

# MISTRAL

Ultrasonic humidifiers  
of small size and capacity



## **WARNING**

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

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



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## IMPORTANT INFORMATION

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### 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.

The device must be installed and used in accordance with the instructions provided and, in particular, hazardous live parts 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.

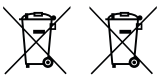
Only qualified personnel may install the product or perform technical support procedures on it.

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.

### 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

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

### **DANGER**

#### **RISK OF ELECTRIC SHOCK 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, 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.
- 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 modify the product.
- Do not expose the equipment to liquids or chemicals.
- Make sure there is an effective earth connection; if there is not, earth the equipment.
- Before powering up the equipment, check all the 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".

### **DANGER**

#### **RISK OF ELECTRIC SHOCK, EXPLOSION OR FIRE**

- Install the humidifier away from electronic equipment.
- Do not install the humidifier above electronic equipment.

### **WARNING**

#### **MALFUNCTIONING OF THE EQUIPMENT**

- Perform the wiring carefully, in compliance with electromagnetic compatibility and safety requirements.
- 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").

### **WARNING**

#### **REGULATORY INCOMPATIBILITY**

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

#### **Health and Hygiene**

The Mistral humidifier features:

- Automatic draining for inactivity;
- Periodic automatic cleaning;
- Plastic material on whose surface bacterial colonies do not proliferate.

Inadequate use and/or poor maintenance of the humidifier can damage your health.

### **WARNING**

#### **BIOLOGICAL RISK**

- In the event of inadequate use and/or poor maintenance it is possible that microorganisms (including the bacterium that causes Legionellosis) may proliferate and be transferred into the air treatment system.
- The humidifier must be used properly and be maintained and cleaned properly at prescribed intervals, as described in chapter "**10. MAINTENANCE**" ON PAGE 51.

# 1. INTRODUCTION

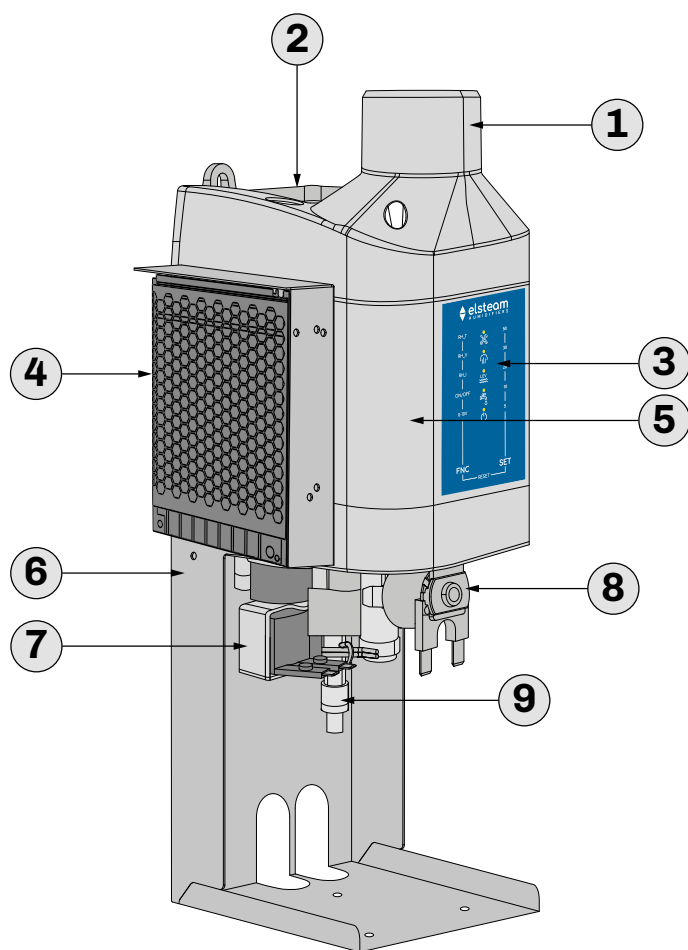
## 1.1 DESCRIPTION

The **Mistral** humidifier is the ELSTEAM solution for compact ultrasonic adiabatic humidification systems.

The **Mistral** humidifier generates humidity by breaking up the molecules of the water contained in the reservoir and producing mist through the energy transferred by ultrasonic ceramic transducers.

The water is aerosolized by oscillating the surface of the transducers in contact with the water using a high frequency signal which generates a column of water above the transducers. During the negative amplitude of the transducer (the surface of the transducer oscillates at high speed), water bubbles are produced that collide with each other during the positive amplitude phase, resulting in water mist that is introduced into the room by the air flow generated by the fan. The mist (humidity) is introduced into the room via a rigid tube.

## 1.2 PRODUCT OVERVIEW



Reference	Description
①	Aerosolized water outlet
②	Suction fan
③	LED user interface
④	Switching power supply unit 230 Vac - 24 Vac/dc
⑤	Water reservoir
⑥	Box for mounting on a wall or on the base (optional)
⑦	Water outlet solenoid valve
⑧	Water inlet solenoid valve
⑨	Outlet manifold

Fig. 1. Overview of **Mistral** humidifier with box

## 1.3 AVAILABLE MODELS

Code	Description
EHUC001M2	Mistral - production capacity 1 kg/h

## 1.4 APPLICATIONS

**Mistral** is mainly used in applications including:

- Storage rooms:
  - Display of fresh produce;
- Food stores;
- Cold rooms and units for temperature, humidity and maturation;
- Wine cellars;
- Air-conditioning with fan convectors.

## 1.5 MAIN FEATURES

- Adiabatic humidifier with low energy consumption;
- Constant and efficient production;
- Small footprint fits in small spaces (1 kg/h unit);
- Electronic control:
  - Via external signal ON/OFF, 0...10 V;
  - Incorporated via 4...20 mA, 0...10 V sensor or resistive;
- Water leakage protection system.

### 1.5.1 Electronic control features

- Proportional control of production of humidity:
  - High efficiency;
  - Rapid response to changes in requirements;
  - Precise production control.
- Protection against no inlet water;
- Automatic draining:
  - Removes scale build-up in the reservoir;
- Signals operating status via LED interface:
  - Continuous monitoring of the operating status;
  - Viewing alerts.

### 1.5.2 I/O specifications

- Analogue/digital input: configurable by **CFG** parameter;
- Digital input: manages enabling operation from an external signal;
- Digital output: manages an alert or is a command for parallel configuration;
- RS-485 serial: serial link for communicating with remote user interface (see "**1.6 ACCESSORIES**" ON PAGE 10).

## 1.6 ACCESSORIES

The following accessories are available for the **Mistral** range of ultrasonic humidifiers:

P/n	Description
<b>EHUK007</b>	Mistral metal support
<b>EHUK008</b>	Mistral metal box
<b>EHUK009</b>	Intake kit
<b>EHUK011</b>	Drain kit
<b>UHFK02</b>	Vertical distribution kit Ø50 mm Mistral
<b>EHRO012</b>	Reverse osmosis system 12 l/h
<b>EVHTP520</b>	Humidity and temperature sensor, proprietary signal
<b>EVHP523</b>	Humidity sensor with 4...20 mA output
<b>0031000043</b>	Inlet tube 8 mm (per metre)
<b>EV3K61XLESRB</b>	Remote user interface 74x32mm, 4 touch keys, two-line LED display, 24 Vdc power supply

## 2. TECHNICAL DATA

### 2.1 TECHNICAL SPECIFICATIONS

TYPE	MU	DESCRIPTION/VALUE
<b>HUMIDITY PRODUCTION</b>		
Production capacity:	kg/h	0.20...1.0
Maximum pressure:	Pa	1...70
Connection outside diameter:	mm (in.)	50 (1.97)
<b>Mist distribution</b>		
Mist distribution:	---	See accessory <b>UHFk02</b>
Maximum air flow rate:	m³/h	48
<b>ELECTRICAL PROPERTIES</b>		
Power supply:	V, Hz	100...240 Vac, -15%/+10%, 50/60
Power absorbed:	W	110 maximum
Current draw:	A	4.5 A
Auxiliary power supply:	V	24 Vdc
<b>Hydraulic properties</b>		
Supply water quality:	---	<b>SEE "5.2.1 WATER SPECIFICATIONS" ON PAGE 23</b>
Supply water conductivity:	µS/cm	• 0...100 (low maintenance) • 0...1250 (general operation)
Supply water hardness:	°f	• 0...5 (low maintenance) • 0...40 (general operation)
Supply water pressure:	MPa (bar)	0.02...1 (0.2...10)
Minimum supply flow rate	L/m	1
Supply water connection:	---	JG 8 mm
Drain water connection:	---	Ø10-12 mm
Supply water temperature:	°C/°F	1...40 °C (33.8...104)
Drain water temperature:	°C/°F	1...60 °C (33.8...140)
<b>General specifications</b>		
Dimensions:	mm (in.)	<b>SEE "4.3 DIMENSIONS" ON PAGE 15</b>
Weight:	kg	~1.4
Electrical compartment and fan IP protection degree:	---	30
<b>Regulation</b>		
Control type:	---	Integrated
Control signal:	---	• ON/OFF • 0...10 V (or proportional) • 4...20 mA
<b>Communication serial port</b>		
Serial port:	---	1 RS-485 Modbus RTU serial port
<b>COMPLIANCE</b>		
CE certification:	---	√

## 2.2 I/O SPECIFICATIONS

Type	Description
Analogue input:	1 configurable analogue input ( <b>CFG</b> = 1...4 or <b>CFG</b> = 6...9)
Digital input:	1 digital input with a potential-free contact for enabling humidification 1 configurable digital input ( <b>CFG</b> = 0 or <b>CFG</b> = 5)
Digital output:	1 non-isolated low-voltage relay output

### Analogue input specifications

	Default	Resistive RH	Current 4...20 mA	Voltage 0...10 V	Digital input
<b>IA1</b>	Temperature alert sensor	•	•	•	•
<b>Range</b>	---	-40...105 °C (-40...220 °F)	1% full scale	1% full scale	---
<b>Solution</b>	---	0.1 °C (1 °F)	0.1	0.1	---
<b>Input impedance</b>	---	10 kΩ	100 Ω	24 kΩ	---

### Digital output specifications

	Default	Description	Load (at 30 Vdc)	Load type
<b>Out1</b>	Alert or command for parallel operation	SPDT	1 A	Resistive

## 3. RECEIVING THE PRODUCT

### **NOTICE**

#### **MALFUNCTIONING OF THE EQUIPMENT**

- Dropping or shaking 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;
- Make sure the humidifier is intact 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 package to the humidifier installation site;
- Open the cardboard packaging;
- Remove the humidifier from the die-cut separator.

#### 3.1.2 Checking the packaging contents

The standard product package contains:

- **Mistral** ultrasonic humidifier;
- Instruction sheet for:
  - Mechanical assembly;
  - Electrical connections;
  - Start-up instructions;
- Switching power supply unit 100...240 Vac / 24 Vdc and wiring.

## 4. MECHANICAL ASSEMBLY

### 4.1 BEFORE YOU START

Read this manual carefully before installing the system.

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 programming of automated control 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.

#### **WARNING**

##### **REGULATORY INCOMPATIBILITY**

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

### 4.2 INFORMATION CONCERNING INSTALLATION AND THE SURROUNDING ENVIRONMENT

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

#### **DANGER**

##### **RISK OF ELECTRIC SHOCK 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, 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.
- 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 modify the product.
- Do not expose the equipment to liquids or chemicals.
- Make sure there is an effective earth connection; if there is not, earth the equipment.
- Before powering up the equipment, check all the wiring connections.

#### **WARNING**

##### **MALFUNCTIONING OF THE EQUIPMENT**

- Perform the wiring carefully, in compliance with electromagnetic compatibility and safety requirements.
- 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.).

4.3 DIMENSIONS

4.3.1 Dimensions of Mistral

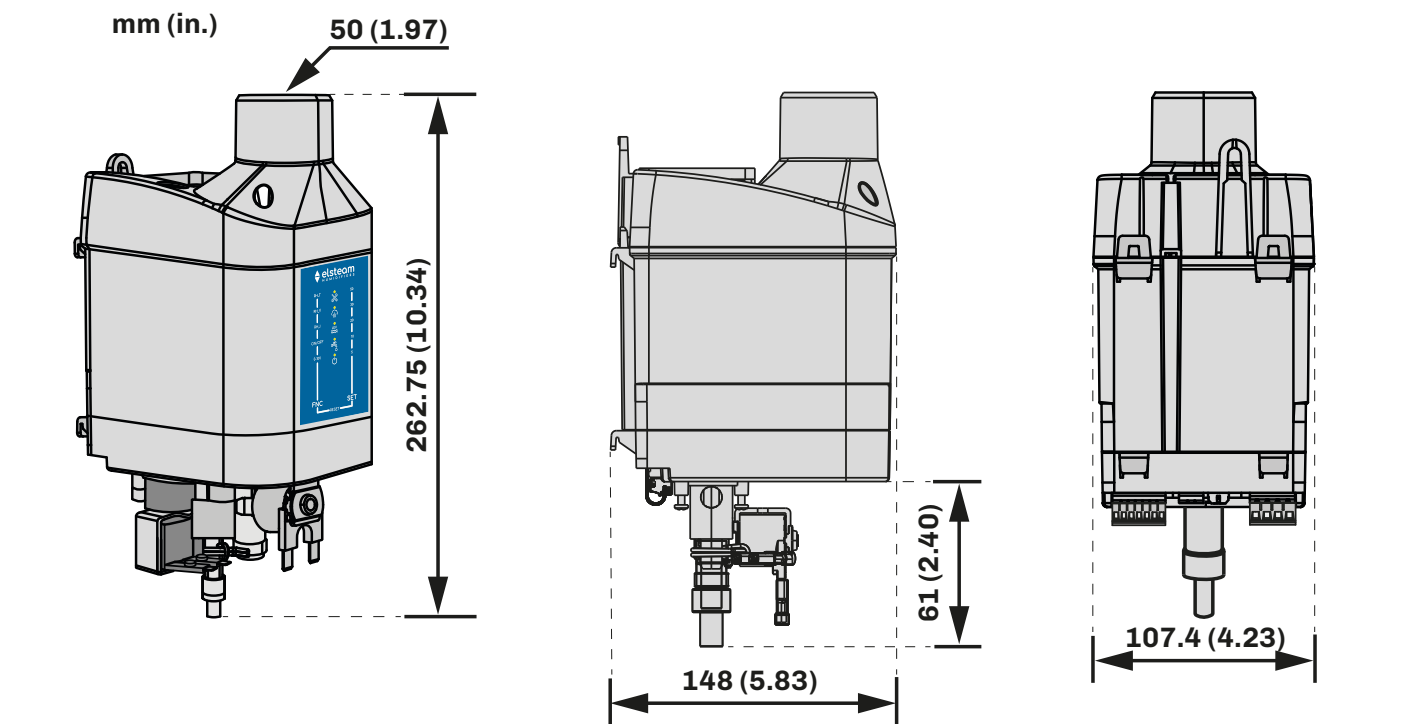


Fig. 2. Dimensions of Mistral

4.3.2 Dimensions of Mistral with box

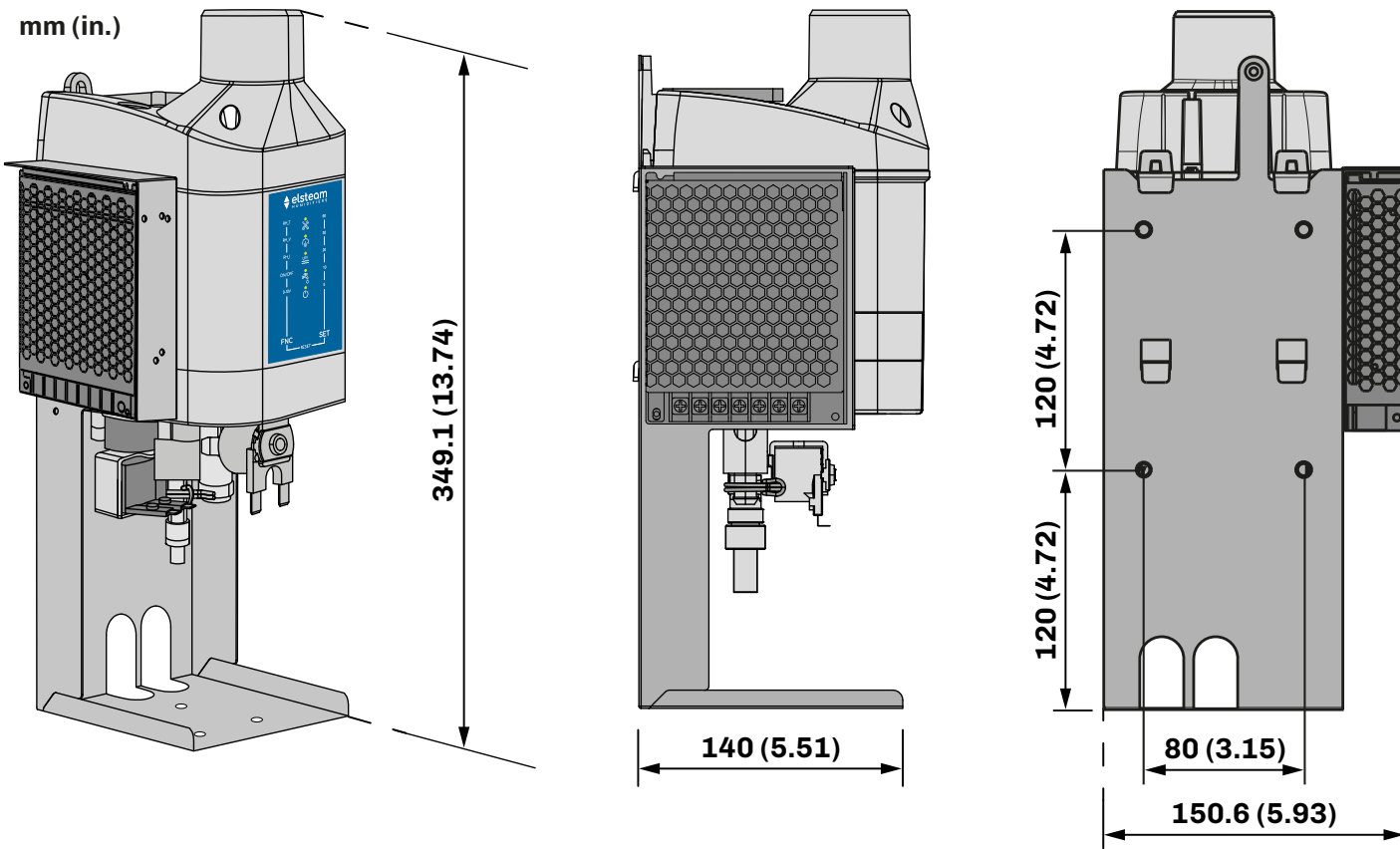


Fig. 3. Dimensions of Mistral with box

4.3.3 Dimensions of Mistral with support bracket

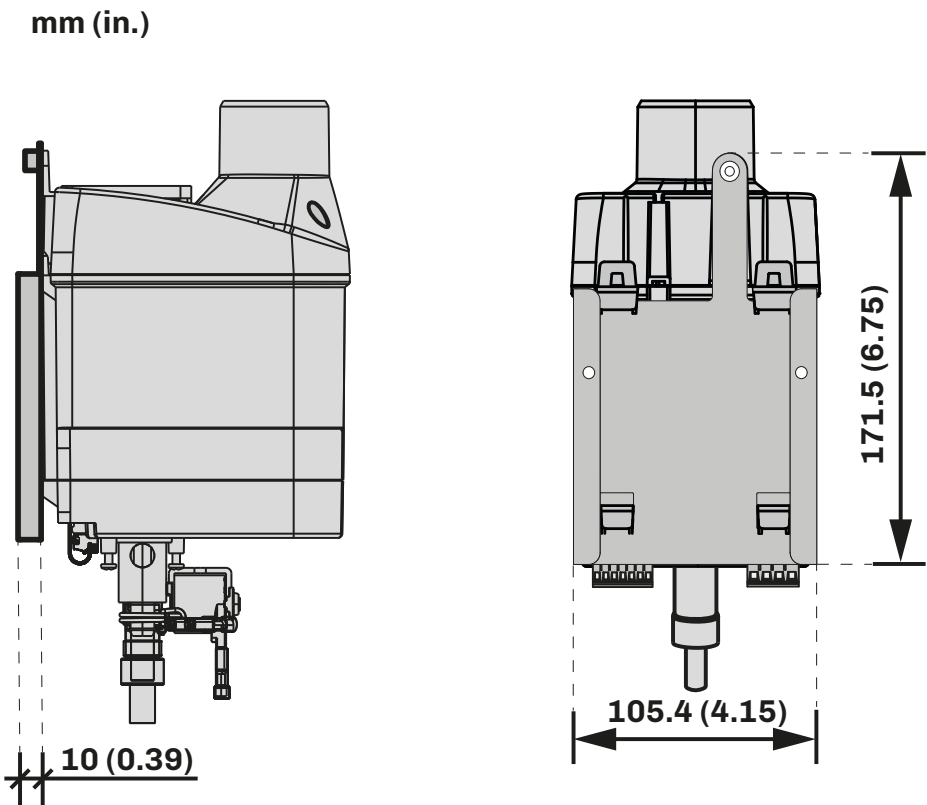


Fig. 4. Dimensions of **Mistral** with support bracket

## 4.4 MINIMUM INSTALLATION DISTANCES

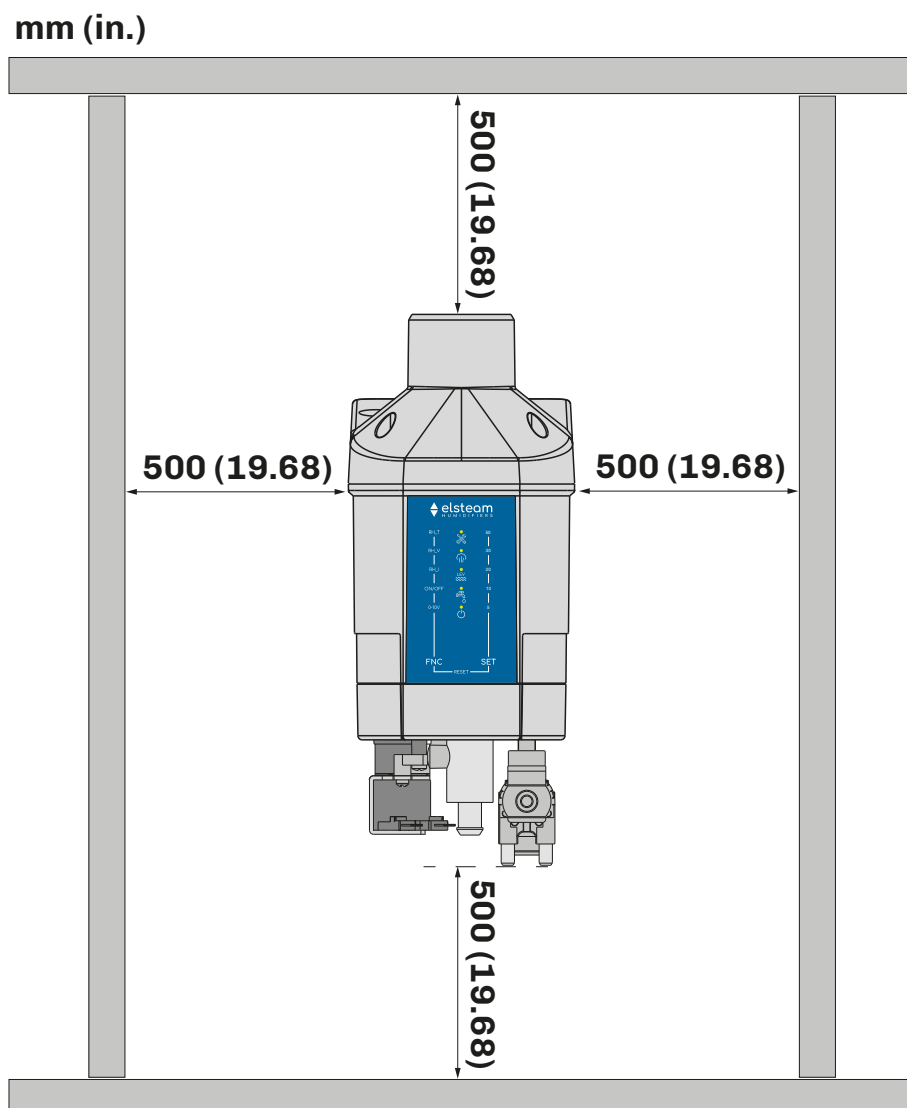
When installing the **Mistral** humidifier in enclosed spaces, observe the minimum distance of 500 mm (19.68 in.) on each side, so as to guarantee adequate ventilation and aeration of the system.

