

OEM

CAREL



ENG

User manual

Manual version: 2.5 dated 02/02/11

→ **LEGGI E CONSERVA
QUESTE ISTRUZIONI** ←
**READ AND SAVE
THESE INSTRUCTIONS**

  **NO POWER
& SIGNAL
CABLES
TOGETHER**
READ CAREFULLY IN THE TEXT!

Integrated Control Solutions & Energy Savings



We wish to save you time and money!
We can assure you that the thorough reading of this manual will guarantee correct installation and safe use of the product described.



WARNING: separate as much as possible the probe and digital input signal cables from the cables carrying inductive loads and power cables to avoid possible electromagnetic disturbance. Never run power cables (including the electrical panel wiring) and signal cables in the same conduits.

IMPORTANT WARNINGS



BEFORE INSTALLING OR HANDLING THE APPLIANCE, PLEASE CAREFULLY READ AND FOLLOW THE INSTRUCTIONS AND SAFETY REGULATIONS CONTAINED IN THIS MANUAL AND INDICATED ON THE LABELS ATTACHED TO THE UNIT.

INSTRUCTION SHEET +050003765 OF THE CP* CONTROL BOARD IS AN INTEGRAL PART OF THIS MANUAL!
CAREFULLY KEEP INSTRUCTION SHEET +050003765 TOGETHER WITH THIS MANUAL!

This humidifier produces non-pressurised steam by means of electrodes immersed in the water contained in the cylinder-boiler (hereafter referred to as the **cylinder**). The electrodes pass electric current through water, which, acting as electrical resistance, heats up. The steam produced is used to humidify rooms or industrial processes, by means of special distributors.

As the quality of the water in use affects the evaporation process, the appliance may be supplied with untreated water **as long as it is drinkable and not demineralised** (refer to supply water requirements); the evaporated water is automatically topped up using of a fill valve.

This appliance has been designed exclusively to humidify rooms directly or in ducts through a distribution system. Installation, use and maintenance shall be carried out according to the instructions contained in this manual.

The environmental conditions and the power supply voltage must comply with the specified values.

Any other use and modification to the appliance not expressly authorised by the manufacturer shall be considered as improper.

Liability for injuries or damage caused by improper use lies exclusively with the user.

Please note that the unit contains live electrical devices and hot surfaces.

All service and/or maintenance operations must be carried out by specialist and qualified personnel aware of the necessary precautions and able to operate properly.

Disconnect the unit from the mains before accessing any internal parts.

The appliance must be installed in compliance with the local regulations in force.

The local safety regulations in force must be applied in all cases.

Disposal of the parts of the humidifier: the humidifier is made up of metal and plastic components. All these parts must be disposed of in compliance with the local legislation on waste disposal.

Materials warranty: 2 years (from the date of production, consumable parts excluded – e.g. the cylinder).



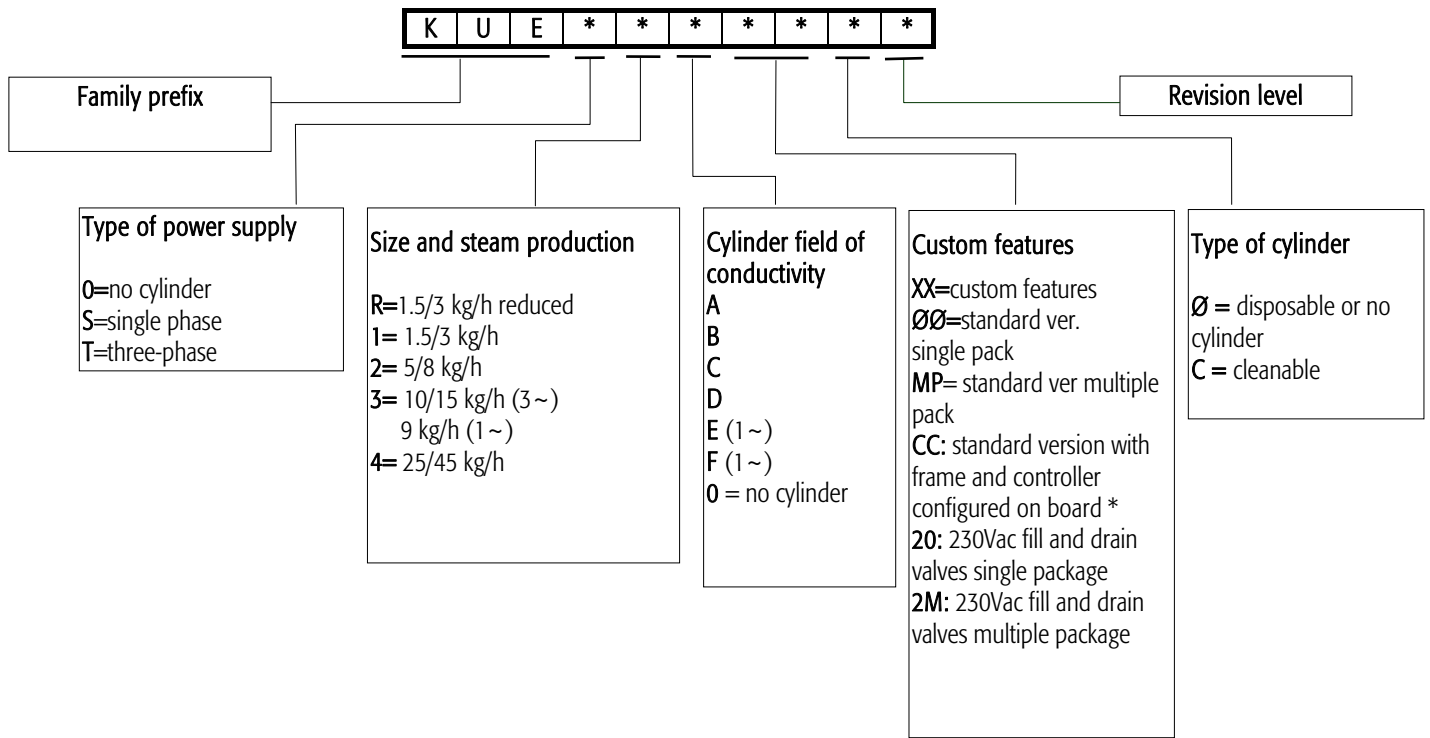
Certification: the quality and safety of Carel's products are guaranteed by the **ISO 9001** certified design and production system, as well as by the mark.

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1. MODELS AND DESCRIPTION OF THE COMPONENTS

The code that identifies the model of humidifier is made up of 10 characters, with the following meaning:

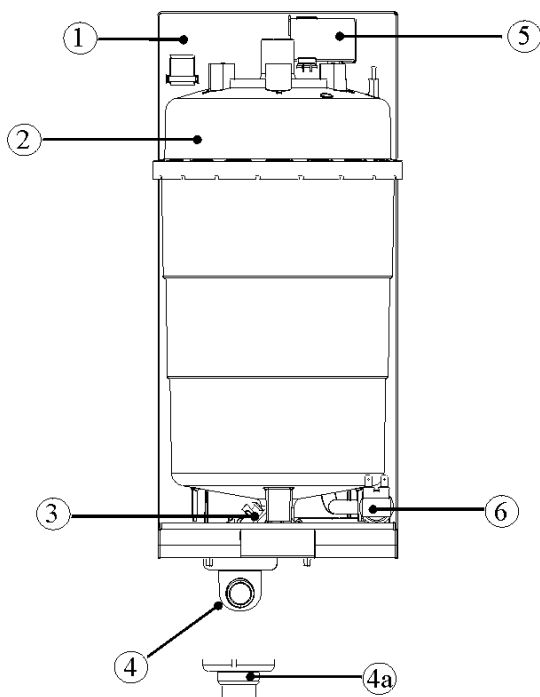


* The controller is configured for the maximum capacity of the KUE selected and can be modified using humiSet.

Example:

KUET3C00C0 = OEM UE KIT with three-phase cylinder, cleanable, 15 kg/h steam, for standard conductivity, revision level 0;
 KUE0R0MP00 = OEM UE KIT, reduced, 1.5/3 kg/h steam, no cylinder, multiple pack, revision level 0.
 KUETROCC00 = OEM UE KIT, reduced, three-phase, 1.5/3 kg/h steam, no cylinder, with frame and controller configured for 3 kg/h, 400 V three-phase.

1.1 Description of the components



KUE*R / KUE*1 / KUE*2 / KUE*3	
no.	description
1	Load-bearing frame
2	Cylinder
3	Drain solenoid valve
4	90° revolving drain connector
4a	Straight drain connector (supplied)
5	Supply tank + conductivity meter
6	Fill solenoid valve

Table 1.a

Fig. 1.a

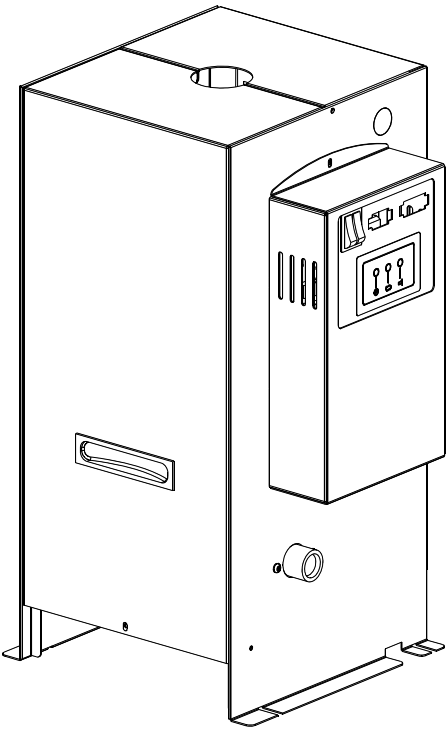


Fig. 1.b

KUE***CC**	
no.	description
*	For the details of the components see Chap.3

Table 1.b

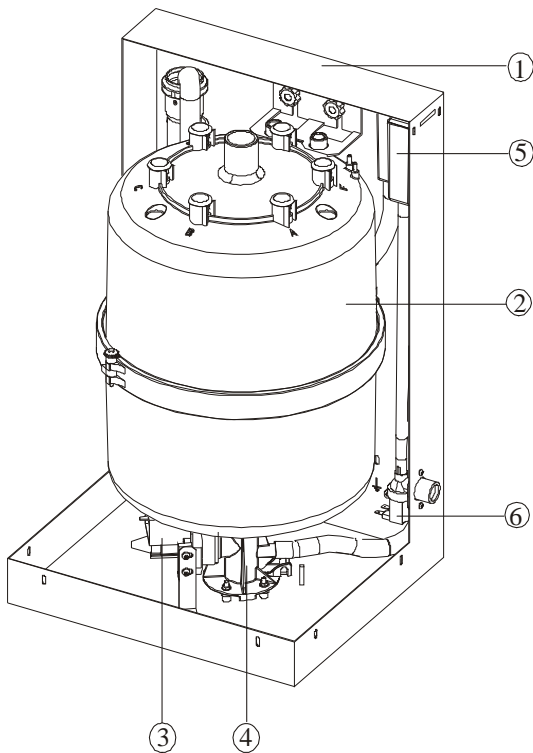
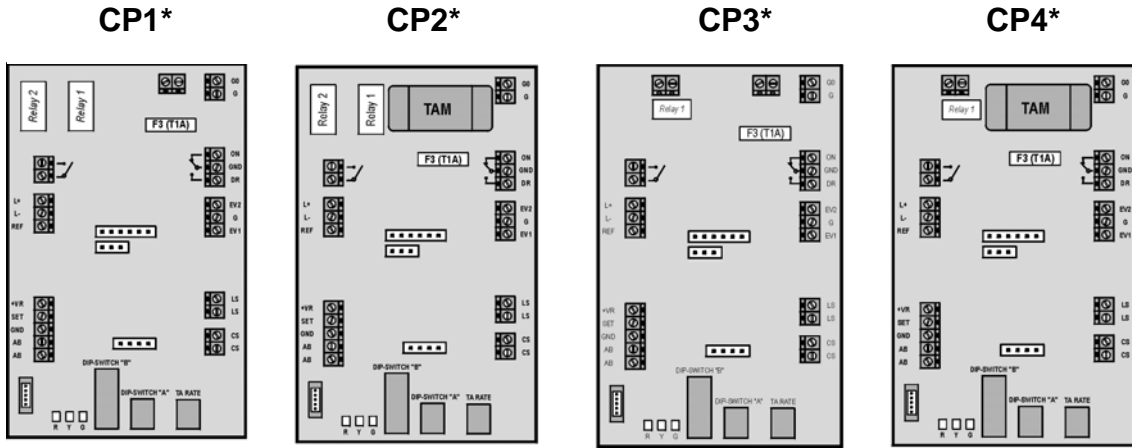


Fig. 1.c

KUE*4	
no.	description
1	Load-bearing frame
2	Cylinder
3	Drain pump
4	Supply/drain manifold
5	Supply tank + conductivity meter
6	Fill solenoid valve

Table 1.c



CP* control boards (also see instruction sheet +050003765 for the boards)
 Fig. 1.d



Fig. 1.e
 External TAM (current transformer) (required only for boards CP1* and CP3*)

Fig. 1.f refers to the following table for the description.

no.	description
1	fill solenoid valve
2	flow limiter
3	supply hose
4	fill hose
5	overflow pipe
6	electrodes for measuring the conductivity
7	supply tank - overflow *
8	high level electrodes
9	steam outlet
10	electrodes (2/6 in the single-phase model, 3/6 in the three-phase model)
11	cylinder casing
12	bottom filters
13	drain solenoid valve
14	corrugated drain pipe
15	drain column
16	drain pump

Table 1.d

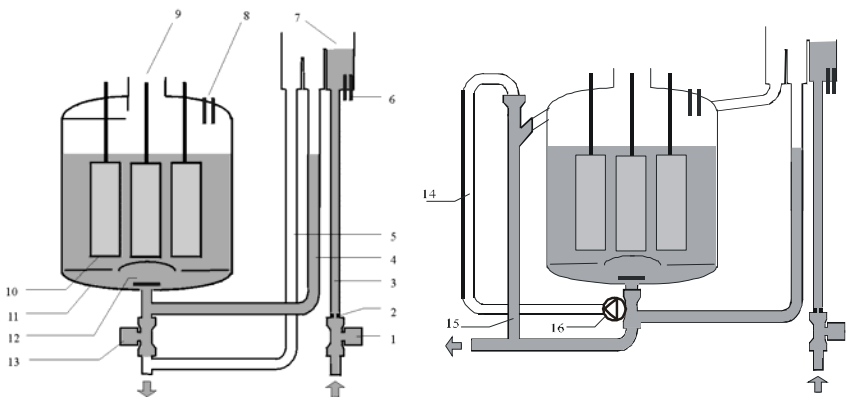


Fig. 1.f

* Device used to prevent the water in the supply tank from exceeding the safety level (for example due to a malfunction of the controller or leaks from the fill solenoid valve, or back pressure). The supply tank is fitted with an overflow diaphragm that releases the excess water introduced, draining it through a special pipe. The overflow diaphragm is below the fill to prevent backflow into the supply hose.

