

High-efficiency Circulator Pump

**ES MAXI**

# Installation/Operating Manual



**Askoll**

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Installation/Operating Manual ES MAXI

Original operating manual

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**Glossary****Discharge line**

The pipeline which is connected to the discharge nozzle

**Noise characteristics**

The noise emission to be expected, indicated as sound pressure level  $L_{pA}$  in dB(A)

**Pump**

Machine without drive, additional components or accessories

**Pump set**

Complete pump set consisting of pump, drive, additional components and accessories

**Suction lift line/suction head line**

The pipeline which is connected to the suction nozzle

## 1 General

### 1.1 Principles

This operating manual is supplied as an integral part of the type series and variants indicated on the front cover. The manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series/size and main operating data. They uniquely identify the pump (set) and serve as identification for all further business processes.

In the event of damage, immediately contact your nearest Askoll service centre to maintain the right to claim under warranty.


Noise characteristics see (⇒ Section 4.5 Page 15)

### 1.2 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel.

### 1.3 Symbols

**Table 1:** Symbols used in this manual

| Symbol  | Description  |
|---|--|
| ✓   | Conditions which need to be fulfilled before proceeding with the step-by-step instructions |
| ▷   | Safety instructions  |
| ⇒   | Result of an action  |
| ⇨   | Cross-references   |
| 1.<br>2.  | Step-by-step instructions  |
|  | Note<br>Recommendations and important information on how to handle the product             |







## 2 Safety



All the information contained in this section refers to hazardous situations.

### 2.1 Key to safety symbols/markings

Table 2: Definition of safety symbols/markings

| Symbol   | Description   |
|--|---|
|  <b>DANGER</b>  | <b>DANGER</b><br>This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.   |
|  <b>WARNING</b> | <b>WARNING</b><br>This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.   |
|  <b>CAUTION</b> | <b>CAUTION</b><br>This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.   |
|                 | <b>General hazard</b><br>In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.  |
|                 | <b>Electrical hazard</b><br>In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage. |
|                 | <b>Machine damage</b><br>In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.  |

### 2.2 General

This manual contains general installation, operating and maintenance instructions that must be observed to ensure safe pump operation and prevent personal injury and damage to property.

The safety information in all sections of this manual must be complied with.

This manual must be read and completely understood by the specialist personnel/operators responsible prior to installation and commissioning.

The contents of this manual must be available to the specialist personnel at the site at all times.

Information attached directly to the pump must always be complied with and be kept in a perfectly legible condition at all times. This applies to, for example:

- Arrow indicating the direction of rotation
- Markings for connections
- Name plate

The operator is responsible for ensuring compliance with all local regulations not taken into account in this manual.

### 2.3 Intended use

- The pump (set) must only be operated within the operating limits described in the other applicable documents.
- Only operate pumps/pump sets which are in perfect technical condition.
- Do not operate the pump (set) in partially assembled condition.
- Only use the pump to handle the fluids described in the data sheet or product literature of the pump model or variant.
- Never operate the pump without the fluid to be handled.
- Observe the minimum flow rates indicated in the data sheet or product literature (to prevent overheating, bearing damage, etc).

- Observe the maximum flow rates indicated in the data sheet or product literature (to prevent overheating, mechanical seal damage, cavitation damage, bearing damage, etc).
- Do not throttle the flow rate on the suction side of the pump (to prevent cavitation damage).
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.

#### **Prevention of foreseeable misuse**

- Never exceed the permissible operating limits specified in the data sheet or product literature regarding pressure, temperature, etc.
- Observe all safety information and instructions in this manual.

### **2.4 Personnel qualification and training**

All personnel involved must be fully qualified to transport, install, operate, maintain and inspect the equipment this manual refers to.

The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.

Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.

Training on the pump (set) must always be supervised by technical specialist personnel.

This device may be operated by **children** from the age of 8 as well as by persons of limited physical, sensory or mental abilities or lacking experience and knowledge, provided that they are supervised, they have been instructed on how to use this device safely and they understand the hazards it presents. It is impermissible for **children** to play with this device. **Children** must not clean the device or perform any **service work to be carried out by the operator** at the device without supervision.

### **2.5 Consequences and risks caused by non-compliance with this manual**

- Non-compliance with this operating manual will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
  - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
  - Failure of important product functions
  - Failure of prescribed maintenance and servicing practices
  - Hazard to the environment due to leakage of hazardous substances

### **2.6 Safety awareness**

In addition to the safety information contained in this manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards, directives and laws

### **2.7 Safety information for the operator/user**

- The operator shall fit contact guards for hot, cold and moving parts and check that the guards function properly.
- Do not remove any contact guards during operation.



- Contain leakages (e.g. at the shaft seal) of hazardous fluids handled (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Adhere to all relevant laws.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)
- If shutting down the pump does not increase potential risk, fit an emergency-stop control device in the immediate vicinity of the pump (set) during pump set installation.

## **2.8 Safety information for maintenance, inspection and installation work**

- Modifications or alterations of the pump are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts authorised by the manufacturer. The use of other parts can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that all maintenance, inspection and installation work is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- The pump casing must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.
- When taking the pump set out of service always adhere to the procedure described in the manual. (⇒ Section 6.4 Page 47)
- Decontaminate pumps which handle fluids posing a health hazard.
- As soon as the work has been completed, re-install and/or re-activate any safety-relevant and protective devices. Before returning the product to service, observe all instructions on commissioning. (⇒ Section 6.1 Page 26)

## **2.9 Unauthorised modes of operation**

Never operate the pump (set) outside the limits stated in the data sheet and in this manual.


The warranty relating to the operating reliability and safety of the supplied pump (set) is only valid if the equipment is used in accordance with its intended use.

### 3 Transport/Temporary Storage/Disposal

#### 3.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify Askoll or the supplying dealer (as applicable) and the insurer about the damage in writing immediately.

#### 3.2 Transport

|   |   |
|---|---|
|  | <div style="background-color: #f4a460; padding: 5px;"><b>⚠ DANGER</b></div> <p><b>The pump (set) could slip out of the suspension arrangement</b><br/>Danger to life from falling parts!</p> <ul style="list-style-type: none"> <li>▷ Always transport the pump (set) in the specified position.</li> <li>▷ Pay attention to the weight data and the centre of gravity.</li> <li>▷ Observe the applicable local health and safety regulations.</li> <li>▷ Use suitable, permitted lifting accessories, e.g. self-tightening lifting tongs.</li> </ul> |
|---|---|

To transport the pump/pump set suspend it from the lifting tackle as shown.




Fig. 1: Proper pump transport




Fig. 2: Incorrect pump transport

#### 3.3 Storage/preservation

If commissioning is to take place some time after delivery, we recommend that the following measures be taken for pump (set) storage.

|   |  |
|---|--|
|  | <div style="background-color: #ffff00; padding: 5px;"><b>CAUTION</b></div> <p><b>Damage during storage by humidity, dirt, or vermin</b><br/>Corrosion/contamination of the pump (set)!</p> <ul style="list-style-type: none"> <li>▷ For outdoor storage cover the packed or unpacked pump (set) and accessories with waterproof material.</li> </ul> |
|---|--|

|  | CAUTION  |
|---|--|
|   | <p><b>Wet, contaminated or damaged openings and connections</b><br/>Leakage or damage to the pump!</p> <ul style="list-style-type: none"> <li>▸ Clean and cover pump openings and connections as required prior to putting the pump into storage.</li> </ul> |

Store the pump (set) in a dry, protected room where the atmospheric humidity is as constant as possible.


If properly stored indoors, the pump set is protected for a maximum of 12 months.

For storing a pump (set) which has already been operated, observe the instructions in (⇒ Section 6.4.1 Page 47)

### 3.4 Return to supplier

1. Drain the pump as per operating instructions. (⇒ Section 7.2 Page 48)
2. Always flush and clean the pump, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the pump set has handled fluids whose residues could lead to corrosion in the presence of atmospheric humidity or could ignite upon contact with oxygen, the pump set must also be neutralised, and anhydrous inert gas must be blown through the pump to ensure drying.

### 3.5 Disposal

|  | ⚠ WARNING  |
|---|--|
|   | <p><b>Fluids, consumables and supplies which are hot and/or pose a health hazard</b><br/>Hazard to persons and the environment!</p> <ul style="list-style-type: none"> <li>▸ Collect and properly dispose of flushing fluid and any residues of the fluid handled.</li> <li>▸ Wear safety clothing and a protective mask, if required.</li> <li>▸ Observe all legal regulations on the disposal of fluids posing a health hazard.</li> </ul> |

1. Dismantle the pump (set).  
Collect greases and other lubricants during dismantling.
2. Separate and sort the pump materials, e.g. by:
  - Metals
  - Plastics
  - Electronic waste
  - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner.

## 4 Description of the Pump (Set)

### 4.1 General description

Glandless, non-self-priming in-line pumps for handling clean or aggressive fluids which are neither chemically nor mechanically aggressive to the pump materials. The combination of a high-efficiency hydraulic system with high-efficiency motor technology, integrated differential pressure control and operating software enables an optimum adjustment of the glandless pumps to changing operating conditions and minimises operating costs.



**Fig. 3:** Description of the pump

|   |                                |   |  |
|---|--------------------------------|---|--|
| 1 | Pump casing                    | 2 | Motor with control module  |
| 3 | Connections for data cables    | 4 | Display  |
| 5 | Control element (press & turn) | 6 | Connections for power supply and general fault message <sup>1)</sup> |

The motor with control module (2) is fastened to the pump casing (1) with four screws. The control module adjusts the differential pressure of the pump to a setpoint which can be set within the control range. The criteria for differential pressure control depend on the set operating mode. In all operating modes, the pump adapts to fluctuating demand (e.g. from control valves being activated).

Advantages of a pump-integrated control system are savings in energy and operating costs and a reduction in flow noises as unnecessarily high heads are reduced. In addition, the combination of an efficient hydraulic system with a high-efficiency electric motor makes sure that the input power is converted into hydraulic energy as efficiently as possible at all times. The newly developed Eco Mode enables further savings in energy and operating costs.

<sup>1)</sup> In addition, ES MAXI pumps 40-120/-180, 50-100/-120/-150/-180 feature a relay for "system operational" message.

## 4.2 Name plate

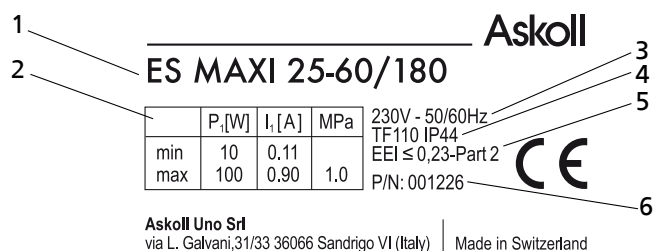


Fig. 4: Name plate (example)

|   |                               |   |                              |
|---|-------------------------------|---|------------------------------|
| 1 | Type series, size             | 2 | Power, max. input power      |
| 3 | Voltage, frequency            | 4 | Temperature class, enclosure |
| 5 | Energy efficiency index (EEI) | 6 | Production number            |

Key to the production number

Example: 2014w12-000201

Table 3: Key to the production number

| Code   | Description                  |
|--------|------------------------------|
| 2014   | Year of production 2014      |
| w12    | Week of production (week 12) |
| 001226 | Consecutive number           |

## 4.3 Design details

## Design

- Highly efficient, maintenance-free wet rotor pump (glandless)

## Drive

- High-efficiency electric motor with continuously variable differential pressure control
- Electronically commutated synchronous motor with permanent magnet rotor
- 1~230 VAC, 50/60 Hz
- IP44 enclosure
- Thermal class F
- Temperature class TF 110
- Interference emissions EN 61 000-6-3
- Interference immunity EN 61 000-6-2

## Bearings

- Product-lubricated special plain bearing

## Connections

- Screw-ended or flanged

## Operating modes

- Constant-pressure and proportional-pressure control
- Eco Mode with dynamic differential pressure setpoint adjustment
- Boost Mode with manual setpoint input

## Automatic functions

- Continuous output adjustment depending on the operating mode
- 0 – 10 V with external differential pressure/speed setpoint
- Dual pump configuration
- Modbus
- Setback operation
- External start/stop
- Deblocking function

- Self-venting function
- Soft start
- Full motor protection with integrated trip electronics

### Manual functions

- Setting the operating mode
- Setting the differential pressure setpoint
- Setting the speed level
- Locking the control panel

