

VEH Series

Immersed electrode humidifiers for air handling units



⚠ WARNING

Make sure you read and fully understand the user manual before using this device.

Non-observance of these instructions will result in death or serious injury.



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IMPORTANT INFORMATION

Liability and residual risks

ELSTEAM assumes no liability for any damage caused by the following (by way of example; this is not an exhaustive list):

- Installation/use for purposes other than those specified and, in particular, not adhering to the safety provisions set out by current regulations in the country in which the product is installed and/or contained in this manual;
- Use in appliances that do not guarantee sufficient protection against electric shocks, water and dust within the installation conditions created;
- Use in appliances that allow access to hazardous parts without the use of a keyed or tooled locking mechanism when accessing the instrument;
- Tampering and/or modifying the product;
- Installation/use in appliances which do not comply with current regulations in the country in which the product is installed.

The customer/manufacturer is responsible for ensuring their machine complies with these regulations.

ELSTEAM's responsibility is limited to the correct and professional use of the product in accordance with regulations and the instructions contained in this manual and other product support documents.

To comply with EMC standards, observe all the electrical connection instructions. As it depends on the wiring configuration as well as the load and the installation type, compliance must be verified for the final machine as specified by the relevant product standard.

Disclaimer

This document is the exclusive property of ELSTEAM. It contains a general description and/or a description of the technical specifications for the services offered by the products listed herein. This document should not be used to determine the suitability or reliability of these products in relation to specific user applications. Each user or integration specialist should conduct their own complete and appropriate risk analysis, in addition to carrying out a product evaluation and test in relation to its specific application or use. Users can send us comments and suggestions on how to improve or correct this publication.

Neither ELSTEAM nor any of its associates or subsidiaries shall be held responsible or liable for improper use of the information contained herein.

ELSTEAM has a policy of continuous development; therefore, ELSTEAM reserves the right to make changes and improvements to any product described in this document without prior notice.

The images in this document and other documentation supplied with the product are provided for illustrative purposes only and may differ from the product itself.

The technical data in this manual is subject to change without prior notice.

Terms and Conditions of use

Permitted use

The device should only be used for humidification inside the air treatment unit (AHU).

The device must be installed and used in accordance with the instructions provided and, in particular, hazardous live parts or highly pressurised water must not be accessible under normal conditions.

The device must be suitably protected from water and dust with regard to its application and must also only be accessible with the aid of a tool.

Only qualified personnel may install the product or perform technical support procedures on it.

The customer must only use the product as described in the documentation relating to that product.

Prohibited use

Any use other than those described in the "**Permitted use**" section and in the product support documentation is prohibited.

Disposal



The device must be disposed of in accordance with local regulations regarding the collection of electrical and electronic appliances.

Consider the environment



The company works towards protecting the environment, while taking account of customer requirements, technological innovations in terms of materials and the expectations of the community to which we belong. ELSTEAM places great importance on respecting the environment, encouraging all associates to become involved with company values and guaranteeing safe, healthy and functional working conditions and workplaces.

Please consider the environment before printing this document.

IMPORTANT SAFETY INFORMATION

Please read this document carefully before installation; study all the warnings before using the device. Only use the device in accordance with the methods described in this document. The following safety messages may be repeated several times in the document, to provide information regarding potential hazards or to attract attention to information which may be useful in explaining or clarifying a procedure.

SYMBOLS



This symbol is used to indicate a risk of electric shock.
It is a safety indication and as such, should be observed to avoid potential accidents or fatalities.



This symbol is used to indicate a risk of serious personal injury.
It is a safety indication and as such, should be observed to avoid potential accidents or fatalities.



This symbol is used to indicate a risk of serious personal injury/burns.
It is a safety indication and as such, should be observed to avoid potential accidents or fatalities.

SAFETY MESSAGES

DANGER

DANGER indicates a situation of imminent danger which, if not avoided, **will lead to death or serious injury**.

WARNING

WARNING indicates a situation of imminent danger which, if not avoided, **may lead to death or serious injury**.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **could cause minor or moderate injury**.

NOTICE

NOTICE indicates a situation not related to physical injuries but which, if not avoided, **could damage the equipment**.

NOTE: The maintenance, repair, installation and use of the equipment must only be entrusted to qualified personnel.

QUALIFIED PERSONNEL

Only suitably trained and experienced personnel capable of understanding the content of this manual and all documentation regarding the product are authorised to work on and with this equipment. Furthermore, the personnel must have completed courses in safety and must be able to recognise and prevent the implied dangers. The personnel must have suitable training, knowledge and experience at a technical level, and be capable of anticipating and detecting potential risks caused by using the product, as well as changing the settings and modifying the mechanical, electric and electronic equipment for the entire system in which the product is used. All personnel working on and with the product must be entirely familiar with the relevant standards and directives, as well as safety regulations.

SAFETY INFORMATION RELATING TO THE PRODUCT

VEH series humidifiers are defined as **"NOT ACCESSIBLE TO THE PUBLIC"**.

Before carrying out any work on the equipment, read these instructions carefully, making sure you understand everything.

DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

- Only use electrically insulated measuring devices and equipment.
- Do not install the equipment while the power supply is connected.
- Cut off the power supply to all equipment, including any connected devices, before removing any covers or hatches, or before installing/uninstalling accessories, hardware, cables or wires.
- Provide safety interlocks (isolators) of a suitable size between the power supply and the humidifier, with a contact opening distance of at least 3 mm for each pole.
- Always use a properly calibrated Voltmeter to make sure the system is powered off.
- The maintenance, repair, installation and use of the equipment must only be entrusted to qualified personnel.
- Do not touch the unshielded components or the terminals while they are live.
- Do not open, disassemble, repair or modify the product.
- Do not expose the equipment to liquids or chemicals.
- Make sure there is an effective earth connection.
- Before applying voltage to the equipment:
 - Make sure all protective elements, such as covers, hatches and grilles, are fitted and/or closed using a tool (e.g. a spanner).
- Check all wiring connections.

DANGER

RISK OF ELECTRIC SHOCK AND FIRE

- Do not use the device with loads greater than those indicated in the technical data section.
- Do not exceed the temperature and humidity ranges indicated in the technical data section.
- Provide safety interlocks (isolators) of a suitable size between the power supply and the humidifier.
- Only use cables with a suitable cross-section as indicated in the section "Wiring best practices".

WARNING

MALFUNCTIONING OF THE EQUIPMENT

- Perform the wiring carefully, in compliance with electromagnetic compatibility and safety requirements.
- Carry out a full start-up test.
- Make sure the wiring is correct for the end application.
- Minimise the length of the connections as much as possible, to avoid winding the cables around electrically connected parts.
- Before applying the power supply, check all the wiring connections.
- Do not connect wires to unused terminals and/or terminals marked with the text "No connection" ("N.C").

The humidifier produces steam at 100 °C (212 °F) and discharges water at a temperature of approximately 98 °C (208.4 °F).

WARNING

HOT WATER VAPOUR

Do not touch the equipment while it is running.

WARNING

RISK OF BURNS

Before carrying out any work on the system, place the equipment out of service and wait for the machine to cool down (< 50 °C (122 °F)).

WARNING

REGULATORY INCOMPATIBILITY

Make sure all the equipment used and systems designed conform to current local, regional and national standards.

1. INTRODUCTION

1.1 Description

The **VEH** series is ELSTEAM's solution for immersed electrode humidification systems dedicated to installations within air handling units (AHUs).

The **VEH** series consists of 2 elements:

- Electric panel;
- Hydraulic unit.

VEH series humidifiers generate humidity (steam) by means of a current passing between 4 or more electrodes immersed in drinking water and bringing it to boiling point.

The steam is controlled by adjusting the intensity of the current transferred to the water by the immersed electrodes, which indirectly controls the boiling of the water.

Steam is produced and pumped directly into an AHU (air handling unit) or into an air conditioning duct by positioning the hydraulic module inside the unit.

VEH series humidifiers do not require a technical area if installed outdoors, as the hydraulic unit is installed inside the AHU; plus, it is not affected by condensation in the steam supply pipe, as it introduces steam from the hydraulic unit directly into the AHU, also overcoming differences in pressure. The hydraulic unit is not subject to drops in energy efficiency caused by condensation and low outdoor temperatures.

To prevent the ice from forming during winter, use heating cables for the water supply and discharge pipes.

NOTE: **VEH** series humidifiers are defined as "**NOT ACCESSIBLE TO THE PUBLIC**".

1.2 Applications

The **VEH** series is mainly used in applications requiring sterile steam, including:

- Hospital settings;
- Medical settings;
- Commercial settings (offices, industrial premises, etc.);
- Industrial processes which use AHUs.

1.3 Main features

- Isothermal humidifier;
- Sterile steam (steam with a temperature of approximately 100 °C (212 °F));
- Automatic removal of limescale from the electrodes and boiler (**reusable**);
- Broad range of steam production (10...100 kg/h);
- Integrated electronic control via probe or humidistat (with external ON/OFF signal, or proportional mode from external signal 0...10 V / 4...20 mA or internal configuration);
- Stainless steel water drainage tray (on request);
- Stainless steel condensate collection tank for AHUs (on request).

1.3.1 Electronic control features

- Proportional (logarithmic) microprocessor control of steam production;
 - High efficiency;
 - Rapid response to changes in requirements;
 - Precise production control.
- Automatic electrode and boiler cleaning system:
 - Reduced maintenance frequency;
 - High performance levels;
 - Longer electrode and boiler life.
- Automatic hydraulic unit discharge:
 - Removal of limescale residues deposited in the manifold sleeve facilitated by the action of the drainage pump, which can even eliminate medium-sized clusters and grind them down;
 - Longer boiler life.
- Operating status signalling via a user interface with a 2-line, 16-character display:
 - Continuous monitoring of the operating status;
 - Automatic analysis of malfunctions.

1.4 Accessories

The following accessories for use with **VEH** series immersed electrode humidifiers are available:

| P/n | Description |
|----------------------|---|
| VEHK07 | VEH hydraulic unit removal flange kit |
| VEHK08 | D40 drainage unit kit |
| VEHK16 | 5 m power cable kit for running from electric panel to hydraulic module VEH10-20-30-40 |
| VEHK17 | 5 m power cable kit for running from electric panel to hydraulic module VEH60-80-100 |
| VEHK26 | Hydraulic connections feedthrough kit |
| VEHK30 | Filling/discharge unit kit external to AHU |
| 0031000048 | 3/4"G Female water inlet hose |
| VI | Water drainage tray |
| 0016020018 | Condensate collection tank 490x690x70 AISI304 |
| 0016020019 | Condensate collection tank 490x950x70 AISI304 |
| 0016020020 | Condensate collection tank 490x1350x70 AISI304 |
| EVHP523 | Humidity probe 4...20 mA |
| EVTPNW630F200 | NTC temperature probe, IP68 |
| EV3411M7 | Universal controller, 1 output, 230 Vac power supply |

2. TECHNICAL DATA

2.1 Technical specifications

| Description | MU | VEH10XS | VEH20•• | VEH30• | VEH40• | VEH60•• | VEH80L | VEH100XL |
|---------------------------------------|----------|--|---|--------|--------|---------|--------|----------|
| Steam production | | | | | | | | |
| Production capacity | kg/h | 10 | 20 | 30 | 40 | 60 | 80 | 100 |
| Pressure limits | Pa/bar | There are no pressure limits (*) | | | | | | |
| Electrical properties | | | | | | | | |
| Power absorbed | kW | 7.5 | 15 | 22.5 | 30 | 45 | 60 | 75 |
| Power supply | V, Hz | 400 Vac, 50/60 | | | | | | |
| Phases | Ph | 3 | | | | | | |
| Absorption per phase | A | 11 | 22 | 32 | 43 | 65 | 87 | 108 |
| Hydraulic properties | | | | | | | | |
| Supply water quality | --- | See section "5.2.1 WATER SPECIFICATIONS" ON PAGE 17 | | | | | | |
| Supply water conductivity | µS*cm | 70...1250 | | | | | | |
| Supply water hardness | °f | 5...50 | | | | | | |
| Minimum supply flow rate | l/h | 300 | | | | | | |
| Supply water pressure | MPa/bar | 0.02...1/0.2...10 | | | | | | |
| Supply water connection | --- | M 3/4" GAS | | | | | | |
| Water drain outer diameter | mm (in.) | 40 (1.57) | | | | | | |
| General specifications | | | | | | | | |
| Dimensions | mm (in.) | See section "4.1 DIMENSIONS" ON PAGE 12 | | | | | | |
| Weight (hydraulic module) | kg | 15 | 18 | 20 | 24 | 26 | 31 | 33 |
| Electric panel IP protection degree | --- | IP54 | | | | | | |
| Hydraulic module IP protection degree | --- | IPX0 | | | | | | |
| Maximum installation altitude | m (ft.) | ≤2000 (6561.6) | | | | | | |
| Regulation | | | | | | | | |
| Control type | --- | Integrated or remote | | | | | | |
| Control signal | --- | Integrated: | 4...20 mA | | | | | |
| | | Remote: | Proportional (0...10 V), ON-OFF or (0...10 V / 4...20 mA) | | | | | |
| Compliance | | | | | | | | |
| CE | --- | Yes, with self-certification | | | | | | |

NOTE: The • symbol indicates that the data applies to every p/n; for further information please contact the ELSTEAM sales office.

(*): Steam production occurs inside the AHU and therefore under equivalent pressure conditions.

3. RECEIVING THE PRODUCT

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

- Droppages and shocks can damage the humidifier beyond repair.
- Tampering with or removing the identification stickers invalidates the warranty.

3.1 Checking the packaging

- Make sure the packaging is intact (one package for each electric panel and one dedicated to the hydraulic unit);
- Make sure the humidifier is intact (both the electric panel and the hydraulic unit) upon delivery and inform the courier immediately, in writing, of any problems caused by careless or improper transportation (accept the package conditionally).

3.1.1 Opening the packaging

- Take the packages to the humidifier installation site;
- Open the cardboard boxes, removing the corner protectors;
- Take the electric panel and the hydraulic unit out of their packaging.

3.1.2 Checking the packaging contents

The product package contains:

- **VEH** series humidifier, consisting of
 - Hydraulic unit;
 - Electric panel;
- Operating and maintenance manual;
- Water inlet connection pipe for use between the main supply and the solenoid valve at the humidifier inlet;
- Cables connecting the hydraulic unit and electric panel;
- Hydraulic unit discharge;
- Key for opening the electric panel.