### ⚠ 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.

#### 4.4.1 Open space



**Fig. 5.** Minimum installation distances

#### 4.4.2 Enclosed space

In the case of an installation in an enclosed space (e.g. fan convector or integration in a technical product) ensure that there is sufficient air circulation to avoid overheating and condensation.

4.5 SUPPORT BRACKET

The **Mistral** humidifier can be installed on a wall with the aid of a support bracket supplied as an accessory (see "**1.6 ACCESSORIES**" ON PAGE 10).

4.5.1 Support bracket dimensions

The following illustration shows the dimensions of the optional support bracket to be used for wall mounting:

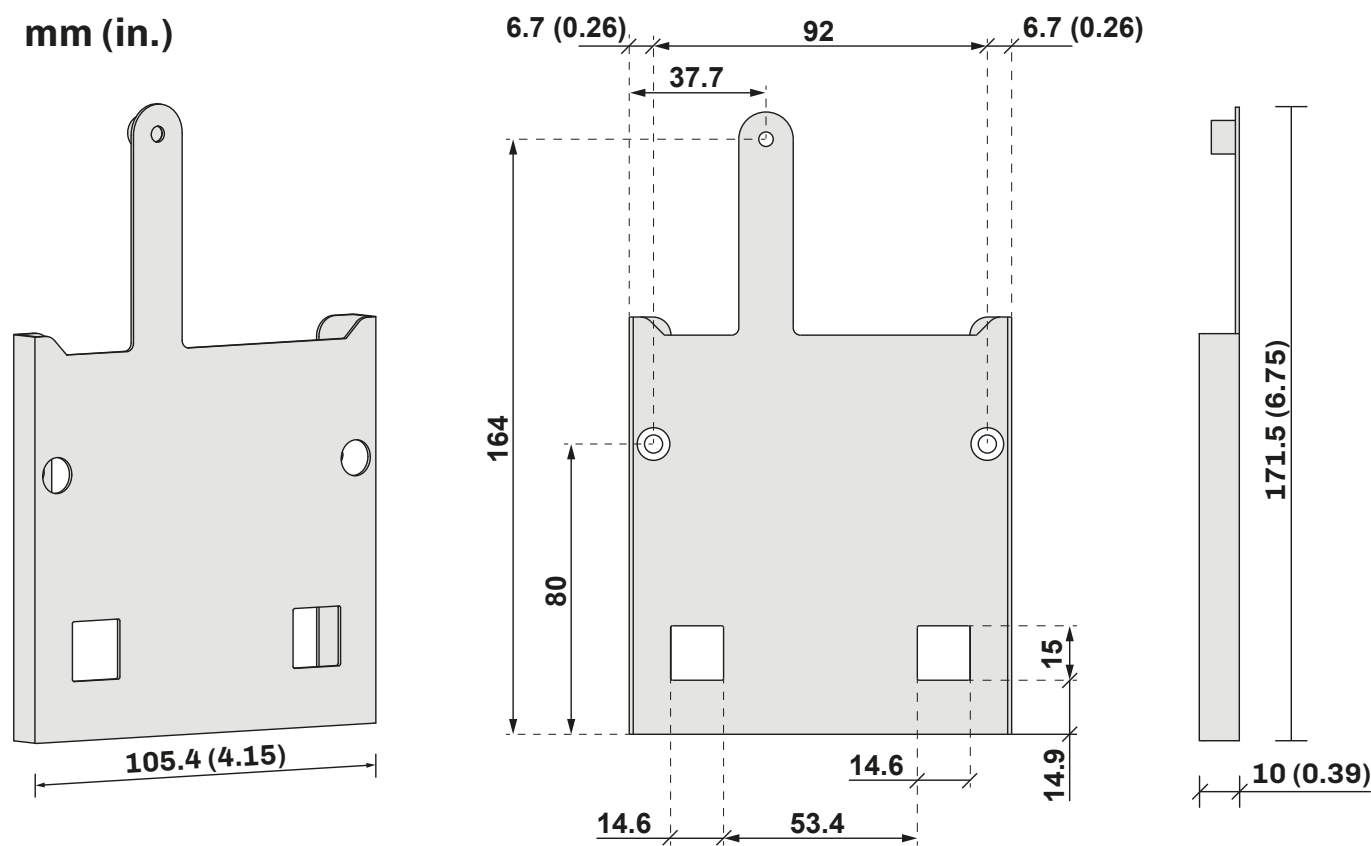


Fig. 6. Support bracket dimensions

4.5.2 Precautions for mounting with a support bracket

**⚡ ⚠ DANGER**

**RISK OF ELECTRIC SHOCK, EXPLOSION OR FIRE**

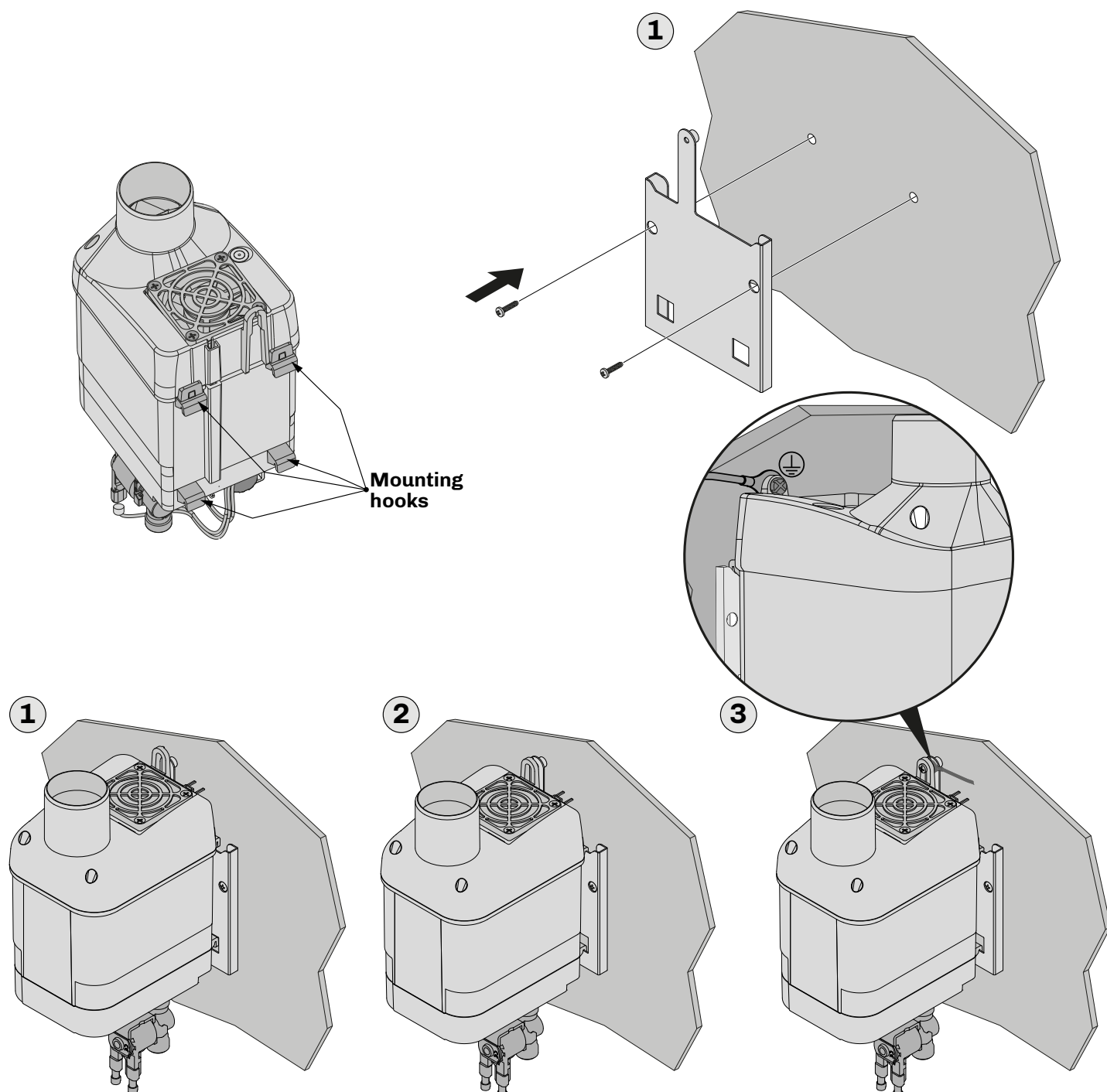
- Install the humidifier away from electronic equipment.
- Do not install the humidifier above electronic equipment.

**⚡ ⚠ DANGER**

**RISK OF ELECTRIC SHOCK**

Make sure there is an effective earth connection.

## 4.6 METHOD OF MOUNTING WITH A SUPPORT BRACKET



**Fig. 7.** Instructions for mounting with a support bracket

### Instructions

- Secure the support bracket to the wall following the instructions given in the picture "**FIG. 7. INSTRUCTIONS FOR MOUNTING WITH A SUPPORT BRACKET**" ON PAGE 19 and the dimensions of the holes and bracket given in the subsection "**4.5.1 SUPPORT BRACKET DIMENSIONS**" ON PAGE 18 (1);
- Attach the **Mistral** humidifier to the bracket, making sure it is secure (2);
- Make provision for an earthing connection via eyelet terminals between the support bracket and the humidifier;
- Secure the humidifier to the wall, where the support bracket is mounted, and the earthing connection using an **M4** flat-head screw, which is appropriate for the fixing wall (3).

4.7 METAL BOX

The **Mistral** humidifier can be installed on a wall or on a supporting base with the aid of the metal box supplied as an accessory (see "1.6 ACCESSORIES" ON PAGE 10).

4.7.1 Dimensions of metal box

The following illustration shows the dimensions of the optional metal box to be used for mounting on a wall or on a supporting base:

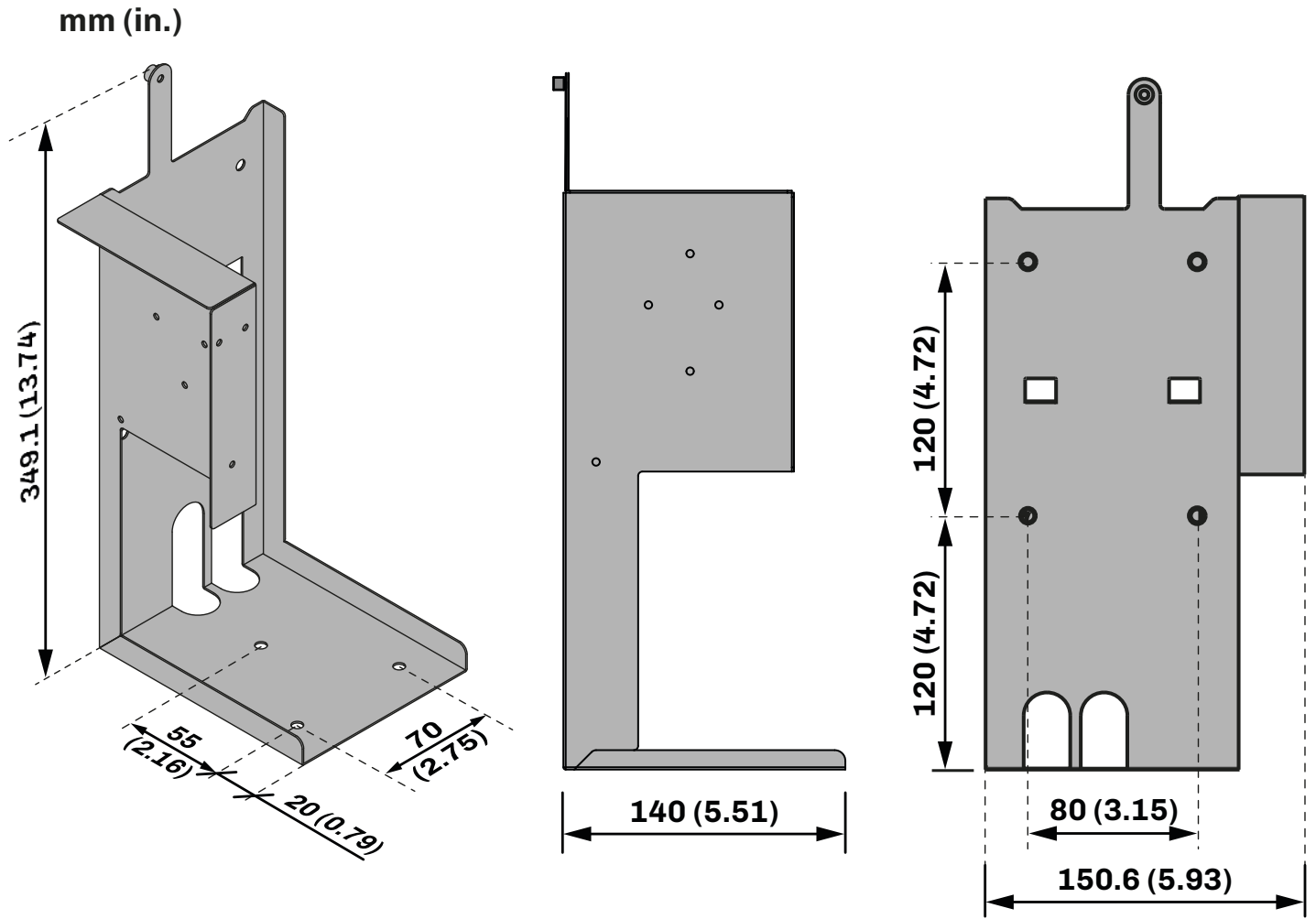


Fig. 8. Dimensions of metal box

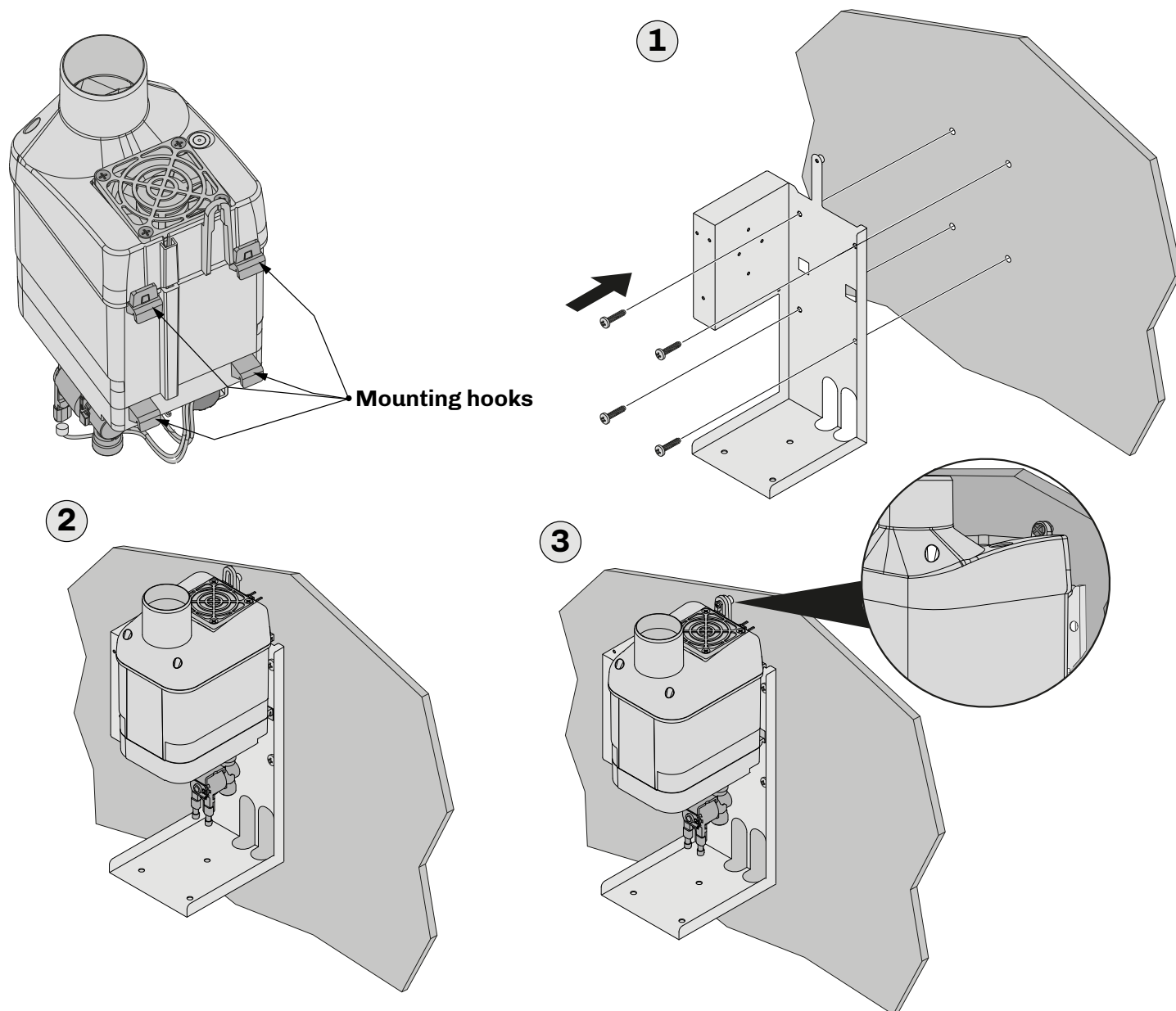
4.7.2 Precautions for mounting with metal box

<p><b>⚡ ⚠ DANGER</b></p> <p><b>RISK OF ELECTRIC SHOCK, EXPLOSION OR FIRE</b></p> <ul style="list-style-type: none"> <li>• Install the humidifier away from electronic equipment.</li> <li>• Do not install the humidifier above electronic equipment.</li> </ul>
<p><b>⚡ ⚠ DANGER</b></p> <p><b>RISK OF ELECTRIC SHOCK</b></p> <p>Make sure there is an effective earth connection.</p>

## 4.8 METHOD OF MOUNTING WITH BOX

The **Mistral** humidifier can be installed on a wall or on a supporting base with the aid of the box supplied as an accessory (see "**1.6 ACCESSORIES**" ON PAGE 10)

### 4.8.1 Installation on a wall

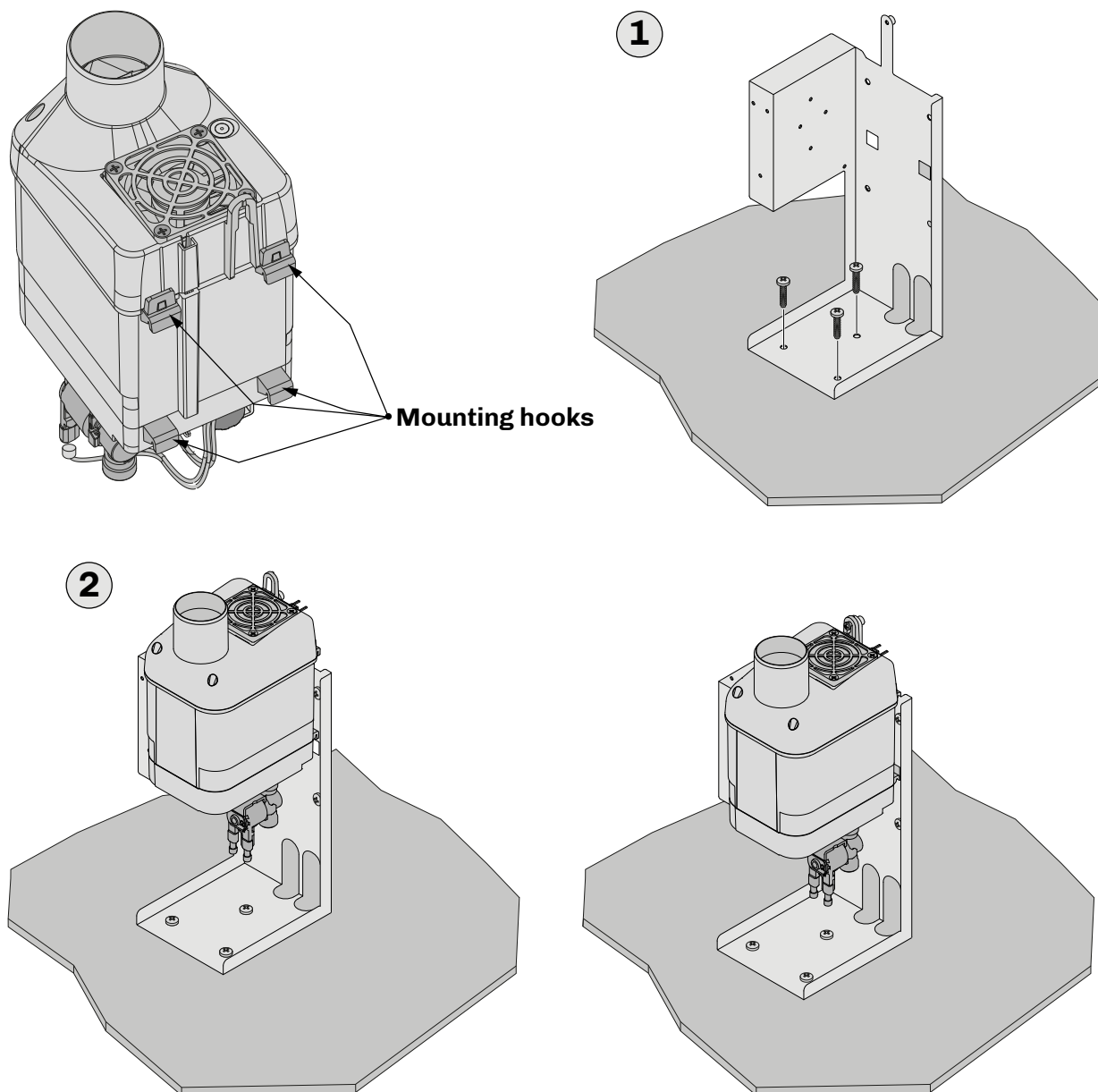


**Fig. 9.** Instructions for mounting the box on a wall

#### Instructions

- Secure the box to the wall following the instructions given in the picture "**FIG. 9. INSTRUCTIONS FOR MOUNTING THE BOX ON A WALL**" ON PAGE 21 and the dimensions of the holes and box given in the subsection "**4.3.2 DIMENSIONS OF MISTRAL WITH BOX**" ON PAGE 15 (1);
- Attach the **Mistral** humidifier to the box, making sure it is secure (2);
- Secure the humidifier to the wall where it is mounted using an M4 flat-head screw, which is appropriate for the fixing wall (3).

#### 4.8.2 Installation on a supporting base



**Fig. 10.** Instructions for mounting the box on a supporting base

##### Instructions

- Secure the box to the base following the instructions given in the picture "**FIG. 10. INSTRUCTIONS FOR MOUNTING THE BOX ON A SUPPORTING BASE**" ON PAGE 22 and the dimensions of the holes and box given in the subsection "**4.3.2 DIMENSIONS OF MISTRAL WITH BOX**" ON PAGE 15 (1);
- Attach the **Mistral** humidifier to the box, making sure it is secure (2);

## 5. HYDRAULIC INSTALLATION AND CONNECTIONS

### 5.1 HUMIDIFIER COMPOSITION

#### 5.1.1 Top and front

The top and front of the **Mistral** humidifier consists of:

- Humidity outlet;
- Fair air intake;
- LED user interface.

#### 5.1.2 Bottom

The bottom of the **Mistral** humidifier consists of

- Water outlet solenoid valve;
- Water inlet solenoid valve;
- Electrical connections.

### 5.2 HYDRAULIC INSTALLATION

For proper hydraulic installation and optimal operation of the humidifier, make provision for:

- A shut-off tap;
- A pressure reducer (if the mains pressure exceeds 1 MPa (10 bar)).

