

**gaSteam** 45/90/180  
pHC control

**CAREL**



**GB** User manual

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



## IMPORTANT WARNINGS

BEFORE INSTALLING OR HANDLING THE APPLIANCE PLEASE CAREFULLY READ AND FOLLOW THE INSTRUCTIONS AND SAFETY STANDARDS DESCRIBED IN THIS MANUAL AND ILLUSTRATED BY THE LABELS ON THE MACHINE.

This humidifier produces non-pressurised steam by means of a heat exchanger powered by a gas burner immersed in the water contained in the boiler. The steam produced is used to humidify environments or industrial processes, using special distributors.

The quality of the water used affects the process of evaporation, and as a result the appliance may be supplied with untreated water, **as long as this is drinkable, demineralised or treated with a softener (see Characteristics of the supply water)**. The evaporated water is automatically replaced using a filling valve.

This appliance has been designed exclusively to directly humidify rooms or ducts, using a distribution system, as long as the installation, use and maintenance operations are carried out according to the instructions contained in this manual and on the labels applied internally and externally.

The conditions of the environment, the fuel and the power supply voltage must comply with the specified values.

All other uses and modifications made to the device that are not authorised by the manufacturer are considered incorrect.

Liability for injury or damage caused by the incorrect use of the device lies exclusively with the user.

Please note that the machine is connected to the gas mains, contains powered electrical devices and hot surfaces.

All service and/or maintenance operations must be performed by specialist and qualified personnel who are aware of the necessary precautions and are capable of performing the operations correctly and in accordance with the safety standards and legislation in force, with specific reference to:

1. **Italian law 1083/71: "Safety standards relating to the use of gaseous fuel";**
2. **Italian Law no.46/90: "Safety standards relating to systems in buildings";**
3. **Presidential Decree no. 447, December 6, 1991: "Regulations to law no. 46, dated March 5, 1990, on safety relating to systems in buildings";**
4. **Italian Law 10/91: "Regulations to the national plan for energy savings and the development of renewable sources of energy".**

Disconnect the machine from the mains power supply before accessing any internal parts.

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




**Disposal of the parts of the humidifier:** The humidifier is made up of metallic and plastic parts.

In reference to European Community directive 2002/96/EC issued on 27 January 2003 and the related national legislation, please note that:

1. WEEE cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
2. the public or private waste collection systems defined by local legislation must be used. In addition, the equipment can be returned to the distributor at the end of its working life when buying new equipment.
3. the equipment may contain hazardous substances: the improper use or incorrect disposal of such may have negative effects on human health and on the environment;
4. the symbol (crossed-out wheeled bin) shown on the product or on the packaging and on the instruction sheet indicates that the equipment has been introduced onto the market after 13 August 2005 and that it must be disposed of separately;
5. in the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

**Warranty on materials:** 2 years (from the date of production, excluding the consumable parts, such as the cylinder).

**Certification:** the quality and safety of CAREL products are guaranteed by CAREL's ISO 9001 certified design and production system, as well as the TÜV, CE  and ETL marks.

**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 de-  
scribed.**

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# 1. GENERAL CHARACTERISTICS OF THE MAIN CONTROL BOARD - PHC

This is a microprocessor electronic controller based on the pGE technology developed by CAREL for the management of all models of humidifier.

It is made up of two electronic boards, positioned one on top of the other and connected together by pin strip.

- **bottom board - "main control board"**: connected to the pGE board with the microprocessor and the clock card, as well as the serial card;
- **top board, or "expansion board"**.

The pHC is designed to run the control program, and is fitted with the set of terminals required for connection to the controlled devices (for example: valves, power contactors) and to the field (probes, external controller).

The program and the parameters are saved in **FLASH MEMORY**, meaning the data is safe even in the event of a power failure (without the need for a backup battery).

The pHC can be connected to pLAN (pCO Local Area Network) and tLAN networks.

The pLAN network is made up of a series of controllers and terminals that interact with one another.

Each controller in the pLAN network can exchange information at high speed. Up to 31 units, either pHC controllers or terminals, can be connected, for the rapid exchange of information.

tLAN communication is available with I/O expansion modules or the PST display (3 or 4 digit).

Connection to the supervisor/telemaintenance serial line on the RS485 standard is ensured by fitting the pHC with optional cards, using the CAREL, Modbus® or ECHELON®, RS232 and GSM communication protocols.

Terminal block

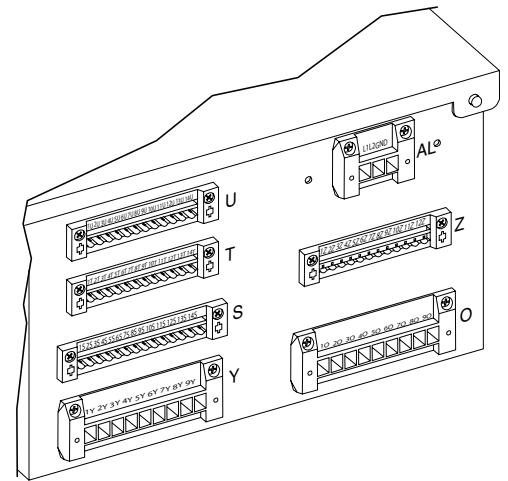


Fig. 1.a

## 2. CONTROL SIGNALS FROM THE FIELD

### 2.1 Humidity or temperature control

The humidifier with humidity control action can be connected to a remote supervisor using optional cards. It can be controlled in the following four different ways (for further details, see chap. 9):

#### a) Type C control: ON/OFF

The humidifier is operated by a mechanical humidistat H, by a voltage-free remote contact CR, or by a combination of the two, which must be connected to terminals 7U, 8U, 9U and 10U on terminal block U in the electrical panel.

The diagrams in Fig. 2.b show the connections to be made in the case of:

- a) operation controlled by a simple enabling contact (CR);
- b) operation by external mechanical humidistat (H);
- c) a combination of the two.

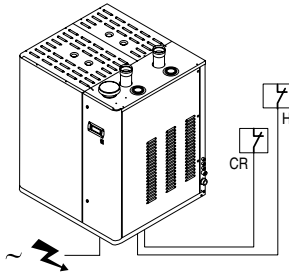


Fig. 2.a

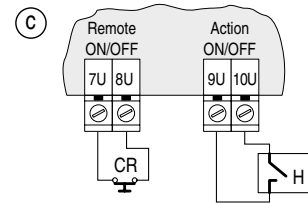
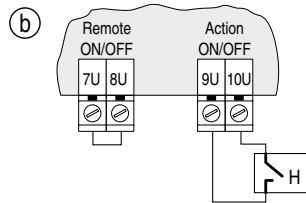
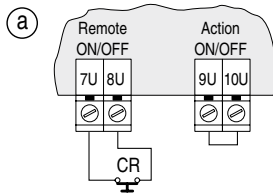


Fig. 2.b

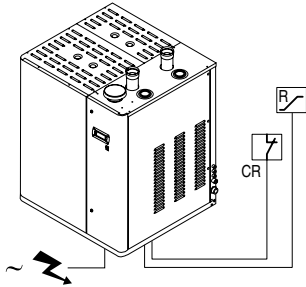


Fig. 2.c

#### b) Type P control:

proportional control, with signal sent by an external controller.

The steam production is managed by an external controller R, which sends the controller a humidity request signal; the controller can be programmed to receive one of the following proportional signals (see par. 9.2.2):

- voltage: 0 to 1 Vdc; 0 to 10 Vdc; 2 to 10 Vdc;
- current: 0 to 20 mA, 4 to 20 mA.

The reference (zero) of the external controller must be connected to the GND terminal (2U) and the control signal to terminal B1 on terminal block U.

To avoid unstable control, the earth of the external controller must be connected to the earth of the controller.

This type of control can also be used with an enabling contact (CR) connected to the "Remote ON/OFF" terminal.

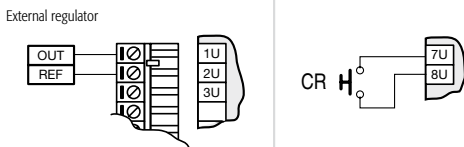


Fig. 2.d

**c) Type H control:**

humidity control with ambient relative humidity probe (and outlet limit probe, if required).

With this configuration (see Fig. 2.e) the main control board, connected to a humidity probe HT, performs a complete control action according to the humidity measured.

An outlet humidity limit probe (see Fig. 2.f) can also be connected: with this configuration, the main control board, connected to a humidity probe HT, performs a complete control action, while also limiting the steam production according to the relative humidity value in the outlet duct, measured by the probe CH.

The diagrams shown in Fig. 2.g indicate the connection to be made using CAREL probes, with:

- just one relative humidity probe (a);
- an outlet humidity limit probe (b).

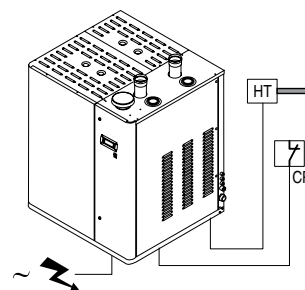


Fig. 2.e

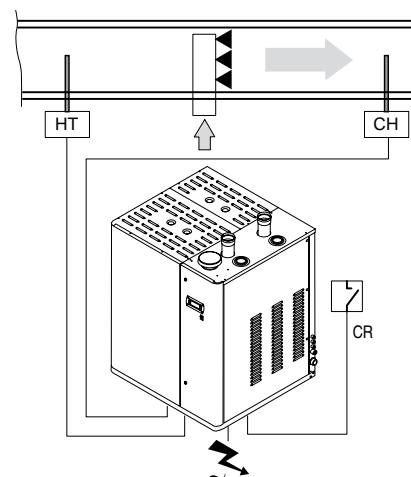


Fig. 2.f

**CAREL PROBES AVAILABLE...**

...for rooms	...for air ducts	...for special applications
ASWH100000	ASDH100000	ASPC230000
	ASDH200000	ASPC110000

Table 2.a

The controller can also be connected to non-CAREL probes (see paragraph 2.3.)

HT: CAREL relative humidity probe;

CH: CAREL outlet relative humidity probe.

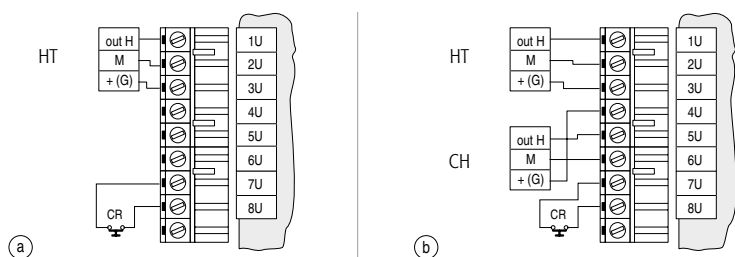


Fig. 2.g

**d) Control for steam baths:**

temperature control with room temperature probe

The humidifier is connected to a temperature probe TT (see Fig. 2.h), and performs a complete control action according to the temperature measured inside the controlled environment.

Fig. 2.i shows the connection of the CAREL probe model ASET03001, with a range of measurement -30T90°C. The recommended CAREL probes have a 0 to 1 volt output, and therefore the range of reading must be set (see par. 7.5). The control signal must be connected to 1U, and the earth reference is GND (2U).

The controller can also be connected to non-CAREL active probes (see par. 2.3).

TT: CAREL temperature probe.

