Table of Contents

**Introduction and Safety**
- Introduction .................................................................................................................. 3
- Inspect the delivery ........................................................................................................ 3
- Product warranty ........................................................................................................... 3
- Safety .............................................................................................................................. 4
- Safety message levels ................................................................................................... 4
- User safety .................................................................................................................... 5
- Monitoring equipment .................................................................................................. 6
- Environmental safety .................................................................................................... 6

**Transportation and Storage**
- Transportation guidelines ............................................................................................. 7
- Precautions ..................................................................................................................... 7
- Position and fastening ................................................................................................. 7
- Lifting ............................................................................................................................. 7
- Storage guidelines ......................................................................................................... 8
- Storage location ............................................................................................................ 8
- Freezing precautions ..................................................................................................... 8
- Long-term storage ......................................................................................................... 8

**Product Description**
- Pump design .................................................................................................................. 9
- Parts ................................................................................................................................. 10
- Monitoring equipment .................................................................................................. 11
- Optional sensors ........................................................................................................... 11
- The data plate ................................................................................................................. 11
- Product denomination ................................................................................................... 12

**Installation**
- Install the pump ............................................................................................................ 13
- Authority regulation ...................................................................................................... 13
- Fasteners ....................................................................................................................... 13
- Install with P-installation ............................................................................................. 14
- Install with S-installation ............................................................................................. 15
- Make the electrical connections .................................................................................. 16
- General precautions ...................................................................................................... 16
- Requirements ................................................................................................................ 16
- Cables ............................................................................................................................ 16
- Earthing (Grounding) ................................................................................................. 17
- Connect the motor cable to the pump ......................................................................... 17
- Connect the motor cable to the starter and monitoring equipment ............................. 17
- Cable charts ............................................................................................................... 18
- Check the impeller rotation ......................................................................................... 22

**Operation**
- Precautions ................................................................................................................... 24
- Distance to wet areas ..................................................................................................... 24
- Noise level .................................................................................................................... 24
- Start the pump .............................................................................................................. 24

**Maintenance**
- Precautions ................................................................................................................... 25
### Table of Contents

- Maintenance guidelines.................................................................................................................................................. 25
- Torque values...................................................................................................................................................................25
- Change the oil..................................................................................................................................................................26
- Empty the oil................................................................................................................................................................27
- Fill with oil.................................................................................................................................................................... 27
- Replace the impeller........................................................................................................................................................27
- Remove the impeller....................................................................................................................................................28
- Install the impeller....................................................................................................................................................... 29
- Service the pump.............................................................................................................................................................30
- Inspection......................................................................................................................................................................30
- Major overhaul..............................................................................................................................................................31
- Service in case of alarm...............................................................................................................................................31

**Troubleshooting**...............................................................................................................................................................33

- Introduction..................................................................................................................................................................33
- The pump does not start................................................................................................................................................33
- The pump does not stop when a level sensor is used............................................................................................... 33
- The pump starts-stops-starts in rapid sequence.........................................................................................................34
- The pump runs but the motor protection trips..........................................................................................................34
- The pump delivers too little or no water.....................................................................................................................35

**Technical Reference**........................................................................................................................................................37

- Motor data........................................................................................................................................................................37
- Application limits.............................................................................................................................................................37
Introduction and Safety

Introduction

Purpose of this manual

The purpose of this manual is to provide necessary information for:

• Installation
• Operation
• Maintenance

CAUTION:
Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.

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

Inspect the delivery
Inspect the package

1. Inspect the package for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. File a claim with the shipping company if anything is out of order.

   If the product has been picked up at a distributor, make a claim directly to the distributor.

Inspect the unit

1. Remove packing materials from the product.
   Dispose of all packing materials in accordance with local regulations.
2. Inspect the product to determine if any parts have been damaged or are missing.
3. If applicable, unfasten the product by removing any screws, bolts, or straps.
   For your personal safety, be careful when you handle nails and straps.
4. Contact your sales representative if anything is out of order.

Product warranty

Coverage

ITT undertakes to remedy faults in products from ITT under these conditions:

• The faults are due to defects in design, materials, or workmanship.
• The faults are reported to an ITT representative within the warranty period.
• The product is used only under the conditions described in this manual.
• The monitoring equipment incorporated in the product is correctly connected and in use.
• All service and repair work is done by ITT-authorized personnel.
• Genuine ITT parts are used.
• Only Ex-approved spare parts and accessories authorized by ITT are used in Ex-approved products.

Limitations

The warranty does not cover faults caused by these situations:

• Deficient maintenance
• Improper installation
• Modifications or changes to the product and installation made without consulting ITT
• Incorrectly executed repair work
• Normal wear and tear

ITT assumes no liability for these situations:
• Bodily injuries
• Material damages
• Economic losses

Warranty claim

ITT products are high-quality products with expected reliable operation and long life. However, should the need arise for a warranty claim, then contact your ITT representative.

Spare parts

ITT guarantees that spare parts will be available for 15 years after the manufacture of this product has been discontinued.

Safety

WARNING:
• The operator must be aware of safety precautions to prevent physical injury.
• Any pressure-containing device can explode, rupture, or discharge its contents if it is over-pressurized. Take all necessary measures to avoid over-pressurization.
• 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. This includes any modification to the equipment or use of parts not provided by ITT. If there is a question regarding the intended use of the equipment, please contact an ITT representative before proceeding.
• This manual clearly identify accepted methods for disassembling units. These methods must be adhered to. Trapped liquid can rapidly expand and result in a violent explosion and injury. Never apply heat to impellers, propellers, or their retaining devices to aid in their removal.
• Do not change the service application without the approval of an authorized ITT representative.

CAUTION:
You must observe the instructions contained in this manual. Failure to do so could result in physical injury, damage, or delays.