2. INSTALLATION: DIMENSIONS, WEIGHTS, HOSE CONNECTIONS

2.1 Positioning

- To favour steam distribution, position the appliance so as to minimise the length of the steam outlet pipe (max 4 m). The unit has been designed for wall mounting; the wall must be able to support the weight of the unit during operation.
- The cylinder of the humidifier may reach temperatures above 60°C.
- Make sure that the humidifier is level.

KUE*R / KUE*1 / KUE*2 / KUE*3

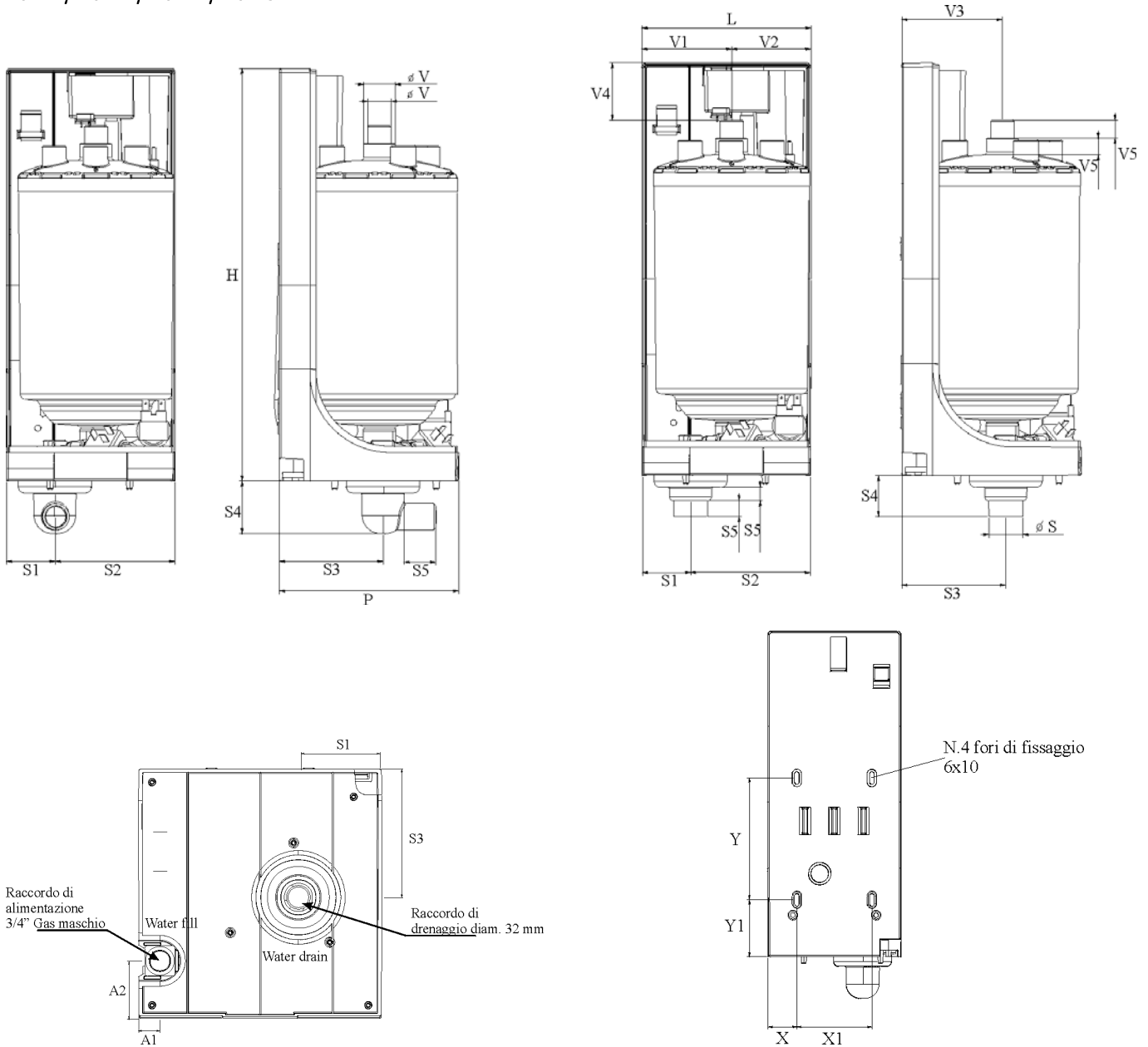


Fig. 2.a

Italian	English
Raccordo di alimentazione 3/4 " Gas maschio	Supply connection 3/4" Gas male
Raccordo di drenaggio diam. 32 mm	Drain connector dia. 32mm
N. 4 fori di fissaggio 6x10	4 fastening holes 6x10

KUE*4

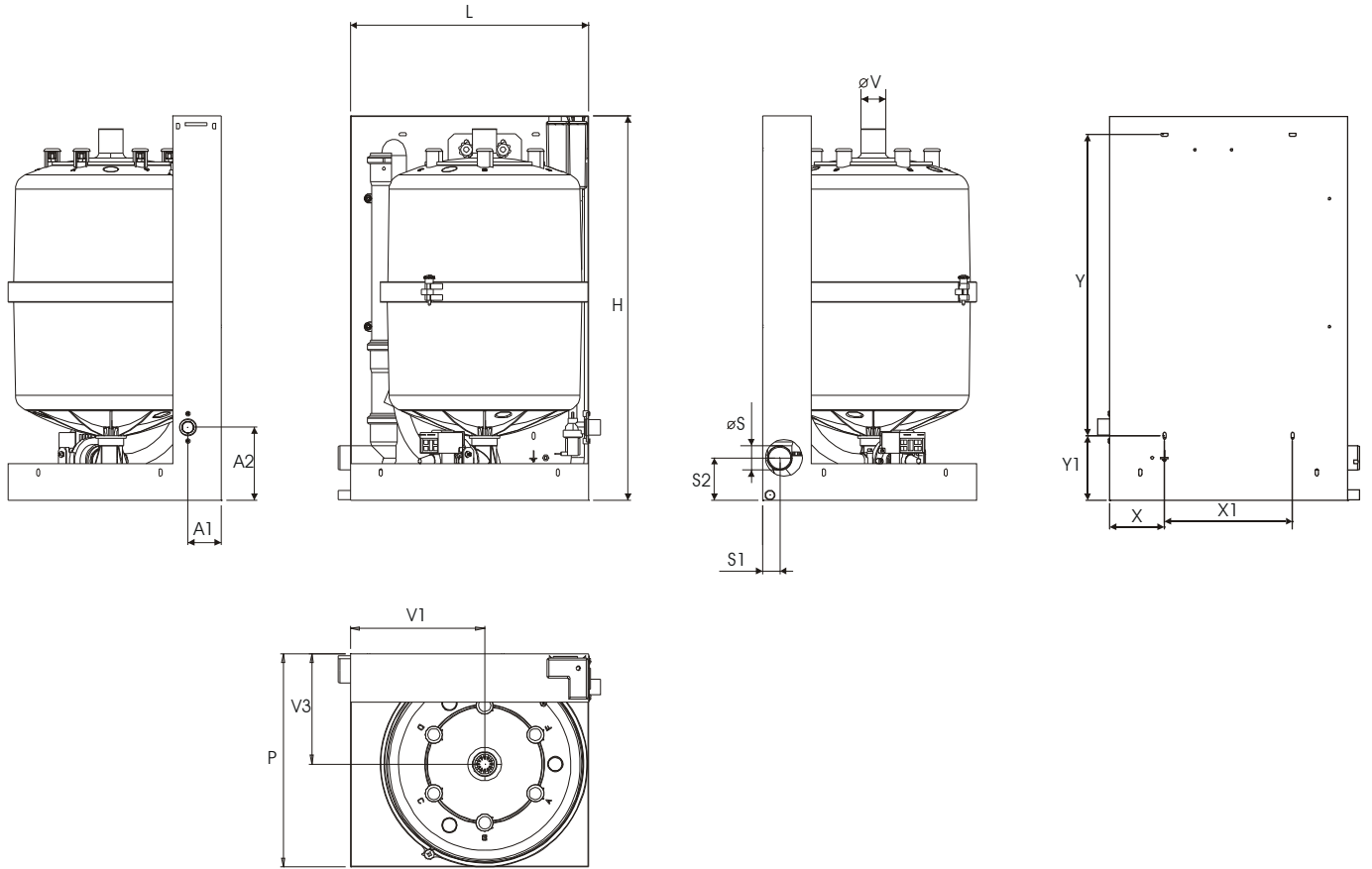


Fig. 2.b

KUE***CC**

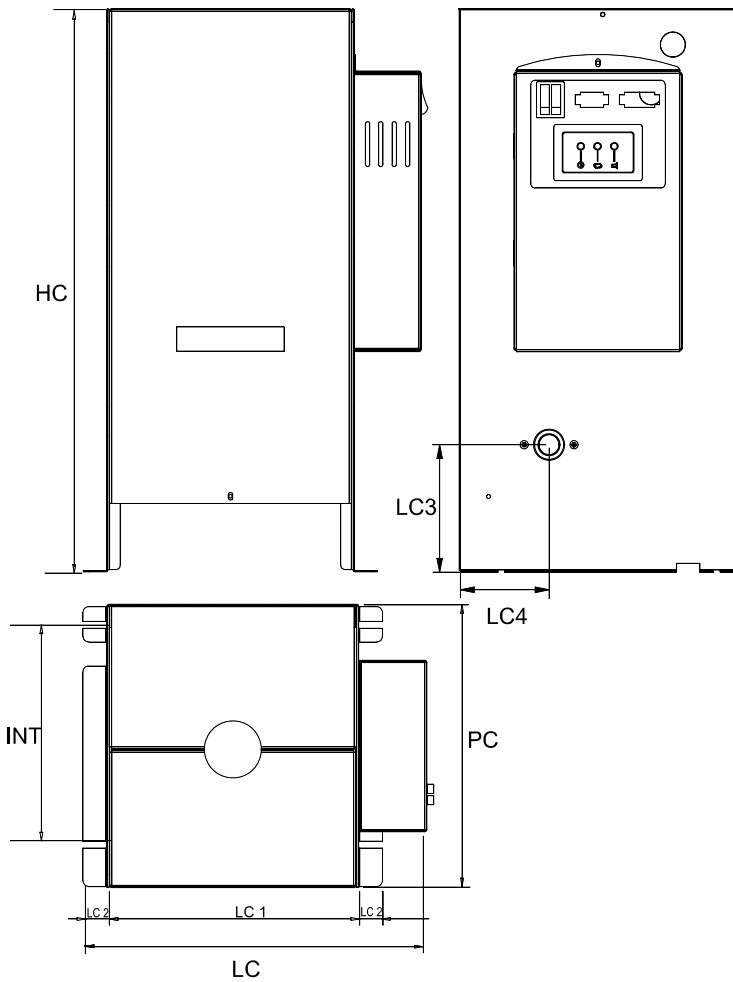


Fig. 2.c

		models				
		KUE*R*	KUE*1*	KUE*2*	KUE*3*	KUE*4*
Weights (kg)	Empty	1,2	1,6	2,9	3,5	7,2
	Packaged	2,0	2,4	3,7	4,3	8,9
	Installed	3,7	5,5	8,9	13,8	39
	Installed + frame	7,7	10	14,3	21	
Dimensions (mm)	H	300	391	412	511	630
	L without cylinder	160	160	185	225	390
	L with cylinder ⁽¹⁾	160	160	204	260	
	P without cylinder	170	170	220	230	350
	P with cylinder ⁽¹⁾	175	175	230	268	
	Ø V	23-30	23-30	31	31	40
	Ø S	32	32	32	32	40
	V1	81	82	93	113	220
	V2	79	78	92	112	
	V3	99	99	124	135	181
	V4	54	54	20	26	
	V5	16-17	16-17	37	37	
	S1	45	46	54	77	28
	S2	114	114	131	148	70
	S3	110	110	120	118	
Hose connection	S4	40-50	40-50	40-50	40-50	
	S5	13-15-30	13-15-30	13-15-30	13-15-30	
Mounting distances	A1	19,5	19,5	19,5	19,5	55
	A2	53	53	53	53	120
	X	35	35	47	68	90
	X1	90	90	90	90	210
Dimensions of the frame (mm)	Y	146	146	213	288	494
	Y1	68	68	69	69	106
	HC	380	470	490	590	
	LC	277	277	302	354	
	LC1	196	196	221	273	
	LC2	21	21	21	21	
	LC3	56,5	115	115	115	
	LC4	80	80	80	80	
	PC	198	198	248	260	
	INT	142,3	142,3	192,3	204,3	

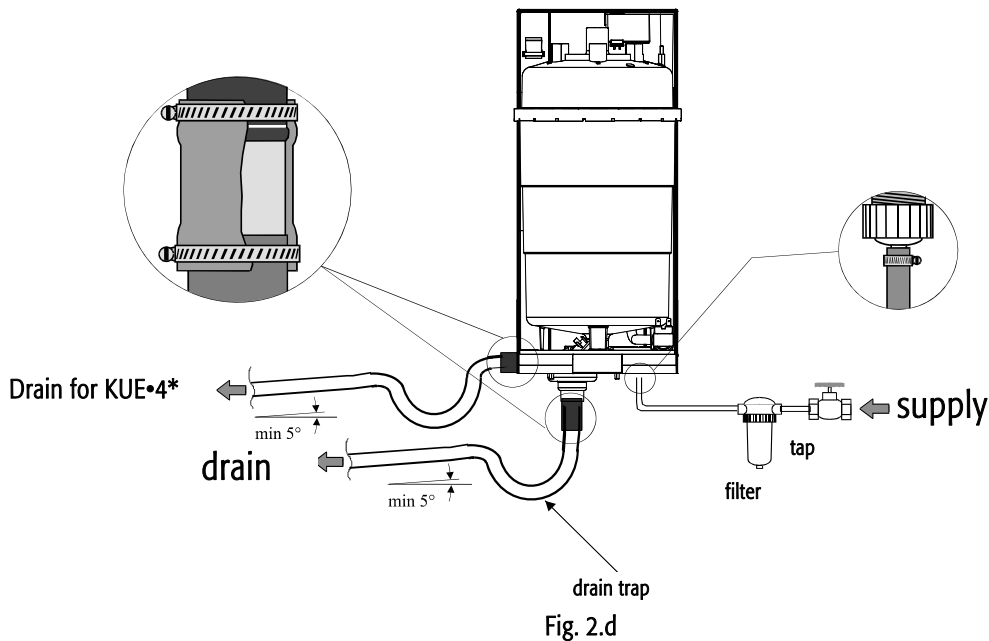
Tab. 2.a

⁽¹⁾ Maximum dimensions with cylinder.