### Signalling and display functions

- Error codes indicated on the display
- General fault message

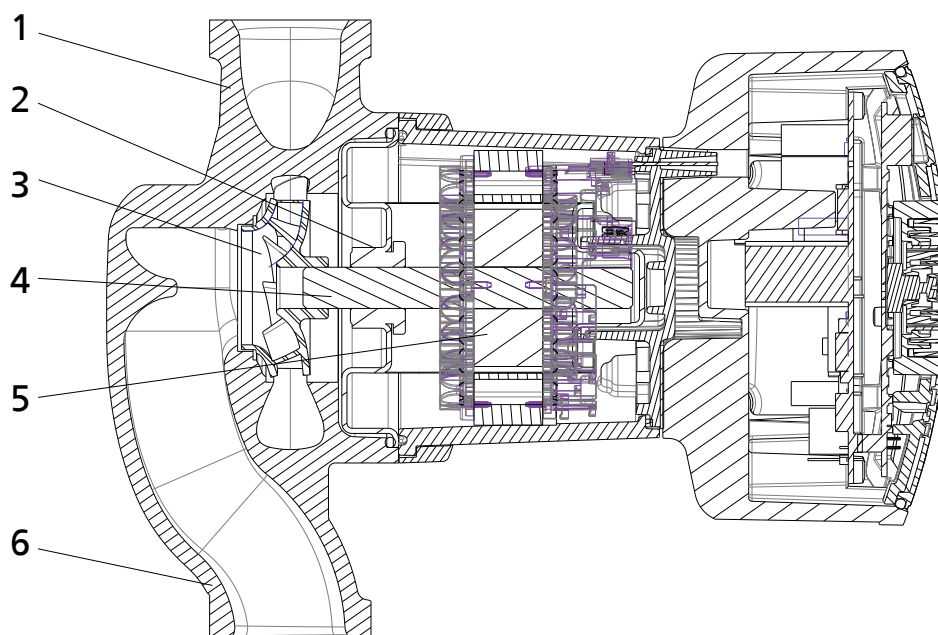
Pump 40-120/-180, 50-100/-120/-150/-180, 65-120, DN 80, DN 100:

- Alternating display of flow rate, electrical input power, and head
- Integrated "system operational" message

Pump DN 25, DN 30, DN 32, 40-60/-70/-80/-90/-100, 50-40/-60/-80/-90, 65-60:

- "System operational" message via additional module

## 4.4 Configuration and function



**Fig. 5:** Sectional drawing of the pump

|   |                  |   |                      |
|---|------------------|---|----------------------|
| 1 | Discharge nozzle | 2 | Radial plain bearing |
| 3 | Impeller         | 4 | Motor shaft          |
| 5 | Motor            | 6 | Suction nozzle       |

**Design** The pump is designed with a radial fluid inlet and a radial outlet arranged on the same axis. The impeller is rigidly connected to the motor shaft. Mechanical sealing is not required as the rotating assembly is completely isolated from the stator winding. The rotating assembly is lubricated and cooled by the fluid handled. The motor housing is made of aluminium. Most of the internal parts are made of stainless steel. The advanced lubricating system, high-quality graphite bearings and precision-balanced impeller ensure smooth running and a long service life.

**Function** The fluid enters the pump via the suction nozzle (6) and is accelerated outward in a cylindrical flow by the rotating impeller (3), which is driven by the motor shaft (4). In the flow passage of the pump casing the kinetic energy of the fluid is converted into

pressure energy. The fluid is pumped to the discharge nozzle (1), where it leaves the pump. The shaft runs in radial plain bearings (2), which are supported by the motor (5).

#### 4.5 Noise characteristics

**Table 4:** Noise characteristics [dB A]

|     | Sound pressure level |
|-----|----------------------|
| All | 45 max.              |

#### 4.6 Scope of supply

Depending on the model, the following items are included in the scope of supply:

##### Screw-ended pumps (ES MAXI 25-60 to 30-120)

- Pump set
- Two-piece thermal insulation (single pump)
- Two sealing elements
- Installation/operating manual

##### Flanged pumps (ES MAXI 32-120 to 100-120)

- Pump set
- Two-piece thermal insulation (single pump)
- Two sealing elements
- Installation/operating manual

#### 4.7 Dimensions and weight

For dimensions and weights please refer to the type series booklet of the pump.

#### 4.8 Accessories

No accessories available.

#### 4.9 Technical data



**Table 5:** Technical data

| Feature or characteristic              | Value   |
|--|---|
| Maximum flow rate                      | Depends on the pump type, see type series booklet     |
| Maximum head                           | Depends on the pump type, see type series booklet     |
| Speed                                  | Depends on the pump type, see type series booklet     |
| Mains voltage                          | 1~ 230 VAC +/- 10 %                                   |
| Frequency                              | 50 Hz / 60 Hz   |
| Rated current                          | See name plate  |
| Thermal class                          | See name plate  |
| Enclosure                              | See name plate  |
| Input power P1                         | Depends on the pump type, see type series booklet     |
| Nominal diameter                       | See name plate / type code in the type series booklet |
| Mating flanges                         | See name plate / type code in the type series booklet |
| Pump weight                            | Depends on the pump type, see type series booklet     |
| Permissible ambient temperature        | 0 °C to +40 °C  |
| Maximum relative humidity              | ≤ 80 %  |
| Permissible fluid temperature          | -10 °C to + 110 °C                                    |
| Maximum permissible operating pressure | PN 10 <sup>2)</sup> / PN 16 <sup>3)</sup>             |

<sup>2)</sup> Standard design

<sup>3)</sup> Special design (surcharge applies)

| Feature or characteristic           | Value   |
|-------------------------------------|---|
| Sound pressure level                | < 45 dB (A)   |
| Minimum inlet pressure              | 80 °C: 0.5 bar; 95 °C: 1.5 bar  |
| Permissible fluids                  | Heating water to VDI 2035<br>Water/glycol mixture, max. mixing ratio 1:1 <sup>4)</sup> (only use brand name products with corrosion inhibitors; observe the information provided by the producer as well as the safety data sheets).<br>Fluids other than those above must only be used upon prior approval by the pump manufacturer.<br>For ethylene/propylene glycols with corrosion inhibitors, commercial oxygen binders, anti-corrosives, fluids with several additives, and cooling brines see the following danger note. |
| EEL                                 | See type series booklet. <sup>5)</sup>  |
| EMC (electromagnetic compatibility) | 2004/108/EC   |
| Interference emission               | EN 61000-6-3  |
| Interference immunity               | EN 61000-6-2  |

|   |  |
|---|--|
|  |  <b>DANGER</b>  |
|   | <p><b>Non-compliance with manufacturer's instructions</b><br/>Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Use permissible fluids only.</li> <li>▷ Always observe the safety data sheets and manufacturer's instructions!</li> <li>▷ Observe the manufacturer's instructions on mixing ratios.</li> <li>▷ If any additives are to be mixed into the fluid, do so on the discharge side of the pump.</li> </ul> |



<sup>4)</sup> If any glycol is contained in the fluid, the operating data of the pump must be adjusted to a higher viscosity, depending on the mixing ratio.

<sup>5)</sup> Reference value for the most efficient of circulators: EEL ≤ 0.20



## 5 Installation at Site

### 5.1 Safety regulations

|   |  |
|---|--|
|  | <p><b>⚠ DANGER</b></p> <p><b>Installation in potentially explosive atmospheres</b><br/>Explosion hazard!</p> <ul style="list-style-type: none"> <li>▷ Never install the pump in potentially explosive atmospheres.</li> <li>▷ Observe the information given in the data sheet and on the name plates of the pump system.</li> </ul>      |
|  | <p><b>⚠ DANGER</b></p> <p><b>Use for drinking water or foodstuff applications</b><br/>Danger of poisoning!</p> <ul style="list-style-type: none"> <li>▷ The pump materials are <b>not</b> suitable for drinking water and foodstuff applications.<br/><b>Never</b> use the pump for drinking water or foodstuff applications.</li> </ul> |




### 5.2 Checks to be carried out prior to installation

Before installing the pump make sure that the following requirements are met:

- Check the data on the name plate of the pump to make sure it can be operated on the available mains.
- The fluid to be handled matches the description of suitable fluids.
- The above safety instructions have been complied with.

### 5.3 Installing the pump set

Install the pump set in an easily accessible place. An arrow on the pump casing and thermal insulation indicates the direction of flow.

|   |   |
|---|---|
|  | <p><b>CAUTION</b></p> <p><b>Ingress of fluid into the motor</b><br/>Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Install the pump set with the pump shaft in horizontal position. Connect the piping without transmitting any stresses and strains.</li> <li>▷ Never install the pump set with the motor terminal box pointing downwards.</li> <li>▷ Undo the hexagon socket head cap screws. Then turn the motor housing.</li> </ul> |
|  | <p><b>NOTE</b></p> <p><b>Installing shut-off valves upstream and downstream of the pump is recommended.</b><br/>Make sure that no leaking water can drip into the pump motor or terminal box.</p>   |
|  | <p><b>⚠ DANGER</b></p> <p><b>Leakage at the pump</b><br/>Leakage of hot fluids!</p> <ul style="list-style-type: none"> <li>▷ Fit the sealing elements and make sure they are positioned correctly.</li> </ul>   |

An arrow on the pump casing indicates the direction of flow.




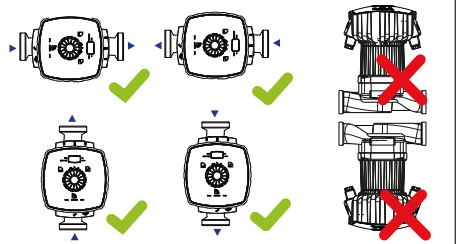
|   |  |
|---|--|
|  | <b>NOTE</b><br>The direction of flow of a vertically installed pump should be upwards.   |
|  | <b>CAUTION</b><br><b>Air entering the pump</b><br>Damage to vertically installed pump sets whose direction of flow is downwards!<br>▶ Fit a vent valve at the highest point of the suction line. |
|  | <b>NOTE</b><br>Do not install the pump at the lowest point of the system to prevent any impurities from collecting in the pump.  |



Table 6: Permissible installation positions

| Sizes |  |
|-------|--|
| All   |  |

**Adjusting the display panel**

The drive unit with integrated display can be rotated.

1. Loosen the four hexagon socket head cap screws.
2. Rotate the drive unit until it has reached the required position.
3. Re-tighten the four hexagon socket head cap screws.

|   |   |
|---|---|
|  | <b> DANGER</b><br><b>Leakage at the pump</b><br>Leakage of hot fluids!<br>▶ Insert the O-ring in the correct position. |
|---|---|




**Screw-ended pumps**

1. Place the pump in the specified installation position.
2. Accurately insert the sealing element.
3. Connect the pump and piping with a pipe union.
4. Tighten the pipe union hand tight with an assembly tool (e.g. pipe wrench).
5. Accurately insert the sealing element in the opposite pipe union.
6. Tighten the pipe union hand tight with an assembly tool (e.g. pipe wrench).



**Flanged pumps**

1. Place the pump in the specified installation position.
2. Accurately insert the sealing element.
3. Connect the pump flange to the pipe flange by means of screws.
4. Tighten the screws hand tight with an assembly tool (e.g. pipe wrench).
5. Accurately insert the sealing element on the opposite side.
6. Connect the pump flange to the pipe flange by means of screws. Tighten the screws hand tight.