Safety message levels

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
• Product malfunction

Definitions

<table>
<thead>
<tr>
<th>Safety message level</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANGER:</td>
<td>A hazardous situation which, if not avoided, will result in death or serious injury</td>
</tr>
<tr>
<td>Safety message level</td>
<td>Indication</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>WARNING:</td>
<td>A hazardous situation which, if not avoided, could result in death or serious injury</td>
</tr>
<tr>
<td>CAUTION:</td>
<td>A hazardous situation which, if not avoided, could result in minor or moderate injury</td>
</tr>
<tr>
<td>Electrical Hazard:</td>
<td>The possibility of electrical risks if instructions are not followed in a proper manner</td>
</tr>
</tbody>
</table>
| NOTICE:              | • A potential situation which, if not avoided, could result in undesirable conditions  
                          • A practice not related to personal injury |

**User safety**

**General safety rules**

These safety rules apply:

• Always keep the work area clean.
• Pay attention to the risks presented by gas and vapors in the work area.
• Avoid all electrical dangers. Pay attention to the risks of electric shock or arc flash hazards.
• Always bear in mind the risk of drowning, electrical accidents, and burn injuries.

**Safety equipment**

Use safety equipment according to the company regulations. Use this safety equipment within the work area:

• Helmet
• Safety goggles, preferably with side shields
• Protective shoes
• Protective gloves
• Gas mask
• Hearing protection
• First-aid kit
• Safety devices

**NOTICE:**

Never operate a unit unless safety devices are installed. Also see specific information about safety devices in other chapters of this manual.

**Electrical connections**

Electrical connections must be made by certified electricians in compliance with all international, national, state, and local regulations. For more information about requirements, see sections dealing specifically with electrical connections.
Hazardous liquids

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 work with biologically hazardous liquids are vaccinated against diseases to which they may be exposed.
- Observe strict personal cleanliness.

Wash the skin and eyes

Do the following if chemicals or hazardous fluids have come into contact with your eyes or your skin:

<table>
<thead>
<tr>
<th>If you need to wash your...</th>
<th>Then...</th>
</tr>
</thead>
</table>
| Eyes                        | 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. |
| Skin                        | 1. Remove contaminated clothing.  
                               2. Wash the skin with soap and water for at least one minute.  
                               3. Seek medical attention, if required. |

Monitoring equipment

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

- Level indicators
- Temperature detectors

Environmental safety

The work area

Always keep the station clean to avoid and/or discover emissions.

Recycling guidelines

Always recycle according to these guidelines:

1. Follow local laws and regulations regarding recycling if the unit or parts are accepted by an authorized recycling company.
2. If the first guideline is not applicable, then return the unit or parts to your ITT representative.

Waste and emissions regulations

Observe these safety regulations regarding waste and emissions:

- Appropriately dispose of all waste.
- Handle and dispose of the processed liquid in compliance with applicable environmental regulations.
- Clean up all spills in accordance with safety and environmental procedures.
- Report all environmental emissions to the appropriate authorities.

Electrical installation

For electrical installation recycling requirements, consult your local electric utility.
Transportation and Storage

Transportation guidelines

Precautions

WARNING:
• Stay clear of suspended loads.
• Observe accident prevention regulations in force.

Position and fastening

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

Lifting

WARNING:
• Crush hazard. The unit and the components can be heavy. Use proper lifting methods and wear steel-toed shoes at all times.
• Lift and handle the product carefully, using suitable lifting equipment.
• The product must be securely harnessed for lifting and handling. Use eyebolts or lifting lugs if available.
• Always lift the unit by its lifting handle. Never lift the unit by the motor cable or by the hose.
• Do not attach sling ropes to shaft ends.

Lifting equipment

Lifting equipment is always required when handling the pump. It must fulfill the following requirements:
• The minimum height (contact ITT for information) between the lifting hook and the floor must be sufficient to lift the pump.
• The lifting equipment must be able to hoist the pump 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 pump for repair work.
• The lifting equipment must be dimensioned to lift the pump with any remaining pumped media in it.
• The lifting equipment must not be oversized.

NOTICE:
Oversized lifting equipment could cause damage if the unit should stick when being lifted.

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.
- Do not place heavy weights on the packed product.

Freezing precautions

The pump is frost-proof while operating or immersed in liquid, but the impeller/propeller and the shaft seal may freeze if the pump is lifted out of the liquid into a surrounding temperature below freezing.

Follow these guidelines to avoid freezing damage:

<table>
<thead>
<tr>
<th>When</th>
<th>Guideline</th>
</tr>
</thead>
</table>
| Before storage| • The pump must be allowed to run for a short time after raising it to discharge remaining pumped liquid.  
• This does not apply to propeller pumps.  
• The discharge opening must be covered in a suitable way, or placed facing down so that any still remaining pumped liquid runs out.  
• If present, the cooling jacket must be drained manually by opening the air vent screws at the top of the cooling jacket. |
| After storage | If the impeller/propeller is frozen, it must be thawed by immersing the pump in liquid before operating the pump.  
**Notice:** Never use a naked flame to thaw the unit. |

Long-term storage

If the pump is stored more than 6 months, the following apply:
- Before operating the pump after storage, it must be inspected with special attention to the seals and the cable entry.
- The impeller/propeller must be rotated every other month to prevent the seals from sticking together.
Product Description

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 limits given in Application limits. If there is a question regarding the intended use of the equipment, please contact an ITT representative before proceeding.

WARNING:
In explosive or flammable environments, only use Ex- or MSHA-approved pumps.

