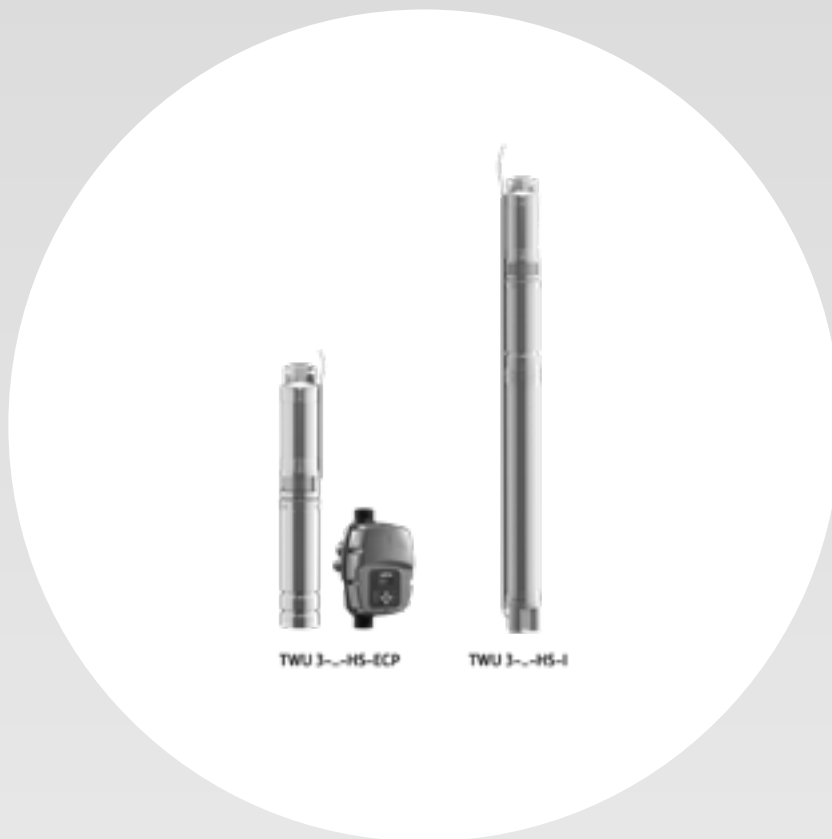


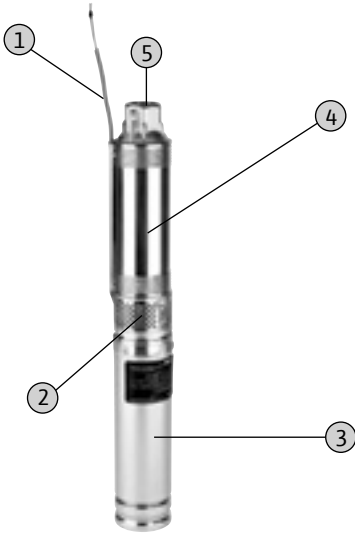
Wilo-Sub TWU 3-...-HS (High Speed)



