

# Combat<sup>®</sup> HVAC L I M I T E D

**GB**

*Operating, Installation and Maintenance Manual*  
**CONDENSING WARM AIR HEATER ECO**



This manual cannot be copied in part or in full for disclosure to third parties without the prior written consent by Combat HVAC Limited

## Declaration of Conformity

### COMBAT HVAC LIMITED

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*With this document we declare that the unit:*

*Model: Warm air heater ECO, ECOxxEA, ECOxxB, ECOxxBE*

*has been designed and manufactured in compliance with the prescriptions of the following EC Directives:*

***Machinery Directive 2006/42/CE***

***Gas Appliance Directive 2009/142/CE (ex 90/396/CE)***

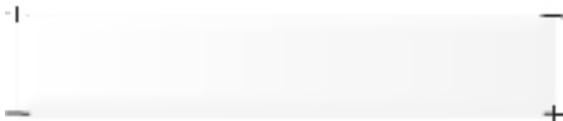
***Electromagnetic Compatibility Directive 2004/108/CE or 2014/30/UE***

***Low Voltage Directive 2006/95/CE or 2014/35/UE***

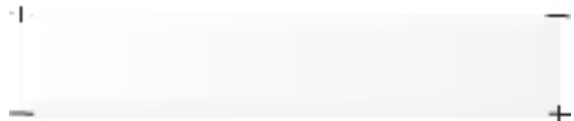
*If the unit is to be installed into an equipment (combined), the manufacturer disclaims any responsibility if this equipment is not previously declared compliant with the requirements specified in IIB Enclosure of the above said Machinery Directive.*

**COMBAT HVAC LIMITED**

CODE



SERIAL NUMBER



Certificate



Number            KIP-088537/G    Replaces            ---  
 Issued            29-06-2015        Scope                Directive 2009/142/EC  
 Report            150500451        Page                 1 of 2  
 PIN                0476CQ0451

**EC TYPE EXAMINATION CERTIFICATE**

Kiwa Cermet Italia hereby declares that the products

Condensing gas-fired air heaters

Trade mark:            COMBAT  
 Models:                as specified in the Annex 1

Marketed by            **COMBAT HVAC Ltd**  
 Wednesbury, United Kingdom

meets the essential requirements as described in the  
 Directive on appliances burning gaseous fuels 2009/142/EC

Mentioned products have been approved for

Appliance type:        B<sub>23</sub>, B<sub>23P</sub>, C<sub>13</sub>, C<sub>33</sub>, C<sub>43</sub>, C<sub>53</sub>, C<sub>63</sub>  
 Gas groups:

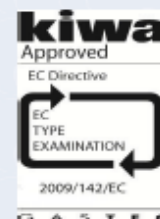
Group	mbar	Group	mbar	Group	mbar
E	20	Esi, E(S)	20/25	Lw	20
H	20;25	Er, E(R)	20/25	B	30; 50
L	25	Ls	13	B/P	30; 50
LL	20	S	25	P	30; 37; 50

The above gas groups can be combined according to the standard EN437:2009 and national situation of countries.

Have been tested according to:  
 EN 1020:2009  
 EN 1196:2011

The validity of this certificate can be verified by means of a register available on the website [www.kiwa.it](http://www.kiwa.it)  
 This certificate will expire if there have been any changes to the product that may have an impact on compliance with the requirements of the Directive, as well as on updates and / or changes to the Technical Standards applicable unless specifically approved by Kiwa Cermet Italy

Chief Operating Officer  
 Giampiero Belcredi



Organismo Notificato n. 0076

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Certificate



Number	KIP-088537/G	Replaces	---
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**EC TYPE EXAMINATION CERTIFICATE**

**ANNEX 1**

**Models:**

ECO20Axx, ECO34Axx, ECO45Axx, ECO65Axx, ECO80Axx, ECO105Axx,  
 ECO20EAxx, ECO34EAxx, ECO45EAxx, ECO65EAxx, ECO80EAxx, ECO105EAxx,  
 ECO20Bxx, ECO34Bxx, ECO45Bxx, ECO65Bxx, ECO80Bxx, ECO105Bxx,  
 ECO20BExx, ECO34BExx, ECO45BExx, ECO65BExx, ECO80BExx,  
 ECO105BExx.

("xx" means country of destination)

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**GASTEC**

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## 1. GENERAL CAUTIONS

This manual is an integral part of the product and must always accompany it.

Should the equipment be sold or passed on to someone else, always make sure that this manual is supplied with the equipment for future reference by the new owner and/or installer.

The manufacturer shall not be held civilly or criminally responsible for injuries to people or animals or damages to things caused by incorrect installation, calibration and maintenance or by failure to follow the instructions contained in this manual or by operations carried out by unqualified staff.

This product must be used only for the applications for which it was designed or approved. Any other use must be regarded as hazardous.

During the installation, operation and maintenance of the equipment described in this manual, the user must always strictly follow the instructions given in all the chapters of this operating and maintenance manual.

**The warm air heater must be installed in compliance with current regulations, according to the manufacturer's instructions and by suitably qualified staff, who has the technical knowledge in the heating sector.**

Conversion between different types of gas and maintenance operations must be carried out before being switched on, and only by suitably qualified staff. **Technical Service Centres certified by current and older standards.**

For more information, visit our Web site [www.combat.co.uk](http://www.combat.co.uk) or contact the manufacturer directly.

The warranty conditions for this equipment can be found in the Combat HVAC Limited Terms and Conditions Of Sale

### Reference standards (only applies to Italy):

- Ministerial Decree No. 74 of 12/04/96;
- Ministerial Decree No. 37 of 22/01/2008;
- UNI-CIG 7129-1, -2, -3, -4 standard, which regulates the installation of natural gas fired equipment;
- UNI-CIG 7131 standard, which regulates the installation of LPG fired equipment;
- Law No. 10/91 and Presidential Decree No. 412/93 on reducing energy consumption;
- Legislative Decree 192/05 of 19/08/2005;
- Legislative Decree 311 of 29/12/2006;
- UNI CIG 11528:2014 standard "Design, installation and commissioning gas systems with heat output higher than 35 kW".

These standards may be subject to changes and/or additions.

## 2. SAFETY INSTRUCTIONS

This chapter describes the safety instructions to be followed by the installer.

### 2.1. Fuel

Before starting up the heater, make sure that:

- the gas mains supply data is compatible with the data stated on the dataplate
- the combustion air intake ducts (when fitted) and the flue exhaust pipes are those specified by the manufacturer;
- the combustion air is supplied in such a way as to avoid even partial obstructions of the intake grille (caused by leaves etc.);
- the fuel intake internal and external seal is checked during the testing stage, as required by applicable standards;
- the heater is supplied with the same type of fuel it has been designed for;
- the system is correctly sized for such flow rate and is fitted with all safety and monitoring devices required by applicable standards;
- the inside of the gas pipes and air distribution ducts for ducted heaters has been thoroughly cleaned;
- the fuel flow rate is suitable for the power required by the heater;
- the fuel supply pressure is between the range specified on the dataplate.

### 2.2. Gas Leaks

If you smell gas:

- do not operate electrical switches, telephones or any other object or device that could produce sparks;
- immediately open doors and windows to create an air flow to vent the gas out of the room;
- close the gas valves;
- Contact your gas provider



## 2.3. Power supply

The equipment must be correctly connected to an effective earthing system, made in compliance with current regulations (CEI 64-8, only applies to Italy).

### Cautions

- Check the effectiveness of the earthing system and, if required, call out a qualified engineer.
- Check that the mains power supply is the same as the power input stated on the equipment dataplate and in this manual.
- Do not swap the neutral with the live wire.
- The electrical system and, more specifically, the cable section, must be suitable for the equipment maximum power input, shown on the dataplate and in this manual.

Do not pull electric cables and keep them away from heat sources.

**NOTE: It is compulsory to install, upstream of the power cable, a fused multi-pole switch with contact opening wider than 3mm.**

**The switch must be visible, accessible and less than 3m away from the control board.**

**All electrical operations (installation and maintenance) must be carried out by suitably qualified staff.**

## 2.4. Operation

Do not allow children or inexperienced people to use any electrically powered equipment.

The following instructions must be followed:

- do not touch the equipment with wet or damp parts of your body and/or with bare feet;
- do not leave the equipment exposed to the elements (rain, sun etc....) unless it is adequately protected;
- do not use the gas pipes to earth electrical equipment;
- do not touch the hot parts of the heater, such as the flue gas exhaust duct;
- do not wet the heater with water or other fluids;
- do not place any object over the equipment;
- do not touch the moving parts of the heater:

## 2.5. Maintenance

**Maintenance operations and combustion inspections must be carried out in compliance with current standards.**

Before carrying out any cleaning and maintenance operations, isolate the heater from the mains power supply via the switch located on the electrical system and/or on the shut-off devices. If the heater is faulty and/or incorrectly operating, switch it off and do not attempt to repair it yourself, but contact the local Technical Service Centre.

All repairs must be carried out by using genuine spare parts. Failure to comply with the above instructions could compromise the safety of the equipment and invalidate the warranty.

If the equipment is not used for long periods, shut the gas supply off through the gas shut off valve and disconnect it from the power supply.

If the heater is to be put out of service, in addition to the above operations, potential sources of hazard on the unit must be removed.

It is strictly forbidden to obstruct the Venturi pipe inlet, located on the burner-fan unit, with your hands or with any other objects. Any obstruction could cause a backfire from the premixed burner.

## 2.6. Transport and Handling

The heater is delivered fastened to a pallet and covered with a suitably secured cardboard box.

Unload the heater from the truck and move it to the site of installation by using means of transport suitable for the shape of the load and for the weight.

If the unit is stored at the customer's premises, make sure a suitable place is selected, sheltered from rain and from excessive humidity, for the shortest possible time.

Any lifting and transport operations must be carried out by skilled staff, adequately trained and knowledgeable on the working procedures and safety regulations.

Once the equipment is moved to the correct position, the unpacking operation can be started.

## 2.7. Packaging

The unpacking operation must be carried out by using suitable tools or safety devices where required. Recovered packaging materials must be separated and disposed of according to applicable regulations in the country of use. While unpacking the unit, check that the unit and all its parts have not been damaged during transport and match the order. If damage has occurred or parts are found to be missing, immediately contact the supplier. The manufacturer is not liable for any damages occurred during transport, handling or unloading.

### 3. TECHNICAL FEATURES

The ECO series modulating warm air heaters have been designed for industrial and commercial environments.

The heater PCB continually modulates the heat output between the minimum and maximum power, according to heating requirements.

The premixing and modulating technology allows the heater to achieve efficiency above 108% of the L.C.V.

The heater can operate independently; it can be started up by simply connecting it to the power mains and to the gas mains. The heaters' heat output ranges from 5 to 97kW.

The units can be controlled:

- from an external time/temperature control;
- externally with the modbus (through SmartControl, Smart.net or Smart.web);
- proportionally, with a 0-10 Vdc external control.

The heat exchanger complies with the manufacturing requirements for condensing warm air heaters, and with standards EN1020 and EN1196.

The combustion chamber and the surfaces of components where condensation occurs (such as the pipe bundle and exhaust hood), are made of AISI 441, in order to provide high resistance to condensation and temperature.

The following table illustrates the types of stainless steels used:

USA-AIS	EN-No.	COMPOSITION
AISI 441	1.4509	X2 CrTiNb 18

The innovative design and the large heat exchanging surface of the combustion chamber and of the tubes ensure optimum efficiency and durability.

The burner is made entirely of stainless steel with special mechanical solutions to ensure optimal reliability and performance levels, as well as high thermal and mechanical resistance.

The control located on the front panel allows the service centre to check and view the working phases and identify any faults that may have occurred.

#### Inherent Safety

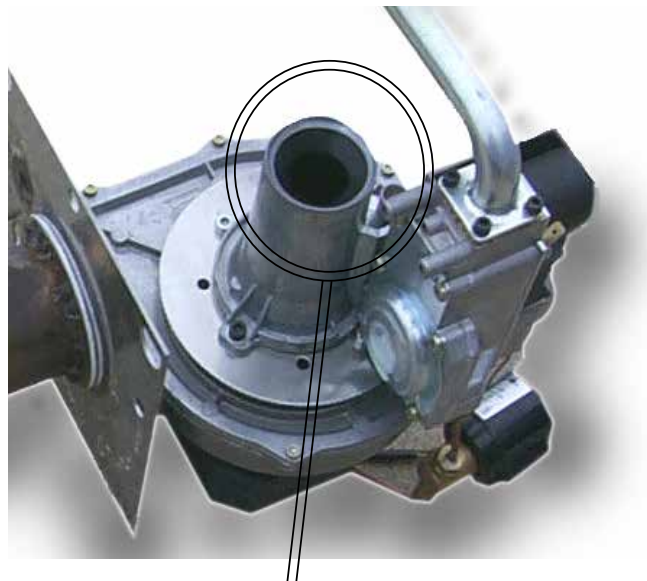
The performance increase at minimum power is achieved by using a sophisticated air/gas mixing technique and by adjusting at the same time the combustion air and the fuel gas.

This technology increases the heater safety as the gas valve supplies the fuel according to the air flow. Unlike with atmospheric burners, the CO<sub>2</sub> proportion remains constant throughout the heater operating range, allowing it to increase its efficiency when the heat output reduces.

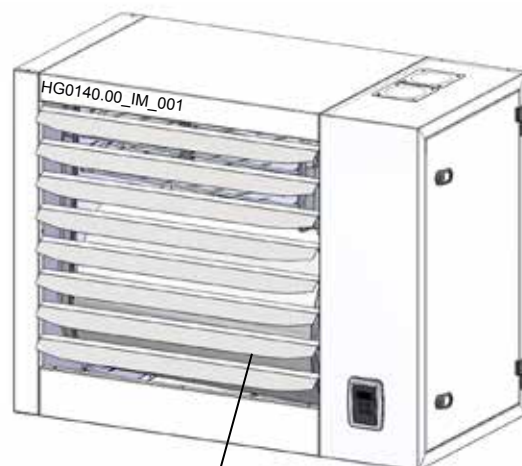
If there is no combustion air, the valve will not supply gas; if the combustion air flow reduces, the valve will automatically reduce the gas flow yet will keep its combustion parameters at optimal levels.

#### Low emissions

The premixed burner, in combination with the air/gas valve, ensures "clean" efficient combustion with low emissions of pollutants.



**DONOT COVERITWITHYOURHANDOROTHEROBJECTS!**



**WARNING: Before switching on the heater, open the louvers by at least 45°**



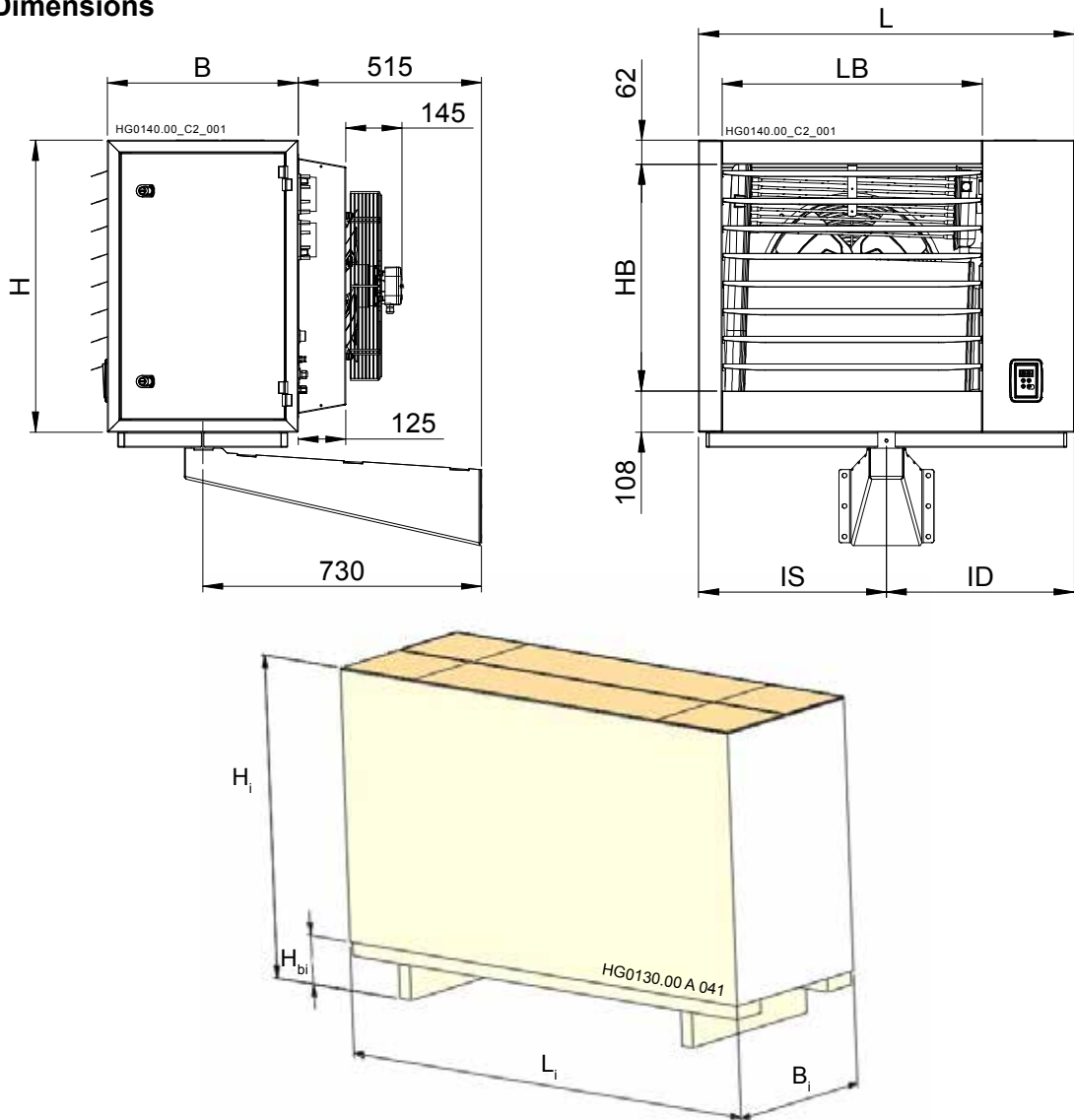
## 3.1. Technical Data

Model:		ECO20A	ECO34A	ECO45A	ECO65A	ECO80A	ECO105A						
Type of equipment		B23P - B53P - C13 - C43 - C53 - C63											
EC certification	PIN.	0476CQ0451											
NOx Class	Val	5											
<b>Heater Performance</b>													
		min	max	min	max	min	max	min	max	min	max	min	max
Burner heat output (Hi)	kW	4.75	19.00	7.60	34.85	8.50	42.00	12.40	65.00	16.40	82.00	21.00	100.00
Useful heat output	kW	4.97	18.18	8.13	33.56	8.97	40.45	13.40	62.93	17.77	80.03	22.77	97.15
Efficiency Hi (Net C.V.)	%	104.63	95.68	106.97	96.30	105.50	96.30	108.06	96.82	108.35	97.60	108.40	97.15
Efficiency Hs (Gross C.V.)	%	94.26	86.20	96.37	86.76	95.07	86.76	97.36	87.22	97.62	87.93	97.68	87.52
Flue losses with burner on (Hi)	%	0.4	4.3	0.6	3.7	0.5	3.7	0.2	3.2	0.3	2.4	0.2	2.8
Flue losses with burner off (Hi)	%	<0.1		<0.1		<0.1		<0.1		<0.1		<0.1	
Losses in enclosure <sup>(1)</sup>		0%		0%		0%		0%		0%		0%	
Max. condensation <sup>(2)</sup>	l/h	0.4		0.9		1.1		2.1		3.3		2.7	
<b>Flue gas emissions</b>													
Carbon monoxide - CO - (0% of O <sub>2</sub> ) <sup>(3)</sup>	ppm	< 5		< 5		< 5		< 5		< 5		< 5	
Nitrogen oxides- NOx - (0% of O <sub>2</sub> ) <sup>(4)</sup>		38 mg/kWh - 22 ppm		42 mg/kWh - 24 ppm		33 mg/kWh - 19 ppm		39 mg/kWh - 22 ppm		32 mg/kWh - 18 ppm		41 mg/kWh - 23 ppm	
Available pressure at flue	Pa	80		90		100		120		120		120	
FLUE GAS temperature, CO <sub>2</sub> content and maximum flue gas flow rate: see gas tables on page 37 and on the following pages													
<b>Electrical Data</b>													
Power supply	V	230 Vac - 50 Hz single-phase											
Power input	W	147	180	270	310	280	310	425	510	500	613	650	750
Power input in stand-by	W	<5											
Ingress Protection Rating	IP	IP 20											
Operating Temperatures	°C	from -15°C a +40°C - for lower temperature, a burner housing heating kit is required											
Storage Temperatures	°C	from -25°C to +60°C											
<b>Connections</b>													
Ø gas connection <sup>(5)</sup>	GAS	UNI/ISO 228/1- G 3/4"		UNI/ISO 228/1- G 3/4"		UNI/ISO 228/1- G 3/4"		UNI/ISO 228/1- G 3/4"		UNI/ISO 228/1- G 3/4" <sup>(6)</sup>		UNI/ISO 228/1- G 3/4" <sup>(6)</sup>	
Ø Combustion air intake/exhaust pipes	mm	80/80		80/80		80/80		80/80		100/100 <sup>(7)</sup>		100/100 <sup>(7)</sup>	
<b>Air flow rate</b>													
Air flow rate	m <sup>3</sup> /h	2700		4300		4500		7800		9000		11100	
Air temperature increase	°C	5.28	19.30	5.42	22.37	5.73	25.74	4.92	23.13	5.66	25.49	5.89	25.09
Number and diameter of fans		1 x Ø350		1 x Ø 450		1 x Ø450		2 x Ø400		2 x Ø450		3 x Ø400	
Fans speed	rpm	1370		1370		1370		1370		1370		1370	
Sound power level (Lw) <sup>(8)</sup>	dB(A)												
<b>Weight</b>													
Net weight	kg			70		77		98		125		143	
Weight when packaged	kg			85									

