

VEH 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 manua



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IMPORTANT INFORMATION

Liability and residual risks

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

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

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

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

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

Disclaimer

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

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

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

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

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

Terms and Conditions of use

Permitted use

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

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

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

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

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

Prohibited use

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

Disposal





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

Consider the environment



The company works towards protecting the environment, while taking account of customer requirements, technological innovations in 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

A A DANGER

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

№ MARNING

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.

OUALIFIED 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

VEH 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.

A A DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

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

🛕 🛕 DANGER

RISK OF ELECTRIC SHOCK AND FIRE

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

MARNING

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)).

MARNING

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 VEH 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.

MARNING

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 properly and be maintained and cleaned properly at 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

VEH OEM is the ELSTEAM immersed electrode humidifier solution dedicated to installations within air handling units (AHUs). The **VEH OEM** humidifier consists of 4 elements:

- · Hydraulic unit;
- Wiring kit;
- · Electronic controller on DIN rail mount;
- TA current sensor.

As an option, it can have the following:

- · 2 hydraulic units;
- · 2 wiring kits;
- Electronic controller + expansion controller on DIN rail mount;
- 2 TA current sensors.

It can all be equipped with an LED HMI interface and other accessories (see chapter"1.8 ACCESSORIES" ON PAGE 13)

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

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

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

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

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

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

1.2 Product overview

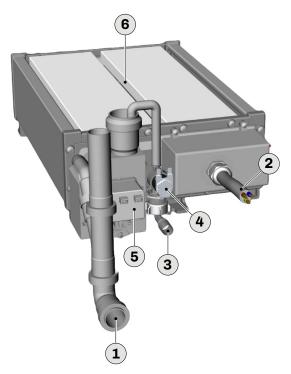


Fig. 1. Hydraulic unit overview

Reference	Description	Reference	Description
1	Water drain outlet	4	Water filling solenoid valve
2	Power supply wiring entry	5	Electric outlet pump
3	Water filling inlet	6	Steam outlet

1.3 Why choose VEH?

Compared to traditional immersed electrode humidifiers on the market, VEH offers several advantages, including:

- No back pressure effects: Steam is produced in the hydraulic unit located inside the AHU.
- Improved thermal efficiency: There are no steam pipes and distributors subject to condensation due to the connection between the boiler and the distributor.
- Quick and easy maintenance: The boiler consists of a parallelepiped tank with a low height; it is easy to access the electrodes and clean it once the two covers are removed.
- It does not require a protected technical area: The hydraulic part is inside the AHU, while the AHU manufacturer has integrated the electrical components and electronic controller into the electrical compartment of the AHU, or at its discretion in another dedicated space.

1.4 Main features

- Isothermal humidifier:
- Sterile steam (steam with a temperature of approximately 100 °C (212 °F));
- · Automatic limescale removal from the tank;
- Broad range of steam production (10...200 kg/h);
- Integrated electronic control via probe or humidistat (with external ON/OFF signal, or in proportional mode from external 0...10 V / 4...20 mA signal or internal configuration);
- · Stainless steel water drainage tray (on request);
- · Stainless steel condensate collection tank for AHUs (on request).

1.4.1 Electronic control features

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

1.5 Applications

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

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

1.6 Available models

P/n	Name	VEH OEM immersed electrode humidifier
EHKOD010T0XS	VEH OEM 10XS	10 kg/h, 400/460 Vac, three-phase, extra small (XS)
EHKOD020T0XS	VEH OEM 20XS	20 kg/h, 400/460 Vac, three-phase, extra small (XS)
EHKOD020T0S	VEH OEM 20S	20 kg/h, 400/460 Vac, three-phase, small (S)
EHKOD030T0M	VEH OEM 30M	30 kg/h, 400/460 Vac, three-phase, medium (M)
EHKOD040T0S	VEH OEM 40S	40 kg/h, 400/460 Vac, three-phase, small (S)
EHKOD040T0L	VEH OEM 40L	40 kg/h, 400/460 Vac, three-phase, large (L)
EHKOD060T0M	VEH OEM 60M	60 kg/h, 400/460 Vac, three-phase, medium (M)
EHKOD060T0XL	VEH OEM 60XL	60 kg/h, 400/460 Vac, three-phase, extra large (XL)
EHKOD080T0L	VEH OEM 80L	80 kg/h, 400/460 Vac, three-phase, large (L)
EHKOD100T0XL	VEH OEM 100XL	100 kg/h, 400/460 Vac, three-phase, extra large (XL)

1.7 Available configurations

1.7.1 400 Vac three-phase models

P/n	Name	VEH OEM immersed electrode humidifier
EHKOD010T4XS	VEH OEM 10XS	10 kg/h, 400 Vac, three-phase, extra small (XS)
EHKOD020T4XS	VEH OEM 20XS	20 kg/h, 400 Vac, three-phase, extra small (XS)
EHKOD020T4S	VEH OEM 20S	20 kg/h, 400 Vac, three-phase, small (S)
EHKOD030T4M	VEH OEM 30M	30 kg/h, 400 Vac, three-phase, medium (M)
EHKOD040T4S	VEH OEM 40S	40 kg/h, 400 Vac, three-phase, small (S)
EHKOD040T4L	VEH OEM 40L	40 kg/h, 400 Vac, three-phase, large (L)
EHKOD060T4M	VEH OEM 60M	60 kg/h, 400 Vac, three-phase, medium (M)
EHKOD060T4XL	VEH OEM 60XL	60 kg/h, 400 Vac, three-phase, extra large (XL)
EHKOD080T4L	VEH OEM 80L	80 kg/h, 400 Vac, three-phase, large (L)
EHKOD100T4XL	VEH OEM 100XL	100 kg/h, 400 Vac, three-phase, extra large (XL)

1.7.2 460 Vac three-phase models

P/n	Name	VEH OEM immersed electrode humidifier
EHKD010T5XS	VEH OEM 10XS	10 kg/h, 460 Vac, three-phase, extra small (XS)
EHK020T5XS	VEH OEM 20XS	20 kg/h, 460 Vac, three-phase, extra small (XS)
EHKD020T5S	VEH OEM 20S	20 kg/h, 460 Vac, three-phase, small (S)
EHKD030T5S	VEH OEM 30S	30 kg/h, 460 Vac, three-phase, small (S)
EHKD030T5M	VEH OEM 30M	30 kg/h, 460 Vac, three-phase, medium (M)
EHKD040T5S	VEH OEM 40S	40 kg/h, 460 Vac, three-phase, small (S)
EHKD040T5L	VEH OEM 40L	40 kg/h, 460 Vac, three-phase, large (L)
EHKD060T5M	VEH OEM 60M	60 kg/h, 460 Vac, three-phase, medium (M)
EHKD060T5XL	VEH OEM 60XL	60 kg/h, 460 Vac, three-phase, extra large (XL)
EHKD080T5L	VEH OEM 80L	80 kg/h, 460 Vac, three-phase, large (L)
EHKD100T5XL	VEH OEM 100XL	100 kg/h, 460 Vac, three-phase, extra large (XL)

1.8 Accessories

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

P/n	Description	P/n	Description
EHKD0K20	Hydraulic unit removal flange kit	0016020018	Condensate collection tank 490x690x70 AISI304
EHKD0K21	D40 drainage unit kit	0016020019	Condensate collection tank 490x950x70AISI304
EHKD0K08	3 m power cable kit for VEH OEM 10-20-30-40	0016020020	Condensate collection tank 490x1350x70 AISI304
EHKD0K09	3 m power cable kit for VEH OEM 60	EVHP523	Humidity probe 420 mA
EHKD0K10	3 m power cable kit for VEH OEM 80-100	EVTPNW30F200	NTC temperature probe, IP68
EHKD0K18	5 m power cable kit for VEH OEM 10-20-30-40	EV3411M7	Universal controller, 1 output, 230 Vac
EHKD0K17	5 m power cable kit for VEH OEM 80-100	EHHKT001P4	Complete control unit
EHKD0K19	5 m power cable kit for VEH OEM 60	EHHKX002E4	Expansion board for VEH OEM 60-80-100
EHKD0K28	1 m power cable kit for VEH OEM 10-20-30	0103349007	TA current sensor
EHKOD29	1 m power cable kit for VEH OEM 40-60-80	0150130001	Fuse holder for VEH OEM 10-20
EHKOD30	1 m power cable kit for VEH OEM 100	0150130002	Fuse holder for VEH OEM 30-40
EHKD0K22	Hydraulic connections feedthrough kit	0150130003	Fuse holder for VEH OEM 60-80-100
EHKD0K23	Filling/discharge unit kit external to AHU	EHVI	Water drainage tray
0031000048	3/4"G Female water inlet hose	EHKODOK01	Hydraulic unit casing for VDI6022-1
EHKO0K01	DIN rail mount for 1 electronic controller		

1.8.1 Hydraulic unit extraction flange

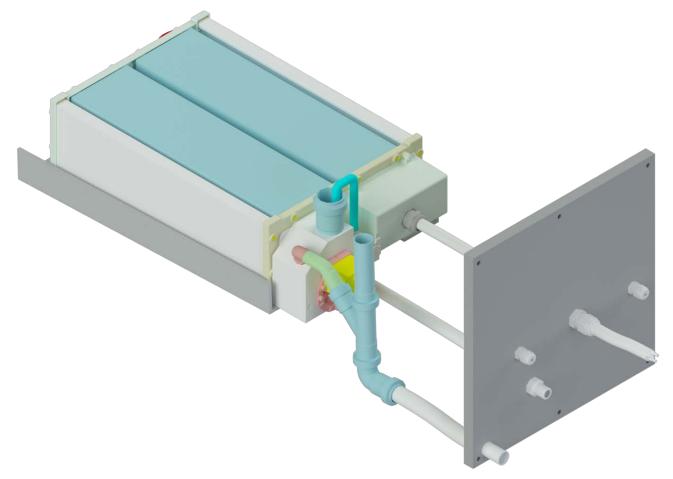


Fig. 2. Hydraulic unit extraction flange

Providing a rectangular hole on the AHU panel and applying the **EHKD0K20** KIT gives the AHU a hydraulic unit extraction window.

Fit the hydraulic unit on the corner guides, taking care to secure it with the fastening screws.

Installing the extraction flange means there is no need to turn off the AHU when carrying out maintenance on the **VEH OEM** humidifier. Simply remove the panel (flange), release the hydraulic unit from the fastening screws in the guides, remove it by sliding it out of the corner guides and finally refit the panel (flange) until the maintenance is finished.

mm (ft.)

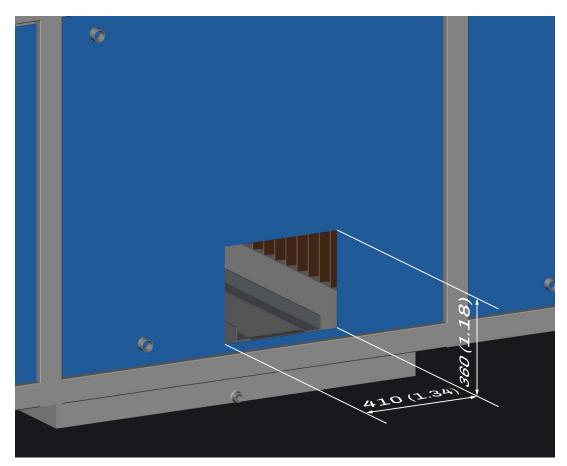


Fig. 3. Hole sizes for EHKD0K20 KIT

Fastening corner guide dimensions

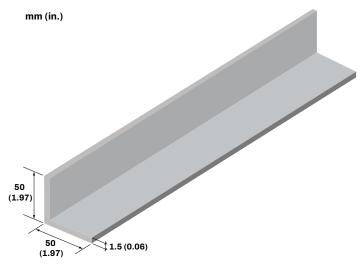


Fig. 4. Corner bracket dimensions

50x50 mm (1.97x1.97 in.) corner bracket with a thickness of at least 1.5 mm (0.06 in.) made of AISI 304 stainless steel or engineering polymer based on polypropylene that does not promote bacterial proliferation.

Fit the fastening corner guides inside the condensate (or leak) collection tank so that they form a 2% slope.

2. TECHNICAL DATA

2.1 Technical specifications

2.1.1 400 Vac models | VEH OEM...