**NOTE:** If using a pressure reducer, make sure it is effective and does not cause any 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).

#### 5.2.1 Water specifications

##### OPTIMAL OPERATING CHARACTERISTICS

- Water pressure of 0.02...1 MPa (0.2...10 bar) with an assured minimum flow rate of 1 l/min;
- Inlet water temperature between 1...40 °C (33.8...104 °F) inclusive;
- Conductivity between 0...100 µS/cm inclusive;
- Maximum water hardness between 0...5 °f.

**NOTE:** Using inlet water with the above characteristics fosters reduced maintenance frequency.

##### GENERAL OPERATING CHARACTERISTICS

- Water pressure of 0.02...1 MPa (0.2...10 bar) with an assured minimum flow rate of 1 l/min;
- Inlet water temperature between 1...40 °C (33.8...104 °F) inclusive;
- Conductivity between 0...1250 µS/cm inclusive;
- Maximum water hardness between 0...40 °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.
- Periodically check the state of repair of the JG connection of the inlet solenoid valve (see "**10.2 PERIODICALLY CHECKING THE STATUS OF THE HUMIDIFIER**" ON PAGE 51).

##### What should you **NOT** do?

- Do not use well water or water with a hardness greater than 40 °f;

#### NOTICE

##### MALFUNCTIONING OF THE EQUIPMENT

- Do not use well water.
- Once the humidifier has been installed, let the remaining water in the pipes flow out to prevent the inlet solenoid valve 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.

**NOTE:** In the case of particularly hard water, you can purchase the optional demineralization KIT **EHRO012**.

5.3 WATER DRAINAGE SYSTEM

**NOTICE**

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

5.3.1 Connection specifications

- Minimum diameter 10...12 mm (0.39...0.47 in.);
- A minimum average slope of 45° and no siphons.

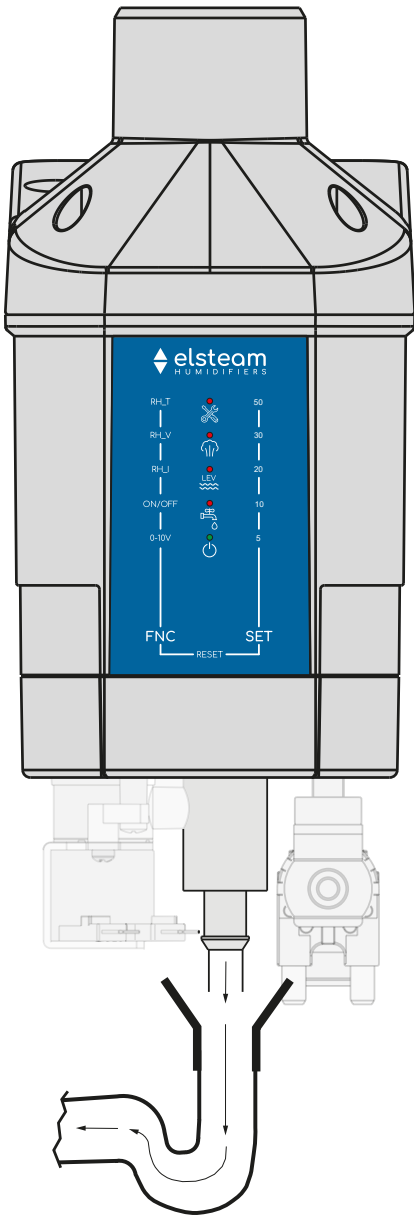


Fig. 11. Outlet and drain pipe characteristics

To eliminate any debris and/or residues/process substances, flush out the water supply lines.

**NOTICE**

**MALFUNCTIONING OF THE EQUIPMENT**  
After installation, flush out the water supply line, directing the water directly into the outlet without introducing it into the humidifier.

5.3.2 Drain water

As the drain water is non-toxic and non-contaminated, it can be drained into the clean water collection system, as defined by local, regional and national regulations and standards in force.

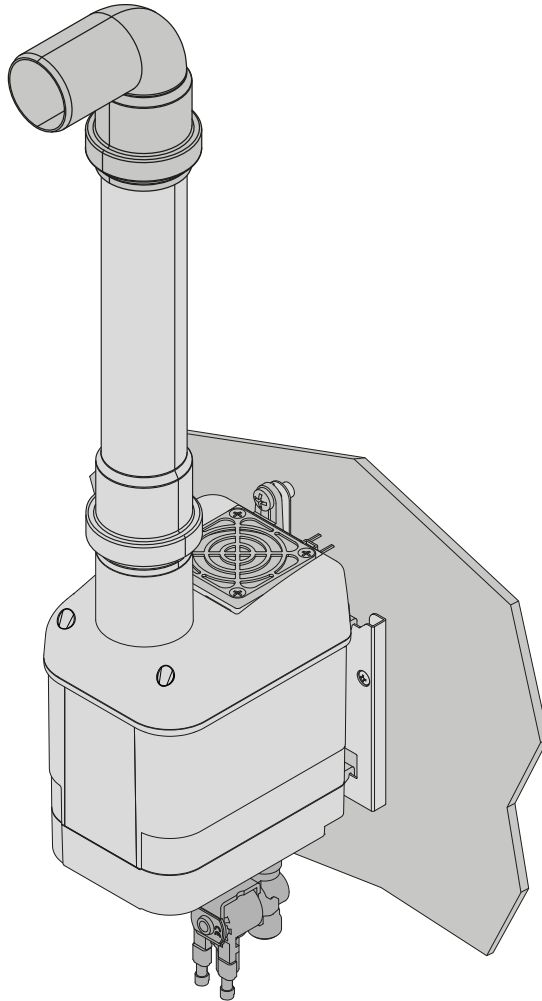
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## 5.4 AEROSOLIZED WATER DISTRIBUTION

The aerosolized water can be distributed via:

- Vertical distribution kit;
- Conveyor;

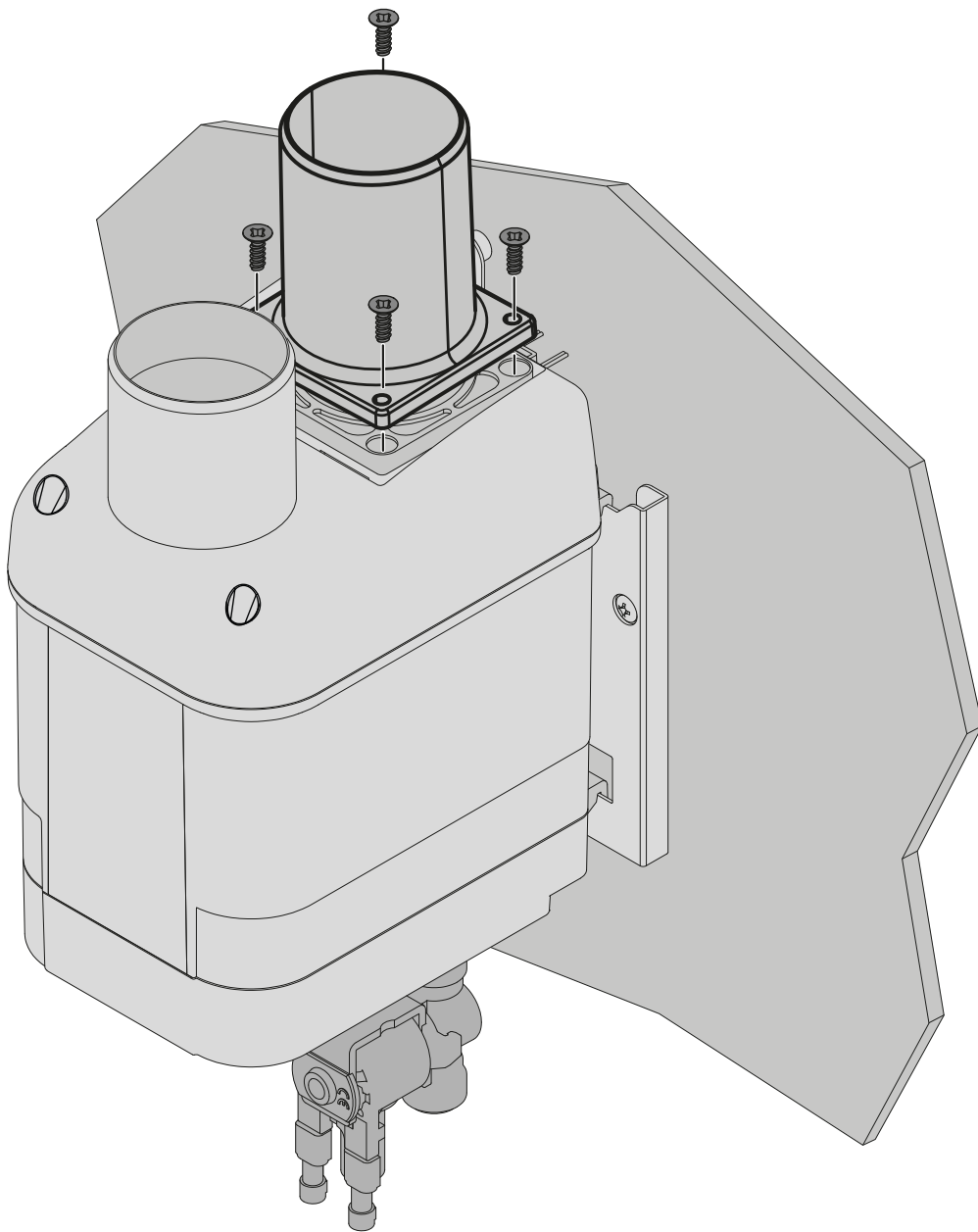
### 5.4.1 Vertical distribution kit



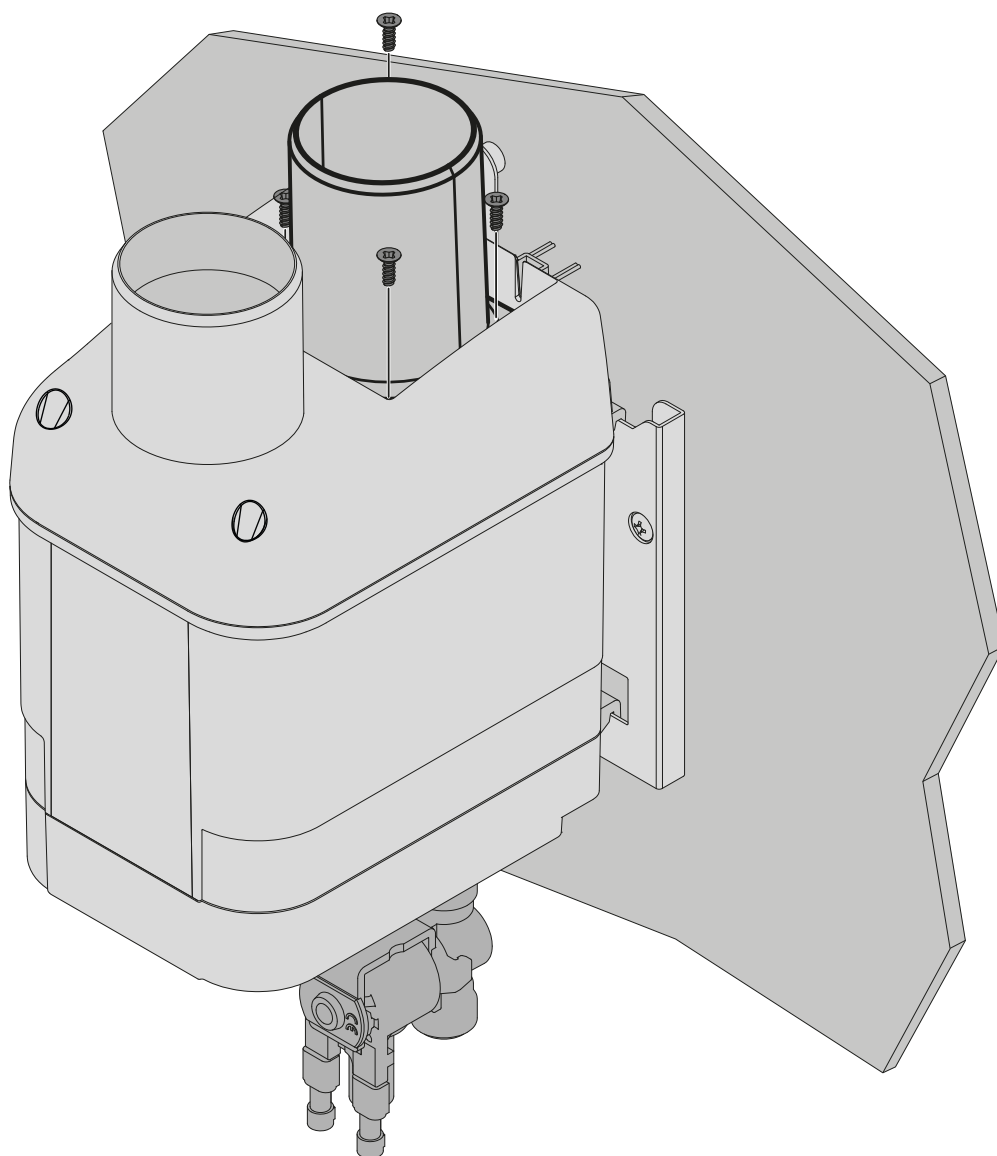
**Fig. 12.** Vertical distribution kit

### 5.4.2 Intake conveyor

With fan

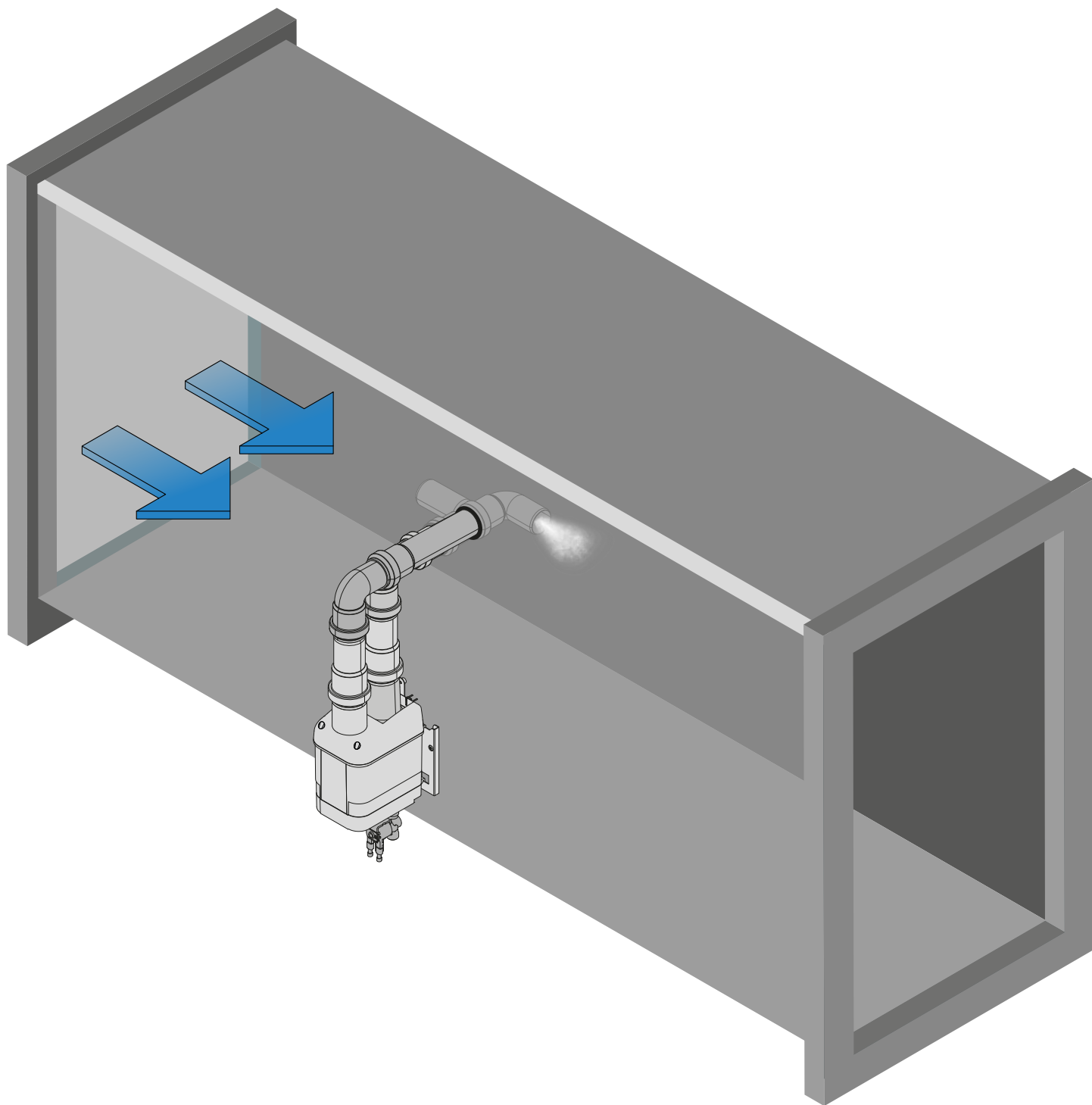


**Fig. 13.** Conveyor with fan



**Fig. 14.** Conveyor without fan

### 5.4.3 Pipe installation example



**Fig. 15.** Pipe installation example

## 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 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, 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.
- 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 modify the product.
- Do not expose the equipment to liquids or chemicals.
- Make sure there is an effective earth connection; if there is not, earth the equipment.
- Before powering up the equipment, check all the 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 of a cross-section suited to the voltage and current requirements.

#### **DANGER**

##### **LOOSE WIRING CAUSES ELECTRIC SHOCKS AND OVERHEATING**

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

#### **WARNING**

##### **REGULATORY INCOMPATIBILITY**

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

## 6.2.2 Wiring guidelines

When wiring the controllers, observe the following standards:

- The I/O and communication wiring must be kept separate from the power supply wiring. These two types of wiring must be routed in separate ducts.
- Make sure the operating environment and conditions fall within the specified values.
- Use wires with the correct diameter, suited to the voltage and current requirements.
- Use copper conductors (compulsory).
- Use shielded twisted pair cables for analogue/digital I/O connections.

Use correctly earthed shielded cables for all analogue inputs and for communication connections. If shielded cables are not used for these connections, electromagnetic interference may cause signal degradation.

Degraded signals can result in unpredictable operation of the controller or the modules and connected equipment.

### ⚠ WARNING

#### MALFUNCTIONING OF THE EQUIPMENT

- Perform the wiring carefully and in compliance with electromagnetic compatibility and safety requirements.
- 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.).

## 6.2.3 Guidelines for screw terminal blocks

### Suitable wiring for the power supply

### ⚡ ⚠ 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.

Step 5.08 mm (0.199 in.)

											N•m	0.5...0.6
mm <sup>2</sup>	0.2...2.5	0.2...2.5	0.25...2.5	0.25...2.5	2 x 0.2...1	2 x 0.2...1.5	2 x 0.25...1	2 x 0.5...1.5	Ø 3.5 mm (0.14 in.)		lb-in	4.42...5.31
AWG	24...14	24...14	22...14	22...14	2 x 24...18	2 x 24...16	2 x 22...18	2 x 20...16				

Fig. 16. Suitable wiring for the power supply

### Suitable wiring for I/O SELV

Step 3.5 mm (0.137 in.)

											N•m	0.5...0.6
mm <sup>2</sup>	0.14...1.5	0.14...1.5	0.25...1.5	0.25...0.5	2 x 0.08...0.5	2 x 0.08...0.5	2 x 0.25...0.34	2 x 0.5...0.5	Ø 3.5 mm (0.14 in.)		lb-in	4.42...5.31
AWG	25...15	25...15	22...15	22...20	2 x 28...20	2 x 28...20	2 x 23...21	2 x 20...20				

Fig. 17. Suitable wiring for I/O SELV

## 6.2.4 Permitted cable lengths

### NOTICE

#### MALFUNCTIONING OF THE EQUIPMENT

- When connecting the power supply, use cables that are no longer than 10 m (32.80 ft.).
- When connecting the sensors, digital inputs and analogue inputs, use cables that are no longer than 10 m (32.80 ft.).
- When connecting the RS-485 serial line, use cables that are no longer than 1000 m (3280 ft.).
- When connecting the digital outputs, use cables that are no longer than 10 m (32.80 ft.).

6.3 WIRING DIAGRAM

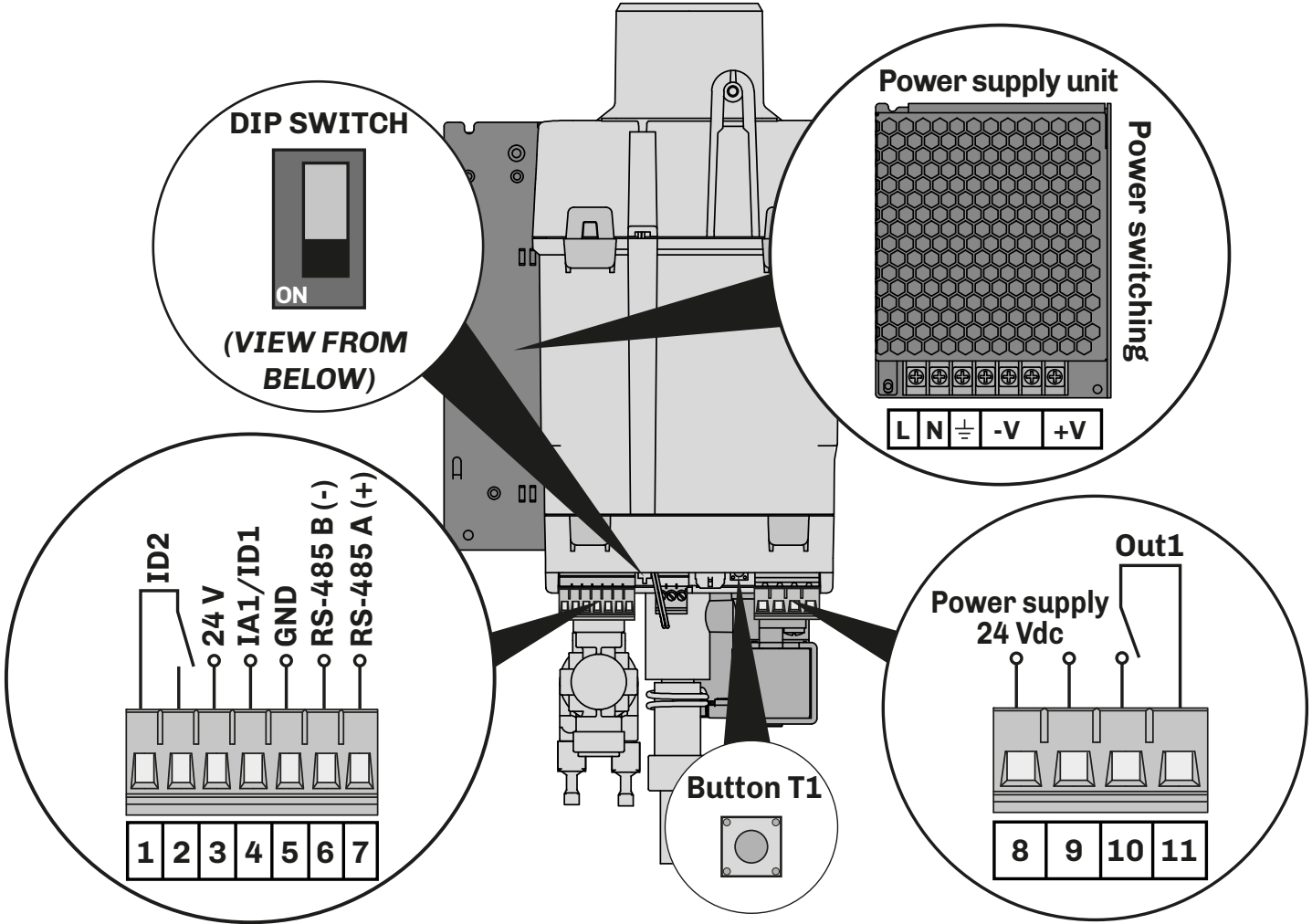


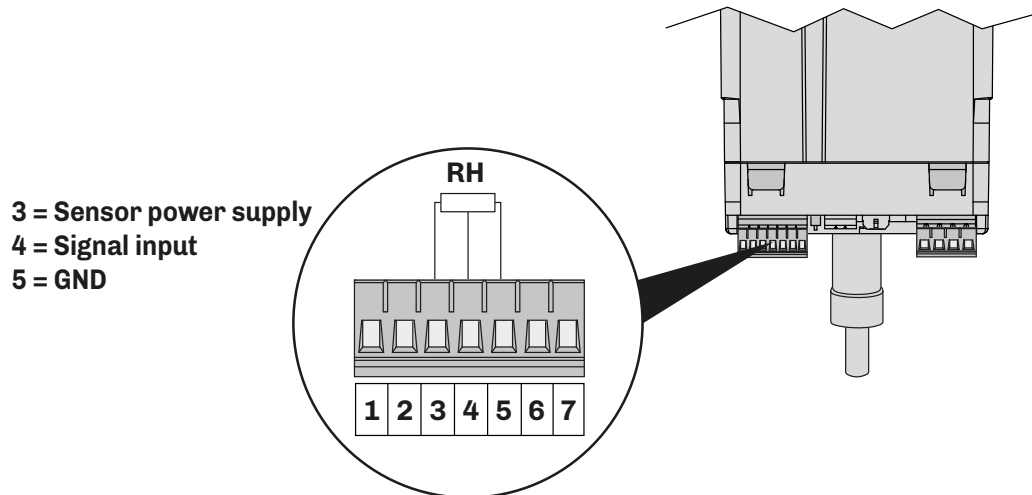
Fig. 18. Mistral humidifier connections

TERMINALS			
L	Phase power supply input (power supply unit)	4-5	Multifunction input <b>IA1/ID1</b>
N	Neutral power supply input (power supply unit)	6-7	Serial communication input <b>RS-485</b>
⏏	Ground power supply input (power supply unit)	8-9	Power supply input 24 Vdc from power supply unit
-V	GND power supply output (power supply unit)	10-11	Digital output <b>Out1</b>
+V	+24 Vdc power supply output (power supply unit)	DIP Switch	Activation of RS-485 serial line termination resistor (120 Ω)
1-2	Digital input enable consent <b>ID2</b>	T1	Reset button for partial Mist-maker operating hours
3	Auxiliary power supply <b>24 V</b> (transducers)		