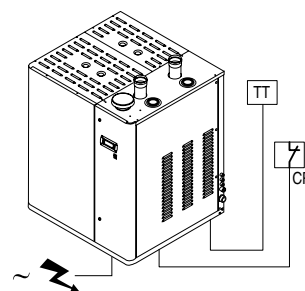


Fig. 2.h

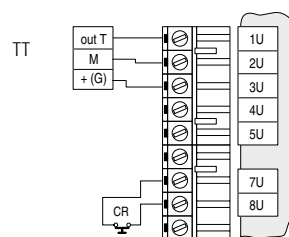


Fig. 2.i

## 2.2 Pin strip position on the board for probe configuration

1	room probe configuration
2	limit probe configuration
3	0 to 10 Vdc
4	all but 0 to 10Vdc
5	tachymetric 2
6	safety thermostat 2

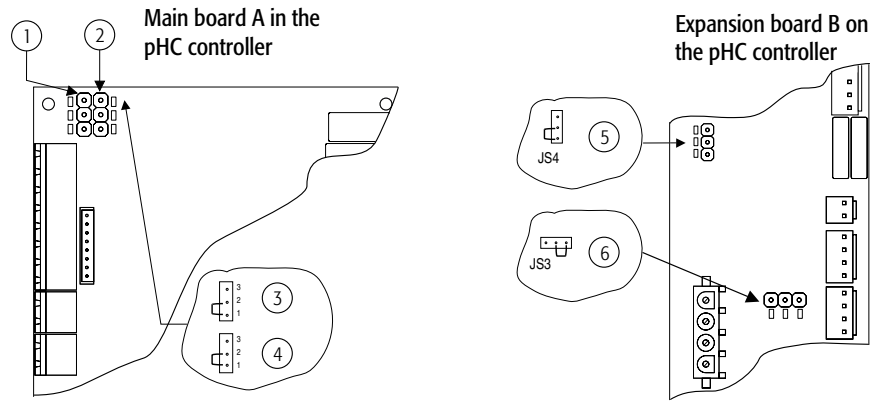


Fig. 2.j

## 2.3 Using other brand probes

Different brand probes can also be used, with the output signals (see par. 7.3) selectable from the following standards:

- voltage: 0 to 1 Vdc, 0 to 10 Vdc, 2 to 10 Vdc;
- current: 4 to 20/ 0 to 20 mA.

In addition, the minimum and maximum values of the signal must be set (see par. 7.5).

A 15 Vdc power supply is available for the probes.

The control signals must be connected:

- for the control probe HT (or TT) to terminal 1U, the earth reference for which is GND (2U);
- for the limit probe CH to terminal 5U, the earth reference for which is GND (6U);
- for the current probe to terminal 4U, the earth reference for which is GND (6U).

### Important warnings:

- To avoid unstable control, the earth of the probes or the external controllers must be connected to the earth on the appliance's controller.
- For the operation of the humidifier, the terminals corresponding to the "remote ON-OFF" signal must be connected to an enabling contact or jumpered (default solution). If these terminals are not connected, all the internal and external devices managed by the controller are disabled, with the exception of the drain pump, limited to the drain cycle due to extended inactivity (see par. 10.5).



## 3. AUXILIARY CONTACTS

### 3.1 Alarm contact

The humidifier controller is fitted with a voltage free contact for the remote alarm signal (one or more events).

The alarm contact is connected via terminals 70, 80 and 90, as shown in Fig. 3.a.

electrical specifications	connection to the alarm contact
250 Vac; I <sub>max</sub> : 8A resistive 2A inductive	removable terminal block as per Fig. 5.13

Table 3.a

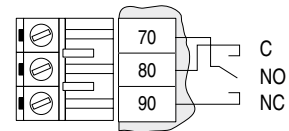


Fig. 3.a

### 3.2 Dehumidification contact

When the humidifier is used as in case c) in paragraph 2.1 (relative humidity control), a contact (NO, voltage-free) can be used to activate an external dehumidification device; in this case, the humidifier can provide complete control over the ambient relative humidity. The dehumidification contact is connected via terminals 13U, 14U on terminal block U, as shown in Fig. 7.7. For further details, see chapter 7.14.

See table 3.a.

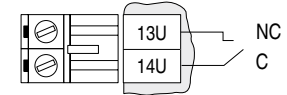


Fig. 3.b

### 3.3 Remote terminal/supervisor systems

The humidifier controller can be connected to up to three pGD user terminals, one of which fitted as standard on board the unit, and 2 optional terminals that can be located up to 200m away.

The controller can also be connected to a supervisory system via RS485, RS232 serial lines or FTT10 LON using the optional cards shown in the following table.

optional cards	characteristics supported	protocols
PCO2004850	used for the direct interface of the controller to an RS485 network	CAREL, Modbus
PCO200MDM0	used for the direct interface of the controller to an RS232 network with an external modem	CAREL for remote connections
PCO20000F0	used to interface of the controller to an FTT10 LON network, when suitably programmed	LON-Echelon

Table 3.b

Connection is also possible to TREND systems using a board sold directly by TREND.

### 3.4 Checks

The following conditions represent correct electrical connection:

- the rated voltage of the appliance corresponds to the mains voltage;
- the fuses installed are suitable for the line and the power supply voltage;
- mains disconnecting switch has been installed so as to be able to disconnect power to the humidifier;
- the electrical connections have been performed as shown in the diagrams;
- the power cable is secured to the tear-proof cable clamp;
- terminals 7U-8U are jumpered or connected to an enabling contact;
- the earth of any non-CAREL probes is connected to the earth on the controller;
- if the appliance is controlled by an external controller, the earth of the signal is connected to the earth of the controller.

## 4. STARTING, CONTROL AND SHUTTING DOWN

### 4.3 The pGD0 graphic display (CAREL code: PGD0PH0F00)

The pGD0 graphic display is an electronic device, compatible with the previous PCOI/PCOT terminals, used for the complete management of the graphics, by displaying icons (defined at an application software development level) and international fonts, in two dimensions: 5x7 and 11x15 pixels. The application software only resides on the pHc board; the terminal does not need any additional software during operation.

In addition, the terminal allows a wide range of operating temperatures (-20T60°C) and guarantees a high index of protection (IP65).

The pGD0 graphic display (20 columns x 4 rows) is backlit.

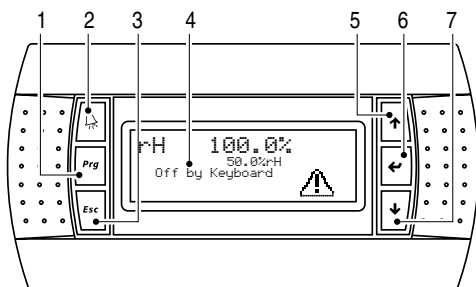


Fig. 4.a

#### 4.3.1 Front panel

1. "PRG" button: programming button  
Accesses the humidifier configuration maintenance and menu;
2. "Allarme" button: alarm button  
Used to display and reset any alarms present;
3. "ESC" button: button to return to the "main screen";
4. Graphic display, 4 rows x 20 columns: Displays the icons and texts for the user interface;
5. "UP arrow" button: scrolls the various screens on the pGD and changes the values of the configuration parameters;
6. "ENTER" button: used, where possible, to scroll the individual rows in the configuration screens and to access the individual configuration parameters;
7. "DOWN arrow" button.

For convenience, the pages on the display are called "screens".

The screens may contain text messages, small pictures, variable values (read and write).

In this case too, for convenience, the variable values (read or write) are called "fields".

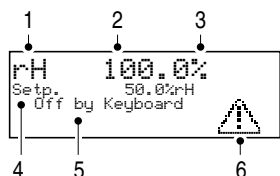


Fig. 4.b

#### 4.3.2 Main screen

Main screen" refers to the screen that appears during the normal operation of the humidifier.

This screen displays the main aspects relating to the operation of the humidifier.

For example, the screen shows the general humidifier operating status, the control mode selected, the humidity value read by the probes, or an indication if any alarms are active.

The following table lists all the possible information shown on the main screen (Fig. 4.b).

Control mode field	
display	mode
r-H	type H control
⊕	type T control
⊖	type P control
ON/OFF	type C control
Signal applied field	
display	mode
Humidity value read by the ambient probe	type H control
Temperature value read by the ambient probe	type T control
Value as a % applied by the external controller to input "B1" on the pHc	type P control
Production value as a percentage of the target	type C control
Unit of measure field	
display	mode
%	type H control
°C (°F)	type T control
%	type P control
%	type C control
Set point field	
This row displays the set point. Only shown in H or T control mode	
General operating status field	
display	description
Off from the keypad	Unit off. Unit switched off from the keypad
Off from Superv.	Unit off. Unit switched off via supervisor
Disabled	Unit on. Humidifier disabled via the keypad
No request	Unit on. No steam request
Pr. 000.0 kg/h	Unit on. Total steam flow-rate currently produced in (kg/h or lb/h). Visible only when the unit is on, the humidifier is enabled for operation and humidity is requested.
Remote off	Unit on. Steam production stopped by the opening of the "Remote ON/OFF" contact
Alarms	Unit on. The production in both cylinders has been stopped by a shutdown alarm. This is displayed for a few moments, after which the message "No Request" is displayed, as, following a shutdown alarm, the humidity request is forced to zero.
display	description
⚠	The alarm icon appears when an alarm or pre-alarm condition is present in one of the two cylinders. Press the Alarm button to check and if necessary reset the alarm (see par. 8.1)

Table 4.a

## 4.4 The main “menu”

The main “menu” offers the user or the installer the possibility to modify all the desired parameters. It is accessed by pressing the “PRG” button, Fig. 4.e.p.

Use the UP and DOWN arrows to scroll the rows in the menu.

The description of the individual items are listed in the following table.

field	description	level of accessibility
set	Enable operation. Set the control parameters.	free
user	Set the configuration parameters with access by password.	password
service	Access the operations reserved for the installer or service personnel.	password
	Information on the firmware	free
clock	System clock. Set	free
	Set the time bands	password
alarm log	Alarm log	free
unit on-off	Unit ON/OFF	free

Table 4.b

As regards the description of the control and configuration parameters (“Set” and “User” items) refer to par. 6.2.2.

The “Unit ON-OFF” item has already been analysed in par. 4.3.6 (“Start unit from keypad”).

### 4.4.1 “Clock” submenu

Entering the “clock” submenu, the user can access the clock (useful for the timed start-up of the humidifier) and the date, Fig. 4.c.

```

clock
Time      10:54
Date      20/02/04
Day       Friday
    
```

Fig. 4.c

#### Setting the clock

The clock can be set using the “UP” and “DOWN” buttons in the following screen, Fig. 4.d.

To set the clock:

- press the “ENTER” button to move the cursor to the field to be changed;
- change the value using “UP” and “DOWN”;
- press the “ENTER” button to confirm.

```

Clock update
Time      10:54
Date      20/02/04
    
```

Fig. 4.d

#### Setting the time bands

This important function is used to automatically set the operation of the humidifier during the days of the week.

These settings are accessed after entering the password “0077”, Fig. 4.i, which opens the time band activation screen, Fig. 4.f.

There are two possible settings:

- timed humidifier On/Off operation;
- timed humidity set point control.

In addition, both functions can be enabled to work at the same time.

```

Clock
password  0000
    
```

Fig. 4.e

```

Scheduler
Humidif. on-off No
Set point       No
    
```

Fig. 4.f

### 4.4.3 Timed humidifier ON/OFF operation

This function can be used to set humidifier on and off times specifically and separately for each day of the week. Once the humidifier is on, the production of humidity depends only on the control parameters set (see par. 6.2.2) and the humidity measured.

Sequence:

- to activate this type of setting, go to the screen shown in Fig. 4.g and set the field on the right of “On-off timezones” to “Yes”;
- press “ENTER” to confirm.

This then activates the following time band control screens. To display these, position the cursor (using “ENTER”) at the top left and then press “UP” and “DOWN”.

Four different time bands can be selected:

#### ON-OFF bands

time band	ON	OFF	description
F1	F1-1	09:00 13:00	the humidifier remains on (the values in the table are the default values. These can be modified by moving the cursor to the values and using the “UP” or “DOWN” button).
	F1-2	14:00 21:00z	
F2	14:00	21:00	the humidifier remains on (the values in the table are the default values, which can be modified.)
F3	Always ON		Humidifier always on
F4	Always OFF		Humidifier always off

Table 4.c

Once the time bands have been set, the bands then need to be enabled for each day. An example of the screen is shown to the side.

Sequence:

- use the “ENTER” button to move the cursor to the time band for the day in question;
- use the “UP” and “DOWN” buttons to choose one of the 4 time bands seen in Table 4.3;
- press “ENTER” to confirm and move to the next value.

