elsteam
HUMIDIFIERS

ZEPHYR OEM

Immersed electrode humidifiers for air handling units

⚠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.

Operating and maintenance manual

924EHKOE4.00 - 07/2024

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IMPORTANT INFORMATION

Liability and residual risks

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

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

The customer/manufacturer is responsible for ensuring their machine complies with these regulations.
ELSTEAM's responsibility is limited to the correct and professional use of the product in accordance with regulations and the instructions contained in this manual and other product support documents.

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

Disclaimer

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

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

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

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

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

Terms and Conditions of use

Permitted use

The device should only be used for humidification inside the air handling unit (AHU).
The device must be installed and used in accordance with the instructions provided and, in particular, hazardous live parts or highly pressurised water must not be accessible under normal conditions.

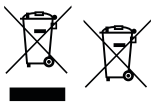
The device must be suitably protected from water and dust with regard to its application and must also only be accessible with the aid of a tool.
Only qualified personnel may install the product or perform technical support procedures on it.

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

Prohibited use

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

Disposal



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

Consider the environment

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

IMPORTANT SAFETY INFORMATION

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

SYMBOLS

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

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

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

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

SAFETY MESSAGES

DANGER

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

WARNING

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

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.

UNAUTHORISED PERSONNEL

The humidifier must **not** be used by persons (including children) with reduced physical, sensory or mental capabilities or persons with no experience or knowledge.

SAFETY INFORMATION RELATING TO THE PRODUCT

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

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

⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

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

⚠ DANGER

LOOSE WIRING CAUSES ELECTRIC SHOCKS AND OVERHEATING

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

⚠ DANGER

RISK OF ELECTRIC SHOCK AND FIRE

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

⚠ WARNING

MALFUNCTIONING OF THE EQUIPMENT

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

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

⚠ WARNING

HOT WATER VAPOUR

Do not touch the equipment while it is running.

⚠ WARNING

RISK OF BURNS

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

⚠ WARNING

REGULATORY INCOMPATIBILITY

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

SAFETY INFORMATION RELATED TO HEALTH AND HYGIENE

The **Zephyr OEM** 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 poor maintenance/cleaning after the humidifier has been shut-down for a long time, microorganisms (including the bacteria that cause Legionellosis) may proliferate and be transferred into the air treatment system.
- The humidifier must be used correctly and be maintained and cleaned properly at the prescribed intervals, as described in the ***MAINTENANCE*** chapter.

Thoroughly remove limescale and biofilm residues from the reservoir and drain (rinse the inside of the reservoir with 20% citric acid and appropriate biocides, and clean the limescale off the surface).

1. INTRODUCTION

1.1 Description

The **Zephyr OEM** humidifier is the ELSTEAM solution for immersed electrode humidifier systems dedicated to PAC/CLOSE CONTROL applications and to all applications that require small kits to install the electrical part for remote management of the hydraulic part.

The **Zephyr OEM** humidifier consists of 4 elements:

- Hydraulic unit;
- Wiring kit (to be purchased separately);
- Electronic controller on DIN rail mount (to be purchased separately);
- TA current sensor.

It can all be equipped with an LED HMI interface and other accessories (see chapter***"1.6 ACCESSORIES" ON PAGE 13***)

Zephyr series humidifiers generate humidity (steam) by means of a current passing between 2 or 3 electrodes immersed in drinking water to bring it to boiling point.

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

The steam is introduced into the air handling unit by means of a steam hose and a linear distributor, after placing the OEM kit inside the compartment provided by the manufacturer.

The **Zephyr OEM** humidifier is inserted into the compartment provided, which is NOT ACCESSIBLE to the public, not exposed to the weather and therefore protected. To prevent ice from forming during winter if the unit is installed outside, use heating cables for the water supply and outlet pipes.

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

1.2 Product overview

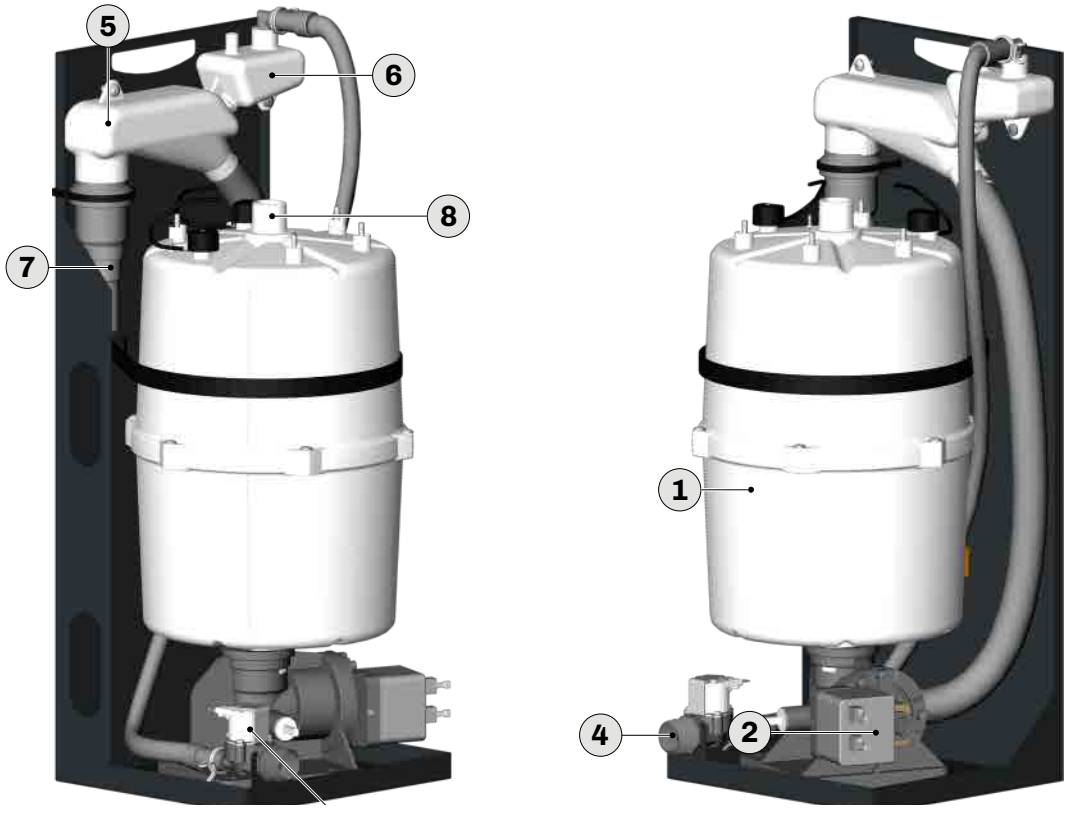


Fig. 1. *Hydraulic unit overview*

Reference	Description	Reference	Description
①	Boiler	⑤	Water outlet and overflow circuit
②	Electric outlet pump	⑥	Water filling reservoir
③	Inlet solenoid valve	⑦	Water outlet pipe (32 mm (1.26 in.) or 40 mm (1.57 in.))
④	Water filling fitting, 3/4" M GAS	⑧	Steam outlet

1.3 Main features

- Isothermal humidifier;
- Sterile steam (steam with a temperature of approximately 100 °C (212 °F));
- Automatic boiler cleaning;
- Cleanable and reusable fire-retardant boiler;
- Operating algorithm optimises energy and water efficiency;
- Broad range of steam production (2...40 kg/h);
- Built-in electronic control;
- Stainless steel water drain tray on request.

1.3.1 Electronic control features

- Proportional control of steam production:
  - High efficiency;
  - Rapid response to changes in requirements;
  - Production control.
- Electrode and boiler cleaning system:
  - Reduced maintenance frequency;
  - High performance levels;
  - Longer electrode and boiler life.
- Automatic or manual boiler draining:
  - Longer boiler life.
- Smart user interface indicates operating status (with display connected only):
  - Continuous monitoring of the operating status;
  - Automatic fault analysis;
  - Advanced error diagnostics;
  - Operating time counter.
- Remote supervision with EPoCA (optional via **EVIF25** interface).

1.4 Applications

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

- Data centres;
- Industrial plants;
- Offices;
- Civil settings;
- Home MEV settings;
- Call centres;
- Hotels;
- Museums and libraries;
- Technological or medical settings;
- Tobacco industry;
- Food industry;
- Maturing;
- Wood industry;
- Paper mills;
- Printing industries;
- Turkish baths.

1.5 Available configurations

1.5.1 ExtraSmall models

P/N	Description	Configuration
EHKO00000XS	Zephyr OEM XS immersed electrode humidifier without boiler	ExtraSmall kit, without boiler
EHKO002M0XS	Zephyr OEM immersed electrode humidifier, 2 kg/h, 400/460 Vac	ExtraSmall kit, 2 kg/h, 230 Vac, single-phase
EHKO003T0XS	Zephyr OEM immersed electrode humidifier, 3 kg/h, 400/460 Vac	ExtraSmall kit, 3 kg/h, 400 Vac, three-phase
EHKO003T0XS	Zephyr OEM immersed electrode humidifier, 3 kg/h, 400/460 Vac	ExtraSmall kit, 3 kg/h, 460 Vac, three-phase

1.5.2 Small models

P/N	Description	Configuration
EHKO00000S	Zephyr OEM S immersed electrode humidifier without boiler	Small kit, without boiler
EHKO003M0S	Zephyr OEM S immersed electrode humidifier, 3 kg/h, 230 Vac	Small kit, 3 kg/h, 230 Vac, single-phase
EHKO008T0S	Zephyr OEM S immersed electrode humidifier, 5–8 kg/h, 400/460 Vac	Small kit, 5 kg/h, 400 Vac, three-phase
EHKO008T0S	Zephyr OEM S immersed electrode humidifier, 5–8 kg/h, 400/460 Vac	Small kit, 5 kg/h, 460 Vac, three-phase
EHKO008T0S	Zephyr OEM S immersed electrode humidifier, 5–8 kg/h, 400/460 Vac	Small kit, 8 kg/h, 400 Vac, three-phase
EHKO008T0S	Zephyr OEM S immersed electrode humidifier, 5–8 kg/h, 400/460 Vac	Small kit, 8 kg/h, 460 Vac, three-phase

1.5.3 Medium models

P/N	Description	Configuration
EHKO00000M	Zephyr OEM M immersed electrode humidifier without boiler	Medium kit, without boiler
EHKO005M0M	Zephyr OEM M immersed electrode humidifier, 5 kg/h, 400/460 Vac	Medium kit, 5 kg/h, 230 Vac, single-phase
EHKO015T0M	Zephyr OEM M immersed electrode humidifier, 10–15 kg/h, 400/460 Vac	Medium kit, 10 kg/h, 400 Vac, three-phase
EHKO015T0M	Zephyr OEM M immersed electrode humidifier, 10–15 kg/h, 400/460 Vac	Medium kit, 10 kg/h, 460 Vac, three-phase
EHKO015T0M	Zephyr OEM M immersed electrode humidifier, 10–15 kg/h, 400/460 Vac	Medium kit, 15 kg/h, 400 Vac, three-phase
EHKO015T0M	Zephyr OEM M immersed electrode humidifier, 10–15 kg/h, 400/460 Vac	Medium kit, 15 kg/h, 460 Vac, three-phase

1.5.4 Large models

P/N	Description	Configuration
EHKO00000L	Zephyr OEM L immersed electrode humidifier without boiler	Large kit, without boiler
EHKO040T0L	Zephyr OEM L immersed electrode humidifier, 20–40 kg/h, 400/460 Vac	Large kit, 20 kg/h, 400 Vac, three-phase
EHKO040T0L	Zephyr OEM L immersed electrode humidifier, 20–40 kg/h, 400/460 Vac	Large kit, 20 kg/h, 460 Vac, three-phase
EHKO040T0L	Zephyr OEM L immersed electrode humidifier, 20–40 kg/h, 400/460 Vac	Large kit, 30 kg/h, 400 Vac, three-phase
EHKO040T0L	Zephyr OEM L immersed electrode humidifier, 20–40 kg/h, 400/460 Vac	Large kit, 30 kg/h, 460 Vac, three-phase
EHKO040T0L	Zephyr OEM L immersed electrode humidifier, 20–40 kg/h, 400/460 Vac	Large kit, 40 kg/h, 400 Vac, three-phase
EHKO040T0L	Zephyr OEM L immersed electrode humidifier, 20–40 kg/h, 400/460 Vac	Large kit, 40 kg/h, 460 Vac, three-phase

1.6 Accessories

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

1.6.1 Linear distributors

P/n	Description
EHSD040T	Linear steam distributor, 400 mm (1.31 ft).
EHSD060T	Linear steam distributor, 600 mm (1.97 ft).
EHSD080T	Linear steam distributor, 800 mm (2.62 ft).
EHSD100T	Linear steam distributor, 1000 mm (3.28 ft).
EHSD130T	Linear steam distributor, 1300 mm (4.26 ft).
EHSDP000T	Custom linear steam distributor.
EHSD040X	Linear steam distributor with high thermal efficiency, 400 mm (1.31 ft).
EHSD060X	Linear steam distributor with high thermal efficiency, 600 mm (1.97 ft).
EHSD080X	Linear steam distributor with high thermal efficiency, 800 mm (2.62 ft).
EHSD100X	Linear steam distributor with high thermal efficiency, 1000 mm (3.28 ft).
EHSD130X	Linear steam distributor with high thermal efficiency, 1300 mm (4.26 ft).
EHSDP000X	Custom steam distributor with high thermal efficiency.
EHSDW022	Steam distributor with 22 mm (0.87 in.) nozzle.
EHSDC038	90° steam distribution connection, Ø38 mm (1.50 in.).

1.6.2 Boilers

P/n	Description
EHBK002M00XS	Cleanable boiler for ExtraSmall standard, 2 kg/h, single-phase models
EHBK002MHCXS	Cleanable boiler for ExtraSmall high-conductivity, 2 kg/h, single-phase models
EHBK002MLCXS	Cleanable boiler for ExtraSmall low-conductivity, 2 kg/h, single-phase models
EHBK003M00S	Cleanable boiler for Small standard, 3 kg/h, single-phase models
EHBK003MHCS	Cleanable boiler for Small high-conductivity, 3 kg/h, single-phase models
EHBK003MLCS	Cleanable boiler for Small low-conductivity, 3 kg/h, single-phase models
EHBK003T00XS	Cleanable boiler for ExtraSmall standard, 3 kg/h, three-phase models
EHBK003THCXS	Cleanable boiler for ExtraSmall high-conductivity, 3 kg/h, three-phase models
EHBK003TLCXS	Cleanable boiler for ExtraSmall low-conductivity, 3 kg/h, three-phase models
EHBK005M00M	Cleanable boiler for Medium standard, 3–5 kg/h, single-phase models
EHBK005MHCM	Cleanable boiler for Medium high-conductivity, 3–5 kg/h, single-phase models
EHBK005MLCM	Cleanable boiler for Medium low-conductivity, 3–5 kg/h, single-phase models
EHBK005T00S	Cleanable boiler for Small standard, 5–8 kg/h, three-phase models
EHBK005THCS	Cleanable boiler for Small high-conductivity, 5–8 kg/h, three-phase models
EHBK005TLCS	Cleanable boiler for Small low-conductivity, 5–8 kg/h, three-phase models
EHBK015T00M	Cleanable boiler for standard, 10–15 kg/h, three-phase models
EHBK015THCM	Cleanable boiler for high-conductivity, 10–15 kg/h, three-phase models
EHBK015TLCM	Cleanable boiler for low-conductivity, 10–15 kg/h, three-phase models
EHBK040T00L	Cleanable boiler for standard, 20–30–40 kg/h, three-phase models
EHBK040THCL	Cleanable boiler for high-conductivity, 20–30–40 kg/h, three-phase models
EHBK040TLCL	Cleanable boiler for low-conductivity, 20–30–40 kg/h, three-phase models

1.6.3 Sensors and control accessories

P/n	Description
EVIF25TW4X0001	EVLINK TTL/Wi-Fi + RTC 12-30VDC
EV3411M7	1-output electronic controller, 230 VAC power supply, 1 multi-sensor analogue input.
EVHTP520	Temperature/humidity sensor with 5...95% r.H. and -10...70 °C range.
EVHP523	4...20 mA humidity transducer with 5...95% r.H. range.
EVHTP523	Humidity and temperature transducer, 8...28 VDC power supply, 2 x 4...20 mA output signals.
EVTPNW30F200	NTC sensor, 3 m long 2-wire thermoplastic cable, 5x20 mm comoulded bulb, IP68 protection.

1.6.4 Plumbing components

P/n	Description
0031000048	¾" GAS female hose to connect the water mains to the water inlet solenoid valve, 300 mm (11.81in.)
EHTV038	Steam pipe, Ø38 mm (1.50 in.)
EHTC010	Condensate outlet pipe, Ø10 mm
EHFILLTANK	Low/high pressure tank filling kit

1.7 Steam distributor/humidifier configuration table

Steam distributor	EHKO humidifiers								
	EHKO002	**EHKO003**	**EHKO005**	**EHKO008**	**EHKO010**	**EHKO015**	**EHKO020**	**EHKO030**	**EHKO040**
EHSD040•	X	X	X	X	X(*)	---	---	---	---
EHSD060•	X	X	X	X	X	X(**)	X(**)	---	X(**)
EHSD080•	X	X	X	X	X	X	X	X(***)	X(***)
EHSD100•	---	---	---	---	X	X	X	X	X
EHSD130•	---	---	---	---	X	X	X	X	X
EHSDY038	Can be used to double the steam output and for small steam emission ducts with short steam distributors								
EHSDC038	X	X	X	X	X	X	X	X	X
EHSDW022	X	X	X	X	X	X	X	X	X

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

(*) = Use 2 **EHSD040•** + 1 **EHSDY038** manifold

(**) = Use 2 **EHSD060•** + 1 **EHSDY038** manifold

(***) = Use 2 **EHSD080•** + 1 **EHSDY038** manifold

(#) = Use 4 **EHSD080•** + 2 **EHSDY038** manifolds

(##) = Use 4 **EHSD100•** + 2 **EHSDY038** manifolds

(###) = Use 2 **EHSR015M2** + 1 **EHSDY038** manifold

2. TECHNICAL DATA

2.1 Technical specifications

2.1.1 ExtraSmall models | Zephyr OEM...

Description	MU	EHKO00000XS	EHKO002M0XS	EHKO003T0XS
Steam production				
Production capacity:	kg/h	2...3	2	3
Pressure limits:	Pa/bar	500/0.005		
Steam connection diameter:	mm (in.)	38 (1.50)		
Electrical properties				
Power absorbed:	kW	1.5...2.2	1.5	2.25
Power supply:	V	Configurable 230/400/460 Vac	230 Vac	Configurable 400 / 460 Vac
Frequency:	Hz	50/60		
Phases:	Ph	Configurable	1	3
Absorption per phase:	A	Configurable	6.4	3.2 / 2.8
Water properties				
Supply water quality:	---	See section ***"5.3.1 INLET WATER SPECIFICATIONS" ON PAGE 24***		
Supply water conductivity:	µS*cm	70...1250		
Supply water hardness:	°f	5...50		
Minimum inlet flow rate:	l/h	300		
Supply water pressure:	MPa/bar	0.02...1/0.2...10		
Water inlet connection:	---	M 3/4" GAS		
Water outlet outside diameter:	mm (in.)	32 (1.26)		
General specifications				
Dimensions:	mm (in.)	See section ***"4.1 DIMENSIONS" ON PAGE 20***		
IP protection degree of the hydraulic unit:	---	IPX0		
Maximum installation altitude:	m (ft.)	≤2000 (6561.6)		
Ambient conditions of the hydraulic unit				
Ambient operating conditions:	°C (°F), %	1...40 (33.8...104), 10...80%		
Transportation and storage conditions:	°C (°F), %	-10...70 (14...185), 5...95%		
Regulation				
Control type/command signal:	---	ON/OFF Proportional Probe		
Supervision/Configuration:	---	RS-485 MODBUS Supervision Wi-Fi		
Compliance				
EC:	---	Yes, with self-certification		

NOTE: Models with dual hydraulic units can be created by adding an expansion to the control board, in which case the aforementioned values become the sum of those for the 2 hydraulic units chosen.

2.1.2 Small models | Zephyr OEM...

Description	MU	EHKO00000S	EHKO003M0S	EHKO005T0S	EHKO008T0S
Steam production					
Production capacity:	kg/h	3...8	3	5	8
Pressure limits:	Pa/bar	500/0.005			
Steam connection diameter:	mm (in.)	22 (0.87)			
Electrical properties					
Power absorbed:	kW	2.2...6	2.2	3.75	6
Power supply:	V	Configurable 230/400/460 Vac	230 Vac	Configurable 400 / 460 Vac	Configurable 400 Vac / 460 Vac
Frequency:	Hz	50/60			
Phases:	Ph	Configurable	1	3	
Absorption per phase:	A	Configurable	9.6	5.4 / 4.7	8.6 / 7.5
Water properties					
Supply water quality:	---	See section ***"5.3.1 INLET WATER SPECIFICATIONS" ON PAGE 24***			
Supply water conductivity:	µS*cm	70...1250			
Supply water hardness:	°f	5...50			
Minimum inlet flow rate:	l/h	300			
Supply water pressure:	MPa/bar	0.02...1/0.2...10			
Water inlet connection:	---	M 3/4" GAS			
Water outlet outside diameter:	mm (in.)	32 (1.26)			
General specifications					
Dimensions:	mm (in.)	See section ***"4.1 DIMENSIONS" ON PAGE 20***			
IP protection degree of the hydraulic unit:	---	IPX0			
Maximum installation altitude:	m (ft.)	≤2000 (6561.6)			
Ambient conditions of the hydraulic unit					
Ambient operating conditions:	°C (°F), %	1...40 (33.8...104), 10...80%			
Transportation and storage conditions:	°C (°F), %	-10...70 (14...185), 5...95%			
Regulation					
Control type/command signal:	---	ON/OFF Proportional Probe			
Supervision/Configuration:	---	RS-485 MODBUS Supervision Wi-Fi			
Compliance					
EC:	---	Yes, with self-certification			

NOTE: Models with dual hydraulic units can be created by adding an expansion to the control board, in which case the aforementioned values become the sum of those for the 2 hydraulic units chosen.

2.1.3 Medium models | Zephyr OEM...

Description	MU	EHKO00000M	EHKO005M0M	EHKO015T0M
Steam production				
Production capacity:	kg/h	5...15	5	10...15
Pressure limits:	Pa/bar	500/0.005		
Steam connection diameter:	mm (in.)	38 (1.50)		
Electrical properties				
Power absorbed:	kW	3.75...11.5	3.75	7.5 / 11.5
Power supply:	V	Configurable 400/460 Vac	230 Vac	Configurable 400/460 Vac
Frequency	Hz	50/60		
Phases:	Ph	Configurable	1	
Absorption per phase:	A	Configurable	16.3	10.8 / 9.4 / 16.3 / 14.2
Water properties				
Supply water quality:	---	See section ***"5.3.1 INLET WATER SPECIFICATIONS" ON PAGE 24***		
Supply water conductivity:	µS*cm	70...1250		
Supply water hardness:	°f	5...50		
Minimum inlet flow rate:	l/h	300		
Supply water pressure:	MPa/bar	0.02...1/0.2...10		
Water inlet connection:	---	M 3/4" GAS		
Water outlet outside diameter:	mm (in.)	32 (1.26)		
General specifications				
Dimensions:	mm (in.)	See section ***"4.1 DIMENSIONS" ON PAGE 20***		
IP protection degree of the hydraulic unit:	---	IPX0		
Maximum installation altitude:	m (ft.)	≤2000 (6561.6)		
Ambient conditions of the hydraulic unit				
Ambient operating conditions:	°C (°F), %	1...40 (33.8...104), 10...80%		
Transportation and storage conditions:	°C (°F), %	-10...70 (14...185), 5...95%		
Regulation				
Control type/command signal:	---	ON/OFF Proportional Probe		
Supervision/Configuration:	---	RS-485 MODBUS Supervision Wi-Fi		
Compliance				
EC:	---	Yes, with self-certification		

NOTE: Models with dual hydraulic units can be created by adding an expansion to the control board, in which case the aforementioned values become the sum of those for the 2 hydraulic units chosen.

2.1.4 Large models | Zephyr OEM...

Description	MU	EHKO00000L	EHKO040T0L
Steam production			
Production capacity:	kg/h	20....40	20/30/40
Pressure limits:	Pa/bar	600/0.006	
Steam connection diameter:	mm (in.)	38 (1.50)	
Electrical properties			
Power absorbed:	kW	15...30	15 / 22.5/30
Power supply:	V	Configurable 400/460 Vac	Configurable 400/460 Vac
Frequency:	Hz	50/60	
Phases:	Ph	3	
Absorption per phase:	A	Configurable	21.7 / 18.8 / 32.5 / 28.2 / 43.3 / 37.3
Water properties			
Supply water quality:	---	See section ***"5.3.1 INLET WATER SPECIFICATIONS" ON PAGE 24***	
Supply water conductivity:	µS*cm	70...1250	
Supply water hardness:	°f	5...50	
Minimum inlet flow rate:	l/h	300	
Supply water pressure:	MPa/bar	0.02...1/0.2...10	
Water inlet connection:	---	M 3/4" GAS	
Water outlet outside diameter:	mm (in.)	40 (1.57)	
General specifications			
Dimensions:	mm (in.)	See section ***"4.1 DIMENSIONS" ON PAGE 20***	
IP protection degree of the hydraulic unit:	---	IPX0	
Maximum installation altitude:	m (ft.)	≤2000 (6561.6)	
Ambient conditions of the hydraulic unit			
Ambient operating conditions:	°C (°F), %	1...40 (33.8...104), 10...80%	
Transportation and storage conditions:	°C (°F), %	-10...70 (14...185), 5...95%	
Regulation			
Control type/command signal:	---	ON/OFF Proportional Probe	
Supervision/Configuration:	---	RS-485 MODBUS Supervision Wi-Fi	
Compliance			
EC:	---	Yes, with self-certification	

NOTE: Models with dual hydraulic units can be created by adding an expansion to the control board, in which case the aforementioned values become the sum of those for the 2 hydraulic units chosen.

3. RECEIVING THE PRODUCT

⚠ CAUTION

IMPROPER HANDLING

- Use all necessary personal protective equipment (PPE), such as safety gloves and shoes, while handling packaging and unpacking.
- Follow the handling instruction given in this manual and any other documentation associated with the product.
- Handle and store the product in its original packaging.
- Do not handle or store the product if the packaging is or seems to be damaged.
- Take all necessary measures to avoid damaging the product and prevent other hazards while handling or opening the packaging.

NOTICE

UNEXPECTED EQUIPMENT OPERATION

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

3.1 Checking the packaging

- Make sure the packaging is intact;
- 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 packages to the humidifier installation site;
- Open the cardboard boxes, removing the corner protectors;
- Take the hydraulic unit, current sensor (TA) and control board out of their packaging.

3.1.2 Checking the packaging contents

The product packaging contains:

- **Zephyr OEM** series humidifier, consisting of:
  - Hydraulic unit;
  - Instruction sheet.