en Installation and operating instructions

Fig. 1

TWU 3-...-HS-ECP



TWU 3-...-HS-I

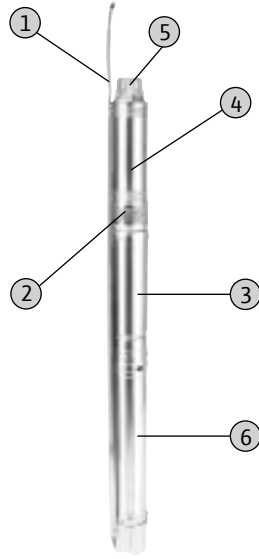


Fig. 2



Fig. 3

TWU 3-...-HS-E-CP

TWU 3-...-HS-I

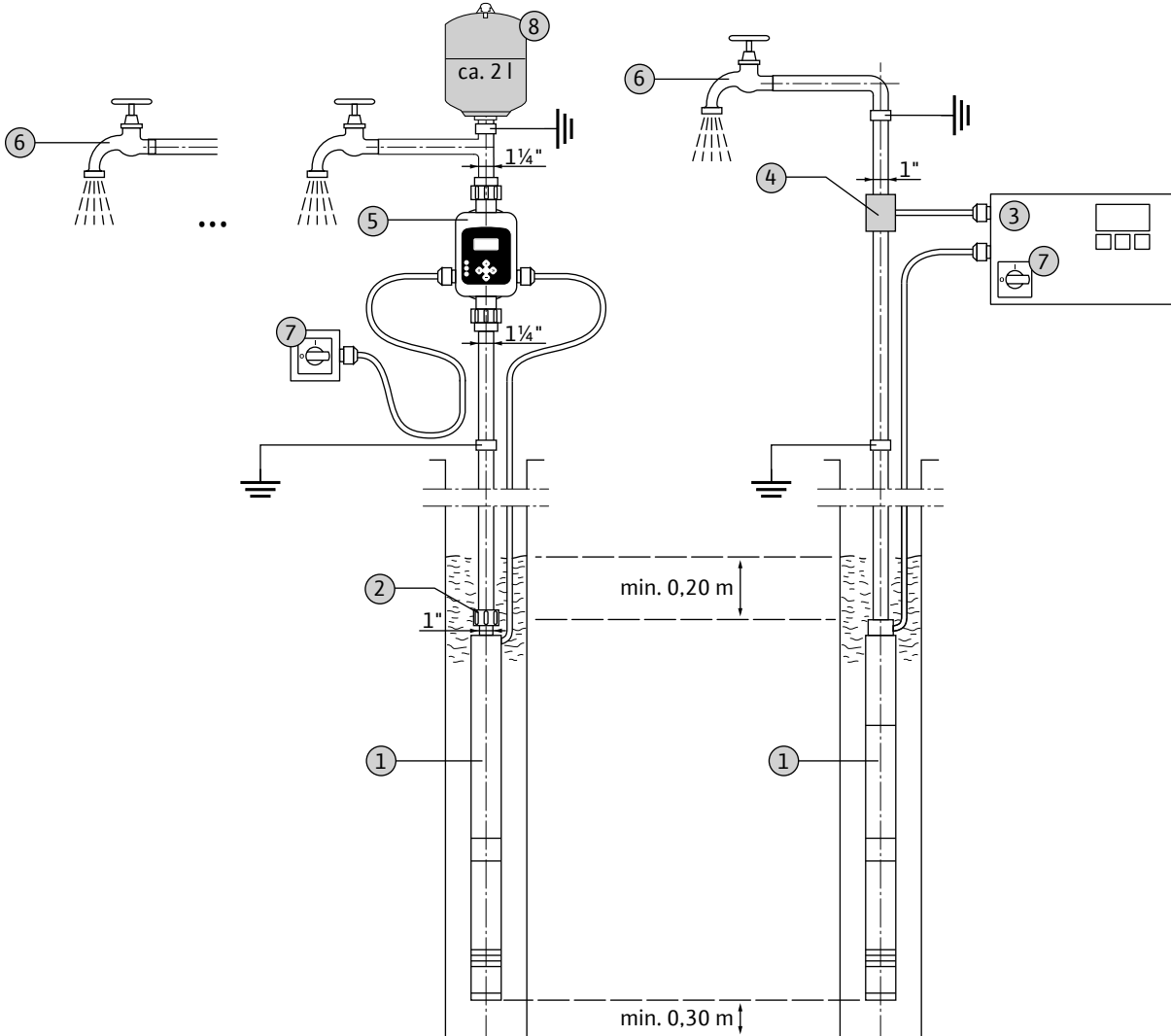


Fig. 4



Fig. 6

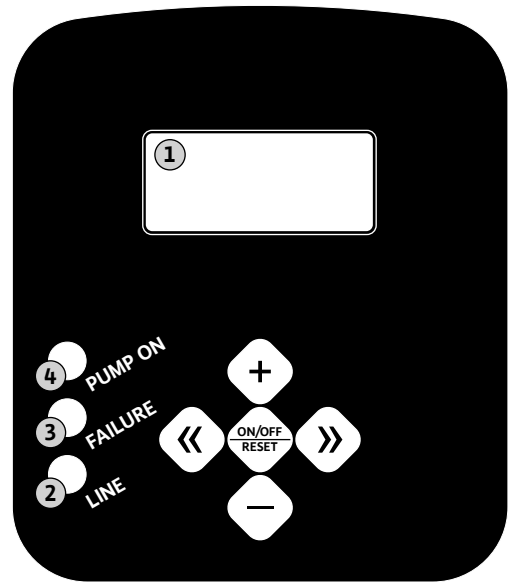


Fig. 5

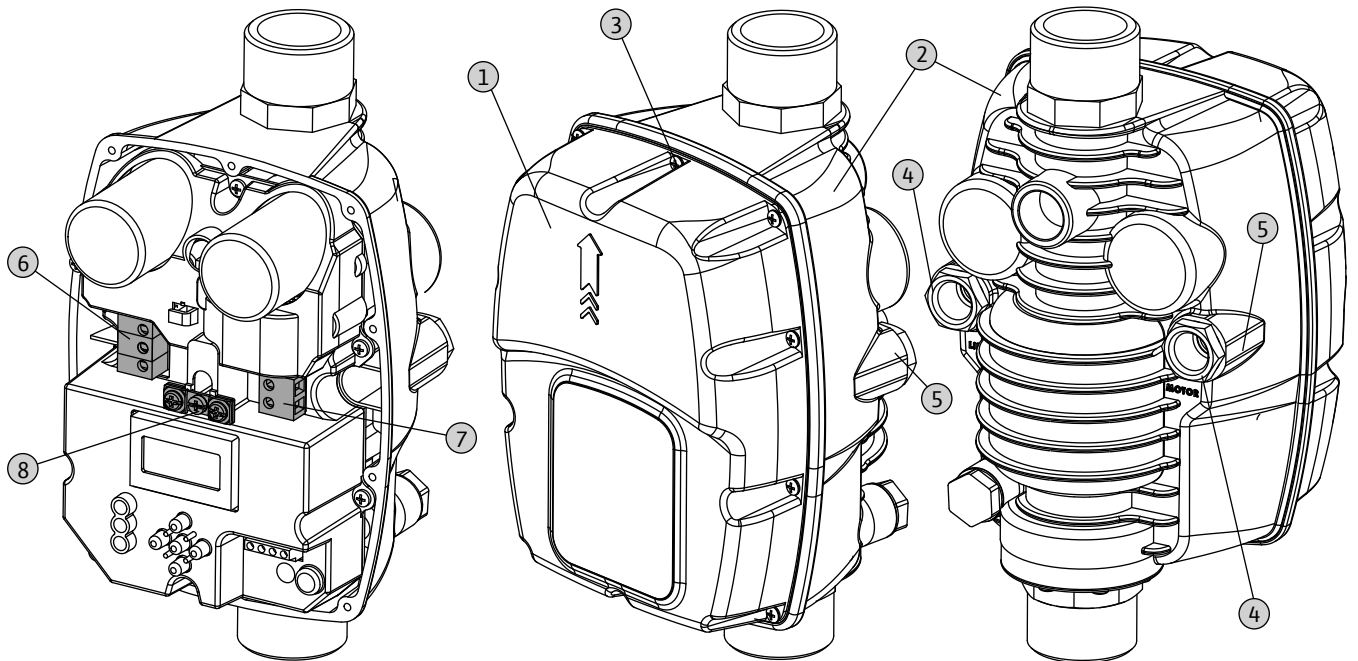


Fig. 7

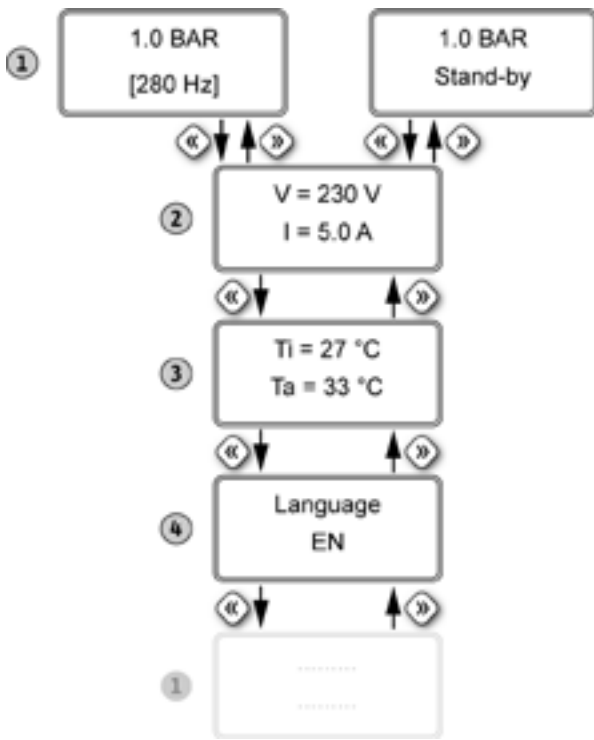


Fig. 8

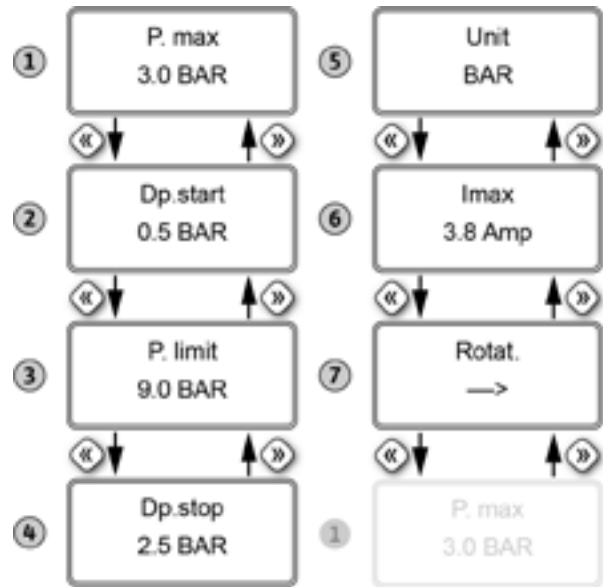


Fig. 9

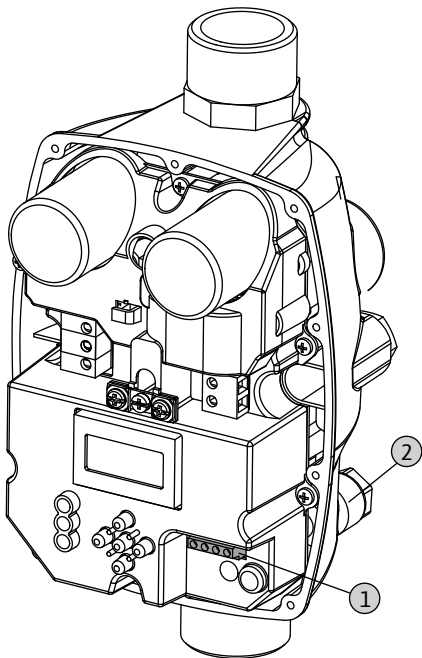


Fig. 10

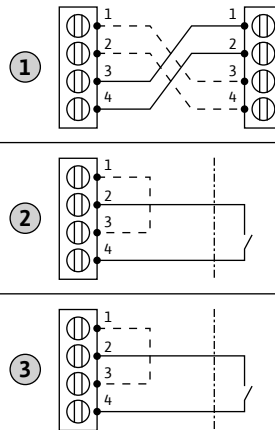
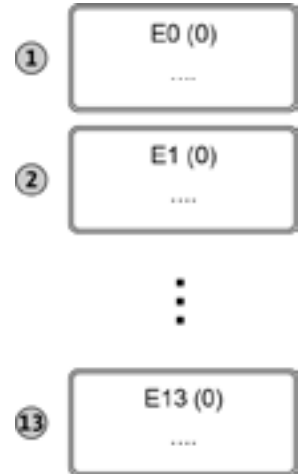


Fig. 11



| | | | | | |
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1 Introduction

1.1 About this document

The language of the original operating instructions is German. All other languages of these instructions are translations of the original operating instructions.

This manual is divided into individual sections, which are listed in the table of contents. Each section has a meaningful heading which clearly describes its content.

A copy of the EC declaration of conformity is a component of these operating instructions.

If a technical modification is made on the designs named there without our agreement, this declaration loses its validity.

1.2 Personnel qualifications

All personnel who work on or with the pump must be qualified for such work; electrical work, for example, may only be carried out by a qualified electrician. All personnel must be of legal age. National accident prevention regulations must also be observed as a basis by the operating and maintenance personnel.

It must be ensured that personnel have read and understood the instructions in this operating and maintenance manual; if necessary, this manual must be ordered from the manufacturer in the required language.

This pump is not intended for use by persons (including children) with limited physical, sensory or mental capacities or without the relevant experience or knowledge, unless they are supervised by a person responsible for their safety and receive instructions from this person on how to use the pump.

Children must be supervised in order to ensure that they do not play with the pump.

1.3 Copyright

This operating and maintenance manual has been copyrighted by the manufacturer. The operating and maintenance manual is intended for use by installation, operating and maintenance personnel. It contains technical regulations and drawings which may not be reproduced or distributed, either completely or in part, or used for purposes of competition, or shared with others without the express consent of the manufacturer. The illustrations used may differ from the original and are only intended as an exemplary representation of the pumps.

1.4 Subject to change

The manufacturer reserves the right to make technical modifications to systems and/or components. This operating and maintenance manual refers to the pump shown on the title page.

1.5 Warranty

In general, the specifications in the current "General Terms and Conditions" apply to the warranty. You can find these here: www.wilo.com/legal
Any deviations must be contractually agreed and shall then be given priority.

1.5.1 General

The manufacturer is obliged to correct any defects found in the pumps it sells, provided that the following points have been fulfilled:

- The quality defects are caused by the materials used or the way the product was manufactured or designed.
- The defects were reported in writing to the manufacturer within the agreed warranty period.
- The pump was used only as prescribed.

1.5.2 Warranty period

The duration of the warranty period is stipulated in the "General Terms and Conditions".
Any deviations must be contractually agreed!

1.5.3 Spare parts, add-ons and modifications

Only genuine spare parts from the manufacturer may be used for repairs, replacements, add-ons and modifications. Unauthorised add-ons and modifications or the use of non-original spare parts can seriously damage the pump and/or injure personnel.

1.5.4 Maintenance

The prescribed maintenance and inspection work should be carried out regularly. This work may only be carried out by qualified, trained and authorised personnel.

1.5.5 Damage to the product

Damage and malfunctions that endanger safety must be eliminated immediately and properly by trained personnel. The pump may only be operated if it is in perfect working order.

In general, repairs should only be carried out by Wilo customer service!

1.5.6 Exclusion from liability

No warranty is granted and no liability is accepted for damage to the pump chamber if one or more of the following points apply:

- Inadequate configuration by the manufacturer due to insufficient and/or incorrect information provided by the operator or customer

- Non-compliance with safety instructions and working instructions as specified in this operating and maintenance manual
- Improper use
- Incorrect storage and transport
- Improper installation/dismantling
- Insufficient maintenance
- Incorrect repairs
- Inadequate construction site or construction work
- Chemical, electrochemical and electrical influences
- Wear
This means the manufacturer's liability excludes all liability for personal injury, material damage or financial losses.

2 Safety

This section lists all the generally applicable safety instructions and technical information. In addition, all the other sections contain specific safety instructions and technical information. All instructions and information must be observed and followed during the various phases of the pump's life cycle (installation, operation, maintenance, transport etc.!) The operator is responsible for ensuring that all personnel follow these instructions and guidelines.

2.1 Instructions and safety instructions

This manual uses instructions and safety instructions for preventing injury and damage to property. To clearly identify them for personnel, the instructions and safety instructions are distinguished as follows:

- Instructions appear in "bold" and refer directly to the preceding text or section.
- Safety instructions are slightly "indented and bold" and always start with a signal word.
 - **Danger**
Serious or fatal injuries can occur!
 - **Warning**
Serious injuries can occur!
 - **Caution**
Injuries can occur!
 - **Caution** (instruction without symbol)
Substantial property damage can occur. Irreparable damage is possible!

- Safety instructions that refer to personal injury appear in black and are always accompanied by a safety symbol. Danger, prohibition or instruction symbols are used as safety symbols.
Example:



Danger symbol: General hazard



Danger symbol, for example, electrical current



Symbol for prohibited action, e.g. No entry!



Instruction symbol, for example, wear protective clothing

The safety symbols used conform to the generally applicable directives and regulations, such as DIN and ANSI.