Steam production				30M	40•	60••	80L	100XL	120XL	160XL	200XL
eteani pi oddotion											
Production capacity:	kg/h	10	20	30	40	60	80	100	60x2	80x2	100x2
Pressure limits:	Pa/bar				There a	re no pr	essure li	mits (*)			
Electrical properties											
Power absorbed:	kW	7.5	15	22.5	30	45	60	75	45x2	60x2	75x2
Power supply:	V, Hz										
Phases:	Ph				,		3				
Absorption per phase:	Α	11	22	32.5	44	65	87	109	130	174	218
Water properties											
Supply water quality:			See	e section	"5.2.1 W	ATER SP	ECIFICA	TIONS"	ON PAGE	23	
Supply water conductivity: μS*cm 701250											
Supply water hardness:	°f		550								
Minimum inlet flow rate:	l/h		300								
Supply water pressure:	MPa/bar					0.021/	0.210				
Supply water connection:						M 3/4	" GAS				
Water drain outside diameter:	mm (in.)					40 (1	57)				
General specifications											
Dimensions:	mm (in.)			Sees	section "4	1.1 DIME	NSIONS	" ON PAG	E 18		
Weight (hydraulic unit):	kg	8.5	11	13	16.5	18	22.5	24	18x2	22.5x2	24x2
IP protection degree of the hydraulic unit:						IP	K0				
Maximum installation altitude:	m (ft.)					≤2000 (6561.6)				
Ambient conditions of the hydr	aulic unit	:									
	°C (°F), %				140	0 (33.81	.04), 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						<u> </u>					
EC:					Yes,	with self	-certifica	ation			

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

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.

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

2.1.2 460 Vac models | VEH OEM...

Description	MU	10XS	20••	30M	40•	60••	80L	100XL	120XL	160XL	200XL
Steam production			,								
Production capacity:	kg/h	10	20	30	40	60	80	100	60x2	80x2	100x2
Pressure limits:	Pa/bar				mits (*)						
Electrical properties											
Power absorbed:	kW	7.5	15	22.5	30	45	60	75	45x2	60x2	75x2
Power supply:	V, Hz					460 Vac	, 50/60				
Phases:	Ph						3				
Absorption per phase:	Α	11	22	32.5	44	65	87	109	130	174	218
Water properties											
Supply water quality: See section "5.2.1 WATER SPECIFICA								TIONS"	ON PAGE	23	
Supply water conductivity:	μS*cm					70	L250				
Supply water hardness:	°f		550								
Minimum inlet flow rate:	l/h					30	00				
Supply water pressure:	MPa/bar					0.021/	0.210				
Supply water connection:						M 3/4	" GAS				
Water drain outside diameter:	mm (in.)					40 (1	L.57)				
General specifications											
Dimensions:	mm (in.)			Sees	section "4	4.1 DIME	NSIONS	" ON PAG	E 18		
Weight (hydraulic unit):	kg	8.5	11	13	16.5	18	22.5	24	18x2	22.5x2	24x2
IP protection degree of the hydraulic unit:						IP	X0				
Maximum installation altitude:	m (ft.)					≤2000 (6561.6)				
Ambient conditions of the hyd	raulic unit	t									
Ambient operating conditions:	°C (°F), %				14	0 (33.81	L04), 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						Capor VIS	1011 441-11				
EC:					Yes.	with self	-certifica	ation			

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

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.

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

3. RECEIVING THE PRODUCT

A 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 electric panel and the hydraulic unit out of their packaging.

3.1.2 Checking the packaging contents

The product package contains:

- VEH OEM series humidifier, consisting of:
 - · One or two hydraulic units;
 - Wiring kit;
 - · Electronic controller on DIN rail mount;
 - TA current sensor.
- Instruction sheet;
- · Water inlet connection pipe for use between the main supply and the solenoid valve at the humidifier inlet;
- Water drain unit.

4. DIMENSIONS AND MECHANICAL ASSEMBLY

4.1 Dimensions

4.1.1 Hydraulic unit

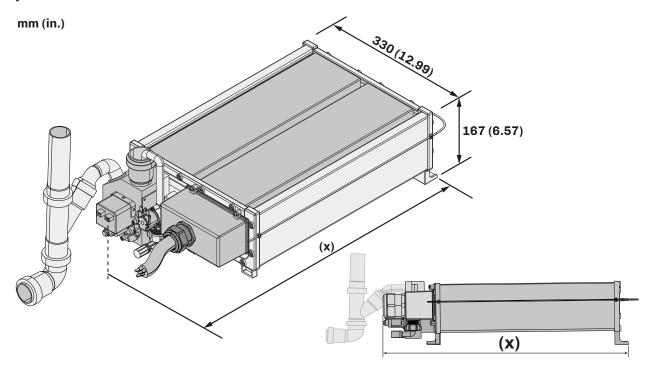


Fig. 5. Hydraulic unit dimensions

Dimension (X) for models [mm (ft.)]	VEH OEM 10XS	VEH OEM 20S	VEH OEM 20XS	VEH OEM 30M	VEH OEM 40L	VEH OEM 40S	VEH OEM 60XL	VEH OEM 60M	VEH OEM 80L	VEH OEM 100XL
4 electrodes	635 (2.08)	785 (2.57)		985 (3.23)	1185 (3.89)		1385 (4.54)			
7 electrodes			635 (2.08)			785 (2.57)		985 (3.23)	1185 (3.89)	1385 (4.54)

4.2 Hydraulic unit installation

4.2.1 Installation instructions

- Place the hydraulic unit inside the condensate tank inside the AHU;
- Secure the hydraulic unit with 3 screws inserted into the anchoring hooks (see "FIG. 6. HYDRAULIC UNIT INSTALLATION" ON PAGE 19) (not mandatory):
- · Connect the inlet solenoid valve to the pipe provided;
- Connect the discharge unit using special water drainage pipes (Ø 40 mm (1.57 in.));
- Restore the connection between the hydraulic unit and the electric panel, keeping the power cables separate from the other service cables.

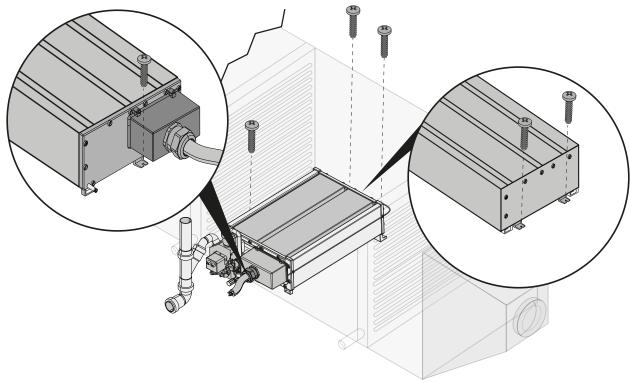


Fig. 6. Hydraulic unit installation

4.2.2 Minimum installation dimensions

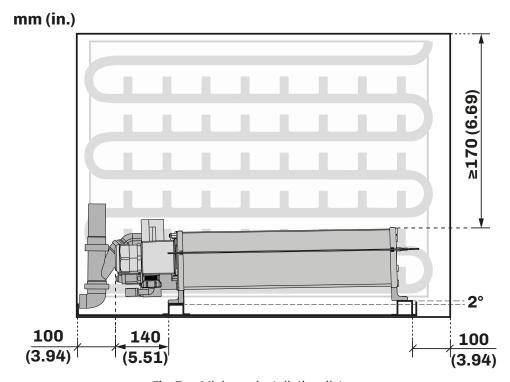


Fig. 7. Minimum installation distances

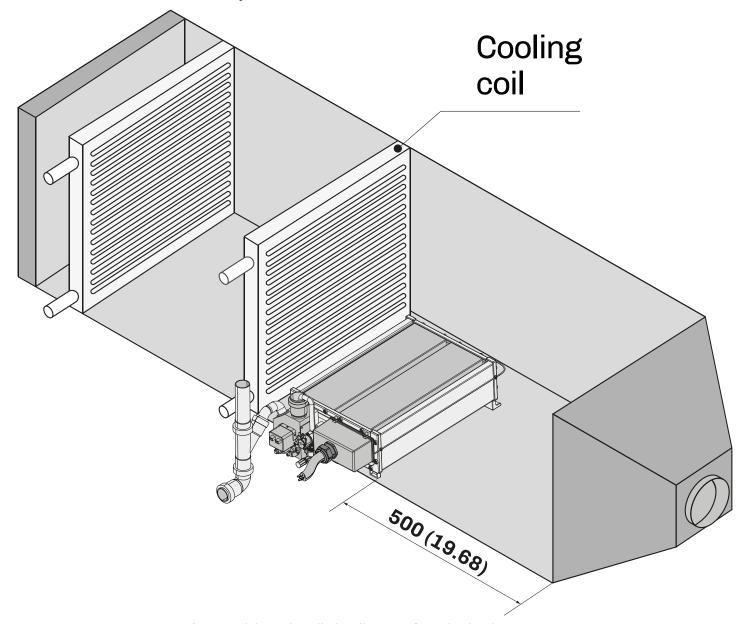


Fig. 8. Minimum installation distances from the droplet separator

4.2.4 Minimum distances for two hydraulic units - AHU

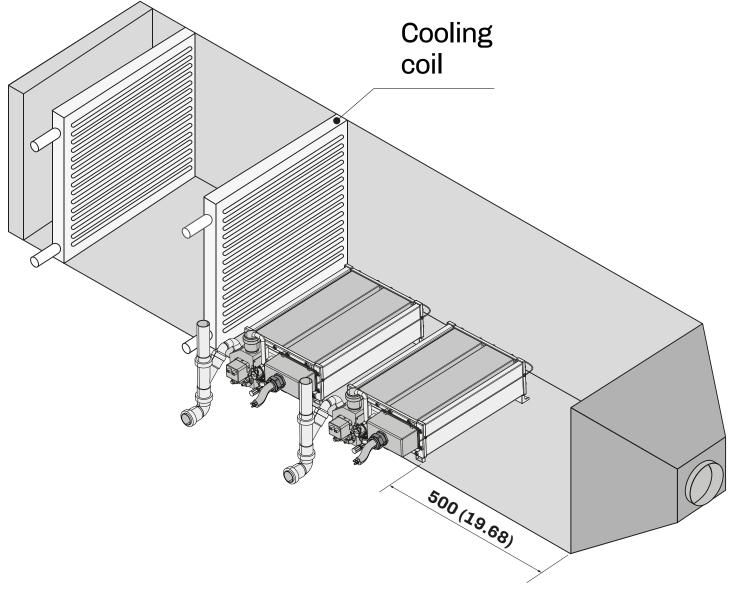


Fig. 9. Minimum installation distances from the droplet separator for two hydraulic units

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

5.1 Hydraulic unit structure

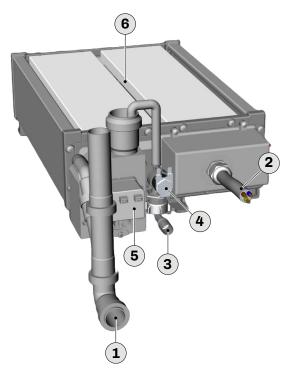


Fig. 10. Hydraulic unit overview

Reference	Description	Reference	Description
	Water drain outlet for connection to waste water drainage pipes (Ø 40 mm (1.57 in.));	4	Water filling solenoid valve
2	Power supply wiring entry	5	Electric outlet pump
3	Water filling inlet, 3/4" GAS male	6	Steam outlet

5.1.1 Rear

· Maximum level sensor connection.

5.2 Plumbing installation

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

- A shut-off tap;
- · A filter supplementing the one already present inside the solenoid valve;
- A pressure reducer (if the mains pressure 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 with the product.

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 supplied in order to reduce water hammer in the water supply to the humidifier.
- During installation, take care not to damage the plastic thread on the solenoid valve.
- The water connection should allow access to the mechanical filter in the inlet solenoid valve in order to clean it.
- Connect the drainage circuit using exclusively the D40 mm (1.57 in.) pipes provided.
- · If the AHU is exposed to atmospheric agents, fit heating cables to the water supply and discharge pipes.

5.2.1 Water specifications

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

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

What should you do?

- Open the water supply and let the water flow into the drain for a few hours before making the final connection in order to clean any processing debris out of the hydraulic system.
- Check the retention status of the hydraulic circuit regularly to prevent faults and consequent water leakage into the room.
- Make sure the hydraulic unit is always installed within a condensate collection tank with drainage.

What should you NOT do?

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

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

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

5.3 Water drainage system

The drainage system must be able to drain a water flow of at least 60 l/minute.