Spare parts

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

Pressure class

<table>
<thead>
<tr>
<th>Pressure class</th>
<th>Head Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT</td>
<td>Low head</td>
</tr>
<tr>
<td>MT</td>
<td>Medium head</td>
</tr>
<tr>
<td>HT</td>
<td>High head</td>
</tr>
</tbody>
</table>
## Parts

<table>
<thead>
<tr>
<th>Position</th>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pump housing</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>Impeller</td>
<td>D-impeller</td>
</tr>
<tr>
<td>3</td>
<td>Inlet</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td>Outlet</td>
<td>–</td>
</tr>
<tr>
<td>5</td>
<td>Stator housing</td>
<td>For information about the motor, see <em>Motor data.</em></td>
</tr>
<tr>
<td>6</td>
<td>Rotor</td>
<td>–</td>
</tr>
<tr>
<td>7</td>
<td>Stator</td>
<td>–</td>
</tr>
<tr>
<td>8</td>
<td>Shaft</td>
<td>The shaft is made of stainless steel, with an integrated rotor.</td>
</tr>
<tr>
<td>9</td>
<td>Bearings</td>
<td>Single-row ball bearings</td>
</tr>
<tr>
<td>10</td>
<td>Mechanical seals</td>
<td>One inner and one outer seal:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Aluminium oxide Al₂O₃</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Silicon carbide RSiC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For information about the pumps mechanical seals, see Parts List.</td>
</tr>
<tr>
<td>11</td>
<td>Oil housing</td>
<td>The oil housing includes a coolant that lubricates and cools the seals;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the housing acts as a buffer between the pumped liquid and the drive unit.</td>
</tr>
<tr>
<td>12</td>
<td>Oil plug</td>
<td>–</td>
</tr>
<tr>
<td>13</td>
<td>Cable entry</td>
<td>–</td>
</tr>
<tr>
<td>14</td>
<td>Cable</td>
<td>–</td>
</tr>
<tr>
<td>15</td>
<td>Inspection plug</td>
<td>–</td>
</tr>
<tr>
<td>16</td>
<td>Sensor</td>
<td>–</td>
</tr>
</tbody>
</table>
Monitoring equipment

The following applies to the monitoring equipment of the pump:

- The stator contains three thermal contacts connected in series which activate the alarm and stop 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.
- Water Detector sensors must be connected to either the OMRON relay 61 F-GP monitoring equipment or an equivalent 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

**Water Detector**

The Water Detector detects water which have entered the oil housing or the stator housing due to seal failure or cable damage. The Water Detector probe is a non-active electrode, placed in the oil- and stator housing. It is used in conjunction with a relay in the control circuit that measures the resistance between probe and frame. If only air or oil is present, the resistance is over 5000 Ohm. If water enters, the resistance decreases to as low as 300 to 500 Ohm.

The data plate

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

![Data Plate Diagram]

1. Curve code/Propeller code
2. Serial number, see *Product denomination* (page 12)
3. Product number
4. Country of origin
5. Additional information
6. Phase; type of current; frequency
7. Rated voltage
8. Thermal protection
9. Thermal class
10. Rated shaft power
11. International standard
12. Degree of protection
13. Rated current
14. Rated speed
15. Maximum submergence
16. Direction of rotation: L=left, R=right
17. Duty class
18. Duty factor
19. Product weight
20. Locked rotor code letter
Product denomination

Sales denomination

The sales denomination consists of the four-digit sales code and two letters that indicate the hydraulic end and type of installation.

This is an example of a sales denomination, and an explanation of its parts.

\[
\text{NP 3085} \\
1 \quad 2 \quad 3
\]

1. Hydraulic part
2. Installation type
3. Sales code

Product code

The product code consists of nine characters divided into two parts.

This is an example of a product code, and an explanation of its parts.

\[
\text{NP 3085.183} \\
1 \quad 2
\]

1. Sales denomination
2. Version

Serial number

The serial number is used for identification of an individual product, and is divided into four parts.

This is an example of a serial number, and an explanation of its parts.

\[
\text{NP 3085.183 - 951 0163} \\
1 \quad 2 \quad 3 \quad 4
\]

1. Product code
2. Production year
3. Production cycle
4. Running number
Installation

Install the pump

**WARNING:**
- Before installing the pump, check that the cable and cable entry have not been damaged during transportation.
- Note that special rules apply to installation in explosive atmospheres.
- Make sure that the pump cannot roll or fall over and injure people or damage property.
- Do not install CSA-approved products in locations that are classified as hazardous in the national electric code, ANSI/NFPA 70-2005.

**NOTICE:**
- Do not run the pump dry.
- Never force piping to make a connection with a pump.

These requirements apply:
- Use the pump dimensional drawing in order to ensure proper installation.
- Provide a suitable barrier around the work area, for example, a guard rail.
- Check the explosion risk before you weld or use electric hand tools.
- Remove all debris from the inlet piping system before you install the pump.

**Authority regulation**

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

**Fasteners**

**WARNING:**
- Only use fasteners of the proper size and material.
- Replace all corroded fasteners.
- Make sure that all fasteners are properly tightened and that there are no missing fasteners.
Install with P-installation

In the P-installation, the pump is installed on a stationary discharge connection, and operates either completely or partially submerged in the pumped liquid. These requirements and instructions only apply when the installation is made according to the dimensional drawing.

Figure 2: P-installation

These items are required:

- Guide bars
- Guide bar bracket for attaching the guide equipment to the access frame or to the upper part of the sump
- Cable holder for holding the cable
- Access frame (with covers) to which the upper guide bar bracket and cable holder can be attached
- Discharge connection for connecting the pump to the discharge line
  - The discharge connection has a flange which fits the pump casing flange and a bracket for attaching the guide equipment.
- Fasteners for the discharge connection
- Anchor bolts

1. Install the access frame:
   a) Place the access frame in position and align it horizontally.
   b) Grout the frame in place.
2. Grout the anchor bolts in place.
   - Be careful when you align and position the discharge connection in relation to the access frame.
3. Place the discharge connection in position, and tighten the nuts.
4. Install the guide bars:
   a) Secure the guide bars in the bracket.
   b) Check that the guide bars are placed vertically. Use a level or a plumb line.
5. Connect the discharge pipe to the discharge connection.
6. Lower the pump along the guide bars.
   - When it reaches the bottom position, the pump automatically connects to the discharge connection.
7. Secure the motor cable:
   a) Fasten the permanent lifting device to the pump and to the access frame. For example, you can use a stainless-steel lifting chain with shackles.
   b) Fasten the cable to the cable holder.
Make sure that the cable cannot be sucked into the pump inlet or that it is neither sharply bent, or pinched. Support straps are required for deep installations.

c) Connect the motor cable and the starter and monitoring equipment according to the separate instructions.