### 5.4 Connecting the piping







|  |  |
|--|--|
|   | <p><b>⚠ DANGER</b></p> <p><b>Excessive loads acting on the pump nozzles</b><br/>Danger to life from leakage of hot fluids!</p> <ul style="list-style-type: none"> <li>▷ Do not use the pump as an anchorage point for the piping.</li> <li>▷ Anchor the pipelines in close proximity to the pump and connect them without transmitting any stresses or strains.</li> <li>▷ Take appropriate measures to compensate thermal expansion of the piping.</li> </ul>   |
|   | <p><b>NOTE</b></p> <p>Installing check and shut-off elements in the system is recommended, depending on the type of plant and pump. However, such elements must not obstruct proper drainage or hinder disassembly of the pump.</p> <ul style="list-style-type: none"> <li>✓ The suction lift line has been laid with a rising slope, the suction head line with a downward slope towards the pump.</li> <li>✓ The nominal diameters of the pipelines are equal to or greater than the nominal diameters of the pump nozzles.</li> <li>✓ The pipelines have been anchored in close proximity to the pump and connected without transmitting any stresses or strains.</li> </ul> <p>1. Thoroughly clean, flush and blow through all vessels, pipelines and connections (especially of new installations).</p> |
|  | <p><b>CAUTION</b></p> <p><b>Welding beads, scale and other impurities in the piping</b><br/>Damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Free the piping from any impurities.</li> </ul>   |

### 5.5 Enclosure/insulation

|   |   |
|---|---|
|  | <p><b>NOTE</b></p> <p>The pump is supplied with a thermal insulation shell.</p>   |
|  | <p><b>⚠ WARNING</b></p> <p><b>The pump takes on same temperature as the fluid handled</b><br/>Risk of burns!</p> <ul style="list-style-type: none"> <li>▷ Insulate the volute casing.</li> <li>▷ Fit protective equipment.</li> </ul> |

### 5.6 Electrical connection

|   |  |
|---|--|
|  | <p><b>⚠ DANGER</b></p> <p><b>Electrical connection work by unqualified personnel</b><br/>Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▷ Always have the electrical connections installed by a trained and qualified electrician.</li> <li>▷ Observe regulations IEC 60364 and, for explosion-proof models, EN 60079.</li> </ul> |
|---|--|

|   |   |
|---|---|
|    | <div data-bbox="491 181 1447 232" style="background-color: #f4a460; padding: 5px;"><b>⚠ DANGER</b></div> <p><b>Work performed on an energised terminal box</b><br/>           Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▷ Switch off the supply voltage at least 5 minutes prior to commencing work and ensure that it cannot be switched on again unintentionally.</li> </ul>  |
|    | <div data-bbox="491 394 1447 445" style="background-color: #f4a460; padding: 5px;"><b>⚠ DANGER</b></div> <p><b>Pump acting as a generator when running in reverse</b><br/>           Danger to life from hazardous induction voltage at the motor terminals!</p> <ul style="list-style-type: none"> <li>▷ Prevent the fluid from flowing back by closing the shut-off elements.</li> </ul>  |
|    | <div data-bbox="491 584 1447 636" style="background-color: #f4a460; padding: 5px;"><b>⚠ WARNING</b></div> <p><b>Incorrect connection to the mains</b><br/>           Damage to the mains network, short circuit!</p> <ul style="list-style-type: none"> <li>▷ Observe the technical specifications of the local energy supply companies.</li> </ul>   |
|    | <div data-bbox="491 775 1447 826" style="background-color: #0072bc; color: white; padding: 5px;"><b>NOTE</b></div> <p>The cable must be of type H05VV-F 3G1 or similar, with an outside diameter <math>\geq 7.2</math> mm. Circuit breaker: 10/16 A (minimal rated current x 1.4) slow blowing fuse or automatic circuit breaker type C.</p>  |
|   | <div data-bbox="491 931 1447 983" style="background-color: #0072bc; color: white; padding: 5px;"><b>NOTE</b></div> <p>Connection to the power supply must be effected by means of a fixed power cable with a minimum cross-section of <math>3 \times 1.5 \text{ mm}^2</math>, which is fitted with a plug-type connection or an all-pole isolating switch with a minimum contact opening of 3 mm.</p>   |
|  | <div data-bbox="491 1133 1447 1184" style="background-color: #0072bc; color: white; padding: 5px;"><b>NOTE</b></div> <p><b>Connection to the power supply must be effected by a power cable which is fitted with an all-pole isolating switch or a plug-type connection.</b><br/>           Should the power cable of this device become damaged, a replacement cable must be fitted by the manufacturer, the manufacturer's customer service technicians or a similarly qualified person to prevent any hazards.</p> |

The cables for the power supply and for transmitting a general fault message as well as the data cables are wired to plug-in terminals located on both sides of the pump. The terminals are arranged in two terminal wiring compartments with a screwed-on cover each (IP44). On one side of the housing, the cables for the power supply and general fault message are guided and wired to the pump. The corresponding symbols for the connections are marked on the cover.

The terminal wiring compartment for data signals (Modbus, 0 - 10 VDC, external start/stop, multiple pump operation) are located on the opposite side of the housing and marked by the corresponding symbols on the cover.



**Fig. 6:** Front left view of the pump

|    |   |
|----|---|
| A1 | Symbol for connection required for multiple pump operation (DUAL) |
| B1 | Symbol for connection to Modbus network                           |
| C1 | Symbol for connection of External Start/Stop signal               |
| D1 | Symbol for connection of external analog 0 - 10 VDC signal        |



**Fig. 7:** Terminal wiring compartment for the data cables

|    |  |
|----|--|
| D2 | Terminal base for the external analog 0 - 10 VDC signal connection |
| C2 | Terminal base for the External Start/Stop signal connection        |
| B2 | Terminal base for connection to Modbus network                     |
| A2 | Terminal base for connection required for multiple pump operation  |



**Fig. 8:** Front right view of the pump

|    |   |
|----|---|
| E1 | Symbol for connection of volt-free general fault message  |
| F1 | Symbol for connection of power supply 1~230 VAC, 50/60 Hz   |
| G1 | Symbol for "system operational" message relay (not shown in the illustration, for ES MAXI pumps 40-100/-120, 50-100/-120/-150/-180) |



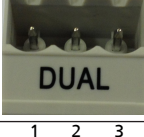

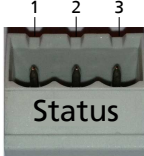


### NOTE

If the unit is to be switched off by means of a mains relay, this relay has to meet the following requirements as a minimum: rated current  $\geq 10$  A, rated voltage 250 VAC.

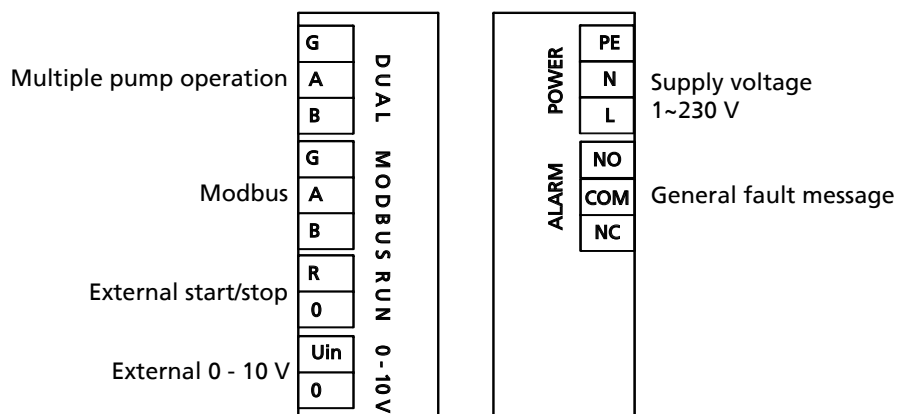
**Table 7:** Key to the symbols

| Function                          | Symbol   | Terminal pair | Terminal cross-section | Terminal identification     | Frequency of starts | Contact rating                            |
|-----------------------------------|----------|---------------|------------------------|-----------------------------|---------------------|---|
| Power supply 1~230 VAC, 50/60 Hz  |          |               | 1.5 mm <sup>2</sup>    | 3 - PE<br>2 - N<br>1 - L    | < 20 / 24 h         |   |
| General fault message             |          |               | 1.5 mm <sup>2</sup>    | 3 - NO<br>2 - COM<br>1 - NC |                     | Min: 12 VDC at 10 mA<br>Max: 250 V at 1 A |
| External analog 0 - 10 VDC signal | 0 - 10 V |               | 1.5 mm <sup>2</sup>    | 1 - 0<br>2 - Uin            |                     |   |

| Function  | Symbol  | Terminal pair   | Terminal cross-section | Terminal identification     | Frequency of starts | Contact rating                            |
|---|---|---|------------------------|-----------------------------|---------------------|---|
| External signal for start/stop of pump (terminal pair supplied bridged) | RUN   | 1 2<br>    | 1.5 mm <sup>2</sup>    | 1 - 0<br>2 - R              |                     |   |
| Modbus  | Modbus  | 1 2 3<br>  | 1.5 mm <sup>2</sup>    | 3 - G<br>2 - A<br>1 - B     |                     |   |
| Multiple pump operation   | DUAL  | 1 2 3<br>  | 1.5 mm <sup>2</sup>    | 3 - G<br>2 - A<br>1 - B     |                     |   |
| "System operational" message <sup>6)</sup>                              |  | 1 2 3<br> | 1.5 mm <sup>2</sup>    | 3 - NO<br>2 - COM<br>1 - NC |                     | Min: 12 VDC at 10 mA<br>Max: 250 V at 1 A |

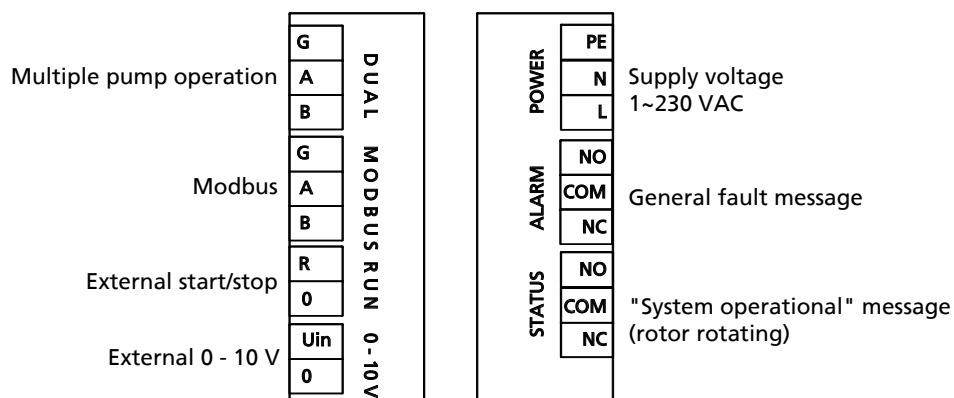
### Connecting the cables at the pump

1. Verify the supply voltage at the site against the data on the name plate of the pump.
2. Undo the two screws at the cover of the terminal wiring compartment. Take this cover off the drive unit.
3. Wire the cables to the terminals as indicated in the wiring diagram.
4. Fit the cover on the terminal wiring compartment. Fasten it to the drive unit with the two screws.



**Fig. 9:** Wiring diagram for ES MAXI 25, 30, 32, 40-60/-70/-80/-90, 50-40/-60/-80/-90, 65-60

<sup>6)</sup> Integrated in ES MAXI pumps 40-120/-180, 50-100/-120/-150/-180



**Fig. 10:** Wiring diagram for ES MAXI 40-120/-180, 50-100/-120/-150/-180

### 5.6.1 Routing the cables

- Route all low-voltage cables as direct as possible.
- Keep low-voltage cables separated from high-voltage cables, e.g. by metal partitions on cable trays.
- Only use shielded cables as low-voltage and bus cables.
- All bus cables must be routed in a line. Star-type wiring is impermissible (see illustration).



#### NOTE

Use shielded bus cables of the stranded, twisted-pair type, e.g. CAT.5 (AWG23) or at least equivalent.



#### NOTE

When routing bus cables, prevent the formation of star points, e.g. in junction boxes. Loop the cables in/out at the devices in daisy-chain configuration.



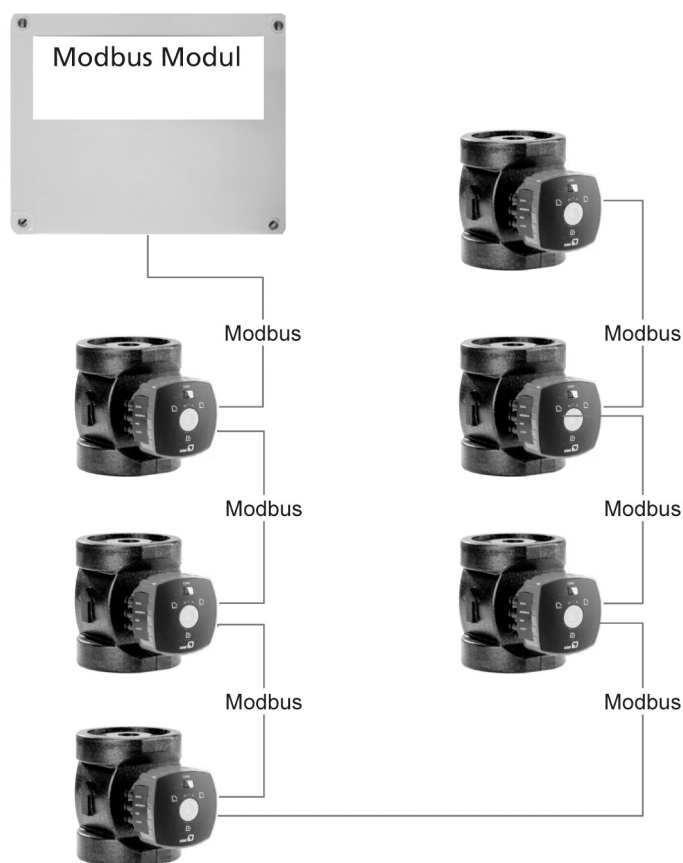


Fig. 11: Correct: routing bus cables in a line

### 5.6.2 Terminating resistors in a Modbus system

Cable reflections occur at the open cable ends (first and last device of a bus system). The higher the selected baud rate, the larger their values. Provide terminating resistors to keep reflections to a minimum. The resistors will establish a defined rest potential.