**NOTES:**

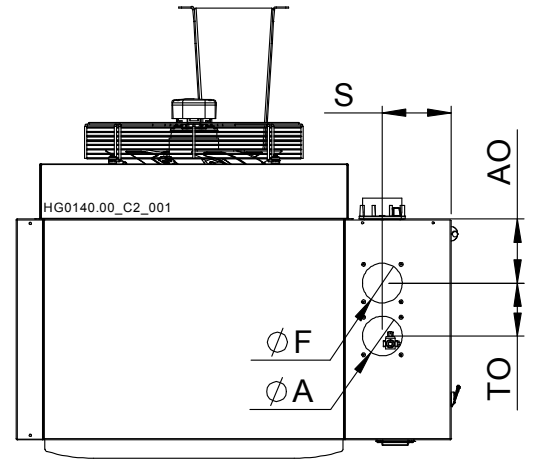
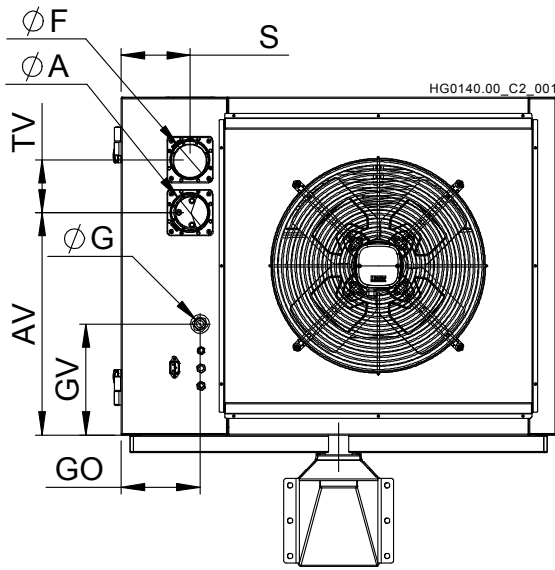
- (1) The losses from the enclosure must be regarded as zero as the heater is installed in a heated environment.
- (2) Max.. condensation produced acquired from testing at 30%Qn.
- (3) Value referenced to cat. H (G20)
- (4) Weighted value to EN1020 ref. to class H (G20), referred to Hi (L.C.V.).
- (5) The gas line must be measured by taking into account the length of the pipes and not the heater diameter.
- For countries requiring an ISO connection different from the one shown above, an adaptor will be supplied.
- (6) For the ECO80A and ECO105A models, the minimum gas supply duct diameter must be UNI/ISO 228/1- G 1".
- (7) Ø100/100 obtained by using adaptors supplied as standard.
- (8) Measured at a distance of 5m from the machine.

## 3.2. Dimensions



Mod. ECO	Overall dimensions			Inlet		Shelf		Supply GAS			Packaging					
	B	H	L	HB	LB	IS	ID	ØG	GO	GV	Bi	Li	Hi	Hbi		
ECO20A	500	690	795	520	490	395	400	3/4"	180	255	810	890	850	123		
ECO34A			985			680	490				495	810	1080	850	123	
ECO45A		765	1310	595	1010	655	660				810	1080	920	123		
ECO65A											810	1410	920	123		
ECO80A		845	1515	675	1180	770	745				210	275	810	1610	1040	123
ECO105A			1740		1410	895	845						810	1810	1040	123

# WARM AIR HEATER ECO



Mod. ECO	Horizontal exhausts (STD)				
	A	F	AV	TV	S
ECO20A	80	80	430	120	155
ECO34A			505		
ECO45A				560	140
ECO65A					
ECO80A	100*	100*	560	140	185
ECO105A					

\* Obtained by using the adaptors supplied as standard.

Mod. ECO	Vertical drains (OPT.)				
	A	F	AO	TO	S
ECO20A	80	80	145	120	155
ECO34A					
ECO45A				140	185
ECO65A					
ECO80A	100*	100*			
ECO105A					

\* Obtained by using adaptors supplied as standard.

## 4. USER'S INSTRUCTIONS

### 4.1. Operating Cycle

The wall mounted ECO heaters operation is fully automatic; they are equipped with electronic equipment with self check facility that manages all the burner control and monitoring operations and with a microprocessor based electronic PCB that controls the heat output regulation.

The heat demand depends on the PCN parameter d0 of the heater electronic PCB:

- d0=2: input ID2-IDC2 closed and NTC1<TH1;
- d0=5: input ID2-IDC2 closed and input 0-10Vdc>Von;
- d0=7: input ID2-IDC2 closed and control from Modbus ON.

The ignition request occurs when the following conditions are met:

- when the heater is powered on and is not in a lockout condition;
- when the contact is closed on terminals ID2/IDC2 of the heater PCB.

When these conditions are met, the burner fan will be immediately started; when the pre purging-time has expired, the flame will be lit with an ignition power of approximately 50% of the maximum power. Once the flame stabilising time has expired, the burner will start to modulate its heat output according to the supply air temperature.

If there is no flame during the ignition stage, the equipment makes 4 ignition attempts; if, at the fifth attempt, ignition is still unsuccessful, the heater will be locked out.

The heater will be switched on when the ID2/IDC2 contact opens on the terminal box; disconnecting the power supply is prohibited, except for emergencies because, if the heater is switched off, the flue gas extractor fan will continue to work for approximately 90 seconds to clean up the combustion chamber (combustion chamber post-cleaning phase).

Failure to perform the post-cooling operations on the exchanger will:

- reduce the life of the exchanger and invalidate the warranty;
- cause the safety thermostat to operate and require a manual reset.

If, during the cooling cycle, there is a new demand for heat, the modulation PCB will wait for the cooling fans to shut down and then reset the counters to start a new cycle.

Parameter **d6** of the modulation PCB, which can be programmed from 0 to 256 seconds, controls the minimum interval between the time the equipment is switched off and restarted.

**IMPORTANT: Powering off the machine before completing the cooling cycle and with machine set to ON is strictly prohibited. Failure to follow these instructions shall invalidate the warranty and cause early deterioration of the heat exchanger.**

### 4.2. Accessories

The ECO heaters are fitted as standard with a multifunction LCD panel located on the front panel, which is used to control, configure and diagnose the equipment parameters.

This panel cannot be remotely controlled.



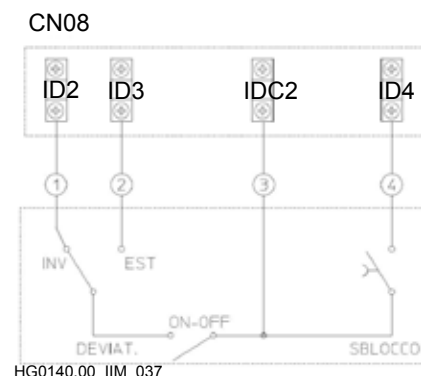
#### Ambient temperature control

The ECO heaters are supplied without remote control and/or room thermostat as they can operate with different remote controls, some of which are supplied as accessories, whilst others are commercially available.

Operating modes:

- A time and temperature thermostat control such as the Combat HVAC NRG Control, with a clean contact to be connected to the PCB ID2/IDC2 terminals;
- SmartControl code G20800IT;
- program SMART.NET G16900-USB.

Instructions on how to install and operate the accessories can be found in manuals supplied with the accessories.



- Cable colour:
1. Brown
  2. Black
  3. Blue
  4. Grey

HG0140.00\_JIM\_037

## Operation with a SmartControl chronothermostat G20800IT

The control operates as a chronothermostat and can be used as a monitoring device for a single zone system at the same temperature, where up to 32 heaters can be installed simultaneously, controlled by a single control.

Being a single zone system, only one ambient temperature and one calendar can be set for the entire zone being monitored.

The chronothermostat is equipped with a very bright, easy to read LED display, where all the parameters of the connected heaters can be read and set up; it also allows users to control the heaters auto or manual mode, to check the burner operation, to plan a weekly, annual calendar and to control the daily time ranges.

For operating instructions and installation diagrams, please see the SmartControl control manual **HG0080IT "SMARTCONTROL CHRONOTHERMOSTAT Operating, Installation and Programming Manual"**.



## Safety thermostats

ECO heaters are fitted with a safety thermostat with automatic reset and positive safety setting. A safety operation of this thermostat occurs when its sensitive component is broken.

When the thermostat is operated, through the flame monitoring equipment, the burner stops and the flame equipment is locked out.

The lockout of the flame equipment, caused by the safety thermostat operation, is indicated on the LCD display of the CPU PCB on the machine with F20.

The lockout is classified as "non-volatile" and requires a manual reset.

Near the safety thermostat, there is an NTC1 probe set to the value of the ST1 parameter, which reduces the burner's heat output when the set point is reached, regardless of other input signals. The probe monitors the heat output / cooling air flow ratio. It is not advisable to change the ST1 value without consulting the Service Centre.

## Ambient temperature setting

Connecting a room thermostat (chronothermostat) or an ON/OFF switch is compulsory.

If a thermostat supplied by third parties is installed, the ambient temperature must be programmed on the thermostat.

In this type of installation, we recommend that a G15100 remote control is used to allow users to check the reasons for the lockout and, if necessary, to remotely reset it without accessing the heater.

## Lockouts Fxx

The modulation PCB can identify more than 30 different types of faults. This ensures accurate diagnostics.

Codes and possible causes of lockouts are listed later the manual. For more serious lockouts, requiring a manual reset, the arrows on the LCD display on board of the machine must be simultaneously pressed or the reset can be remotely carried out with the controls provided.

## 4.3. Interface Panel

The ECO heaters are fitted as standard with a multifunction LCD panel located on the front panel of the suspended heater, which is used to control, configure and diagnose all operating parameters of the equipment.

The panel is fitted with a red 3 digit LCD display and with four function keys: ↑, ↓, ESC and ENTER; the display allows the user to display the heater operating mode and its Faults.

It allows the service centre to change the main operating parameters.

Changing parameters requires a password.

### Viewing the machine status

The machine status is shown on the display by the following wordings:

- rdy** the machine is on without burner flame, it is waiting for the ON control and/or the heat demand from the thermostat;
- On** the machine is on with burner flame or is in the ignition phase;
- OFF** the machine is turned off by the control on the LCD.  
**Any heat demands will be ignored.**  
To light the burner, the LCD must show the wording "heater ON";
- Fxx** Fault detected.

During normal operation, the display will show the wording **On** if the burner is on; **rdy** when the heater is being switched off or the room temperature has been reached.

**Air** the EST operation has been selected under the FUN menu; set FUN to ON or OFF;

**Axx** ECO heater address;  
If the heater has an address other than Ø, the display will show, alternating it with the operation in progress, the address assigned to the heater.

In the event of communication problems between the CPU-SMART PCB and the LCD panel, the word **CPU** will flash on the display if the problem is caused by the CPU; three flashing dots will be displayed if the problem is caused by the display PCB. If needs be, check that the display and the PCB are correctly connected and that the small cable RJ11 is securely held in the connector.

### Navigating the menu

The menu has three levels. The first is visible without entering a password, the second and third require entering second and third level passwords.

If the ECO heater is connected to a Smart Control or to the SMART.NET, and therefore with an address different from Ø, parameters can only be viewed and cannot be modified. Some menus are not available.

The Service Centre that is required to use all menus must follow these instructions:

- disconnect the power supply;
- set the PCB address to Ø;
- restore power;
- after finishing the work, please remember to reset the switches to the previously set position.

Use the arrows to scroll the menus: ↑ (up arrow) and ↓ (down arrow). Press ENTER to select the menu, and again to select the parameter. Change the parameter with the arrows and confirm the change by pressing ENTER.

To exit the parameter or menu, press ESC. If you exit the programming function, after about 10 minutes the program will exit

the menu and go back to the "machine status" display.

To change the parameter, press the arrow keys: pressing ↑ (up arrow) increases the parameter by 1, pressing ↓ (down arrow) reduces it by 1. When the arrow keys are pressed for at least three seconds, the parameter scrolling speed is increased.

To confirm a change in parameters, press ENTER for at least 3 seconds. A change in the parameter is indicate by the display flashing.

All submenus can be scrolled from the bottom to the top, and they start over when the end of the menu is reached.

### First level menus

The following menus are available on the first level:

- machine status provides information about its operation (ex. rdy, ON, etc.);  
ON, OFF);
- FUN from FUN it is possible to select the function ON, OFF or EST (do not select EST);
- REG this menu allows the user to force the burner to the minimum or the maximum for combustion tests; it automatically returns to the previous position at the end of the preset time (10 minutes);
- TIN allows the user to read the value of the 0/10 Vdc signal (if present) coming into the heater;
- Pra not used;
- ABI used to enter the PWD to access second and third level menus.

Entering the password 001 will provide access to the second level and make the Set Point, I/O, Parameters and Fault menus available.

### Entering the password

- From the initial screen (ON/OFF/rdy/FXX) use the ↑ (arrow up) and ↓ (arrow down) keys to reach the ABI function; hold down the ENTER key for 3 seconds;
- Set the password inside the ABI and menu confirm it with ENTER; hold it down for approximately 3 seconds (the flashing display will confirm that the parameter has been stored);
- Press ESC and, by using the ↑ and ↓ arrow keys, return to the initial screen (ON/OFF/rdy/FXX); press ENTER for 3 seconds;
- Use the ↑ and ↓ arrow keys to reach the desired menu item (Fit, I/O, SET, PAR);
- Press ENTER to access the function;
- Use the ↑ and ↓ arrow keys to select the parameters to be displayed and edited;
- Press ENTER to display the parameter value;
- Use the ↑ and ↓ arrow keys to edit the value (only SET and PAR);
- Press ENTER to confirm the change made;
- To exit the parameter and the menu, press ESC until the initial screen is displayed (ON/OFF/rdy/FXX).



## Second and third level menus

The second and third level menus are reserved to the Service Centre and can be accessed only by entering a password, which can be requested for the manufacturer's Service Centre. For more detail, see Paragraph 7.3 "Programming with a LCD panel".

## Fault list

In the event of a lockout, the heater PCB will display a code, which indicates what problem has occurred.

To reset the heater, simultaneously simply press the LCD panel arrow keys for at least 3 seconds or operate one of the remote controls provided.

The Faults are classified according to the type of error; the most common and easier to sort out by user are:

F1x these faults are caused by the burner failed ignition; they all require a manual reset.

F20 heater safety thermostat lockout; this fault must be manually reset.

F21 jumper missing between terminals ID1 and IDC1 or fire breaker connected to terminals ID2 and IDC2 tripped.

F3x lockouts caused by faults of the flue gas extractor.

F4x lockouts caused by an error or by a missing temperature probe; they must be sorted out by the Service Centre.

F51 the temperature of the air supplied has exceeded the upper limit set in parameter TH1; as the temperature drops, the lockout will sort itself out; manual reset is not required.

F60 on the LCD panel only, the heater is connected to a SmartControl or to SMART.NET but does not communicate. When communication is restored, the lockout condition will disappear; manual reset is not required.

The list and meanings of all faults are shown in the FAULT table in Paragraph 5.7 "Analysis of Lockouts - Faults".

## 4.4. Reset

The modulation PCB allows the operator to identify more than thirty different causes of lockouts. This makes it possible to manage each event very accurately.

To reset the lockouts, press both arrows simultaneously for a few seconds.

Lockouts may be remotely controlled by using:

- the digital input ID4-IDC4 - button N.O.;
- the Smart Control - optional;
- the ModBus protocol.

If ignition fails, the flame monitoring system reattempts ignition four times. After four failed attempts, it will lock out and will display the code F10.

The lockout codes and their cause is shown in the FAULT table in Paragraph 5.7 "Analysis of Lockouts - Faults".

If the flame monitoring equipment has locked out (codes from F10 to F20), it can be reset it by using the button on the equipment itself. This lockout is shown by a LED that lights up on the equipment.

**WARNING : The flame monitoring equipment memorises the number of manual resets that are performed during its lifetime. In case of five resets performed in a period of 15 minutes, without a flame being ignited and detected, the equipment will go into a "timed" lockout (F13). In this case, it is required to wait another 15 minutes before resetting it again.**

**Press the reset button on the equipment to immediately reset this lockout condition.**

**NOTE: SHOULD THE SAFETY THERMOSTAT (STB) OPEN BEFORE STARTING THE START-UP CYCLE (THIS COULD BE CAUSED, FOR EXAMPLE, BY LOW TEMPERATURES), THE PILOT LIGHT EQUIPMENT WILL BE KEPT IN "STAND-BY" AND FAULT F15 WILL BE SHOWN AFTER 300 SECONDS.**

## 4.5. Set-up

The ECO heaters have three heat output regulation modes:

- 0/-10 Vdc
- ModBus
- NTC1 temperature probe.

To correctly set the control parameters, a d0 parameter must be programmed, which identifies the type of control associated with the heater.

Function	Equipment	Heater
Flame modulation	d0=2	NTC1
	d0=5	0-10Vdc
	d0=7	Modbus – H71

### Operation with chronothermostat

The heater operation is entirely automatic and, by using a chronothermostat, the ambient temperatures can be regulated. The chronothermostat and the PCB monitor all the control and regulation functions, whilst the safety functions are performed by the flame monitoring equipment and by the safety thermostats.

### Operation with SMART CONTROL

The heater controls can be operated remotely from the Smart Control panel (OPTIONAL code G20800IT), which uses the ModBus protocol and can control up to 32 heaters.

To use the Smart Control as a temperature control, simply change the d0 parameter on each heater with a default value of 2 set for the NTC1, by setting it to 7 (ModBus control).

The Smart Control can be used to supervise/display and monitor (active part of the regulation).

A temperature probe is fitted inside the SmartControl; a remote temperature regulation probe can be added.

The remote probe can be programmed as the main probe or it can be added to the internal probe to obtain an average value between the two measurements.