An example of a setting is shown to the side.

```

Scheduler
On-off timezones No
Humid.timezones  Yes
    
```

Fig. 4.g

```

Humid. on-off
Mon:F3 Tue:F3 Wed:F3
Thu:F3 Fri:F3 Sat:F3
Sun:F3
    
```

Fig. 4.h

```

Humid. on-off
Mon:F1 Tue:F1 Wed:F1
Thu:F1 Fri:F1 Sat:F2
Sun:F4
    
```

Fig. 4.i

```
Scheduler
On-off timezones No
Humid.timezones Yes
```

Fig. 4.j

```
Set point
ON SET
Z1: 00:00 000.0%
Z2: 00:00 000.0%
```

Fig. 4.k

```
Set point
ON SET
Z3: 00:00 000.0%
Z4: 00:00 000.0%
```

Fig. 4.l

```
Set point
ON SET
Z1: 08:30 050.0%
Z2: 12:30 040.0%
```

Fig. 4.m

```
Set point
ON SET
Z3: 13:30 050.0%
Z4: 18:00 030.0%
```

Fig. 4.n

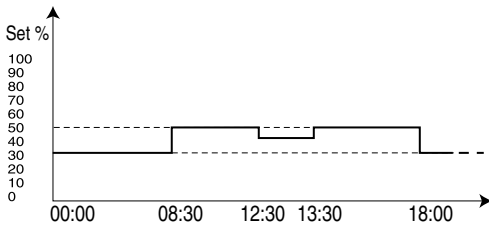


Fig. 4.o

```
Scheduler
Humidif. on-off Yes
Set point Yes
```

Fig. 4.p

#### 4.4.3 Timed set point control

With this type of control, the humidity H (or temperature T) set point can be varied during the day. Up to 4 switching points can be set, with both the time and new set point. This setting is valid for every day of the week.

Sequence:

- move to the screen shown to the side and set the field to the right of "Humid. timezones" to "Yes";
- press "ENTER" to confirm.

This then activates the following control screens for the set point switching points (position the cursor using "ENTER" at the top left and then press "UP" and "DOWN").

To set the switching points, go to the following two screens.

Setting the switching points:

- press "ENTER" to move the cursor to the field to be changed;
- use the "UP" and "DOWN" buttons to set the desired time and the new humidity set point that will take effect from that moment on;
- press "ENTER" to confirm and to go to the next field.

For example, if the two screens are set as shown to the side, the trend of the set point during each day of the week will be as shown in the example.

#### - Combined control

The activation of both control modes is used to set both the humidifier ON/OFF times and the set point values during the day. To do this, both the values in the fields on the screen to the side must be set to "Yes".

This will enable all the subsequent screens for setting the time bands and the set point.

#### 4.4.4 Alarm log

The humidifier memory can record the alarms that are activated during the life of the humidifier.

The memory saves up to 200 events, and information is available both on the type of alarm and on the date and time it occurred. To access the alarm log, simply go to the "Alarm log" submenu ("History Alarms"). Use the "UP" and "DOWN" buttons to scroll all the events that have been saved (the number of the event is shown in the top right of the screen).

An example of a screen is shown to the side.

#### 4.4.5 Shutting down

When shutting down the appliance at the end of the season or alternatively for maintenance on the electrical parts and/or water circuit, the humidifier should be placed out of service.

➔ **NOTE:** empty the cylinder before shutting down the humidifier to prevent fouling.

##### Sequence:

- open the mains disconnecting switch on the power line to the humidifier;
- move the rocker switch to 0 (see Fig. 4.z) and check that the display on the controller is off;
- close the shut-off tap on the water line to the humidifier.

To empty the cylinder when shutting down, refer to par. 5.3.

In the event of a malfunction with the pump, or a malfunction with the electrical parts, the boiler can be emptied manually using the manual drain tap, see the figure to the side.



Fig. 4.q

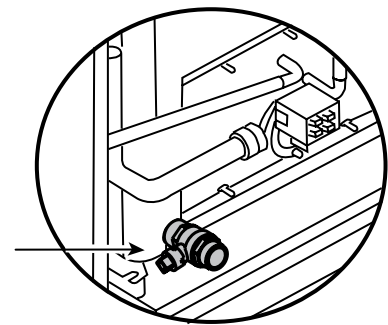


Fig. 4.q.a

## 4.1 Starting the appliance

### Starting for the first time

When the humidifier is started for the first time, the AUTO-TEST procedure should be run (see par 7.7), which automatically checks the main functions of the unit (fill, drain and control of the level sensor). If enabled, the AUTO-TEST procedure starts whenever the electronic controller is switched on.

Nonetheless, the AUTO-TEST procedure can be disabled (see par. 7.7).

#### 4.1.1 Start-up procedure and sequence

**I – 0 switch:** ON/OFF (Fig. 4.a).

After having closed the disconnecting switch in the power line to the humidifier, switch on the appliance by moving the rocker switch to position "I".

The start-up sequence then begins, which includes an initial phase followed by the operation of the appliance.

After the switch has been moved to the On position, the graphic display shows the screens in the sequence described in the figures below.

1. Start power supply, system boot (around 10 seconds)

Nothing is displayed, Fig. 4.s.

2. Language setting (around 30 seconds)

In this phase, the user has 30 seconds to change the language (see par. 4.3.10), Fig. 4.t.

To pass directly to the next phase, press the "ESC" button.

3. Operating phase, main screen Fig. 4.u.



Fig. 4.r



Fig. 4.s

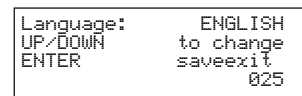


Fig. 4.t

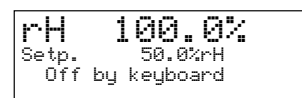


Fig. 4.u

#### 4.1.2 Main functions

##### STARTING THE UNIT FROM THE KEYPAD

Switch the unit on from the keypad. After the start-up sequence, the humidifier is not yet ready to operate, and the main screen appears as in Fig. 4.d.

To start the unit, proceed as follows:

1. Select the MENU

- press the "PRG" button. The "Menu" screen is displayed, Fig. 4.v.a;
- scroll with the "DOWN" arrow until moving the cursor to the "UNIT ON-OFF" field, Fig. 4.e.b;

2. Enable

- press the "Enter" button. The following screen is displayed, shown in Fig. 4.v.c;
- press "Enter". The following main screen is automatically displayed, as shown in Fig. 4.v.d.

At this stage, the system is on and the operation of the humidifier can be started (see the next par.).

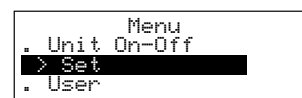


Fig. 4.v.a

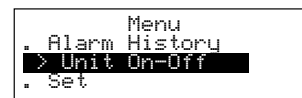


Fig. 4.v.b

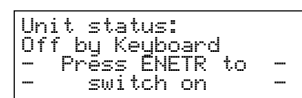


Fig. 4.v.c

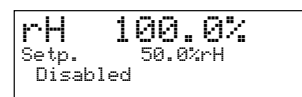


Fig. 4.v.d

```
Humidif.enabled: NO
Burners Sequence:
Parallel
Seq. hyster.: 5.0%
```

Fig. 4.v.e

```
* Humidif.enabled: NO
Burners Sequence:
PARALLEL
Seq. hyster.: 5.0%
```

Fig. 4.v.f

```
rH 100.0%
Setp. 50.0%rH
```

Fig. 4.v.g

### ENABLE OPERATION - START/STOP STEAM PRODUCTION

Once the unit is on, the "enable" function effectively starts the humidifier.

Subsequently, steam production is related solely to the humidity request or the presence of an alarm or a remote OFF signal.

If the humidifier is not enabled for operation, the main screen appears as in Fig. 4.v.d.

- Enabling operation:

1. Select the MENU
  - a. Press "PRG". The "Menu" screen is displayed, Fig. 4.v.b;
  - b. Scroll with the "DOWN" arrow until highlighting the "Set" row, Fig. 4.v.a;
  - c. Press "Enter". The screen shown in Fig. 4.v.e is displayed;
2. Start the unit
  - a. Press the "Enter" button to move the cursor to the field to be modified, Fig. 4.v.f;
  - b. Press "UP" or "DOWN" to change the value. The screen shown in Fig. 4.v.g is displayed;
  - c. Press "ENTER" to confirm.  
Note that in the main screen the term "Disabled" no longer appears, Fig. 4.v.g.

At this stage, the humidifier is ready to produce steam.

▶ **NOTE:** the production of steam now depends only on the control parameters selected (see par. 6.2.3) and the signal applied (humidity or temperature probe or signal from external controller).

- Disabling operation

Similarly to as described in the previous paragraph, the operation of the humidifier can be stopped, disabling the unit.

The sequence is the same, but rather set the "Humidif. enabled" variable to "NO".

```
Control Params
%rH Set P. 50.0%
Max.Prod. 70.0%
%rH Different. 5.0%
```

Fig. 4.v.h

```
Control Params.
%rH Set P. 50.0%
Max. Prod. 70.0%
%rH Different. 5.0%
```

Fig. 4.v.i

```
Control params.
%rH Set P. 60.0%
Max.Prod. 70.0%
%rH Different. 5.0%
```

Fig. 4.v.j

```
Control Params.
Temp Set 40.0 °C
Temp Diff. 5.0 °C
```

Fig. 4.v.k

### MODIFYING THE MAXIMUM PRODUCTION ALLOWED AND THE SET POINT

The maximum production allowed can be modified in all control modes.

The set point, on the other hand, can only be modified in the control modes where this is featured (see par. 6.1).

Both the parameters are modified in the following sequence:

1. Select the MENU
  - a. Press "PRG". The "Menu" screen is displayed, Fig. 4.v.b;
  - b. Scroll with the "DOWN" arrow until highlighting the "Set" row, Fig. 4.v.a;
  - c. Press "Enter". The screen shown in Fig. 4.v.e is displayed;
2. Access and modify the control parameters
  - a. Using the "UP" or "DOWN" buttons, move to the screen shown in Fig. 4.v.h;
  - b. Using the "ENTER" button, move to the field to be modified, Fig. 4.v.i;
  - c. Using the "UP" and "DOWN" buttons, change the value and press "ENTER" to confirm, Fig. 4.v.j.

**NOTE:** it can be seen that with this sequence, the humidity differential can also be changed, in the modes where featured.

If temperature control mode has been set, the screen shown in Fig. 4.v.k is displayed.

```
Quick set
Humidifier On
Max Prod. 70.0%
```

Fig. 4.v.l

```
Quick set
Humidifier On
%rH Set P. 50.0%
Max Prod. 70.0%
```

Fig. 4.v.m

```
Quick set
Humidifier On
Temp Set P. 40°C
Max Prod. 70.0%
```

Fig. 4.v.n

### QUICK ACCESS TO THE SET POINT PARAMETERS SCREEN

The previous screen can be accessed quickly, from the main screen, by pressing the PRG button:

- in C control mode: ON/OFF and P control mode: Ext. Controller, pressing PRG displays the screen shown in Fig. 4.v.l;
- in H control mode: with or without limit probe, Fig. 4.v.m;
- in T control mode: the screen shown in Fig. 4.v.n is displayed.

### INDICATING THE ALARM STATUS

If an alarm is present, the display shows the alarm icon.

In the event of alarms, the alarm button lights up.

If the causes disappear, the alarm button flashes until the alarm is reset.

For the description of the alarms refer to chap. 8.

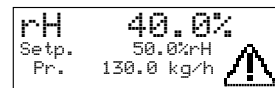


Fig. 4.z.o

### SETTING THE LANGUAGE

The language can be set to English or Italian.

The sequence is listed below:

- Press "PRC". The "Menu" screen is displayed, Fig. 4.v.p;
- Using the "DOWN" button, move to the "service" field, Fig. 4.v.q;
- Press "ENTER", Fig. 4.v.r.
- Press "ENTER" to move the cursor to the language field and change the setting using the "UP" or "DOWN" arrows, Fig. 4.v.s;
- Press "ENTER" to confirm.

The language can also be set during the "start-up sequence" (par. 4.3.1): in fact, when the following screen appears, the language can be set by simply pressing one of the two "UP" or "DOWN" arrows, and then pressing the "ENTER" button to save the change.

▶ **NOTE:** The default language is English.