4. DIMENSIONS AND MECHANICAL ASSEMBLY

4.1 Dimensions

4.1.1 Hydraulic unit

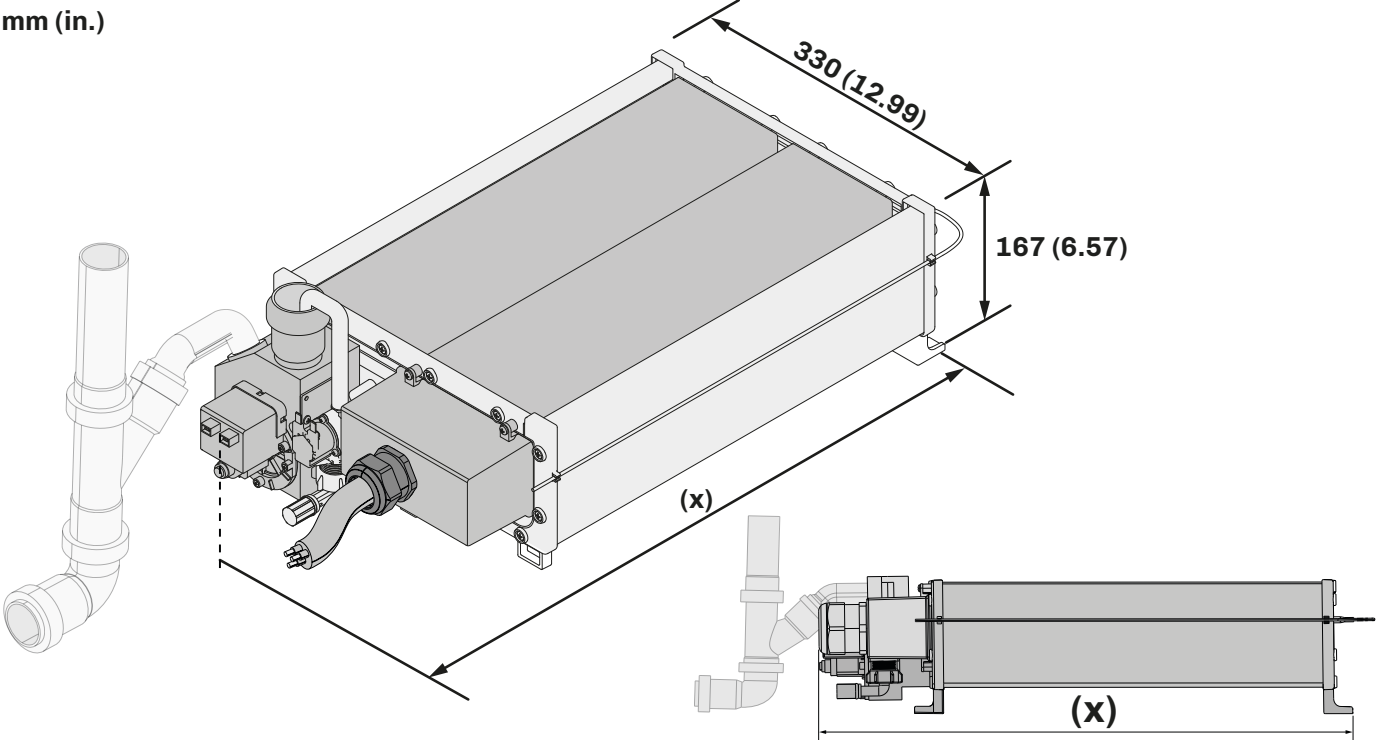


Fig. 1. Hydraulic unit dimensions

| Dimension (X) for [mm (ft.)] models | VEH10XS | VEH20S | VEH20XS | VEH30M | VEH30S | VEH40L | VEH40S | VEH60XL | VEH60M | VEH80L | VEH100XL |
|---|---------------|---------------|---------------|---------------|---------------|----------------|---------------|----------------|---------------|----------------|----------------|
| 4 electrodes | 635 (2.08) | 785 (2.57) | --- | 985 (3.23) | --- | 1185 (3.89) | --- | 1385 (4.54) | --- | --- | --- |
| 7 electrodes | --- | --- | 635 (2.08) | --- | 785 (2.57) | --- | 785 (2.57) | --- | 985 (3.23) | 1185 (3.89) | 1385 (4.54) |

4.1.2 Electric panel

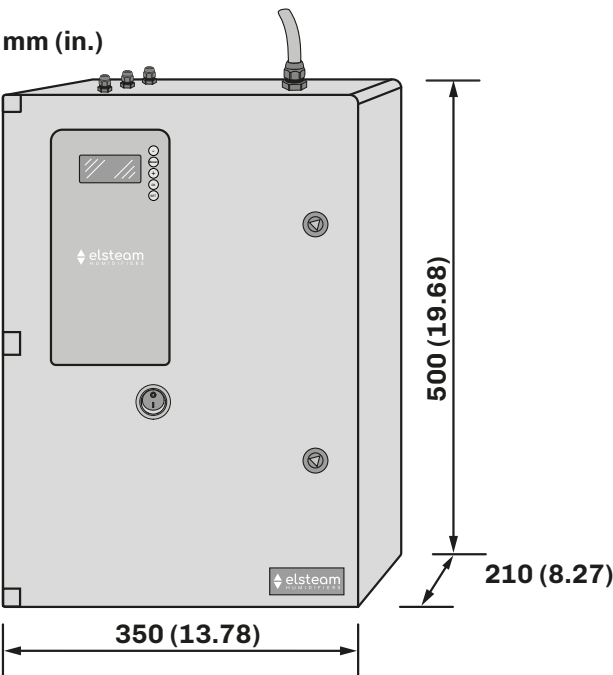


Fig. 2. Electric panel dimensions

4.2 Installation

4.2.1 Minimum installation dimensions

Electric panel

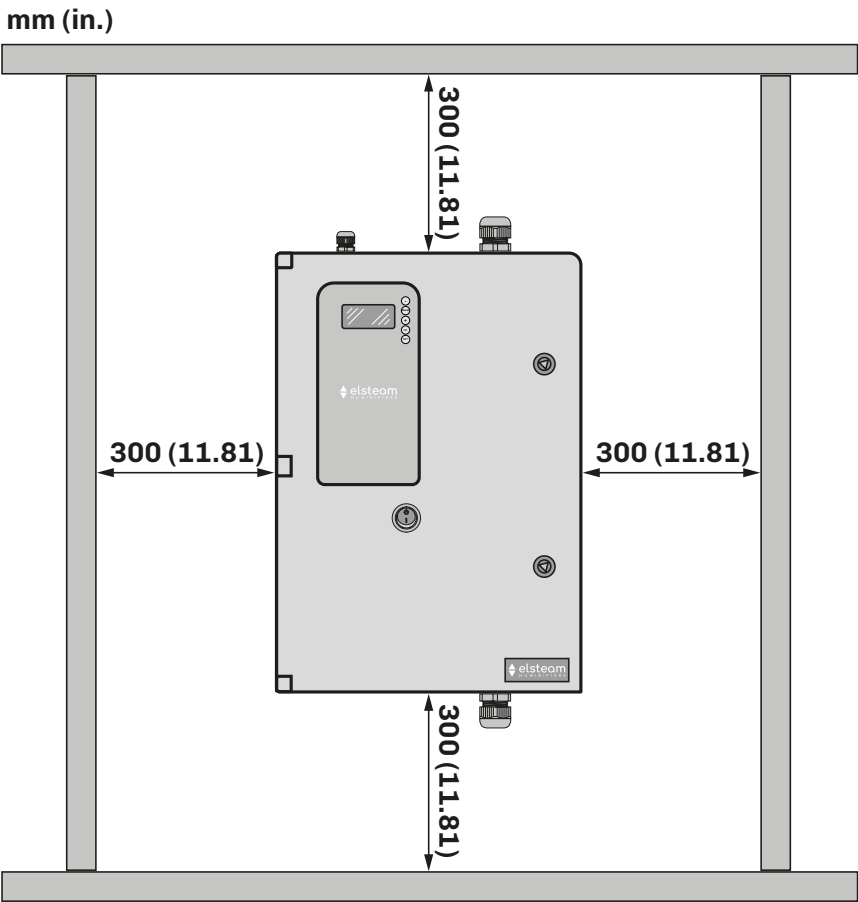


Fig. 3. Minimum installation distances

Hydraulic unit

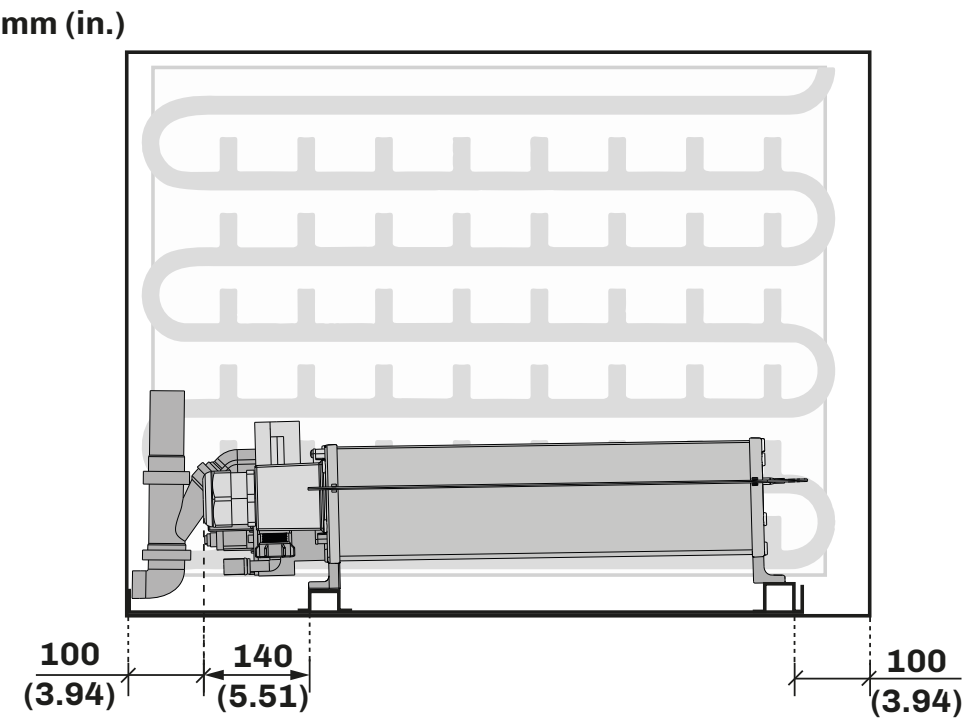


Fig. 4. Minimum installation distances

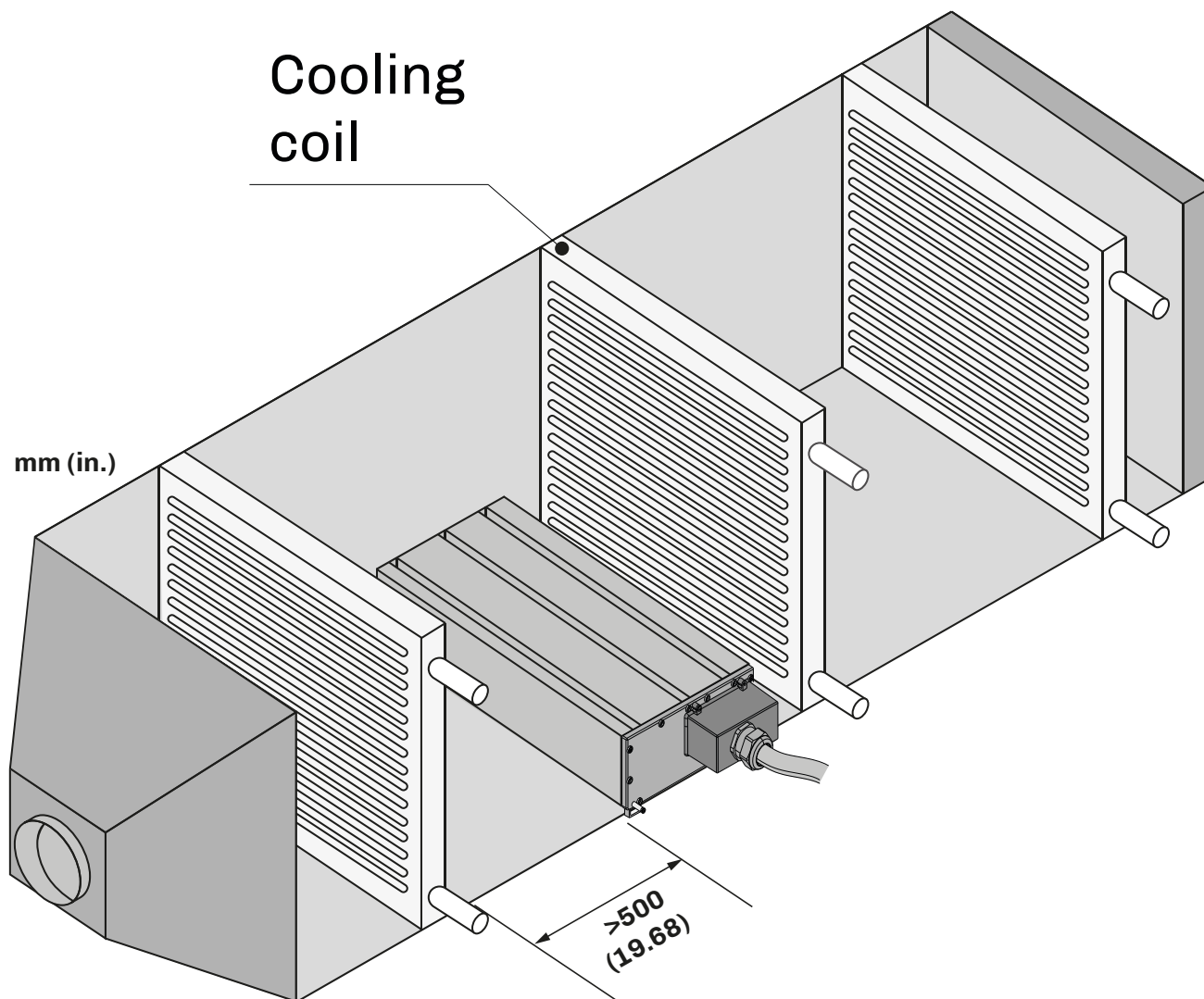


Fig. 5. Minimum installation distances - from coil

4.3 Installation

⚠ ⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

Make sure there is an effective earth connection.

NOTICE

FAULTY INSTALLATION

When installing the electric panel, only use the hooks provided.

4.3.1 Electric panel installation instructions

Electric panel

- Make 4 holes in the wall;
- Insert the hooks into the rear of the electric panel (in the pre-prepared holes) and secure them using the screws provided;
- Secure the electric panel to the wall.

NOTICE

FAULTY INSTALLATION

- The electric panel must be installed in accordance with best practices.
- Make sure the electric panel is properly secured to the wall on which it is installed.