The appliance can be either wall-mounted by using the appropriate fastening holes or installed on bracket so that the water connections can be completed.

2.2 Connecting the hoses

The installation of the humidifier requires the connection to the water supply and drain hoses.



2.3 Drain

	models				
	KUE*R*	KUE*1*	KUE*2*	KUE*3*	KUE*4*
Max. instant drain flow l/min	~ 4	~ 4	~ 4	~ 4	~ 22.5
Darin water attachment (mm)	32	32	32	32	40
Min. ID of the drain hose	25	25	25	25	36

Tab. 2.b

2.4 Supply

	models				
	KUE*R*	KUE*1*	KUE*2*	KUE*3*	KUE*4*
Max. instant supply flow l/min	0.6	0.6	0.6	1.2	4
Supply water attachment	$\frac{3}{4}$ "G Male	$\frac{3}{4}$ "G Male	$\frac{3}{4}$ "G Male	$\frac{3}{4}$ "G Male	$\frac{3}{4}$ "G Male
Min. ID of the sill pipe or hose	6	6	6	6	6

Tab. 2.c

To simplify installation, it is recommended to use the CAREL hose with an inside diameter of 6 mm and an outside diameter of 8 mm (code 1312350APN) and the revolving $\frac{3}{4}$ G connection, either straight (code 9995727ACA) or 90° (code 9995728ACA), available upon request.

A shut-off tap and a mechanical filter should be installed to trap any solid impurities.

The drain water is connected using a section of rubber or plastic hose resistant to 100°C, with a recommended inside diameter of 32 mm or 40 mm for the 25 to 45kg/h models (compliant with DIN 19535, UNI 8451/8452).

The drain connector is suitable for heat sealing with polypropylene drain pipes.

IMPORTANT WARNING: the drain hose must be free, without backpressure and with a drain trap immediately downstream of the connection to the humidifier.

2.5 Checks

The following conditions represent correct water connection:

- installation of a shut-off tap in the supply water line;
- presence of a mechanical filter in the supply water line;
- water temperature and pressure within the allowed values;
- drain hose resistant to temperatures of 100°C;
- minimum inside diameter of the drain hose of 25 mm or 36 mm for the 25 to 45kg/h models;
- minimum slope of the drain hose greater than or equal to 5°;
- electrically **non-conductive** sleeve.
- presence of a drain trap in the drain hose

IMPORTANT WARNING: when installation is completed, flush the supply hose for around 30 minutes by piping the water directly into the drain without sending it into the humidifier. This will eliminate any scale or processing residues that may block the fill valve or cause foam when boiling.

2.6 Installation of the steam hose and condensate return hose

- The connection between humidifier and distributor must be made using a pipe suitable for this purpose, such as the CAREL hose.
- Avoid the formation of pockets or traps where the condensate may accumulate.
- Make sure that the hose is not choked due to tight curves or twisting.
- Fasten the ends of the hose with screw clamps.

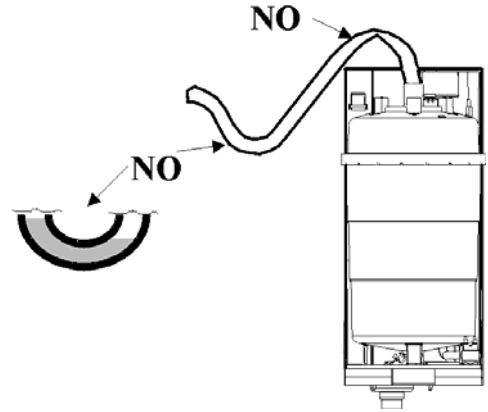


Fig. 2.e

The pipe may run according to either of the two following solutions:

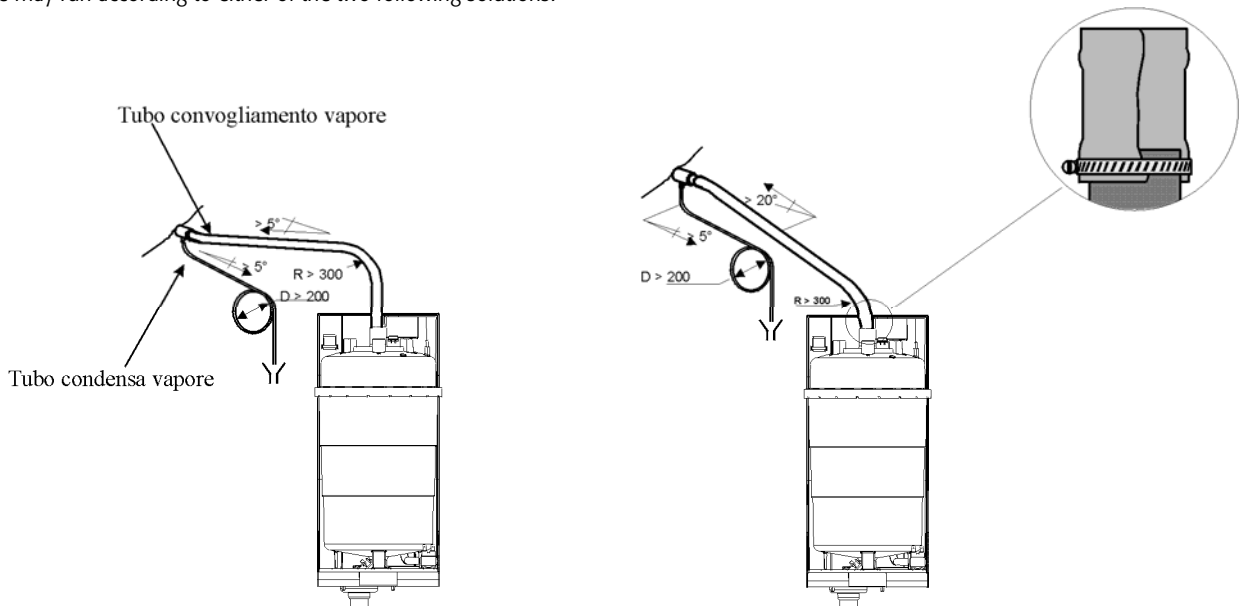


Fig. 2.f

Italian	English
Tubo convogliamento vapore	
Tubo condensa vapore	

IMPORTANT WARNING: the length of the steam pipe should not exceed 4 m.

To allow the drain trap in the steam condensate hose to operate properly, it must be filled with water before starting the humidifier.

2.7 Characteristics of the water

2.7.1 Supply water

The humidifier must be supplied with mains water, with the following characteristics:

- pressure between 0.1 and 0.8 MPa (1 to 8 bar, 14.5 to 116 psi);
- temperature between 1 and 40 °C;
- instant flow rate not lower than the rated fill solenoid valve flow rate (refer to table 2.4.1);
- connection type 3/4" G male.

LIMIT VALUES FOR THE SUPPLY WATER WITH MEDIUM-HIGH CONDUCTIVITY IN AN IMMERSED ELECTRODE HUMIDIFIER

Hydrogen ions	pH	-	
Specific conductivity at 20°C	$\sigma_{R, 20^{\circ}\text{C}}$	-	$\mu\text{S}/\text{cm}$
Total dissolved solids	TDS	-	mg/l
Dry residue at 180°C	R_{180}	-	mg/l
Total hardness	TH	-	mg/l CaCO_3
Temporary hardness		-	mg/l CaCO_3
Iron + Manganese		-	mg/l Fe + Mn
Chlorides		-	ppm Cl
Silica		-	mg/l SiO_2
Residual chlorine		-	mg/l Cl
Calcium sulphate		-	mg/l CaSO_4
Metallic impurities		-	mg/l
Solvents, diluents, soaps, lubricants		-	mg/l

LIMITS	
Min	Max
7	8.5
300	1250
(¹)	(¹)
(¹)	(¹)
100(²)	400
60(²)	300
0	0.2
0	30
0	20
0	0.2
0	100
0	0
0	0

Tab. 2.d

(¹) Values depending on specific conductivity; in general: $\text{TDS} \cong 0.93 * \sigma_{20}$, $R_{180} \cong 0.65 * \sigma_{20}$

(²) not lower than 200% of the chloride content in mg/l of Cl

(³) not lower than 300% of the chloride content in mg/l of Cl

LIMIT VALUES FOR THE SUPPLY WATER WITH MEDIUM-LOW CONDUCTIVITY IN AN IMMERSED ELECTRODE HUMIDIFIER

Hydrogen ions	pH	-	
Specific conductivity at 20°C	$\sigma_{R, 20^{\circ}\text{C}}$	-	$\mu\text{S}/\text{cm}$
Total dissolved solids	TDS	-	mg/l
Dry residue at 180°C	R_{180}	-	mg/l
Total hardness	TH	-	mg/l CaCO_3
Temporary hardness		-	mg/l CaCO_3
Iron + Manganese		-	mg/l Fe + Mn
Chlorides		-	ppm Cl
Silica		-	mg/l SiO_2
Residual chlorine		-	mg/l Cl
Calcium sulphate		-	mg/l CaSO_4
Metallic impurities		-	mg/l
Solvents, diluents, soaps, lubricants		-	mg/l

LIMITS	
Min	Max
7	8.5
125	500
(¹)	(¹)
(¹)	(¹)
50(²)	250
30(²)	150
0	0.2
0	20
0	20
0	0.2
0	60
0	0
0	0

Tab. 2.e

(¹) Values depending on specific conductivity; in general: $\text{TDS} \cong 0.93 * \sigma_{20}$, $R_{180} \cong 0.65 * \sigma_{20}$

(²) not lower than 200% of the chloride content in mg/l of Cl

(³) not lower than 300% of the chloride content in mg/l of Cl

Warning: no relation can be demonstrated between water hardness and conductivity.

IMPORTANT WARNING: do not treat water with softeners! This could cause corrosion of the electrodes or the formation of foam, leading to potential operating problems or failures.

Avoid:

- using well water, industrial water or water drawn from cooling circuits; in general, avoid using potentially contaminated water, either from a chemical or bacteriological point of view;
- adding disinfectants or corrosion inhibitors to water, as these substances are potentially irritant.

2.8 Drain water

Inside the humidifier the water boils and is transformed into steam, without the addition of any substances. The drain water, as a result, contains the same substances that are dissolved in the supply water, yet in greater quantities, depending on the concentration in the supply water and the set draining cycles, and **may reach temperatures of 100°C**. Not being toxic, it may be drained into the sewage system. The drain connector has an external diameter of 32 mm.

3. OEM WITH FRAME (only 24Vac fill and drain valves or with 24Vac fill valve and 230Vac drain pump)

3.1 Introduction

This is a special OEM version fitted on a frame, with a pre-wired control board, switch and drain button.

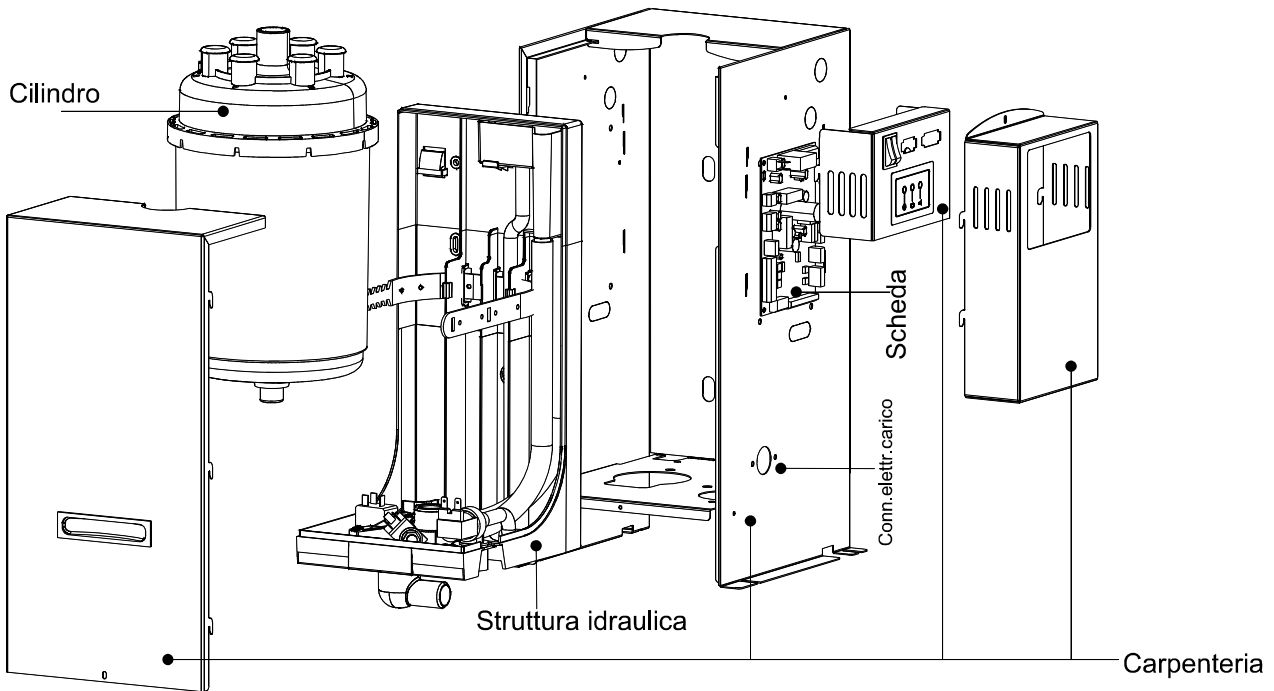


Fig. 3.a

Italian	English
Cilindro	Cylinder
Struttura idraulica	Water circuit support structure
Conn. elett. carico	Fill elect. conn.
Scheda	Board
Carpenteria	Frame

3.2 Frame

The humidifiers are supplied with a compact, openable, hot galvanised metal frame, complete with handle and screw closing. The frame includes a case for housing the control board

3.3 Control board

The controller used for these OEM units is the CP4 with microprocessor, complete with software for immersed electrode humidifiers:

- Type of configuration, ON/OFF or 0 to 10 V proportional;
- Built-in current sensor;
- 24 Vac power supply;
- AFS antifoam algorithm;
- Possibility of remote ON/OFF (AB-AB);
- Outputs: 1 x 250 Vac relay, 5 Amp (2 Amp) for electrode power supply;
- 1 x 250 Vac relay, 5 Amp (2 Amp) for alarm output;
- Possibility of RS485 serial connection (optional TACP485000);
- Can be configured using the HUMISET000 programming kit.