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

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

NOTE: the drain pipes are not supplied (except for the initial \(\text{\subset} 40\) section, see "FIG. 7. MINIMUM INSTALLATION DISTANCES" ON PAGE 19\).

NOTE: a fixed drain connection must be used.

5.3.1 Connection specifications

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

If the installation does not comply with these specifications, install a water and limescale collection tank at the drain outlet point outside the AHU (p/n **EHVI**) (contact the Elsteam sales office for further information).

Discharge tank features

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

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

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

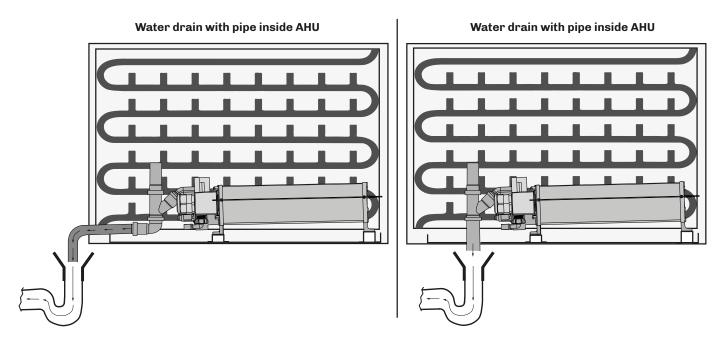


Fig. 11. Drainage tank features

If the water hardness reflects the optimal specifications indicated in sub-section "5.2.1 WATER SPECIFICATIONS" ON PAGE 23, the tank will only need cleaning once a year.

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.

5.4 Steam distribution in the AHU

△ △ WARNING

RISK OF BURNS

- The hydraulic unit must be installed so that it cannot be accessed by unauthorised persons.
- 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).

\land 🛆 WARNING

HOT WATER VAPOUR

Do not touch the equipment while it is running.

MARNING

MALFUNCTIONING OF THE EQUIPMENT

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

Fig. 12. Positioning the hydraulic unit in the AHU

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

6. ELECTRICAL CONNECTIONS

6.1 Before you start

Read this manual carefully before installing the equipment.

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

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

A A DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

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

WARNING

REGULATORY INCOMPATIBILITY

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

6.2 Connection best practice

6.2.1 Wiring best practices

A A 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.



LOOSE WIRING CAUSES ELECTRIC SHOCKS AND OVERHEATING

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

MARNING

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.).

MARNING

REGULATORY INCOMPATIBILITY

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

Suitable wiring for the power supply

Step 17.8 mm (0.70 in.)

$\frac{\text{mm}}{\text{in}}$	7		_			() c	N•m	2,
in.	0.26				Ø 3.5 mm (0.14 in.)		lb-in	22
	mm²	4	4	4				
	AWG	10	10	10				
no. o	of conductors		3+G					

Fig. 13. Suitable wiring for the power supply - VEH OEM 10

Step 17,8 mm (0.70 in.)

mm 7 0.28		_			Ø 3.5 mm (0.14 in.)	N•ı
mn	n² (6	6	6		
AW	/G 8	8	8	8		
no. of conduc	tors		3+G	_		

Fig. 14. Suitable wiring for the power supply - VEH OEM 20

Step 26,5 mm (1.04 in.)

mm 7 0.28				Ø 3.5 mm (0.14 in.)	N•m <i>lb-in</i>	3 26.55
mm ²	10	10	10			
AWG	7	7	7			
no. of conductors		3+G				

Fig. 15. Suitable wiring for the power supply - VEH OEM 30

Step 26,5 mm (1.04 in.)

	,					
mm 7 0.28					N•m	3
in. 0.28		\		Ø 3.5 mm (0.14 in.)	N•m 3 Ib-in 26	26.55
mm ²	16	16	16			
AWG	5	5	5			
no. of conductors		3+G				

Fig. 16. Suitable wiring for the power supply - VEH OEM 40

Step 35,5 mm (1.40 in.)

mm 7 0.28				Ø 3.5 mm (0.14 in.)	N•m <i>lb-in</i>	4 35.40
mm ²	16	16	16			
AWG	5	5	5			
no. of conductors	·	3+G				

Fig. 17. Suitable wiring for the power supply - VEH OEM 60

Step 35,5 mm (1.40 in.)

_ ` ` `							
mm 7 0.28					() c	N•m	4
in. 0.28				Ø 3.5 mm (0.14 in.)		lb-in	35.40
mm ²	25	25	25				
AWG	7	7	7				
no. of conductors		3+G					

Fig. 18. Suitable wiring for the power supply - VEH OEM 80

Step 35,5 mm (1.40 in.)

mm in.	0.28				Ø 3.5 mm (0.14 in.)	N•m <i>lb-in</i>	4 35.40
	mm ²	25	25	25			
	AWG	3	3	3			
no.	of conductors		3+G				

Fig. 19. Suitable wiring for the power supply - VEH OEM 100

🛕 🛕 DANGER

RISK OF ELECTRIC SHOCK

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

	VEH10	VEH20	VEH30	VEH40	VEH60	VEH80	VEH100
Current (A)	16	32	50	50	80	100	125
Туре	Rapid						
Size	10x38	10x38	14x51	14x51	22x58	22x58	22x58

Fig. 20. Overload protection devices according to model

6.3 Dimensioning electrical components

P/n	Nominal current	Cable section (L maximum 15 m)	Recommended LOVATO/ ITALWEBER fuse holder	Recommended LOVATO contactor	Electric panel and tank wiring 3 m/5 m H07RNF NEOPRENE
EHKOD010T•XS	11	3G4	FB01B	11BG0910 A024 (20A)	3 x 6 mm ²
EHKOD020T•XS	22	3G10	FB01B	BF2600 A024 (45A)	3 x 6 mm²
EHKOD020T•S	22	3G10	FB01B	BF2600 A024 (45A)	3 x 6 mm²
EHKOD030T•M	32.5	3G16	FB02A	BF3800 A024 (56-60A)	3 x 6 mm²
EHKOD030T•S	32.5	3G16	FB02A	BF3800 A024 (56-60A)	3 x 6 mm ²
EHKOD040T•M	44	3G16	FB02A	BF4000 A024 (70A)	3 x 16 mm ²
EHKOD040T•L	44	3G16	FB02A	BF4000 A024 (70A)	3 x 16 mm ²
EHKOD060T•M	65.0	3G25	ITW2303058	BF5000 A024 (90A)	3 x 16 mm ²
EHKOD060T•XL	65.0	3G25	ITW2303058	BF5000 A024 (90A)	3 x 16 mm ²
EHKOD0080T•L	87	3G35	ITW2303058	BF6500 A024 (100A)	3 x 25 mm²
EHKOD100T•XL	109	3G35	ITW2303058	11BF9500 A024 (125A)	3 x 25 mm²

6.4 Electrical connections

6.4.1 Control board

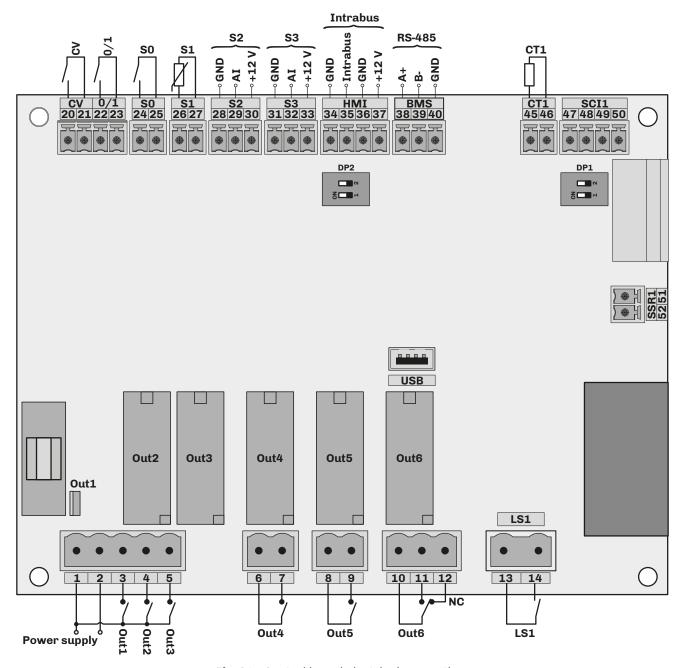


Fig. 21. Control board electrical connections

TERMI	NALS		
1-2	24 Vac power supply	24-25	Digital input: humidistat (CFG = 0-1) (S0)
1-3	Digital output: water outlet solenoid valve	26-27	S1 analogue input: temperature (anti-freezing and hold)
1-4	Digital output: water outlet pump	2830	S2 analogue input: humidity sensor (or 010 V signal)
1-5	Digital output: contactor (steam generation)	3133	S3 analogue input: humidity limit sensor
6-7	Digital output: dehumidification enable	3436	Serial line connection: HMI Intrabus
8-9	Digital output: ventilated distributor control	3840	Serial line connection: RS-485 modbus for BMS slave
1012	Digital output: alarm	45-46	Analogue connection: external current sensor CT1 (TA)
13-14	Hazardous voltage digital input: level sensor LS1	4752	Reserved
20-21	Digital input: enable from ventilation (CV)	DP1	Activate termination resistor on SCI1 RS-485 serial line. 1 = SCI1 RS-485 serial termination; 2 = Reserved
22-23	Digital input: remote ON/OFF (0/1)	DP2	Termination resistor on BMS / CANBUS RS-485 serial line. 1 = BMS RS-485 serial termination 2 = CANBUS serial termination

6.4.2 Expansion

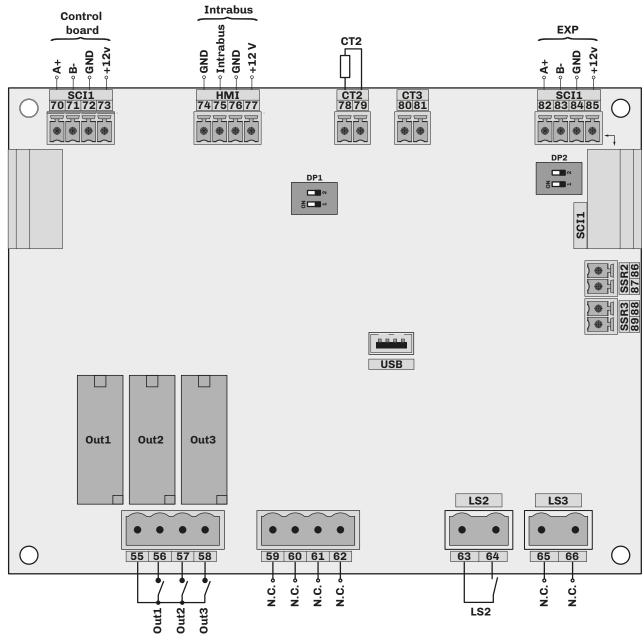


Fig. 22. Expansion electrical connections

TERMIN	NALS							
	Distant and bailes Country and the coloured	80-81	Reserved					
55-56	Digital output: boiler 2 water outlet solenoid valve	8285	8285 Connection to expansion board SCI1					
	Taire		Modbus communication address of expansion board					
55-57	Digital output: boiler 2 water outlet pump		1	2	Address offset relative to LA1			
55-58	Digital output: electrodes (steam generation)		OFF	OFF	LA1 + 0			
63-64	Hazardous voltage digital input: level sensor LS2	DP1	OFF	ON	LA1 + 1			
7073	Connection to control board SCI1		ON	OFF	LA1 + 2			
7477	Serial line input: HMI Intrabus		ON	ON	LA1 + 3			
78-79	Analogue input: external current sensor CT2 (TA) for boiler 2	Activate termination resistor on SCI1 RS-485 serial line. 1 = SCI1 RS-485 serial termination; 2 = Reserved						

6.5 Configurations

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

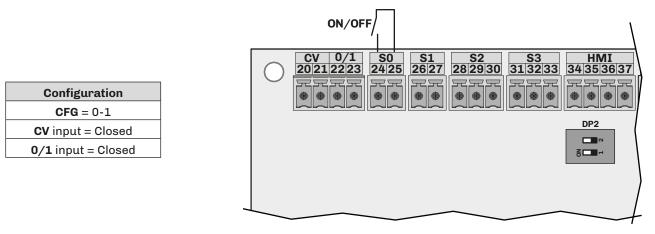


Fig. 23. ON/OFF connection with humidistat or external contact (CFG = 0-1)