## 6.4 CONFIGURATIONS

### 6.4.1 Resistive humidity sensor connection

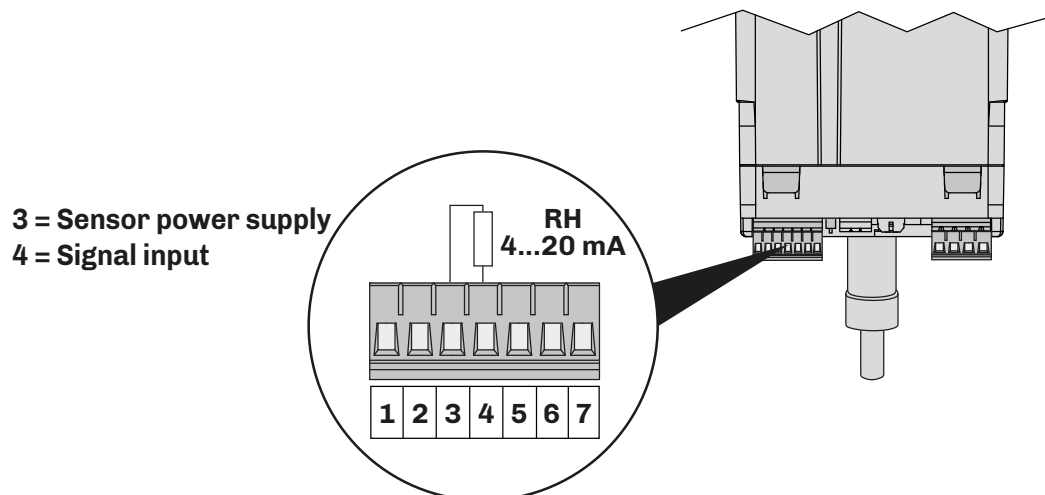
- Stand-alone configuration **CFG = 4**,
- Parallel configuration as master **CFG = 9**.



**Fig. 19.** Resistive humidity sensor connection

### 6.4.2 Humidity sensor connection 4...20 mA

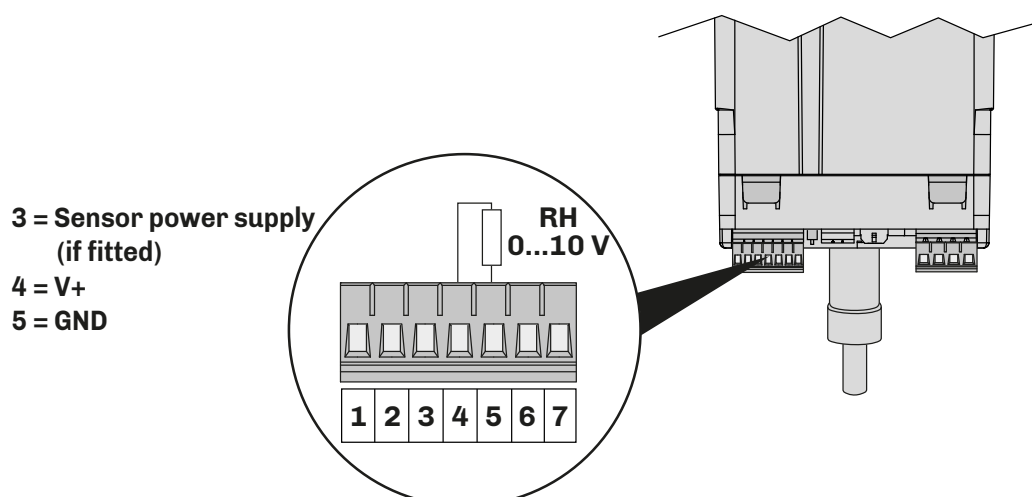
- Stand-alone configuration **CFG = 2**,
- Parallel configuration as master **CFG = 7**.



**Fig. 20.** Humidity sensor connection 4...20 mA

### 6.4.3 Humidity sensor connection 0...10 V

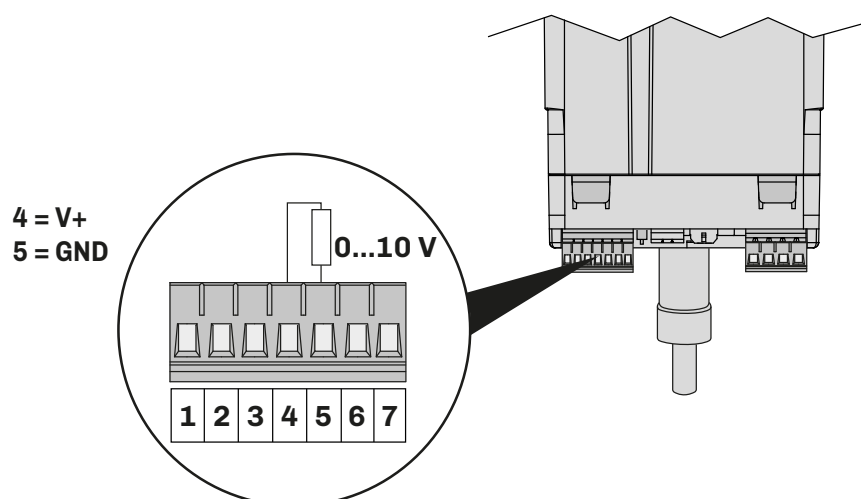
- Stand-alone configuration **CFG = 3**,
- Parallel configuration as master **CFG = 8**.



**Fig. 21.** Humidity sensor connection 0...10 V

### 6.4.4 External proportional humidistat connection with signal 0...10 V

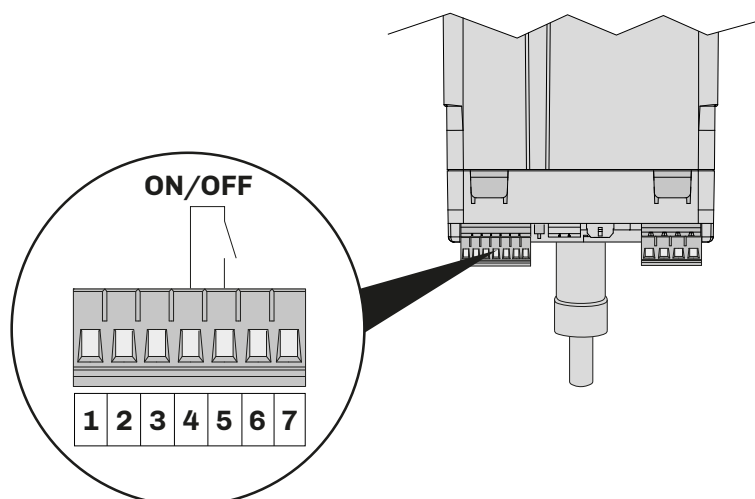
- Stand-alone configuration **CFG = 1**,
- Parallel configuration as master **CFG = 6**.



**Fig. 22.** External proportional regulator connection with signal 0...10 V

### 6.4.5 ON/OFF connection with humidistat or external contact

- Stand-alone configuration **CFG = 0**;
- Parallel configuration as master **CFG = 5**.



**Fig. 23.** ON/OFF connection with humidistat or external contact

## 7. USER INTERFACE

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 MISTRAL USER INTERFACE

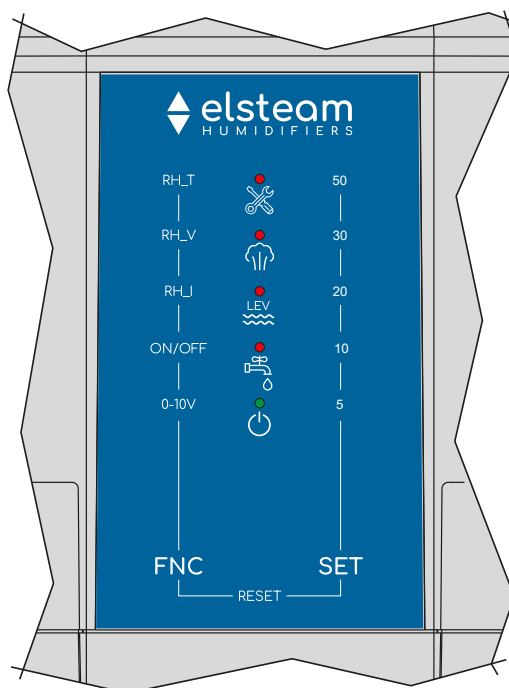


Fig. 24. LED user interface

#### 7.1.1 LED

LED	Function	Description
	Alert LED	<b>Lit steadily:</b> Level sensor board alert
		<b>Blinking:</b> It indicates an alert according to the number of blinks (see "14.1 ALERTS TABLE (LED INTERFACE)" ON PAGE 60)
		<b>OFF:</b> In all other cases
	High/low humidity LED	<b>Lit steadily:</b> Analogue input on alert
		<b>Blinking:</b> <b>0.5 s ON / 0.5 s OFF:</b> High humidity alert if <b>CFG = 2, 3, 4, 7, 8, 9</b> <b>1 s ON / 1 s OFF:</b> Low humidity alert if <b>CFG = 2, 3, 4, 7, 8, 9</b>
		<b>OFF:</b> In all other cases
	Level sensor Alert LED	<b>Lit steadily:</b> Level sensor alert
		<b>Blinking:</b> It indicates a warning according to the number of blinks (see "14.1 ALERTS TABLE (LED INTERFACE)" ON PAGE 60)
		<b>OFF:</b> In all other cases
	Water Alert LED	<b>Lit steadily:</b> Filling procedure failed
		<b>Blinking:</b> <b>3 s ON / 3 s OFF:</b> Water below minimum level for activating mist-maker <b>0.5 s ON / 0.5 s OFF:</b> If, after draining, the sensors still detect water
		<b>OFF:</b> In all other cases
	Power Supply LED	<b>Lit steadily:</b> Mist-maker ON and humidifier produces humidity
		<b>Blinking:</b> <b>0.5 s ON / 0.5 s OFF:</b> Humidity enable consent <b>ID2</b> not given <b>1 s ON / 3 s OFF:</b> Mistral produces no humidity
		<b>OFF:</b> Humidifier not powered

#### 7.1.2 Keys

Keys	Tap and release to...	Tap and hold for at least 1 second to...	Tap and hold for at least 4 seconds to...
<b>FNC</b>	Change fan speed	During lamp test: enter the operating mode configuration menu	Start reservoir emptying
<b>SET</b>	---	Humidity setpoint setting	Change maximum humidity production

## 7.2 EV3K USER INTERFACE

EV3K is available as an accessory completing the range of **Mistral** humidifiers (see "**1.6 ACCESSORIES**" ON PAGE 10).



Fig. 25. EV3K user interface

### 7.2.1 Icons

Icon	Lit steadily	OFF
1	Display shows the humidity sensor value on the top row	In all other cases
☁	Humidity production in progress	No humidity production
∧	Proportional operating mode (CFG = 1 or CFG = 6)	In all other cases
∩	ON/OFF operating mode (CFG = 0 or CFG = 5)	In all other cases
V	0...10 V sensor operating mode (CFG = 3 or CFG = 8)	In all other cases
I	4...20 mA sensor operating mode (CFG = 2 or CFG = 7)	In all other cases
R	Resistive sensor operating mode (CFG = 4 or CFG = 9)	In all other cases
°C	Display shows temperature in °C	In all other cases
%	Display shows humidity in %	In all other cases
⌚	Displayed value is operating hours (fan or mist-maker)	In all other cases
⚠	Alert warning in progress	No alert in progress
μS	Changing value of P1 in progress	In all other cases
⚠	Warning in progress	No warning in progress
🔒	ID2 closed (humidity consent present)	ID2 open (humidity consent not provided)
SP	Changing humidity setpoint in progress	In all other cases

### 7.2.2 Touch keys

The touch key functions are described below:

Keys...	Tap and release to...	Tap and hold for at least 3 seconds to...
🔒 SET	<ul style="list-style-type: none"> <li>Confirm the values on the display</li> <li>Set/change the humidity setpoint</li> </ul>	Enter the parameters menu
⏻	Go back a level	---
FNC ✓	<ul style="list-style-type: none"> <li>Scroll down through the values</li> <li>Navigate within the menu</li> </ul>	Go to the maintenance and reset operating hours menu
^	<ul style="list-style-type: none"> <li>Scroll up through the values</li> <li>Navigate within the menu</li> </ul>	---

### 7.2.3 Main view

Depending on the chosen operating mode (CFG) the display has a different main view. The main views according to the configured operating mode are shown below:

#### ON/OFF mode operation



Fig. 26. ON/OFF operation - ID1 and ID2 open

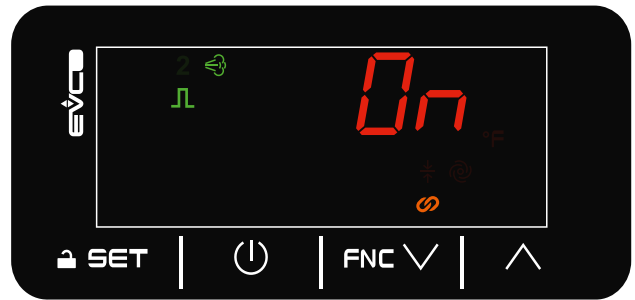


Fig. 27. ON/OFF operation - ID1 and ID2 closed

#### Proportional mode operation



Fig. 28. Proportional operation - ID1 and ID2 open

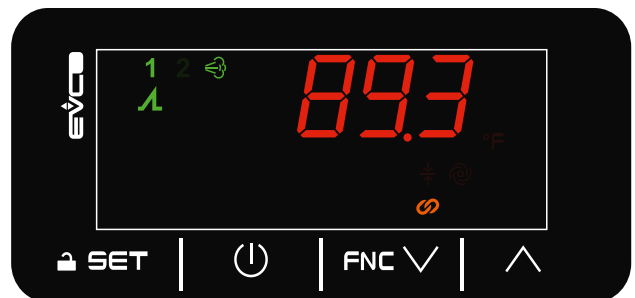


Fig. 29. Proportional operation - ID1 and ID2 closed

With ID2 closed, the top row of the display shows the read value of the 0...10 V input signal, while the bottom row is off.

#### Operation with sensor

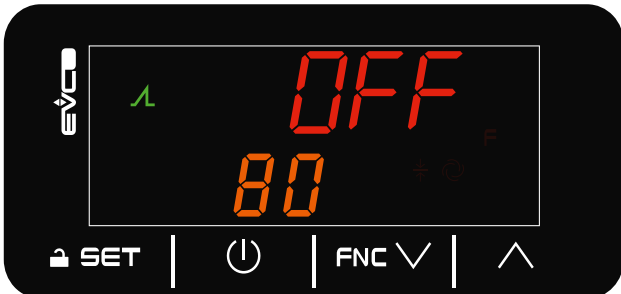


Fig. 30. Proportional operation - ID1 and ID2 open

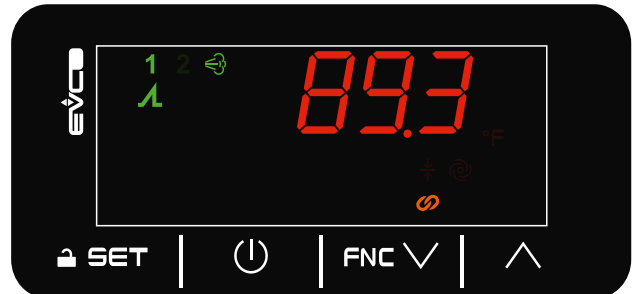


Fig. 31. Proportional operation - ID1 and ID2 closed

With ID2 closed, the top row of the display shows the value of the connected sensor, while the bottom row shows the setpoint value (SP).

In addition, depending on the type of sensor connected and therefore the operating mode with the chosen sensor, a corresponding icon will come on, as described in the subsection "7.2.1 ICONS" ON PAGE 35.

### 7.2.4 Setting and changing the setpoint

#### If CFG=0, 1, 5, 6, 10

Setpoint not configurable.

#### If CFG= 2, 3, 4, 7, 8, 9

In the main view, to change the setpoint, tap and release the **SET** button. The value on the bottom row of the display will blink to indicate that you can make the change by scrolling with the **FNC**  $\nabla$  or  $\wedge$  buttons. Tap the **SET** button to confirm the desired value.





## 7.2.5 Maintenance menu

In the maintenance menu, you can view:

- The value read by the connected sensor;
- The value read by the on-board NTC sensor;
- The statuses of the digital inputs **ID1** and **ID2**;
- The fan speed;
- The operating hours of the mist-maker;
- The operating hours of the fan;
- The state of the outputs:
  - Mist-maker;
  - Fan;
  - Inlet solenoid valve;
  - Outlet solenoid valve;
  - Digital output **UD1**.
- Any alerts in progress.

## 7.2.6 Maintenance parameters

The following is a table with the labels shown on the display and their description:

Top row	Bottom row	Description
Pb1 sensor value	<b>Pb1</b>	If sensor Pb1 is connected, the value read by the sensor is displayed.
Pb2 sensor value	<b>Pb2</b>	If sensor Pb2 is connected, the value read by the sensor is displayed.
Status <b>ID1</b>	<b>di1</b>	If connected, the status of the digital input <b>ID1</b> is displayed. <b>CLo</b> = <b>ID1</b> closed; <b>OPn</b> = <b>ID1</b> open.
Status <b>ID2</b>	<b>di2</b>	If connected, the status of the digital input <b>ID2</b> is displayed. <b>CLo</b> = <b>ID2</b> closed; <b>OPn</b> = <b>ID2</b> open.
Value <b>F0</b>	<b>FAn</b>	The <b>F0</b> (fan speed) parameter configuration value is displayed.
Value <b>r6</b>	<b>PrM</b>	The <b>r6</b> (maximum steam production) parameter configuration value is displayed.
Mist-maker hours	<b>MH</b>	The operating hours of the mist-maker are displayed if $\leq 9999$ h
Mist-maker hours	<b>MHH</b>	If the mist-maker operating hours are $> 9999$ , the operating hours data is divided according to the following logic: $(\text{MHH} \times 1000) + \text{MHL}$ . For example: <b>MHH</b> = 1; <b>MHL</b> = 2956 $\rightarrow (1 \times 1000) + 2956 = 12956$ h
Mist-maker hours	<b>MHL</b>	If the mist-maker operating hours are $> 9999$ , the operating hours data is divided according to the following logic: $(\text{MHH} \times 1000) + \text{MHL}$ . For example: <b>MHH</b> = 1; <b>MHL</b> = 2956 $\rightarrow (1 \times 1000) + 2956 = 12956$ h
0	<b>rMH</b>	Resets the mist-maker operating hours. Tap the  <b>SET</b> key, enter the password value 149 using the <b>FNC</b> $\vee$ or $\wedge$ keys, tap  <b>SET</b> to confirm the reset. On the top row "—" blinks for 3 seconds after which 0 is displayed indicating that the reset has been accomplished.
Fan hours	<b>FH</b>	The operating hours of the fan are displayed if $\leq 9999$ h
Fan hours	<b>FHH</b>	If the fan operating hours are $> 9999$ , the operating hours data is divided according to the following logic: $(\text{MHH} \times 1000) + \text{MHL}$ . For example: <b>MHH</b> = 1; <b>MHL</b> = 5894 $\rightarrow (1 \times 1000) + 5894 = 15894$ h
Fan hours	<b>FH L</b>	If the fan operating hours are $> 9999$ , the operating hours data is divided according to the following logic: $(\text{MHH} \times 1000) + \text{MHL}$ . For example: <b>MHH</b> = 1; <b>MHL</b> = 5894 $\rightarrow (1 \times 1000) + 5894 = 15894$ h
0	<b>RFH</b>	Resets the fan operating hours. Tap the  <b>SET</b> key, enter the password value 149 using the <b>FNC</b> $\vee$ or $\wedge$ keys, tap  <b>SET</b> to confirm the reset. On the top row "—" blinks for 3 seconds after which 0 is displayed indicating that the reset has been accomplished.
Mist-maker output status	<b>OM</b>	The mist-maker output status is displayed. <b>OFF</b> = Mist-maker output OFF; <b>ON</b> = Mist-maker output ON.
Fan output status	<b>oF</b>	The fan output status is displayed. <b>OFF</b> = Fan output OFF; <b>ON</b> = Fan output ON.

Top row	Bottom row	Description
Inlet solenoid valve status	oi	The inlet solenoid valve status is displayed. <b>OFF</b> = Inlet solenoid valve output OFF; <b>ON</b> = Inlet solenoid valve output ON.
Outlet solenoid valve status	od	The outlet solenoid valve status is displayed. <b>OFF</b> = Outlet solenoid valve output OFF; <b>ON</b> = Outlet solenoid valve output ON.
Digital output status <b>UD1</b>	or	The <b>UD1</b> digital output status is displayed. <b>OFF</b> = <b>UD1</b> digital output OFF; <b>ON</b> = <b>UD1</b> digital output ON.