Make sure that the impeller rotation is correct. For more information, see Check the impeller rotation (page 22).

Clean all debris from the sump before starting the pump.

Install with S-installation

In the S-installation, the pump is transportable and intended to operate either completely or partially submerged in the pumped liquid. The pump is equipped with a connection for hose or pipe and stands on a base stand.

These requirements and instructions only apply when the installation is made according to the dimensional drawing. For information about the different installation types, see Parts List.

![Figure 3: S-installation](image)

1. Run the cable so that it has no sharp bends, is not pinched, and cannot be sucked into the pump inlet.
2. Connect the discharge line.
3. Lower the pump into the sump.
4. Place the pump on the base and make sure it cannot fall over or sink.
   Alternatively, the pump can be suspended with a lifting chain just above the sump bottom. Make sure that the pump cannot rotate at startup or during operation.
5. Connect the motor cable and the starter and monitoring equipment according to the separate instructions.
   Make sure that the impeller rotation is correct. For more information, see Check the impeller rotation (page 22).
Make the electrical connections

General precautions

Electrical Hazard:
• A certified electrician must supervise all electrical work. Comply with all local codes and regulations.
• Before starting work on the pump, make sure that the pump and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.
• Leakage into the electrical parts can cause damaged equipment or a blown fuse. Keep the end of the motor cable above the liquid level.
• Make sure that all unused conductors are insulated.
• 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.

CAUTION:
If the pump is equipped with automatic level control and/or internal contactor, there is a risk of sudden restart.

Requirements

These general requirements apply for electrical installation:
• The supply authority must be notified before installing the pump if it will be connected to the public mains. When the pump is connected to the public power supply, it may 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, the connected voltage is specified by a yellow sticker close to the cable entry.
• The fuses and circuit breakers must have the proper rating, and the pump overload protection (motor protection breaker) must be connected and set to the rated current according to the data plate and if applicable the cable chart. The starting current in direct-on-line starting can be up to six times higher than the rated current.
• The fuse rating and the cables must be in accordance with the local rules and regulations.
• If intermittent operation is prescribed, the pump must be provided with monitoring equipment supporting such operation.
• The motor is convertible between different voltages, if stated on the data plate.
• The thermal contacts/thermistors must be in use.

Cables

These are the requirements to follow when you install cables:
• The cables must be in good condition, not have any sharp bends, and not be pinched.
• The sheathing must not be damaged and must not have indentations or be embossed (with markings, etc.) at the cable entry.
• The cable entry seal sleeve and washers must conform to the outside diameter of the cable.
• The minimum bending radius must not be below the accepted value.
• If using a cable which has been used before, a short piece must be peeled off when refitting it so that the cable entry seal sleeve does not close around the cable at the same point again. If the outer sheath of the cable is damaged, then replace the cable. Contact an ITT service shop.
• The voltage drop in long cables must be taken into account. The drive unit’s rated voltage is the voltage measured at the cable connection point in the pump.

NOTICE:
Do not use Variable Frequency Drive (VFD) with this pump.
Earthing (Grounding)

**Electrical Hazard:**

- You must earth (ground) all electrical equipment. This applies to the pump equipment, the driver, and any monitoring equipment. Test the earth (ground) lead to verify that it is connected correctly.
- If the motor cable is jerked loose by mistake, the earth (ground) conductor should be the last conductor to come loose from its terminal. Make sure that the earth (ground) conductor is longer than the phase conductors. This applies to both ends of the motor cable.
- Risk of electrical shock or burn. You must connect an additional earth- (ground-) fault protection device to the earthed (grounded) connectors if persons are likely to come into physical contact with the pump or pumped liquids.

**Connect the motor cable to the pump**

**CAUTION:**

Leakage into the electrical parts can cause damaged equipment or a blown fuse. Keep the end of the motor cable above the liquid level.

For more information about the cable entry, see the Parts list.

1. Remove the cable clamp (optional), by unscrewing the hexagon socket screws.
2. Remove the cable entry from the stator housing.
3. Remove the stator housing.
   This provides access to the terminal board/closed end splices.
4. Check the data plate to see which connections are required for the power supply:
   - Y
   - D
   - Y serial
   - Y parallel
   - Y/D
5. Arrange the connections on the terminal board/closed end splices in accordance with the required power supply.
6. Connect the mains leads (L1, L2, L3, and earth (ground)) according to applicable cable chart.
   The earth (ground) lead must be 50 mm (2.0 in.) longer than the phase leads in the junction box of the unit.
7. Make sure that the pump is correctly connected to earth (ground).
8. Install the stator housing.
9. Instal the cable entry and the cable clamp (optional) and tighten.

**Connect the motor cable to the starter and monitoring equipment**

**WARNING:**

Do not install the starter equipment in an explosive zone or in the sump.

**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.

The single phase pumps must be equipped with a starter which has start and run capacitors.
A specially Flygt designed starter is required for the operation of single phase pumps. The connection of the motor cable to the starter is shown in the wiring diagram.

1. If thermal contacts are included in the pump installation, 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* (page 18).

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.

### Cable charts

If a longer pump cable is used with an extra 10 mm² earth cable fitted to the motor housing to fulfill the demands of the Low Voltage Directive, then this cable must also be connected to the earth connection.