- Safety instructions that only refer to property damage are printed in grey, without safety symbols.

2.2 General safety information

- When installing or removing the pump, never work alone in rooms and sump. A second person must always be present.
- The pump must always be switched off before any work is performed on it (assembly, dismantling, maintenance, installation). The pump must be disconnected from the electrical system and secured against being switched on again. All rotating parts must have come to a standstill.
- The operator must report any faults or irregularities that occur to a line manager immediately.
- The end-user must shut down the equipment immediately if defects occur that represent a safety risk. These include:
 - Failure of the safety and/or monitoring devices
 - Damage to important parts
 - Damage to electrical equipment, cables and insulations.
- Tools and other objects should only be kept in their designated places so that they can be found quickly.
- Sufficient aeration must be provided when working in enclosed rooms.
- When welding and/or working with electronic devices, make sure there is no risk of explosion.
- Only use lifting gear which is legally defined as such and officially approved.
- The lifting gear must be kept safely and must be suitable for the conditions of use (weather, hooking unit, load, etc.).
- Mobile equipment for lifting loads should be used in such a way that it is guaranteed to remain stable during operation.

- When using mobile equipment for lifting non-guided loads, take action to prevent tipping, shifting, sliding, etc.
- Measures should be taken to ensure that no person is ever directly beneath a suspended load. Furthermore, it is also prohibited to move suspended loads over workplaces where people are present.
- If mobile equipment is used for lifting loads, a second person should be present to coordinate the procedure if required (for example, if the operator's field of vision is blocked).
- The load to be lifted must be transported so that no-one will be injured if there is a power failure. Furthermore, if such work is being carried out outdoors, it must be cancelled if the weather conditions worsen.

These instructions must be strictly observed. Non-observance can result in injury or substantial property damage.



the electromagnetic compatibility (EMC) requirements. Special separate shielding measures (e.g. shielded cables, filters, etc.) may be necessary for the power supply and control cables.

NOTE:

Changes to the cable length or the cable position can have a significant impact on the dimensions of the EMC interferences. Use of an interference suppressor is recommended if interferences occur in other devices!

Connections may only be made provided the switchgear meets the harmonised EU standards. Mobile radio equipment may cause malfunctions in the system.



BEWARE of electromagnetic radiation! Electromagnetic radiation can pose a fatal risk for people with cardiac pacemakers. Put up appropriate signs and make sure anyone affected is aware of the danger!

2.3 Electrical work



ELECTRICAL hazard!
Incorrectly performed electrical work can result in fatal injury! This work may only be carried out by a qualified electrician.

BEWARE of moisture!
Moisture penetrating the cable will damage both the pump and the cable. Never immerse the cable end in fluid and always protect it from moisture. Unused wires must be insulated!

The pumps are operated with single-phase current. The governing national directives, standards and regulations (e.g. VDE 0100) as well as the requirements of the local energy supply company must be observed.

The person operating the pump must know where it is supplied with power and how to cut off the supply. It is advisable to install a residual-current device (RCD). If there is a possibility that people can come into contact with the pump and the fluid (for example on construction sites), the connection **must** be equipped with an additional residual-current device (RCD).

The section entitled "Electrical connection" must be observed when connecting the product. The technical specifications must be observed strictly! The pumps must always be grounded.

If the pump has been switched off by a protective device, it must not be switched on again until the error has been corrected.

When the pump is connected to the electrical control panel, particularly when electronic devices such as soft start-up control or frequency converters are used, the switchgear manufacturer's specifications must be followed to comply with

2.4 Safety and monitoring equipment

The pumps are equipped with the following monitoring devices:

- Undervoltage
- Overvoltage
- Short-circuit
- Temperature (frequency converter)
- Dry run
- Leakage

These functions are implemented by the frequency converter and do not have to be connected separately.

Personnel must be informed about the installed systems and how they work.

2.5 Conduct during operation

When operating the pump, always follow the locally applicable laws and regulations for work safety, accident prevention and handling electrical machinery. To help ensure safe working practice, the responsibilities of employees should be clearly specified by the operator. All personnel are responsible for ensuring that regulations are observed.

The pump is equipped with moving parts. During operation, these parts rotate in order to pump the fluid. Certain substances in the fluid can result in very sharp edges forming on the moving parts.

WARNING: rotating parts!

The rotating parts can crush and sever limbs. Never reach into the hydraulics or touch the rotating parts when the machine is in operation. Before performing maintenance or repairs, switch off the pump and wait for the rotating parts to come to a standstill!



2.6 Fluids

Each fluid differs in respect of composition, corrosiveness, abrasiveness, dry matter content and in many other aspects. Generally, our pumps can be used for many applications. Please note that if requirements change (density, viscosity or general composition), this can also affect many operating parameters of the pump.

When using and/or replacing the pump in a different fluid:

- The motor is filled with oil. The fluid can be contaminated by this oil if the mechanical seal is defective.
- When used in domestic hot water applications, all the parts in contact with fluid must be fit for the purpose. This must be checked in accordance with the local regulations and laws.

The pumps must not be used in wastewater and sewage and/or with fluids that are hazardous to health.

2.7 Sound-pressure

The submersible pump generates a sound-pressure level of approx. 70 dB (A) during operation. However, the actual sound-pressure level depends on several factors. These include, for example, the installation depth, installation, fixation of accessories and piping, the duty point, immersion depth, etc.

We recommend that the operator should take an additional measurement at the workplace once the unit is running at its duty point and under all operating conditions.



CAUTION: Wear ear defenders! According to applicable laws and regulations, ear protection must be worn if the sound-pressure level is 85 dB (A) or more! The end-user must make sure that this is complied with!

2.8 CE marking

The CE marking is attached to the rating plate.

3 Product description

The pump is manufactured with great care and is subject to constant quality controls. Trouble-free operation is guaranteed if the device is installed and maintained correctly.

3.1 Intended use and fields of application



ELECTRICAL hazard
When using the pump in swimming pools or other basins that can be entered, there is a risk of electrocution. Note:

- Use is strictly forbidden if there are people in the basin!
- If there are no people in the basin, protective measures must be taken according to DIN EN 62638 (or the appropriate national regulations).



RISK of fatal injury from magnetic field (TWU 3-...-HS-ECP)!

The permanently magnetised rotor inside the motor presents an acute danger to persons with pacemakers. Non-observance results in death or the most serious of injuries.

- Do not open the motor!
- Only allow Wilo customer service to dismantle and install the rotor for maintenance and repair work!
- Persons with pacemakers must follow the general behavioural guidelines that apply for handling electrical equipment when working on the pump!



NOTE (TWU 3-...-HS-ECP):

The magnets inside the motor do not pose a danger provided the motor is completely mounted. As such, the pump assembly does not pose a special danger to persons with pacemakers, who can safely approach the pump without any restrictions.



DANGER – explosive fluids!

It is strictly prohibited to pump explosive fluids (gasoline, kerosene etc.). The pumps are not designed for these fluids!

The submersible pumps are suitable for:

- Water supply from boreholes, wells and rainwater storage tanks
 - Domestic water supply, sprinkling and irrigation
 - Pumping water without long-fibre and abrasive constituents
- The submersible pumps must not be used for pumping:
- Wastewater
 - Sewage/faeces
 - Untreated sewage

Intended use includes compliance with this manual. Any other use is regarded as non-compliant with the intended use.

3.1.1 Pumping drinking water

When used to pump drinking water, the local guidelines/laws/regulations must be checked to establish whether the pump is suitable for this application.

The pumps do not comply with the specifications of TrinkwV and are not approved in accordance with ACS or local guidelines e.g. KTW and elastomer guidelines.

3.2 Set-up

The Wilo-Sub TWU 3-...-HS is a submersible pump that is immersed in a stationary installation, either vertically or horizontally, and operated via a frequency converter.

Fig. 1: Description of the submersible pump

| | | | |
|---|---------------|---|------------------------------|
| 1 | Cable | 4 | Hydraulics housing |
| 2 | Suction piece | 5 | Pressure connection |
| 3 | Motor housing | 6 | Internal frequency converter |

Fig. 2: Description of the external frequency converter

| | | | |
|---|---------------------|---|---------------------------|
| 1 | Inlet | 3 | Control panel and display |
| 2 | Pressure connection | | |

3.2.1 Hydraulics

Multistage hydraulics with radial impellers in sectional construction. The hydraulics housing and the pump shaft are made of stainless steel and the impellers are made of Noryl. The connection on the pressure side is designed as a vertical threaded flange with a female thread and integrated non-return valve.

The pump is not self-priming, i.e. the fluid must flow in either automatically or with supply pressure and a minimum coverage must be ensured at all times.

3.2.2 Motor

The motors used are all oil-filled three-phase AC motor for direct starting on the frequency converter. The motor housing is made of stainless steel and has a shaft connection for 3" hydraulics. The motor is cooled by the pumped fluid. Therefore, the motor must always be operated immersed. The limit values for maximum fluid temperature and minimum flow velocity must be adhered to.

The connection cable has free cable ends, is longitudinally watertight and is connected to the motor by a detachable plug.

3.2.3 Frequency converter

The frequency converter is either enclosed as an external component (TWU 3-...-HS-ECP) or it is integrated in the motor (TWU 3-...-HS-I).

Like the motor, the frequency converter is cooled by the fluid. To do this, the external frequency converter must be installed in the ascending pipe. The internal frequency converter is cooled by the surrounding fluid.

The frequency converter offers the monitoring functions:

| Monitoring | HS-ECP | HS-I |
|-----------------------------------|--------|------|
| Undervoltage | • | • |
| Overvoltage | • | • |
| Short-circuit | • | • |
| Temperature (frequency converter) | • | • |
| Dry run | • | • |
| Leakage | • | - |

The external frequency converter is not overflow-proof! Note that the device has protection class "IPX5" and only ever install it overflow-proof in dry rooms!

3.2.4 Seal

The sealing between the motor and hydraulics is achieved by a lip seal.

3.3 Function description**3.3.1 Version "HS-I"**

In the "HS-I" version, the pump is switched on and off via a separate switching system. After it is switched on, the pump is accelerated to its maximum speed via the integrated frequency converter, pumping at full power. Frequency-dependent control and pressure-dependent control are not possible.

3.3.2 Version "HS-ECP"

The "HS-ECP" version is operated with an external frequency converter. This both serves as a separate control unit for the pump and it provides a control function for constant pressure ("CP"). This function makes it possible to always ensure the same pressure at the tap, regardless of the volume flow.