7.2.7 Accessing the parameters menu

User parameters

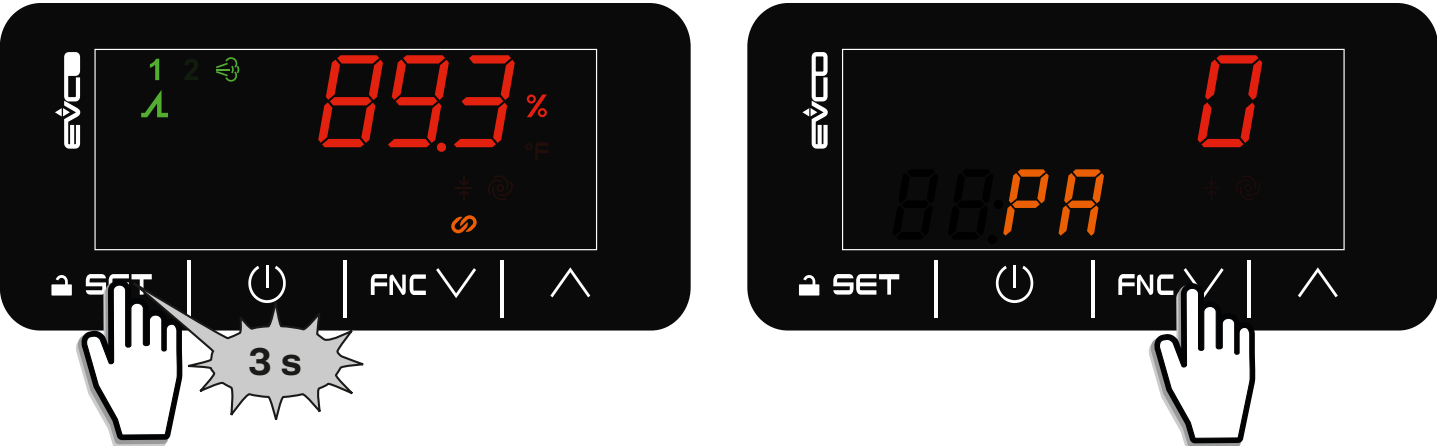


Fig. 32. Accessing the user parameters menu

Maintenance engineer parameters

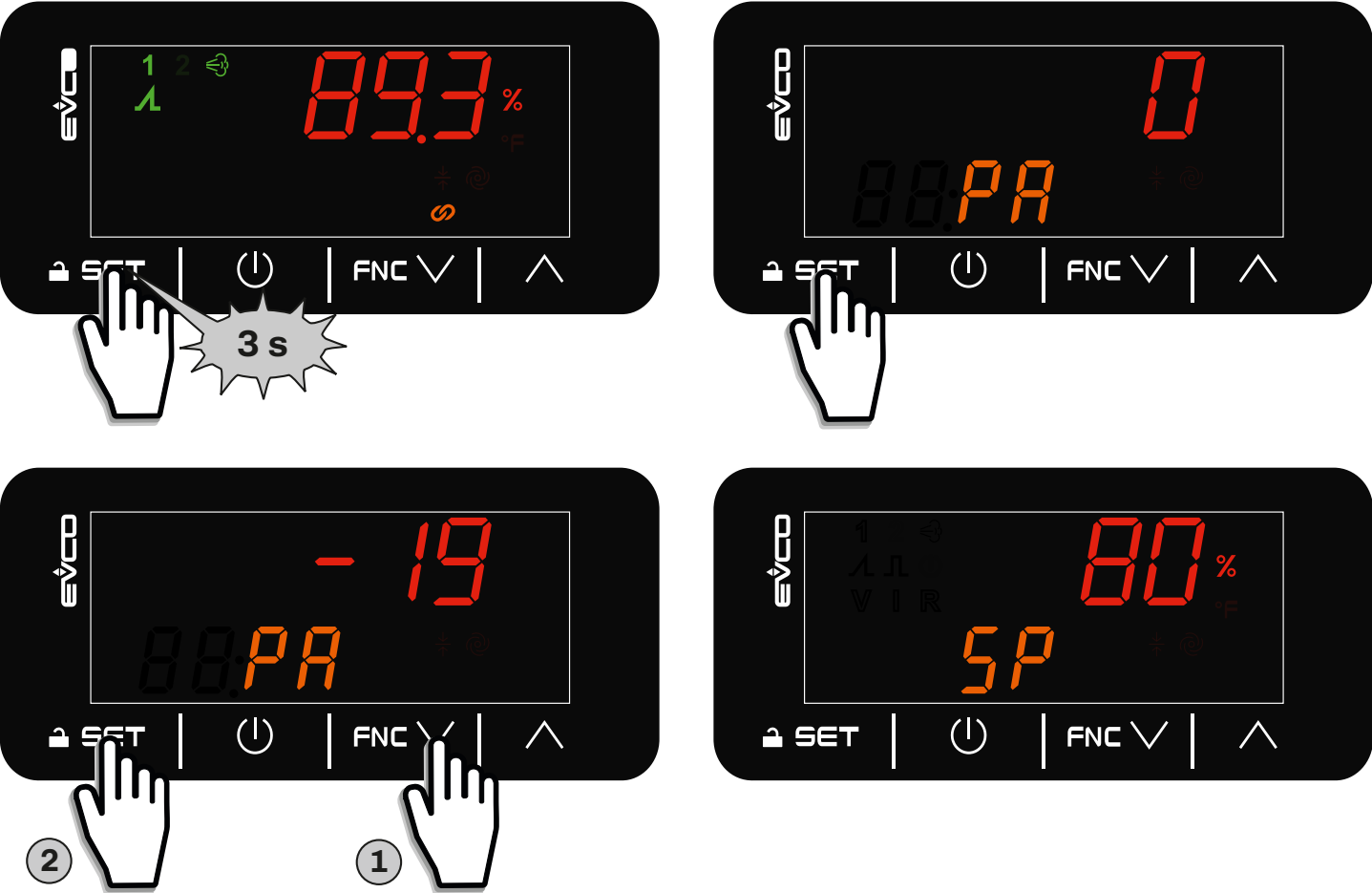


Fig. 33. Accessing the maintenance engineer parameters menu

7.2.8 Changing fan speed

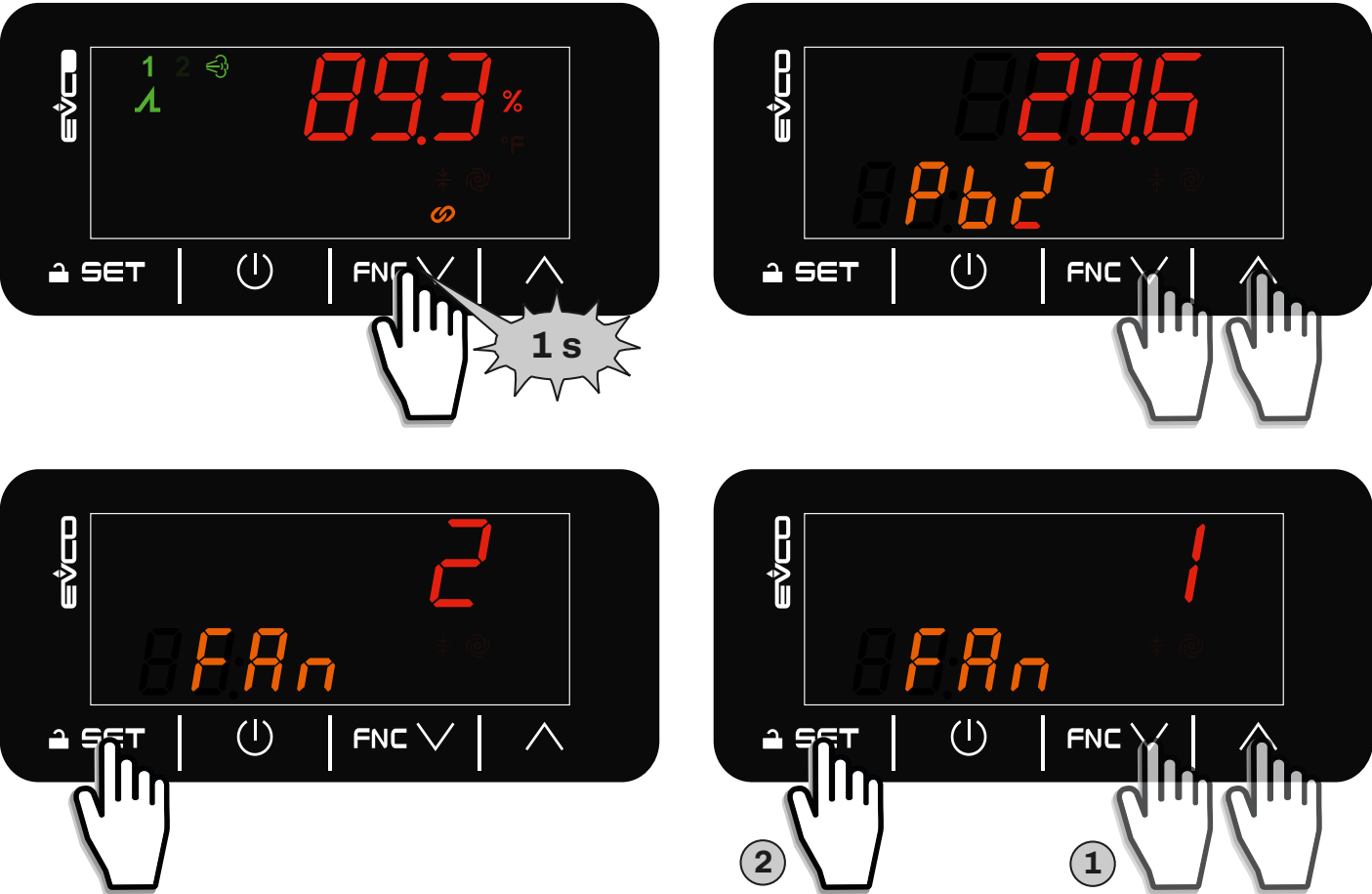


Fig. 34. Changing fan speed

7.2.9 Maximum humidity production configuration

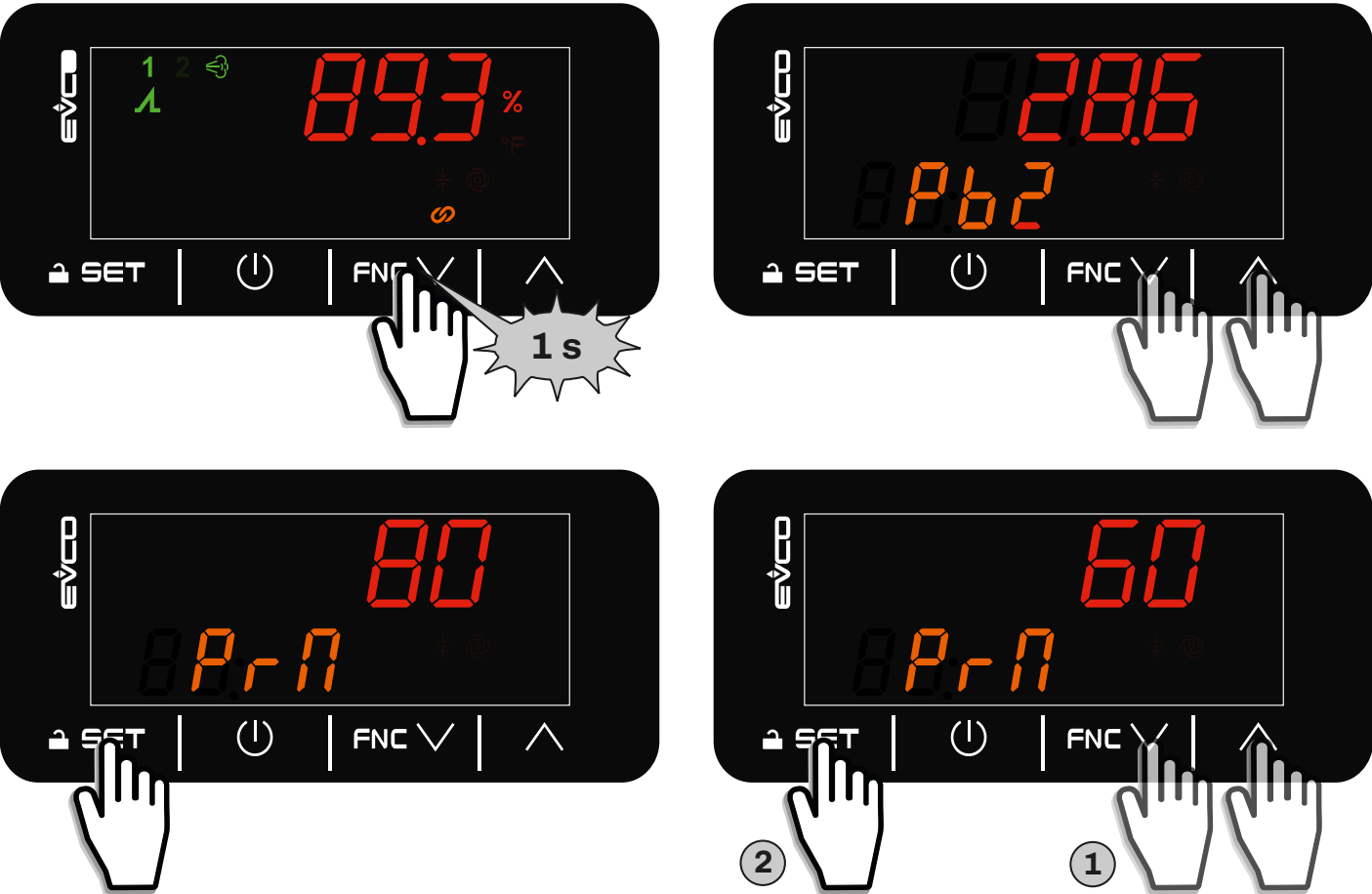


Fig. 35. Changing fan speed

## 8. FIRST POWER-UP AND START-UP

### 8.1 INTRODUCTION

#### **DANGER**

##### **RISK OF ELECTRIC SHOCK 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 powering up the equipment, check all the 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 humidity outlet closure clamps are properly tightened.
- Make sure there are no pockets of condensate or throttling in the mist (humidity) delivery channel.

### 8.2 SWITCHING ON THE HUMIDIFIER

To start up the humidifier follow the instructions given in the table below.

Instructions	References
1. Do the wiring for the humidifier according to the required configuration	"6.3 WIRING DIAGRAM" ON PAGE 31
2. Activate the isolator installed outside the humidifier and open the water supply source	"6. ELECTRICAL CONNECTIONS" ON PAGE 29
3. Open the water inlet shutoff cock upstream of the humidifier	"5.2 HYDRAULIC INSTALLATION" ON PAGE 23
4. The humidifier will start a water draining and filling cycle	"9. OPERATION" ON PAGE 41
5. Set the <b>CFG</b> parameter depending on the required mode of operation.	• "9.2 OPERATING MODE CONFIGURATION" ON PAGE 41 • "12.1 TABLE OF ADJUSTMENT PARAMETERS" ON PAGE 55
6. Configure the machine parameters according to the characteristics of the water and usage of the humidifier	"12.1 TABLE OF ADJUSTMENT PARAMETERS" ON PAGE 55
7. Set the humidity setpoint to 100%	"9.4 HUMIDITY SETPOINT CONFIGURATION" ON PAGE 44
8. Check for humidity production	"9.7 HUMIDITY ADJUSTMENT" ON PAGE 47
9. Set the humidity setpoint to the desired value	"7.2.4 SETTING AND CHANGING THE SETPOINT" ON PAGE 36
10. The humidifier periodically (parameter <b>C1</b> ) fully drains the water and replaces it cyclically, performing the washing procedure, in order to maintain efficient humidifier operating conditions	"9.1 DRAINING WATER / WASHING RESERVOIR" ON PAGE 41

### 8.3 CHECKS TO BE CARRIED OUT EACH TIME THE HUMIDIFIER IS SWITCHED ON

Each time the humidifier is turned on, perform the following checks:

1. Check that the mist delivery is consistent with the demand for humidity;
2. Make sure there are no hydraulic leaks;
3. Check that there are no alerts in progress (see alerts table).

## 9. OPERATION

### 9.1 DRAINING WATER / WASHING RESERVOIR

The water reservoir can be emptied in the following cases:

- When powering up;
- After an idle time determined by parameter **C0** (if **C0**  $\neq$  0);
- After an active time determined by parameter **C1** (if **C1**  $\neq$  0);
- In the case of the first high temperature alert event (parameters **A1** and **A2**);
- In the case of maintenance, manual emptying is initiated by pressing and holding the **FNC** button for at least 4 seconds.

In the case of emptying the reservoir due to inactivity, the **Mistral** humidifier will run the fan for a time **F5** to dry the reservoir. If there is a demand for humidity, the humidifier will fill the reservoir.

At the end of each emptying phase, the drain valve is kept open for another 2 seconds.

### 9.2 OPERATING MODE CONFIGURATION

When powering up, while the LEDs are blinking, press the **FNC** button for at least 1 second to enter the analogue input configuration menu.

Press the **FNC** button again until the desired operating mode configuration is selected and press the **SET** button to confirm your choice.

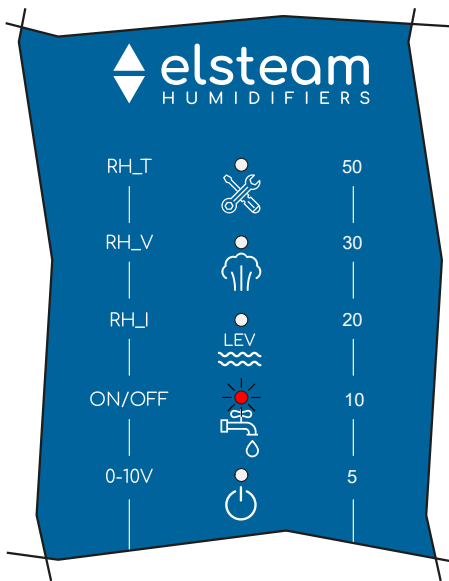
Par.	Description	MU	Range
<b>CFG</b>	Operating mode. <b>0</b> = Stand-alone, ON/OFF operation, alert relay; <b>1</b> = Stand-alone, proportional operation, alert relay; <b>2</b> = Stand-alone, operation with 4...20 mA sensor, alert relay; <b>3</b> = Stand-alone, operation with 0...10 V sensor, alert relay; <b>4</b> = Stand-alone, operation with resistive humidity sensor, alert relay; <b>5</b> = Master, ON/OFF operation; <b>6</b> = Master, proportional operation; <b>7</b> = Master, operation with 4...20 mA sensor; <b>8</b> = Master, operation with 0...10 V sensor; <b>9</b> = Master, operation with resistive humidity sensor; <b>10</b> = Slave.	---	0...10

Depending on the LED(s) on, one mode of operation is chosen.

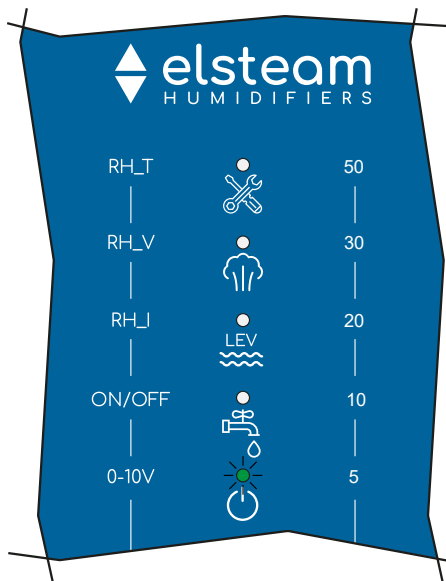
In the table on the next page, you can find the relation between **LED ON - OPERATING MODE**.

# Relation between LED BLINKING - OPERATING MODE.

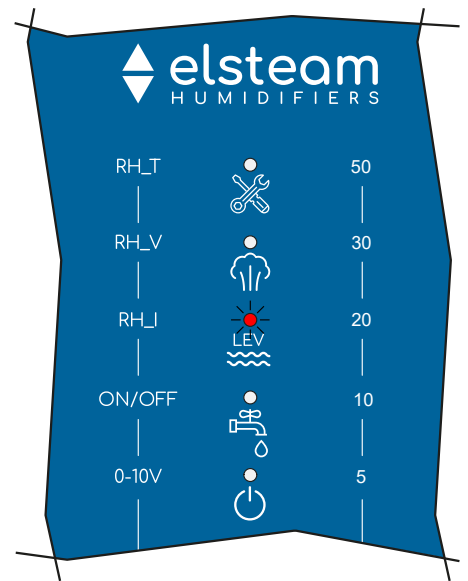
## Mode 0 (CFG = 0)



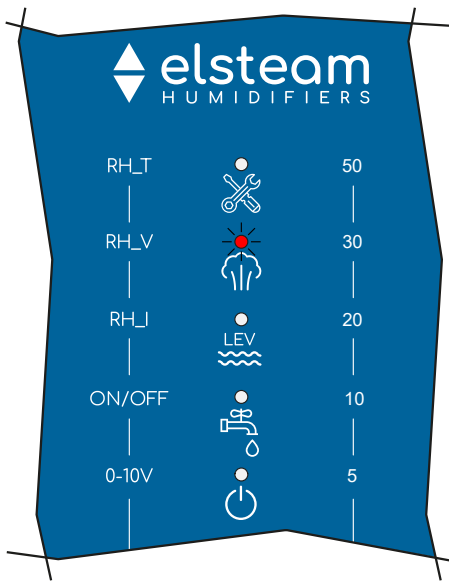
## Mode 1 (CFG = 1)



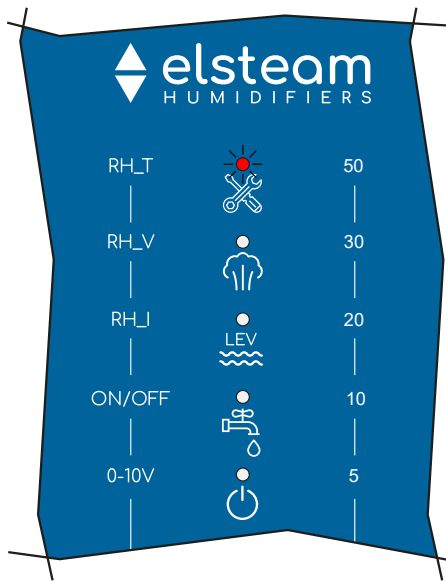
## Mode 2 (CFG = 2)



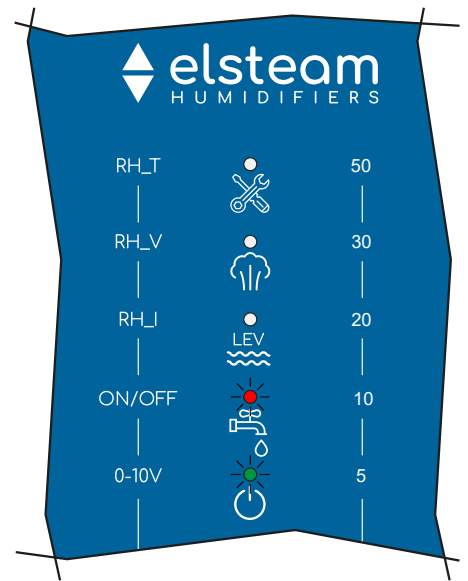
## Mode 3 (CFG = 3)



## Mode 4 (CFG = 4)



## Mode 5 (CFG = 5)



Relation between LED BLINKING - OPERATING MODE.		
Mode 6 (CFG = 6)	Mode 7 (CFG = 7)	Mode 8 (CFG = 8)
Mode 9 (CFG = 9)	Mode 10 (CFG = 10)	

### 9.3 FAN SPEED CONFIGURATION

During normal operation, to configure the fan speed press the **FNC** button.

Each time the **FNC** button is pressed, the value of parameter **F0** increments by 1.

Wait 5 seconds after last pressing the **FNC** button to exit the procedure and save the new value.

The **F0** parameter values corresponding to the lit LED are:

LED			
LED ON/OFF	OFF	OFF	OFF
Value F0	F0 = 0		
LED ON/OFF	OFF	OFF	ON
Value F0	—	—	F0 = 1
LED ON/OFF	OFF	ON	OFF
Value F0	—	F0 = 2	—
LED ON/OFF	ON	OFF	OFF
Value F0	F0 = 3	—	—

9.4 HUMIDITY SETPOINT CONFIGURATION

Procedure available with CFG = 2,3,4,7,8,9.






During normal operation, to set the setpoint press the SET button.

During the phase of configuring the humidity setpoint SP, a LED corresponding to a set percentage value will light up. The humidity setpoint can vary within the range of values set by parameters r1 and r2.

Each time the SET button is pressed, the humidity value is increased by 5%.

Wait 5 seconds after last pressing the SET button to exit the procedure and save the new value.