- The bus cables between the Modbus devices must be arranged in a line.
- Prior to arranging the terminating resistors, de-energise the control unit.
- At the first and last Modbus device of a bus line, a terminating resistor must be connected between terminals "+" and "-".
- Resistance of the terminating resistor: 120 Ohm

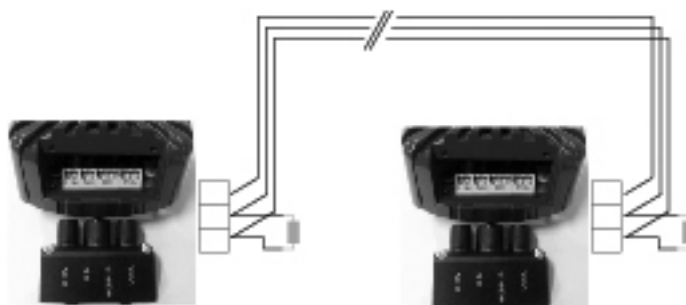


Fig. 12: Terminating resistors

### 6 Commissioning/Start-up/Shutdown


#### 6.1 Commissioning/start-up


##### 6.1.1 Prerequisites for commissioning/start-up

Before commissioning/starting up the pump set, make sure that the following conditions are met:

- The pump set has been properly connected to the electric power supply and is equipped with all protection devices.
- The pump has been primed with the fluid to be handled. The pump has been vented.


##### 6.1.2 Priming and venting the pump


|   |  |
|---|--|
|  | <b>NOTE</b><br>The pumps are self-venting. |
|---|--|


|   |  |
|---|--|
|  | <b>CAUTION</b><br><b>Increased wear due to dry running</b><br>Damage to the pump set!<br><ul style="list-style-type: none"> <li>▷ Never operate the pump set without liquid fill.</li> <li>▷ Never close the shut-off element in the suction line and/or supply line during pump operation.</li> </ul> |
|---|--|

1. Prime the pump and suction line with the fluid to be handled.
2. Fully open the shut-off element in the suction line.

##### 6.1.3 Start-up

|   |  |
|---|--|
|  | <b>DANGER</b><br><b>Non-compliance with the permissible pressure and temperature limits if the pump is operated with the suction and discharge lines closed.</b><br>Leakage of hot fluids!<br><ul style="list-style-type: none"> <li>▷ Never operate the pump with the shut-off elements in the suction line and/or discharge line closed.</li> <li>▷ Only start up the pump set against a slightly or completely open discharge-side shut-off element.</li> </ul> |
|---|--|

|   |  |
|---|--|
|  | <b>DANGER</b><br><b>Excessive temperatures due to insufficient lubrication of shaft seal</b><br>Damage to the pump set!<br><ul style="list-style-type: none"> <li>▷ Never operate the pump set without liquid fill.</li> <li>▷ Prime the pump as per operating instructions.</li> <li>▷ Always operate the pump within the permissible operating range.</li> </ul> |
|---|--|

|   |  |
|---|--|
|  | <b>CAUTION</b><br><b>Abnormal noises, vibrations, temperatures or leakage</b><br>Damage to the pump!<br><ul style="list-style-type: none"> <li>▷ Switch off the pump (set) immediately.</li> <li>▷ Eliminate the causes before returning the pump set to service.</li> </ul> |
|---|--|

- ✓ The system piping has been cleaned.
  - ✓ Pump, suction line and inlet tank, if any, have been vented and primed with the fluid to be pumped.
  - ✓ The lines for priming and venting have been closed.
1. Fully open the shut-off element in the suction head/suction lift line.
  2. Close or slightly open the shut-off element in the discharge line.
  3. Start up the motor.

#### 6.1.4 Control panel

##### Control elements

All settings are made using the dial on the housing front. To turn the dial, press the control button in the middle of the dial.

10 LED segments are arranged around the dial. These segments represent setpoint values ranging from 10 % to 100 %. The LED segments light up in blue when pump settings are being made (the figure below shows a setpoint of 40 %).

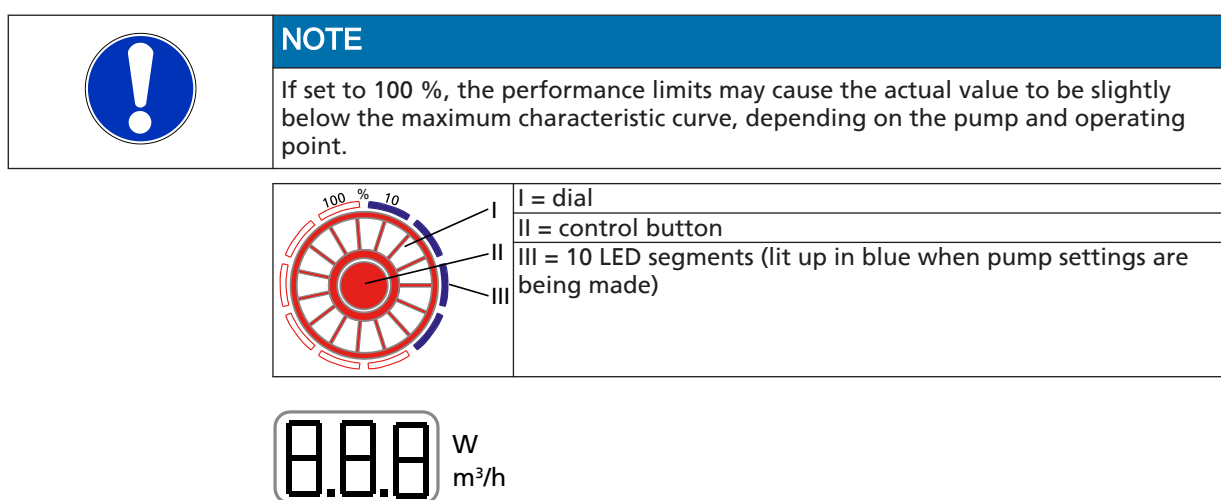


Fig. 13: Display

##### Display

The flow rate and the electrical input power are shown as 3-digits numbers on the integrated display. The display alternates in 5-second intervals between the two values in [m<sup>3</sup>/h] and [W] respectively.





The setpoint is indicated in [%].

If not settings have been made for some time, the display will revert to idle mode; the 10 LEDs light up one after the other in a circle and signal pump operation.

##### Symbols

The operating modes, functions and settings are indicated by symbols on the front panel. Lit symbols indicate which operating mode or function is active, whether an external 0 - 10 V signal is being transmitted and whether the pump is emitting a general fault message.

Table 8: Key to the symbols

| Symbol   | Description  | Unit              |
|--|--|-------------------|
| <b>m<sup>3</sup>/h</b>   | Flow rate (calculated)<br>This symbol is lit when the flow rate value is shown on the display. (The display alternates in 5-second intervals between the flow rate and the electrical input power).        | m <sup>3</sup> /h |
| <b>W</b>   | Electrical input power (measured)<br>This symbol is lit when the power value is shown on the display. (The display alternates in 5-second intervals between the flow rate and the electrical input power). | W                 |
|             | <b>Constant-pressure Control</b> operating mode<br>This symbol is lit when this operating mode is active.  | -                 |
|             | <b>Proportional-pressure Control</b> operating mode<br>This symbol is lit when this operating mode is active.  | -                 |
|             | <b>Fixed-speed Operation</b> operating mode<br>This symbol is lit when this operating mode is active.  | -                 |
|  <b>ECO</b> | <b>ECO</b> energy saving mode<br>Both these symbols are lit when this operating mode is active.  | -                 |
| <b>0 - 10 V</b>  | <b>0 - 10 V</b> operating mode<br>This symbol is lit when this operating mode is active.   | VDC               |
| <b>MODBUS</b>  | <b>Modbus</b> operating mode<br>This symbol is lit when this operating mode is active.   | -                 |
| <b>DUAL</b>  | <b>Multiple Pump Operation</b> operating mode<br>This symbol is lit when this operating mode is active.  | -                 |
| <b>SERVICE</b>   | The pump signals a general fault message<br>An error code is shown on the display.<br>The display indicates error code E01 - E06.  | -                 |

#### 6.1.4.1 Locking the control panel

Regardless of the operating mode the pump is in, its control panel can be locked with a second DIP switch in the wiring compartment of the pump to prevent unintentional changes of the setpoint, etc. If the **Control Panel Lock** function is enabled, the factory settings cannot be reset.

Table 9: Setting at the pump

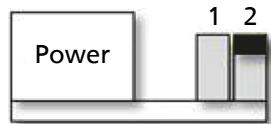

| Status of the Control Panel Lock function | Position of DIP switch 2 at the pump   |
|---|--|
| = enabled                                 | <div> <div>Terminals</div> <div>Power</div> <div>DIP</div> <div>1 2</div> <div>Top</div> <div>Bottom</div>  </div> |
| = disabled                                | <div> <div>Terminals</div> <div>Power</div> <div>DIP</div> <div>1 2</div> <div>Top</div> <div>Bottom</div>  </div> |

Table 10: Function of the DIP switches

| Function                   | DIP switch 1 | DIP switch 2 |
|----------------------------|--------------|--------------|
| Lock of pump control panel | -            | <b>X</b>     |
| Setback operation of pump  | <b>X</b>     | -            |

#### 6.1.4.2 Resetting the factory setting

To reset the factory setting of the pump press the control button for more than 30 seconds.

This comprises the following settings:

|                            |   |
|----------------------------|---|
| Mode of operation          | Proportional-pressure Control                             |
| Functions                  | The <b>Dual, Modbus, 0 - 10 V</b> functions are disabled. |
| Setpoints                  | 50 %  |
| Modbus parameter baud rate | 19,200 baud   |
| Modbus-Parameter Slave-ID  | 17  |

### 6.1.5 Mode of operation

#### 6.1.5.1 Information on settings

For common applications such as two-pipe systems Proportional-pressure Control ( $\Delta p-v$ ) is the recommended operating mode. This operating mode offers an extended control range with additional potential savings compared to Constant-pressure Control ( $\Delta p-c$ ). Depending on the balancing of branch circuits, undersupply may occur at a consumer installation.

The Constant-pressure Control operating mode ( $\Delta p-c$ ) can be selected as an option (e.g. for underfloor heating systems). If noises are audible at low flow rates the Proportional-pressure Control operating mode ( $\Delta p-v$ ) can be selected.

The setting of the discharge head setpoint depends on the piping curve of the system and on the heat requirements. As standard the pumps are set to Proportional-pressure Control ( $\Delta p-v$ ) and maximum performance.

#### 6.1.5.2 Constant-pressure control

##### Function

Irrespective of the flow rate, within the permissible flow rate range limited by the maximum pump characteristic ①, the pump control system maintains a constant pump head based on the set differential pressure setpoint  $H_s$ .

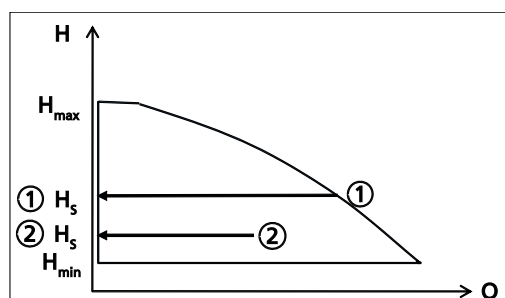




Fig. 14: Constant-pressure Control function

##### Setting

Activating the display from idle mode: Press the control button.

