

Installation, Operation, and Maintenance manual

8147.020/.190 Bravo 300



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1 Introduction and Safety

1.1 Introduction

Purpose of the manual

The purpose of this manual is to provide the necessary information for working with the unit. Read this manual carefully before starting work.

Read and keep the manual

Save this manual for future reference, and keep it readily available at the location of the unit.

Intended use



WARNING:

Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment and the surroundings. This includes any modification to the equipment or use of parts not provided by Grindex. If there is a question regarding the intended use of the equipment, please contact a Grindex representative before proceeding.

Other manuals

See also the safety requirements and information in the original manufacturer's manuals for any other equipment furnished separately for use in this system.

1.2 Safety terminology and symbols

About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product and its surroundings
- Product malfunction

Hazard levels

Hazard level	Indication
 DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury
 WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury
 CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury

Hazard level	Indication
NOTICE:	Notices are used when there is a risk of equipment damage or decreased performance, but not personal injury.

Special symbols

Some hazard categories have specific symbols, as shown in the following table.

Electrical hazard	Magnetic fields hazard
 Electrical Hazard:	 CAUTION:

1.3 User safety

All regulations, codes, and health and safety directives must be observed.

The site

- Observe lockout and tagout procedures before starting work on the product, such as transportation, installation, maintenance, or service.
- Pay attention to the risks presented by gas and vapors in the work area.
- Always be aware of the area surrounding the equipment, and any hazards posed by the site or nearby equipment.

Qualified personnel

This product must be installed, operated, and maintained by qualified personnel only.

Protective equipment and safety devices

- Use personal protective equipment as needed. Examples of personal protective equipment include, but are not limited to, hard hats, safety goggles, protective gloves and shoes, and breathing equipment.
- Make sure that all safety features on the product are functioning and in use at all times when the unit is being operated.

1.4 Ex-approved products

Follow these special handling instructions if you have an Ex-approved unit.

Personnel requirements

These are the personnel requirements for Ex-approved products in potentially explosive atmospheres:

- All work on the product must be carried out by certified electricians and Grindex-authorized mechanics. Special rules apply to installations in explosive atmospheres.
- All users must know about the risks of electric current and the chemical and physical characteristics of the gas, the vapor, or both present in hazardous areas.
- Any maintenance for Ex-approved products must conform to international and national standards (for example, IEC/EN 60079-17).

Grindex disclaims all responsibility for work done by untrained and unauthorized personnel.

Product and product handling requirements

These are the product and product handling requirements for Ex-approved products in potentially explosive atmospheres:

- Only use the product in accordance with the approved motor data.
- The equipment must never run dry during operation. The volute must be filled with liquid during operation. Dry running during service and inspection is only permitted outside the classified area.
- Before you start work on the product, make sure that the product and the control panel are isolated from the power supply and the control circuit, so they cannot be energized.
- Do not open the product while it is energized or in an explosive gas atmosphere.
- Intrinsically safe circuits are normally required for the automatic level-control system by the level regulator if mounted in zone 0.
- The yield stress of fasteners must be in accordance with the approval drawing and the product specification.
- Do not modify the equipment without approval from an authorized Grindex representative.
- Only use parts that are provided by an authorized Grindex representative.
- The thermal contacts that are fitted to the stator windings must be connected correctly to a separate motor control circuit and in use. The thermal contacts shall be connected to a monitoring device, which disconnects the power supply immediately upon activation. This action prevents the rise of temperatures above the temperature value for the approval classification.
- The width of flameproof joints is more than the values specified in the tables of the EN/IEC 60079-1 standard. For information contact the manufacturer.
- The gap of flameproof joints is less than the values specified in Table 2 of the EN/IEC 60079-1 standard. For information contact the manufacturer.
- It is NOT allowed to repair the flameproof joints.
- Ambient temperature: -20°C to 60°C (T3); -20°C to 25°C (T4)

Guidelines for compliance

Compliance is fulfilled only when you operate the unit within its intended use. Do not change the conditions of the service without the approval of a Grindex representative. When you install or maintain explosion proof products, always comply with the directive and applicable standards (for example, IEC/EN 60079-14).

Minimum permitted liquid level

See the dimensional drawings of the product for the minimum permitted liquid level according to the approval for explosion proof products. If the information is missing on the dimensional drawing, the product must be fully submerged. Level-sensing equipment must be installed if the product can be operated at less than the minimum submersion depth.

Monitoring equipment

For additional safety, use condition-monitoring devices. Examples of condition-monitoring devices include, but are not limited to, the following:

- Level indicators
- Temperature detectors in addition to the stator thermal detectors

Any thermal detectors or thermal protection devices delivered with the pump must be installed and in use at all times.

The site owner is responsible for selection, installation, and proper maintenance of functional monitoring equipment for motor protection.

1.5 Special hazards

1.5.1 Working in temporary installations

Certain industries, such as mining or construction, have a dynamic nature and require temporary installation of equipment. Due to the rugged nature of these applications, normal use of electrical equipment causes wear and tear that can result in insulation breaks, short-circuits, and exposed wires. To maximize safety when using the unit in rugged applications, the following conditions must be met:

- If electrical cables must be located such that they are at risk of being run over by heavy equipment, then provide mechanical protection to prevent physical damage to the cables.
- Visually inspect electrical equipment before use. Remove from service any equipment with exposed wires or visible damage.
- Use ground-fault circuit interrupters on all receptacles, or have an assured equipment grounding conductor program.

1.5.2 Biological hazards

The product is designed for use in liquids that can be hazardous to your health. Observe these rules when you work with the product:

- Make sure that all personnel who may come into contact with biological hazards are vaccinated against diseases to which they may be exposed.
- Observe strict personal cleanliness.



WARNING: Biological Hazard

Infection risk. Rinse the unit thoroughly with clean water before working on it.

1.5.3 Wash the skin and eyes

Follow these procedures for chemicals or hazardous fluids that have come into contact with your eyes or your skin:

Condition	Action
Chemicals or hazardous fluids in eyes	<ol style="list-style-type: none"> 1. Hold your eyelids apart forcibly with your fingers. 2. Rinse the eyes with eyewash or running water for at least 15 minutes. 3. Seek medical attention.
Chemicals or hazardous fluids on skin	<ol style="list-style-type: none"> 1. Remove contaminated clothing. 2. Wash the skin with soap and water for at least 1 minute. 3. Seek medical attention, if necessary.

1.6 Protecting the environment

Emissions and waste disposal

Observe the local regulations and codes regarding:

- Reporting of emissions to the appropriate authorities
- Sorting, recycling and disposal of solid or liquid waste
- Clean-up of spills

Exceptional sites**CAUTION: Radiation Hazard**

Do NOT send the product to Xylem if it has been exposed to nuclear radiation, unless Xylem has been informed and appropriate actions have been agreed upon.

EN

1.7 End-of-life product disposal

Handle and dispose of all waste in compliance with local laws and regulations.

EU and UK only: Correct disposal of this product – waste electrical and electronic equipment

- EU: Directive 2012/19/EU on waste electrical and electronic equipment (WEEE)
- UK: SI 2013 No. 3113



WS0009973B

This marking on the product, accessories or literature indicates that the product should not be disposed of with other waste at the end of its working life.

1.8 Spare parts**CAUTION:**

Only use the manufacturer's original spare parts to replace any worn or faulty components. The use of unsuitable spare parts may cause malfunctions, damage, and injuries as well as void the warranty.

1.9 Warranty

For information about warranty, see the sales contract.

2 Transportation and Storage

2.1 Examine the delivery

2.1.1 Examine the package

1. Examine the package for damaged or missing items upon delivery.
2. Record any damaged or missing items on the receipt and freight bill.
3. If anything is out of order, then file a claim with the shipping company.
If the product has been picked up at a distributor, make a claim directly to the distributor.

2.1.2 Examine the unit

1. Remove packing materials from the product.
Dispose of all packing materials in accordance with local regulations.
2. To determine whether any parts have been damaged or are missing, examine the product.
3. If applicable, unfasten the product by removing any screws, bolts, or straps.
Use care around nails and straps.
4. If there is any issue, then contact a sales representative.

2.2 Transportation guidelines

2.2.1 Precautions



DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.



Position and fastening

The unit can be transported either horizontally or vertically. Make sure that the unit is correctly fastened during transportation, and cannot roll or fall over.

2.2.2 Lifting

Always inspect the lifting equipment and tackle before starting any work.



WARNING: Crush Hazard

Always lift the unit by its designated lifting points.
Use suitable lifting equipment and ensure that the product is properly harnessed.
Wear personal protective equipment.
Stay clear of cables and suspended loads.

NOTICE:

Never lift the unit by its cables or hose.

Lifting equipment

Lifting equipment is always required when handling the unit. It must fulfill the following requirements:

- The minimum height (contact Grindex for information) between the lifting hook and the floor must be sufficient to lift the unit.
- The lifting equipment must be able to hoist the unit straight up and down, preferably without the need for resetting the lifting hook.
- The lifting equipment must be securely anchored and in good condition.
- The lifting equipment must support weight of the entire assembly and must only be used by authorized personnel.
- Two sets of lifting equipment must be used to lift the unit for repair work.
- The lifting equipment must be dimensioned to lift the unit with any remaining pumped media in it.
- The lifting equipment must not be oversized.



CAUTION: Crush Hazard

Improperly-dimensioned lifting equipment can lead to injury. A site-specific risk analysis must be done.

2.3 Temperature ranges for transportation, handling and storage

Handling at freezing temperature

At temperatures below freezing, the product and all installation equipment, including the lifting gear, must be handled with extreme care.

Make sure that the product is warmed up to a temperature above the freezing point before starting up. Avoid rotating the impeller/propeller by hand at temperatures below the freezing point. The recommended method to warm the unit up is to submerge it in the liquid which will be pumped or mixed.

NOTICE:

Never use a naked flame to thaw the unit.

Unit in as-delivered condition

If the unit is still in the condition in which it left the factory - all packing materials are undisturbed - then the acceptable temperature range during transportation, handling and storage is: -50°C (-58°F) to $+60^{\circ}\text{C}$ ($+140^{\circ}\text{F}$).

If the unit has been exposed to freezing temperatures, then allow it to reach the ambient temperature of the sump before operating.

Lifting the unit out of liquid

The unit is normally protected from freezing while operating or immersed in liquid, but the impeller/propeller and the shaft seal may freeze if the unit is lifted out of the liquid into a surrounding temperature below freezing.

Follow these guidelines to avoid freezing damage:

1. Empty all pumped liquid, if applicable.
2. Check all liquids used for lubrication or cooling, both oil and water-glycol mixtures, for the presence of unacceptable amounts of water. Change if needed.

Water-glycol mixtures: Units equipped with an internal closed-loop cooling system are filled with a mixture of water and 30% glycol. This mixture remains a flowing liquid at temperatures down to -13°C (9°F). Below -13°C (9°F), the viscosity increases such that the glycol mixture will lose its flow properties.

However, the glycol-water mixture will not solidify completely and thus cannot harm the product.

2.4 Storage guidelines

Storage location

The product must be stored in a covered and dry location free from heat, dirt, and vibrations.

NOTICE:

Protect the product against humidity, heat sources, and mechanical damage.

NOTICE:

Do not place heavy weights on the packed product.

Long-term storage

If the unit is stored for more than six months, then the following apply:

- Before operating the unit after storage, it must be inspected. Special attention must be given to the seals and the cable entry.
- The impeller or propeller must be rotated every other month to prevent the seals from sticking together.

