GB	*Maintenance and service manual of* *PCH condensing warm air heater module*

TRANSLATION OF ORIGINAL Manual

VER. 01.2020

Dichiarazione di Conformità
Statement of Compliance

CE

APEN GROUP S.p.A.
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Fax +39.02.95742758
Internet: http://www.apengroup.com

Il presente documento dichiara che la macchina:
With this document we declare that the unit:

Modello: ***Model:***	**Generatore d'aria calda: modulante a condensazione PCH** ***Warm Air Heater: PCH modulating and condensing***

è stata progettata e costruita in conformità con le disposizioni delle Direttive Comunitarie:
has been designed and manufactured in compliance with the prescriptions of the following EC Directives:

- **Regolamento Apparecchi a Gas 2016/426/UE**
  Gas Appliance Regulation 2016/426/UE
- **Direttiva compatibilità elettromagnetica 2014/30/UE**
  Electromagnetic Compatibility Directive 2014/30/UE
- **Direttiva Bassa Tensione 2014/35/UE**
  Low Voltage Directive 2014/35/UE
- **Regolamento ErP 2281/2016/UE**
  ErP Regulation 2281/2016/UE
- **Direttiva ROHS II 2011/65/UE e ROHS III 2015/863/UE**
  ROHS II 2011/65/UE and ROHS III 2015/863/UE Directives

è stata progettata e costruita in conformità con le norme:
has been designed and manufactured in compliance with the standards:

- **EN17082:2019**
- **EN60335-1**
- **EN60335-2-102**
- **EN 60068-2-1**
- **EN 60068-2-2**
- **EN 60068-2-78**
- **EN55014-1**
- **EN55014-2**

Organismo Notificato:
Notified body:
Kiwa Cermet Italia S.p.A
0476
PIN 0476CQ0451
Nr. KIP-17562

La presente dichiarazione di conformità è rilasciata sotto la responsabilità esclusiva del fabbricante
This declaration of conformity is issued under the sole responsibility of the manufacturer

Pessano con Bornago
23/04/2026

Apen Group S.p.A.
Un Amministratore
Mariagiovanna Rigamonti

CODE

SERIAL NUMBER

VER. 07.2022

UK Declaration of Conformity

APEN GROUP S.p.A.
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With this document we declare that the unit:

Model:	***Warm Air Heater: PCH modulating and condensing***

has been designed and manufactured in compliance with the prescriptions of the following Regulations:

- **Regulation 2016/426 on gas appliances as brought into UK law and amended**
- **Electromagnetic Compatibility Regulations 2016**
- **Electrical Equipment (Safety) Regulations 2016**
- **The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012**
- **ErP Regulation 2016/2281/UE**

has been designed and manufactured in compliance with the standards:

- **EN17082:2019**
- **EN60335-1**
- **EN60335-2-102**
- **EN60730-1**
- **EN 60068-2-1**
- **EN 60068-2-2**
- **EN55014-1**
- **EN55014-2**
- **EN61000-3-2**
- **EN61000-3-3**

Notified body:
Kiwa Ltd
0558
PIN 0476CQ0451

This declaration of conformity is issued under the sole responsibility of the manufacturer

Pessano con Bornago
10/03/2026

Apen Group S.p.A.
Un Amministratore
Mariagiovanna Rigamonti

CODE SERIAL NUMBER

TABLE OF CONTENTS

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.
The appliance covered by this manual is a direct-exchange condensing gas-fired warm air heater. This appliance is designed to be installed in air handling units (AHUs or Roof Tops), for space and room heating. The appliance must only be used for the purpose for which it was designed. Any other use is considered dangerous. Incorrect use may impair the operation, service life and safety of the appliance."
During the installation, operation and maintenance of the equipment described in this manual, strictly follow the instructions given in all the chapters of this use and instruction manual.

The warm air heater must be installed and serviced in compliance with current regulations, according to the manufacturer's instructions and by qualified staff, technically specialised in the heating field.

ATTENTION: Due to the physics of the thermal exchange and the intrinsic functioning of the PCH modules, the surface temperatures of the exchanger, as they depend on different factors such as the installation of the module inside the AHU/Roof-top unit and the dimensioning of the air distribution ducts and/or terminals cannot be guaranteed by the controls on board the PCH alone. If the PCH modules are used in combination with flammable or slightly flammable refrigerant gases (A2L), precautions must be taken to ensure that accidental refrigerant leaks do not lead to dangerous situations.

First start-up, conversion between different types of gas and maintenance operations must be carried out only by suitably qualified staff of Technical Service Centres complying with the requisites required by the regulations in force in their country.
Maintenance must be carried out with methods and timescales specified in this manual, and in any case in compliance with the regulations in force in the country where the equipment is installed.

For Italy, the “technical service” tab of Apen Group website www.apengroup.com indicates several Technical Service Centres that the user can contact to have the first start-up, adjustment and maintenance of the product carried out according to law 37/2007 (ex 46/90)
For more information, visit our website www.apengroup.com or contact Apen Group directly.

The warranty conditions are specified on the warranty certificate supplied with this equipment and/or on the sales documents.

1.1. Graphic symbols used in this manual

The following symbols are used in this manual whenever it is necessary to draw the operator’s attention on a safety issue:

	**Notes**.
	**Cautions**.
	**Instructions for the correct assembly**.
	**Safety rules for users or operators of the equipment and for nearby workers**.

2. SAFETY-RELATED WARNINGS

This chapter describes the safety instructions to be followed by machine operators.

2.1. Fuel

Before starting up the heater, make sure that:
- the gas mains supply data are compatible with the data stated on the nameplate;
- the combustion air intake ducts (when fitted) and the flue gas pipes are only 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 gas seal of the feeding system has been tested and approved in compliance with the 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 have been thoroughly cleaned;
- the size of fuel supply pipes is suitable for the power required by the heater;
- the fuel supply pressure is between the range specified on the nameplate.

2.2. Gas Leaks

If you smell gas:
- do not operate electrical switches, the telephone or any other object/device that can cause sparks or naked flames;
- immediately open doors and windows to create an air flow to vent the gas out of the room;
- close the gas valves;
- switch off the power supply via a disconnector outside the unit;
- move away from the unit
- call for **qualified staff.**
- call the **Fire Brigade.**

NOTE: IT is strictly prohibited to supply gas to the circuit with pressures higher than 60 mbar. Such pressures could cause the valve to break

2.3. Personal protective equipment

While using and maintaining the units, personal protective equipment must be used, i.e.:

	**Clothing: The operator that carries out maintenance or uses the system must compulsorily wear clothing compliant with the essential safety requirements in force. Moreover, he/she must wear safety shoes with non-slip sole, in particular in environments with slippery floor.**
	**Gloves: Suitable protective gloves must be used during cleaning and maintenance operations.**

2.4. Safety signals

The unit is provided with the following safety signals, that the staff must necessarily respect:

	**General danger**
	**Dangerous electrical voltage**

2.5. Power supply

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

Cautions

- Check the efficiency 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 nameplate and in this manual.
- Do not mistake the neutral for the live wire.
- The heater can be connected to the mains power supply with a plug-socket only if the latter does not allow live and neutral to be swapped.
- The electrical system and, more specifically, the cable section, must be suitable for the equipment maximum power input, shown on the nameplate and in this manual.
- Do not pull electric cables and keep them away from heat sources.

It is compulsory to install, upstream of the power cable, a fused omnipolar switch with contact opening greater than 3mm. The switch must be visible, accessible and positioned less than 3 metres away from the equipment. All electrical operations (installation and maintenance) must be carried out by qualified staff.

2.6. Use

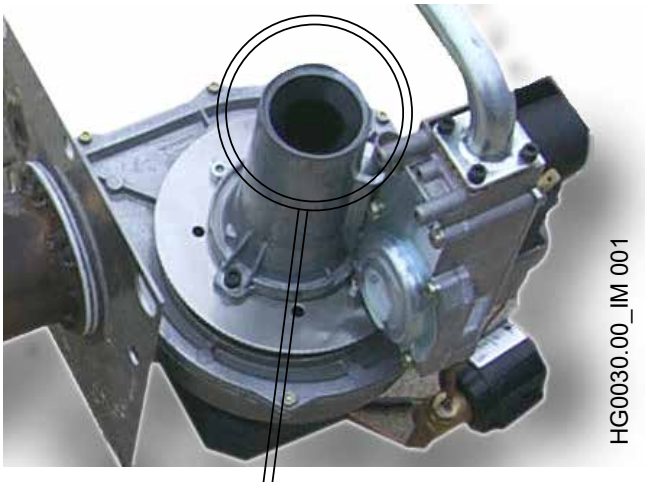
Do not allow children or inexperienced people to use any electrically powered equipment.
The following instructions must be followed:

- 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 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.

2.7. 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 boiler from the mains power supply using the switch located on the electrical system and/or on the shut-out devices.
If the heater is faulty and/or incorrectly operating, switch it off and do not attempt to repair it yourself, but contact our 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 appliance is not used for a long time, the gas valves must be closed and the appliance disconnected from the power mains.
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 disabled.
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.



DO NOT COVER IT WITH YOUR HAND OR OTHER OBJECTS!

2.8. Transport and handling

The heater is delivered fastened to a pallet and covered with a suitably secured cardboard box. The multiple module models are covered with a layer of bubble wrap and have polystyrene reinforcements to protect the corners.
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 informed on the working procedures and safety regulations.
Once the equipment is moved to the correct position, the unpacking operation can be started.

2.9. Unpacking

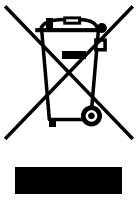
The unpacking operation must be carried out by using suitable tools or safety devices where required. Recovered packaging materials must be separated and disposed of according to applicable regulations in the country of use. While unpacking the unit, check that the unit and all its parts have not been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

Packing material disposal
The packing safeguards the product from transport damages. All the materials used are environmentally friendly and recyclable. Please contact a specialised distributor or your local administration for more information on waste disposal.

2.10. Dismantling and disposal

Should the machine be dismantled or demolished, the person in charge with the operation shall proceed as follows:

Disposal of end-of-life products



This equipment is marked in compliance with European Directive 2012/19/EU on waste electrical and electronic equipment (WEEE). This Directive defines the rules for collecting and recycling waste equipments throughout the entire territory of the European Union.

WEEE contains both pollutants (that can negatively affect the environment) and raw materials (that can be reused). IT is therefore necessary to subject WEEE to appropriate treatments, in order to remove and safely dispose of pollutants and to extract and recycle raw materials. IT is forbidden to dispose of WEEE as unsorted waste. These operations facilitate recovery and recycling of the materials, thus reducing the environmental impact.

All materials recovered will be processed and disposed of according to what provided for by the laws in force in the country of use and/or according to the standards indicated in the safety sheets of the chemicals.

INFORMATION FOR DISPOSAL valid in ITALY (Legislative Decree 49/2014)
The heaters and relating accessories are considered "professional WEEE - waste electrical and electronic equipment". According to the legislation in force in Italy, professional WEEE must be sent to treatment plants suitable for these types of waste. Please contact the Apen Group for end-of-life products so as to obtain all the information necessary for their correct waste disposal, which is possible thanks to the Collective System (Union) to which the company is associated. Please remember that product disposal without complying with the mode described above is a violation liable to administrative and penal sanctions.

INFORMATION FOR DISPOSAL valid abroad (EU COUNTRIES except Italy).
The European Directive 2012/19/EC shall be implemented in every EU member state. There may be different application modalities for the various member states, even in terms of modality for waste disposal depending on its type (House-hold or Professional WEEE). To this regard at the end of the life of the product, we highly recommend you call the distributor or installer so as to obtain information on the correct disposal, in compliance with the existing laws of the installation country.

2.11. Installation

The PCH heat exchanger must be used in the following conditions:

- The fuel used must have a sulphur content according to the European standard, namely: maximum peak, for short periods, 150 mg/m^3, annual average lower than 30 mg/m^3;
- Combustion air must not contain chlorine, ammonia, alkalis, sulphides or sulphur derivatives; for example, installation near swimming pools or laundries exposes the unit to the effects of such agents; if this is the case it is necessary to take air from the outside.

3. TECHNICAL DATA

There are 3 configurations of PCH, listed below:
- A Single module (A System);
- B Horizontally combined modules (B System);
- C Vertically combined modules (C System).

A - PCH single modules (A System)
They consist of a single heat exchanger; the range includes six models, i.e.: PCH020, 034, 045, 065, 080 and 105. The heat output ranges from 5 to 97.2 kW produced.
The modules can be installed both horizontally and vertically, according to the air flow direction.

Model		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105	
Type of equipment		B23P - C13 - C33 - C53 - C63											
EC approval	PIN.	0476CQ0451											
NOx Class	Val	5											
Type of fuel		Gaseous											
		Heater Performance											
		min	max	min	max	min	max	min	max	min	max	min	max
Burner heat output (Hi) (1)	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 [P_{min}, P_{rated}]*	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
Hi Efficiency (N.C.V.) [η_{pl}, η_{nom}]*	%	104.6	95.7	106.9	96.3	105.5	96.3	108.1	96.8	108.3	97.6	108.4	97.1
Hs efficiency (G.C.V.) [η_{pl}, η_{nom}]*	%	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	
Max. condensation (2)	l/h	0.4		0.9		1.1		2.1		3.3		2.7	
		Flue gas emissions											
Carbon monoxide - CO - (0% of O_2) (3)	ppm	< 5		< 5		< 5		< 5		< 5		< 5	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hi) (4)		29 mg/kWh - 16 ppm		51 mg/kWh - 29 ppm		36 mg/kWh - 20 ppm		45 mg/kWh - 25 ppm		31 mg/kWh - 18 ppm		40 mg/kWh - 23 ppm	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hs) (5)		26 mg/kWh - 15 ppm		46 mg/kWh - 26 ppm		32 mg/kWh - 18 ppm		41 mg/kWh - 23 ppm		28 mg/kWh - 16 ppm		36 mg/kWh - 20 ppm	
Pressure available at the flue	Pa	80		90		100		120		120		120	
		Flue gas temperature, CO_2 content and maximum flue gas flow rate: see gas tables on page 32 and on the following pages											
		Electrical Characteristics											
Supply voltage	V	230 Vac - 50 Hz single-phase											
Rated power [el_{min} - el_{max}]*	kW	0.011	0.045	0.011	0.074	0.014	0.060	0.015	0.097	0.020	0.123	0.020	0.130
Protection Rating	IP	IP X5D											
Operating Temperatures	°C	from -15°C to +40°C - for lower temperatures, a burner housing heating kit is required (7)											
		Connections											
Ø gas connection		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"		UNI/ISO 228/1-G 3/4"	
Intake/exhaust pipes Ø	mm	80/80		80/80		80/80		80/80		80/80		80/80	
		Air flow rate											
Air flow rate (15°C)(6)	m^3/h	2700		4300		4500		7800		9000		11100	
		Weight											
Net Weight	kg	48		56		63		75		99		109	

NOTES:
* Symbol of conformity with Reg.EU/2281/2016.
(1) With natural gas mixture with 20% hydrogen rated heat input decreased by 5%.
(2) Max. condensation produced acquired from testing at 30%Qn.
(3) Value referred to cat. H (G20).
(4) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to net calorific value (Hi, N.C.V).
(5) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to gross calorific value (Hs, G.C.V).
(6) Reference air flow rate for the calculation of yields and season energy efficiencies and emissions listed in the table
(7) If the burner housing heater kit is installed, add 105 W (230V) per module to the rated power value on the nameplate.

B - PCH Horizontally combined modules (B System)
They consist of two or more heat exchangers; the number of burners, gas equipment and flues is equal to the number of heat exchangers.
The electrical connection is the same for all modules.
The range includes two module models, PCH130, 160 and 210, the three module model, PCH320, and four module model PCH420.

The heat output ranges from 13.4 to 388.6 kW produced.
Module operation is cascaded by means of 0/10 Vdc signal and/or ON/OFF signal taken to the single module.
The modules can be installed both horizontally and vertically, according to the air flow direction.

Model		PCH130		PCH160		PCH210		PCH320		PCH420	
Type of equipment		B23P - C13 - C33 - C53 - C63									
EC approval	PIN.	0476CQ0451									
NOx Class	Val	5									
Type of fuel		Gaseous									
		Heater Performance									
		min	max	min	max	min	max	min	max	min	max
Burner heat output (Hi) (1)	kW	12.40	130.00	16.40	164.00	21.00	200.00	21.00	300.00	21.00	400.00
Useful heat output [P_{min}, P_{rated}]*	kW	13.40	125.86	17.77	160.06	22.77	194.30	22.77	291.45	22.77	388.60
Hi Efficiency (N.C.V.) [η_{pl}, η_{nom}]*	%	108.1	96.8	108.3	97.6	108.4	97.1	108.4	97.1	108.4	97.1
Hs efficiency (G.C.V.) [η_{pl}, η_{nom}]*	%	97.36	87.22	97.62	87.93	97.68	87.52	97.68	87.52	97.68	87.52
Flue losses with burner on (Hi)	%	0.2	3.2	0.3	2.4	0.2	2.8	0.2	2.8	0.2	2.8
Flue losses with burner off (Hi)	%	<0,1		<0,1		<0,1		<0,1		<0,1	
Max. condensation (2)	l/h	4.2		6.6		5.4		8.1		10.8	
		Flue gas emissions									
Carbon monoxide - CO - (0% of O_2) (3)	ppm	< 5		< 5		< 5		< 5		< 5	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hi) (4)		45 mg/kWh - 25 ppm		31 mg/kWh - 18 ppm		40 mg/kWh - 23 ppm		40 mg/kWh - 23 ppm		40 mg/kWh - 23 ppm	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hs) (5)		41 mg/kWh - 23 ppm		28 mg/kWh - 16 ppm		36 mg/kWh - 20 ppm		36 mg/kWh - 20 ppm		36 mg/kWh - 20 ppm	
Pressure available at the flue	Pa	120		120		120		120		120	
		Flue gas temperature, CO_2 content and maximum flue gas flow rate: see gas tables on page 32 and on the following pages									
		Electrical Characteristics									
Supply voltage	V	230 Vac - 50 Hz single-phase									
Rated power [el_{min} - el_{max}]*	kW	0.015	0.194	0.020	0.246	0.020	0.260	0.020	0.390	0.020	0.520
Protection Rating	IP	IP X5D									
Operating Temperatures	°C	from -15°C to +40°C - for lower temperatures, a burner housing heating kit is required (7)									
		Connections									
Ø gas connection		UNI/ISO 228/1-G 1½"		UNI/ISO 228/1-G 1½"		UNI/ISO 228/1-G 1½"		UNI/ISO 228/1-1 x G 1½" e 1 x G 3/4"		UNI/ISO 228/1-2 x G 1½"	
Intake/exhaust pipes Ø	mm	2 x 80/80		2 x 80/80		2 x 80/80		3 x 80/80		4 x 80/80	
		Air flow rate									
Air flow rate (15°C)(6)	m³/h	15600		18000		22200		33300		44400	
		Weight									
Net Weight	kg	177		230		255		381		515	

NOTES:
* Symbol of conformity with Reg.EU/2281/2016.
(1) With natural gas mixture with 20% hydrogen rated heat input decreased by 5%.
(2) Max. condensation produced acquired from testing at 30%Qn.
(3) Value referred to cat. H (G20).
(4) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to net calorific value (Hi, N.C.V).
(5) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to gross calorific value (Hs, G.C.V).
(6) Reference air flow rate for the calculation of yields and season energy efficiencies and emissions listed in the table
(7) If the burner housing heater kit is installed, add 105 W (230V) per module to the rated power value on the nameplate.

C- PCH Vertically combined modules (C System)
They consist of two heat exchangers; the number of burners, gas equipment and flues is equal to the number of heat exchangers. The gas and electrical connection is the same for all modules. These modules have a reduced width and low pressure drops when air goes through.
The range includes two module models, PCH132, 162 and 212.

The heat output ranges from 13.4 to 194.4 kW produced. Module operation is cascaded by means of 0/10 Vdc signal and/or ON/OFF signal taken to the single module.
The modules can be installed with horizontal air flow direction only. Heaters with vertical air flow cannot be installed.