4. DIMENSIONS AND MECHANICAL ASSEMBLY

4.1 Dimensions

4.1.1 Hydraulic unit

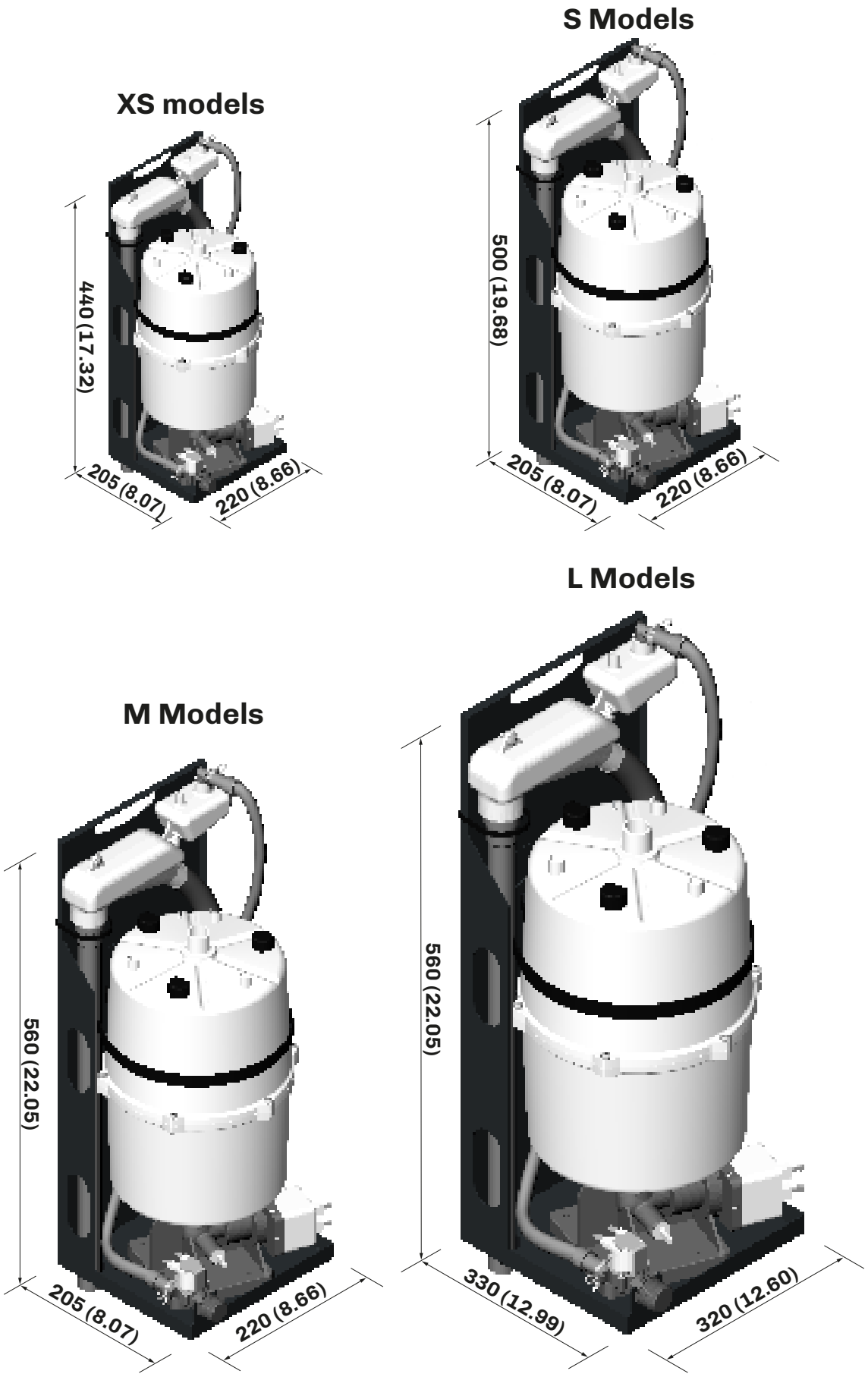


Fig. 2. *Hydraulic unit dimensions*

4.2 Zephyr OEM kit

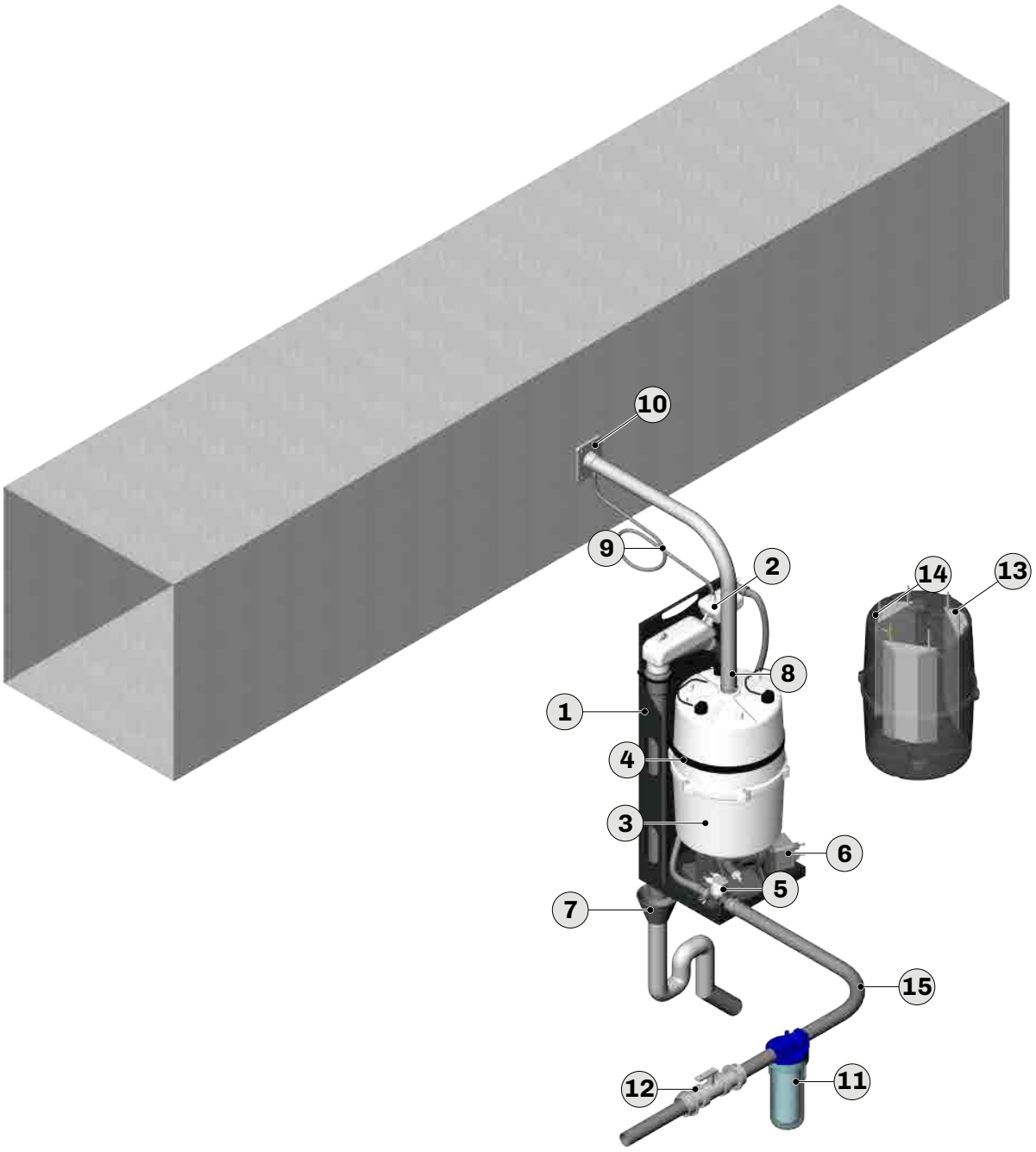


Fig. 3. *Installing the* ***Zephyr OEM***

Reference	Description
1	Rear metal mounting panel
2	Water filling reservoir
3	Boiler
4	Boiler fastening strap
5	Inlet solenoid valve
6	Electric outlet pump
7	Water outlet circuit (not supplied)
8	Steam outlet pipe (can be purchased as an accessory)

Reference	Description
9	Condensate outlet pipe
10	Steam line distributor
11	Water filter (not supplied)
12	Shut-off valve (not supplied)
13	Electrodes
14	Maximum level sensor
15	Water filling pipe (not supplied)

4.2.1 Installation hole spacing

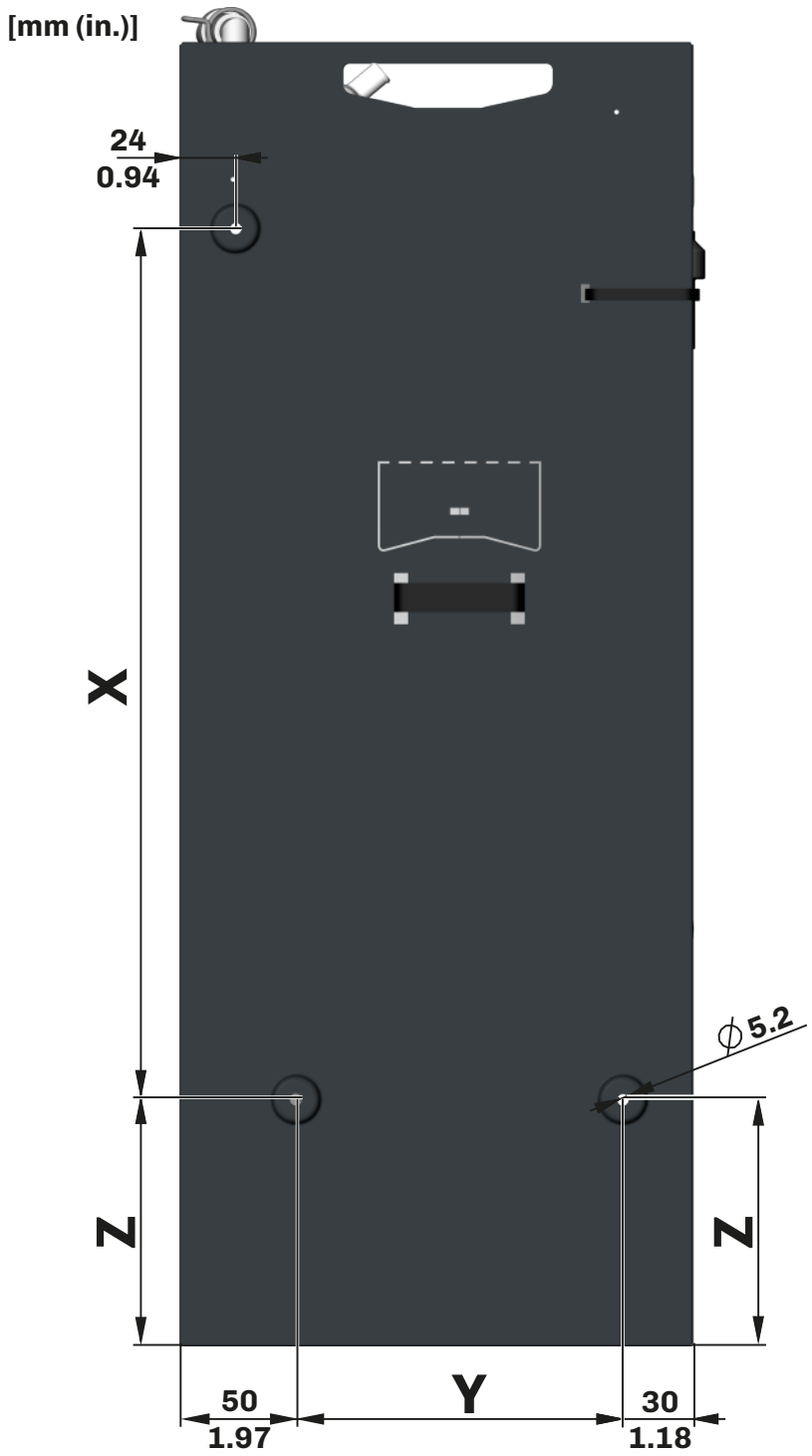


Fig. 4. *Minimum installation distances*

Zephyr OEM models	Dimension (X) [mm (in.)]	Dimension (Y) [mm (in.)]	Dimension (Z) [mm (in.)]
ExtraSmall	254 (10.0)	140 (5.51)	106 (4.17)
Small	314 (12.36)		
Medium	374 (14.72)		
Large	493.5 (19.42)	240 (9.45)	110 (4.33)

5. INSTALLING THE PLUMBING

5.1 Before you start

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

⚠ WARNING

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

5.2 Hydraulic unit structure

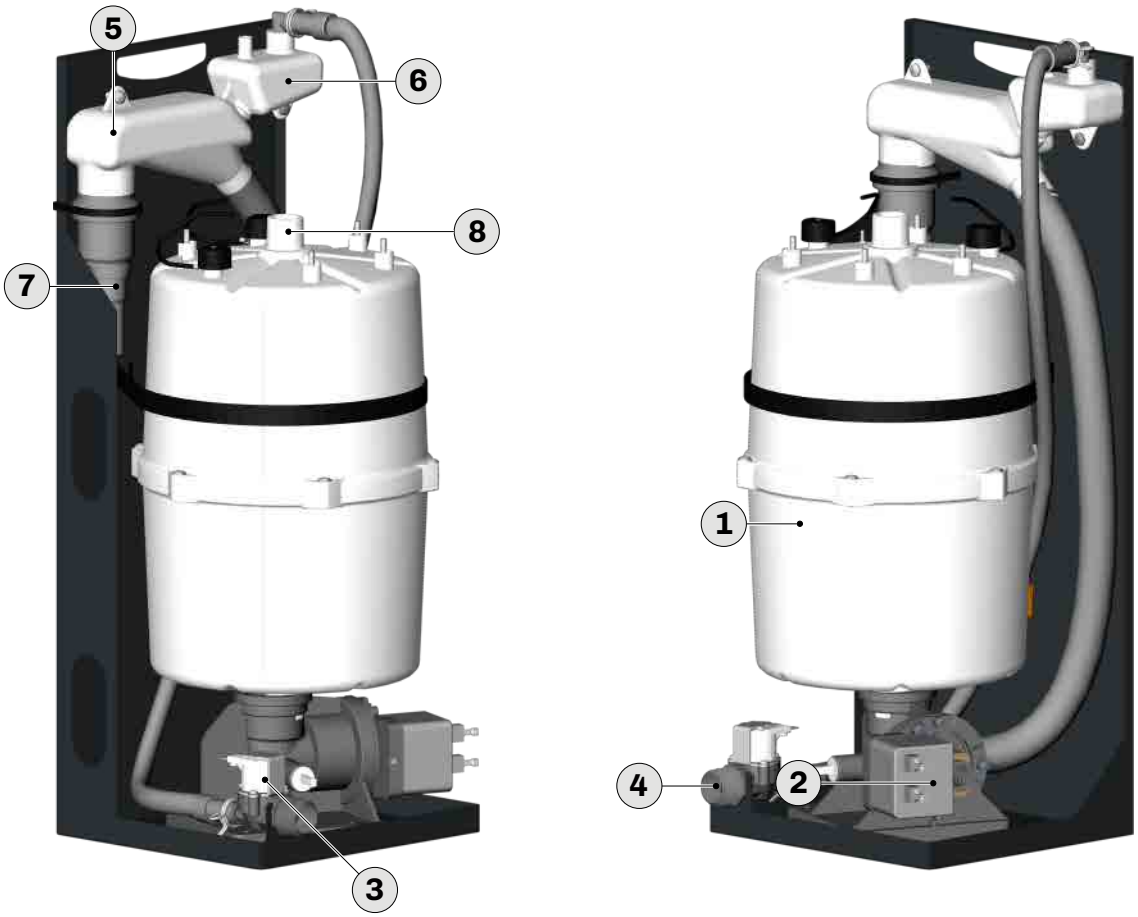


Fig. 5. *Hydraulic unit overview*

Reference	Description	Reference	Description
1	Boiler	5	Water outlet and overflow circuit
2	Electric outlet pump	6	Water filling reservoir
3	Inlet solenoid valve	7	Water outlet pipe (32 mm (1.26 in.) or 40 mm (1.57 in.))
4	Water filling fitting, 3/4" M GAS	8	Steam outlet

5.3 Installing the plumbing

To install the plumbing correctly, provide the following outside the air handling unit, in the immediate vicinity of the hydraulic unit:

- A shut-off tap;
- A filter supplementing the one already present inside the solenoid valve;
- A pressure reducer (if the mains pressure exceeds1 MPa (10 bar)).

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

Do not use pre-existing system pipework or used materials.

Only use the materials supplied or, where appropriate, the products supplied by ELSTEAM as accessories (see***"1.6 ACCESSORIES" ON PAGE 13***).

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

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

- The water supply must have a minimum pressure of 0.02 MPa (0.2 bar).
- Connect the solenoid valve to the mains using the hose (available as an accessory) in order to reduce water hammer in the water supply to the humidifier.
- During installation, take care not to damage the plastic thread on the solenoid valve.
- The water connection should allow access to the mechanical filter in the inlet solenoid valve in order to clean it.
- Only connect the outlet circuit using pipes with the specifications described in this manual.
- If the air handling unit is exposed to the weather, fit heating cables to the water supply and outlet pipes.

5.3.1 Inlet water specifications

General specifications

Description	Features
Water pressure	0.02...1 MPa (0.2...10 bar)
Minimum instantaneous inlet flow rate	Models: EHKO002-005 — Value: 1.2 l/min Models: EHKO010-015 — Value: 2.2 l/min Models: EHKO020-040 — Value: 3.5 l/min
Water temperature	1...50 °C (33.8...122 °F)
Electrical conductivity	75...1250 µS/cm (at a temperature of 20 °C (68 °F))
Total hardness	5...50 °f

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

Optimal properties

Description	Optimal properties with standard boiler
Water pressure	1...6 bar
Minimum instantaneous inlet flow rate	Models: EHKO002-005 — Value: 1.2 l/min Models: EHKO010-015 — Value: 2.2 l/min Models: EHKO020-040 — Value: 3.5 l/min
Water temperature	7... 20 °C (44.6... 68 °F)
Electrical conductivity	300...550 µS/cm
Total hardness	10...25 °f

NOTE: There is no way to establish the precise reduction in maintenance when using water with optimal properties as water morphology varies greatly even with the same hardness and electrical conductivity. In fact, the sediments that form may have different structures, from very hard to crumbly, scaly or muddy, depending on the chemical composition of the water, which is not made up of *CaCO3* alone, but also of a range of other elements/compounds.

What should you do?

- Let the water drain for a few hours before making the final connection in order drain any residues left from manufacturing and installation and ensure a free flow to the humidifier during operation.
- Check the condition of the rubber connection regularly to prevent faults that may lead to water leaks in the room.

What should you NOT do?

- Soften the water. If the water hardness is over 50 °f or if the hardness is such that frequent maintenance is required, mix a percentage of demineralised water with drinking water to ensure a minimum electrical conductivity of 200 µS/cm and a hardness of at least 10 °f;

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

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

5.4 Water drainage system

The drainage system must be able to drain water at a flow rate of at least 30 l/min.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

Dimension the outlet pipe correctly in order to prevent blocking/clogging due to limescale residues while draining.

NOTE: outlet pipes are not supplied.
NOTE: a fixed outlet connection must be used.

5.4.1 Outlet connection specifications

Connecting to an open drain with tundish

Zephyr OEM 2...15 kg/h

- Minimum diameter 32 mm (1.26 in.);
- A minimum average slope of 45° with no traps or obstructions.

Zephyr OEM 20...40 kg/h

- Minimum diameter 40 mm (1.57 in.)
- A minimum average slope of 45° with no traps or obstructions.

If the installation fails to meet these specifications, install a water and limescale drain tank at the bottom of the humidifier (*p/n* ***EHVI***) (contact the Elsteam sales office for further information).

Tank specifications

- Outlet diameter 38 mm (1.50 in.);
- Drain pipe with trap for limescale collection.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

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

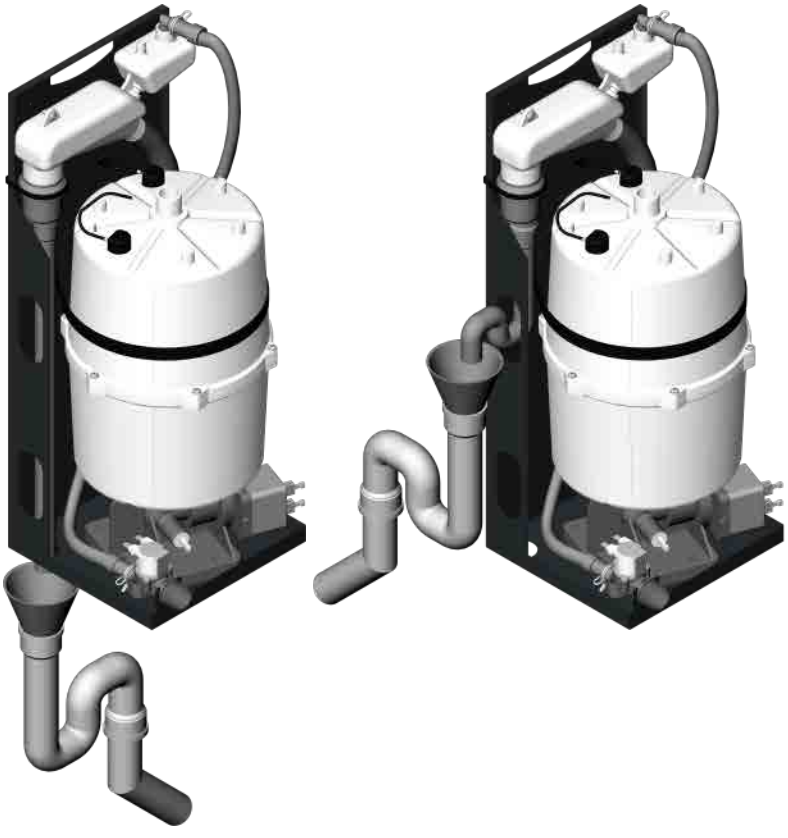


Fig. 6. *Example drain connections*

If the water hardness meets the specifications indicated in section ***"5.3.1 INLET WATER SPECIFICATIONS" ON PAGE 24,*** the tank will only need to be cleaned once a year (water hardness in the range 5...30 °f) when only used during the winter. The maintenance technician is responsible for checking for deposit build-ups and for proper maintenance to ensure correct humidifier system operation and prevent water leaks on the surfaces around the **EHVI** tank.

If the drainage network or drainage tank is made of electrically conductive material, safety standards require it to be electrically earthed.

DANGER

RISK OF ELECTRIC SHOCK

If the drainage tank is made of electrically conductive material, earth the tank or the drainage network.

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

WARNING

RISK OF BURNS

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

5.5 Steam distribution

WARNING

RISK OF BURNS

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

WARNING

HOT WATER VAPOUR

Do not touch the equipment while it is running.

WARNING

MALFUNCTIONING OF THE EQUIPMENT

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

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

6. ELECTRICAL CONNECTIONS

6.1 Before you start

Read this manual carefully before installing the equipment.

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

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

⚠ ⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

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

⚠ WARNING

REGULATORY INCOMPATIBILITY

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

6.2 Connection best practice

6.2.1 Wiring best practices

⚠ ⚠ DANGER

RISK OF ELECTRIC SHOCK AND FIRE

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

When wiring the humidifiers, observe the following instructions:

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

⚠ ⚠ DANGER

LOOSE WIRING CAUSES ELECTRIC SHOCKS AND OVERHEATING

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

⚠ WARNING

MALFUNCTIONING OF THE EQUIPMENT

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

⚠ WARNING

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

6.3 Dimensioning electrical components

Configurations (*)	Steam prod. [kg/h]	Power supply [V, 50/60 HZ]	Power [kW]	Nominal current [A]	High current alarm [A]	Fuse type	24 Vac power	Maximum current during use (**)	TA management (***)	Boiler cable type (#)	Back pressure [max mm H2O]
EHKO0000XS	---	230 Vac single-phase	Maximum 2.2	---	---	---	60 VA	---	External	---	50
EHKO002M2XS	2	230 Vac single-phase	1.5	6.5	9.8	10x38 10A gG		20 A		2x4 mm²	
EHKO003T4XS	3	400 Vac three-phase	2.2	3.2	4.8	10x38 10A gG				3x2.5 mm²	
EHKO003T5XS		460 Vac three-phase	2.2	2.8	4.2	10x38 10A gG				3x2.5 mm²	
EHKO00000S	---	Configurable	**1ph:** max 2.2 **3ph:** max 6	---	---	---	60 VA	---	External	---	50
EHKO003M2S	3	230 Vac single-phase	2.2	9.6	14.3	10x38 16A gG		20 A		2x4 mm²	
EHKO005T4S		400 Vac three-phase	3.75	5.4	8.1	10x38 10A gG				3x2.5 mm²	
EHKO005T5S	5	460 Vac three-phase	3.75	4.7	7.1	10x38 10A gG				3x2.5 mm²	
EHKO008T4S	8	400 Vac three-phase	6	8.6	12.9	10x38 16A gG				3x2.5 mm²	
EHKO008T5S		460 Vac three-phase	6	7.5	11.3	10x38 16A gG				3x2.5 mm²	
EHKO00000M	---	Configurable	**1ph**: max 3.75 **3ph**: max 11.3	---	---	---	60 VA	---	External	---	50
EHKO005M2M	3...5	230 Vac single-phase	3.75	16.3	24.5	10x38 32A gG		25 A		2x6 mm²	
EHKO010T4M	5...15	400 Vac three-phase	7.5	10.8	16.2	10x38 16A gG		20 A		3x2.5 mm²	
EHKO010T5M		460 Vac three-phase	7.5	9.4	14.1	10x38 16A gG		20 A		3x2.5 mm²	
EHKO015T4M		400 Vac three-phase	11.3	16.3	24.5	10x38 32A gG		25 A		3x6 mm²	
EHKO015T5M		460 Vac three-phase	11.3	14.2	21.3	10x38 32A gG		25 A		3x6 mm²	
EHKO00000L	---	400 Vac three-phase	Maximum 30	---	---	---	60 VA	----	External	---	60
EHKO020T4L	20...40	400 Vac three-phase	15	21.7	32.6	14x51 40A gG		45 A		3x10 mm²	
EHKO020T5L			15	18.8	28.2	14x51 40A gG		45 A		3x10 mm²	
EHKO030T4L			22.5	32.5	48.8	14x51 50A gG		56 A		3x10 mm²	
EHKO030T5L			22.5	28.2	42.3	14x51 50A gG		45 A		3x10 mm²	
EHKO040T4L			30	43.3	65.0	22x58 80A gG		70 A		3x16 mm²	
EHKO040T5L			30	37.3	56.0	22x58 80A gG		56 A		3x16 mm²	

(*) EHHKT011P4 electronic control

(**) Temperatures up to 40°C – 24 Vac contactor coil – Check the offsets at 55 and 70°C, and size in accordance with current regulations

(***) L = 2 m maximum voltage drop of 0.2 V

(#) P/n **0103349007**

6.4 Electrical connections

6.4.1 Control board

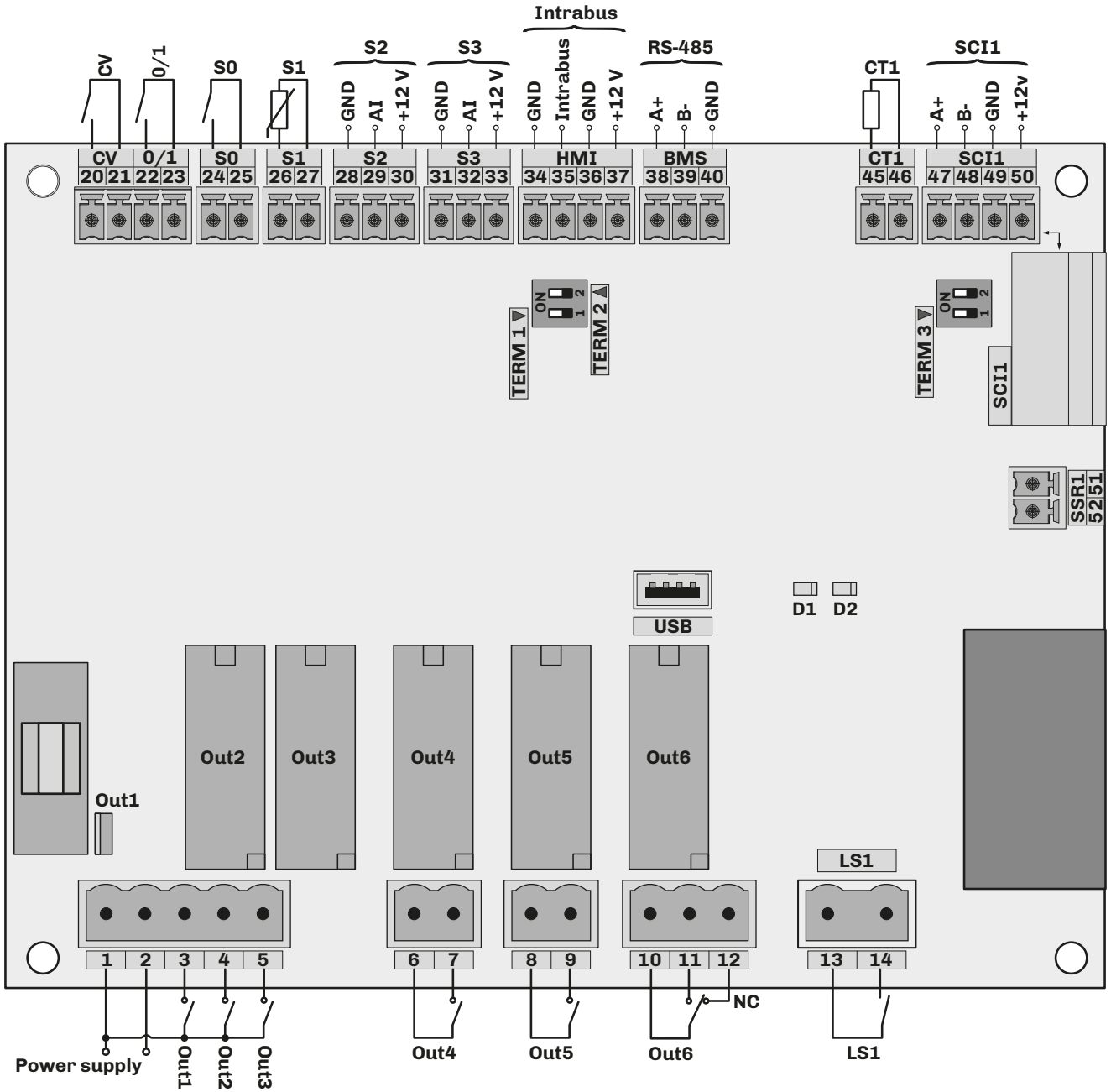


Fig. 7. *Control board electrical connections*

TERMINALS			
1-2	24 Vac power supply	**26-27**	**S1** analogue input: temperature (anti-freeze and hold)
1-3	Digital output: water outlet solenoid valve	**28...30**	**S2** analogue input: humidity sensor
1-4	Digital output: water outlet pump	**31...33**	**S3** analogue input: humidity limit sensor
1-5	Digital output: contactor (steam generation)	**34...36**	Serial line connection: HMI Intrabus
6-7	Digital output: dehumidification enable	**38...40**	Serial line connection: RS-485 modbus for BMS slave
8-9	Digital output: ventilated distributor control	**45-46**	Analogue connection: external current sensor **CT1** (TA)
10...12	Digital output: alarm	**47...50**	Connection to expansion board **SCI1**
13-14	Hazardous voltage digital input: level sensor **LS1**	**51-52**	Reserved
20-21	Digital input: fan enable (**CV**)	**TERM3**	Activate termination resistor on the **SCI1 RS-485** serial line. **ON =** Termination resistor enabled; **off** = Disabled.
22-23	Digital input: remote ON/OFF (**0/1**)	**TERM1**	Termination resistor on **BMS RS-485** serial line. **ON =** Termination resistor enabled; **off** = Disabled.
24-25	Digital input: humidistat (CFG = 0-1) (**S0**)	**TERM2**	Termination resistor on **CANBUS** serial line. **ON =** Termination resistor enabled; **off** = Disabled.

