ApenGroup®
aermaxline

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

ErP
2021
Compliant
EU/2016/2281

CE

VER. 00.00.2017

Dichiarazione di Conformità
Statement of Compliance

CE

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

Modello: ***Model:***	**Generatore d'aria calda: a due stadi PRH e modulante a condensazione PCH** ***Warm Air Heater: PRH two stages and 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/CE**
  Gas Appliance Regulation 2016/426/CE
- **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 2016/2281/UE**
  ErP Regulation 2016/2281/UE

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

- **EN1020:2009**
- **EN 1196:2011 (only PCH)**
- **EN60335-1**
- **EN60335-2-102**
- **EN60730-1 (only PCH)**
- **EN 60068-2-1 (only PCH)**
- **EN 60068-2-2 (only PCH)**
- **EN55014-1**
- **EN55014-2**
- **EN61000-3-2**
- **EN61000-3-3**

Organismo Notificato:
Notified body:

Kiwa Cermet Italia S.p.A
0476
PIN 0476CQ0451

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
05/02/2018

Apen Group S.p.A.
Un Amministratore

CODE SERIAL NUMBER

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1. GENERAL CAUTIONS

This manual is an integral part of the product and must always accompany it.
Should the equipment be sold or passed on to someone else, always make sure that this manual is supplied with the equipment for future reference by the new owner and/or installer.
The manufacturer shall not be held civilly or criminally responsible for injuries to people or animals or damages to things caused by incorrect installation, calibration and maintenance or by failure to follow the instructions contained in this manual or by operations carried out by unqualified staff.
This product must be used only for the applications for which it was designed or approved. Any other use must be regarded as hazardous.
During the installation, operation and maintenance of the equipment described in this manual, the user must always strictly follow the instructions given in all the chapters of this use and instruction manual.

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

Conversion between different types of gas and maintenance operations must be carried out before being switched on, and only by suitably qualified staff. **Technical Service Centres certified by current and older standards** prevailing in the installation country and in compliance with the issued authorisation.

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 fuel intake internal and external seal is checked during the testing stage, as required by applicable standards;
- the heater is supplied with the same type of fuel it has been designed for;
- the system is correctly sized for such flow rate and is fitted with all safety and monitoring devices required by applicable standards;
- the inside of the gas pipes and air distribution ducts for ducted heaters has been thoroughly cleaned;
- the fuel flow rate is suitable for the power required by the heater;
- the fuel supply pressure is between the range specified on the nameplate.

2.2. Gas Leaks

If you smell gas:
- do not operate electrical switches, telephones or any other object or device that could produce sparks;
- immediately open doors and windows to create an air flow to vent the gas out of the room;
- close the gas valves;
- call for **qualified staff.**

NOTE: supplying the gas circuit with pressure greater than 60 mbar is strictly prohibited.

Such pressures could cause the valve to break.

2.3. Power supply

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

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.

NOTE: It is compulsory to install, upstream of the power cable, a fused multi-pole switch with contact opening wider than 3mm.
The switch must be visible, accessible and less than 3m away from the control board.
All electrical operations (installation and maintenance) must be carried out by qualified staff.

2.4. 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.

2.5. Maintenance

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

Before carrying out any cleaning and maintenance operations, isolate the unit from the mains power supply using the switch located on the electrical system and/or on the shut-off devices. If the heater is faulty and/or incorrectly operating, switch it off and do not attempt to repair it yourself, but contact 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 equipment is not used for long periods, shut the gas supply off through the gas stopcock and disconnect it from the power supply. If the heater is to be put out of service, in addition to the above operations, potential sources of hazard on the unit must be 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.

2.6. Transport and handling

The heater is delivered fastened to a pallet and covered with a suitably secured cardboard box.
Unload the heater from the truck and move it to the site of installation by using means of transport suitable for the shape of the load and for the weight. If the unit is stored at the customer's premises, make sure a suitable place is selected, sheltered from rain and from excessive humidity, for the shortest possible time. Any lifting and transport operations must be carried out by skilled staff, adequately trained and informed on the working procedures and safety regulations. Once the equipment is moved to the correct position, the unpacking operation can be started. 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 or unloading.

2.7. Dismantling and demolition

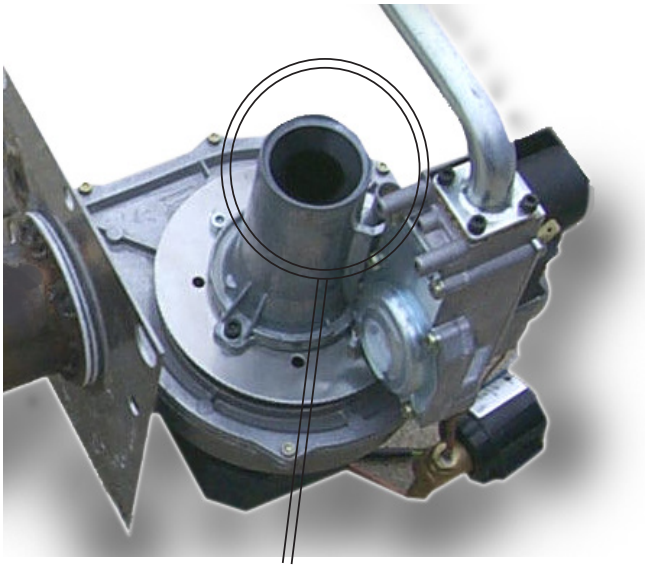
Should the machine be dismantled or demolished, the person in charge with the operation will have to:

- remove the electric wiring
- remove all plastic parts

-**NOTE: 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.**

2.8. Installation

The LK and LP 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/m3, annual average lower than 30 mg/m3;
• Combustion air must not contain chlorine, ammonia or alkalis; installation near swimming pools or laundries exposes the boiler to the effects of such agents.



DO NOT COVER IT WITH YOUR HAND OR OTHER OBJECTS!

3. TECHNICAL DATA

There are 3 configurations of PRH/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 - B53P - C13 - C43 - C53 - C63 - C83											
CE 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)	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}]*	%	104.63	95.68	106.97	96.30	105.50	96.30	108.06	96.82	108.35	97.60	108.40	97.15
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	
Envelope loss factor [F_{env}]* (1)	%	0%		0%		0%		0%		0%		0%	
Seasonal space heating energy efficiency [Reg.EU/2281/2016] [$\eta_{s,h}$]*	%	90.5		92.1		90.8		93.2		93.2		93.1	
Emission efficiency [Reg.EU/2281/2016] [η_{sflow}]*	%	97.5		97.3		97.0		97.4		97.1		97.0	
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)		38 mg/kWh - 22 ppm		42 mg/kWh - 24 ppm		33 mg/kWh - 19 ppm		39 mg/kWh - 22 ppm		41 mg/kWh - 23 ppm		39 mg/kWh - 22 ppm	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hs) (5)		34 mg/kWh - 20 ppm		38 mg/kWh - 22 ppm		30 mg/kWh - 17 ppm		35 mg/kWh - 20 ppm		37 mg/kWh - 21 ppm		35 mg/kWh - 20 ppm	
Pressure available at the flue	Pa	80		90		100		120		120		120	
		Flue gas temperature, CO_2 content and flue gas mass flow rate: see gas tables on page 22 and on the following pages											
		Electrical Characteristics											
Supply voltage	V	230 Vac - 50 Hz single-phase											
Rated electricity consumption [el_{min} - el_{max}]*	kW	0.011	0.045	0.011	0.074	0.024	0.082	0.015	0.097	0.020	0.123	0.020	0.130
Power input in stand-by [el_{sb}]*	kW	0.005											
Protection Rating	IP	IP X5D											
Operating Temperatures	°C	from -15°C to +40°C - for lower temperatures, a burner housing heating kit is required											
		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	39		48		58		72		98		118	

NOTES:
* Symbol of conformity with Reg.EU/2281/2016.
(1) The losses from the enclosure must be regarded as zero as the machine is installed in an air handling/roof top unit.
(2) Max. condensation produced acquired from testing at 30%Qn.
(3) Value referred to cat. H (G20).
(4) Weighted value to EN1020:2009 ref. to cat. H (G20), referred to net calorific value (Hi, N.C.V).
(5) Weighted value to EN1020:2009 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

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 gas and 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 388.8 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, regardless of the heater positioning.

Model		PCH130		PCH160		PCH210		PCH320		PCH420	
Type of equipment		B23P - B53P - C13 - C43 - C53 - C63 - C83									
CE approval	PIN.	0476CQ0451									
NOx Class	Val	5									
		Heater Performance									
		min	max	min	max	min	max	min	max	min	max
Burner heat output (Hi)	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}]*	%	108.06	96.82	108.35	97.60	108.40	97.15	108.40	97.15	108.40	97.15
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	
Envelope loss factor [F_{env}]* (1)		0%		0%		0%		0%		0%	
Seasonal space heating energy efficiency [Reg.EU/2281/2016] [$\eta_{s,h}$]*	%	93.9		94.0		94.0		94.2		94.4	
Emission efficiency [Reg.EU/2281/2016] [η_{sflow}]*	%	98.1		97.9		97.9		98.1		98.3	
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)		39 mg/kWh - 22 ppm		41 mg/kWh - 23 ppm		39 mg/kWh - 22 ppm		39 mg/kWh - 22 ppm		39 mg/kWh - 22 ppm	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hs) (5)		35 mg/kWh - 20 ppm		37 mg/kWh - 21 ppm		35 mg/kWh - 20 ppm		35 mg/kWh - 20 ppm		35 mg/kWh - 20 ppm	
Pressure available at the flue	Pa	120		120		120		120		120	
		Flue gas temperature, CO_2 content and flue gas mass flow rate: see gas tables on page 22 and on the following pages									
		Electrical Characteristics									
Supply voltage	V	230 Vac - 50 Hz single-phase									
Rated electricity consumption [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
Power input in stand-by [el_{sb}]*	kW	0.005									
Protection Rating	IP	IP X5D									
Operating Temperatures	°C	from 15°C to +40°C - for lower temperatures, a burner housing heating kit is required									
		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)	m^3/h	15600		18000		22200		33300		44400	
		Weight									
Net Weight	kg	154		206		250		375		500	

NOTES:
* Symbol of conformity with Reg.EU/2281/2016.
(1) The losses from the enclosure must be regarded as zero as the machine is installed in an air handling/roof top unit.
(2) Max. condensation produced acquired from testing at 30%Qn.
(3) Value referred to cat. H (G20).
(4) Weighted value to EN1020:2009 ref. to cat. H (G20), referred to net calorific value (Hi, N.C.V).
(5) Weighted value to EN1020:2009 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

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 - B53P - C13 - C43 - C53 - C63 - C83					
CE approval	PIN.	0476CQ0451					
NOx Class	Val	5					
		Heater Performance					
		min	max	min	max	min	max
Burner heat output (Hi)	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}]*	%	108.06	96.82	108.35	97.60	108.40	97.15
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	
Envelope loss factor [F_{env}]* (1)		0%		0%		0%	
Seasonal space heating energy efficiency [Reg.EU/2281/2016] [$\eta_{s,h}$]*		93.9		94.0		94.0	
Emission efficiency [Reg.EU/2281/2016] [η_{sflow}]*		98.1		97.9		97.9	
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)		39 mg/kWh - 22 ppm		41 mg/kWh - 23 ppm		39 mg/kWh - 22 ppm	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hs) (5)		35 mg/kWh - 20 ppm		37 mg/kWh - 21 ppm		35 mg/kWh - 20 ppm	
Pressure available at the flue	Pa	120		120		120	
		Flue gas temperature, CO_2 content and flue gas mass flow rate: see gas tables on page 22 and on the following pages					
		Electrical Characteristics					
Supply voltage	V	230 Vac - 50 Hz single-phase					
Rated electricity consumption [el_{min} - el_{max}]*	kW	0.015	0.194	0.020	0.246	0.020	0.260
Power input in stand-by [el_{sb}]*	kW	0.005					
Protection Rating	IP	IP X5D					
Operating Temperatures	°C	from -15°C to +40°C - for lower temperatures, a burner housing heating kit is required					
		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	148		200		240	