Model		PCH132		PCH162		PCH212	
Type of equipment		B23P - C13 - C33 - C53 - C63					
EC approval	PIN.	0476CQ0451					
NOx Class	Val	5					
Type of fuel		Gaseous					
		Heater Performance					
		min	max	min	max	min	max
Burner heat output (Hi) (1)	kW	12.40	130.00	16.40	164.00	21.00	200.00
Useful heat output [P_{min}, P_{rated}]*	kW	13.40	125.86	17.77	160.06	22.77	194.30
Hi Efficiency (N.C.V.) [η_{pl}, η_{nom}]*	%	108.1	96.8	108.3	97.6	108.4	97.1
Hs efficiency (G.C.V.) [η_{pl}, η_{nom}]*	%	97.36	87.22	97.62	87.93	97.68	87.52
Flue losses with burner on (Hi)	%	0.2	3.2	0.3	2.4	0.2	2.8
Flue losses with burner off (Hi)	%	<0,1		<0,1		<0,1	
Max. condensation (2)	l/h	4.2		6.6		5.4	
		Flue gas emissions					
Carbon monoxide - CO - (0% of O_2) (3)	ppm	< 5		< 5		< 5	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hi) (4)		45 mg/kWh - 25 ppm		31 mg/kWh - 18 ppm		40 mg/kWh - 23 ppm	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hs) (5)		41 mg/kWh - 23 ppm		28 mg/kWh - 16 ppm		36 mg/kWh - 20 ppm	
Pressure available at the flue	Pa	120		120		120	
		Flue gas temperature, CO_2 content and maximum flue gas flow rate: see gas tables on page 32 and on the following pages					
		Electrical Characteristics					
Supply voltage	V	230 Vac - 50 Hz single-phase					
Rated power [el_{min} - el_{max}]*	kW	0.015	0.194	0.020	0.246	0.020	0.260
Protection Rating	IP	IP X5D					
Operating Temperatures	°C	from -15°C to +40°C - for lower temperatures, a burner housing heating kit is required (7)					
		Connections					
Ø gas connection		UNI/ISO 228/1-G 1½"		UNI/ISO 228/1-G 1½"		UNI/ISO 228/1-G 1½"	
Intake/exhaust pipes Ø	mm	2 x 80/80		2 x 80/80		2 x 80/80	
		Air flow rate					
Air flow rate (15°C)(6)	m^3/h	15600		18000		22200	
		Weight					
Net Weight	kg	152		199		218	

NOTES:
* Symbol of conformity with Reg.EU/2281/2016.
(1) With natural gas mixture with 20% hydrogen rated heat input decreased by 5%.
(2) Max. condensation produced acquired from testing at 30%Qn.
(3) Value referred to cat. H (G20).
(4) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to net calorific value (Hi, N.C.V).
(5) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to gross calorific value (Hs, G.C.V).
(6) Reference air flow rate for the calculation of yields and season energy efficiencies and emissions listed in the table
(7) If the burner housing heater kit is installed, add 105 W (230V) per module to the rated power value on the nameplate.

3.1. Regulation (EU) 2016/2281

Product Information in accordance with Annex 2 point 5 a)

Model:	See table
Warm air heaters B1 [yes/no]:	No
Warm air heaters C2 [yes/no]:	No
Warm air heaters C2 [yes/no]:	No
Type of fuel [gaseous/liquid/electricity]:	Gaseous

Model	Capacity		Useful efficiency		Other elements					Power consumption		
	Rated heating capacity	Minimum capacity	Useful efficiency at rated heating capacity	Useful efficiency at minimum capacity	Casing loss factor	Ignition burner consumption	Emissions of nitrogen oxides	Output efficiency	Seasonal space heating energy efficiency	At rated heating capacity	At minimum capacity	In stand-by mode
	$P_{rated,h}$	P_{min}	η_{nom}	η_{pl}	F_{env}	P_{ign}	NO_x	$\eta_{s,flow}$	$\eta_{s,h}$	el_{max}	el_{min}	el_{sb}
	kW	kW	%	%	%	kW	mg/kWh ref. GCV	%	%	kW	kW	kW
PCH020	18.2	5.0	86.1	94.2	0.0	0.0	26	97.5	90.4	0.045	0.011	0.005
PCH034	33.6	8.1	86.6	96.3	0.0	0.0	46	97.3	92.1	0.074	0.011	0.005
PCH045	40.4	9.0	86.7	95.0	0.0	0.0	32	97.0	90.8	0.060	0.014	0.005
PCH065	62.9	13.4	87.1	97.3	0.0	0.0	41	97.4	93.1	0.097	0.015	0.005
PCH080	80.0	17.8	87.8	97.5	0.0	0.0	28	97.1	93.2	0.123	0.02	0.005
PCH105	97.2	22.8	87.4	97.6	0.0	0.0	36	97.0	93.1	0.130	0.02	0.005
PCH130 PCH132	125.9	13.4	87.1	97.3	0.0	0.0	41	98.1	93.9	0.194	0.015	0.01
PCH160 PCH162	160.1	17.8	87.8	97.5	0.0	0.0	28	97.9	94.0	0.246	0.02	0.01
PCH210 PCH212	194.3	22.8	87.4	97.6	0.0	0.0	36	97.9	94.0	0.260	0.02	0.01
PCH320	291.5	22.8	87.4	97.6	0.0	0.0	36	98.1	94.2	0.390	0.02	0.015
PCH420	388.6	22.8	87.4	97.6	0.0	0.0	36	98.3	94.4	0.520	0.02	0.02

4. OPERATING CYCLE

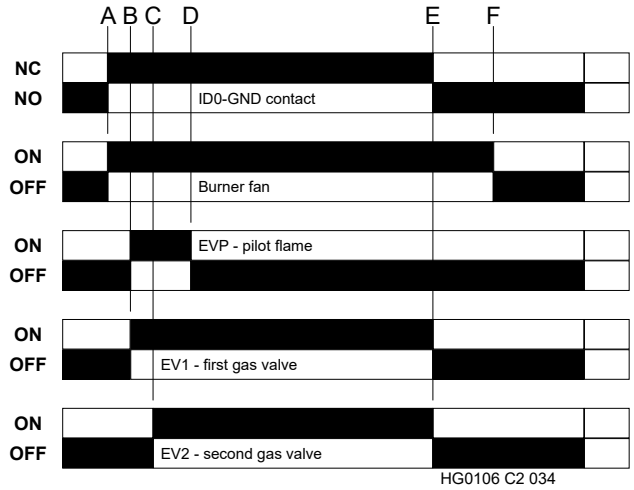
Burner operation

On heat request, from the 0/10 Vdc signal to the terminals B1/GND of the CN06 terminal board, the modulation PCB starts the operating cycle. This will enable flame monitoring equipment (TER) [A] activation.

Other prerequisites to start the cycle are: terminals ID0/GND of terminal board CN08 closed and terminals ID4/ID5/IDC of terminal board CN02 with jumpers.

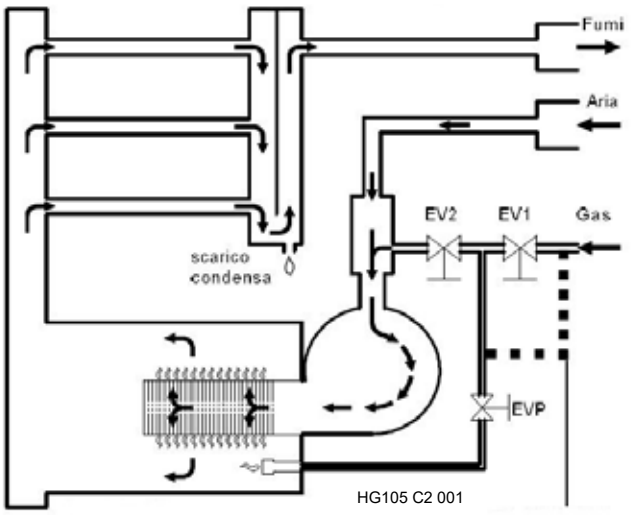
The terminals indicated above refer to the single CPU PCB. On the interface terminal board M1 the correspondences are: 1=D+, 2=D-, 3=GND, 4=B1, 5=Q1-C; 6=Q1-NO, 7=GND, 8=ID0.

The equipment will immediately start the burner [A] fan pre-washing the combustion chamber for a set time. After the pre-wash, the ignition phase will begin: the equipment opens the solenoid valve EV1 and in parallel the solenoid valve EVP that supplies the pilot burner [B].



After detecting the pilot flame, the equipment opens the main gas valve EV2 [C] supplying the main burner.

After the operation overlapping time of the two burners (pilot and main) has elapsed, the modulation PCB cuts off the solenoid valve EVP supply and turns the pilot burner [D] off.



Flame detection is carried out by a single electrode for both the pilot burner and the main burner.

The ignition program turns the burner on at an intermediate heat output, which corresponds to approx. 30% of the maximum output. Once the flame is stabilised at the ignition power for a few seconds, the burner starts modulating its output reaching the required value in a variable time set in the modulation PCB program.

During the operation, the modulation PCB will adjust the heat output of the burner proportionally to the voltage value (0-10 Vdc) present at the terminals. In case of multiple modules the output modulation, 0/10 Vdc signal, could turn off one or more modules in cascading operation.

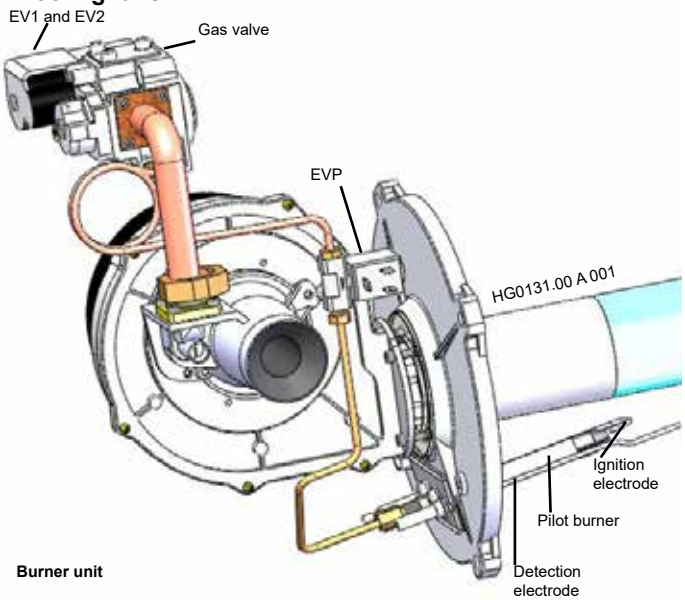
The voltage value will have to be sent via an external regulator not supplied as standard.

Burner switch-off

Once the heat request is over, voltage signal lower than set limit (0.5 Vdc, Parameter V4_OFF(R42)), the modulation PCB will turn the burner [E] off; the fan will continue to ventilate the combustion chamber, after the wash, for a set time [F]. The opening of the ID0/GND contact (indicated in the terminal board M1 at contacts 7 and 8) always causes the stop of the burner without generating any fault.

The opening of ID4/IDC or ID5/IDC contacts also causes the burner to switch off, but with fault signal (E24 and E25, respectively). These contacts are supplied with jumpers.

Cooling fans



Burner unit

Management from CPU

For the devices that require the control of the cooling fans, their activation is managed with a timer via the CPU modulation PCB. The default time is 5 seconds and can be edited, through the LCD display of the CPU PCB on the machine (parameter P32), up to a maximum of 45 seconds.

When the heat request is over, low 0-10 Vdc signal or contact opening, the modulation PCB will turn the burner off, while the cooling fans, if managed, will continue operating for a set time (parameter P33), editable through the LCD display of the CPU PCB on the machine, enough to cool the exchanger down.

Management from AHU / ROOF-TOP control unit

In the devices where the cooling fan management is carried out by means of AHU or ROOF-TOP control unit, it is necessary to comply with the time setting indicated below.

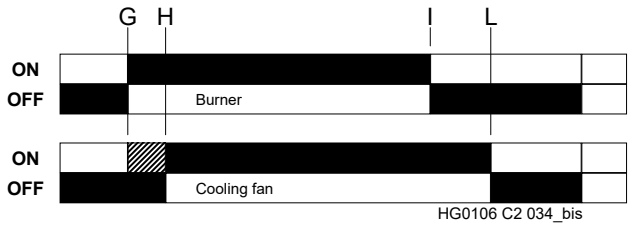
Start-up
The fan can be started together with burner [G] or it can be delayed for maximum 45 seconds [H], to prevent cold air from entering the room. If a fan electrical protection control and/or a fan air flow control exist, these must be connected in series to the burner ON enabling and to ID0/GND contacts of terminal board CN08 (indicated in the terminal board M1 at contacts 7 and 8).

Switching off
At the end of the heat request the cooling ventilation must be kept for a time above 5 minutes [L]; this is to allow the correct cooling of the heat exchanger. Failure to perform the post-cooling operations on the exchanger will cause:
- a shorter lifetime of the exchanger and the guarantee will be null and void;
- the safety thermostat to trigger and the relevant 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 and start a new cycle.

Powering off the unit 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.

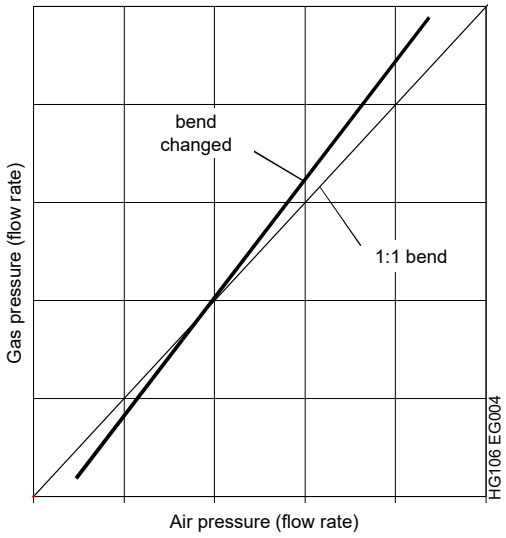
Safety thermostats
A safety thermostat with automatic reset and positive safety setting is installed on the heater module; the breakage of the sensitive element corresponds to a safety intervention.
The triggering of the thermostat, through the flame monitoring equipment, causes the burner stop and the flame equipment lockout.



The lockout of the unit, caused by the safety thermostat triggering, is indicated on the LCD display of the CPU PCB on board the machine with E20/E22.
The lockout E20 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 (R12), which adjusts the burner heat output when the set point is reached, regardless of the 0/10 Vdc input signal. The probe monitors the heat output/cooling air flow ratio.
It is not advisable to change the ST1 value (R12) without consulting the APEN GROUP Service Centre.

4.1. Air/gas premixing operation

The PCH heater is equipped with a burner with complete air/gas premixing. Air is mixed with gas inside the motor-fan impeller. The air suctioned by the impeller will run though the calibrated Venturi pipe creating a vacuum. The vacuum in the Venturi is balanced by the gas valve, which is of the pneumatic control type. The air pressure - gas pressure ratio of the valve is 1:1. This ratio is corrected by acting on offset adjustment screw (placed on the gas valve). The heater is supplied with offset already adjusted and screw sealed.
A second adjustment is provided by the screw placed on the Venturi, which regulates the maximum gas flow rate value and determines the carbon dioxide level (CO_2) in the flue gas. This is also a default setting. The screw is not sealed to allow the conversion to another gas type. To adjust the offset and the CO_2 see the chapter dedicated to the service.
The modulation PCB, fitted on the heater, manages the motor rotation speed (in cc) according to the heat output requested by the environment. By changing the rotation speed of the motor, the air flow rate varies and so does the gas flow rate; the minimum and maximum rotation values of the fan are programmed on the PCB and cannot be edited by the user and/or installer.



5. USER'S INSTRUCTIONS

Please carefully read the safety warnings described in the previous pages. The operations that the user can carry out are limited to the use of the controls on the LCD display interface of the CPU PCB on the machine.

5.1. Operation of the heater

The PCH module is fitted inside a machine, roof-top unit or AHU, and its management is demanded to the control on the machine. Follow what stated in the manual of the machine containing PCH to switch on, adjust and switch off the PCH module.
The instructions that follow are intended for the PCH module operator.
Provided with an electronic equipment with self-check function, capable of safely handling all burner control and command operations, and with a microprocessor PCB with LCD display interface (a microprocessor, too) for controlling the adjustment of heat output, the operation of the PCH module is fully automatic. The ignition request is carried out by adjusting the machine in which the PCH module is fitted.

5.2. Interface panel

The PCH heater is fitted as standard with a multifunction LCD panel located inside the burner housing, and is used to control, configure and diagnose all operating parameters of the equipment.
The instrument 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 also allows the service centre to change the main operating parameters.
Changing parameters is protected by a password.

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

rdy	OFF FROM SUPERVISOR Unit off and waiting for ON command from the supervisor (Smart X) or the temperature control system via modbus
Sty	REMOTE OFF Unit switched off by ID0/GND remote digital input (ON/OFF terminals on terminal block M1)
rOF	Temperature control OFF condition (e.g. NTC or 0-10V signal)
OFF	OFF FROM LCD PANEL Unit turned off from LCD control on board of the machine
Exx	OFF FROM ALARM Unit turned off from Exx alarm. (e.g. "E10") **Any heat demands will be ignored**
HEA	UNIT RUNNING (Heating)
Air	UNIT RUNNING (Ventilation)
COO *	UNIT RUNNING (Conditioning)
SAn *	UNIT RUNNING (Domestic)
Air	**"CTRL_07" control (parameter C71=1) under the PAr menu has been enabled by mistake; change C71=0**
Axx	**Unit address;** The display will show, alternating it with the operation in progress, the address assigned to the module. (e.g. "A01")

(**only in the presence of Smart)*

During normal operation, the display will show "HEA" if the burner is on; "rdy" or "Sty" when the boiler is being switched off; "rOF" if the temperature has been met.

If there are communication problems between CPU PCB and LCD panel, the display will show flashing:
"**CPU**" if the problem lies with the CPU;
"**...**" if the problem lies in the display board.
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. "**EPr**" will be displayed if the problem is caused by the EEPROM PCB, check that it is properly inserted inside the connector.

Navigating the menu
The menu has three levels. The first and the second are accessible without entering a password, the third requires entering writing-level passwords to change the parameters.
Also with modbus address other than Ø, all parameters can be viewed and/or edited through the LCD panel.
Use the ↑ (up arrow) and ↓ (down arrow) buttons to scroll through the menus. To select the menu, or select the parameter, press ENTER. The parameter can be changed using the arrows: 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. A change in the parameter is indicate by the display flashing.
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. 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 information is available on the first level:

Machine status	Provides information on unit operation (rdy/Sty/rOF/OFF/HEA/Air/COO/SAn)
Axx	Shows the address assigned to the CPU PCB of the unit (1 to 15); it is displayed alternating with "Machine Status" (e.g., "A01" = address1)
Exx	In case of an alarm in progress, shows the error code (e.g. "E10")

Second level menu
The following menus are available on the second level:

Fun	Allows to choose the type of operation: Aut or OFF
rEg	Allows to force the burner at minimum or maximum output in order to perform combustion tests;
dEG	Allows to activate the system deaeration cycle; (not used)
inP	Allows to display the status of inputs
Out	Allows to display the status of outputs
PAr	Allows to display and edit (after entering the password) parameters of adjustments, functions and controls

Operation - Fun Menu
Allows to select the type of operation of the CPU PCB, between AUT (automatic) and OFF (off).