3 Product Description

3.1 Products included

Pump model	Standard version	Ex-proof	Slurry
Bravo 300, 8147.020	X		X
Bravo 300, 8147.190		X	X

3.2 Pump design

The pump is submersible, and driven by an electric motor.

Intended use

The product is intended for moving waste water, sludge, raw and clean water. Always follow the application limits given in [Technical Reference](#) on page 48. If there is a question regarding the intended use of the equipment, then contact a sales or authorized service representative before proceeding.



DANGER: Explosion/Fire Hazard

Special rules apply to installations in explosive or flammable atmospheres. Do not install the product or any auxiliary equipment in an explosive zone unless it is rated explosion-proof or intrinsically-safe. If the product is rated explosion-proof or intrinsically-safe, then see the specific explosion-proof information in the safety chapter before taking any further actions.

NOTICE:

Do NOT use the unit in highly corrosive liquids.

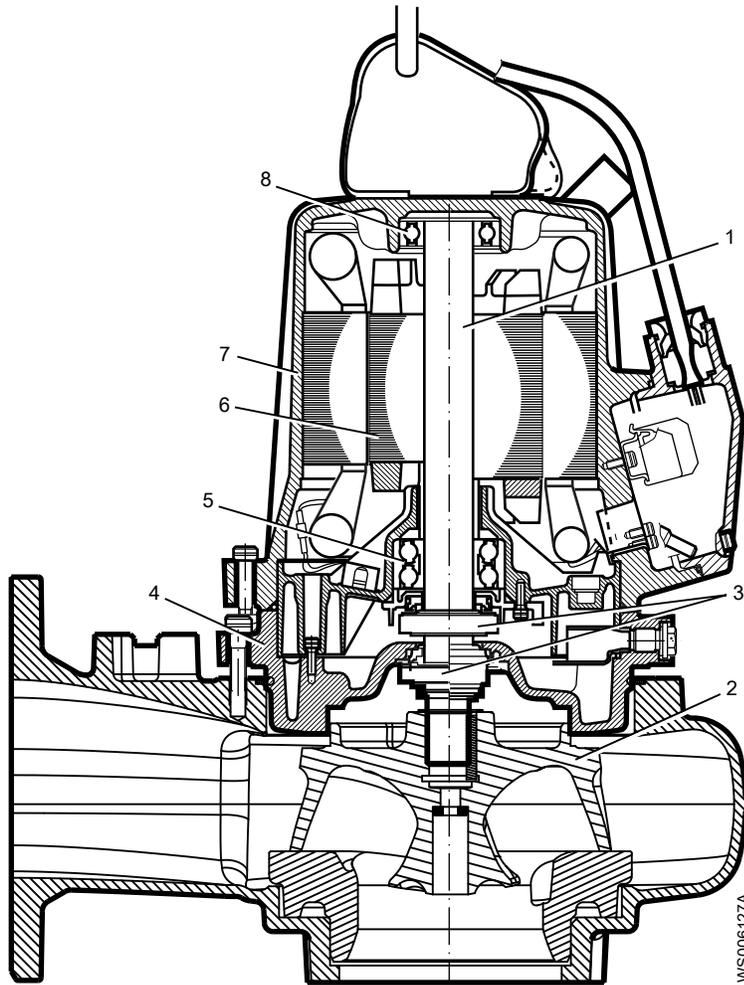
Spare parts

- Modifications to the unit or installation should only be carried out after consulting with Grindex.
- Original spare parts and accessories authorized by Grindex are essential for compliance. The use of other parts can invalidate any claims for warranty or compensation. For more information, contact a sales or authorized service representative.

Pressure class

H High head

Parts



Position	Part	Description
1	Shaft	The shaft is made of stainless steel, with an integrated rotor.
2	Impeller	H-impeller
3	Mechanical seals	One inner and one outer seal in a combination of materials: <ul style="list-style-type: none"> • Aluminium oxide Al_2O_3 • Corrosion-resistant cemented carbide WCCR For information about the pumps mechanical seals, see Parts List.
4	Oil housing	lubricates and cools the seals; the housing acts as a buffer between the pumped liquid and the drive unit.
5	Main bearing	The bearing consisting of a two-row angular contact ball bearing.
6	Motor	For information about the motor, see Technical Reference on page 48.
7	Stator housing	The pump is cooled by the ambient liquid/air.
8	Support bearing	The bearing consisting of a single-row ball bearing.

3.3 Sensors and monitoring equipment

The following applies to the monitoring equipment of the pump:

- The stator incorporates three thermal contacts connected in series that activate the alarm and stops the pump at overtemperature
- The thermal contacts open at 125°C (257°F).
- Ex-approved pumps must have thermal contacts connected to the control panel.
- The sensors and optional sensors must be connected to the monitoring equipment.
- The monitoring equipment must be of a design that makes automatic restart impossible.
- Information in the junction box shows if the pump is equipped with optional sensors.

Optional sensors

FLS FLS is a miniature float switch for detection of liquid in the stator housing. Due to its design it is best suited for pumps in a vertical position. The FLS sensor is installed in the bottom of the stator housing.

CLS CLS is a sensor for detection of water in the oil housing. The sensor initiates an alarm when the oil contains approximately 35% water. The sensor is installed in the bearing housing/bearing holder with its sensing part in the oil housing. The CLS sensor is not applicable to Ex-approved pumps.

NOTICE:

The CLS sensor body is made of glass. Handle the sensor with care.

One CLS and one FLS sensor can be used in the same pump, if they are connected in parallel.

3.4 The data plate

Introduction

The data plate is a metal label located on the main body of the pump. The data plate lists key product specifications.

The data plate

This list of callouts is applicable for all versions of data plates:

1. Pump type number
2. Frequency
3. Phases, type of current
4. Rated shaft power
5. Thermal class
6. WEEE-Directive symbol
7. Locked rotor code-letter
8. Country of origin
9. Maximum power consumption
10. Product weight
11. Maximum submersion depth
12. Degree of protection
13. Maximum capacity
14. Rated current
15. Direction of the start reaction
16. Direction of the impeller rotation
17. Maximum head

18. Serial number

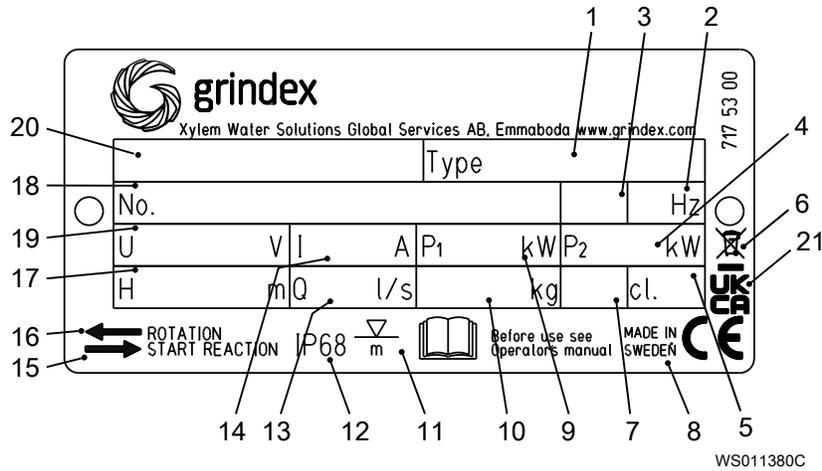
The first two characters describe the production year.

19. Rated voltage

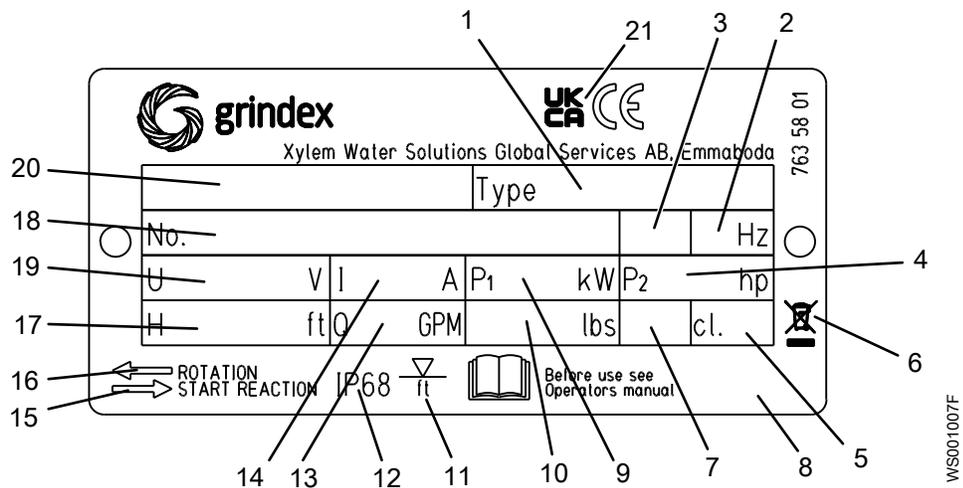
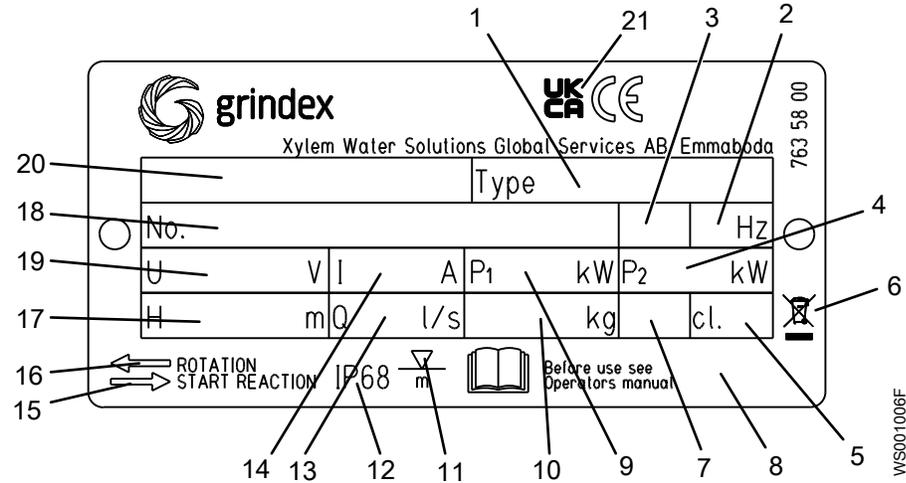
20. Pump model

21. UKCA marking

This is the data plate for non explosion-proof version .020:



These are the data plates for explosion-proof version .190:



3.5 Motor regulation

This product is submersible and therefore exempted from the motor efficiency requirement, in accordance with EU commission regulation 2019/1781 Article 2(2)(e).