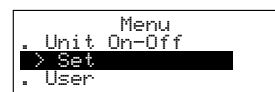


Fig. 4.z.p

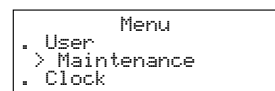


Fig. 4.z.q



Fig. 4.z.r



Fig. 4.z.s

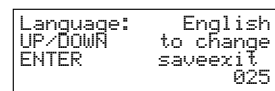


Fig. 4.z.t

## 5. READING AND SETTING THE PARAMETERS

The configuration and control parameters are grouped into two sets:

1. **LEVEL 1** - set point and control parameters
2. **LEVEL 2** - configuration parameters

Each parameter has the following attributes:

name	text identifying the parameter
range	limit values for the setting of the parameter
default	factory setting of the parameter value
unit of measure	symbol displayed for the unit of measure used for the parameter

Table 5.a

### 5.1 Reading and setting the set point

The set point can be read on the main screen, appearing in the field to the right of the text "Set P."

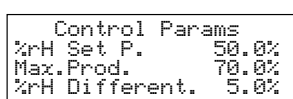
control mode	display in the field to the right of "Set P."
Type H	humidity set point
Type T	temperature set point

Table 5.b

#### 5.1.1 Setting the ambient humidity set point

Sequence:

- go to the main screen and press "PRG";
- enter the "SET" submenu;
- scroll the screens to reach the one shown on the left;
- press "ENTER" to move the cursor to the field to the right of "rH Set P";
- press "UP" and "DOWN" to change the value;
- press "ENTER" to confirm.



Control Params	
%rH Set P.	50.0%
Max.Prod.	70.0%
%rH Different.	5.0%

Fig. 5.a

Characteristics and range of the set point:

	unit of measure	default value (1)	min. limit	max. limit
humidity setting (H control)	% rH	50.0	0.0	100.0

Table 5.c

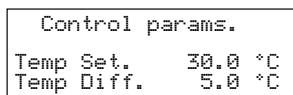
ⓘ **WARNING:** the outlet humidity set point, relevant to the limit probe, is saved by the parameter "Limit Set" (see par. 6.2.2).

#### 5.1.2 Setting the temperature set point

Questa operazione è possibile solo se è stata attivata la modalità di regolazione T.

Sequence:

- go to the main screen and press "PRG";
- press "ENTER" to move the cursor to the field to the right of "Temp Set.";
- press "UP" and "DOWN" to change the value;
- press "ENTER" to confirm.



Control params.	
Temp Set.	30.0 °C
Temp Diff.	5.0 °C

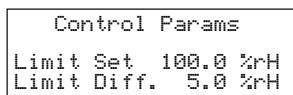
Fig. 5.b

#### 5.1.3 Setting the outlet humidity set point

The outlet humidity set point can only be set if H control mode with outlet limit has been activated (see the paragraph "Setting the control mode", par. 7.2).

Sequence:

- go to the main screen and press "PRG";
- enter the "SET" submenu;
- scroll the screens to reach the one shown on the left;
- press "ENTER" to move the cursor to the field to the right of "L set point";
- press "UP" and "DOWN" to change the value;
- press "ENTER" to confirm.



Control Params	
Limit Set	100.0 %rH
Limit Diff.	5.0 %rH

Fig. 5.c

## 5.2 Reading and setting the control parameters - reading the measurements

### 5.2.1 Reading the measurements and the main parameters

The measurements and the main parameters can be displayed very simply by scrolling the screens that, starting from the main screen (par. 4.3.3), are accessed by pressing the "UP" and "DOWN" buttons. These screens contain the values listed in the table on the opposite page.



display	unit of measure	accessibility	description
steam:	kg/h or lb/hr		total steam flow-rate
Amb. Hum:	%rH	in H control mode	humidity measured in the room
Set P.	%rH		ambient humidity set point
Amb. T:	°C (°F)	in T control mode	room temperature
Set T.:	°C (°F)		room temperature set point
Set P. Lim.:	%rH	in H control mode + limit	set point at the outlet
Humid. Limit:	%rH		relative humidity at the outlet
Prod.Bur1:	kg/h or lb/hr		current production of burner 1
Fan 1:	RPM		speed of fan 1
Prod.Bur2:	kg/h or lb/hr		current production of burner 2 (UG180)
Fan 2:	RPM		speed of fan 2 (UG180)
Preheat Set:	°C (°F)		preheating set point (if preheating is not enabled, "N.A." is displayed)
Antifreeze Set:	°C (°F)		antifreeze set point (if not enabled, "N.A." is displayed)
Conductivity	µS/cm		conductivity of the mains supply water
Flue gas temperature	°C (°F)		flue gas temperature
Burner 1:			
Burner 2:			

Table 5.d

Scroll the screens until reaching the "Menu password" request. Enter the password "77" to access a series of screens that provide information normally reserved for the installer or service personnel. To enter the password, simply:

- press "ENTER" to move the cursor to the "0000" field;
- press "UP" or "DOWN" to enter the number "0077";
- press "ENTER" to confirm.

The information included on these screens is listed in the following table.

text	option	description	
gaSteam status	see Table. 4.a	similar to the status that appears on the main screen	
Burner 1 (2)	status	On	combustion active
		Off	combustion not active
		Alarm	alarm
	activity:	Off	burner not active
		Production	steam production in progress
		Preheat	preheating in progress
		Pre-purge	pre-purge in progress
		Antifreeze	antifreeze in progress
	Speed:	fan speed (rpm)	

Table 5.e

### 5.2.2 Setting the control parameters

The control parameters are the values corresponding to the ambient humidity control (or temperature) control process.

To access these parameters, scroll the screens present under the "SET" submenu.

#### Control parameters

display	range	default	UOM	accessibility	description
Burner sequence, UG180 only	Parallel, Series	Parallel		always	Operating mode (see Chap. 9 Operating principles)
Seq. hyster.: UG180 only	0 to 20.0	5.0	%	always	hysteresis for the shutdown/ignition of the burners only in series or parallel burner sequence with rotation (see "setting the operating sequence of the two burners") UG180
Max. prod.	25.0 to 100.0	70.0	%	always	Maximum production of the humidifier as a percentage
	12.5 to 100.0				For the concept of rotation see par. 6.3 "Options" Note: for the minimum limit for this parameter - see par. 5.17 "setting the production"
%rH Set P.	0 to 100.0	50	%	in H control mode and H control mode with outlet limit	Humidity set point
%rH Differential	2.0 to 20.0	5.0	%	only in H control mode with outlet limit	Humidity differential
Limit Set	(%rH set point) to 100.0	80.0	%	only in H control mode with outlet limit	Outlet humidity set point
L. Diff.	2.0 to 20.0	5.0	%	only in T control mode	Outlet humidity differential
Temp Set	0 to 50.0	30.0	°C		Temperature set point
	32.0 to 122.0	86.0	°F		
	2.0 to 19.9	5.0	°C		Temperature differential
	35.6 to 68	41.0	°F		
Low	0 to 100.0	10.0	%	in H control mode and H control mode with outlet limit	Low humidity alarm threshold
High	0 to 100.0	90.0	%	only in H control mode with outlet limit	High humidity alarm threshold
High	0 to 100.0	100.0	%rH	only in H control mode with outlet limit	High outlet humidity alarm threshold
Low	0 to (high threshold)	0	°C	only in T control mode	Low temperature alarm threshold
	32.0 to (high threshold)	32.0	°F		
High	(low threshold) to 60.0	60.0	°C		High ambient temperature alarm threshold
	(low threshold) to 140.0	140.0	°F		

### 5.2.3 Setting the "operating sequence of the two burners" (UG180 only)

The gaSteam 180 manages the operation of the two burners so that in stable operation these produce 180 kg/h of steam.

Ideally, the gaSteam 180 can be considered as two separate humidifiers, each with its own burner, and able to produce up to 90 kg/h.

The two systems are managed based on the setting of the "Burner Sequence" parameter, seen in the table above.

- "PARALLEL" mode: the steam request is divided equally between the burners. In this case, therefore, the steam production provided by the two burners is the same.
- "SERIES" mode: (also called "sequential"): if the steam request is less than 50% of the rated production, only one burner is operated. Only if the request exceeds the 50 % does the other burner start.

As each burner must operate so that the corresponding "ideal" humidifier produces a minimum (25% for natural gas; 33% for butane-propane) of the "ideal" flow-rate of 90 kg/h, "SERIES" mode naturally offers a wider overall range of modulation of steam production.

- PARALLEL mode: the minimum possible production is 45 kg/h;
- SERIES mode: the minimum production is 22.5 kg/h

**Key**

1	production burner 1; total
2	total request
3	production burner 2; total
4	2% in P control; 0.1xPO in H/T control
5	total production

**Example of PARALLEL mode**

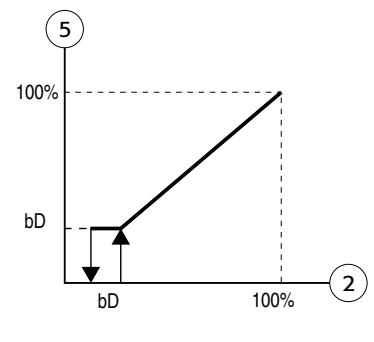
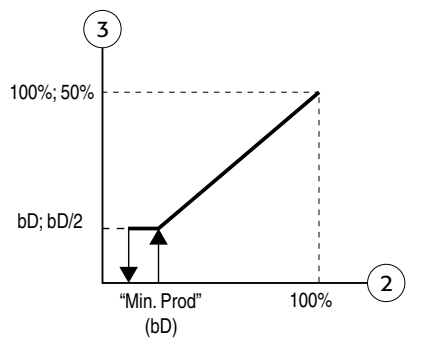
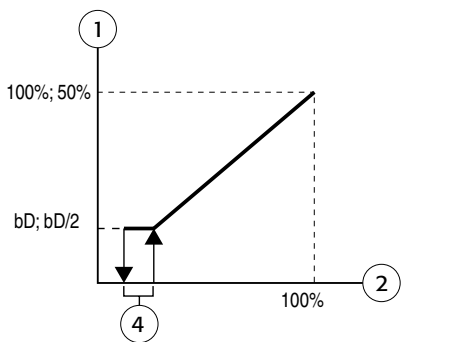
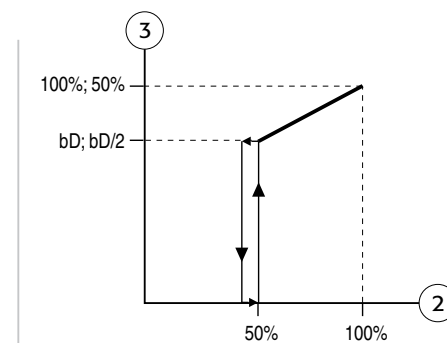
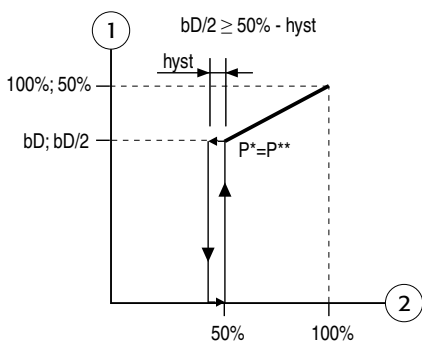
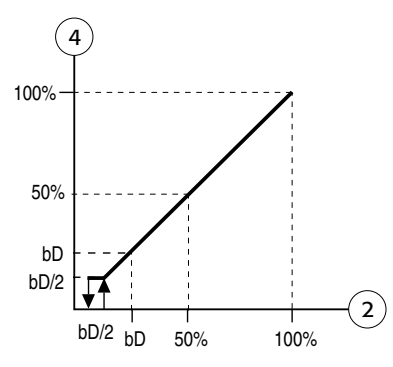
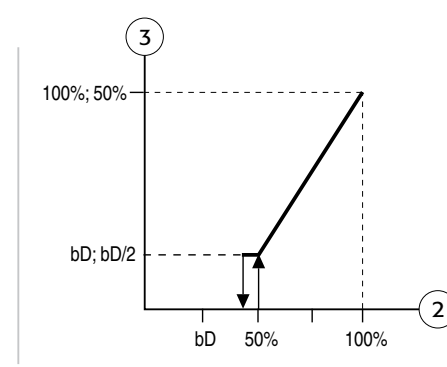
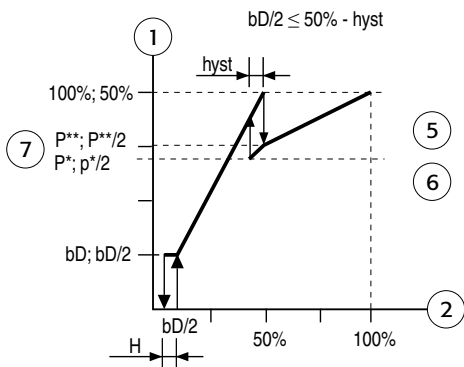