OFF	Has priority also over external controls (0-10V type)
Aut	Corresponds to ON, the system sets itself up to receive inputs from the remote control (Smart X), adjustments, or external controls

Adjustment - rEg Menu
Allows forcing the burner to operate at maximum (Hi) or minimum (Lo) power, in order to check combustion or for the “chimney sweep” function (the ID0\GND contact must be closed and the burner must be on). The burner returns to the initial state automatically at the end of the set time (about 10 minutes)

Hi	Burner set to maximum output
Lo	Burner set to minimum output

Input - InP Menu
Allows to display the value and/or status of analogue and digital inputs. For the meaning and the default values, please refer to the table CPU PCB Parameters of Paragraph 5.5 "Modulation PCB Parameters".

nt1	**“Value” for NTC1 probe temperature (modulation)**
nt2	“Value” for NTC2 probe temperature (not used)
nt3	“Value” for NTC1 probe temperature (not used)
An0	**“Value” for Number of flue gas fan revolutions (Premix)**
An1	**“Value" for Analogue input voltage B1 (0-10V) - Power Modulation**
An2	“Value" for Analogue input voltage B2 (0-10V) (not used)
An3	"Value" for Analogue input B3 (not used)
id0	**Open/closed status of "OPn/CLS" Id0 digital input (ON/OFF remote)**
id1	Open/closed status of "OPn/CLS" Id1 digital input
id2	Open/closed status of "OPn/CLS" Id2 digital input
id3	Open/closed status of "OPn/CLS" Id3 digital input
id4	Open/closed status of "OPn/CLS" 230 Vac Id4 input (1=contact closed; 0=alarm E24 in progress)
id5	Open/closed status of "OPn/CLS" 230 Vac Id5 input (1=contact closed; 0=alarm E25 in progress)

Output - Out Menu
Allows to display the value and/or status of analogue and digital outputs. For the meaning and the default values, please refer to the table CPU PCB Parameters of Paragraph 5.5 "Modulation PCB Parameters".

y0	"Value" of PWM (%) for flue gas fan (premix)
y1	"Value" for Y1 output (PWM %)
y2	“Value” for Y2 output (0-10 Vdc)
y3	“Value” for Y3 output (0-10 Vdc)
ion	"Value" (%) of flame detection signal (100: value >2mA)
U1	Open/closed status of "OPn/CLS" Q1 output (Lockout signal)
U2	Open/closed status of "OPn/CLS" Q2 output
U3	Open/closed status of "OPn/CLS" Q3 output
rL1	Open/closed status of "OPn/CLS" RL1 relay (0= OFF; 1 ON)

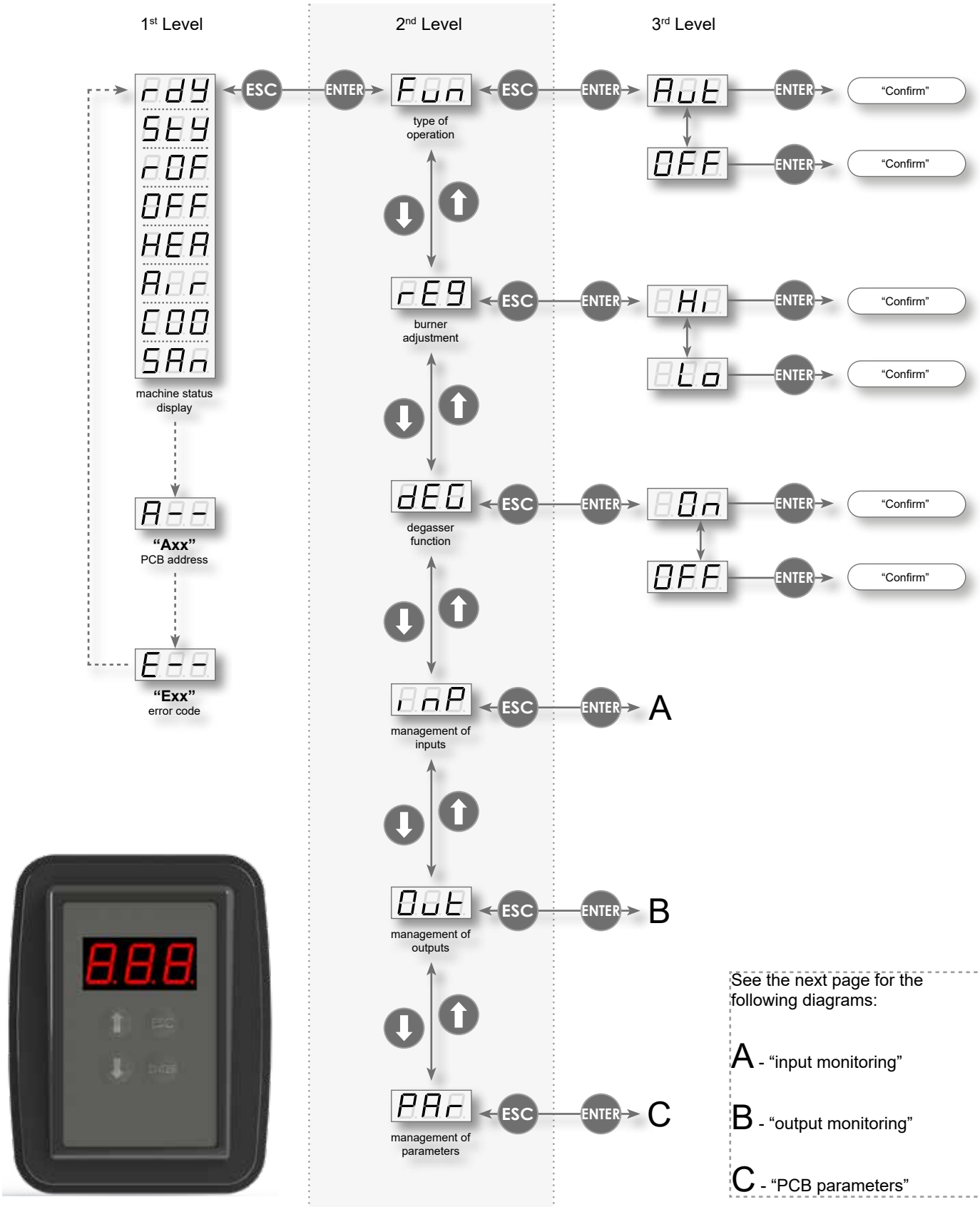
Parameters - PAr Menu
Allows to display, and edit, the value of the main parameters of the CPU PCB. For the meaning and the default values, please refer to the table CPU PCB Parameters of Paragraph 5.5 "Modulation PCB Parameters".
By entering the menu, it is possible to display parameter values inside the relevant submenus

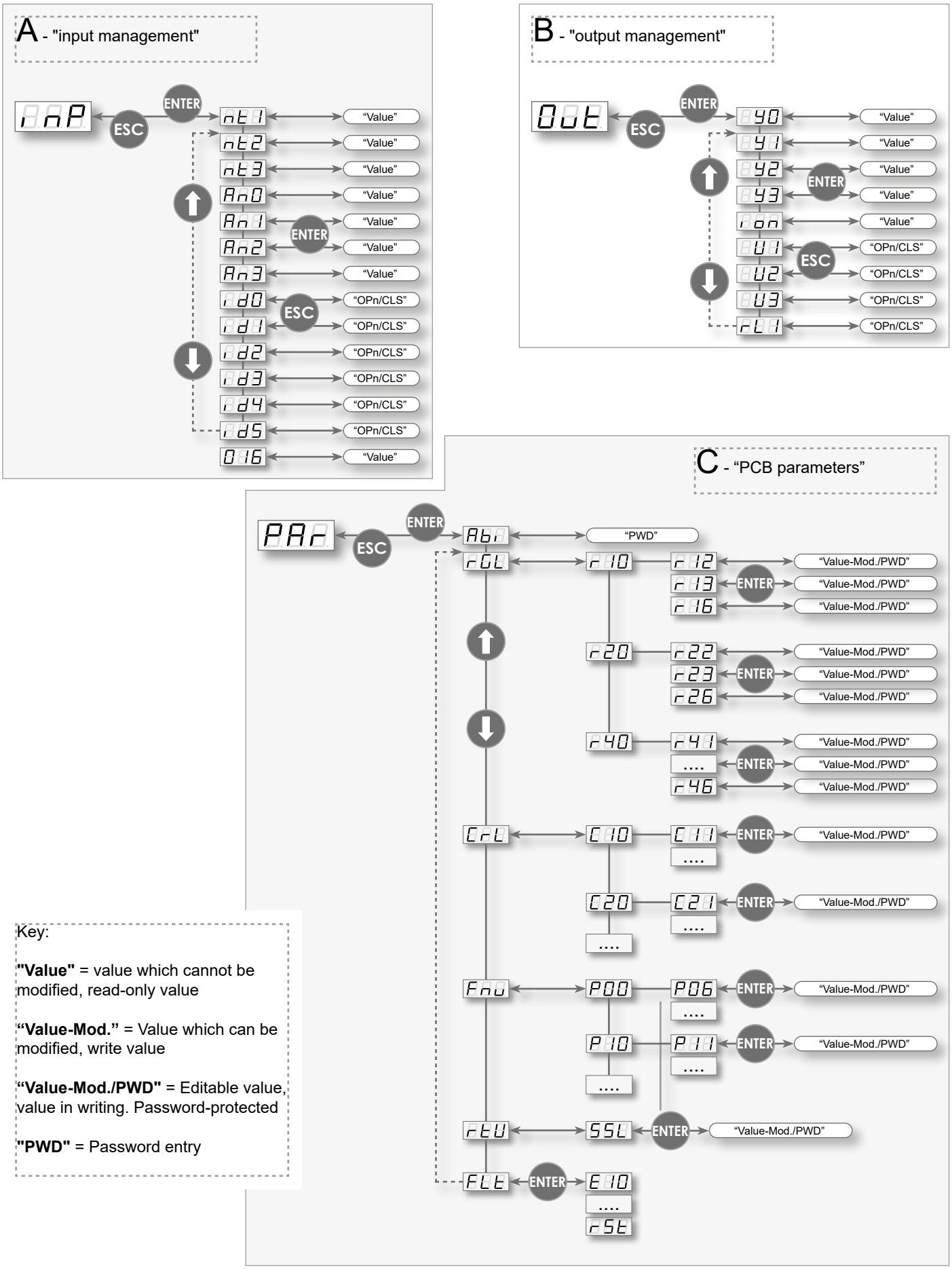
rGL	(adjustments parameters)
CrL	(controls parameters)
Fnu	(functions parameters)
rtU	(modbus serial parameters)
FLt	(alarm history)

In order to change the value of the parameters, the password must be entered in the **Abi** submenu.

Entering the password
- From the home screen (rdy/Sty/rOF/OFF/HEA/Air/COO/SAn/EXX) press ENTER then use the ↑ (up arrow) and ↓ (down arrow) arrows to go to the PAR item; use the ↑ (up arrow) and ↓ (down arrow) arrows to go to the ABI item and press ENTER;
- Set the password inside the ABI menu and confirm it with ENTER (the flashing display will confirm that the parameter has been stored);
- Press ESC to return to the PAR menu
- Move with the ↑ and ↓ arrows to scroll within the PAR menu to the desired submenu item (rGL, CrL, Fnu, rtU);
- Press ENTER to access the submenu;
- Use the ↑ and ↓ arrow keys to select the parameters to be displayed and edited;
- Press ENTER to display the parameter value;
- Use the ↑ and ↓ arrows to edit the value;
- Press ENTER to confirm the change made;
- To exit the parameter and the menu, press ESC until the home screen is displayed.

Navigation map of LCD display menu - CPU G26800





5.3. Reset

The modulation PCB allows the operator to identify more than 30 different causes of lockouts. This allows a precise diagnostics managing each event very accurately.
To reset a lockout, press both the ↑ and ↓ arrows simultaneously, until the LCD display flashes.
It is possible to operate the lockout reset remotely using one of the following solutions:

- the digital input ID1-GND - button N.O.;
- the Smart X Web/Easy control - optional;
- the ModBus protocol, if implemented by the manufacturer of the machine containing the PCH module.

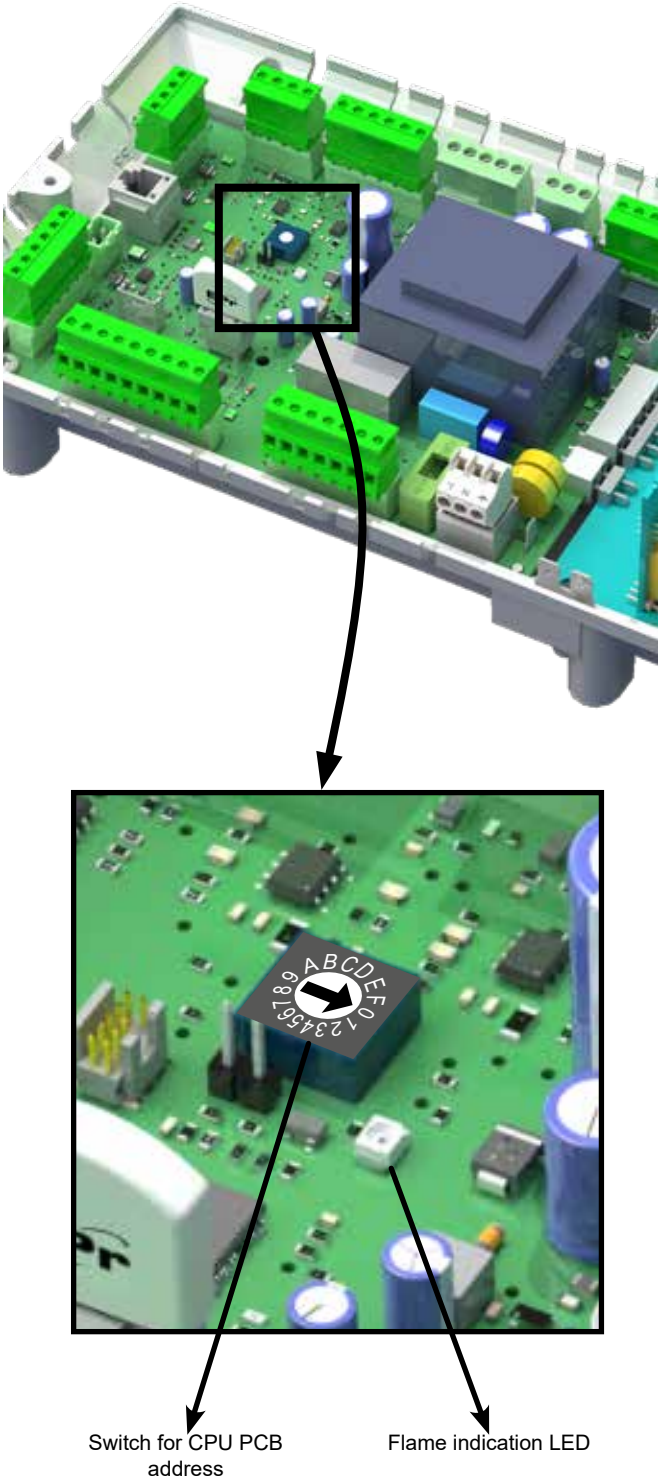
If ignition fails, the flame monitoring PCB reattempts ignition four times. After four failed attempts, it will lock out and will display the code E10.
The lockout codes and their cause are shown in the ERRORS table in Paragraph 5.6 “Analysis of Lockouts - Exx".
If the flame monitoring equipment has locked out (errors from E10 to E22), it can be reset by using the dedicated button on the equipment itself. This type of lockout is also shown by a warning LED that lights up.

The flame monitoring equipment stores the number of manual resets that are performed remotely over time. If ignition fails with more than 5 resets performed in 15 minutes it switches to "timed" lockout (E13). In this case, it is required to wait another 15 minutes before remotely resetting it again. The reset button on the equipment allows to reset lockout E13 immediately.

Should the safety thermostat (STB) open before starting the start-up cycle, the flame MONITORING equipment is kept in "stand-by" and E22 lockout is shown.

5.4. Flame indication LED

An orange LED is present on board the CPU PCB, indicating the opening of the gas valve and/or the presence of flame.



5.5. Modulation PCB Parameters

All values of the parameters of the modulation CPU PCB are shown for all PCH heater models.
The “LCD” column shows the parameters that could be modified with Password via remote LCD control (even with modbus address ≠ 0).
The “Smart” column shows the parameters that can only be modified with Smart X or via modbus with a second level Password, which can be requested to the manufacturer's Customer Service.

Parameters of G26800 CPU PCB version 8.05.xx									
Parameter Name									
Smart	LCD	U.M.	PCH 020	PCH 034	PCH 045	PCH 065	PCH 080	PCH 105	DESCRIPTION
FUNC 00	**Fnu P00**		**Equipment operation**						
TER			1						TER presence (flame monitoring equipment)
HP	HP		0						HP presence (Heat Pump)
SMART			0						SMART presence (control via Modbus) *0 = Smart not present* *1 = uses PID and ON/OFF of the Smart* *2 = uses only ON/OFF command of the Smart*
PTH	P06		100						Maximum limit of PT%_OUT (burner output limit)
PTL	P07		0						Minimum limit of PT%_OUT (burner output limit)
FUNC 01	**Fnu P10**		**Burner operation**						
b1	P11	rpm	213	210	168	182	172	195	Motor RPM MINIMUM value (Y0): 90÷1999 (1=10 RPM)
b2	P12	rpm	660	710	580	651	655	635	Motor RPM MAXIMUM value (Y0): 90÷1999 (1=10RPM)
b3	P13	rpm	320	300	345	340	355	240	Motor RPM START-UP value (Y0): 90÷1999 (1=10RPM)
b4	P14		2						TACH signal divider
b5	P15	rpm	50						Error E3x; no. of revolutions x10 (50=500rpm): 0÷999
b6	P16	sec	20						Error E3x; error dwell time before fault F3x: 0÷999
b7	P17	sec	15						Pre-cleaning time with maximum output
b8	P18	sec	10						Flame stabilisation time (ignition)
b9	P19	%	45						Proportional factor value (kp_pwm) for PWM1 calculation
b10	P1A	%	20						Integral factor value (ki_pwm) for PWM1 calculation
b11	P1B	sec	90						Combustion chamber post-washing time
b12		sec	0						Flame monitoring equipment ON delay time (TER)
b13		kW	5	8	8	12	16(1)	21(1)	MIN. value Furnace heat input
b14		kW	19	35	42	65(2)	82(1)(4)	100(1)(3)	MAX. value Furnace heat input
REG 01	**rGL R10**		**Modulation Probe NTC Control**						
REG_01	R11		1						Adjustment enabling (0=disabled; 1=enabled)
ST1	R12	°C	50						ST1 function setpoint
Xd1	R13	°C	5						ST1 hysteresis
Kp1		%	10						Proportional coefficient
Ki1		%	5						Integral coefficient
TH1	R16	°C	65						Alarm temperature for ST1 for fault E51; Autoresolve with NTC1<ST1
AC1			0						Modulation and/or ON/OFF *0 = modulation only* *1 = modulation and ON/OFF*
MOD1			1						Modulation configuration *0 = Reverse and/or Direct (changes according to the phase sent via modbus, heating, ventilation or conditioning)* *1 = Reverse only (for heating)* *2 = Direct only (for ventilation or conditioning)*
ING1A			1 (NTC1)						Defines the analogue input to be used for calculation

Parameters of G26800 CPU PCB version 8.05.xx

Parameter Name									
Smart	LCD	U.M.	PCH 020	PCH 034	PCH 045	PCH 065	PCH 080	PCH 105	DESCRIPTION
REG 02	**rGL R20**		**Flue gas Temperature Probe NTC Control**						
REG_02	R21		0 (1 for PCH-0Fxx models and MBQ modules for AH)						Adjustment enabling 0 = disabled 1 = enabled
ST2	R22	°C	75						ST2 function setpoint
Xd2	R23	°C	5						ST2 hysteresis
Kp2		%	25						Proportional coefficient
Ki2		%	10						Integral coefficient
TH2	R26	°C	85						Alarm temperature for ST2 for fault E52; Autoresolve with NTC2<ST2
AC2			1						Modulation and/or ON/OFF *0 = modulation only* *1 = modulation and ON/OFF*
MOD2			1						Modulation configuration *0 = Reverse and/or Direct (changes according to the phase sent via modbus, heating, ventilation or conditioning)* *1 = Reverse only (for heating)* *2 = Direct only (for ventilation or conditioning)*
ING2A			2 (NTC2)						Defines the analogue input to be used for calculation
REG 03	**rGL R30**		**Adjustment 03 - NOT USED ON PCH**						
REG_03	R31		0						Adjustment enabling *0 = disabled*
REG 04	**rGL R40**		**Modulation from 0/10 Vdc Control**						
REG_04	R41		2						Adjustment enabling *0 = disabled* *1 = enabled as modulation only* *2 = enabled as modulation and burner ON/OFF*
V4_OFF	R42	V	0.5						Voltage value for burner OFF
V4_DIF	R43	V	0.5						Differential for burner ON
T4_ON	R44	sec	5						Signal dwell time for ON
T4_OFF	R45	sec	5						OFF signal dwell time
ING4A	R46		5 (B1)						Defines the analogue input to be used for calculation
REG 05	**rGL R50**		**Adjustment 05 - NOT USED ON PCH**						
REG_05	R51		0						Adjustment enabling *0 = disabled*
CTRL 01	**CrL C10**		**Control 01 - NOT USED ON PCH**						
CTRL_01	C11		0						Control enabling *0 = disabled*
CTRL 02	**CrL C20**		**Control 02 - NOT USED ON PCH**						
CTRL_02	C21		0						Control enabling *0 = disabled*
CTRL 03	**CrL C30**		**Burner Compartment Antifreeze Control**						
CTRL_03	C31		0 (1 with Enclosure Heating KIT)						Control enabling *0 = disabled* *1 = enabled*
ST_Van	C32	°C	0						Burner compartment antifreeze setpoint
P3	C33	°C	2						Hysteresis on antifreeze setpoint
ING_Van	C34		3 (NTC3)						Compartment temperature analogue input
OUT_Van	C35		8 (LBW)						Digital output for resistance control