NOTES:
* Symbol of conformity with Reg.EU/2281/2016.
(1) The losses from the enclosure must be regarded as zero as the machine is installed in an air handling/roof top unit.
(2) Max. condensation produced acquired from testing at 30%Qn.
(3) Value referred to cat. H (G20).
(4) Weighted value to EN1020:2009 ref. to cat. H (G20), referred to net calorific value (Hi, N.C.V).
(5) Weighted value to EN1020:2009 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

4. OPERATING CYCLE

Burner operation

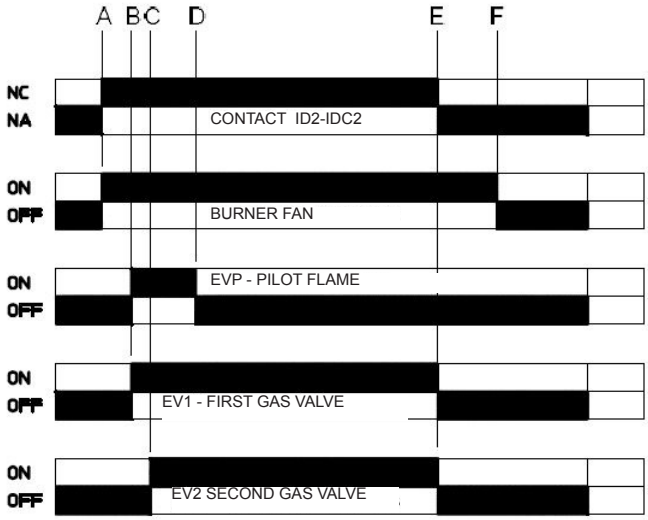
On heat request, from the 0/10 Vdc signal to the terminals B1/GND of the CN06 terminal board, the modulation PCB starts the operating cycle. This will enable flame monitoring equipment (TER) [A] activation.

Other prerequisites to start the cycle are: terminals ID2/IDC2 of terminal board CN08 closed and terminals ID1/IDC1 of terminal board CN02 with jumpers.

NOTE: The indicated terminals refer to the single PCB. On the interface terminal board M1 the correspondences are: 1=D+, 2=D-, 3=GND, 4=B1, 5=COM; 6=NO, 7=IDC2, 8=ID2.

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.

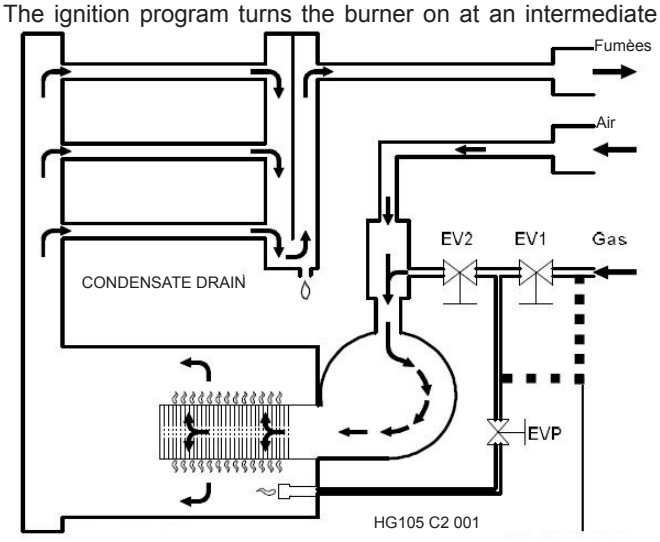
After the operation overlapping time of the two burners (pilot and main) has elapsed, the modulation PCB cuts off the solenoid valve EVP supply and turns the pilot burner [D] off.

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 maximum value, if requested, 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.

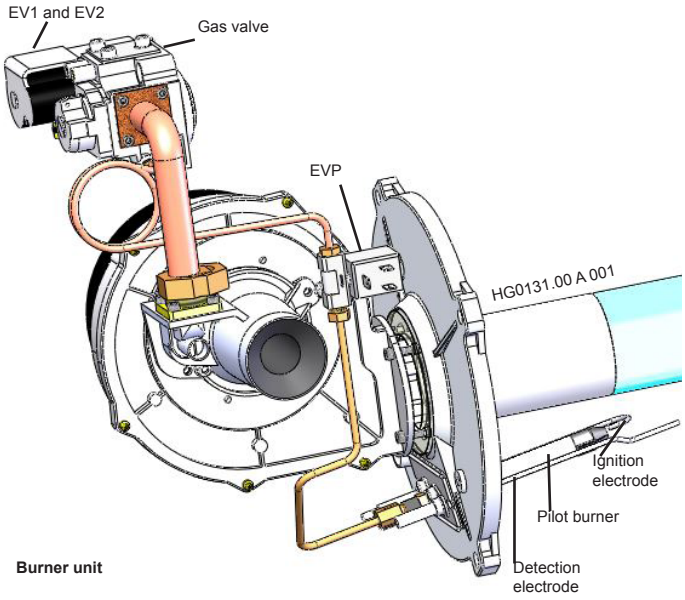
The voltage value will have to be sent via an external regulator that is not supplied in the standard version by APEN GROUP.



Burner switch-off

Once the heat request is over, voltage signal lower than set limit (0.5 Vdc, Parameter H52), 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 ID2/IDC2 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 ID1/IDC1 contact causes the burner to switch off, but with fault signal (F21). This contact is supplied with jumper.



Burner unit

Cooling fans

For the devices that require the control of the cooling fans, their activation is managed with a timer via the APEN GROUP modulation PCB.

The default time is 1 second and can be edited, through the LCD display of the CPU PCB on the machine, from 1 to 255 seconds (parameter D3).

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 (D4), editable through the LCD display of the CPU PCB on the machine, enough to cool the exchanger down.

NOTE: In the devices where the cooling fan management is carried out separately, it is necessary to comply with the time setting indicated in the following paragraphs.

Start-up

The fan can be started together with burner [G] or it can be delayed for maximum 60 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 ID2/IDC2 contacts of terminal board CN08 (indicated in the terminal board M1 at contacts 7 and 8).

Switch-off

At the end of the heat request the cooling ventilation must be kept for a time above three minutes [L]; this is to allow the correct cooling of the 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.

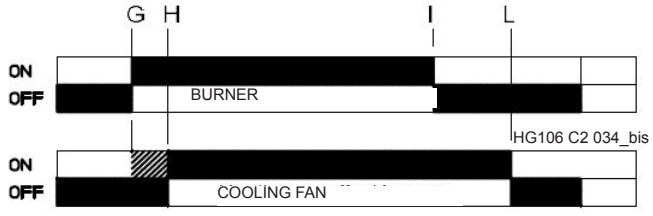
If, during the cooling cycle, there is a new demand for heat, the modulation PCB will wait for the cooling fans to shut down and then reset the counters and start a new cycle.

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

IMPORTANT: Powering off the 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 equipment, caused by the safety thermostat triggering, is indicated on the LCD display of the CPU PCB on the machine with F20.

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

Near the safety thermostat, there is an NTC1 probe set to the value of the ST1 parameter, which reduces the burner's heat output when the set point is reached, regardless of 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 without consulting the APEN GROUP Service Centre.

Lockouts Fxx

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

Codes and possible causes of lockouts are listed later in the manual.

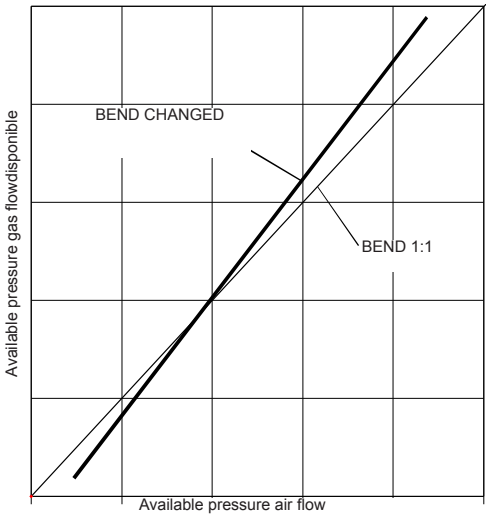
For the more serious lockouts, where necessary, proceed with the manual reset, which can be performed via the LCD display of the CPU PCB on the machine by pressing the arrows at the same time.

4.1. Air/gas premixing operation

The PCH heater is equipped with a burner with complete air with 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.



HG106 EG004

5. USER'S INSTRUCTIONS

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

5.1. Operation of the heater

The PCH module is fitted inside a machine, roof-top or air handling unit, and its management is demanded to the control on the machine where it is fitted.
The user will have to follow what stated in the manual of the machine containing the PCH to switch on, adjust and switch-off the PCH.
The instructions that follow are intended for the PCH operator.
Heater operation is fully automatic; it is equipped with electronic equipment with self-check function that manages all the burner control and monitoring operations and with a microprocessor-based electronic PCB which, together with the LCD display of the CPU microprocessor PCB on the machine, controls the heat output regulation.
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 requires a password.

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

rdy the machine is on without burner flame, it is waiting for the ON control and/or the heat demand from the thermostat;

On the machine is on with burner flame or is in the ignition phase;

OFF the machine is turned off by the control on the LCD. **Any heat demands will be ignored.** To light the burner, the LCD must show the wording "heater ON";

Fxx Fault detected.

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

Air **SUMMER (EST) operation has been selected by mistake under the FUN menu; set FUN to ON or OFF;**

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

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

Navigating the menu
The menu has three levels. The first is accessible without entering a password, the second and third require entering second and third level passwords to change the parameters.

If the PCH PCB is connected to a Smart Web or Easy, and therefore with an address different from Ø, all parameters can be viewed and modified from the remote control.
The service centre requiring to work on such parameters must enter the relevant level password.

Use the arrows to scroll the menus: ↑ (up arrow) and ↓ (down arrow). Press ENTER to select the menu, and again to select the parameter. Change the parameter with the arrows and confirm the change by pressing ENTER.
To exit the parameter or menu, press ESC. If you exit the programming function, after about 10 minutes the program will exit the menu and go back to the "machine status" display.
To change the parameter, press the arrow keys: pressing ↑ (up arrow) increases the parameter by 1, pressing ↓ (down arrow) reduces it by 1. When the arrow keys are pressed for at least three seconds, the parameter scrolling speed is increased.
To confirm a change in parameters, press ENTER for at least 3 seconds. A change in the parameter is indicate by the display flashing.
All submenus can be scrolled from the bottom to the top, and they start over when the end of the menu is reached.