6.4.2 Power supply and earth wiring connection

DANGER

RISK OF ELECTRIC SHOCK

Make sure that the entire system is earthed to the highest standards.

6.5 Configurations

6.5.1 ON/OFF connection with humidistat or external contact (CFG = 0-1)

Configuration
CFG = 0-1
CV input = Closed
0/1 input = Closed

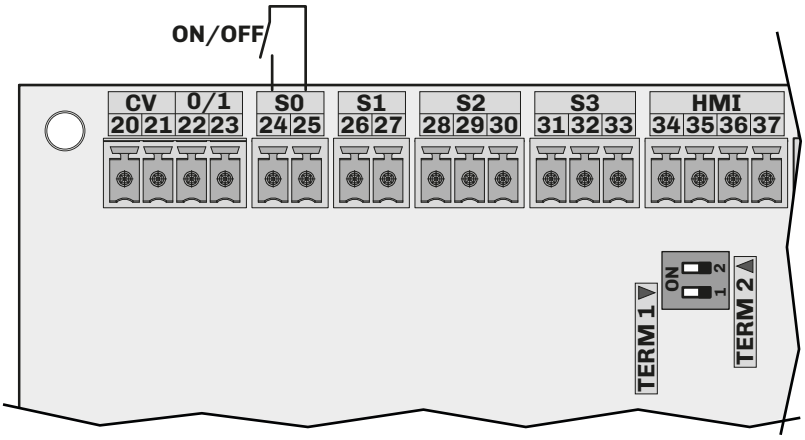


Fig. 8. *ON/OFF connection with humidistat or external contact (**CFG** = 0-1)*

NOTE: To start humidity production, the **CV** and **0/1** contacts must be closed.

6.5.2 External proportional humidistat connection (CFG = PROP)

Configuration
CFG = PROP
P2 = 0-10 **P2** = 0-5 **P2** = 0.20 **P2** = 4.20
CV input = Closed
0/1 input = Closed

28 = GND
29 = V+

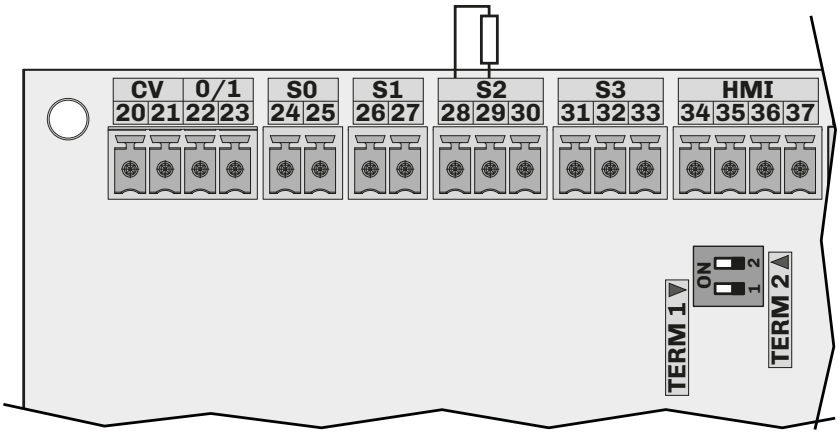


Fig. 9. *External proportional humidistat connection (**CFG** = PROP)*

NOTE: To start humidity production, the **CV** and **0/1** contacts must be closed.

6.5.3 Humidity sensor connection (CFG = HUM)

Configuration
CFG = HUM
P2 = 0-10 **P2** = 0-5 **P2** = 0.20 **P2** = 4.20
CV input = Closed
0/1 input = Closed

S2 input
29 = Sensor signal input
30 = Sensor power supply

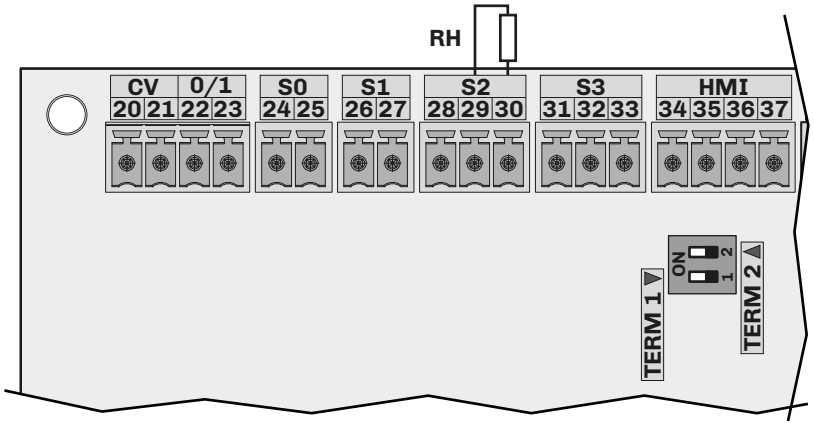


Fig. 10. *Humidity sensor connection (**CFG** = HUM)*

NOTE: To start humidity production, the **CV** and **0/1** contacts must be closed.

6.5.4 EVHTP520 humidity sensor connection (CFG = HUM and CFG = HUML)

Configuration
CFG = HUM **CFG** = HUML
P2 = E520
P7 = E520
CV input = Closed
0/1 input = Closed

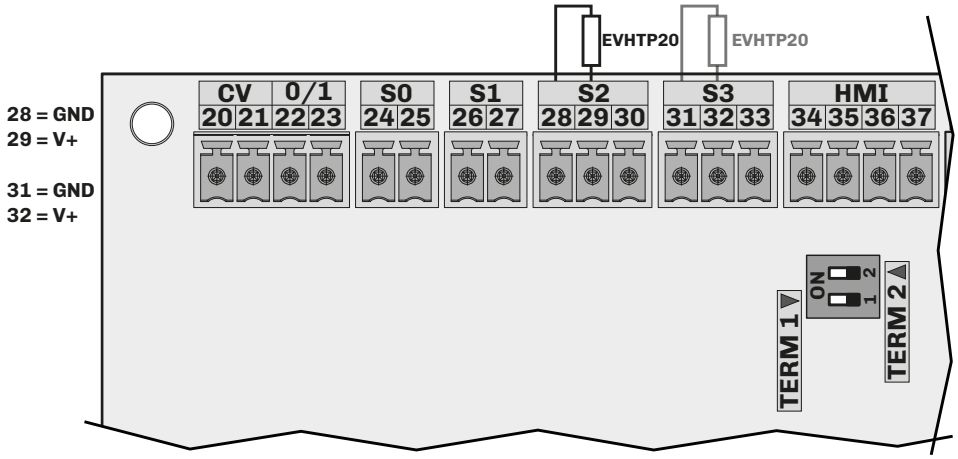


Fig. 11. *EVHTP520 humidity sensor connection (**CFG** = HUM and **CFG** = HUML)*

NOTE: To start humidity production, the **CV** and **0/1** contacts must be closed.

6.5.5 Connection for humidity sensor and limit sensor (CFG = HUML)

Configuration
CFG = HUML
P2 = 0.20 **P2** = 4.20
P7 = 0.20 **P7** = 4.20
CV input = Closed
0/1 input = Closed

S2 input
29 = Sensor signal input
30 = Sensor power supply

S3 input
32 = Sensor signal input
33 = Sensor power supply

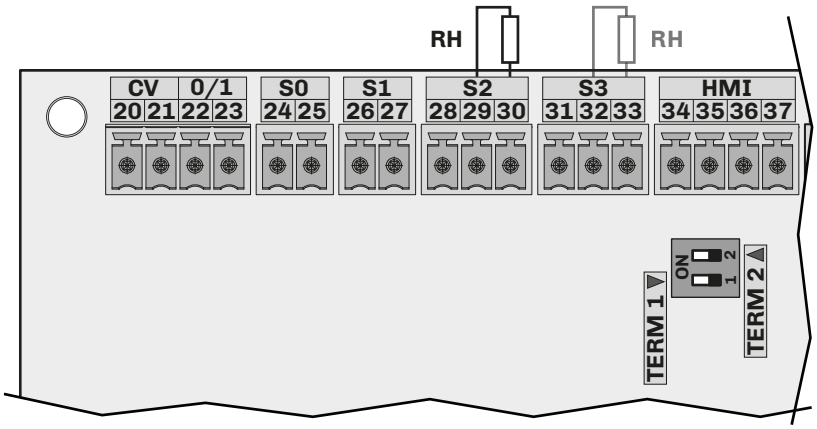


Fig. 12. *Connection for humidity sensor and limit sensor (**CFG** = HUML)*

NOTE: To start humidity production, the **CV** and **0/1** contacts must be closed.

6.5.6 Humidity sensor connection 0...5 V / 0...10 V

Configuration
CFG = HUM **CFG** = HUML
P2 = 0-5 **P2** = 0-10
P7 = 0-5 **P7** = 0-10
CV input = Closed
0/1 input = Closed

S2 input
28 = GND
29 = V+
30 = Sensor power supply

S3 input
31 = GND
32 = V+
33 = Sensor power supply

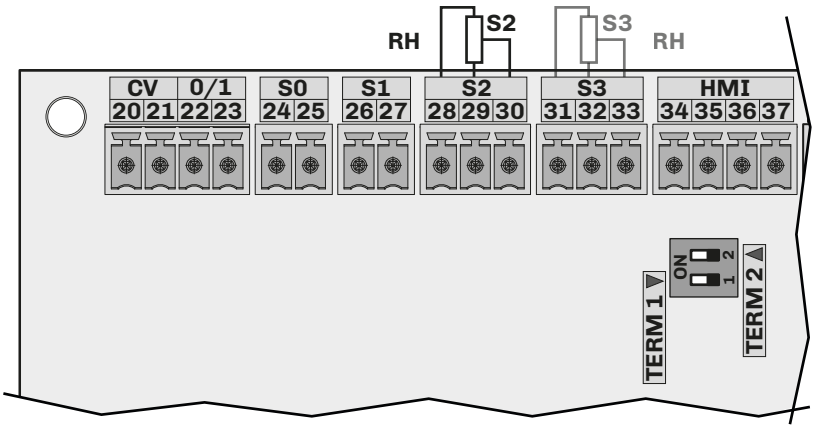


Fig. 13. *Humidity sensor connection 0...5 V / 0...10 V*

NOTE: To start humidity production, the **CV** and **0/1** contacts must be closed.

6.5.7 Temperature sensor connection (CFG = 1T)

Configuration
CFG = 1T
P2 = PTC **P2** = 1000 **P2** = NTC
CV input = Closed
0/1 input = Closed

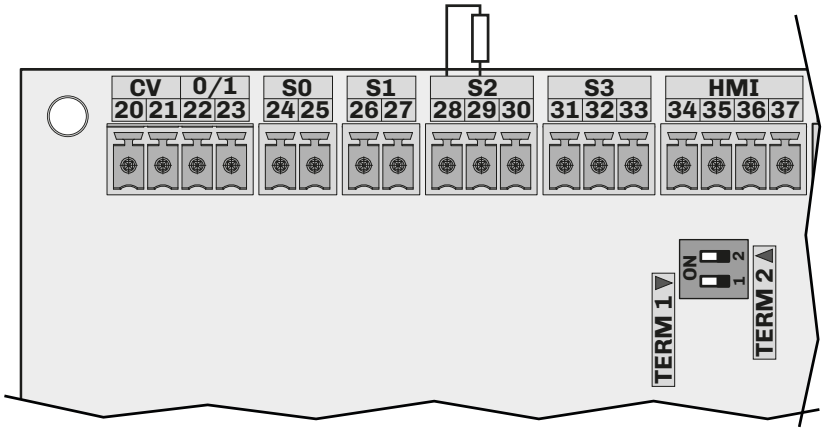


Fig. 14. *Temperature sensor connection (**CFG** = 1T)*

NOTE: To start humidity production, the **CV** and **0/1** contacts must be closed.

6.5.8 Connection for two temperature sensors (CFG = 2T)

Configuration
CFG = 2T
P2 = PTC **P2** = 1000 **P2** = NTC
P7 = PTC **P7** = 1000 **P7** = NTC
CV input = Closed
0/1 input = Closed

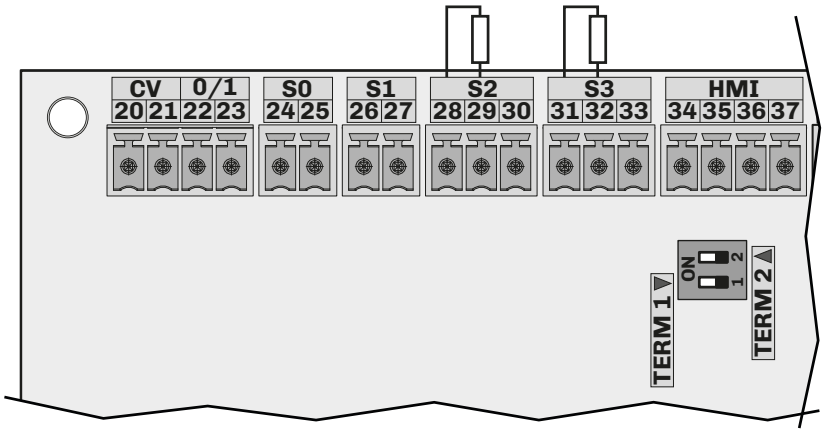


Fig. 15. *Temperature sensor connection (**CFG** = 2T)*

NOTE: To start humidity production, the **CV** and **0/1** contacts must be closed.

6.6 DIP switch functions

The control board and the expansion board have dip switches to configure the termination resistors and the Modbus address of the expansion board.

6.6.1 DIP switch | Control board

DIP	Description	Description
TERM3	Activate termination resistor on the **SCI1 RS-485** serial line. **ON =** Termination resistor enabled; **off** = Disabled.	Set to ON if connected to the expansion, but only if it is the first or last element wired in the network.
TERM1	Termination resistor on **BMS RS-485** serial line. **ON =** Termination resistor enabled; **off** = Disabled.	Set to ON if connected to the MODBUS network, but only if it is the first or last element wired in the network.
TERM2	Termination resistor on **CANBUS** serial line. **ON =** Termination resistor enabled; **off** = Disabled.	Set to ON only if it is the first or last element wired in the network. It must be ON if wired to an EPJ terminal.

6.6.2 DIP switch | Expansion

DIP	Description			Description
DP1	Modbus communication address of expansion board			Used to set the Modbus communication address of the expansion board.
	ADDR1	**ADDR2**	Expansion board address	
	OFF	OFF	2	
	OFF	ON	3	
	ON	OFF	4	
	ON	ON	5	
TERM1	Activate termination resistor on SCI1 RS-485 serial line. **ON =** Termination resistor enabled; **off** = Disabled.			Set to ON if connected to the expansion, but only if it is the first or last element wired in the network.

7. USER INTERFACE (OPTIONAL)

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

7.1 User interface

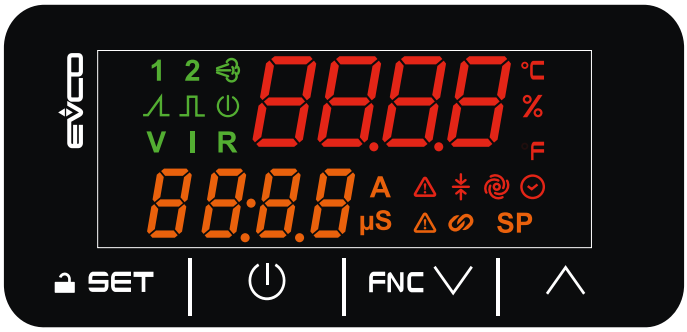


***Fig. 16. Zephyr OEM** humidifier user interface (optional)*

7.1.1 Icons

Icon	Lit steadily	OFF
1	• Main sensor configured and present • **CFG** = 1T (one temperature probe)	In all other cases
2	• Limit sensor configured and present • **CFG** = 2T (two temperature probes)	In all other cases
	Steam request	In all other cases
	Proportional operating mode	In all other cases
	ON/OFF operating mode	In all other cases
	Humidifier OFF	Humidifier ON
V	Voltage sensor operating mode	In all other cases
I	Current sensor operating mode	In all other cases
R	Resistive sensor operating mode	In all other cases
A	Display shows the current absorbed by the electrodes	In all other cases
µS	Changing value of **P1** in progress	In all other cases

Icon	Lit steadily	OFF
	Warning in progress	No warning in progress
	CV input closed (enable signal given)	**CV** input open (enable signal not given)
SP	Changing humidity setpoint in progress	In all other cases
	Alarm in progress	No active alarms
	Contactor ON	Contactor OFF
	Washing or draining in progress	In all other cases
	Displayed value is operating hours	In all other cases
F	Display shows temperature in °F	In all other cases
%	Display shows humidity in %	In all other cases
°C	Display shows temperature in °C	In all other cases

7.1.2 Keys

Key...	Tap and release to...	Tap and hold for at least 3 seconds to...
	Go back a level	Humidifier ON/OFF
FNC	• Scroll down through the values • Navigate within the menu	Go to the maintenance and reset operating hours menu
	• Scroll up through the values • Navigate within the menu	Activate manual draining
SET	• Confirm the values on the display • Set/change the humidity setpoint	Enter the main menu

7.1.3 First start-up

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.

At the first start-up, you must enter the electrical conductivity of the inlet water, after which the humidifier OFF screen will open automatically.

NOTE: If you do not know the electrical conductivity of the water, it can be obtained from the drinking water supplier's website.

Fig. 17. *First start-up - Setting the electrical conductivity*

Fig. 18. *Humidifier OFF*

7.2 User interface menu

7.2.1 Home screen

HOME screen with ON/OFF regulation from digital input (CFG = 0-1)

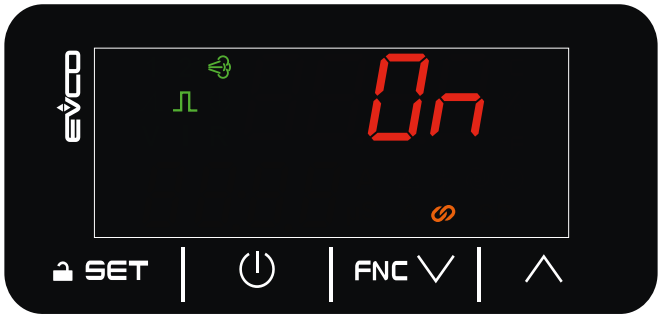


Fig. 19. *Home screen with ON/OFF regulation from digital input (**CFG** = 0-1)*

Top line: Shows the state of the digital control input (**S0**).
NOTE: The **CV** and **0/1** contacts must be closed to produce humidity.

HOME screen with proportional regulation (CFG = PROP)

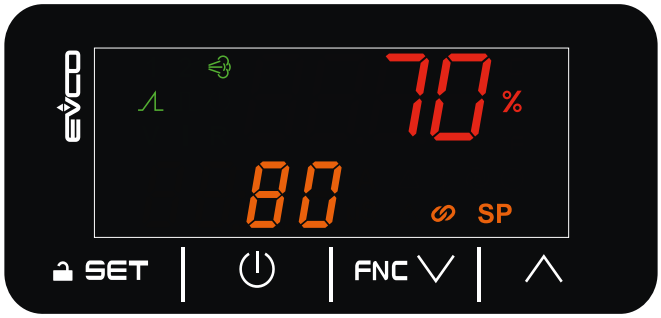


Fig. 20. *Home screen with proportional regulation (**CFG** = PROP)*

Top line: Actual humidity request in %.
NOTE: The **CV** and **0/1** contacts must be closed to produce humidity.

HOME screen with regulation via humidity sensor (CFG = HUM) or humidity sensor and limit sensor (CFG = HUML)

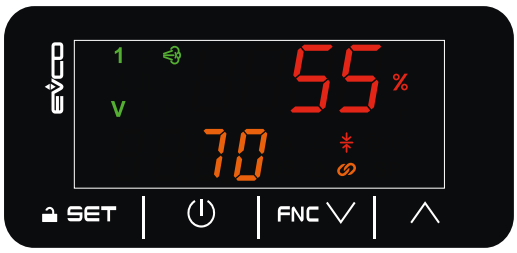


Fig. 21. Home screen with humidity sensor alone

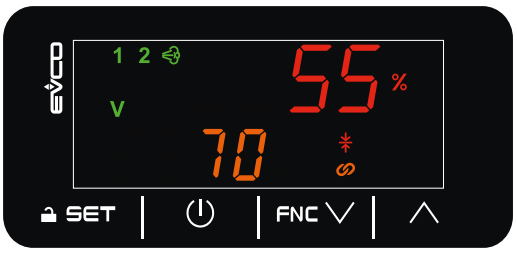


Fig. 22. Home screen with humidity sensor and limit sensor

Top line: Humidity measured by the room humidity sensor.
Bottom line: Humidity setpoint.
NOTE: The **CV** and **0/1** contacts must be closed to produce humidity.

7.2.2 Changing the main sensor humidity setpoint

With **CFG** = HUM or **CFG** = HUML only.

To change the humidity setpoint:

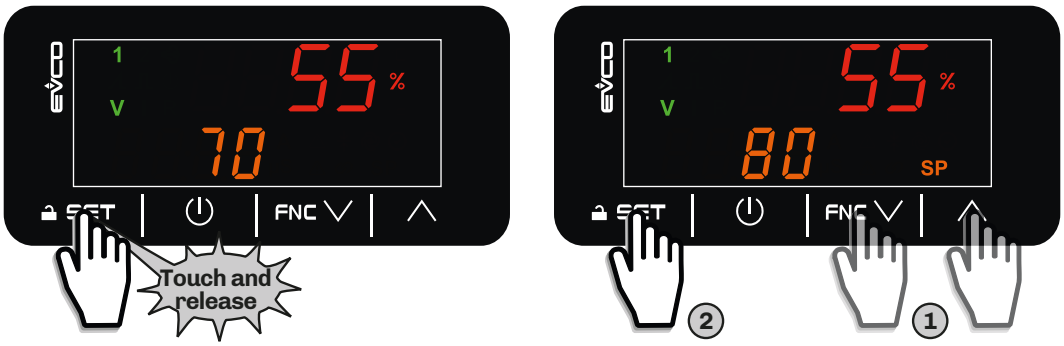


Fig. 23. Changing the humidity setpoint

7.2.3 Changing the temperature setpoint

With **CFG** = 1T or **CFG** = 2T only.

