inspection	
Once ever 6 months or 3,000 hours, whichever comes first	Cleaning and inspection of lifting chain or rope: <ul style="list-style-type: none"> • Replace if damage, corrosion, or wear has occurred to the chain or rope. • Remove if foreign object is attaching to it. • Check winches, hooks and chains for signs of failure or wear and corrosion. Clean or lubricate them if necessary and replace any damaged components. Remove if foreign object is attaching to it. • Verify that the bolts, nuts and screws are properly tightened. When tightening, renew the threadlocker if necessary. • Check the fasteners on the bottom every time the tank is empty. 	
		Inspecting cable, oil, mechanical seals, bearings, wearing parts (impeller, suction flange...): If the oil contains water, inspect the parts and replace any damaged one.
Yearly	Inspecting cable, oil, mechanical seals, bearings, wearing parts (impeller, suction flange...). If the oil contains water, inspect the parts and replace any damaged one.	
Once every 2 years or 9000 hours, whichever comes first	Changing oil	
	Changing the mechanical seals	Changing bearings
Once every 2 to 5 years	Overhaul: The pump must be overhauled even if appears normal during operation. Especially, the pump may need to be overhauled earlier if it is used continuously.	



Always replace rubber parts (O-rings, gaskets) of disassembled components during inspection



An earth (ground) continuity test must always be performed after service.

7.4 Cleaning

Remove any debris attached to the pump's surface, and wash the pump with tap water. If the hydraulic part is fouled, clean it thoroughly. Pay particular attention to the hydraulic parts and completely remove any debris.

If the pump is used only occasionally, after each use flush out the hydraulic part to prevent the formation of deposits; run the pump for a few cycles with clean water. Also take care not to allow sediments to form on the float switches, to ensure that the start and stop thresholds remain correct.

7.5 Inspection

Verify that there is no damage, and that the bolts, nuts and screws are properly tightened.

Tighten screws with correct tightening torques (**see Point 7.6**). When tightening, renew the threadlocker if necessary.

7.5.1 Electric cable inspection



Cables and their terminations are particularly prone to damage. They shall be inspected at regular intervals and whenever is possible. Check that the electric cable is intact with no signs of pulling, cuts or other signs of misuse.

A faulty cable may enable liquids to enter the unit and may cause electrical leakage, short circuit, electrical shock or fire. Check that the cable gland is intact. Damaged or defective parts shall be replaced immediately.

7.5.2 Bearings inspection

All bearing are rolling element type grease lubricated for life. Check the shaft noisy or heavy operation (turn the shaft by hand) and in case, replace the defective ball bearings.



Defective bearings may reduce the -Ex safety.

7.5.3 Oil inspection and changing procedure

Oil change and mechanical seals inspection is necessary if the leakage detector detects an ingress of water into the seal chamber.

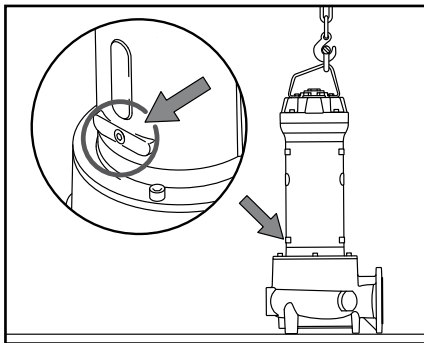
CAUTION Oil type: TOTAL Bio Hydraulic TMP FR46 oil or equivalent with ISO Viscosity Grade (Kinematic Viscosity at 40°C) 40-90 cSt, Flash point ≥ 240°C. If the recommended oil is not available, contact ZENIT.

! Possible excess pressure in the oil chamber: take care when unscrewing the oil plug. Unscrew the plug slowly, covering it with a rag of suitable size.

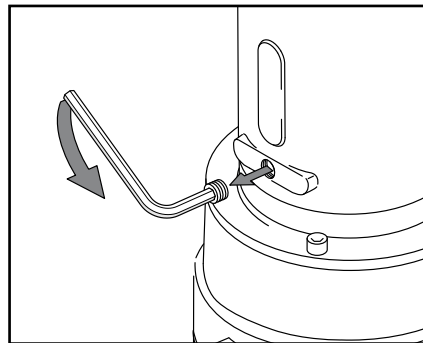
CAUTION The drained oil must be disposed of in accordance with local regulations. Consign it to a specialist disposal centre.