<table>
<thead>
<tr>
<th>Connection locations</th>
<th>Phase sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image.png" alt="Diagram" /></td>
<td><img src="image.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

1. Control leads
2. Starter equipment
3. Mains leads
4. Motor cable
5. Terminal blocks on pump
6. Statror leads
7. Control cable

### Colors and marking of the mains leads

<table>
<thead>
<tr>
<th>Mains: Three phase motor</th>
<th>Mains: Single phase motor</th>
<th>SUBCAB 7GX / HCR (SO7E6E5-F)</th>
<th>SUBCAB 4GX</th>
<th>SUBCAB AWG</th>
<th>H07RN-F 10GX</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>P</td>
<td>Black 1</td>
<td>Brown</td>
<td>Red</td>
<td>Black 1</td>
</tr>
<tr>
<td>L2</td>
<td>C</td>
<td>Black 2</td>
<td>Black</td>
<td>Black</td>
<td>Black 2</td>
</tr>
<tr>
<td>L3</td>
<td>N</td>
<td>Black 3</td>
<td>Grey</td>
<td>White</td>
<td>Black 3</td>
</tr>
</tbody>
</table>
### Colors and marking of the control leads

<table>
<thead>
<tr>
<th>Control</th>
<th>SUBCAB 7 GX / HCR (SO7E6E5-F) and SUBCAB 4 GX</th>
<th>SUBCAB AWG</th>
<th>H07RN-F 10GX</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>White T1 / Black 4</td>
<td>Orange</td>
<td>Black 7</td>
</tr>
<tr>
<td>T2</td>
<td>White T2 / Black 5</td>
<td>Blue</td>
<td>Black 8</td>
</tr>
<tr>
<td>Water Detector (Wa)</td>
<td>– / Black 6</td>
<td>–</td>
<td>Black 9</td>
</tr>
</tbody>
</table>

### Colors and marking of the stator leads

<table>
<thead>
<tr>
<th>Stator connection</th>
<th>Lead color</th>
<th>Lead color, single phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1</td>
<td>Red</td>
<td>White (main)</td>
</tr>
<tr>
<td>U2</td>
<td>Green</td>
<td>Red (main)</td>
</tr>
<tr>
<td>U5</td>
<td>Red+U5</td>
<td></td>
</tr>
<tr>
<td>V1</td>
<td>Brown</td>
<td></td>
</tr>
<tr>
<td>V2</td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>V5</td>
<td>Brown+V5</td>
<td></td>
</tr>
<tr>
<td>W1</td>
<td>Yellow</td>
<td></td>
</tr>
<tr>
<td>W2</td>
<td>Black</td>
<td></td>
</tr>
<tr>
<td>W5</td>
<td>Yellow+W5</td>
<td></td>
</tr>
<tr>
<td>Z1</td>
<td>–</td>
<td>Black (auxiliary)</td>
</tr>
<tr>
<td>Z2</td>
<td>–</td>
<td>Blue (auxiliary)</td>
</tr>
</tbody>
</table>

### Cable charts

The figures in this section show all applicable cable charts.
<table>
<thead>
<tr>
<th>Model</th>
<th>Connection</th>
<th>Leads</th>
<th>Detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>H07RN-F 10GX</td>
<td>Y/D</td>
<td>6</td>
<td>with</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water Detector</td>
</tr>
<tr>
<td>SUBCAB 7GX +2x1.5</td>
<td>Y/D</td>
<td>6</td>
<td>without Water Detector</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Connection</th>
<th>Leads</th>
<th>Detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBCAB 7GX / SUBCAB AWG, single phase</td>
<td>D</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Connection</th>
<th>Leads</th>
<th>Detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBCAB 7GX / SUBCAB AWG, single phase</td>
<td>D</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>
**Sensor-connection**

**Thermal contact**

<table>
<thead>
<tr>
<th>WH or YE</th>
<th>T1</th>
<th>T1</th>
</tr>
</thead>
<tbody>
<tr>
<td>or GY</td>
<td></td>
<td>*OG</td>
</tr>
</tbody>
</table>

Max. 250V, Max. 5A
Max. 16A, cosφ = 0.6
Max. 23A, cosφ = 1

*Subcab AWG 550 24 00

**Water Detector**

<table>
<thead>
<tr>
<th>WH or YE</th>
<th>T1</th>
<th>T1</th>
</tr>
</thead>
<tbody>
<tr>
<td>or GY</td>
<td></td>
<td>*OG</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WH or YE</th>
<th>T2</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>or GY</td>
<td></td>
<td>*BU</td>
</tr>
</tbody>
</table>

*Subcab AWG 550 24 00

**Alarm**

- < 500 Ω
  - Output terminal 3 – 4 closed
- > 500 Ω
  - Output terminal 2 – 4 closed

**No alarm**

**Check the impeller rotation**

**WARNING:**
The starting jerk can be powerful.

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, do one of these steps:
   • If the motor has a 1-phase connection, contact the local ITT shop.
   • If the motor has a 3-phase connection, transpose two phase leads and do this procedure again.
Operation

Precautions

- Never operate the pump without safety devices installed.
- Never operate the pump with the discharge valve closed.
- Make sure that all safety guards are in place and secure.
- Make sure you have a clear path of retreat.
- Never work alone.
- Beware of the risk of a sudden start if the product is used with an automatic level control and/or internal contactor.

Distance to wet areas

Electrical Hazard:
Risk of electrical shock when pumping or mixing near a lake, jetties, beaches, ponds, fountains, or similar. There must be a safety distance of at least 20 m (65 ft.) between the person and the product if the person is in contact with the pumped or mixed liquid.

Noise level

NOTICE:
The noise level of the product is lower than 70 dB. However, the noise level of 70 dB may be exceeded in some installations and at certain operating points on the performance curve. Make sure that you understand the noise level requirements in the environment where the pump is installed. Failure to do so may result in hearing loss or violation of local laws.

Start the pump

WARNING:
- If you need to work on the pump, make sure that it is isolated from the power supply and cannot be energized.
- Make sure that the pump cannot roll or fall over and injure people or damage property.
- In some installations, the pump and the surrounding liquid may be hot. Bear in mind the risk of burn injuries.
- Make sure nobody is close to the pump when it is started. The pump will jerk in the opposite direction of the impeller rotation.

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

Precautions

**WARNING:**
- Always follow safety guidelines when working on the pump. See *Introduction and Safety* (page 3).
- Disconnect and lock out electrical power before installing or servicing the pump.
- Make sure that the pump cannot roll or fall over and injure people or damage property.
- Rinse the pump thoroughly with clean water before working on the pump.
- Rinse the components in water after dismantling.