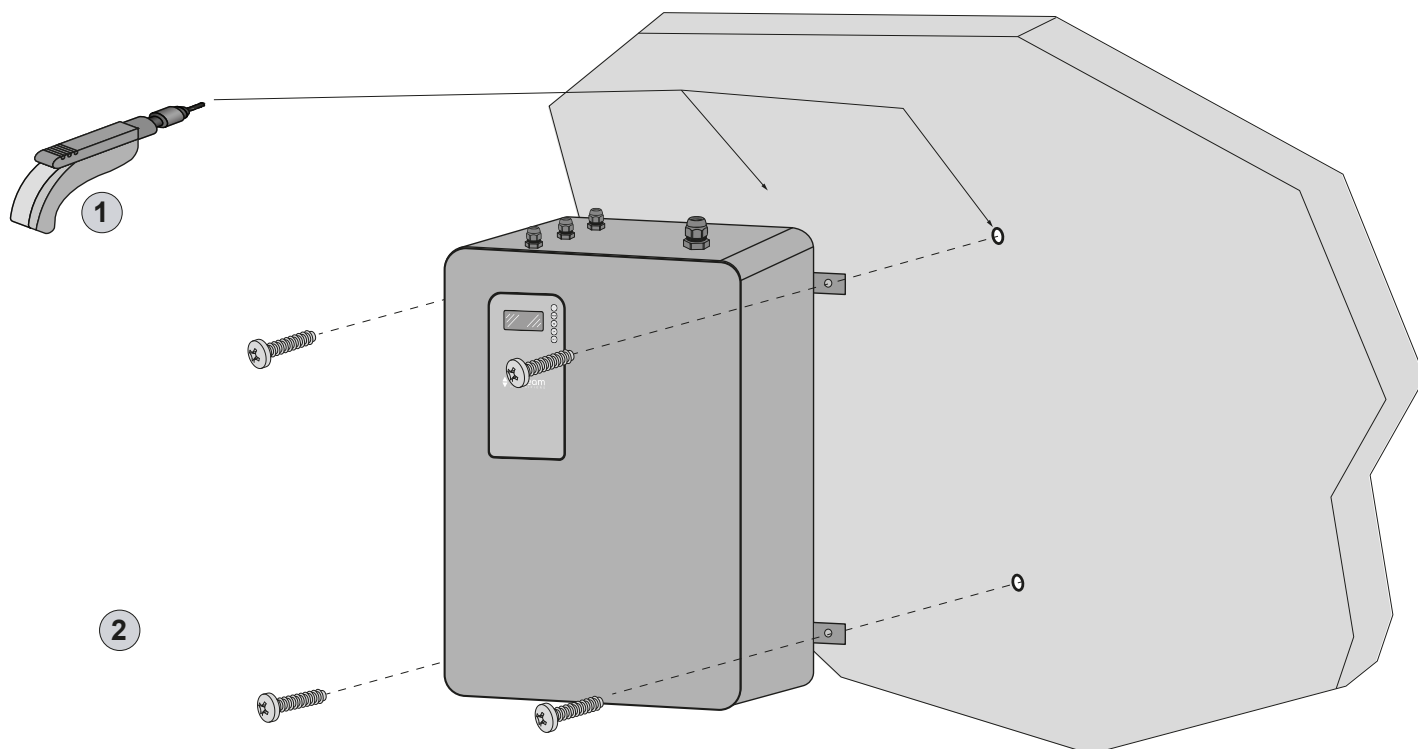


Fig. 6. Electric panel installation

Hydraulic unit

- Place the hydraulic unit inside the condensate tank inside the AHU;
- Connect the inlet solenoid valve to the pipe provided;
- Connect the discharge unit using special water drainage pipes (Ø 40 mm (1.57 in.));
- Restore the connection between the hydraulic unit and the electric panel, keeping the power cables separate from the other service cables.

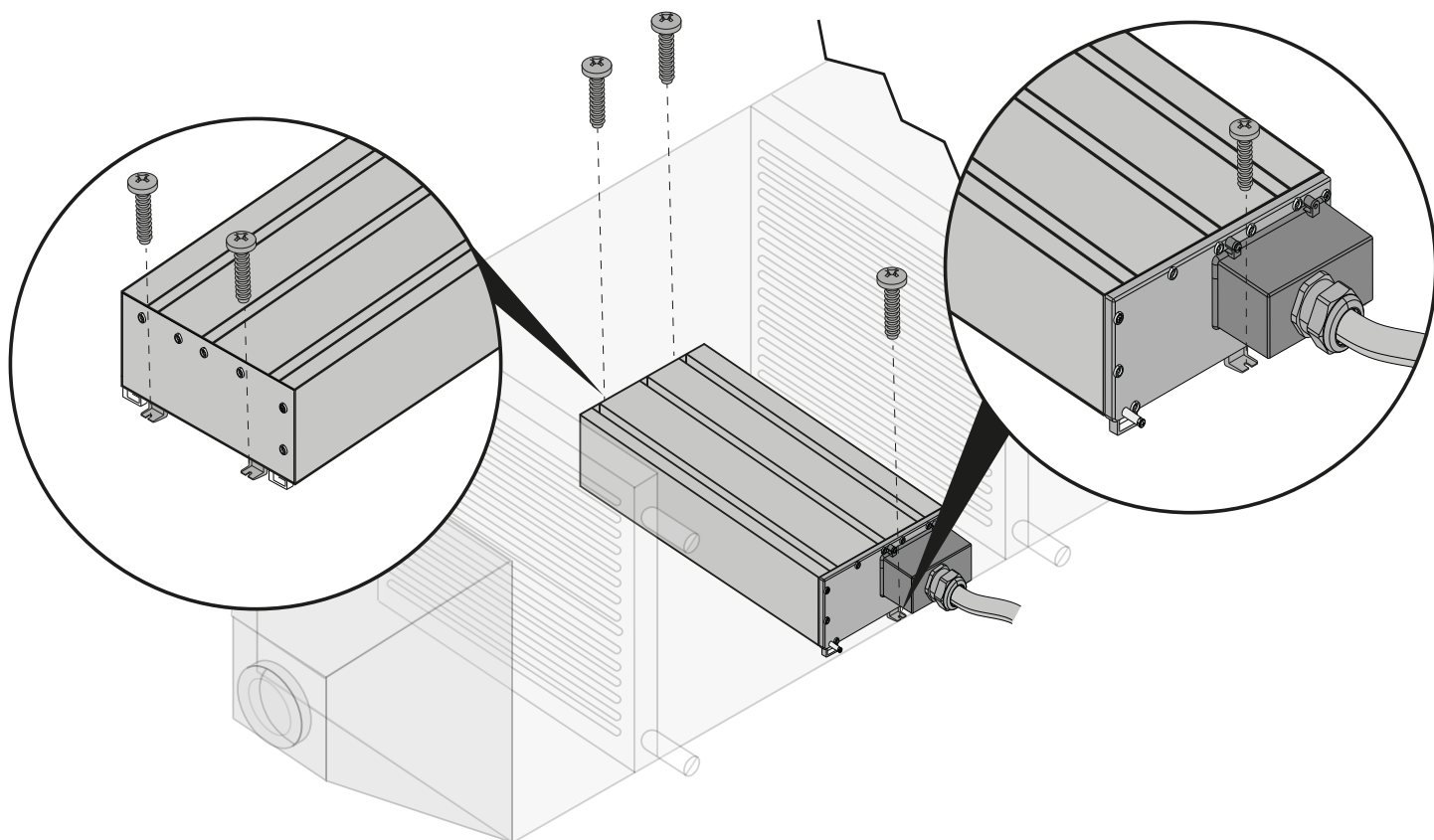


Fig. 7. Hydraulic unit installation

5. INSTALLATION

VEH series humidifiers are defined as "NOT ACCESSIBLE TO THE PUBLIC".

5.1 Hydraulic unit structure

5.1.1 Top

- Steam outlet;

5.1.2 Front

- Water drain for connection to waste water drainage pipes (Ø 40 mm (1.57 in.));
- Tear resistant cable gland for power supply cables;
- 3/4" GAS male water supply fitting.
- Electrical connections (Fastons) for filling solenoid valve and electric drain pump.

5.1.3 Rear

- Maximum level sensor connection.

5.2 Hydraulic installation

For correct hydraulic installation, the following should be provided outside the AHU and in the immediate surroundings of the hydraulic unit installation site:

- A shut-off tap;
- A filter supplementing the one already present inside the solenoid valve;
- A pressure reducer (if the mains pressure exceeds 1 MPa (10 bar)).

If using metal pipes, make sure they are properly earthed.

Do not use pre-existing system pipework or used materials. Only use the materials supplied with the product.

NOTE: if using a pressure reducer, make sure it is effective and does not cause drastic pressure drops when the mains pressure is very low.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

- The water supply must have a minimum pressure of 0.02 MPa (0.2 bar).
- Connect the solenoid valve to the mains using the hose supplied in order to reduce water hammer in the water supply to the humidifier.
- During installation, take care not to damage the plastic thread on the solenoid valve.
- Hydraulic connection should offer access to the mechanical filter in the inlet solenoid valve to allow it to be cleaned.
- Connect the drainage circuit using exclusively the D40 mm (1.57 in.) pipes provided.
- If the AHU is exposed to atmospheric agents, fit heating cables to the water supply and discharge pipes.

5.2.1 Water specifications

- Water pressure between 0.02...1 MPa (0.2...10 bar) inclusive;
- Temperature between 1...50 °C (33.8...122 °F) inclusive;
- Conductivity between 75...1250 µS/cm inclusive;
- Maximum water hardness between 5...50 °f.

NOTE: higher water hardness or a higher level of organic matter does not preclude proper equipment operation, nevertheless these factors mean that more frequent maintenance will be required.

What should you do?

- Let the water flow through the drain for a few hours before making the final connection.
- Check the retention status of the hydraulic circuit regularly to prevent faults and consequent water leakage into the room.
- Make sure the hydraulic unit is always installed within a condensate collection tank with drainage.

What should you **NOT** do?

- Soften the water. If the water hardness is over 50 °f or if the hardness level requires frequent maintenance, use demineralised water mixed with drinking water in a percentage that ensures minimum conductivity of 200 µS/cm and hardness of at least 10 °f;

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

- Do not use softened water.
- Once the humidifier has been installed, let the remaining water in the pipes flow out to prevent the filter from becoming clogged.
- Make sure the humidifier parts are perfectly intact.
- If any of the humidifier parts are not intact, do not proceed with installation.

5.3 Water drainage system

As a humidifier with automatic boiler cleaning, the water drain must anticipate a water outflow of at least 1 l/s.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT
Size the drain pipe correctly in order to prevent blockages and clogging during automatic cleaning.

NOTE: the drain pipes are not supplied (except for the first section d40 x1000 mm).
NOTE: a fixed drain connection must be used.

5.3.1 Connection specifications

- Minimum diameter 40 mm (1.57 in.);
- Maximum bend radius 300 mm (0.98 ft.);
- Minimum average incline of 45° and without traps (outside the AHU, inside refer to the accessories kits).

If these specifications are not adhered to in the installation, install a water and limescale collection tank at the drain outlet point outside the AHU (p/n **VI**) (contact the Elsteam sales office for further information).

Discharge tank features

- Discharge (drainage) tank with trap for limescale collection.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT
If the water hardness is over 40 °f, carry out maintenance/manual cleaning of the tank at least twice a year.

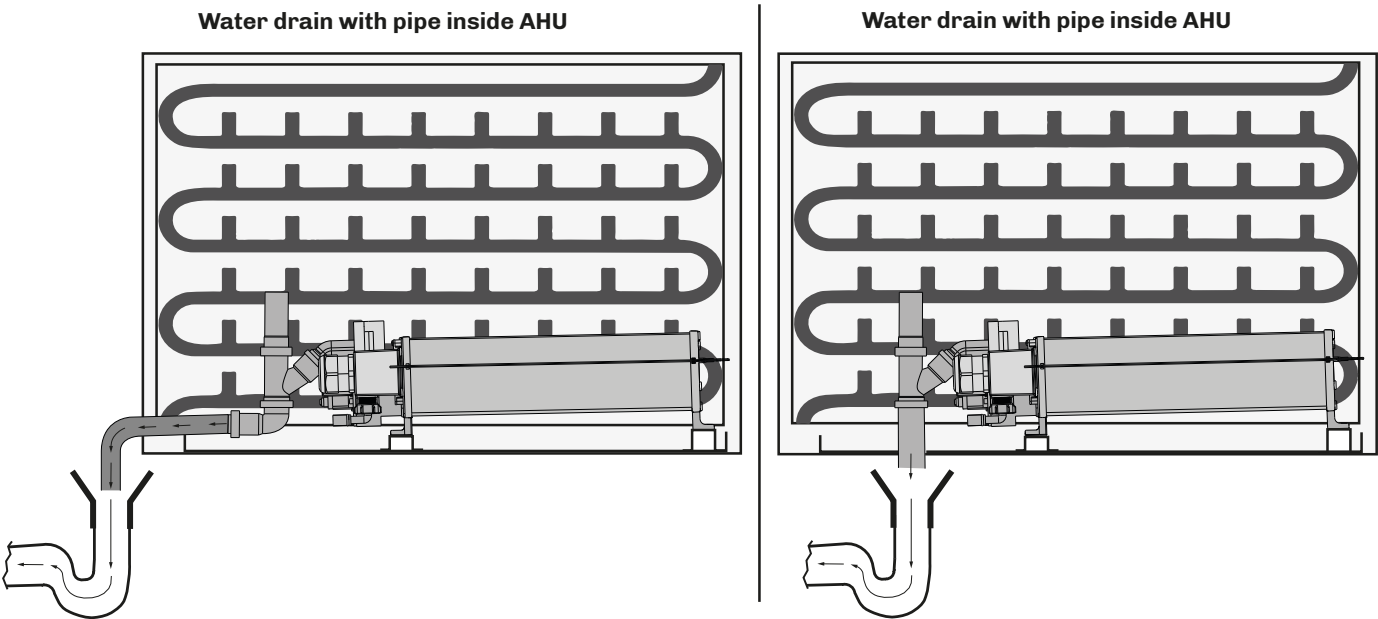


Fig. 8. Drainage tank features

If the water hardness reflects the optimal specifications indicated in sub-section "5.2.1 WATER SPECIFICATIONS" ON PAGE 17, the tank will only need cleaning once a year.
If the drainage network - or the drainage tank - is made using electrically conductive material, safety standards require that it is connected to the electrical earthing system.

⚡ ⚠ DANGER

RISK OF ELECTRIC SHOCK
If the drainage tank is made using electrically conductive material, the tank or the drainage network must be earthed.

Drained water may reach a temperature of 98 °C (208.4 °F) or higher.

⚠ ⚡ WARNING

RISK OF BURNS

- Before starting to drain the water, wear all necessary personal protective equipment (PPE).
- Do not touch the equipment when draining the water.

5.4 Steam distribution in the AHU

WARNING

RISK OF BURNS

- The hydraulic unit must be installed so that it cannot be accessed by unauthorised persons.
- The inside of the air treatment unit (where the hydraulic unit is installed) must only be accessed by qualified personnel using a tool (e.g. a spanner).

WARNING

HOT WATER VAPOUR

Do not touch the equipment while it is running.

WARNING

MALFUNCTIONING OF THE EQUIPMENT

- Install the equipment in a position which ensures the minimum distances from all adjacent structures and equipment as indicated in this document.
- Install all equipment in compliance with the technical specifications indicated in the relevant documentation.