Oil changing procedure Enclosure type G

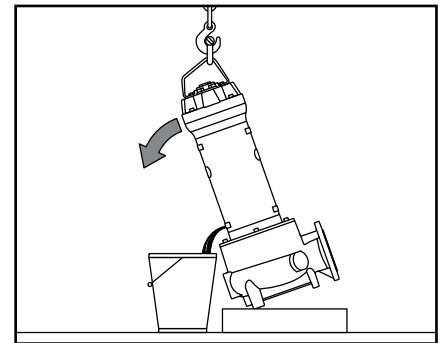
! Position the pump on a firm, even surface. Use a suitable lifting system of appropriate size. Secure it to prevent it from rolling or rocking.



1. Identify the plug of the pump's oil chamber

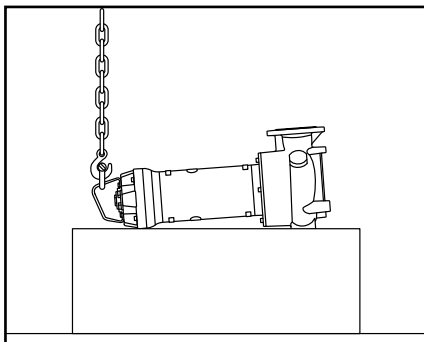


2. Unscrew the plug of the oil chamber

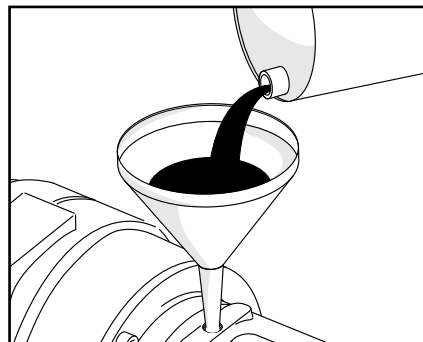


3. Allow the oil to drain into a vessel of suitable size, transparent if possible

4. Place the vessel containing the oil on a horizontal surface and let it stand for a few minutes to allow any water in it to settle to the bottom:
- Oil clean and free from water: the mechanical seal is in good condition and new oil can be placed in the system.
 - Oil with a very little water: this may be due to bedding-in of the mechanical seal during the initial operating hours. The mechanical seal is in good condition and new oil can be placed in the system.
 - Oil containing water and dirt; the mechanical seal must be inspected and replaced with a new one. The replacement must be made by an authorized Service Centre;



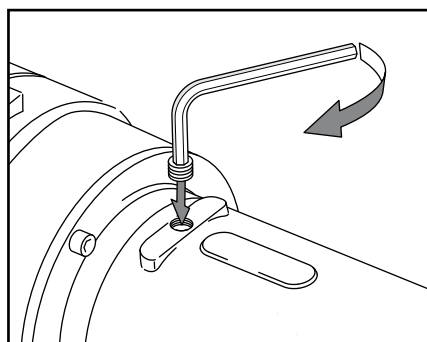
5. Lay the pump horizontal on the workbench



6. Fill the mechanical seal chamber with lubricating oil



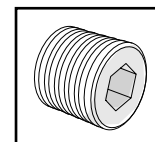
Enclosure type	Mechanical seal chamber oil capacity (ml)
G05M	140
G05L	215
G06S - G06L	310
G07S - G07L	370
G08L	570
G10S - G10L	1800



7. Screw the top plug onto the oil chamber

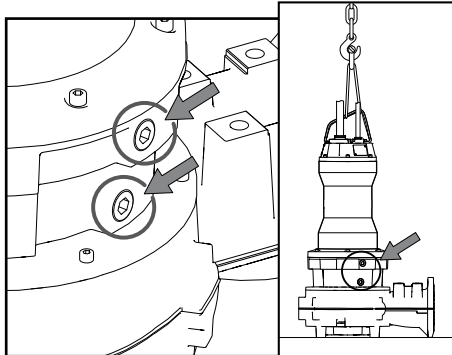
CAUTION Use Loctite 243 threadlocker or equivalents

Enclosure type	Oil chamber plug
G05M - G05L G06S - G06L G07S - G07L G08L	1/8" NPT
G10S - G10L	3/8" DIN 906

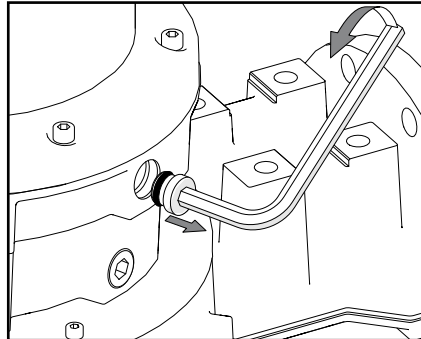


Oil changing procedure Enclosure type M

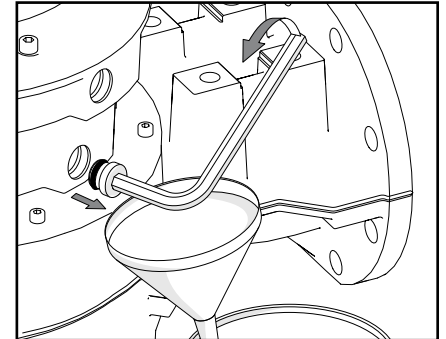
! Position the pump on a firm, even surface. Use a suitable lifting system of appropriate size. Secure it to prevent it from rolling or rocking.