Parameters of G26800 CPU PCB version 8.05.xx

Parameter Name									
Smart	LCD	U.M.	PCH 020	PCH 034	PCH 045	PCH 065	PCH 080	PCH 105	DESCRIPTION
CTRL 04	**CrL C40**					**No Voltage Control**			
CTRL_04	C41					1			Control enabling *0 = disabled* *1 = enabled*
T4_V	C42	sec				45			Time in seconds of post-ventilation
CTRL 05	**CrL C50**					**Remote Reset from Digital Input**			
CTRL_05	C51					0			Control enabling *0 = disabled* *1 = enabled*
ING05	C52					9 (ID1)			Digital input enabled as RESET
CTRL 06	**CrL C60**					**Remote alarm or flame presence signal**			
CTRL_06	C61					1			Control enabling *0 = disabled* *1 = enabled as lockout signal* *2 = enabled as flame signal*
OUT06	C62					5 (Q1)			Digital output enabled
CTRL 07	**CrL C70**					**Summer ventilation from digital input**			
CTRL_07	C71					0			Control enabling *0 = disabled*
ING07	C72					0			Digital input enabled
CTRL 08	**CrL C80**					**Counter and reset control**			
HOURS	C81					1			Burner operating hours counter
CYCLES	C82					1			Ignition cycles counter
FAULT						1			Fault counter
RESET	C84					0			Reset control *1 = PCB fault reset*
CTRL 09						**Air Filter Control**			
CTRL_09						0			Control enabling *0 = disabled*
FUNC 02						**Function 02 - NOT USED ON PCH**			
FN_02						0			Control enabling *0 = disabled*
FUNC 03	**Fnu P30**					**Ventilation Management Function (EC-AC Fans) - NOT USED ON PCH**			
FN_03	P31					0			Function enabling *0 = disabled* *1 = proportional PT%_OUT enabled* *2 = proportional enabled to PID%_PRESS, value of REG_04_05;* *3 = start and modulation with temperatures TIN3, TFN3 and TCD3* *4 = proportionally enabled to analogue input ING3A*
T_ON	P32	sec				5			Seconds of delay for fan start
T_OFF	P33	sec				150			Seconds of delay for fan stop
OUT3A						0			Digital output for main fan
OUT3B						3 (Y2)			Analogue output for main fan
ING3A						1 (NTC1)			Reference analogue input
TIN3	P37	°C				35			Heating fan ON temperature
TFN3	P38	°C				65			Temperature for output linearisation
TCD3	P39	°C				20			Conditioning fan ON temperature
SOFT	P3A					0			Soft Starter mode analogue output OUT3B *0 = disabled* *1 = enabled*
T_S	P3B	sec				30			Soft starter duration (seconds)

Parameters of G26800 CPU PCB version 8.05.xx									
Parameter Name									
Smart	LCD	U.M.	PCH 020	PCH 034	PCH 045	PCH 065	PCH 080	PCH 105	DESCRIPTION
FUNC 04	**Fnu P40**		**Function 04 - NOT USED ON PCH**						
FN_04	P41		0						Function Enabling *0 = disabled*
FUNC 05	**Fnu P50**		**Function 05 - NOT USED ON PCH**						
S5	P51		0						Function enabling *0 = disabled*
FUNC 06	**Fnu P60**		**Function 06 - NOT USED ON PCH**						
FN_06			0						Function enabling *0 = disabled*
FUNC 08	**Fnu P80**		**Function 08 - NOT USED ON PCH**						
FN_08	P81		0						Function Enabling *0 = disabled*
FUNC 09			**Function 09 - NOT USED ON PCH**						
FN_09			0						Function enabling *0 = disabled*
FUNC 10			**Function 10 - NOT USED ON PCH**						
FN_10			0						Function enabling *0 = disabled*

NOTES:

(1) Models PCH105 and PCH080 are not approved for operation with gas G2.350 (Poland)
(2) Set 57 (kW) for operation with gas G2.350 or G27 (Poland)
(3) Set 94 (kW) for operation with gas G25.1 (Hungary) or G27 (Poland)
(4) Set 75 (kW) for operation with gas G27 (Poland)

Parameters of G26800 CPU PCB version 8.05.xx

Parameter Name								
Smart	LCD	PCH 020	PCH 034	PCH 045	PCH 065	PCH 080	PCH 105	DESCRIPTION
	Fnu-PA0	**RS485 Serial Communication Configurations**						
D_SL	SSL	0						slave serial baud rate (SMART X) *0 = baud rate 19,200 - Even Parity* *1 = baud rate 9,600 - Even Parity* *2 = baud rate 19,200 - Odd Parity* *3 = baud rate 9,600 - Odd Parity* *4 = baud rate 19,200 - No Parity* *5 = baud rate 9,600 - No Parity*
		NTC input configuration						
NTC1		1						Activates or deactivates NTC1 input
DNt1	dt1	0						Offset for NTC1 input
NTC2		0 (1 for PCH-0Fxx models and MBQ modules for AH)						Activates or deactivates NTC2 input *0 = disabled* *1 = enabled*
DNt2	dt2	0						Offset for NTC2 input
NTC3		0 (1 with Enclosure Heating KIT)						Activates or deactivates NTC3 input *0 = disabled* *1 = enabled*
DNt3	dt3	0						Offset for NTC3 input
		B0 Input Configurations (flue gas fan speed)						
B0		1						B0 analogue input enabling *0 = disabled* *1 = enabled*
		B1 Input Configurations (0 - 10V)						
B1		1						B1 analogue input enabling *0 = disabled* *1 = enabled as analogue input*
XA1		0						X-axis minimum value – minimum input voltage
XB1		9.99						X-axis maximum value – maximum input voltage
YA1		0						Y-axis minimum value – minimum magnitude value *
YB1		9.99						Y-axis maximum value – maximum magnitude value
CV1		0.01						Coefficient for PRØ displaying; value displayed on Smart and used for controls
UM1		8						1=°C; 2=bar; 3=mbar; 4=Pa; 5=%; 6=l/h; 7=mc/h; 8= V
		B2 Input Configurations - NOT USED ON PCH						
B2		0						B2 analogue input enabling *0 = disabled* *1 = enabled as analogue input*
		B3 Input Configurations - NOT USED ON PCH						
B3		0						B3 analogue input enabling *0 = disabled* *1 = enabled as analogue input* *2 = enabled as frequency input*

Parameters of G26800 CPU PCB version 8.05.xx								
Parameter Name								
Smart	LCD	PCH 020	PCH 034	PCH 045	PCH 065	PCH 080	PCH 105	DESCRIPTION
					Digital Input Configurations			
ID1					4			ID1 digital input enabling *0 = disabled* *1 = N.C input (Fault with input Open) with manual reset* *2 = N.C input (Fault with input Open) with Autoresolve* *3 = N.O. input (Fault with input Closed) with Autoresolve* *4 = enabled as N.O. (to enable functions, without Faults)*
TD1					0			Alarm triggering or function enabling delay time
ID2					0			ID2 digital input enabling *0 = disabled* *1 = N.C input (Fault with input Open) with manual reset* *2 = N.C input (Fault with input Open) with Autoresolve* *3 = N.O. input (Fault with input Closed) with Autoresolve* *4 = enabled as N.O. (to enable functions, without Faults)*
TD2					0			Alarm triggering or function enabling delay time
ID3					0			ID3 digital input enabling *0 = disabled* *1 = N.C input (Fault with input Open) with manual reset* *2 = N.C input (Fault with input Open) with Autoresolve* *3 = N.O. input (Fault with input Closed) with Autoresolve* *4 = enabled as N.O. (to enable functions, without Faults)*
TD3					0			Alarm triggering or function enabling delay time
					Y0 Analogue Output Configuration - DO NOT CHANGE!			
YM0					1 (Reverse)			Direct/reverse output configuration 0 = direct output: the maximum calculation value (100%) corresponds to the maximum output value 1 = reverse output: the maximum calculation value (100%) corresponds to the minimum output value
YL0					0			Minimum voltage (or PWM in %) output value
YH0					10			Maximum voltage (or PWM in %) output value
YF0					4			Fixed voltage or % output value (forced by program)
YT0					10			Voltage increase/decrease (or in %) every second*
YC0					4			Fixed voltage or % output value (forced by program) - only for Conditioning (FUNC_04)
YS0					0.5			Fixed voltage or % output value (forced by program) - only for SOFT STARTER mode (FUNC_03 - par. SOFT=1)
YN0					0			Output Linearisation Mode *0 = linear output value between YL0 and YH0* *1 = output with values limited to YL0 and YH0 (for request values below YL1 the output will be YL1, for request values above YH1 the output will be YH1)*

5.6. Analysis of Lockouts - Exx

The modulation **CPU** PCB handles two types of lockouts:
- preventive, it warns the customer that the PCH heater requires maintenance;
- operational, it stops the PCH heater for safety reasons or to ensure its correct operation.

Some operational faults require manual reset; others reset themselves when the problem that caused them is solved.
Below is a complete list of faults, possible causes and possible solutions.

CODE	DESCRIPTION	CAUSE	RESET
Flame Safety Alarms - Caused by the flame monitoring equipment (**TER**)			
E08	TER error due to power supply failure (recorded in Alarm History; not displayed on Smart or LCD).	• Interruption of 230 V AC power supply to TER (CN12 connectors 1 and 2) with burner on; • Opening of contacts ID4-ID5 with burner on (see alarms E24-E25); • Voltage dips or interruptions in mains supply	
E09	TER error due to incorrect power supply (recorded in Alarm History; not displayed on Smart or LCD).	• 24 V DC power supply frequency (connector CN12 - 4) <40 Hz or >65 Hz. • Power supply on connector CN - 12 << 20V or >> 36V.	
E10	Failure to ignite the burner after 4 attempts performed by the equipment.	• No gas; • Phase and neutral reversed; • Earth wire not connected; • Phase-Phase connection without neutral; • Ignition electrode failed or badly positioned; • Detection electrode failed or badly positioned; • Detection electrode that moves or disperses to the earthing system when hot; • Low CO2 value; • Gas supply pressure too high (>60mbar) • Clogged condensate drain (ice or impurities) - clean siphon and/or exhaust duct; • Condensate detection electrode grounded or faulty	Manual
E11	Untimely (parasitic) flame. The equipment detects a flame presence signal with burner off	• Loss of insulation of TER equipment; • Loss of insulation of the detection cable or electrode	Manual
E12	Ignition failure; not visible. The count, displayed in the event log via modbus, indicates problems with ignition	Check the causes as indicated in fault E10	
E13	TER equipment does not accept the reset from CPU (max 5 reset attempts in 15 minutes)	Check the causes as indicated in fault E10. *Disconnect and restore power supply*	Manual
E14	Lack of communication between TER equipment and CPU for more than 60 seconds	• TER equipment or CPU PCB fault; • Connections on the STB thermostat to earth; • Capillary of the STB thermostat that discharges on the earth faston of the thermostat body	Autoresolve
E15	The flame monitoring equipment (TER) does not reach the "Running" status after 300 seconds from the heat request by the CPU	• Faulty TER equipment; • No gas or wrong burner adjustment; • Insufficient gas pressure; • Total or partial obstruction of the fume outlet	Manual or Autoreset (every 5')
E16	General lockout of the flame monitoring equipment (TER)	• Reports a safety burner switching off following uninterrupted operation >24h; • Faulty TER equipment	Manual or Autoreset (every 5')
E17	TER equipment internal fault - No 24 Vac power supply to TER equipment	• TER equipment protection fuse breakage *Check electrical continuity of fuse. If there is no continuity (fuse blown) replace TER equipment* • No +24 Vac supply on CN12 terminal block (CPU-TER connection) *Replace CPU modulation PCB*	Manual or Autoreset (every 5')

CODE	DESCRIPTION	CAUSE	RESET
E18	Flame loss with TER equipment in running phase. The count, which can be displayed in the event log, indicates that the burner will turn off after flame stabilisation time or when the maximum Heat Input is reached	• Reduced gas flow rate on the line or excessive pipeline heat loss; • Incorrect burner setting (CO2 too low)	
Alarms for safety device activation			
E20	Activation of safety thermostat STB	• Excess air temperature due to lack of air circulation/ flow; • Safety thermostat broken or not connected	Manual
E22	STB safety thermostat activation in ignition phase	• Frost or temperature below -20°C; • Safety thermostat or flue gas thermostat broken or not connected	Autoresolve
E24	ID4 input alarm	• ID4 - IDC (CN02) input open • no jumper	Autoresolve
E25	ID5 input alarm	• ID5 - IDC (CN02) input open • no jumper	Autoresolve
Flue Gas Fan Fault Alarms (VAG)			
E30	No flue gas fan (VAG) start-up or speed too low in start-up phase	• Flue gas fan (VAG) power supply interrupted; • Flue gas fan (VAG) fault; • CPU PCB fault. *To check possible CPU failure, disconnect 4-wire connector (PWM) from flue gas fan (VAG) and check ABSENCE of voltage between GND-Y0 (HALL) and B0-Y0 contacts of terminal board CN03. The presence of voltage indicates a failure of the CPU PCB*	Manual or Autoreset (every 5')
E31	Flue gas fan speed (VAG) too high in stand-by phase	• VAG electric cables interrupted, not connected or wrongly connected; • Flue gas fan (VAG) fault; • CPU PCB fault. *To check for possible failure of the flue gas fan, in stand-by condition ("Rdy" or "Sty" status on LCD display), keep the cables connected to the flue gas fan (VAG) and check the direct voltage value (Vdc) between the GND and B0 terminals of the CN03 terminal block. The presence of voltage (~5-6 Vdc) indicates a fault in the flue gas fan inverter*	Manual or Autoreset (every 5')
E32	Flue gas fan speed (VAG), during operation, outside minimum and maximum set parameters	• VAG electric cables interrupted, not connected or wrongly connected; • Flue gas fan (VAG) fault	Manual or Autoreset (every 5')
Digital input alarms			
E36	ID1 input alarm	Programming error of par. ID1. *Set par. ID1=0 (if not used for connection with remote controls) or ID1=4*	Manual or Autoresolve
E37	ID2 input alarm	Programming error of par. ID2. *Set par. ID2=0 (if not used for connection with remote controls) or ID2=4*	Manual or Autoresolve
E38	ID3 input alarm	Programming error of par. ID3. *Set par. ID3=0 (if not used for connection with remote controls) or ID3=4*	Manual or Autoresolve
Alarms of analogue inputs and NTC probes			
E41	NTC1 probe error	No signal from NTC probe or faulty NTC probe	Autoresolve
E42	NTC2 probe error	No signal from NTC probe or faulty NTC probe	Autoresolve
E43	NTC3 probe error	No signal from NTC probe or faulty NTC probe	Autoresolve
E49	Air pressure probe or filter probe error	No probe signal or probe faulty (input signal B2 < 0.3 Vdc)	

CODE	DESCRIPTION	CAUSE	RESET
		Overtemperature Alarms	
E51	NTC1 probe temperature > TH1	• Air flow rate insufficient; • Cooling fan(s) inoperative; • Wrong parameter TH1 adjustment	Autoresolve with NTC1 < ST1
E52	NTC2 probe temperature > TH2	• Air flow rate insufficient; • Cooling fan(s) inoperative; • Wrong parameter TH2 adjustment	Autoresolve with NTC2 < ST2
		Modbus communication alarms	
E60	Modbus Slave serial network communication error (CN04)	• Modbus serial network disconnected; • The address of the CPU PCB is wrong and/or not configured	Autoresolve
		Alarms for no voltage or dirty filters	
E71	Dirty air filter, preventive warning	Not used.	
E72	Dirty air filter, lockout alarm	Not used.	
E75	No voltage during operating cycle (excluding standby); fault is not visible on remote control but only counted	No voltage during operation	
		Parameter configuration error alarms	
E80	Pressure probe error	Not used. Programming error of par. CTRL_01. *Set par. CTRL_01 = 0*	
E81	Pressure less than ST_H20 setpoint	Not used. Programming error of par. CTRL_01. *Set par. CTRL_01 = 0*	
E82	Pressure higher than TH_H20 limit value	Not used. Programming error of par. CTRL_01. *Set par. CTRL_01 = 0*	
E85	B3 input alarm (Frequency/4-20mA)	Not used. Programming error of par. S5. *Set par. S5=0*	
E86	B3 input alarm (Frequency/4-20mA)	Not used. Programming error of par. B3. *Set par. B3=0* Programming error of par. S5. *Set par. S5=0*	
E98	Input configuration error	No input enabling for functions or controls (e.g. no activation of NTC1 input combined with REG_01)	Autoresolve
E99	Function configuration error	No activation of compulsory functions for the product type (e.g. no activation of CTRL_04 for product type "PCH")	Autoresolve
		EEPROM alarms	
E100 (CPU)	Eeprom access error	Eeprom missing or inserted in the opposite direction	Autoresolve
E101 (EPr)	Eeprom data error	Eeprom removed during operation or damaged	Autoresolve

If there are communication problems between CPU PCB and LCD panel, the display will show flashing:
"**CPU**" if the problem lies with the CPU;
"**...**" if the problem lies in the display board.
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. "**EPr**" will be displayed if the problem is caused by the EEPROM PCB, check that it is properly inserted inside the connector.

Axx is not a Fault indication, but corresponds to the machine address, see Paragraph 5.2.

5.7. Connections to the Flue

The PCH heater module is fitted with a watertight combustion circuit and with the burner fan located upstream of the heat exchanger.
Connection to the flue, according to how the heater is installed, should 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.
If the heater is installed outdoor, a "B" type installation is also a "C" type.
More specifically, the heater is certified for the following exhausts: B23P-C13-C33-C53-C63; for more information on the flue types, please refer to current regulations.

Flue outlet is compulsory for PCH heaters fitted inside an Air Handling or Roof Top unit installed indoor.

For the flue, certified pipes and terminals must be used, taking into account that for PCH condensate modules the following materials must be used:
- aluminium with a thickness of at least 1.5 mm;
- stainless steel with a thickness of at least 0.6 mm; the steel must have a carbon content equal to or lower than 0.2 %.

Sealed pipes must be used to prevent condensate from leaking from the pipes; the seal must be adequate to withstand flue gas temperature ranging between 25°C and 120°C.
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. Insulate the pipe 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.

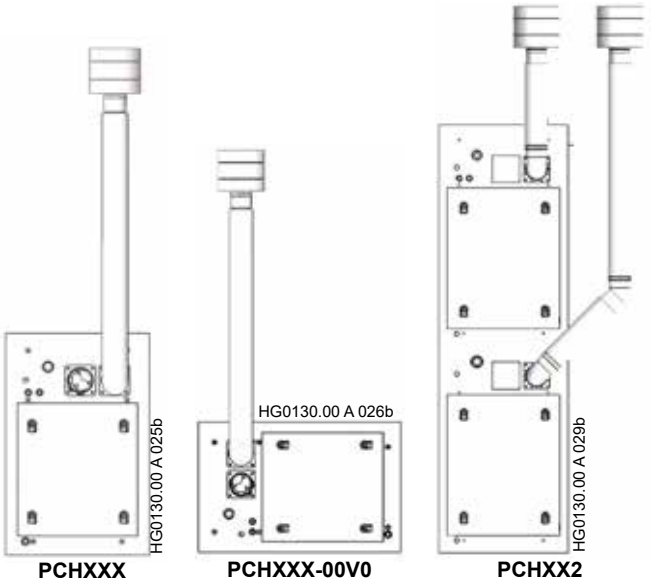
The horizontal sections of chimney must be installed with a slightly incline (1°- 3°) towards the heater, in order to prevent the build up of condensation in the exhaust.