To change the temperature setpoint:

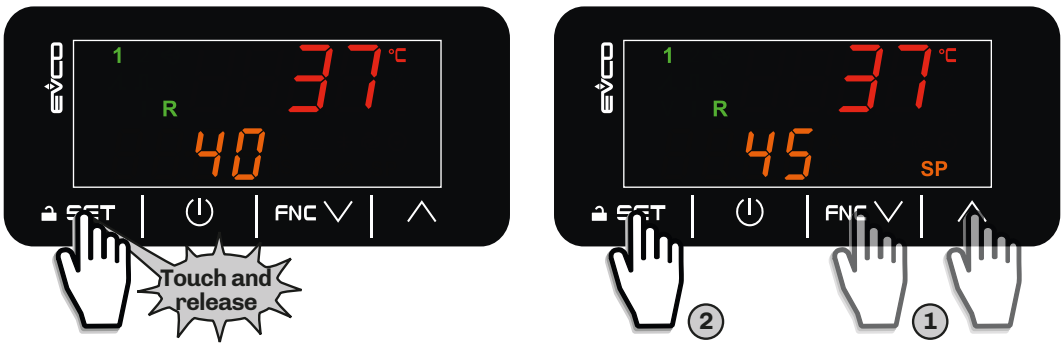


Fig. 24. Changing the temperature setpoint

7.2.4 Manual draining

To start manual draining:

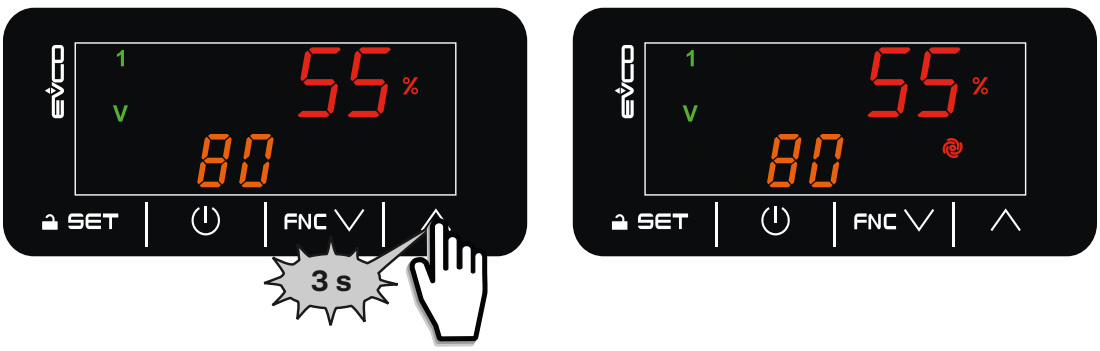


Fig. 25. Manual draining

7.2.5 Menu

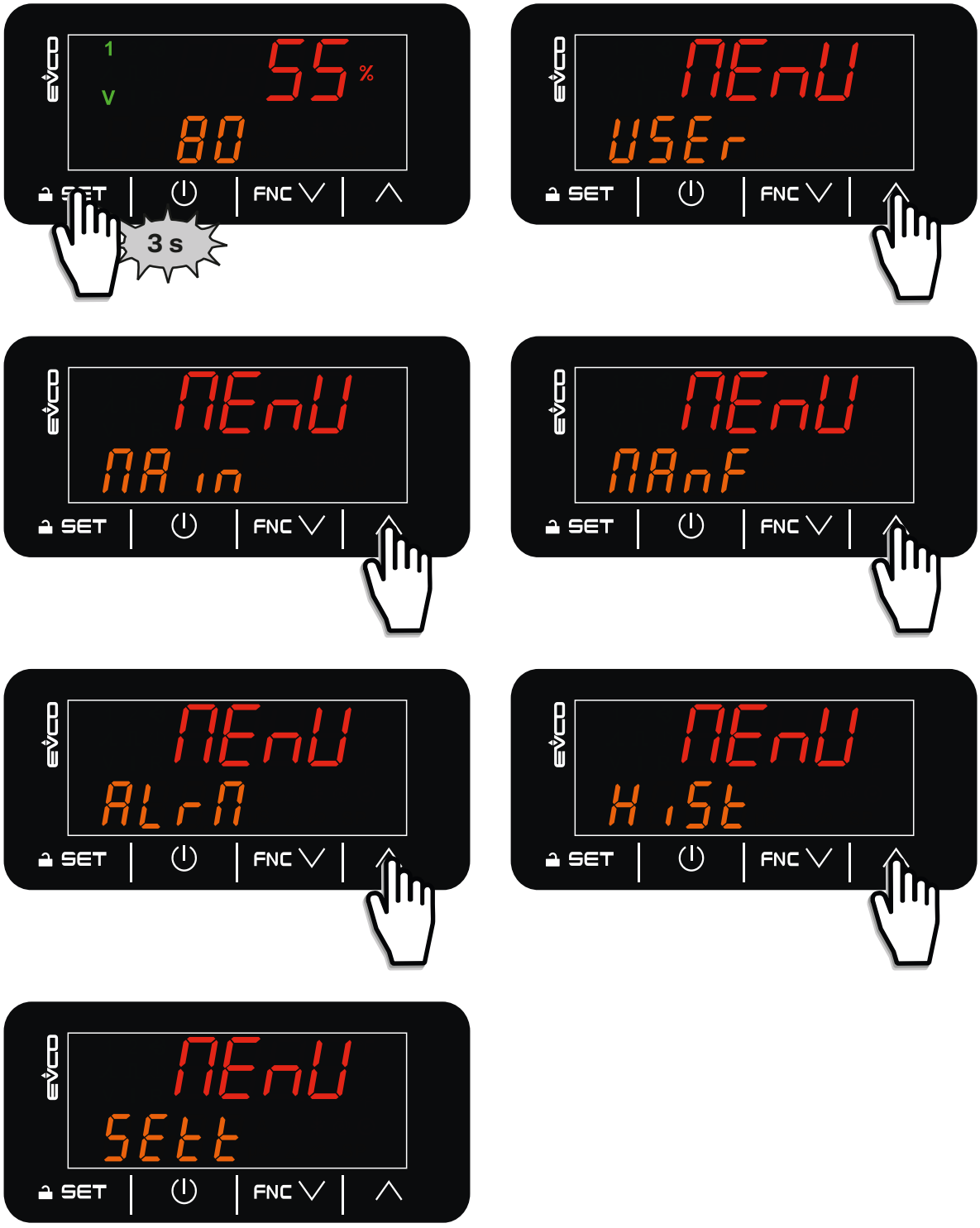


Fig. 26. *Menu*

Menu	Description
USEr	Access the user menu
MAIn	Access the maintenance technician menu
MAnF	**RESERVED. NOT ACCESSIBLE TO THE PUBLIC.**
ALrM	Currently accessing alarm control
HISt	Access the alarm log
SEtt	Reset parameters to factory settings

7.2.6 User Menu

The user menu can be used to display and change user parameters.

To access the user menu:

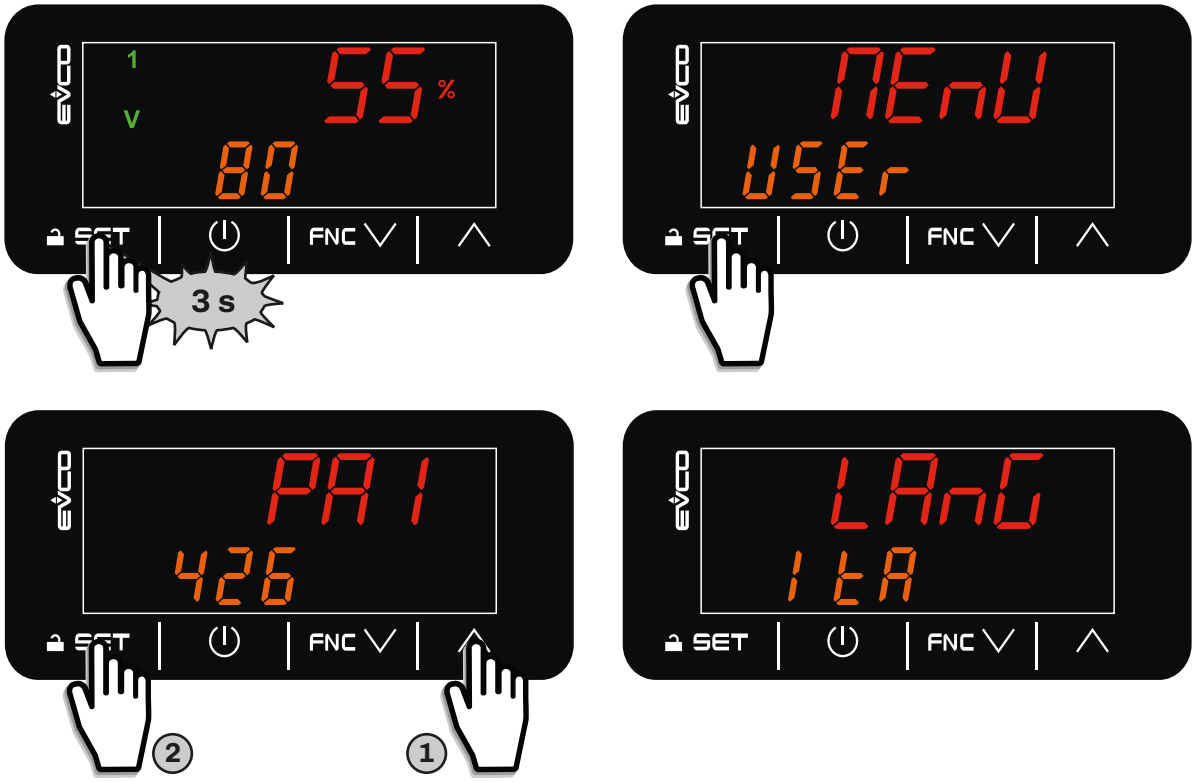


Fig. 27. *User menu*

Top line	Bottom line	Description
LAnG	Set language	Sets the display language. **EnG** = English; **Ita** = Italian.
SP1	Humidity setpoint	Sets the humidity setpoint. See ***"9.10 TABLE OF ADJUSTMENT PARAMETERS" ON PAGE 50***
SP2	Humidity limit setpoint	Sets the humidity limit setpoint `. See ***"9.10 TABLE OF ADJUSTMENT PARAMETERS" ON PAGE 50***
SP3	Temperature setpoint	Sets the temperature setpoint (wellness application). See ***"9.10 TABLE OF ADJUSTMENT PARAMETERS" ON PAGE 50***

7.2.7 Maintenance menu

To access the maintenance menu:

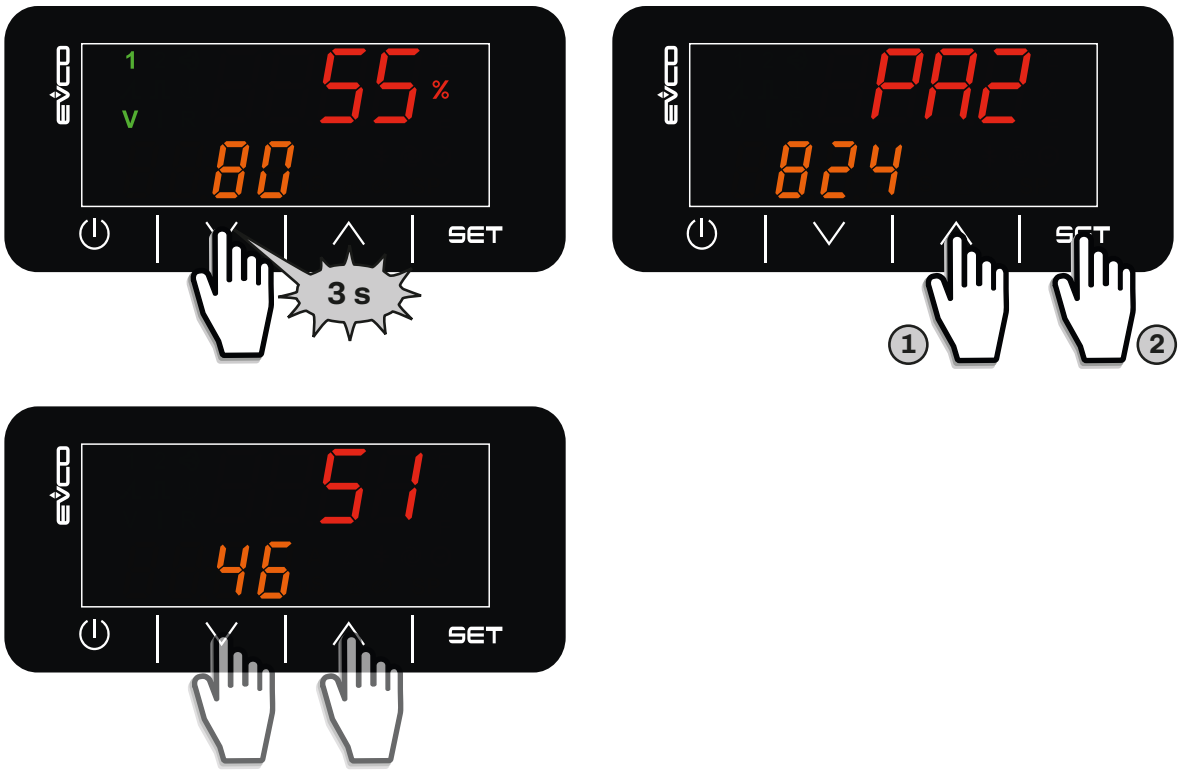


Fig. 28. *Maintenance menu*

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

Top line	Bottom line	Description
SP1	Setpoint **SP1** value	Displays the value of setpoint **SP1**.
SP2	Setpoint **SP2** value	Displays the value of setpoint **SP2**.
SP3	Setpoint **SP3** value	Displays the value of setpoint **SP3**.
CFG	Set operating mode	Sets the operating mode See ***"9.10 TABLE OF ADJUSTMENT PARAMETERS" ON PAGE 50***
c0...c11	Parameter value	See ***"9.10 TABLE OF ADJUSTMENT PARAMETERS" ON PAGE 50***
S1	Sensor S1 value	Displays the value read by sensor S1 if it is connected.
S2	Sensor S2 value	Displays the value read by sensor S2 if it is connected.
S3	Sensor S3 value	Displays the value read by sensor S3 if it is connected.
tA	Sensor tA value	Displays the value read by sensor CT1 if it is connected.
CU	**CV** input status.	Displays the status of the **CV** digital input (fan enable) if it is connected. **OFF** = **CV** input closed; **On** = **CV** input open.
OI	**0/1** input status	Displays the status of the **0/1** digital input (remote ON/OFF) if it is connected. **OFF** = **0/1** input closed; **On** = **0/1** input open.
SO	**S0** input status	Displays the status of the **S0** digital input (remote humidistat enable) if it is connected. **OFF** = **S0** input closed; **On** = **S0** input open.
LS	**LS1** input status	Displays the status of the **LS1** digital input (level sensor) if it is connected. **OFF** = **LS1** input closed; **On** = **LS1** input open.
oEU	Inlet solenoid valve output status	Displays the status of the inlet solenoid valve. **OFF** = Inlet solenoid valve output OFF; **ON** = Inlet solenoid valve output ON.
oP	Outlet pump status	Displays the status of the outlet pump. **OFF** = Outlet pump output OFF; **ON** = Outlet pump output ON.

Top line	Bottom line	Description
oS	Steam generation contactor status	Displays the status of the steam generator contactor. **OFF** = Steam generator electrode output OFF; **ON** = Steam generator electrode output ON.
od	Dehumidification enable output status	Displays the status of the dehumidification enable output. **OFF** = Dehumidification enable output OFF; **ON** = Dehumidification enable output ON.
oF	Fan output status	Displays the status of the fan digital output. **OFF** = Fan output OFF; **ON** = Fan output ON.
oAL	General alarm output status	Displays the status of the general alarm output. **OFF** = General alarm output OFF; **ON** = General alarm ON.
HrS	Operating hours management page	Enters the page that displays the operating hours of the humidifier and its parts. To access the page: Double tap the SET key, enter password **PA2** using the FNC ∨ or ∧ keys, and tap SET to confirm.
MAnu	Output forcing page	Enters the output forcing page. To access the page: Double tap the SET key, enter password **PA2** using the FNC ∨ or ∧ keys, and tap SET to confirm.

7.2.8 Displaying/resetting the operating hours

The operating hours can be displayed and reset from the maintenance menu.

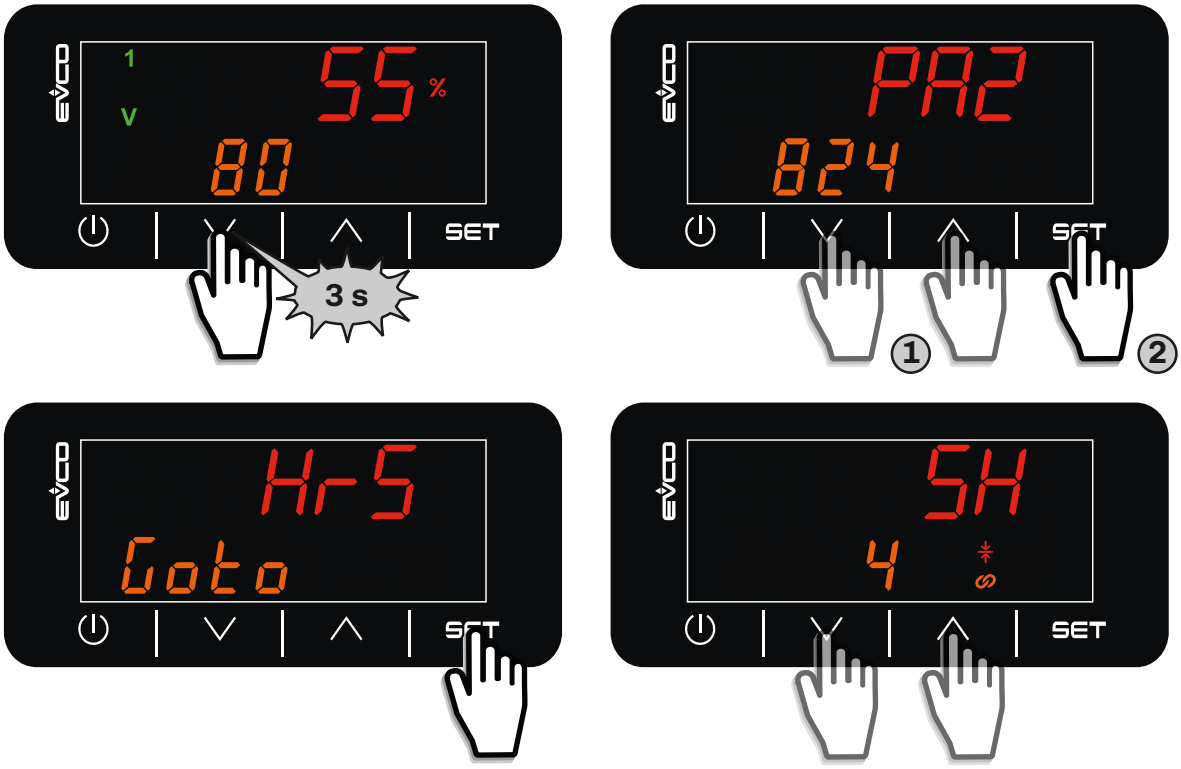


Fig. 29. *Displaying the operating hours*

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

Top line	Bottom line	Description
SH	Humidifier hours	Displays the hours of humidifier operation.
PbH	Partial H.U. hours	Displays the partial hours of hydraulic unit operation.
tbH	Total H.U. hours	Displays the total hours of hydraulic unit operation.
EUH	Inlet SV hours	Displays the hours of outlet solenoid valve operation.
PH	Outlet pump hours	Displays the hours of outlet pump operation.
FH	Fan hours	Displays the operating hours of the fans.

Reset operating hours

The operating hours can be reset by setting the parameters to 0.

7.2.9 Output functional test

The output functional test page can be accessed from the maintenance menu. Here the outputs can be forced on or off:

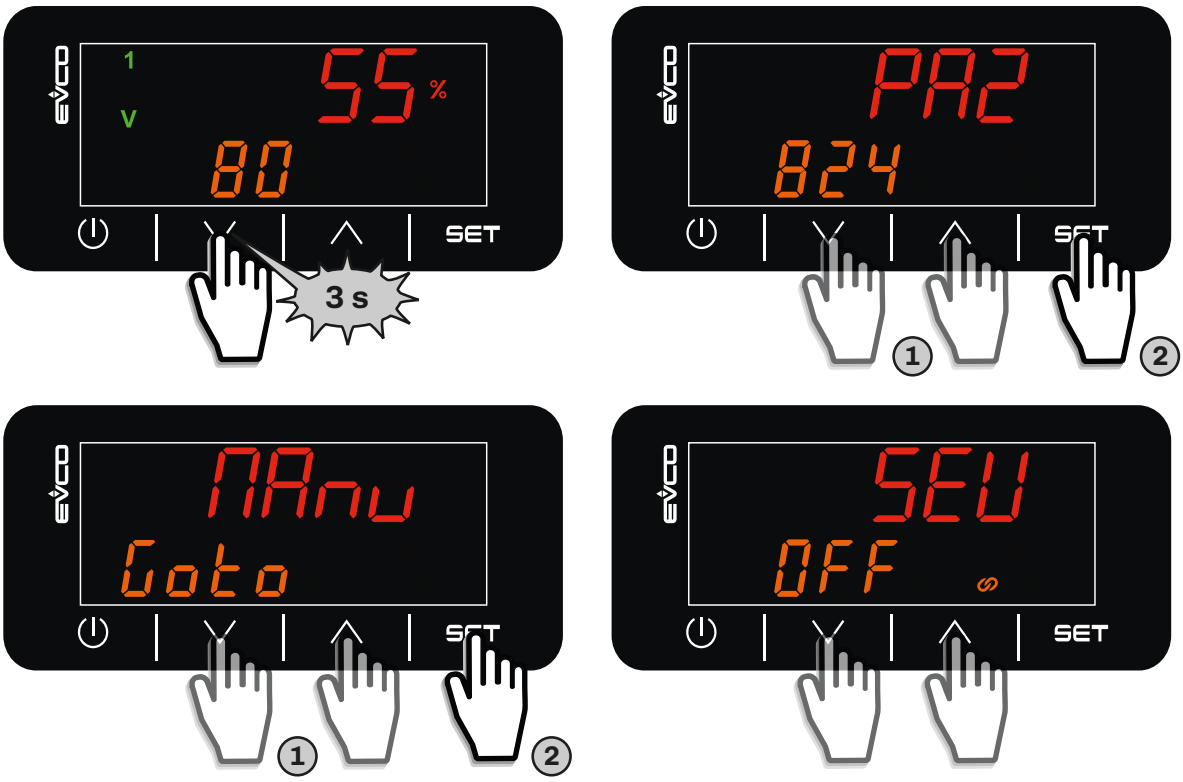


Fig. 30. *Output functional test*

The table below contains the labels shown on the display and their descriptions:

Top line	Bottom line	Description
SEU	Inlet SV output status	Forces the inlet solenoid valve output on/off. **OFF** = Inlet solenoid valve output forced OFF; **ON** = Inlet solenoid valve output forced ON.
SP	Outlet pump output status	Forces the outlet pump output on/off. **OFF** = Outlet pump output forced OFF; **ON** = Outlet pump output forced ON.
SS	Steam generation contactor status	Forces the steam generation contactor on/off. **OFF** = Steam generator electrode output forced OFF; **ON** = Steam generator electrode output forced ON.
Sd	Dehumidification enable output status	Forces the dehumidifier enable output on/off. **OFF** = Dehumidification enable output forced OFF; **ON** = Dehumidification enable output forced ON.
SF	Fan output status	Forces the fan output on/off. **OFF** = Fan output forced OFF; **ON** = Fan output forced ON.
SAL	General alarm output status	Forces the general alarm output on/off. **OFF** = General alarm output forced OFF; **ON** = General alarm output forced ON.

8. POWER-UP AND START-UP

8.1 First start-up instructions

DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

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

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

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

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.

At the first start-up, the machine is disabled until the inlet water conductivity has been entered, after which the humidifier OFF screen will open automatically.

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

- Check the filling and drain network (see sections: ***"5.3 INSTALLING THE PLUMBING" ON PAGE 24, "5.4 WATER DRAINAGE SYSTEM" ON PAGE 25*** and ***"5.5 STEAM DISTRIBUTION" ON PAGE 26***);
- Let the water flow through the drain for a few hours before making the final connection;
- Fit the power fuses;
- Connect the humidistat or the probe in accordance with the required operation ***(SEE "6.4 ELECTRICAL CONNECTIONS" ON PAGE 29);***
- Check that the **CV** and **0/1** contacts are closed, see ***"6.4 ELECTRICAL CONNECTIONS" ON PAGE 29;***
- Activate the isolator installed outside the humidifier and open the water supply source;
- Start the humidifier according to the start-up instructions provided by the OEM manufacturer;
- Set the electrical conductivity of the inlet water (if you do not know the electrical conductivity of the water, it can be obtained from the drinking water supplier's website);
- Set the humidity request setpoint **SP** to 100%;
- The humidifier starts a boiler loading cycle;
- Set the humidity setpoint **SP** to the value required for the application;
- The humidifier drains the water and replenishes it cyclically to perform the dilution procedure in order to keep the humidifier in a good operating condition. The humidifier cyclically carries out a full wash and then restarts with a lower frequency. Operation has been developed to ensure maximum energy efficiency and optimal water use.

8.2 Instructions for seasonal or long-term shut-down

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

- Manually drain the product using the manual drainage launch procedure;
- When draining is complete, deactivate the isolator installed outside the humidifier and open the water supply source;
- Open the manual drain plug to complete draining the manifold and pump.

WARNING

BIOLOGICAL RISK

- In the event of poor maintenance/cleaning after the humidifier has been shut-down for a long time, microorganisms (including the bacteria that cause Legionellosis) may proliferate and be transferred into the air treatment system.
- The humidifier must be used correctly and be maintained and cleaned properly at the prescribed intervals, as described in the ***MAINTENANCE*** chapter.

8.3 Starting up after a seasonal or long-term shut-down

- It is advisable to clean the boiler before a seasonal start-up;
- Check the steam inlet and outlet lines (see sections: ***"5.3 INSTALLING THE PLUMBING" ON PAGE 24, "5.4 WATER DRAINAGE SYSTEM" ON PAGE 25*** and ***"5.5 STEAM DISTRIBUTION" ON PAGE 26)***;
- Let the water flow through the drain for a few hours before making the final connection;
- Check the power fuses;
- Check the humidistat or sensor connections, depending on the required operation ***(SEE "6.4 ELECTRICAL CONNECTIONS" ON PAGE 29);***
- Check that the **CV** and **0/1** contacts are closed, see ***"6.4 ELECTRICAL CONNECTIONS" ON PAGE 29;***
- Activate the isolator installed outside the humidifier and open the water supply source;
- Start the humidifier according to the start-up instructions provided by the OEM manufacturer;
- Set the electrical conductivity of the inlet water (if you do not know the electrical conductivity of the water, it can be obtained from the drinking water supplier's website);
- Set the humidity request setpoint **SP** to 100%;
- The humidifier starts a boiler loading cycle;
- Set the humidity setpoint **SP** to the value required for the application;
- The humidifier drains the water and replenishes it cyclically to perform the dilution procedure in order to keep the humidifier in a good operating condition. The humidifier cyclically carries out a full wash and then restarts with a lower frequency. Operation has been developed to ensure maximum energy efficiency and optimal water use.

9. OPERATION

9.1 Principle of operation

The **Zephyr OEM** humidifier is the ELSTEAM solution for immersed electrode humidifier systems dedicated to PAC/CLOSE CONTROL applications and to all applications that require small kits to install the electrical part for remote management of the hydraulic part.

ZEPHYR series humidifiers generate humidity (steam) by means of a current passing between 2 or 3 electrodes immersed in drinking water to bring it to boiling point.

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

The steam is introduced into the air handling unit by means of a steam hose and a linear distributor, after placing the OEM kit inside the compartment provided by the manufacturer.

9.2 Humidity regulation

The humidity can be regulated in 6 ways, depending on how the **CFG** parameter is set:

- ON-OFF regulation (**CFG** = 0-1);
- Proportional regulation (**CFG** = PROP);
- Regulation with the humidity sensor (**CFG** = HUM);
- Regulation with the humidity sensor and limit sensor (**CFG** = HUML);
- Regulation with a temperature probe (wellness applications) (**CFG** = 1T);
- Regulation with two temperature probes (wellness applications) (**CFG** = 2T)

9.2.1 ON-OFF regulation | CFG = 0-1

To use the **Zephyr OEM** with ON-OFF regulation, the following conditions must be met:

- **CFG** = 0-1;
- Enable digital input closed (**CV**);
- Remote ON/OFF digital input closed (**0/1**).