The humidity percentage values corresponding to the lit LEDs are:

LED					
Humidity value	50%	30%	20%	10%	5%

9.4.1 Examples of humidity setpoint configuration

Example 25% Humidity Setpoint:

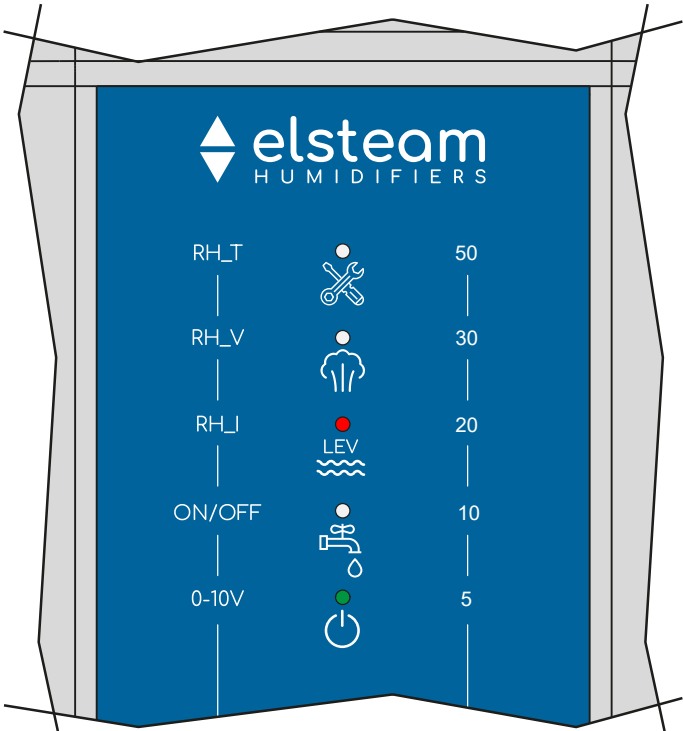







Fig. 36. Example of humidity setpoint configuration at 25%

LED					
LED ON/OFF	OFF	OFF	ON	OFF	ON
Humidity value	—	—	20%	—	5%

Example 50% Humidity Setpoint:

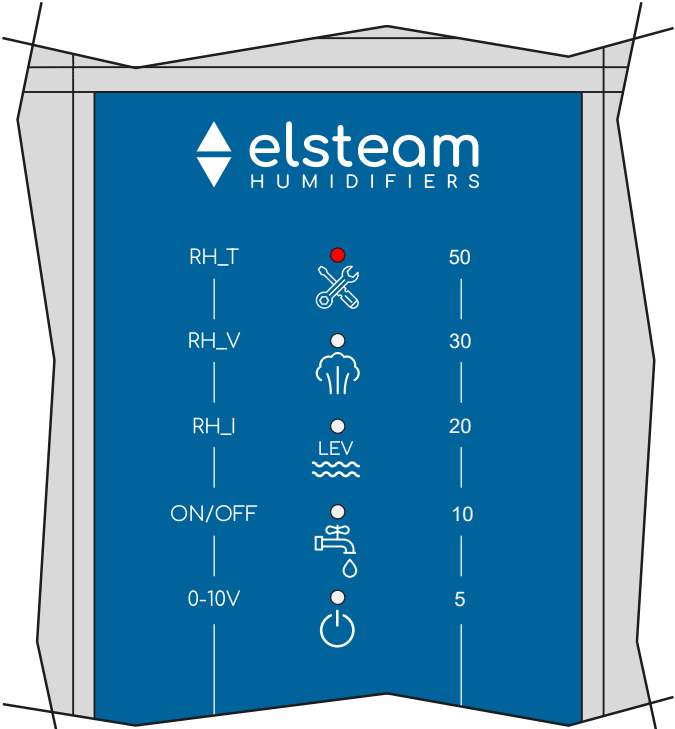


Fig. 37. Example of humidity setpoint configuration at 50%

LED					
LED ON/OFF	ON	OFF	OFF	OFF	OFF
Humidity value	50%	—	—	—	—

Example 75% Humidity Setpoint:

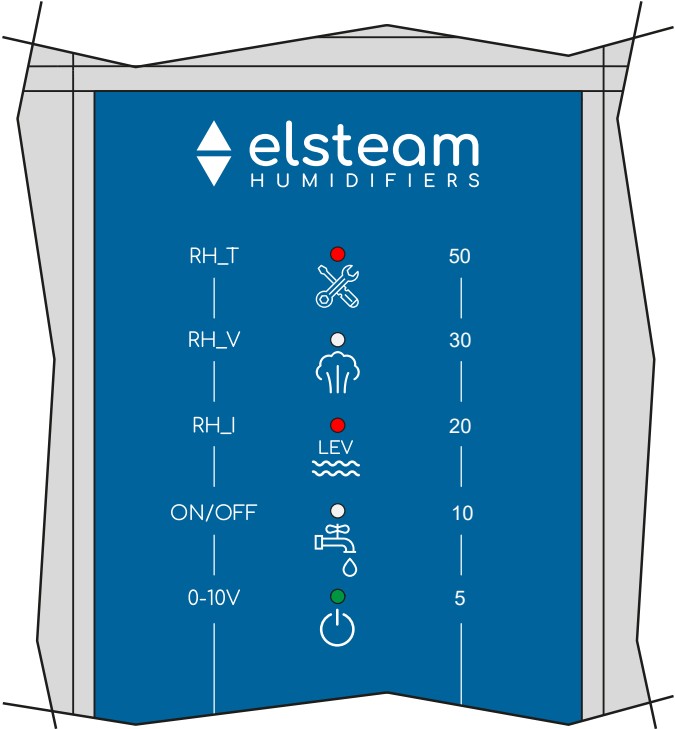


Fig. 38. Example of humidity setpoint configuration at 75%

LED					
LED ON/OFF	ON	OFF	ON	OFF	ON
Humidity value	50%	—	20%	—	5%

Example 100% Humidity Setpoint:

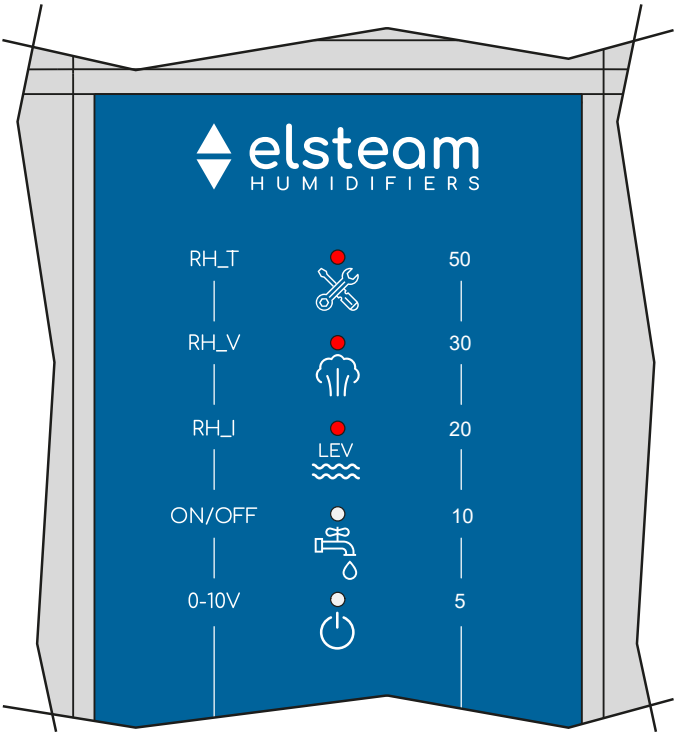


Fig. 39. Example of humidity setpoint configuration at 100%

LED					
LED ON/OFF	ON	ON	ON	OFF	OFF
Humidity value	50%	30%	20%	—	—

9.5 MAXIMUM STEAM PRODUCTION CONFIGURATION

During normal operation, to configure the maximum steam production press the **SET** button.

Each time the **SET** button is pressed, the humidity value is increased by 5%.

Wait 5 seconds after last pressing the **SET** button to exit the procedure and save the new value.

The humidity percentage values corresponding to the lit LEDs are:

LED					
Humidity value	50%	30%	20%	10%	5%

9.6 TEMPERATURE SENSOR

A sensor is installed on the board to measure the temperature of the water in the reservoir during normal operation.

The internal temperature sensor is used by the humidifier for any temperature alerts (see **"14.1 ALERTS TABLE (LED INTERFACE)" ON PAGE 60**).

If **A1** = 0, the high temperature alert is disabled.

If **A1** > 0, **Mistral** generates the alert when the temperature detected by the internal sensor exceeds threshold **A1** for a time **A2**. In this situation the humidifier empties the reservoir and fills it again.

If after emptying, the alert occurs again within a time **A3**, a high temperature alert is signalled.

If, instead, after a time **A3**, no alert is generated, the previous event is cleared.

If **A3** = 0, no emptying is carried out and the alert is generated immediately.

# 9.7 HUMIDITY ADJUSTMENT


## 9.7.1 ON/OFF regulator

Humidity adjustment in ON/OFF mode is made by setting:

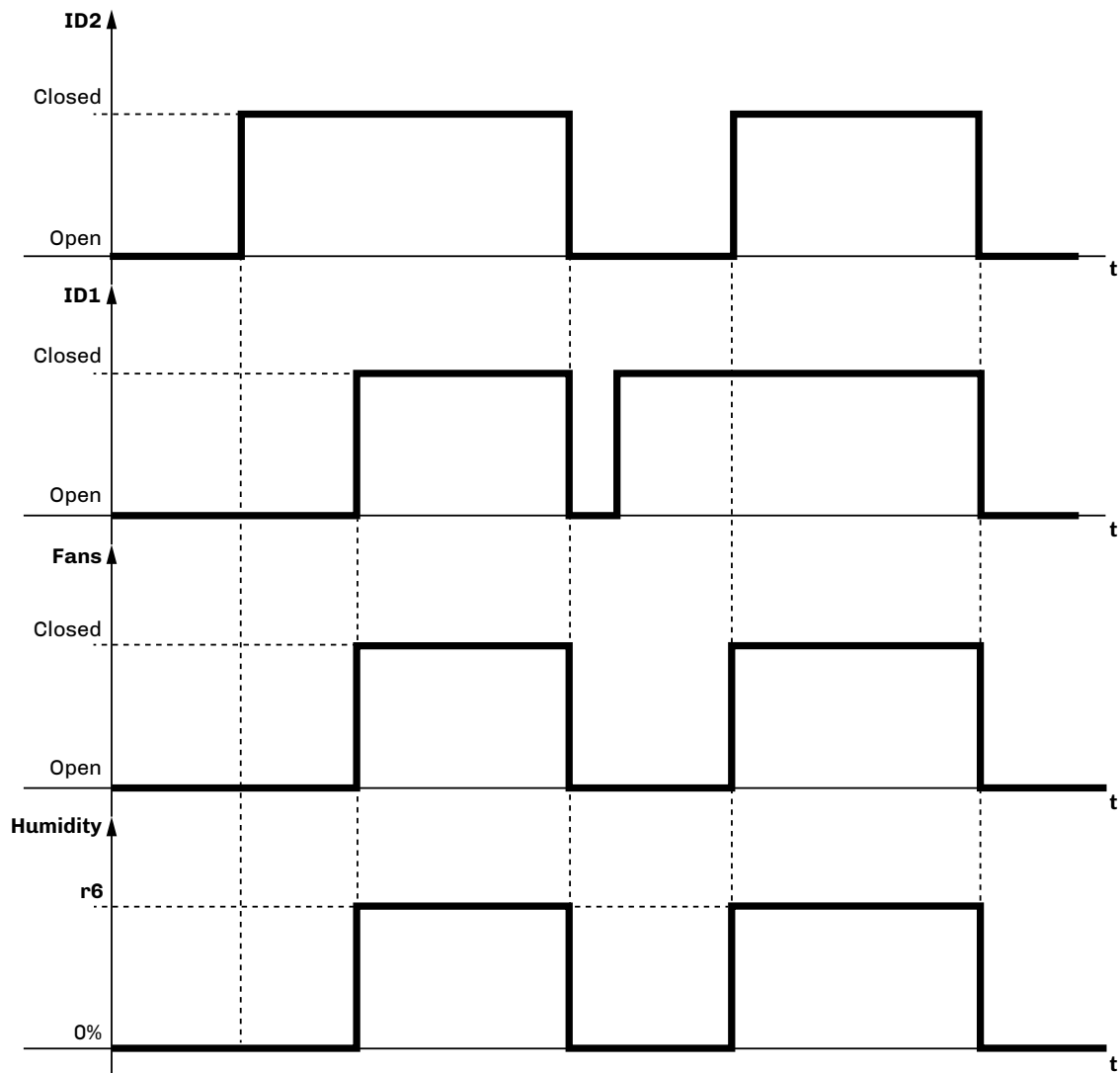
- **CFG** = 0 or **CFG** = 5.

The outlet starts to produce humidity (at parameter value **r6**) when both digital inputs are closed.

If the digital input **ID2** is open (consent not provided), the  LED will blink with a period of 0.5 s ON - 0.5 s OFF.

If consent is given, but the humidifier is not producing any humidity, the  LED will blink with a period of 1 s ON - 3 s OFF:

The following diagram explains the operating logic:



**Fig. 40.** Humidity adjustment - ON-OFF


### 9.7.2 External proportional regulator with 0...10 V input

The humidity adjustment in proportional mode with 0...10 V input is done by setting:

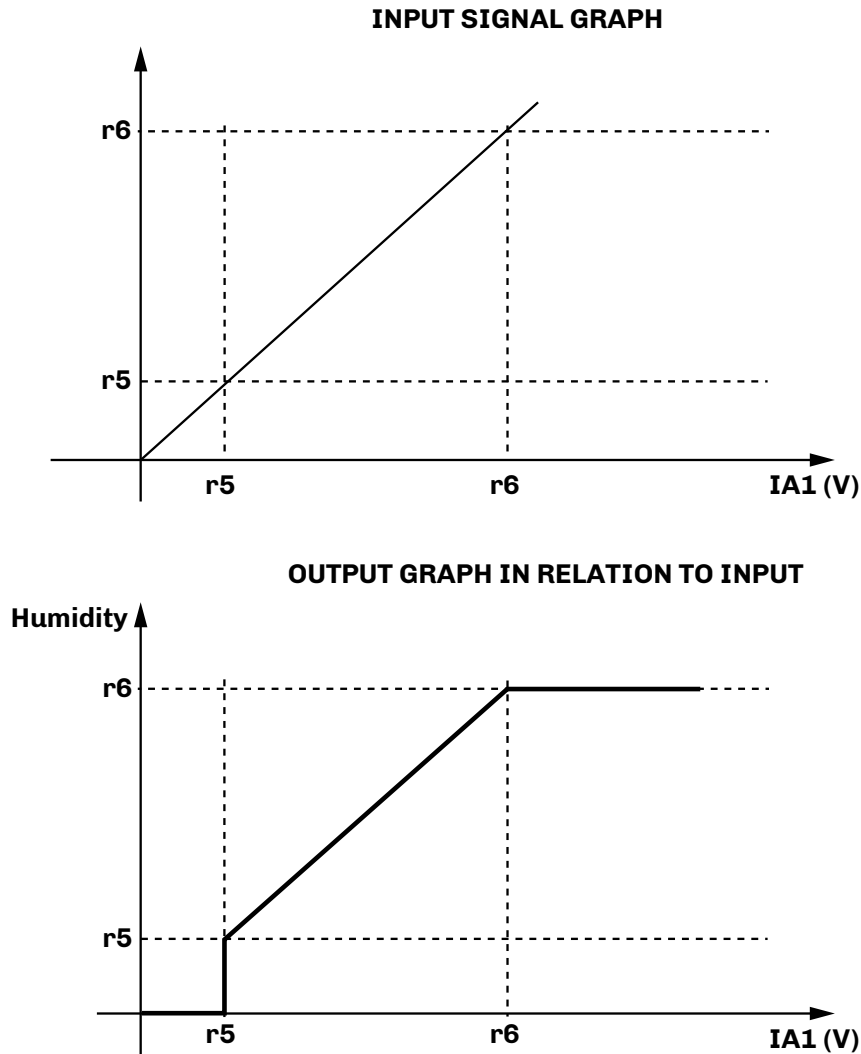
- **CFG = 1** or **CFG = 6**.

The outlet starts producing humidity in proportion to the input signal.

If the digital input **ID2** is open (consent not provided), the  LED will blink with a period of 0.5 s ON - 0.5 s OFF.

If consent is given, but the humidifier is not producing any humidity, the  LED will blink with a period of 1 s ON - 3 s OFF:

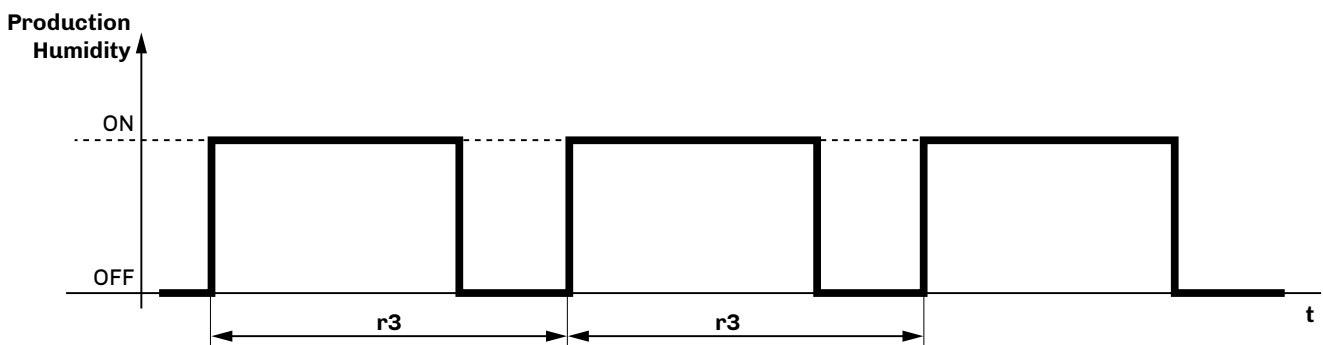
The following diagram explains the operating logic:



**Fig. 41.** External proportional regulator with 0...10 input

In order to produce humidity, **Mistral** must receive consent from the ventilation, so digital input **ID2** must be closed.

The proportional humidity function has a PWM type modulation which provides for a cycle time between two consecutive activations of the humidity production output (parameter **r3**).



**Fig. 42.** External proportional regulator with 0...10 input - Consecutive activation delay

### 9.7.3 Regulator with humidity sensor

Humidity adjustment via a humidity sensor is made by setting:

- **CFG = 2; CFG = 3; CFG = 4** or
- **CFG = 7; CFG = 8; CFG = 9.**

The outlet produces humidity with the following logic:

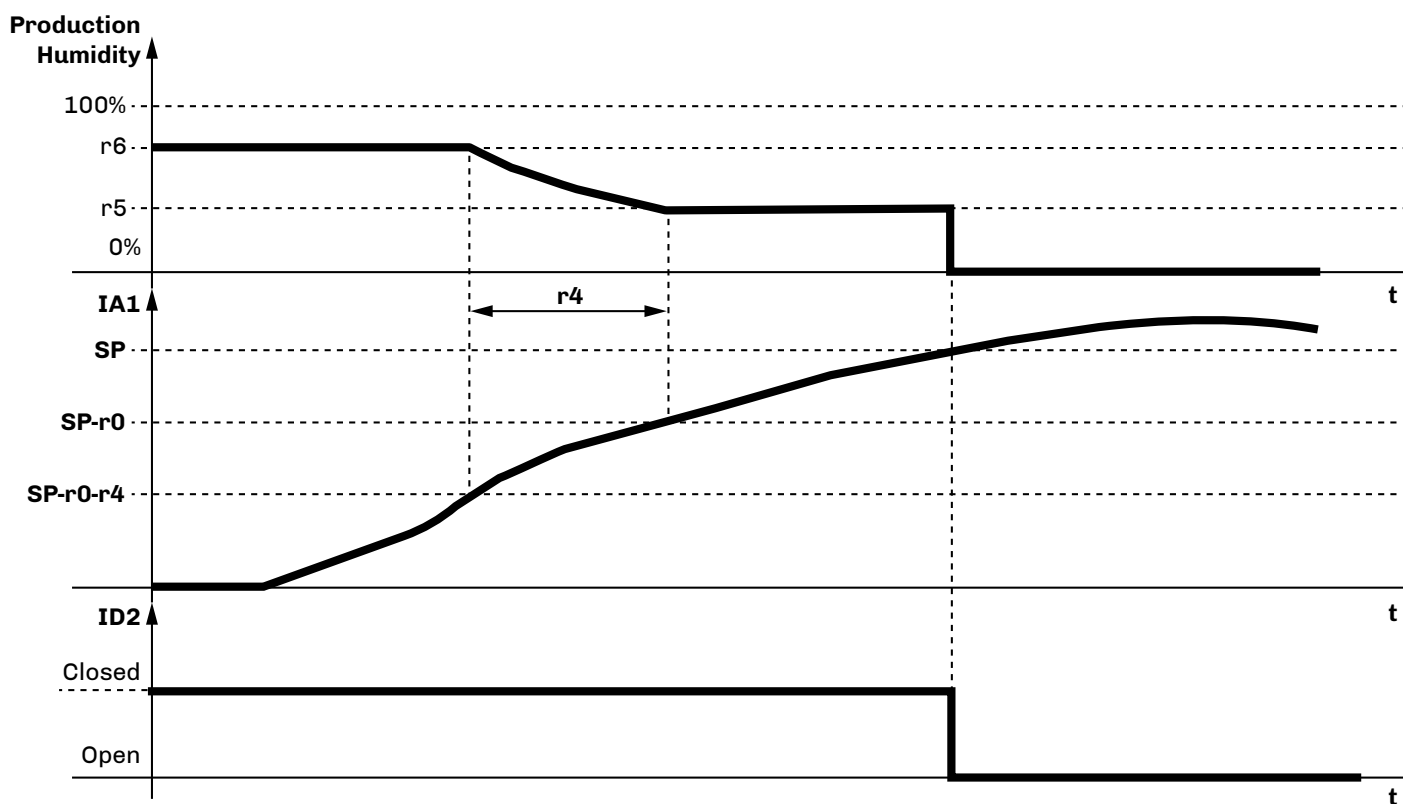


Fig. 43. Adjustment with humidity sensor

- If the sensor reading is less than **SP-r0-r4**, then the humidity production is at its maximum;
- If the sensor reading is between **SP-r0-r4** and **SP-r0**, then the production is proportional between **r5** and **r6**;
- If the sensor reading is between **SP-r0** and **SP** then there is little or no production;
- **Mistral** does not produce humidity under any other conditions;
- **Mistral** does not produce any humidity with the sensor in error.

## 9.8 RECORDING HOURS OF OPERATION

The **Mistral** humidifier, among its functions, includes recording the operating hours, to monitor and alert you when to perform routine maintenance. Some of the recordings made include:

- Partial hours of mist-maker operation;
- Partial hours of fan operation.

The operating hours are stored in the internal memory.

This is referred to as partial hours, as the recorded operating hours can be reset to zero.

To view/reset the partial operating hours, you need to connect the remote user interface (see "**1.6 ACCESSORIES**" ON PAGE 10).

### 9.8.1 Mist-maker operating hours: partial number

If the mist-maker operating hours > **A10**, the **EHUC** humidifier will generate a warning. If **A10** = 0, no warning is generated.

The data is considered partial because it can be reset by pressing and holding button **T1** for at least 4 seconds.

To view and reset the partial operating hours of the fan see "**7.2.5 MAINTENANCE MENU**" ON PAGE 37

### 9.8.2 Fan operating hours: partial number

If the fan operating hours > **A13**, the **EHUC** humidifier will generate a warning. If **A13** = 0, no warning is generated.

The data is considered partial because it can be reset by pressing and holding button **T1** for at least 4 seconds.