EN

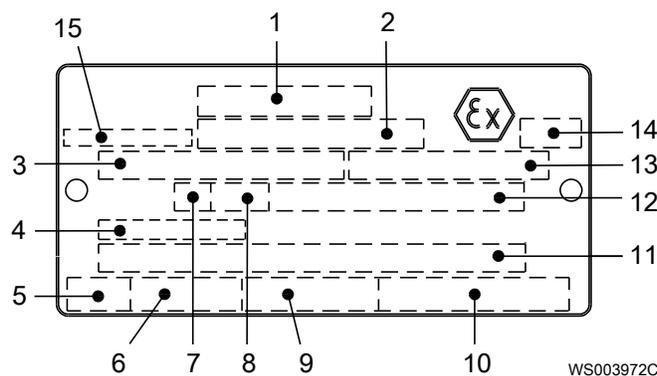
3.6 Approvals

Product approvals for hazardous locations

Pump	Approval
8147.190	European Norm (EN) <ul style="list-style-type: none"> • ATEX Directive 2014/34/EU • EN IEC 60079-0:2018, EN 60079-1:2014, EN ISO 80079-36:2016, EN ISO 80079-37:2016 •  II 2 G Ex db h IIB T4 Gb •  I M2 Ex db h I Mb
	IEC <ul style="list-style-type: none"> • IECEx scheme 02 • IEC 60079-0:2017, IEC 60079-1:2014-06, ISO 80079-36:2016, ISO 80079-37:2016 • Ex db h IIB T4 Gb • Ex db h I Mb
	FM (FM Approvals) <ul style="list-style-type: none"> • Explosion proof for use in Class I, Div. 1, Group C and D • Dust ignition proof for use in Class II, Div. 1, Group E, F and G • Suitable for use in Class III, Div. 1, Hazardous Locations
	UKEx <ul style="list-style-type: none"> • UK SI 2016 No. 1107 • EN IEC 60079-0:2018, EN 60079-1:2014, EN ISO 80079-36:2016, EN ISO 80079-37:2016 •  II 2 G Ex db h IIB T4 Gb •  I M2 Ex db h I Mb

EN approval plate

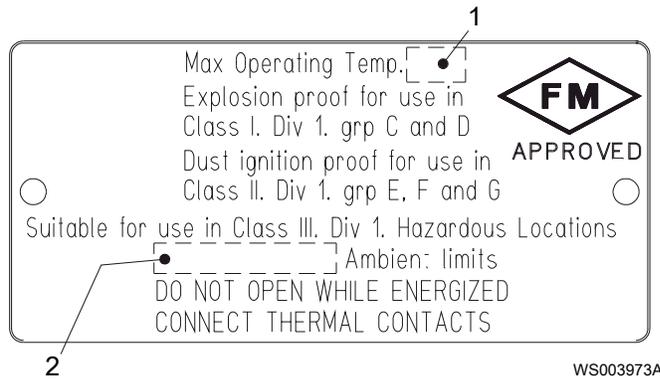
This illustration describes the EN approval plate and the information that is contained in its fields.



1. Approval
2. Approval authority and Approval number
3. Approved drive unit
4. Cable entry temperature
5. Stall time
6. Starting current or Rated current
7. Duty class
8. Duty factor
9. Input power
10. Rated speed
11. Additional information
12. Maximum ambient temperature
13. Serial number
14. ATEX marking
15. Country of origin

FM approval plate

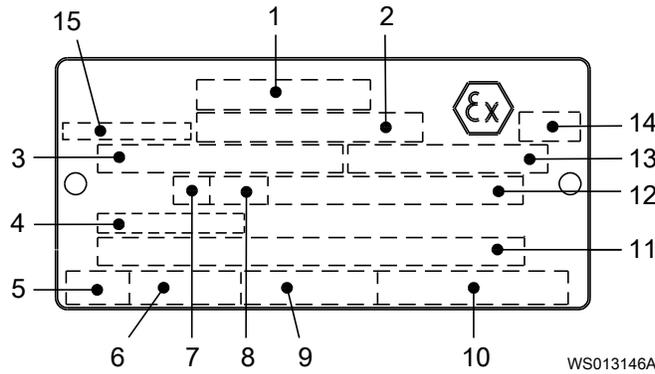
This illustration describes the FM approval plate and the information that is contained in its fields.



- 1. Temperature class
- 2. Maximum ambient temperature

United Kingdom: UKEx approval plate

This illustration describes the UKEx approval plate and the information that is contained in its fields.



- 1. Approval
- 2. Approval authority and Approval number
- 3. Approved drive unit
- 4. Cable entry temperature
- 5. Stall time
- 6. Starting current or Rated current
- 7. Duty class
- 8. Duty factor
- 9. Input power
- 10. Rated speed
- 11. Additional information
- 12. Maximum ambient temperature
- 13. Serial number
- 14. UKEx marking
- 15. Country of origin

4 Installation

4.1 Precautions

EN

Before starting work, make sure that the safety instructions have been read and understood.



DANGER: Electrical Hazard

Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.



DANGER: Inhalation Hazard

Before entering the work area, make sure that the atmosphere contains sufficient oxygen and no toxic gases.

4.1.1 Hazardous atmospheres



DANGER: Explosion/Fire Hazard

Special rules apply to installations in explosive or flammable atmospheres. Do not install the product or any auxiliary equipment in an explosive zone unless it is rated explosion-proof or intrinsically-safe. If the product is rated explosion-proof or intrinsically-safe, then see the specific explosion-proof information in the safety chapter before taking any further actions.

General requirements

These requirements apply:

- Use the pump dimensional drawing in order to ensure proper installation.

Before installing the pump, do the following:

- Provide a suitable barrier around the work area, for example, a guard rail.
- Make sure that equipment is in place so that the unit cannot roll or fall over during the installation process.
- Check the explosion risk before you weld or use electric hand tools.
- Check that the cable and cable entry have not been damaged during transport.
- Always remove all debris and waste material from the sump, inlet piping, and discharge connection, before you install the pump.

NOTICE:

Do not run the pump dry.

NOTICE:

Never force piping to make a connection with a pump.

Authority regulation

Vent the tank of a sewage station in accordance with local plumbing codes.

Fasteners

- Only use fasteners of the correct size and material.
- Replace all corroded or damaged fasteners.
- Make sure that all the fasteners are correctly tightened and that there are no missing fasteners.

4.2 Make the electrical connections

4.2.1 General precautions



DANGER: Electrical Hazard

Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.



WARNING: Electrical Hazard

Risk of electrical shock or burn. A certified electrician must supervise all electrical work. Comply with all local codes and regulations.



WARNING: Electrical Hazard

There is a risk of electrical shock or explosion if the electrical connections are not correctly carried out, or if there is fault or damage on the product. Visually inspect equipment for damaged cables, cracked casings or other signs of damage. Make sure that electrical connections have been correctly made.



WARNING: Crush Hazard

Risk of automatic restart.



CAUTION: Electrical Hazard

Prevent cables from becoming sharply bent or damaged.

NOTICE:

Leakage into the electrical parts can cause damaged equipment or a blown fuse. Keep the cable ends dry at all times.

Requirements

These general requirements apply for the electrical installation:

- If the pump will be connected to the public mains, then the supply authority must be notified before installing the pump. When the pump is connected to the public power supply, it can cause flickering of incandescent lamps when started.
- The mains voltage and frequency must agree with the specifications on the data plate. If the pump can be connected to different voltages, then follow the specified voltage on the yellow sticker close to the cable entry.
- If the operation can be intermittent, such as S3 periodic duty, then the pump must be supplied with monitoring equipment supporting such operation.

- If stated on the data plate, then the motor is convertible between different voltages.
- The thermal contacts or thermistors must be in use.
- For FM-approved pumps, a leakage sensor must be connected and in use to meet approval requirements.

Motor and short-circuit protection

NOTICE:

A qualified electrician must select the size of motor protection breakers and fuses. The size must be chosen for the specific motor data such as rated current and starting current.

It is important that the short-circuit protection is not over-dimensioned. Over-dimensioned fuses or motor protection breakers decrease the protection for the motor.

- The fuse rating and the cables must be in accordance with the local rules and regulations.
- The fuses and circuit breakers must have the correct rating.
- The pump overload protection must be connected and set to the rated current.

The starting current in direct-on-line start can be up to six times higher than the rated current.

For more information, see the data plate and if applicable, the cable chart for the rated current.

Cables

When cables are installed, these requirements must be followed:

- The cables must be in good condition, not have any sharp bends, and not be pinched.
- The cables must not be damaged and must not have indentations.
- The cables must not be embossed at the cable entry.
- The cable entry seal sleeve and washers must conform to the outer diameter of the cable.
- The minimum bend radius must not be smaller than the accepted value.
- If a cable is reused, a short piece at the end must be peeled off when the cable is refitted. This action is necessary so that the seal sleeve of the cable entry does not close around the cable at the same point again. If the outer jacket of the cable is damaged, then the cable must be replaced.

Contact a sales or authorized service representative.

- The voltage drop in long cables must be considered. The rated voltage of the drive unit is the voltage that is measured at the cable connection point in the pump.
- If a variable frequency drive (VFD) is used, the screened cable must be used according to the European CE and EMC requirements. For more information, contact a sales or authorized service representative.
- For SUBCAB™ cables, the twisted pair copper foil must be trimmed.
- All unused conductors must be insulated.

4.2.2 Grounding (earthing)

Grounding (earthing) must be done in compliance with all local codes and regulations.

**DANGER: Electrical Hazard**

All electrical equipment must be grounded (earthed). Test the ground (earth) lead to verify that it is connected correctly and that the path to ground is continuous.

**WARNING: Electrical Hazard**

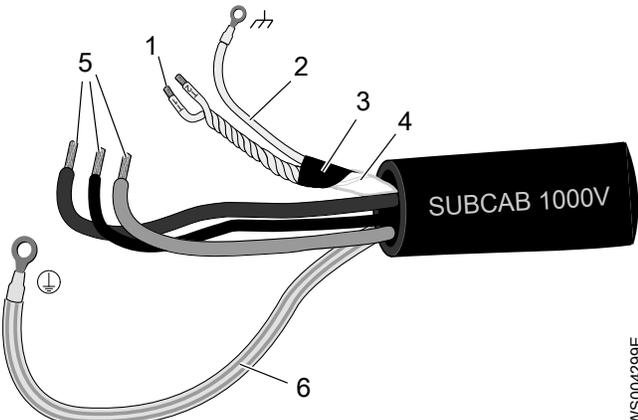
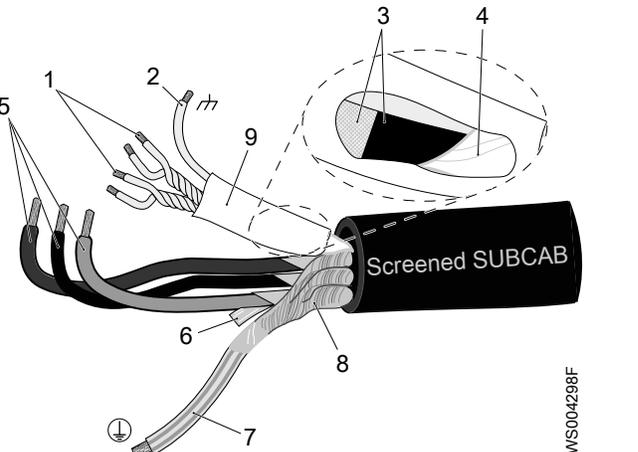
Risk of electrical shock. The ground (earth) lead must be sufficiently longer than the phase leads to make sure that the ground lead is the last to become disconnected if the cable is jerked loose.

**WARNING: Electrical Hazard**

Risk of electrical shock or burn. You must connect an additional ground- (earth-) fault protection device to the grounded (earthed) connectors if persons are likely to come into contact with liquids that are also in contact with the pump or pumped liquid.

4.2.3 Prepare the SUBCAB™ cables

This section applies to SUBCAB™ cables with twisted-pair control conductors.