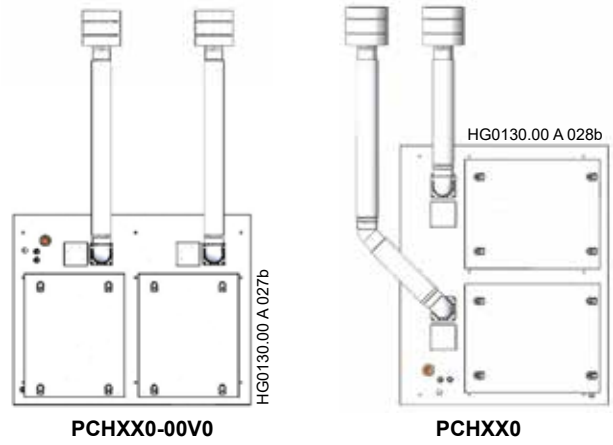
All components are certified in compliance with EN 1856-1 and EN1856-2 standards. They are identified by an ID plate showing their features. Below is an *example*:

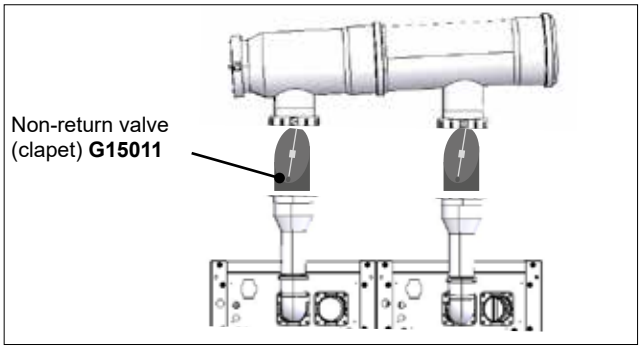
0694-CPR-52977	1856-1	T200	P1	W	V2	L50050	O70
Certificate no.							
Number of the Standard							
Temperature class							
Pressure level (N=negative, P=positive, H=high pressure, 1 and 2 = permissible loss, value 1 more restrictive)							
Condensation resistance class (D = dry use, W = wet use)							
Corrosion resistance class							
Material and thickness							
Inner resistance to fire (G=Yes, O=No) and distance (in mm) from combustible materials							

In case of installation of ducts different from those supplied by the manufacturer, always make sure that they are suitable for the type of application and the type of equipment on which they are installed. Above all, always check that the temperature class and corrosion resistance class (EN1443) are suitable for the type of system and the operating characteristics of the equipment itself.
However, the following minimum resistance classes are recommended:
- Temperature class: T200
- Pressure level: P1
- Condensate resistance class W
- Corrosion resistance class: 1

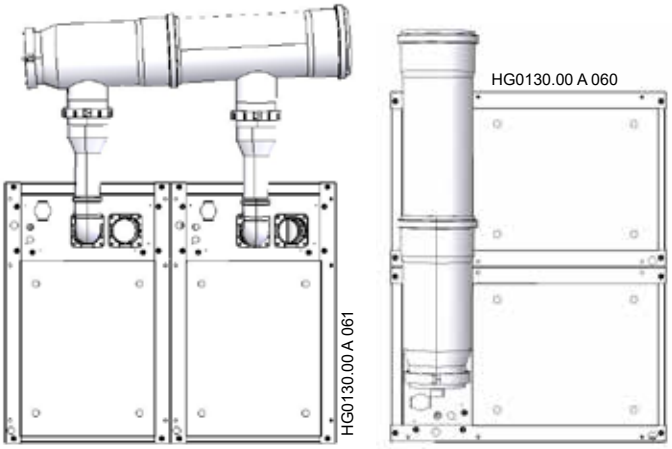
Common exhausts
Where possible, it is always preferable to use independent exhausts; PCH module exhausts are pressurised, therefore in this way it is possible to prevent incorrect sizing from causing a system malfunction.
When common exhausts are fitted, they must be designed by providing some anti-reflux valves (code G15011) at the outlet of each flue, before the connection with the common flue, preventing a module from discharging its own combustion gases inside another module.







Apen Group can provide common exhausts for the **"B-System"** configuration.
If you want to design common exhausts with PP fittings and plastic non-return valve, it is necessary to request the version PCHXX0-0F00 or PCHXX0-0FV0, which provide flue gas temperature control by thermostat and temperature sensor.



PCHXX0-0FV0 **PCHXX0-0F00**

Flue gas data
The table to be used to calculate the flue gas exhaust system with commercially available pipes can be found in paragraph 5.9 "GAS connection" within the Gas regulation data.

The maximum permitted recirculation percentage is 10%.

Selection Guide
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 drops of individual components must be calculated; each component has a different pressure drop value as the flue gas flow rate is different.
Then the pressure drops of each component identified must be added, checking that the result is not higher than the value available for the PCH heater module used; if a combustion air supply pipe is fitted, losses must be added to the flue pressure drops.
If the sum of pressure drops caused by the fittings is higher than the pressure available at the exhaust, ducts with greater diameter must be used, rechecking the calculation; a pressure drop higher than the pressure available at the flue reduces the heater module thermal output.

If the module is installed indoor: the use of coaxial connections is allowed for PCH heaters with a maximum length of 3 metres;

The flue outlet terminal must be installed in compliance with reference national regulation requirements, always avoiding flue gas recirculation.

If the duct routing requires the use of bends, the length of the bends must be subtracted from the available length:
- Ø 80 wide radius bend at 90° EqL = 1.65m;
- Ø 80 wide radius bend at 45° EqL = 0.80m;
- Ø 100 wide radius bend at 90° EqL = 2.30m;
- Ø 100 wide radius bend at 45° EqL = 1.03m;
- Ø 130 wide radius bend at 90° EqL = 2.20m;
- Ø 130 wide radius bend at 45° EqL = 1.00m.

To allow proper analysis of combustion and avoid flue gas recirculation through the combustion air intake duct, it is necessary to always build a short section of chimney, even in case of installations on the roof.

5.8. Condensate drain

The PCH modules are flue gas condensing heaters.
The formation of condensate in the heat exchanger must be duly drained from the exchanger to the outside.
To this end, the PCH heaters are already fitted as standard with a condensate drain kit made up of:

SINGLE MODULE HEATERS
- trap equipped with a detection electrode
- condensate drain fitting (G1/2"M gas threaded connection) on the outer panel of the module.

MULTIPLE MODULE HEATERS
- trap equipped with a detection electrode for each module
- condensate drain fitting (G1/2"M gas threaded connection) on the outer panel of the module and lower trap air vent pipe, placed on the front panel near the lower module.

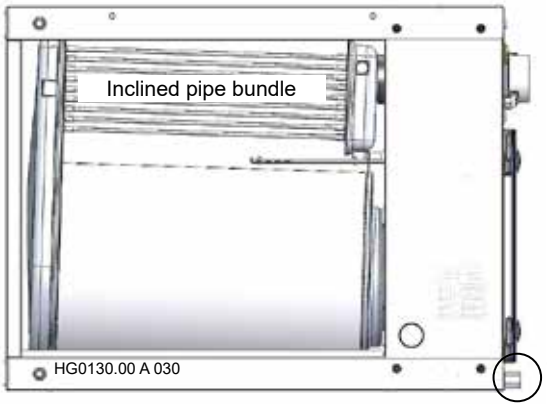
Precautions
The pipe must be sized according to the maximum amount of condensate produced by the appliance (see Par. "Technical Data"), and made of a material suitable for the passage of hot condensate. Use:
- for hot pipes (water and flue gas passage), aluminium, stainless steel, silicone or Viton or EPDM;
- for cold pipes (water pipes), PVC and any materials suitable for hot pipes.

Do not use galvanised iron, galvanised steel, copper or any other material not suitable for the condensate drain fitting.

Neutralising the condensation
Depending on the type of application, an optional condensate neutralisation kit is available, as follows:

	kW max	BxHxL [cm]	CaCO3 [kg]
G14303	120	20x18x30	5
G05750	1500	30x24x64	25

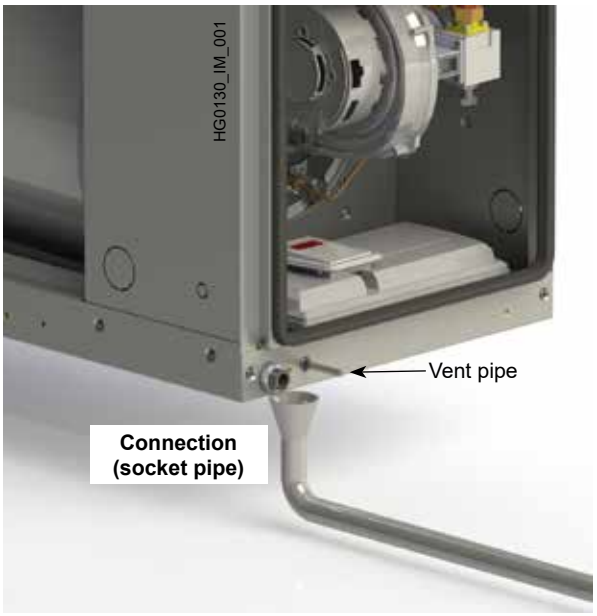
Build up of condensation in the heat exchanger
During normal operation, condensate must not be allowed to accumulate within the heat exchanger.
A sensor fitted in the PCH heater internal water trap checks the condensate level and stops the burner from operating before the condensate reaches a potentially dangerous level inside the fume collection hood. Whilst installing the module inside a unit and, later on, when positioning the unit on the floor, it is essential to make sure that the module, and therefore the heat exchanger, are perfectly level to maintain the typical incline of the tube bundle.



CAUTIONS
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 flue gas discharged from the condensate drain.

According to the type of installation, the module can drain the condensate in the following ways:
- free drainage;
- drainage to water pipes;
- drainage inside the unit (water trap).

Free drainage
If the unit is installed outdoors, unless the temperatures never drop below freezing, the water could be drained directly outside, without any connections to other pipes, making sure that the condensate flows away from the unit. If the drainage needs to be ducted, it is necessary to install an open type connection (socket pipe), similar to the one in picture below, to prevent ice forming in the pipe from blocking proper condensate drainage, resulting in water accumulation in the exchanger. If the drain pipe is installed in an outdoor site, it may need to be heated by means of a heating cable.



Drainage into water courses
Taking the condensation drain inside the heated room 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 (condensate neutralisation kit).
The pipe must be routed inside the unit (in warm conditions) up to the point where it enters the site, avoiding external routing.

Drainage inside the unit
This solution is also a good protection against any icing; the internal connection between PCH module and water trap can be made using a silicone pipe available at Apen Group.
For this method of installation it is essential to check that the materials of the water trap of the Air Handling or Roof Top unit where the PCH heater is installed are suitable for the relevant use (e.g.: no galvanised metal sheet).

Additional cautions
- For the condensate drain pipe linear sections, provide for a slope equal to or greater than 3%, i.e. 3 cm per metre (otherwise provide for a booster pump);
- Install the condensate neutralisation kit in the rooms, near the condensate drain fitting of the heater, to prevent condensate water from freezing inside the container;
- Do not drain the condensate in pipes made with materials incompatible with the condensate acidity: risk of corrosion.

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

5.9. GAS Connection

Use the gas line connections only with CE certified components.

The PCH module is supplied complete with:
- double coil gas valve;
- gas stabiliser and filter (inside the gas valve).

Al components are fitted inside the burner housing.
To complete the installation, as required by the current regulations, the following components must be fitted:
- anti-vibration joint;
- gas valve;
- gas filter [without stabiliser]

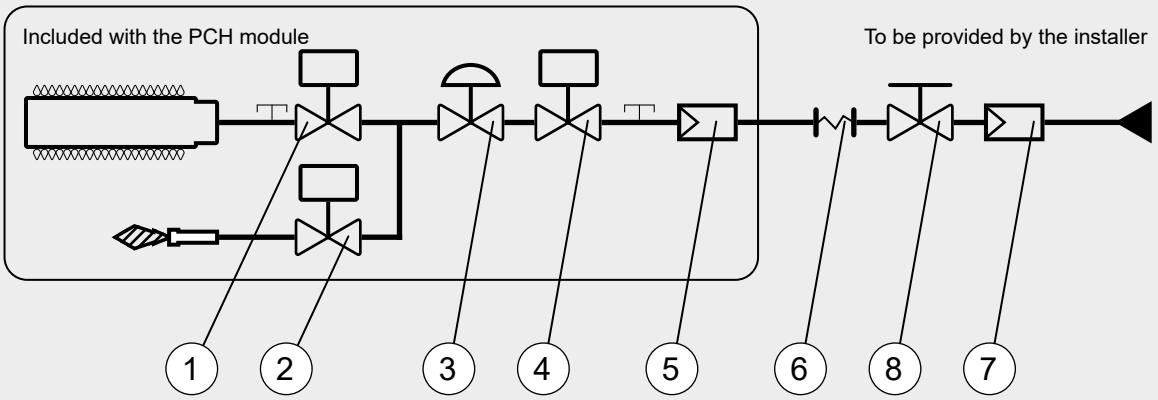
NOTE: AN EN126 certified gas filter with filtration level lower than or equal to 50 microns must be used, with no pressure stabiliser, with great capacity, since the filter supplied as standard, upstream of the gas valve, has a limited surface.

NOTE: For ease of maintenance, connect the heater by means of a seal and swivel gasket. Avoid using threaded connections directly on the gas connection of the equipment.

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

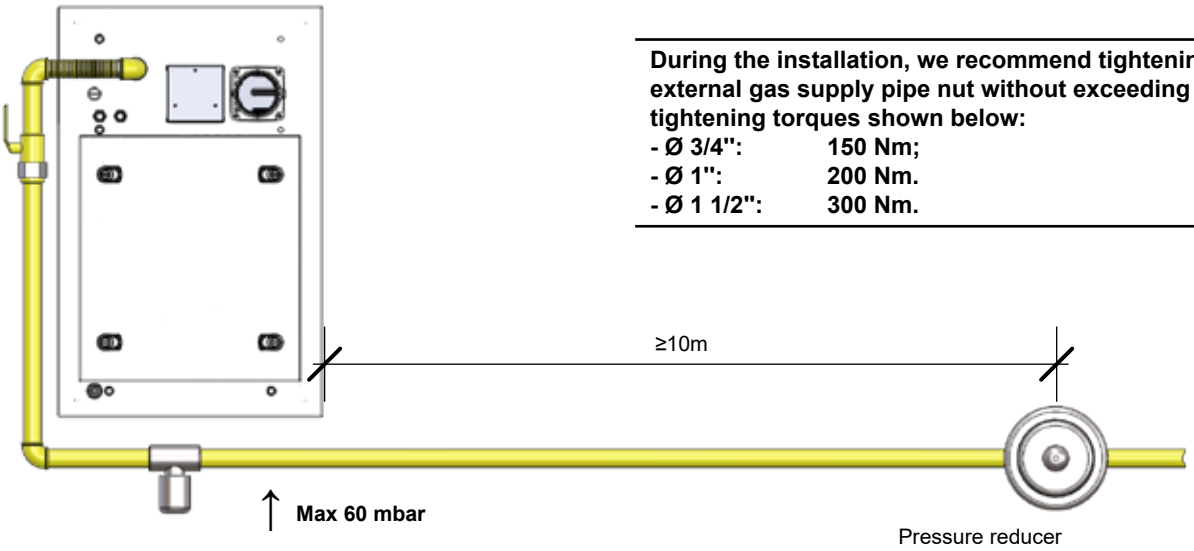
If pressure is higher than 60mbar, a pressure reducer must be installed at a distance of at least 10 m and no pressure stabiliser must be fitted between the pressure reducer and the heater, but leaving the gas filter.

Current legislation allows a maximum pressure inside the rooms, or thermal stations, of 40 mbar; higher pressure must be reduced upstream of the boiler room or the site where the PCH module is installed.



KEY

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



During the installation, we recommend tightening the external gas supply pipe nut without exceeding the tightening torques shown below:
- Ø 3/4": 150 Nm;
- Ø 1": 200 Nm.
- Ø 1 1/2": 300 Nm.

5.10. Country Table - Gas Category

Country	Category	Gas	Pressure	Gas	Pressure	Gas	Pressure
AT, CH	II2H3B/P, I2HY20	G20	20 mbar	G20Y20	20 mbar	G30/G31	50 mbar
BE <70kW	I2E(S)B, I2EY20, I3P	G20/G25	20/25 mbar	G20Y20	20 mbar	G31	37 mbar
BE >70kW	I2E(R)B, I2EY20, I3P	G20/G25	20/25 mbar	G20Y20	20 mbar	G31	37 mbar
DE	II2ELL3B/P, I2EY20	G20/G25	20 mbar	G20Y20	20 mbar	G30/G31	50 mbar
DK, FI, GR, SE, NO, IT, CZ, EE, LT, SI, AL, MK, BG, HR, TR, RU	II2H3B/P, I2HY20	G20	20 mbar	G20Y20	20 mbar	G30/G31	30 mbar
RO	II2H3B/P, I2HY20	G20	20 mbar	G20Y20	20 mbar	G30/G31	30 mbar
	II2L3B/P	G25	20 mbar			G30/G31	30 mbar
ES, GB, IE, PT, SK	II2H3P, I2HY20	G20	20 mbar	G20Y20	20 mbar	G31	37 mbar
FR	II2Esi3P, I2EY20	G20/G25	20/25 mbar	G20Y20	20 mbar	G31	37 mbar
LU	II2E3P, I2EY20	G20/G25	20 mbar	G20Y20	20 mbar	G31	37/50 mbar
NL	II2EK3B/P, I2EY20	G20/G25.3	20/25 mbar	G20Y20	20 mbar	G30/G31	30 mbar
HU	II2HS3B/P, I2HY20	G20/G25.1	25 mbar	G20Y20	25 mbar	G30/G31	30 mbar
CY, MT	I3B/P					G30/G31	30 mbar
LV*	II2H3B/P, I2HY20	G20	20 mbar	G20Y20	20 mbar	G30/G31	30 mbar
IS	I3P					G31	37 mbar
PL	II2ELwLs3B/P, I2EY20	G20/G27/ G2.350	20/20/13 mbar	G20Y20	20 mbar	G30/G31	37 mbar

(*) Gas Category in accordance with the declaration of the Member State pursuant to Art. 4, paragraph 1 of Regulation (EU) 2016/426 (ref. Official Journal EU 2018/C 206/01)
(G20Y20) The suffix “Y20” means that the equipment is suitable for operation with natural gas and a natural gas mixture with 20% hydrogen.

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

NOTE: In compliance with standards EN17082, EN 437 and ISO3166, GB refers to the United Kingdom.

Codes with no extension:

- PCH020IT 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:

- PCH020FR-xxx**0** 0 indicates that the equipment has been tested and set up for natural gas [G20];
- PCH020MT-xxx**1** 1 indicates that the equipment has been tested and set up for LPG [G31];
- PCH020NL-xxx**2** 2 indicates that the equipment has been tested and set up for 'L' natural gas [G25], or ‘K’ [G25.3];
- PCH020HU-xxx**3** 3 indicates that the equipment has been tested and set up for natural gas [G25.1];
- PCH020PL-xxx**4** 4 indicates that the equipment has been tested and set up for gas [G2.350].

Another adhesive label, located near the fuel connection of the equipment, specifically indicates the type of gas and the supply pressure for which the equipment has been set up and tested.

NOTE: The unit is supplied already set for natural gas [G20] and equipped with the kit for conversion to LPG. The kit for conversion to LPG is not supplied in countries where conversion is prohibited.

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

5.11. Gas Settings Table

NOTE: For “multi-module” PCH models, for gas consumption and mass flow values, consider the sum of the data of the corresponding individual module, as shown in the table below:

PCH Model	Module
PCH130 - PCH132	2 x PCH065
PCH160 - PCH162	2 x PCH080
PCH210 - PCH212	2 x PCH105
PCH320	3 x PCH105
PCH420	4 x PCH105

TYPE OF GAS G20 - Cat. E-H													
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105	
Output		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
SUPPLY PRESSURE	[mbar]	20 [min 17-max 25] *											
PILOT NOZZLE Ø	[mm]	0.7											
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	0.50	2.01	0.80	3.69	0.90	4.44	1.31	6.88	1.74	8.68	2.22	10.58
CARBON DIOXIDE -CO_2 CONTENT	[%] ±0.2	8.8	9.1	8.7	9.1	8.7	9.1	8.7	9.1	8.7	9.1	8.5	9.1
OXYGEN	[%] ±0.4	5.3	4.7	5.3	4.7	5.3	4.7	5.3	4.7	5.3	4.7	5.3	4.7
AIR EXCESS		1.34	1.29	1.34	1.29	1.34	1.29	1.34	1.29	1.34	1.29	1.34	1.29
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26	70	28	80
FLUE GAS MASS FLOW RATE (MAX.)	[kg/h]	33.0		60.6		73.0		113.0		142.5		173.8	
GAS ORIFICE PLATE	[mm]	4.4		6.2		7.5		10.3		9.8		15.8	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	
* For Hungary, supply pressure is 25 mbar													

TYPE OF GAS G25 - Cat. L-LL													
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105	
Output		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
SUPPLY PRESSURE	[mbar]	25* [min 17-max 30 **]											
PILOT NOZZLE Ø	[mm]	0.7											
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	0.58	2.34	0.93	4.29	1.05	5.17	1.53	8.00	2.02	10.09	2.58	12.30
CARBON DIOXIDE -CO_2 CONTENT	[%] ±0.2	8.8	9	8.6	9	8.8	8.9	8.8	9.2	8.6	9.1	8.8	9
OXYGEN	[%] ±0.4	4.9	4.6	5.3	4.6	4.9	4.7	4.9	4.2	5.3	4.4	4.9	4.6
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26	70	28	80
GAS ORIFICE PLATE	[mm]	7.4		8.9		8.9		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	
* For Germany and Romania, supply pressure is 20 mbar.													
** For Romania, max. supply pressure is 25 mbar.													