To view and reset the partial operating hours of the fan see "**7.2.5 MAINTENANCE MENU**" ON PAGE 37

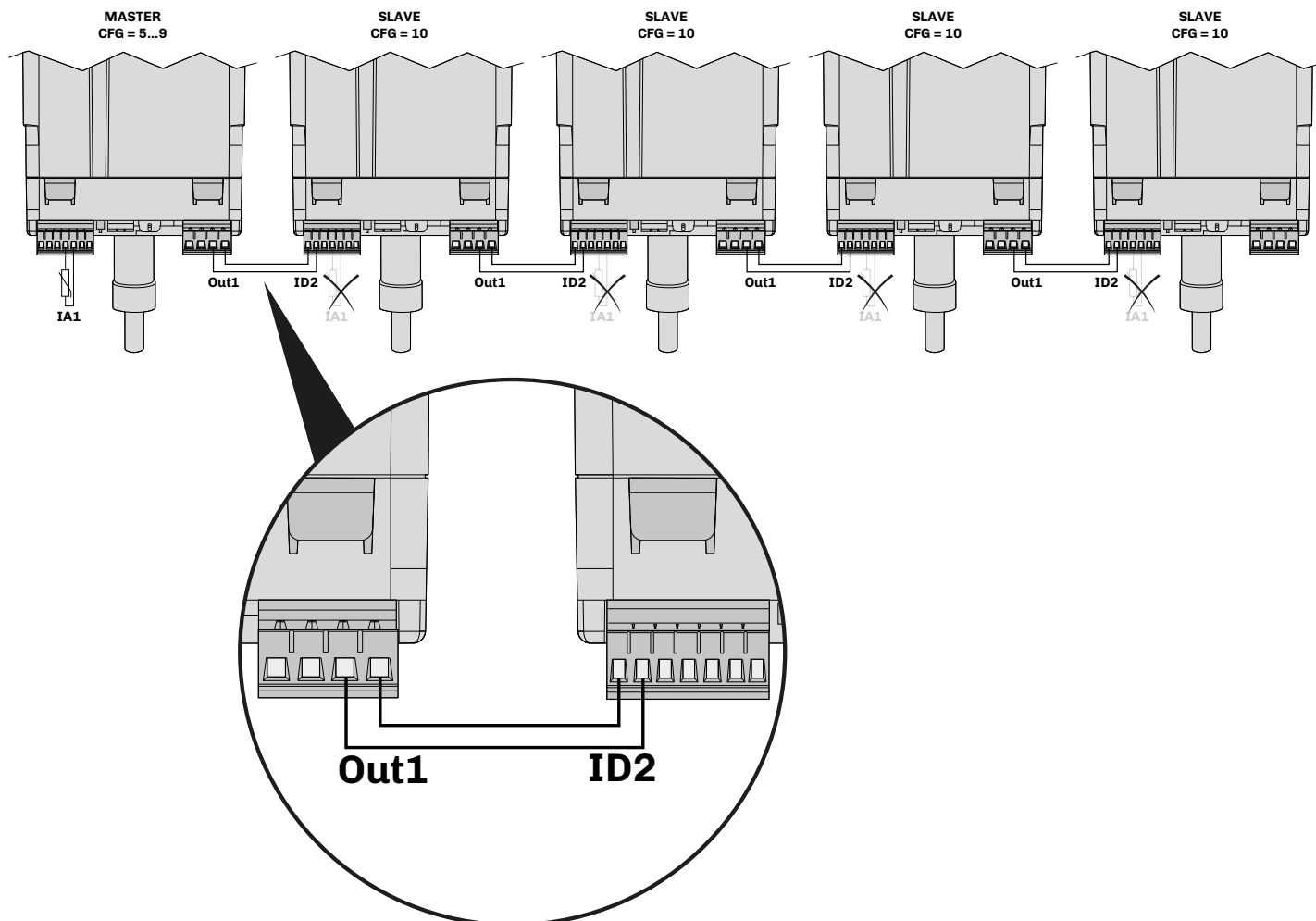
## 9.9 PARALLEL OPERATION

Up to 5 humidifiers can be connected in parallel.

By configuring and setting the first humidifier only (MASTER), the others (SLAVES) will follow the operation of the first humidifier by replicating it precisely (parametrizations are not replicated if they are changed on the MASTER).

To activate this operating mode, you need to:

- Set one humidifier as Master, by setting **CFG** = 5...9;
- Set all the other humidifiers as Slave, by setting **CFG** = 10 on each humidifier;
- Connect the analogue input **IA1** on the Master humidifier;
- Connect the digital output **Out1** of each humidifier to the digital input **ID2** of the next humidifier.



**Fig. 44.** Parallel operation

**NOTE:** In this operating mode, the digital output is used to propagate the operating signal.

**NOTE:** For humidifiers set to SLAVE, do not connect input **IA1**.

## 10. MAINTENANCE

### DANGER

#### RISK OF ELECTRIC SHOCK OR ELECTRIC ARC

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

### 10.1 INTRODUCTION

The **Mistral** humidifier is designed for operation with the water specifications described in subsection "**5.2.1 WATER SPECIFICATIONS**" ON PAGE 23.

Using water with different specifications and/or with a hardness level approaching the limit of 40 °f causes maintenance to be required more frequently.

The reservoir requires frequent maintenance and seasonal cleaning in the following conditions:

Water conductivity	Water hardness
0...100 µS/cm	0...5 °f

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

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

### NOTICE

#### MALFUNCTIONING OF THE EQUIPMENT

- Only use the humidifier with the water specifications indicated in this manual.
  - Only carry out humidifier maintenance in accordance with the instructions provided in the Maintenance section of this manual.
- There are leaks due to breakages, cracks and fissures.

### DANGER

#### RISK OF ELECTRIC SHOCK OR ELECTRIC ARC

- Any procedure on the humidifier, including routine or extraordinary maintenance, must only be carried out while the power supply is disconnected.
  - In the event of water leakage, disconnect the humidifier electric power supply immediately by means of the external isolator.
- If any adverse event not described in this documentation arises, carry out maintenance and/or replace the humidifier. Contact ELSTEAM customer service for guidelines and instructions;

### DANGER

#### RISK OF ELECTRIC SHOCK OR ELECTRIC ARC

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

### 10.2 PERIODICALLY 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	Renew the seals and make sure there are no leaks after an hour of continuous operation.
Every 7 days	<ul style="list-style-type: none"><li>• Make sure the humidifier works properly (based on the instructions provided in this manual);</li><li>• Make sure there are no leaks in the hydraulic system;</li><li>• Make sure there is no unusual operation.</li></ul>
Every 30 days	<ul style="list-style-type: none"><li>• Make sure there are no blockages in the water drain;</li><li>• Make sure the water drains effectively;</li><li>• Thoroughly remove limescale and biofilm residues from the reservoir and the drain (rinse the inside of the reservoir with 20% acetic acid and appropriate biocides, cleaning the scale off the surface).</li></ul>
Seasonally	<ul style="list-style-type: none"><li>• Check the tightness of the seals and replace them if necessary.</li></ul>

The Mistral humidifier features:

- Automatic draining for inactivity;
- Periodic automatic cleaning;
- Plastic material on whose surface bacterial colonies do not proliferate.

Inadequate use and/or poor maintenance of the humidifier can damage your health.

## **⚠ WARNING**

### **BIOLOGICAL RISK**

- In the event of inadequate use and/or poor maintenance it is possible that microorganisms (including the bacterium that causes Legionellosis) may proliferate and be transferred into the air treatment system.
- The humidifier must be used properly and be maintained and cleaned properly at prescribed intervals, as described in chapter **"10. MAINTENANCE" ON PAGE 51**.

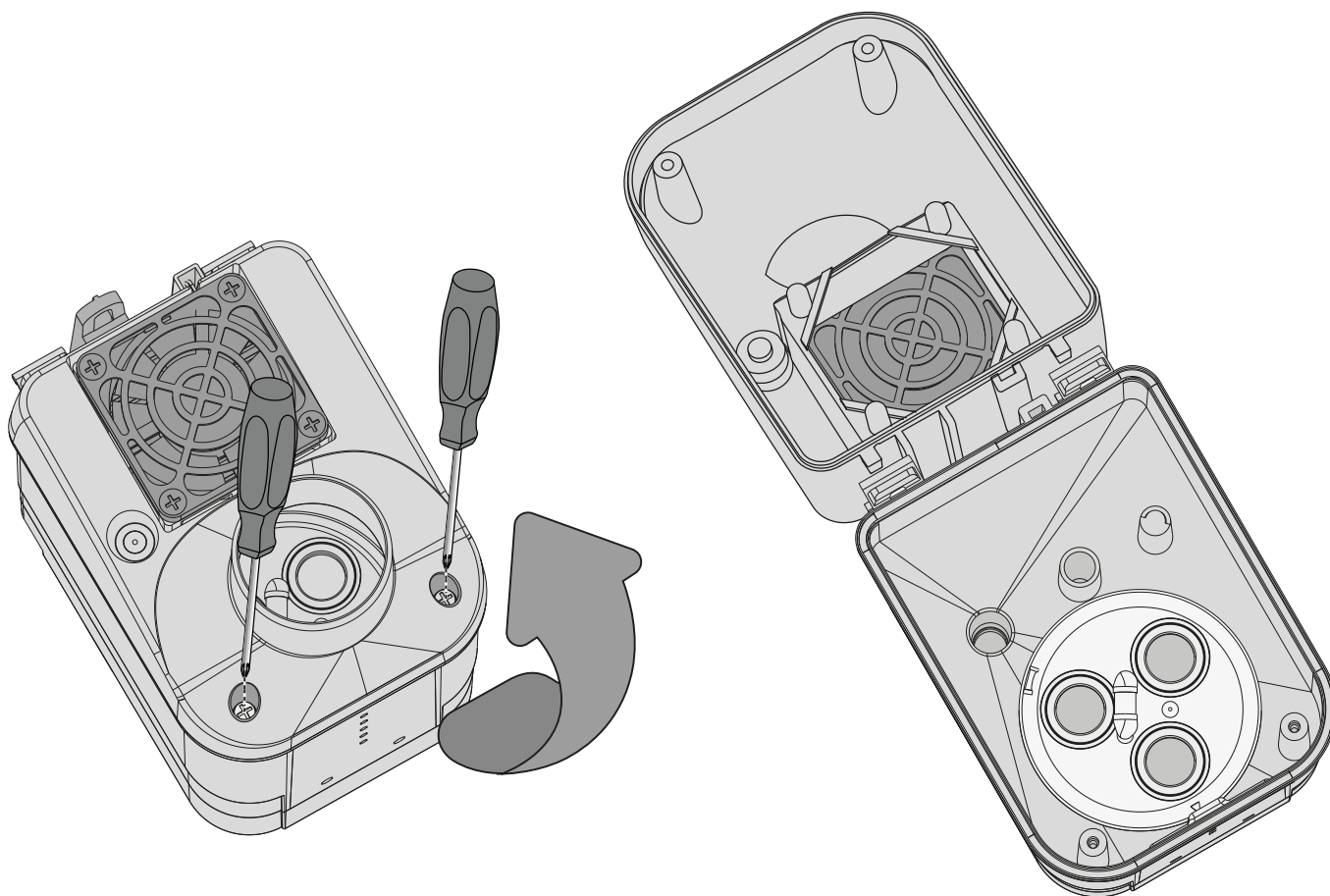
## **10.3 CLEANING THE RESERVOIR**

Cleaning and maintenance of the reservoir must be done every 60 days when using non-demineralized drinking water to ensure optimal operation of the humidifier. With demineralized water the cleaning frequency is seasonal.

This procedure is useful to prevent the water drain from clogging.

Below are the cleaning instructions:

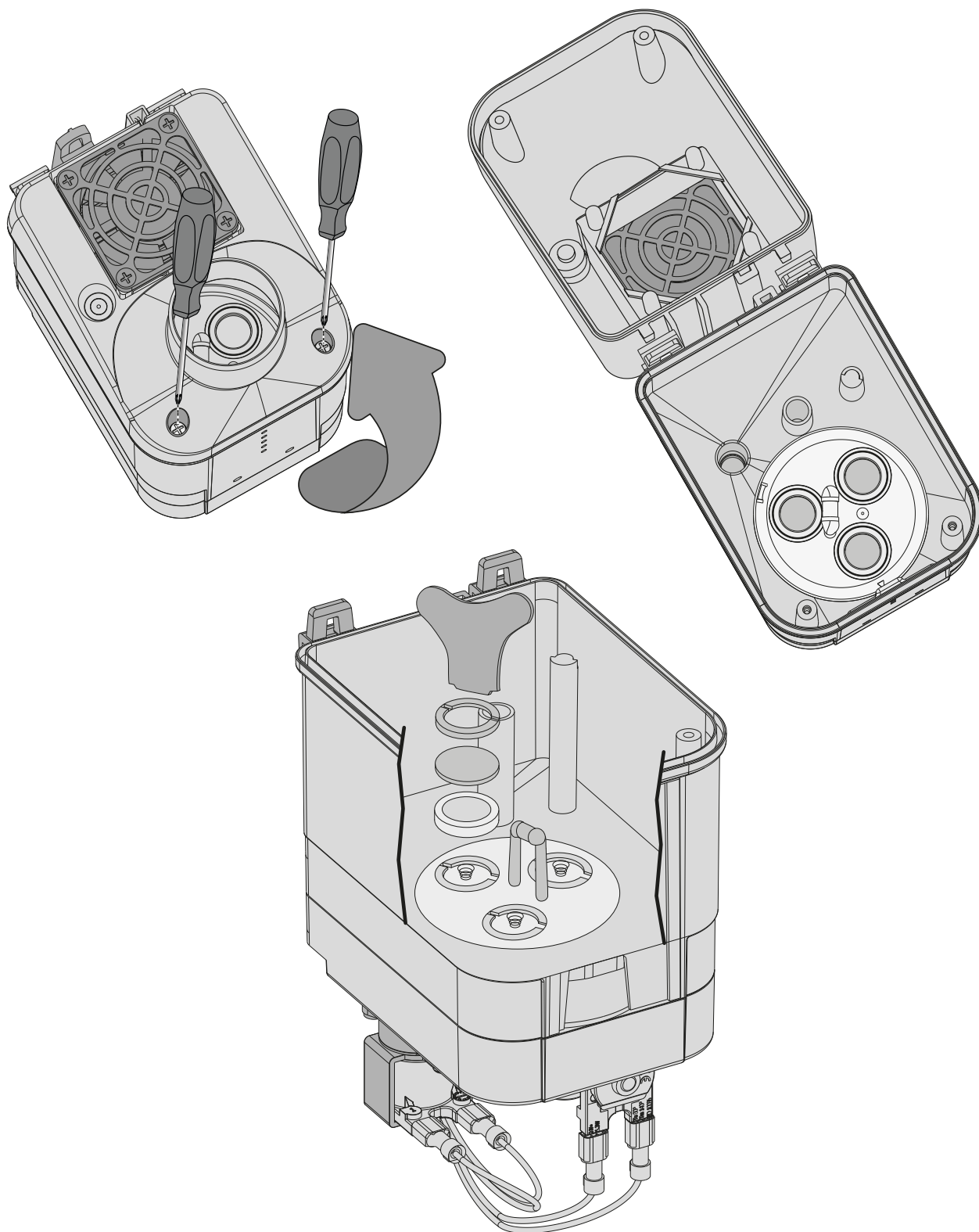
- Drain the humidifier (see **"9.1 DRAINING WATER / WASHING RESERVOIR" ON PAGE 41**);
- Disconnect the machine power supply using the external isolator;
- Unscrew the screws at the top of the humidifier;
- Clean the reservoir;
- Check the cover seal is intact;
- Install the cover by screwing the screws into the upper face.



**Fig. 45.** Opening the **Mistral** cover to clean the reservoir

## 10.4 REPLACING MIST-MAKER CERAMIC DISCS

The illustration gives instructions on how to properly replace the ceramic discs of the mist-maker.



**Fig. 46.** Replacing mist-maker ceramic discs

### **NOTICE**

#### **FAN NOT WORKING**

When removing the cover, be careful not to damage the fan power cables located at the back of the humidifier.

11. SPARE PARTS

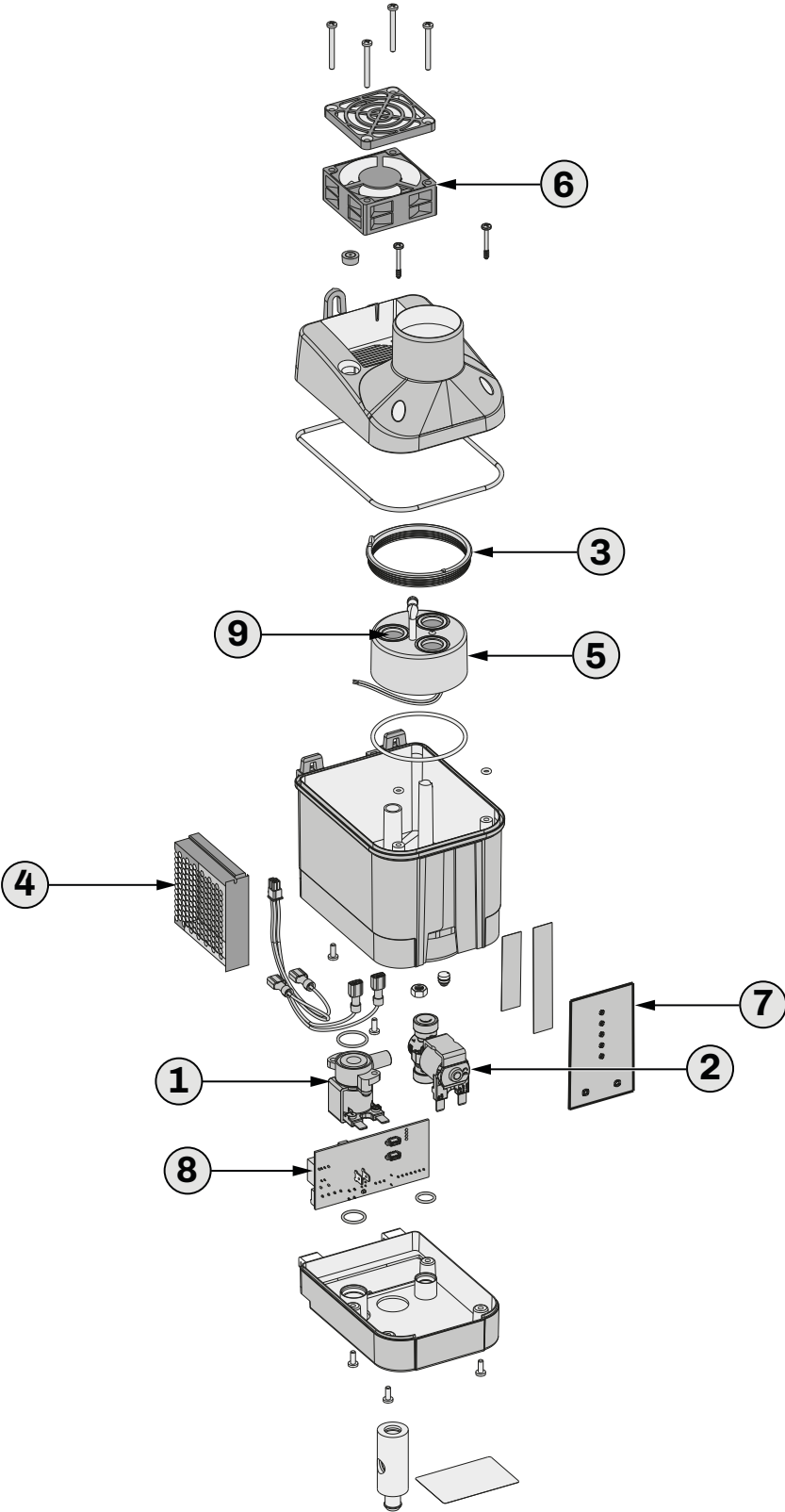


Fig. 47. Mistral Humidifier spare parts

Ref.	P/n	Description	Ref.	P/n	Description
①	EHUK001	EHUC water drain valve kit	⑥	EHUK012	24 Vdc low speed fan + technopolymer grid
②	EHUK002	EHUC water inlet valve kit	⑦	EHUK020	Level regulator and user interface
③	EHUK003	EHUC seal kit	⑧	EHUK021	EHUC controller
④	EHUK004	EHUC switching power supply unit	⑨	1220000001	DK ceramic transducer set (9 pc blister pack)
⑤	EUHK005	EHUC mist-maker			

## 12. ADJUSTMENT PARAMETERS

### Description of columns in the Table of Parameters

- **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;
- **Default:** Indicates the pre-set factory configuration;
- **PW:** Indicates the access level for the parameter.

### 12.1 TABLE OF ADJUSTMENT PARAMETERS

Par.	Description	MU	Range	PW	Default
<b>SETPOINT group</b>					
<b>SP</b>	Humidity setpoint.	%	r1...r2	U	70
<b>CONFIGURATIONS Group</b>					
<b>CFG</b>	Operating mode. <b>0</b> = Stand-alone, ON/OFF operation, alert relay; <b>1</b> = Stand-alone, proportional operation, alert relay; <b>2</b> = Stand-alone, operation with 4...20 mA sensor, alert relay; <b>3</b> = Stand-alone, operation with 0...10 V sensor, alert relay; <b>4</b> = Stand-alone, operation with resistive humidity sensor, alert relay; <b>5</b> = Master, ON/OFF operation; <b>6</b> = Master, proportional operation; <b>7</b> = Master, operation with 4...20 mA sensor; <b>8</b> = Master, operation with 0...10 V sensor; <b>9</b> = Master, operation with resistive humidity sensor; <b>10</b> = Slave.	---	0...10	U	0
<b>ANALOGUE INPUTS group</b>					
<b>P1</b>	Water conductivity.	μS*cm	70...1250	M	500
<b>MAIN REGULATOR group</b>					
<b>r0</b>	Hysteresis. With <b>CFG</b> = 2, 3, 4, 7, 8, 9.	%	2...20	U	2
<b>r1</b>	Minimum humidity setpoint value. With <b>CFG</b> = 2, 3, 4, 7, 8, 9.	%	0...r2	M	20
<b>r2</b>	Maximum humidity setpoint value. With <b>CFG</b> = 2, 3, 4, 7, 8, 9.	%	r1...100	M	95
<b>r3</b>	Minimum delay time between two consecutive humidity production activations. With <b>CFG</b> ≠ 10.	s	1...240	M	20
<b>r4</b>	Proportional band. With <b>CFG</b> = 2, 3, 4, 7, 8, 9.	%	0...50	M	50
<b>r5</b>	Minimum humidity production. With <b>CFG</b> ≠ 10.	%	0...r6	M	20
<b>r6</b>	Maximum humidity production. With <b>CFG</b> ≠ 10.	%	r5...100	U	100
<b>REGULATOR PROTECTION group</b>					
<b>c0</b>	Number of continuous idle hours causing the water reservoir to empty. <b>0</b> = Function disabled.	h	0...250	U	12
<b>c1</b>	Number of operating hours causing the water reservoir to empty. <b>0</b> = Function disabled.	h	0...250	U	24
<b>FANS group</b>					
<b>F0</b>	Fan speed. <b>0</b> = Fan off; <b>1</b> = Speed <b>F1</b> ; <b>2</b> = Speed <b>F2</b> ; <b>3</b> = Speed <b>F3</b> .	---	0...3	U	2
<b>F4</b>	Fan off delay from switching mist-maker off (with <b>CFG</b> = 10).	s	0...240	M	20
<b>F5</b>	Fan operation time after emptying due to inactivity.	s	0...999	M	20

Par.	Description	MU	Range	PW	Default
<b>TEMPERATURE ALERTS group</b>					
<b>A5</b>	Low humidity alert threshold only if <b>CFG</b> = 2, 3, 4, 7, 8, 9. Fixed hysteresis = 2%.	---	0...100	M	20
<b>A6</b>	High humidity alert threshold only if <b>CFG</b> = 2, 3, 4, 7, 8, 9. Fixed hysteresis = 2%.	---	0...100	M	95
<b>A7</b>	High low humidity alert delay only if <b>CFG</b> = 2, 3, 4, 7, 8, 9.	s	0...999	M	120
<b>A13</b>	Number of fan operating hours to signal partial operating hours. The count can be reset to zero by pressing and holding for at least 4 s.	1000h	0...99	M	60
<b>DIGITAL INPUTS group</b>					
<b>i0</b>	<b>ID2</b> port digital input polarity. 0 = Normally closed; 1 = Normally open.	---	0/1	M	0
<b>PASSWORD group</b>					
<b>PAS</b>	Parameter access password.	num	-99...999	M	-19
<b>EVLINK DATALOGGING group</b>					
<b>bLE</b>	Serial port configuration for EVconnect/EPoCA connectivity. 0 = Spare; 1 = Forced for EVconnect or EPoCA; 2...99 = EPoCA local network address.	---	0...99	M	1
<b>rE0</b>	Datalogger sampling interval	min	0...240	M	60
<b>rE1</b>	Enable data logging for data logger. 0 = No; 1 = Yes.  Logged data: • Humidity sensor (if fitted); • Temperature sensor (level board); • Mist-maker output status; • Fan output status; • EEVC output status; • EEVS output status.	---	0/1	M	0
<b>MODBUS SERIAL CONFIGURATION group</b>					
<b>LA1</b>	COM1 serial line modbus protocol controller address.	num	1...247	M	20
<b>LA1</b>	COM2 serial line modbus protocol controller address.	num	1...247	M	247

# 13. MODBUS RTU FUNCTIONS AND RESOURCES

## 13.1 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 slaves and write to their registers, while slave devices cannot initiate any information transfer 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.