The prepared SUBCAB™ cable	The prepared screened SUBCAB™ cable, without cable lugs
 <p>1. T1+T2 twisted pairs in control element 2. Drain wire in control element (tinned copper strands) with shrink tube 3. Aluminum and textile layers 4. Insulation jacket or plastic jacket, for the control element 5. Power conductors 6. Ground (earth) conductor with yellow-green shrink tube</p> <p style="text-align: right;">WS004299E</p>	 <p>1. T1+T2 and T3+T4 twisted pairs in control element 2. Drain wire in control element (tinned copper strands) with shrink tube 3. Aluminum and textile layers 4. Insulation jacket or plastic jacket, for the control element 5. Power conductors 6. Plastic laminated aluminum foil, screen 7. Ground (earth) conductor with yellow-green shrink tube 8. Uncovered screen/braided wire 9. shrink tube</p> <p style="text-align: right;">WS004298F</p>

1. Peel off the outer jacket at the end of the cable.
2. Prepare the control element:
 - a) Peel the insulation jacket or plastic jacket.
 - b) Peel the aluminum and textile layers.

The aluminum foil is a conductive screen. Do not peel more than necessary, and remove the peeled foil.

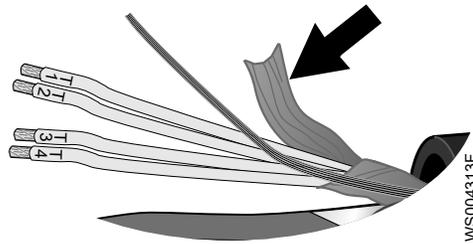


Figure 1: Aluminum foil on the control element.

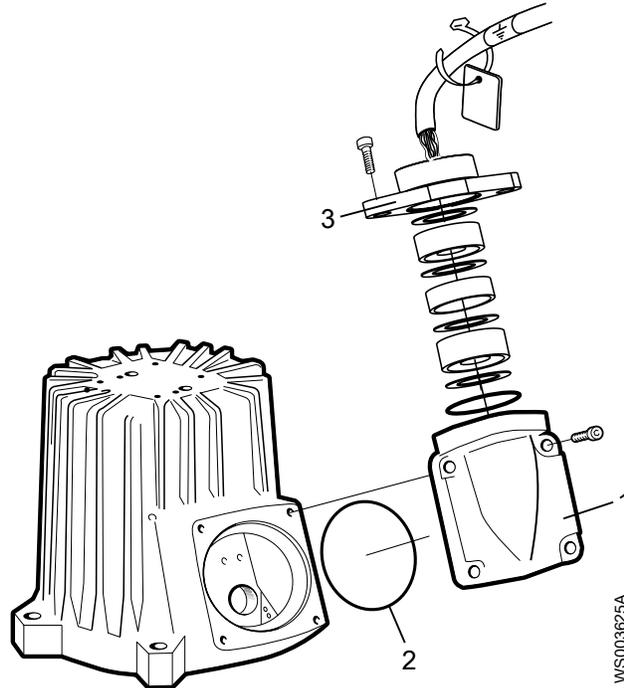
- c) Put a white shrink tube over the drain wire.
- d) Twist T1+T2 and T3+T4.
- e) Put a shrink tube over the control element.
Make sure that the conductive aluminum foil and drain wire are covered.
3. Prepare the ground (earth) conductor of the SUBCAB™ cable:
 - a) Peel the yellow-green insulation from the ground (earth) conductor.
 - b) Check that the ground (earth) conductor is at least 10% longer than the phase conductors in the cabinet.
 - c) If applicable, put a cable lug on the ground conductor.
4. Prepare the ground (earth) conductor of the screened SUBCAB™ cable:
 - a) Untwist the screens around the power conductors.
 - b) Twist all power conductor screens together to create a ground (earth) conductor.
 - c) Put a yellow-green shrink tube over the ground (earth) conductor.
Leave a short piece uncovered.
 - d) Check that the connected ground (earth) conductor has sufficient slack.
The conductor must stay connected even if the power conductors are pulled loose.
5. Prepare the power conductors:
 - a) Remove the aluminum foil around each power conductor.
 - b) Peel the insulation from each power conductor.
6. Prepare the ends of the ground (earth) conductor, the power conductors, and the drain wire:

Connection type	Action
Screw	Fit cable lugs to the ends.
Terminal block	Fit end sleeves or leave the ends as they are.

4.2.4 Connect the motor cable to the pump

NOTICE:

Leakage into the electrical parts can cause damaged equipment or a blown fuse. Keep the end of the motor cable dry at all times.



1. Entrance cover
2. O-ring
3. Entrance flange

1. Remove the entrance cover and the O-ring from the stator housing.
This provide access to the terminal board/closed end splices.
2. Check the data plate to see which connections are required for the power supply.
3. Arrange the connections on the terminal board/closed end splices in accordance with the required power supply.
4. Connect the mains leads (L1, L2, L3, and ground (earth)) according to applicable cable chart.
The ground (earth) lead must be 50 mm (2.0 in.) longer than the phase leads in the junction box of the unit.
5. Make sure that the pump is correctly connected to ground (earth).
6. Make sure that any thermal contacts incorporated in the pump are properly connected to the terminal block/closed end splices.
7. Install the entrance cover and the O-ring on the stator housing.
8. Fasten the screws on the entrance flange so that the cable insertion assembly bottoms out.

4.2.5 Connect the motor cable to the starter and monitoring equipment



DANGER: Explosion/Fire Hazard

Special rules apply to installations in explosive or flammable atmospheres. Do not install the product or any auxiliary equipment in an explosive zone unless it is rated explosion-proof or intrinsically-safe. If the product is rated explosion-proof or intrinsically-safe, then see the specific explosion-proof information in the safety chapter before taking any further actions.

NOTICE:

- Thermal contacts are incorporated in the pump.
- Thermal contacts must never be exposed to voltages higher than 250 V, breaking current maximum 4 A. It is recommended that they are connected to 24 V over separate fuses to protect other automatic equipment.

1. Connect the T1 and T2 control conductors to the monitoring equipment.
Do not connect the T1 and T2 leads to thermal contacts if the temperature of the pumped liquid is above 40°C (104°F).

NOTICE:

Ex-approved products must always have the thermal contacts connected irrespective of the ambient temperature.

2. Connect the mains leads (L1, L2, L3, and earth [ground]) to the starter equipment.
For information about the phase sequence and the color codes of the leads, see [Cable charts](#) on page 23.
3. Check the functionality of the monitoring equipment:
 - a) Check that the signals and the tripping function work properly.
 - b) Check that the relays, lamps, fuses, and connections are intact.
 Replace any defective equipment.

4.2.6 Cable charts

Description

This topic contains general connection information. It also provides cable charts that show connection alternatives for use with different cables and power supply.

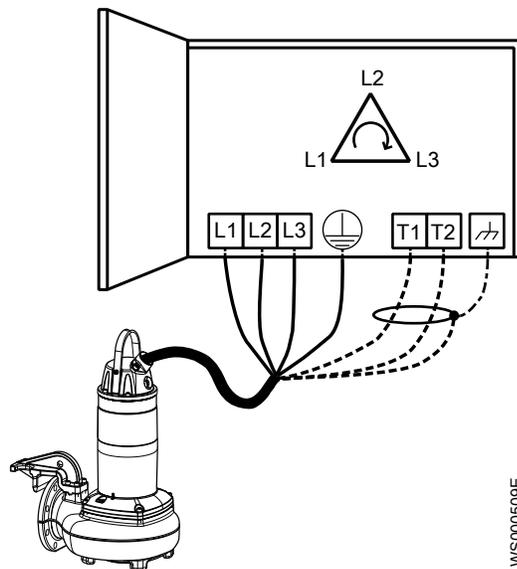
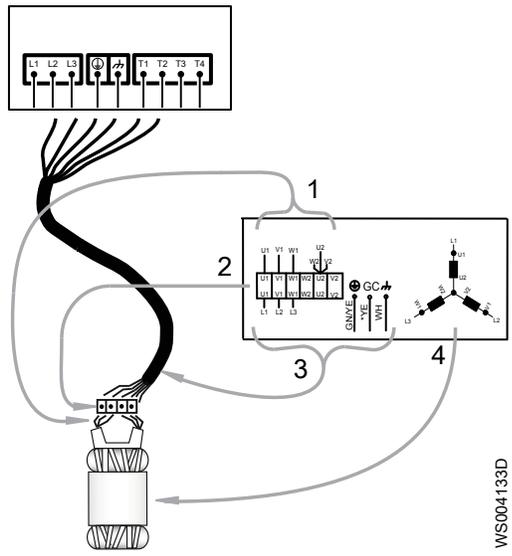


Figure 2: Phase sequence

Connection locations

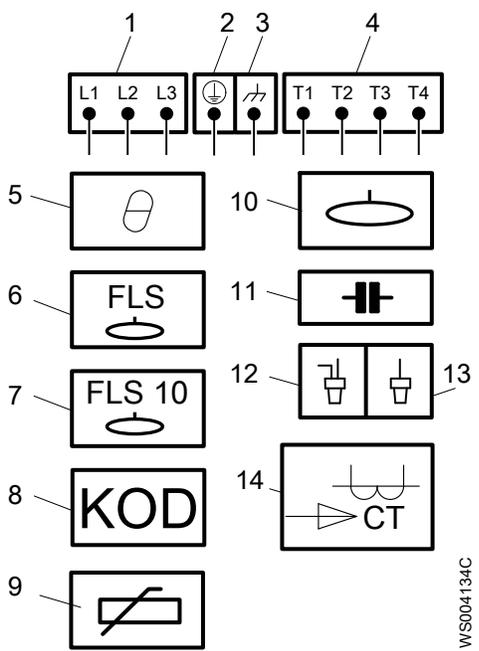
The figures in this section illustrate how to interpret the connection strip symbols.

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1. Stator leads
2. Terminal board
3. Power cable leads
4. Stator (internal connection illustrated)

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1. Starter equipment and mains leads (L1, L2, L3)
2. Ground (earth)
3. Functional ground
4. Control leads (T1, T2, T3, T4)
5. Thermal contact
6. FLS
7. FLS 10
8. CLS
9. Thermistor
10. Level sensor
11. Capacitor
12. Crimp connection
13. Crimp isolation
14. Current transformer

WS004134C

Color code standard

Code	Description
BN	Brown
BK	Black
WH	White
OG	Orange
GN	Green
GNYE	Green-Yellow
RD	Red
GY	Grey
BU	Blue

Code	Description
YE	Yellow

Colors and markings of leads

Motor connection		Mains 1 ~ 3 ~	SUBCAB 7GX Screenflex 7GX	SUBCAB 4GX Screenflex 4GX	HCR S07E6E5 H07RN	SUBCAB AWG	SUBCAB Screened	
Colors and marking of main leads		1	L1	BK 1	BN	BK 1	RD	BN
COLOR STANDARD BN=Brown BK=Black WH=White OG=Orange GN=Green GN/YE=Green-Yellow RD=Red GY=Grey BU=Blue YE=Yellow	STATOR LEADS U1,U5 RD U2,U6 GN V1,V5 BN V2,V6 BU W1,W5 YE W2,W6 BK T1,T2 WH/YE *SUBCAB AWG ** Ground Conductor is stranded around cores GC=Ground Check	2	L2	BK 2	BK	BK 2	BK	BK
		3	L3	BK 3	GY	BK 3	WH	GY
			L1	BK 4	-	BK 4	-	-
			L2	BK 5	-	BK 5	-	-
			L3	BK 6	-	BK 6	-	-
				GN/YE	GN/YE	GN/YE	GN/YE	-
				Screen (WH)	Screen (WH)	-	-	Screen (WH)
			GC	-	-	-	YE	-