When the Smart Control is also used to control the temperature, you must:

- index the heater modules from 1 to 32 by entering the address of each module through the dip switch;
- connect a NTC temperature probe to the Smart Control (use the internal probe);
- set the control parameters both on the PCB and the Smart Control.

The remote NTC temperature probe which can be connected must be a 10 K $\Omega$ ,  $\beta$  3435 type.

The probe must be connected to the NTC/NTC terminals and can be located locally or elsewhere, according to the settings required.

**NOTE: The remote NTC temperature probe is an optional external probe (code G07202); not to be mistaken for the modulation probe NTC1.**

The Smart Control is powered by a 24 Vdc voltage.

To enable the demand for heat, close the Smart Control I1 input (make a jumper between terminals V+ and I1).

The Smart Control displays the following information: burner on/off, percentage of modulation, alarms and resets.

The Smart Control requires you to:

- specify if the probe is external (remote), internal or both;
- change the number of slaves (connected heaters) according to requirements;
- set the ON-OFF or PID settings;
- set the heating mode (operation: "heating") and the desired set point value, locally or remotely.
- set the time ranges.

For more information on how to remotely operate the controls with the Smart Control, please refer to the **HG0080.00IT "SMARTCONTROL CHRONOTHERMOSTAT MANUAL. Operating, Installation and Programming Manual"**.

The Smart Control, through its PID regulation, calculates the modulation percentage and compares the calculated value against the operation percentage of each module: The modulation percentage sent to the modules is always the same. When the set point is exceeded, the heaters will be switched off.



## 5. INSTALLATION INSTRUCTIONS

Instructions for installing and setting the heater are intended for suitably qualified personnel only.

### 5.1. General Installation Instructions

Where allowed, the heater can be installed directly in the room to be heated.

To install the heaters inside the rooms, different regulations and requirements must be complied with according to the type of fuel used and to the country of destination.

In fact, the installer must strictly comply with applicable standards and regulations in the country where the machine will be installed and therefore set up.

#### Ventilation

##### Room Sealed Installation

**when installed as a room sealed heater, the air for combustion is drawn in from outside the building. It is important to ensure that there is adequate ventilation to provide air for the fan/s.**

##### Heaters Installed Within The Heated Space.

**Where the volume of the heated space is greater than 4.7M3 per kilowatt of total rated heat input and the air change rate is at least 0.5/h, additional high and low level ventilation will not be required.**

**For a building having an air change rate less than 0.5/h, ventilation will e necessary in accordance with the local and national codes. Ventilation direct to outside must be provide as follows:**

**Heaters up to 70 Kw heat input: 5.0cm2 per Kw of rated input.**

##### Building Ventilation

**Where ventilation is required, air must be taken from an outside point where it is not likely to be contaminated or obstructed.**

**where natural ventilation is used, suitable ventilation wit outside air at low level must be provided in accordance with the above section and local and national codes.**

**Where mechanical ventilation is used, extract rate must be 5%-10% less than the inlet rate. The mechanical ventilation must be interlocked with the burner on the heater.**

#### Condensation drain

The heater is supplied completed with a water trap to drain the condensation. The water trap is an integral part of the heater and is regarded as a safety component; therefore, replacing it with a different type, not approved by the heater's manufacturer is prohibited.

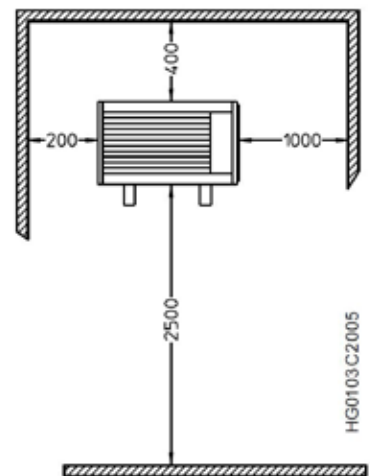
The condensation must be drained in compliance with standards applicable in the country where the heater is installed.

### 5.2. Installation

The minimum height and distances from the walls and the floor

when installing the heater are shown in the following drawing. MINIMUM DISTANCES TO BE OBSERVED

The minimum distances are the distances required to carry out maintenance operations and are stated in mm; the height of 2500mm is the minimum height required by the standard for "suspended" machines.



Two types of supporting shelves, fixed and rotating,

are available for the installation.

The codes for the available shelves are:

- G27900 Fixed shelf kit for ECO20A-65A;
- G27820 Rotating shelf kit for ECO20A;
- G27830 Rotating shelf kit for ECO34A-45A;
- G27850 Rotating shelf kit for ECO65A-80A;
- G27870 Rotating shelf kit for ECO105A.

a) -

## Fixed shelves

To install the fixed shelves to the walls:

- fix it to the wall and level the bracket with a spirit level:

**NOTE:** make sure that the screws and wall plugs are suitably sized for the type of wall and that they can withstand the heater weight.

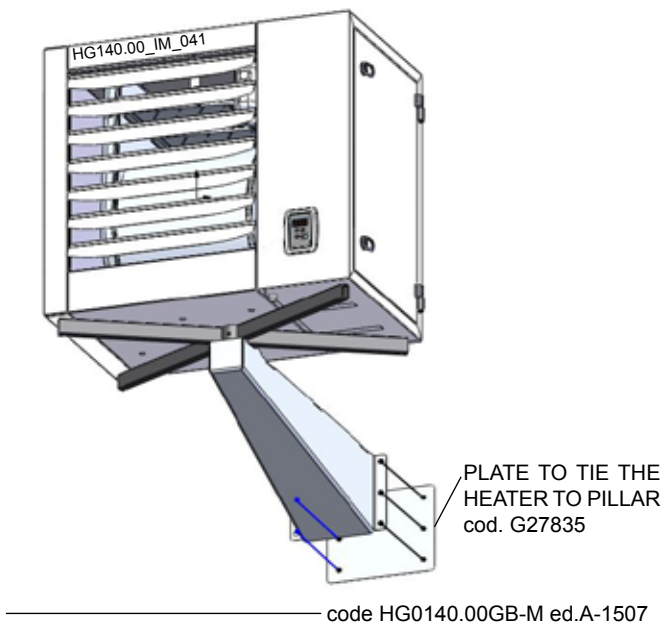
- Place the suspended heater by centering it on the brackets in order to match the holes on the heater with the holes on the brackets, taking into account that, for all models, the tips of the brackets are flush with the edge of the suspended heater;
- Use the paper template supplied to mark the holes to fix the brackets to the wall;
- Fix the heater in position by using the M8 supplied as standard, inserting locking washer between the screw and the bracket.

## Rotating shelves

The instructions on how to fit the rotating shelf and a paper template to position the shelf onto the wall can be found inside the shelf packaging.

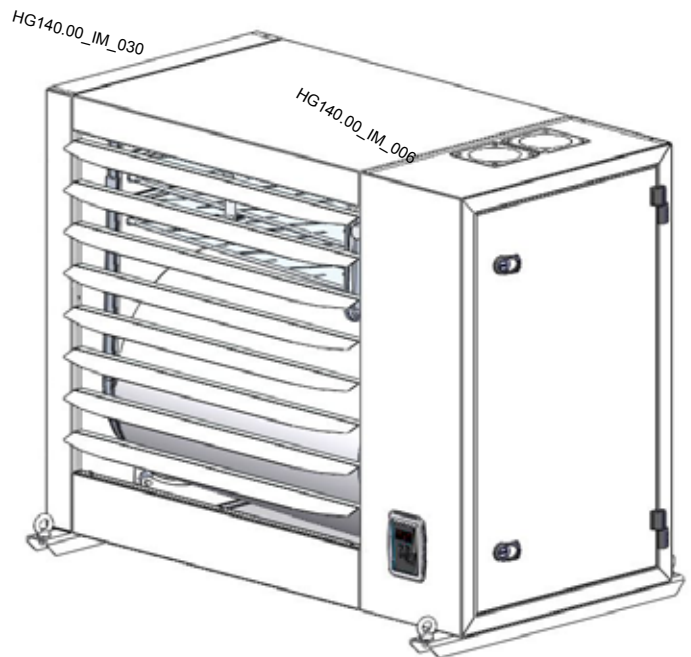
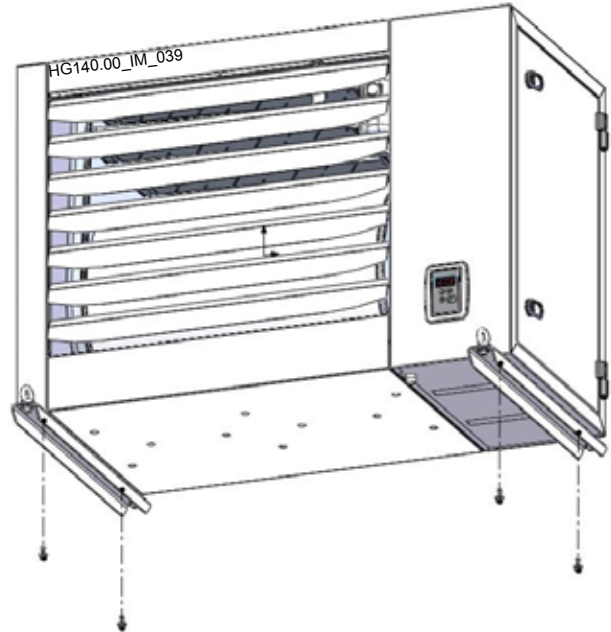
Using rotating shelves is recommended in the following cases:

- a) when fitting the heater onto a corner;
- b) when fitting the shelf onto a pole;
- c) when fitting the heater at a right angle with the wall it is fixed to.



## Suspended heater

ECO20A-80A HEATERS: To install a suspended heater by using eyebolts, tie rods or chains, a kit containing supporting pins is available, as an accessory; its code is: G27880. This kit is suitable for all ECO models and does not include eyebolts (optional accessory code X00728).



### 5.3. Condensation Drainage

Special attention must be paid to the condensate drain; an incorrectly installed drain, in fact, could jeopardize the correct operation of the equipment.

The factors to be taken into account are:

- risk of condensation build-up inside the heat exchanger;
- risk of condensation water freezing in the pipes;
- risk of fumes discharged from the condensate drain.

#### Build up of condensation in the heat exchanger

During normal operation, condensate must not be allowed to accumulate within the heat exchanger.

A sensor fitted the ECO heater internal water trap checks and stops the burner from operating before the condensate reaches a potentially dangerous level inside the flue gas collection hood. When installing the heater, special attention must be paid to make sure it is perfectly level in order to maintain the typical inclination of the tube bundle.

#### Connection to the condensate drain

The ECO heaters are supplied with the condensation drain in the bottom section of the heater.

It is the installers responsibility to ensure that the condensate is discharged in accordance with the local and national authorities regulations in force

#### Precautions

Materials to be used for the condensation drainage system:

- aluminium, stainless steel, silicone or Viton pipe.
- for cold pipes, carrying water only, PVC pipes.

Do not use copper or galvanised iron pipes.

#### Protection from frost

The condensation drainage system must be suitably protected to prevent the condensation in the circuit from freezing.

We recommend that the condensation collection system is located inside heated rooms. If the system is located outdoors, the pipe, after the water trap, must have an open type connection to make sure that any ice formed inside the external system does not prevent the condensation from being drained away. In any case, it is recommend that the longest pipe should be laid inside the heated room, for example by collecting the condensation flush to the floor with the down pipe located inside the room.

#### Free drainage

If the unit is installed outdoors, unless the temperatures never drops below freezing, the condense could be drained directly outside, without any connections to other pipes. It is essential to check that the condensate flows away from the unit.

If the drain needs to be connected to pipes, an open type connection (socket pipe), similar to the one illustrated in picture below must be installed to prevent ice forming in the pipe from blocked condensate drain, and the ensuing build-up of condensate in the heat exchanger.

If the drain pipe is installed in an outdoor site, it may need to be insulated and/or heated by means of a heating cable.

#### Drainage into water courses

Taking the condensation drain inside the room to be heated is a good solution in order to avoid the formation of ice; condensation can be drained into water courses or can be collected and treated with alkaline solutions.

#### Neutralising the condensation

The condensation produced by the combustion of natural gas has an acidity of 3.5-3.8 PH.

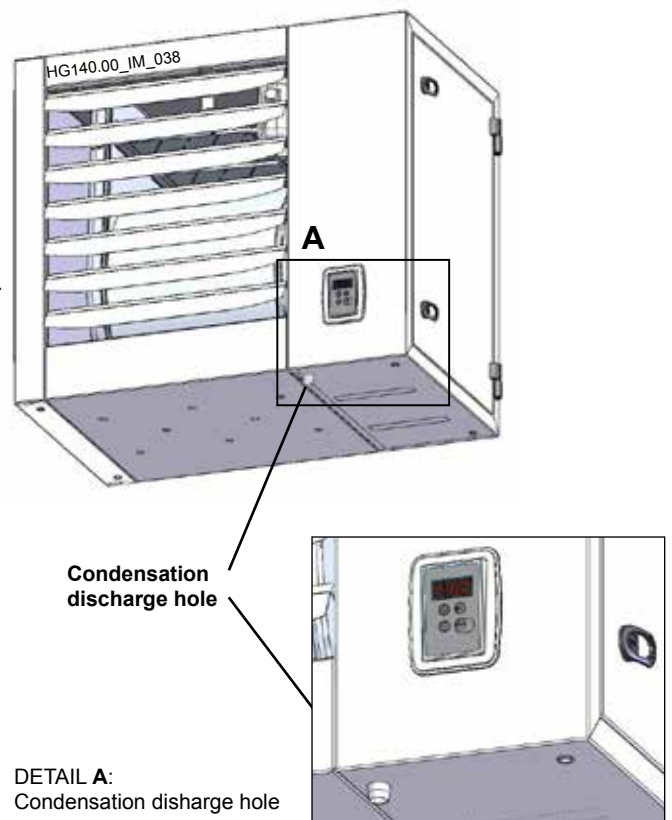
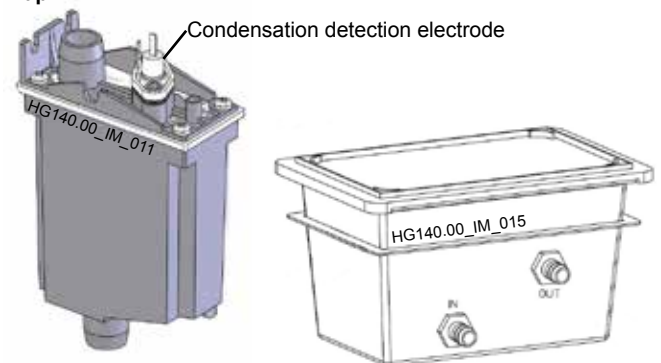
On request, Combat can supply the kit (G14303) required to neutralise the condensation; the kit consists of:

- a plastic tank for the collection of condensation (measuring BxHxL 30x18x20cm);
- calcium carbonate.

For more information, contact the Service Centre.

**WARNING: Not all countries allow the types of condensation drains described here. Please refer to the requirements specified by local legislation.**

#### Trap





## 5.4. Connections to the Flue

The ECO heaters are fitted with a watertight combustion circuit and with a fan located upstream of the heat exchanger. Connection to the flue, according to where the heater is installed, can be made as "C" type, with combustion air being drawn from outside, or as "B" type with combustion air being drawn from the heater installation site.

More specifically, the heater is certified for the following exhausts: C13-C33-C53-C63-B23.

Certified pipes and terminals must be used.

The air intake terminals and flue exhausts must prevent access to a ball with a diameter higher than or equal to 12 mm.

**COMBAT sells certified intake or exhaust terminals that must therefore be bought together with the heaters.**

The ECO heaters are supplied as standard with horizontal fittings, flue and air intake, located in the back of the heater. It is possible, even during the installation stage, to move the flue exhaust and air intake fittings to the top of the heater; this is useful when the exhaust is fitted to the roof.

On request, and according to the quantity, the heater can be provided with fittings in the top section to fit a vertical exhaust. To make the flue exhaust, taking into account that the ECO heaters are of a condensing type, the following material must be used.

- Aluminium with a thickness higher than or equal to 1.5 mm;
- - stainless steel with a thickness of at least 0.6 mm; the steel must have a carbon content of at least 0.2%.

Pipes fitted with a seal must be used in order to prevent the flue gases leaking from the pipes; the seal must be suitable to withstand flue temperatures ranging between 25°C and 210°C for ECO heaters.

**WARNING: Using plastic materials on flue exhaust ducting is strictly prohibited.**

For ECO heaters, the flue does not need to be insulated to prevent the formation of condensation in the pipe, as this will not affect the heater, which is fitted with a water trap.

**IMPORTANT: The horizontal sections of flue must be installed with a slightly incline (1°- 3°) towards the heater, in order to prevent the build up of condensation in the exhaust.**

Protect the pipe with a guard if required to protect the flue from accidental contact.

For the air intake, use:

- Aluminium with a thickness of at least 1.0 mm;
- Stainless steel with a thickness of at least 0.4 mm;

## Selection Guide

The table showing the flue exhaust system calculation data can be found in Paragraph 7.2 "Gas settings data table". The maximum recirculation percentage is 11%.

The tables below show the pressure drop for Ø 80 and Ø 100 terminals and exhaust ducting.

If the terminal is not directly connected to the heater and, therefore, extra routing is required, according to the length of the ducting, the diameter of the selected terminals, extensions and bends must be checked.

After establishing the routing, the pressure drop must be calculated for each component by referring to the tables below according to the ECO heater used; each component has a different pressure drop value as the flue gases flow rate is different.

Add together the pressure drops of the single components, checking that the result is not higher than the available value for the heater to be used. If a combustion air supply pipe is fitted, the pressure losses must be added to the flue exhaust pressure drop

If the sum of pressure drop is higher than the pressure available, ducting with higher diameter must be used, rechecking the calculation; a pressure drop higher than the pressure available at the flue exhaust reduces the heater module heat output.

**NOTE:** If the module is installed indoor:

- using coaxial connections is allowed for heaters for a pipe length not exceeding 3 metres;
- the flue exhaust terminal must be installed in compliance with reference national regulation requirements.

**NOTE:** The following pictures show examples of flue exhaust and air intake that can be created by using the kits available from the catalogue; the table shows the pipe maximum lengths between the heater and the terminal. If the duct routing requires the use of bends, the length required must be subtracted from the available length:

Bend Ø 80	90°	EqL1.65 m
Bend Ø 80	45°	EqL0.80 m
Bend Ø 100	90°	EqL0.2.30 m
Bend Ø 100	45°	EqL0.1.03 m

\* Valid equivalent lengths for wide radius bends.



# WARM AIR HEATER ECO

NOTE: Values calculated on the flue mass flow rate achieved with natural gas G20.

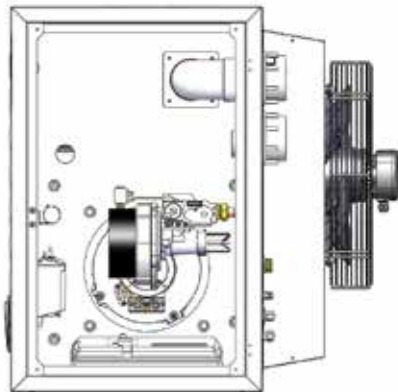
## Installing the terminals

The ECO heaters are fitted with a top and bottom provision for air inlet and flue exhaust.

According to installation requirements, the terminals can be fitted at the back or at the top.

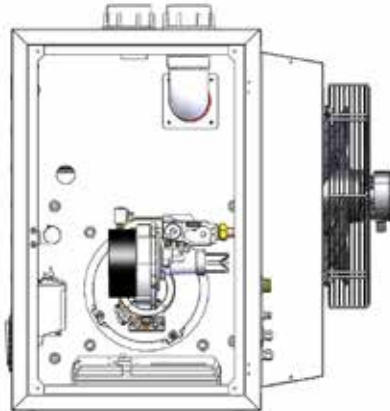
The exhaust and drainage castings are normally installed on the back of the machine; should it be necessary to use the top outlets, the castings must be extracted from the rear section, the covers and their seals from the top holes must be removed, the castings must be inserted in the desired housing and the covers and seals tightened above the unused housings in order to ensure their water tightness.