Entering the password

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

First level menus
The following menus are available on the first level:
machine status provides information about PCH operation (e.g. rdy, ON, etc.);

FUN	from FUN it is possible to select the function ON, OFF or EST (do not select EST);
REG	this menu allows the user to force the burner to the minimum or the maximum for combustion tests; it automatically returns to the previous position at the end of the preset time (10 minutes);
TIN	allows the user to read the value of the 0/10 Vdc signal to the PCH input;
Pra	not used;
ABI	used to enter the PWD to access and modify the second and third level menus.

Setpoint Menu
For the meaning and the default values please refer to the table CPU-SMART PCB PARAMETERS of Paragraph 4.4 "Modulation PCB Parameters".

H51	Select the 0/10 Vdc adjustment operation;
H52	IS the OFF value on the 0/10 Vdc signal;
H53	IS the ON value on the 0/10 Vdc signal;
ST1	Delivery air modulation temperature;
ST2	Not used;
H43	Not used;
H44	Not used;
H45	Not used;
ST5	Not used;
ST6	Not used;

I/O menu - Inputs outputs
From **I/O** menu it is possible to display the values measured by the sensors.

NTC1	Air delivery temperature;
NTC2	Not used;
NTC3	Not used;
An1	0/10 V input voltage display;
PRH	Not used;
FLH	Not used;
rPu	no. of FAN revolutions;
PU2	Not used;
uSA	Not used;
IOn	Measures the ionization current; 0 to 100 for currents 0 to 2 microAmperes, 100 above 2 microAmperes.

Enter the second password to access the third level and, besides the previous menus, it is also possible to view the PAR and FLT menus.
The technical service centres will need this password which must be requested to Apen Group.

PAR menu - Parameters
The **Par** submenu allows the access to "b" and "d" parameters:
from b1 to b15 burner parameters;
from d0 to d9 operation configuration.
For the meaning and the default values, please refer to the table CPU-SMART PCB PARAMETERS of Paragraph 4.4 "Modulation PCB parameters".
Besides "b" and "d" parameters, the following parameters can be changed:
S1 Modulation probe enabling;
SP1 ST1 hysteresis (only if the probe is used as temperature limit);
tH1 Maximum temperature of the modulation probe, switches the burner off regardless of the other conditions set;
from S2 Not used.
to H41

Flt Menu (Fault)
It displays the fault event log; use the arrow keys to scroll the list of error codes and press ENTER to display the historical value of the selected fault.
The first visible value, rst, is used to reset the fault event log; this operation must not be performed by the user but by the service centre. The reset operation can be carried out by changing the parameter **d7** to 1 and confirming it by pressing and holding ENTER for at least 3 seconds. After the reset, **d7** returns to 0.
The list and meanings of all faults are shown in the FAULT table in Paragraph 4.5 "Analysis of Lockouts - Faults".

5.3. Reset

The modulation PCB allows the operator to identify more than thirty different causes of lockouts. This makes it possible to manage each event very accurately.
To reset the lockouts, press both arrows simultaneously for a few seconds.
LOCKOUTS may be remotely controlled by using:
- the digital input ID4-IDC4 - button N.O.;
- the Smart 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 F10.
The lockout codes and their cause are shown in the FAULT table in Paragraph 4.5 “Analysis of Lockouts - Faults”.
If the flame monitoring equipment has locked out (codes from F10 to F20), it can be reset by using the button on the equipment itself. This lockout is shown by a LED that lights up on the equipment.

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

NOTE: SHOULD THE SAFETY THERMOSTAT (STB) BE OPEN BEFORE STARTING THE START-UP CYCLE (THIS COULD BE CAUSED, FOR EXAMPLE, BY LOW TEMPERATURES), THE FLAME MONITORING EQUIPMENT WILL BE KEPT IN "STAND-BY" INDICATING LOCKOUT F15.

5.4. Modulation PCB Parameters

All values of the parameters of the CPU-SMART PCB are shown for all PCH heater models.
(1) parameters that could be modified with 001 Password via remote LCD control.
(2) parameters that could be modified with a second level Password which can be requested to the manufacturer's Service Centre.
(3) parameters that could be modified only with a Smart Web/Easy or via modbus.

Parameters of CPU-SMART PCB version 7.02.02									
PARAMETER			PCH020	PCH034	PCH045	PCH065	PCH080	PCH105	DESCRIPTION
Control parameters									
d0	(2)		5						Flame modulation: 2=NTC1; 5=0÷10Vdc; 7=Modbus (PID with SmartWeb or Easy)
d1	(2)		5						Type of equipment: 0=heater; 2=boiler; 5=PCH
d2	(2)		1						Remote lockout signal output (Q1): 0=disabled; 1=enabled
d3	(2)	sec	5						Fan delay time ON (RL2): 0÷255
d4	(2)	sec	180						Fan delay time OFF (RL2): 0÷255 (1=5sec. 60=300 sec.)
d5	(2)		0						Flue gas T control enabling (NTC3): 0=disabled; 1=enabled
d6	(2)	sec	5						Interval between switching off and on (Off timer): 0÷255
d7	(2)		0						Fault counters reset: 0÷1
d8	(2)		0						Boiler antifreeze enabling (NTC1): 0=disabled; 1=enabled NOT USED
d9	(2)		0						Dampers enabling: 0=disabled; Do Not Change
Burner parameters									
b1	(2)	rpm	213	210	169	195	172	195	Motor RPM MINIMUM value (PWM1): 90÷999 (1=10 RPM)
b2	(2)	rpm	660	710	580	651	655	635	Motor RPM MAXIMUM value (PWM1): 90÷999 (1=10RPM)
b3	(2)	rpm	320	300	345	340	355	240	Motor RPM START-UP value (PWM1): 90÷999 (1=10RPM)
b4	(2)		2						HALL signal divider: 2÷3
b5	(2)	rpm	50						Error F3x; no. of revolutions x10 (50=500rpm): 0÷300
b6	(2)	sec	20						Error F3x; error dwell time before fault F3x: 0÷255
b7	(2)	sec	20						Pre-cleaning time with maximum output: 0÷255. DO NOT CHANGE THE PRESET VALUE.
b8	(2)	sec	10						Flame stabilisation time (ignition): 0÷255
b9	(2)	sec	90						Combustion chamber post-cleaning time (FAN ON): 0÷255
b10	(2)	%	3						Motor rpm % increase for each b11 seconds: 1÷100
b11	(2)	sec	8						Time interval for motor rpm increase: 1÷100
b12	(2)	%	30						Antifreeze mode FAN motor modulation % value: 30÷100
b13	(2)	pwm	65						Integral factor value (ki_pwm) for PWM1 calculation - (exA36):0÷249
b14	(2)	pem	45						Proportional factor value (kp_pwm) for PWM1 calculation - (exA37):0÷249
b15	(2)	sec	0						Flow control time at start-up 0÷255
b16	(2)		0						ID5 digital input control: 0=input disabled; 1=enabled with N.C. input required; 2=enabled with N.O. input required
b17	(2)		0						ID6 digital input control: 0=input disabled; 1=enabled with N.C. input required; 2=enabled with N.O. input required
Limit NTC1 control (with D0=5 or 7)									
S1	(2)		1						NTC1 probe enabling: 0=disabled; 1=enabled
ST1	(1)	°C	45						NTC1 setpoint: -10÷90
SP1	(2)	°C	5						SP1 hysteresis: 0÷10
XD1	(3)	%	6						Proportional band from 4 to 100
TN1	(3)	sec	15						Integral time: 1÷255
AC1	(3)		0						0=modulation only; 1=ON/OFF if D0=5 or 7, modulation 0/10V or MODBUS
TH1	(2)	°C	60						Upper Temperature limit for fault F51 activation: 10÷95 autoreset if NTC1<TH1-15°C

Parameters of CPU-SMART PCB version 7.02.02				
PARAMETER	PCH020 PCH034 PCH045 PCH065 PCH080 PCH105			DESCRIPTION
Control 0/10 Vdc - D0=5				
H51	(1)		1	Active only with D0=5 (0/10V) 0=modulation only; 1=modulation and ON/OFF
H52	(1)	V	0.5	OFF voltage, burner switching off if H51=1: 0÷10 1Module = 0.5; 2Modules = 1.5; 3Modules = 2.5; 4Modules = 3.5.
H53	(1)	V	0.5	Voltage Delta with burner ignition ON 1Module = 0.5; 2Modules = 1.0; 3Modules = 1.5; 4Modules = 1.5.
H54	(3)	sec	10	Lower input dwell time: 0÷255
H55	(3)	sec	10	Upper input dwell time: 0÷255
Circulator output control - NOT USED ON PCH				
H11	(2)		0	0=output disabled; 1=analogue output Y1 enabled (PWM2); 2=analogue output Y2 enabled (0÷10Vdc)
H12	(3)	V	4.0	Y2 output minimum voltage: 0÷10
H13	(3)	V	10.0	Y2 output maximum voltage: 0÷10
H14	(3)	%	80	PWM2 minimum value: 0÷100
H15	(3)	%	100	PWM2 maximum value: 0÷100
H16	(3)		2	2=circulator modulation proportional to FAN (do not change)
H17	(3)		1	0=PWM (Y1) or 0/10V (Y2) output according to "direct" logic; 1=PWM (Y1) or 0/10V (Y2) output according to "reverse" logic
NTC2 control - USED ON PCH WITH OPTIONAL PROBE				
S2	(2)		0	0=NTC2 disabled; 1=NTC2 enabled
ST2	(1)	°C	2.0	NTC2 setpoint: -10÷90
P2	(2)	°C	1.0	ST2 hysteresis: 0÷40
XD2	(3)		40	Neutral area, proportional modulation band divided by 100: 4 ÷100
TN2	(3)	sec	5	Integration time: 1÷255
ANTIFREEZE control - active with D8=1 - NOT USED ON PCH				
STA	(3)	°C	2.0	Antifreeze setpoint: -10÷+20
PA	(3)	°C	1.0	Antifreeze setpoint hysteresis: 0÷10
FLUE GAS TEMPERATURE control - active with D5=1 - NOT USED ON PCH				
H41	(2)	°C	5	Flue gas temperature (NTC3); neutral band from 1÷50
H42	(3)	sec	5	Run time for flue gas control cycle (15=30 seconds): 0÷255
H43	(1)	°C	95	Flue gas temperature at maximum capacity (Tmax with PT%=100): 0÷140
H44	(1)	°C	85	Flue gas temperature at medium capacity (Tmed with PT%=50): 0÷140
H45	(1)	°C	75	Flue gas temperature at minimum capacity (Tmin with PT%=0): 0÷140
H46	(3)		0	Flue gas temperature operation: 0=modulation only - 1=burner OFF
TH3	(3)	°C	103	Temperature upper limit (autoreset if NTC3<TH3): 0÷140

Parameters of CPU-SMART PCB version 7.02.02				
PARAMETER	**PCH020 PCH034 PCH045 PCH065 PCH080 PCH105**			**DESCRIPTION**
Hydraulic circuit WATER PRESSURE control- NOT USED ON PCH				
S5	(2)		0	Pressure probe B2 output enabling: 0=disabled; 1=enabled as ON/OFF input; 2=enabled as analogue input without fault F83 autoreset; 3=enabled as analogue input with fault F83 autoreset
ST5	(1)	bar	0.70	B2 setpoint: 0÷9.99
P5	(2)	bar	0.30	ST5 hysteresis: 0÷9.99
XA5	(3)	V	1.18	B2 pressure probe signal input minimum voltage: 0÷9.99
XB5	(3)	V	2.72	B2 pressure probe signal input maximum voltage: 0÷9.99
YA5	(3)	bar	0.10	Pressure matching the B2 probe input minimum voltage
YB5	(3)	bar	2.90	Pressure matching the B2 probe input maximum voltage
TH5	(3)	V	2.50	Upper pressure limit for fault F82 activation: 0÷9.99
Hydraulic circuit WATER FLOW control- NOT USEDON PCH				
S6	(2)		0	Flow sensor B3 output enabling: 0=disabled 1=enabled as ON/OFF input without F85 fault autoreset 2=enabled as ON/OFF input with F85 fault autoreset 3=enabled as pulsed input without F85 and F86 fault autoreset 4=enabled as pulsed input with F85 and F86 fault autoreset
ST6	(1)	From l/h	56	Flowmeter setpoint - in l/h (x10)
P6	(2)		5	ST6 hysteresis: - in l/h (x10)
XA6	(3)	Hz	14	B3 pressure probe signal input minimum frequency: 0÷999
XB6	(3)	Hz	229	B3 pressure probe signal input maximum frequency: 0÷999
YA6	(3)	l/h	29	Flow rate matching the B3 probe inlet minimum frequency
YB6	(3)	l/h	500	Flow rate matching the B3 probe inlet maximum frequency
TR6	(3)	sec	2	Fault F85/F86 indication time delay (1=1second): 0÷250. During the ignition stage, the b15 value is used.