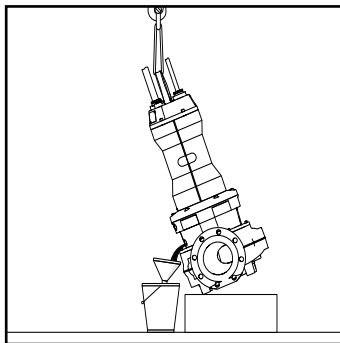
1. Identify the plugs of the pump's oil chamber



2. Unscrew the plug on the top of the oil chamber



3. Unscrew the plug on the bottom of the oil chamber

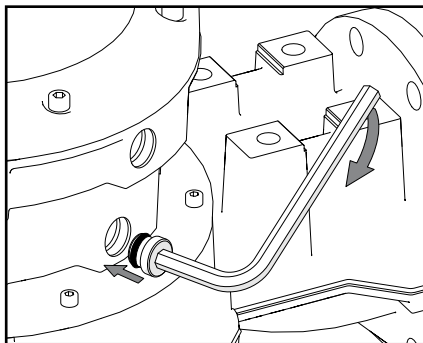


4. Allow the oil to drain into a vessel of suitable size, transparent if possible

NOTE: to check that the vessel is of sufficient capacity, refer to the Table for the amount of oil in the chamber

5. Place the vessel containing the oil on a horizontal surface and let it stand for a few minutes to allow any water in it to settle to the bottom:

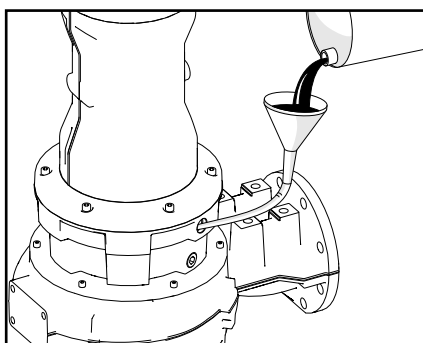
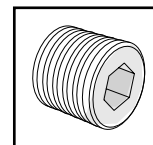
- Oil clean and free from water: the mechanical seal is in good condition and new oil can be placed in the system.
- Oil with a very little water: this may be due to bedding-in of the mechanical seal during the initial operating hours. The mechanical seal is in good condition and new oil can be placed in the system.
- Oil containing water and dirt; the mechanical seal must be inspected and replaced with a new one. The replacement must be made by an authorized Service Centre;



6. Screw the bottom plug onto the oil chamber

CAUTION Use Loctite 243 threadlocker or equivalents

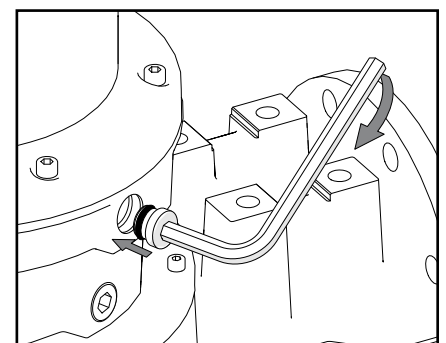
Enclosure type	Oil chamber plug
M08S - M08L	2x 3/8" DIN 906



7. Fill the mechanical seal chamber with lubricating oil



Enclosure type	Mechanical seal chamber oil capacity (ml)
M08S - M08L	2300



8. Screw the top plug onto the oil chamber



7.6 Fasteners

Fastening screw shall only be replaced with identical ones in accordance with the following chart:

Fasteners	Material	Grade-Property class
Hexagon head screws (EN ISO 4017)	Stainless steel	A2-70 or A2-80, A4-70, A4-80 (EN ISO 3506-1)
Hexagon socket head cap screws (EN ISO 4762)		
Hexagon bolts with flange (ISO 4162)	Galvanized carbon steel	8.8 (EN ISO 898-1)

Tightening torques (Nm)

M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
2.7	5.4	9.0	22	44	76	187	364	629	1240

CAUTION Use Loctite 243 threadlocker or equivalents

8. DISPOSAL

Appropriate waste sorting for the subsequent recycling, treatment and disposal in an environmentally sound way of the disused equipment avoids negative effects on the environment or human health and favours the re-use or recycling of the equipment's materials.