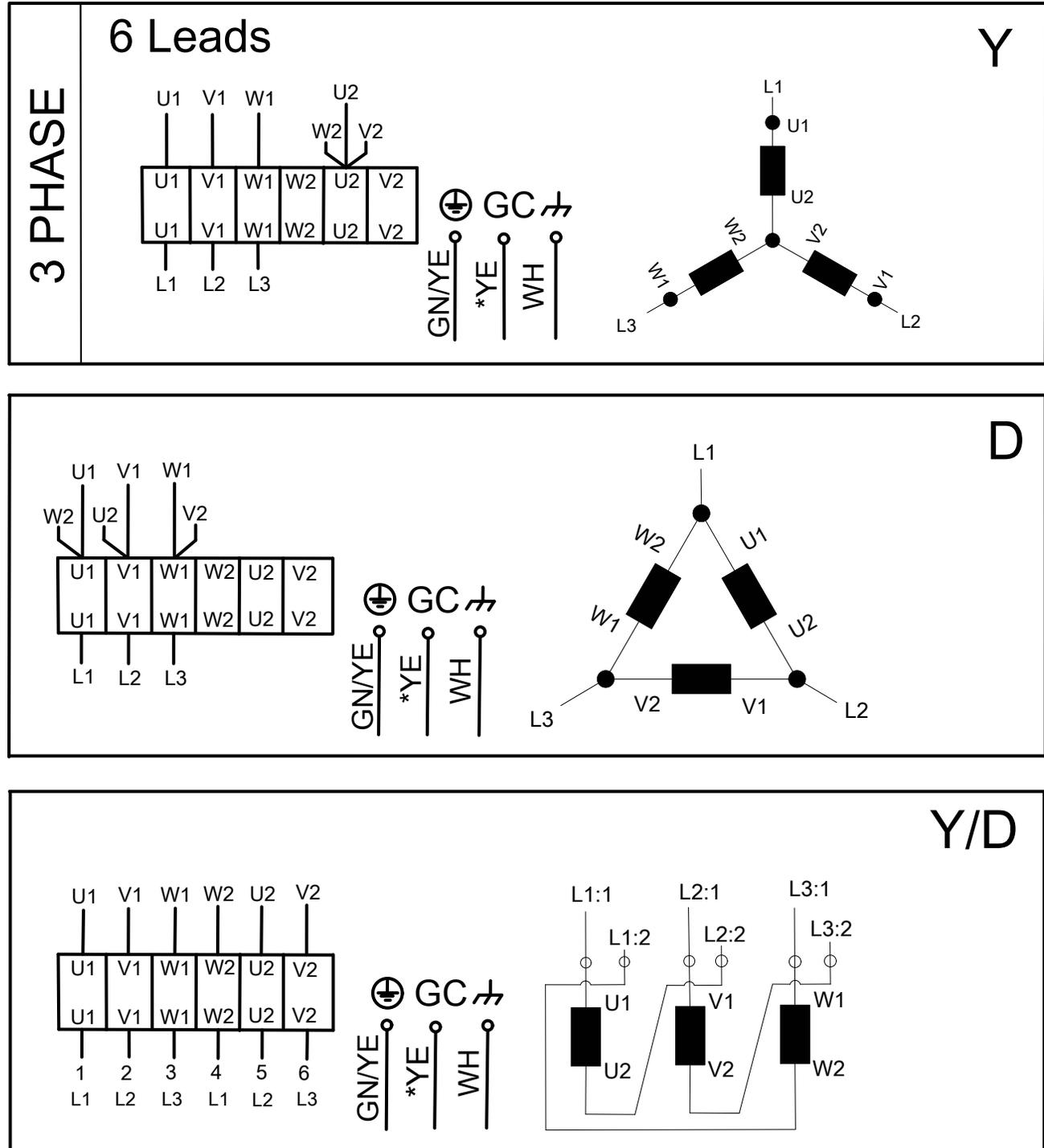
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Figure 3: Motor connection

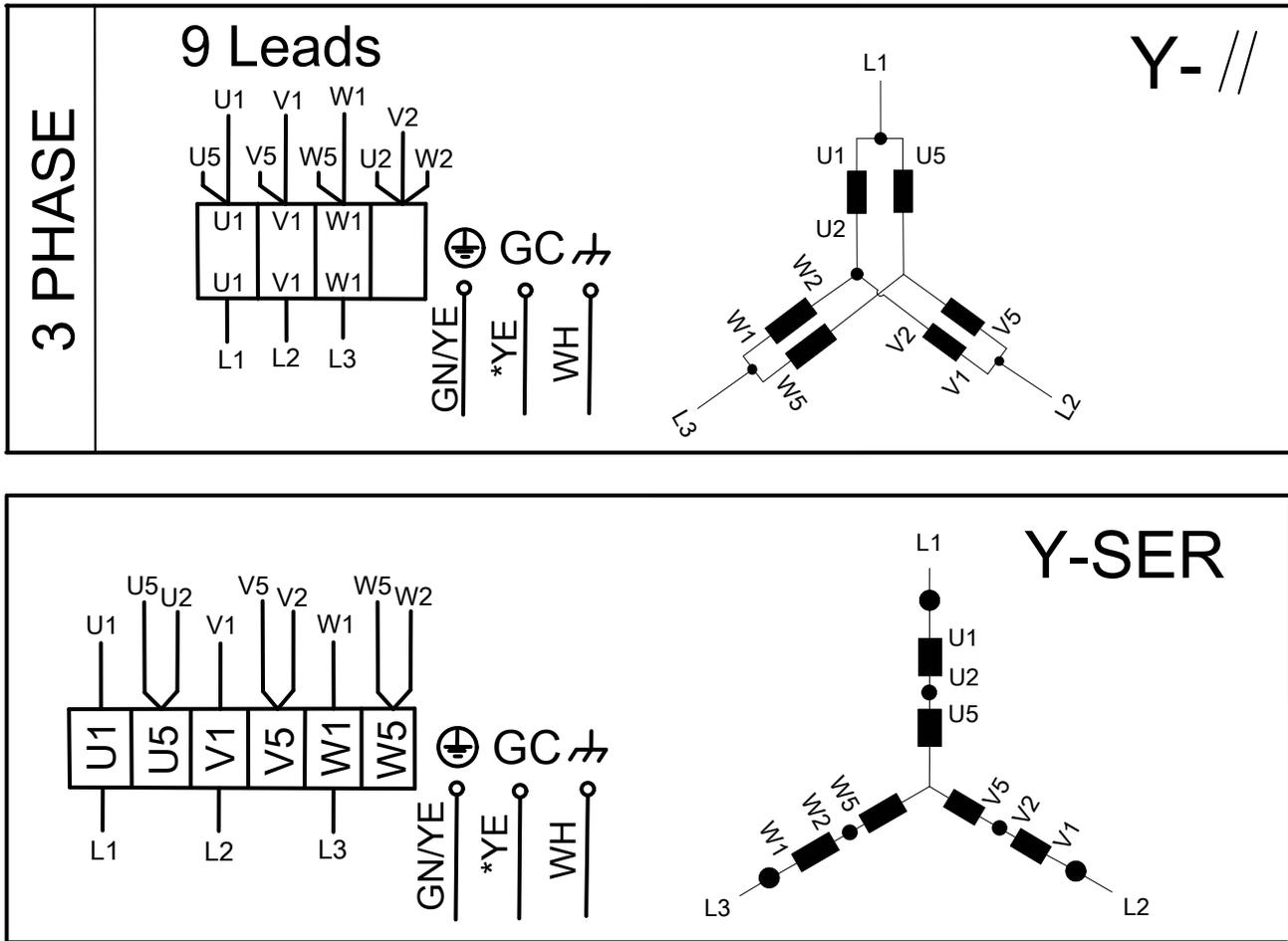
3-phase connection

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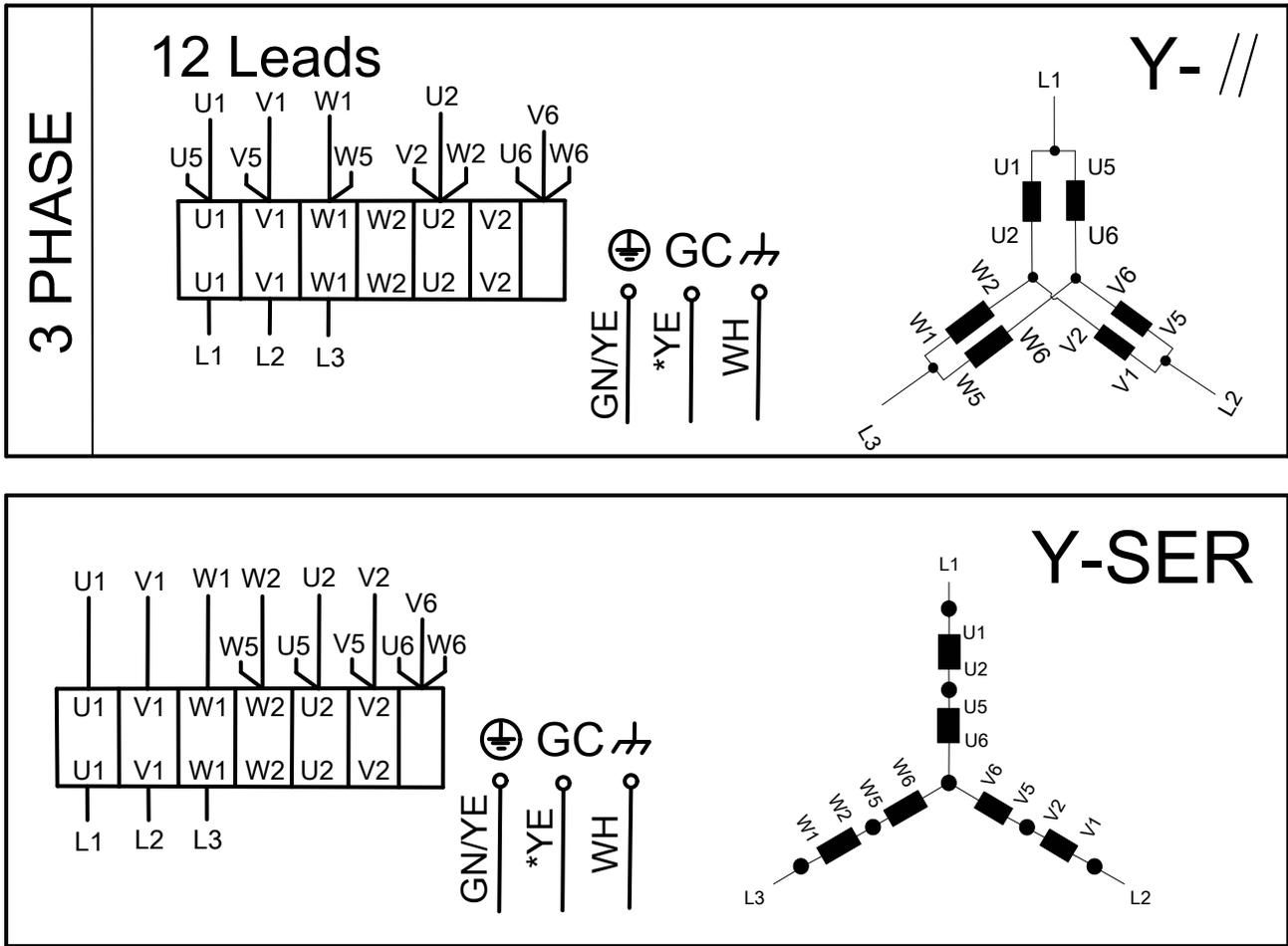
Figure 4: 6 leads