5.5. Analysis of Lockouts - Faults

The CPU-SMART manages 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 resets; others reset themselves when the problem that caused them is solved.
Below is a complete list of faults, possible causes and possible solutions.

FAULT	DESCRIPTION	CAUSE	RESET
Lockout caused by Flame - Caused by the flame monitoring equipment (TER)			
F10	Failure to ignite flame after 4 attempts performed by the equipment.	• Live and neutral reversed • Earth wire not connected. • Phase-phase connection without neutral. • Start-up electrode failed or badly positioned • Detection electrode failed or badly positioned • Detection electrode that moves or disperses to the earthing system when hot. • Condensation detection electrode defective or earthed	Manual reset
F11	Untimely flame (detection when for the flame monitoring equipment there should not be a flame)		
F12	Ignition failure; not visible. The count, displayed in the history, indicates whether the heater has had problems with ignition.		Auto-reset
F13	The TER equipment does not accept the reset command from CPU-SMART	• TER has finished its 5 reset attempts in the period of 15 minutes.	Wait for 15 minutes or use the equipment reset device
F14	Lack of communication between TER equipment and CPU for more than 60 seconds	• TER equipment or CPU-SMART PCB broken • Connections on the STB thermostat to earth • Capillary of the STB thermostat that discharges on the earth faston of the thermostat body	Auto-reset
F15	The CPU-SMART PCB sent the ignition signal to the TER equipment which, after 300 seconds and with no lockout, has not communicated its correct operation status.	• Blocked safety thermostat at start up	Check contact closing
		• Poor gas mains pressure • Low CO_2 value • Faulty TER equipment	Manual reset, auto-reset after 5 minutes
F16	Generic equipment lockout	• It indicates that if the heat request has remained active for more than 24 consecutive hours, the TER equipment has performed a control cycle switching temporarily to stand-by mode	Manual reset, auto-reset after 5 minutes
F17	Internal malfunction of TER equipment that does not accept reset command from CPU-SMART	• Faulty TER equipment	Manual reset, auto-reset after 5 minutes
Lockouts caused by temperature (safety lockouts)			
F20	Activation of safety thermostat STB	• Excess air temperature due to lack of air circulation • Safety thermostat broken or not connected	Manual reset
F21	(NOT USED - Jumped) Input ID1 open	• ID1 - IDC1 jumper missing	Manual reset
FAN lockout - burner fan			
F30	Fan speed too low in start up phase - VAG	• Burner fan broken. • FAN electric cables interrupted, not connected or wrongly connected	Manual reset
F31	Fan speed too high in start up phase - VAG		
F32	Fan speed, during operation, outside minimum and maximum set parameters - VAG		Manual reset, auto-reset after 5 minutes
NTC probes broken or missing			
F41	Probe NTC1 error, air intake temperature	No signal from probe or broken probe	Auto-reset

FAULT	DESCRIPTION	CAUSE	RESET
		Over-temperature	
F51	The temperature of the air intake probe NTC1>TH1	• The minimum heat output of the PCH heater is over-sized compared to the heat output required by the environment. • Check the TH1 parameter - air intake set point. • Cooling fan(s) inoperative • Air flow rate insufficient	Auto-reset if NTC1< TH1-15
		Check ModBus communication	
F60	Communication error between CPU-SMART PCB and ModBus, Smart Web or SMART Easy network	• ModBus network is disconnected. • The address of the PCB is wrong and/or not configured in the ModBus network.	Auto-reset
		No voltage	
F75	No voltage during operation cycle (excluding stand-by); the fault is not visible on remote control but only counted.	• No voltage during operation	Auto-reset
		Internal malfunction of CPU-SMART PCB	
F00	Internal malfunction of CPU-SMART PCB	• Perform a manual reset of the PCB; replace the CPU-SMART PCB if the problem persists	Manual reset

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

5.6. 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, can be made as "C" type, with combustion air being drawn from outside, or as "B" type with combustion air being drawn from the heater installation site.
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-C43-C53-C63; for more information on the flue types, please refer to current regulations.

NOTE: A "C" type exhaust 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 %.

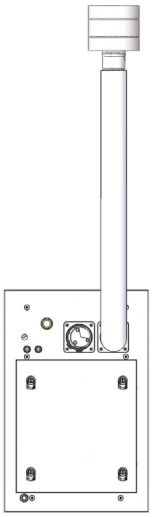
Sealed pipes must be used to prevent condensate from leaking from the pipes; the seal must be adequate to withstand flue gas temperature ranging between 25°C and 120°C.
The flue does not need to be insulated to prevent the formation of condensation in the pipe, as this will not affect the heater, which 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.

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

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 GXXXXX) at the outlet of each flue, before the connection with the common flue, preventing a module from discharging it own combustion gases inside another module.

Flue gas data
The table to be used to calculate the flue gas exhaust system with commercially available pipes can be found in paragraph 5.8 "GAS connection" within the Gas regulation data.

The maximum permitted recirculation percentage is 10%.



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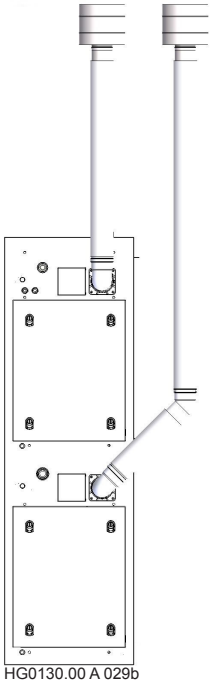

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Selection Guide
If the terminal is not directly connected to the heater and, therefore, extra routing is required, according to the length of the ducting, the diameter of the selected terminals, extensions and bends must be checked.
After establishing the routing, the pressure drops must be calculated for all components; 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.

NOTE: 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 gas terminal must be installed in compliance with reference national regulation requirements.

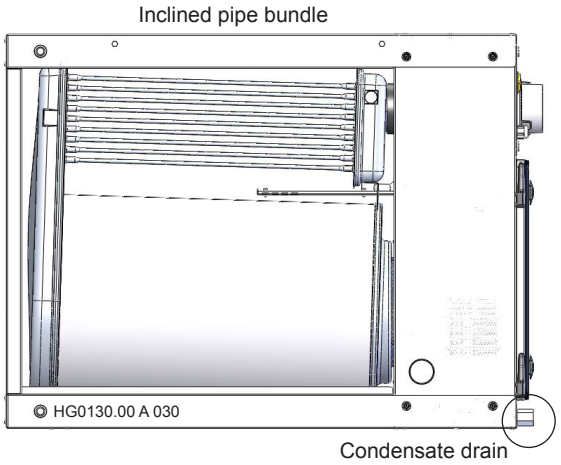
If the duct routing requires the use of bends, the length of the bends must be subtracted from the available length:
- Ø 80 wide radius bend at 90° EqL = 1.6m;
- Ø 80 wide radius bend at 45° EqL = 1.1m;
- Ø 100 wide radius bend at 90° EqL = 2.4m;
- Ø 100 wide radius bend at 45° EqL = 0.9m.

5.7. Condensate drain

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.

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 trap checks and stops the burner operation before the condensate reaches a potentially dangerous level inside the flue gas 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.



Connection to the condensate drain
The PCH modules are supplied with a condensate drain on the module outer panel.
According to the applications, APEN GROUP can supply a condensate neutraliser kit (code G14303).

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).

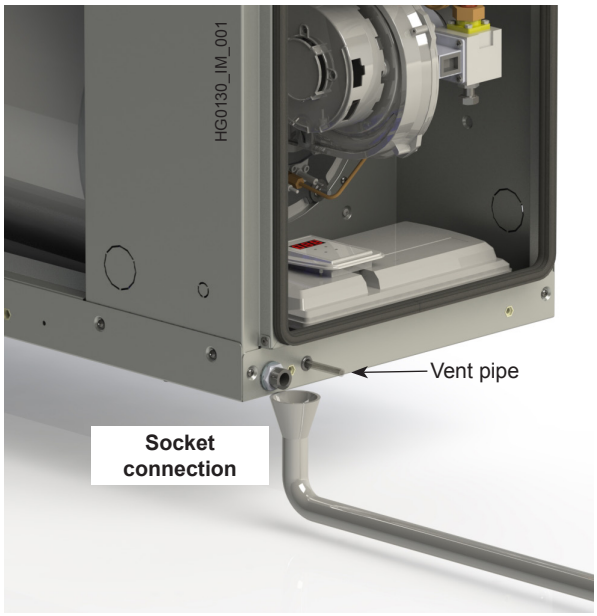
Multiple PCH heaters are provided with a single condensate drainage that collects the single internal module exhausts and a lower trap air vent pipe, placed on the front panel near the lower module.

Precautions
Materials to be used for the condensation drainage system:

- aluminium, stainless steel, silicone or Viton pipe or EPDM for hot pipes that allow the flue gas to go through;
- for cold pipes (water pipes), PVC and any materials suitable for hot pipes.

Do not use copper or galvanised iron pipes.

Free drainage
If the unit is installed outdoors, unless the temperatures never drops below freezing, the water could be drained directly outside, without any connections to other pipes. It is essential to check that the condensate flows away from the unit.
If the 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 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 room to be heated is a good solution in order to avoid the formation of ice; condensation can be drained into water courses or can be collected and treated with alkaline solutions (condensate neutraliser kit, code G14303).
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 on the water trap; 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).

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

5.8. GAS Connection

Use the gas line connections only with CE certified components.

The PCH module is supplied complete with:
- dual gas valve;
- stabiliser and gas filter.

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.

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.