NOTE: The terminals are supplied with silicone seals; on request a kit with EPDM seals can be requested.



HG140.00\_IM\_033

**flue gas exhaust and rear air intake**



HG140.00\_IM\_034

**flue gas exhaust and rear air intake**

## Horizontal B23 terminal

Open combustion circuit, combustion air intake from the room and exhaust to the outdoor. Standards UNI-CIG 7129 and 7131 require the provision of suitable vents on the walls.

**NOTE:** In this configuration, combustion air intake requires an IP20 safety meshing to be fitted, which must prevent a solid object with a diameter higher than 12mm from going through; at the same time, the meshing must have holes larger than 8mm.

$L_{max}$  of the pipe routing made with the  $\varnothing$  shown, excluding the terminal.

The terminal consists of:

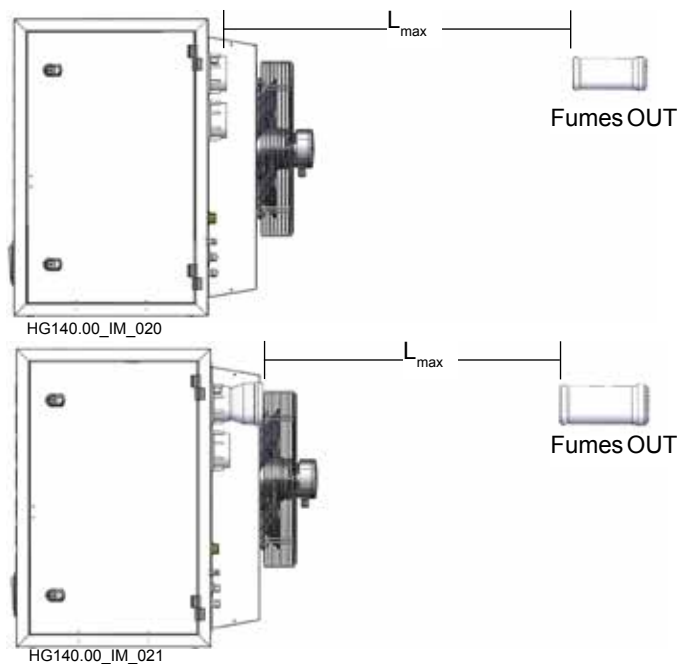
- An adaptor from ECO outlet to exhaust  $\varnothing$  (where necessary)
- A wall fitted terminal, exhaust only.

$\varnothing$ 80 pipes and bends: TB23-08-HS0

Mod. ECO	20A	34A	45A	65A	80A	105A
$L_{max}$ [m]	30	30	25	15	-	-

$\varnothing$ 100 pipes and bends: TB23-10-HS0 + G15815-08-10 (eccentric adaptor only for mod. ECO20A-65A)

Mod. ECO	20A	34A	45A	65A	80A	105A
$L_{max}$ [m]	-	-	-	30	30	20



## Vertical B23 terminal

Open combustion circuit, combustion air intake from the room and exhaust to the outdoor. Standards UNI-CIG 7129 and 7131 require the provision of suitable vents on the walls.

**NOTE:** In this configuration, combustion air intake requires an IP20 safety meshing to be fitted, which must prevent a solid object with a diameter higher than 12mm from going through; at the same time, the meshing must have holes larger than 8mm.

$L_{max}$  of the pipe routing made with the  $\varnothing$  shown, excluding the terminal.

The terminal consists of:

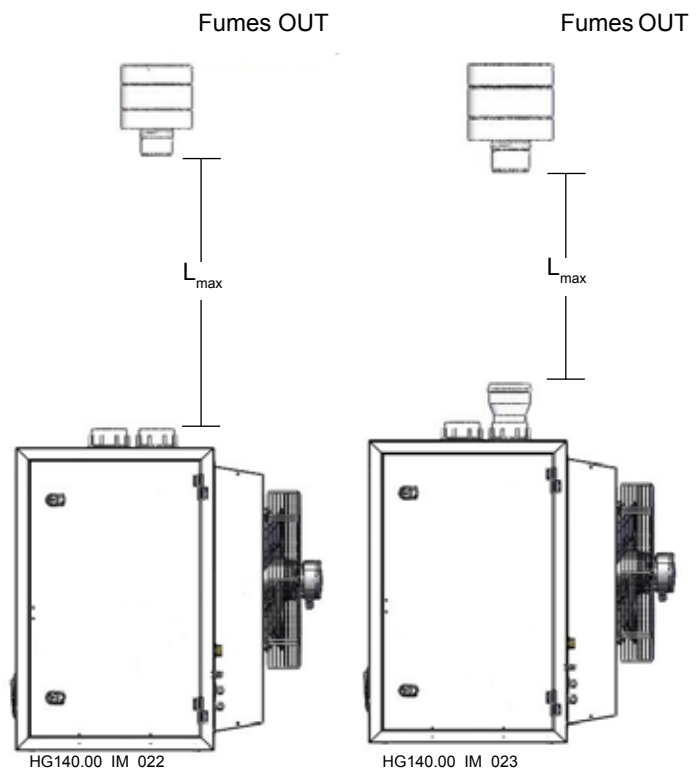
- An adaptor from ECO outlet to exhaust  $\varnothing$  (where necessary)
- A roof mounted terminal, windproof exhaust.

$\varnothing$ 80 pipes and bends: TB23-08-VSW

Mod. ECO	20A	34A	45A	65A	80A	105A
$L_{max}$ [m]	30	30	30	15	-	-

$\varnothing$ 100 pipes and bends: TB23-10-VSW + G15815-08-10 (eccentric adaptor only for mod. ECO20A-65A)

Mod. ECO	20A	34A	45A	65A	80A	105A
$L_{max}$ [m]	-	-	-	30	30	20



## Type C53 terminal

Combustion circuit watertight to the environment. One of the ducts is connected to the roof, the other to the wall.

$L_{max}$  of the pipe routing made with the  $\varnothing$  shown, excluding the terminal.

The terminal consists of:

- An adaptor from ECO outlet to exhaust  $\varnothing$  (where necessary)
- An adaptor from ECO outlet to intake  $\varnothing$  (where necessary);
- A roof mounted terminal, windproof exhaust.

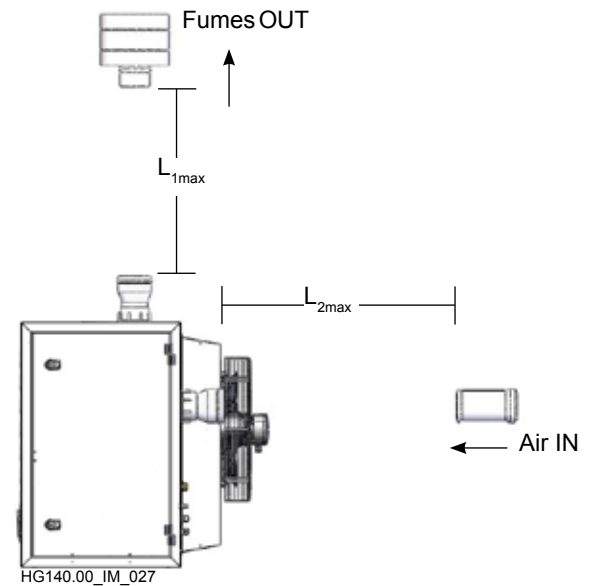
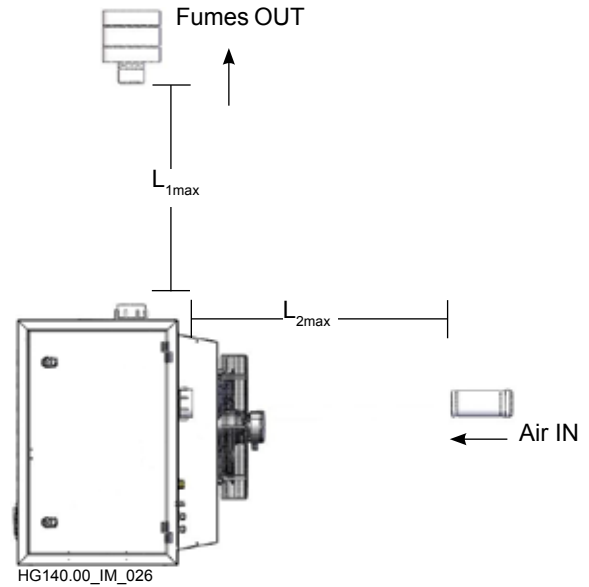
**NOTE:** The maximum length allowed has been divided in equal parts on the exhaust ( $L_{1max}$ ) and on the intake ( $L_{2max}$ ); the lengths between intake and exhaust can also be divided differently without exceeding the sum shown.

$\varnothing 80$  pipes and bends: TB23-08-VSW + TB23-08-HS0

Mod. ECO	20A	34A	45A	65A	80A	105A
$L_{max}$ [m]	30+30	20+20	15+15	8+8	-	-

$\varnothing 100$  pipes and bends: TB23-10-VSW + 2xG15815-08-10 + TB23-10-HS0 (adaptor only for mod. ECO20A-65A)

Mod. ECO	20A	34A	45A	65A	80A	105A
$L_{max}$ [m]	-	-	30+30	25+25	15+15	10+10



## Horizontal coaxial C13 terminal

Combustion circuit watertight to the environment. The ducts go directly through the wall.

$L_{max}$  of the pipe routing made with the  $\varnothing$  shown, excluding the terminal.

The terminal consists of:

- An adaptor from ECO outlet to exhaust  $\varnothing$  (where necessary)
- An adaptor from ECO outlet to intake  $\varnothing$  (where necessary);
- A horizontal coaxial terminal.

**NOTE:** The maximum length allowed has been divided in equal parts on the exhaust ( $L_{1max}$ ) and on the intake ( $L_{2max}$ ); the lengths between intake and exhaust can also be divided differently without exceeding the sum shown.

$\varnothing 80$  pipes and bends: TC13-08-HC1

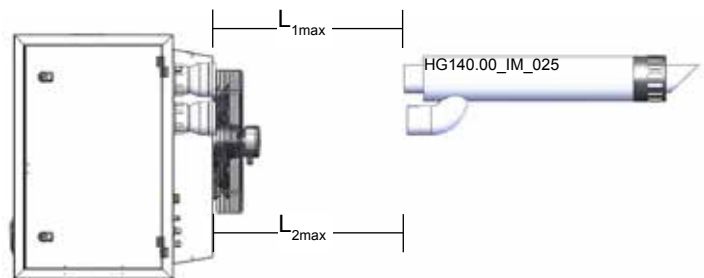
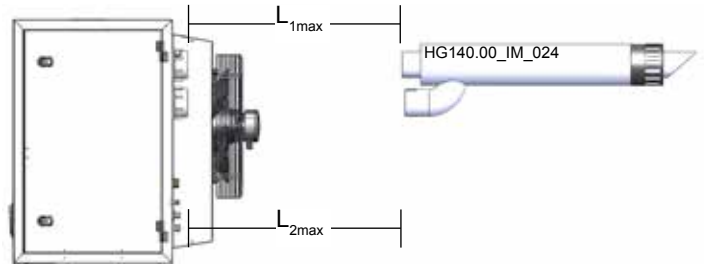
Mod. ECO	20A	34A	45A	65A	80A	105A
$L_{max}$ [m]	30+30	30+30	15+15	5+5	-	-

$\varnothing 100$  pipes and bends: TC13-10-HC2 + 2xG15835-08-10 (eccentric adaptors only for mod. ECO20A-65A)

Mod. ECO	20A	34A	45A	65A	80A	105A
$L_{max}$ [m]	-	-	30+30	15+15	5+5	1+1

$\varnothing 130$  pipes and bends: TC13-13-HC5 + 2xG15815-10-13 + 2xG15810-13-45 (adaptors and bends only suitable only for model ECO80A-105A)

Mod. ECO	20A	34A	45A	65A	80A	105A
$L_{max}$ [m]	-	-	-	-	30+30	30+30



## Roof mounted coaxial C33 terminal

Combustion circuit watertight to the environment. The ducts are connected to the outside with a coaxial terminal.

$L_{max}$  of the pipe routing made with the  $\emptyset$  shown, excluding the terminal.

The terminal consists of:

- An adaptor from ECO outlet to exhaust  $\emptyset$  (where necessary)
- An adaptor from ECO outlet to intake  $\emptyset$  (where necessary);
- A roof terminal from separate to coaxial

**NOTE:** The maximum length allowed has been divided in equal parts on the exhaust ( $L_{1max}$ ) and on the intake ( $L_{2max}$ ); the lengths between intake and exhaust can also be divided differently without exceeding the sum shown.

$\emptyset 80$  pipes and bends: TC33-08-VC1K

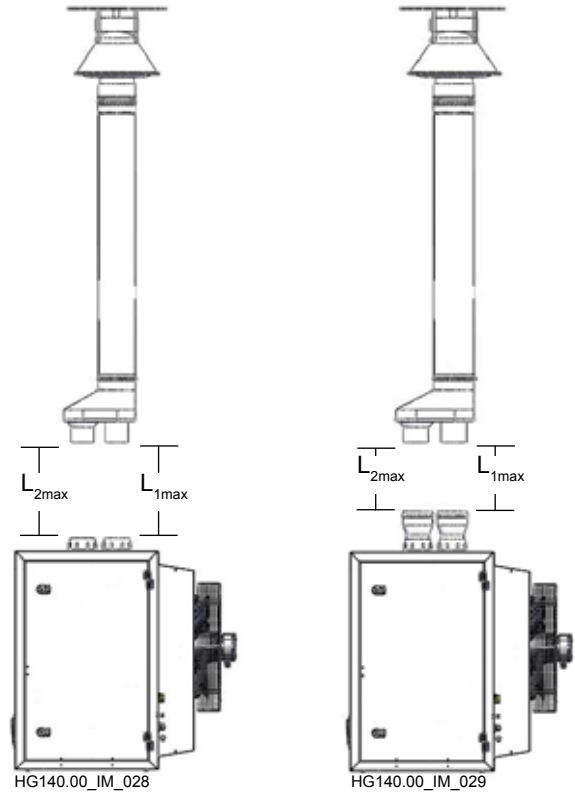
Mod. ECO	20A	34A	45A	65A	80A	105A
$L_{max}$ [m]	30+30	10+10	8+8	1+1	-	-

$\emptyset 100$  pipes and bends: TC33-10-VC2K + 2xG15835-08-10 (eccentric adaptors only for mod. ECO20A-65A)

Mod. ECO	20A	34A	45A	65A	80A	105A
$L_{max}$ [m]	-	30+30	30+30	15+15	8+8	2+2

$\emptyset 130$  pipes and bends: TC33-13-VC5K +2xG15815-10-13 + 2xG15810-13-45 (adaptors and bends only suitable only for model ECO80A-105A)

Mod. ECO	20A	34A	45A	65A	80A	105A
$L_{max}$ [m]	-	-	-	-	30+30	25+25



## 5.5. Electrical Connections

### Power supply

The heater must be correctly connected to an effective earthing system, fitted in compliance with current legislation.

Single phase 230VAC power supply with neutral; do not swap the neutral with the live wire.

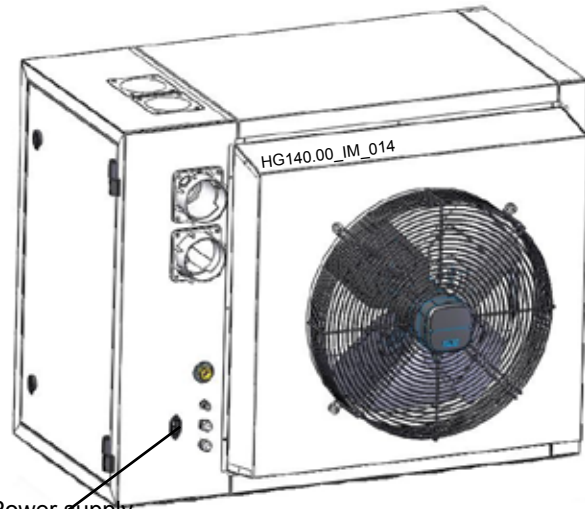
For safety reasons, the flame monitoring device prevents operation if phase and neutral are swapped, fault F1X.

The heater can be connected to the mains power supply with a single plug-socket only if the latter does not allow swapping the live with the neutral.

The electrical system and, more specifically, the cable section, must be suitable for the equipment maximum power input, see Paragraph 3.1 "Technical Data" - Table.

Make sure the power cables are kept away from heat sources.

**NOTE: It is compulsory to fit, upstream of the heater, a multipole isolator fitted with a suitable fuse. The phase, earth and neutral cable section must be at least 1.5mm<sup>2</sup>.**



Power supply socket

### Connecting the room thermostat and the remote control

It is compulsory to connect the heater to a thermostat, a clock, a chronothermostat or a switch, in order to allow the user to control the heater on and off operations.

On the other hand, providing remote controls is not compulsory, but it is at the user's and installer's discretion.

We recommend that at least the G15100 remote control is connected to allow the customer to remotely reset the equipment. Connect the room thermostat to terminals ID2/IDC2 of the heater. If used with the G15100 remote control, follow the diagram shown to the side.

The thermostat, switch and lamp contacts are supplied by low voltage.

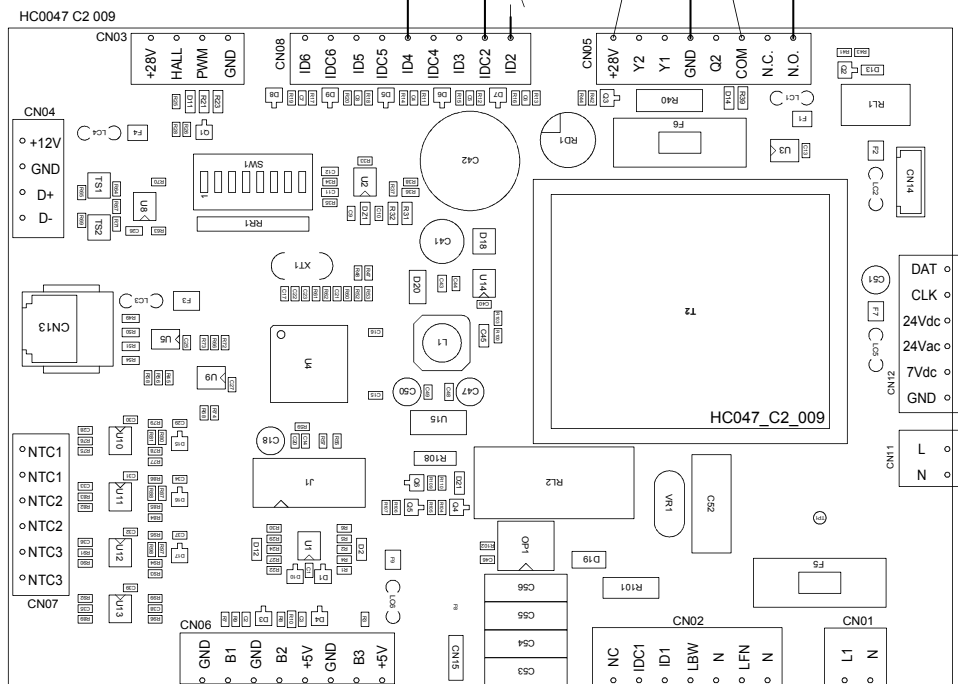
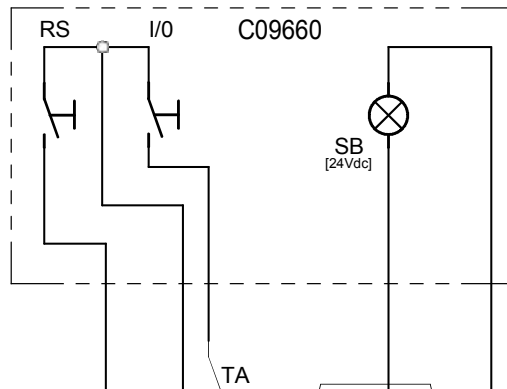
The thermostat contact must have zero voltage.