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Figure 5: 9 leads

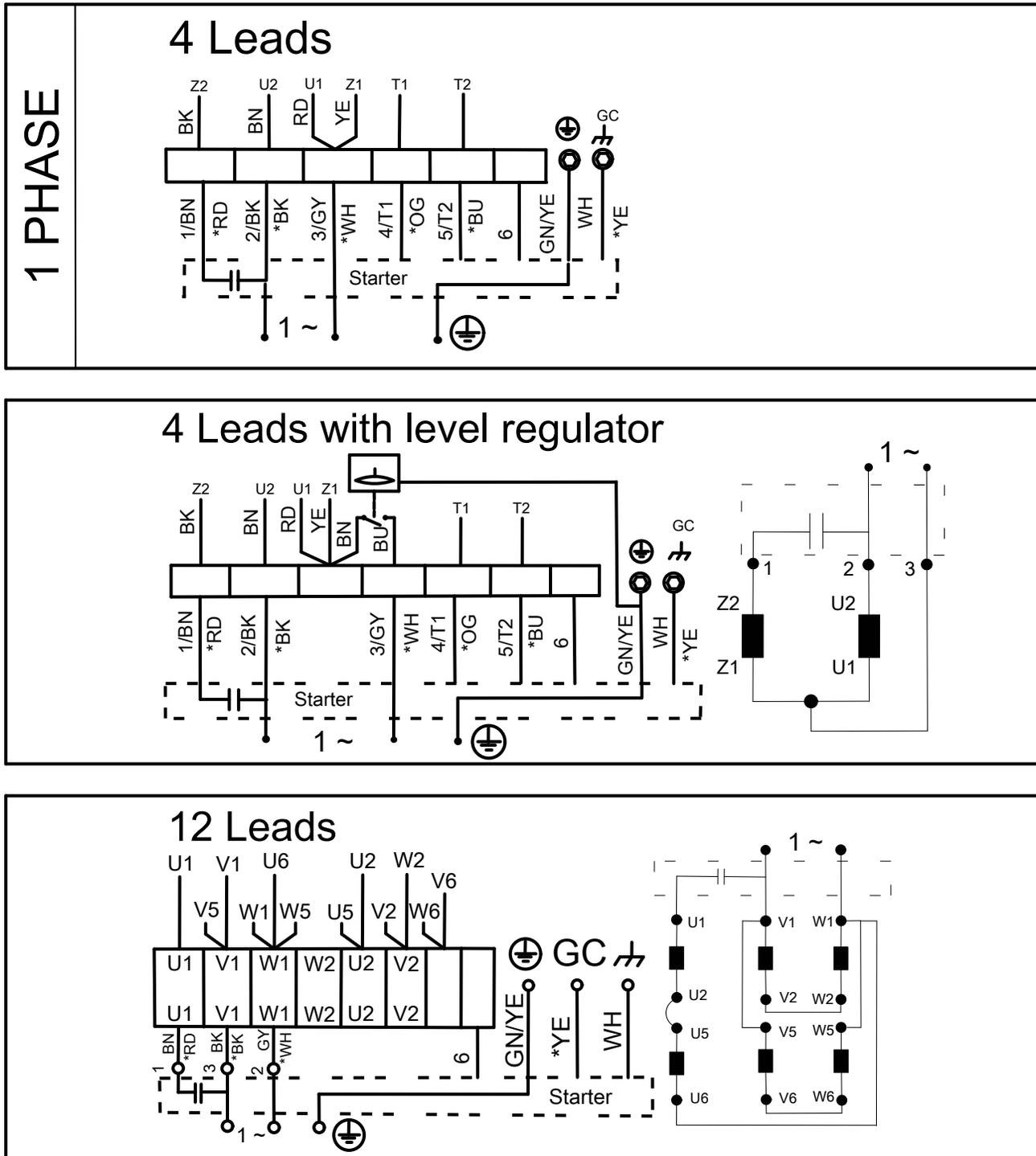
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Figure 6: 12 leads

1-phase connection



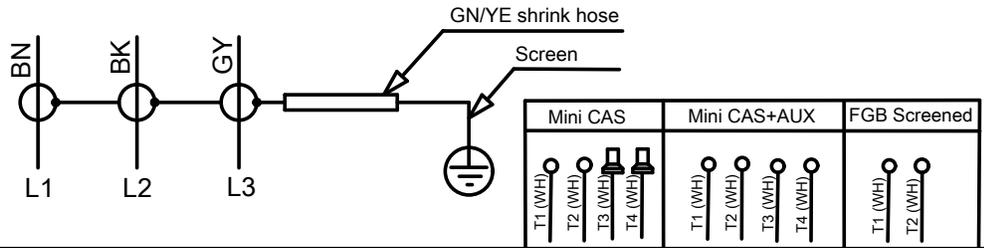
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Figure 7: 4 leads, 4 leads with level regulator, 12 leads

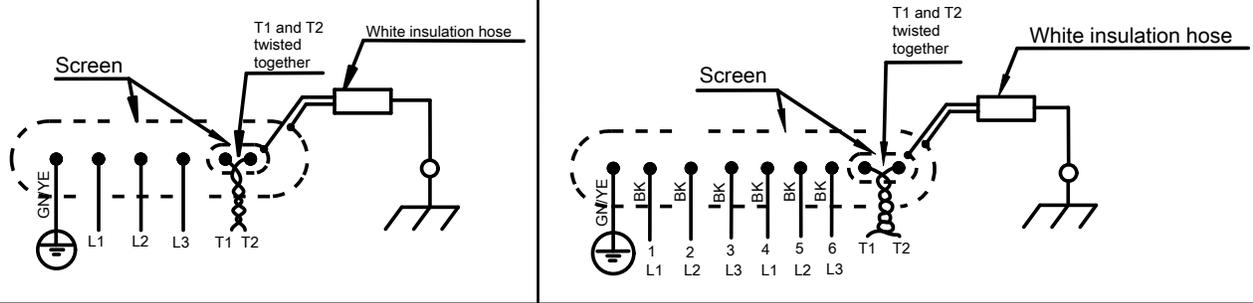
Screened cable connection

Screened connection SUBCAB & FGB Screened

Cable without sep. ground conductor
Screen as ground conductor



Screen - SUBCAB and Screenflex



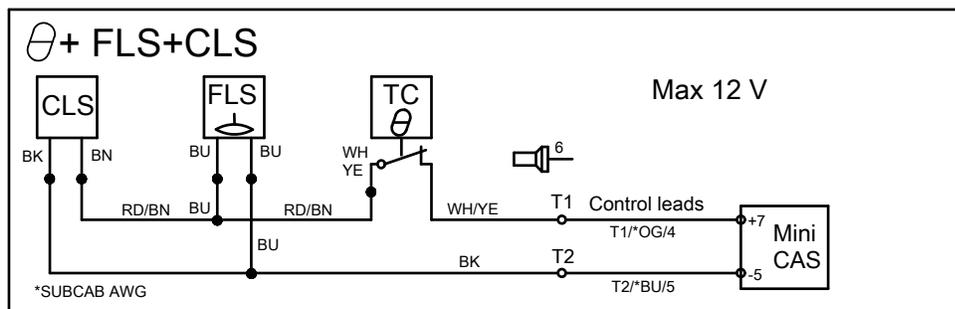
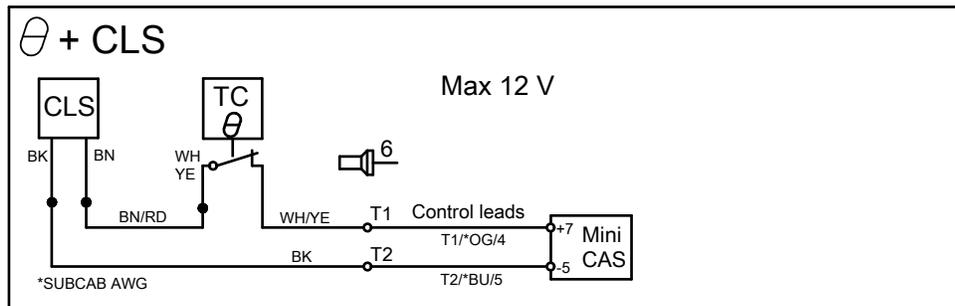
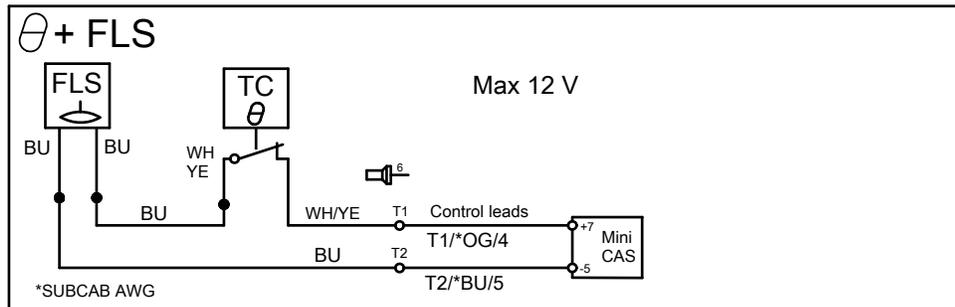
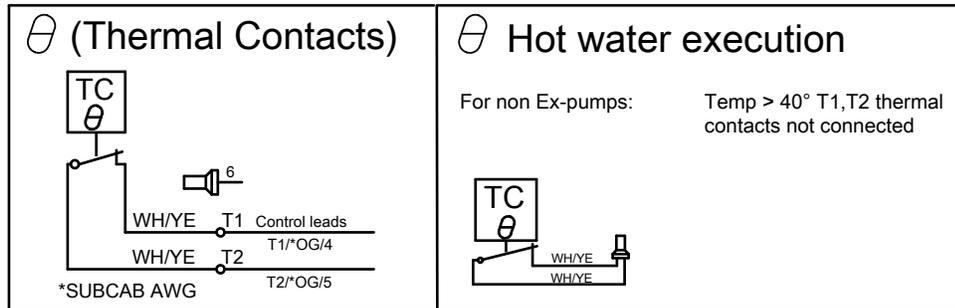
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Figure 8: Screened connection SUBCAB and FGB screened, SUBCAB and Screenflex

Sensors connection

SENSORS	Control	SUBCAB 7GX & 4GX Screenflex	HCR S07E6E5 7GX	H07RN-F 10GX	SUBCAB AWG	SUBCAB screened	SUBCAB 7 x 1.5
	T1	WH T1	BK 4	BK 7	OG	WH T1	1
	T2	WH T2	BK 5	BK 8	BU	WH T2	2
	T3	-	BK 6	BK 9	-	WH T3	3
	T4	-	-	-	-	WH T4	-

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Sensor connection characteristics

The values have a 10 % tolerance.

Sensors	Value (mA)	Definition
FLS and thermal contact	0	Overtemperature
	7.8	OK
	36	Leakage
CLS and thermal contact	0	Overtemperature
	5.5	OK
	29	Leakage (5 seconds delay)
CLS, FLS and thermal contact	0	Overtemperature
	13.3	OK
	36–42	Leakage (0/5 seconds delay)

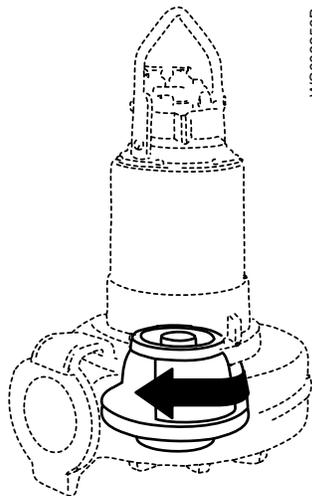
4.3 Check the impeller rotation



CAUTION: Crush Hazard

The starting jerk can be powerful. Make sure nobody is close to the unit when it is started.