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

6.5.2 External proportional humidistat connection (CFG = PROP)

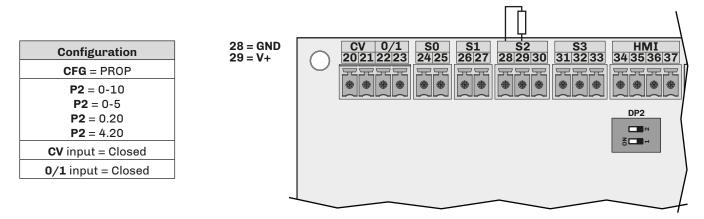


Fig. 24. External proportional humidistat connection (CFG = PROP)

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

6.5.3 Humidity sensor connection (CFG = HUM)

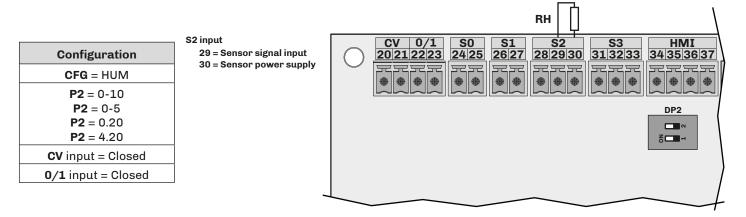


Fig. 25. Humidity sensor connection (CFG = HUM)

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

6.5.4 Humidity sensor connection EVHTP520 (CFG = HUM)

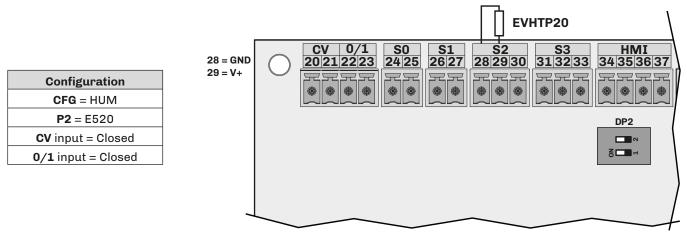


Fig. 26. Humidity sensor connection EVHTP520 (CFG = HUM)

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)

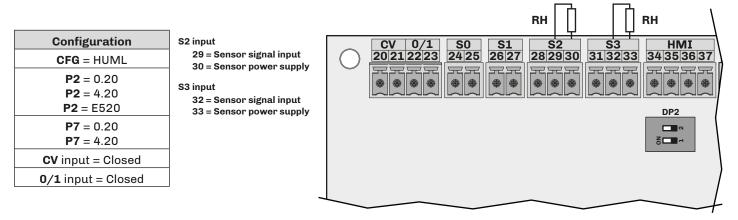


Fig. 27. Connection for humidity sensor and limit sensor (CFG = HUML)

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

6.5.6 Temperature sensor connection (CFG = 1T)

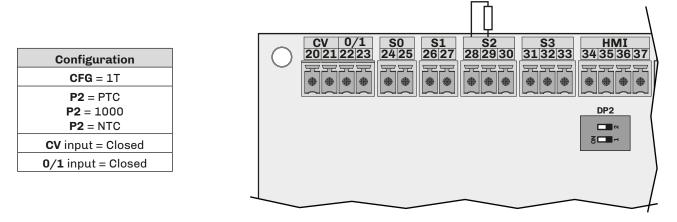


Fig. 28. Temperature sensor connection (CFG = 1T)

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

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

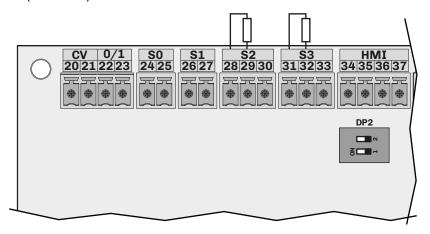


Fig. 29. Temperature sensor connection (CFG = 2T)

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

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

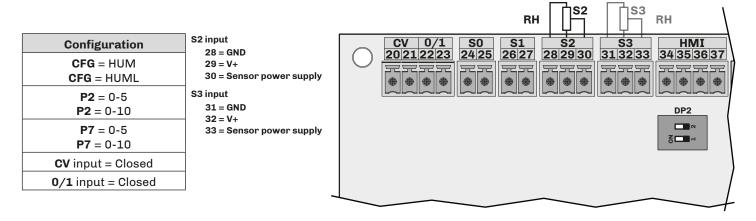


Fig. 30. Humidity sensor connection 0...5 V

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

6.6 Power supply and earth wiring connection



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. 31. VEH humidifier user interface

7.1.1 Icons

Icon	Lit steadily	OFF	Icon	Lit steadily	OFF
1	 Main sensor configured and present CFG = 1T (one temperature probe) 	In all other cases	\triangle	Warning in progress	No warning in progress
2	 Limit sensor configured and present CFG = 2T (two temperature probes) 	In all other cases	0	CV input closed (enable signal given)	CV input open (enable signal not given)
€39	Steam request	In all other cases	SP	Changing humidity setpoint in progress	In all other cases
1	Proportional operating mode	In all other cases	\triangle	Alarm in progress	No alarm in progress
Л	ON/OFF operating mode	In all other cases	*	Contactor ON	Contactor OFF
①	Humidifier OFF	Humidifier ON	@	Washing or draining in progress	In all other cases
V	Voltage sensor operating mode	In all other cases	⊙	Displayed value is operating hours	In all other cases
	Current sensor operating mode	In all other cases	F	Display shows temperature in °F	In all other cases
R	Resistive sensor operating mode	In all other cases	%	Display shows humidity in %	In all other cases
	Display shows the current absorbed by the electrodes	In all other cases	°C	Display shows temperature in °C	In all other cases
μS	Changing value of P1 in progress	In all other cases			

7.1.2 Keys

Key	Tap and release to	Tap and hold for at least 3 seconds to
(1)	Go back a level	Humidifier ON/OFF
FNC V	Scroll down through the values Navigate within the menu	Go to the maintenance and reset operating hours menu
\wedge	Scroll up through the valuesNavigate within the menu	Activate manual draining
≟ SET	Confirm the values on the displaySet/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 have the electrical conductivity value of the water, it can be obtained from the website of the drinking water supplier.





Fig. 32. First start-up - Setting the electrical conductivity

Fig. 33. 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. 34. 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. 35. Home screen with proportional regulation (CFG = PROP)

Top line: Actual humidity request in %.

Bottom line: Humidity request.

 ${f NOTE}$: The ${f CV}$ and ${f 0/1}$ contacts must be closed to produce humidity.





Fig. 36. Home screen with humidity sensor alone

Fig. 37. 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:

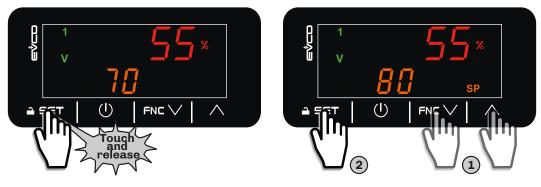


Fig. 38. Changing the humidity setpoint

7.2.3 Changing the temperature setpoint

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

To change the temperature setpoint:

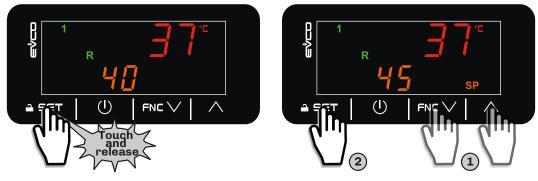


Fig. 39. Changing the temperature setpoint

7.2.4 Manual draining

To start manual draining:

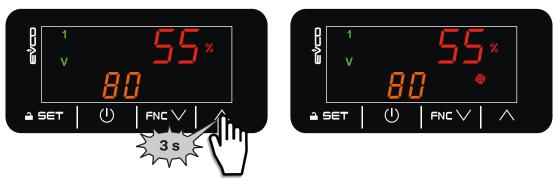


Fig. 40. Manual draining

7.2.5 Menu

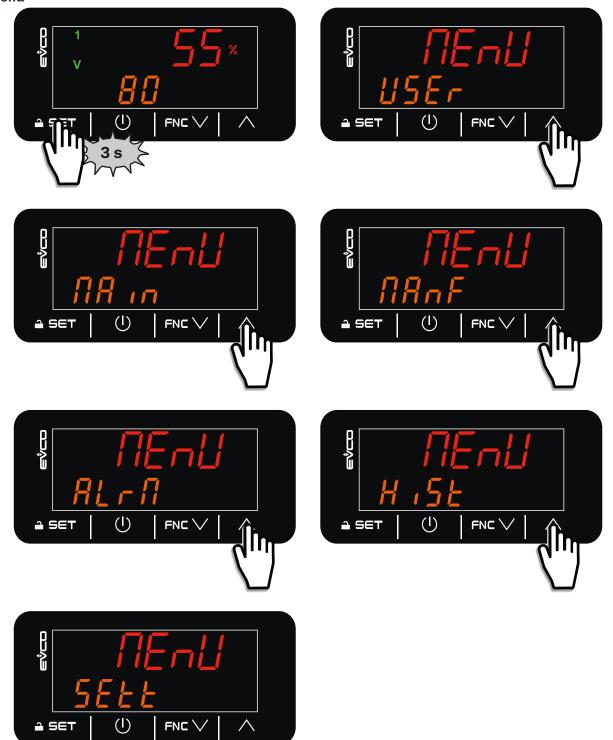


Fig. 41. Menu

Menu	Description	
USEr	Access the user menu	
NA in	Access the maintenance technician menu	
NAnF	RESERVED. NOT ACCESSIBLE TO THE PUBLIC.	
ALLA	Currently accessing alarm control	
H ,5E	Access the alarm log	
SEEE	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:

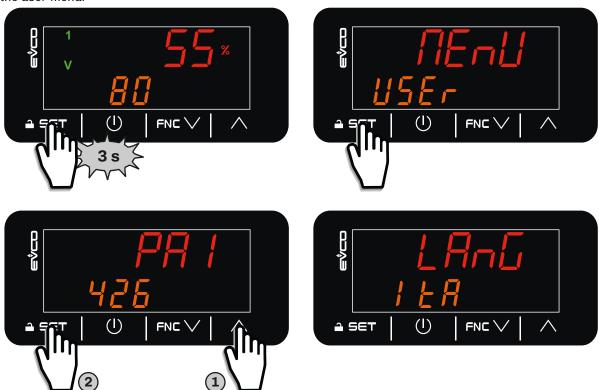


Fig. 42. User menu

Top line	Bottom line	Description
LAnG		Sets the display language. EnG = English; Ita = Italian.
SP1	Humidity setpoint	Sets the humidity setpoint. See "9.10 TABLE OF ADJUSTMENT PARAMETERS" ON PAGE 49
SP2	Urimidity limit cotholist	Sets the humidity limit setpoint`. See "9.10 TABLE OF ADJUSTMENT PARAMETERS" ON PAGE 49
SP3	Temperature setpoint	Sets the temperature setpoint (wellness application). See "9.10 TABLE OF ADJUSTMENT PARAMETERS" ON PAGE 49

7.2.7 Maintenance menu

To access the maintenance menu:

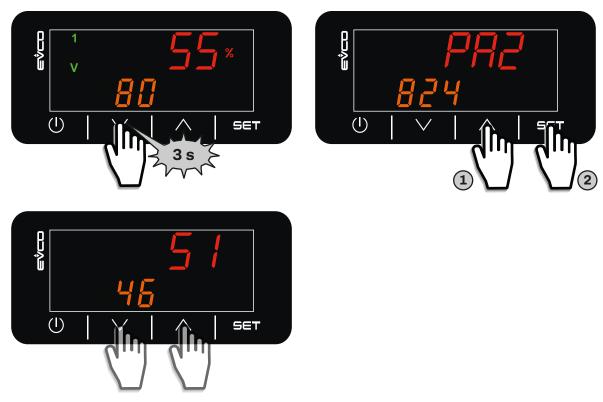


Fig. 43. Maintenance menu

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 49
c0c11	Parameter value	See "9.10 TABLE OF ADJUSTMENT PARAMETERS" ON PAGE 49
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.
S 3	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 SO digital input (remote humidistat enable) if it is connected. OFF = SO input closed; On = SO 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.
οР	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 A SET key, enter password PA2 using the FNC V or N keys, and tap A SET to confirm.
MAnu Output forcing page Output forcing page Enters the output forcing page. To access the page: Double tap the ♣ SET key, en or ∧ keys, and tap ♣ SET to confirm.		To access the page: Double tap the A SET key, enter password PA2 using the FNC \vee