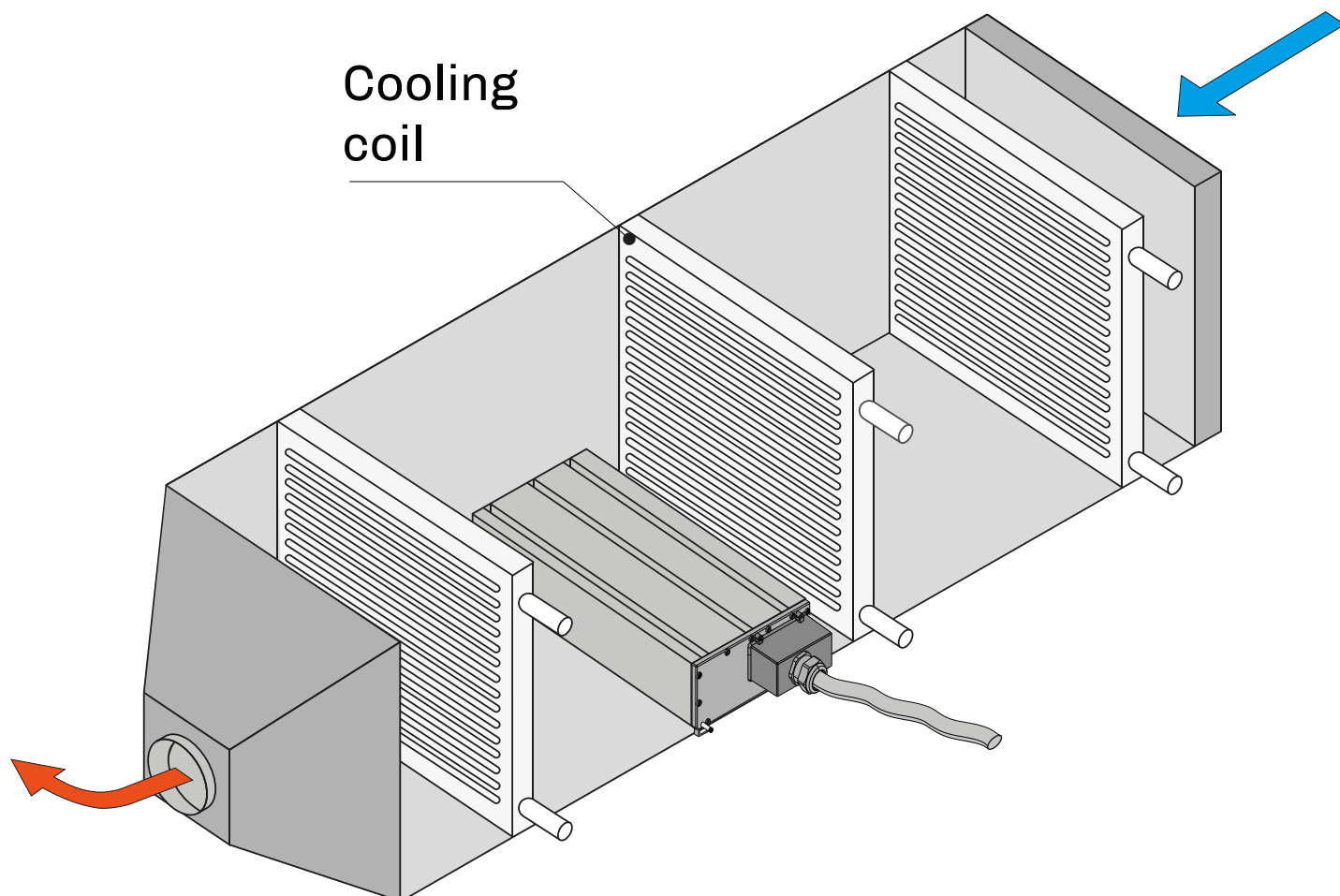


Fig. 9. Positioning the hydraulic unit in the AHU

NOTE: in ambient temperature conditions which may lead to the formation of ice, it is wise to take all necessary precautions to prevent the supply water and the drain water from freezing and causing the humidifier to malfunction.

6. ELECTRICAL CONNECTIONS

6.1 Before you start

Read this manual carefully before installing the equipment.

In particular, the safety instructions, electrical requirements and current regulations for the machine or the process in which this device is involved must be observed.

The use and application of the information contained herein requires experience in the design and installation of humidification systems. Only the user, integrator or manufacturer of the machine can be familiar with all the conditions and factors which arise during installation and configuration, operation and maintenance of the machine or the process, and as such can identify the relevant automation equipment and the corresponding interlocks and safety systems which can be used effectively and appropriately. When selecting automation and control equipment and other connected equipment and software, for a particular application, you must consider all applicable local, regional and national standards and/or regulations.

DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

- Only use electrically insulated measuring devices and equipment.
- Do not install the equipment while the power supply is connected.
- Cut off the power supply to all equipment, including any connected devices, before removing any covers or hatches, or before installing/uninstalling accessories, hardware, cables or wires.
- Provide safety interlocks (isolators) of a suitable size between the power supply and the humidifier, with a contact opening distance of at least 3 mm for each pole.
- Always use a properly calibrated Voltmeter to make sure the system is powered off.
- The maintenance, repair, installation and use of the equipment must only be entrusted to qualified personnel.
- Do not touch the unshielded components or the terminals while they are live.
- Do not open, disassemble, repair or modify the product.
- Do not expose the equipment to liquids or chemicals.
- Make sure there is an effective earth connection.
- Before applying voltage to the equipment:
 - Make sure all protective elements, such as covers, hatches and grilles, are fitted and/or closed using a tool (e.g. a spanner).
 - Check all wiring connections.

WARNING

REGULATORY INCOMPATIBILITY

Make sure all the equipment used and systems designed conform to current local, regional and national standards.

6.2 Connection best practice

6.2.1 Wiring best practices

DANGER

RISK OF ELECTRIC SHOCK AND FIRE

- Do not use the device with loads greater than those indicated in the technical data section.
- Do not exceed the temperature and humidity ranges indicated in the technical data section.
- Provide safety interlocks (isolators) of a suitable size between the power supply and the humidifier.
- Only use cables with a suitable cross-section as indicated in the section "Wiring best practices".

When wiring the humidifiers, observe the following instructions:

- Make sure the operating environment and conditions fall within the specified values.
- Use cables with the correct diameter, suited to the voltage and current requirements.
- Use double-insulated cables suitable for outdoor use (minimum requirement: H05RN-F) which also include an earth wire.

DANGER

LOOSE WIRING CAUSES ELECTRIC SHOCKS AND OVERHEATING

Tighten the connections in compliance with the technical specifications relating to tightening torques.

WARNING

MALFUNCTIONING OF THE EQUIPMENT

- Perform the wiring carefully, in compliance with electromagnetic compatibility and safety requirements.
- Carry out a full start-up test.
- Make sure the wiring is correct for the end application.
- Minimise the length of the connections as much as possible, to avoid winding the cables around electrically connected parts.
- Before applying the power supply, check all the wiring connections.
- Do not connect cables to unused terminals and/or terminals marked with the text "No connection" (N.C.).

⚠ WARNING

REGULATORY INCOMPATIBILITY

Make sure all the equipment used and systems designed conform to current local, regional and national standards.

Suitable wiring for the power supply

Step 17.8 mm (0.70 in.)

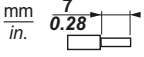



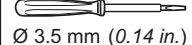

| | | | | | | | |
|--|---|---|---|---|---|--------|-------|
|  |  |  |  |  |  | N•m | 2.5 |
| | | | | Ø 3.5 mm (0.14 in.) | | lb-in. | 22.12 |
| mm ² | 4 | 4 | 4 | | | | |
| AWG | 10 | 10 | 10 | | | | |
| no. of conductors | 3+G | | | | | | |

Fig. 10. Suitable wiring for the power supply - **VEH10**

Step 26.5 mm (1.04 in.)

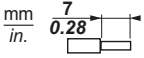



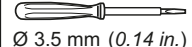

| | | | | | | | |
|--|---|---|---|---|---|--------|-------|
|  |  |  |  |  |  | N•m | 3 |
| | | | | Ø 3.5 mm (0.14 in.) | | lb-in. | 26.55 |
| mm ² | 10 | 10 | 10 | | | | |
| AWG | 7 | 7 | 7 | | | | |
| no. of conductors | 3+G | | | | | | |

Fig. 11. Suitable wiring for the power supply - **VEH20**

Step 26.5 mm (1.04 in.)

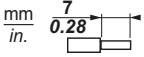



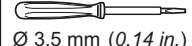

| | | | | | | | |
|--|---|---|---|---|---|--------|-------|
|  |  |  |  |  |  | N•m | 3 |
| | | | | Ø 3.5 mm (0.14 in.) | | lb-in. | 26.55 |
| mm ² | 10 | 10 | 10 | | | | |
| AWG | 7 | 7 | 7 | | | | |
| no. of conductors | 3+G | | | | | | |

Fig. 12. Suitable wiring for the power supply - **VEH30**

Step 26.5 mm (1.04 in.)

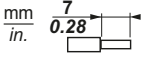



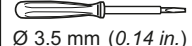

| | | | | | | | |
|--|---|---|---|---|---|--------|-------|
|  |  |  |  |  |  | N•m | 3 |
| | | | | Ø 3.5 mm (0.14 in.) | | lb-in. | 26.55 |
| mm ² | 16 | 16 | 16 | | | | |
| AWG | 5 | 5 | 5 | | | | |
| no. of conductors | 3+G | | | | | | |

Fig. 13. Suitable wiring for the power supply - **VEH40**

Step 35.5 mm (1.40 in.)

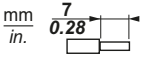



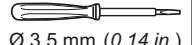

| | | | | | | | |
|--|---|---|---|---|---|--------|-------|
|  |  |  |  |  |  | N•m | 4 |
| | | | | Ø 3.5 mm (0.14 in.) | | lb-in. | 35.40 |
| mm ² | 16 | 16 | 16 | | | | |
| AWG | 5 | 5 | 5 | | | | |
| no. of conductors | 3+G | | | | | | |

Fig. 14. Suitable wiring for the power supply - **VEH60**

Step 35.5 mm (1.40 in.)

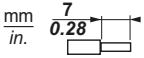



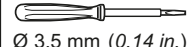

| | | | | | | | |
|--|---|---|---|---|---|--------|-------|
|  |  |  |  |  |  | N•m | 4 |
| | | | | Ø 3.5 mm (0.14 in.) | | lb-in. | 35.40 |
| mm ² | 25 | 25 | 25 | | | | |
| AWG | 7 | 7 | 7 | | | | |
| no. of conductors | 3+G | | | | | | |

Fig. 15. Suitable wiring for the power supply - **VEH80**

Step 35.5 mm (1.40 in.)

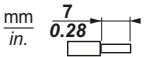



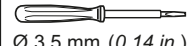

| | | | | | | | |
|--|---|---|---|---|---|--------|-------|
|  |  |  |  |  |  | N•m | 4 |
| | | | | Ø 3.5 mm (0.14 in.) | | lb-in. | 35.40 |
| mm ² | 25 | 25 | 25 | | | | |
| AWG | 3 | 3 | 3 | | | | |
| no. of conductors | 3+G | | | | | | |

Fig. 16. Suitable wiring for the power supply - **VEH100**

6.2.2 Cable glands and cable routing

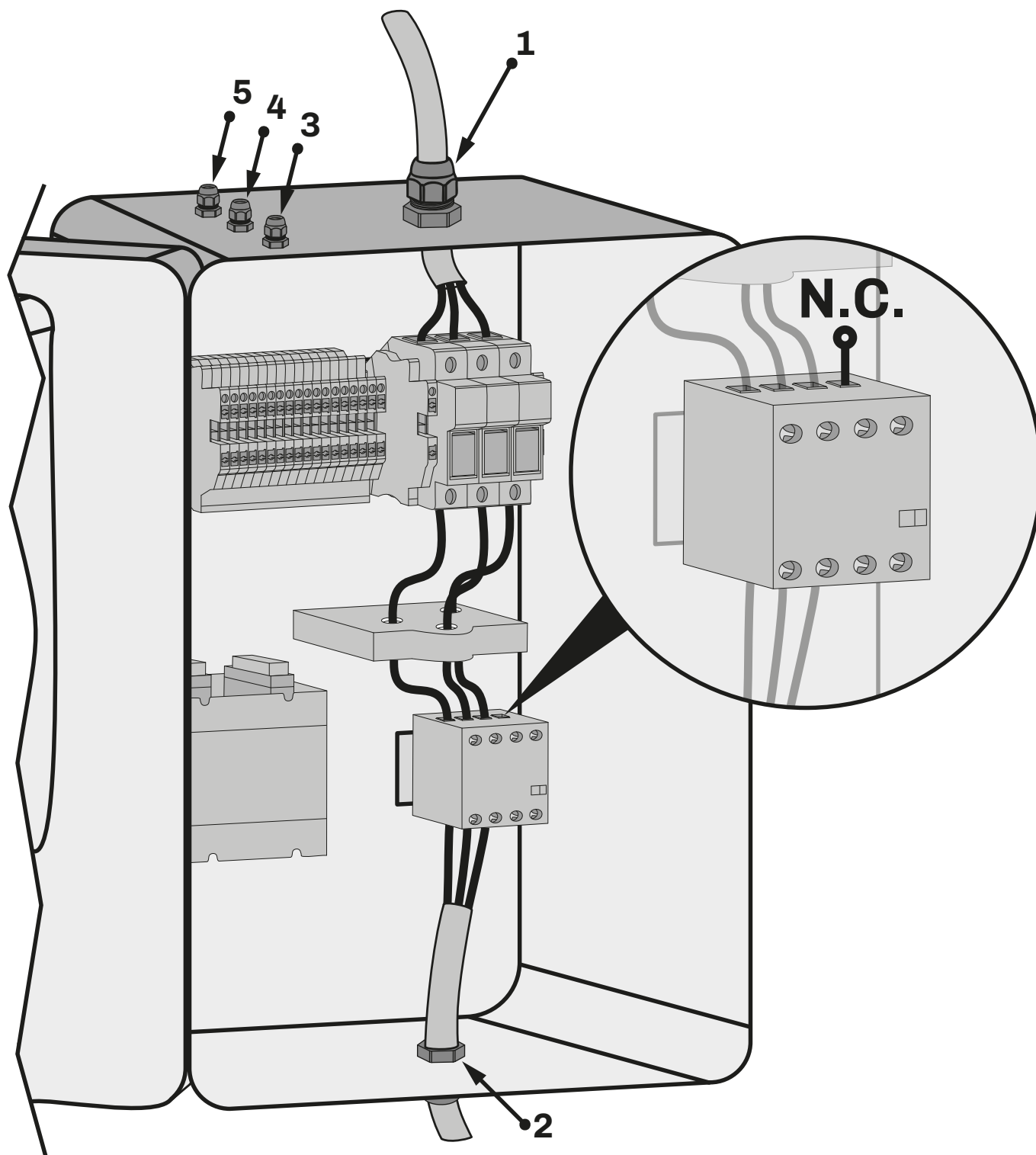


Fig. 17. Suitable wiring for the power supply - **VEH100**

| Ref. | Description |
|------|--|
| 1 | Power cable entry on cable gland (PGx depending on model) |
| 2 | Power cable exit on cable gland (PGx depending on model) |
| 3 | Solenoid valve and electric pump power cable exit on cable gland PG9 |
| 4 | Level sensor wiring exit on cable gland PG9 |
| 5 | I/O regulation wiring entry on cable gland PG9 |

NOTE: when using an auxiliary contact outside the remote control switch, please contact the Elsteam sales office.