The pump is controlled via the frequency converter, where the set pressure is set. When water is drawn from the tap, the frequency converter switches the unit on. The frequency converter uses the preset pressure to calculate the required volume flow and it adjusts the motor speed accordingly. This enables a constant pressure at all times at the tap.

3.4 Operating modes**3.4.1 Operating mode S1 (continuous duty)**

The pump can operate continuously at the rated load without exceeding the permissible temperature.

3.5 Technical data

| Submersible pump | | | |
|---|--------|---------------------------------|--------|
| Mains connection [U/f]: | | See rating plate | |
| Rated power [P ₂]: | | See rating plate | |
| Maximum delivery head [H] | | See rating plate | |
| Maximum volume flow [Q]: | | See rating plate | |
| Activation type [AT]: | | direct | |
| Fluid temperature [t]: | | 3...35 °C | |
| Protection class: | | IP58 | |
| Insulation class [Cl.]: | | F | |
| Speed [n]: | | max. 8400 1/min | |
| Max. immersion depth: | | 150 m | |
| Submerged [OT ₃]: | | S1 | |
| Non-immersed [OT _E]: | | - | |
| Max. switching frequency: | | 30/h | |
| Max. sand content: | | 50 g/m ³ | |
| Min. flow at motor: | | 0.08 m/s | |
| Pressure connection TWU | | | |
| TWU 3-...-HS-I: | | Rp 1 | |
| TWU 3-02../3-03..-HS-ECP: | | Rp 1 | |
| TWU 3-05....-HS-ECP: | | Rp 1¼ | |
| External frequency converter | | | |
| Mains connection: | | 1~230 V, 50 Hz | |
| Output power: | | 3~230 V/max. 280 Hz/max. 1.5 kW | |
| Fluid temperature [t]: | | 3...35 °C | |
| Ambient temperature [t]: | | 4...40 °C | |
| Protection class: | | IPX5 | |
| Max. pressure: | | 7.5 bar | |
| Connection: | | G 1¼ | |
| Control function: | | Constant pressure | |
| Maximum current consumption (I _{max}) | | | |
| Rated power [P ₂]: | 0.6 kW | 0.9 kW | 1.1 kW |
| Rated motor current I _N : | 4.2 A | 5.9 A | 8.2 A |

3.6 Type key

| Example: Wilo-Sub TWU 3-0305-HS-E-CP | |
|--------------------------------------|--|
| TWU | Submersible pump |
| 3 | Diameter of the hydraulics in inches |
| 03 | Rated volume flow in m ³ /h |
| 05 | Number of hydraulic stages |
| HS | High-speed version with speeds of up to 8400 l/min |
| E | Frequency converter version E = external frequency converter I = internal frequency converter |
| CP | Control function CP = constant pressure control via variable speed without = fixed speed of up to 8400 l/min |

3.7 Scope of delivery

- Submersible pump with cable
- Installation and operating instructions
- External frequency converter (with "HS-ECP" only)

3.8 Accessories (optionally available)

- Cooling jacket
- Level sensors
- Motor cable kits
- Sealing set for motor cable extension

4 Transportation and storage

4.1 Delivery

On receiving the consignment, check immediately that this is complete and undamaged. If any parts are damaged or missing, the transport company or the manufacturer must be notified on the day of delivery since claims made after this date cannot be recognised.

Damage to parts must be noted on the freight documentation.

4.2 Transport

Only the appropriate and approved lifting gear, transportation and hoist may be used. These must have sufficient load-bearing capacity to ensure that the pump can be transported safely. When using chains, these are to be secured against slipping.

The personnel must be qualified for the tasks and must follow all applicable national safety regulations during the work.

The pump is delivered by the manufacturer or shipping agency in suitable packaging. This normally precludes the possibility of damage occurring during transportation and storage. The packaging should be stored in a safe place for reuse if the product is frequently used at different locations.

4.3 Storage

Newly delivered submersible pumps are prepared in such a way that they can be stored for at least 1 year. The pump should be cleaned thoroughly before it is put into temporary storage!

Consider the following for storage:

- Place the pump on a firm bearing surface and secure it against slipping and falling over. Submersible pumps can be stored vertically or horizontally. If pumps are stored horizontally in more than 9 layers, ensure that they do not bend.

Otherwise, impermissible bending tensions can arise in the hydraulics and the pump may be damaged. Support the hydraulics accordingly!

DANGER due to falling over!

Never set the unit down unsecured. If the pump falls over, this may lead to injuries!



- Submersible pumps can be stored at temperatures down to -15 °C. The store room must be dry. We recommend a frost-protected room for storage with temperature between 5 °C and 25 °C.
- The submersible pump is not allowed to be stored in rooms in which welding work is carried out, because the resulting gases or radiation can damage the elastomer components and coating.
- The pump's suction and pressure connections and the external frequency converter should be permanently sealed to prevent contamination.
- The power supply cables should be protected against kinking, damage, and moisture.

ELECTRICAL hazard!

Damaged power supply cables can cause fatal injury! Defective cables must be replaced by a qualified electrician immediately.



BEWARE of moisture!

Moisture penetrating the cable will damage both the pump and the cable. For this reason, never immerse the cable end in the fluid or any other liquid.

- The submersible pump and the external frequency converter must be protected from direct sunlight, heat, dust, and frost.
- If the submersible pump and the external frequency converter have been stored for a long period of time, they should be cleaned of impurities such as dust and oil residue before commissioning. Check the impeller for ease of movement.

Note:

Elastomer parts and coating are subject to natural brittleness. If the product is to be stored for longer than 6 months, we recommend checking these parts and replacing them as necessary. Consult the manufacturer for further details.

4.4 Return delivery

Pumps that are returned to the factory must be properly packaged. This means that impurities have been removed from the pump and that it has been decontaminated if used with fluids that are hazardous to health.

For shipping, the parts must be packed in tear-proof plastic bags of sufficient size in such a manner that they are tightly sealed and leak-proof. Furthermore, the packaging must protect the pump from damage during transportation. If you have any questions, please contact the manufacturer!

5 Installation

In order to prevent damage to the device or serious injury during installation, note:

- Installation work – assembly and installation of the submersible pump – may only be carried out by qualified persons by following the safety instructions at all times.
- The submersible pump should be inspected for transport damage before any installation work is carried out.

5.1 General

In the event of pumping through longer discharge pipelines (particularly in the case of longer ascending pipes), pressure surges can occur.

Pressure surges can result in destruction of the pump/system and noise pollution due to flap knock. Water hammers can be reduced or prevented by applying suitable measures (e.g. non-return valves with an adjustable closing time, electrically actuated shut-off devices, special routing of the discharge pipeline).

If you are using a level control device, make sure that the minimum water coverage is present. Air pockets in the hydraulic housing or pipe system must be avoided at all costs and must be removed using a suitable ventilation system. Protect the submersible pump from frost.

5.2 Installation types

- Vertical stationary installation, immersed
- Horizontal stationary installation, immersed – only in conjunction with a cooling jacket!

5.3 Installation



DANGER of falling!

When installing the pump and its accessories, work is sometimes performed directly at the edge of the well or tank. Carelessness or wearing inappropriate clothing could result in a fall. There is a risk of fatal injury! Take all necessary safety precautions to prevent this.

When installing the pump, note the following:

- This work must be performed by qualified personnel and electrical work must be performed by a qualified electrician.
- The operating space must be clean, free of coarse solids, dry, frost-free and, if necessary, decontaminated and suitable for the particular pump. There must be sufficient water inflow for the submersible pump's maximum output in order to prevent dry run and/or air intake.
- When working in tanks, wells or boreholes, a second person must be present for safety reasons. Take the necessary countermeasures if there is a risk of toxic or suffocating gases collecting!
- Ensure that lifting equipment can be fitted without any trouble, since this is required for assembly/dismantling of the pump. It must be possible to reach the pump safely in its operating and storage locations using the lifting equipment. The set-down location must have a solid bearing surface. For transporting the pump, the lifting gear must be secured to the prescribed lifting eyelets. When using chains, these must be connected to the lifting eyes using a shackle. Lifting gear must be technically approved.
- Power supply cables must be laid out in such a way that safe operation and trouble-free installation/dismantling are possible at all times. The pump must never be carried or dragged by the power supply cable. Check whether the cable present is long enough for its cross-section and its installation type.
- When using switchgear, the corresponding protection class should be observed. Switchgears are to be generally arranged overflow-proof.
- Structural components and foundations must be of sufficient stability in order to allow the product to be fixed securely and functionally. The operator or the supplier is responsible for provision of the foundations and their suitability in terms of dimensions, stability and strength!
- Check that the available design documentation (installation plans, layout of the operating space, intake ratios) is complete and correct.
- Also refer to all regulations, rules and laws for working with heavy and suspended loads. Wear appropriate protective clothing/equipment.
- Please also observe the applicable national accident prevention regulations and trade association safety provisions.



NOTE:

- To achieve the necessary cooling, the pump must always be immersed when in operation. The minimum water submersion must be ensured at all times!
- Never let the pump run dry! If the water level fluctuates strongly, we recommend installing additional dry-running protection!
- No additional non-return valve may be used on the pressure side. This would result in system malfunction.
- A diaphragm expansion tank (1 – 2 litres) must be installed between the frequency converter and the tap. This minimises the number of starts in the event of small leaks in the pipe system.
- **TWU 3-...-ECP:**
Before lowering the pump, note the rated current specifications on the motor rating plate! This value marks the maximum permissible default value for the operating parameter I_{max}. When commissioning the pump, I_{max} must be entered on the external frequency converter, also see section 3.5

5.3.1 Motor filling

The motor is filled ex works with food-safe white oil that is potentially biodegradable. This oil filling guarantees that the pump is frost-proof at temperatures down to -15 °C.

The motor is designed in such a way that it cannot be filled from outside. Only the manufacturer can fill the motor.

5.3.2 Vertical installation of the pump

Fig. 3: Installation

| | | | |
|---|--|---|------------------------------|
| 1 | Unit | 5 | External frequency converter |
| 2 | 1" -> 1¼" adaptor | 6 | Tap |
| 3 | Switchgear | 7 | Main switch |
| 4 | Separate pressure sensor (to be installed on-site) | 8 | Diaphragm expansion tank |

In this installation method, the submersible pump is installed directly on the ascending pipe. The installation depth is determined by the length of the ascending pipe. In narrow well shafts, a centring device must be used because the pump must not come into contact with the walls of the well as this could damage the cable and pump. Use hoisting gear with sufficient bearing capacity.