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.
- 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.

Maintenance guidelines

During 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, and O-rings with grease.

During 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.

Torque values

Screws and nuts

<table>
<thead>
<tr>
<th>Property class</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
<th>M8</th>
<th>M10</th>
<th>M12</th>
<th>M16</th>
<th>M20</th>
<th>M24</th>
<th>M30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel, A2 and A4, torque Nm (ft-lbs)</td>
<td>70 +80</td>
<td>2.7 (2)</td>
<td>5.4 (4)</td>
<td>9.3 (6.9)</td>
<td>22 (16)</td>
<td>44 (32)</td>
<td>76 (56)</td>
<td>187 (138)</td>
<td>364 (268)</td>
<td>629 (464)</td>
</tr>
</tbody>
</table>

1 Property class 70 is torque tightened as class 80.
### Change the oil

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

---

**Table of Torque Values (Nm (ft-lbs))**

<table>
<thead>
<tr>
<th>Property class</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
<th>M8</th>
<th>M10</th>
<th>M12</th>
<th>M16</th>
<th>M20</th>
<th>M24</th>
<th>M30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon steel and alloyed steel, torque</td>
<td>8.8</td>
<td>2.9 (2.1)</td>
<td>5.7 (4.2)</td>
<td>9.8 (7.2)</td>
<td>24 (18)</td>
<td>47 (35)</td>
<td>81 (60)</td>
<td>194 (143)</td>
<td>385 (285)</td>
<td>665 (490)</td>
</tr>
<tr>
<td></td>
<td>10.9</td>
<td>4.0 (2.9)</td>
<td>8.1 (6)</td>
<td>14 (10.3)</td>
<td>33 (24.3)</td>
<td>65 (48)</td>
<td>114 (84)</td>
<td>277 (204)</td>
<td>541 (399)</td>
<td>935 (689)</td>
</tr>
<tr>
<td></td>
<td>12.9</td>
<td>4.9 (3.6)</td>
<td>9.7 (7.2)</td>
<td>17 (12.5)</td>
<td>40 (30)</td>
<td>79 (58)</td>
<td>136 (100)</td>
<td>333 (245)</td>
<td>649 (480)</td>
<td>1120 (825)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Property class</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
<th>M8</th>
<th>M10</th>
<th>M12</th>
<th>M16</th>
<th>M20</th>
<th>M24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel, A2 and A4, torque</td>
<td>70 +80⁺</td>
<td>1.2 (0.9)</td>
<td>2.7 (2)</td>
<td>5.4 (4)</td>
<td>9.3 (6.9)</td>
<td>22 (16)</td>
<td>44 (32)</td>
<td>76 (56)</td>
<td>120 (88)</td>
</tr>
<tr>
<td>Carbon steel and alloyed steel, torque</td>
<td>8.8</td>
<td>2.3 (1.7)</td>
<td>4.6 (3.4)</td>
<td>7.8 (5.8)</td>
<td>19 (14)</td>
<td>38 (28)</td>
<td>65 (48)</td>
<td>158 (116)</td>
<td>308 (228)</td>
</tr>
<tr>
<td></td>
<td>10.9</td>
<td>3.2 (2.4)</td>
<td>6.5 (4.8)</td>
<td>11 (8)</td>
<td>26 (19)</td>
<td>52 (38)</td>
<td>91 (67)</td>
<td>222 (164)</td>
<td>433 (320)</td>
</tr>
<tr>
<td></td>
<td>12.9</td>
<td>3.9 (2.9)</td>
<td>7.8 (5.8)</td>
<td>14 (10.3)</td>
<td>32 (23.6)</td>
<td>63 (46)</td>
<td>109 (80)</td>
<td>266 (196)</td>
<td>519 (383)</td>
</tr>
</tbody>
</table>
Empty the oil

**WARNING:**
The oil housing may be pressurized. Hold a rag over the oil plug to prevent oil from spraying out.

1. Place the pump in a horizontal position so that the oil plug is at the bottom (number 1 in the figure).
2. Place a container under the pump.
3. Remove the vent plug (number 2 in the figure).
4. Remove the plug and drain the oil.

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.

1. Replace the O-rings of the oil plugs.
2. Refit the oil plug in the hole that faces downwards, and tighten.
   
   **Tightening torque:** 10-40 Nm (7.5-29.5 ft-lbs)
3. Fill with oil.
   
   The oil level should be at the lower side of the openings (position A in the figure).
   
   **Quantity:** approximately 0.4 liters (0.42 quarts).
4. Refit the plugs and tighten.
   
   **Tightening torque:** 10-40 Nm (7.5-29.5 ft-lbs)

Replace the impeller

**Required tools:**

- 8 mm hexagon bit adapter.
- Impeller puller
  
  If applicable, contact your local ITT 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.
- A worn impeller and/or pump housing can have very sharp edges. Wear protective gloves.
- 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.
Remove the impeller

**CAUTION:**
A worn impeller and/or pump housing can have very sharp edges. Wear protective gloves.

1. Remove the pump housing.
2. Remove the impeller screw.
   If applicable, use the rod.
3. Remove the washer.
4. Remove the impeller.
   Use the impeller puller or the crowbars.
Install the impeller

1. Prepare the shaft:
   a) Make sure that the end of the shaft is clean and free from burrs.
      Polish off any flaws with a fine emery cloth.
   b) Replace the parallel pin.
   c) Lubricate the shaft.

2. Mount the impeller:
   a) Fit the washer on the lubricated impeller screw.

3. Tighten the impeller screw:
   If applicable, use the rod.
   Tightening torque: 22Nm (16 ft-lbs)
Check that the impeller can rotate freely.

4. Mount the pump housing:
   a) Fit the pump housing.
   b) Fit and tighten the lubricated screws.
      Tightening torque: 57 Nm (42 ft-lbs).