Should the installer decide to fit a lockout warning light, its power supply must be 24VDC and its maximum power input must be < 25 mA. Contact and light cable section: 0.5 mm

**NOTE: For safety reasons, using a multipole cable carrying both the power supply and the control cables (different voltages) is prohibited; furthermore, this could cause electromagnetic interference on the heater PCB.**

### Key

- SB Lockout indicator light
- RS Reset button
- I/O ON-OFF switch
- TA Room thermostat [to be fitted by the installer]





### SmartControl Connection

The SmartControl must be connected by using the connector provided. Connect the power supply, making sure polarity is correct.

Connect the RS485 network to its terminals, making sure polarity is correct.

For multiple heaters, connect terminals D+ and D-, making sure polarity is correct; the network can be made both as a serial and star network.

**NOTE: The correct address for each PCB must then be set up. Addresses must start from 1 to N without interruptions in the numbering sequence. The address of each PCB, if different from zero, is displayed on the LCD as Axx, where xx is the address.**

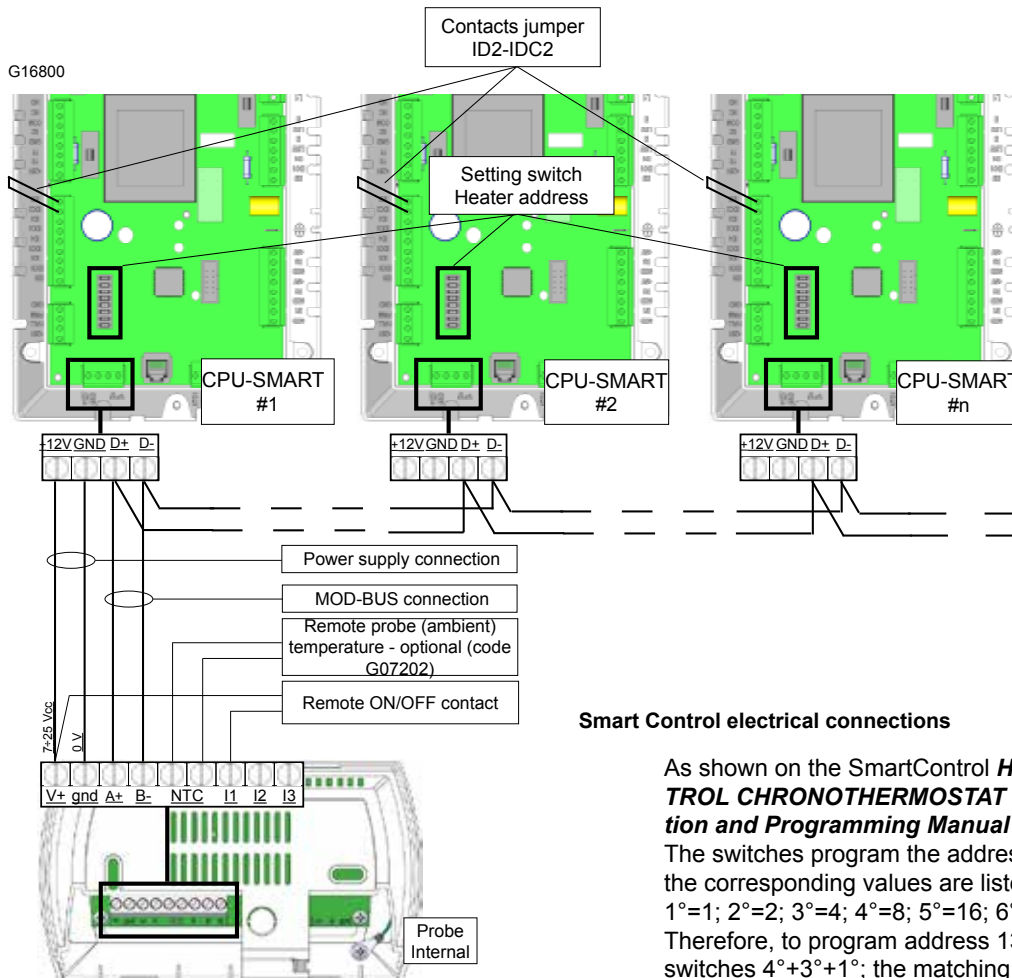
To program the SmartControl, please read the operating manual supplied with the accessory.

### Summer ventilation

To enable the fans only (summer ventilation with burner off), three types of controls are available:

- the ID3-IDC2 contact;
- the SmartControl;
- manual control with the LDC control on board of the machine.

**NOTE: Before switching off the blowers, the heater carries out the post-ventilation cycle.**



**Smart Control electrical connections**

As shown on the SmartControl *HG0080IT "SMARTCONTROL CHRONOTHERMOSTAT"* manual *Operating, Installation and Programming Manual*.

The switches program the address by using a binary code; the corresponding values are listed below:

1°=1; 2°=2; 3°=4; 4°=8; 5°=16; 6°=32.

Therefore, to program address 13, you must set to ON switches 4°+3°+1°; the matching address will be 8+4+1=13. When an address is changed, the PCB must be powered off and on again.

## 5.6. Modulation PCB Parameters

All values of the parameters of the CPU-SMART PCB are shown for all ECO heater models.

- (1) parameters that could be modified with 001 Password;
- (2) parameters that could be modified with a Password which can be requested to the manufacturer's Service Centre;
- (3) parameters that could be modified with a Smart Control or modbus.

CPU-SMART PCB version 7.01.xx Parameters							
PARAMETER	ECO20A	ECO34A	ECO45A	ECO65A	ECO80A	ECO105A	DESCRIPTION
<b>Setting parameters</b>							
<b>d0</b>	(2)			2			Flame modulation: 2=NTC1; 5=0÷10Vdc; 7=Modbus (SmartControl and PID)
<b>d1</b>	(2)			0			Type of equipment: 0=heater; 2=boiler; 5=PCH
<b>d2</b>	(2)			1			Remote lockout signal output (Q1): 0=disabled; 1=enabled
<b>d3</b>	(2)	sec		45			Fan ON delay time (RL2): 0÷255
<b>d4</b>	(2)	sec		30 (=150 sec)			Fan OFF delay time (RL2): 0÷255 (1=5sec 60=300 sec)
<b>d5</b>	(2)			0			Fumes T monitoring enabled (NTC3): 0=disabled; 1=enabled
<b>d6</b>	(2)	sec		5			Interval between switching off and on (Timer Off): 0÷255
<b>d7</b>	(2)			0			Reset Fault counters: 0÷1
<b>d8</b>	(2)			0			Enable boiler antifreeze (NTC1): 0=disabled; 1=enabled NOT USED
<b>d9</b>	(2)			0			Enable fire dampers: 0=disabled; Do not change
<b>Burner parameters</b>							
<b>b1</b>	(2)	rpm	see table "Burner - motor rpm parameters" pae 34				Motor RPM MINIMUM value (PWM1): 90÷999 (1=10 RPM)
<b>b2</b>	(2)	rpm	see table "Burner - motor rpm parameters" pae 34				Motor RPM MAXIMUM value (PWM1): 90÷999 (1=10RPM)
<b>b3</b>	(2)	rpm	see table "Burner - motor rpm parameters" pae 34				Motor RPM START-UP value (PWM1): 90÷999 (1=10RPM)
<b>b4</b>	(2)			2			HALL signal splitter: 2÷3
<b>b5</b>	(2)	rpm		50			Error F3x; no. of RPM x10 (50=500rpm): 0÷300
<b>b6</b>	(2)	sec		20			Error F3x; error duration before fault F3x: 0÷255
<b>b7</b>	(2)	sec		20			Pre-cleaning time at maximum power: 0÷255. DO NOT CHANGE THE PRESET VALUE
<b>b8</b>	(2)	sec		10			Flame modulation time (ignition): 0÷255
<b>b9</b>	(2)	sec		90			Combustion chamber post-cleaning time (FAN ON) 0÷255
<b>b10</b>	(2)	%		5			Motor RPM increase every b11 seconds: 1÷100
<b>b11</b>	(2)	sec		5			Time interval to increase motor RPM:: 1÷100
<b>b12</b>	(2)	%		30			Antifreeze mode FAN motor modulation % value: 30÷100
<b>b13</b>	(2)	sec		65			Integral factor value (ki_pwm) to calculate the PWM1- (exA36):0÷249
<b>b14</b>	(2)	pem		45			Proportional factor value (kp_pwm) to calculate the PWM1- (exA37): 0÷249
<b>b15</b>	(2)	sec		0			Flow monitoring time at start-up 0÷255
<b>b16</b>	(2)			0			Blowers monitoring: 0=input disabled; 1=enabled with requested input N.C.; 2=enabled with requested input N.O.
<b>b17</b>	(2)			0			Blowers monitoring: 0=input disabled; 1=enabled with requested input N.C.; 2=enabled with requested input N.O.
<b>Modulation probe NTC1 monitoring with D0=2; limit in the event of D0=5 or 7</b>							
<b>S1</b>	(2)			1			Enabling NTC1 probe: 0=disabled; 1=enabled
<b>ST1</b>	(1)	°C	LP	48			NTC1 set point: -10÷90
			LK	40			
<b>SP1</b>	(2)	°C		5			SP1 hysteresis: 0÷10
<b>XD1</b>	(3)	%		6			Proportional range from 4 to 100
<b>TN1</b>	(3)	sec		15			Integral time: 1÷255
<b>AC1</b>	(3)			0			0=modulation only; 1=ON/OFF if D0=5 or 7, 0/10V modulation or MODBUS
<b>TH1</b>	(2)	°C		60			Fault F51 enabling time upper limit: 10÷95 autoreset if NTC1<TH1-15°C

CPU-SMART PCB parameters version 7.01.xx							
PARAMETER	ECO20A	ECO34A	ECO45A	ECO65A	ECO80A	ECO105A	DESCRIPTION
<b>0/10 Vdc - D0=5 control</b>							
<b>b4</b>	(1)			1			Active only with D0=5 (0/10V) 0=modulation only; 1=modulation and ON/OFF
<b>H52</b>	(1)	V		0.5			Voltage OFF; burner off if H51=1
<b>H53</b>	(1)	V		0.5			Delta voltage for burner ON
<b>H54</b>	(3)	sec		10			Bottom input time on: 0÷255
<b>H55</b>	(3)	sec		10			Top input time on: 0÷255
<b>Circulator outlet monitoring - NOT USED ON LP and LK</b>							
<b>H11</b>	(2)			0			0=output disabled;1=analogue output Y1 enabled (PWM2); 2=analogue output Y2 enabled (0÷10Vdc)
<b>H12</b>	(3)	V		4.0			Y2 output minimum voltage: 0÷10
<b>H13</b>	(3)	V		10.0			Y2 output maximum voltage: 0÷10
<b>H14</b>	(3)	%		80			PWM2 minimum value: 0÷100
<b>H15</b>	(3)	%		100			PWM2 maximum value: 0÷100
<b>H16</b>	(3)			2			2= circulator modulation proportional to the FAN (do not change)
<b>H17</b>	(3)			1			0=PMW output (Y1) or 0/10V (Y2) according to "direct" logic; 1=PWM output (Y1) or 0/10V (Y2) according to "reverse" logic:
<b>NTC2 monitoring - NOT USED ON THE LP and LK</b>							
<b>S2</b>	(2)			0			0=NTC2 disabled; 1=NTC2 enabled
<b>ST2</b>	(1)	°C		2.0			NTC2 Setpoint: -10÷90
<b>P2</b>	(2)	°C		1.0			ST2 hysteresis: 0÷40
<b>XD2</b>	(3)			40			Neutral area, proportional modulation band divided by 100; 4 ÷100
<b>TN2</b>	(3)	sec		5			Integration time: 1÷255
<b>ANTIFREEZE control - active with D8=1 - NOT USED ON THE LP and LK</b>							
<b>STA</b>	(3)	°C		2.0			Antifreeze setpoint: -10÷+20
<b>PA</b>	(3)	°C		1.0			Antifreeze setpoint hysteresis:: 0÷10
<b>FLUE GAS TEMPERATURE monitoring - active with D8=1 - NOT USED ON THE LP and LK</b>							
<b>H41</b>	(2)	°C		5			Flue gas temperature (NTC3); neutral band from 1÷50
<b>H42</b>	(3)	sec		5			Flue gas monitoring cycle duration (15=30 seconds): 0÷255
<b>H43</b>	(1)	°C		95			Flue gas temperature at maximum output (Tmax with PT%=100):0÷140
<b>H44</b>	(1)	°C		85			Flue gas temperature at medium output (Tmed with PT%=50): 0÷140
<b>H45</b>	(1)	°C		75			Flue gas temperature at minimum output (Tmin with PT%=0): 0÷140
<b>H46</b>	(3)			0			Flue gas temperature operation: 0=modulation only - 1= burner OFF
<b>TH3</b>	(3)	°C		103			Upper temperature limit (autoreset if NTC3<TH3): 0÷140
<b>Hydraulic circuit WATER PRESSURE monitoring - NOT USED ON LP and LK</b>							
<b>S5</b>	(2)			0			Enabling pressure probe B2 output: 0=disabled;1=enabled as ON/OFF input; 2=enabled as analogue input without autoreset fault F83; 3=enabled as analogue input with autoreset fault F83
<b>ST5</b>	(1)	bar		0.70			B2 Setpoint: 0÷9.99
<b>P5</b>	(2)	bar		0.30			ST5 hysteresis: 0÷9.99
<b>XA5</b>	(3)	V		1.18			B2 pressure probe signal input minimum voltage: 0÷9.99
<b>XB5</b>	(3)	V		2.72			B2 pressure probe signal input maximum voltage: 0÷9.99
<b>YA5</b>	(3)	bar		0.10			Pressure matching the B2 probe inlet minimum voltage
<b>YB5</b>	(3)	bar		2.90			Pressure matching the B2 probe inlet maximum voltage
<b>TH5</b>	(3)	V		2.50			Pressure upper limit to activate fault F82: 0÷9.99

## CPU-SMART PCB version 7.01.xx Parameters

PARAMETER	ECO20A	ECO34A	ECO45A	ECO65A	ECO80A	ECO105A	DESCRIPTION
<b>Hydraulic circuit WATER FLOW monitoring - NOT USED ON LP and LK</b>							
<b>S6</b>	(2)			0			Flow sensor B3 output enabling: 0=disabled 1=enabled as ON/OFF input without F85 fault autoreset 2=enabled as ON/OFF input with F85 fault autoreset 3=enabled as pulsed input without F85 and F86 fault autoreset 4=enabled as pulsed input with F85 and F86 fault autoreset
<b>ST6</b>	(1)	From l/h		56			Flowmeter setpoint - in l/h (x10)
<b>P6</b>	(2)			5			ST6 hysteresis - in l/h (x10)
<b>XA6</b>	(3)	Hz		14			B3 pressure probe signal input minimum frequency: 0÷999
<b>XB6</b>	(3)	Hz		229			B3 pressure probe signal input maximum frequency: 0÷999
<b>YA6</b>	(3)	l/h		29			Flow rate matching the B3 probe inlet minimum frequency
<b>YB6</b>	(3)	l/h		500			Flow rate matching the B3 probe inlet maximum frequency
<b>TR6</b>	(3)	sec		2			Fault F85/F86 indication time delay (1=1second): 0÷250 During the ignition stage, the b15 value is used.

### "Burner parameters - motor rpm" Table

PARAMETER	LK020	LK034	LK045	LK065	LK080	LK105	DESCRIPTION	
<b>b1</b>	rpm						Motor RPM MINIMUM value (PWM1): 90÷999 (1=10 RPM)	
		LP	602	575	488	535		518
<b>b2</b>	rpm						Motor RPM MAXIMUM value (PWM1): 90÷999 (1=10RPM)	
		LK	213	210	177	182		162
<b>b3</b>	rpm						Motor RPM START-UP value (PWM1): 90÷999 (1=10RPM)	
		LP	730	703	644	645		618
	LK	660	710	580	651	655	635	
	LP	320	315	290	328	317	-	
	LK	320	300	345	340	355	388	

## 5.7. Analysis of lockouts- faults

The CPU-SMART manages two types of lockouts:

- preventive, it warns the customer that the ECO heaters require maintenance;
- operational, it stops the ECO heater for safety reasons or to ensure its correct operation.

Some operational faults require manual resets; others reset themselves when the problem that caused them is solved.

Below is a complete list of faults, possible causes and possible solutions.

FAULT	DESCRIPTION	CAUSE	RESET
Lockout caused by Flame - Caused by the flame monitoring equipment (TER)			
F10	Failure to ignite flame after 4 attempts performed by the equipment.	<ul style="list-style-type: none"> <li>• Phase and neutral reversed.</li> <li>• Earth wire not connected.</li> <li>• Phase-phase connection without neutral.</li> <li>• Start-up electrode failed or badly positioned</li> <li>• Detection electrode failed or badly positioned</li> <li>• Detection electrode that moves or disperses to the earthing system when hot.</li> <li>• Low CO<sub>2</sub> value</li> </ul>	Manual reset
F11	Ill-timed flame		
F12	Ignition failure; not visible. The count, displayed in the history, indicates whether the heater has had problems with ignition.		
F13	The TER equipment does not accept the reset command from CPU-SMART	TER has finished its 5 reset attempts in the period of 15 minutes.	Wait 15 min or press the reset button on the equipment
F14	Lack of communication between TER equipment and CPU for more than 60 seconds	TER equipment or CPU-SMART PCB broken	Auto-reset
F15	The CPU-SMART PCB sent the ignition signal to the equipment. After 300 seconds, the equipment has not yet lit the flame.	safety thermostat locked out at start up	Check contact closing
		<ul style="list-style-type: none"> <li>• No gas mains pressure</li> <li>• Live and neutral reversed</li> <li>• Earthing terminals missing or faulty</li> <li>• Faulty TER equipment</li> </ul>	Manual reset
F16	Generic equipment lockout	Faulty TER equipment	Manual reset
F17	Internal malfunction of TER equipment that does not accept reset command from CPU-SMART	Faulty TER equipment	Manual reset on equipment
Lockouts caused by temperature (safety lockouts)			
F20	Activation of safety thermostat STB	<ul style="list-style-type: none"> <li>• Excess air temperature due to lack of air circulation</li> <li>• Safety thermostat broken or not connected</li> </ul>	Manual reset
F21	Input ID1 open caused by: NOT USED - Jumped	ID1 - IDC1 jumper missing	Manual reset of CPU-SMART
FAN lockout - burner fan			
F30	Fan speed too low in start up phase - VAG	Burner fan broken. FAN electrical cables broken or not connected	Manual reset
F31	Fan speed too high in start up phase - VAG		
F32	Fan speed, during operation, outside minimum and maximum set parameters - VAG		Manual reset, auto-reset after 5 minutes
F35	Burner stopped	<ul style="list-style-type: none"> <li>• Contact opens if b16=1.</li> <li>• Contact closes if b16=2.</li> </ul>	Manual reset, auto-reset after 5 minutes
F38	Burner stopped	<ul style="list-style-type: none"> <li>• Contact opens if b17=1;</li> <li>• Contact closes if b17=2.</li> </ul>	Manual reset, auto-reset after 5 minutes

FAULT	DESCRIPTION	CAUSE	RESET
NTC probes broken or missing			
F41	Probe NTC1 error, air intake temperature	No signal from probe or broken probe	Auto-reset
Over-temperature			
F51	The temperature of the air intake probe NTC1>TH1	<ul style="list-style-type: none"> <li>The minimum heat output of the heater is oversized compared to the heat output required by the environment.</li> <li>Check the TH1 parameter - air intake set point.</li> </ul>	Auto-reset if NTC1< TH1-15
Check ModBus communication			
F60	Communication error between CPU-SMART PCB and ModBus network, SmartControl or SMART.NET	<ul style="list-style-type: none"> <li>ModBus network is disconnected.</li> <li>The address of the PCB is wrong and/or not configured in the ModBus network.</li> </ul>	Auto-reset
No voltage			
F75	No voltage during operation cycle (excluding stand-by); the fault is not visible on remote control but only counted.	No voltage during operation	Auto-reset
Internal malfunction of CPU-SMART PCB			
F00	Internal malfunction of CPU-SMART PCB	Perform a manual reset of the PCB; replace the CPU-SMART if the problem persists.	Manual reset

In the event of communication problems between the CPU-SMART PCB and the LCD panel, the word **CPU** will flash on the display if the problem is caused by the CPU; three flashing dots will be displayed if the problem is caused by the display PCB. If needs be, check that the display and the PCB are correctly connected and that the small cable RJ11 is securely held in the connector.