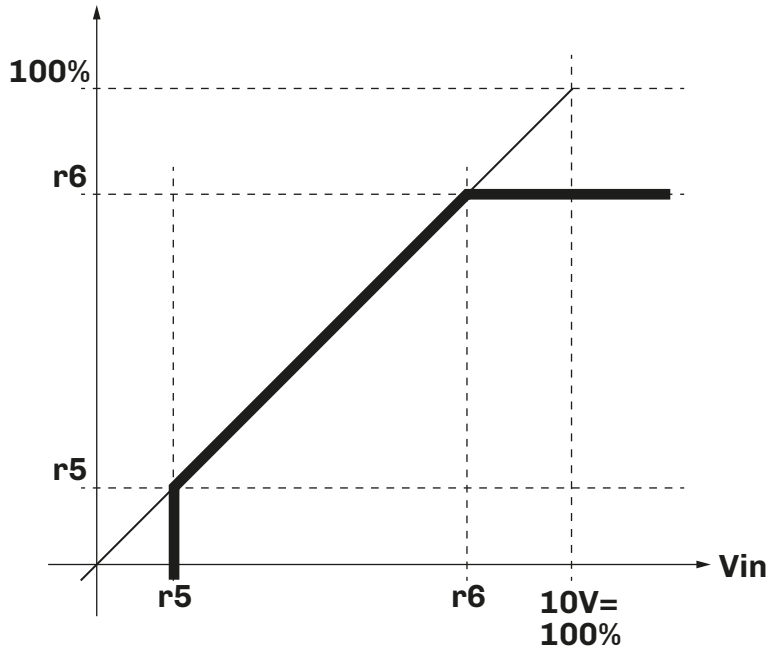
When the **S0** digital input is closed, the **Zephyr OEM** generates humidity at the maximum value set in parameter **r6**.

9.2.2 Proportional regulation | CFG = PROP

To use the **Zephyr OEM** with proportional regulation, the following conditions must be met:

- **CFG** = PROP;
- Set the minimum humidity production **r5**;
- Set the maximum humidity production **r6**;
- Enable digital input closed (**CV**);
- Remote ON/OFF digital input closed (**0/1**).

The humidity production varies with the value read at the **S1** analogue input, with the logic expressed in the graph below, without exceeding parameter **r6**:



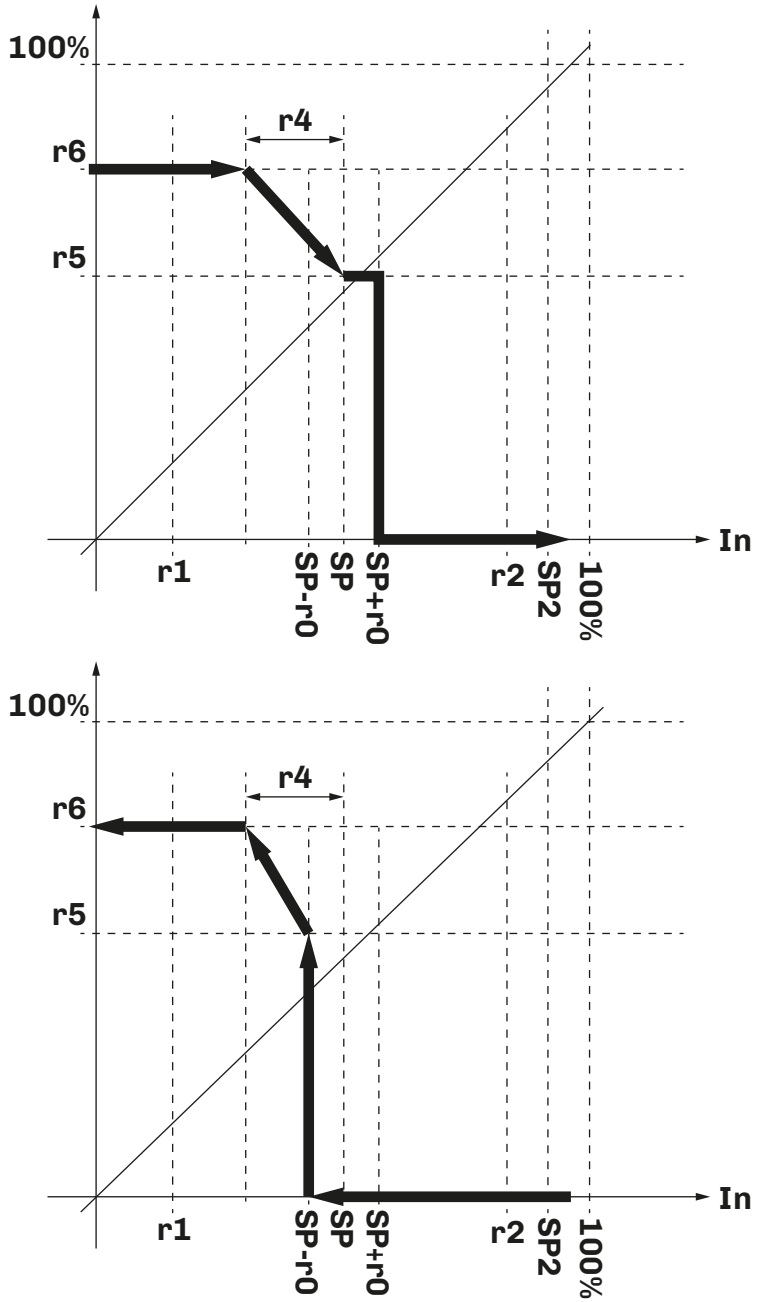
KEY	
Line	**Description**
——	V_{in}
▬	Production

Fig. 31. *How proportional regulation works | **CFG** = PROP*

9.2.3 Regulation with the humidity sensor | CFG = HUM

To use the **Zephyr OEM** with regulation based on a humidity sensor, the following conditions must be met:

- **CFG** = HUM or **CFG** = HUML;
- Set parameter **P2** according to the sensor type to be used;
- Set the minimum humidity production **r5**;
- Set the maximum humidity production **r6**;
- Enable digital input closed (**CV**);
- Remote ON/OFF digital input closed (**0/1**).



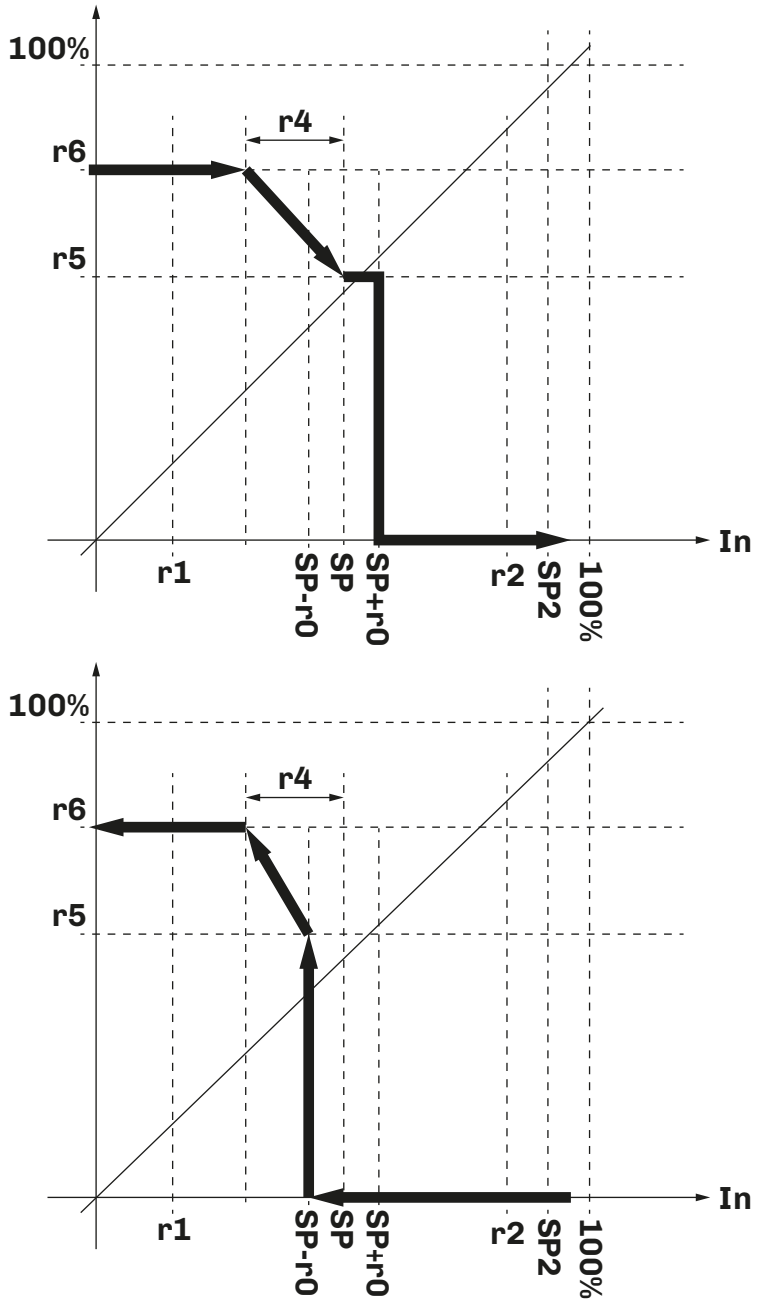
KEY	
Line	**Description**
——	V_{in}
▬	Production

Fig. 32. *How regulation with the humidity sensor works | **CFG** = HUM*

9.2.4 Regulation with the humidity sensor + limit sensor | CFG = HUML

To use the **Zephyr OEM** with regulation based on a humidity sensor and limit sensor, the following conditions must be met:

- **CFG** = HUML;
- Set parameter **P2** according to the sensor type to be used;
- Set parameter **P7** according to the limit sensor type to be used;
- Set the minimum humidity production **r5**;
- Set the maximum humidity production **r6**;
- Enable digital input closed (**CV**):
- Remote ON/OFF digital input closed (**0/1**).



KEY	
Line	**Description**
——	V_{in}
▬▬	Production

Fig. 33. *How regulation with the humidity sensor + limit sensor works | **CFG** = HUML*

Humidity production behaves in the same way as for regulation with the humidity sensor (**CFG** = HUM), but the second sensor connected to analogue input **S2** stops steam generation, depending on the humidity delivery.

The humidity limit activates when the humidity measured by sensor **S2** exceeds **SP2 + r10**.

9.2.5 Regulation with a temperature probe | CFG = 1T

To use the **Zephyr OEM** with regulation based on a temperature sensor, the following conditions must be met:

- **CFG** = 1T;
- Set parameter **P0** according to the sensor type to be used
- Set the minimum humidity production **r5**;
- Set the maximum humidity production **r6**;
- Enable digital input closed (**CV**):
- Remote ON/OFF digital input closed (**0/1**).

Principle of operation

The humidity requirement is managed with proportional temperature regulation between **SP3** and the proportional band **r20**, according to the following logic:

- Temperature ≥ **SP3**: 0% humidity request;
- Temperature ≤ **SP3** - **r20**: humidity request at **r6**;
- **SP3** < Temperature < **r20**: proportionally linearised humidity request (minimum production **r5**).

9.2.6 Regulation with two temperature probes | CFG = 2T

To use the **Zephyr OEM** with regulation based on two temperature sensors, the following conditions must be met:

- **CFG** = 2T;
- Set parameter **P0** according to the sensor type to be used
- Set the minimum humidity production **r5**;
- Set the maximum humidity production **r6**;
- Set parameter **r23**;
- Set parameter **r24**;
- Enable digital input closed (**CV**);
- Remote ON/OFF digital input closed (**0/1**).

9.3 Water dilution

Water dilution in the hydraulic unit is controlled in two ways, depending on how parameter **c3** is set:

Par.	Description	MU	Range
c3	Type of draining for dilution. **0** = Current-based; **1** = Time-based.	---	0/1

NOTE: The electrodes are off while draining the water. Draining is activated 3 seconds after turning the electrodes off.

9.3.1 Current-based water dilution

Setting **c3** = 0 configures water dilution based on the measured currents.

The evaporation cycle and water filling times to reach the required production are monitored during operation.

The electrical conductivity of the water tends to rise while producing humidity because it concentrates the substances in the water, and consequently the times mentioned above tend to reduce; during this stage, the **Zephyr OEM** activates the outlet pump until the internal current drops below the threshold set in parameter **c6**.

NOTE: The electrodes are off during draining to ensure safety.

The configuration parameters for current-based water dilution are:

Par.	Description	MU	Range
c6	Draining value for dilution (if **C3** = 0).	%	20...80

9.3.2 Time-based water dilution

Setting **c3** = 1 configures time-based water dilution to ensure that the water is diluted periodically without waiting for the internal conditions to become critical.

The **Zephyr OEM** dilutes the water after time **c5** for a duration of **c4**.

The configuration parameters for time-based water dilution are:

Par.	Description	MU	Range
c4	Draining duration for dilution (if **C3** = 1).	s	0...9999
c5	Time between two dilution draining events (if **C3** = 1).	min	30...999

9.4 Hydraulic unit draining

When the electrical conductivity of the water becomes too high, the hydraulic unit must be drained completely to restore optimal operating conditions.

The evaporation cycle and water filling times to reach the required production are monitored during operation.

Once it has been completely drained, it is washed a second time if the **Zephyr OEM** detects that the unfavourable conditions persist; if the second washing fails to create optimal operating conditions, alarm **AL08** is generated and the humidifier is forced OFF until maintenance is carried out (see ***"12.1 ZEPHYR OEM ALARMS TABLE" ON PAGE 61***).

9.5 Complete hydraulic unit emptying

The **Zephyr** hydraulic unit must be emptied completely in the following cases:

- After the inactivity time set in parameter **c0**;
- After the activity time set in parameter **c1**;
- If the timer is not working, when the humidifier is powered up;
- Whenever electrical power is supplied;
- When manual draining is activated from the user menu.

The configuration parameters for the cleaning cycles are:

Par.	Description	MU	Range
c0	Number of consecutive days of inactivity after which the hydraulic unit is emptied. **0** = Function disabled.	days	0...10
c1	Number of consecutive days of activity after which the hydraulic unit is emptied. **0** = Function disabled.	days	0...100

9.6 Level sensor

When the humidifier is running, the water may exceed the level sensor at the top of the hydraulic unit. This is caused by low electrical conductivity of the water in the boiler. The **Zephyr OEM** activates the outlet pump to drain it partially and resumes the evaporation cycles to achieve optimum electrical conductivity.

9.7 Foam management

Foaming may occur while the water is boiling in the hydraulic unit. Foaming is generally due to surfactants (manufacturing residues in the water filling system, water treatment agents, softeners) or an excessive concentration of dissolved salts in the water.

If **c11** = 1, the **Zephyr OEM** indicates and manages this condition.

If there is no foam in the boiler, the **Zephyr OEM** resumes normal operation.

If the level sensor is reached again within time **c12**, there is foam in the boiler. The **Zephyr OEM** empties the boiler completely. Thereafter, if the following occurs within time **c12**:

- The level sensor is reached again, and the **Zephyr OEM** performs two complete washing cycles;
- If the level sensor is not reached, the **Zephyr OEM** resumes normal operation.

If there is foam, the **Zephyr OEM** displays the code **W05** (see ***"12.1 ZEPHYR OEM ALARMS TABLE" ON PAGE 61***).

9.8 Operating hours

The **Zephyr OEM** records the hours of humidifier operation to allow periodic maintenance.
The following times are monitored:

- Total hours of machine operating; this cannot be reset and shows the hours of humidifier operation;
- Partial hours of hydraulic unit operation; this can be reset after maintenance on the tank;
- Total hours of hydraulic unit operation; this can be reset after replacing the tank;
- Operating hours of the inlet solenoid valve; this can be reset after replacing the component;
- Operating hours of the inlet pump; this can be reset after replacing the component.

The configuration parameters for the maintenance warning thresholds are:

Par.	Description	MU	Range
M10	Operating hours threshold for unit maintenance warning.	hx10	100....1000
M11	Partial operating hours threshold for the hydraulic unit maintenance warning.	hx10	100....1000
M12	Total operating hours threshold for the hydraulic unit maintenance warning.	hx10	100....1000
M13	Operating hours threshold for valve maintenance warning.	hx10	100....1000
M14	Operating hours threshold for the outlet pump maintenance warning.	hx10	100....1000

9.8.1 Resetting the operating hours

The operating hours can be reset from the maintenance menu by setting the parameters to 0.

9.9 Overproduction

When the humidity production exceeds 30% of the steam demand, draining is performed to return the steam production to the required value.

10. CONFIGURATION 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:
  - **U** = User parameters;
  - **M** = Maintenance parameters.

9.10 Table of adjustment parameters

Par.	Description	MU	Range	Default	PW
	SETPOINT group				
SP1	Humidity setpoint.	%	**r1...r2**	70.0	U
SP2	Humidity limit setpoint.	%	**r11...r12**	85.0	U
SP3	Wellness temperature setpoint.	°C/°F	**r21...r22**	40.0	U
	CONFIGURATION group				
CFG	Operating mode (see ***"9.2 HUMIDITY REGULATION" ON PAGE 44***) **0-1** (0) = ON/OFF from digital input; **PROP** (1) = Proportional input; **HUM** (2) = Humidity sensor; **HUML** (3) = Humidity sensor + limit sensor; **1T** (4) = 1 temperature sensor; **2T** (5) = 2 temperature sensors.	---	0-1 / PROP / HUM / HUML / 1T / 2T	0-1	M
duAL	Dual boiler humidifier operation. **0** = Parallel; **1** = Sequential.	---	0/1	0	U
P0	Type of sensor **S1** temperature of pre-heating + anti-freeze. **---** (0) = Disabled; **PTC** (1) = PTC; **NTC** (2) = NTC.	---	--- / PTC / NTC	---	M
P1	Electrical conductivity of the water.	µS/cm	0...1250	0	M
P2	Type of regulator/sensor/probe **S2** (regulation input). **PTC** (0) = PTC probe; **1000** (1) = Pt1000 probe; **NTC** (2) = NTC probe; **0-10** (3) = Proportional input 0...10 V; **0-5** (4) = Proportional input 0...5 V; **0.20** (5) = Input 0...20 mA; **4.20** (6) = Input 4...20 mA; **E520** (7) = EVHTP520 proprietary probe.	---	PTC /1 000 / NTC / 0-10 / 0-5 / 0.20 / 4.20 / E520	0-10	M
P3	Minimum value of **S2** (if **CFG** = HUM or **CFG** = HUML).	%rH	0...100	0	M
P4	Maximum value of **S2** (if **CFG** = HUM or **CFG** = HUML).	%rH	0...100	100	M
P5	Offset of sensor **S2** (if **CFG** = HUM or **CFG** = HUML).	%rH	-10...10	0	M
P6	Offset of sensor **S1** (temperature).	°C/°F	-10.0...10.0	0.0	M
P7	Type of sensor/probe **S3** (limit or averaging sensor with input **P2** if temperature). Similar to **P2**.	---	PTC /1 000 / NTC / 0-10 / 0-5 / 0.20 / 4.20 / E520	0-10	M
P8	Minimum value of **S3** (if **CFG** = HUML).	%rH	0...100	0	M
P9	Maximum value of **S3** (if **CFG** = HUML).	%rH	0...100	100	M
P10	Offset of sensor **S3** humidity (if **CFG** = HUML).	%rH	-10...10	0	M
P11	TA sensor K (1000 = current multiplier of 1.000).	---	0...2000	1000	M
P12	Ventilation presence (enables maintenance management based on utility operating hours). **No** = No ventilation; **Yes** = Ventilation present.	---	No/Yes	Yes	M

Par.	Description	MU	Range	Default	PW
P13	Offset of sensor **S2** temperature (of **CFG** = 1T or **CFG** = 2T).	°C/°F	-10.0...10.0	0.0	M
P14	Offset of sensor **S3** temperature (of **CFG** = 1T or **CFG** = 2T).	°C/°F	-10.0...10.0	0.0	M
P20	Electrical conductivity of the water at 100°C (212 °F). **0** = 3000 µS/cm; **1** = 4000 µS/cm; **2** = 5000 µS/cm.	---	0...2	1	M
P21	Temperature unit of measure (changing value means that the temperature parameter limits will need to be reset manually). **0** = °C; **1** = °F.	---	0/1	0	M
P22	Steam production unit of measurement. **0** = kg/h; **1** = lb/h.	---	0/1	0	M
	REGULATION group				
r0	Humidity probe setpoint hysteresis.	%	0...20	2	M
r1	Minimum value for setting humidity setpoint.	%	0...**r2**	20	M
r2	Maximum value for setting humidity setpoint.	%	**r1**...100	95	M
r4	Humidity proportional band.	%	0...50	50	M
r5	Minimum production.	%	20...**r6**	20	M
r6	Maximum production.	%	**r5**...100	75	U
r10	Humidity limit probe setpoint hysteresis.	%	0...20	2	M
r11	Minimum value for setting humidity limit setpoint.	%	0...r12	20	M
r12	Maximum limit setpoint value.	%	**r11**...100	95	M
r20	Temperature proportional band.	°C/°F	0.1... 10.0	5.0	M
r21	Minimum value for setting temperature setpoint.	°C/°F	10.0...**r22**	20.0	M
r22	Maximum value for setting temperature setpoint.	°C/°F	**r21**...60.0	50.0	M
r23	Wellness temperature probe 1 weight.	%	0...100	50	M
r24	Wellness temperature probe 2 weight.	%	0...100	50	M
c0	Number of consecutive days of inactivity after which the hydraulic unit is emptied. **0** = Function disabled.	days	0...10	2	M
c1	Number of consecutive days of activity after which the hydraulic unit is emptied. **0** = Function disabled.	days	0...100	14	M
c3	Type of draining for dilution. **0** = Current-based; **1** = Time-based.	---	0/1	0	M
c4	Draining duration for dilution (if **c3** = 1).	s	0...9999	5	M
c5	Time between two dilution draining events (if **c3** = 1).	m	30...999	60	M
c6	Percentage draining for dilution (if **c3** = 0).	%	20...80	30	M
c10	Maximum initial water filling time for water inlet check.	s	50...2000	1200	M
c11	Anti-foam process. **0** = Disabled; **1** = Enabled.	---	0/1	0	M
c14	Time to drain the hydraulic unit completely. **(*)** Default according to model, from: **3 kg/h** = 30 s; **5..15 kg/h** = 40 s; **20...200 kg/h** = 180 s.	s	0...240	**(*)**	M
c15	Hours of dual hydraulic unit machine rotation.	hours	10...500	150	M
c16	Low conductivity algorithm enable. **0** = Disabled; **1** = Enabled.	---	0/1	0	M
	MAINTENANCE/ALARMS group				
M5	Low humidity alarm threshold. The hysteresis is fixed at 2%. **0** = Disabled.	%	0...100	20	M
M6	High humidity alarm threshold. The hysteresis is fixed at 2%. **0** = Disabled.	%	0...100	95	M
M7	High/low humidity alarm delay. **0** = Disabled.	s	0...999	120	M
M8	Delay in alarm for no production	hours	1...100	48	M
M9	Maximum number of automatic attempts to rearm alarm **AL03** “No water” after which the alarm blocks manual rearming.	num	1...10	3	M
M10	Operating hours threshold for unit maintenance warning.	hx10	100....10000	4000	M
M11	Partial operating hours threshold for the hydraulic unit maintenance warning.	hx10	100....2000	200	M
M12	Total operating hours threshold for the hydraulic unit maintenance warning.	hx10	100....2000	1000	M
M13	Operating hours threshold for valve maintenance warning.	hx10	100....2000	1000	M
M14	Operating hours threshold for pump maintenance warning.	hx10	100....2000	1000	M
M15	Operating hours threshold for fan maintenance warning.	hx10	100....2000	1000	M

Par.	Description	MU	Range	Default	PW
M20	High temperature alarm threshold. The hysteresis is fixed at 0.5 °C; **0** = Disabled.	°C/°F	0.0...80.0	50.0	M
M21	Maximum number of automatic attempts to rearm the high temperature alarm after which the alarm blocks manual rearming (attempts every hour)	num	1...10	3	M
	COMMUNICATION group				
LA1	Modbus communication protocol address.	num	1...247	247	M
Lb1	Modbus transmission speed (baud rate). **0** = 2400; **1** = 4800; **2** = 9600; **3** = 19200; **4** = 38400.	---	0...4	4	E
LP1	Modbus parity bit. **0** = None; **1** = Odd; **2** = Even.	---	0...2	2	E
LS1	Modbus stop bit. **0** = 1 stop bit; **1** = 2 stop bits.	---	0/1	0	E
	PASSWORD group				
PA1	First level password. **0** = No password	---	-99...999	0	U
PA2	Second level password.	---	-99...999	824	M

11. MODBUS RTU FUNCTIONS AND RESOURCES

11.1 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.

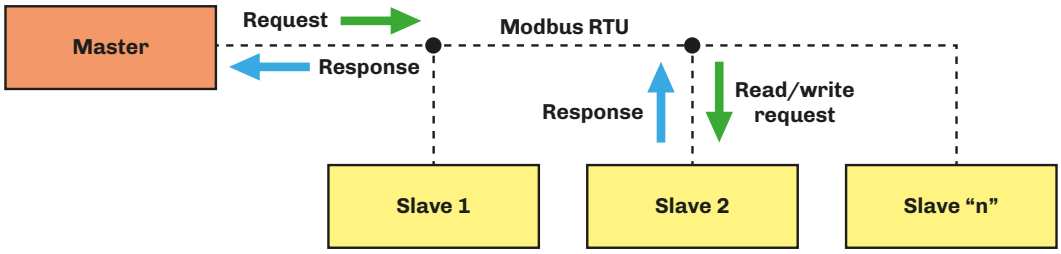


Fig. 34. *Diagram showing message exchange in a Modbus communication*

The Modbus protocol establishes a Protocol Data Unit (PDU) that is independent from the communication layer below it, introducing some additional fields specified on the Application Data Unit (ADU) (***"FIG. 35. FRAMING OF A MESSAGE USING MODBUS PROTOCOL" ON PAGE 53***) 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.

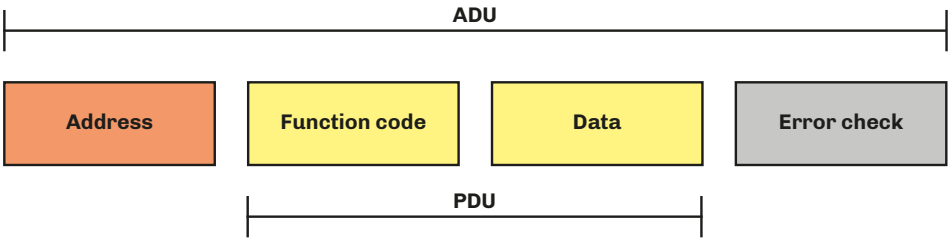


Fig. 35. *Framing of a message using Modbus protocol*

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

11.2 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

11.3 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.

11.3.1 Available Modbus commands and data areas

The commands implemented are as follows:

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

11.4 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 device address in a Modbus message is set by parameter **LA1**.

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
LA1	Modbus communication protocol address.	---	0...247	247
Lb1	Modbus transmission speed (baud rate). **0** = 2400; **1** = 4800; **2** = 9600; **3** = 19200; **4** = 38400.	---	0...4	4
LP1	Modbus parity bit. **0** = None **1** = Odd; **2** = Even.	---	0...2	2
LS1	Modbus stop bit. **0** = 1 stop bit; **1** = 2 stop bits.	---	0/1	0

The RS-485 RTU serial line has the following characteristics:

- RTU mode;
- Bit: 8 bit

11.5 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 27***.

In particular, take care to make the connections correctly, observing the instructions in section ***"6.4 ELECTRICAL CONNECTIONS" ON PAGE 29***

11.6 Modbus table content

Table content description

The table below contains the information required to access the resources properly and directly.
There are two tables:

- The Modbus address table, which contains all the configuration parameters for the device and the corresponding Modbus addresses;
- Modbus resource table, which contains all the status (I/O) and alarm resources in the device memory.