The motor must not sit on the bottom of the well as this can lead to tensions and slagging of the motor. This would mean that heat dissipation is no longer guaranteed and the motor could overheat.

In addition, the pump should not be installed at the same height as the filter pipe. The intake current can draw up sand and solid material, which would mean that the motor cooling is no longer

guaranteed. This would result in increased wear of the hydraulics. To prevent this, it may be necessary to use a cooling jacket or install the pump in the vicinity of unperforated well casings.



NOTE:

Note the following when installing threaded pipes:

- The threaded pipes must be screwed into each other leak-tight and firmly. To achieve this, wrap the threaded pin with hemp or Teflon tape.
- When screwing in the pipes, make sure that the pipes are aligned (not tilted) to ensure that the thread is not damaged.
- Note the submersible pump's direction of rotation and use suitable threaded pipes (right-hand or left-hand thread) so that the pipes do not become loose during operation.
- The threaded pipes must be secured against accidental loosening.

1. Screw the individual pipes together.
2. Extend the power supply cable connected at the factory to the necessary length, according to the available space in the borehole, using heat-shrink tubing or a cast resin connection:
 - TWU 3-...-ECP: to the frequency converter's installation location

Use a round cable to extend the cable; this ensures that the cable inlet on the frequency converter seals properly!

3. Check the insulation resistance
To check the insulation resistance, use an insulation tester (measuring voltage is 500 V) to measure the resistance of the motor winding and the power supply cable. The resistance must not fall below the following values:
 - At initial commissioning: min. 20 MΩ
 - During further measurements: min. 2 MΩ

If insulation resistance is too low, it is possible that moisture has penetrated into the power supply cable and/or motor. Do not connect the pump again and consult the manufacturer!

4. Fit the piping to the pump's pressure connection.
5. Route the power supply cable along the piping. Always fasten the cable below and above a pipe adaptor, using a cable clip.
6. Fit a mounting bracket to the pressure connection of the last pipe and fit a supporting clamp below the flange.

Make sure that the cable is not damaged by the supporting clamp. The cable must always be laid outside the supporting clamp!
7. Fasten the lifting equipment to the mounting bracket and hoist the entire unit.
8. Pivot the unit over the borehole and lower it slowly.

Make sure that the cable and the wall of the well are not damaged!

9. Place two scantlings over the well shaft. Lower the unit until the supporting clamp is in resting on the scantlings.
10. Disassemble the mounting bracket from the discharge pipe and fit the well closure (e.g. well cover) on the discharge pipe.



WARNING: Danger of crushing!
During installation, the entire weight of the unit is borne by the lifting equipment and the bearer cable may be under tension. This can result in severe crushing! Before disassembling the mounting bracket, make sure that the bearer cable is NOT under tension!



- The guy must be fastened to the suspension points (eyelets) provided on the pressure port for that purpose. If these suspension points are not available, an intermediate flange containing suspension points must be installed.

DANGER due to improper fixation.
The guy must not be wound around the pressure port or affixed to the piping. This could result in slipping or the piping might become separated. There is an increased risk of injury! Always fasten the guy to the prescribed suspension points!

11. Fasten the lifting equipment to the well closure and hoist the entire unit (consisting of the pump, piping and well closure).
12. Disassemble the supporting clamp, remove the scantlings and lay the power supply cable through the well closure to the outside.
13. Place the unit on the well and fasten the well closure.
14. Fit the discharge pipeline to the tap on the well closure and lay the power supply cable to the switchbox.

Installing piping for deep wells

Long piping is needed for deep wells. With lengths of 10 m or more, impermissible bending tension may occur when lifting the piping and it may become damaged.

To prevent this, the piping must be installed successively in short lengths.

To do this, the individual sections (recommendation: max. 3 m) are lowered into the borehole and installed one after the other. This way, longer piping can be installed for deep wells without any problems.



NOTE:
 Metallic pressure pipes must be integrated in the potential equalisation in accordance with the locally applicable regulations and recognized rules of technology:

- Since the external frequency converter has an insulating effect, note that the pipeline upstream and downstream of the frequency converter as well as the pump unit are integrated into the potential equalization.
- Note the extensive, impedance connection of the contacts!

Installing flexible piping

The pump can also be used with flexible piping (e.g. hoses). In this case, the piping is fitted to the pressure connection and then lowered into the borehole together with the pump.

Note:

- Nylon or stainless steel guys are used to lower the pump.
- The guy must have sufficient bearing capacity for the complete system (pump, piping, cable, water column).

5.3.3 Horizontal installation of the pump

This installation method is only permissible in conjunction with a cooling jacket. The pump is installed directly in the water tank/reservoir and flanged onto the discharge pipeline. The cooling jacket's supports have to be installed at the specified distance in order to prevent bending of the unit. For more information, see the installation and operating instructions for the cooling jacket in question.

The connected piping must be self-supporting, i.e. it must not be supported by the unit.

In the case of horizontal installation, the pump and piping are installed separately. Make sure that the pressure connection for the pump and the pressure connection for the piping are at the same height.

1. Drill the mounting holes for the support into the floor of the operating space (tank/reservoir). See the relevant instructions for information about the anchor bolts, distances between holes and size of holes. Pay attention to the required tightness of screws and anchors.
2. Fasten the supports to the floor and move the pump into the correct position using suitable hoisting gear.
3. Fasten the pump to the supports with the fixation material provided. Make sure that the rating plate faces upwards!
4. Once the pump has been firmly installed, the pipe system can be mounted or a pipe system installed previously can be attached. Make sure that the pressure connections are at the same height.
5. Connect the discharge pipe to the pressure connection. The threaded connection must be sealed. Make sure that the pipe system was installed vibration-free and stress-free (if necessary, use elastic adaptors).
6. Lay the cable in such a way that it does not pose a danger to anyone (maintenance personnel, etc.) at any time (during operation, during maintenance work, etc.). The power supply cables must not be damaged. The electrical connections must be carried out by an authorised expert.

5.3.4 Installing an external frequency converter

Fig. 4: Description

| | | | |
|---|---------------------|---|-------------------------|
| 1 | Inlet | 3 | Direction of flow arrow |
| 2 | Pressure connection | | |

The frequency converter is installed directly in the piping so that it is cooled by the fluid being pumped during operation.

Note:

- Ambient conditions:
 - Ambient temperature: 4...40 °C (frost-proof)
 - Fluid temperature: 3...35 °C
 - Protection class: IPX5 (overflow-proof installation).
- The electrical connection and all settings are carried out on the frequency converter itself. It therefore needs to be easily accessible.
- During installation, note the direction of flow. See the direction of flow arrow on the frequency converter's housing.



NOTE:

The pressure and inlet connection on the frequency converter is sized **G 1¼**, the pressure connection on the pump is sized **Rp 1** for version TWU 3-05...-ECP **Rp 1¼**. Depending on the discharge pipeline, **1 or 2 adaptors** need to be installed downstream of the frequency converter by the customer.

5.4 Dry-running protection

Submersible pumps are cooled by the fluid. Therefore, the motor must always be immersed. In addition, make sure that no air enters the hydraulics housing. The pump must therefore always be immersed in the fluid up to the top edge of the hydraulic housing. For optimum operational reliability, we recommend installing a dry-running protection system.

The TWU 3-...-HS has a built-in dry-running protection in the frequency converter. If the water level fluctuates strongly, the motor's maximum switching cycles may be exceeded. This could lead to overheating of the motor. In this case, we therefore recommend an additional dry-running protection provided by the customer.

Dry-running protection is provided with the help of electrodes or level sensors. The signal transmitter is fixed in the borehole/basin and switches off the pump when the water level falls below the minimum water submersion.

5.4.1 Remedies for avoiding excessive switching cycles

Manual reset – the motor is switched off when the water level falls below the minimum coverage level and switched back on when a sufficient water level is reached.

Separate reactivation point – a second switching point (additional electrode) is used to obtain a sufficient difference between the activation

and deactivation points. This prevents constant switching. This function can be put into effect with a level control relay.

5.5 Electrical connection



RISK of death due to electrocution!

Incorrect electrical connections can cause fatal electric shocks. Electrical connections may only be carried out by a qualified electrician approved by the local energy supply company, in accordance with locally applicable regulations.

- The mains connection current and voltage must be as stated on the rating plate.
- Connect the power supply cable in accordance with the applicable standards and regulations and according to the conductor assignment.
- Any available monitoring equipment must be connected and tested to ensure that it is working properly.
- Earth the submersible pump according to the regulations. Units that are permanently installed must be grounded in compliance with nationally applicable standards. If a separate protective earth conductor is available, it must be connected to the marked drilled hole or earth terminal (⊕) using a suitable screw, nut, toothed washer and flat washer. The cross-section of the cable for the protective earth conductor connection must comply with local regulations.
- A power supply separator (main switch) **must** be provided by the customer!
- We recommend using a residual-current device (RCD).
- Switchgears must be purchased as accessories.

5.5.1 Technical information

- Activation type: Direct
- Fuse on mains side: 16 A
- Cable cross-section, pump/frequency converter:
 - Up to 30 m: 1.5 mm²
 - From 30...90 m: 2.5 mm²
- Cable cross-section, power supply separator/frequency converter:
 - Up to 1.1 kW: 1.5 mm²
 - from 1.2 kW: 2.5 mm²
 - With cable lengths of 5 m or more, always use a cable cross-section of 2.5 mm² in order to avoid any interference due to voltage drop.
- Temperature resistance of the cable: max. 75 °C
- Only slow-blow fuses or K-type circuit breakers may be used as a back-up fuse.

5.5.2 Unit with built-in frequency converter (TWU 3-...-HS-I)

The version with built-in frequency converter is delivered ex works with a connected power supply cable. This cable has to be extended, according to the available space in the borehole, using heat-shrink tubing or a cast resin connection, by the customer **before installation**.

Before the power supply cable is connected to the switchbox/main switch, the insulation resistance must be measured again. This way, you can identify damage caused during installation.