TYPE OF GAS G25.3 - Cat. K													
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105	
Output		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
SUPPLY PRESSURE	[mbar]	25 [min 20-max 30]											
PILOT NOZZLE Ø	[mm]	0.7											
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	0.57	2.29	0.91	4.19	1.02	5.05	1.49	7.82	1.97	9.87	2.53	12.03
CARBON DIOXIDE -CO_2 CONTENT	[%] ±0.2	8.7	9.1	8.8	9	8.8	9.1	8.9	9.1	8.7	9.1	8.8	9.4
OXYGEN	[%] ±0.4	5.1	4.4	4.9	4.6	4.9	4.4	4.7	4.4	5.1	4.4	4.9	3.8
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26	70	28	80
GAS ORIFICE PLATE	[mm]	5.4		7.7		8.9		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	

TYPE OF GAS G2.350 - Cat. Ls (Only for PL-Poland)									
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065*	
Output		min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table							
SUPPLY PRESSURE	[mbar]	13 [min 10-max 16]							
PILOT NOZZLE Ø	[mm]	0.75							
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	0.70	2.79	1.12	5.13	1.25	6.18	1.82	8.38
CARBON DIOXIDE -CO_2 CONTENT	[%] ±0.2	8.4	9	8.4	9	8.6	9	8.4	8.8
OXYGEN	[%] ±0.4	5.4	4.3	5.4	4.3	5.0	4.3	5.4	4.6
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86
GAS ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		30.5	
* Maximum nominal heat output 57.0 kW									

NOTE: Models PCH080, PCH105, PCH160, PCH162, PCH210, PCH212, PCH320, PCH420 are not approved for operation with gas G2.350. The minimum and maximum heat outputs of models PCH065, PCH130 and PCH132 are lower with respect to the operation with G20. The conversion kit for G2.350 is only supplied on request.

TYPE OF GAS G25.1 - Cat. S (Only for HU-Hungary)													
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105*	
Output		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
SUPPLY PRESSURE	[mbar]	25 [min 20-max 33]											
PILOT NOZZLE Ø	[mm]	0.70											
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	0.58	2.33	0.93	4.28	1.04	5.16	1.52	7.99	2.01	10.07	2.58	11.55
CARBON DIOXIDE -CO_2 CONTENT	[%] ±0.2	9.3	9.5	9.1	9.6	9.4	9.6	9.3	9.7	9.8	10.3	9.4	9.6
OXYGEN	[%] ±0.4	6.3	6.0	6.6	5.8	6.2	5.8	6.3	5.7	5.5	4.7	6.2	5.8
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26	70	28	80
GAS ORIFICE PLATE	[mm]	7.4		8.9		8.9		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 - Cat. Lw [former GZ41.5] (Only for PL-Poland)													
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065*		PCH080**		PCH105***	
Output		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
SUPPLY PRESSURE	[mbar]	20 [min 16-max 23]											
PILOT NOZZLE Ø	[mm]	0.70											
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	0.61	2.45	0.98	4.50	1.10	5.43	1.60	7.36	2.12	9.69	2.71	12.14
CARBON DIOXIDE -CO_2 CONTENT	[%] ±0.2	8.7	9.2	8.7	9.1	8.6	9.1	8.6	8.8	8.7	9.1	8.5	8.7
OXYGEN	[%] ±0.4	5.0	4.1	5.0	4.2	5.2	4.2	5.2	4.8	5.0	4.2	5.3	5.0
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26	70	28	80
GAS ORIFICE PLATE	[mm]	8.3		11.4		10.3		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		30.5		Not required	
* Maximum rated heat output 57 kW ** Maximum rated heat output 75 kW *** Maximum nominal heat output 94 kW													

TYPE OF GAS G30 - Cat. 3B-P*													
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065		PCH080**		PCH105***	
Output		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
SUPPLY PRESSURE	[mbar]	30 [min 25-max 35] - 37 [min 25-max 45] - 50 [min 42.5-max 57.5]											
PILOT NOZZLE Ø	[mm]	0.51											
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	0.37	1.50	0.60	2.75	0.67	3.31	1.42	5.13	1.89	6.47	1.66	7.89
CARBON DIOXIDE -CO_2 CONTENT	[%] ±0.2	10.8	11.4	10.8	11.5	10.8	10.9	10.7	11.3	10.1	10.3	10.4	10.6
OXYGEN	[%] ±0.4	4.8	3.9	4.8	3.8	4.8	4.7	5.0	4.1	5.9	5.6	5.4	5.1
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26	70	28	80
GAS ORIFICE PLATE	[mm]	3.2		4.4		5.2		6.5		7.0		9.3	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	
* Change of CPU board parameters b1-b2 required:													
	Par. b1	165		183		120		130		135		110	
	Par. b2	580		610		540		555		560		490	
** Minimum rated heat output 18 kW *** Minimum rated heat output 24 kW													

TYPE OF GAS G31 - Cat. 3P													
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105	
Output		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
SUPPLY PRESSURE	[mbar]	30 [min 25-max 35] - 37 [min 25-max 45] - 50 [min 42.5-max 57.5]											
PILOT NOZZLE Ø	[mm]	0.51											
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	0.37	1.48	0.59	2.71	0.66	3.26	0.96	5.05	1.27	6.37	1.63	7.77
CARBON DIOXIDE -CO_2 CONTENT	[%] ±0.2	9.3	9.8	9.2	9.7	9.3	9.4	9.4	9.6	9.3	9.6	9.5	9.8
OXYGEN	[%] ±0.4	6.7	6.0	6.9	6.1	6.7	6.6	6.6	6.3	6.7	6.3	6.4	6.0
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26	70	28	80
FLUE GAS MASS FLOW RATE (MAX.)	[kg/h]	38.80		71.55		87.65		134.18		169.27		204.19	
GAS ORIFICE PLATE	[mm]	3.2		4.4		5.2		6.5		7.0		9.3	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	

5.12. Commissioning (First start-up)

The PCH heater module is supplied already set up and tested for the gas specified on the nameplate. Before turning on the PCH module check the following:

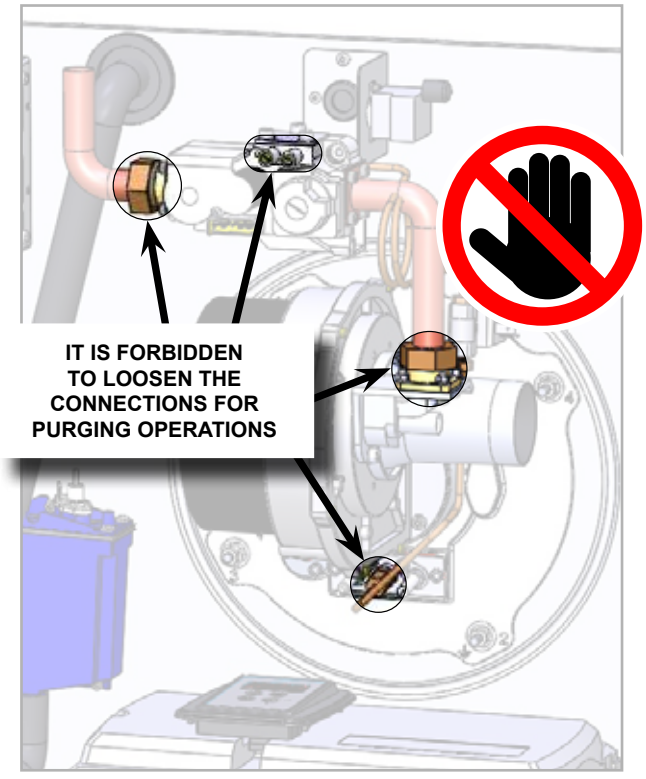
- make sure the gas being supplied matches the gas for which the PCH has been set up;
- check, with the pressure intake "IN" on the gas valve, that the valve input pressure corresponds to that required for the type of gas being used;
- check that electrical connections correspond to those indicated in 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;
- insert the power plug into the PCH compartment and energise the heater via the machine's main switch.

To turn on the heater, follow the instructions below:

- Check that the display shows "rOF", if "OFF" is displayed instead, work on the control, under "Fun", and set the device to "Aut";
- Check that the "An1" value is higher than "the "Von"="R42"+"R43" value on the LCD display.

When "HEA" appears on the LCD display, the heater starts the ignition cycle.

Sometimes, when turned on for the first time, the 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 (for unlocking operations use the buttons on the LCD display).



IT IS FORBIDDEN to loosen the gas connections, the pressure connectors, the pilot burner duct, or any other gas connection point located inside the burner housing, to purge the air or inert gas that may be present inside the main feeding piping. The purging of air or inert gas from gas feeding lines must be carried out in accordance with current legislation.

Always carry out a flue gas analysis after commissioning the heater, as described in Paragraph 5.12.1 "Burner adjustment".

5.12.1. Burner adjustment

Wait until the heater is switched on. Check that the heater is running at maximum power, as follows:

- check that An1 input signal is equal to 10 V;
- from the LCD display, access the REG menu and use the Hi and Lo controls to force operation at maximum or minimum output (even if the CPU address switch is different from 0).

At maximum output, verify that the inlet pressure at the gas valve (*Figure A*) and the CO_2 concentration are consistent with the values in the tables in Paragraph 5.11 “Gas settings tables”, according to the type of gas used.
If the pressure value differs, perform the adjustment upstream of the heater.
If the CO_2 value differs, work the adjusting screw on the Venturi pipe (*Figure B*). Loosening the screw will increase the CO_2 value, screwing it down will decrease the value.
Set the heater to minimum output and verify that the CO_2 level corresponds to the values in the tables in Paragraph 5.11 "Gas settings table", according to the type of gas used. If the values do not match, turn the offset screw (*Figure A*), screwing it (clockwise) to increase the CO_2 % value or unscrewing it (anti-clockwise) to decrease the CO_2 value.

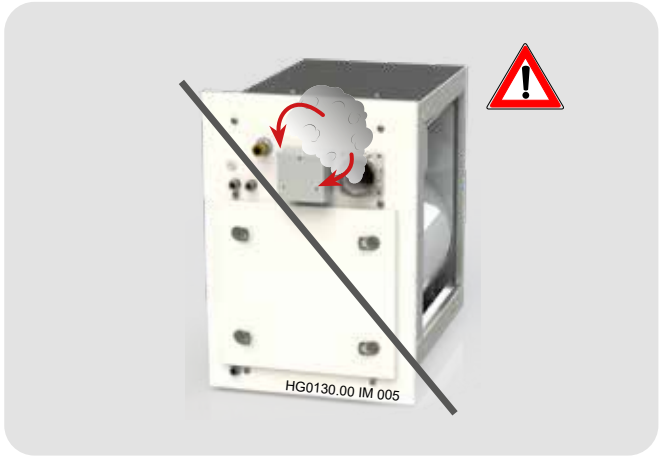
The offset screw is millimetre-accurate, please act gently on it to avoid altering the valve calibration.

Repeat the adjustment. Finally, check that there are no leaks of combustion products (CO, CO_2) in accordance with the methods indicated above and within the limits indicated in the technical data and gas settings tables, contained within this manual, and in accordance with the local regulations in force in the country of installation.

NOTE: All measurements must be performed at least three times, at intervals of no less than 1 minute, under steady-state conditions (thermal equilibrium), i.e., when the combustion product temperature is substantially constant (variation of ± 2°C and in any case for at least 5 minutes) and with no recirculation of combustion products into the environment. In the case of common flues, the steady state is considered to have been reached after at least 10 minutes of operation.

To allow proper analysis of combustion and avoid flue gas recirculation through the combustion air intake duct, it is recommended to always build a short section of chimney, even in case of installations on the roof.

WRONG



CORRECT

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_2 as shown in the tables in Paragraph 5.11 "Gas settings table".

Figure A - **GAS Valve**

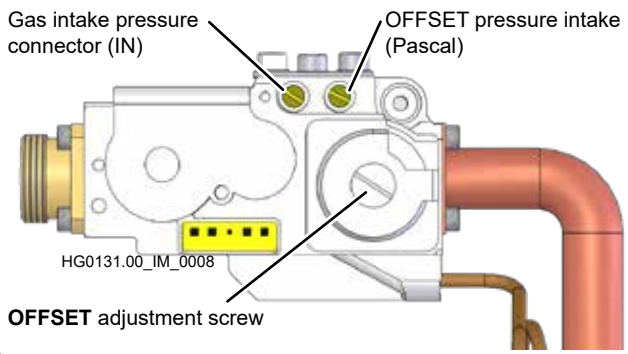
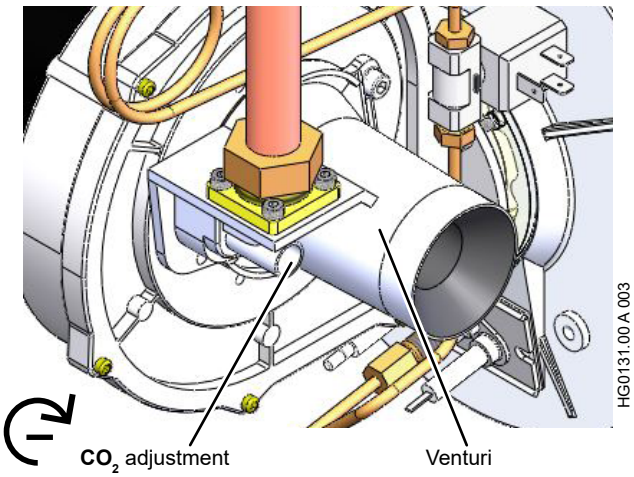
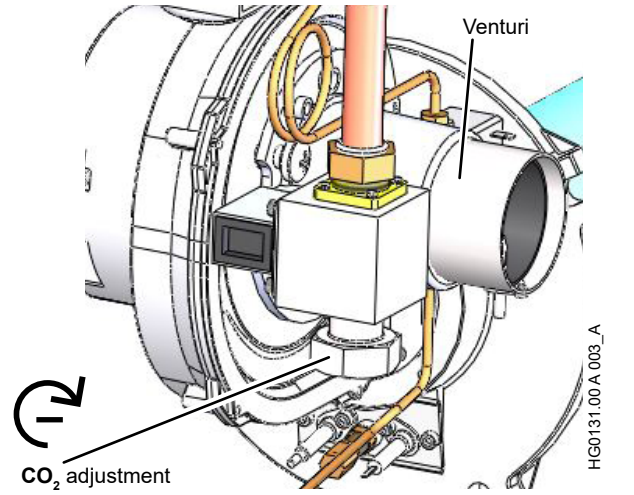


Figure B - **CO_2 adjustment**

Models:
PCH020, PCH034, PCH045, PCH065, PCH080



Models:
PCH105



5.13. GAS conversion

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

Conversion from one type of gas to another can only be performed by authorised service centres.
The appliance is supplied as standard configured for natural gas (G20 Cat E-H). Depending on the country of destination, a gas conversion kit for that country is supplied as standard [see Paragraph 5.10 "Country Table - Gas Category"].
The kit is not supplied in countries where conversion is prohibited.

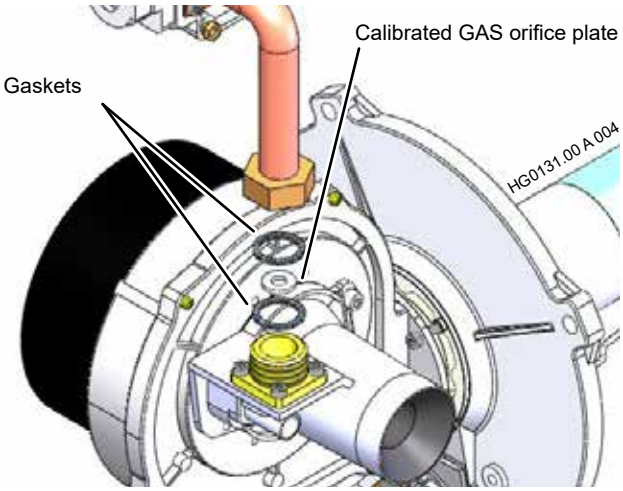
The kit consists of:
- calibrated gas orifice plate;
- pilot nozzle (depending on gas type);
- air orifice plate (if applicable);
- adhesive plate "Equipment converted for...".

To convert the unit, follow these instructions:

1. disconnect the power supply;
2. replace the fitted gas orifice plate, positioned between the gas pipe and the Venturi pipe (*Figure C*), with the specific one supplied [see tables in Paragraph 5.11 "Gas settings table"];
3. replace the pilot nozzle (*Figure D*) with the specific nozzle supplied (if necessary, depending on the type of gas) [see tables in Paragraph 5.11 "Gas settings table"];
4. fit the calibrated air orifice plate to the air inlet of the Venturi pipe (*Figure E*) (if necessary, depending on the appliance model) [see tables in Paragraph 5.11 "Gas settings table"].
5. restore power supply and set the heater up for ignition;
6. while the start-up electrode is sparking, make sure there are no gas leaks.
7. **perform a flue gas analysis as described in Paragraph 5.12.1 "Burner adjustment";**
8. replace the nameplate indicating "Equipment regulated for natural gas" with the one in the kit that indicates "Equipment converted for...".

Figure C - **GAS orifice plate**

Models:
PCH020, PCH034, PCH045, PCH065, PCH080



Models:
PCH105

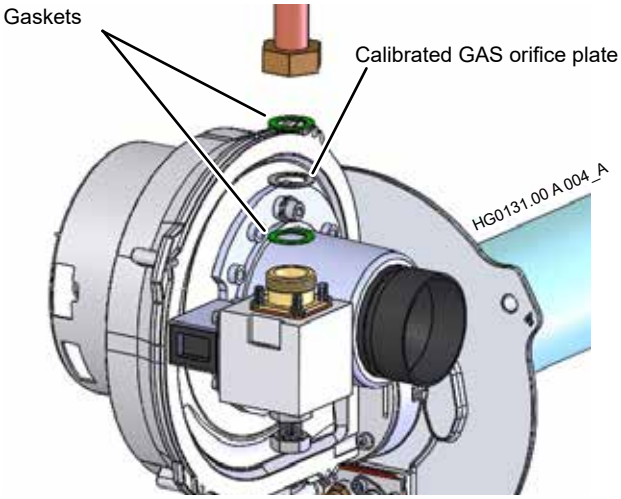


Figure D - **Pilot Nozzle**

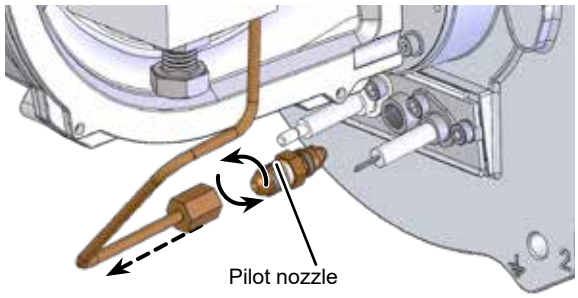
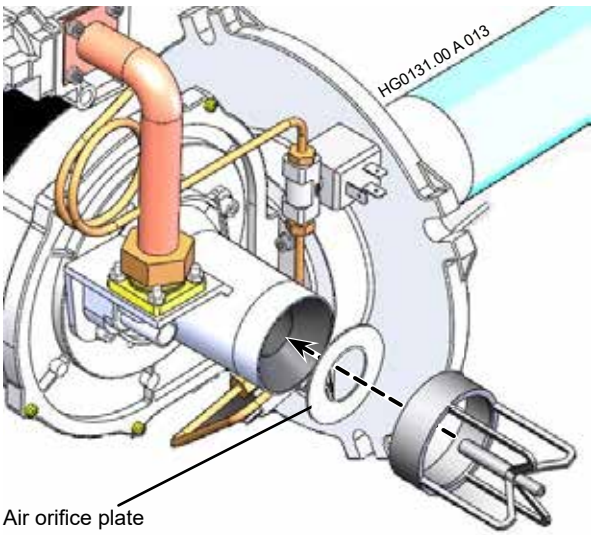


Figure E - **AIR orifice plate**



5.13.1. Conversion to LPG

The unit is supplied as standard with the kit for conversion to LPG. The kit for conversion to LPG is not supplied in countries where conversion is prohibited.