1. Start the motor.
2. Stop the motor after a few seconds.
3. Check that the impeller rotates according to this illustration.



The correct direction of impeller rotation is clockwise when you look at the pump from above.

4. If the impeller rotates in the wrong direction, then do one of these steps:
 - If the motor has a 1-phase connection, then contact a sales or authorized service representative.
 - If the motor has a 3-phase connection, then transpose two phase leads and do this procedure again.

5 Operation

5.1 Precautions

Before taking the unit into operation, check the following:

- All recommended safety devices are installed.
- The cable and cable entry have not been damaged.
- All debris and waste material has been removed.

NOTICE:

Never operate the pump with the discharge line blocked, or the discharge valve closed.



WARNING: Crush Hazard

Risk of automatic restart.

Distance to wet areas



WARNING: Electrical Hazard

Risk of electrical shock or burn. You must connect an additional ground- (earth-) fault protection device to the grounded (earthed) connectors if persons are likely to come into contact with liquids that are also in contact with the pump or pumped liquid.



CAUTION: Electrical Hazard

Risk of electrical shock or burn. The equipment manufacturer has not evaluated this unit for use in swimming pools. If used in connection with swimming pools then special safety regulations apply.

Noise level

NOTICE:

The sound power level of the product is lower than 70 dB(A). However, in some installations the resulting sound pressure level may exceed 70 dB(A) at certain operating points on the performance curve. Make sure that you understand the noise level requirements in the environment where the product is installed. Failure to do so may result in hearing loss or violation of local laws.

5.2 Start the pump



CAUTION: Crush Hazard

The starting jerk can be powerful. Make sure nobody is close to the unit when it is started.



CAUTION: Thermal Hazard

The surfaces or parts of the unit may become hot during operation. Allow surfaces to cool before starting work, or wear heat-protective clothing.

NOTICE:

Make sure that the rotation of the impeller is correct. For more information, see Check the impeller rotation.

1. Check the oil level in the oil housing.
 2. Remove the fuses or open the circuit breaker, and check that the impeller can rotate freely.
-



WARNING: Crush Hazard

Never put your hand into the pump housing.

3. Conduct insulation test phase to ground. To pass, the value must exceed 5 megaohms.
4. Check that the monitoring equipment works.
5. Start the pump.

6 Maintenance

6.1 Precautions

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Before starting work, make sure that the safety instructions have been read and understood.



DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.



DANGER: Inhalation Hazard

Before entering the work area, make sure that the atmosphere contains sufficient oxygen and no toxic gases.



WARNING: Biological Hazard

Infection risk. Rinse the unit thoroughly with clean water before working on it.



CAUTION: Crush Hazard

Make sure that the unit cannot roll or fall over and injure people or damage property.

Make sure that you follow these requirements:

- Check the explosion risk before you weld or use electrical hand tools.
- Allow all system and pump components to cool before you handle them.
- Make sure that the product and its components have been thoroughly cleaned.
- Before starting work, make sure that the work area is well-ventilated.
- Do not open any vent or drain valves or remove any plugs while the system is pressurized. Make sure that the pump is isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, or disconnect piping.

Ground continuity verification

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

6.2 Maintenance guidelines

During the maintenance and before reassembly, always remember to perform these tasks:

- Clean all parts thoroughly, particularly O-ring grooves.
- Change all O-rings, gaskets, and seal washers.
- Lubricate all springs, screws, O-rings with grease.

During the reassembly, always make sure that existing index markings are in line.

The reassembled drive unit must always be insulation-tested and the reassembled pump must always be test-run before normal operation.

6.3 Torque values

All screws and nuts must be lubricated to achieve correct tightening torque. Screws that are screwed into stainless steel must have the threads coated with applicable lubricants to prevent seizing.

If there is a question regarding the tightening torques, then contact a sales or authorized service representative.

Screws and nuts

Table 1: Stainless steel, A2 and A4, torque Nm (lbf-ft)

Property class	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
50	1.0 (0.74)	2.0 (1.5)	3.0 (2.2)	8.0 (5.9)	15 (11)	27 (20)	65 (48)	127 (93.7)	220 (162)	434 (320)
70, 80	2.7 (2)	5.4 (4)	9.0 (6.6)	22 (16)	44 (32)	76 (56)	187 (138)	364 (268)	629 (464)	1240 (915)
100	4.1 (3)	8.1 (6)	14 (10)	34 (25)	66 (49)	115 (84.8)	248 (183)	481 (355)	—	—

Table 2: Steel, torque Nm (lbf-ft)

Property class	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
8.8	2.9 (2.1)	5.7 (4.2)	9.8 (7.2)	24 (18)	47 (35)	81 (60)	194 (143)	385 (285)	665 (490)	1310 (966.2)
10.9	4.0 (2.9)	8.1 (6)	14 (10)	33 (24)	65 (48)	114 (84)	277 (204)	541 (399)	935 (689)	1840 (1357)
12.9	4.9 (3.6)	9.7 (7.2)	17 (13)	40 (30)	79 (58)	136 (100)	333 (245)	649 (480)	1120 (825.1)	2210 (1630)

Table 3: Brass, torque Nm (lbf-ft)

M5	M8	M10
2.7 (2.0)	11 (8.1)	22 (16.2)

Hexagon screws with countersunk heads

For hexagon socket head screws with countersunk head, maximum torque for all property classes must be 80% of the values for property class 8.8.

Round nuts with set screws

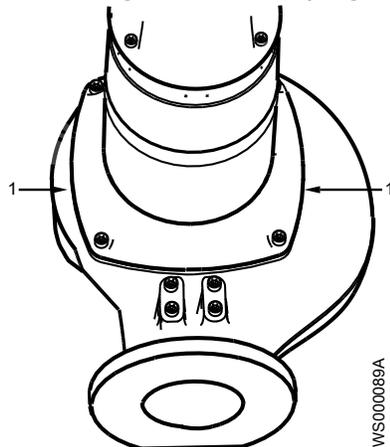
Table 4: Set screw, torque Nm (lbf-ft)

The torque values are only valid for the set screw, and not for the round nut.

M8	M10
18 (13)	35 (26)

6.4 Change the oil

This image shows the plugs that are used to change the oil.



1. Oil plug

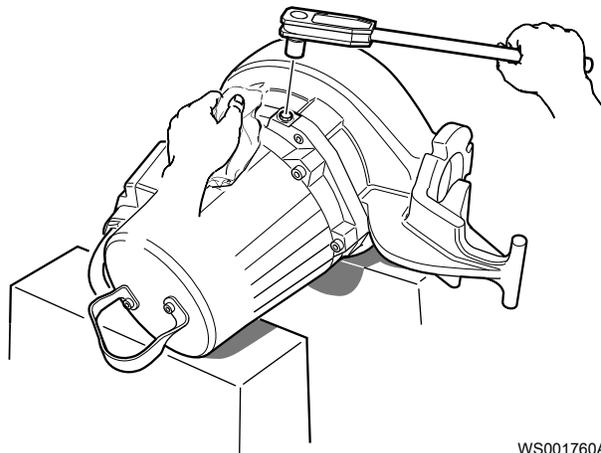
Empty the oil



CAUTION: Compressed Gas Hazard

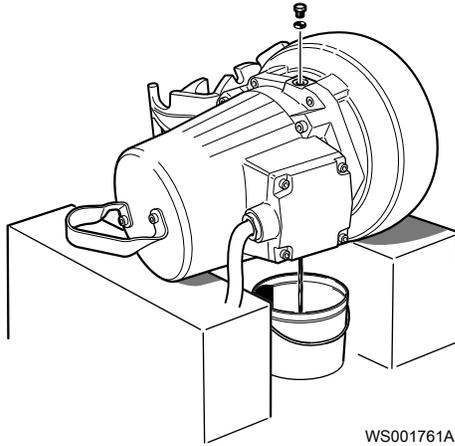
Air inside the chamber may cause parts or liquid to be propelled with force. Be careful when opening. Allow the chamber to de-pressurize before removal of the plug.

1. Place the pump in a horizontal position and unscrew the oil plug.
If the pump has a hole with the markings "oil out" it is important that this hole is used for drainage.



2. Place a container under the pump and turn the pump.
3. Unscrew the other oil plug.

If this hole has the markings "oil in", raise the pump upright for a short period of time during drainage in order to drain all the oil.



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Fill with oil

The oil should be a medical white oil of paraffin type that fulfills FDA 172.878 (a) and viscosity close to VG32. Examples of suitable oil types are the following:

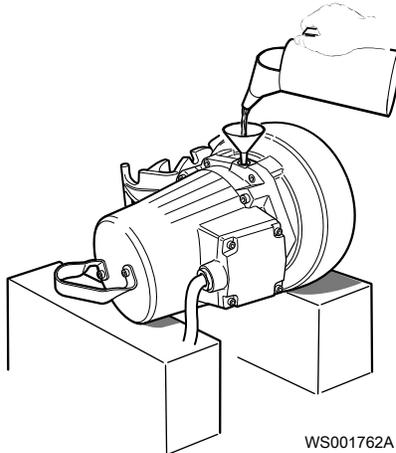
- Statoil MedicWay 32™
- BP Enerpar M 004™
- Shell Ondina 927™
- Shell Ondina X430™

1. Replace the O-rings of the oil plugs.
2. Refit an oil plug in the hole that faces downwards or is marked "oil out", and tighten.

Tightening torque: 10-40 Nm (7.5-29.5 ft-lb)

3. Fill with oil through the hole on the opposite side or the hole marked "oil in".
If the hole is marked "oil in", slightly tilt the pump and lower it again in order to fill the pump with the correct quantity.

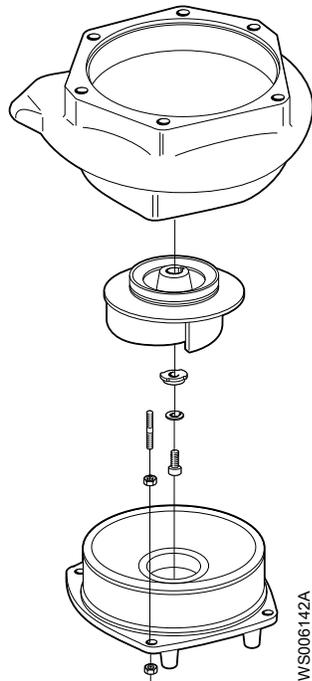
Quantity: approximately 2.1 L (2.2 qt).



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4. Refit the oil plug and tighten.
Tightening torque: 10-40 Nm (7.5-29.5 ft-lb).

6.5 Replace the impeller



Required tools:

- 10 mm hexagon bit adapter with an extension of at least 125 mm (4.92 in.)
- Impeller puller
If applicable, contact your local Grindex representative for correct type and size.
- Rod (wooden or copper) for locking the impeller in place, if applicable.
- Two crowbars, if applicable



WARNING:

- If you fail with the impeller installation, you must redo the installation procedure from the beginning.
- When laying the pump on its side, do not allow the weight of the pump to rest on any portion of the impeller. The impeller must not be allowed to make contact with the concrete floor or other hard and rough surfaces.



CAUTION: Cutting Hazard

Worn parts can have sharp edges. Wear protective clothing.

6.5.1 Remove the impeller



CAUTION: Cutting Hazard

Worn parts can have sharp edges. Wear protective clothing.