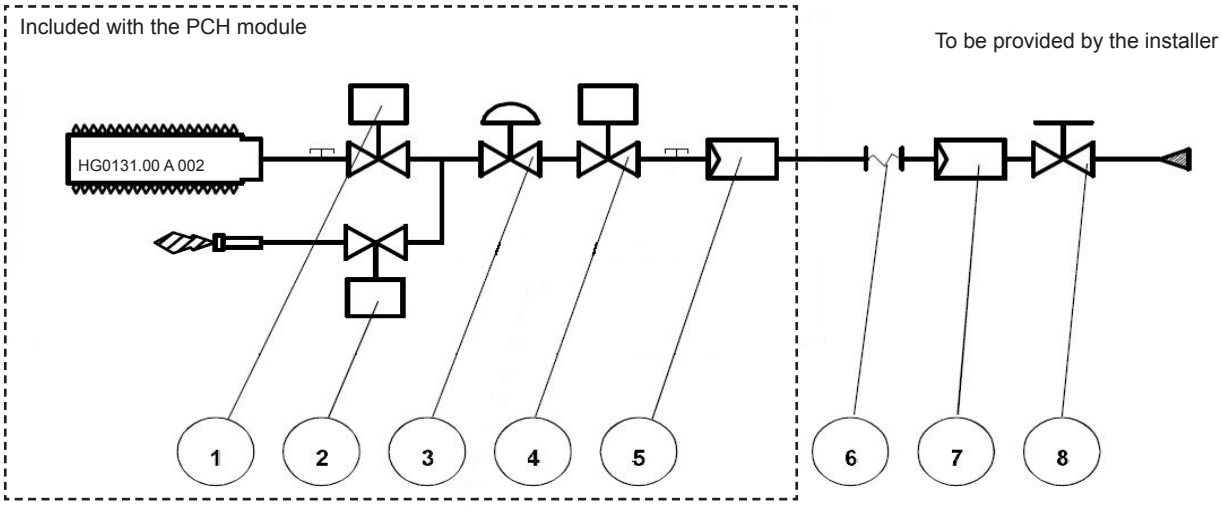
IMPORTANT: For proper maintenance, connect the PCH module by means of a seal and swivel gasket.

Avoid using threaded connections directly on the gas connection.

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.

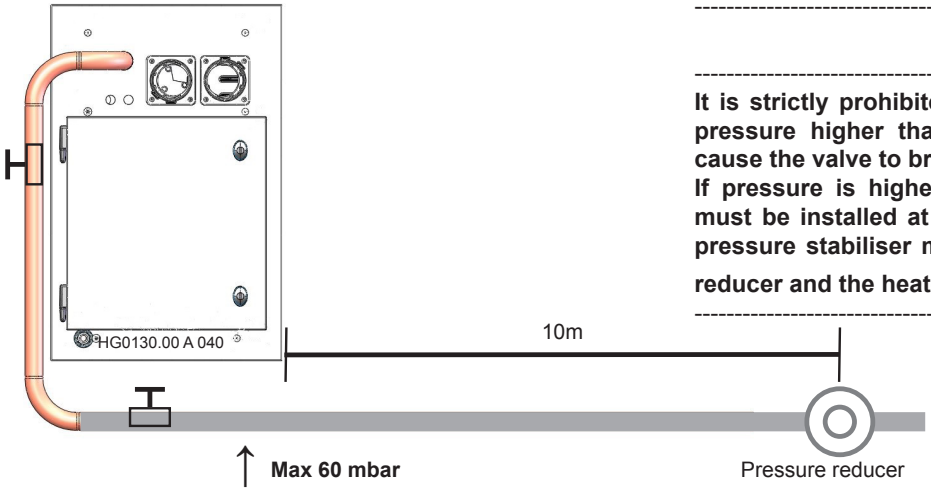
KEY

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



During the installation, we recommend to tighten the nut fastening the external gas supply pipe without exceeding the tightening torques shown below:

- Ø 3/4": 150 Nm;
- Ø 1": 200 Nm.
- Ø 1 1/2": 300 Nm.



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.

Country Table - Gas Category

Country	Category	Gas	Pressure	Gas	Pressure
AT, CH	II2H3B/P	G20	20 mbar	G30/G31	50 mbar
BE <70kW	I2E(S)B, I3P	G20/G25	20/25 mbar	G31	37 mbar
BE >70kW	I2E(R)B, I3P	G20/G25	20/25 mbar	G31	37 mbar
DE	II2ELL3B/P	G20/G25	20 mbar	G30/G31	50 mbar
DK, FI, GR, SE, NO, IT, CZ, EE, LT, SI, AL, MK, BG, RO, HR, TR	II2H3B/P	G20	20 mbar	G30/G31	30 mbar
ES, GB, IE, PT, SK	II2H3P	G20	20 mbar	G31	37 mbar
FR	II2Esi3P	G20/G25	20/25 mbar	G31	37 mbar
LU	II2E3P	G20/G25	20 mbar	G31	37/50 mbar
NL (up to 31/12/2017)	II2L3B/P	G25	25 mbar	G30/G31	50 mbar
NL (from 01/01/2018)	II2EK3B/P	G20/G25.3	20/25 mbar	G30/G31	30 mbar
HU	II2HS3B/P	G20/G25.1	25 mbar	G30/G31	30 mbar
CY, MT	I3B/P			G30/G31	30 mbar
LV	I2H	G20	20 mbar		
IS	I3P			G31	37 mbar
PL	II2ELwLs-3B/P	G20/G27/G2.350	20/13 mbar	G30/G31	37 mbar
RU	II2H3B/P	G20	20 mbar	G30/G31	30 mbar

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

NOTE: In compliance with standards EN1020, 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.

Suitable for the G+ Gas [Only for Holland]
"The appliance was configured for the appliance category K (I2K) and is suitable for the use of G and G+ distribution gases according to the specifications as included in the NTA 8837:2012 Annex D with a Wobbe index of 43.46 – 45.3 MJ/m3 (dry, 0 °C, upper value) or 41.23 – 42.98 (dry, 15 °C, lower value).
This appliance can moreover be converted and/or be calibrated for the appliance category E (I2E). This therefore implies that the appliance "is suitable for G+ gas and H gas or is demonstrably suitable for G+ gas and can demonstrably be made suitable for H gas" within the meaning of the "Dutch Decree of 10 May 2016 regarding amendment of the Dutch Gas Appliances Decree and the Dutch Commodities (Administrative Fines) Act in connection with the changing composition of gas in the Netherlands as well as technical amendment of some other decrees".

Gas Settings Table

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]	0.51	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	[%]	8.8	9.1	8.7	9.1	8.7	9.1	8.7	9.1	8.7	9.1	8.5	9.1
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26	70	28	80
FLUE GAS MASS FLOW RATE (MAX.)	[kg/h]	31		57		72		107		135		165	
GAS ORIFICE PLATE	[mm]	5.8		7.4		7.5		11		12.2		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]	0.59	2.34	0.93	4.29	1.05	5.17	1.53	8.00	2.02	10.1	2.21	12.30
CARBON DIOXIDE -CO_2 CONTENT	[%]	8.8	9	8.6	9	8.8	8.9	8.8	9.2	8.6	9.1	8.8	9
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, supply pressure is 20 mbar													

TYPE OF GAS G25.3 - Cat. K (Only Netherlands - from 01/01/2018)													
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	[%]	8.7	9.1	8.8	9	8.8	9.1	8.9	9.1	8.7	9.1	8.8	9.4
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	
* For Germany, supply pressure is 20 mbar													

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]	0.71	2.81	1.13	5.17	1.26	6.22	1.84	9.63
CARBON DIOXIDE -CO_2 CONTENT	[%]	8.4	9	8.4	9	8.6	9	7.3	7.9
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: 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.
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]	0.59	2.33	0.93	4.29	1.04	5.16	1.52	7.99	2.01	10.1	2.21	12.29
CARBON DIOXIDE -CO_2 CONTENT	[%]	9.3	9.5	9.1	9.6	9.4	9.6	9.3	9.7	9.8	10.3	9.4	9.6
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	
* 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]	0.57	2.26	0.90	4.15	1.01	5.00	1.48	7.74	1.95	9.76	2.50	11.90
CARBON DIOXIDE -CO_2 CONTENT	[%]	8.7	9.2	8.7	9.1	8.6	9.1	8.6	8.8	8.7	9.1	8.5	8.7
FLUE GAS TEMPERATURE	[°C]	38	111	31	94	30	93	31	77	26	67	28	74
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 rated 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] - 50 [min 42.5-max 57.5]											
PILOT NOZZLE Ø	[mm]	0.51											
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	0.40	1.58	0.63	2.90	0.71	3.49	1.03	5.39	1.49	6.80	1.70	8.30
CARBON DIOXIDE -CO_2 CONTENT	[%]	10.8	11.4	10.8	11.5	10.8	10.9	10.7	11.3	10.1	10.3	10.4	10.6
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26.5	70	28	80
GAS ORIFICE PLATE	[mm]	3.7		5.0		5.2		6.5		7.0		9.3	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	
* 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]	0.39	1.55	0.62	2.85	0.70	3.43	1.01	5.31	1.34	6.70	1.47	8.18
CARBON DIOXIDE -CO_2 CONTENT	[%]	9.3	9.8	9.2	9.7	9.3	9.4	9.4	9.6	9.3	9.6	9.5	9.8
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26.5	70	28	80
FLUE GAS MASS FLOW RATE (MAX.)	[kg/h]	24		45		58		84		107		130	
GAS ORIFICE PLATE	[mm]	3.7		5.0		5.2		6.5		7.0		9.3	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	

NOTE:
For PCH130 and PCH132 gas consumption and mass flow rate values are twice the PCH065 values.
For PCH 160 and PCH162 gas consumption and mass flow rate values are twice the PCH080 values.
For PCH 210 and PCH212 gas consumption and mass flow rate values are twice the PCH105 values.
For PCH320 gas consumption and mass flow rates are three times higher than the PCH105.
For PCH420 gas consumption and mass flow rates are four times higher than the PCH105.

5.9. Starting up for the first time

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;
- power on the heater with the general switch located on the unit and insert the power plug inside the PCH compartment.

To turn on the heater, follow the instructions below:

- Check that the display shows RDY; if OFF is displayed instead, work on the control, under FUN, and set the device to ON**;**
- Check that the Tin value is higher than the Von value on the LCD display.

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

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

5.10. Analysis of combustion

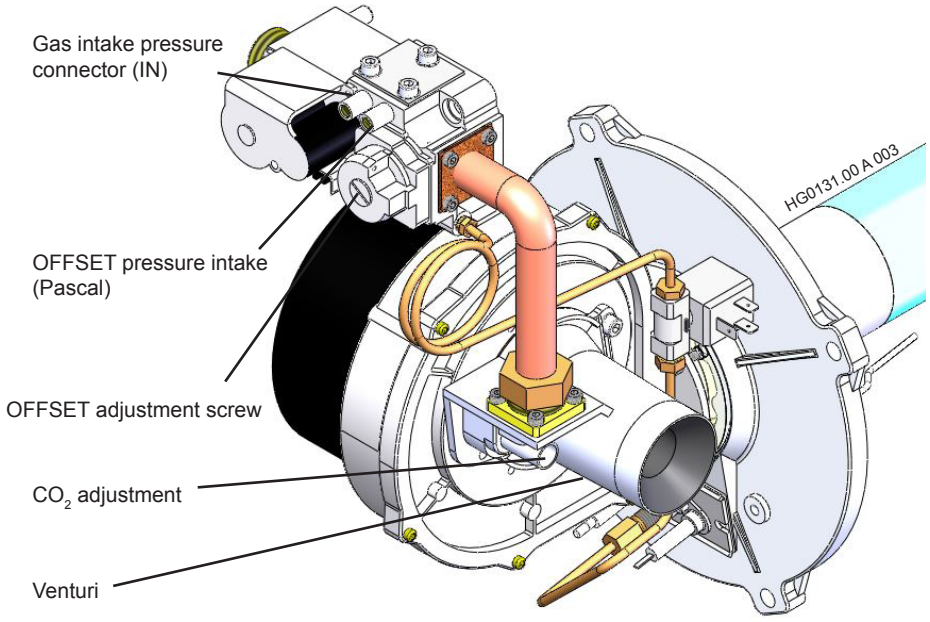
Wait until the heater is switched on. Check that the heater is running at maximum power by using one of the two methods below:

- check that Tin input signal is equal to 10 V;
- from the LCD display, access the REG menu, then use the Hi and Lo controls to force operation at maximum or minimum output.