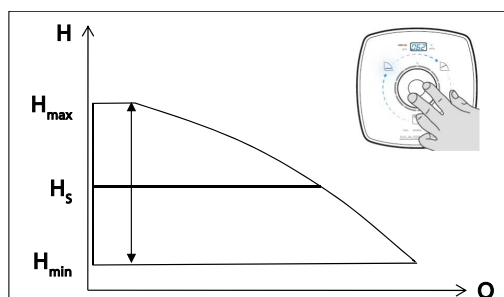
The display will show the current operating mode as well as, in alternation, the electrical input power and the flow rate. If 5 minutes pass without any settings being made or the control button being pressed, the display will revert to idle mode.

**Table 11:** Setting the operating mode to Constant-pressure Control and selecting the setpoint

|  |  |
|--|--|
|  | <p>Step 1: Activating the setting mode<br/>Press the control button for 3 seconds.<br/>The mode which has last been selected will start flashing.</p>   |
|  | <p>Step 2: Selecting the <b>Constant-pressure Control</b> operating mode<br/>Turn the dial until the symbol of the required operating mode starts flashing.</p>   |
|  | <p>Step 3: Activating the <b>Constant-pressure Control</b> operating mode<br/>Press the control button.<br/>The setpoint which has last been set will be indicated by means of the flashing blue LED segments.</p>   |
| <p>Confirming the current setpoint ⇒ Step 4a<br/>Changing the setpoint ⇒ Step 4b</p> |  |
|  | <p>Step 4a: Confirming the current setpoint<br/>Press the control button.</p>  |
|  | <p>Step 4b: Changing the setpoint<br/>Turn the dial and set the required setpoint in increments of 1 % within the range from 0 % to 100 %. (Turning the dial clockwise will increase the setpoint; turning the dial anti-clockwise will decrease it). The LED segments will light up in increments of 10 % of the setpoint.<br/>Press the control button to save the setpoint.</p> |

**NOTE**

If 10 seconds pass without any settings being made or saved, the control unit will revert to the previous settings.

**Fig. 15:** Constant-pressure Control settings**NOTE**

To start the pump the terminal pair "RUN" must be bridged (factory-set) or the terminal pair must receive the signal "Start". (⇒ Section 6.1.5.7.4 Page 44)



**Fig. 16:** Terminal pair RUN

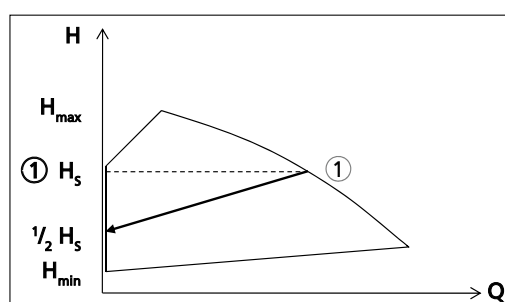
1 = 0

2 = R

### 6.1.5.3 Proportional-pressure control

#### Function

Within the permissible flow rate range the pump control system decreases or increases the differential pressure setpoint of the pump between  $\frac{1}{2} H_s$  and  $H_s$  (factory-set) in a linear fashion with the flow rate.



**Fig. 17:** Proportional-pressure Control function

#### Setting

Activating the display from idle mode: Press the control button.

The display will show the current operating mode as well as, in alternation, the electrical input power and the flow rate. If 5 minutes pass without any settings being made or the control button being pressed, the display will revert to idle mode.

**Table 12:** Setting the operating mode to Proportional-pressure Control and selecting the setpoint

|  |  |
|--|--|
|  | <p>Step 1: Activating the setting mode<br/>Press the control button for 3 seconds.<br/>The mode which has last been selected will start flashing.</p>  |
|  | <p>Step 2: Selecting the <b>Proportional-pressure Control</b> operating mode<br/>Turn the dial until the symbol of the required operating mode starts flashing.</p>  |
|  | <p>Step 3: Activating the <b>Proportional-pressure Control</b> operating mode<br/>Press the control button.<br/>The setpoint which has last been set will be indicated by means of the flashing blue LED segments.</p> |
| <p>Confirming the current setpoint ⇒ Step 4a<br/>Changing the setpoint ⇒ Step 4b</p> |  |



Step 4a: Confirming the current setpoint  
Press the control button.



Step 4b: Changing the setpoint  
Turn the dial and set the required setpoint in increments of 1 % within the range from 0 % to 100 %. (Turning the dial clockwise will increase the setpoint; turning the dial anti-clockwise will decrease it). The LED segments will light up in increments of 10 % of the setpoint.  
Press the control button to save the setpoint.



#### NOTE

If 10 seconds pass without any settings being made or saved, the control unit will revert to the previous settings.

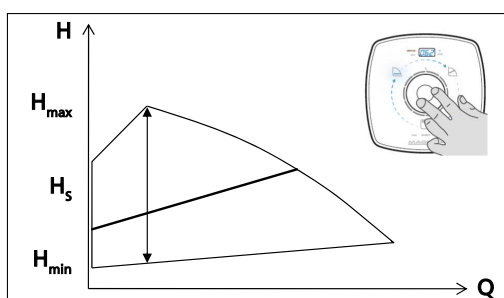


Fig. 18: Proportional-pressure Control settings



#### NOTE

To start the pump the terminal pair "RUN" must be bridged (factory-set) or the terminal pair must receive the signal "Start". (⇒ Section 6.1.5.7.4 Page 44)



Fig. 19: Terminal pair RUN

1 = 0

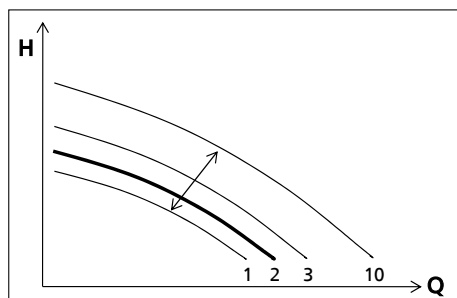
2 = R

#### 6.1.5.4 Fixed-speed operation

##### Fixed-speed Operation function

The pump is operated at the set speed level (characteristic curve). The speed can be set to one of 100 levels. In the example (see Fig. Fixed-speed Operation settings) the pump is operated at speed level 2.





**Fig. 20:** Fixed-speed Operation function

### Setting

Activating the display from idle mode: Press the control button.

The display will show the current operating mode as well as, in alternation, the electrical input power and the flow rate. If 5 minutes pass without any settings being made or the control button being pressed, the display will revert to idle mode.

**Table 13:** Setting the operating mode to Fixed-speed Operation and selecting the setpoint

|  |   |
|--|---|
|  | <p><b>Step 1: Activating the setting mode</b><br/>Press the control button for 3 seconds.<br/>The mode which has last been selected will start flashing.</p>  |
|  | <p><b>Step 2: Selecting the <b>Fixed-speed Operation</b> operating mode</b><br/>Turn the dial until the symbol of the required operating mode starts flashing.</p>  |
|  | <p><b>Step 3: Activating the <b>Fixed-speed Operation</b> operating mode</b><br/>Press the control button.<br/>The setpoint which has last been set will be indicated by means of the flashing blue LED segments.</p>   |
| <p>Confirming the current setpoint ⇒ Step 4a<br/>Changing the setpoint ⇒ Step 4b</p> |   |
|  | <p><b>Step 4a: Confirming the current setpoint</b><br/>Press the control button.</p>  |
|  | <p><b>Step 4b: Changing the setpoint</b><br/>Turn the dial and set the required setpoint in increments of 1 % within the range from 0 % to 100 %. (Turning the dial clockwise will increase the setpoint; turning the dial anti-clockwise will decrease it). The LED segments will light up in increments of 10 % of the setpoint.<br/>Press the control button to save the setpoint.</p> |



### NOTE

If 10 seconds pass without any settings being made or saved, the control unit will revert to the previous settings.

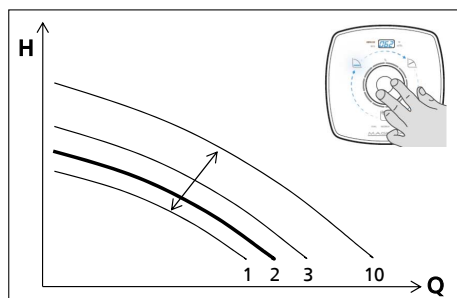


Fig. 21: Fixed-speed Operation settings

**NOTE**

To start the pump the terminal pair "RUN" must be bridged (factory-set) or the terminal pair must receive the signal "Start". (⇒ Section 6.1.5.7.4 Page 44)

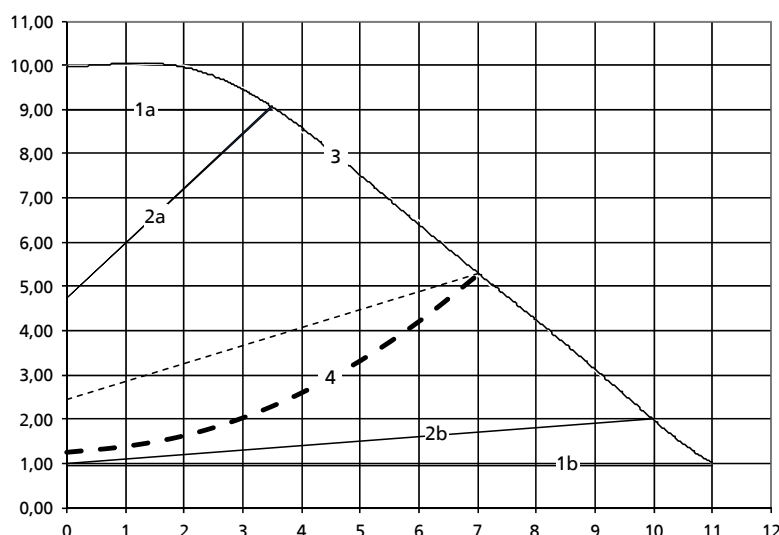


Fig. 22: Terminal pair RUN

|       |
|-------|
| 1 = 0 |
| 2 = R |

**6.1.5.5 Eco Mode****Function**

In Eco Mode the pump characteristic curve (4) is quadratic, starting at the discharge head setpoint  $H_{\text{Eco Start}} = 1/4 \times H_s$  with  $H_s$  = selected setpoint (see Setting the operating mode to **Proportional-pressure Control**). By changing the differential pressure setpoint the pump characteristic curve can be adjusted to higher or lower differential pressures or discharge heads. Compared to the **Proportional-pressure Control** operating mode the Eco Mode can save more than 40 % in electrical input power. The various pump characteristic curves and control ranges are illustrated in Fig. Eco Mode – Characteristic curve, example of a size ES MAXI 25-100 pump.



**Fig. 23:** Eco Mode – Characteristic curve, example of a size 25-100 pump

|    |  |
|----|--|
| 1a | Upper limit of the Constant-pressure Control     |
| 1b | Lower limit of the Constant-pressure Control     |
| 2a | Upper limit of the Proportional-pressure Control |
| 2b | Lower limit of the Proportional-pressure Control |
| 3  | Maximum characteristic curve                     |
| 4  | Eco Mode characteristic curve                    |

### Setting

Activating the display from idle mode: Press the control button.

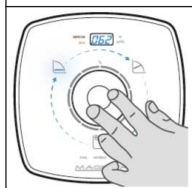
The display will show the current operating mode as well as, in alternation, the electrical input power and the flow rate. If 5 minutes pass without any settings being made or the control button being pressed, the display will revert to idle mode.

**Table 14:** Setting the operating mode to Eco Mode and selecting the setpoint

|  |  |
|--|--|
|  | <p><b>Step 1: Activating the setting mode</b><br/>Press the control button for 3 seconds.<br/>The mode which has last been selected will start flashing.</p>   |
|  | <p><b>Step 2: Selecting the <b>Eco Mode</b> operating mode</b><br/>Turn the dial until the symbol of the required operating mode starts flashing.</p> <p><b>ECO</b></p>                                  |
|  | <p><b>Step 3: Activating the <b>Eco Mode</b> operating mode</b><br/>Press the control button.<br/>The setpoint which has last been set will be indicated by means of the flashing blue LED segments.</p> |
| <p>Confirming the current setpoint ⇒ Step 4a<br/>Changing the setpoint ⇒ Step 4b</p> |  |



Step 4a: Confirming the current setpoint  
Press the control button.



Step 4b: Changing the setpoint  
Turn the dial and set the required setpoint in increments of 1 % within the range from 0 % to 100 %. (Turning the dial clockwise will increase the setpoint; turning the dial anti-clockwise will decrease it). The LED segments will light up in increments of 10 % of the setpoint.  
Press the control button to save the setpoint.



#### NOTE

If 10 seconds pass without any settings being made or saved, the control unit will revert to the previous settings.