Service the pump

<table>
<thead>
<tr>
<th>Type of service</th>
<th>Purpose</th>
<th>Inspection interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial inspection</td>
<td>To make a check up of the pump condition by an authorized ITT service representative and, based on the result and findings from these measures, to determine the intervals for periodical inspection and major overhaul for the specific installation.</td>
<td>Within the first year of operation.</td>
</tr>
<tr>
<td>Periodical inspection</td>
<td>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.</td>
<td>Up to every year Applies to normal applications and operating conditions at media (liquid) temperatures &lt;40°C.</td>
</tr>
<tr>
<td>Major overhaul</td>
<td>To secure a long operating lifetime for the product. It includes replacement of key components and the measures taken during an inspection.</td>
<td>Up to every 3 year These intervals apply to normal applications and operating conditions at media (liquid) temperatures &lt;40°C.</td>
</tr>
</tbody>
</table>

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).

Inspection

<table>
<thead>
<tr>
<th>Service item</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable</td>
<td>1. If the outer jacket is damaged, replace the cable.</td>
</tr>
<tr>
<td></td>
<td>2. Check that the cables do not have any sharp bends and are not pinched.</td>
</tr>
<tr>
<td>Connection to power</td>
<td>Check that the connections are properly tightened.</td>
</tr>
<tr>
<td>Electrical cabinets</td>
<td>Check that they are clean and dry.</td>
</tr>
<tr>
<td>Service item</td>
<td>Action</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Impeller</td>
<td>1. Check the impeller clearance.</td>
</tr>
<tr>
<td></td>
<td>2. Adjust the impeller, if necessary.</td>
</tr>
<tr>
<td>Stator housing²</td>
<td>1. Drain all liquid, if any.</td>
</tr>
<tr>
<td></td>
<td>2. Check the resistance of the leakage sensor.</td>
</tr>
<tr>
<td></td>
<td>A small amount of water due to condensation is acceptable.</td>
</tr>
<tr>
<td></td>
<td>More water is an indication of leakage. Oil is an indication of seal failure between the stator housing and the oil housing.</td>
</tr>
<tr>
<td></td>
<td>Contact your ITT representative.</td>
</tr>
<tr>
<td>Insulation</td>
<td>Use a megger maximum 1000 V.</td>
</tr>
<tr>
<td></td>
<td>1. Check that the resistance between the earth (ground) and phase lead is more than 5 megohms.</td>
</tr>
<tr>
<td></td>
<td>2. Conduct a phase-to-phase resistance check.</td>
</tr>
<tr>
<td>Junction box</td>
<td>Check that it is clean and dry.</td>
</tr>
<tr>
<td>Lifting device</td>
<td>Check that local safety regulations are followed.</td>
</tr>
<tr>
<td>Lifting handle</td>
<td>1. Check the screws.</td>
</tr>
<tr>
<td></td>
<td>2. Check the condition of the lifting handle.</td>
</tr>
<tr>
<td></td>
<td>3. Replace if necessary.</td>
</tr>
<tr>
<td>O-rings</td>
<td>1. Replace the oil plug O-rings.</td>
</tr>
<tr>
<td></td>
<td>2. Replace the O-rings at the entrance or junction cover.</td>
</tr>
<tr>
<td></td>
<td>3. Grease the new O-rings.</td>
</tr>
<tr>
<td>Overload protection and other protections</td>
<td>Check the correct settings.</td>
</tr>
<tr>
<td>Personnel safety devices</td>
<td>Check the guard rails, covers, and other protections.</td>
</tr>
<tr>
<td>Rotation direction</td>
<td>Check the impeller rotation.</td>
</tr>
<tr>
<td>Oil housing²</td>
<td>Fill with new oil, if necessary.</td>
</tr>
<tr>
<td>Terminal block/closed end splice</td>
<td>Check that the connections are properly tightened.</td>
</tr>
<tr>
<td>Thermal contacts</td>
<td>Normally closed circuit; interval 0–1 ohm.</td>
</tr>
<tr>
<td>Voltage and amperage</td>
<td>Check the running values.</td>
</tr>
</tbody>
</table>

**Major overhaul**

For a major overhaul, take this action in addition to the tasks listed under Inspection.

<table>
<thead>
<tr>
<th>Service item</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support and main bearing</td>
<td>Replace the bearings with new bearings.</td>
</tr>
<tr>
<td>Mechanical seal</td>
<td>Replace with new seal units.</td>
</tr>
</tbody>
</table>

**Service in case of alarm**

For information about indication values for sensors, see *Sensor connection*.

<table>
<thead>
<tr>
<th>Alarm source</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Detector</td>
<td>Check for water in the oil in the oil housing, or water in the stator housing.</td>
</tr>
<tr>
<td></td>
<td>If the oil contains too much water:</td>
</tr>
<tr>
<td></td>
<td>1. Drain the oil and water.</td>
</tr>
<tr>
<td></td>
<td>2. Replace with new oil.</td>
</tr>
</tbody>
</table>

² Regardless of individual applications, the stator housing and the oil housing should not be inspected less frequently than the intervals for normal applications and operating conditions at media (liquid) temperatures <40°C.
<table>
<thead>
<tr>
<th>Alarm source</th>
<th>Action</th>
</tr>
</thead>
</table>
| If the stator housing contains water: | 1. Drain all liquid, if any.  
2. 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.                             |
Troubleshooting

Introduction

Follow these guidelines when troubleshooting the pump:

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

The pump does not start

WARNING:
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.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| An alarm signal has been triggered on the control panel. | Check that:  
  • The impeller rotates freely.  
  • The sensor indicators do not indicate an alarm.  
  • The overload protection is not tripped.  
  If the problem still persists:  
  Contact the local ITT service shop. |
| The pump does not start automatically, but can be started manually. | Check that:  
  • 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. |
| The installation is not receiving voltage.     | Check that:  
  • 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:  
  • The impeller  
  • The sump in order to prevent the impeller from clogging again. |

If the problem persists, refer to the Flygt Service Guide on the web or contact the local ITT service shop. Always state the serial number of your pump when you contact ITT, see Product Description (page 9).
The pump does not stop when a level sensor is used

**WARNING:**
Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| The pump is unable to empty the sump to the stop level. | Check that:  
  • 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: |
| There is a malfunction in the level-sensing equipment. |  
  • 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, refer to the Flygt Service Guide on the web or contact the local ITT service shop. Always state the serial number of your pump when you contact ITT, see *Product Description* (page 9).