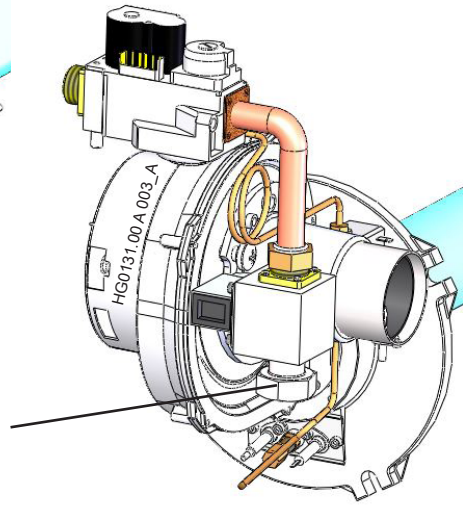
At maximum output, check again that the input pressure in the valve corresponds to the value required; adjust if necessary.
Perform the combustion analysis to verify that the level of CO_2 corresponds to the figures in the tables in Paragraph 4.6 "GAS Connection".
If the measured value is different, turn the adjustment screw on the Venturi pipe. Loosening the screw will increase the CO_2 level, screwing it down will decrease the level.
Set the heater to minimum output, and verify that the level of CO_2 corresponds to the figures in the tables in Paragraph 4.6 "GAS Connection". If the values do not match, screw or loosen the offset screw respectively to increase or decrease the CO_2 level and repeat the procedure.

NOTE: The heater directly supplied to function with LPG is set up for G31 gas. If the unit runs on G30 instead, it is necessary to verify and possibly adjust settings for CO_2 as shown in the tables in Paragraph 4.6 "GAS connection".

For models: PCH020, PCH034, PCH045, PCH065, PCH080



For models: PCH105



5.11. Conversion to LPG

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

The unit is supplied already set for natural gas and with the kit for conversion to LPG, including:
- calibrated gas orifice plate;
- pilot nozzle;
- adhesive plate "Equipment converted...".

The kit is not supplied in countries where conversion is prohibited.
To convert the unit, follow these instructions:
- disconnect from power supply;
- between the gas pipe and the Venturi, replace the gas orifice plate fitted (natural gas) with the one supplied with the kit (for LPG);
- replace the pilot nozzle (natural gas) with the one in the kit (LPG);
- restore power supply and set the heater up for ignition;
- while the start-up electrode is sparking, make sure there are no gas leaks.

When the burner is lit and working at maximum capacity, verify that:
- the valve intake pressure corresponds to the value required for the type of gas that you are using;
- the combustion analysis procedure is performed as described in Paragraph 4.8 "Combustion Analysis";
- the level of CO_2 is within the limits indicated for the type of gas being used (tables in Paragraph 4.6 "GAS connection"). If a different value is detected, change it by turning the adjustment screw: screwing it down decreases the CO_2 level, loosening it increases the level.
- that the gas valve Venturi pipe connector does not leak.

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

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

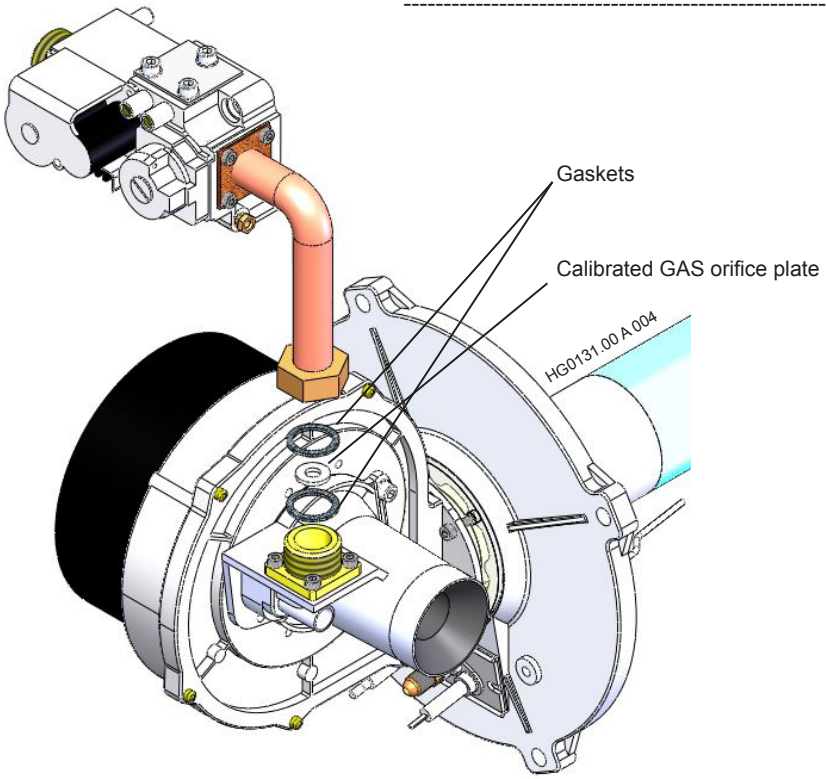
Conversion for gasses from G20 to G25 or G25.1 or G25.3 or G27 is allowed only in countries of category II2ELL3B/P [Germany], II2Esi3P [France], II2E3P [Luxembourg] and category II2HS3B/P [Hungary] and category II2ELwLs3B/P [Poland]. For countries in category II2L3B/P [Netherlands up to 31/12/2017] and II2EK3B/P [Netherlands from 01/01/2018] 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.
Conversion from one type of gas to another can only be performed by authorised service centres.
Conversion to G25 and/or G25.1, G25.3, G27 where possible, consists in:
- insertion of orifice plate (according to the gas type and the equipment model)

After the conversion, relight the burner and:
- check that the intake pressure to the gas valve corresponds to the level required for the type of gas [see tables in Paragraph 7.2 "GAS Connection Tables"];
- check that the level of CO_2, at maximum and minimum heat output, is between the values indicated for the type of gas. If the value is different, change it by turning the adjustment screw on the Venturi pipe: screwing it down decreases the value, loosening it increases the value.

Stick the nameplate "Equipment converted for gas G25...." in place of the one that says "Equipment set up for .....".

NOTE: 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.

NOTE: 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.



5.13. Conversion to gas G2.350

Conversion is allowed only for Poland.
Conversion from one type of gas to another can only be performed by authorised service centres.
Conversion to G2.350 consists in:

- for all models: pilot nozzle replacement.
- only for model PCH065: mounting a calibrated orifice plate on the air intake of the Venturi pipe [see tables in Paragraph 5.8 "GAS connection"].

After the conversion, relight the burner and:

- check that the intake pressure to the gas valve corresponds to the level required for the type of gas [see tables in Paragraph 5.8 "GAS Connection"];
- check that the level of CO_2, at maximum and minimum heat output, is between the values indicated for the type of gas. If the value is different, change it by turning the adjustment screw on the Venturi pipe: screwing it down decreases the value, loosening it increases the value.

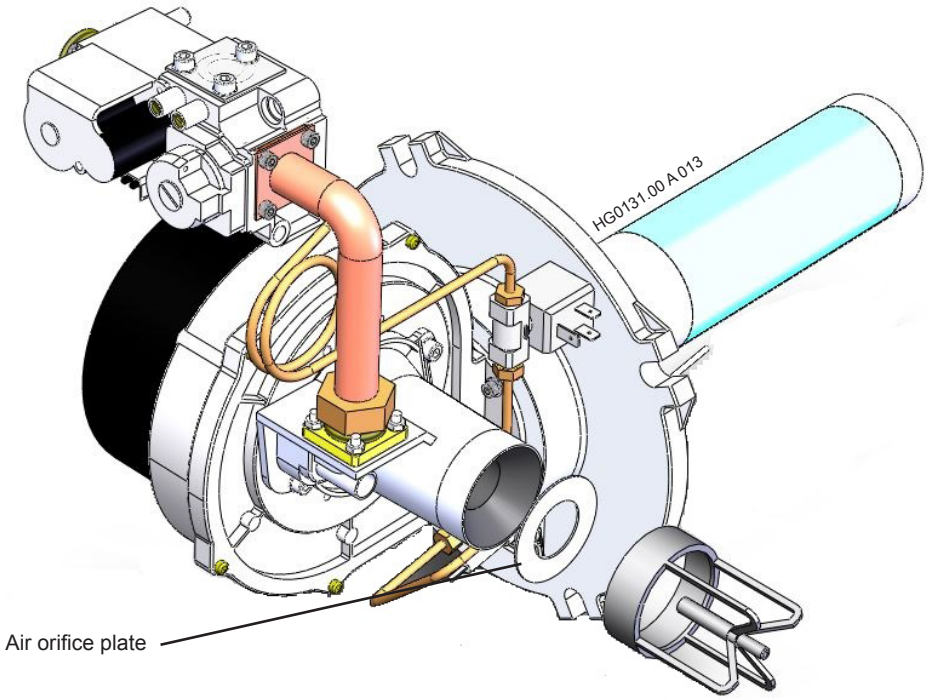
Stick the nameplate "Equipment converted for gas G2.350...." in place of the one that says "Equipment set up for .....".

NOTE: The minimum and maximum heat outputs of models 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.

NOTE: The conversion kit is supplied on request

5.14. Replacing the Gas Valve

If the gas valve must be replaced, it is required to proceed with an inspection and possibly calibrate the CO_2 level through the adjustments on the Venturi pipe.
It is advisable not to calibrate the offset: the valve calibration is performed by the manufacturer.
If necessary, carry out the combustion analysis procedure as described in Paragraph 4.8 "Analysis of combustion".
It is recommended to always carry out the flue gas analysis after replacing the gas valve.



5.15. Replacing the modulation PCB

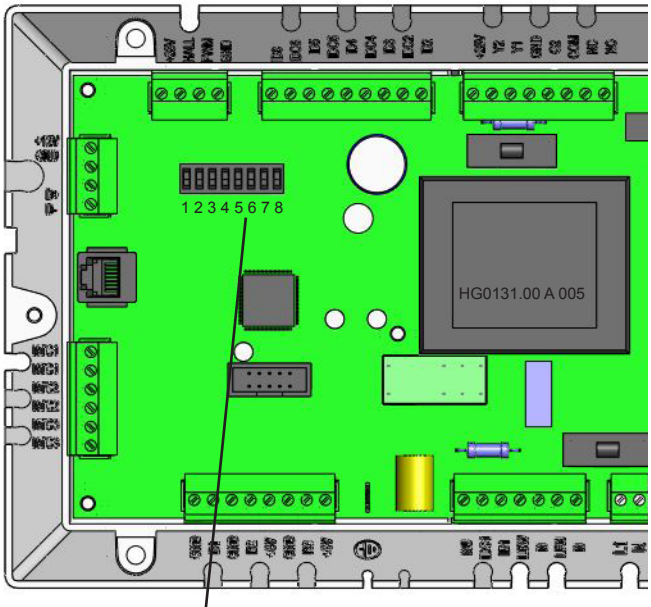
When replacing the PCB, it is required to carry out a few checks and set a few parameters through the LCD command or Smart Web/Easy.
Every PCH heater has a list of pre-programmed default values. It is advisable to update the list at every change performed on site in order to be able to reprogram a spare PCB if needed.
* The following information only applies to PCH heaters; for the other equipment using the same modulation PCB, refer to the relevant manual.