3.4 Water fill

The fill solenoid valve with $\frac{3}{4}$ "G male connector is located on the right side of the frame, with the measurements shown in table 2.1.1 (LC3, LC4), so as to make this accessible for cleaning the filter on the solenoid valve when the unit is installed.

3.5 Drain

Drain assembly made up of a manifold and drain solenoid valve with 90° connector and 32 mm diameter fitting, with the possibility to replace the drain with a straight pipe, supplied.

3.6 Water circuit

Water circuit with supply tank plus conductivity meter and cylinder fill, drain and overflow hoses.

3.7 Structure

Back made from polypropylene reinforced with fibreglass, cylinder secured by convenient strap closing system.

3.8 Switch and manual drain button

The humidifier is fitted with a switch from turning the unit on/off and a button for the manual drain function.

3.9 External connections

The unit can be managed externally via 2 connectors:

- a four pin connector used to control a phase of the power supply to the external power contactor coil (terminals 1,2) and for the 24 Vac power supply to the auxiliary circuits (terminals 3, 4);
- the second 3 pin connector is used for the connection to the probe (see diagram 4.7).

3.10 Power cable

The power cable is 3 metres long, is flame retardant and is supplied with a rubber cable gland. One end has special cable terminals for connection to the cylinder, and the other end is free.

3.11 Current transformer (TAM)

This is fitted on the control board, and monitors one of the phases of the power supply to measure the current.

3.12 LED panel

The operation the humidifier is displayed using a panel fitted with coloured LEDs, with the following meanings

green: power present

yellow: steam production in progress

red: alarm signal

These events are indicated by sequences of flashes; for the meanings see the instruction sheet +050003765.

3.13 Technical specifications

Steam production, weights and dimensions see Chap. 2.

The index of protection is IP20.

4. ELECTRICAL CONNECTIONS (WITH CAREL CONTROLLER, MODEL CP)

Before making the connections, make sure that the unit is disconnected from the mains power supply. For further information on the controller, refer to the corresponding instruction sheet.

4.1 Single-phase wiring diagram, EXTERNAL TAM (CP1 *)

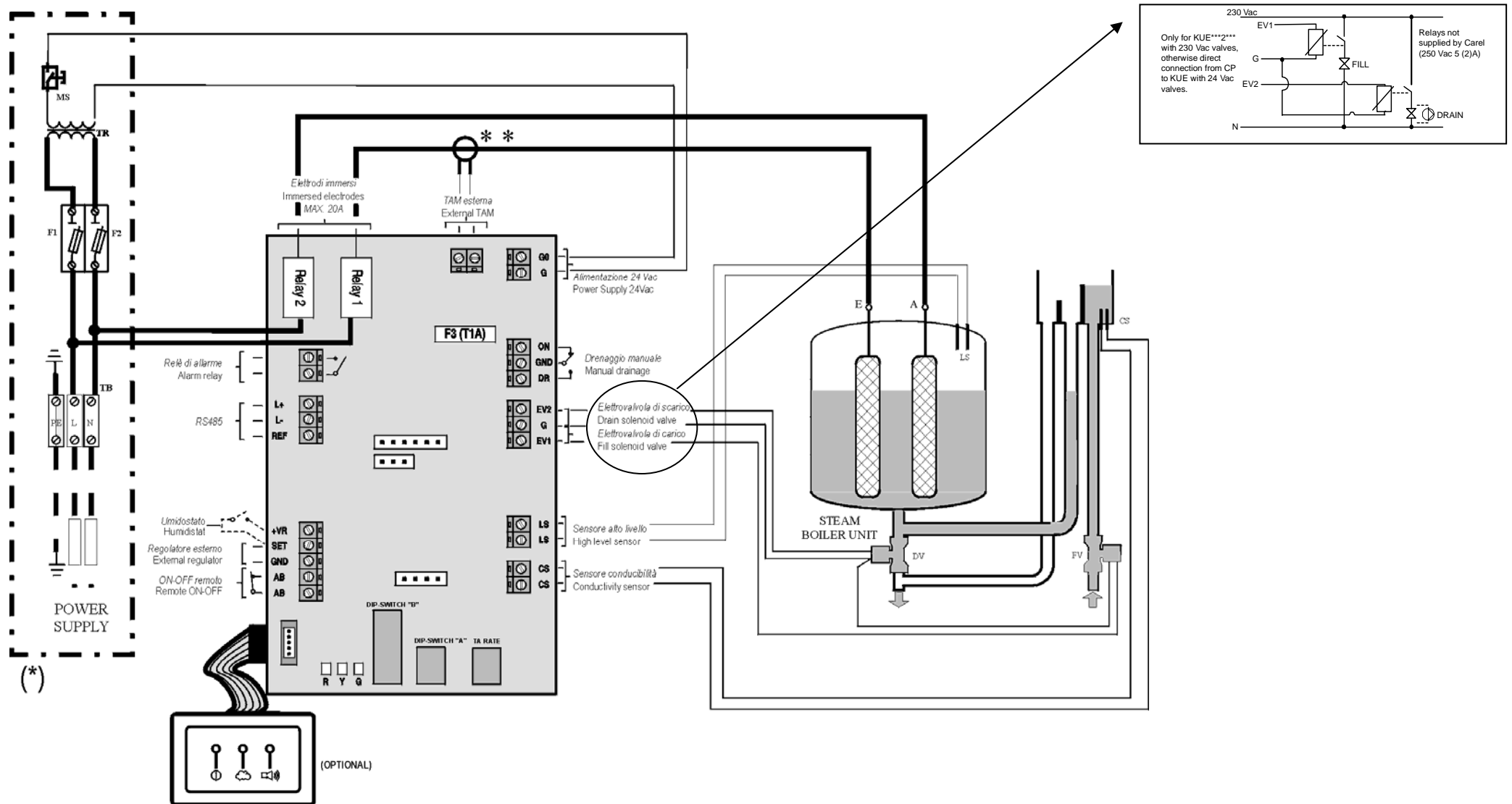


Fig. 4.a

(*) material not supplied by CAREL;

(**) refer manual +050003765

4.2 Single-phase wiring diagram, INTERNAL TAM (CP2 *)

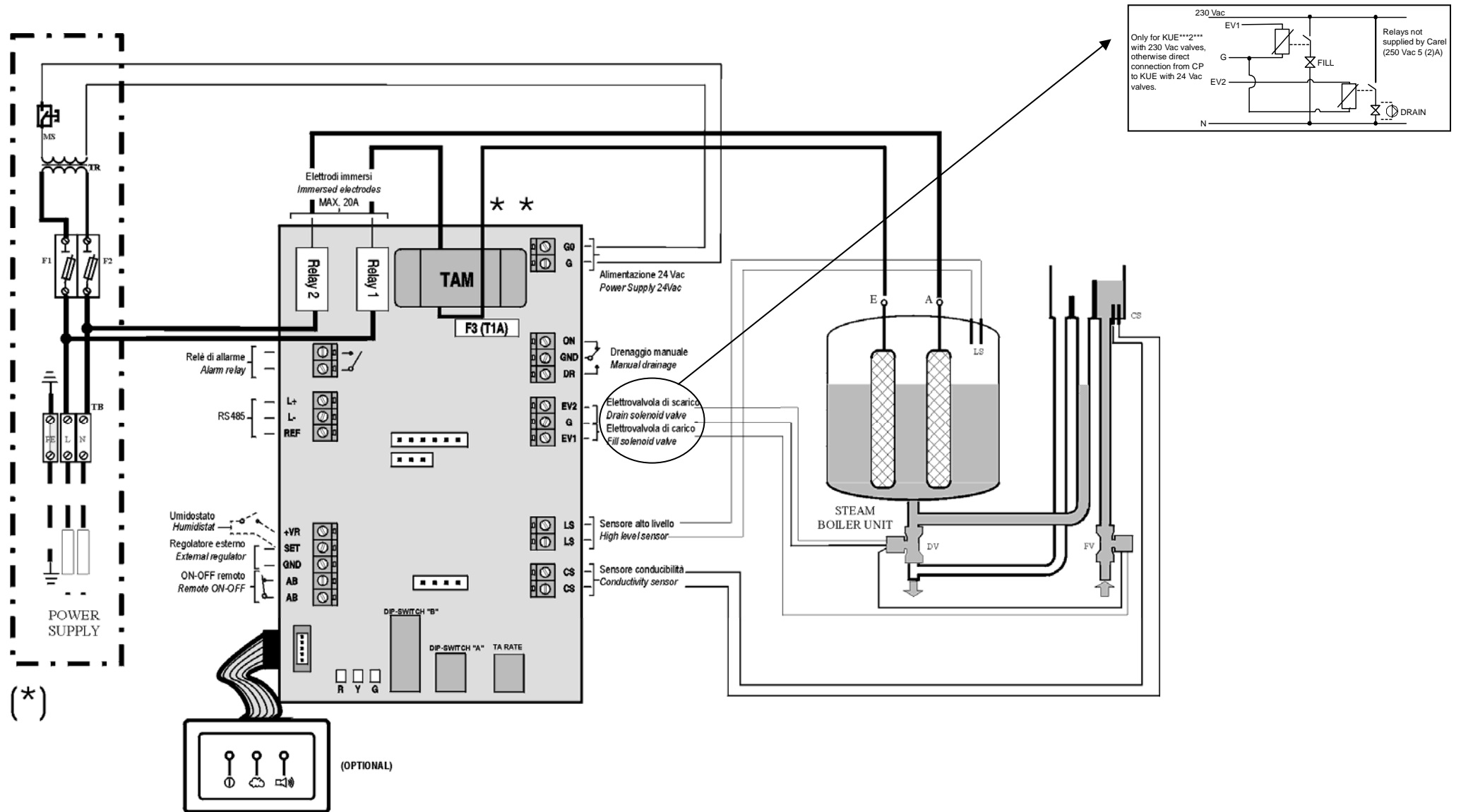


Fig. 4.b

(*) material not supplied by CAREL;

(**) refer manual +050003765

4.3 Single-phase wiring diagram, INTERNAL TAM with contactor (CP4 *)

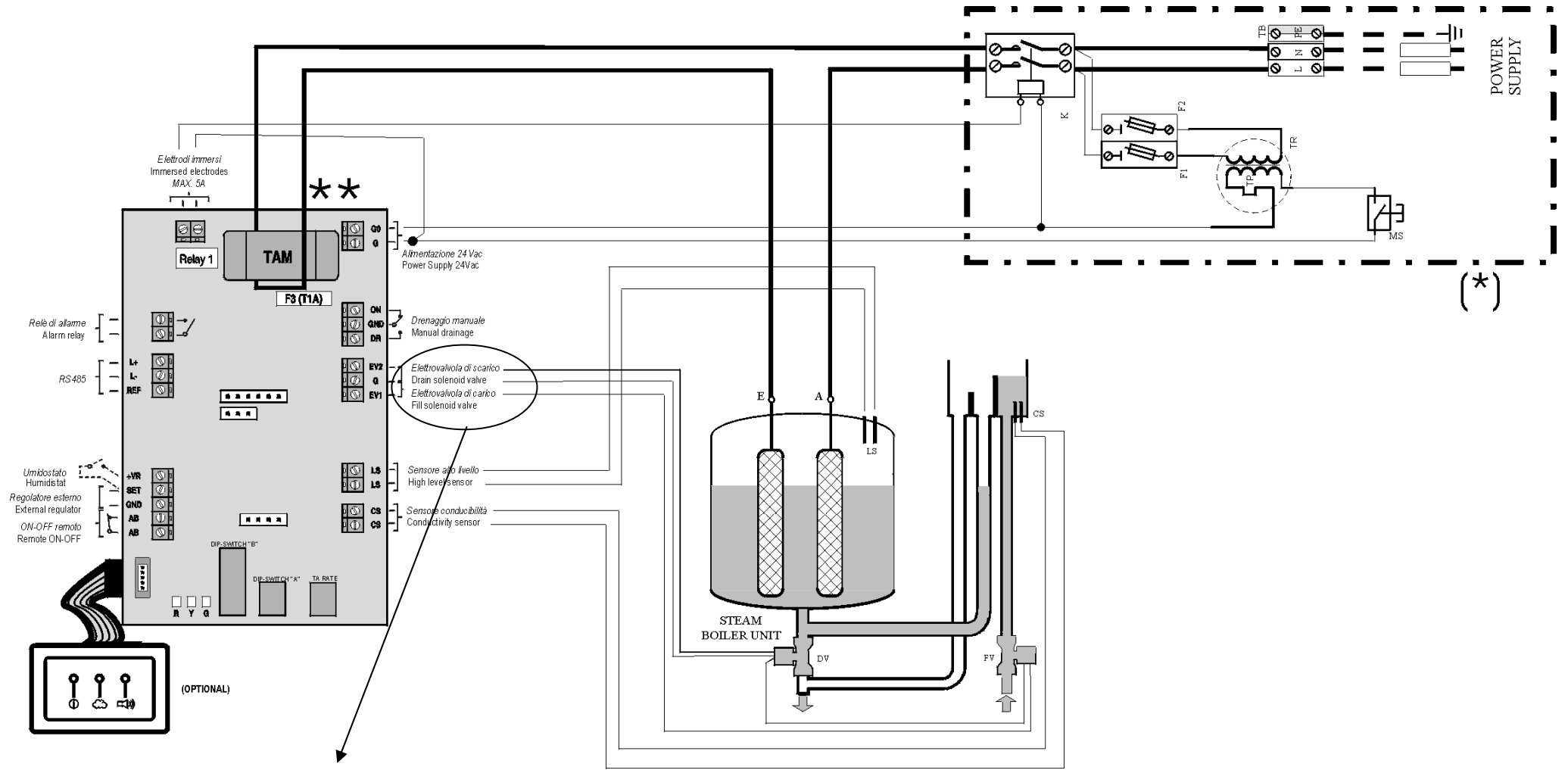
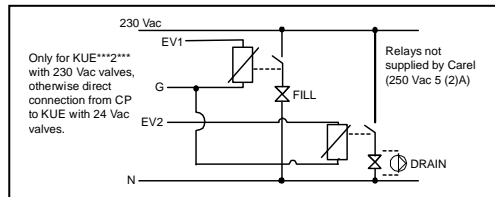