Fig. 5.d

**Example of SERIES mode**



**Key**

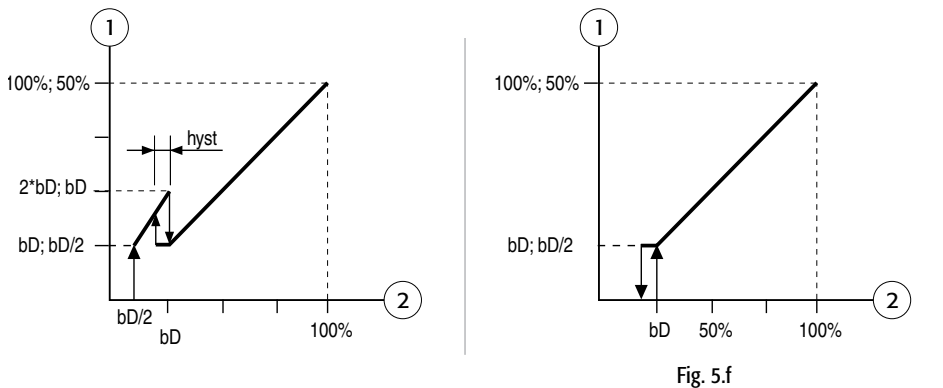
1	production burner 1; total
2	total request
3	production burner 2; total
4	total production
5	H= 2% in P control; 0.1xPO in H/T control
6	hyst= "Seq.Hyster" parameter (def: 5.0%, range: 0-20.0%)
7	P*= 100% - 2*hyst - bD P**= 100% - bD

Fig. 5.e

It can be seen that an hysteresis is required in the intermediate burner On/Off zone, which is managed by the "Seq. Hyster." parameter seen in the previous table.

To offer a wider range of modulation in parallel mode, the concept of "ROTATION" has been introduced (see OPTIONS - Rotation of the request between the burners).

If ROTATION is active, in PARALLEL mode too one burner is started first, while the other remains off until the steam request is between 12.5% and 25%. Above 25%, both burners start operating in parallel mode.



**Key**

1	production burner 1; total
2	total request
3	production burner 2; total

### 5.3 "Rotation" of the steam request between the two burners (UG180 only)

parameter name	options	default
Burner rotation	NO ROTATION	No Rotation
	AT START	
	IN PRODUCTION	

Table 5.g

#### Description

In normal operation, depending on the humidity request and the control mode selected (series or parallel), the control logic automatically calculates how much energy must be generated by each burner/fan system.

The rotation of the request consists in periodically reversing these production references.

The rotation of the request ensures, in the long term, similar operating hours for the two burners in the gaSteam, with the consequence of not only having more uniform wear on the combustion systems, but also a more uniform accumulation of lime-scale deposits on the two exchangers.

Two types of rotation are available:

- **IN PRODUCTION:** this is rotation by time, that is, whenever the difference in operating hours between the two burners reaches 10 hours, the production references are reversed.
- **AT START:** whenever that the steam production ends, when following request is received, the burner with the less operating hours always starts first, along as the difference in operating hours has exceeded 10 h.

**Note:** the difference of 10 h can be modified. The parameter is called "Time Diff." and is displayed on the same screen as the "Burner rotation" only if one of the two rotation modes is enabled.

## 6. CONFIGURATION PARAMETERS

### 6.1 Reading and setting the configuration parameters - "USER" submenu

The configuration parameters are used to set the operating modes of the controller, that is, assign the essential functions of the humidifier.

These parameters are normally managed by the installer or the service personnel, and therefore a password is required to access the screens that contain these parameters.

To access these screens, the sequence is:

- press "PRG";
- enter the "user" submenu;
- when the "User Password" is requested, enter the number "77".

To change the parameters in the same screen, proceed as follows:

- press "ENTER" to position the cursor on the desired parameter;
- press "UP" or "DOWN" to change the value;
- press "ENTER" to confirm and access the next parameter.

The type and meaning of these parameters are listed in the following paragraphs.

### 6.2 Configuring the control mode

This parameter can be used to choose between 5 different control modes, listed in the table below.

parameter name	display	description (for a detailed description see chap. 7)	
Type of control	H: Probe %rH	H control (default)	Humidity control with probe in the room
	H: Probe %rH + Limit	H control	Humidity control with room probe and limit probe
	P: Ext. Control	P control	Proportional control with signal sent by an external controller
	T: Temp. Control	T control	Temperature control with probe in the room
	C: ON/OFF	C control	Humidity control with humidistat

Table 7.a

### 7.3 Humidity control with humidistat

Humidity control with humidistat.

parameter name	display
Probe type	0 to 1V (default)
(not accessible in C control mode: ON/OFF)	0 to 10V
	2 to 10V
	0 to 20mA
	4 to 20mA
	NTC
	0 to 135 ohm

Table 7.b

### 7.4 Unit of measure

Select the unit of measure, between metric and imperial.

parameter name	display
Unit of measure	°C-kg/h (default)
	°F - lb/hr


Tab. 7.c

### 7.5 Configuring the ambient humidity (or temperature) probe

This is used to set the minimum value, maximum value and the offset for the probe used in the room.

screen name	parameter name	range	default	accessibility	UOM	
					H control	T control
Config. Amb. Probe (not accessible in C control mode: ON/OFF)	Min.	0 to (Max. )	0.0		%rH	°C
	Max.	(Min) to 100	100.0		%rH	°C
	Offset	-10.0 to 10.0	0.0		%rH	°C (or °F)

Table 7.d

 **NOTE for T control:** the setting of the minimum and the maximum values for the probe is only in degrees centigrade.

The offset, on the other hand, being linked to the difference between the reading made by the probe and by a reference thermometer, depends on which unit of measure has been selected.

For example, if having selected imperial measurements: if based on the measurements made it is clear that the value read by the probe is normally 2°F higher than the reading made by a reference thermometer, to correct the error set the offset to -2.0°F).

## 6.6 Configuring the limit humidity probe

This is used to set the minimum value, maximum value and the offset for the limit probe.

screen name	parameter name	range	default	UOM
Config. Limit Probe (accessible only in H control mode with outlet limit)	Type	0 to 1 V	0 to 1 V	
		0 to 10 V, 2 to 10 V, 0 to 20 mA, 4 to 20 mA, NTC		
	Min.	0 to (Max.)	0.0	%rH
	Max.	(Min) to 255	100.0	%rH
	Offset	-10.0 to 10.0	0.0	%rH

Table 6.e

## 6.7 Initial auto-test

This is an automatic procedure used to check the correct status of the fill valve and the drain pump and the correct operation of the float present in the level sensor.

- the boiler is filled until reaching the highest level of the level sensor;
- after which a drain cycle is performed until reaching the lowest level of the level sensor.

All this takes place without igniting the burners.

The auto-test must first be enabled.

To enable/disable the auto-test procedure, go to the "USER" submenu, enter the password "77" and go to the screen shown in Fig. 7.a.

Move the cursor to "Auto-test" and use the UP/DOWN arrows to set "YES".

➤ **NOTE:** The auto-test is only performed if the humidifier is enabled for production, "Humid. Enabled=Yes" and if the controller is enabled from the keypad. This function is useful for service or when first starting the appliance.

➤ **IMPORTANT:** In these conditions, the auto-test occurs whenever the controller is switched off an on again. To avoid the auto-test being performed whenever the controller is switched on, it is recommended to disable the function.

```
Burners rotation:
NO ROTATION
Autotest: NO
```

```
Burners rotation:
NO ROTATION
Autotest: YES
```

Fig. 6.a

### 6.7.1 End Autotest: softened water mode

At the end of the autotest the screen shown to the side is displayed, used to enable/disable operation with softened water and set the number of evaporation cycles between two drain for dilution cycles.

- pressing "ALARM" confirms the settings displayed and exits the screen;
- pressing "ENTER" positions the cursor in the field that is used to enable or disable the mode, by pressing the "UP" or "DOWN" buttons;
- pressing "ENTER" again moves to the field for setting the number of cycles, "UP" and "DOWN" change the value.
- pressing "ENTER" again and then "ALARM" confirms the values set and exits the screen.

```
Softened water
NO (normal/demin.)
Forced drains 2
- Press ALARM -
```

Fig. 6.b

⚠ **IMPORTANT:** The value set by default for the number of evaporation cycles between two drain cycles (Force drain cycles) is the value recommended by the manufacturer. To change this setting without causing operating problems, contact qualified personnel.

### 6.7.2 End Autotest: setting the heat value of the supply gas

After exiting the "Softened water" screen, the screen shown to the side is displayed, (Fig. 7.c) which prompts the user to set or confirm the HHV of the supply gas in Kj/m<sup>3</sup>. This option has been made necessary for the American market, where the value varies considerably between the regions where the humidifier may be installed.

- pressing "ALARM" confirms the value displayed and exits the screen;
- pressing "ENTER" allows the value to be set using the "UP" and "DOWN" buttons;
- pressing "ENTER" again confirms the value set and then pressing "ALARM" exits the screen.

```
Insert calorific
power:
37.9x1000 Kj/m3
- Press Alarm -
```

Fig. 6.c

⚠ **IMPORTANT:** The value set determines the correct operation of the humidifier. Contact qualified personnel before changing it.

## 6.8 Setting the pre-purge speed and calibrating the fan speed

➤ **NOTE:** These operations must be carried out by qualified personnel.

The pre-purge speed is indicated in "RPM" and is normally set by the manufacturer based on the characteristics of the combustion system and the gas.

To modify this parameter, go to the following screen and change the "Pre-purge" parameter.

During service, it may also be useful to check if the fan speed measured with a stroboscope coincides with the speed set via SW. The "Manual" parameter can be used to force a desired speed for performing the test.

```
Blower speed
Pre-purge 3450RPM
Manual 3000RPM
```

Fig. 6.d

## 6.9 Water supply with REVERSE OSMOSIS system

The gaSteam is a humidifier suitable for operation on demineralised water, which reduces the phenomena of saline deposits and fouling inside the boiler and on the walls of the exchangers. In this regard, the water pipe can be connected to a reverse osmosis system for demineralising the water. The rated water flow to the installation must be equal to the flow-rate of the solenoid valve fitted.

## 6.10 Setting the maximum ratio between the water filled and the water drained for dilution

During normal operation, the gaSteam periodically performs drain cycles, called drain "for dilution", followed by refilling with supply water. These drain cycles have the fundamental task of reducing the high conductivity of the water inside the boiler due to the continuous concentration of salts during the repeated fill/evaporation cycles.

The control logic calculates how many fill/evaporation cycles must be completed before performing the dilution, based on the conductivity of the supply water. Normally, if the supply water is not very conductive, the drain cycles for dilution are performed less frequently. With this type of water, therefore, the number of fills between two successive drain cycles for dilution can be very high. This number therefore needs to be limited.

To do this, use the "Max ratio fill/drain" parameter, under the screen seen in the previous paragraph. The default value is 10.

## 6.11 Preheating

The preheating function is used to keep the water above a temperature set by the user when no steam is requested. Preheating thus speeds up the return to the steam production when next requested.