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

Programming the parameters
The parameters that must be programmed are the following:
- d0, d1, and d5 - to identify the type of equipment;
- b1, b2, b3 - regulate the motor revolutions of the flue fan;
- S1 - enables the NTC1 hot air intake probe;
- ST1 is the set point value for NTC1;
- H51, H52 and H53 - to regulate the 0/10 Vdc;
- S2, ST2 and P2 - to heat the electrical compartment (if provided);
- TH1 is the upper temperature limit above which you have the F51 fault

Programming the parameters - Operating mode
Parameters can be modified from the LCD display on the machine or, alternatively, from Smart Web/Easy.

The Smart Web/Easy can be used to access all parameters [see tables on previous pages]; parameters have passwords, which are issued by the APEN GROUP assistance service. Please refer to the Smart Web/Easy manual for instructions for the procedure for access and modification of functional parameters. Please remember that all changes to parameters must be done ONLY with the burner OFF (with display showing rdy or off).



Switch for Smart Web/Easy

6. MAINTENANCE

To keep the heater efficient and guarantee a long lifetime of the same, it is advisable to run some inspections at regular intervals:

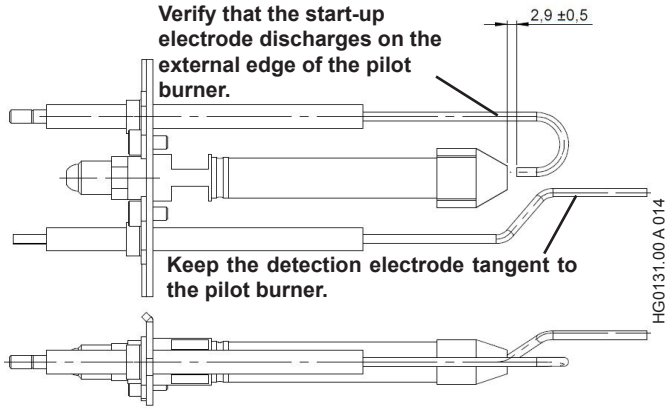
1) check the status of start-up and detection electrodes and pilot flame;
2) check the status of flue exhaust and air intake ducts and terminals;
3) check the status of the Venturi pipe;
4) check and if necessary clean the exchanger and burner;
5) check and clean the water trap;
6) check the intake pressure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

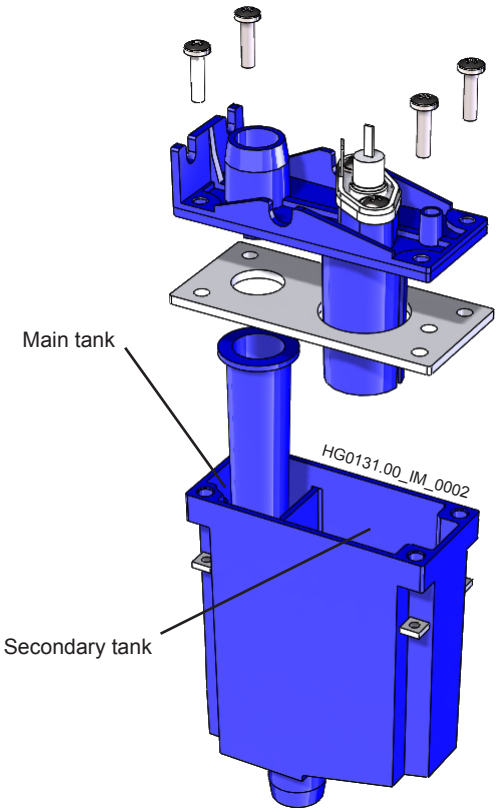
NOTE: Operations at points 1, 2, 3, 4 and 5 must be performed after disconnecting the heater from the electrical mains and closed the gas supply. Operations at point 6, 7, 8 and 9 must be done with the heater on.

Maintenance interval chart

Maintenance	every year	Extraordinary
1) Electrodes and Pilot	●	
2) Flue gas/Air Terminals	●	
3) Venturi pipes	●	
4) Exchanger/Burner		●
5) Condensate collection trap	●	
6) Gas valve	●	
7) Flame Equipment	●	
8) Safety thermostat(s)	●	
9) Ionization current	●	

1) Inspection of electrodes
Dismantle the complete pilot flame and use a jet of compressed air to clean the mesh and nozzle. Check the integrity of the ceramic and use sandpaper to remove any oxidation on the metal parts of the electrodes. Check the correct position of the electrodes (see drawing below). It is important that the detection electrode is tangent to the head of the pilot and not inside it. The start-up electrode must discharge onto the mesh of the pilot burner.
Every time you clean and check the starting/detection and the pilot flame electrodes it is necessary to replace all the gaskets between the burner and the pilot flame.





2) Inspection of flue gas exhaust and air intake ducts
Visually inspect where possible or use specific tools to check the status of the ducts.
Remove dust that forms on the air intake terminal.

3) Inspection and cleaning of the Venturi pipe
Remove any dirt at the mouth of the Venturi pipe with a brush, and be careful to not let it fall inside the piece.

4) Inspection and cleaning of the exchanger and burner
Good combustion in PCH heaters prevents dirt, which is normally caused by bad combustion. It is advisable, therefore, to not clean the exchanger and burner unless there are exceptional circumstances. An accumulation of 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.
Should it become necessary to clean the burner and/or exchanger, all the gaskets between the burner and the exchanger must be replaced.

5) 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 seal conditions. Check the integrity of the detection electrode and use sandpaper to remove any oxidation on the metal part.
Fill in the main tank with clean water and close the cover. Reconnect the trap to the condensate drain system.

6) Inspection of intake gas pressure
Check that the intake pressure at the valve corresponds to the value required for the type of gas that you are using.
This verification must be done with the heater on at the maximum heat capacity.

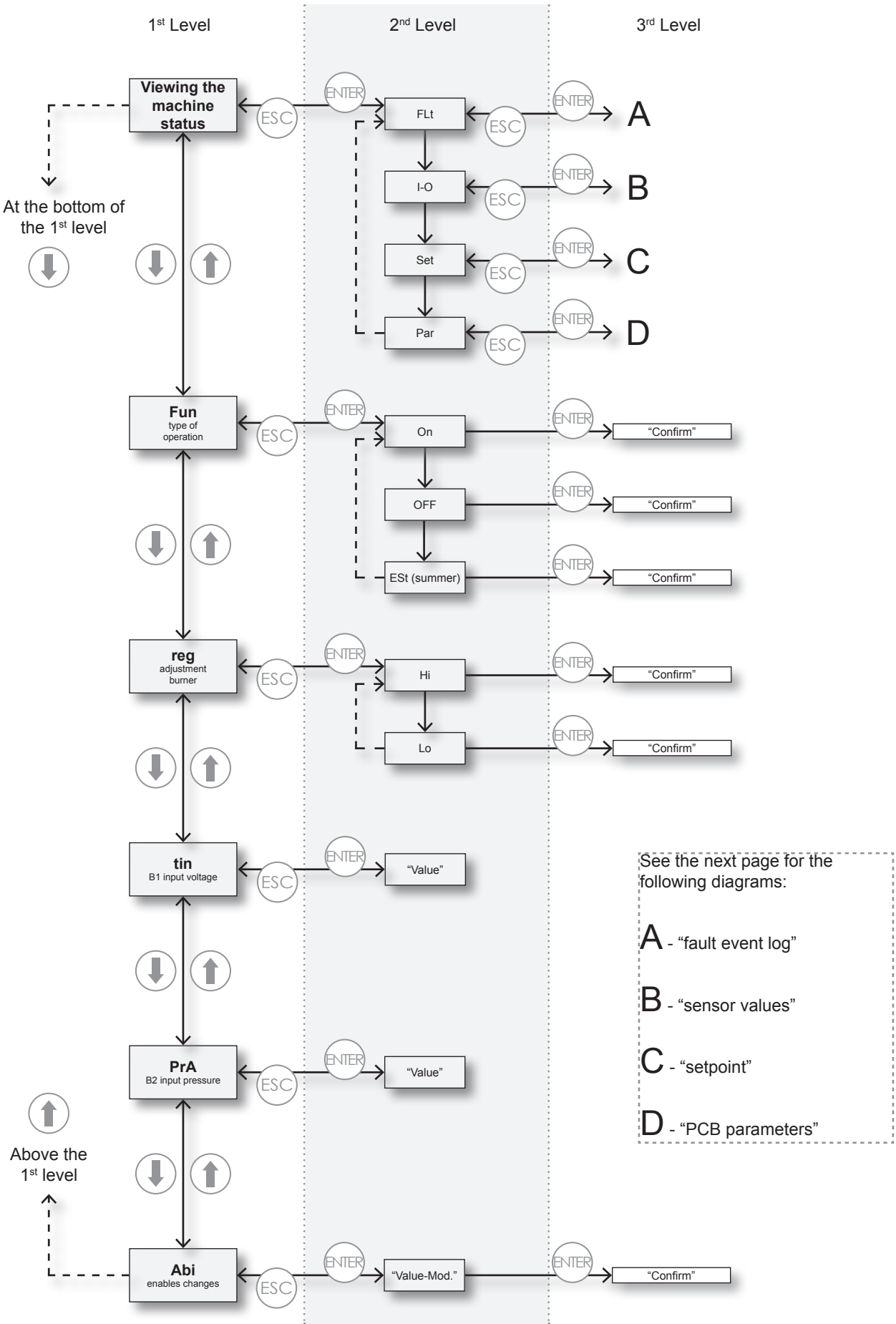
7) Inspection of flame monitoring equipment
With the heater running, close the gas tap and verify that the machine is locked out, signalled on the LCD display of the CPU PCB on the machine with F10. Reopen the gas tap, reset the lockout and wait for the heater to restart.