⚡ ⚠ DANGER

RISK OF ELECTRIC SHOCK

- Cut off the power supply to all equipment, including any connected devices, before removing any covers or hatches, or before installing/uninstalling accessories, hardware, fuses, cables or wires.
- Always use a properly calibrated Voltmeter to make sure the system is powered off.

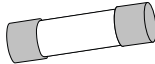
| | | | | | | | |
|---|--------|--------|--------|--------|--------|--------|--------|
|  | VEH10 | VEH20 | VEH30 | VEH40 | VEH60 | VEH80 | VEH100 |
| Corrente (A) | 16 | 32 | 50 | 50 | 80 | 100 | 125 |
| Tipologia | Rapido | Rapido | Rapido | Rapido | Rapido | Rapido | Rapido |
| Dimensione | 10x38 | 10x38 | 14x51 | 14x51 | 22x58 | 22x58 | 22x58 |

Fig. 18. Overload protection devices according to model

6.2.3 Replacing fuses - Fuse box

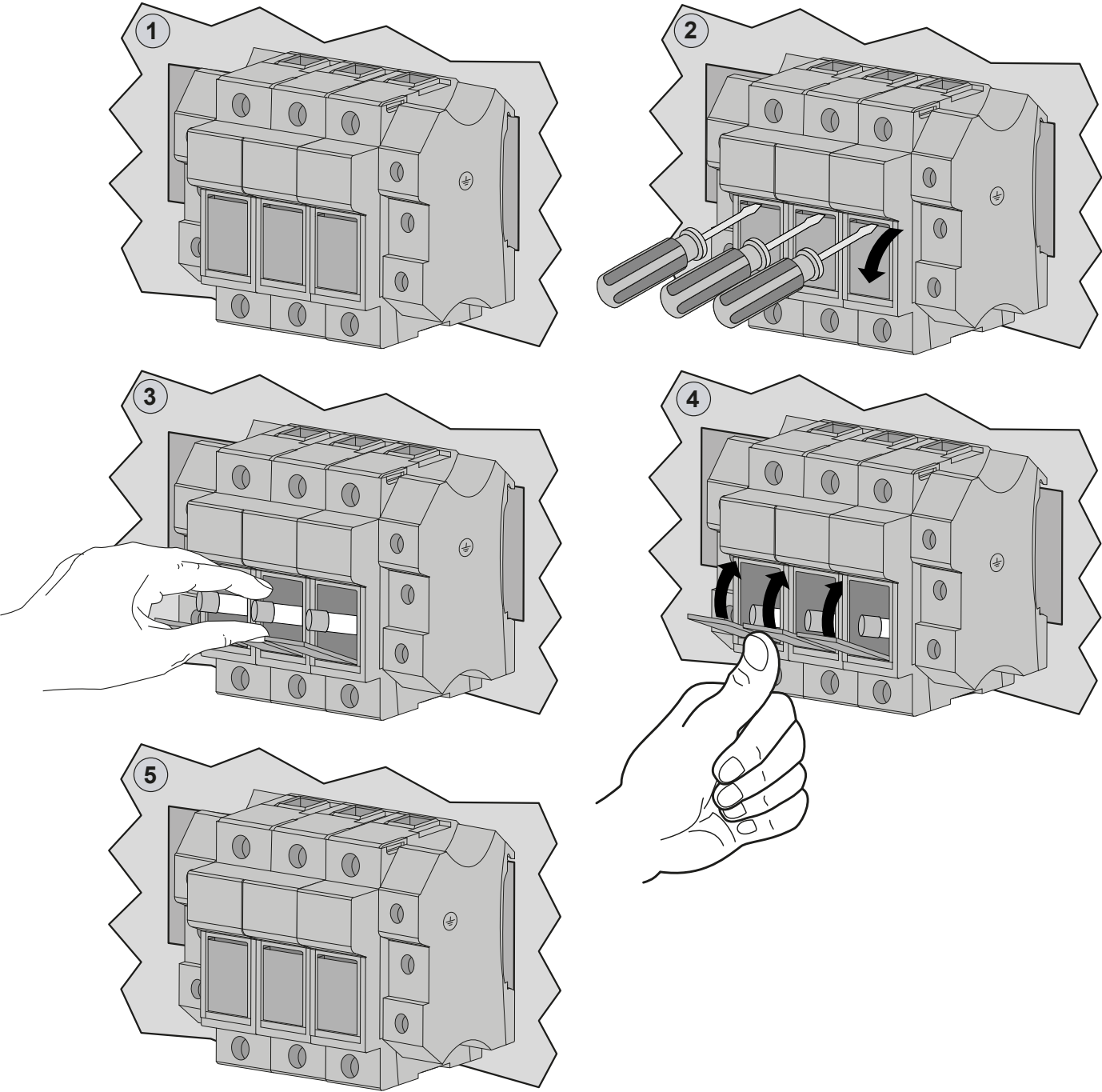


Fig. 19. Overload protection device

6.3 Wiring diagram

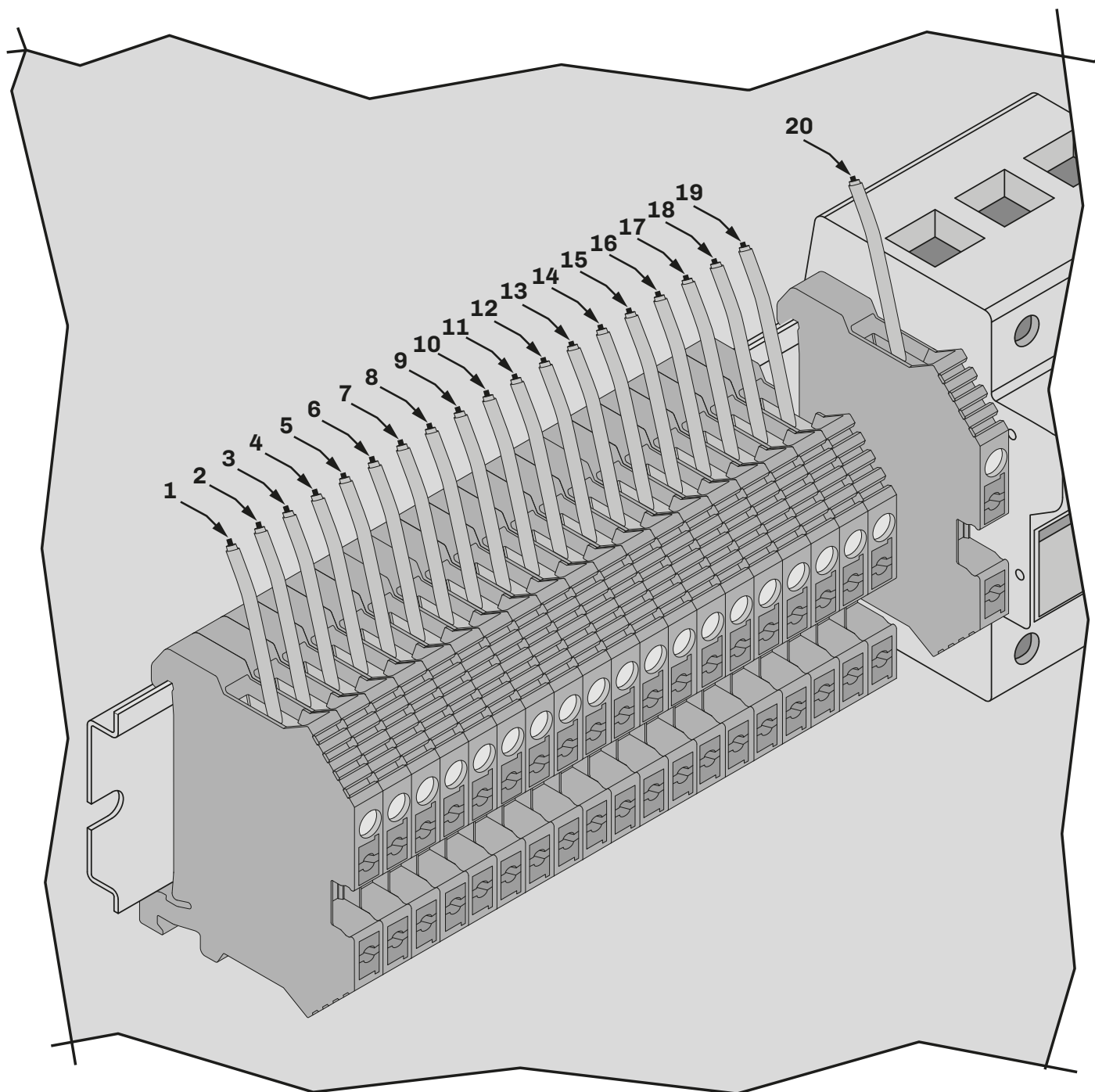


Fig. 20. Auxiliary terminal block wiring diagram

| Number | Description |
|----------------|--|
| 1-2 | SELV control signal input connection 0...10 V 1 = 0...10 V (+) 2 = 0...10 V (-) |
| 3-4 | SELV ON/OFF contact connection |
| 5-6 | SELV control signal input connection 4...20 mA 5 = 4...20 mA (-) 6 = 4...20 mA (+) |
| 7-8 | SELV digital input for enabling ventilation |
| 9-10 | Connection to AHU micro-switch enabling terminal (*) |
| 11-12 | SELV alarm digital output connection |
| 13...15 | Modbus connection RS-485 11 = RS-485 + 12 = RS-485 - 13 = RS-485 GND |
| 16-17 | 24 Vac electric drain pump connection |
| 18-19 | 12 Vac inlet solenoid valve connection |
| 20 | Maximum level sensor connection |

(*): The micro-switch contact should have a minimum pole opening of 8 mm (0.31 in.).

7. USER INTERFACE AND INITIALISATION

Make sure the humidifier and all the installed components are properly connected before start-up, in accordance with regulations, criteria and all applicable local, regional and national standards.

7.1 User interface

7.1.1 Humidifier on/off switch



Fig. 21. Humidifier on/off switch

7.1.2 Main screen display with external humidity control (ON/OFF or 0...10 V)

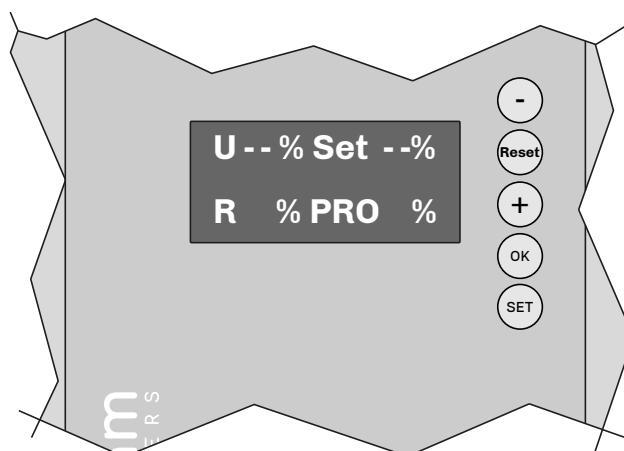


Fig. 22. Main screen display with external humidity control

7.1.3 Main screen display with internal humidity control (4...20 mA)

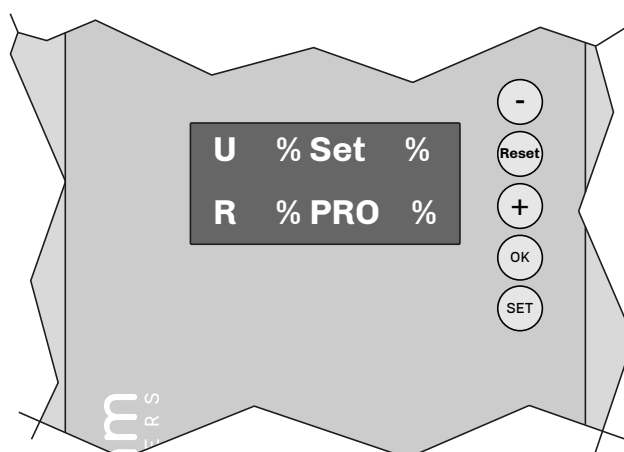





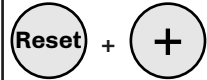
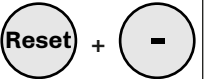


Fig. 23. Main screen display with internal humidity control

7.2 Keys

| Keys | | | | | Combinations | |
|--|---|---|---|--|---|---|
|  |  |  |  |  |  |  |
| <ul style="list-style-type: none">Go back in the menuDecrease the value | Press and hold 5 s for Maintenance and Drain procedure | <ul style="list-style-type: none">Go forward in the menuIncrease the value | Confirm the value on the display | Enter the system configuration menu | Increase display backlighting brightness | Decrease display backlighting brightness |

7.3 Menu

The **VEH** series humidifier menu includes the following entries:

- ON/OFF mode (U);
- Language (U);
- Humidity control (U);
- Emptying time (**RESERVED - DO NOT CHANGE**);
- Water fill time (M);
- Water drain time (M);
- AT coefficient (**RESERVED - DO NOT CHANGE**);
- Minimum input setting 0...10 V (M);
- Water change interval (M).

NOTE: (U) Parameters that can be changed by the user;

(M) Parameters that can **only** be changed by the installer or maintenance technician.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

- Parameters marked as RESERVED must only be changed by ELSTEAM personnel.
- Any changes not made by ELSTEAM personnel to parameters marked as RESERVED are unauthorised and will immediately invalidate the product warranty.
- ELSTEAM does not assume responsibility for changes made to parameters marked as RESERVED by personnel not expressly authorised by ELSTEAM itself.

7.3.1 Switching on/off

To switch the **VEH** dehumidifier on or off, press the switch on the front of the electric panel.

When the machine is switched on, it empties the tank by activating the electric drain valve for an emptying time T. If steam production is required, once emptying is complete, the water filling procedure begins in throttled mode so as to allow a high level of heating efficiency, until the required power is reached.

NOTE: The isolator installed externally must be made operational before the humidifier is switched on.

7.3.2 Language

You can set the desired language by selecting one of the 4 available options:

- Italian.
- English.
- French.
- German

Default: Italian

7.3.3 Humidity control

Humidity control can be selected from the following options:

- Internal: in this case you will be asked to set the humidity as desired between 0 and 100%, using a 4...20 mA probe which should be connected as described in the section "**6.3 WIRING DIAGRAM" ON PAGE 24**.
- External: in this case the choice concerns the type of humidistat used:
 - ON/OFF type;
 - Proportional type in voltage 0...10 V;
 - Proportional type in current 4...20 mA.

7.3.4 Emptying time

RESERVED - DO NOT CHANGE

7.3.5 Water fill time

Used to set the time period for which the water inlet valve remains open. The time is expressed in seconds. Range from 1 to 250.

7.3.6 Water drain time

Used to set the time period for which the drain remains open to allow a small amount of water to drain out of the tank. The time is expressed in seconds. Range from 1 to 250.


7.3.7 AT coefficient

RESERVED - DO NOT CHANGE

7.3.8 Water change interval

Indicates the interval between full water changes in the tank. The time is expressed in hours.