7.2.8 Displaying/resetting the operating hours

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

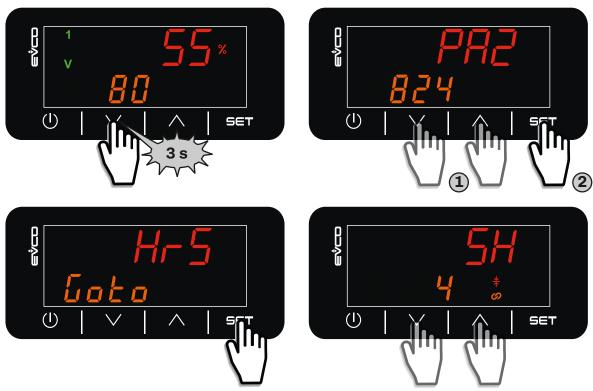


Fig. 44. Displaying the operating hours

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.	
РН	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:

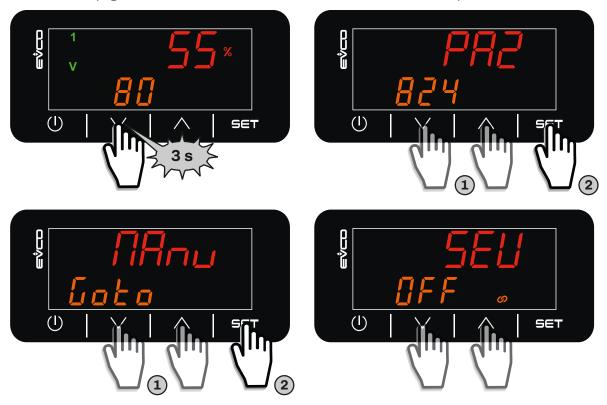


Fig. 45. Output functional test

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

A A 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: "5.2 PLUMBING INSTALLATION" ON PAGE 22, "5.3 WATER DRAINAGE SYSTEM" ON PAGE 23 and "5.4 STEAM DISTRIBUTION IN THE AHU" ON PAGE 24);
- · 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 28);
- Check that the CV and 0/1 contacts are closed, see "6.4 ELECTRICAL CONNECTIONS" ON PAGE 28;
- · Close the electric panel door;
- Activate the isolator installed outside the humidifier and open the water supply source;
- Press the ON/OFF key on the electric panel door to start the humidifier:
- Set the electrical conductivity of the incoming water (if you do not have the electrical conductivity value of the water, it can be obtained from the website of the drinking water supplier);
- Set the humidity 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 properly and be maintained and cleaned properly at 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: "5.2 PLUMBING INSTALLATION" ON PAGE 22, "5.3 WATER DRAINAGE SYSTEM" ON PAGE 23 and "5.4 STEAM DISTRIBUTION IN THE AHU" ON PAGE 24);
- 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 28);
- Check that the CV and 0/1 contacts are closed, see "6.4 ELECTRICAL CONNECTIONS" ON PAGE 28;
- · Close the electric panel door;
- Activate the isolator installed outside the humidifier and open the water supply source;
- Press the ON/OFF key on the electric panel door to start the humidifier;
- Set the electrical conductivity of the incoming water (if you do not have the electrical conductivity value of the water, it can be obtained from the website of the drinking water supplier);
- Set the humidity 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 **VEH OEM** series is the ELSTEAM immersed electrode humidifier solution dedicated to installations within air handling units (AHUs).

VEH OEM series humidifiers generate humidity (steam) by means of a current passing between 4 or 7 electrodes immersed in drinking water to bring it to boiling point.

The steam is controlled by adjusting the current strength transferred to the water via the immersed electrodes. When there is a humidity request, the inlet solenoid valve lets water into the hydraulic unit until the required production is reached, at which point the solenoid valve is closed.

When the steam production is below the required level, the inlet solenoid valve is activated again until the optimal working condition is reached.

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 VEH 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).

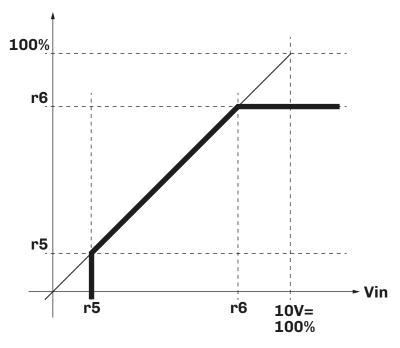
When the S0 digital input is closed, the VEH OEM generates humidity at the maximum value set in parameter r6.

9.2.2 Proportional regulation | CFG = PROP

To use the **VEH 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**:



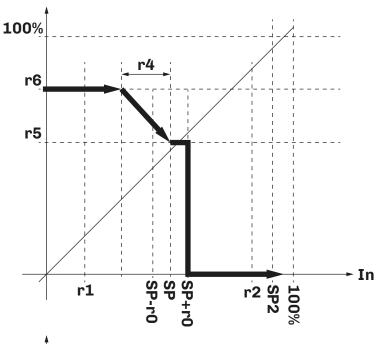
KEY			
Line Description			
	V _{in}		
	Production		

Fig. 46. How proportional regulation works | CFG = PROP

9.2.3 Regulation with the humidity sensor | CFG = HUM

To use the **VEH 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		

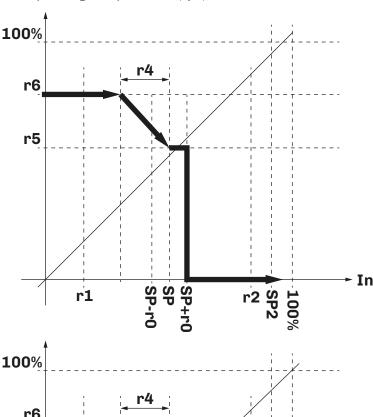
100%) 	r4_;		
r6 r5			/	
	r1	SP-r0	100% SP2	In

Fig. 47. How regulation with the humidity sensor works | $\mathbf{CFG} = \mathbf{HUM}$

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

To use the **VEH 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	

	r1	SP-r0	g r	SP2	→ In
r5 _.					
r6 _.		r4	: <i></i>		
100%					/

Fig. 48. How regulation with the humidity sensor + limit sensor works | CFG = HUML

The humidity production behaves in the same way as for regulation with the humidity sensor (**CFG** = HUM), but the second sensor connected to the **S2** analogue input stops steam generation according to 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 VEH OEM with regulation based on a temperature sensor, the following conditions must be met:

- CFG = 1T;
- Set parameter PO 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 required;
- Temperature ≤ SP3 r20: humidity requirement at r6;
- SP3 < Temperature < r20: proportionally linearized humidity required (minimum production r5).

9.2.6 Regulation with two temperature probes | CFG = 2T

To use the VEH 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:

ı	Par.	Description	MU	Range
		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 **VEH 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).	%	2080

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 VEH 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
с4	Draining duration for dilution (if C3 = 1).	s	09999
с5	Time between two dilution draining events (if C3 = 1).	min	30999

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 **VEH 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 TABLE OF VEH ALARMS" ON PAGE 60**).

9.5 Complete hydraulic unit emptying

The VEH 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:

I	Par.	Description	MU	Range
		Number of consecutive days of inactivity after which the hydraulic unit is emptied. 0 = Function disabled.	days	010
		Number of consecutive days of activity after which the hydraulic unit is emptied. 0 = Function disabled.	days	0100

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 **VEH 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 **VEH OEM** indicates and manages this condition.

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

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

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

If there is foam, the VEH OEM displays the code W05 (see "12.1 TABLE OF VEH ALARMS" ON PAGE 60).

9.8 Operating hours

The **VEH 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	1001000
M11	Partial operating hours threshold for the hydraulic unit maintenance warning.	hx10	1001000
M12	Total operating hours threshold for the hydraulic unit maintenance warning.	hx10	1001000
M13	Operating hours threshold for valve maintenance warning.	hx10	1001000
M14	Operating hours threshold for the outlet pump maintenance warning.	hx10	1001000

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.	%	r1r2	70.0	U
SP2	Humidity limit setpoint.	%	r11r12	85.0	U
SP3	Wellness temperature setpoint.	°C/°F	r21r22	40.0	U
	CONFIGURATION group				
CFG	Operating mode (see "9.2 HUMIDITY REGULATION" ON PAGE 43) 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	М
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		М
P1	Electrical conductivity of the water.	μS/cm	01250	0	М
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 010 V; 0-5 (4) = Proportional input 05 V; 0.20 (5) = Input 020 mA; 4.20 (6) = Input 420 mA; E520 (7) = EVHTP520 proprietary probe.		PTC /1 000 / NTC / 0-10 / 0-5 / 0.20 / 4.20 / E520	0-10	М
Р3	Minimum value S2 (if CFG = HUM or CFG = HUML).	%rH	0100	0	М
P4	Maximum value S2 (if CFG = HUM or CFG = HUML).	%rH	0100	100	М
P5	Sensor offset S2 (if CFG = HUM or CFG = HUML).	%rH	-1010	0	М
P6	S1 sensor offset (temperature).	°C/°F	-10.010.0	0.0	М
P7	Type of sensor/probe S3 (limit or mediating probe with input P2 if temperature). Similar to P2 .		PTC /1 000 / NTC / 0-10 / 0-5 / 0.20 / 4.20 / E520	0-10	М
P8	Minimum value S3 (if CFG = HUML).	%rH	0100	0	М
P 9	Maximum value S3 (if CFG = HUML).	%rH	0100	100	М
P10	Sensor offset S3 humidity (if CFG = HUML).	%rH	-1010	0	М
P11	TA sensor K (1000 = current multiplier of 1.000).		02000	1000	М
P12	Ventilation presence (enables maintenance management based on utility operating hours). No = No ventilation; Yes = Ventilation present.		No/Yes	Yes	М

Par.	Description	MU	Range	Default	PW
P13	Sensor offset S2 temperature (if CFG = 1T or CFG = 2T).	°C/°F	-10.010.0	0.0	М
P14	Sensor offset S3 temperature (if CFG = 1T or CFG = 2T).	°C/°F	-10.010.0	0.0	М
P20	Electrical conductivity of the water at 100°C (212 °F). $0 = 3000 \mu\text{S/cm}$; $1 = 4000 \mu\text{S/cm}$; $2 = 5000 \mu\text{S/cm}$.		02	1	М
P21	Temperature unit of measure (changing value means that the temperature parameter limits will need to be reset manually). $0 = ^{\circ}\text{C}$; $1 = ^{\circ}\text{F}$.		0/1	0	М
P22	Steam production unit of measurement. $0 = \text{kg/h}$; $1 = \text{lb/h}$.		0/1	0	М
	REGULATION group				
r0	Humidity probe setpoint hysteresis.	%	020	2	М
r1	Minimum value for setting humidity setpoint.	%	0 r2	20	М
r2	Maximum value for setting humidity setpoint.	%	r 1 100	95	М
r4	Humidity proportional band.	%	050	50	М
r5	Minimum production.	%	20 r6	20	М
r6	Maximum production.	%	r5 100	75	U
r10	Humidity limit probe setpoint hysteresis.	%	020	2	М
r11	Minimum value for setting humidity limit setpoint.	%	0r12	20	М
r12	Maximum limit setpoint value.	%	r 11 100	95	М
r20	Temperature proportional band.	°C/°F	0.1 10.0	5.0	М
r21	Minimum value for setting temperature setpoint.	°C/°F	10.0 r22	20.0	М
r22	Maximum value for setting temperature setpoint.	°C/°F	r21 60.0	50.0	М
r23	Wellness temperature probe 1 weight.	%	0100	50	М
r24	Wellness temperature probe 2 weight.	%	0100	50	М
c0	Number of consecutive days of inactivity after which the hydraulic unit is emptied. 0 = Function disabled.	days	010	2	М
c1	Number of consecutive days of activity after which the hydraulic unit is emptied. 0 = Function disabled.	days	0100	14	М
c3	Type of draining for dilution. 0 = Current-based; 1 = Time-based.		0/1	0	М
с4	Draining duration for dilution (if $c3 = 1$).	s	09999	5	М
с5	Time between two dilution draining events (if c3 = 1).	m	30999	60	М
c6	Percentage draining for dilution (if c3 = 0).	%	2080	30	М
c10	Maximum initial water filling time for water inlet check.	s	502000	1200	М
c11	Anti-foam process. 0 = Disabled; 1 = Enabled.		0/1	0	М
c14	Time to drain the hydraulic unit completely. (*) Default according to model, from: 3 kg/h = 30 s; 515 kg/h = 40 s; 20200 kg/h = 180 s.	S	0240	(*)	М
c15	Hours of dual hydraulic unit machine rotation.	hours	10500	150	М
c16	Low conductivity algorithm enable. 0 = Disabled; 1 = Enabled.		0/1	0	М
	MAINTENANCE/ALARMS group				
M5	Low humidity alarm threshold. The hysteresis is fixed at 2%. 0 = Disabled.	%	0100	20	М
M6	High humidity alarm threshold. The hysteresis is fixed at 2%. 0 = Disabled.	%	0100	95	М
M7	High/low humidity alarm delay. 0 = Disabled.	s	0999	120	М
M8	Delay in alarm for no production	hours	1100	48	М
M9	Maximum number of automatic attempts to rearm alarm ALO3 "No water" after which the alarm blocks manual rearming.	num	110	3	М
M10	Operating hours threshold for unit maintenance warning.	hx10	10010000	4000	М
M11	Partial operating hours threshold for the hydraulic unit maintenance warning.	hx10	1002000	200	М
M12	Total operating hours threshold for the hydraulic unit maintenance warning.	hx10	1002000	1000	М
M13	Operating hours threshold for valve maintenance warning.	hx10	1002000	1000	М
M14	Operating hours threshold for pump maintenance warning.	hx10	1002000	1000	М
M15	Operating hours threshold for fan maintenance warning.	hx10	1002000	1000	М