#### NOTE

To start the pump the terminal pair "RUN" must be bridged (factory-set) or the terminal pair must receive the signal "Start". (⇒ Section 6.1.5.7.4 Page 44)



Fig. 24: Terminal pair RUN

|       |
|-------|
| 1 = 0 |
| 2 = R |

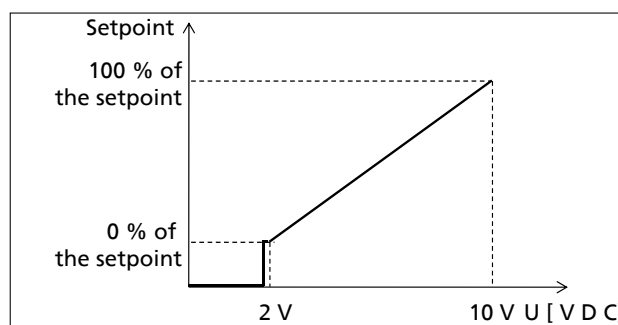
#### 6.1.5.6 0 - 10 V

##### Function

An external analog 0 - 10 VDC signal serves as external setpoint input for the pump. The pump processes the current external analog signal as a differential pressure setpoint if the **Constant-pressure Control** or **Proportional-pressure Control** operating modes are active, or as speed setpoint if the **Fixed-speed Operation** operating mode is active. If the signal level is below <2 VDC the pump will switch off and the last LED segment will extinguish.

Table 15: Setpoint settings at the pump for signal level 0 - 10 V

| Signal level of 0 - 10 V signal | Setpoint setting at the pump |
|---------------------------------|------------------------------|
| 10 VDC                          | 100 % of the setpoint        |
| 2 VDC                           | 0 % of the setpoint          |
| < 2 VDC                         | Pump will switch off         |
| ≥ 2 VDC                         | Pump will start up           |



**Fig. 25:** Analog 0 - 10 V signal as setpoint for the pump

### Setting

The external analog signal is wired to the terminal pair "0 - 10 V" integrated in the pump. (⇒ Section 9.2 Page 51)

Activating the display from idle mode: Press the control button.

The display will show the current operating mode as well as, in alternation, the electrical input power and the flow rate. If 5 minutes pass without any settings being made or the control button being pressed, the display will revert to idle mode.

**Table 16:** Activating/de-activating 0 - 10 V operating mode and setting the setpoint

|  |   |
|--|---|
|  | <p>Step 1: Enabling the sub-mode (DUAL, Modbus, 0 - 10 V)<br/>Press the control button for 6 seconds.<br/>One of the symbols representing the <b>Multiple Pump Operation</b> (DUAL), <b>Modbus</b> and <b>0 - 10 V</b> sub-modes will start flashing.</p> |
|  | <p>Step 2: Selecting the <b>0 - 10 V</b> operating mode<br/>Turn the dial until the symbol of the required operating mode starts flashing.<br/><b>0-10V</b></p>   |
|  | <p>Step 3: Activating or de-activating the <b>0 - 10 V</b> operating mode<br/>Press the control button.<br/>The symbol will light up. When the signal is activated, the circular segments will indicate the value of the input signal.</p>                |



### NOTE

If 10 seconds pass without any settings being made or saved, the control unit will revert to the previous settings.

**Table 17:** LED segments per signal level [V]

| Lit LED segment | Voltage |
|-----------------|---------|
| 0               | 2,4     |
| 1               | 3,2     |
| 2               | 4,0     |
| 3               | 4,8     |
| 4               | 5,6     |
| 5               | 6,4     |
| 6               | 7,2     |
| 7               | 8,0     |
| 8               | 8,8     |

| Lit LED segment | Voltage |
|-----------------|---------|
| 9               | 9,6     |
| 10              | 10,0    |

The external analog signal is wired to the terminal pair "0 - 10 V" integrated in the pump.



#### NOTE

To start the pump the terminal pair "RUN" must be bridged (factory-set) or the terminal pair must receive the signal "Start". (⇒ Section 6.1.5.7.4 Page 44)



Fig. 26: Terminal pair RUN

|       |
|-------|
| 1 = 0 |
| 2 = R |

### 6.1.5.7 Functions

#### 6.1.5.7.1 Setback operation



#### **⚠ DANGER**

##### **Work at the DIP switch by unqualified personnel**

Danger of death from electric shock!

- The pump must be de-energised before the Setback Operation function can be enabled/disabled at DIP switch 1.

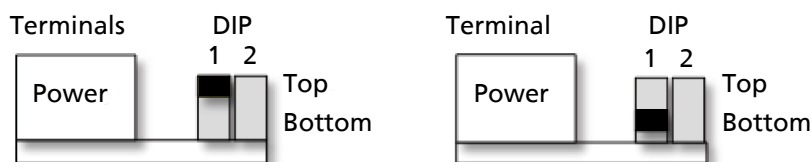
#### Function

When the fluid temperature has been sinking continuously the pump recognises minimum heating requirements. If the **Setback Operation** function is enabled, the pump automatically switches to operation at minimum speed and also reduces the speed of the circular running light. When the setpoint is changed, the pump changes from Setback Operation to its previous operating mode. When the demand on heating performance rises again, the pump automatically returns to its previous operating mode. Unless the **0 - 10 V** function is active, the **Setback Operation** function can be enabled in all operating modes via DIP switch 1 (the function is enabled with DIP switch 1 in top position).



#### NOTE

This function is disabled in the factory setting.

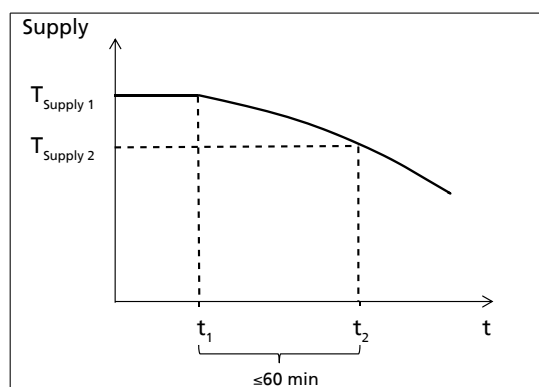


**Fig. 27:** Position of DIP switch 1

| Position of DIP switch 1 | Setback Operation function |
|--------------------------|----------------------------|
| Top                      | Enabled                    |
| Bottom                   | Disabled                   |

### Prerequisites:

1. The pump is installed in the supply line.
2. The Setback Operation function must be enabled in the higher-level control system (this will reduce the supply temperature).



**Fig. 28:** Setback operation

### 6.1.5.7.2 Multiple pump operation (DUAL function)

#### Function

Multiple Pump Operation is activated when a maximum of two pumps are started up. The duty/stand-by operating mode becomes active after a few seconds and will stop one of the pumps. The pump which remains active (on duty) is operated at 0 - 100 %; the other pump will be on stand-by.

The **External Start/Stop** function will be deactivated for the stand-by pump, irrespective of the wiring of the terminal pair RUN.

The duty pump can be controlled by means of the **0 - 10 V** operating mode or the integrated **External Start/Stop** function.

#### Automatic pump changeover (1)

The pumps come with an integrated timer, which switches off the duty pump after 24 hours of operation and starts up the stand-by pump. To this effect, two minutes before the duty pump is switched off it signals a start command to the stand-by pump. The stand-by pump will be started up and the first pump will be switched off.

#### Redundant operation (2)

In the event of a failure of the duty pump the stand-by pump will be started up automatically and will take over the functions of the failed pump. The two functions (1) and (2) will be carried out automatically.

#### Setting

The control modules of the two pumps are connected with a commercial, shielded data cable. The terminals of the terminal pair RUN must be bridged at both pumps. (⇒ Section 9.2 Page 51)

**NOTE**

The settings of the connected pumps could differ.

Each pump is operated in accordance with its settings. For example, one pump could be operated in variable-speed mode and the other in Fixed-speed Operation mode.

To ensure that the changeover from duty pump to stand-by pump will not have any impact on the operation regarding duty point and operating mode, the settings of both pumps must be identical.

Activating the display from idle mode: Press the control button.

The display will show the current operating mode as well as, in alternation, the electrical input power and the flow rate. If 5 minutes pass without any settings being made or the control button being pressed, the display will revert to idle mode.

**Table 18:** Activating/de-activating the Multiple Pump Operation (DUAL) operating mode

|  |   |
|--|---|
|  | <p>Step 1: Enabling the sub-mode (DUAL, Modbus, 0 - 10 V)<br/>Press the control button for 6 seconds.<br/>One of the symbols representing the <b>Multiple Pump Operation (DUAL)</b>, <b>Modbus</b> and <b>0 - 10 V</b> sub-modes will start flashing.</p> |
|  | <p>Step 2: Selecting the <b>Multiple Pump Operation (DUAL)</b> operating mode<br/>Turn the dial until the symbol of the required operating mode starts flashing.<br/><b>DUAL</b></p>  |
|  | <p>Step 3: Activating or de-activating the <b>Multiple Pump Operation (DUAL)</b> operating mode<br/>Press the control button.<br/>The symbol will light up.</p>   |

**NOTE**

If 10 seconds pass without any settings being made or saved, the control unit will revert to the previous settings.

### 6.1.5.7.3 Connection to bus systems with Modbus

**Table 19:** Technical data of the Modbus interface

| Parameter              | Description/value  |
|------------------------|--|
| Terminal cross-section | 1.5 mm <sup>2</sup>  |
| Interface              | RS485 (TIA-485A) optically isolated  |
| Bus connection         | Shielded bus cable, twisted in pairs, 1x 2x 0.5 mm <sup>2</sup>  |
| Cable length           | 1000 m maximum, stub lines impermissible, for cable lengths > 30 m take suitable measures to prevent overvoltages. |
| Wave impedance         | 120 ohm (cable type B to TIA 485-A)  |
| Data rate [baud]       | 2,400, 4,800, 9,600, 19,200 (factory setting)  |
| Protocol               | Modbus RTU standard  |
| Data format            | 8 data bits, EVEN parity, 1 stop bit   |
| Modbus address         | ID #17 (factory setting)   |



### Function

All pumps come with the **Modbus** function and the corresponding Modbus terminal pair integrated in the control module. The pumps are Modbus slaves and only respond to the Modbus master (external hardware and software). The pump can neither be set nor operated as a Modbus master. The send and receive commands comply with the requirements of the standard protocol Modbus RTU.

Neither the bus cable nor the hardware and software of a Modbus master are included in the pumps' scope of supply.

### Connection

Remove the cover of the terminal wiring compartment. Connect the bus cable (shielded, 2-core, 0.5 mm<sup>2</sup>) to terminal pair A and B of the three-piece Modbus terminal.

Terminal G is connected to Earth. The shield of the bus cable can be connected to this terminal, for example. The terminals are suitable for cable cross-sections of up to 1.5 mm<sup>2</sup>.

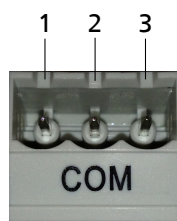


Fig. 29: Terminal pair COM

|   |                      |
|---|----------------------|
| 1 | B (signal conductor) |
| 2 | A (signal conductor) |
| 3 | G (Earth)            |

All Modbus data points can be read at all times (monitoring) without having to disable the **Modbus** function at the pump. All data points are listed below.

Before the pump can receive and respond to any Modbus input, the **Modbus** function has to be enabled at the pump (see settings). The Modbus input is overwritten by any input made at the site (manual input at the pump), an external analog signal (**0 - 10 V** function), a bridged terminal pair RUN, and the **External Start/Stop** function. The pump assigns the following priorities to the various types of input.

Table 20: Priorities

| Priority | Function/input   |
|----------|--|
| 1        | Input via the <b>External Start/Stop</b> function or a bridged terminal pair RUN |
| 2        | Setpoint input via the <b>0 - 10 V</b> function                                  |
| 3        | Manual setpoint input on site at the control panel                               |
| 4        | Modbus input   |

Regardless of whether the pump is receiving input of priority 1, 2 or 3, it will only start up when the terminal pair RUN is bridged or when this terminal pair receives such a signal (provided that the pump is connected to an appropriate voltage supply).



### NOTE

The pump is delivered with the terminal pair RUN bridged.

This allows the two functions **Modbus** and **0 - 10 V** to be activated at the pump in parallel, for example. The input is processed by the pump in the order of priorities indicated above.

If the **Modbus** as well as **DUAL** (Multiple Pump Operation) functions are active, both single pumps must be connected to Modbus as changes made to the settings of the duty pump will not be transferred to the stand-by pump via the terminal pair DUAL.