## 6. GAS CONNECTION

Use the gas line connections only with EC certified components

The heater is supplied complete with:

- a dual gas valve;
- a gas governor and filter.

All components are fitted inside the burner housing. To complete the installation, as required by current standards, the following components must be fitted

- Gas valve

Furthermore, we recommend that a large capacity gas filter is used, without pressure stabiliser, as the filter fitted as standard upstream of the gas valve has a small capacity.

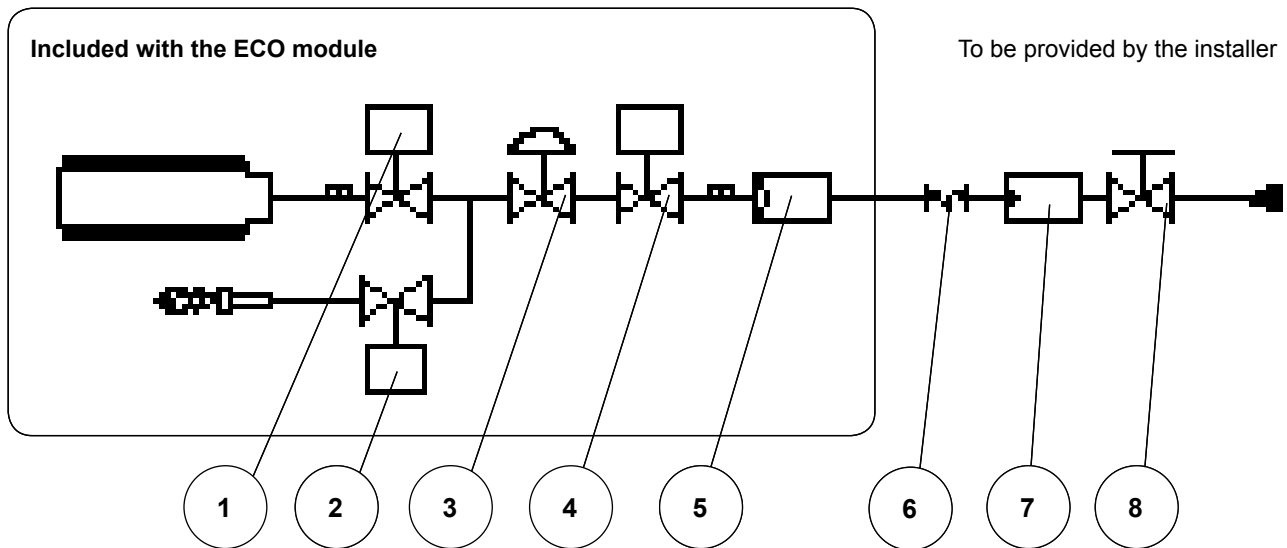
**NOTE: For a correct maintenance, connect the heater by means of a seal and swivel gasket.**

Avoid using threaded connected directly on the gas connection.

Current legislation allow a maximum pressure inside the rooms, or thermal station, of 40mbar; higher pressure must be reduced upstream of the boiler room or the site where the heater is installed.

**KEY**

- 1 Main burner gas solenoid valve
- 2 Pilot burner gas solenoid valve
- 3 Pressure governor
- 4 Safety gas solenoid valve
- 5 Gas filter (small section)
- 6 Anti-vibration joint
- 7 Gas filter (large section)
- 8 Gas valve



During the installation, tighten the gas supply pipe locking nut external to the heater without exceeding, for Ø3/4", a tightening torque of 150Nm.

Is strictly prohibited to supply gas to the circuit with pressure higher than 60mbar. Such pressures could cause the valve to break.

## 7. SERVICING INSTRUCTIONS

The first start-up must be carried out only by authorised service centres.

The first start-up also includes a combustion analysis, which is compulsory.

The equipment is certified in the EC and non-EC countries, according to the gas categories shown below.

### 7.1. Country table - gas category

Country	Category	Gas	Pressure	Gas	Pressure
AT, CH	I12H3B/P	G20	20 mbar	G30/G31	50 mbar
BE <70kW	I2E(S)B, I3P	G20/G25	20/25 mbar	G31	37 mbar
BE >70kW	I2E(R)B, I3P	G20/G25	20/25 mbar	G31	37 mbar
DE	I12ELL3B/P	G20/G25	20 mbar	G30/G31	50 mbar
DK, FI, GR, SE, NO, IT, CZ, EE, LT, SI, AL, MK, BG, RO, HR, TR	I12H3B/P	G20	20 mbar	G30/G31	30 mbar
ES, GB, IE, PT, SK	I12H3P	G20	20 mbar	G31	37 mbar
FR	I12Esi3P	G20/G25	20/25 mbar	G31	37 mbar
LU	I12E3P	G20/G25	20 mbar	G31	37/50 mbar
NL	I12L3B/P	G25	25 mbar	G30/G31	50 mbar
HU	I12HS3B/P	G20/G25.1	25 mbar	G30/G31	30 mbar
CY, MT	I3B/P			G30/G31	30 mbar
LV	I2H	G20	20 mbar		
IS	I3P			G31	37 mbar
PL	I12ELwLs3B/P	G20/G27/ G2.350	20/13 mbar	G30/G31	37 mbar
RU	I12H3B/P	G20	20 mbar	G30/G31	30 mbar

The following information is clearly printed on the equipment packaging: country of destination, gas category and equipment code. The code allows users to find out the factory settings.

**NOTE: In compliance with standards EN1020, EN 437 and ISO3166, GB refers to the United Kingdom.**

#### Codes with no extension:

- ECO20GB if there is no extension, it means that the equipment has been tested and set to run with natural gas [G20]

#### Codes with extension:

The fourth letter indicates the type of gas the equipment has been set up for:

- ECO20FR-xxx0 0 indicates that the equipment has been tested and set up for natural gas [G20];
- ECO20MT-xxx1 1 indicates that the equipment has been tested and set up for LPG [G31];
- ECO20NL-xxx2 2 indicates that the equipment has been tested and set up for 'L' natural gas [G25];
- ECO20HU-xxx3 3 indicates that the equipment has been tested and set up for natural gas [G25.1];
- ECO20PL-xxx4 4 indicates that the equipment has been tested and set up for gas [Gz350];

A second adhesive label, located near the fuel connection, specifically states the type of gas and the supply pressure it has been set up and tested for.

## 7.2. Gas settings table

TYPE OF GAS G20													
TYPE OF EQUIPMENT		ECO20A		ECO34A		ECO45A		ECO65A		ECO80A		ECO105A	
		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
GAS SUPPLY PRESSURE	[mbar]	20 [min 17-max 25] *											
Ø PILOT NOZZLE	[mm]	0.7											
GAS CONSUMPTION (15°C-1013mbar)	m³/h	0.51	2.01	0.80	3.69	0.90	4.44	1.31	6.88	1.74	8.68	1.90	10.6
CARBON DIOXIDE -CO <sub>2</sub> CONTENT	[%]	8.8	9.1	8.7	9.1	8.7	9.1	8.7	9.1	8.7	9.1	8.5	9.1
FLUE GAS TEMPERATURE	[°C]	38	111	31	94	30	93	31	86	26	70	28	80
FLUE MASS FLOW RATE (MAX.)	[kg/h]	31		57		72		107		135		165	
GAS ORIFICE PLATE	[mm]	4.4		6.4		7.2		10		9.7		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	

\* For Hungary, the air supply pressure is 25 mbar

TYPE OF GAS G25													
TYPE OF EQUIPMENT		ECO20A		ECO34A		ECO45A		ECO65A		ECO80A		ECO105A	
		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
GAS SUPPLY PRESSURE	[mbar]	25 [min 17-max 30] *											
Ø PILOT NOZZLE	[mm]	0.7											
GAS CONSUMPTION (15°C-1013mbar)	m³/h	0.59	2.34	0.93	4.29	1.05	5.17	1.53	8.00	2.02	10.1	2.21	12.3
CARBON DIOXIDE -CO <sub>2</sub> CONTENT	[%]	8.8	9	8.6	9	8.8	8.9	8.8	9.2	8.6	8.9	8.8	9
FLUE GAS TEMPERATURE	[°C]	38	111	31	94	30	93	31	86	26	70	28	80
GAS ORIFICE PLATE	[mm]	5.3		7.2		9.0		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	

\* For Germany supply pressure is 20 mbar  
\*\* For Germany (cat.LL) nozzle 0.75

TYPE OF GAS G2.350 (only for PL-Poland)											
TYPE OF EQUIPMENT		ECO20A		ECO34A		ECO45A		ECO65A*		ECO80A**	
		min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table									
GAS SUPPLY PRESSURE	[mbar]	13 [min 10-max 16] *									
Ø PILOT NOZZLE	[mm]	0.75									
GAS CONSUMPTION (15°C-1013mbar)	m³/h	0.71	2.81	1.13	5.17	1.26	6.22	1.84	9.63	2.43	12.1
CARBON DIOXIDE -CO <sub>2</sub> CONTENT	[%]	8.4	9	8.4	9	8.6	9	7.3	7.9	8.6	8.9
FLUE GAS TEMPERATURE	[°C]	38	111	31	94	30	93	31	86	26	70
GAS ORIFICE PLATE	[mm]	7.9		Not required		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		30.5		30.5	

\* Maximum nominal heat output 57.0 kW  
\*\*Maximum nominal heat output 75.0 kW

**NOTE: The minimum and maximum heat outputs of models ECO65A, ECO80A will be lower compared to their operation with G20. The models ECO105A are not suitable for operation with gas G2.350. The conversion kit for G2.350 is only supplied on request.**

TYPE OF GAS G2.350 (only for HU-Hungary)													
TYPE OF EQUIPMENT		ECO20A		ECO34A		ECO45A		ECO65A		ECO80A		ECO105A*	
		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
GAS SUPPLY PRESSURE	[mbar]	25 [min 20-max 33] *											
Ø PILOT NOZZLE	[mm]	0.70											
GAS CONSUMPTION (15°C-1013mbar)	m <sup>3</sup> /h	0.59	2.33	0.93	4.29	1.04	5.16	1.52	7.99	2.01	10.1	2.21	12.3
CARBON DIOXIDE -CO <sub>2</sub> CONTENT	[%]	9.3	9.5	9.1	9.6	9.4	9.6	9.3	9.7	9.2	9.6	9.4	9.6
FUMES TEMPERATURE	[°C]	38	111	31	94	30	93	31	86	26	70	28	80
GAS ORIFICE PLATE	[mm]	5.3		7.2		9.5		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	

\* Maximum nominal heat output 94.0 kW

TYPE OF GAS G27 (Only for PL-Poland)													
TYPE OF EQUIPMENT		ECO20A		ECO34A		ECO45A		ECO65A*		ECO80A**		ECO105A***	
		min	max	min	max	min	max	min	max	min	max	min	max
Power													
CATEGORY		according to the country of destination - see reference table											
GAS SUPPLY PRESSURE	[mbar]	20 [min 16-max 23] *											
Ø PILOT NOZZLE	[mm]	0.70											
GAS CONSUMPTION (15°C-1013mbar)	m <sup>3</sup> /h	0.57	2.26	0.90	4.15	1.01	5.00	1.48	7.74	1.95	9.76	2.50	11.90
CARBON DIOXIDE -CO <sub>2</sub> CONTENT	[%]	8.7	9.2	8.7	9.1	8.6	9.1	8.6	8.8	8.7	9.1	8.5	8.7
FUMES TEMPERATURE	[°C]	38	111	31	94	30	93	31	77	26	67	28	74
GAS ORIFICE PLATE	[mm]	5.7		8.1		9.5		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		30.5		Not required	

\* Maximum nominal heat output 57 kW  
 \* Maximum nominal heat output 75 kW  
 \* Maximum nominal heat output 94 kW

TYPE OF GAS G30													
TYPE OF EQUIPMENT		ECO20A		ECO34A		ECO45A		ECO65A		ECO80A		ECO105A	
		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
GAS SUPPLY PRESSURE	[mbar]	30 [min 25-max 35] - 50 [min 42,5-max 57.5]											
Ø PILOT NOZZLE	[mm]	0.51											
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	0.40	1.58	0.63	2.90	0.71	3.49	1.03	5.39	1.36	6.80	1.49	8.30
CARBON DIOXIDE -CO <sub>2</sub> CONTENT	[%]	10.8	11.4	10.8	11.5	10.8	10.9	10.7	11.3	11.2	11.6	10.9	11.2
FUMES TEMPERATURE	[°C]	38	111	31	94	30	93	31	86	26	70	28	80
GAS ORIFICE PLATE	[mm]	3.0		4.3		5.2		6.3		6.2		8.5	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	

TYPE OF GAS G31													
TYPE OF EQUIPMENT		ECO20A		ECO34A		ECO45A		ECO65A		ECO80A		ECO105A	
		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
GAS SUPPLY PRESSURE	[mbar]	30 [min 25-max 35] - 37 [min 25-max 45] - 50 [min 42.5-max 57.5]											
Ø PILOT NOZZLE	[mm]	0.51											
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	0.4	1.58	0.63	2.9	0.71	3.49	1.03	5.39	1.36	6.8	1.49	8.3
CARBON DIOXIDE -CO <sub>2</sub> CON- TENT	[%]	10.8	11.4	10.8	11.5	10.8	10.9	10.7	11.3	11.2	11.6	10.9	11.2
FUMES TEMPERATURE	[°C]	38	111	31	94	30	93	31	86	26	70	28	80
flue gas MASS FLOW RATE (MAX.)	[kg/h]	24		45		58		84		107		130	
GAS ORIFICE PLATE	[mm]	3.0		4.3		5.2		6.3		6.2		8.5	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	

## 7.3. Configuring with LCD Display

Parameters are shown and can be changed only if they have been enabled using **Abi** menu password.

To change parameters, the board address must be 0. If it is not, change the address to 0.

### Abi (set point change enabled)

Passwords for **Abi** menu are the following:

- Enables the change of heater set points, listed under **Set** menu. Password is 1 (one);
- Enables the change of heater parameters, listed under **Par** menu. This password is used by service staff and must be requested from Combat. See Paragraph 5.6 "Modulation PCB Parameters".

If no keys are pressed for 10 minutes after entering the password, previous state is automatically restored.

Use arrows to scroll the menu. Press **ENTER** to select a parameter or set point, then use arrows to display required value. Press **ENTER** for 3 seconds to confirm. The value will flash on display to confirm it has been stored.

### Set Point Menu

Meaning and default values of each parameter are listed in parameter table. See Paragraph 5.6 "Modulation PCB Parameters".

H51	0/10 Vdc control;
H52	0/10 Vdc control;
H53	0/10 Vdc control;
St1	modulation temperature;
St2	not used;
H43	not used;
H44	not used;
H45	not used;
St5	not used;
St6	not used;

### Parameter Menu

Through **Par** submenu you can access "b" and "d" parameters:

- **from b1 to b15** burner parameters;
- **from d0 to d9** settings for boiler operation.

Meaning and default values of each parameter are listed in parameter table. See Paragraph 5.6 "Modulation PCB Parameters". In addition to "b" and "d" parameters, the following parameters can be changed:

<b>S1</b>	enables modulation sensor;
<b>SP1</b>	hysteresis of ST1 (only if the sensor is used as temperature limit);
<b>tH1</b>	maximum temperature of modulation sensor. It turns the burner off independently from other settings;
S2	not used;
P2	not used;
S5	not used;
<b>P5</b>	not used;
<b>S6</b>	not used;
<b>P6</b>	not used;
<b>H11</b>	not used;
<b>H41</b>	not used;

### I/O Menu

In **I/O** menu you can view values detected by sensors.

<b>NTC1</b>	temperature of delivery water;
<b>NTC2</b>	not used (displays -10);
<b>NTC3</b>	not used;
<b>An1</b>	Input 0/10V - If used;
<b>PrH</b>	not used;
<b>FLH</b>	not used;
<b>rPu</b>	number of revolutions of the fan;
<b>Pu2</b>	not used;
<b>uSA</b>	not used;
<b>IOn</b>	measures ionization current from 0/100 for currents from 0 to 2 microamperes, 100 over 2 microamperes.

### Flt Menu

It displays error history. Use arrow keys to scroll list and press **ENTER** to display historical value of selected error.

The first value **rst** resets error history. Do not use this parameter. It is reserved to Service Staff. To reset, change the value to 1 and press **ENTER** for 3 seconds.

After reset, **rst** returns to 0.

The list and the meaning of errors is shown on **FAULT** table.

### Flue temperature control

This function regulates flue temperature during flame modulation phase so that it never exceeds the set range.

D5=1 to enable. If NTC3 sensor is not installed, the board issues F43 error. If d5=0, the board issue configuration error F99.



## 7.4. Starting up for the first time

The ECO heaters are supplied with settings entered and tested for the gas specified on the nameplate. Before turning on the heater, check the following:

- make sure the gas being supplied matches the gas for which the heater has been set up;
- check, through the pressure intake "IN" on the gas valve, that the pressure entering the valve corresponds to the value required for the type of gas being used;
- check that electrical connections correspond to those indicated in this manual or other wiring diagrams enclosed with the unit;
- check that efficient earthing connections have been completed, carried out as specified by current safety regulations;
- power on the heater with the general switch on the heater and connect the power plug inside the compartment;

To turn on the heater, follow the instructions below: Check that RDY appears on the display. If OFF appears, use the control, under FUN, to turn the machine to ON; Check that heat is being demanded by the connected control. When ON appears on the LCD display, the heater starts the ignition cycle.

**NOTE: Frequently, when started up for the first time, the pilot burner cannot ignite because there is air in the gas pipe. This will lock out the equipment. You will need to reset the equipment and repeat the operation until it ignites.**

## 7.5. Analysis of combustion

Wait until the heater is switched on. Check that the heater reaches its maximum power: from the LCD display, access the REG menu, then use the Hi and Lo controls to force operation at maximum or minimum output.

If the heater is controlled by the SmartControl or by the Smart-Web, the function shown is not available and the switches must be reset and the operation controlled from the LCD panel.

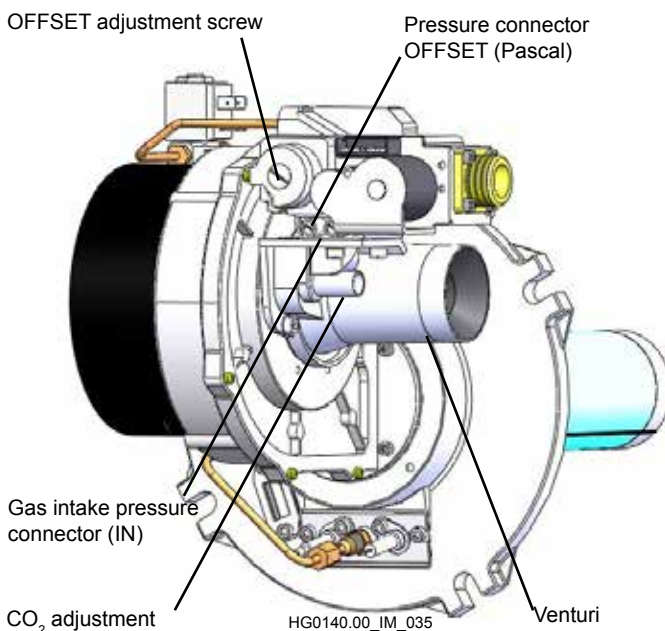
At maximum output, check again that the input pressure in the valve corresponds to the value required; adjust if necessary. Perform the combustion analysis to verify that the level of CO<sub>2</sub> corresponds to the figures in the tables in Paragraph 7.2 "GAS Connections tables".