1. Remove the suction cover.
If necessary, then pry off the suction cover.
2. Remove the impeller screw and the washer.
If applicable, use the rod.
3. Remove the impeller from the shaft:

- a) Insert a M16 screw into the square nut.
 - b) Turn the screw to push off the impeller.
4. Remove the screw and the square nut.

6.5.2 Install the impeller

1. Prepare the shaft:
 - a) Check that the end of the shaft is clean and free from burrs.
Polish off any flaws with a fine emery cloth.
 - b) Make sure that the parallel key is seated in the keyway on the shaft.
2. Mount the impeller:
 - a) Fit the washer and square nut to the lubricated impeller screw.
 - b) Press the impeller onto the shaft with the impeller screw.
3. Tighten the impeller screw.
Tightening torque: 80 Nm (59 ft-lbs)
If applicable, use the rod.
Check that the impeller can rotate freely.
4. Mount the suction cover:
 - a) Fit the studs on the pump housing.
 - b) Fit the first hexagon nut onto the studs.
 - c) Fit the suction cover to the studs.
Make sure that the impeller rotates freely from the suction cover before tightening the hexagon nuts. The clearance between the impeller and the suction cover should be as small as possible.
 - d) Fit the second hexagon nuts onto the studs.
 - e) Tighten the nuts.
Tightening torque: 57 Nm (42 ft-lb).
5. Raise the pump to a vertical position.
Check that the impeller can rotate freely.

6.6 Service the pump

Type of service	Purpose	Inspection interval
Initial inspection	To make a check up of the pump condition by an authorized Grindex service representative and, based on the result and findings from these measures, to determine the intervals for periodical inspection and overhaul for the specific installation.	Within the first year of operation.
Periodical inspection	To prevent operational interruptions and machine breakdown. Measures to secure performance and pump efficiency are defined and decided for each individual application. It can include such things as impeller trimming, wear part control and replacement, control of zinc-anodes and control of the stator.	Up to every year Applies to normal applications and operating conditions at media (liquid) temperatures <40°C.

Type of service	Purpose	Inspection interval
Overhaul	To secure a long operating lifetime for the product. It includes replacement of key components and the measures taken during an inspection.	Up to every 3 year These intervals apply to normal applications and operating conditions at media (liquid) temperatures <40°C.

NOTICE:

Shorter intervals may be required when the operating conditions are extreme, for example with very abrasive or corrosive applications or when the liquid temperatures exceed 40°C (104°F).

6.6.1 Inspection

Service item	Action
Cable	<ol style="list-style-type: none"> 1. If the outer jacket is damaged, then replace the cable. 2. Check that the cables do not have any sharp bends and are not pinched.
Connection to power	Check that the connections are properly secured.
Electrical cabinets	Check that they are clean and dry.
Impeller	<ol style="list-style-type: none"> 1. Check the impeller clearance. 2. Adjust the impeller, if necessary.
Stator housing	<ol style="list-style-type: none"> 1. Drain all liquid, if any. 2. Check the resistance of the leakage sensor. Normal value approximately 1500 ohms, alarm approximately 430 ohms.
Insulation	<p>Use a megger maximum 1000 V.</p> <ol style="list-style-type: none"> 1. Check that the resistance between the ground (earth) and phase lead is more than 5 megohms. 2. Conduct a phase-to-phase resistance check.
Junction box	Check that it is clean and dry.
Lifting device	Check that the local safety regulations are followed.
Lifting handle	<ol style="list-style-type: none"> 1. Check the screws. 2. Check the condition of the lifting handle and the chain. 3. If necessary, replace.
O-rings	<ol style="list-style-type: none"> 1. Replace the oil plug O-rings. 2. Replace the O-rings at the entrance or junction cover. 3. Grease the new O-rings.
Overload protection and other protections	Check the correct settings.
Personnel safety devices	Check the guard rails, covers, and other protections.
Rotation direction	Check the impeller rotation.
Oil housing	Fill with new oil, if necessary.

Service item	Action
Terminal block/closed end splice	Check that the connections are properly secured.
Thermal contacts	Normally closed circuit; interval 0–1 ohm.
Voltage and amperage	Check the running values.

6.6.2 Overhaul

The basic repair kit includes O-rings, seals, and bearings.

For an overhaul, do the following in addition to the tasks listed under Inspection.

Service item	Action
Support and main bearing	Replace the bearings with new bearings.
Mechanical seal	Replace with new seal units.

6.6.3 Service in case of alarm

For information about indication values for sensors, see [Sensors connection](#) on page 31.

Alarm source	Action
CLS	Check for water in the oil housing. If the oil contains too much water, then do the following: <ol style="list-style-type: none"> 1. Drain the oil and water. 2. Replace with new oil.
FLS	<ol style="list-style-type: none"> 1. Check for liquid in the stator housing. 2. Drain all liquid, if any. 3. Check the mechanical seal unit, the O-rings, and the cable entry, if liquid was found.
Thermal contact	Check the start and stop levels.
The overload protection	Check that the impeller can rotate freely.

7 Troubleshooting

7.1 Electrical troubleshooting



DANGER: Electrical Hazard

Troubleshooting a live control panel exposes personnel to hazardous voltages. Electrical troubleshooting must be done by a qualified electrician.

Follow these guidelines when troubleshooting:

- Disconnect and lock out the power supply except when conducting checks that require voltage.
- Make sure that no one is near the unit when the power supply is reconnected.
- When troubleshooting electrical equipment, use the following:
 - Universal instrument multimeter
 - Test lamp (continuity tester)
 - Wiring diagram

7.2 The pump does not start



DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.



NOTICE:

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Cause	Remedy
An alarm signal has been triggered on the control panel.	Check that: <ul style="list-style-type: none"> • The impeller rotates freely. • The sensor indicators do not indicate an alarm. • The overload protection is not tripped.
The pump does not start automatically, but can be started manually.	Check that: <ul style="list-style-type: none"> • The start level regulator is functioning. Clean or replace if necessary. • All connections are intact. • The relay and contactor coils are intact. • The control switch (Man/Auto) makes contact in both positions. Check the control circuit and functions.

Cause	Remedy
The installation is not receiving voltage.	Check that: <ul style="list-style-type: none"> • The main power switch is on. • There is control voltage to the start equipment. • The fuses are intact. • There is voltage in all phases of the supply line. • All fuses have power and that they are securely fastened to the fuse holders. • The overload protection is not tripped. • The motor cable is not damaged.
The impeller is stuck.	Clean: <ul style="list-style-type: none"> • The impeller • The sump in order to prevent the impeller from clogging again.

If the problem persists, then contact a sales or authorized service representative.

Always state the product number and the serial number of the pump, see [Product Description](#) on page 11.

7.3 The pump does not stop when a level sensor is used



DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.



Cause	Remedy
The pump is unable to empty the sump to the stop level.	Check that: <ul style="list-style-type: none"> • There are no leaks from the piping and/or discharge connection. • The impeller is not clogged. • The non-return valve(s) are functioning properly. • The pump has adequate capacity. For information: Contact a sales or authorized service representative.
There is a malfunction in the level-sensing equipment.	<ul style="list-style-type: none"> • Clean the level regulators. • Check the functioning of the level regulators. • Check the contactor and the control circuit. • Replace all defective items.
The stop level is set too low.	Raise the stop level.

If the problem persists, then contact a sales or authorized service representative.

Always state the product number and the serial number of the pump, see [Product Description](#) on page 11.

7.4 The pump starts-stops-starts in rapid sequence

Cause	Remedy
The pump starts due to back-flow which fills the sump to the start level again.	Check that: <ul style="list-style-type: none"> • The distance between the start and stop levels is sufficient. • The non-return valve(s) work(s) properly. • The length of the discharge pipe between the pump and the first non-return valve is sufficiently short.
The self-holding function of the contactor malfunctions.	Check: <ul style="list-style-type: none"> • The contactor connections. • The voltage in the control circuit in relation to the rated voltages on the coil. • The functioning of the stop-level regulator. • Whether the voltage drop in the line at the starting surge causes the contactor's self-holding malfunction.

If the problem persists, then contact a sales or authorized service representative.

Always state the product number and the serial number of the pump, see [Product Description](#) on page 11.

7.5 The pump runs but the motor protection trips



DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.



NOTICE:

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Cause	Remedy
The motor protection is set too low.	Set the motor protection according to the data plate and if applicable the cable chart.
The impeller is difficult to rotate by hand.	<ul style="list-style-type: none"> • Clean the impeller. • Clean out the wet well. • Check that the impeller is correctly trimmed.
The drive unit cannot receive full voltage on all three phases.	<ul style="list-style-type: none"> • Check the fuses. Replace fuses that have tripped. • If the fuses are intact, then notify a certified electrician.
The phase currents change, or they are too high.	Contact a sales or authorized service representative.

Cause	Remedy
The insulation between the phases and ground in the stator is defective.	<ol style="list-style-type: none"> 1. Use an insulation tester. Use a 1000 VDC insulation and continuity tester to check that the insulation between the phases, and between any phase and ground, is > 5 megohms. 2. If the insulation is less, then do the following: Contact a sales or authorized service representative.
The density of the pumped fluid is too high.	<p>Make sure that the maximum density is 1100 kg/m³ (9.2 lb/US gal)</p> <ul style="list-style-type: none"> • Change to a more applicable pump • Contact a sales or authorized service representative.
There is a malfunction in the overload protection.	Replace the overload protection.

If the problem persists, then contact a sales or authorized service representative.

Always state the product number and the serial number of the pump, see [Product Description](#) on page 11.

7.6 The pump delivers too little or no water



DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.



NOTICE:

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Cause	Remedy
The impeller rotates in the wrong direction.	<ul style="list-style-type: none"> • If it is a 3-phase pump, then transpose two phase leads. • If it is a 1-phase pump, then do the following: Contact a sales or authorized service representative.
One or more of the valves are set in the wrong positions.	<ul style="list-style-type: none"> • Reset the valves that are set in the wrong position. • Replace the valves, if necessary. • Check that all valves are correctly installed according to media flow. • Check that all valves open correctly.
The impeller is difficult to rotate by hand.	<ul style="list-style-type: none"> • Clean the impeller. • Clean out the sump. • Check that the impeller is properly trimmed.
The pipes are obstructed.	To ensure a free flow, clean out the pipes.

Cause	Remedy
The pipes and joints leak.	Find the leaks and seal them.
There are signs of wear on the impeller, pump, and casing.	Replace the worn parts.
The liquid level is too low.	<ul style="list-style-type: none">• Check that the level sensor is set correctly.• Depending on the installation type, add a means for priming the pump, such as a foot valve.

If the problem persists, then contact a sales or authorized service representative.

Always state the product number and the serial number of the pump, see [Product Description](#) on page 11.

8 Technical Reference

8.1 Application limits

Data	Description
Liquid temperature	40°C (104°F) maximum
pH of the pumped media (liquid)	5.5–14
Liquid density	For more information, contact a local sales or service representative.
Depth of immersion	Maximum 20 m (65 ft)
Other	For the specific weight, current, voltage, power ratings, and speed of the pump, see the data plate of the pump.

8.2 Motor data

Feature	Description
Motor type	Squirrel-cage induction
Frequency	50 Hz or 60 Hz
Supply	3-phase
Starting method	Direct on-line Star-delta
Maximum starts for each hour	30 evenly spaced starts for each hour
Code compliance	IEC 60034-1
Voltage variation without overheating	±10%, if it does not run continuously at full load
Voltage imbalance tolerance	2%
Stator insulation class	H (180°C [356°F])

Motor encapsulation

Motor encapsulation is in accordance with IP68.



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