There are three options:

### 1. Preheating disabled;

### 2. Preheating enabled: operation by temperature + restriction on %rH

In the classic mode, preheating is controlled depending on the water temperature and is activated according to the value read by the humidity (in H control) or temperature probes (in T control) or the signal applied (in P control). This is enabled by setting "TEMP. + %rH" for the preheating options present in the screen shown in Fig. 7f.

```
Pre-heating:
DISABLED
Set PreHeat: 80.0 °C
```

Fig. 7.e

```
Pre-heating:
TEMP. +%rH
Set PreHeat: 80.0 °C
```

Fig. 6.f

Preheating is activated depending on the humidity value measured by the probe and by the operating mode set.

In C mode (ON/OFF), preheating is never activated.

In P mode (proportional), preheating is activated and deactivated depending on the signal applied to the room probe input.

By default, preheating is activated when the signal applied exceeds 3%, while it is deactivated when it falls below 1% (see Fig. 7.g).

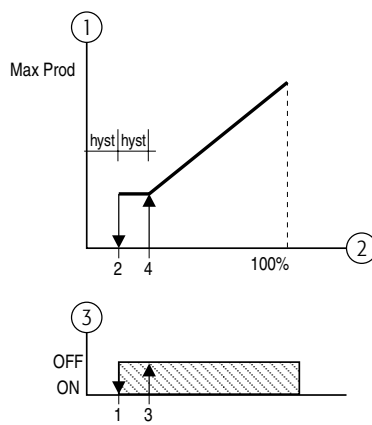
In humidity control mode preheating is activated when the relative humidity falls below the "humidity set point + preheating offset - hysteresis" and is deactivated when it rises above the "humidity set point + preheating offset" (see Fig. 7.g).

The values of the preheating offset and hysteresis parameters can be changed from the default values. These must be as follows:

Preheating offset: Range= 2.0 - 20.0 [°C] ; Default= 3.0 [°C]

Hysteresis: Range= 2.0 - 5.0 [°C] ; Default= 2.0 [°C]

Graph of Proportional Mode



Graphic of Control Mode

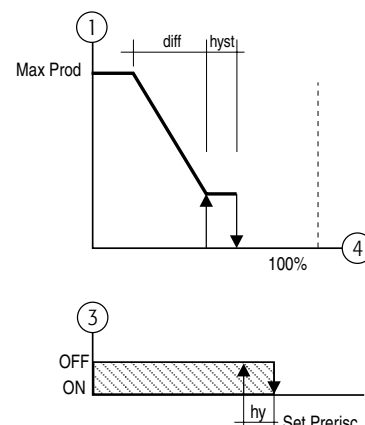


Fig. 6.g

Key

1	production %
2	signal applied to probe 1 input
3	preheating
4	probe rH1

Once preheating is activated, the heating is modulated by the systems (burners + fans) depending on the water temperature measured by the NTC probe and the "preheating set point" (see Fig. 7h). The preheating set point temperature is a parameter with a range 70T-90°C and a default equal to 80°C.

**Key**

1	Reference % for the burner
2	temperature
3	Fixed differential of 20°C
4	preheating temperature (def.: 80°C)

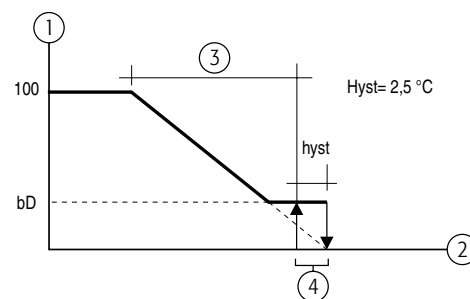


Fig. 6.h

**3) Preheating enabled: operation with temperature control only**

In this case, preheating is always enabled, that is, it is not activated depending on the humidity value or the temperature measured by the external probe.

The reference for the combustion systems only depends on the water temperature measured by the NTC probe and by the preheating set point, as illustrated in the previous graph.

This option is enabled by choosing the "ONLY TEMPERATURE" option in the previous screen (Fig. 7f).

**6.11.1 Preheating on request**

Setting preheating to "ON REQUEST", that is, whenever a humidity request causes the burner to ignite, means that the temperature of the water inside the boiler is checked, and if this is lower than the set value, the humidifier will heat the water to this value before actually responding to the request. In this way, even with quite moderate requests and with cold water, steam production will start relatively quickly.

**6.12 Antifreeze**

The antifreeze option can be very useful in applications that feature the installation of the gaSteam outdoors, especially in colder countries where there is the real risk that, if no steam is requested, the water inside the boiler might freeze.

For this reason, an option that can be enabled by the user has been added that starts heating the water if the temperature measured by the NTC probe is too low.

The humidifier must be activated and continuously connected to the power and gas supplies, excluding any interruptions.

The antifreeze function acts as displayed in the following graph.

**Key**

1	reference % for the burner
2	NTC temperature

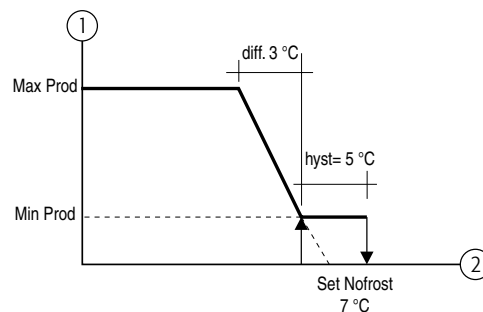


Fig. 6.i

**6.13 Reversing the logic of the alarm relay**

Normally, the alarms that stop the humidifier energise the coil in the alarm relay.

This logic can be reversed, so that the coil remains energised when no alarm is present, and is de-energised when an alarm is activated.

To do this, set the following parameter:

screen name	parameter name	range	default
Options	Al. Relay	ENERGISED	ENERGISED
		NOT ENERGISED	

Table 6.f

## 6.14 Options

### Drain due to inactivity

The drain due to inactivity is used to completely empty the water from the humidifier if the cylinder does not produce steam for a period set by parameter, which by default is 3 days.

By default, the drain due to inactivity is enabled.

It can be disabled by setting the parameter in the following table.

screen name	parameter name	range	default
Options	Drain for inactivity	Y,N	Y

Table 6.g

In addition, the value of the parameter relating to the period of inactivity can be changed, available by scrolling the screens.

The parameter is:

screen name	parameter name	range	default	UOM
Options	Days of inactivity	1 to 199	3	d (days)

Table 6.h

### Warn when exceeding maintenance hour limit

The gaSteam features a limit to the number of operating hours of the humidifier, beyond which it is recommended to perform maintenance (see the par. on MAINTENANCE).

In this case, a "maintenance request" alarm is sent.

Nonetheless, this alarm can be disabled, by setting the "Maint. warning" parameter to "N".

screen name	range	default	UOM
Maint. warning	Y, N	Y	h (hours)

Table 6.i

### Dehumidification

The dehumidification function is only possible if terminals 13U - 14U on terminal block U are connected electrically to a dehumidifier (see par. 3.2).

By default, dehumidification is not enabled.

During normal operation, dehumidification may occur only if the following conditions are satisfied:

1. the dehumidification option is enabled;
2. the ambient humidity probe is connected;
3. the humidifier has not been disabled by "Remote ON/OFF";

If these conditions are satisfied, the dehumidification process is activated depending on the humidity measured, based on the "dehumidification set point" and "dehumidification differential" parameters, as shown in the graph to the side.

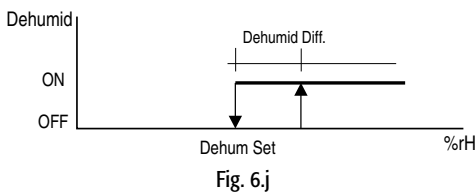


Fig. 6.j

Control Params	
DeHum.set	100.0%
DeHum.diff.	5.0%

Fig. 6.k

To activate the dehumidification function, the following parameter needs to be enabled:

screen name	parameter name	range	default
Options	Dehumidify	Y, N	N

Table 6.j

Once dehumidification has been enabled, the "set point" and "differential" parameters can be modified. To do this, go to the following screen, under the "SET" submenu.

The characteristics of these parameters are listed below:

screen name	parameter name	range	default	UOM
Control Param	DeHumid.set	(humidity set point) to 100.0	100.0	%
	DeHumid.diff.	2.0 to 19.9	5.0	%

Table 6.k

### Manually set the conductivity of the supply water and set the conductivity alarm thresholds

The conductivity of the supply water, as well as normally being monitored to prevent excessively conductive water from entering ("High conductivity alarms" - see "Alarms"), is also useful for determining the limit of fill/evaporation cycles between two drain cycles for dilution.

As the conductivity of the water is directly responsible for the accumulation of salts inside the boiler.

To change these two limits, set a parameter that, if not equal to zero, takes the place of the conductivity read by the conductivity meter. The lower this parameter, the higher the limit values described above. By default the parameter is set to zero.

The limit values for the high conductivity warning and alarm can also be set on the same screen.

The screen has the following characteristics:

screen name	parameter name	range	default	UOM
Conductivity	Forced (B4)	0 to 2000 (*)	0	uS/cm
	Pre-Al (B5)	0 to (B6)	1000	uS/cm
	Alarm (B6)	(B5) to 2000	1250	uS/cm

Table 7.l

(\*): supply water conductivity:

- b4= 0: the controller uses the conductivity measured automatically by the conductivity meter;
- b4= 1 to 4: the value set corresponds to the number of evaporation cycles between two drain for dilution cycles: each "b4" evaporation cycles one drain to dilute cycle is performed;
- b4> 4: the controller uses the value of b4 as the conductivity and IGNORES the value measured by the conductivity meter.

**Note:** to the side of the above parameters there may be the codes B4, B5 and B6, which indicate the name of the parameter that was normally used with the gaSteam 40, 45 and 90.



### 6.15 Setting the production ramp

During operation, the steam request may change depending on the readings of the probes or the signal from the external controller.

The speed at which the humidifier shifts to the new request can be slowed down by setting the parameter (formerly parameter b9 in the old gaSteam models 40, 45, 90) that is located in the screen shown to the side.

- parameter set to zero: the control logic uses an internal ramp (30 s) to shift from one request to the next;
- parameter set to a value other than 0: the logic recalculates the fan speed variation step, based on the assumption that to change from 0 to 100% of production must take the time set for this parameter.

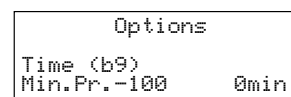


Fig. 6.l

### 6.16 Setting the fan speed for minimum and rated production

These values are set by default to ensure the correct air/gas mix with the natural gas.

These are found on the screen to the side.

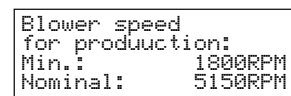


Fig. 6.m

### 6.17 Setting the minimum production

The minimum production as a % guaranteed by each burner depends on the type of gas used.

Normally, its value is 25% for natural gas, and 33% for butane and propane.

The reference screen is the following.

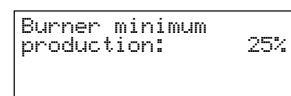


Fig. 6.n

### 6.18 Disable the display of the change language screen on power-up

During the start-up sequence (see par. 4.3.4), the screen that is used to change the language normally appears for 30 seconds. To deactivate this screen on power-up:

- go to the following screen;
- set the value to the right "Show language mask to unit start-up" to "N";
- press "ENTER" to confirm.

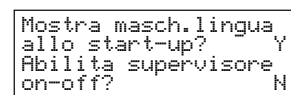


Fig. 6.o

### 6.19 Enable remote off via supervisor

In the same screen seen in the previous paragraph (par. 7.19), humidifier on/off via supervisor can also be enabled.

To do this, simply set "Y" to the right of the question "Enable supervisory on-off?".

### 6.20 Configure the communication protocols

By accessing the screen containing the parameters shown in Table 7.o, the controller can be configured so as to be able to communicate correctly using different communication protocols.

The parameters in question are listed in the following table:

parameter name	range	default	UOM
ID number for BMS Network	0 to 200	1	
Comm. speed	1200, 2400, 4800, 9600, 19200	19200	Bps
Protocol	CAREL, Modbus, LON, RS232, GSM	CAREL	

Table 6.m

## 7. "MAIN "MENU" - AUXILIARY FUNCTIONS "SERVICE" ("MAINTENANCE") SUBMENU

By entering the "service" submenu, the installer or service personnel can access information and perform any required operations.