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

For conversion to LPG gas, where possible, proceed as indicated in Paragraph 5.14 "GAS Conversion".

5.13.2. Conversion to gas G25 - G25.1 - G25.3 - G27

The conversion kit to G25 , G25.1 and G27 is only supplied on request. The conversion kit to G25 is included in the standard supply for France, Germany and Luxembourg.

Conversion for gasses from G20 to G25 or G25.1 or G25.3 or G27 is allowed only in countries of category II2ELL3B/P [Germany], II2Esi3P [France], II2E3P [Luxembourg] and category II2HS3B/P [Hungary] and category II2ELwLs3B/P [Poland]. For countries in category II2EK3B/P [Netherlands] the unit is supplied already set up and regulated for G25 or G25.3.
For category I2E countries, where conversion from G20 to G25 is not permitted [Belgium], the unit is supplied set for operation with G20 gas.
For conversion to gas G25 or G25.1 or G25.3 or G27, where possible, proceed as indicated in Paragraph 5.14 "GAS Conversion".

Always pay close attention to the level of CO_2 in G25.1; for G25.1 minimum and maximum heat output in the PCH105 model will always be lower than when used with G20.

5.13.3. Conversion to gas G2.350

The conversion kit is supplied on request

Conversion is allowed only for Poland.

For conversion to gas G2.350, where possible, proceed as indicated in Paragraph 5.14 "GAS Conversion".

The minimum and maximum heat outputs of models PCH065, PCH130 and PCH132 are lower with respect to the operation with G20. Models PCH080, PCH105, PCH160, PCH162, PCH210, PCH212, PCH320, PCH420 are not suitable for operation with gas G2.350.

5.14. Replacing the Gas Valve

Should it become necessary to replace the gas valve, after replacement, the CO2 content must be checked and, if necessary, calibrated by means of the regulator on the Venturi pipe (Figure B - previous pages), following the instructions in Paragraph 5.12.1 "Burner adjustment".

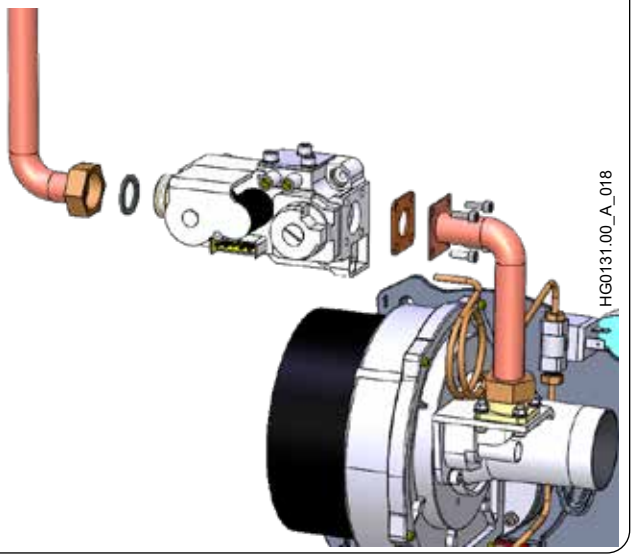
Proceed as follows to replace the gas valve:
1. disconnect the power supply;
2. loosen the gas connections, taking care not to lose the calibrated gas orifice plate (*Figure C*);
3. replace the valve and all interface gaskets (*Figure F*);
4. restore power supply and set the heater up for ignition;
5. while the start-up electrode is sparking, make sure there are no gas leaks.

7. After replacement of the gas valve, always carry out a flue gas analysis, as described in Paragraph 5.12.1 "Burner adjustment".

Whenever the gas valve and/or parts thereof are replaced, all gaskets concerned must be replaced.

To ensure proper sealing of the gaskets, connections to the valve must be tightened to a torque between:
minimum 30 Nm
maximum 50 Nm.

Figure F **- GAS Valve replacement**



5.15. CPU modulation PCB replacement

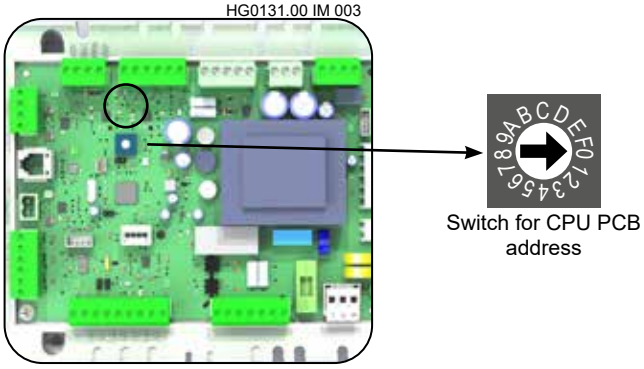
When replacing the CPU modulation PCB, it is required to carry out some essential operations, described below.

1. Disconnect voltage to the module
2. Disconnect all terminals from the CPU PCB
3. Remove and store the **EEPROM** memory card
4. Disconnect the TER safety PCB
5. Remove and replace the CPU modulation PCB
6. Position the new CPU PCB, insert the previously stored EEPROM memory card (point 3)

(**The EEPROM card contains all the configured parameters, by inserting it into the new CPU, it is not necessary to reprogram the parameters**)

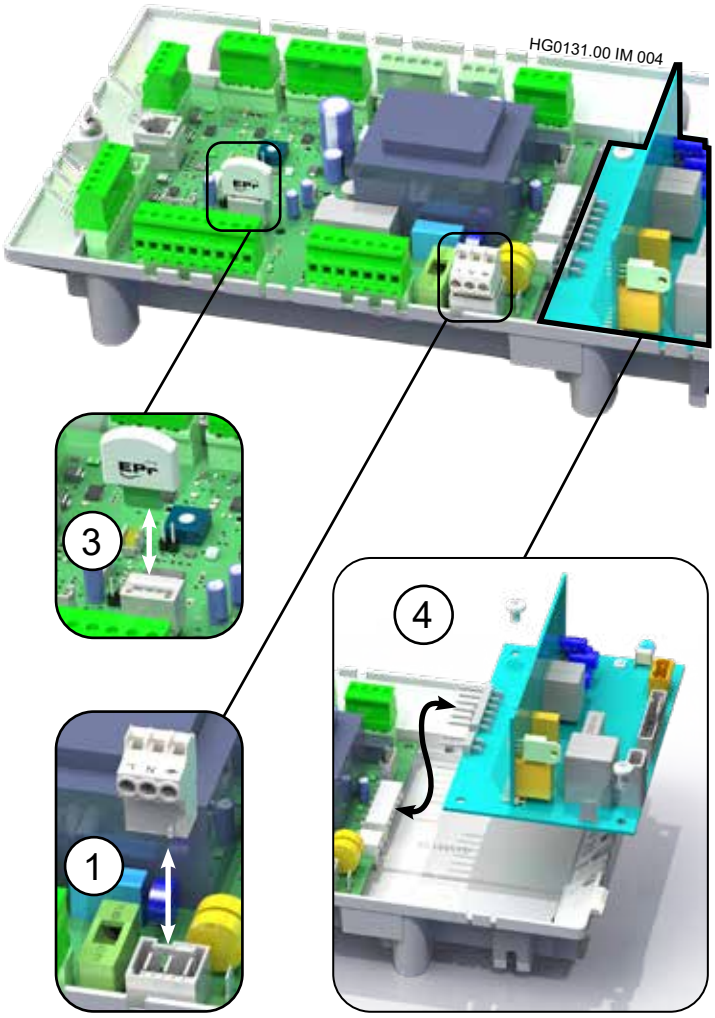
7. Reconnect the TER safety PCB and all terminals respecting the original positions.

HG0131.00 IM 003



8. Check the hardware configuration of the CPU PCB (Modify the address of the PCB with the switch selector, copying that of the CPU board replaced)
9 Switch the module back on
10 To ensure energy efficiency, perform a combustion analysis procedure as indicated in Paragraph 5.13 “Analysis of combustion”.

HG0131.00 IM 004



6. MAINTENANCE

Maintenance and periodic inspections must be carried out in compliance with current regulations and according to local standards and only by authorised personnel with specific expertise.
To keep the heater efficient and guarantee a long lifetime of the same, it is still necessary to perform the following checks at regular intervals:

1) check the ionisation current
2) check the condition of ignition/detection electrodes and pilot flame;
3) check and clean the exchanger and burner;
4) check the condition of the Venturi pipe;
5) check the inlet pressure at the gas valve;
6) check the flame monitoring equipment;
7) check the safety thermostat(s);
8) check the condition of flue ducts, seals, flue exhaust and air intake terminals;
9) check and clean the water trap;
10) check electrical wiring and gas pipes;
11) combustion analysis;
12) check and clean the burner compartment.

At the end of any maintenance work, the heater must always be commissioned.

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

Maintenance interval chart

Maintenance	every 1 year	Extraordinary
1) Ionization current	●	
2) Ignition electrode *Detection electrode* *Pilot flame*	●	
3) Exchanger/Burner		
Inspection	●	
Cleaning		●
4) Venturi pipes	●	
5) Gas valve	●	
6) Flame Equipment	●	
7) Safety thermostat(s)	●	
8) Flue gas / Air Terminals / Seals	●	
9) Condensate collection tray and trap	●	
10) Check of electrical wiring and gas pipes	●	
11) Combustion Analysis	●	
12) Burner compartment cleaning	●	

1) Inspection of the ionization current
The operation can be carried out directly from the LCD display, by entering the Out menu, with the burner ignited. The parameter IOn indicates the value of the ionisation current as follows:

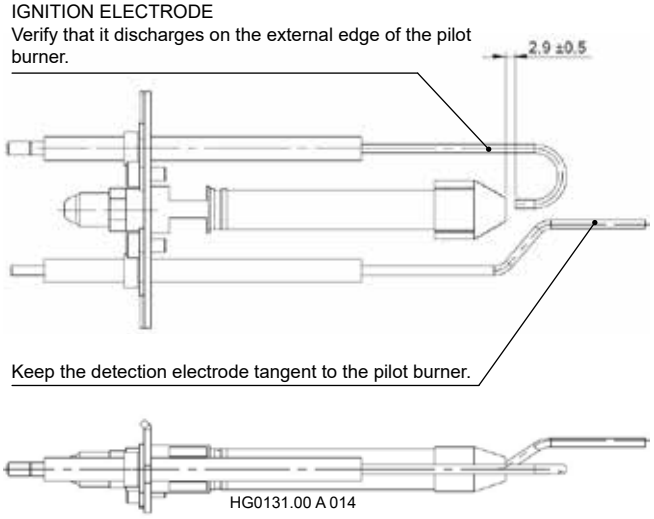
- 100, indicates that the value is more than 2 microAmperes, which is plenty for the equipment to function;
- from 0 to 100, indicates a value from 0 to 2 microAmperes; for example, 35 corresponds to 0.7 microAmperes, which is the minimum threshold detectable for the flame monitoring equipment.

The ionisation current value must not be less than 2 microAmps, lower values indicate that the detection electrode is poorly positioned, oxidised or about to stop functioning.

2) Inspection of the condition of ignition and detection electrodes and of the pilot flame
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 (as shown below). IT IS important that the DETECTION electrode is tangent to the pilot head and not facing inwards. The IGNITION electrode must discharge the spark to the pilot burner grid.

Every time you clean and check the ignition and/or detection electrodes or the pilot flame in general, it is necessary to replace all the gaskets fitted between the burner and the pilot flame.

To ensure a correct sealing of gaskets, the screws of pilot flame unit must be tightened to a torque of 1.5 Nm (-0 / +0.5 Nm).



3) Inspection and cleaning of exchanger and burner
Good combustion in PCH heaters prevents dirt, which is normally caused by bad combustion. Visually check the integrity of the exchanger annually (holes, cracks or signs of sagging or deformation) and clean it or clean the burner, only if necessary.
An accumulation of dirt inside the exchanger could be revealed by a considerable variation in the gas capacity that is not caused by improper functioning of the gas valve.
If it is necessary to clean the exchanger and/or burner, remove the latter by unscrewing the tightening nuts, clean with compressed air, and check the integrity and positioning of the ignition/ detection electrodes (point "2" in this list). Replace all gaskets fitted between the burner and the exchanger. Re-tighten the nuts according to the numbering on the burner plate.

Every time the burner or parts of it (e.g.: electrodes, pilot, peep-hole, flue fan) are removed, it is necessary to replace all the gaskets involved.

To ensure a correct sealing of gaskets, the nuts of burner flange must be tightened to a torque of 8 Nm (-0 / +1 Nm).

Whenever the burner, or parts of it (e.g. electrodes, pilot, peep-hole, flue fan) are removed, a flue gas analysis must always be carried out, as described in Paragraph 5.12.1 "Burner adjustment".

4) Inspection and cleaning of the Venturi pipe
Use a brush to remove any dirt from the Venturi pipe, taking care not to let it fall inside the Venturi pipe itself.

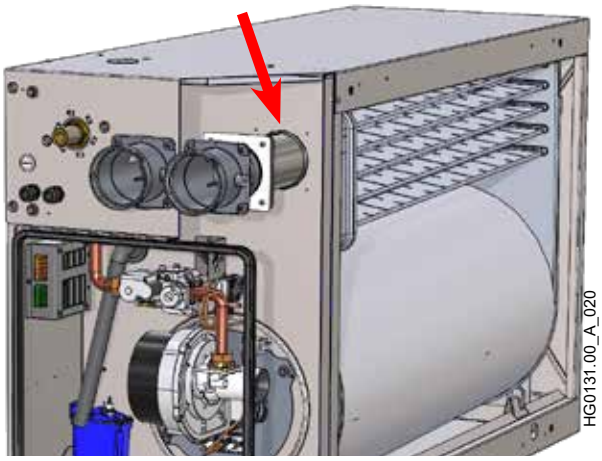
5) Inspection of gas valve inlet pressure
Check that the inlet pressure at the gas valve is in accordance with Paragraph 5.11 "Gas settings table", depending on the type of gas used.
This verification must be done with the heater on at the maximum heat capacity.

6) Inspection of flame monitoring equipment
This procedure must be done with the heater on and the burner lit.
Close the gas valve and check that the heater goes into the lockout status, indicated on the LCD display, of the CPU PCB on board the machine, with E10.
Reopen the gas valve, reset the heater and wait for the burner to restart.

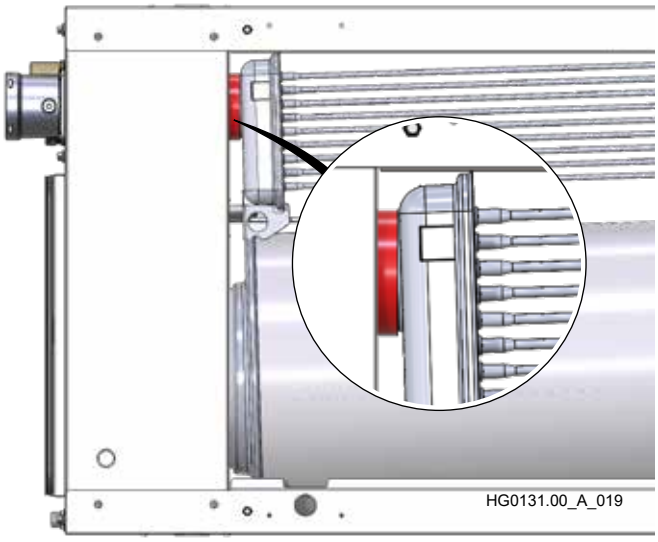
7) Inspection of the safety thermostat(s)
This procedure must be done with the heater on and the burner lit.
Open, with an insulated tool [**danger 230 V**], the thermostat series, disconnecting the fast-on from the safety thermostat and check that the heater goes into the lockout status, waiting for the E20 lockout signal to appear on the LCD display of the CPU board on the machine.
Close, with insulated tool [**danger 230 V**], the thermostat series, and then reset the heater.

The operations described in this section must be carried out with suitable equipment, by qualified and experienced personnel. High-voltage danger (230 V).

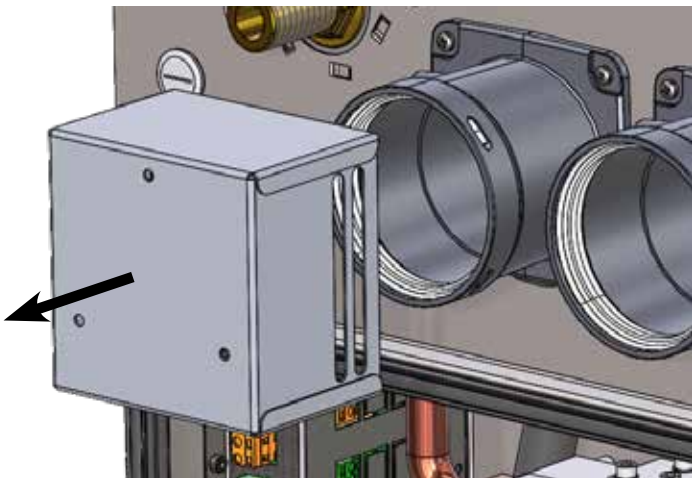
8) Inspection of the condition of flue exhaust and air intake ducts and seals
Visually inspect, where possible, or use specific tools to check the status of the ducts.
Check the condition and correct positioning of the flue duct seals and replace them if necessary.
Check the condition and correct positioning of the cylindrical gasket connecting the exchanger with the flue duct inside the burner compartment.
The gasket is visible, from inside the burner compartment, by removing the flue duct closing flange, without removing the duct itself



and from the outside, between the panel of the compartment and the heater.
If necessary, replace it from inside the compartment, after removing the flue duct.



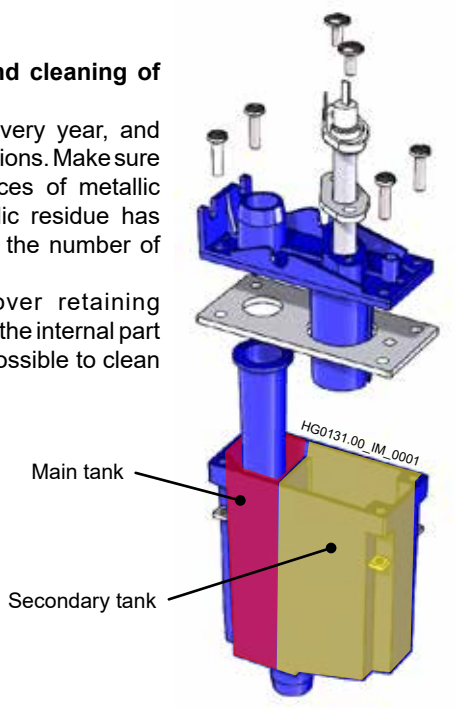
Clean the combustion air intake terminal, removing any dust that may have formed inside it.



9) Inspection and cleaning of the water 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.

Remove the cover retaining screws and clean the internal part of the trap (it is possible to clean the trap under running water) by checking that all ducts are free. Check the integrity of the detection electrode and use sandpaper to remove any oxidation on the metal part. Proceed to replace the gaskets. Fill in the main tank with clean water and close the cover. Reconnect the trap to the condensate drain system.



Every time the condensate drain trap or parts of it (e.g.: electrodes) are cleaned, it is necessary to replace all the gaskets involved.