- Measure with an insulation tester (measuring voltage is 500 V) to measure the resistance of the power supply cable and the motor winding.
- The resistance must not fall below the following values:
 - At initial commissioning: min. 20 MΩ
 - During further measurements: min. 2 MΩ

If the insulation resistance is too low, it is possible that moisture has penetrated into the cable and/or motor. Do not connect the pump again and consult the manufacturer!

If the insulation resistance is OK, connect the unit to the mains supply by connecting the power supply cable to the switchbox.

Electrical connections may only be made by a qualified electrician!

The wires of the connection cable are assigned as follows:

| 3-wire connection cable | |
|-------------------------|----------|
| Wire colour | Terminal |
| brown | L |
| blue | N |
| green/yellow | PE |

5.5.3 Unit with external frequency converter (TWU 3-...-HS-ECP)

The connection on the pump and mains side is made at the frequency converter.

Electrical connections may only be made by a qualified electrician!

Fig. 5: Components on the frequency converter

| | | | |
|---|------------------------------|---|------------------|
| 1 | Cover | 5 | Cable bushing |
| 2 | Housing bottom | 6 | “MOTOR” terminal |
| 3 | Threaded housing connections | 7 | “LINE” terminal |
| 4 | Threaded cable connections | 8 | Earth terminal |

Pump/frequency converter connection

The power supply cable connected at the factory has to be extended, according to the available space in the borehole, using heat-shrink tubing or a cast resin connection, by the customer **before installation**, and then connected to the frequency converter.

Before the power supply cable is connected to the frequency converter, the insulation resistance must be measured again. This way, you can identify damage caused during installation.

Use a round cable to extend the power supply cable; this ensures that the cable inlet on the frequency converter seals properly!

1. Measure with an insulation tester (measuring voltage is 500 V) to measure the resistance of the power supply cable and the motor winding. The resistance must not fall below the following values:
 - At initial commissioning: min. 20 MΩ
 - During further measurements: min. 2 MΩ**If the insulation resistance is too low, it is possible that moisture has penetrated into the cable and/or motor. Do not connect the pump again and consult the manufacturer!**
2. Loosen the two screws on the housing bottom and remove the cover.
3. Loosen the two cable inlets on the housing bottom.
4. There are two terminals in the frequency converter: MOTOR and LINE. Place the threaded cable connection on the power supply cable and pass it through the cable inlet on the side of the “MOTOR” terminal. Screw the threaded cable connection into the housing and fasten the power supply cable.
5. Pull out the terminal, connect the power supply cable to the “MOTOR” terminal in accordance with the wire allocation shown below, and then replace the terminal.

| 4-wire connection cable | |
|-------------------------|----------|
| Wire colour | Terminal |
| black | U |
| blue or grey | V |
| brown | W |
| green/yellow | PE |

6. Fasten the protective earth conductor to the earth terminal above the “MOTOR” terminal. To do this, use a blade connector.

Mains/frequency converter connection

RISK of fatal electric shock

The power supply cable on the mains side has to be connected first to the frequency converter and only then to the power supply separator/switchbox! Failure to comply with this sequence results in the full mains voltage being present at the open cable end. There is a risk of fatal injury! Always comply with this sequence and have a qualified electrician perform the electrical connection.



Use a round cable for the power supply cable; this ensures that the cable inlet on the frequency converter seals properly!

1. Place the second threaded cable connection on the power supply cable and pass it through the opening on the side of the “LINE” terminal.
2. Screw the threaded cable connection into the housing, fastening the power supply cable.

3. Pull out the terminal, connect the power supply cable to the "LINE" terminal and then replace the terminal.
4. Fasten the protective earth conductor to the earth terminal above the "LINE" terminal. To do this, use a blade connector.
5. Replace the cover on the housing bottom and screw the two screws back into the housing.
6. Now lead the power supply cable to the power supply separator (main switch) or to the switchbox. Make sure that the power supply cable is laid securely and does not pose a danger (e.g. loops that someone could trip on).
7. Connect the power supply cable to the power supply separator (main switch) or the switchbox.

5.5.4 Connecting the monitoring equipment

The monitoring functions are implemented via the frequency converter and do not have to be connected separately.

| Overview of monitoring devices | | |
|-----------------------------------|--------|------|
| Function | HS-ECP | HS-I |
| Undervoltage | • | • |
| Overvoltage | • | • |
| Short-circuit | • | • |
| Temperature (frequency converter) | • | • |
| Dry run | • | • |
| Leakage* | • | - |

Key:

- • = built-in
- - = to be provided by customer
- * = leakage detection is switched off in the factor and has to be activated via the menu!

Please also refer to the "Setting the operating parameters" section.

- In the "...-HS-ECP" variant with an external frequency converter, the error messages are displayed on the frequency converter's display and are confirmed/reset accordingly.
- In the "...-HS-I" variant with an internal frequency converter, the pump is automatically switched off when an error occurs. The pump is only switched back on once the system is reset via the main switch.

5.6 Motor protection and activation types

5.6.1 Motor protection

The motor protection is integrated in the frequency converter:

- In the TWU 3-...-HS-ECP, the relevant value has to be set via the frequency converter.
- In the TWU 3-...-HS-I, the value is preset. We also recommend installing a residual-current device (RCD).

Local and national regulations must be observed when connecting the pump.

5.6.2 Activation types

Direct activation

At full load, the motor protection should be set to the rated current shown on the rating plate. At partial load, we recommend that the motor protection be set 5 % above the current measured at the duty point.

6 Commissioning

The "Commissioning" section contains all the important instructions for the operating personnel for starting up and operating the pump.

The following general conditions must always be met and checked:

- Installation type, including cooling (does a cooling jacket have to be installed?)
- Operating parameters (for TWU 3-...-HS-ECP)
- Minimum water submersion / max. immersion depth

These general conditions should also be checked after a lengthy period of standstill, and any defects detected are to be remedied!

Always keep this manual either by the pump or in a place specially reserved for it, where it is accessible for the entire operating personnel at all times.

In order to prevent damage or serious injury when commissioning the pump, the following must be observed:

- Commissioning of the pump may only be carried out by qualified and trained personnel in accordance with the safety instructions.
- All persons working on or with the pump must have received, read and understood this operating and maintenance manual.
- All safety devices and emergency cut-outs must be connected and checked to ensure that they work properly.
- Electrical engineering and mechanical adjustments must be carried out by qualified personnel.
- The pump is suitable for use under the specified operating conditions.
- The work area of the pump is not a recreational area and is to be kept free of people! No persons are allowed in the work area during start-up or operation.
- Make sure a second person is present at all times when you are working in wells and tanks. If there is a risk of toxic gases forming, sufficient aeration must be ensured.

6.1 Electrical system

Connect the pump and install the power supply cables as described in the "Installation" section and in accordance with the VDE guidelines and applicable national regulations.

The pump must be properly protected and earthed.

Observe the direction of rotation! If the direction of rotation is incorrect, the pump will not perform as specified and may be damaged.

Make sure all monitoring devices are connected and have been tested.



ELECTRICAL hazard!
Electrical current can cause fatal injuries if not handled correctly! All connections must be made by a qualified electrician!

6.2 Rotation direction monitoring

Rotation is controlled via the frequency converter.

- The pump with built-in frequency converter (TWU 3-...-HS-I) automatically turns in the right direction.
- In the version with an external frequency converter (TWU 3-...-HS-ECP), the direction of rotation is shown on the display and can be adjusted from the menu. See “Setting the operating parameters”.

6.3 Operation and function (TWU 3-...-HS-ECP)

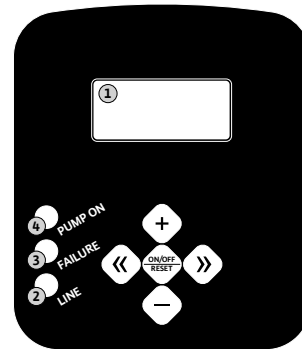
Once all the installation work is complete, the operating parameters have to be adjusted on the frequency converter.

These adjustments are only possible in the “ECP” version. In the “I” version with an internal frequency converter, no further adjustments are possible.

Overview of functions

- Constant pressure at the tap
- Soft start and stop to reduce pressure surges
- Dry-running protection in the event of low water in the inlet
- Automatic reset of the dry-running protection after a specified time
- Leak monitoring
- Rotation direction monitoring and switching of rotation direction
- Additional connection for functional extension

Fig. 6: Operating elements



- Display (1)
- Green LED (2) mains voltage:
 The green LED lights up if the power has been connected correctly. If the power connection is faulty, the LED does not light up.
- Red LED (3) error message:
 The red LED lights up if an error occurs. Consult the error list to see what error has occurred.
- Yellow LED (4) pump operating status:
 The yellow LED indicates the pump’s operating status. If the LED is lit, the pump is running. If the LED is off, the pump is in standby mode.
- “ON-OFF/Reset” button: changes from standby (OFF) to operation (ON); resets alarm and error messages
- “+” button: increases the displayed value
- “-” button: reduces the displayed value
- “»” button: scrolls forward through the menu
- “«” button: scrolls backward through the menu

6.3.1 Main menu

All parameters are shown via the display on the frequency converter. You can use the button beneath the display for menu control and to change the values.

Fig. 7: Main menu

| | | | |
|---|--|---|---|
| 1 | Display during normal operation 1.0 Bar (280 Hz) | 4 | Internal temperatures Ti = 27 °C Ta = 33 °C |
| 2 | Display during standby mode 1.0 Bar Stand-by | 5 | User language Language EN |
| 3 | Voltage and current V = 207 V I = 5.0 A | | |

The parameters can be displayed in standby mode and during operation. Use the “»” or “«” arrow keys to switch between individual parameters.

1. **Normal operation:** during normal operation, the display shows the currently measured pressure and the current motor speed as a frequency value.
2. **Standby mode:** in standby mode, or if the power supply is interrupted, the display shows the last measured pressure and the message "Stand-by". There is no automatic activation in standby mode!
3. **V, I:** voltage and current
The display shows the input voltage to the inverter and the power consumption of the motor.
4. **Ti, Ta:** temperature display
The display shows the ambient temperature within the inverter and the IGBT power module. These temperature values impact on the intelligent performance management which limits the motor's maximum frequency as soon as defined pre-alarm limit values are reached (factory-set).
5. **Language:** user language
The display shows the currently selected user language. Several languages are available for selection. To change the language, use the "+" or "-" buttons.

6.3.2 Adjusting the operating parameters

All parameters are shown via the display on the frequency converter. You can use the button beneath the display for menu control and to change the values.