7.3.9 Manual water drainage

To drain the water manually, press and hold  for 5 seconds; the text **MAINTENANCE** will appear on the display.

NOTE: Switch the humidifier off and on again every time manual drainage is carried out.

7.3.10 Nominal current setting

RESERVED - DO NOT CHANGE

7.3.11 Wash time

Sequence of a filling cycle and a drain cycle, and the subsequent reintroduction of steam production in order to dilute the concentration of mineral salts inside the boiler tank.

7.3.12 0-10 V signal calibration coefficient

RESERVED - DO NOT CHANGE

7.3.13 DP Enabling

RESERVED - DO NOT CHANGE

7.3.14 ModBus Address

ModBus addressing

7.3.15 ModBus Speed

ModBus speed parameter setting

7.3.16 Empty Tank Test

RESERVED - DO NOT CHANGE

7.3.17 Drain due to inactivity time

In the absence of a request for humidity, with the humidifier active but in standby, the drain due to inactivity procedure is enabled once 24 hours have passed without humidity being requested. The parameter can be set to a value between 1 and 48 hours depending on the characteristics of the supply water and on the sanitary requirements of the installation.

7.3.18 RTH ramp

Procedure for managing the internal proportional system in accordance with the incoming signal.

RESERVED - DO NOT CHANGE

7.4 Power-up and start-up

DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

- Do not install the equipment while the power supply is connected.
- Cut off the power supply to all equipment, including any connected devices, and remove the power fuses before removing any covers or hatches, or before installing/uninstalling accessories, hardware, cables or wires.
- Always use a properly calibrated Voltmeter to make sure the system is powered off.
- Do not touch the unshielded components or the terminals while they are live.
- Make sure there is an effective earth connection; if there is not, earth the equipment.
- Before applying voltage to the equipment:
 - Make sure all protective elements, such as covers, hatches and grilles, are fitted and/or closed.
 - Check all wiring connections.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

- Make sure the water mains is correctly connected.
- Make sure there are no traps in the drainage duct.
- Make sure the steam outlet closure clamps are properly tightened.
- Make sure there are no pockets of condensate or throttling in the steam delivery channel.

To start the humidifier (with humidistat connected or probe connected if in proportional mode):

- Check the filling and drain network (see sections: "**5.2 HYDRAULIC INSTALLATION**" **ON PAGE 17**, "**5.3 WATER DRAINAGE SYSTEM**" **ON PAGE 18** and "**5.4 STEAM DISTRIBUTION IN THE AHU**" **ON PAGE 19**);
- Fit the power fuses;
- Connect the humidistat or the probe in accordance with the required operation (see section "**6.3 WIRING DIAGRAM**" **ON PAGE 24**);
- Make sure there is a voltage-free contact or a short-circuit ("jumper") between terminals 7-8 Enabling contact, see chapter "**13. WIRING DIAGRAMS**" **ON PAGE 39**;
- Activate the isolator installed outside the humidifier and open the water supply source;
- Press the ON/OFF key on the door of the electric panel;
- Set the required humidity setpoint to 100%;
- The humidifier starts a water filling (**filling in progress**) and draining (**draining in progress**) phase;
- When draining is complete (**draining complete**), set the required humidity setpoint as desired;
- Set the type of control (internal/external) to be used and the required setpoint value;
- When humidity is requested, the humidifier starts a boiler filling cycle, filling to the minimum water level that guarantees rapid steam production;
- The humidifier fully drains the water and replaces it cyclically, performing the washing procedure, in order to maintain efficient humidifier operating conditions.

8. OPERATION

8.1 How it works...

While it is powering up, the **VEH** humidifier performs the following tasks:

- Full boiler wash to remove limescale residue from electrodes and inside the tank;
- Complete emptying of the boiler, to guarantee start-up and operation with clean water;
- Checking the current between electrodes, to make sure the boiler does not have water in it;

NOTE: if some water is left after emptying, the humidifier generates the "Drain alarm", see section "**10.1 TABLE OF ALARMS AND SOLUTIONS**" ON PAGE 33 .

If the humidity controller (humidistat) needs the humidifier to produce steam, the **VEH** humidifier activates power control and starts filling the boiler with water to activate steam production.

The humidifier lets small amounts of water into the boiler, until the amount needed to produce steam in accordance with requirements is reached.

Depending on the humidistat requirement, the humidifier adjusts steam production by modulating the water level (and consequently the intensity of the current) by filling and draining water as necessary, for correct and precise management.

In the event of overproduction of steam, the humidifier drains small amounts of water until correct steam production is resumed, in order to avoid electrical and thermal overloads.

To keep the saline content of the water within operational values, the **VEH** humidifier drains small amounts of water at set intervals.

Regular boiler cleaning (rinsing) intervals can be set via the user interface on the electric panel.

NOTE: calibration takes place in the factory. For custom calibration, contact ELSTEAM customer service.

Only personnel authorised by ELSTEAM may make changes. ELSTEAM is not responsible for the effects of unauthorised personnel tampering with the parameters.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

The equipment should only be used and calibrated by qualified personnel who have been authorised by ELSTEAM.

8.2 Manual water drainage

- Activate the "Manual drainage" function via the user interface;
- The hydraulic unit starts the water draining process (the text **MAINTENANCE** appears on the display when the drain process is complete (approx. 6 minutes); the humidifier needs to be switched off and on again);
- Wait for the user interface to confirm drainage completion;

8.3 Switch-off procedure due to extended period of inactivity

If you need to switch off the humidifier for long periods of time, you must:

- Manually drain the product using the manual drainage launch procedure;
- The hydraulic unit starts the water drainage process;
- Only 6 minutes **after** the **drainage process has been completed**, switch off the humidifier and disconnect it using the isolator switch fitted during installation.

9. MODBUS RTU FUNCTIONS AND RESOURCES

9.1 Introduction

Modbus RTU (Remote Terminal Unit) protocol is a means of communication which allows data exchange between a computer and programmable logic controllers.

This protocol is based on the exchange of messages between master-slave and client-server devices. Master devices can receive information from the slaves and write in their registers, while slave devices cannot start any transfer of information until they receive a request from the slave device.

Modbus communication is used in industrial automation systems (IAS) and in the construction of building management systems (BMS). Modbus protocol is widely utilised due to the fact it is easy to use, very reliable and has an open source code that can be used royalty-free on any application or device.

Modbus RTU is the most common application and uses CRC error detection and binary encoding.

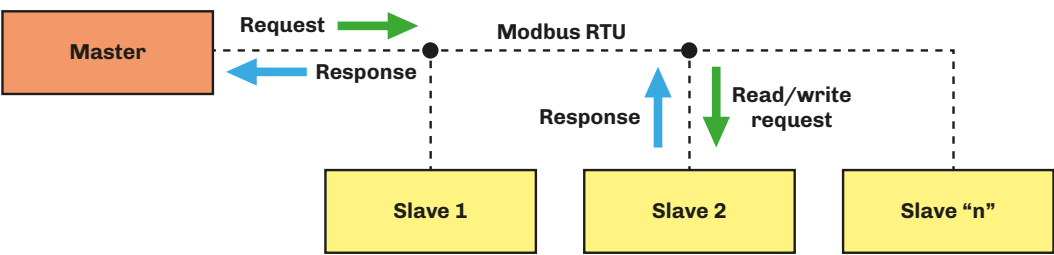


Fig. 24. Diagram showing message exchange in a Modbus communication

Modbus protocol establishes a Protocol Data Unit (PDU) independent from the communication layer below it, introducing some additional fields specified on the Application Data Unit (ADU) ("**FIG. 25. FRAMING OF A MESSAGE USING MODBUS PROTOCOL" ON PAGE 30**") to specific buses and networks.

Devices such as PLCs (Programmable Logic Controller), HMIs (Human Machine Interface), control panels, drivers, motion controllers, I/O devices, etc. can use Modbus to begin a remote procedure, and the protocol is often used to connect a supervising computer with a Remote Terminal Unit in a supervision, control and data acquisition (SCADA) system.

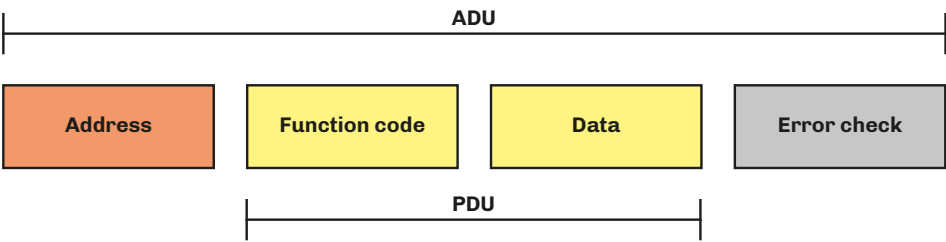


Fig. 25. Framing of a message using Modbus protocol

For further information relating to Modbus protocol, visit the official Modbus website: www.modbus.org.

9.2 Modbus message structure

Modbus RTU protocol requires the message to start with a silent time interval of at least 3.5 character times. This feature is often implemented by executing a time interval of multiple of character times at the baud rate used in the network. The characters available for each field are in binary form.

A description of the structure of a Modbus RTU message is provided below.

| Start | Address | Function | Data | CRC | Stop |
|--|--|---|--|--|--|
| 3.5 x character time | 8 bit | 8 bit | (N x 8 bit) | 16 bit | 3.5 x character time |
| Time period in which data must not be exchanged over the communication bus, to allow the connected instruments to recognise the end of one message and the start of the next | Corresponds to the address for the device with which the master has established dialogue; this is a value between 1...247. The address 0 is reserved for the broadcast message sent to all slave devices | Code for the function to execute or which has been executed | Contains the data sent by the master or sent back by the slave as a response to a question | Allows the master and the slave to check whether any errors are present during communication, and if there are, to ignore the message received | Time period in which data must not be exchanged over the communication bus, to allow the connected instruments to recognise the end of one message and the start of the next |

9.3 Modbus functions and registers

The Modbus registers for the device are organised around the four types of basic data reference indicated above, and this type of data is further identified by the first number of the address.

9.3.1 Available Modbus commands and data areas

The commands implemented are as follows:

| Command | Description |
|----------------------|--------------------------|
| 03 (hex 0x03) | Resource reading command |
| 06 (hex 0x06) | Resource writing command |

9.4 Address configuration

The RS-485 communication serial port can be used to configure the device, the parameters, the statuses and the Modbus variables and to monitor device operation using Modbus protocol.

The address of a device within a Modbus message is set by the **MODBUS Address** parameter.

The address **0** is only used for broadcast messages, recognised by all slaves. Slave devices do not respond to a broadcast message.

Serial line configuration parameters, which can be accessed via the user interface menu, are:

| Par. | Description | MU | Range | Default |
|-----------------------|---|------|---|---------|
| MODBUS Address | Modbus protocol controller address. | --- | 0...255 | 1 |
| MODBUS Speed | Modbus transmission speed (baud rate). 1200 = 1200 baud; 2400 = 2400 baud; 4800 = 4800 baud; 9600 = 9600 baud; 19200 = 19200 baud; 38400 = 38400 baud; 56000 = 56000 baud; 115200 = 115200 baud. | Baud | 1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 56000 / 115200 | 19200 |

The RS-485 RTU serial line has the following characteristics (which cannot be changed):

- RTU mode;
- Parity: No parity (none);
- Bit: 8 bit
- Stop bit: 1 bit.

9.5 Connections

For the entire system to work properly, including the RS-485 RTU serial line, observe the instructions provided in chapter **"6. ELECTRICAL CONNECTIONS" ON PAGE 20**.

In particular, make sure the connections are performed correctly, observing the instructions in section **"6.3 WIRING DIAGRAM" ON PAGE 24**.

9.6 Modbus tables content

Table content description

The table below contains the information required to access the resources properly and directly.

There is a table:

- Modbus address table, which contains all the configuration parameters for the device and the corresponding Modbus addresses.

Description of columns in the Table of addresses

- **Par.:** List of configurable device parameters;
- **Description:** Indicates parameter operation and any possible selections;
- **MU:** Measurement unit relating to the parameter;
- **Range:** Describes the interval of values that the parameter can assume. This can be correlated with other instrument parameters (indicated with the parameter code).
NOTE: if the actual value is outside the permitted limits for that parameter (for example, because other parameters defining the aforementioned limits have been altered), the value of the violated limit is displayed instead of the actual value;
- **Addr. Val.:** Indicates the address of the Modbus register containing the resource you want to access;
- **R/W:** Indicates the option of reading or writing the resource:
 - **R:** The resource is read-only;
 - **W:** The resource is write-only;
 - **R/W:** The resource can be both read and written.
- **CPL:** When the fields indicates Y, the value read by the register needs to be converted because the value represents a number with a sign. In the other cases the value is always positive or zero.
- **DATA SIZE:** Indicates the size in data bits:
 - **WORD** = 16 bit
 - **Byte** = 8 bit
 - The "n" bits = 0...15 bit depending on the value of "n"

9.7 VEH Modbus addresses

9.7.1 Table of Modbus addresses

| Description | Addr. Val. | R/W | DATA SIZE | CPL | Range | MU |
|---|------------|-----|-----------|-----|--------------|-----|
| Display language. | 1 | R/W | WORD | N | 0...3 | Num |
| Humidity setpoint (a). | 2 | R/W | WORD | N | 1...99 | % |
| Ramp. | 3 | R | WORD | N | 1...99 | % |
| Nominal current. | 4 | R/W | WORD | N | - | A |
| AT coefficient | 5 | R/W | WORD | N | 10...9999 | Num |
| Water drain time. | 6 | R/W | WORD | N | 1...255 | s |
| Water fill time. | 7 | R/W | WORD | N | 1...255 | s |
| Emptying time. | 11 | R/W | WORD | N | 1...255 | s |
| Water change interval. | 12 | R/W | WORD | N | 3600...64800 | s |
| Humidity control selection. 0 = Internal; 1 = External. | 13 | R/W | WORD | N | 0/1 | Num |
| External control selection. 0 = ON/OFF; 1 = Proportional. | 14 | R/W | WORD | N | 0/1 | Num |
| Proportional external command. 0 = 0...10 V; 1 = 4...20 mA. | 15 | R/W | WORD | N | 0/1 | Num |
| Level switch input selection. 0 = Digital input; 1 = High-voltage input. | 16 | R/W | WORD | N | 0/1 | Num |
| Level switch input polarity. 0 = NO; 1 = NC. | 17 | R/W | WORD | N | 0/1 | Num |
| External humidity (a). | 20 | R | WORD | N | - | % |
| No water alarm. | 21 | R | WORD | N | 0/1 | Num |
| Pump/drain motor alarm. | 22 | R | WORD | N | 0/1 | Num |
| Drain blocked alarm. | 23 | R | WORD | N | 0/1 | Num |
| Software version. | 25 | R | WORD | N | 0/1 | Num |
| Empty tank test. 0 = Off; 1 = On. | 26 | R/W | WORD | N | 0/1 | Num |
| Current production. | 27 | R/W | WORD | N | - | % |

10. DIAGNOSTICS

The table below lists alarms with corresponding solutions. Inhibiting alarms trigger the alarm relay.