Fig. 4.c



(*) material not supplied by CAREL;
 (**) refer manual +050003765

4.4 Single-phase wiring diagram, EXTERNAL TAM with contactor (CP3 *)

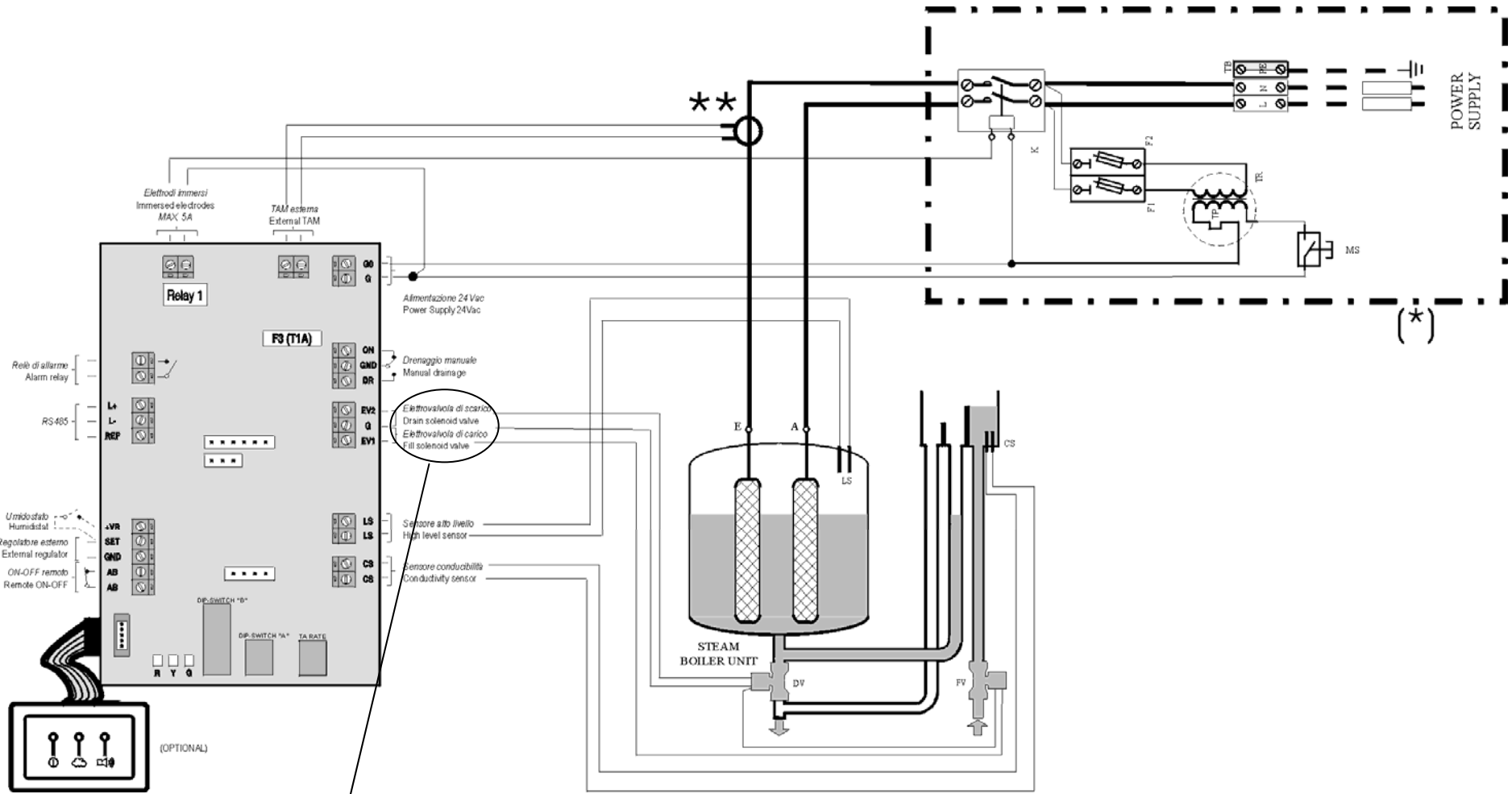
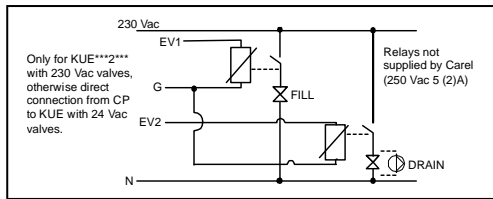


Fig. 4.d



Only for KUE***2** with 230 Vac valves, otherwise direct connection from CP to KUE with 24 Vac valves.
 Relays not supplied by Carel (250 Vac 5 (2)A)

(*) material not supplied by CAREL;
 (***) refer manual +050003765

4.5 Three-phase wiring diagram, EXTERNAL TAM with contactor (CP3 *)

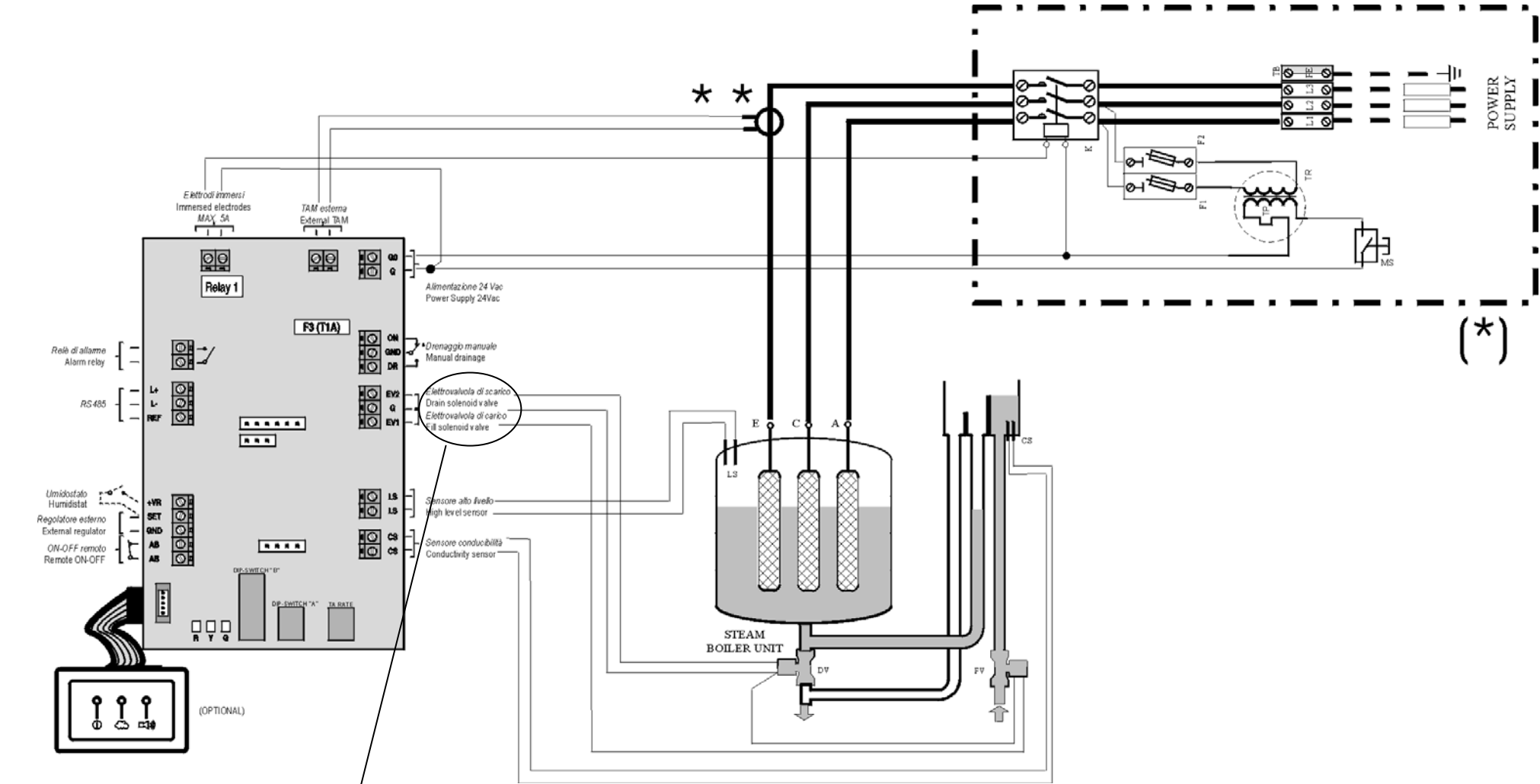
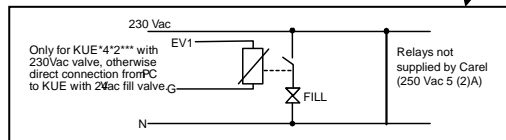


Fig. 4.e



(*) material not supplied by CAREL;
 (**) refer manual +050003765

4.6 Three-phase wiring diagram, INTERNAL TAM with contactor (CP4 *)

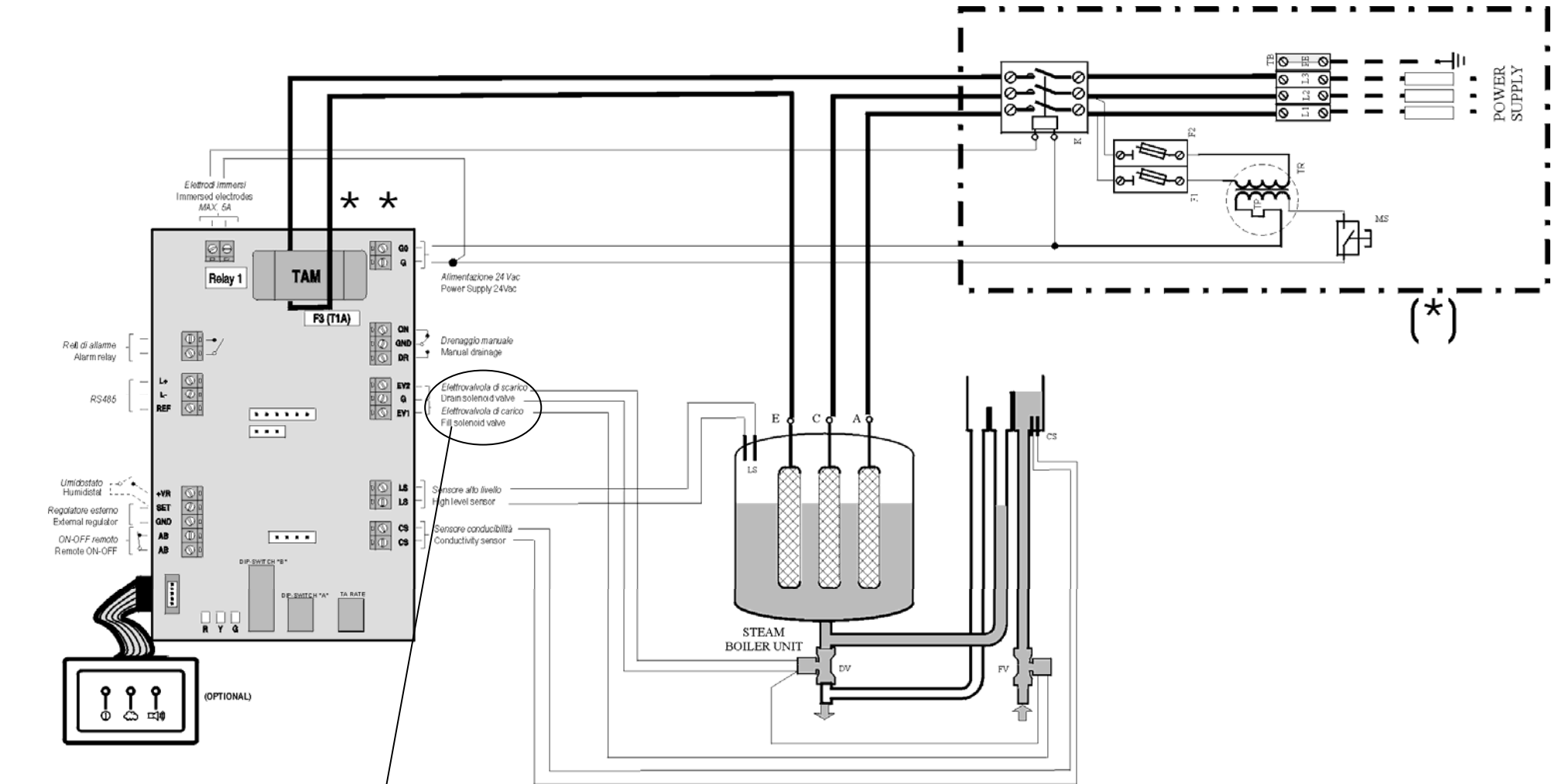
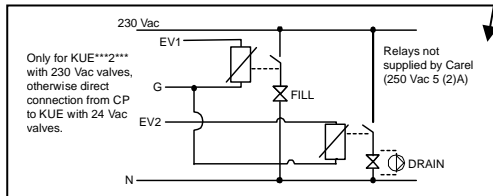