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 fields indicates Y, the value read by the register needs to be converted because the value represents a number with a sign. In the other cases the value is always positive or zero.
- **DATA SIZE**: Indicates the size in data bits:
  - **DWORD** = 32 bit
  - **DOUBLE** = 32 bit with sign
  - **SHORT** = 16 bit with sign
  - **WORD** = 16 bit
  - **Byte** = 8 bit
  - The "**n**" bits = 0...15 bit depending on the value of "n"

11.7 Modbus addresses

11.7.1 Modbus address table

Par.	Description	Val. Adr.	R/W	DATA SIZE	CPL	MU	Range
	SETPOINT group						
SP1	Humidity setpoint.	2001	R/W	SHORT	Y	%	**r1...r2**
SP2	Humidity limit setpoint.	2002	R/W	SHORT	Y	%	**r11...r12**
SP3	Temperature probe setpoint.	2086	R/W	SHORT	Y	°C/°F	**r21...r22**
	CONFIGURATION group						
CFG	Control input selection. **0-1** (0) = ON/OFF from digital input; **PROP** (1) = Proportional input; **HUM** (2) = Humidity sensor; **HUML** (3) = Humidity sensor + limit sensor; **1T** (4) = 1 temperature sensor; **2T** (5) = 2 temperature sensors.	2003	R/W	BYTES	---	---	0...5
duAL	Dual boiler humidifier operation. **0** = Parallel; **1** = Sequential.	2066	R/W	1 BIT	---	---	0/1
nTyp	Master/Slave operation. **0** = Disabled; **1** = Parallel; **2** = Rotation; **3** = Balancing.	2073	R/W	BYTES	---	---	0...3
nAdr	Networked master/slave module (only if enabled Master/ Slave Operation **nTyp** ≠ 0). **1** = Master; **2** = Slave 1; **3** = Slave 2; **4** = Slave 3; **5** = Slave 4.	2070	R/W	BYTES	---	---	1...5
nPrE	Master/Slave machine pre-heating enabled. **0** = Disabled; **1** = Enabled.	2074	R/W	1BIT	---	---	0/1
ntot	Total number of Master/Slave machines.	2072	R/W	3 BIT	---	num	2...5
nbAc	Number of Master/Slave backup machines.	2071	R/W	2BIT	---	num	1...3
nHrs	Hours of Master/Slave machine rotation.	2075	R/W	BYTES	---	hours	10...500
P0	S1 sensor type (temperature). **---** (0) = Disabled; **PTC** (1) = PTC; **NTC** (2) = NTC.	2076	R/W	3 BIT	---	---	0...2
P1	Electrical conductivity of the water.	2006	R/W	WORD	---	µS/cm	0...1250
P2	**S2** sensor type (humidity 1 / proportional input). **PTC** (0) = PTC probe; **1000** (1) = Pt1000 probe; **NTC** (2) = NTC probe; **0-10** (3) = Proportional input 0...10 V; **0-5** (4) = Proportional input 0...5 V; **0.20** (5) = Input 0...20 mA; **4.20** (6) = Input 4...20 mA; **E520** (7) = EVHTP520 proprietary probe.	2007	R/W	BYTES	---	---	0...7
P3	Minimum value of **S2** (if **CFG** = HUM or **CFG** = HUML).	2008	R/W	BYTES	---	%rH	0...100
P4	Maximum value of **S2** (if **CFG** = HUM or **CFG** = HUML).	2009	R/W	BYTES	---	%rH	0...100
P5	Offset of sensor **S2** (if **CFG** = HUM or **CFG** = HUML).	2010	R/W	BYTES	Y	%rH	-10...10
P6	Offset of sensor **S1** (temperature).	2011	R/W	SHORT	Y	°C/°F	-10.0...10.0
P7	**S3** sensor type (humidity 2 limit). Similar to **P2**.	2012	R/W	BYTES	---	---	0...7
P8	Minimum value of **S3** (if **CFG** = HUML).	2013	R/W	BYTES	---	%rH	0...100
P9	Maximum value of **S3** (if **CFG** = HUML).	2014	R/W	BYTES	---	%rH	0...100
P10	Offset of sensor **S3** (if **CFG** = HUML).	2015	R/W	SHORT	Y	%rH	-10...10
P12	Ventilation presence (enables maintenance management based on utility operating hours).	2077	R/W	1 BIT	---	---	0/1

Par.	Description	Val. Adr.	R/W	DATA SIZE	CPL	MU	Range
P13	Offset of sensor **S2** temperature (of **CFG** = 1T or **CFG** = 2T).	2078	R/W	SHORT	Y	°C/°F	-10.0...10.0
P14	Offset of sensor **S3** temperature (of **CFG** = 1T or **CFG** = 2T).	2079	R/W	SHORT	Y	°C/°F	-10.0...10.0
P20	Electrical conductivity of the water at 100°C (212°F). **0** = 3000 µS/cm; **1** = 4000 µS/cm; **2** = 5000 µS/cm.	2016	R/W	3 BIT	---	---	0...2
P21	Temperature unit of measure (changing value means that the temperature parameter limits will need to be reset manually). **0** = °C; **1** = °F.	2017	R/W	1 BIT	---	---	0/1
P22	Steam production unit of measurement. **0** = kg/h; **1** = lb/h.	2080	R/W	1 BIT	---	---	0/1
	REGULATION group						
r0	Sensor 1 setpoint hysteresis.	2018	R/W	BYTES	---	%	0...20
r1	Minimum setpoint value.	2019	R/W	BYTES	---	%	0...**r2**
r2	Maximum setpoint value.	2020	R/W	BYTES	---	%	**r1**...100
r4	Proportional band.	2021	R/W	BYTES	---	%	0...50
r5	Minimum production.	1927	R/W	BYTES	---	%	0...**r6**
r6	Maximum production.	1926	R/W	BYTES	---	%	**r5**...100
r10	Limit sensor setpoint hysteresis.	2024	R/W	BYTES	---	%	0...20
r11	Minimum limit setpoint value.	2025	R/W	BYTES	---	%	0...r12
r12	Maximum limit setpoint value.	2026	R/W	BYTES	---	%	**r11**...100
c0	Number of continuous days of inactivity after which the boiler is emptied. **0** = Function disabled.	2027	R/W	BYTES	---	days	0...10
c1	Number of continuous days of activity after which the boiler is emptied. **0** = Function disabled.	2028	R/W	BYTES	---	days	0...100
c2	Number of cleaning cycles (filling+draining) following emptying due to activity or inactivity.	2029	R/W	BYTES	---	num	0...10
c3	Type of draining for dilution. **0** = Current-based; **1** = Time-based.	2030	R/W	1 BIT	---	---	0/1
c4	Draining duration for dilution (if **C3** = 1).	2031	R/W	WORD	---	s	0...9999
c5	Time between two dilution draining events (if **C3** = 1).	2032	R/W	WORD	---	min	30...999
c6	Draining value for dilution (if **C3** = 0).	2033	R/W	BYTES	---	%	20...80
c10	Maximum initial water filling time for water inlet check, depending on the model.	2036	R/W	WORD	---	s	50...2000
c11	Anti-foam process. **0** = Disabled; **1** = Enabled.	2037	R/W	1 BIT	---	---	0/1
c12	Time to detect foam after lowering the current by 30%.	2038	R/W	WORD	---	s	10...300
c13	Enable water filling with steam generation active.	2039	R/W	1 BIT	---	---	0/1
c14	Time to drain the hydraulic unit completely.	2040	R/W	BYTES	---	s	0...240
c15	Hours of dual hydraulic unit machine rotation.	2065	R/W	WORD	---	hours	10...500
c16	Low conductivity algorithm enable.	1323	R/W	1 BIT	---	---	0/1
	MAINTENANCE/ALARMS group						
M5	Low humidity alarm threshold. The hysteresis is fixed at 2%. **0** = Disabled.	2041	R/W	BYTES	---	%	0...100
M6	High humidity alarm threshold. The hysteresis is fixed at 2%. **0** = Disabled.	2042	R/W	BYTES	---	%	0...100
M7	High/low humidity alarm delay. **0** = Disabled.	2043	R/W	WORD	---	s	0...999
M8	Delay in alarm for no production.	2064	R/W	BYTES	---	h	1...100
M9	Maximum number of automatic attempts to rearm alarm **AL03** "No water" after which the alarm blocks manual rearming	2067	R/W	BYTES	---	num	1...10
M10	Operating hours threshold for unit maintenance warning.	2044 ... 2045	R/W	DWORD	---	hours x10	100....10000
M11	Operating hours threshold for partial boiler maintenance warning.	2046 ... 2047	R/W	DWORD	---	hours x10	100....2000
M12	Operating hours threshold for full boiler maintenance warning.	2048 ... 2049	R/W	DWORD	---	hours x10	100....2000

Par.	Description	Val. Adr.	R/W	DATA SIZE	CPL	MU	Range
M13	Operating hours threshold for valve maintenance warning.	2050 ... 2051	R/W	DWORD	---	hours x10	100....2000
M14	Operating hours threshold for pump maintenance warning.	2052 ... 2053	R/W	DWORD	---	hours x10	100....2000
M15	Operating hours threshold for fan maintenance warning.	2054 ... 2055	R/W	DWORD	---	hours x10	100....2000
M20	High temperature alarm threshold. The hysteresis is fixed at 3 °C (6 °F); **0** = Disabled.	2068	R/W	BYTES	---	°C/°F	0.0...80.0
M21	Maximum number of automatic attempts to rearm the high temperature alarm after which the alarm blocks manual rearming (attempts every hour)	2069	R/W	BYTES	---	num	1...10
	COMMUNICATION group						
LA1	Modbus communication protocol address.	2056	R/W	BYTES	---	num	1...247
Lb1	Modbus transmission speed (baud rate). **0** = 2400; **1** = 4800; **2** = 9600; **3** = 19200; **4** = 38400.	2057	R/W	BYTES	---	---	0...4
LP1	Modbus parity bit. **0** = None; **1** = Odd; **2** = Even.	2058	R/W	BYTES	---	---	0...2
LS1	Modbus stop bit. **0** = 1 stop bit; **1** = 2 stop bits.	2059	R/W	1 BIT	---	---	0/1
	PASSWORD group						
PA1	First level password. **0** = No password.	2061	R/W	SHORT	Y	---	-99...999
PA2	Second level password.	2062	R/W	SHORT	Y	---	-99...999

11.7.2 Modbus resource table

Code	Description	Val. Adr.	Filter value	R/W	DATA SIZE	CPL	MU	Range
DI1_s0	Digital input **S0** status.	257	---	R	1 BIT	---	---	0/1
DI2_cv	Digital input **CV** status.	258	---	R	1 BIT	---	---	0/1
DI3_of	Digital input **0/1** status.	259	---	R	1 BIT	---	---	0/1
DI4_ls	Level sensor input status.	260	---	R	1 BIT	---	---	0/1
DO1_EV1	Inlet solenoid valve output status.	385	---	R	1 BIT	---	---	0/1
DO2_DP1	Inlet pump output status.	386	---	R	1 BIT	---	---	0/1
DO3_G1	Steam generation output status.	387	---	R	1 BIT	---	---	0/1
DO4_DEH	Dehumidification output status.	388	---	R	1 BIT	---	---	0/1
DO5_FANS	Ventilated distributor output status.	389	---	R	1 BIT	---	---	0/1
DO6_AL	Alarm output status.	390	---	R	1 BIT	---	---	0/1
AI_ temperature	Temperature sensor **S1** value.	516	---	R	SHORT	Y	°C/°F	-3276.8... 3276.7
AI_Humidity	Humidity sensor **S2** value.	517	---	R	SHORT	Y	%rH	-32768... 32767
AI_Humidity_L	Humidity limit sensor **S3** value.	518	---	R	SHORT	Y	%rH	-32768... 32767
AI_Request	Proportional input **S2** value.	519	---	R	SHORT	Y	%	-32768... 32767
AI_Current	Current sensor **CT1** value.	520	---	R	SHORT	Y	A	-327.68... 327.67
PackedAlarm1	Status of warning **W01**.	769	0	R	1 BIT	---	---	0/1
PackedAlarm1	Status of alarm **AL01**.	769	1	R	1 BIT	---	---	0/1
PackedAlarm1	Status of warning **W02**.	769	2	R	1 BIT	---	---	0/1
PackedAlarm1	Status of alarm **AL02**.	769	3	R	1 BIT	---	---	0/1
PackedAlarm1	Status of alarm **AL03**.	769	4	R	1 BIT	---	---	0/1
PackedAlarm1	Status of warning **W04**.	769	5	R	1 BIT	---	---	0/1
PackedAlarm1	Status of warning **W05**.	769	6	R	1 BIT	---	---	0/1
PackedAlarm1	Status of warning **W06**.	769	7	R	1 BIT	---	---	0/1
PackedAlarm1	Status of alarm **AL07**.	769	8	R	1 BIT	---	---	0/1
PackedAlarm1	Status of warning **W08**.	769	9	R	1 BIT	---	---	0/1
PackedAlarm1	Status of alarm **AL08**.	769	10	R	1 BIT	---	---	0/1
PackedAlarm1	Status of alarm **AL09**.	769	11	R	1 BIT	---	---	0/1
PackedAlarm1	Status of alarm **AL10**.	769	12	R	1 BIT	---	---	0/1
PackedAlarm1	Status of alarm **AL11**.	769	13	R	1 BIT	---	---	0/1
PackedAlarm1	Status of warning **W12**.	769	14	R	1 BIT	---	---	0/1
PackedAlarm1	Status of warning **W13**.	769	15	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL14**.	770	0	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL15**.	770	1	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL16**.	770	2	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL17**.	770	3	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL18**.	770	4	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL19**.	770	5	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL20**.	770	6	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL21**.	770	7	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL22**.	770	8	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL23**.	770	9	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL24**.	770	10	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL25**.	770	11	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL26**.	770	12	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL27**.	770	13	R	1 BIT	---	---	0/1
PackedAlarm2	Status of alarm **AL28**.	770	14	R	1 BIT	---	---	0/1
PackedAlarm2	Status of warning **W29**.	770	15	R	1 BIT	---	---	0/1

Code	Description	Val. Adr.	Filter value	R/W	DATA SIZE	CPL	MU	Range
PackedAlarm3	Status of alarm **AL29**.	771	0	R	1 BIT	---	---	0/1
PackedAlarm3	Status of warning **W30**.	771	1	R	1 BIT	---	---	0/1
PackedAlarm3	Status of alarm **AL30**.	771	2	R	1 BIT	---	---	0/1
PackedAlarm3	Status of alarm **AL31**.	771	3	R	1 BIT	---	---	0/1
PackedAlarm3	Status of warning **W32**.	771	4	R	1 BIT	---	---	0/1
PackedAlarm3	Status of warning **W33**.	771	5	R	1 BIT	---	---	0/1
PackedAlarm3	Status of warning **W34**.	771	6	R	1 BIT	---	---	0/1
PackedAlarm3	Status of warning **W35**.	771	7	R	1 BIT	---	---	0/1
PackedAlarm3	Status of alarm **AL35**.	771	8	R	1 BIT	---	---	0/1
PackedAlarm3	Status of alarm **AL36**.	771	9	R	1 BIT	---	---	0/1
PackedAlarm3	Status of alarm **AL37**.	771	10	R	1 BIT	---	---	0/1
PackedAlarm3	Status of alarm **AL38**.	771	11	R	1 BIT	---	---	0/1
BMS_AL1	**AL01** manual reset.	773	---	R/W	1 BIT	---	---	0/1
BMS_AL3	**AL03** manual reset.	774	---	R/W	1 BIT	---	---	0/1
BMS_W04	**W04** manual reset.	775	---	R/W	1 BIT	---	---	0/1
BMS_AL22	**AL22** manual reset.	776	---	R/W	1 BIT	---	---	0/1
BMS_AL29_B2	**AL29** manual reset.	777	---	R/W	1 BIT	---	---	0/1
BMS_AL31_B2	**AL31** manual reset.	778	---	R/W	1 BIT	---	---	0/1
BMS_W32_B2	**W32** manual reset.	779	---	R/W	1 BIT	---	---	0/1
manWash	Manual draining command (OFF/ON).	1282	---	R/W	1 BIT	---	---	0/1
GeneralAlarm	General alarm status (OFF/ON).	1283	---	R/W	1 BIT	---	---	0/1
unitOn	Unit status (OFF/ON).	1284	---	R/W	1 BIT	---	---	0/1
---	Restore default parameters command	1285	---	R/W	1 BIT	---	---	0/1
HoursService	Hours of humidifier operation (LOW) (*).	1286	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
	Hours of humidifier operation (HIGH) (*).	1287	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
HoursBoilerP	Partial hours of boiler operation. (LOW) (*).	1288	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
	Partial hours of boiler operation. (HIGH) (*).	1289	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
HoursBoilerT	Total hours of boiler operation (hours x 10) (LOW) (*).	1290	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
	Total hours of boiler operation (hours x 10). (HIGH) (*).	1291	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
HoursEV1	Hours of water inlet solenoid valve operation (hours x 10) (LOW) (*).	1292	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
	Hours of water inlet solenoid valve operation (hours x 10) (HIGH) (*).	1293	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
HoursPump	Hours of outlet pump operation (hours x 10) (LOW) (*).	1294	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
	Hours of outlet pump operation (hours x 10). (HIGH) (*).	1295	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
HoursFan	Hours of fan operation (hours x 10) (LOW) (*).	1296	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
	Hours of fan operation (hours x 10). (HIGH) (*).	1297	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
curr100	Nominal current.	1298	---	R/W	WORD	---	A	0.00...655.35
tevap	Evaporation time.	1299	---	R/W	WORD	---	s	0.0 ... 6553.5
actProd	Actual steam production.	1303	---	R/W	SHORT	Y	kg/h	-3276.8 ... 3276.7
limH	Humidity limit sensor status (ON/OFF).	1304	---	R/W	1 BIT	---	---	0/1

Code	Description	Val. Adr.	Filter value	R/W	DATA SIZE	CPL	MU	Range
HoursAct	Hours of continuous activity. (LOW) (*).	1316	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
	Hours of continuous activity. (HIGH) (*).	1317	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
HoursNotAct	Hours of continuous inactivity. (LOW) (*).	1318	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
	Hours of continuous inactivity. (HIGH) (*).	1319	---	R/W	DWORD	---	h x 10	0.0 ... 429496729.5
MBS_SwEn	On/Off command from BMS.	1922	---	R/W	1 BIT	---	---	0/1

(*) **Calculation of operating hours**
Operating hours = (HIGH register x 65536) + LOW register

12. DIAGNOSTICS

The table below lists alarms with corresponding solutions. Indication takes place via the alarm LED ⚠ and the buzzer. Each alarm is recorded in the alarm log.

12.1 Zephyr OEM alarms table

Code	Description	Cause	Effects	Solution
W01	Warning: +30% overcurrent	• Overcurrent between the electrodes • Electrodes not working or shorted • Current sensor not working • Control board not working • Boiler compromised • High electrical conductivity • Use softened water	• Fixed alarm icon • **W01** displayed • Partial draining • **W01** recorded in the log	• Carry out maintenance • Replace the boiler • Check that the outlet pump is working • Check that the TA is working (if external) • Check the water properties
AL01	Alarm: +50% overcurrent		• Fixed alarm icon • **AL01** displayed • Humidifier OFF • **AL01** recorded in the log	
W02	Warning: no production	• Foam in the boiler • Water inlet flow rate too low • Boiler failing • Water pipes or filter clogged • Backpressure at the steam outlet is greater than rated value • Very low electrical conductivity • No production for a long time	• Fixed alarm icon • **W02** displayed • No effect on regulation • **W02** recorded in the log	• Check the water mains flow rate • Check that the solenoid valve is working • Carry out maintenance on the solenoid valve • Replace the solenoid valve • Check for foam • Check the backpressure in the steam outlet duct
AL02	Alarm: no production		• Fixed alarm icon • **AL02** displayed • Alarm relay ON • Humidifier OFF if **AL02** > 100 h • **AL02** recorded in the log	
AL03	Alarm: no water	• Water fill time > **c10** • Inlet filter clogged • Solenoid valve not working • Water pressure too low • Water inlet circuit leaking	• Fixed alarm icon • **AL03** displayed • Humidifier inhibited for 15 minutes • **AL03** recorded in the log	• Check the water mains flow rate • Check that the solenoid valve is working • Carry out maintenance on the solenoid valve • Replace the solenoid valve • Check and clean the internal pipes and inlet/outlet manifold • Cleaning the boiler • Replace the boiler (if there is significant limescale residue)
W04	Warning: insufficient draining	• Insufficient water drained • Water inlet/outlet clogged	• Fixed alarm icon • **W04** displayed • Alarm relay ON • **W04** recorded in the log	• Cleaning the boiler • Replace the boiler (if there is significant limescale residue) • Clean the pump, outlet manifold and outlet circuit • Replace the outlet pump if it is not working
W05	Warning: foam	The water in the boiler reaches the maximum level sensor	• Fixed alarm icon • **W05** displayed • Anti-foam washing activated • **W05** recorded in the log	• Automatic reset • If it persists over time, disconnect the humidifier water connections and let the water drain, then wash and clean the boiler • Check if the filling water is softened
W06	Warning: suspected high electrical conductivity	• High current • Low filling frequency	• Fixed alarm icon • **W06** displayed • Automatic washing activated • **W06** recorded in the log	• Carry out maintenance • Check the inlet water properties
AL07	Alarm: machine service life	Hours of unit operation > **M10**	• Fixed alarm icon • **AL07** displayed • Alarm relay ON • **AL07** recorded in the log	Carry out full maintenance

Code	Description	Cause	Effects	Solution
W08	Warning: boiler maintenance	Hours of boiler operation > **M11**	• Fixed alarm icon • **W08** displayed • Alarm relay ON • **W08** recorded in the log	Clean the boiler
AL08	Alarm: boiler service life	Hours of boiler operation > **M12**	• Fixed alarm icon • **AL08** displayed • Alarm relay ON • Humidifier OFF • **AL08** recorded in the log	Replace the boiler
AL09	Alarm: solenoid valve maintenance	Hours of solenoid valve operation > **M13**	• Fixed alarm icon • **AL09** displayed • No effect on regulation • **AL09** recorded in the log	• Clean the water inlet filter • Check for leaks • Replace the inlet solenoid valve if necessary • Reset the counter
AL10	Alarm: pump maintenance	Hours of pump operation > **M14**	• Fixed alarm icon • **AL10** displayed • No effect on regulation • **AL10** recorded in the log	• Clean the pump and the inlet and outlet manifold • Clean the inlet/outlet circuit • Check for leaks • Replace the outlet pump if necessary • Reset the counter
AL11	Alarm: fan maintenance	Hours of fan operation > **M15**	• Fixed alarm icon • **AL11** displayed • No effect on regulation • **AL11** recorded in the log	• Clean the fans and grilles • Remove residues and dust incrustations • Replace any fans that are not working • Reset the counter
W12	Warning: low humidity	Humidity production < **M5** for a time > **M7**	• Fixed alarm icon • **W12** displayed • Alarm relay ON • **W12** recorded in the log	• If it occurs together with other alarms, check accordingly • If the humidifier is underdimensioned, contact the system designer • Check **R6** and set it > 70%
W13	Warning: high humidity	Humidity production > **M6** for a time > **M7**	• Fixed alarm icon • **W13** displayed • Alarm relay ON • **W13** recorded in the log	• If it occurs together with other alarms, check accordingly • If the humidifier is overdimensioned, contact the system designer • Check **R6** and set it < 70%
AL14	Alarm: temperature sensor **S1**	• Probe not working • Probe not connected properly • Incorrect probe type	• Fixed alarm icon • **AL14** displayed • Humidifier OFF • **AL14** recorded in the log	• Check the sensor type • Check the sensor wiring • Change the sensor type • Check for electrical noise

Code	Description	Cause	Effects	Solution
AL15	Alarm: humidity sensor **S2**	• Sensor not working • Sensor not connected correctly • Control board not working	• Fixed alarm icon • **AL15** displayed • Alarm relay ON • Humidifier OFF • **AL15** recorded in the log	• Check the sensor type (**P2**) • Check the sensor wiring • Change the sensor type • Check for electrical noise
AL16	Alarm: humidity limit sensor **S3**		• Fixed alarm icon • **AL16** displayed • Alarm relay ON • Humidifier OFF • **AL16** recorded in the log	• Check the sensor type (**P7**) • Check the sensor wiring • Change the sensor type • Check for electrical noise
AL17	Alarm: proportional request from regulator		• Fixed alarm icon • **AL17** displayed • Alarm relay ON • Humidifier OFF • **AL17** recorded in the log	• Check the regulator wiring • Check the regulator type
AL18	Alarm: current sensor **CT**		• Fixed alarm icon • **AL18** displayed • Alarm relay ON • Humidifier OFF • **AL18** recorded in the log	• Check for water leaks • Check the electrical phase wiring on the boiler and contactor • Check that the TA is working • If the control board or current sensor are not working, replace the control board
AL19	Alarm: temperature sensor 1	• Probe not working • Probe not connected properly • Incorrect probe type	• Fixed alarm icon • **AL19** displayed • Alarm relay ON • Humidifier OFF • **AL19** recorded in the log	• Check the sensor type • Check the sensor wiring • Change the sensor type • Check for electrical noise
AL20	Alarm: temperature sensor 2		• Fixed alarm icon • **AL20** displayed • Alarm relay ON • Humidifier OFF • **AL20** recorded in the log	
AL21	Alarm: hydraulic unit 2 current sensor	• Phase via sensor disconnected • Control board not working • Current sensor not working • Inlet solenoid valve not working • Possible water leakage	• Fixed alarm icon • **AL21** displayed • Alarm relay ON • Humidifier OFF • **AL21** recorded in the log	• Check for water leaks • Check the electrical phase wiring on the hydraulic unit and contactor • Check that **TA** 2 is working • If the control board or current sensor are not working, replace the control board
AL22	Alarm: high temperature in wellness room	Wellness room temperature > **M20**	• Fixed alarm icon • **AL22** displayed • Alarm relay ON • Humidifier OFF • **AL22** recorded in the log	• Wait until room temperature < **M20** - 3 °C • Check and eliminate the cause of wellness room temperature > **M20**
AL23	Alarm: hydraulic unit 2 expansion board offline	No communication between control board and expansion device	• **AL23** displayed • Alarm relay ON • All regulators for the second boiler are switched off • **AL23** recorded in the log	• Restore communication between control board and expansion device • Automatic reset
AL24	Alarm master offline (only on slave)	No communication between slave humidifier and master humidifier when nTyP ≠ 0	• **AL24** displayed • Alarm relay ON • All regulators related to the Master humidifier are switched off (slaves operate as stand-alone) • **AL24** recorded in the log	• Restore communication between slave humidifier and master humidifier • Automatic reset