Fig. 8: Operating parameters

| | | | |
|---|----------|---|--------|
| 1 | Pmax | 5 | Unit |
| 2 | Dp Start | 6 | Imax |
| 3 | P limit | 7 | Rotat. |
| 4 | Dp Stop | | |



The operating parameters are not displayed in the menu during normal operation and are only required during installation. To access these menu items, switch the pump into standby mode. Then press the "+" and "-" buttons together and hold for 5 seconds.

Use the "»" or "«" arrow keys to switch between individual parameters. To modify a value, use the "+" or "-" buttons. To exit the menu, press the "ON-OFF/Reset" button.

See the table in the appendix (Chap. 10.2) for the possible setting range, the factory setting and the recommended setting for each function.


1. **P. max:** set pressure
 The Pmax value is used to set the desired pressure for the system. The set pressure is available at all the taps.
2. **Dp.start:** negative differential pressure for defining the start-up pressure
 When you open a tap, the pressure in the system drops. The "Dp Start" differential pressure can be set in order to prevent the pump from starting each time a tap is opened. This value specifies the difference from "Pmax" at

which the pump is switched on (Pmax - Dp Start = pump starts).

3. **P. limit:** maximum permissible system pressure
 On reaching the entered threshold value, the pump automatically switches off and the E9 error message (overpressure) is shown on the display.
The pump does not switch on again automatically. To switch on the pump again, the operator must first acknowledge the error message and restart the pump.
4. **Dp.stop:** positive differential pressure for defining the switch-off pressure
 After closing the last tap, the pump continues to run for a factory-set period (follow-up time). Consequently, the pressure in the system increases. Differential pressure "Dp Start" can be set in order to prevent overloading of the system. This value specifies the difference from "Pmax" at which the pump is switched off (Pmax + Dp Stop = pump stops).

5. **Unit:** sets the unit of pressure (bar or PSI)



6. **Imax:**
 This value defines the maximum current consumption during normal operation. If consumption exceeds this value or if it falls below 0.5 A, the pump is switched off. If the value 0.5 A is set during installation, the "Imax" limit value has to be specified each time the pump is switched on. The pump only starts once the limit value has been entered.

The set "Imax" value must not exceed the rated current specified on the rating plate. A higher value would result in overloading and cause irreparable damage to the pump!

7. **Rotat.:** changes the direction of rotation



6.4 Commissioning

The work area of the unit is not a recreational area and is to be kept free of people! No persons are allowed in the work area during start-up or operation.

6.4.1 Initial commissioning

Check the following prior to initial commissioning:

- The pump was installed and connected correctly.
- Insulation check was carried out.
- The operating parameters on the frequency converter (for TWU 3-...-HS-ECP) have been set correctly.
- The system has been vented and flushed.

6.4.2 Venting the pump and unit

- Open all the slide valves in the discharge pipeline.
- Switch the pump on. To bypass the built-in dry-running protection of the TWU 3-...-HS-ECP, hold down the "+" button on the frequency converter. The pump starts pumping at maximum output.
The air escapes through the corresponding air vent valves. If you have not installed any air vent valves, open the taps so that the air can escape from them!
- Once the pump and pipe system have been vented, switch the pump off again. To do this with the TWU 3-...-HS-ECP, press the "ON/OFF" button on the frequency converter.

6.4.3 Before switching on

Check the following prior to switching on the submersible pump:

- Proper and secure cable routing (e.g. no loops)
- Firm fit of all components (pump, piping, etc.)
- Operating conditions:
 - Temperature of the fluid
 - Immersion depth
 - Ambient temperature when external frequency converter is used
- Open all the gate valves in the pressure pipe. The pump must not be switched off when the valves are throttled or closed.

6.4.4 Switching on

- Pump with built-in frequency converter (TWU 3-...-HS-I)
The pump does not have an automatic activation function and has to be switched on and off manually using a separate operating point (on/off switch) provided by the customer. A separate pressure controller must be installed for automatic operation.
- Pump with external frequency converter (TWU 3-...-HS-ECP)
The pump is now in standby mode and "Standby" is shown on the display. To switch the pump on, press the "ON/OFF" button on the frequency converter. The pump starts and either pumps water or switches to standby mode, depending on the operating conditions. When water is drawn from a tap, the pump starts and provides the desired water pressure. When no more water is being drawn, the pump switches back to standby mode.

6.4.5 After switching on

The rated current is briefly exceeded during the start-up procedure. Once the start-up procedure has completed, the operating current may no longer exceed the rated current.

If the motor does not start immediately after the pump is switched on, it must be switched off without delay. The start pauses specified in the "Technical data" section must be observed before starting up again. If the fault recurs, the unit must be switched off again immediately. The pump should only be restarted once the fault has been rectified.

6.5 Conduct during operation

When operating the pump, always follow the locally applicable laws and regulations for work safety, accident prevention and handling electrical machinery. The operator is obliged to define the responsibilities of employees to help ensure safe working practice. All personnel are responsible for ensuring that regulations are observed.

The pump is equipped with moving parts. During operation, these parts rotate in order to pump the fluid. Certain substances in the fluid can result in very sharp edges forming on the moving parts.



WARNING: rotating parts!

The rotating parts can crush and sever limbs. Never reach into the hydraulics or touch the rotating parts when the machine is in operation. Before performing maintenance or repairs, switch off the pump and wait for the rotating parts to come to a standstill!

The following must be checked at regular intervals:

- Operating voltage (permissible deviation +/- 5 % of the rated voltage)
- Frequency (permissible deviation +/- 2 % of the rated frequency)
- Current consumption (permissible deviation between phases is a maximum of 5 %)
- Switching frequency (see technical data)
- Minimum water submersion
- Quiet and low-vibration running
- Gate valves in the pressure pipe must be open.

6.6 Auxiliary contact (TWU 3-...-HS-ECP)

The frequency converter is prepared for connecting an auxiliary contact, which is factory-set for use in single or dual pump operation.

Contact Wilo customer service to use other functions of the auxiliary contact.

The associated menu is not enabled by default. The following functions are available depending on the menu item setting:

- **1 <->** = normal or dual operation (factory setting)
In this setting, the pump can work as an independent system or as a double-pump system together with a second system.
- **2 <-** = remote operation
The system is switched on and off via remote control. This is used, for example, if the pump is only allowed to start when all the inlet slide valves are open. The control for the inlet slide valves can be linked to the auxiliary contact in this case.

- **3 X2 = Pmax2**

Makes it possible to enter a second value for the maximum pressure: "Pmax2". If, for example, higher pressure is required at the taps for consumers that are only used occasionally, this pressure can be accessed via a switch. If the switch is open, the "Pmax" value is used. If the switch is closed, the "Pmax2" value is used.

6.6.1 Installing the auxiliary contact

Fig. 9: Installation

| | |
|---|-----------------------------------|
| 1 | Position of the auxiliary contact |
| 2 | Threaded cable connection |

The threaded cable connections for the auxiliary contact are seal as standard. To lead in a cable, you have to unscrew the cap and drill through or pierce the seal on the cap's head.



WARNING: Danger of injury to hands!
If the cap is not securely fixed during drilling or piercing, there is an increased risk of injury!
Fasten the cap so that it is securely held during the work and cannot slip. For your own safety, wear protective gloves!

Fig. 10: Overview of connections

| | | | |
|---|------------------------------------|---|---------------------------------|
| 1 | Connection for dual pump operation | 3 | Connection for switch for Pmax2 |
| 2 | Connection for remote operation | | |

To use the unit as a single-pump system, the auxiliary contact must be set to the value "1 <->" and a cable may not be connected to the auxiliary contact!

BEWARE of short-circuits!
An incorrect connection at the auxiliary contact could cause a short-circuit. This can lead to destruction of the frequency converter. Connect devices to the auxiliary contact exactly as shown in the wiring diagram!

7 Shutdown/disposal

All work must be carried out with the greatest care.

Proper protective clothing is to be worn. When carrying out work in wells and/or tanks, the respective local protection measures must be observed in all cases. A second person must be present for safety reasons.

Only auxiliary lifting devices that are in a technically perfect condition and lifting gear that has been officially approved may be used for lowering and raising the pump.



RISK of death due to malfunction!
Lifting gear and lifting devices must be in a perfect technical condition. Work may only commence if the lifting device has been checked and found to be in perfect working order. If it is not inspected, fatal injuries may result!

7.1 Temporary decommissioning

For this type of shutdown, the pump remains installed and is not cut off from the electricity supply. In the event of temporary decommissioning the pump must remain completely immersed so that it is protected from frost and ice. Ensure that the temperature in the operating space and of the fluid does not fall below +3 °C.

The ambient temperature at the installation site of the frequency converter must always be between 4 and 40 °C!

This ensures that the pump is always ready for operation. For extended downtime, a regular (monthly to quarterly) 5-minute function test should be carried out.

CAUTION!

Only perform function runs under the proper operating and usage conditions. Never run the machine dry! Violating this can lead to total damage!

7.2 Decommissioning for maintenance work or storage

- Switch off the system and secure it against being switched on again by unauthorised persons.
- Have a qualified electrician disconnect the pump from the mains.
- Close the slide valves in the discharge pipeline downstream of the well cover.
You can then begin disassembly.



DANGER due to toxic substances!
Pumps that pump liquids hazardous to health must always be decontaminated before undertaking any other work! Otherwise there is a risk of death! Wear the necessary physical protection equipment!



BEWARE of burns!
The housing parts can heat up to well above 40 °C. There is a risk of burns! After switching it off, let the pump cool down to ambient temperature.

7.2.1 Removal

In the case of vertical installation, disassembly takes place in the same way as installation:

- Disassemble the well cover.
- Dismantle the ascending pipe and unit in the reverse order to installation.

When configuring and selecting the lifting equipment, note that during dismantling, the entire weight of the piping, the pump (including the power supply cable) and the water column has to be lifted!

In the case of horizontal installation, the water tank/reservoir has to be drained completely. Thereafter the pump can be released from the discharge pipeline and disassembled.

7.2.2 Return delivery / storage

For shipping, the parts must be packed in tear-proof plastic bags of sufficient size in such a manner that they are tightly sealed and leak-proof. The parts may only be shipped by forwarding agents who have been instructed appropriately.

Please also refer to the “Transport and storage” section!