Fig. 4.f



(*) material not supplied by CAREL;
 (**) refer manual +050003765

4.7 Three-phase wiring diagram, KUE with frame, INTERNAL TAM with contactor (CP4 *)

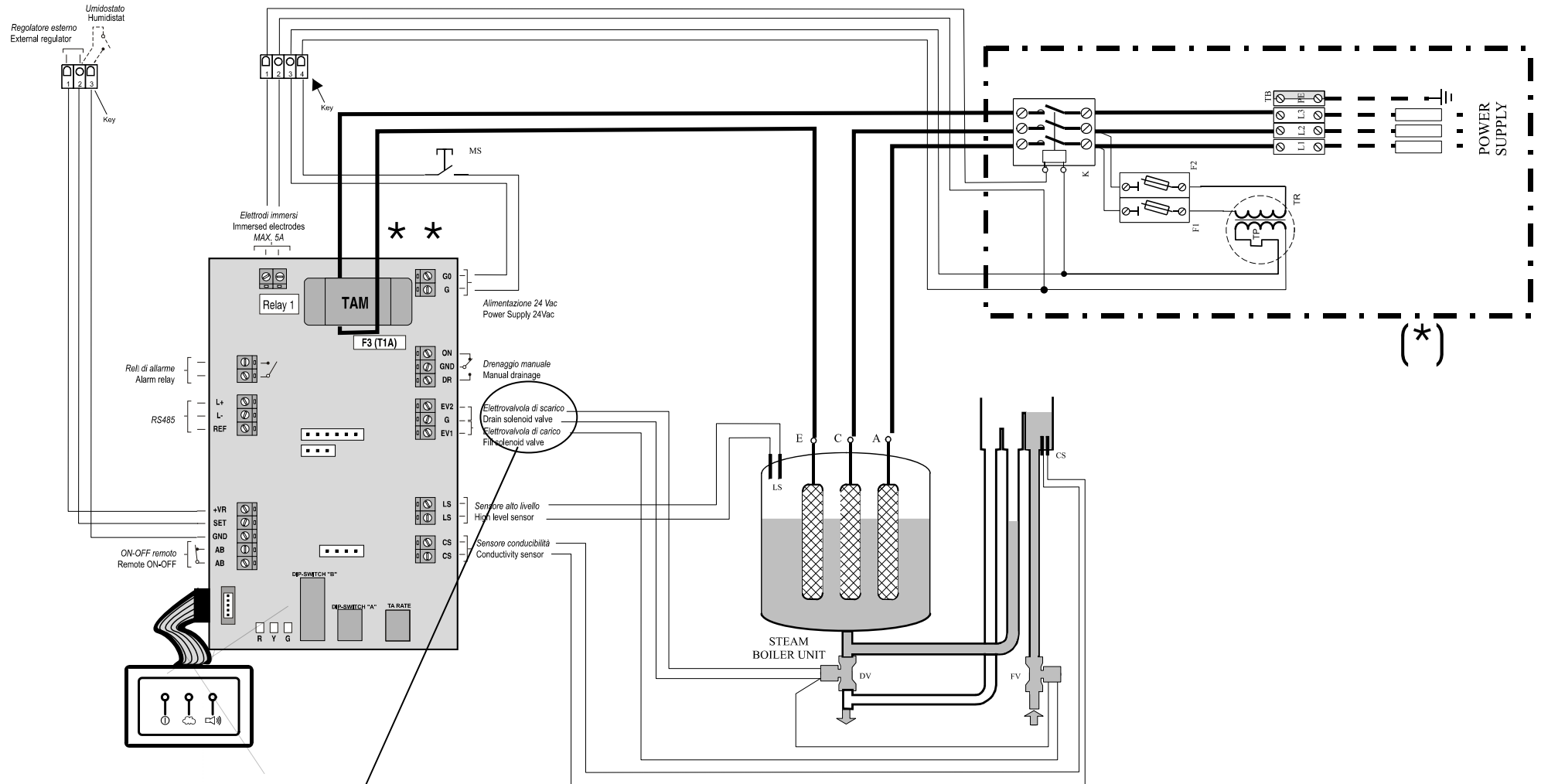
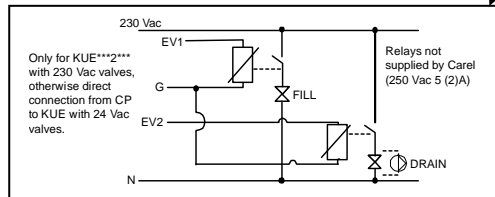


Fig. 4.g



(*) material not supplied by CAREL;
 (** refer manual +050003765

4.8 Single-phase wiring diagram, KUE with frame, INTERNAL TAM with contactor (CP4 *)

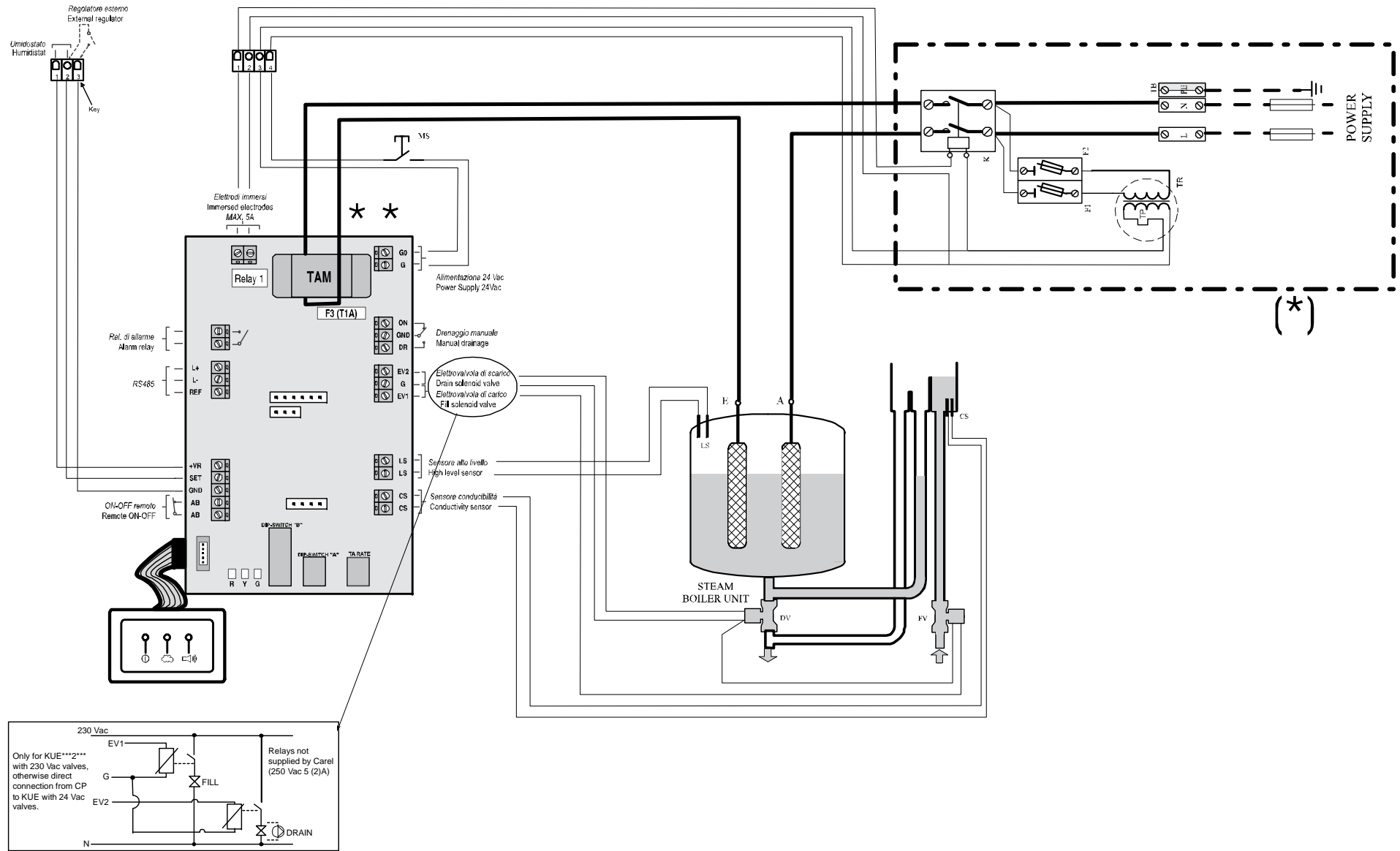


Fig. 4.h

(*) material not supplied by CAREL;
 (**) refer manual +050003765

4.9 Three-phase wiring diagram, EXTERNAL TAM with contactor (CP3 *) for KUE*4

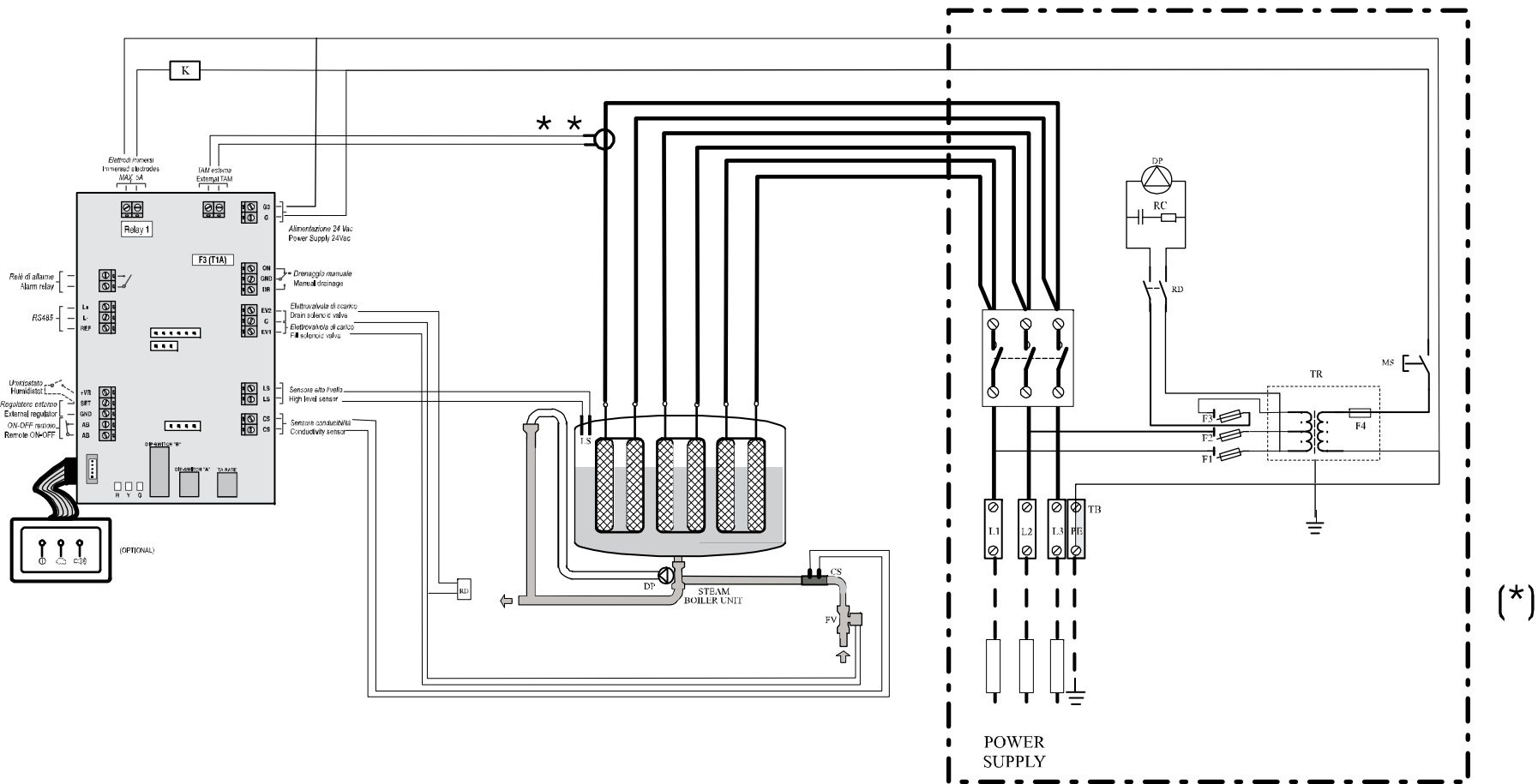
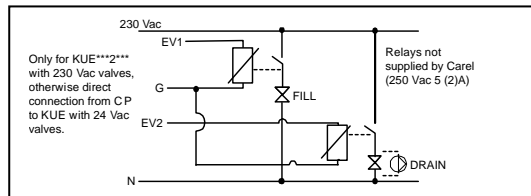


Fig. 4.i



(*) material not supplied by CAREL;
 (**) refer manual +050003765

5. STARTING, CONTROL AND SHUTDOWN

IMPORTANT WARNINGS:

1. Before starting the unit, check that the humidifier is in good condition, that there are no water leaks and that the electrical parts are dry.
2. Do not power the appliance if it is damaged or even partially wet!

When installation is completed, flush the supply hose for around 30 minutes by piping the water directly into the drain without sending it into the humidifier. This will eliminate any scale or processing residues that may block the fill valve or cause foam when boiling.

5.1 Preliminary checks

Before starting the humidifier, check that:

- the water and electrical connections and the steam distribution system have been completed according to the instructions contained in this manual;
- the water shut-off tap to the humidifier is open;
- the line fuses are installed and intact;
- terminals AB on the CP control board are jumpered or connected to the remote ON/OFF contact; also check that the ON/OFF contact is closed;
- the steam outlet pipe is not choked.

5.2 Starting

5.2.1 Starting with an empty cylinder

This phase will be performed automatically when the unit is started: the rated production will be reached after a certain time (this time depends considerably on the conductivity of the supply water and may last a number of some hours).

6. MAINTENANCE AND SPARE PARTS

6.1 Replacing the cylinder

IMPORTANT WARNING: the cylinder may be hot. Allow it to cool before touching it or use protective gloves.

To access the cylinder:

- completely drain the water contained in the cylinder;
- turn the appliance off and open the mains power disconnecting switch (**safety procedure**);
- open and remove the cover;
- remove the steam hose from the cylinder;
- disconnect the electrical connections from the top of the cylinder;
- release the cylinder from the fastening device and lift it up to remove it;
- fit the new cylinder in the humidifier by performing the previous operations in reverse.

Cylinder maintenance (refer to cylinders instruction sheet)

The life of the cylinder depends on a number of factors, including: the complete filling with lime scale and/or the partial or complete corrosion of the electrodes, the correct use and sizing of the humidifier, the output, and the quality of the water, as well as careful and regular maintenance. Due to the aging of the plastic and the consumption of the electrodes, even an openable steam cylinder has a limited life, and it is therefore recommended to replace it after 5 years or 10,000 operating hours.

Important warnings

The humidifier and its cylinder contain live electrical components and hot surfaces, and therefore **all service and/or maintenance operations must be performed by expert and qualified personnel, who are aware of the necessary precautions**. Before performing any operations on the cylinder, check that the humidifier is disconnected from the power supply; carefully read and follow the instructions contained in the humidifier manual. Remove the cylinder from the humidifier only after having drained it completely using the corresponding button. Check that the model and the power supply voltage of the new cylinder correspond to the data on the rating plate.