Par.	Description	MU	Range	Default	PW		
M20	High temperature alarm threshold. The hysteresis is fixed at 0.5 °C; 0 = Excluded.	°C/°F	0.080.0	50.0	М		
M21	Maximum number of automatic attempts to rearm the high temperature alarm after which the alarm blocks manual rearming (attempts every hour)	num	110	3	М		
	COMMUNICATION group						
LA1	Modbus communication protocol address.	num	1247	247	М		
Lb1	Modbus transmission speed (baud rate). 0 = 2400; 1 = 4800; 2 = 9600; 3 = 19200; 4 = 38400.		04	4	E		
LP1	Modbus parity bit. 0 = None; 1 = Odd; 2 = Even.		02	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		-99999	0	U		
PA2	Second level password.		-99999	824	М		

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.

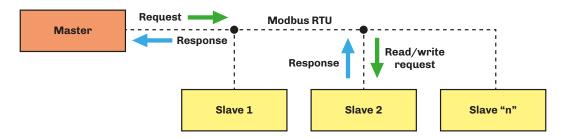


Fig. 49. Diagram showing message exchange in a Modbus communication

Modbus protocol establishes a Protocol Data Unit (PDU) independent from the communication layer below it, introducing some additional fields specified on the Application Data Unit (ADU) ("FIG. 50. FRAMING OF A MESSAGE USING MODBUS PROTOCOL" ON PAGE 52) 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.

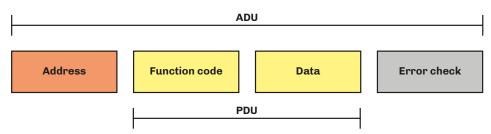


Fig. 50. Framing of a message using Modbus protocol

For further information relating to 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
exchanged over the communication bus, to allow the connected instruments to recognise the end of one message and the start of the part	dialogue; this is a value between 1247. The	function to	contains the data sent by the master or sent back by the slave as a response to a	and the slave to check whether any errors are present during communication, and if there are, to ignore	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.		0247	247
Lb1	Modbus transmission speed (baud rate). 0 = 2400; 1 = 4800; 2 = 9600; 3 = 19200; 4 = 38400.		04	4
LP1	Modbus parity bit. 0 = None; 1 = Odd; 2 = Even.		02	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 25.

In particular, take care to make the connections correctly, observing the instructions in section "6.4 ELECTRICAL CONNECTIONS" ON PAGE 28

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	Υ	%	r1r2
SP2	Humidity limit setpoint.	2002	R/W	SHORT	Υ	%	r11r12
SP3	Temperature probe setpoint.	2086	R/W	SHORT	Υ	°C/°F	r21r22
	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			05
duAL	Dual boiler humidifier operation. 0 = Parallel; 1 = Sequential.	2066	R/W	1 BIT			0/1
пТур	Master/Slave operation. 0 = Disabled; 1 = Parallel; 2 = Rotation; 3 = Balancing.	2073	R/W	BYTES			03
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			15
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	25
nbAc	Number of Master/Slave backup machines.	2071	R/W	2BIT		num	13
nHrs	Hours of Master/Slave machine rotation.	2075	R/W	BYTES		hours	10500
P0	S1 sensor type (temperature). — (0) = Disabled; PTC (1) = PTC; NTC (2) = NTC.	2076	R/W	3 BIT			02
P1	Electrical conductivity of the water.	2006	R/W	WORD		μS/cm	01250
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 010 V; 0-5 (4) = Proportional input 05 V; 0.20 (5) = Input 020 mA; 4.20 (6) = Input 420 mA; E520 (7) = EVHTP520 proprietary probe.	2007	R/W	BYTES			07
Р3	Minimum value S2 (if CFG = HUM or CFG = HUML).	2008	R/W	BYTES		%rH	0100
P4	Maximum value S2 (if CFG = HUM or CFG = HUML).	2009	R/W	BYTES		%rH	0100
P5	Sensor offset S2 (if CFG = HUM or CFG = HUML).	2010	R/W	BYTES	Υ	%rH	-1010
P6	S1 sensor offset (temperature).	2011	R/W	SHORT	Υ	°C/°F	-10.010.0
P7	S3 sensor type (humidity 2 limit). Similar to P2.	2012	R/W	BYTES			07
P8	Minimum value S3 (if CFG = HUML).	2013	R/W	BYTES		%rH	0100
P9	Maximum value S3 (if CFG = HUML).	2014	R/W	BYTES		%rH	0100
P10	Sensor offset S3 (if CFG = HUML).	2015	R/W	SHORT	Υ	%rH	-1010
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	Sensor offset S2 temperature (if CFG = 1T or CFG = 2T).	2078	R/W	SHORT	Υ	°C/°F	-10.010.0
P14	Sensor offset S3 temperature (if CFG = 1T or CFG = 2T).	2079	R/W	SHORT	Υ	°C/°F	-10.010.0
P20	Electrical conductivity of the water at 100°C (212°F). $0 = 3000 \ \mu\text{S/cm}$; $1 = 4000 \ \mu\text{S/cm}$; $2 = 5000 \ \mu\text{S/cm}$.	2016	R/W	3 BIT			02
P21	Temperature unit of measure (changing value means that the temperature parameter limits will need to be reset manually). $0 = ^{\circ}\mathbf{C}$; $1 = ^{\circ}\mathbf{F}$.	2017	R/W	1 BIT			0/1
P22	Steam production unit of measurement. $0 = \text{kg/h}$; $1 = \text{lb/h}$.	2080	R/W	1 BIT			0/1
	REGULATION group						
r0	Sensor 1 setpoint hysteresis.	2018	R/W	BYTES		%	020
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		%	050
r5	Minimum production.	1927	R/W	BYTES		%	0 r6
r6	Maximum production.	1926	R/W	BYTES		%	r5100
r10	Limit sensor setpoint hysteresis.	2024	R/W	BYTES		%	020
r11	Minimum limit setpoint value.	2025	R/W	BYTES		%	0r12
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	010
c1	Number of continuous days of activity after which the boiler is emptied. 0 = Function disabled.	2028	R/W	BYTES		days	0100
c2	Number of cleaning cycles (filling+draining) following emptying due to activity or inactivity.	2029	R/W	BYTES		num	010
с3	Type of draining for dilution. 0 = Current-based; 1 = Time-based.	2030	R/W	1 BIT			0/1
с4	Draining duration for dilution (if C3 = 1).	2031	R/W	WORD		s	09999
с5	Time between two dilution draining events (if C3 = 1).	2032	R/W	WORD		min	30999
c6	Draining value for dilution (if C3 = 0).	2033	R/W	BYTES		%	2080
c10	Maximum initial water filling time for water inlet check, depending on the model.	2036	R/W	WORD		s	502000
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	10300
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	0240
c15	Hours of dual hydraulic unit machine rotation.	2065	R/W	WORD		hours	10500
c16	Low conductivity algorithm enable.	1323	R/W	1 BIT			0/1
M5	MAINTENANCE/ALARMS group Low humidity alarm threshold. The hysteresis is fixed at 2%. 0 = Disabled.	2041	R/W	BYTES		%	0100
M6	High humidity alarm threshold. The hysteresis is fixed at 2%. 0 = Disabled.	2042	R/W	BYTES		%	0100
M7	High/low humidity alarm delay. 0 = Disabled.	2043	R/W	WORD		s	0999
M8	Delay in alarm for no production.	2064	R/W	BYTES		h	1100
M9	Maximum number of automatic attempts to rearm alarm AL03 "No water" after which the alarm blocks manual rearming	2067	R/W	BYTES		num	110
M10	Operating hours threshold for unit maintenance warning.	2044 2045	R/W	DWORD		hours x10	10010000
M11	Operating hours threshold for partial boiler maintenance warning.	2046 2047	R/W	DWORD		hours x10	1002000
M12	Operating hours threshold for full boiler maintenance warning.	2048 2049	R/W	DWORD		hours x10	1002000

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	1002000
M14	Operating hours threshold for pump maintenance warning.	2052 2053	R/W	DWORD		hours x10	1002000
M15	Operating hours threshold for fan maintenance warning.	2054 2055	R/W	DWORD		hours x10	1002000
M20	High temperature alarm threshold. The hysteresis is fixed at 3 °C (6 °F); 0 = Excluded.	2068	R/W	BYTES		°C/°F	0.080.0
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	110
	COMMUNICATION group						
LA1	Modbus communication protocol address.	2056	R/W	BYTES		num	1247
Lb1	Modbus transmission speed (baud rate). 0 = 2400; 1 = 4800; 2 = 9600; 3 = 19200; 4 = 38400.	2057	R/W	BYTES			04
LP1	Modbus parity bit. 0 = None; 1 = Odd; 2 = Even.	2058	R/W	BYTES			02
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	Υ		-99999
PA2	Second level password.	2062	R/W	SHORT	Υ		-99999