7.3 Recommissioning

Before recommissioning, the submersible pump must be cleaned of contaminants.

The submersible pump can then be installed and put into operation in accordance with the specifications in this operating and maintenance manual.

The submersible pump may only be switched on again if it is in proper working order.

7.4 Disposal

7.4.1 Oils and lubricants

Operating fluid must be collected in suitable tanks and disposed off in accordance with the locally applicable guidelines.

7.4.2 Protective clothing

Used protective clothing must be disposed off in accordance with the locally applicable guidelines.

7.4.3 Information on the collection of used electrical and electronic products

Proper disposal and appropriate recycling of this product prevents damage to the environment and dangers to your personal health.



NOTICE:

Disposal in domestic waste is forbidden!

In the European Union, this symbol can appear on the product, the packaging or the accompanying documentation. It means that the electrical and electronic products in question must not be disposed of along with domestic waste.

To ensure proper handling, recycling and disposal of the used products in question, please note the following points:

- Only hand over these products at designated, certified collecting points.
- Observe the locally applicable regulations! Please consult your local municipality, the nearest waste disposal site, or the dealer who sold the product to you for information on proper disposal. For further information on recycling, go to www.wilo-recycling.com.

8 Maintenance and repair

The motor is filled with food-safe white oil that is potentially biodegradable. This motor filling is used to lubricate the motor bearing and cool the motor winding. Accordingly, there is no need to carry out any maintenance work.

Any repairs to the motor or the frequency converter or replacement of the motor filling must be carried out by Wilo customer service only.

9 Troubleshooting and possible solutions

In order to prevent damage to property and serious injury when repairing malfunctions on the unit, observe the following:

- Attempt to remedy a fault only if you have qualified staff. This means that each job must be carried out by trained qualified personnel, for example, electrical work must be performed by a trained electrician.
- Always secure the unit against an accidental restart by disconnecting it from the mains. Take appropriate safety precautions.
- Always have a second person on hand to ensure the unit is switched off in an emergency.
- Secure moving parts to prevent injury.
- Unsanctioned modifications to the unit are made at the operator's own risk and release the manufacturer from any warranty obligations!

9.1 Alarm signals on the display of the external frequency converter (“HS-ECP” version)

The alarm signals must always be confirmed by pressing the “Reset” button on the frequency converter. The display also has to be confirmed for errors that cause the system to automati-

cally restart via the auto reset function. This is to ensure that the user is properly informed.

Alarm messages (Fig. 11)

Every alarm message contains the error code and a number set in brackets that specifies how often the relevant error has occurred.

List of error codes:

1. **E0 – Undervoltage:** Supply voltage too low. Check value (V) at the input
If this error is displayed, the system has to be checked by a qualified electrician. If this error occurs frequently, the system may be damaged!
2. **E1 – Overvoltage:** Supply voltage too high. Check value (V) at the input
If this error is displayed, the system has to be checked by a qualified electrician. If this error occurs frequently, the system may be damaged!
3. **E2 – Short-circuit:** Displayed if there is a short-circuit at the motor connection in the frequency converter (motor). This can be due to faulty cable insulation, a faulty motor or water ingress. This error can only be reset by disconnecting the unit from the mains!



ELECTRICAL hazard!

Electrical current can cause fatal injuries if not handled correctly! If this error is displayed, the connection has to be checked and repaired by a qualified electrician.

4. **E3 – Dry run:** Displayed if the system is switched off due to low water. If the “auto reset function” is activated, the system is automatically restarted after the set interval.
5. **E4 – Ambient temperature:** Permitted ambient temperature of the frequency converter has exceeded. Check installation conditions and find a remedy.
6. **E5 – Temperature IGBT module:** Permissible maximum temperature of the IGBT module in the frequency converter has exceeded. Check the conditions under which the frequency converter operates particularly the water temperature and current consumption of the pump.
7. **E6 – Overload:** Displayed if the current consumption exceeds the “Imax” value set in the operating parameters. This can be caused by harsher operating conditions, frequent restarts or a faulty motor.
Before resetting the error, check the following:
 - Does the set “Imax” value match the specification on the rating plate (also see section 3.5)?
 - Is the system working under permissible operating conditions?
 If both points have been checked and the error continues to occur, consult Wilo customer service.
8. **E8 – Serial error:** Error in the internal serial communication of the frequency converter. Contact Wilo customer service.

9. **E9 – Overpressure:** The set limit value “P limit” was exceeded. If the error repeats, check the “P limit” parameter and determine the cause for overpressure (e.g. blockage in the pressure pipe) and rectify the same.
10. **E11 – Starts/h (leakage):** Displayed if the system starts frequently at brief intervals. In this case, there is probably a leak in the system. Reactivation is only possible if the fault has been acknowledged!
Before confirming, make sure that there is no leakage in the system. Frequent starts can damage the pump!
If there is no leakage but automatic operation is still not possible, you can adjust or switch off monitoring with the help of Wilo customer service.
11. **E12 – Error 12 V:** Malfunction in the internal low voltage circuit of the frequency converter. Contact Wilo customer service.
12. **E13 – Pressure sensor:** Pressure sensor delivers incorrect values. Contact Wilo customer service.

9.2 Faults

9.2.1 Fault: The unit will not start or only after a delay

1. Electricity supply interrupted, short-circuit or earth fault in the cable and/or motor winding
 - Have the motor and wires checked by a specialist and replaced if necessary
 - Check the error messages on the frequency converter
2. Tripping of fuses, motor protection switch and/or monitoring devices
 - Have the connections checked by an expert and changed if necessary
 - Install and set motor protection switches and miniature circuit breakers according to the technical instructions, reset monitoring devices
 - Check that the impeller runs freely, if necessary clean it and ensure it runs freely again
3. Pressure difference between Pmax and Pmin is too small
 - Adjust the “Dp Start” value in the operating parameters
4. Water consumption too small
 - Water extraction is not detected, install a diaphragm expansion tank with a volume of 1 – 2 l

9.2.2 Fault: The unit starts, but the motor protection switch triggers shortly after commissioning

1. The thermal trigger on the motor protection switch is incorrectly selected and set
 - Have a specialist compare the selection and setting of the trigger with the technical specifications and correct it as necessary
2. Increased power consumption due to major voltage drop
 - Have an electrician check the voltage on each phase and rewire if necessary
3. Incorrect direction of rotation
 - Change the direction of rotation via the menu.
4. Impeller slowed by accumulation, clogging and/or solid matter, increased current consumption

- Switch off the unit, secure it against being switched back on again and free the impeller or clear the suction port
5. The fluid is too dense
 - Contact the manufacturer

9.2.3 Fault: Unit is running but not pumping

1. The "E3" error (dry run) is shown on the display
 - No fluid available: Check inlet, open slide valve if necessary
 - Clean the supply line, slide valve, suction piece, suction port or suction strainer
 - During standstill, the pressure pipe drains; check the pipework for leakage and the non-return valve for contaminants; remedy errors
2. Impeller blocked or slowed
 - Switch off the unit, secure it against being switched back on again and free the impeller
3. Defective piping
 - Replace defective parts
4. Intermittent operation (cycling)
 - Check switching system

9.2.4 Fault: The unit runs, but not within the specified operating values

1. Intake blocked
 - Clean the supply line, slide valve, suction piece, suction port or suction strainer
2. Impeller blocked or slowed
 - Switch off the unit, secure it against being switched back on again and free the impeller
3. Incorrect direction of rotation
 - Change the direction of rotation via the menu.
4. Air in the system
 - Vent the system
5. Defective piping
 - Replace defective parts
6. Inadmissible levels of gas in the fluid
 - Consult the plant
7. Excessive decrease in the water table during operation
 - Check the system's supply and capacity
8. "Pmax" value set too high
 - Adjust the "Pmax" value according to the pump curve or install a unit with greater output

9.2.5 Fault: The unit does not run smoothly and is noisy

1. Unit is operating in an inadmissible range
 - Check the operational data of the unit and correct if necessary and/or adjust the operating conditions
2. Suction port, suction strainer and/or impeller clogged
 - Clean the suction port, suction strainer and/or impeller
3. Impeller stiff
 - Switch off the unit, secure it against being switched back on again and free the impeller

4. Inadmissible levels of gas in the fluid
 - Consult the plant
5. Incorrect direction of rotation
 - Change the direction of rotation via the menu.
6. Signs of wear
 - Replace worn parts
7. Defective motor bearing
 - Consult the plant
8. Unit is installed under tension
 - Check installation, use expansion joints if necessary

9.2.6 Fault: Automatic control of the system not working

1. Taps are closed, unit continues to run or starts up again immediately
 - Difference between Pmax and Pmin too small, adjust "Dp Start" value in the operating parameters
2. Unit constantly switches on and off
 - Leakage in the system; check pipework and remedy leakage
3. Unit does not shut down
 - Leakage in the system; check pipework and remedy leakage
 - Non-return valve on the pressure port does not close properly; switch off unit, secure it from being switched on again, clean non-return valve

9.2.7 Further steps for troubleshooting

If the points listed here do not rectify the fault, contact customer service. They can help you as follows:

- Telephone or written support from customer service
 - On-site support from customer service
 - Inspection or repair of the unit at the factory
- Please note that you may be charged for some services provided by our customer service! For more details, please contact customer service.

10 Appendix

incorrect orders, the serial and/or article number should always be supplied.

10.1 Spare parts

Spare parts can be ordered from the manufacturer's customer service. To avoid return queries and

Subject to change without prior notice!

10.2 Overview of factory and recommended settings for the TWU 3-...-HS-ECP operating parameters

| Parameter (user) | Setting range | Setting | |
|--|--------------------|-----------------|-------------|
| | | Factory-setting | Recommended |
| Pmax | 1.5...7.5 bar | 3.0 bar | As required |
| Language | IT, EN, FR, DE, ES | IT | As required |
| Dp Start | 0.3...1.5 bar | 1.0 bar | 0.5 bar |
| P limit | 2.5...10.0 bar | 10.0 bar | |
| Dp Stop | 0.4...4.0 bar | 2.5 bar | 0.5 bar |
| Direction of rotation | ---> / <--- | ---> | As required |
| Parameter (Wilo customer service) | | | |
| Follow-up time | 2...60 s | 10 s | 10 s |
| Max. starts/h | OFF...50 | 30 | 30 |
| Auxiliary contact | 1...3 | 1 | 1 |

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