If the measured value is different, turn the adjustment screw on the venturi. Unscrewing the screw will raise the level of CO<sub>2</sub>, tightening will lower the level.

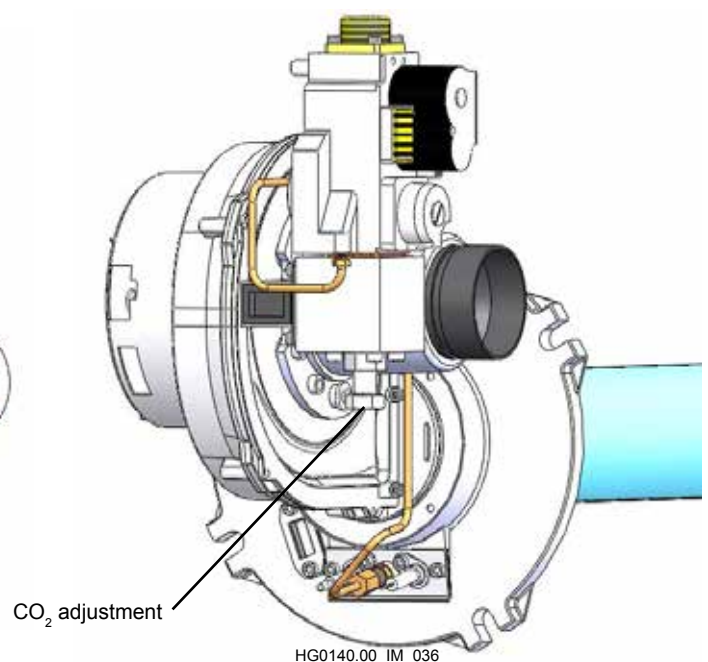
Set the heater to minimum output, and verify that the level of CO<sub>2</sub> corresponds to the figures in the tables in Paragraph 7.2 "GAS Connections Tables". If the figures do not match, turn the offset screw (tighten it to raise and slacken it to lower the level of CO<sub>2</sub> and repeat the procedure.

**NOTE: The heater directly supplied to function with LPG is set up for G31 gas. If the unit runs on G30 instead, it is necessary to verify and possibly adjust settings for CO<sub>2</sub> as shown in tables in Paragraph 7.2 "GAS Connections Tables".**

For models: ECO20A-80A



For models: ECO105A



## 7.6. Conversion to LPG

**Conversion is strictly prohibited in some countries, such as Belgium, which do not allow the double gas category.**

The unit is supplied with standard settings for natural gas. Additional components are provided as a standard kit for conversion to LPG, including:

- calibrated gas valve;
- pilot nozzle;
- adhesive label stating "Converted equipment...".

The kit is not supplied in countries where conversion is prohibited. To convert the unit, follow these instructions:

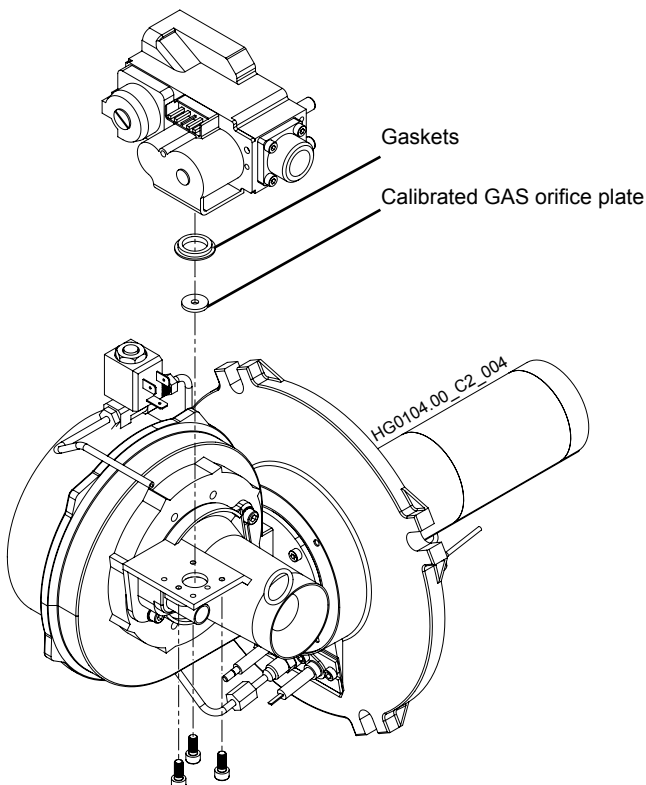
- disconnect from the power supply;
- replace the gas valve mounted between the gas tube and the venturi (which is for natural gas) with the one in the kit (for LPG);
- replace the pilot nozzle (methane) with the one in the kit (LPG);
- reconnect to the electrical mains and set the heater up for ignition;
- while the start-up electrode is sparking, make sure there are no gas leaks.

When the burner is lit and working at maximum output, verify that:

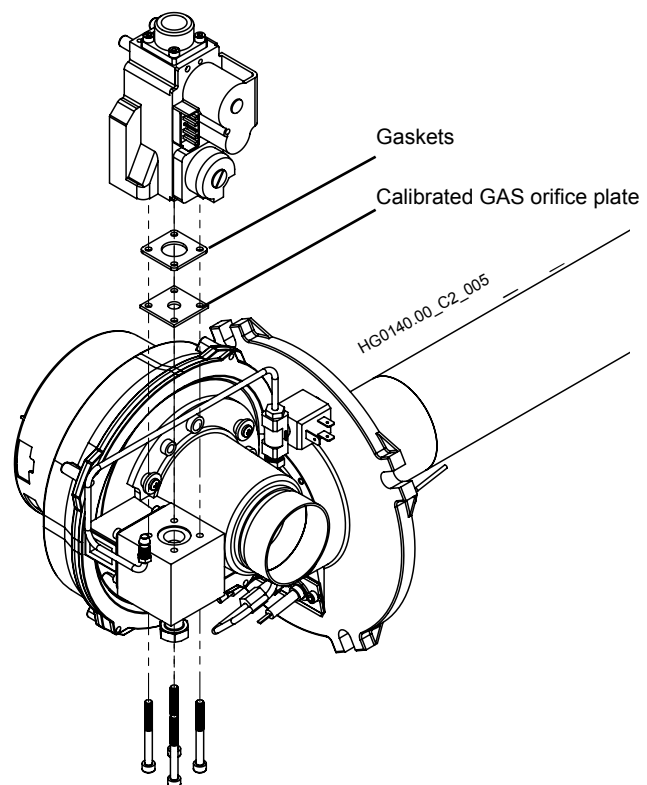
- the valve intake pressure matches the value required for the type of gas connected;
- the combustion analysis procedure is performed as described in Paragraph 7.5 "Analysis of Combustion";;
- the level of CO<sub>2</sub> is within the limits indicated for the type of gas being used (tables in Paragraph 7.2 "GAS Connection Tables"). If a different value is detected, change it by turning the adjustment screw: tighten it to lower the level of CO<sub>2</sub>, slacken it to raise it.
- that there the venturi gas valve connector does not leak.

After converting and regulating the unit, replace the nameplate with that says "Equipment regulated for methane gas" with the one in the kit that says "Equipment converted ...".

**For models: ECO20A-80A**



**For models: ECO105A**



## 7.7. Conversion to gas G25 - G25.1

Conversion for gases from G20 to G25 is allowed only in countries of category I12ELL3B/P [Germany] and category I12HS3B/P [Hungary].

For I12L3B/P countries [Netherlands] the unit is supplied and already set up for G25.

For category 2E countries, where conversion from G20 to G25 is not permitted [France, Belgium and Luxembourg], the unit is supplied set up to function with either G20 or G25 without the need to be converted.

Conversion from one type of gas to another can only be performed by authorised service centres.

Conversion to G25 and/or G25.1, where possible, consists in:

- for all models: pilot nozzle replacement.
- fitting the orifice plate (allowed only for Germany, Netherlands and Hungary; it is prohibited in other countries).

After the conversion, relight the burner and:

- check that the intake pressure to the gas valve corresponds to the level required for the type of gas [see tables in Paragraph 7.2 "GAS Connection Tables"];
- check that the level of CO<sub>2</sub>, at maximum and minimum heat output, is between the values indicated for the type of gas. If the value is different, change it by turning the adjustment screw on the venturi: tighten it to decrease the value, slacken it to raise the value.

Stick the label "Equipment converted for gas G25...." in place of the one stating "Equipment set up for .....".

**NOTE: Always pay close attention to the level of CO<sub>2</sub> in G25.1; for G25.1 minimum and maximum heat output in the ECO105A model will always be lower than when used with G20.**

**NOTE: The conversion kit is supplied on request**

## 7.8. Conversion to gas G2.350

Conversion is allowed only for Poland.

Conversion from one type of gas to another can only be performed by authorised service centres.

Conversion to G2.350 involves:

- for all models: replacement of pilot nozzle.
- only for models ECO65A and ECO80A: mounting a calibrated butterfly valve on the air intake of the venturi [see tables in Paragraph 7.2 "GAS Connection Tables"].

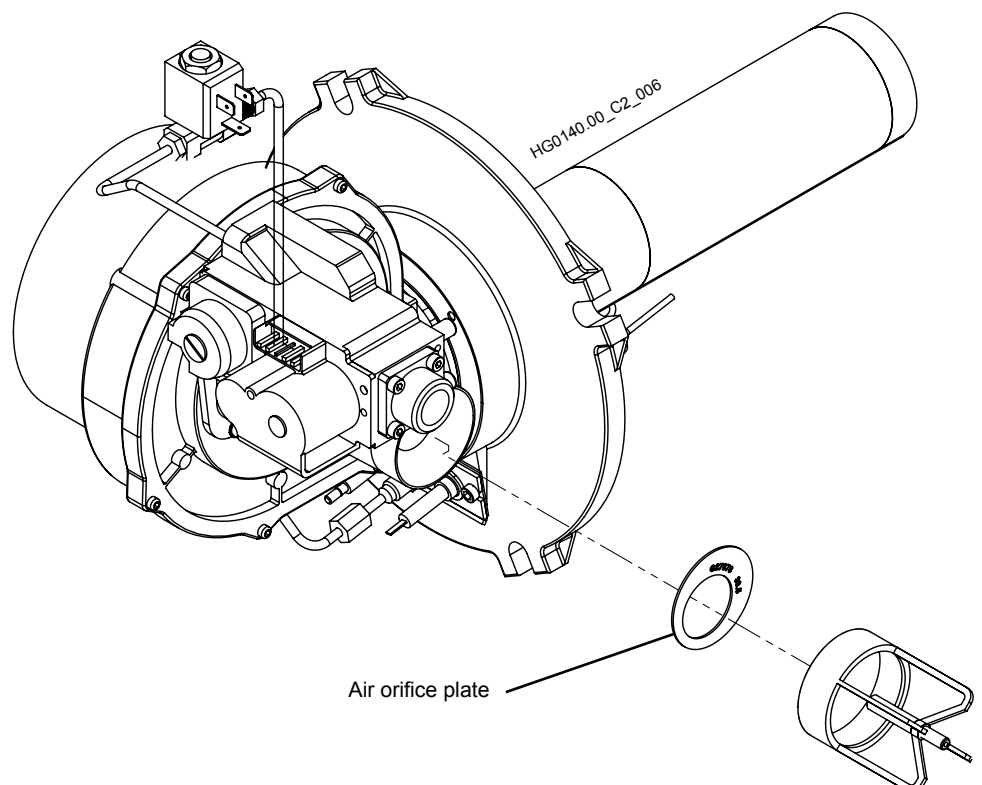
After the conversion, relight the burner and:

- check that the intake pressure to the gas valve corresponds to the level required for the type of gas [see tables in Paragraph 7.2 "GAS Connection Tables"];
- check that the level of CO<sub>2</sub>, at maximum and minimum heat output, is between the values indicated for the type of gas. If the value is different, change it by turning the adjustment screw on the venturi: tighten it to decrease the value, slacken it to raise the value.

Stick the nameplate "Equipment converted for gas G2.350...." in place of the one that says "Equipment set up for .....".

**NOTE: The minimum and maximum heat outputs of models ECO65A, ECO80A will be lower compared to their operation with G20. The models ECO105A are not suitable for operation with gas G2.350.**

**NOTE: The conversion kit is supplied on request**



## 7.9. Replacing the gas valve

If the gas valve must be replaced, it is required to proceed with an inspection and possibly calibrate the CO<sub>2</sub> level through the adjustments on the venturi.

It is advisable to not calibrate the offset: the manufacturer is responsible for calibrating the valve.

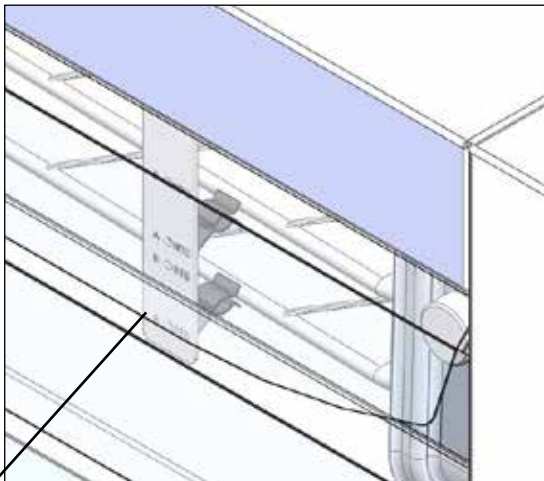
If necessary, carry out the combustion analysis procedure as described in Paragraph 7.5 "Analysis of combustion".

It is recommended to always carry out the flue gas analysis after replacing the gas valve.

## 7.10. Replacing STB and NTC

If STB thermostat or NCT probe need to be replaced, the position showed in table below and on the bracket installed on the heater have to be followed.

MODEL	POSITION
ECO20A	A
ECO34A	B
ECO45A	C
ECO65A	D
ECO80A	E
ECO105A	F



Bracket with the indication of the position (A, B, C, etc.) of STB and NTC

## 7.11. Replacing the modulation PCB

When replacing the PCB, it is required to carry out a few checks and set a few parameters through the LCD command or Smart Control.

Every ECO heater has a list of pre-programmed default values. It is advisable to update the list at every change performed on site in order to be able to reprogram a spare PCB if needed.

### Verify the hardware configuration of the PCB

Modify the address of the PCB with the switches, copying the exact configuration of the PCB that was just replaced.

### Programming the parameters

The parameters that must be programmed are the following:

- d0, d1, and d5 - to identify the type of equipment;
- b1, b2, b3 - regulate the motor revolutions of the flue fan;
- S1 - enables the NTC1 hot air intake probe;
- ST1 is the set point value for NTC1;
- H51, H52 and H53 - to regulate the 0/10 Vdc (if provided);
- S2, ST2 and P2 - to heat the electrical compartment (if provided).

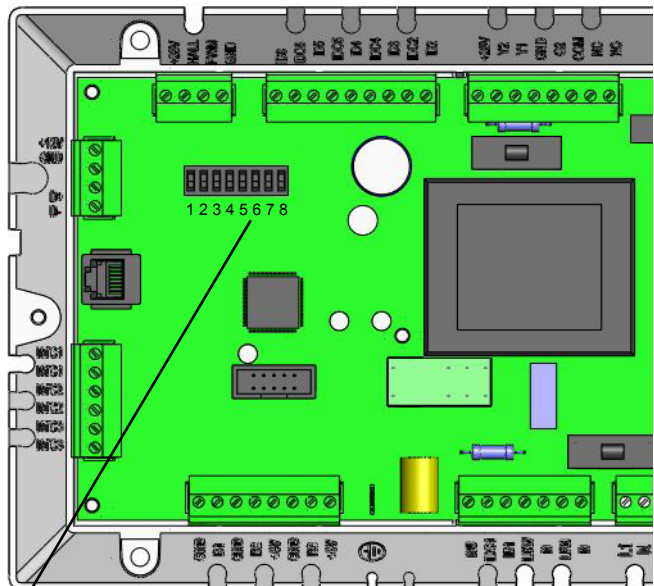
### Programming the parameters - Operating mode

Parameters can be modified from the LCD display on the machine or, alternatively, from the Smart Control.

The Smart Control can be used to access all parameters [see tables on previous pages]; parameters have passwords, which are issued by the Combat Technical Service Dept.

Please refer to the Smart Control manual for instructions for the procedure for access and modification of functional parameters. Please remember that all changes to parameters must be done ONLY with the burner OFF (with display showing rdy or off).

HG0130.00 A 005



Switch for Smart Control



## 8. MAINTENANCE

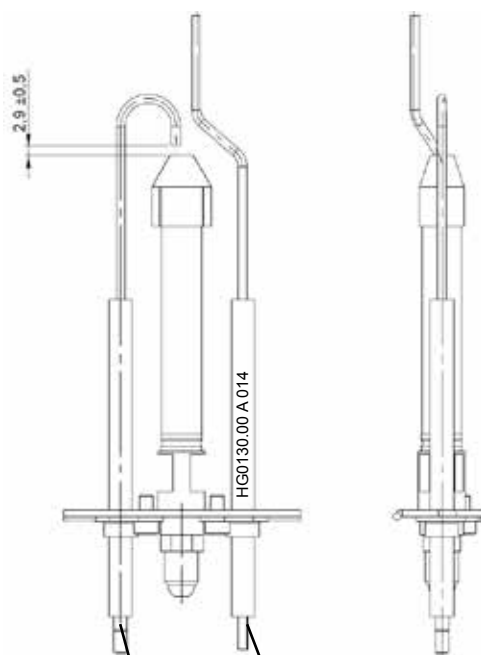
To keep the machine efficient and guarantee a long lifetime of the heater, it is advisable to run some inspections every year, before turning it on for the season:

- 1) check the status of the start-up electrodes, detection electrodes and pilot flame;
- 2) check the status of flue exhaust and air intake ducts and terminals;
- 3) check the status of the venturi;
- 4) check and clean the exchanger and burner;
- 5) check and clean the water trap
- 6) check the intake pressure at the gas valve;
- 7) check the function of the flame monitoring equipment;
- 8) check the safety thermostat(s);
- 9) check the ionization current.

**NOTE: Operations at points 1, 2, 3, 4 and 5 must be performed after disconnecting the heater from the electrical mains and closed the gas supply. Operations at point 6, 7, 8 and 9 must be done with the heater on.**

### 1) Inspection of electrodes

Dismantle the complete pilot flame and use a jet of compressed air to clean the mesh and nozzle. Check the integrity of the ceramic and use sandpaper to remove any oxidation on the metal parts of the electrodes. Check the correct position of the electrodes (see drawing below). It is important that the detection electrode is at a tangent to the head of the pilot and not inside it. The start-up electrode must discharge onto the mesh of the pilot burner.



Verify that the start-up electrode discharges on the external edge of the pilot burner.

Keep the detection electrode at a tangent to the pilot burner.

**2) Inspection of flue exhaust and air intake ducts** Visually inspect where possible or examine with specific tools to check the condition of the ducts.

Remove dust that forms on the air intake terminal.

### 3) Inspection and cleaning the venturi

Remove any dirt at the mouth of the venturi with a brush, and be careful to not let it fall inside the venturi.

### 4) Inspection and cleaning of the exchanger and burner

Perfect combustion in ECO heaters prevents soot forming, which is normally caused by bad combustion. It is advisable, therefore, to not clean the exchanger and burner unless there are exceptional circumstances.