### 7.1 "SERVICE" - information on the firmware

The first screen in this submenu indicates the code and the version of the application installed. In addition, the language can be changed (see par. 4.3.10 Fig. 4.24).

The second screen corresponds to "System information", that is, the BIOS and BOOT versions installed, see the figure to the side.

```

System info
Bios 03.55 26/07/04
Boot 03.01 15/04/02
  
```

Fig. 7.a

```

Hour counters
Humidifier    0h
Burner 1     0h
Burner 2     0h
  
```

Fig. 7.b

```

Service
Password      0
  
```

Fig. 7.c

```

Hours counters reset
Burner 1:  NO
Burner 2:  NO
GaSteam:   NO
  
```

Fig. 7.d



Fig. 7.e

### 7.2 "SERVICE" - display the operating hours

The third screen indicates the total operating hours, and the operating hours of each individual burner, Fig. 7.b.

- **NOTE:** The operating hours displayed are proportional to production. For example, if burner 1 has operated for 100 hours at 100%, the value displayed will be 100 h, On the other hand, if burner 1 has operated for 100 hours at 70 %, 70 h will be displayed.

#### Operations with password access

The following operations must only be carried out by installation or service personnel. Access is only possible on entering the password "77" in the screen shown to the side.

#### To enter the password, simply:

- press "ENTER" to move the cursor to the field with the "0";
- press "UP" or "DOWN" to enter the number "77";
- press "ENTER" to confirm.

#### **- Reset the operating hours**

##### Password access only.

The operating hours of the burner should be reset whenever the boiler is cleaned or the exchanger replaced.

On the other hand, it is not recommended to reset the total operating hours of the humidifier, as it may be useful to know how many hours the humidifier has been working for. Resetting the total hour counter may be useful if completely replacing the combustion system (exchangers, burners).

The operating hours can be reset from inside the following screen.

#### To reset the hours:

- press the "ENTER" button to move the cursor to the field in question;
- press "UP" and "DOWN" to change the value;
- press "ENTER" to confirm and move to the next field.

### 7.3 Manually draining the cylinder

The cylinder can be drained manually to complete empty the water contained inside.

This operation is particularly useful when maintenance needs to be performed on the boiler, the exchangers or the burners, or alternatively when the humidifier needs to be shut down at the end of the season.

#### The sequence to start the manual draining cycle is the following:

- press the UP and DOWN arrows together for 5 seconds until the drain cycle is activated.
- Once the drain cycle is terminated, the humidifier returns to the same operating conditions as prior to the drain cycle.

- **NOTE:** the duration of the complete boiler drain cycle is preset. Nonetheless, the manual draining can be stopped by pressing the UP and DOWN buttons again for 5 seconds.

If the cylinder needs to be replaced, when the manual draining is complete the humidifier must be switched off.

## 7.4 Procedure for testing the electrical parts

Password access only.

This procedure allows the installer or the service personnel to check the correct operation of all the electrical parts, i.e.:

- the activation of the fans/burners;
- the opening of the water fill valve;
- the activation of the drain pump;
- the activation of the dehumidification contact;
- the activation of the alarm relays.

To access the test screens, the humidifier must be disabled (Humid.enabled: NO) and then activated from the keypad.

The sequence is the following:

1. press PRG;
2. enter the "service" submenu;
3. scroll the screens until the "Service Password" is requested;
4. enter the password "77" to access the subsequent screens;
5. scroll the screens until reaching the enable manual procedure screen;
6. enable the manual procedures, setting the "Manual" field to "Y". Once the screen has been enabled, the fields relating to the outputs will be active, Fig. 7f;
7. to activate the outputs simply move to the desired output and change the value with the "UP" and "DOWN" buttons, Fig. 7g;
8. note that by enabling the manual procedures, the following screen can be accessed to activate the burners/fans, Fig. 7h;
9. to enable burner/fan 1, move to the "Burn.1" field and set it to "Y". Once having done this, two other fields will be displayed, which indicate the request as a % and the fan speed in RPM, Fig. 7i;
10. to switch on burner 1, simply move to the "Req" field and set it to any value other than zero. In this way, both the Honeywell board for burner 1 and fan 1 will be powered;
11. the same is true for burner/fan 2 (UG180 only), however to move to the "Burn.2" field, Fig. 7j.

```
In Manuale: N
Carico: - Scarico: -
DeUmid.: - Allarme: -
```

Fig. 5.f

```
In Manuale: S
Carico: N Scarico: N
DeUmid.:N Allarme: N
```

Fig. 5.g

```
Procedura manuale
Bruc.1: N Bruc.2: N
```

Fig. 5.h

```
Procedura manuale
Bruc.1: S Bruc.2: N
Rich.: 0.0%
Vent.: 0000
```

Fig. 5.i

```
Procedura manuale
Bruc.1: S Bruc.2: S
Rich.: 0.0% 0.0%
Vent.: 0000 0000
```

Fig. 5.j

Once the outputs have been tested, exit the manual procedure by either setting the "Manual" variable to "N" on the screen seen in point 5, or alternatively by simply switching the unit off using the keypad.

## 8. ALARMS, TROUBLESHOOTING

### 8.1 Alarms

When an alarm is activated, the Alarm button starts flashing intermittently.

In these conditions, pressing the Alarm button once displays the type of alarm (and the code, in line with the standard for CAREL humidifiers).

In the event of potentially dangerous alarms, the controller automatically stops the production of steam. For some alarm events (see Table 8.a), as well as the signal, the alarm relay is activated, described in par. 3.1.

If the causes of the alarm are no longer present, the humidifier and alarm relay can be reset automatically or manually, depending on the type of fault, while the message displayed is cancelled manually (see Table 8.b).

Even if no longer active, the alarm status continues to be indicated until the "reset display" button is pressed.

The alarms that are still active cannot be reset.

In the event where more than one alarm is active, the display indicates all the codes in sequence, only if after having pressed the Alarm button once, the "UP" or "DOWN" button is also pressed.

### 8.2 Alarm management and signals

Table of alarms

meaning	causes	solution	reset	alarm codes displayed (2)= alarm relating to cylinder 2	alarm relay	action
Low production alarm	<ul style="list-style-type: none"> <li>power not available;</li> <li>with the unit on, there is no steam production;</li> <li>flue or air inlet blocked;</li> <li>gas tap closed;</li> <li>malfunction of the burner and/or the controller.</li> </ul>	<ul style="list-style-type: none"> <li>check the pressure of the gas and that the gas tap is open;</li> <li>check that the air inlet is free;</li> <li>check the power connection to the fan;</li> <li>check the operation of the brushless fan, the flue and the air inlet;</li> <li>burner flame malfunction;</li> <li>check the connections between the flame control board and the burner and between the electrical panel and the flame control board;</li> <li>check the connections between the control unit and the terminal block inside the electrical panel.</li> </ul>	manual	Alarm: EP Low Production (Burners Off)	active	stop production
No water	no water supply	<ol style="list-style-type: none"> <li>check that the supply pipe to the humidifier and the internal tubing are not blocked or choked and that there is enough pressure (0 to 1 to 0.8 MPa, 1 to 8 bar);</li> <li>check the operation of the fill solenoid valve and that the filter is clean;</li> <li>check that there is not excessive back-pressure in the steam outlet, causing the activation of the overflow;</li> </ol> check that the steam outlet pipe is not choked or that there are no pockets of condensate	automatic	Alarm: EF No Water (Burners Off)	active	activate automatic procedure
High conductivity alarm	high conductivity of the supply water	<ol style="list-style-type: none"> <li>check the threshold set;</li> <li>switch the machine off and clean the electrodes that measure the conductivity of the water;</li> </ol> if the problem persists, change the origin of the supply water or add a suitable treatment system, (demineralisation, even partial). N.B.: the problem is not resolved by softening the supply water.	manual	Alarm: EC High Conductivity (Burners Off)	active	stop production
High conductivity warning	high water conductivity pre-alarm	<ol style="list-style-type: none"> <li>check the conductivity of the supply water; if necessary, add a suitable water treatment system.</li> </ol> N.B.: the problem is not resolved by softening the supply water	automatic	Pre-alarm: Ec High Conductivity	not active	signal only
High humidity warning	high humidity in the room	check the operation of the probe and the value set for the upper limit parameter	automatic	Pre-alarm: E- High Humidity	not active	signal only
Low humidity warning	low humidity in the room	check the operation of the probe and the value set for the lower limit parameter	automatic	Pre-alarm: E_ Low Humidity	not active	signal only
High temperature warning	high temperature in the room	check the operation of the probe and the value set for the upper limit parameter	automatic	Pre-alarm: E> High Temperature	not active	signal only
Low temperature warning	low temperature in the room	check the operation of the probe and the value set for the lower limit parameter	automatic	Pre-alarm: E_ Low Temperature	not active	signal only
High outlet humidity alarm	high outlet humidity	check the operation of the outlet probe	Automatic	Pre-alarm: E= Humidity Limit Probe Alarm	not active	signal only
Main probe disconnected alarm	room probe not connected	check the connection of the probe, the parameter A2 for the room probe and the setting of parameter A0 (see chap. 9)	automatic	Alarm: E3 Room Probe Not Connected or Damaged	active	stop production
Outlet probe disconnected alarm	outlet probe not connected	check the connection of the probe, the outlet humidity limit parameter and the setting of the "type of control" parameter	automatic	Alarm: E4 Limit Probe Not Connected or Damaged	not active	signal only

segue

meaning	causes	solution	reset	alarm codes displayed (2)= alarm relating to cylinder 2	alarm relay	action
Foam alarm	excessive foam in the cylinder during the boiling phase	the formation of foam is generally due to the presence of surfactants in the water (lubricants, solvents, detergents, water treatment or softening agents) or an excessive concentration of dissolved salts: 1. purge the water supply lines; 2. clean the cylinder; check for the presence of a softener (in this case, use another type of water or reduce the softening).	automatic	Pre-alarm: EA Foam Present	not active	signal only
Cylinder full	cylinder full signal with unit off	with the machine off: 1. check for any leaks from the fill solenoid valve or the return of condensate from the pipe; check the cleaning of the level sensors	automatic	Pre-alarm: EU Boiler Full	not active	signal only
Test alarm	Auto-test failed; probable problems in water supply, level control or water drain cycle	Make sure that the unit receives water (1 to 8 bar; 0 to 1-0.8 MPa; 14.5 to 116 PSI); Make sure that the unit drains the water; Switch the machine off and clean the level control and the fill valve, the pump and the drain filter	manual; turn the unit off and on again	Alarm: EE Test Alarm (burners off)	active	Strop production
Low level alarm	Low level of the water in the cylinder or fault with the level control	Check the correct supply of water to the cylinder ; Switch the machine off and clean: the cylinder , the level control and the fill solenoid valve	manual	Alarm: EL Min. Water Level (burners off)	active	stop production
NTC probe disconnected	NTC water temperature not connected	Check the operation of the preheating function and the setting of the parameters; check the connections on the terminal block on the cover of the cylinder	automatic	Alarm: E5 NTC Probe Not Connected or Damaged	active	preheating deactivated.
System fan 1 (2) alarm	fan error	Check the electrical connections between the control board and the fan; if necessary, remove the brushless fan and check its operation	manual	Alarm: Ed Fan Alarm 1 (2) (burner 1 (2) off)	active	stop production of the corresponding burner
System thermostat 1 (2) alarm	safety thermostat activated due to abnormal overheating of the cylinder sue to operation without water	Stop the unit and perform complete maintenance on the cylinder	Manual	Alarm: Et Klixon 1 (2) (burner 1 (2) off)	active	stop production of the corresponding burner
Clock error	backup battery completely discharged or general problems with the clock	Replace the pHc controller	manual	Clock Card Alarm	not active	signal only
High flue gas temperature warning: Maintenance recommended	Flue gas temperature higher than normal operation, presence of lime scale	Carry out maintenance and/or clean the exchanger	automatic	Pre-alarm: ER - High Flue Gas Temp. (2) Boiler Maintenance	Not active	signal only
High flue gas temperature alarm	Flue gas temperature excessively high, boiler full of lime scale	Switch the machine off, clean the exchanger, check burner calibration	manual	Alarm: ER High Flue Gas Temp. (2) (Burner off)	Active	stop production of the corresponding burner
Level sensor blocked warning	Lime scale on the sensor	Carry out maintenance on the level sensor	automatic	Pre alarm: EL - Level sensor blocked	Not active	activate automatic procedure
Level sensor blocked alarm	No more attempts to unblock	Carry out maintenance on the level sensor	manual	Alarm: EL - Level sensor fault	Active	stop production
Drain warning	Filter blocked, level sensor tube blocked, drain pump malfunctioning	Carry out maintenance	automatic	Pre-alarm: CL - Drain maintenance	Not active	signal only
Drain alarm	Drain pump broken, Filter blocked, level sensor tube blocked	Carry out maintenance	manual	Alarm: CL - Drain maintenance	Active	stop production

Table 8.a

### 8.2.2 Resetting the alarms

The alarms are signalled by the flashing of the Alarm button and display of the alarm icon .