If the **DUAL** function is active, the pumps are automatically changed over every 24 hours of (uninterrupted) operating time; in the event of a failure of the duty pump, the stand-by pump will take over the function of the duty pump. For this reason, the Modbus input must be identical for both pumps to ensure that each duty pump will reach the required operating point.

If only one of the two pumps is connected to Modbus, this pump can receive new input via Modbus. However, this input will not be transferred to the second pump via the terminal pair DUAL. The parameters of the two pumps may differ in this case, and the operating point may no longer be reached after pump changeover.

If the **Modbus** function has been de-activated, active Modbus input will no longer be processed by the control module. Instead, the previously active local input functions will be re-activated. When returning to the Modbus operating mode, the Modbus input must be re-written and re-sent by the control station.

### Data points

Data points of type R are read-only; data points of type R/W are read & write enabled.

**Table 21:** Overview of Modbus operating parameters

| Parameter description    | Register | Length [byte] | Type/format | Unit   | Access |
|--------------------------|----------|---------------|-------------|--|--------|
| Error vector, bit code   | 07 D0    | 00 02         | INT16       | Bit 0 = error code E01<br>Bit 1 = error code E02<br>Bit 2 = error code E03<br>Bit 3 = error code E04<br>Bit 4 = error code E05<br>Bit 5 = error code E06<br>(error codes see table "Key to the error vectors") | R      |
| Calculated head          | 07 D2    | 00 02         | INT16       | Head in m x 10   | R      |
| Calculated flow rate     | 07 D4    | 00 02         | INT16       | Flow rate in m <sup>3</sup> /h x 10  | R      |
| Current speed            | 07 D8    | 00 02         | UINT16      | Speed in rpm   | R      |
| Pump status              | 07 D9    | 00 02         | UINT16      | 0 = pump stop<br>1 = pump in operation   | R      |
| Operating hours pump     | 07 DA    | 00 02         | INT16       | Operating hours  | R      |
| Pump power               | 07 DC    | 00 02         | INT16       | Watt   | R      |
| Current pump load        | 07 DE    | 00 02         | UINT16      | Value between 0 - 100 %  | R      |
| Selection operating mode | 08 34    | 00 01         | ENUM        | 1 = Constant-pressure Control<br>4 = Proportional-pressure Control (factory setting)<br>8 = Eco Mode<br>16 = Fixed-speed Operation   | R/W    |
| Setpoint input           | 08 35    | 00 02         | UINT16      | 0 - 9999 equals 0 - 100 % of the setpoint  | R/W    |
| Pumps start/stop         | 08 36    | 00 01         | ENUM        | 0x05 = pump stop<br>0xA0 = pump start (cannot overwrite the external RUN contact)  | R/W    |
| Modbus baud rate         | 0B B8    | 00 01         | ENUM        | 0 = 9,600<br>3 = 9,600<br>4 = 19,200 (factory setting)   | R/W    |
| Modbus address           | 0B B9    | 00 02         | UINT16      | 0 - 240; default address 17  | R/W    |

| Function | Function code                                       |
|----------|---|
| Read     | Function code 03<br>(0x03 read holding registers)   |
| Write    | Function code 16<br>(0x10 write multiple registers) |

All registers (07 D0 ... 07 DE) can be read out via function code 0x03 (read holding registers) as one unit.

Table 22: Key to the error vectors

| Error vector | Description                 | Bit |
|--------------|-----------------------------|-----|
| E01          | Temperature limit exceeded  | 0   |
| E02          | Overcurrent                 | 1   |
| E03          | Internal fault              | 2   |
| E04          | Rotor blocked               | 3   |
| E05          | Overload / adjusted speed   | 4   |
| E06          | Supply voltage too high/low | 5   |

**NOTE**

Error E05 is a warning. The pump will not stop but reduce its speed until no overload is detected any more.

**Examples of Modbus communication**

1. Monitoring the speed:  
To be able to read the current speed of the pump, the following request has to be sent by the master: Modbus Request 11 03 07 D8 00 01 07 D5
2. Setpoint input:  
The setpoint can be set to any value from 0 - 9999, with 9999 equalling 100 % of the setpoint.  
Example: Write setpoint 50 %  
Modbus Request 11 10 08 35 00 01 02 13 88 EA A3
3. Input control mode:  
The operating mode of the pump can also be changed via Modbus (see table).  
Example: Write Fixed-speed Operation control mode  
Modbus Request 11 10 08 34 00 01 02 00 10 E7 E8

**Setting**




The pump can be connected to a Modbus network with a commercial, shielded data cable. (⇒ Section 9.2 Page 51)

The procedure below describes how to activate/de-activate the **Modbus** operating mode.

Activating the display from idle mode: Press the control button.

The display will show the current operating mode as well as, in alternation, the electrical input power and the flow rate. If 5 minutes pass without any settings being made or the control button being pressed, the display will revert to idle mode.

Table 23: Activating/de-activating the Modbus operating mode

|   |  |
|---|--|
|  | Step 1: Enabling the sub-mode (DUAL, Modbus, 0 - 10 V)<br>Press the control button for 6 seconds.<br>One of the symbols representing the <b>Multiple Pump Operation</b> (DUAL), <b>Modbus</b> and <b>0 - 10 V</b> sub-modes will start flashing. |
|  | Step 2: Selecting the <b>Modbus</b> operating mode<br>Turn the dial until the symbol of the required operating mode starts flashing.<br><b>MODBUS</b>  |
|  | Step 3: Activating or de-activating the <b>Modbus</b> operating mode<br>Press the control button.<br>The symbol will light up.   |

The Modbus address of the pump is set in the Modbus master (e.g. by connecting a laptop with Modbus master functionality and providing the pump with the corresponding input).



#### NOTE

If 10 seconds pass without any settings being made or saved, the control unit will revert to the previous settings.

#### 6.1.5.7.4 External start/stop

##### Function

The pump is started up/stopped as a function of an external signal. To determine the status of the transferred signal, one of the two terminals is internally supplied with a low voltage. The voltage at both terminals of the pair is measured against a common earthing point. The measurement at the second terminal of the pair will indicate the voltage drop.

**Table 24:** Pump start and stop

| Measured voltage drop | Response  |
|-----------------------|---|
| 0                     | Pump starts up (contact closed / terminals bridged) |
| > 0                   | Pump stops (contact open / terminals not bridged)   |

##### Setting

The external signal is wired to the terminal pair RUN integrated in the pump.  
(⇒ Section 9.2 Page 51)



**Fig. 30:** Terminal pair RUN

|       |
|-------|
| 1 = 0 |
| 2 = R |

#### 6.1.5.7.5 Saving data

##### Function

The operating data of the pump are saved. Data storage will be maintained also when the pump is stopped or de-energised. Once the pump is switched on again it will be operated with the data and duty point that were active before the pump was last stopped.

##### Settings

None

#### 6.1.5.7.6 Deblocking the impeller

##### Function

The pump is started up at maximum torque to remove any hydraulic blocking which may occur (at the impeller or motor shaft). The pump input power is limited in this case (protective function). If the blocking cannot be removed, the pump will stop the start-up attempt and display error code E04. After a short break the pump will try to start up again. The number of start-up attempts is unlimited. Once the pump has started up successfully, it will acknowledge the error message; error code E04 will disappear from the display.

### Settings

None

#### 6.1.5.7.7 Protective functions

##### Function

The electronic motor protection automatically reduces the pump power in the event of overloading. Warning E05 is shown on the display.

### Settings

None

#### 6.1.5.7.8 Alerts

##### Function

To protect the pump from destruction it is stopped in the event of severe errors (E01 - E04, E06).

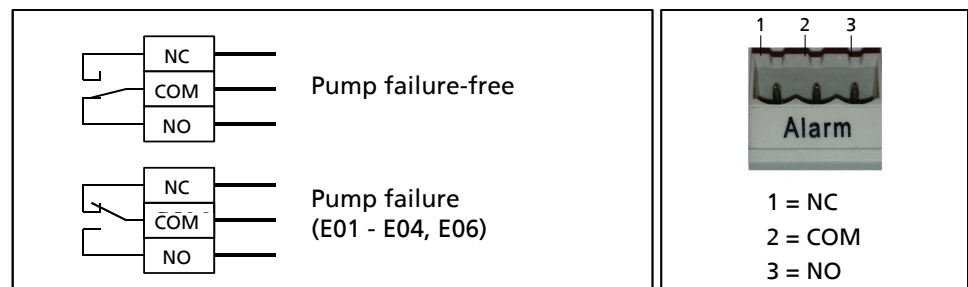
The integrated relay with a volt-free NC and a volt-free NO contact can be used as a general fault message.

**Table 25:** Error codes, causes and response

| Error code on the pump display | Cause               | Response            |
|--------------------------------|---------------------|---------------------|
| E01                            | Overheating         | The pump is stopped |
| E02                            | Overcurrent         | The pump is stopped |
| E03                            | Internal fault      | The pump is stopped |
| E04                            | Rotor blocked       | The pump is stopped |
| E05                            | Rise in temperature | Speed is reduced    |
| E06                            | Voltage error       | The pump is stopped |

### Setting

The signal is wired to the terminal pair Alarm with terminals NO/COM/NC. (⇒ Section 9.2 Page 51)



**Fig. 31:** Wiring diagram for the alarm message

#### 6.1.5.7.9 "System operational" message

Pumps of sizes 40-120/-180 and 50-100/-120/-150/-180 signal their operational status via the integrated, volt-free relay contact.

Pump not in operation = rotor not rotating, no flow

Pump in operation = rotor rotating

This information can be accessed at the "status" terminal pair with terminals NO/COM/NC.

Wiring diagram (⇒ Section 9.2 Page 51)

ES MAXI pumps of DN 25, 30, 32 and 40-60/-70/-80/-90/-100 as well as 50-40/-60/-80/-90 can output a "system operational" message when connected to the "system operational" signalling module (observe the supplementary operating manual).

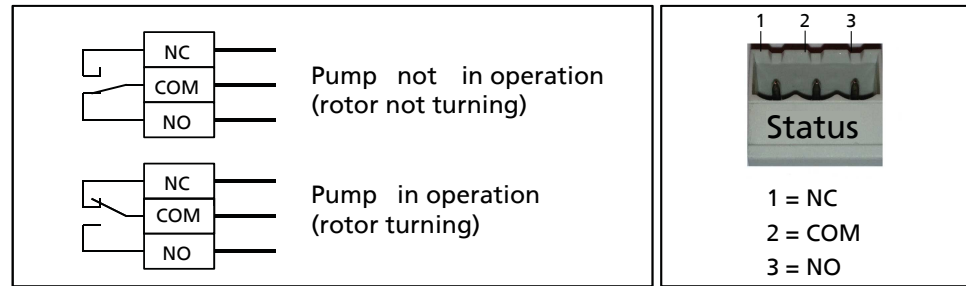


Fig. 32: Wiring diagram for "system operational" message

### 6.2 Shutdown

- ✓ The shut-off element in the suction line is and remains open.
- 1. Close the shut-off element in the discharge line.
- 2. Switch off the motor and make sure the pump set runs down smoothly to a standstill.

|  |  |
|--|--|
|  | <b>NOTE</b>  |
|  | <p>If the discharge line is equipped with a check valve, the shut-off element in the discharge line may remain open, provided the site's requirements and regulations are taken into account and observed.</p> |

For prolonged shutdown periods:

- 1. Close the shut-off element in the suction line.

|  |  |
|--|--|
|  | <b>CAUTION</b>   |
|  | <p><b>Risk of freezing during prolonged pump shutdown periods</b><br/>Damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Drain the pump and the cooling/heating chambers (if any) or otherwise protect them against freezing.</li> </ul> |

### 6.3 Operating limits

|  |   |
|--|---|
|  | <b>⚠ DANGER</b>   |
|  | <p><b>Non-compliance with operating limits for pressure, temperature, fluid handled and speed</b><br/>Hot fluid may escape!</p> <ul style="list-style-type: none"> <li>▷ Comply with the operating data indicated in the data sheet.</li> <li>▷ Avoid prolonged operation against a closed shut-off element.</li> <li>▷ Never operate the pump at product temperatures exceeding those specified in the data sheet or on the name plate.</li> </ul> |

#### 6.3.1 Ambient temperature

|  |  |
|--|--|
|  | <b>CAUTION</b>   |
|  | <p><b>Operation outside the permissible ambient temperature</b><br/>Damage to the pump (set)!</p> <ul style="list-style-type: none"> <li>▷ Observe the specified limits for permissible ambient temperatures.</li> </ul> |


Observe the following parameters and values during operation:

**Table 26:** Fluid temperature specified for the ambient temperature [°C]

|     | Fluid temperature | Ambient temperature |
|-----|-------------------|---------------------|
| All | 110               | 30                  |
|     | 90                | 40                  |

**6.3.2 Density of the fluid handled**

The pump input power changes in proportion to the density of the fluid handled.

|   |  |
|---|--|
|  | <div style="background-color: yellow; padding: 2px;"><b>CAUTION</b></div> <p><b>Impermissibly high density of the fluid handled</b><br/>Motor overload!</p> <p>► Observe the information on fluid density in the data sheet.</p> |
|---|--|

**6.4 Shutdown/storage/preservation****6.4.1 Measures to be taken for shutdown****The pump (set) remains installed**

- ✓ Sufficient fluid is supplied for the operation check run of the pump.
- 1. Start up the pump (set) regularly between once a month and once every three months for approximately five minutes during prolonged shutdown periods. This will prevent the formation of deposits within the pump and the pump intake area.