Code	Description	Cause	Effects	Solution
AL25	Alarm: slave 1 offline or alarmed (only on master)	• No communication between master humidifier and salve 1 humidifier when **nTyP** ≠ 0 • Slave 1 alarmed with regulation block	• **AL25** displayed • Alarm relay ON • Slave 1 OFF, other humidifiers operate normally • **AL25** recorded in the log	• Restore communication between master humidifier and slave 1 humidifier • Automatic reset
AL26	Alarm: slave 2 offline or alarmed (only on master)	• No communication between master humidifier and salve 2 humidifier when **nTyP** ≠ 0 • Slave 2 alarmed with regulation block	• **AL26** displayed • Alarm relay ON • Slave 2 OFF, other humidifiers operate normally • **AL26** recorded in the log	• Restore communication between master humidifier and slave 2 humidifier • Automatic reset
AL27	Alarm: slave 3 offline or alarmed (only on master)	• No communication between master humidifier and salve 3 humidifier when **nTyP** ≠ 0 • Slave 3 alarmed with regulation block	• **AL27** displayed • Alarm relay ON • Slave 3 OFF, other humidifiers operate normally • **AL27** recorded in the log	• Restore communication between master humidifier and slave 3 humidifier • Automatic reset
AL28	Alarm: slave 4 offline or alarmed (only on master)	• No communication between master humidifier and salve 4 humidifier when **nTyP** ≠ 0 • Slave 3 alarmed with regulation block	• **AL28** displayed • Alarm relay ON • Slave 4 OFF, other humidifiers operate normally • **AL28** recorded in the log	• Restore communication between master humidifier and slave 4 humidifier • Automatic reset
W29	Warning: +30% overcurrent in hydraulic unit 2	• Overcurrent between the electrodes • Electrodes not working or shorted • Current sensor not working • Control board not working • Boiler compromised • High electrical conductivity • Use softened water	• Fixed alarm icon • **W29** displayed • Partial draining • **W29** recorded in the log	• Carry out maintenance • Replace hydraulic unit 2 • Check that the outlet pump for hydraulic unit 2 is working • Check that the TA is working (if external) • Check the water properties
AL29	Alarm: +50% overcurrent in hydraulic unit 2		• Fixed alarm icon • **AL29** displayed • Humidifier OFF • **AL29** recorded in the log	
W30	Warning: no production from hydraulic unit 2	• Foam in hydraulic unit 2 • Water inlet flow rate too low • Hydraulic unit 2 failing • Water pipes or filter clogged • Backpressure at the steam outlet is greater than rated value • Very low electrical conductivity • No production for a long time	• Fixed alarm icon • **W30** displayed • No effect on regulation • **W30** recorded in the log	• Check the water mains flow rate • Check that the solenoid valve is working in hydraulic unit 2 • Carry out maintenance on the solenoid valve in hydraulic unit 2 • Replace the solenoid valve • Check for foam • Check the backpressure in the steam outlet duct
AL30	Alarm: no production from hydraulic unit 2		• Fixed alarm icon • **AL30** displayed • Alarm relay ON • Humidifier OFF if **AL30** > 100 h • **AL30** recorded in the log	
AL31	Alarm: no water in hydraulic unit 2	• Water fill time > **c10** • Inlet filter clogged • Solenoid valve not working • Water pressure too low • Water inlet circuit leaking	• Fixed alarm icon • **AL31** displayed • Humidifier inhibited for 15 minutes • **AL31** recorded in the log	• Check the water mains flow rate • Check that the solenoid valve is working in hydraulic unit 2 • Carry out maintenance on the solenoid valve in hydraulic unit 2 • Replace the solenoid valve • Check and clean the internal pipes and inlet/outlet manifold • Clean hydraulic unit 2 • Replace hydraulic unit 2 (if there is significant limescale residue)
W32	Warning: insufficient draining from hydraulic unit 2	• Insufficient water drained • Water inlet/outlet clogged	• Fixed alarm icon • **W32** displayed • Alarm relay ON • **W32** recorded in the log	• Clean hydraulic unit 2 • Replace hydraulic unit 2 (if there is significant limescale residue) • Clean the pump, outlet manifold and outlet circuit • Replace the outlet pump if it is not working

Code	Description	Cause	Effects	Solution
W33	Warning: foam in hydraulic unit 2	The water in hydraulic unit 2 reaches the maximum level sensor	• Fixed alarm icon • **W33** displayed • Anti-foam washing activated • **W33** recorded in the log	• Automatic reset • If it persists over time, disconnect the humidifier water connections and let the water drain, then wash and clean the boiler • Check if the filling water is softened
W34	Warning: suspected high electrical conductivity in hydraulic unit 2	• High current • Low filling frequency	• Fixed alarm icon • **W34** displayed • Automatic washing activated • **W34** recorded in the log	• Carry out maintenance • Check the inlet water properties
W35	Warning: hydraulic unit 2 maintenance	Hours of hydraulic unit 2 operation > **M11**	• Fixed alarm icon • **W35** displayed • Alarm relay ON • **W35** recorded in the log	Clean the boiler
AL35	Alarm: hydraulic unit 2 service life	Hours of hydraulic unit 2 operation > **M12**	• Fixed alarm icon • **AL35** displayed • Alarm relay ON • Humidifier OFF • **AL35** recorded in the log	Replace boiler 2
AL36	Alarm: hydraulic unit 2 solenoid valve maintenance	Hours of hydraulic unit 2 solenoid valve operation > **M13**	• Fixed alarm icon • **AL36** displayed • No effect on regulation • **AL36** recorded in the log	• Clean the water inlet filter • Check for leaks • Replace the inlet solenoid valve if necessary • Reset the counter
AL37	Alarm: hydraulic unit 2 pump maintenance	Hours of hydraulic unit 2 pump operation > **M14**	• Fixed alarm icon • **AL37** displayed • No effect on regulation • **AL37** recorded in the log	• Clean the pump and the inlet and outlet manifold • Clean the inlet/outlet circuit • Check for leaks • Replace the outlet pump if necessary • Reset the counter

13. MAINTENANCE

13.1 Before you start

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

⚠⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

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

⚠⚠ WARNING

RISK OF BURNS

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

NOTE: 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.

13.2 Introduction to maintenance

The boiler provided (equipped) requires frequent maintenance and seasonal cleaning in the following conditions:

Electrical conductivity of the water	Water hardness
75...600 µS/cm	5...30 °f

It is not possible to provide specific instructions to determine the maintenance frequency, as it depends heavily on the morphology of the water used, which can vary even with the same hardness and electrical conductivity.

When using **Zephyr OEM** series humidifiers with more critical water conditions (harder with high electrical conductivity), for example:

Electrical conductivity of the water	Water hardness
700...1250 µS/cm	35...50 °f

that lead to an increase in maintenance frequency (even weekly in extreme cases), a special range of boilers designed and developed to operate with hard water can be used (see ***"1.6 ACCESSORIES" ON PAGE 13***).

Using the special boiler reduces the maintenance and cleaning frequency, but cannot be quantified solely from the electrical conductivity and hardness of the water.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

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

If frequent boiler maintenance is required, check the quality of the water supply.

Moreover, replace the boiler promptly when:

- The drain water is very dark (reddish/black) and demonstrates the start of electrode corrosion caused by the highly aggressive nature of concentrated water and the associated electrical phenomena;
- The humidifier frequently drains the water completely to dilute it and perform a complete wash; **Zephyr OEM** series humidifiers normally renew the water in the boiler in a balanced way, optimising efficiency while reducing the risk of malfunction in relation to the amount of steam produced.
  NOTE: A high concentration of salts in the water in the boiler results in high electrical conductivity, which can cause various high current alarms and lead to frequent draining cycles.
- The boiler has reached 5 seasons or 24 months of continuous operation with maintenance carried out in accordance with best practices or in any case at most 20000 hours;
- There are large amounts of limescale that lead to colour and surface variations on the outer walls of the boiler due to overheating caused by limescale bridging between the electrical phases;
  NOTE: Limescale inside the boiler is normal, even in large amounts, as the boiler collects the limescale present in the water; therefore performing maintenance/cleaning on it is essential for correct operation.

NOTE: Since the boiler is a consumable item, it is not covered by warranty, unless problems are encountered during the initial start-up.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

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

- There are leaks due to breakages, cracks and fissures.
  NOTE: The water in the boiler is subjected to an electrical voltage and therefore leaks from the boiler are dangerous.

DANGER

RISK OF ELECTRIC SHOCK OR ELECTRIC ARC

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

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

DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

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

- After a period of activity and/or due to the water properties, limescale formation inside the boiler may bring the electrodes closer together and/or closer to the boiler walls. This could potentially form a conducting path that may lead to a temperature increase when there is no water (causing the boiler surfaces to become black) and melt the boiler wall, allowing live water to leak out (replace the hydraulic unit);

DANGER

RISK OF ELECTRIC SHOCK OR ELECTRIC ARC

- In the event of water leakage, disconnect the humidifier power supply immediately.
- Check the boiler sealing gaskets and replace them if necessary

13.3 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 replacing components	Make sure there are no leaks after an hour of continuous operation.
Every 7 days	• Make sure the humidifier works properly (based on the instructions provided in this manual); • Make sure there are no leaks in the plumbing system; • Make sure there is no unusual operation.
Every 30 days	• Make sure there are no blockages in the water drain; • Make sure the water drains effectively; • Remove any limescale residue from inside the drain.
Every 60 days	• Make sure that the limescale build up in the boiler is not excessive; • Wash the inside of the boiler with a 20% concentration of citric acid, removing limescale from the electrodes and boiler. • If necessary, replace the electrodes and gaskets.
Every 3 years (*)	Replace the boiler.
Every 7 years (**)	Replace the boiler.

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

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

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

WARNING

BIOLOGICAL RISK

- In the event of poor maintenance/cleaning after the humidifier has been shut-down for a long time, microorganisms (including the bacteria that cause Legionellosis) may proliferate and be transferred into the air treatment system.
- The humidifier must be used correctly and be maintained and cleaned properly at the prescribed intervals, as described in the ***MAINTENANCE*** chapter.

Thoroughly remove limescale and biofilm residues from the reservoir and drain (rinse the inside of the reservoir with 20% citric acid and appropriate biocides, and clean the limescale off the surface).

13.4 Cleaning the boiler

- Drain the humidifier manually;
- Disconnect the machine power supply using the external isolator;
- Disconnect the electrode power cables and the signal cable of the high level sensor, which are connected at the top of the boiler (take care not to damage the amperometric transformer (TA) on the electronic board);
- Disconnect the steam delivery pipe from the top of the boiler;
- Release the boiler from the fastener holding it to the metal structure;
- Remove the boiler from the water supply and outlet manifolds;
- Undo the 4 screws in the coupling area between the top and bottom of the boiler;
- Clean any limescale residues from the boiler and its electrodes with a plastic scraper;
- Leave the boiler to soak in a citric acid solution for a few hours and then repeat the previous step;
- Wash the whole boiler in running water to flush away any material removed by hand;
- Carefully refit the central seal in position and close the boiler with the screws in the coupling area;
- Reassemble the boiler by following the removal procedure in reverse.
- Check that the electrodes are securely fastened to the boiler and make good electrical connections by securing the cable lugs in such a way that the wiring harness cannot become loose during normal humidifier operation.

⚠⚠ DANGER

LOOSE WIRING CAUSES ELECTRIC SHOCKS AND OVERHEATING

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

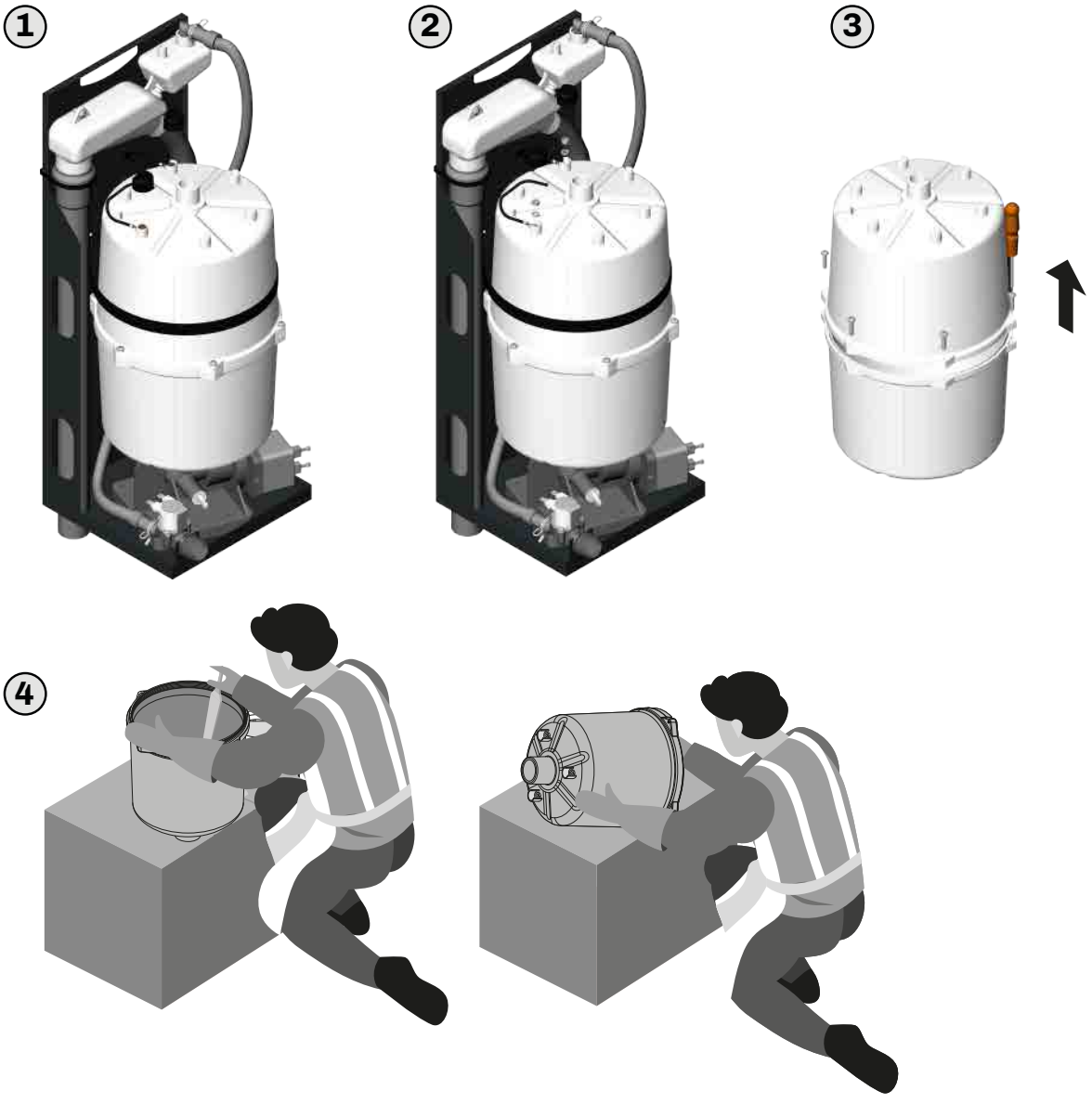


Fig. 36. *Cleaning the boiler*

13.5 Replacing the boiler

- Drain the humidifier manually;
- Disconnect the machine power supply using the external isolator;
- Disconnect the electrode power cables and the signal cable of the high level sensor, which are connected at the top of the boiler (take care not to damage the amperometric transformer (TA) on the electronic board);
- Disconnect the steam delivery pipe from the top of the boiler;
- Release the boiler from the fastener holding it to the metal structure;
- Remove the boiler from the water supply and outlet manifolds;
- Insert the new boiler as described in ***"13.6 FITTING THE BOILER" ON PAGE 70***;
- Depending on the Zephyr humidifier you have, make sure that the cable connections are tightened properly (see ***"6. ELECTRICAL CONNECTIONS" ON PAGE 27***);
- Check that the electrodes are securely fastened to the boiler and make good electrical connections (in accordance with the current regulations) by securing the cable lugs in such a way that the wiring harness cannot become loose during normal humidifier operation.

⚠⚠ DANGER

LOOSE WIRING CAUSES ELECTRIC SHOCKS AND OVERHEATING

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

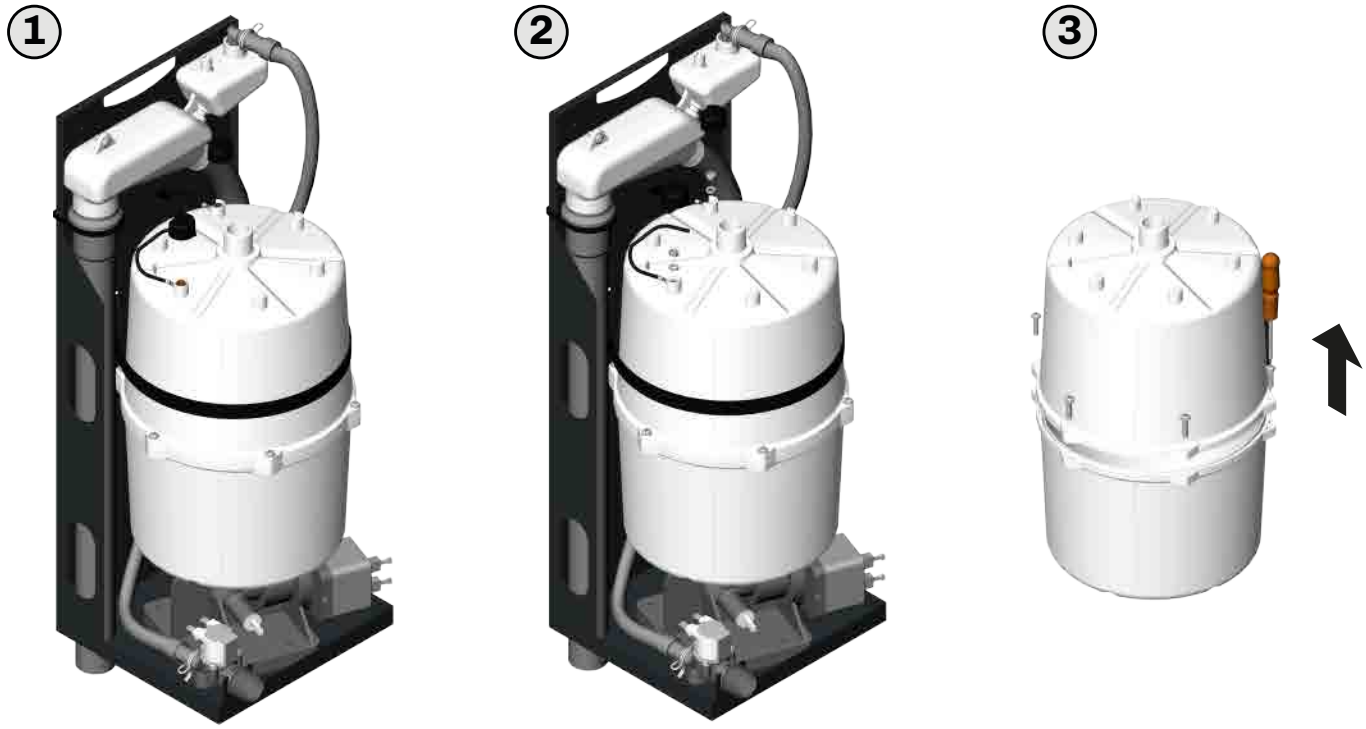


Fig. 37. *Replacing the boiler*

13.5.1 Tightening torque for electrode connections

Boiler	Nuts	Spanner	Tightening torque
3...15 kg/h	M5	SW8	2.5 Nm
20...40 kg/h	M6	SW10	4 Nm

13.6 Fitting the boiler

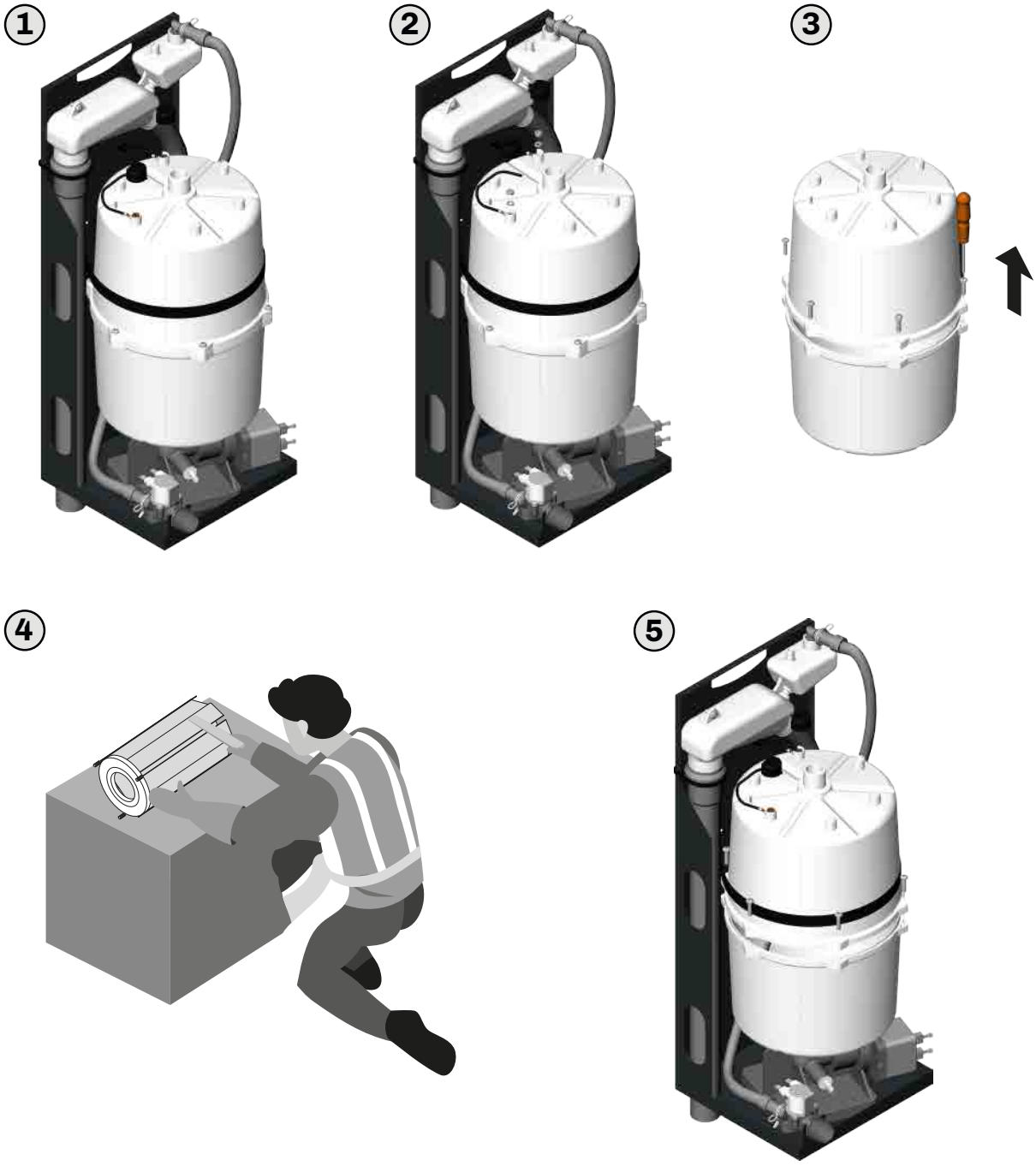
- Insert the boiler into the outlet manifold and secure it with the Velcro strap to prevent it from falling off;
- Check that the electrodes are securely fastened to the boiler and make good electrical connections by securing the cable lugs in such a way that the wiring harness cannot become loose during normal humidifier operation.

⚠ DANGER

LOOSE WIRING CAUSES ELECTRIC SHOCKS AND OVERHEATING

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

13.7 Cleaning/replacing the electrodes



14. SPARE PARTS

14.1 Hydraulic unit

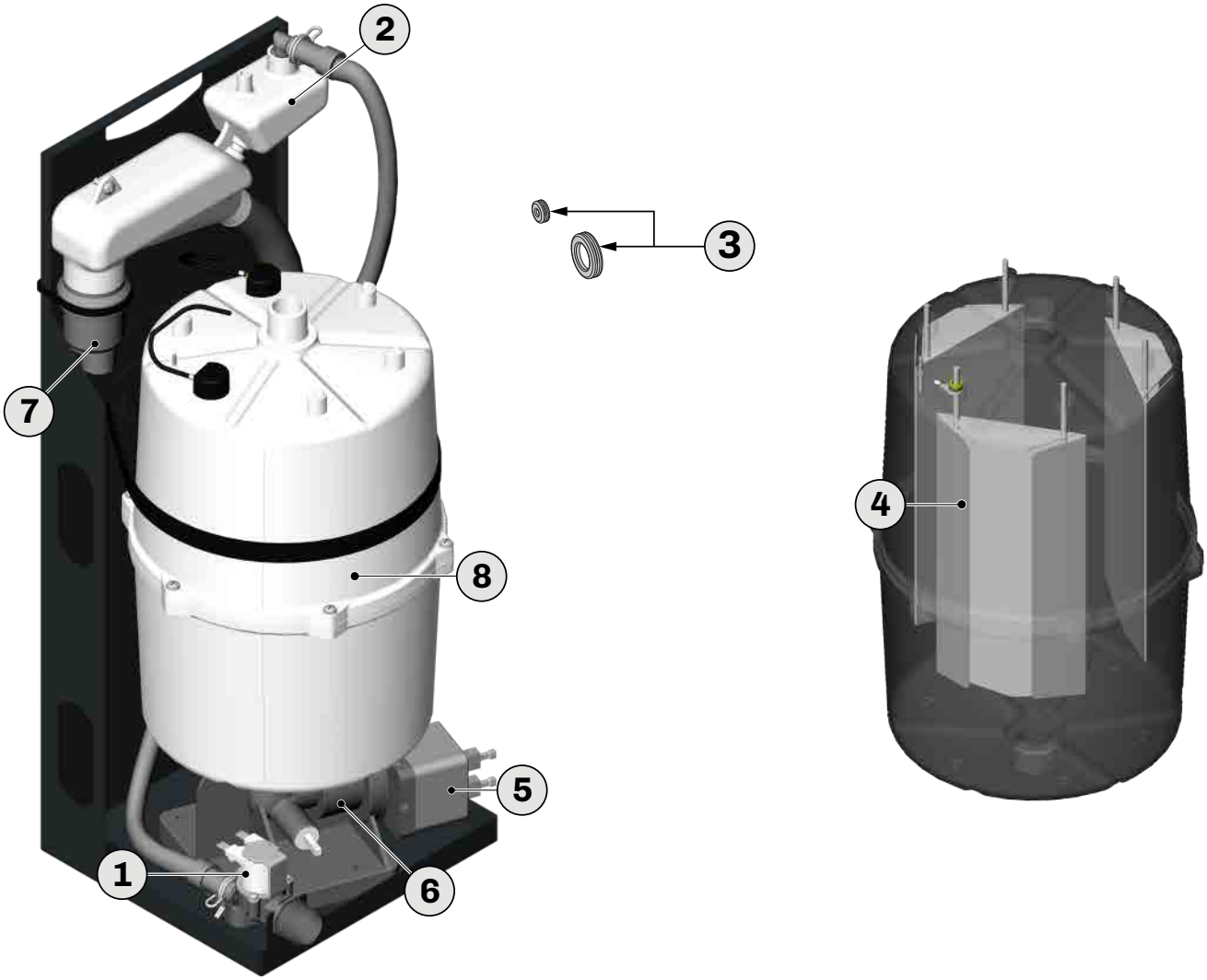


Fig. 38. *Spare parts for* ***Zephyr OEM series - Plumbing Part***

Ref.	P/n	Description
1	**EHKT0K01**	Inlet solenoid valve **EHKO08**...**EHKO15**
	EHKT0K02	Inlet solenoid valve **EHKO20**...**EHKO40**
	EHKT0K03	Inlet solenoid valve **EHKO02**...**EHKO05**
2	**EHKT0K07**	Filling reservoir
3	**EHKT0K09**	**XS**-**S**-**M** boiler seal kit
	EHKT0K10	**L** boiler seal kit
4	**EHKT0K21**	Electrode kit for **EHBK005M00M**
	EHKT0K22	Electrode kit for **EHBK005MHCM**
	EHKT0K23	Electrode kit for **EHBK005MLCM**
	EHKT0K27	Electrode kit for **EHBK002M00XS**
	EHKT0K28	Electrode kit for **EHBK002MHCXS**
	EHKT0K29	Electrode kit for **EHBK002MLCXS**
	EHKT0K30	Electrode kit for **EHBK015T00M**
	EHKT0K31	Electrode kit for **EHBK015THCM**
	EHKT0K32	Electrode kit for **EHBK015TLCM**
	EHKT0K33	Electrode kit for **EHBK040T00L**/ **EHBK050T00L**
	EHKT0K34	Electrode kit for **EHBK040THCL**/ **EHBK050THCL**
	EHKT0K35	Electrode kit for **EHBK040TLCL**
	EHKT0K39	Electrode kit for **EHBK003M00S**
	EHKT0K40	Electrode kit for **EHBK003MHCS**
	EHKT0K41	Electrode kit for **EHBK003MLCS**
	EHKT0K42	Electrode kit for **EHBK005T00S**
	EHKT0K43	Electrode kit for **EHBK005THCS**
	EHKT0K44	Electrode kit for **EHBK005TLCS**
	EHKT0K45	Electrode kit for **EHBK003T00XS**
	EHKT0K46	Electrode kit for **EHBK003THCXS**
	EHKT0K47	Electrode kit for **EHBK003TLCXS**

Ref.	P/n	Description
5	**EHKT0K04**	Electric outlet pump
6	**EHKT0K05**	Inlet/outlet manifold
7	**EHKT0K06**	Outlet circuit kit
8	**EHBK002M00XS**	Cleanable boiler for ExtraSmall standard, 2 kg/h, single-phase models
	EHBK002MHCXS	Cleanable boiler for ExtraSmall high-conductivity, 2 kg/h, single-phase models
	EHBK002MLCXS	Cleanable boiler for ExtraSmall low-conductivity, 2 kg/h, single-phase models
	EHBK003M00S	Cleanable boiler for Small standard, 3 kg/h, single-phase models
	EHBK003MHCS	Cleanable boiler for Small high-conductivity, 3 kg/h, single-phase models
	EHBK003MLCS	Cleanable boiler for Small low-conductivity, 3 kg/h, single-phase models
	EHBK003T00XS	Cleanable boiler for ExtraSmall standard, 3 kg/h, three-phase models
	EHBK003THCXS	Cleanable boiler for ExtraSmall high-conductivity, 3 kg/h, three-phase models
	EHBK003TLCXS	Cleanable boiler for ExtraSmall low-conductivity, 3 kg/h, three-phase models
	EHBK005M00M	Cleanable boiler for Medium standard, 3–5 kg/h, single-phase models
	EHBK005MHCM	Cleanable boiler for Medium high-conductivity, 3–5 kg/h, single-phase models
	EHBK005MLCM	Cleanable boiler for Medium low-conductivity, 3–5 kg/h, single-phase models
	EHBK005T00S	Cleanable boiler for Small standard, 5–8 kg/h, three-phase models
	EHBK005THCS	Cleanable boiler for Small high-conductivity, 5–8 kg/h, three-phase models
	EHBK005TLCS	Cleanable boiler for Small low-conductivity, 5–8 kg/h, three-phase models
	EHBK015T00M	Cleanable boiler for standard, 10–15 kg/h, three-phase models
	EHBK015THCM	Cleanable boiler for high-conductivity, 10–15 kg/h, three-phase models
	EHBK015TLCM	Cleanable boiler for low-conductivity, 10–15 kg/h, three-phase models
	EHBK040T00L	Cleanable boiler for standard, 20–30–40 kg/h, three-phase models
	EHBK040THCL	Cleanable boiler for high-conductivity, 20–30–40 kg/h, three-phase models
	EHBK040TLCL	Cleanable boiler for low-conductivity, 20–30–40 kg/h, three-phase models

14.2 Electrical part

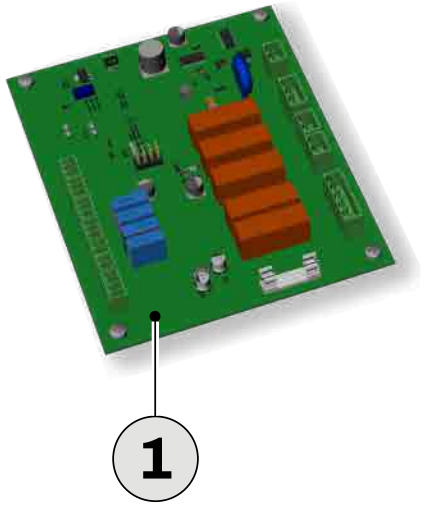


Fig. 39. *Electrical spare parts for* ***Zephyr OEM***

Ref.	P/n	Description
①	**EHHKT011P4**	Complete control unit

15. WIRING DIAGRAMS

15.1 Wiring diagram for 230 Vac models

The customer is responsible for connecting the transformer/contactor/fuse holder.