11.7.2 Modbus resource table

DI2_cv Digital i DI3_of Digital i DI4_ls Level se DO1_EV1 Inlet so DO2_DP1 Inlet pu DO3_G1 Steam g DO4_DEH Dehumi DO5_FANS Ventilat DO6_AL Alarm o AI_ temperature AI_Humidity Humidit AI_Request Proport AI_Current Current PackedAlarm1 Status o	of alarm AL01 .	257 258 259 260 385 386 387 388 389 390 516 517 518 519 520 769		R R R R R R R R R	SIZE 1 BIT SHORT SHORT	Y		0/1 0/1 0/1 0/1 0/1 0/1 0/1 0/1
DI2_cv Digital i DI3_of Digital i DI4_ls Level se DO1_EV1 Inlet so DO2_DP1 Inlet pu DO3_G1 Steam g DO4_DEH Dehumi DO5_FANS Ventilat DO6_AL Alarm o AI_ temperature AI_Humidity Humidit AI_Request Proport AI_Current Current PackedAlarm1 Status o	input CV status. input O/1 status. ensor input status. elenoid valve output status. ump output status. generation output status. idification output status. ted distributor output status. output status. rature sensor S1 value. ty sensor S2 value. ty limit sensor S3 value. et sensor CT1 value. of warning W01. of alarm AL01.	259 260 385 386 387 388 389 390 516 517 518 519 520 769		R R R R R R R	1 BIT SHORT	 Y	 °C/°F	0/1 0/1 0/1 0/1 0/1 0/1 0/1 0/1
DI3_of Digital in DI4_Is Level set DO1_EV1 Inlet so DO2_DP1 Inlet put DO3_G1 Steam get DO4_DEH Dehuming DO5_FANS Ventilated DO6_AL Alarm of temperature AI_Humidity Humidity Humidity AI_Humidity Humidity AI_Humidity Humidity AI_Request Proportion AI_Current Current PackedAlarm1 Status of PackedAlar	input 0/1 status. ensor input status. blenoid valve output status. ump output status. generation output status. idification output status. ted distributor output status. output status. rature sensor S1 value. ty sensor S2 value. ty limit sensor S3 value. ttional input S2 value. of warning W01. of alarm AL01.	259 260 385 386 387 388 389 390 516 517 518 519 520 769		R R R R R R R	1 BIT SHORT	 Y	 °C/°F	0/1 0/1 0/1 0/1 0/1 0/1 0/1 0/1
DI4_IS Level set DO1_EV1 Inlet so DO2_DP1 Inlet pu DO3_G1 Steam g DO4_DEH Dehumi DO5_FANS Ventilat DO6_AL Alarm of temperature AI_temperature AI_Humidity Humidit AI_Humidity_L Humidit AI_Request Proport AI_Current Current PackedAlarm1 Status of PackedA	ensor input status. plenoid valve output status. pump output status. generation output status. idification output status. ted distributor output status. putput status. rature sensor S1 value. ty sensor S2 value. ty limit sensor S3 value. put sensor CT1 value. of warning W01. of alarm AL01.	260 385 386 387 388 389 390 516 517 518 519 520 769		R R R R R R	1 BIT SHORT	 Y	 °C/°F	0/1 0/1 0/1 0/1 0/1 0/1 0/1 -3276.8 3276.7
DO1_EV1 Inlet so DO2_DP1 Inlet pu DO3_G1 Steam g DO4_DEH Dehumi DO5_FANS Ventilat DO6_AL Alarm o AI_ temperature AI_Humidity Humidit AI_Humidity_L Humidit AI_Request Proport AI_Current Current PackedAlarm1 Status o	plenoid valve output status. Imp output status. generation output status. idification output status. ted distributor output status. output status. rature sensor S1 value. ty sensor S2 value. ty limit sensor S3 value. et sensor CT1 value. of warning W01. of alarm AL01.	386 387 388 389 390 516 517 518 519 520 769		R R R R R	1 BIT 1 BIT 1 BIT 1 BIT 1 BIT 1 BIT SHORT	 Y	 °C/°F	0/1 0/1 0/1 0/1 0/1 0/1 -3276.8 3276.7
DO2_DP1 Inlet pur DO3_G1 Steam g DO4_DEH Dehumi DO5_FANS Ventilat DO6_AL Alarm of temperature AI_temperature AI_Humidity Humidit AI_Humidity_L Humidit AI_Request Proport AI_Current Current PackedAlarm1 Status of PackedAlarm1 Stat	generation output status. generation output status. idification output status. ted distributor output status. output status. rature sensor S1 value. ty sensor S2 value. ty limit sensor S3 value. ttional input S2 value. of warning W01. of alarm AL01.	386 387 388 389 390 516 517 518 519 520 769		R R R R R	1 BIT 1 BIT 1 BIT 1 BIT 1 BIT SHORT	 Y Y	 °C/°F	0/1 0/1 0/1 0/1 0/1 -3276.8 3276.7
DO3_G1 Steam g DO4_DEH Dehumi DO5_FANS Ventilat DO6_AL Alarm of AI_temperature AI_Humidity Humidit AI_Humidity_L Humidit AI_Request Proport AI_Current Current PackedAlarm1 Status of P	generation output status. idification output status. ted distributor output status. output status. rature sensor S1 value. ty sensor S2 value. ty limit sensor S3 value. rtional input S2 value. of warning W01. of alarm AL01.	387 388 389 390 516 517 518 519 520 769		R R R R R	1 BIT 1 BIT 1 BIT 1 BIT SHORT	 Y	 °C/°F	0/1 0/1 0/1 0/1 -3276.8 3276.7
DO4_DEH Dehumi DO5_FANS Ventilat DO6_AL Alarm of AI_temperature AI_Humidity Humidit AI_Humidity_L Humidit AI_Request Proport AI_Current Current PackedAlarm1 Status of PackedAlarm	idification output status. ted distributor output status. putput status. rature sensor S1 value. ty sensor S2 value. ty limit sensor S3 value. tional input S2 value. of warning W01. of alarm AL01.	388 389 390 516 517 518 519 520 769		R R R R	1 BIT 1 BIT 1 BIT SHORT	 Y	 °C/°F	0/1 0/1 0/1 -3276.8 3276.7
DO5_FANS Ventilated DO6_AL Alarm of temperature AI_temperature AI_Humidity Humidity AI_Humidity_L Humidity AI_Request Proporty AI_Current Currenty PackedAlarm1 Status of PackedA	ted distributor output status. output status. rature sensor S1 value. ty sensor S2 value. ty limit sensor S3 value. tional input S2 value. of warning W01. of alarm AL01.	389 390 516 517 518 519 520 769		R R R R	1 BIT 1 BIT SHORT SHORT	Y	 °C/°F	0/1 0/1 -3276.8 3276.7
AI_temperature AI_Humidity Humidit AI_Humidity_L Humidit AI_Request Proport AI_Current Current PackedAlarm1 Status of PackedAlarm1 S	ty sensor S2 value. ty limit sensor S3 value. tional input S2 value. it sensor CT1 value. of warning W01. of alarm AL01.	390 516 517 518 519 520 769		R R R	1 BIT SHORT SHORT	Y	°C/°F	0/1 -3276.8 3276.7
AI_temperature AI_Humidity AI_Humidity_L Humidit AI_Request Proport AI_Current Current PackedAlarm1 Status of	ty sensor S1 value. ty sensor S2 value. ty limit sensor S3 value. tional input S2 value. at sensor CT1 value. of warning W01. of alarm AL01.	516 517 518 519 520 769		R R R	SHORT	Y	°C/°F	-3276.8 3276.7
AI_Humidity_L Humidit AI_Request Proport AI_Current Current PackedAlarm1 Status of Packe	ty limit sensor S3 value. tional input S2 value. It sensor CT1 value. of warning W01 . of alarm AL01 .	518 519 520 769		R			%rH	-32768
AI_Request Proport AI_Current Current PackedAlarm1 Status of Packe	tional input S2 value. It sensor CT1 value. of warning W01 . of alarm AL01 .	519 520 769			SHORT			32767
PackedAlarm1 Status of	of warning W01 . of alarm AL01 .	520 769		R	1	<u> </u>	%rH	-32768 32767
PackedAlarm1 Status of	of warning W01 . of alarm AL01 .	769		- ' '	SHORT	Υ	%	-32768 32767
PackedAlarm1 Status of	of alarm AL01 .			R	SHORT	Υ	А	-327.68 327.67
PackedAlarm1 Status of			0	R	1 BIT			0/1
PackedAlarm1 Status of	of warning W02 .	769	1	R	1 BIT			0/1
PackedAlarm1 Status of		769	2	R	1 BIT			0/1
PackedAlarm1 Status of		769	3	R	1 BIT			0/1
PackedAlarm1 Status of	of alarm AL03 .	769	4	R	1 BIT			0/1
PackedAlarm1 Status of	of warning W04 .	769	5	R	1 BIT			0/1
PackedAlarm1 Status of	of warning W05 .	769	6	R	1 BIT			0/1
PackedAlarm1 Status of	of warning W06 .	769	7	R	1 BIT			0/1
PackedAlarm1 Status of	of alarm AL07 .	769	8	R	1 BIT			0/1
PackedAlarm1 Status of	of warning W08 .	769	9	R	1 BIT			0/1
PackedAlarm1 Status of	of alarm AL08 .	769	10	R	1 BIT			0/1
PackedAlarm1 Status of PackedAlarm1 Status of PackedAlarm1		769	11	R	1 BIT			0/1
PackedAlarm1 Status		769	12	R	1 BIT			0/1
		769	13	R	1 BIT			0/1
		769	14	R	1 BIT			0/1
PackedAlarm1 Status		769	15	R	1 BIT			0/1
PackedAlarm2 Status		770	0	R	1 BIT			0/1
PackedAlarm2 Status		770	1	R	1 BIT			0/1
PackedAlarm2 Status		770	2	R	1 BIT			0/1
PackedAlarm2 Status		770	3	R	1 BIT			0/1
PackedAlarm2 Status		770	4	R	1 BIT			0/1
PackedAlarm2 Status		770	5	R	1 BIT			0/1
PackedAlarm2 Status		770	6	R	1 BIT			0/1
PackedAlarm2 Status		770	7	R	1 BIT			0/1
PackedAlarm2 Status	of alarm AL22 .	770	8	R	1 BIT			0/1
PackedAlarm2 Status		770	9	R	1 BIT			0/1
PackedAlarm2 Status	of alarm AL24 .	770	10	R	1 BIT			0/1
PackedAlarm2 Status		770	11	R	1 BIT			0/1
PackedAlarm2 Status	of alarm AL25 .	770	12	R	1 BIT			0/1
PackedAlarm2 Status		770	13	R	1 BIT			0/1
PackedAlarm2 Status	of alarm AL26 .	770	14	R	1 BIT			0/1
PackedAlarm2 Status	of alarm AL26 . of alarm AL27 .					1		

Code	Description	Val. Adr.	Filter value	R/W	DATA SIZE	CPL	ми	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.		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
	Hours of humidifier operation (LOW) (*).	1286		R/W	DWORD		h x 10	0.0 429496729.5
HoursService	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
noursboller	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
Tiour sponor r	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	429496729.5
HoursPump	Hours of outlet pump operation (hours x 10) (LOW) (*).	1294		R/W	DWORD		h x 10	0.0 429496729.5
riour si unip	Hours of outlet pump operation (hours x 10). (HIGH) (*).	1295		R/W	DWORD		h x 10	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			DWORD		h x 10	0.0 429496729.5
curr100	Nominal current.	1298		R/W			Α	0.00655.35
tevap	Evaporation time.	1299		R/W	WORD		s	0.0 6553.5
actProd	Actual steam production.	1303		-	SHORT	Υ	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 **A** and the buzzer. Each alarm is recorded in the alarm log.

12.1 Table of VEH alarms

Code	Description	Cause	Effects	Solution
W01	Warning: +30% overcurrent	Overcurrent between the electrodes Electrodes not working or shorted	 Fixed alarm icon W01 displayed Partial draining W01 recorded in the log 	Carry out maintenance Replace the boiler Check that the outlet pump is
AL01	Alarm: +50% overcurrent	 Current sensor not working Control board not working Boiler compromised High electrical conductivity Use softened water 	 Fixed alarm icon AL01 displayed Humidifier OFF AL01 recorded in the log 	working • Check that the TA is working (if external) • Check the water properties
W02	Warning: no production	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
AL02	Alarm: no production		 Fixed alarm icon AL02 displayed Alarm relay ON Humidifier OFF if AL02 > 100 h AL02 recorded in the log 	solenoid valve Replace the solenoid valve Check for foam Check the backpressure in the steam outlet duct
AL03	No water alarm	 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 drainedWater 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 workingProbe not connected properlyIncorrect 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		 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	Sensor not connected correctly Control board not working	 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	 Fixed alarm icon AL19 displayed Alarm relay ON Humidifier OFF AL19 recorded in the log 	Check the sensor type Check the sensor wiring
AL20	Alarm: temperature sensor 2	Incorrect probe type	 Fixed alarm icon AL20 displayed Alarm relay ON Humidifier OFF AL20 recorded in the log 	Change the sensor type Check for electrical noise
AL21		 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		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 slave 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 slave 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 slave 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 slave 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 	 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
AL29	Alarm: +50% overcurrent in hydraulic unit 2	 Control board not working Boiler compromised High electrical conductivity Use softened water 	 Fixed alarm icon AL29 displayed Humidifier OFF AL29 recorded in the log 	Check that the TA is working (if external) Check the water properties
W30	Warning: no production from hydraulic unit 2	Foam in hydraulic unit 2 Water inlet flow rate too low Hydraulic unit 2 failing	 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
AL30	Alarm: no production from hydraulic unit 2	 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 AL30 displayed Alarm relay ON Humidifier OFF if AL30 > 100 h AL30 recorded in the log 	solenoid valve in hydraulic unit 2 Replace the solenoid valve Check for foam Check the backpressure in the steam outlet duct
AL31		 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		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

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

A A 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.

MARNING

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)).

13.1 Introduction

VEH series humidifiers are designed for operation with the water specifications indicated in sub-section" **5.2.1 WATER SPECIFICATIONS**" **ON PAGE 23.**

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

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

Water conductivity	Water hardness
200600 μS/cm	1030 °f

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

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

Water conductivity	Water hardness
7001250 μS/cm	3550 °f

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

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

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

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

Furthermore, the hydraulic unit should be cleaned promptly when:

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

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

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

- (*): The electrodes are made using AISI 316 steel with self-extinguishing engineering plastic parts.
 - There are leaks due to breakages, cracks and fissures (replace the hydraulic unit).

 NOTE: the water inside the boiler is subjected to electrical voltage and therefore leaks from the boiler are dangerous.