11) Flue gas analysis (CO, CO_2)

Carry out the flue gas analysis according to Paragraph 5.12.1 "Burner adjustment" and within the limits indicated in the tables in Paragraph 3. "Technical Data" and in accordance with the tables in Paragraph 5.11 "Gas settings table", depending on the type of gas used, according to local regulations, at a minimum obligatory annual frequency, or:

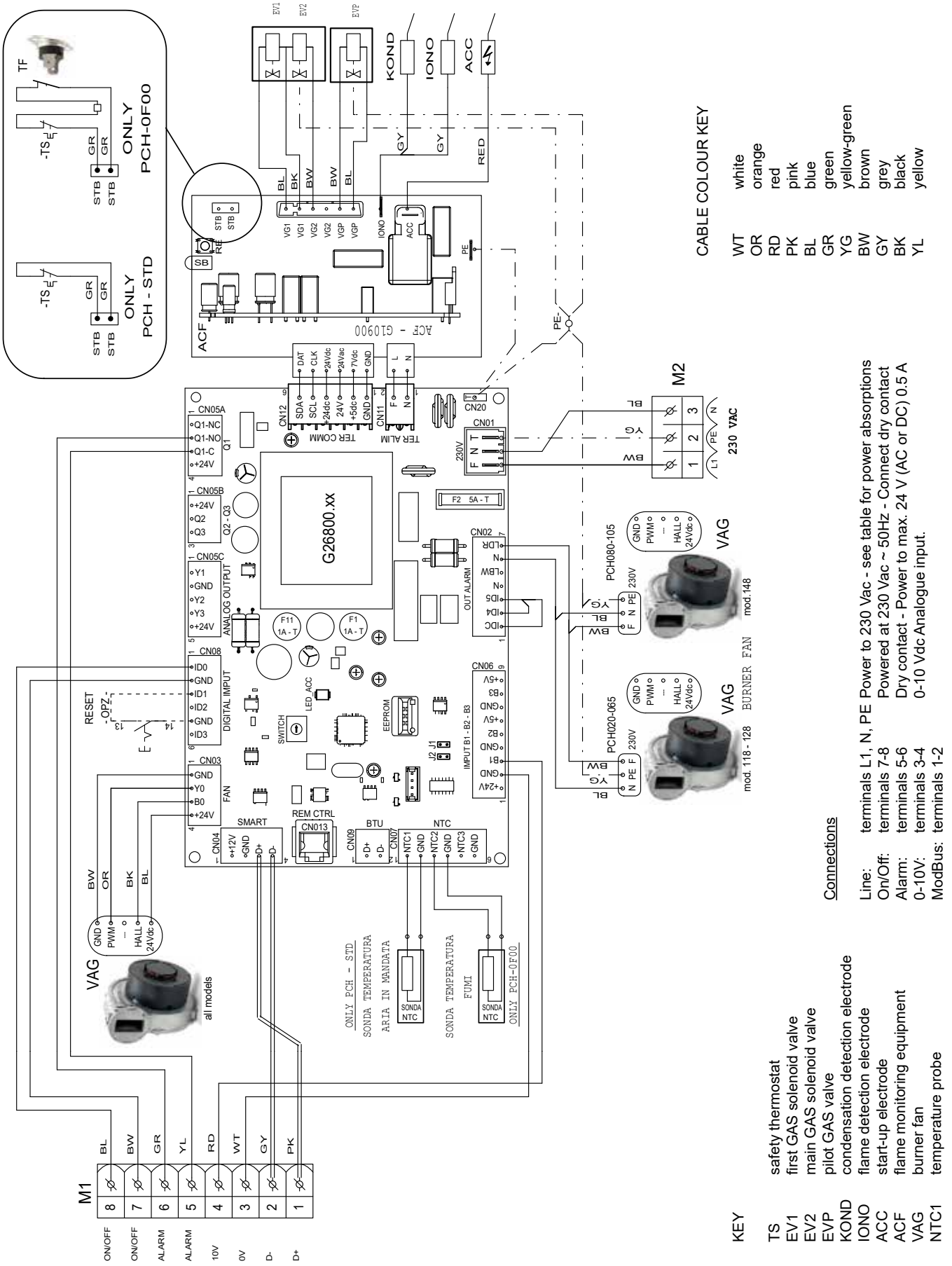
- with higher frequencies, depending on local regulations in the country of installation;
- in the event of replacement of components and/or operations described in the previous paragraphs [see list in Paragraph 6. "Maintenance"].

12) Inspection and cleaning of the burner compartment

Check and clean the inside of the burner compartment, removing any traces of dirt, insects or any other foreign bodies inside.
A burner compartment in poor condition could cause a change in combustion parameters and/or damage to the various components inside the compartment.

7. WIRING DIAGRAM

Single PCH wiring diagram: PCH020 - PCH105 (code JG0386.01)



CABLE COLOUR KEY

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

KEY

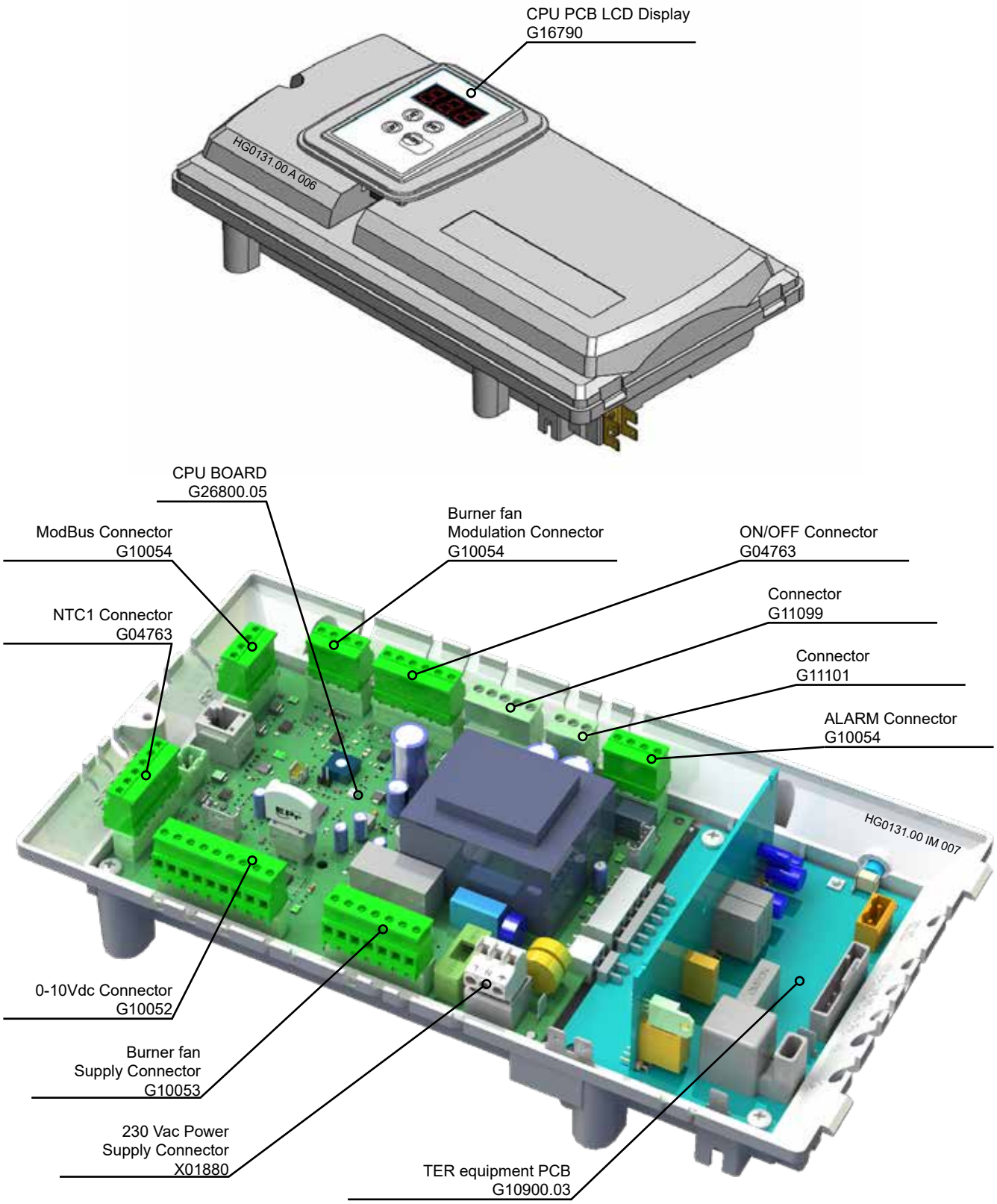
TS	safety thermostat
EV1	first GAS solenoid valve
EV2	main GAS solenoid valve
EVP	pilot GAS valve
KOND	condensation detection electrode
IONO	flame detection electrode
ACC	start-up electrode
ACF	flame monitoring equipment
VAG	burner fan
NTC1	temperature probe

Connections

Line:	terminals L1, N, PE Power to 230 Vac - see table for power absorptions
On/Off:	terminals 7-8 Powered at 230 Vac ~ 50Hz - Connect dry contact
Alarm:	terminals 5-6 Dry contact - Power to max. 24 V (AC or DC) 0.5 A
0-10V:	terminals 3-4 0-10 Vdc Analogue input.
ModBus:	terminals 1-2

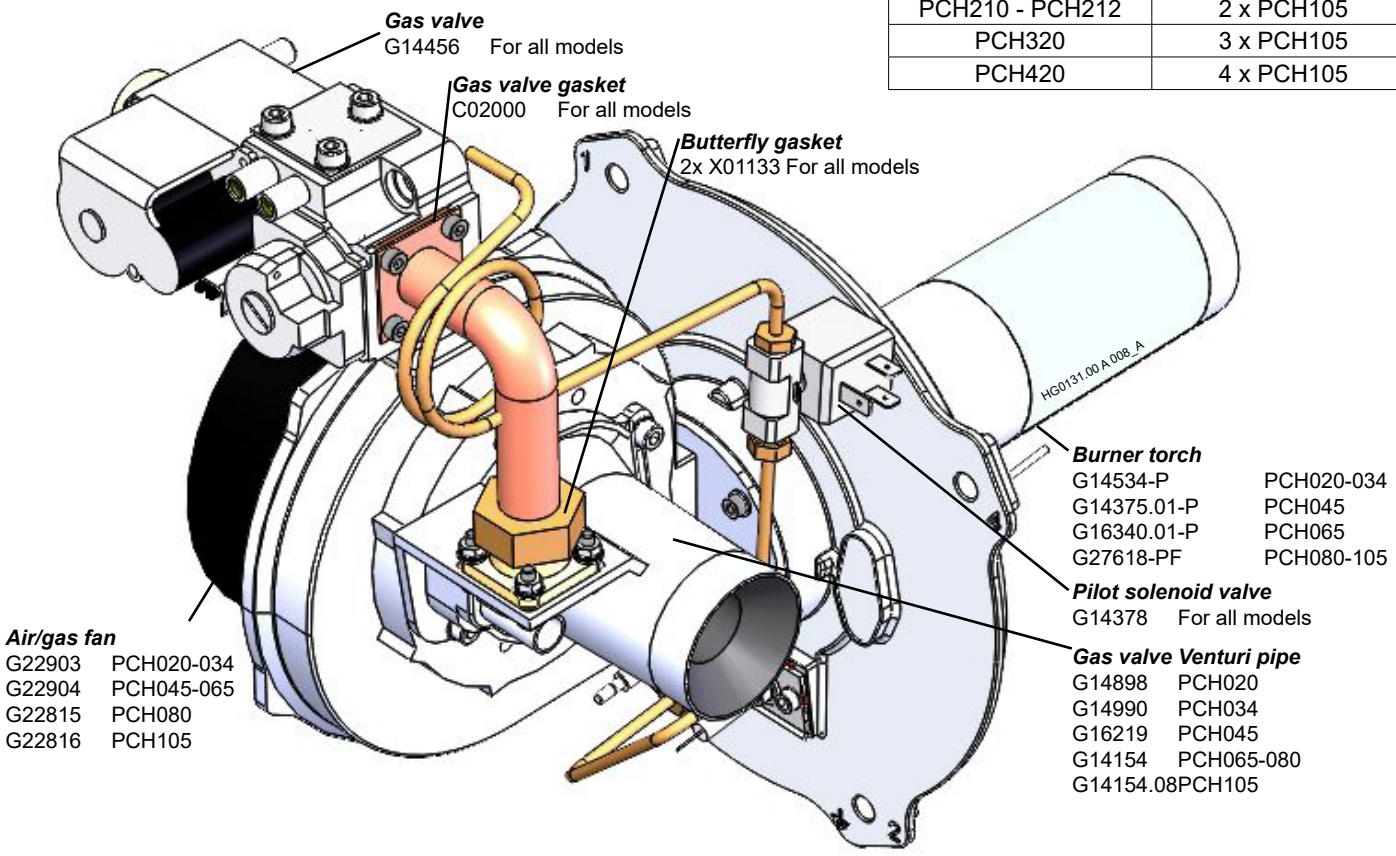
8. LIST OF SPARE PARTS

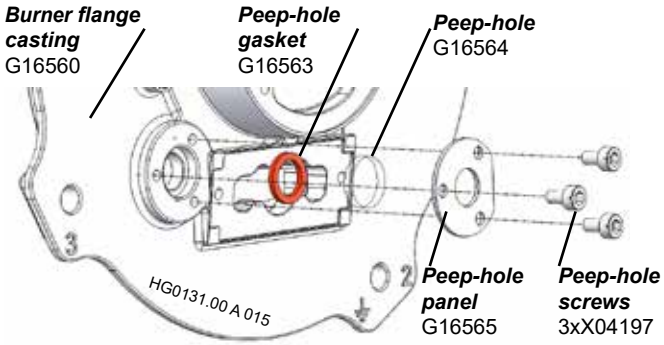
8.1. Parts for the control panel

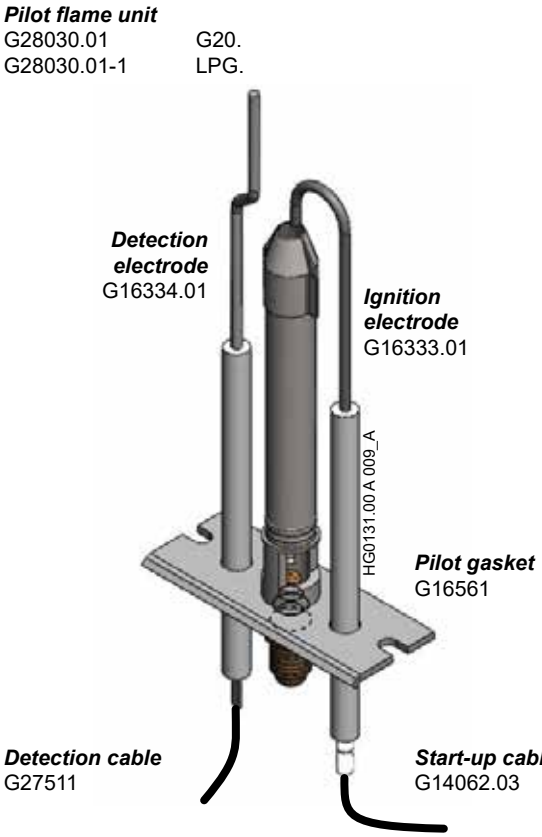


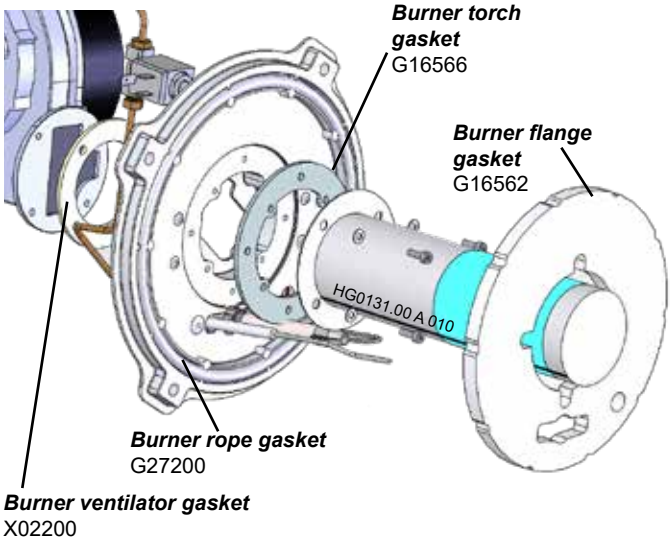
PCH Model	Module
PCH130 - PCH132	2 x PCH065
PCH160 - PCH162	2 x PCH080
PCH210 - PCH212	2 x PCH105
PCH320	3 x PCH105
PCH420	4 x PCH105

8.2. Parts for the burner unit









8.3. Other spare parts available

Flue gas drainage casting
G11300-F00

Exhaust casting
G11300-A00

Round gasket
X01967

Type "B" terminal
G28814

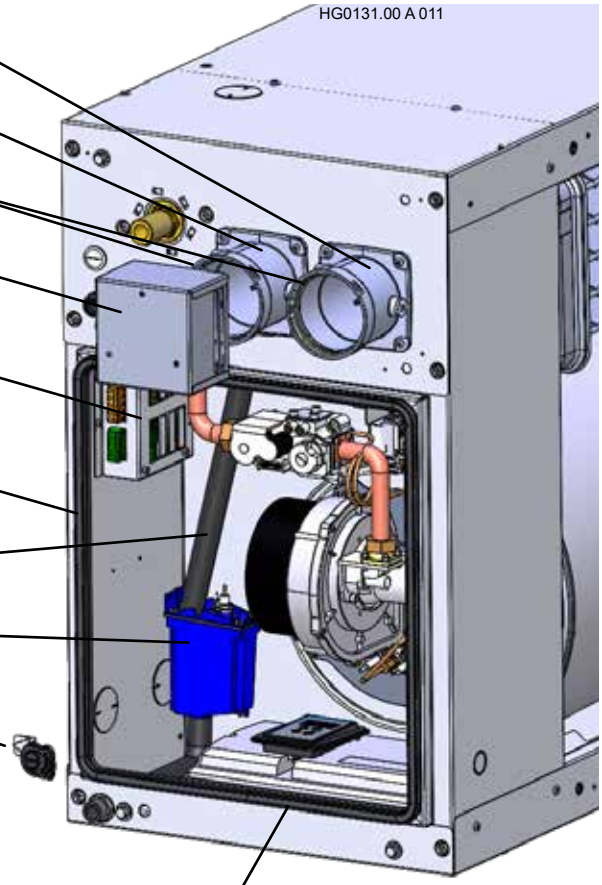
Terminal board
G28892 PCH020-105
PCH130-210
PCH132-212
G28894 PCH320-420

Housing black seal
X01495

Condensate drain pipe
G27576 For all models

Trap
C09385 For all models

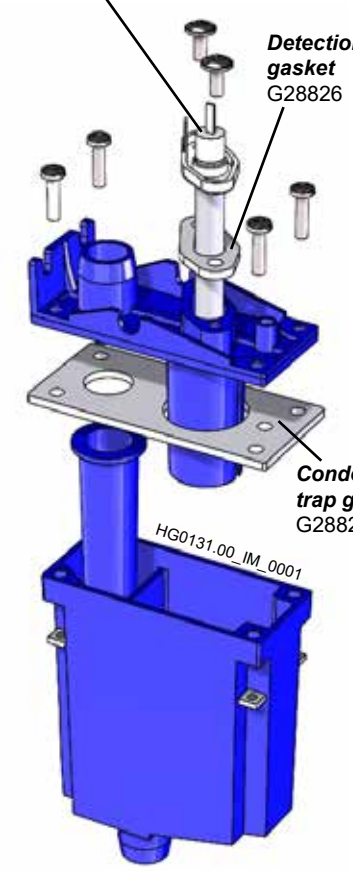
Door closure
X04511



CPU PCB Unit
G28301.13 PCH020-065
G28302.13 PCH080-105

Condensation detection electrode
G27806

Detection electrode gasket
G28826



Condensate trap gasket
G28827.02

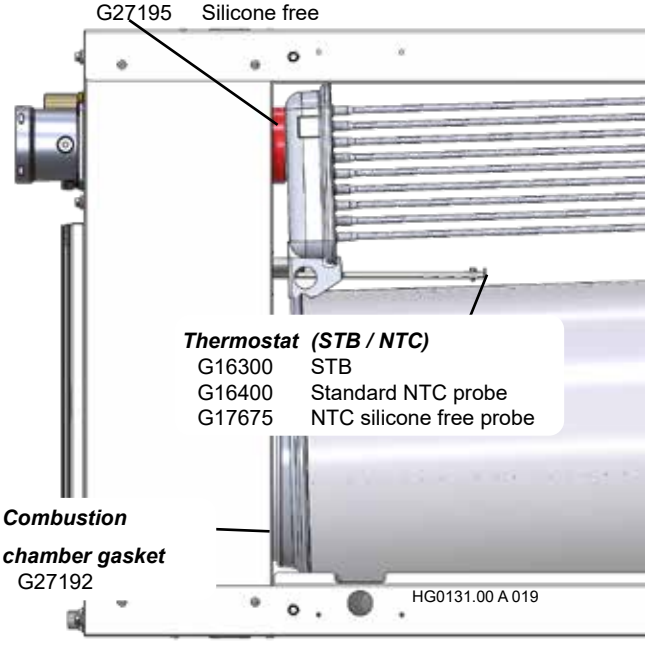
Water trap complete with electrode for condensation detection
C09385.01

Remote control (OPTIONAL)
Smart X Web G29700
Smart X Easy G29500

Round gasket
G27194 Standard
G27195 Silicone free

Thermostat (STB / NTC)
G16300 STB
G16400 Standard NTC probe
G17675 NTC silicone free probe

Combustion chamber gasket
G27192



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