The alarms are reset in the sequence shown in the following table:

sequence	effect
Pressing once	Display the Alarm code. (NOTE: in the event where more than one alarm is present, to display all the alarms, after pressing the Alarm button the first time, press the "UP" or "DOWN" buttons)
Pressed a second time	if the causes of the alarm are no longer present, resets the alarm and the alarm relay (in the alarms where this is activated)
Pressed a third time	if the causes of the alarm are no longer present, resets the display of the alarm and cancels the following screen: <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;">Nessun Allarme Attivo</div>
Pressed a fourth time	return to main screen

Table 8.b

## 9.1 Operating principle

In a gas humidifier, the production of steam is obtained inside a boiler containing water that is heated to and then held at boiling temperature.

The heat required to boil the water is provided by one or two burners that burn a mixture of air/gas. The heat power of the flame created due to combustion is modulated by adjusting the speed of the brushless fans equipped on the burners.

During the normal operation of the gaSteam, the level of the water is monitored using a three-float level sensor. In stable operation, there are repeated periods in which the water is filled and the level rises, and periods of evaporation in which the level descends. In these phases, the level remains between the middle and top floats.

Due to these repeated fill/evaporation cycles, the conductivity inside the boiler increases due to the progressive accumulation of salts introduced with the water. The control logic therefore periodically drains the water and replaces it with fresh mains water, so as to eliminate part of this excessive salinity.

## 9.2 Control principles

The range of humidifiers includes the following control options.

### 9.2.1 ON/OFF control

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

The external contact may be a humidistat:

- **closed:** the humidifier produces steam if the remote ON/OFF contact is also closed;
- **open:** the production of steam ends after the completion of the evaporation cycle in progress (max. 10 to 15 min from the opening of the contact).

Note that if the remote ON/OFF contact opens, the production of steam ceases immediately, irrespective of the point that the current evaporation cycle has reached.

### 9.2.2 Proportional control

The production of steam (hourly quantity) is proportional to the value of a signal, Y, from an external device; the type of signal can be selected between the following standards: 0 to 1Vdc, 0 to 10Vdc, 2 to 10Vdc, 0 to 20mA, 4 to 20mA. The entire range is indicated as BP (proportional band).

The maximum production of the humidifier, corresponding to the value maximum of the external signal, can be programmed (by setting the Max.Product. parameter) from 25% to 100% of the rated output of the humidifier.

The minimum production, Min. Prod., has an activation hysteresis,  $hy$ , equal to 5% of the range BP of the external signal Y.

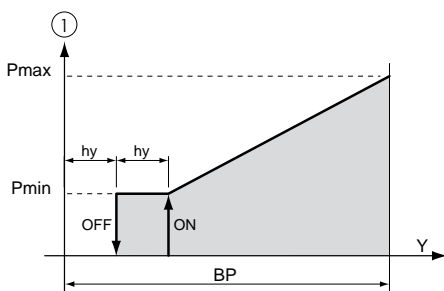


Fig. 9.a

#### 1. Steam production.

In the case of the UG180 humidifier, the following types of control sequence are available.

model	type of sequence	range min. prod. %	type of gas
UG180	parallel	25% - max prod.%	natural gas
	parallel with rotation	12.5% - max prod.%	
	series	12.5% - max prod.%	

Table 9.a

### 9.2.3 Autonomous control with relative humidity transducer

The production of steam is related to the % rH reading made by the relative humidity transducer connected to the controller, and increases as the value read deviates from the set point  $St$ . The maximum production, which is delivered when the relative humidity is less than the set point by a value at least equal to the differential ("H differential"), can be programmed (by setting the Max.Product. parameter) from 20% to 100% of the rated output of the humidifier, in operation with the parallel sequence (see par. 7.2) and from 10% to 100% in operation with the series sequence (see par. 6.2.3).

The minimum production, Min. Prod. (10% or 20%, depending on the operating sequence selected), has an activation hysteresis,  $hy$ , equal to 2% of the range.

The dehumidification function, if enabled (par. 7.14), overlaps the control diagram and is activated when the relative humidity % rH, send by the transducer, is higher than  $St$  by a set amount ("dehum.offset"); the hysteresis of the step, also programmable, is "dehum.diff."

To check that the relative humidity measured by the transducer is within certain preset values, two alarm thresholds can be set in autonomous control:

- high relative humidity alarm threshold;
- low relative humidity alarm threshold.

When these thresholds are exceeded, an alarm is activated, after a delay of 60 seconds.

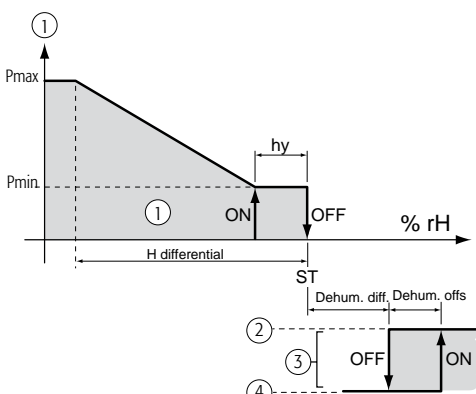


Fig. 9.b

1	steam production	3	dehumidification
2	activated	4	deactivated

#### 9.2.4 Autonomous control with relative humidity transducer and outlet humidity compensation transducer

In this case too the controller modulates steam production as a function of the % rH measurement performed by the relative humidity transducer, however, in addition, the output is limited if the relative humidity % rH2 measured by a second compensation transducer placed in the air duct downstream from the humidifier exceeds the maximum desired value.

The compensation probe has its own set point ("L set point") and differential ("L differential"), based on which the limit in production is calculated (see Fig. 9.c).

The overall steam production is equal to the difference between the steam request from the main transducer and the request from the compensation transducer.

To prevent the relative humidity measured by the transducer in the air duct downstream from the humidifier exceeding a value considered as excessive, in this control mode a high outlet relative humidity alarm threshold can be set (also see chap. 8).

This threshold is equal to the sum between the limit set point ("L set point") and an offset ("High Offset"). When this threshold is exceeded, an alarm is activated, after a delay of 60 seconds.

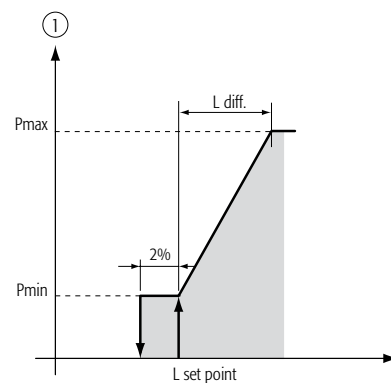


Fig. 9.c

#### 9.2.5 Application for steam baths: autonomous control with temperature transducer

In applications for steam baths, in which the control probe measures the temperature rather than the humidity, the same principles are true as in par. 9.2.3, with the temperature replacing the humidity. In this operating mode, the dehumidification function is not available.

Recommended transducer: ASET030001.

High temperature limit 60°C.

## 10. OTHER FUNCTIONS

### 10.1 Measuring the conductivity of the supply water

The controller measures the conductivity of the supply water. The measurement is made using the conductivity meter by opening the fill solenoid valve.

The field of reading ranges from 0 to 1500  $\mu\text{S}/\text{cm}$ . Two thresholds are available:

**xx: pre-alarm threshold** (signal only, without activating the alarm relay, and automatic reset when the condition is no longer present);

**xx: alarm threshold** (production shuts down, activation of the alarm relay).

The alarm is activated when the reading exceeds one of the two thresholds continuously for 60 minutes, or alternatively instantly if the value read is 3 times higher than the threshold.

To disable either of these thresholds, simply set the corresponding value to a number outside of the field of reading the conductivity meter, that is, greater than 1500  $\mu\text{S}/\text{cm}$ .

### 10.2 Flue gas discharge temperature measurement

The temperature of the flue gas discharge is constantly monitored so as to ensure correct operation. The field of reading ranges from 0 to 200°C. Within these limits a number of operating thresholds are set:

- **no production threshold**: if the flue gas temperature falls below this value, it means that the burner is not on and the no production alarm (Ep) is activated;
- **pre-alarm threshold**: first upper threshold, above this value the recommended maintenance warning is activated. Also used to switch the burner to safety mode following abnormal operation with insufficient water in the boiler;
- **alarm threshold**: above this value production is stopped and the high temperature alarm (ER) is activated.

The alarms or warnings are activated if the temperature reaches and then stays above these thresholds for at least 20 seconds. In the case when the pre-alarm threshold is used to switch off the burner in certain situations, such as drain cycles that last too long, activation is brought forward to 4 seconds.

### 10.3 Automatic draining

Automatic draining is managed by the controller: part of the water contained in the cylinder is drained automatically, and replaced with fresh water to prevent an excessive concentration of salts following the process of evaporation.

The drain pump is opened for a set time when the number of fill/evaporation cycles exceeds a limit calculated automatically, based on the conductivity read by the conductivity meter.

### 10.4 Antifoam procedure

With certain types of supply water, foam may form during the production of steam just above the water; this situation must be resolved, as it may cause water to be released together with the steam.

For this purpose, two electrodes are fitted on the ceiling of the cylinder. When these electrodes detect the presence of foam, a draining procedure is started to resolve the problem. The procedure consists of repeated drain cycles until the "foam present" pre-alarm disappears.

### 10.5 Dehumidification request signal

If activated, this function closes the contact of a relay when the relative humidity measured by the transducer connected to the control module exceeds the set threshold. This signal can be used to start an external.

### 10.6 Automatically emptying the cylinder due to extended inactivity

If the cylinder remains on but without steam production for a number of days equal to the value set for the parameter described in par. 7.18 (default 3 days), the controller completely empties the water contained inside the cylinder. This function prevents the corrosion of the electrodes due to saline water if the humidifier is not operated for extended periods. The function can be disabled (see par. 7.18).

### 10.7 Automatic reset from no water

If the supply of water is interrupted (mains water stoppage, fault in the osmosis or softening system), the controller stops normal operation and enters a special phase in which production is disabled so as to avoid dry operation. In this situation, the return of the supply water is checked every 10 minutes, and production is not resumed until water returns. During this phase the EF alarm is displayed.



## 10.8 Repeating the humidity request

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A variable voltage signal, between 0 and 10Vdc, is available between the two terminals on connector M8 on the pHc board.

This signal indicates the production of the humidifier as a percentage, as follows:

Production reference	->	0 to 10V output
0%		0 V
Maximum production % (Max.Prod.)	->	10 V

## 10.9 Automatic procedure to unblock the floating level sensor

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If for some reason (e.g. lime scale deposits) the level sensor sends incorrect information to the controller, an automatic procedure is activated to attempt to eliminate the causes of the error. This procedure involves a drain cycle, followed by a fill cycle. In this way the sensor float is moved to attempt to remove the cause of the blockage.

Steam production is not stopped, unless when, following an excessive drain cycle, the temperature of the flue gas increases excessively, thus indicating dry operation that may damage the unit. In this case, production will resume at the end of the procedure. If this type of procedure occurs more than 10 times over 10 days (default value), the controller will activate an alarm that shuts the unit down, signalling the constant malfunction of the level sensor.

# CAREL