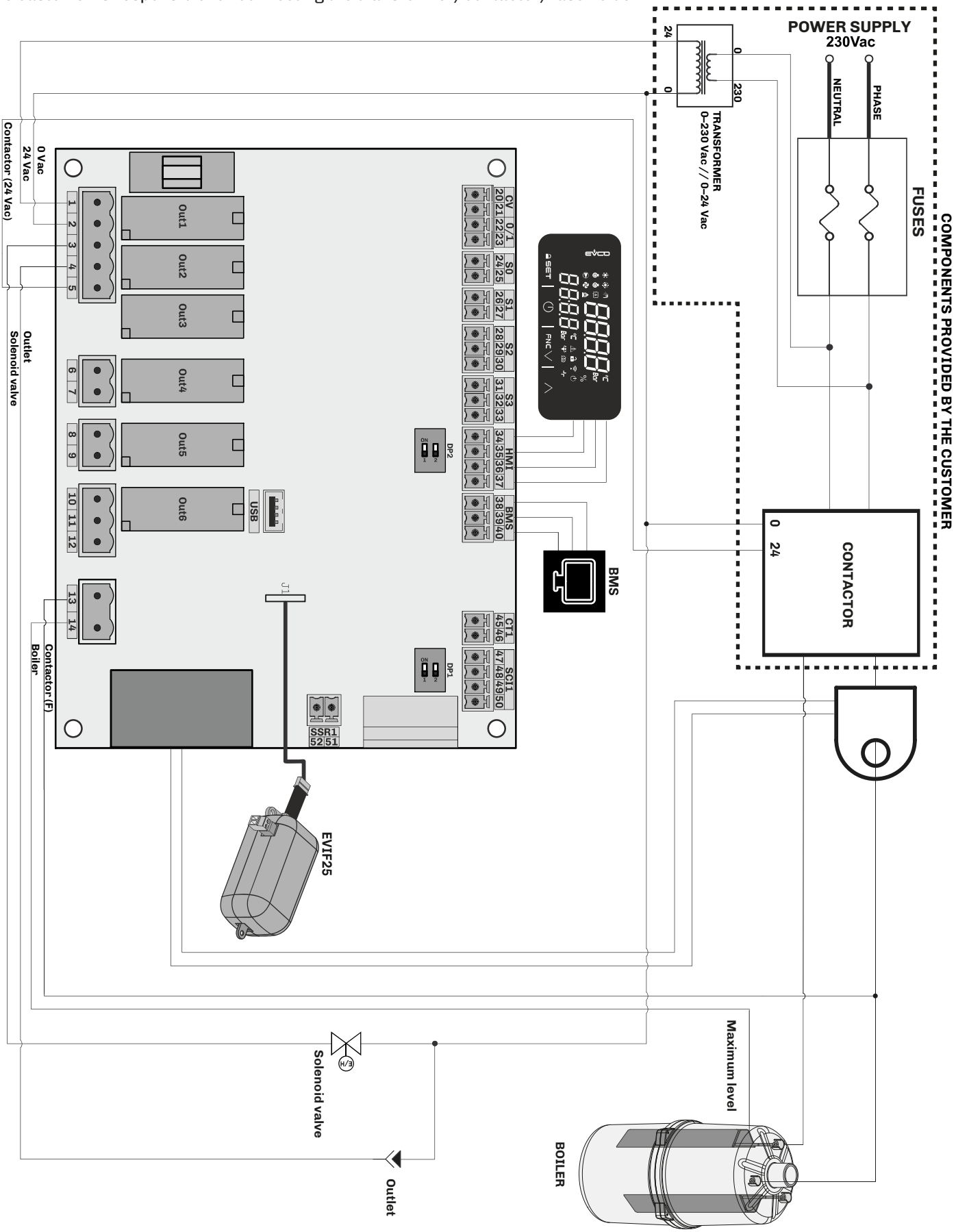


Fig. 40. *Wiring diagram for models* ***EHKO003 / EHKO005***

15.2 Wiring diagram for 400/460 Vac 3Ph models

The customer is responsible for connecting the transformer/contactor/fuse holder.

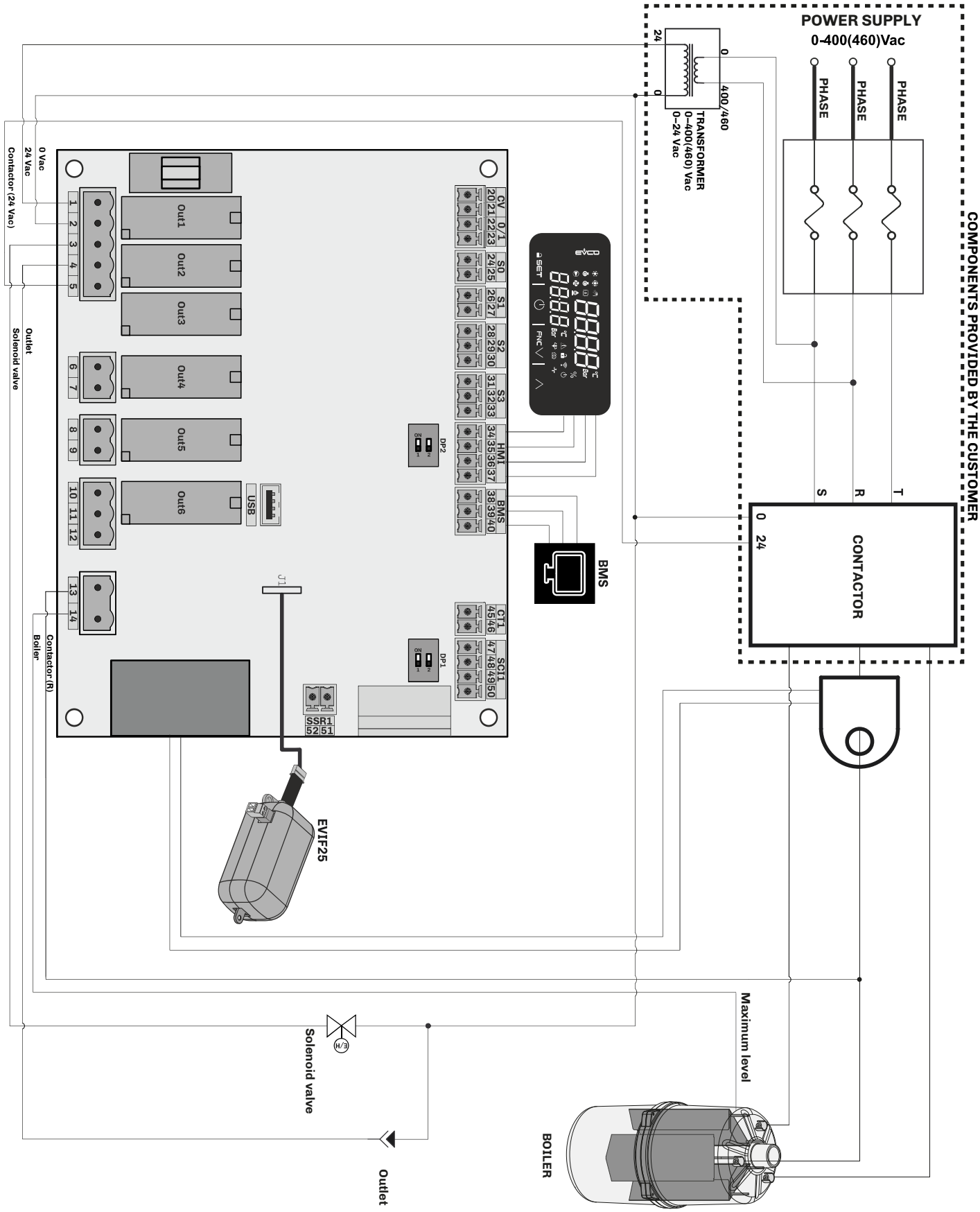


Fig. 41. *Wiring diagram for models* ***EHKO003 / EHKO005 / EHKO010 / EHKO020***

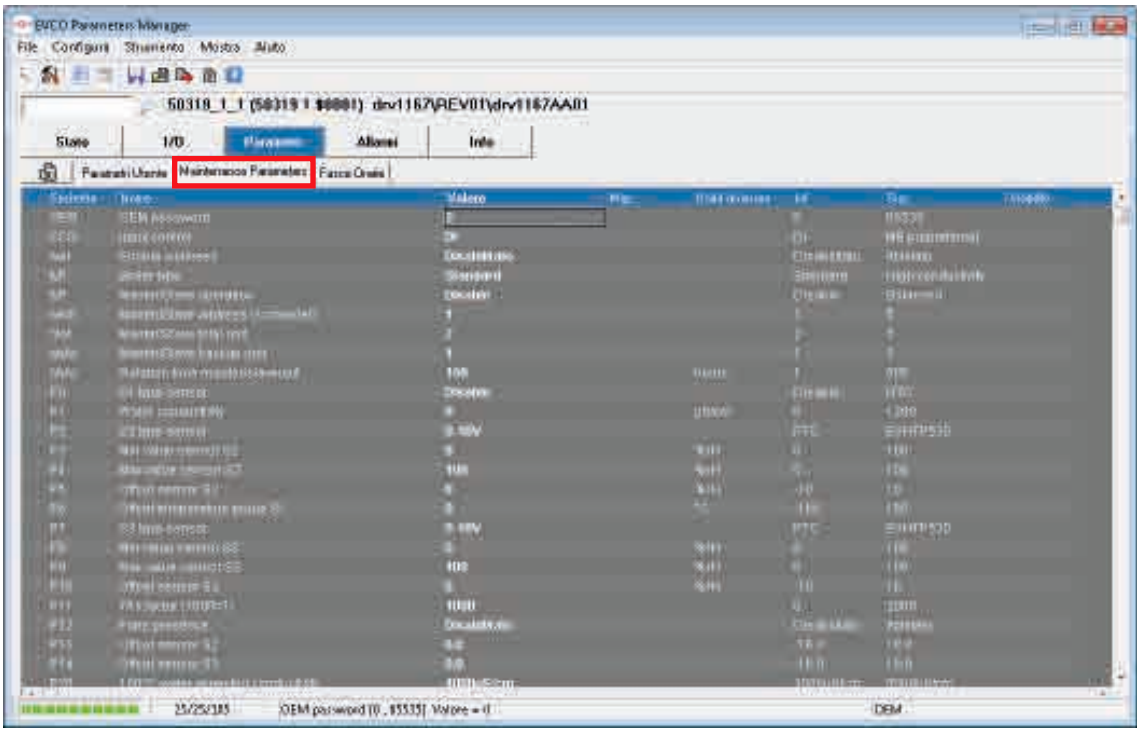
16. SELECTING AND DEFINING THE MODEL

16.1 Introduction

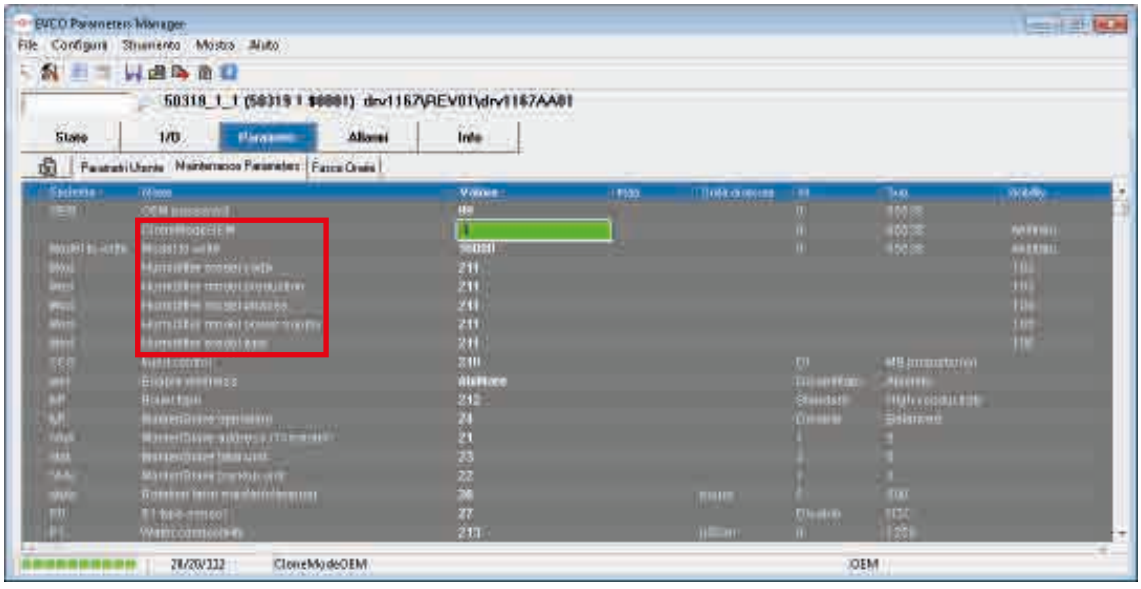
The **Parameters Manager**, can be used to choose the desired humidifier model and configure the machine.

16.2 Procedure for selecting and defining the model

1. Run **Parameters Manager**;
2. Enter the ***Parameters*** sheet followed by the ***Maintenance Parameters*** section;



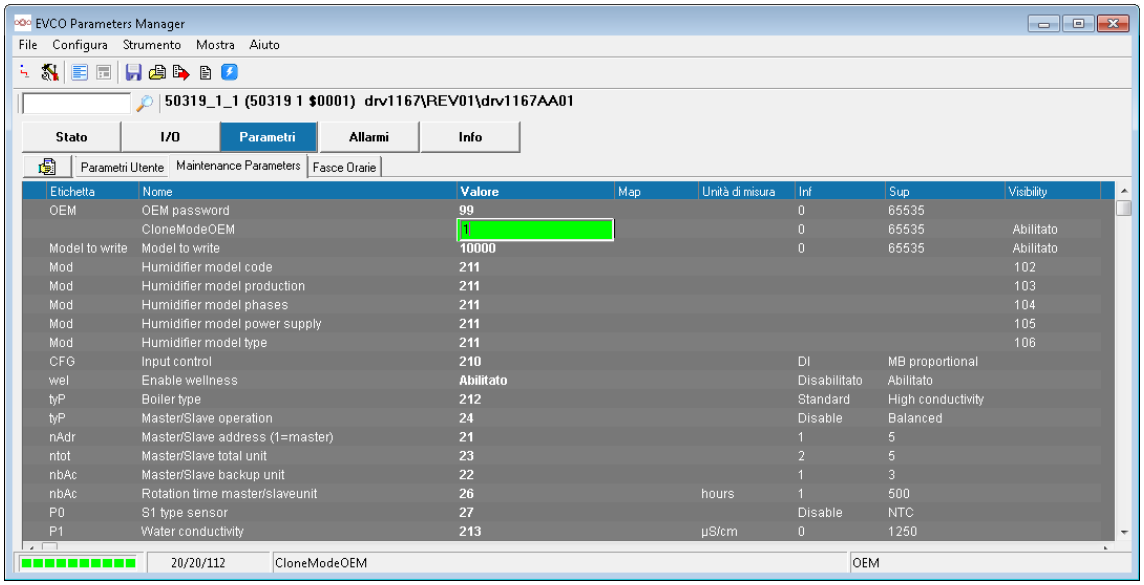
3. Enter the access password (32917) in the OEM Password field. The fields needed to access, select and define the model will then be displayed (wait 5 seconds to see them appear automatically);



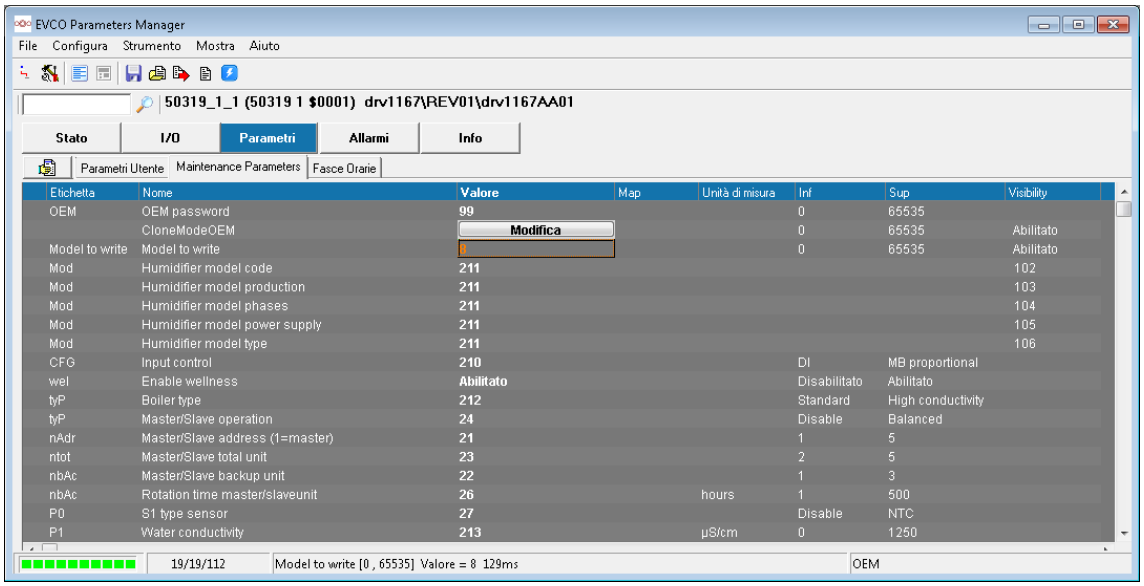
These fields are:

- **CloneModeOEM**: allows the OEM user to enter the mode for selecting and defining the model;
- **Model To Write**: sets the code of the model to be entered;
- **Humidifier Model code**: Displays the p/n of the selected humidifier (read-only);
- **Humidifier Model production**: Displays the production capacity (in kg/h) of the selected humidifier (read-only);
- **Humidifier Model phases**: Displays the number of power supply phases for the selected humidifier (read-only);
- **Humidifier Model power supply**: Displays the power supply type for the selected humidifier (read-only);
- **Humidifier Model type**: Displays the selected humidifier series (read-only).

4. Set the **CloneModeOEM** field to 1; the board will enter the mode for selecting and defining the model.
NOTE: Some parameters may have abnormal values. Do not edit these values.



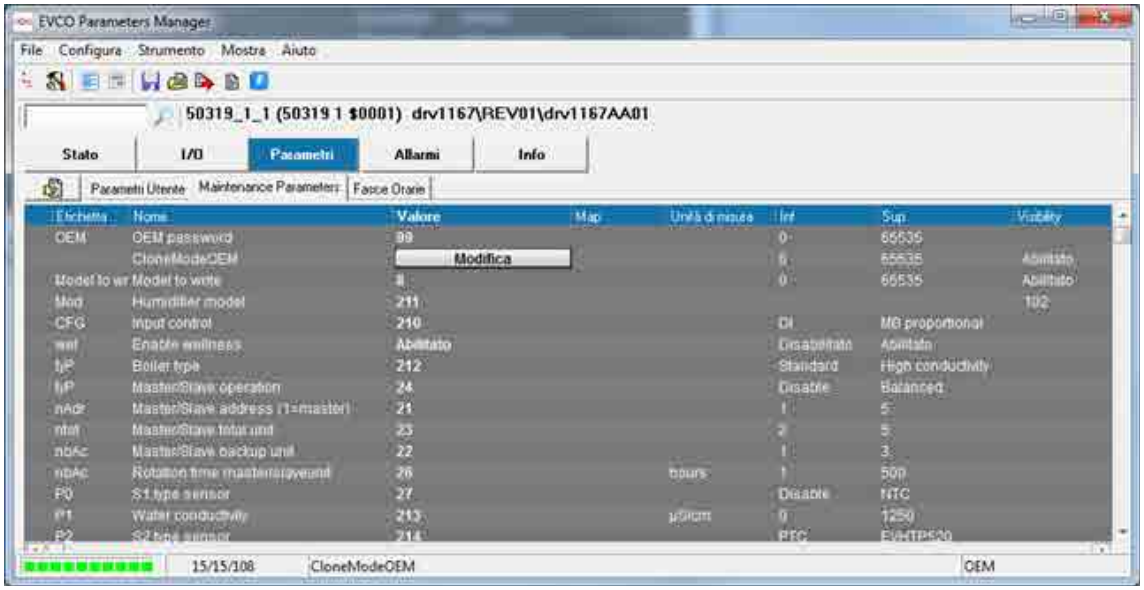
5. Set the **Model To Write** field to the numerical code of the desired model (8 in the example);



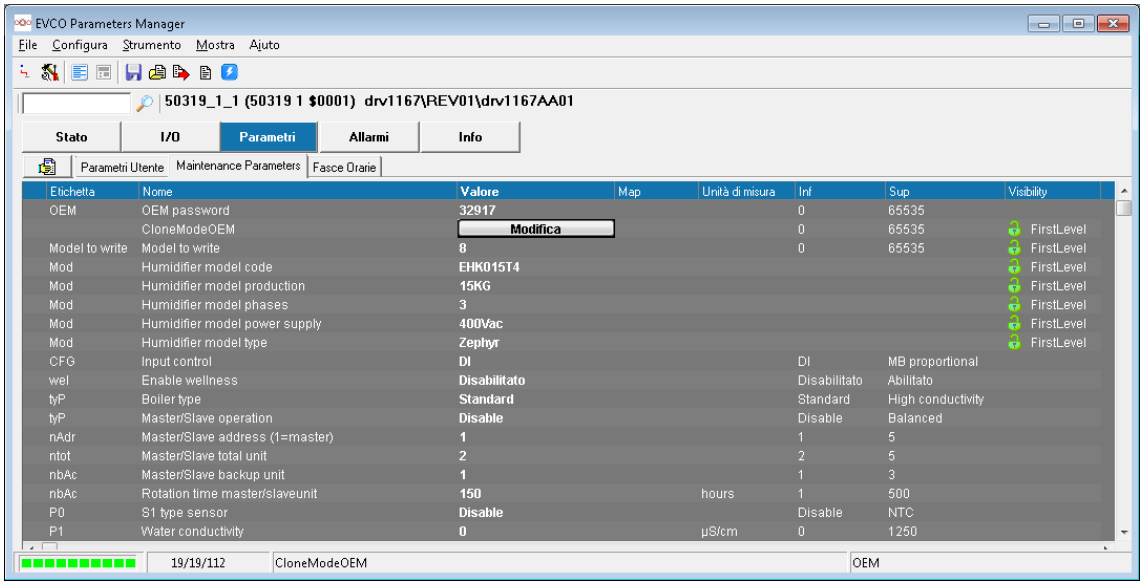
Par.	Description		MU	Range
Model To Write	Humidifier model.		---	0...60
	0 = EHKO003M2 **1** = EHKO003T2 **2** = EHKO003T4 **3** = EHKO005M2 **4** = EHKO005T2 **5** = EHKO005T4 **6** = EHKO010T4 **7** = EHKO010T2 **8** = EHKO015T4 **9** = EHKO015T2 **10** = EHKO020T4 **11** = EHKO020T2 **12** = EHKO030T4 **13** = EHKO040T4 **14** = EHKO050T4 **15...17** = Reserved	**18...36** = Reserved **37** = EHKO002M2 **38** = EHKO003T5 **39** = EHKO005T5 **40** = EHKO010T5 **41** = EHKO015T5 **42** = EHKO020T5 **43** = EHKO030T5 **44** = EHKO040T5 **45** = EHKO050T5 **46...59** = Reserved **60** = EHKO008T4		

NOTE: Do not enter values marked as **RESERVED** in the table above.

6. Set the **CloneModeOEM** field to 0 to exit from the mode for selecting and defining the model;



7. The procedure takes a few seconds to complete. Please wait.
When the procedure is complete, the description of the configured model will appear in the **Humidifier Model** field.



8. Procedure finished.

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