10.1 Table of Alarms and Solutions

| Description | Cause | Effects | Solution |
|-------------------------|--|---|--|
| No Water alarm | No water in the boiler | Humidity production inhibited | <ul style="list-style-type: none"> • Make sure the inlet shut-off valve is open; • Check the solenoid valve connections; • Make sure the solenoid valve filter is not blocked with deposits; • Make sure the solenoid valve is working properly and replace it if necessary; • Make sure the supplementary filter installed upstream of the humidifier is not blocked, replace the filter cartridge if necessary. |
| No Production alarm (#) | No production or insufficient production | <ul style="list-style-type: none"> • # appears on the display • Indication only • Alarm relay ON | <ul style="list-style-type: none"> • Check the water inlet solenoid valve (filter clogged or solenoid valve damaged); • Check for any breakages or leaks in the humidifier tank; • Contact Elsteam customer service to replace the AT; • Make sure the electrical power cables are connected correctly. |
| Drain alarm | Insufficient or no water drainage | <ul style="list-style-type: none"> • Indication only (if partial drain) • Humidity production inhibited (if drain completely blocked) | <ul style="list-style-type: none"> • Check the amount of limescale in the boiler tank and in the drain ducts for the machine and for the system downstream of the humidifier; • Manually clean the limescale from inside the hydraulic unit, fill and drain manifold and in the drain ducts; • Make sure the drain pump electrical connections are correct; • Make sure the drain pump is working properly; • Make sure there are no leaks from the inlet solenoid valve. |
| High Current alarm | The measured current exceeded the nominal current safety threshold for an extended period | Production inhibited | <ul style="list-style-type: none"> • See Drain alarm Solution; • Check how the limescale is deposited in the boiler and make sure there are jumpers between the electrodes; • Clean it; • Check the supply water type and make sure it corresponds with the specifications described in this manual. |
| No Enabling | The activation contact is not connected | The humidifier does not come on | <ul style="list-style-type: none"> • Make sure there is a closed contact at terminals 7 and 8; • Make sure the electronic control is working. |
| Maximum level alarm (*) | Foam is present or electrodes are coated in limescale and therefore worn out or uninsulated, inlet solenoid valve leaking. | <ul style="list-style-type: none"> • * appears on the display • Indication only | <ul style="list-style-type: none"> • Perform manual drain procedure to wash the hydraulic unit and remove the foam; • Perform maintenance and cleaning on the electrodes and the tank, replace the electrodes if necessary; • Check for leaks from the outlet solenoid valve and replace it if necessary. |

11. MAINTENANCE

VEH series humidifiers are defined as "NOT ACCESSIBLE TO THE PUBLIC".

DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

- Any procedure on the humidifier, including maintenance of any type, must only be carried out while the power supply is disconnected.
- The maintenance, repair, installation and use of the equipment must only be entrusted to qualified personnel.

WARNING

RISK OF BURNS

Before carrying out any work on the system, place the equipment out of service and wait for the machine to cool down (< 50 °C (122 °F)).

11.1 Introduction

VEH series humidifiers are designed for operation with the water specifications indicated in sub-section "5.2.1 WATER SPECIFICATIONS" ON PAGE 17.

Using water with different specifications and/or with a hardness level approaching the limit of 50 °f causes maintenance to be required more frequently.

As a guideline, the hydraulic unit requires frequent maintenance and seasonal cleaning in the following conditions:

| Water conductivity | Water hardness |
|--------------------|----------------|
| 200...600 µS/cm | 10...30 °f |

It is not possible to provide certain instructions to determine the maintenance frequency, as it depends heavily on the morphology of the water used, which can also vary under equal specifications (conductivity and hardness).

If using VEH series humidifiers with more critical water conditions, for example:

| Water conductivity | Water hardness |
|--------------------|----------------|
| 700...1250 µS/cm | 35...50 °f |

maintenance must be carried out more frequently, several time per season (even weekly in extreme cases).

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

Only use the humidifier with the water specifications indicated in this manual.

If frequent maintenance takes place, check the quality of the water supply.

Furthermore, the hydraulic unit should be cleaned promptly when:

- The drain water is very dark (reddish/black) and demonstrates the start of electrode corrosion (*) caused by the highly aggressive nature of concentrated water (replace the electrodes if necessary);
- The humidifier does not work properly, triggering the high current alarm frequently.
NOTE: a high concentration of salts in the water inside the boiler results in high electrical conductivity, which can cause various high current alarms and lead to frequent drain cycles;
- The hydraulic unit has reached 5 seasons or 24 months of continuous operation with maintenance performed in accordance with best practices;
- There are large amounts of limescale linked to variations in colour and surface on the outer walls of the hydraulic unit, due to overheating caused by limescale bridges between the electrical phases (replace the electrodes if necessary);
NOTE: Limescale inside the boiler is normal, even in large amounts, as the boiler collects the limescale present in the water; therefore performing maintenance/cleaning on it is essential for correct operation.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

Only carry out boiler maintenance in accordance with the instructions provided in the Maintenance section of this manual.

(*): The electrodes are made using AISI 316 steel with self-extinguishing engineering plastic parts.

- There are leaks due to breakages, cracks and fissures (**replace the hydraulic unit**).
NOTE: the water inside the boiler is subjected to electrical voltage and therefore leaks from the boiler are dangerous.

DANGER

RISK OF ELECTRIC SHOCK OR ELECTRIC ARC

- Any procedure on the humidifier, including maintenance of any type, must only be carried out while the power supply is disconnected.
- In the event of water leakage, disconnect the humidifier power supply immediately.

- If any adverse event not described in this documentation arises, carry out maintenance and/or replace the hydraulic unit. Plus, contact ELSTEAM customer service for the relevant guidelines and instructions;

DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

If an adverse event occurs, disconnect the humidifier power supply immediately.

- After a period of activity and/or due to water specifications, because of the formation of limescale inside the boiler, the electrodes may come closer together and/or closer to the walls of the boiler, forming potential electrical conductors which, in the absence of water, may lead to an increase in temperature (causing the surfaces of the boiler to become black) and cause the boiler wall to melt, leading to the leakage of live water (**replace the hydraulic unit**);

DANGER

RISK OF ELECTRIC SHOCK OR ELECTRIC ARC

- In the event of water leakage, disconnect the humidifier power supply immediately.
- Check and, if necessary, replace the hydraulic unit sealing gaskets.
- If the tank is compromised, replace the entire hydraulic unit.

Checking the status of the humidifier

Perform the following scheduled checks on the humidifier:

| When... | What to do... |
|---------------------|--|
| At first start-up | Make sure there are no leaks after an hour of continuous operation. |
| When changing parts | Make sure there are no leaks after an hour of continuous operation. |
| Every 5 days | <ul style="list-style-type: none">• Make sure the humidifier works properly (based on the instructions provided in this manual);• Make sure there are no leaks in the hydraulic system;• Make sure there is no unusual operation. |
| Every 30 days | <ul style="list-style-type: none">• Make sure there are no blockages in the water drain;• Make sure the water drains effectively;• Remove any limescale residue from inside the drain. |
| Every 60 days | <ul style="list-style-type: none">• Make sure not too much limescale residue has built up inside the hydraulic unit;• Wash the inside of the boiler with a 20% concentration of acetic acid, removing limescale from the electrodes and boiler;• If necessary, replace the electrodes and gaskets. |
| Every 2 years (*) | Replace the hydraulic unit. |
| Every 5 years (**) | Replace the hydraulic unit. |

(*) **NOTE:** If humidifier used continuously.

(**) **NOTE:** If humidifier used seasonally.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

Replace the sealing gaskets every time the hydraulic unit is serviced.

11.2 Regular cleaning of the product and its components

- Drain the humidifier, following the instruction provided in section "**8.2 MANUAL WATER DRAINAGE**" ON PAGE 29;
- Disconnect the machine power supply using the external isolator;
- Open the AHU and approach the hydraulic unit, removing the tank covers from the unit as described in paragraph "**11.3 CLEANING THE BOILER**" ON PAGE 36;
- Unscrew the manifold from the filling/discharge unit;
- Remove any pieces of limescale;
- Disconnect the inlet solenoid valve, remove the filter at the bottom and thoroughly clean it again;
- Reassemble the inlet solenoid valve;
- Re-attach the filling/discharge unit manifold.

11.3 Cleaning the boiler

- Drain the humidifier;
- Disconnect the machine power supply using the external isolator;
- Open the top of the tank inside the AHU;
- Use the 2 screws at the front to disconnect the filling/discharge manifold from the front of the hydraulic unit;
- Loosen the 4 screws on the sides of the top cover and remove the 2 covers;
- Gently lift the hydraulic unit until any remaining water has drained out;
- Wash the hydraulic unit tank using a citric acid or acetic acid solution and detach any limescale from the electrodes from the surface of the electrodes using a plastic spatula;
- Fully reassemble the hydraulic unit.

11.4 Cleaning the optional STAINLESS STEEL discharge tank (VI accessory)

- Remove the tank connection from the drain;
- Remove the tank from the bottom of the humidifier;
- Clean the tank by removing limescale deposits and rinsing it under running water;
- Re-fit the tank correctly and reconnect the drain.

11.5 Replacing the electrodes

- Drain the humidifier;
- Disconnect the machine power supply using the external isolator;
- Open the top of the tank inside the AHU;
- Use the 2 screws at the front to disconnect the filling/discharge manifold from the front of the hydraulic unit;
- Loosen the 4 screws on the sides of the top cover and remove the 2 covers;
- Unscrew the nuts securing the electrodes, lift them from the part opposite the connections and slide them out of the connection slot;
- Insert the new electrodes, reversing the disassembly instructions;
- Secure the electrodes in their seat, making sure they are well fastened and that the O-RING seals are positioned correctly;
- Reconnect the electrical cables using flanged nuts and special Nord Lock washers, making sure connection takes place in accordance with best practices and current regulations.

DANGER

LOOSE WIRING CAUSES ELECTRIC SHOCKS AND OVERHEATING

Tighten the connections in compliance with the technical specifications relating to tightening torques.

Tightening torque between nut and locknut, for the ring terminal: 4 Nm.

11.6 Opening the electric panel

For installers and maintenance personnel **only**.

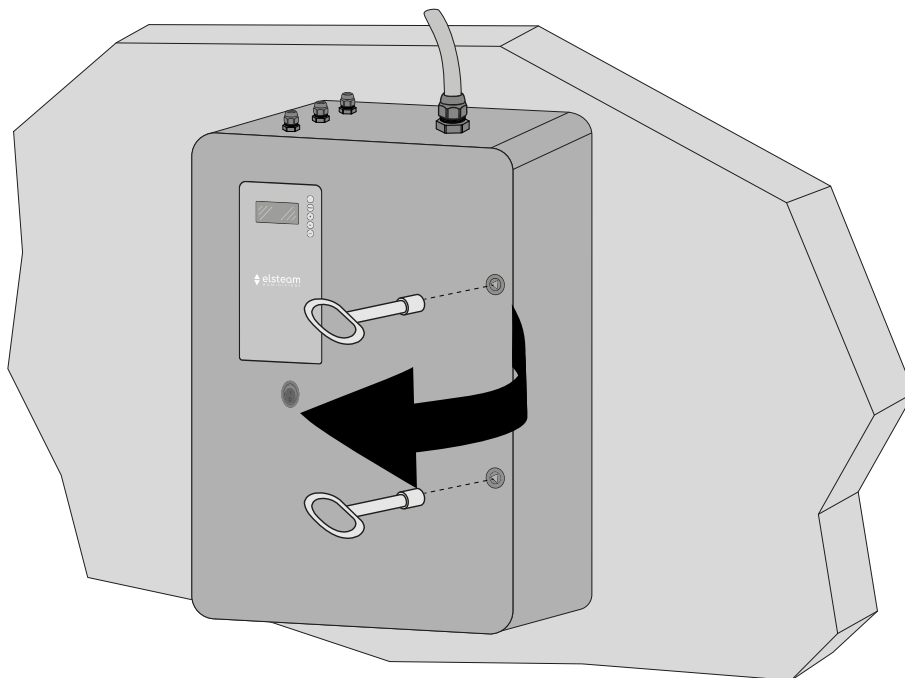


Fig. 26. Opening the electric panel

12. SPARE PARTS

12.1 Hydraulic unit

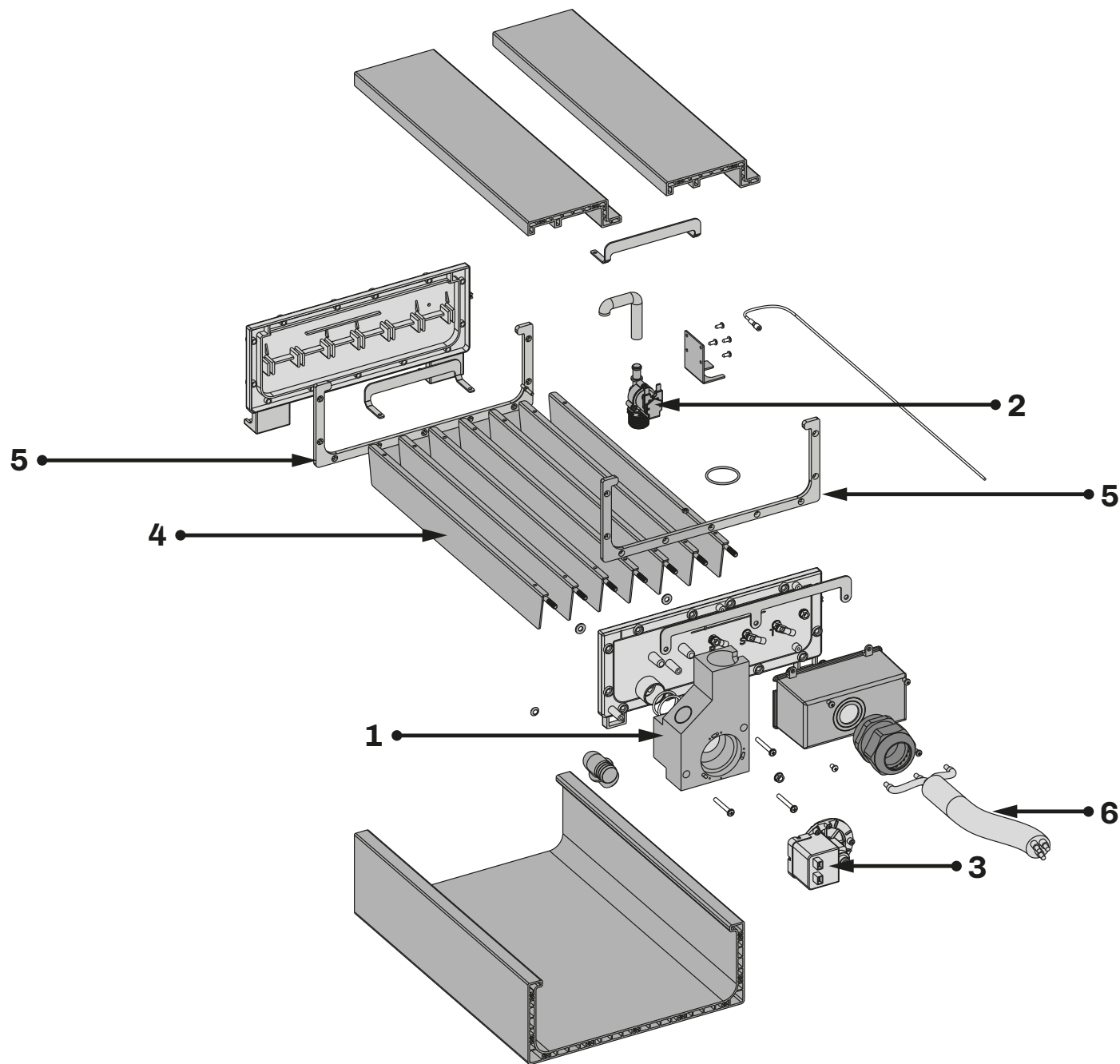


Fig. 27. Spare parts: **VEH series - Hydraulic unit**

| Ref. | P/n | Description |
|------|--------|---|
| 1 | VEHK05 | VEH water filling/discharge manifold unit |
| 2 | VEHK25 | VEH inlet solenoid valve |
| 3 | VEHK29 | VEH electric drain pump |
| 4 | VEHK10 | Electrode kit for VEH10XS/VEH20XS |
| | VEHK11 | Electrode kit for VEH20S/VEH30S/VEH40S |
| | VEHK12 | Electrode kit for VEH30M/VEH60M |
| | VEHK13 | Electrode kit for VEH40L/VEH80L |
| | VEHK14 | Electrode kit for VEH60XL/VEH100XL |
| 5 | VEHK15 | VEH hydraulic unit gasket kit |
| 6 | VEHK27 | Power cable kit for running from electric panel to hydraulic module for VEH10-20-30-40 |
| | VEHK28 | Power cable kit for running from electric panel to hydraulic module for VEH60-80-100 |