Periodical checks

- **After one hour of operation**

For both disposable and openable cylinders, check that there are no significant water leaks

- **Every fifteen days or no more than 300 operating hours**

For both disposable and openable cylinders check operation, that there are no significant water leaks and the general condition of the container. Check that during operation there are no arcs or sparks between the electrodes.

- **Every three months or no more than 1000 operating hours**

For disposable cylinders, check operation, that there are no significant water leaks and, if necessary, replace the cylinder; for openable cylinders, check that there are no markedly blackened parts of the container: if this is the case, check the condition of the electrodes, and if necessary replace them together with the O-rings and the cover gasket.

- **Annually or no more than 2500 operating hours**

For disposable cylinders, replace the cylinder; for openable cylinders check operation, that there are no significant water leaks, the general conditions of the container, check that there are no markedly blackened parts of the container: if this is the case, check the condition of the electrodes, and if necessary replace them together with the O-rings and the cover gasket.

- **After five years or no more than 10,000 operating hours**

For both disposable and openable cylinders, replace the cylinder.

After extended use or alternatively when using water with a high salt content, the solid deposits that naturally form on the electrodes may reach the stage where they also stick to the inside wall of the cylinder; in the event of especially conductive deposits, the consequent heat produced may overheat the plastic and melt it, and, in more severe cases, puncture the cylinder, allowing water to leak back into the tank.

As a precaution, check, at the frequency recommended further on, the deposits and the blackening of the wall of the cylinder, and replace the cylinder if necessary.

CAUTION: always disconnect the appliance before touching the cylinder in the event of leaks, as current may be passing through the water.

6.2 Maintenance of the other components in the water circuit

IMPORTANT WARNINGS:

- when cleaning the plastic components do not use detergents or solvents;
- scale can be removed using a solution of 20% acetic acid and then rinsing with water.

The steam humidifier has just one part that requires periodical replacement: **the steam production cylinder.**

This operation is necessary when the lime scale deposits that form inside the cylinder prevent the sufficient passage of current. This situation is displayed on the controller by an alarm signal. The frequency of this operation depends on the supply water: the higher the content of salts or impurities, the more frequently the cylinder will need replacing.

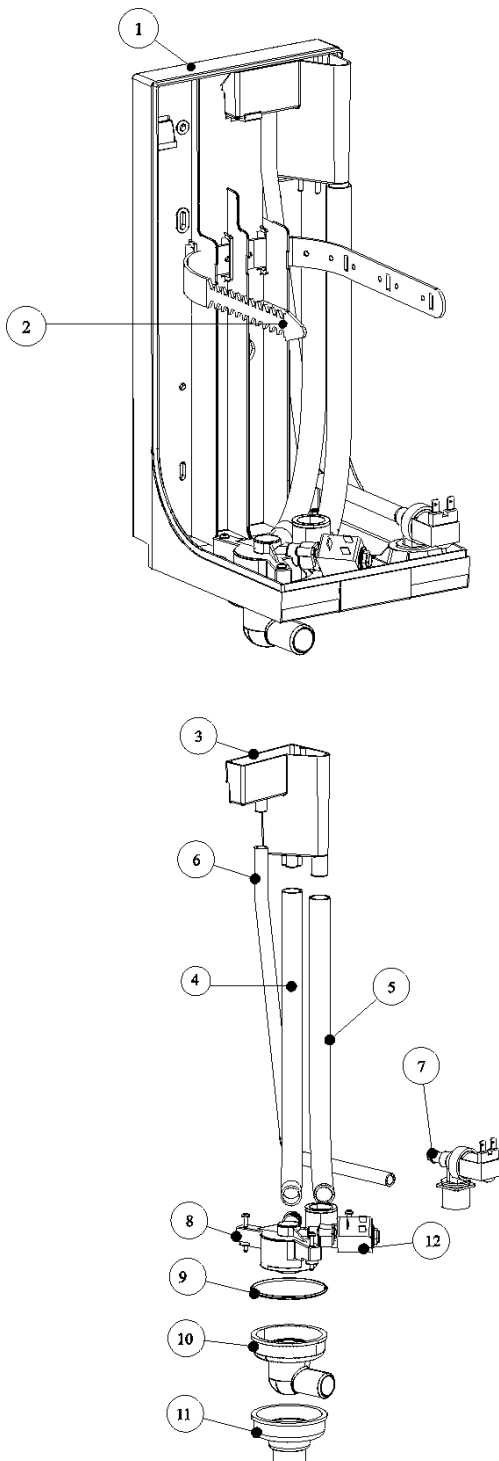


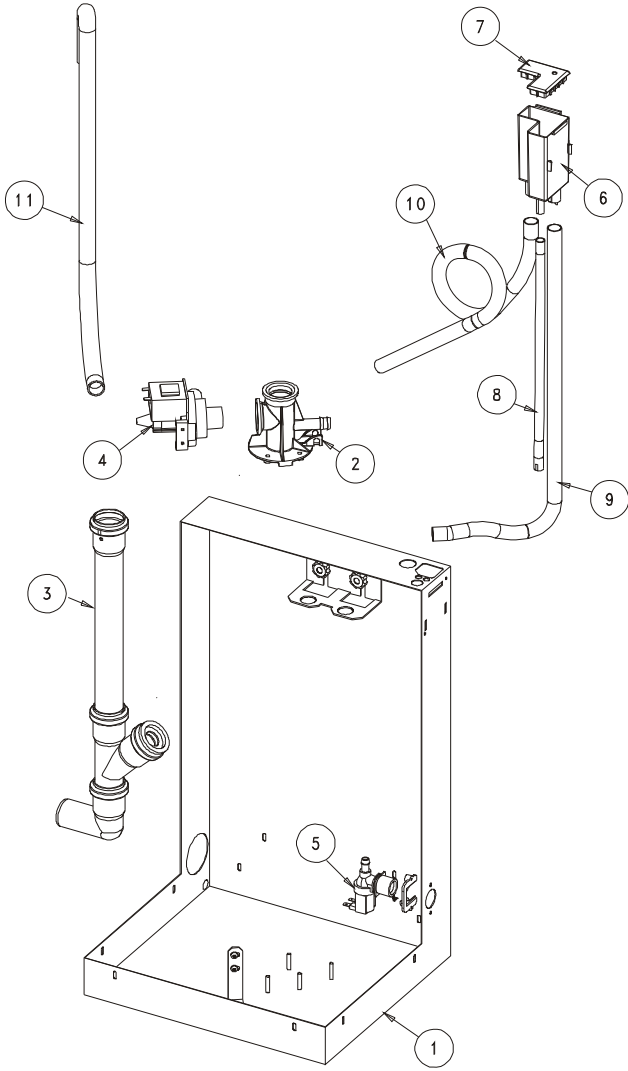
Fig. 6.a

no	description	Order code
1	Load-bearing frame	
2	Cylinder locking strap	18C499A006
3	Supply tank + conductivity meter	13C119A003
4	Overflow pipe	UEKT00000*
5	Cylinder fill hose	
6	Tank fill hose	
7	Fill solenoid valve (24 Vac)	KITVC000** (rif. Tab. 6.d)
7 bis	Fill solenoid valve (230 Vac)	KITVC020** (rif. Tab. 6.d)
8	Fill/Drain group	13C499A030
9	Gasket	KITRACC000
10	90° drain connector	
11	Straight drain connector (supplied)	
12	Drain solenoid valve (24 Vac)	13C499A030
12 bis	Drain solenoid valve (230 Vac)	13C499A044

Tab. 6.a

* for the complete codes see Table 5.4.1.1 and 5.4.3.1 "SPARE PARTS"

- **Fill solenoid valve** (Fig. 6.a, part no. 7, 5)
After having disconnected the cables and the pipe, remove the solenoid valve and check the condition of the inlet filter; clean if necessary using water and a soft brush.
- **Supply and drain manifold** (Fig. 6.a, part no. 8, 2)
Check that there are no solid residues in the cylinder attachment, remove any impurities.
Check that the seal (O-ring) is not damaged or cracked; if necessary, replace it.
- **Drain solenoid valve / drain pump** (Fig. 6.a, part no. 12, 4)
Disconnect the power supply, remove the coil, unscrew the fastening screws and remove the valve body; remove any impurities and rinse.
- **Supply tank + conductivity meter** (Fig. 6.a, part no. 3, 6)
Check that there are no obstructions or solid particles and that the electrodes for measuring the conductivity are clean, remove any impurities and rinse.
- **Supply, fill, overflow pipes** (Fig. 6.a, part no. 4, 5, 6 – 8, 9, 10, 11)
Check that these are free and do not contain impurities; remove any impurities and rinse.



no	description	Order code
1	Load-bearing frame	
2	Supply/drain manifold	18C499A001
3	Drain circuit	13C499A034
4	Drain pump	KITPSE0000
5	Fill solenoid valve (24 vac)	KITVC00040
5 bis	Fill solenoid valve (230 vac)	KITVC02040
6	Supply tank	UEKVASC000
7	Supply tank cover	
8	Tank fill hose	
9	Cylinder fill hose	UEKT0000XL
10	Overflow pipe	
11	Corrugated drain pipe	13C479A001

Table 6.b

IMPORTANT WARNING: after having replaced or checked the parts in the water circuit, check that the connections have been carried out correctly and the corresponding seals have been used. Re-start the unit and perform a number of fill and drain cycles (from 2 to 4), then, applying the safety procedure, check for any water leaks.

6.3 Component replacement

6.3.1 Fuses in the auxiliary circuits

models	KUES*	KUETR*	KUET1*	KUET2*	KUET3*	KUET4*
fuses F1-F 2	1 A, GL, 10.3 x 38 in fuse carrier on DIN rail (0605319AXX)					
fuse F3 (pump)						1 A, fast-blow 10.3 x 38 in fuse carrier on DIN rail (0605319AXX)
fuse 3 ***	1 A, T, 5x20					

Table 6.c

***: only on the CP control board.

6.4 Spare parts

6.4.1 SINGLE-PHASE humidifiers:

Standard spare parts

	model	KUESR*	KUES1*	KUES2*	KUES3*
Water circuit					
cylinder locking strap		18C499A006	18C499A006	18C499A006	18C499A006
supply tank + conductivity meter		13C119A003	13C119A003	13C119A003	13C119A003
fill solenoid valve kit (24 Vac)		KITVC00006	KITVC00006	KITVC00006	KITVC00012
drain solenoid valve kit (24 Vac)		13C499A030	13C499A030	13C499A030	13C499A030
fill solenoid valve kit (230 Vac)		KITVC02008	KITVC02008	KITVC02008	KITVC02012
drain solenoid valve kit (230 Vac)		13C499A044	13C499A044	13C499A044	13C499A044
drain fittings kit		KITRACC000	KITRACC000	KITRACC000	KITRACC000
internal hose kit *		UEKT00000S	UEKT00000S	UEKT00000S	UEKT00000S

Sealed cylinders					
200 to 230 VAC 1~, conductivity 350 to 1250 µS/cm		BLOSRF00H1	BLOS1F00H1	BLOS2F00H0	BLOS3F00H0

Electronics	
control board ver. CP **	CP**
control board ver. CPY **	CPY**

Table 6.d

** : specify kg/h, power supply, options

* : hoses must be cut to the required size before installation

6.4.2 Spare parts for special applications

The following spare parts are supplied separately from the standard humidifier, therefore they must be ordered separately.

	model	KUESR*	KUES1*	KUES2*	KUES3*
Sealed cylinders					
200 to 230 VAC 1~, conductivity 125 to 350 µS/cm		BLOSRE00H1	BLOS1E00H1	BLOS2E00H0	BLOS3E00H0

Table 6.e

6.4.3 THREE-PHASE humidifiers:

Standard spare parts

MODEL	KUETR*	KUET1*	KUET2*	KUET3*	KUET4* 25kg/h	KUET4* 35kg/h	KUET4* 45kg/h≥400V
Water circuit							
cylinder locking strap	18C499A006	18C499A006	18C499A006	18C499A006	--	--	--
supply tank + conductivity meter	13C119A003	13C119A003	13C119A003	13C119A003	18C453A008	18C453A008	18C453A008
fill solenoid valve kit (24 Vac)	KITVC00006	KITVC00006	KITVC00006	KITVC00012	KITVC00040	KITVC00040	KITVC00040
drain solenoid valve kit (24 Vac)	13C499A030	13C499A030	13C499A030	13C499A030	KITPSE0000	KITPSE0000	KITPSE0000
fill solenoid valve kit (230 Vac)	KITVC02008	KITVC02008	KITVC02008	KITVC02012	KITVC02040	KITVC02040	KITVC02040
drain solenoid valve kit (230 vac)	13C499A044	13C499A044	13C499A044	13C499A044	KITPSE0000	KITPSE0000	KITPSE0000
drain fittings kit	KITRACC000	KITRACC000	KITRACC000	KITRACC000	--	--	--
internal hose kit *	UEKT00000S	UEKT00000S	UEKT00000M	UEKT00000M	UEKT0000XL	UEKT0000XL	UEKT0000XL

Sealed cylinders							
200 to 230 VAC 3~, conductivity 350 to 1250µS/cm	BLOTRB00H1	BLOT1B00H1	BLOT2B00H0	BLOT3B00H0	BLOT4C00H0	BLOT4B00H0	--
400 VAC 3~, conductivity 350 to 750 µS/cm	--	BLOT1C00H0	BLOT2C00H0	BLOT3C00H0	--	--	--
400 VAC 3~, conductivity 350 to 1250 µS/cm	BLOTRD00H0	--	--	--	BLOT4D00H0	BLOT4D00H0	BLOT4C00H0

Electronics	
control board ver. CP **	CP**
control board ver. CPY **	CPY**

Table 6.f

** : specify kg/h, power supply, options

* : hoses must be cut to the required size before installation

6.4.4 Spare parts for special applications

The following spare parts are supplied separately from the standard humidifier, therefore they must be ordered separately.