RISK OF ELECTRIC SHOCK OR ELECTRIC ARC

- Any procedure on the humidifier, including maintenance of any type, must only be carried out while the power supply is disconnected.
- In the event of water leakage, disconnect the humidifier power supply immediately.
 - If any adverse event not described in this documentation arises, carry out maintenance and/or replace the hydraulic
 unit. Plus, contact ELSTEAM customer service for the relevant guidelines and instructions;

🛕 🛕 DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ELECTRIC ARC

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

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



RISK OF ELECTRIC SHOCK OR ELECTRIC ARC

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

Checking the status of the humidifier

Perform the following scheduled checks on the humidifier:

When	What to do			
At first start-up	Make sure there are no leaks after an hour of continuous operation.			
When changing parts	INIAKE SUITE LITELE ALTE ITO TEAKS ALTER ATT HOUL OF CONTUINAUUS ODER ALTOH.			
 Make sure the humidifier works properly (based on the instructions provided in this manual); Make sure there are no leaks in the hydraulic system; Make sure there is no unusual operation. 				
Every 30 days	 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 not too much limescale residue has built up inside the hydraulic unit; 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 2 years (*)	Replace the hydraulic unit.			
Every 5 years (**)	Replace the hydraulic unit.			

(*) NOTE: If humidifier used continuously.

(**) NOTE: If humidifier 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 properly and be maintained and cleaned properly at 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).

NOTICE

MALFUNCTIONING OF THE EQUIPMENT

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

13.2 Regular cleaning of the product and its components

- Drain the humidifier, following the instruction provided in section "9.8 OPERATING HOURS" ON PAGE 48;
- · Disconnect the machine power supply using the external isolator;
- Open the AHU and approach the hydraulic unit, removing the tank covers from the unit as described in paragraph "13.3
 CLEANING THE TANK" ON PAGE 67;
- Unscrew the manifold from the filling/discharge unit;
- · Remove any pieces of limescale;
- Disconnect the inlet solenoid valve, remove the filter at the bottom and thoroughly clean it again;
- · Reassemble the inlet solenoid valve;
- · Re-attach the filling/discharge unit manifold.

13.3 Cleaning the tank

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

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

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

13.5 Replacing the electrodes

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



LOOSE WIRING CAUSES ELECTRIC SHOCKS AND OVERHEATING

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

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

14. SPARE PARTS

14.1 Hydraulic unit

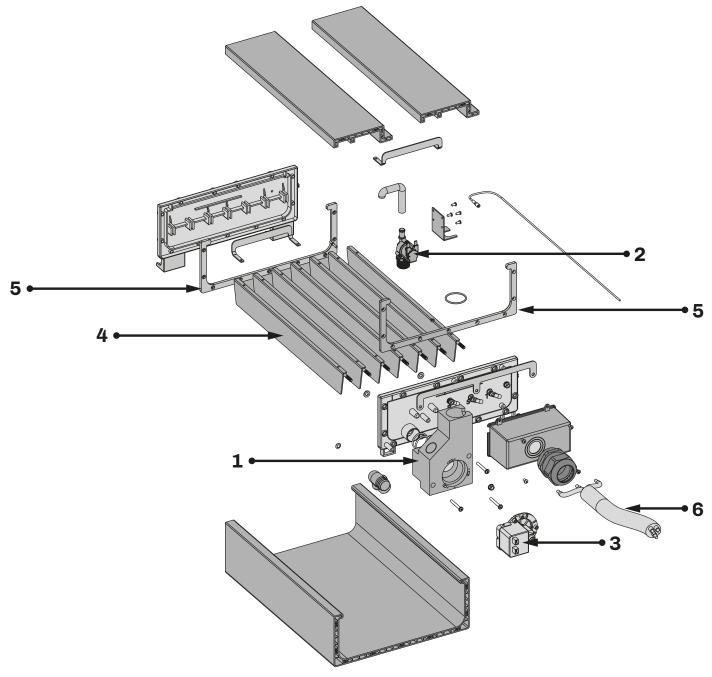


Fig. 51. Spare parts for VEH OEM - Hydraulic unit

Ref.	P/n	Description		
1	EHKD0K01	VEH OEM water inlet/outlet manifold unit		
2	EHKT0K02	EH OEM filling solenoid valve		
3	EHKT0K04	EH OEM electric outlet pump		
	EHKD0K02	Electrode kit for VEH OEM 10XS/VHE OEM 20XS		
	EHKD0K03	Electrode kit for VEH OEM 20S/VEH OEM 30S/VEH OEM 40S		
4	EHKD0K04	Electrode kit for VEH OEM 30M/VEH OEM 60M		
	EHKD0K05	Electrode kit for VEH OEM 40L/VEH OEM 80L		
	EHKD0K06	Electrode kit for VEH OEM 60XL/VEH OEM 100XL		
5	EHKD0K07	VEH OEM hydraulic unit gasket kit		
6	EHKD0K08	Power cable kit from electric panel to hydraulic unit for VEH 0EM 10-20-30-40		
_ °	EHKD0K09	Power cable kit from electric panel to hydraulic unit for VEH 0EM 60-80-100		

14.2 Electrical part

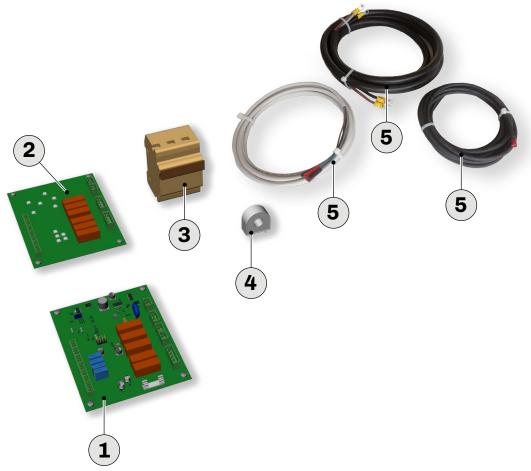


Fig. 52. Electrical spare parts: VEH OEM

Fig. 52. Lieuti icui spui e pui is. VEN OLIV		
Ref.	P/n	Description
1	EHHKT001P4	Complete control unit
2	EHHKX002E4	Control unit expansion for dual-hydraulic unit version
3	EHKT0K76	Fuse kit for VEH OEM 10 , gG10x38 16 A
	EHKT0K77	Fuse kit for VEH OEM 20 , gG10x38 32 A
	VEHK20	Fuse kit for VEH OEM 30 , gG14x51 40 A
	EHKT0K78	Fuse kit for VEH OEM 40 , gG14x51 50 A
	VEHK22	Fuse kit for VEH 0EM 60 , gG22x58 80 A
	EHKT0K79	Fuse kit for VEH OEM 80 , gG22x58 100 A
	EHKT0K80	Fuse kit for VEH OEM 100 , gG22x58 125A
4	0103349007	TA current sensor
(5)	EHKD0K28	1 m power cable kit for VEH OEM 10-20-30
	EHKOD29	1 m power cable kit for VEH OEM 40-60-80
	EHKOD30	1 m power cable kit for VEH OEM 100
	EHKD0K08	3 m power cable kit for VEH OEM 10-20-30-40
	EHKD0K09	3 m power cable kit for VEH OEM 60
	EHKD0K10	3 m power cable kit for VEH OEM 80-100
	EHKD0K17	5 m power cable kit for VEH OEM 10-20-30-40
	EHKD0K18	5 m power cable kit for VEH OEM 80-100
	EHKD0K19	5 m power cable kit for VEH OEM 60
	0101014020	(Optional) 400 Vac transformer for VEH OEM models
_	0209310001	(Optional) Contactor for VEH OEM 10 models
	0209310002	(Optional) Contactor for VEH OEM 20 models
	0209310003	(Optional) Contactor for VEH OEM 30 models
		(Optional) Contactor for VEH OEM 40 models
	0209310004	(Optional) Contactor for VEH OEM 60 models
		(Optional) Contactor for VEH OEM 80 models
	0209310006	(Optional) Contactor for VEH OEM 100 models

15.1 VEH OEM humidifier (4 or 7 electrodes)

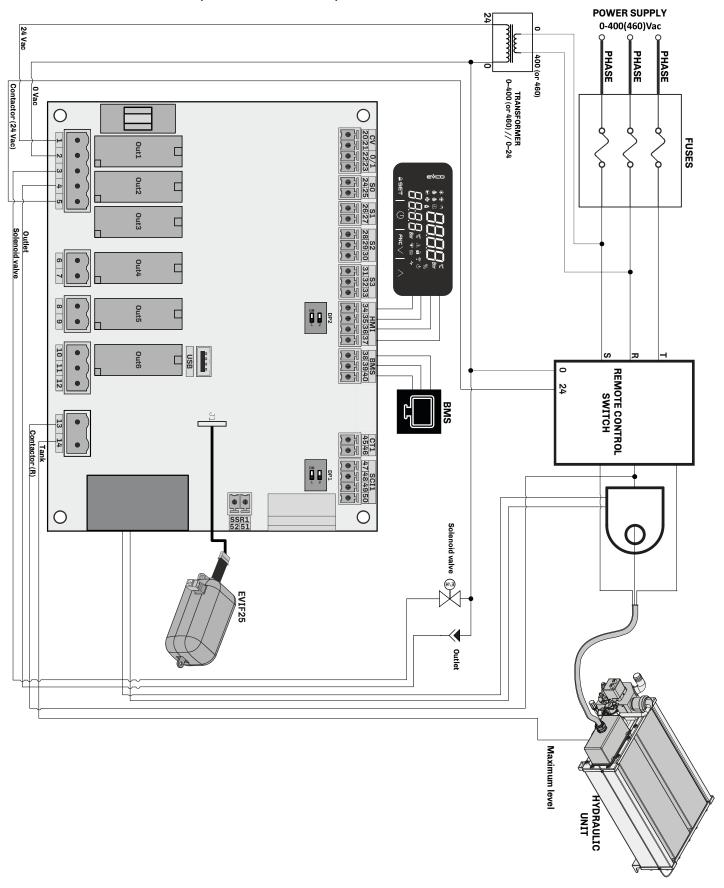


Fig. 53. Wiring diagram for 4- or 7-electrode models

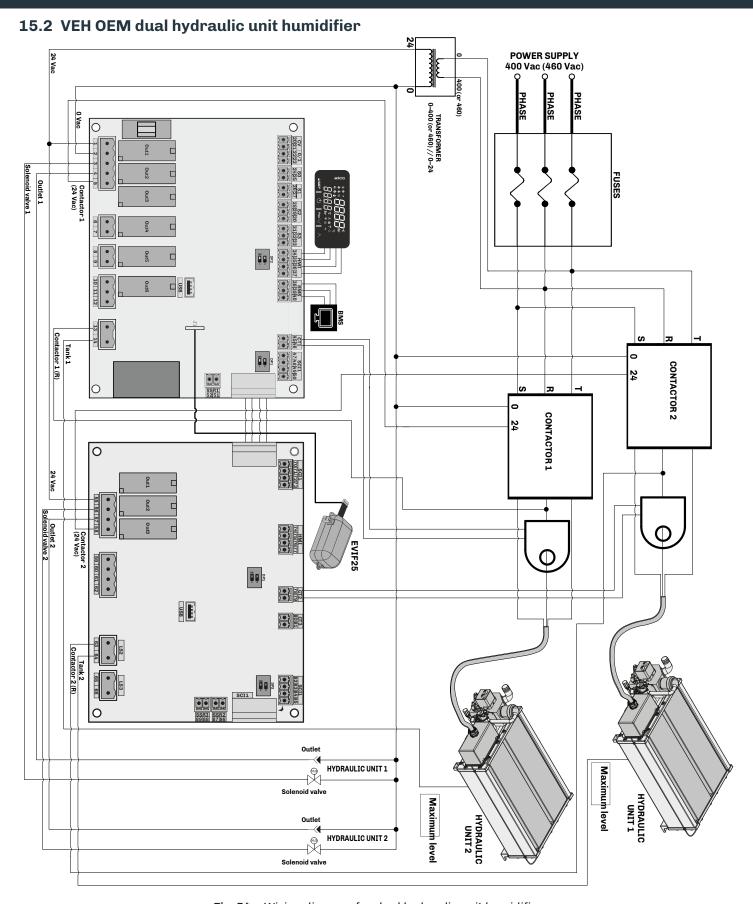


Fig. 54. Wiring diagram for dual hydraulic unit humidifier

16. MODEL SELECTION AND DEFINITION

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

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

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