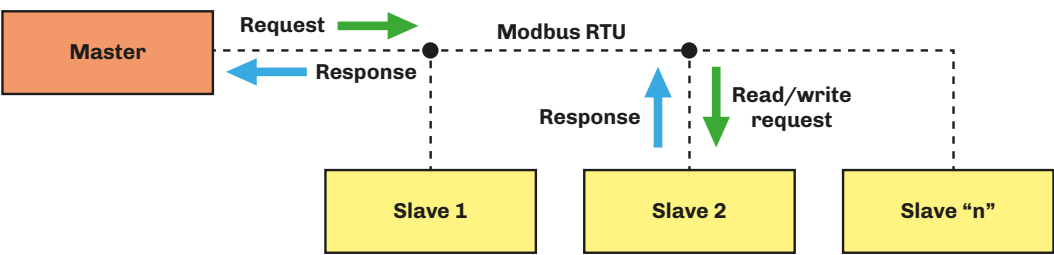


Fig. 48. Diagram showing message exchange in a Modbus communication

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. 49. FRAMING OF A MESSAGE USING MODBUS PROTOCOL" ON PAGE 57**) 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.

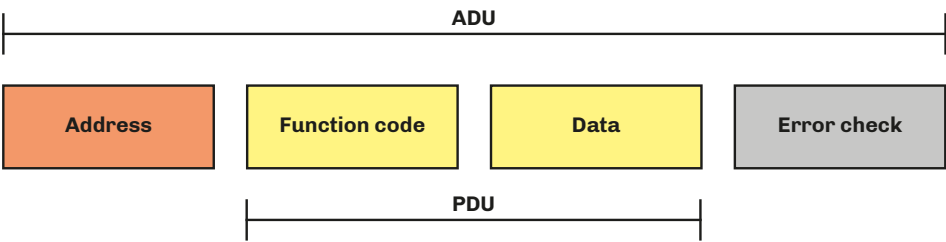


Fig. 49. Framing of a message using Modbus protocol

For further information relating to Modbus protocol, visit the official Modbus website: [www.modbus.org](http://www.modbus.org).

## 13.2 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

## 13.3 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.

### 13.3.1 Available Modbus commands and data areas

The commands implemented are as follows:

Command	Description
<b>03 (hex 0x03)</b>	Resource reading command
<b>06 (hex 0x06)</b>	Resource writing command

## 13.4 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
<b>LA1</b>	Modbus protocol controller address.	---	1...247	20

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

- RTU mode;
- Parity: Even;
- Baudrate: 9600;
- Bit: 8 bit;
- Stop bit: 1 bit.

## 13.5 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 29.

In particular, make sure the connections are performed correctly, observing the instructions in section "**6.3 WIRING DIAGRAM**" ON PAGE 31.

## 13.6 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;
- **Val. Adr.:** 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 field 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"

## 13.7 MISTRAL MODBUS ADDRESSES

### 13.7.1 Table of Modbus addresses

Par.	Description	Val. Adr.	R/W	DATA SIZE	CPL	MU	Range
<b>SETPOINT group</b>							
<b>SP</b>	Humidity setpoint.	1539	R/W	WORD	---	%	r1...r2
<b>CONFIGURATIONS Group</b>							
<b>CFG</b>	Operating mode.	1540	R/W	BYTES	---	---	0...10
<b>ANALOGUE INPUTS group</b>							
<b>P1</b>	Water conductivity.	1541	R/W	WORD	---	μS*cm	70...1250
<b>MAIN REGULATOR group</b>							
<b>r0</b>	Hysteresis. With <b>CFG</b> = 2, 3, 4, 7, 8, 9.	1545	R/W	WORD	---	%	2...20
<b>r1</b>	Minimum humidity setpoint value. With <b>CFG</b> = 2, 3, 4, 7, 8, 9.	1546	R/W	WORD	---	%	0...r2
<b>r2</b>	Maximum humidity setpoint value. With <b>CFG</b> = 2, 3, 4, 7, 8, 9.	1547	R/W	WORD	---	%	r1...100
<b>r3</b>	Minimum delay time between two consecutive humidity production activations. With <b>CFG</b> ≠ 10.	1548	R/W	WORD	---	s	1...240
<b>r4</b>	Proportional band. With <b>CFG</b> = 2, 3, 4, 7, 8, 9.	1549	R/W	WORD	---	%	0...50
<b>r5</b>	Minimum humidity production. With <b>CFG</b> ≠ 10.	1550	R/W	WORD	---	%	0...r6
<b>r6</b>	Maximum humidity production. With <b>CFG</b> ≠ 10.	1551	R/W	WORD	---	%	r5...100
<b>REGULATOR PROTECTION group</b>							
<b>c0</b>	Number of continuous idle hours causing the water reservoir to empty.	1556	R/W	WORD	---	h	0...250
<b>c1</b>	Number of operating hours causing the water reservoir to empty.	1557	R/W	WORD	---	h	0...250
<b>FANS group</b>							
<b>F0</b>	Fan speed.	1559	R/W	3 BIT	---	---	0...3
<b>F4</b>	Fan off delay from switching mist-maker off (with <b>CFG</b> = 10).	1563	R/W	WORD	---	s	0...240
<b>F5</b>	Fan operation time after emptying due to inactivity.	1564	R/W	WORD	---	s	0...999
<b>TEMPERATURE ALERTS group</b>							
<b>A5</b>	Low humidity alert threshold only if <b>CFG</b> = 2, 3, 4, 7, 8, 9.	1568	R/W	WORD	---	---	0...100
<b>A6</b>	High humidity alert threshold only if <b>CFG</b> = 2, 3, 4, 7, 8, 9.	1569	R/W	WORD	---	---	0...100
<b>A7</b>	High low humidity alert delay only if <b>CFG</b> = 2, 3, 4, 7, 8, 9.	1570	R/W	WORD	---	s	0...999
<b>A13</b>	Number of fan operating hours to signal partial operating hours.	1574	R/W	WORD	---	1000h	0...99
<b>DIGITAL INPUTS group</b>							
<b>i0</b>	<b>ID2</b> port digital input polarity.	1607	R/W	1 BIT	---	---	0/1
<b>PASSWORD group</b>							
<b>PAS</b>	Parameter access password.	1609	R/W	WORD	Y	num	-99...999
<b>EVLINK DATALOGGING group</b>							
<b>bLE</b>	Serial port configuration for EVconnect/EPoCA connectivity.	1612	R/W	WORD	---	---	0...99
<b>rE0</b>	Datalogger sampling interval.	1613	R/W	WORD	---	min	0...240
<b>rE1</b>	Enable data logging for datalogger.	1614	R/W	1 BIT	---	---	0/1
<b>MODBUS SERIAL CONFIGURATION group</b>							
<b>LA1</b>	COM1 serial line modbus protocol controller address.	1615	R/W	WORD	---	num	1...247
<b>LA1</b>	COM2 serial line modbus protocol controller address.	1616	R/W	WORD	---	num	1...247

## 14. DIAGNOSTICS


The table below lists alerts with corresponding solutions.

Warnings are made via LED lighting up (see "14.1 ALERTS TABLE (LED INTERFACE)" ON PAGE 60).


**NOTE:** The last blink of each alert is followed by 5 s OFF.

### 14.1 ALERTS TABLE (LED INTERFACE)

#### 14.1.1 Warnings



LED	Lamp No.	Description	Cause	Effects	Solution
	1	Mist-maker current warning	Absorption warning thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>No effect on regulation</li> <li>LED blinks</li> </ul>	<ul style="list-style-type: none"> <li>Schedule maintenance and/or component replacement</li> <li>Contact ELSTEAM technical support</li> </ul>
	2	Fan current warning	Absorption warning thresholds exceeded in normal operation		
	3	Inlet solenoid valve current warning	Absorption warning thresholds exceeded in normal operation		
	4	Outlet solenoid valve current warning	Absorption warning thresholds exceeded in normal operation		

#### 14.1.2 Alarms


LED	Lamp No.	Description	Cause	Effects	Solution
	1	Mist-maker current alert	Absorption alert thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>Mist-maker OFF</li> <li>If CFG = 0...4 then Out1 is activated</li> <li>LED blinks 0.5 s ON / 5 s OFF</li> </ul>	<ul style="list-style-type: none"> <li>Replace mist-maker</li> <li>Contact ELSTEAM technical support</li> </ul>
	2	Fan current alert	Absorption alert thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>Fan OFF</li> <li>If CFG = 0...4 then Out1 is activated</li> <li>LED blinks 0.5 s ON / 5 s OFF</li> </ul>	<ul style="list-style-type: none"> <li>Replace the fan</li> <li>Contact ELSTEAM technical support</li> </ul>
	3	Inlet solenoid valve current alert	Absorption alert thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>Inlet solenoid valve OFF</li> <li>If CFG = 0...4 then Out1 is activated</li> <li>LED blinks 0.5 s ON / 5 s OFF</li> </ul>	<ul style="list-style-type: none"> <li>Replace the inlet solenoid valve</li> <li>Contact ELSTEAM technical support</li> </ul>
	4	Outlet solenoid valve current alert	Absorption alert thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>Outlet solenoid valve OFF</li> <li>If CFG = 0...4 then Out1 is activated</li> <li>LED blinks 0.5 s ON / 5 s OFF</li> </ul>	<ul style="list-style-type: none"> <li>Replace the outlet solenoid valve</li> <li>Contact ELSTEAM technical support</li> </ul>
	5	Level board high temperature alert	Impurities in the water in the reservoir	<ul style="list-style-type: none"> <li>No effect on regulation</li> <li>If CFG = 0...4 then Out1 is activated</li> <li>LED blinks 0.5 s ON / 5 s OFF</li> </ul>	<ul style="list-style-type: none"> <li>Check the characteristics of the water</li> <li>Clean the reservoir</li> <li>Switch the humidifier off and on again</li> </ul>
	6	Mist-maker operating hours alert	<ul style="list-style-type: none"> <li>If P1 = 70...449 µS*cm, operating hours &gt; A10</li> <li>If P1 = 450...849 µS*cm, operating hours &gt; A11</li> <li>If P1 = 850...1250 µS*cm, operating hours &gt; A12</li> </ul>	<ul style="list-style-type: none"> <li>No effect on regulation</li> <li>If CFG = 0...4 then Out1 is activated</li> <li>LED blinks 0.5 s ON / 5 s OFF</li> </ul>	Carry out maintenance (see "10. MAINTENANCE" ON PAGE 51)
	7	Fan operating hours alert	Operating hours > A13	<ul style="list-style-type: none"> <li>No effect on regulation</li> <li>If CFG = 0...4 then Out1 is activated</li> <li>LED blinks 0.5 s ON / 5 s OFF</li> </ul>	Carry out maintenance (see "10. MAINTENANCE" ON PAGE 51)

#### 14.1.3 High or low humidity alert


Only if CFG = 2, 3, 4, 7, 8, 9.

LED	Description	Cause	Effects	Solution
	High humidity alarm	<ul style="list-style-type: none"> <li>RH sensor &gt; A6 for a time A7</li> <li>RH sensor not working</li> </ul>	<ul style="list-style-type: none"> <li>No effect on regulation</li> <li>LED blinks 0.5 s ON / 0.5 s OFF</li> </ul>	RH sensor < A6 - 2 % reactivation is automatic
	Low humidity alarm	<ul style="list-style-type: none"> <li>RH sensor &lt; A5 for a time A7</li> <li>RH sensor not working</li> </ul>	<ul style="list-style-type: none"> <li>No effect on regulation</li> <li>LED blinks 1 s ON / 1 s OFF</li> </ul>	RH sensor > A5 + 2 % reactivation is automatic


#### 14.1.4 Level sensor alert

LED	Description	Cause	Effects	Solution
	Level sensor alert	Level board not working	<ul style="list-style-type: none"> <li>• Adjustment OFF</li> <li>• LED blinks 0.5 s ON / 0.5 s OFF</li> </ul>	Contact ELSTEAM technical support
	Level sensor self-test alert			<ul style="list-style-type: none"> <li>• Check for correct water pressure.</li> <li>• If the alert reoccurs at reset, replace the control board</li> </ul>

#### 14.1.5 Water alert

LED	Description	Cause	Effects	Solution
	Empty reservoir alert	<ul style="list-style-type: none"> <li>• Level board not working</li> <li>• Minimum water level not reached</li> <li>• Water present after draining</li> </ul>	<i>Level board not working:</i> <ul style="list-style-type: none"> <li>• Mist-maker and fan OFF</li> <li>• LED on steady</li> </ul>	Contact ELSTEAM technical support
			<i>Minimum water level not reached:</i> <ul style="list-style-type: none"> <li>• Mist-maker OFF</li> <li>• LED blinks 3 s ON/3 s OFF</li> </ul>	
			<i>Water present after draining:</i> <ul style="list-style-type: none"> <li>• Mist-maker and fan OFF</li> <li>• LED blinks 0.5 s ON/ 0.5 s OFF</li> </ul>	

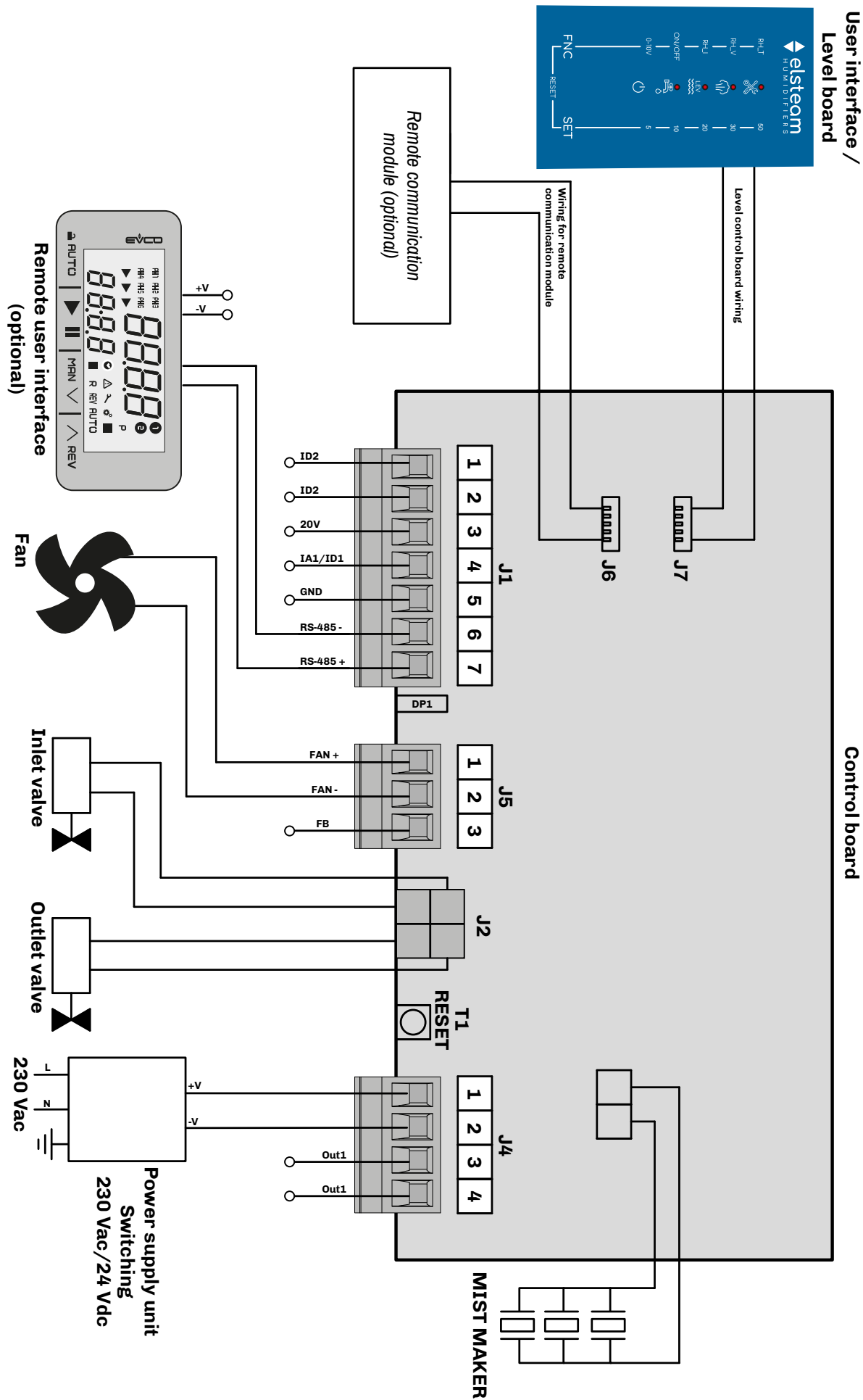
### 14.2 ALERTS TABLE (EV3K INTERFACE)

The table below lists alarms with corresponding solutions. Warnings are made via alert LED  lighting up. The upper line of the display shows **Err** (if alert in progress) or **UUor** (if warning in progress).

Code	Description	Cause	Effects	Solution
<b>Pr1</b>	Adjustment sensor error	<ul style="list-style-type: none"> <li>• Probe not working</li> <li>• Sensor not connected properly</li> <li>• Incorrect probe type</li> </ul>	<ul style="list-style-type: none"> <li>• Showing code <b>Pr1</b></li> <li>• ON alarm output</li> </ul>	<ul style="list-style-type: none"> <li>• Check the sensor type</li> <li>• Check the probe wiring</li> <li>• Change the probe type</li> </ul>
<b>Pr2</b>	NTC on-board sensor error	<ul style="list-style-type: none"> <li>• NTC on-board sensor not working</li> <li>• Level board not working</li> </ul>	<ul style="list-style-type: none"> <li>• Showing code <b>Pr2</b></li> <li>• Adjustment OFF</li> </ul>	<ul style="list-style-type: none"> <li>• Replace level board</li> <li>• Contact ELSTEAM technical support</li> </ul>
<b>A1</b>	Inlet solenoid valve minimum current alert	Absorption thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>• Showing code <b>A1</b></li> <li>• Inlet solenoid valve OFF</li> <li>• If <b>CFG</b> = 0...4 then <b>Out1</b> is activated</li> <li>• LED blinks 0.5 s ON / 5 s OFF</li> </ul>	<ul style="list-style-type: none"> <li>• Replace the inlet solenoid valve</li> <li>• Contact ELSTEAM technical support</li> </ul>
<b>A2</b>	Inlet solenoid valve maximum current alert	Absorption thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>• Showing code <b>A2</b></li> <li>• No effect on regulation</li> <li>• If <b>CFG</b> = 0...4 then <b>Out1</b> is activated</li> <li>• LED blinks 0.5 s ON / 5 s OFF</li> </ul>	
<b>A3</b>	Outlet solenoid valve minimum current alert	Absorption thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>• Showing code <b>A3</b></li> <li>• Outlet solenoid valve OFF</li> <li>• If <b>CFG</b> = 0...4 then <b>Out1</b> is activated</li> <li>• LED blinks 0.5 s ON / 5 s OFF</li> </ul>	<ul style="list-style-type: none"> <li>• Replace the outlet solenoid valve</li> <li>• Contact ELSTEAM technical support</li> </ul>
<b>A4</b>	Outlet solenoid valve maximum current alert	Absorption thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>• Showing code <b>A4</b></li> <li>• No effect on regulation</li> <li>• If <b>CFG</b> = 0...4 then <b>Out1</b> is activated</li> <li>• LED blinks 0.5 s ON / 5 s OFF</li> </ul>	
<b>A5</b>	Mist-maker minimum current alert	Absorption thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>• Showing code <b>A5</b></li> <li>• No effect on regulation</li> <li>• If <b>CFG</b> = 0...4 then <b>Out1</b> is activated</li> <li>• LED blinks 0.5 s ON / 5 s OFF</li> </ul>	<ul style="list-style-type: none"> <li>• Replace the mist-maker</li> <li>• Contact ELSTEAM technical support</li> </ul>
<b>A6</b>	Mist-maker maximum current alert	Absorption thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>• Showing code <b>A6</b></li> <li>• Mist-maker OFF</li> <li>• If <b>CFG</b> = 0...4 then <b>Out1</b> is activated</li> <li>• LED blinks 0.5 s ON / 5 s OFF</li> </ul>	
<b>A7</b>	Fan minimum current alert	Absorption thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>• Showing code <b>A7</b></li> <li>• No effect on regulation</li> <li>• If <b>CFG</b> = 0...4 then <b>UD1</b> is activated</li> <li>• LED blinks 0.5 s ON / 5 s OFF</li> </ul>	<ul style="list-style-type: none"> <li>• Automatic reactivation</li> <li>• Contact ELSTEAM technical support</li> </ul>
<b>A8</b>	Fan maximum current alert	Absorption thresholds exceeded in normal operation	<ul style="list-style-type: none"> <li>• Showing code <b>A8</b></li> <li>• Fan OFF</li> <li>• If <b>CFG</b> = 0...4 then <b>Out1</b> is activated</li> <li>• LED blinks 0.5 s ON / 5 s OFF</li> </ul>	

Code	Description	Cause	Effects	Solution
<b>A9</b>	Mist-maker operating hours alert	<ul style="list-style-type: none"> <li>• If <b>P1</b> = 70...449 <math>\mu\text{S}\cdot\text{cm}</math>, operating hours &gt; <b>A10</b></li> <li>• If <b>P1</b> = 450...849 <math>\mu\text{S}\cdot\text{cm}</math>, operating hours &gt; <b>A11</b></li> <li>• If <b>P1</b> = 850...1250 <math>\mu\text{S}\cdot\text{cm}</math>, operating hours &gt; <b>A12</b></li> </ul>	<ul style="list-style-type: none"> <li>• Showing code <b>A9</b></li> <li>• No effect on regulation</li> <li>• If <b>CFG</b> = 0...4 then <b>Out1</b> is activated</li> <li>• LED blinks 0.5 s ON / 5 s OFF</li> </ul>	Carry out maintenance (see " <b>10. MAINTENANCE</b> " ON <b>PAGE 51</b> )
<b>A10</b>	Fan operating hours alert	Fan operating hours > <b>A13</b>	<ul style="list-style-type: none"> <li>• Showing code <b>A10</b></li> <li>• No effect on regulation</li> <li>• If <b>CFG</b> = 0...4 then <b>Out1</b> is activated</li> <li>• LED blinks 0.5 s ON / 5 s OFF</li> </ul>	Carry out maintenance (see " <b>10. MAINTENANCE</b> " ON <b>PAGE 51</b> )
<b>A11</b>	Low humidity alarm	RH sensor < <b>A5</b> for a time <b>A7</b>	<ul style="list-style-type: none"> <li>• Showing code <b>A11</b></li> <li>• No effect on regulation</li> <li>• LED blinks 1 s ON / 1 s OFF</li> </ul>	Reactivation is automatic if RH sensor > <b>A5</b> + 2 %
<b>A12</b>	High humidity alarm	RH sensor > <b>A6</b> for a time <b>A7</b>	<ul style="list-style-type: none"> <li>• Showing code <b>A12</b></li> <li>• No effect on regulation</li> <li>• LED blinks 0.5 s ON / 0.5 s OFF</li> </ul>	Reactivation is automatic if RH sensor < <b>A6</b> - 2 %
<b>A13</b>	Level board high temperature alert	Impurities in the water in the reservoir	<ul style="list-style-type: none"> <li>• Showing code <b>A13</b></li> <li>• No effect on regulation</li> <li>• If <b>CFG</b> = 0...4 then <b>Out1</b> is activated</li> <li>• LED blinks 0.5 s ON / 5 s OFF</li> </ul>	<ul style="list-style-type: none"> <li>• Check the characteristics of the water</li> <li>• Clean the reservoir</li> <li>• Switch the humidifier off and on again</li> </ul>

15. WIRING DIAGRAM



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