MODEL	KUETR*	KUET1*	KUET2*	KUET3*	KUET4* (25kg/h)	KUET4* (35kg/h)	KUET4* (45kg/h≥400V)
Sealed cylinders							
200 to 230 VAC 3~, conductivity 125 to 350 µS/cm	BL0TRA00H1	BL0T1A00H1	BL0T2A00H0	BL0T3A00H0	BL0T4B00H0	BL0T4B00H0	
400 VAC 3~, conductivity 125 to 350 µS/cm	BL0TRC00H1	BL0T1A00H1	BL0T2B00H0	BL0T3B00H0	BL0T4C00H0	BL0T4C00H0	BL0T4B00H0
400 VAC 3~, conductivity 350 to 750 µS/cm	BL0TRD00H1	BL0T1C00H1	BL0T2C00H0	BL0T3C00H0	BL0T4D00H0	BL0T4D00H0	BL0T4C00H0
400 VAC 3~, conductivity 750 to 1250 µS/cm	BL0TRD00H1	BL0T1D00H1	BL0T2D00H0	BL0T3D00H0	BL0T4D00H0	BL0T4D00H0	BL0T4D00H0
460 VAC 3~, conductivity 125 to 350 µS/cm	BL0TRL00H1	BL0T1B00H1	BL0T2C00H0	BL0T3C00H0	BL0T4D00H0	BL0T4C00H0	BL0T4C00H0
460 VAC 3~, conductivity 350 to 1250 µS/cm	BL0TRM00H1	BL0T1D00H1	BL0T2D00H0	BL0T3D00H0	BL0T4D00H0	BL0T4D00H0	BL0T4D00H0
575 VAC 3~, conductivity 125 to 350 µS/cm	--	--	BL0T2C00H0	BL0T3C00H0	BL0T4D00H0	BL0T4D00H0	BL0T4D00H0
575 VAC 3~, conductivity 350 to 1250 µS/cm	--	--	BL0T2D00H0	BL0T3D00H0	BL0T4D00H0	BL0T4D00H0	BL0T4D00H0

Openable cylinders							
200 to 230 VAC 3~, conductivity 125 to 350 µS/cm	BLCTRA00W1	BLCT1A00W1	BLCT2A00W0	BLCT3A00W0	BLCT4B00W0	BLCT4B00W0	
200 to 230 VAC 3~, conductivity 350 to 1250 µS/cm	BLCTR800W1	BLCT1B00W1	BLCT2B00W0	BLCT3B00W0	BLCT4C00W0	BLCT4B00W0	
400 VAC 3~, conductivity 125 to 350 µS/cm	BLCTRC00W1	BLCT1A00W1	BLCT2B00W0	BLCT3B00W0	BLCT4C00W0	BLCT4C00W0	BLCT4B00W0
400 VAC 3~, conductivity 350 to 750 µS/cm	BLCTRD00W1	BLCT1C00W1	BLCT2C00W0	BLCT3C00W0			
400 VAC 3~, conductivity 350 to 1250 µS/cm	BLCTRD00W1				BLCT4D00W0	BLCT4D00W0	BLCT4C00W0
400 VAC 3~, conductivity 750 to 1250 µS/cm		BLCT1D00W1	BLCT2D00W0	BLCT3D00W0			
460/575 VAC 3~, conductivity 125 to 350 µS/cm			BLCT2C00W0	BLCT3C00W0	BLCT4D00W0		
460/575 VAC 3~, conductivity 350 to 1250 µS/cm			BLCT2D00W0	BLCT3D00W0	BLCT4D00W0		
460 VAC 3~, conductivity 125 to 350 µS/cm	BLCTRL00W1	BLCT1B00W1				BLCT4C00W0	BLCT4C00W0
460 VAC 3~, conductivity 350 to 1250 µS/cm	BLCTRM00W1	BLCT1D00W1				BLCT4D00W0	BLCT4D00W0
575 VAC 3~, conductivity 125 to 350 µS/cm						BLCT4D00W0	BLCT4D00W0
575 VAC 3~, conductivity 350 to 1250 µS/cm						BLCT4D00W0	BLCT4D00W0
electrode kit (200 to 230 VAC 3~, 125 to 350 µS/cm)			KITBLCT2A0	KITBLCT3A0	KITBLCT4B0	KITBLCT4B0	
electrode kit (200 to 230 VAC 3~, 350 to 1250 µS/cm)			KITBLCT2B0	KITBLCT3B0	KITBLCT4B0	KITBLCT4B0	
electrode kit (400 VAC 3~, 125 to 350 µS/cm)			KITBLCT2B0	KITBLCT3B0	KITBLCT4C0	KITBLCT4C0	KITBLCT4B0
electrode kit (400 VAC 3~, 350 to 750 µS/cm)			KITBLCT2C0	KITBLCT3C0			
electrode kit (400 VAC 3~, 350 to 1250 µS/cm)					KITBLCT4D0	KITBLCT4D0	KITBLCT4C0
electrode kit (400 VAC 3~, 750 to 1250 µS/cm)			KITBLCT2D0	KITBLCT3D0			
electrode kit (460/575 VAC 3~, 125 to 350 µS/cm)			KITBLCT2C0	KITBLCT3C0	KITBLCT4D0		
electrode kit (460/575 VAC 3~, 350 to 1250 µS/cm)			KITBLCT2D0	KITBLCT3D0	KITBLCT4D0		
electrode kit (460 VAC 3~, 125 to 350 µS/cm)						KITBLCT4C0	KITBLCT4C0
electrode kit (460 VAC 3~, 350 to 1250 µS/cm)						KITBLCT4D0	KITBLCT4D0
electrode kit (575 VAC 3~, 125 to 350 µS/cm)						KITBLCT4D0	KITBLCT4D0
electrode kit (575 VAC 3~, 350 to 1250 µS/cm)						KITBLCT4D0	KITBLCT4D0
electrode gasket kit			KITBLC2FG0	KITBLC3FG0			

Table 6.g

6.5 Troubleshooting

For the alarms, see instruction sheet +050003765, which is an integral part of this manual.

PROBLEM	CAUSES	SOLUTION
the humidifier does not turn on	<ol style="list-style-type: none"> 1. no electrical power supply; 2. controller connectors inserted incorrectly; 3. fuses blown; 4. transformer fault 	<ol style="list-style-type: none"> 1. check the protection device upstream of the humidifier and that the power supply is present; 2. check that the connectors are properly inserted in terminal block; 3. check fuses F1/F2/F3; 4. check that the voltage at the transformer secondary is 24 Vac
the humidifier does not start operation	<ol style="list-style-type: none"> 1. remote ON/OFF contact open (relay/terminals AB – AB) on CP controller 2. control signal not compatible with the type set 	<ol style="list-style-type: none"> 1. close the ON/OFF contacts (relay/terminals AB – AB) on CP controller 2. check that the external signal is 0 to 10 V
the humidifier fills with water without producing steam	<ol style="list-style-type: none"> 1. excessive backpressure in steam outlet; 2. cylinder inlet filter blocked; 3. lime scale in the supply tank; 4. drain solenoid valve fault 	<ol style="list-style-type: none"> 1. check that the steam outlet hose is not bent or choked; 2. clean the filter; 3. clean the supply tank; 4. check for abnormal voltage (24 Vac and/or 230 Vac) at drain solenoid valve and/or replace the drain solenoid valve
the line thermal overload switch is activated	<ol style="list-style-type: none"> 1. the thermal overload switch is undersized 2. excess current to the electrodes 	<ol style="list-style-type: none"> 1. check that the thermal overload switch is rated for a current equal to at least 1.5 times the rated current of the humidifier 2. check the operation of the drain solenoid valve, the seal of the fill solenoid valve when not energised, drain some of the water and re-start
the humidifier wets the duct	<ol style="list-style-type: none"> 1. the steam distributor is not installed correctly (too near the top of the duct or the condensate return is blocked); 2. the system is oversized; 3. humidifier on when the fan in the duct is off 	<ol style="list-style-type: none"> 1. check that the steam distributor has been installed correctly; 2. decrease the steam production set on the controller; 3. check the connection of a device (flow switch or differential pressure switch) slaving the operation of the humidifier to the fan in the duct (terminals AB - AB) on the CP controller
the humidifier wets the floor below	<ol style="list-style-type: none"> 1. the supply or overflow circuit has leaks; 2. the steam outlet hose is not properly secured to the cylinder 	<ol style="list-style-type: none"> 1. check the entire water circuit; 2. check that the clamp on the steam outlet is tight

Table 6.h

6.6 Alarms

For the alarms, see instruction sheet +050003765, which is an integral part of this manual.

7. OPERATING PRINCIPLE, CONTROL AND OTHER FUNCTIONS

7.1 Operating principle

In an electrode humidifier the production of humidity is obtained inside a cylinder (boiler) containing water that is heated to and then held at boiling temperature. The water that evaporates over time is automatically replaced with water from the mains supply. **The heat required to boil the water is produced by passing an electrical current through the cylinder. This is done by connecting the electrodes immersed inside the cylinder to the mains power supply.**

The quantity of current that initially flows depends greatly on the type of water supplied from the mains. Normally, a recently-started cylinder has low current; nonetheless, over time the quantity of salts inside the water increases (evaporation in fact does not carry the salts with it). This allows the level of current required by the unit to provide the quantity of steam requested to be reached.

In stable operating conditions, the level of production required is automatically achieved using the water level control on the cylinder. This is in fact reflected in higher or lower levels of current.

The salts introduced by the automatic refilling of the water are partly deposited as lime scale inside the cylinder, contributing to the progressive depletion of the cylinder, and partly remain dissolved in the water. To avoid excessive accumulation of salts, a quantity of water is periodically and automatically drained and then replaced with fresh water.

7.2 Control principles

The range of humidifiers includes the following control options.

7.2.1 ON/OFF control - CP controllers

The action is all or nothing, activated by an external contact that consequently determines the control set point and differential.

7.2.2 Proportional control - CP controllers

The steam production (quantity per hour) is proportional to the value of a signal Y coming from an external device; the type of signal can be selected – programmed via RS485 – from the following standards: 0 to 10 V (default), 2 to 10 V, 0 to 1 V. The entire range is indicated as BP (proportional band).

The maximum production, P_{max} , corresponding to the maximum value of the Y external signal, and can be programmed between 20% and 100% of the rated humidifier value (dip A3-A4).

The minimum production, P_{min} , is set to 20% of the rated value, with an activation hysteresis, given by the value hy , corresponding to 2% of the entire BP interval of the external signal Y .

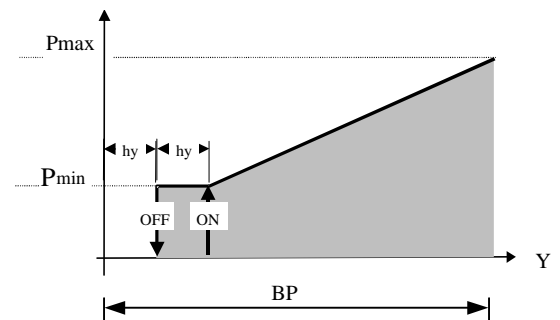


Fig. 7.a

8. TECHNICAL SPECIFICATIONS

MODEL	KUETR*	KUESR*	KUES1*	KUET1*	KUES2*	KUET2*	KUES3*	KUET3*	KUET4*
steam									
flow-rate (kg/h)	1.5 to 3	1.5 to 3	1.5 to 3	1.5 to 3	5	5 to 8	9	10 to 15	25 to 45
connection (dia. mm)	22/30				30			40	
outlet pressure limits (Pa)	0 to 500				0 to 500			0 to 600	0 to 2300

supply water

connection	G ³ / ₄								
temperature limits (°C)	1 to 40								
pressure limits (MPa)	0.1...0.8 (1 to 8 bar, 14.5 to 116 psi)								
hardness limits (°fH)	≤ 40								
instant flow-rate (l/min)	0.6				1.2			4	
range of conductivity (μS/cm)	125 to 1250								

drain water

connection (φ mm)	32							40	
typical temperature (°C)	≤ 100								
instant flow-rate (l/min)	~ 4							22.5	

environmental conditions

ambient operating temperature (°C)	1 to 50								
ambient operating humidity (% rH)	10 to 60 (90 non-condensing)								
storage temperature (°C)	-10T70								
storage humidity (% rH)	5 to 95								
index of protection (CEI EN 60529)	IP00								

electronic controller (see CP controller instruction sheet)

type	CP1*, CP2*, CP3*, CP4*							CP3*	
auxiliary voltage / frequency (V - Hz)	24VAC(-15% to +10%) / 50 - 60Hz								
maximum auxiliary power (VA)	30								
signal inputs	input impedance for 0 to 10 V, 2 to 10 V, 0 to 1 V signals: 15 kΩ								

Electrical specifications: see the instruction sheet for the CP controller, code +050003765

MODEL	KUETR*	KUESR*	KUES1*	KUET1*	KUES2*	KUET2*	KUES3*	KUET3*	KUET4*								
Power																	
rated power supply voltage: 208V-1 ~ N code U	1.5	3	1.5	3	1.5	3	1.5	3	5	5	8	9	10	15	25	35	45
instant steam production ⁽¹⁾ (kg/h)	1.5	3	1.5	3	1.5	3	1.5	3	5			8.7					
power input at rated voltage (kW)	1.12	2.25	1.12	2.25	1.12	2.25	1.12	2.25	3.75			6.52					
rated power supply voltage: 230V-1 ~ N code D									5			9					
instant steam production ⁽¹⁾ (kg/h)									5			9					
power input at rated voltage (kW)									3.75			6.75					
rated power supply voltage: 208V-3 ~ code W									5	8			10	15	25	35	
instant steam production ⁽¹⁾ (kg/h)									5	8			10	15	25	35	
power input at rated voltage (kW)									3.75	6.00			7.50	11.25	18.75	26.25	
rated power supply voltage: 230V-3 ~ code K									5	8			10	15	25	35	
instant steam production ⁽¹⁾ (kg/h)									5	8			10	15	25	35	
power input at rated voltage (kW)									3.75	6.00			7.50	11.25	18.75	26.25	
rated power supply voltage: 400V-3 ~ code L									5	8			10	15	25	35	45
instant steam production ⁽¹⁾ (kg/h)									5	8			10	15	25	35	45
power input at rated voltage (kW)									3.75	6.00			7.50	11.25	18.75	26.25	33.75
rated power supply voltage: 460V-3 ~ code M									5	8			10	15	25	35	45
instant steam production ⁽¹⁾ (kg/h)									5	8			10	15	25	35	45
power input at rated voltage (kW)									3.75	6.00			7.50	11.25	18.75	26.25	33.75
rated power supply voltage: 575V-3 ~ code N									5	8			10	15	25	35	45
instant steam production ⁽¹⁾ (kg/h)									5	8			10	15	25	35	45
power input at rated voltage (kW)									3.75	6.00			7.50	11.25	18.75	26.25	33.75

Tab. 8.a

CAREL reserves the right to modify or change its products without prior notice.

NOTE: _____

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