The pump starts-stops-starts in rapid sequence

<table>
<thead>
<tr>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| The pump starts due to back-flow which fills the sump to the start level again. | Check that:  
  • 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:  
  • 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. |
| The start relay is not correctly set (only for 1-phase motor) | Adjust the start relay. |
| The run capacitor is defective (only for 1-phase motor) | Replace the run capacitor. |

If the problem persists, refer to the Flygt Service Guide on the web or contact the local ITT service shop. Always state the serial number of your pump when you contact ITT, see *Product Description* (page 9).

The pump runs but the motor protection trips

**WARNING:**
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.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The motor protection is set too low.</td>
<td>Set the motor protection according to the data plate and if applicable the cable chart.</td>
</tr>
</tbody>
</table>
| The impeller is difficult to rotate by hand. | • Clean the impeller.  
• Clean out the sump.  
• Check that the impeller is properly trimmed. |
| The drive unit is not receiving full voltage on all three phases. | • Check the fuses. Replace fuses that have tripped.  
• If the fuses are intact, notify a certified electrician. |
| The phase currents vary, or they are too high. | Contact the local ITT service shop. |
| The insulation between the phases and ground in the stator is defective. | 1. Use an insulation tester. With a 1000 V DC megger, check that the insulation between the phases and between any phase and ground is > 5 megohms.  
2. If the insulation is less:  
Contact the local ITT service shop. |
| The density of the pumped fluid is too high. | Make sure that the maximum density is 1100 kg/m³ (9.2 lb/US gal)  
• Change to a more suitable pump.  
• Contact the local ITT service shop. |
| There is a malfunction in the overload protection. | Replace the overload protection.  |

If the problem persists, refer to the Flygt Service Guide on the web or contact the local ITT service shop. Always state the serial number of your pump when you contact ITT, see Product Description (page 9).

**The pump delivers too little or no water**

**WARNING:**
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.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| The impeller rotates in the wrong direction. | • If it is a 3-phase pump, transpose two phase leads.  
• If it is a 1-phase pump:  
Contact the local ITT service shop. |
| One or more of the valves are set in the wrong positions. | • 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. | • Clean the impeller.  
• Clean out the sump.  
• Check that the impeller is properly trimmed. |
<p>| The pipes are obstructed. | Clean out the pipes to ensure a free flow. |</p>
<table>
<thead>
<tr>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The pipes and joints leak.</td>
<td>Find the leaks and seal them.</td>
</tr>
<tr>
<td>There are signs of wear on the impeller, pump, and casing.</td>
<td>Replace the worn parts.</td>
</tr>
<tr>
<td>The liquid level is too low.</td>
<td>• Check that the level sensor is set correctly.</td>
</tr>
<tr>
<td></td>
<td>• Depending on the installation type, add a means for priming the pump, such as a foot valve.</td>
</tr>
</tbody>
</table>

If the problem persists, refer to the Flygt Service Guide on the web or contact the local ITT service shop. Always state the serial number of your pump when you contact ITT, see *Product Description* (page 9).
Technical Reference

Motor data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor type</td>
<td>Squirrel-cage induction motor</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 or 60 Hz</td>
</tr>
<tr>
<td>Supply</td>
<td>1-phase or 3-phase</td>
</tr>
<tr>
<td>Starting method</td>
<td>• Direct on-line</td>
</tr>
<tr>
<td></td>
<td>• Star-delta</td>
</tr>
<tr>
<td>Maximum starts per hour</td>
<td>20 evenly spaced starts per hour</td>
</tr>
<tr>
<td>Code compliance</td>
<td>IEC 60034-1</td>
</tr>
<tr>
<td>Rated output variation</td>
<td>±5%</td>
</tr>
<tr>
<td>Voltage variation</td>
<td>±10%, provided that it does not run continuously at full load</td>
</tr>
<tr>
<td>without overheating</td>
<td></td>
</tr>
<tr>
<td>Voltage imbalance</td>
<td>2%</td>
</tr>
<tr>
<td>tolerance</td>
<td></td>
</tr>
<tr>
<td>Stator insulation class</td>
<td>F (155°C [310°F])</td>
</tr>
</tbody>
</table>

Application limits

<table>
<thead>
<tr>
<th>Data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid temperature</td>
<td>40°C (104°F) maximum</td>
</tr>
<tr>
<td></td>
<td>The pump can be operated at continuous duty and full load only if at least 2/3 of the stator housing is submerged.</td>
</tr>
<tr>
<td></td>
<td>For intermittent duty the recommended liquid level must never sink beneath the top of the volute.</td>
</tr>
<tr>
<td>Liquid density</td>
<td>1100 kg/m³ (9.2 lb per US gal) maximum</td>
</tr>
<tr>
<td>pH of the pumped media</td>
<td>1–13 for stainless steel pumps</td>
</tr>
<tr>
<td>(liquid)</td>
<td></td>
</tr>
<tr>
<td>Depth of immersion</td>
<td>20 m (65 ft) maximum</td>
</tr>
<tr>
<td>Other</td>
<td>For the specific weight, current, voltage, power ratings, and speed of the pump, see the data plate of the pump.</td>
</tr>
</tbody>
</table>
What can ITT Water & Wastewater do for you?

Integrated solutions for fluid handling are offered by ITT Water & Wastewater as a world leader in transport and treatment of wastewater. We provide a complete range of water, wastewater and drainage pumps, equipment for monitoring and control, units for primary and secondary biological treatment, products for filtration and disinfection, and related services. ITT Water & Wastewater, headquartered in Sweden, operates in some 140 countries across the world, with own plants in Europe, China and North and South America. The company is wholly owned by the ITT Corporation of White Plains, New York, supplier of advanced technology products and services.