**The pump is removed from the pipe and stored**


The pump has been properly drained (⇒ Section 7.2 Page 48) and the safety instructions for dismantling the pump have been observed.

Observe any additional instructions and information provided. (⇒ Section 3 Page 10)

**6.5 Returning to service**

For returning the pump to service observe the sections on commissioning/start-up and the operating limits.

In addition, carry out all servicing/maintenance operations before returning the pump (set) to service.

|   |  |
|---|--|
|  | <div style="background-color: orange; padding: 2px;"><b>⚠ WARNING</b></div> <p><b>Failure to re-install or re-activate protective devices</b><br/>Risk of injuries by escaping fluid!</p> <p>► As soon as the work is completed, re-install and/or re-activate any safety-relevant and protective devices.</p> |
|---|--|

## 7 Servicing/Maintenance

### 7.1 Servicing/inspection

The circulator pumps are almost maintenance-free.

If the pump has not been in operation for a prolonged period of time or if the system is severely contaminated, the rotor can become blocked.

The rotor can be deblocked by undoing the screw plug, inserting a screwdriver into the shaft end, and rotating the rotor.



#### NOTE

Any repairs on the pump must only be performed by one of our authorised service partners.  
In the event of a failure, please contact your heating system engineer.

### 7.2 Drainage/cleaning



#### ⚠ WARNING

**Fluids, consumables and supplies which are hot and/or pose a health hazard**  
Hazard to persons and the environment!

- ▷ Collect and properly dispose of flushing fluid and any residues of the fluid handled.
- ▷ Wear safety clothing and a protective mask, if required.
- ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.

1. Always flush the pump if it has been used for handling noxious, hot or other hazardous fluids.  
Always flush and clean the pump before transporting it to the workshop.  
Provide a cleaning record for the pump.

### 7.3 Removing the pump set from the piping

#### 7.3.1 Dismantling the complete pump set



#### ⚠ DANGER

**Work performed on an energised terminal box**  
Danger of death from electric shock!

- ▷ Switch off the supply voltage at least 5 minutes prior to commencing work and ensure that it cannot be switched on again unintentionally.



#### ⚠ DANGER

**Strong magnetic field in the rotor area**  
Danger of death for persons with pacemaker!

- ▷ Keep a safety distance of at least 0.3 m.






#### ⚠ DANGER

**Pump acting as a generator when running in reverse**  
Danger to life from hazardous induction voltage at the motor terminals!

- ▷ Prevent the fluid from flowing back by closing the shut-off elements.



|  |  |
|--|--|
|   | <p><b>⚠ WARNING</b></p> <p><b>Danger by strong magnetic field</b><br/>           Danger of crushing injuries when pulling out the rotor!<br/>           Due to the strong magnetic field the rotor can be suddenly pulled back into its original position!<br/>           Danger of magnetic parts near the rotor being attracted!</p> <ul style="list-style-type: none"> <li>▷ The rotor must generally only be removed from the motor housing by authorised specialist personnel.</li> <li>▷ Remove any magnetic parts from the vicinity of the rotor.</li> <li>▷ Keep the assembly area clean.</li> <li>▷ Keep a safety distance of at least 0.3 m from electronic components.</li> </ul> |
|   | <p><b>CAUTION</b></p> <p><b>Strong magnetic field in the rotor area</b><br/>           Interference with magnetic data carriers, electronic devices, components and instruments!<br/>           Uncontrolled magnetic attraction forces between magnetic components, tools or similar!</p> <ul style="list-style-type: none"> <li>▷ Remove any magnetic parts from the vicinity of the rotor.</li> <li>▷ Keep the assembly area clean.</li> </ul>  |
|  | <p><b>CAUTION</b></p> <p><b>Danger by strong magnetic field</b><br/>           Negative impact on or damage to electrical devices!</p> <ul style="list-style-type: none"> <li>▷ The rotor must generally only be removed from the motor housing by authorised specialist personnel.</li> </ul>   |

- ✓ The relevant notes and steps stated have been observed/carried out.
  - ✓ The pump has cooled down to ambient temperature.
  - ✓ A container for collecting the fluid has been positioned underneath the pump set.
1. De-energise the pump set (disconnect the motor) and ensure that it cannot be re-energised unintentionally.
  2. Close the shut-off elements.
  3. Disconnect the discharge and suction nozzles from the piping.
  4. Depending on the pump/motor size, remove the supports from the pump set.
  5. Remove the complete pump set from the piping.

## 8 Trouble-shooting


**⚠ WARNING**
**Improper work to remedy faults**

Risk of injury!

- ▷ For any work to remedy faults observe the relevant information in this manual or in the relevant accessory manufacturer's product literature.

If problems occur that are not described in the following table, consultation with the customer service is required.

- A** Pump is running but does not deliver
- B** Pump starts up but stops again immediately

**E01** Error code on the display

**E02** Error code on the display

**E03** Error code on the display

**E04** Error code on the display

**E05** Error code on the display

**E06** Error code on the display

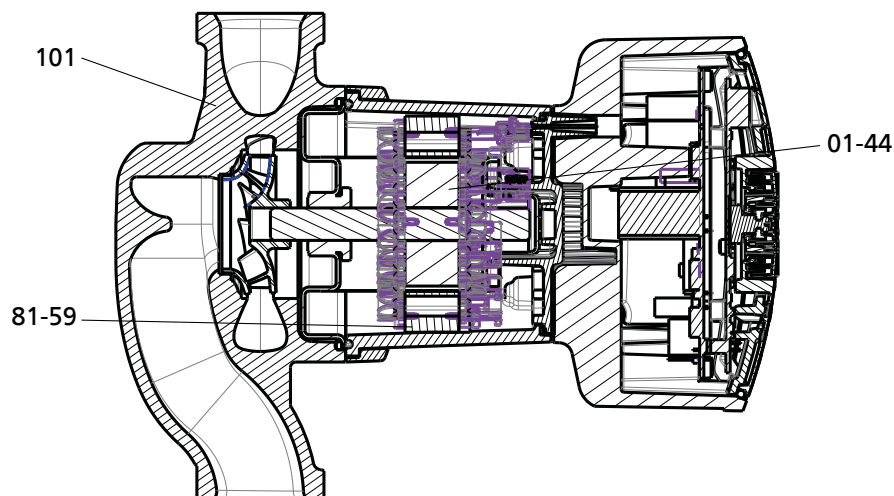
**Table 27:** Trouble-shooting

| A        | B        | E01      | E02      | E03      | E04      | E05      | E06      | Possible cause  | Remedy <sup>7)</sup>   |
|----------|----------|----------|----------|----------|----------|----------|----------|---|--|
| <b>X</b> | -        | -        | -        | -        | -        | -        | -        | Master switch OFF, defective fuse, earth conductor not or incorrectly connected | Check master switch.<br>Check fuse.<br>Check pump connection.  |
| -        | <b>X</b> | -        | -        | -        | -        | -        | -        | Remote start/stop contact has been removed.                                     | Fit connecting bridge for Start/Stop function.   |
| -        | -        | <b>X</b> | -        | -        | -        | -        | -        | Overheating   | Let the pump cool down for some minutes. Then try to re-start it. Verify that the water and ambient temperature are within the indicated temperature ranges.   |
| -        | -        | -        | <b>X</b> | -        | -        | -        | -        | Overcurrent   | Disconnect the pump from the power supply (for 1 minute). Then re-connect it to the power supply.  |
| -        | -        | -        | -        | <b>X</b> | -        | -        | -        | Internal fault  | Disconnect the pump from the power supply (for 1 minute). Then re-connect it to the power supply.  |
| -        | -        | -        | -        | -        | <b>X</b> | -        | -        | Rotor blocked   | Start up and stop the pump several times.<br>If the pump is still blocked, properly dismantle and deblock it.  |
| -        | -        | -        | -        | -        | -        | <b>X</b> | -        | Rise in temperature   | To prevent a temperature increase inside the pump the speed has been reduced.<br>Once the pump has cooled down, it will revert to its normal operating data. If the temperature continues to rise, E01 will be indicated on the display. |
| -        | -        | -        | -        | -        | -        | -        | <b>X</b> | Voltage error   | Verify that the voltage matches the data on the name plate.  |

<sup>7)</sup> Release pump pressure before attempting to remedy faults on parts which are subjected to pressure.

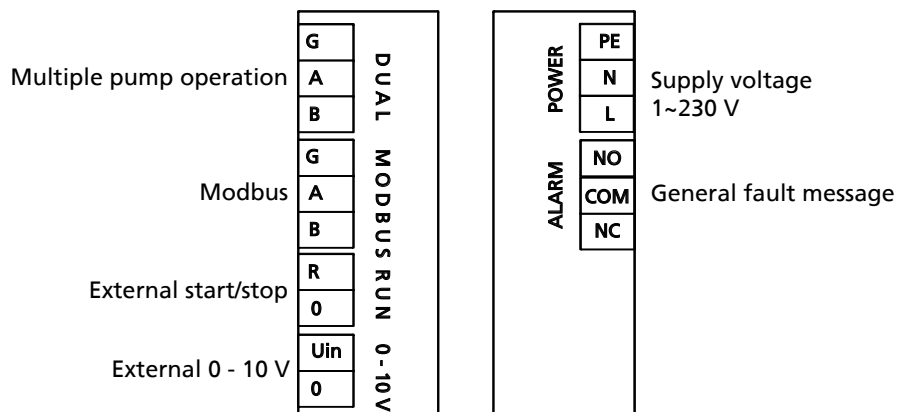
## 9 Related Documents

### 9.1 Sectional drawing with list of components

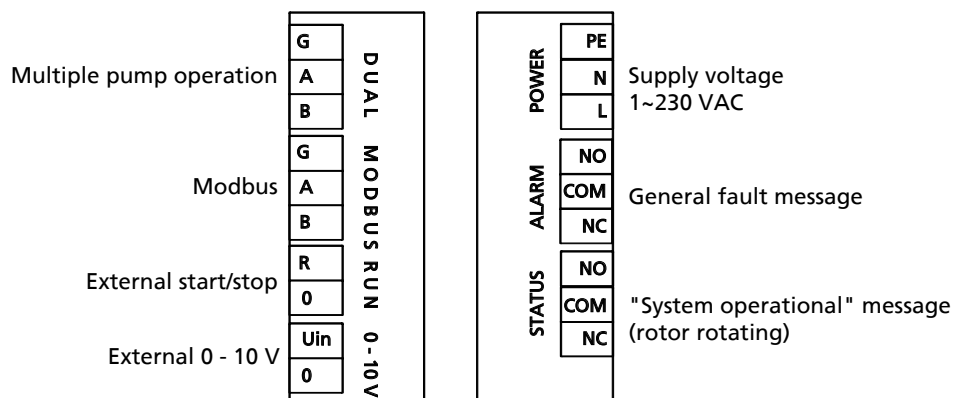


| Part No. | Description | Part No. | Description   |
|----------|-------------|----------|---------------|
| 01-44    | Rotor       | 101      | Volute casing |
| 81-59    | Stator      |          |               |

### 9.2 Wiring diagrams



**Fig. 33:** Wiring diagram for ES MAXI pumps 25, 30, 32, 40-60/-70/-80/-90, 50-40/-60/-80/-90, 65-60



**Fig. 34:** Wiring diagram for ES MAXI pumps 40-120/-180, 50-100/-120/-150/-180

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