12.2 Electric panel

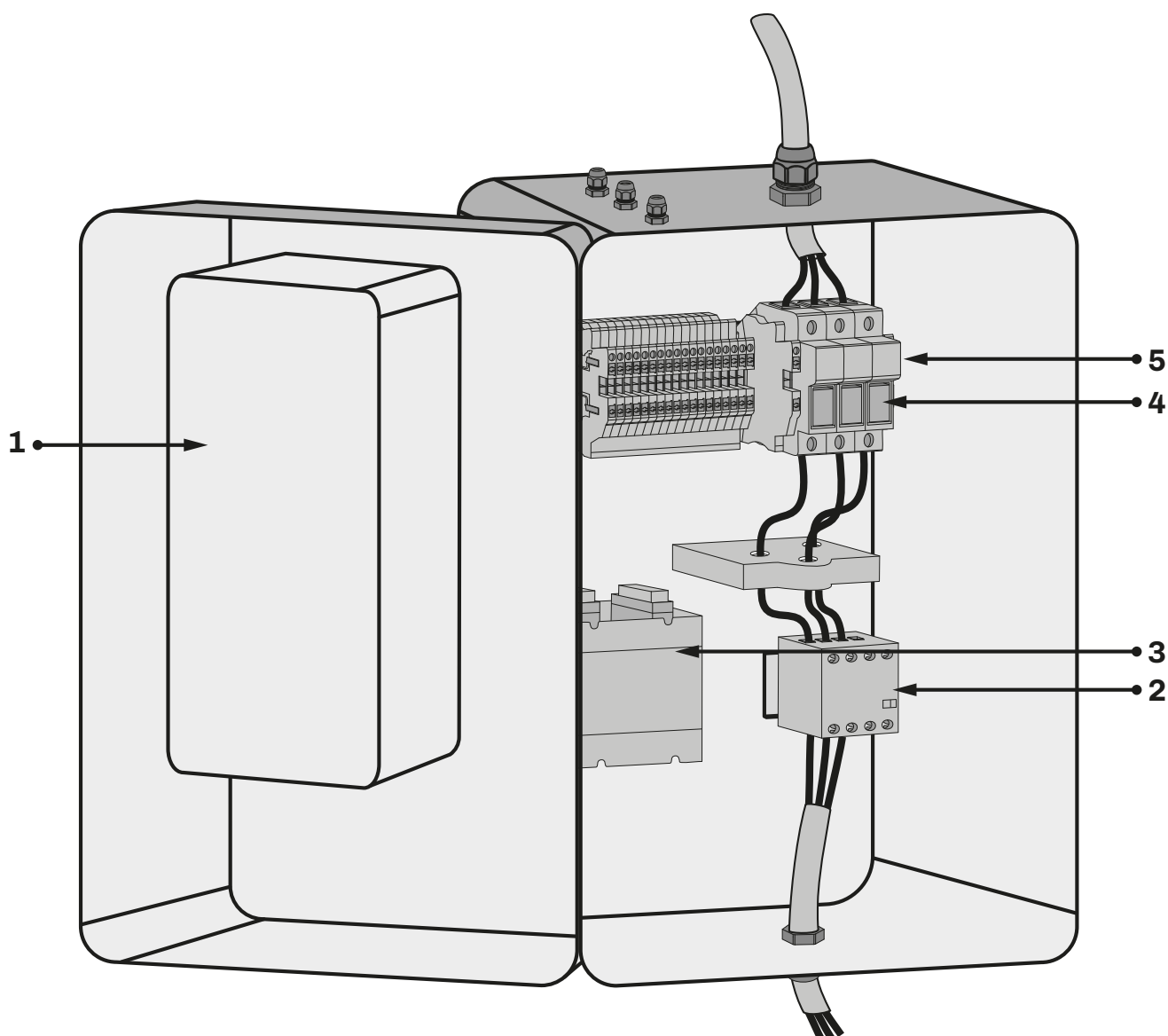


Fig. 28. Spare parts: VEH series - Electric panel

| Ref. | P/n | Description |
|------|-------------------|--|
| 1 | VEHK06 | Complete control unit |
| 2 | 0209310001 | Remote control switch for VEH10 models |
| | 0209310002 | Remote control switch for VEH20 models |
| | 0209310003 | Remote control switch for VEH30 models |
| | 0209310005 | Remote control switch for VEH40 models |
| | 0209310004 | Remote control switch for VEH60 models |
| | 0209710007 | Remote control switch for VEH80 models |
| | 0209310006 | Remote control switch for VEH100 models |
| 3 | 0101014020 | 400 Vac transformer for VEH models |
| 4 | 0150130001 | Fuse box for VEH10-20 models |
| | 0150130002 | Fuse box for VEH30-40 models |
| | 0150130003 | Fuse box for VEH60-80-100 models |
| 5 | VEHK18 | Fuse kit for VEH10 gG10x38 16 A |
| | VEHK19 | Fuse kit for VEH20 gG10x38 32 A |
| | VEHK20 | Fuse kit for VEH30 gG14x51 40 A |
| | VEHK21 | Fuse kit for VEH40 gG14x51 50 A |
| | VEHK22 | Fuse kit for VEH60 gG22x58 80 A |
| | VEHK23 | Fuse kit for VEH80 gG22x58 100 A |
| | VEHK24 | Fuse kit for VEH100 gG22x58 125 A |

13. WIRING DIAGRAMS

13.1 4-Electrode models

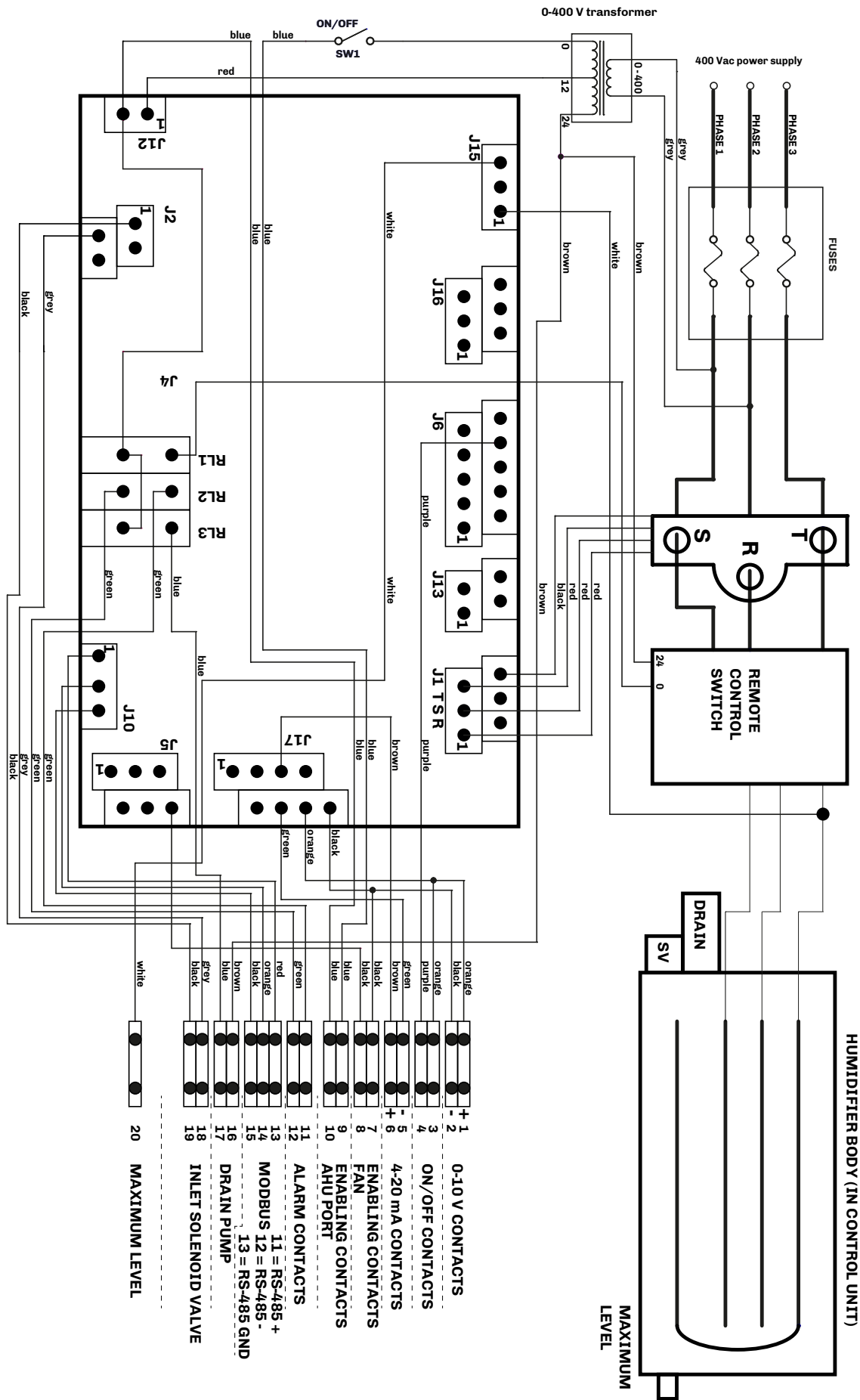


Fig. 29. Wiring diagram for 4-Electrode models

13.2 7-Electrode models

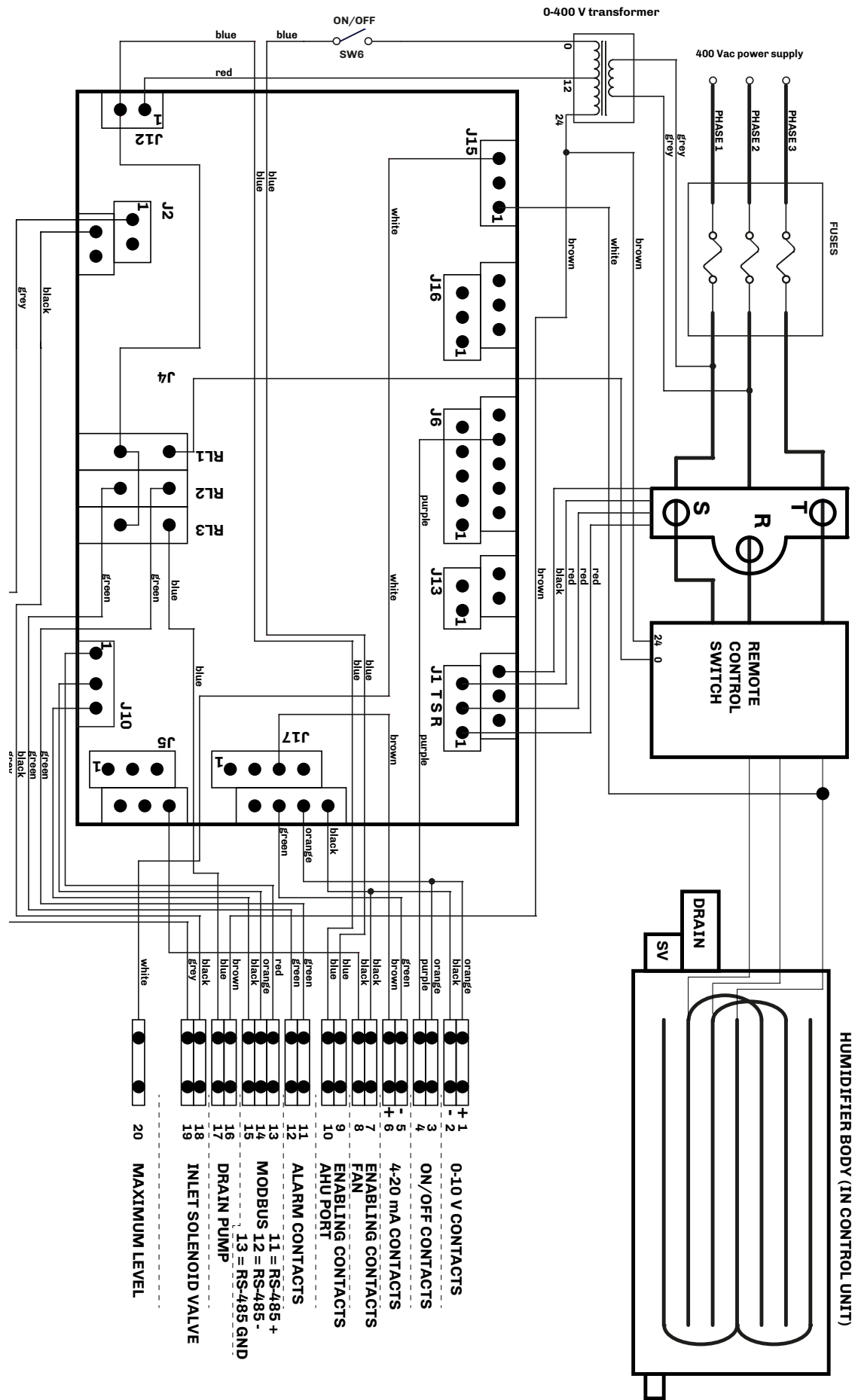


Fig. 30. Wiring diagram for 7-Electrode models

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The customer (manufacturer, installer or end user) assumes all responsibility for device configuration.

ELSTEAM does not assume any responsibility for potential errors and reserves the right to make any changes, at any time, without the basic functional and safety-related features being affected.

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