An accumulation of soot inside the exchanger could be revealed by a sizeable variation in the heat output that is caused by improper functioning of the gas valve.

Should it become required to clean the burner and/or exchanger, all of the gaskets mounted between the burner and the exchanger must be replaced.

### 5) Inspection and cleaning of the condense trap

Clean the trap every year, and check the connections. Make sure there are no traces of metallic residue. If metallic residue has formed, increase the number of inspections.

### 6) Inspection of intake gas pressure

Verify that the intake pressure at the valve corresponds to the value required for the type of gas connected.

This verification must be done with the heater on at the maximum heat output.

### 7) Inspection of flame monitoring equipment

With the heater operating, close the gas tap and verify that the machine faults, signaled on the LCD display on the CPU PCB on the machine with code F10. Reopen the gas tap, reset the fault and wait for the heater to start back up.

### 8) Inspection of the safety thermostat(s);

This procedure must be done with the heater on and the burner lit. Open the thermostat series with an insulated tool [230 V], remove the fast-on from the safety thermostat, wait for the F20 block signal to appear on the LCD display on the CPU PCB on the machine. Re-close the thermostat series, then reset the fault.

### 9) Inspection of the ionization current

This procedure can be done directly from the LCD display by entering into the I/O menu. The IOn parameter indicates the value of the ionization current, and the reading is as follows:

- 100, indicates that the value is more than 2 microAmperes, which is plenty for the equipment to function;
- from 0 to 100, indicates a value from 0 to 2 microAmperes; for example, 35 corresponds to 0.7 microAmperes, which is the minimum threshold detectable for the flame monitoring equipment.

The value of the ionisation current must not be below 2 micro-Amperes. Lower values indicate: the detection electrode in a bad position, a rusted electrode or one about to stop functioning.

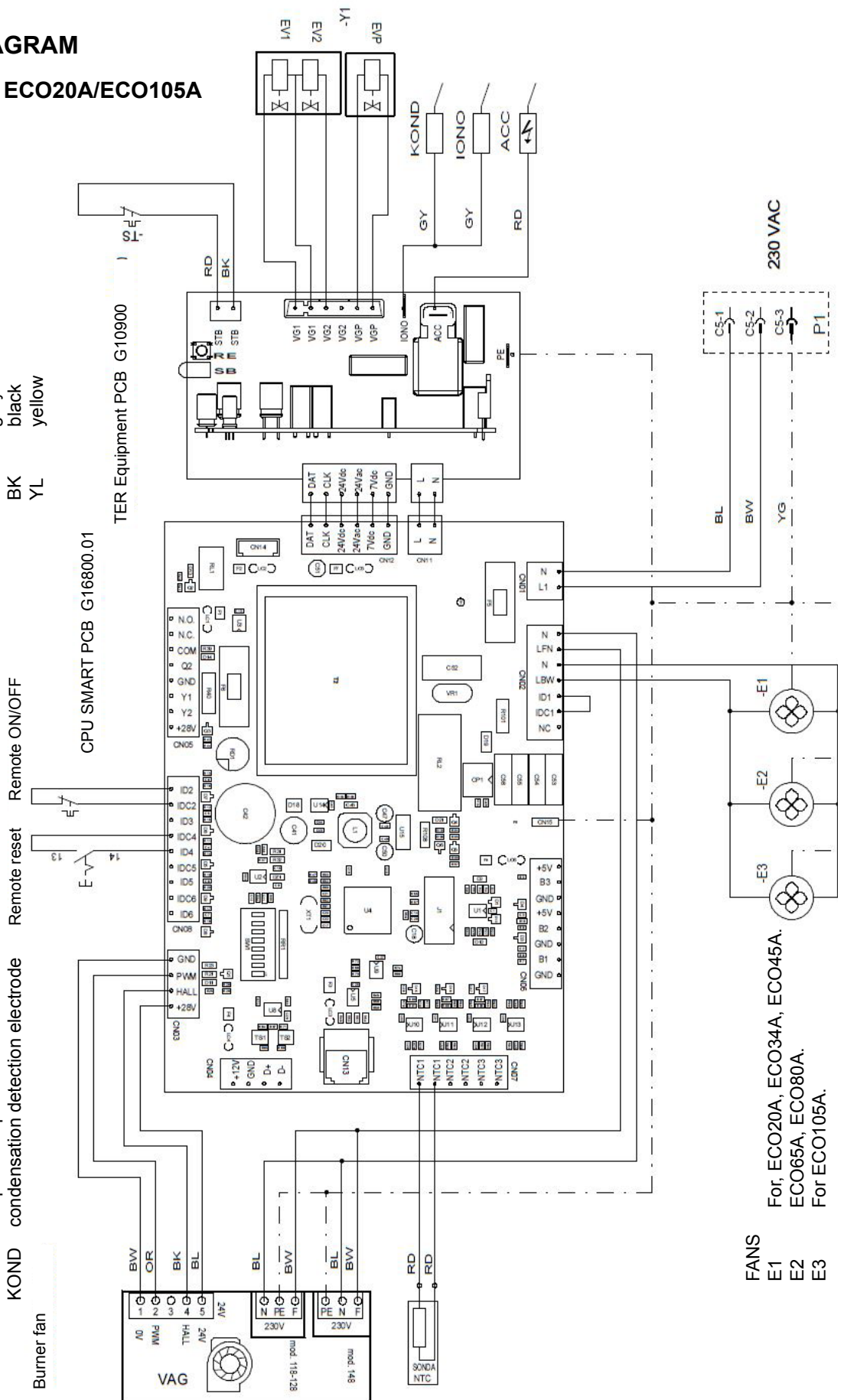
## 9. WIRING DIAGRAM

Wiring diagram **ECO20A/ECO105A**  
(code JG0350.00)

### CABLE COLOUR CODING

WT	white
OR	orange
RD	red
PK	pink
BL	blue
GR	green
YG	yellow-green
BW	brown
GY	grey
BK	black
YL	yellow

KEY	TS	safety thermostat
	EV1	first GAS solenoid valve
	EV2	main GAS solenoid valve
	EVP	pilot GAS valve
	IONO	flame detection electrode
	ACC	start-up electrode
	TER	flame monitoring equipment
	VAG	burner fan
	NTC1	temperature probe
	KOND	condensation detection electrode

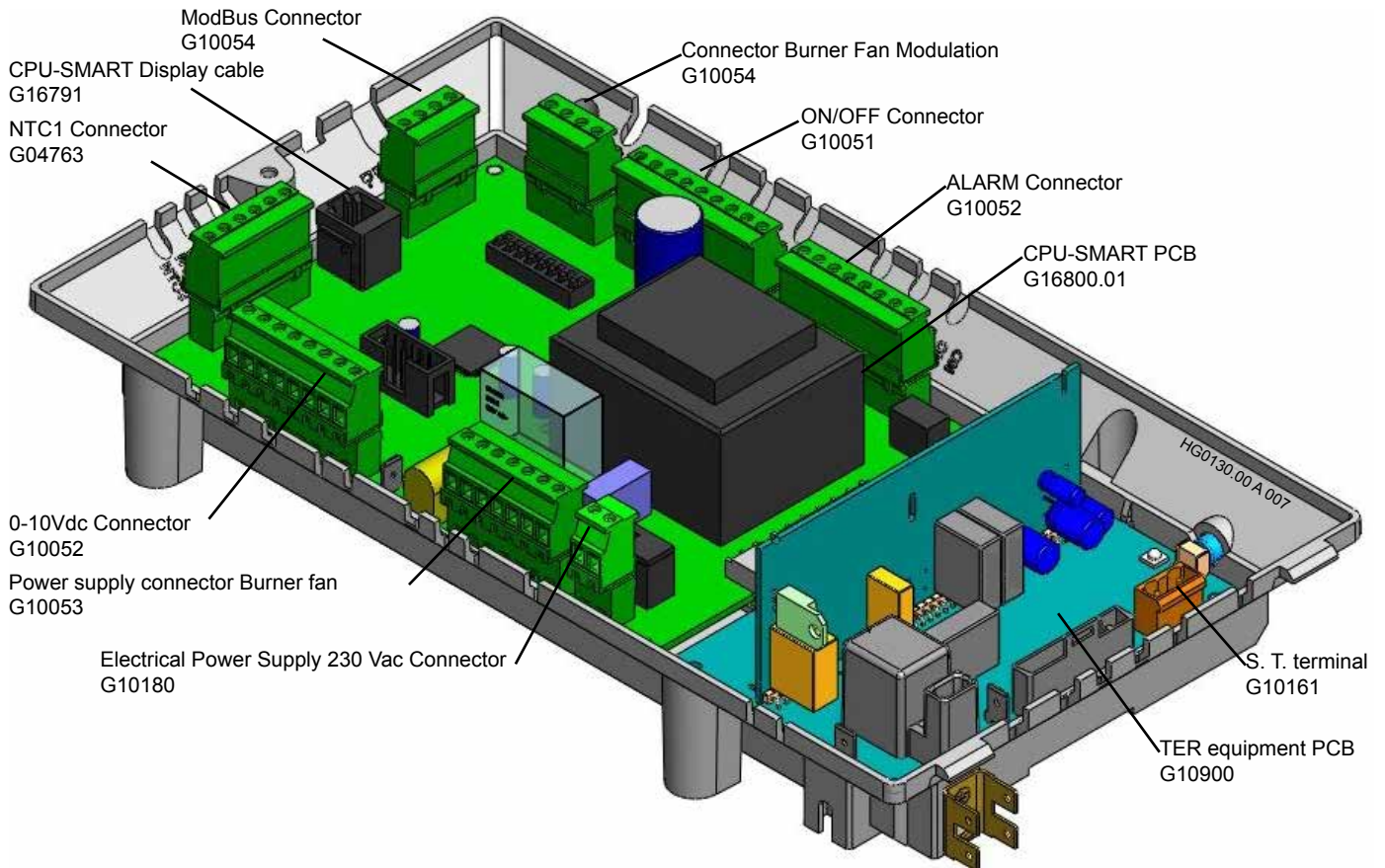
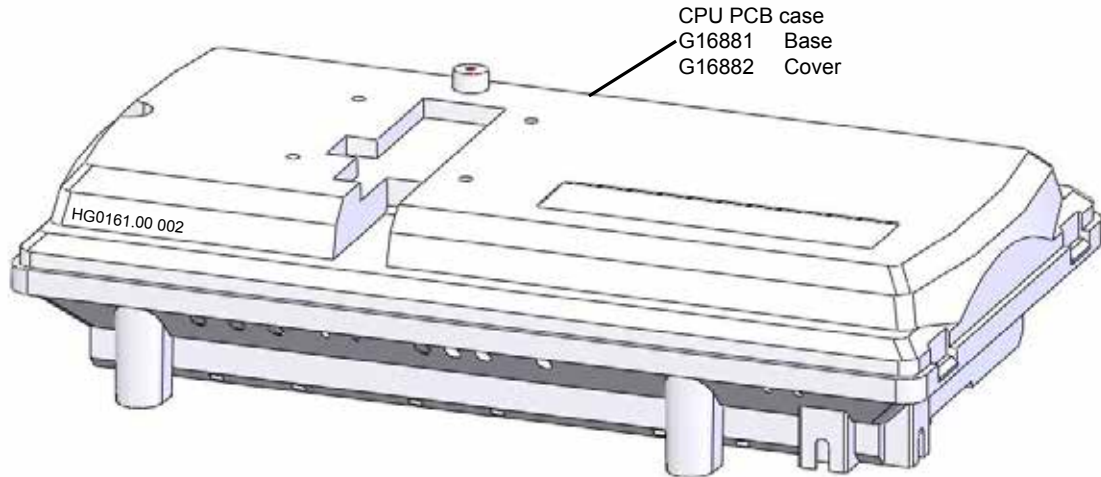


FANS  
E1 For ECO20A, ECO34A, ECO45A.  
E2 ECO65A, ECO80A.  
E3 For ECO105A.

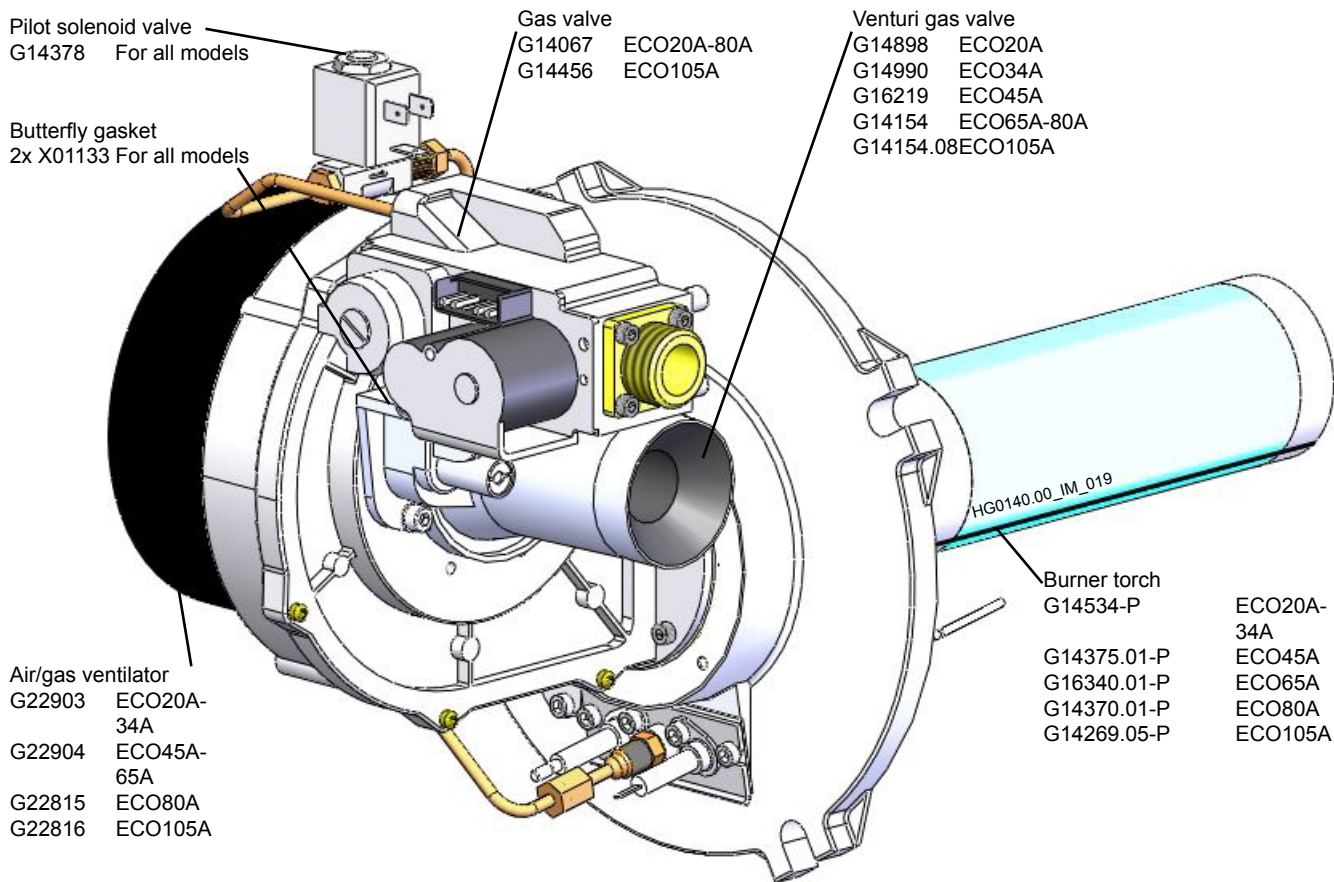


## 10. LIST OF SPARE PARTS

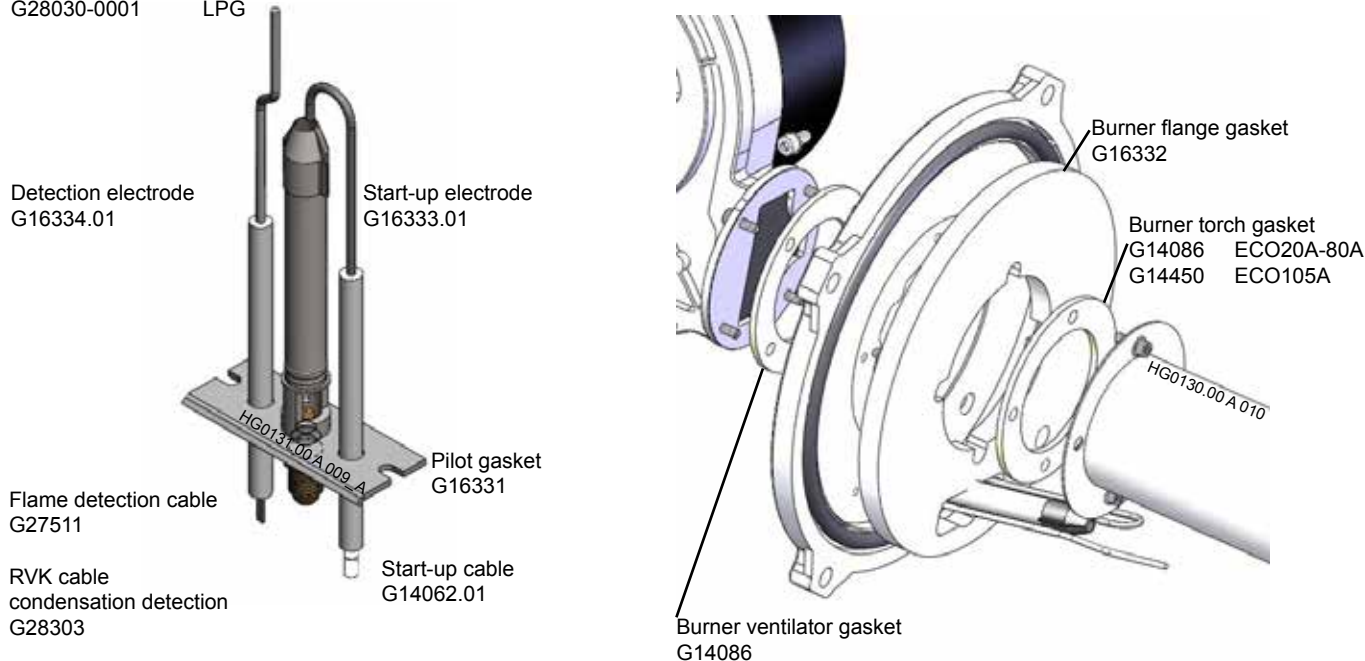
### 10.1. Parts for the electrical panel



## 10.2. Parts for the burner unit

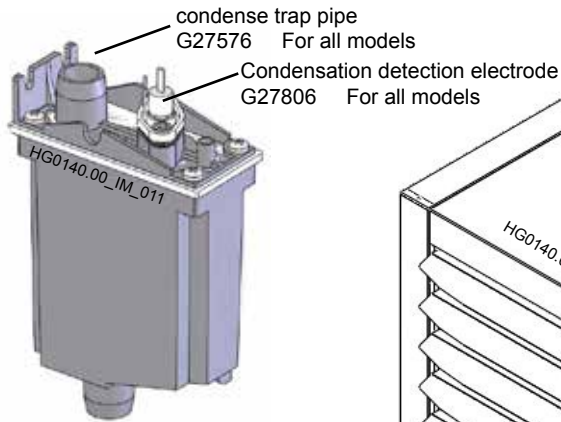


Pilot flame unit  
G28030 for all gas categories.  
G28030-0001 LPG



# WARM AIR HEATER ECO

Condense trap complete with condensation detection electrode G27810 For all models



Tabs			
G27582	no.7	ECO20A	
G27583	no.7	ECO34A	
	no.8	ECO45A	
	no.18	ECO105A	
G27585	no.8	ECO65A	
G27586	no.18	ECO80A	

NTC1 probe  
G16400 For all models

Safety thermostat  
G16300 For all models