Properly dispose of the product by disassembling it, presorting the contents, and sending them to the waste material treatment site.

Use the public or private waste collection service in accordance with the relevant local laws and regulations.

Consult your local municipality, the nearest waste disposal site, or the dealer who sold the product to you for information on proper disposal.



The crossed bin symbol on the equipment, or its packaging, indicates that the product must be collected separately from other waste at the end of its useful life and not with mixed urban waste.

9. TROUBLESHOOTING GUIDE

CAUTION Checks and corrective work must only be performed by skilled technician.

Before starting any work on the pump, make sure that the fuses have been removed or the mains switch has been switched off.

It must be ensured that the power supply cannot be accidentally switched on. All rotating parts must have stopped moving.

Make sure that no one is near the pump when the power supply is reconnected to conduct checks that require voltage.

Failure to do so could result in death or serious injury.

	Problem	Possible cause	Solution
1	The pump fails to start or, starts but stop immediately	No proper power is supplied (i.e. power outage, voltage drop, etc.)	Contact a skilled electrician
		Power cable is faulty or disconnected	Inspect the cable and check that the connections to power line are properly tightened
		Malfunction in control system (control panel).	Have the cause investigated and repaired by a skilled electrician
		Fuses blown	Check fuses type and rating and replace them with correct ones
		Tripped circuit breaker	Refer to Point 2
		Tripped thermal protector	Refer to Point 3
		Leakage detector alarm	Refer to Point 9
		Tripped residual current device (RCD)	Refer to Point 4
		Damaged or wrongly connected capacitor (single phase motor)	Contact a skilled electrician to replace the capacitor and check that it's correctly connected
Tripped level control	Check that the level switches are correctly connected and functioning		

	Problem	Possible cause	Solution
2	The power supply circuit breaker trips	Phase voltages too low or not balanced	Contact a skilled electrician
		Wrong electrical connection	Contact a skilled electrician to check and correct the electrical installation
		Overload relay is set too low or is faulty	Check the overload relay. Set the relay according with the rated current on the dataplate
		Stator windings are faulty	Contact an authorised service center
		Clogged hydraulic	Clean the hydraulic parts and remove the blocking material
		Blocked rotor	Contact an authorised service center
3	The thermal protection trips after a short operating time	The pump is immersed in a liquid which is too hot	Cool down the liquid
		Clogged hydraulic	Clean the hydraulic parts and remove the blocking material
		Internal moving parts are damaged	Contact an authorised service center
		Uncorrect voltage	Check that the supplied voltage matches with the one on the pump's dataplate
		Fault in bearings	Contact an authorised service center
		Starts per hour exceed the permitted number	Refer to Point 6
4	Tripped residual current device (RCD)	Water in the motor	Contact an authorised service center
		Low motor winding insulation	Contact an authorised service center
		Fault in cable	Have the cable checked and repaired by a qualified electrician
5	The pump operates but the flow is low or null	Clogged hydraulic	Clean the hydraulic parts and remove the blocking material
		Clogged outlet pipe	Clean the outlet pipe
		Blocked non-return valve	Clean the non-return valve
		Outlet valve blocked or closed	Open and/or clean the outlet valve
		Wrong direction of rotation	Check the direction of rotation, interchange any two of the phases
		Leakage in the pipeline	Check the pipeline and fix the leakage causes
6	Starts per hour exceed the permitted number	Wrong setting of the level switches	Correct the level switches setting
		Level control malfunction	check the level switches functionality
		Turbulence near the level switches	Remove the causes of turbulence or change the positioning of the level switches
		Undersized tank	Adjust the tank dimension
7	Noisy operation and excessive vibrations	Internal moving parts are damaged	Contact an authorised service center
		Fault in bearings	Contact an authorised service center
		Impeller blades are dirty, damaged or worn	Contact an authorised service center
		Blocked impeller	Clean the hydraulic parts and remove the blocking material
		Impeller rotates in the wrong direction	Check the direction of rotation, interchange any two of the phases
		Electrical phase missing	Contact a skilled electrician
		Oscillation caused by the installation	Check installation structure
8	The pump works correctly but absorbed current is too high	Wrong duty point	Make sure the pump operates within its operative range
		Uncorrect voltage	Check that the supplied voltage matches with the one on the pump's dataplate
		Clogged hydraulic	Clean the hydraulic parts and remove the blocking material
		Fault in bearings	Contact an authorised service center
		Impeller rotates in the wrong direction	Check the direction of rotation, interchange any two of the phases
9	Leakage detection	Damaged cables, o-rings or cable glands	Contact an authorised service center
		Wearing or breaking down of mechanical seals or o-rings	