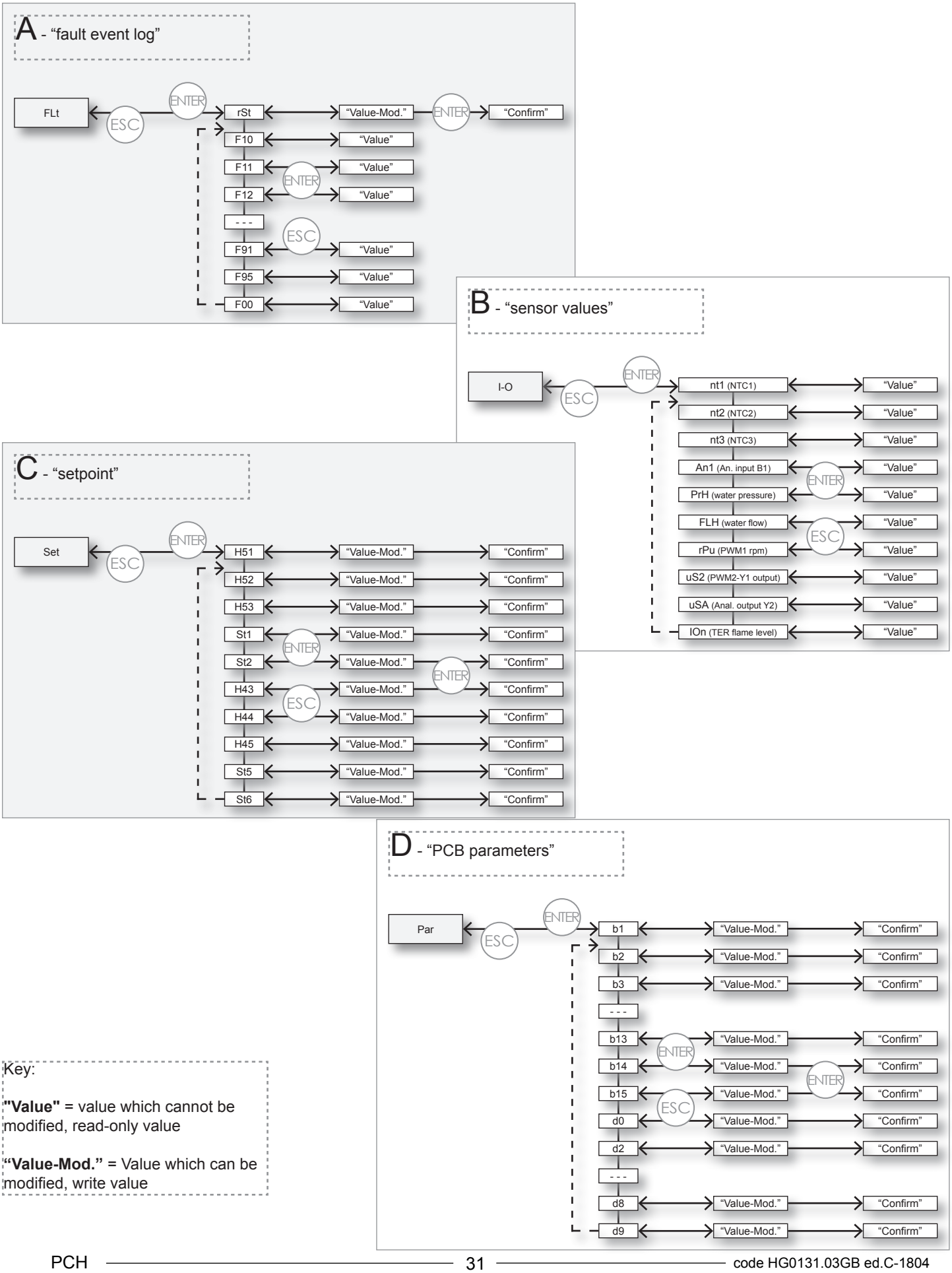
8) Inspection of the safety thermostat(s)
This procedure must be done with the heater on and the burner lit. Open the thermostat series with an insulated tool [230 V], remove the fast-on from the safety thermostat, wait for the F20 block signal to appear on the LCD display on the CPU PCB on the machine. Close again the thermostat series, then reset the lockout.

9) Inspection of the ionization current
This procedure can be done directly from the LCD display by entering into the I/O menu. The IOn parameter indicates the value of the ionization current, and the reading is as follows:
- 100, indicates that the value is more than 2 microAmperes, which is plenty for the equipment to function;
- from 0 to 100, indicates a value from 0 to 2 microAmperes; for example, 35 corresponds to 0.7 microAmperes, which is the minimum threshold detectable for the flame monitoring equipment.

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

Navigation map of LCD display menu





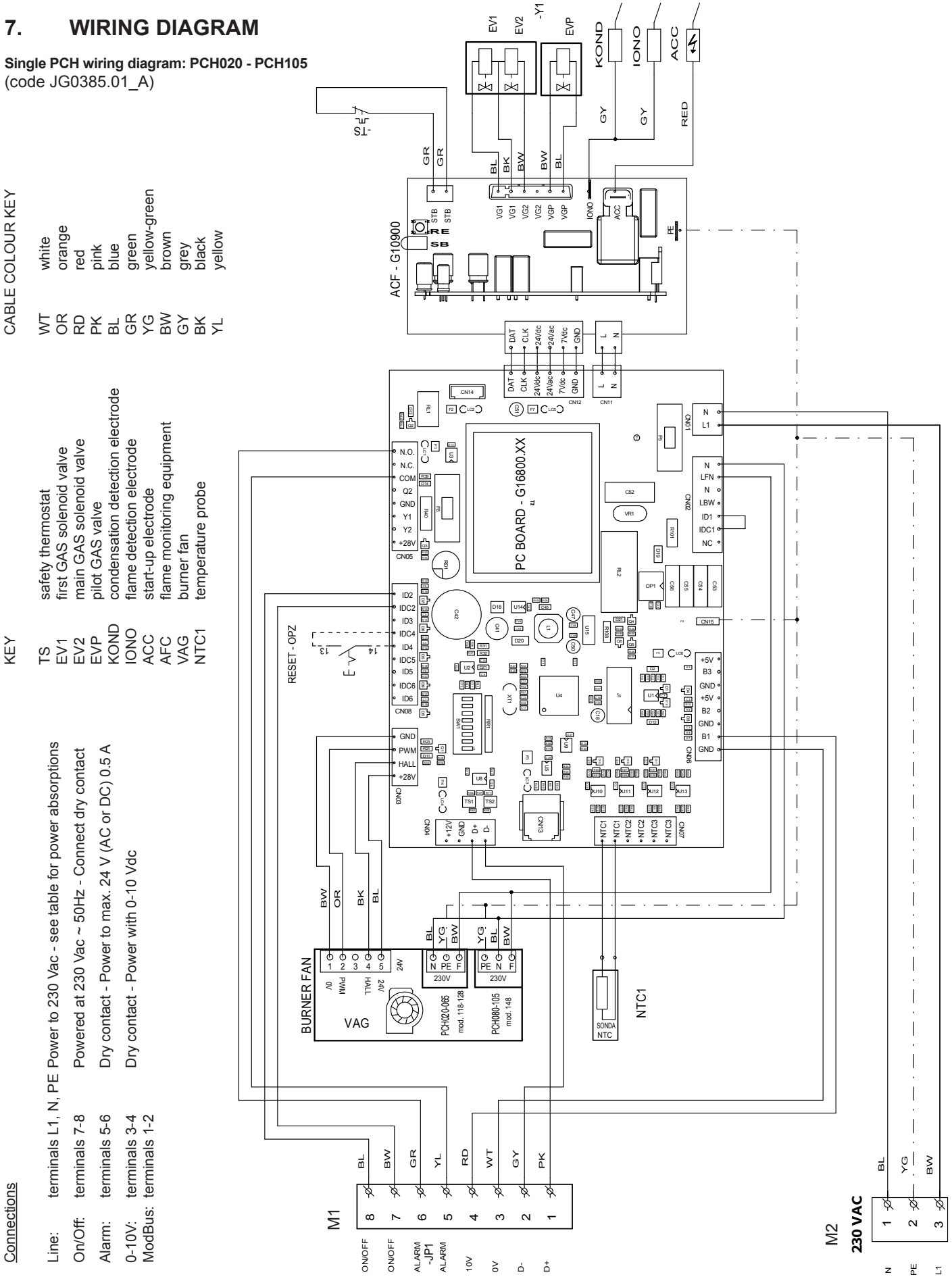
Key:

"Value" = value which cannot be modified, read-only value

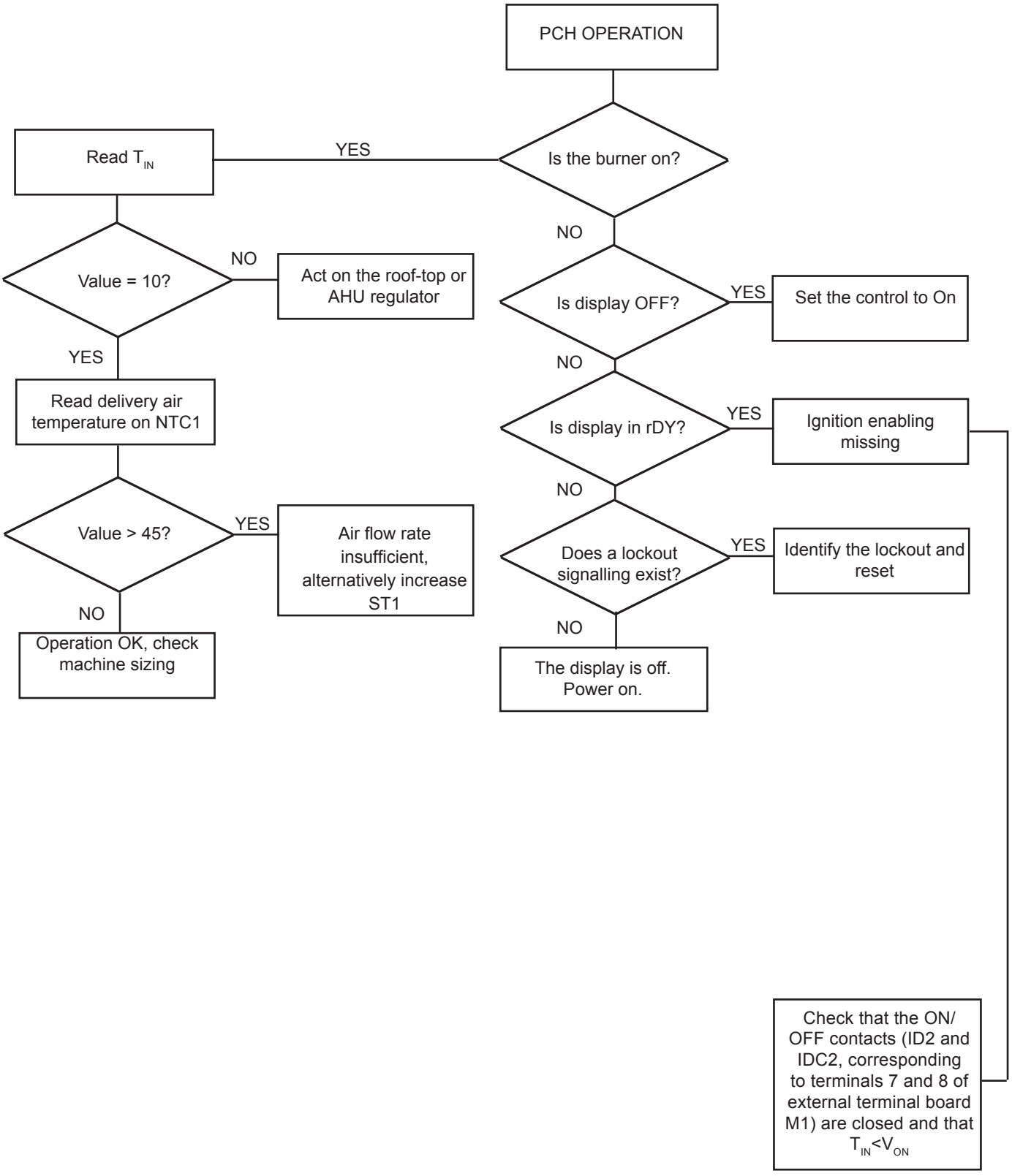
“Value-Mod.” = Value which can be modified, write value

7. WIRING DIAGRAM

Single PCH wiring diagram: PCH020 - PCH105
(code JG0385.01_A)

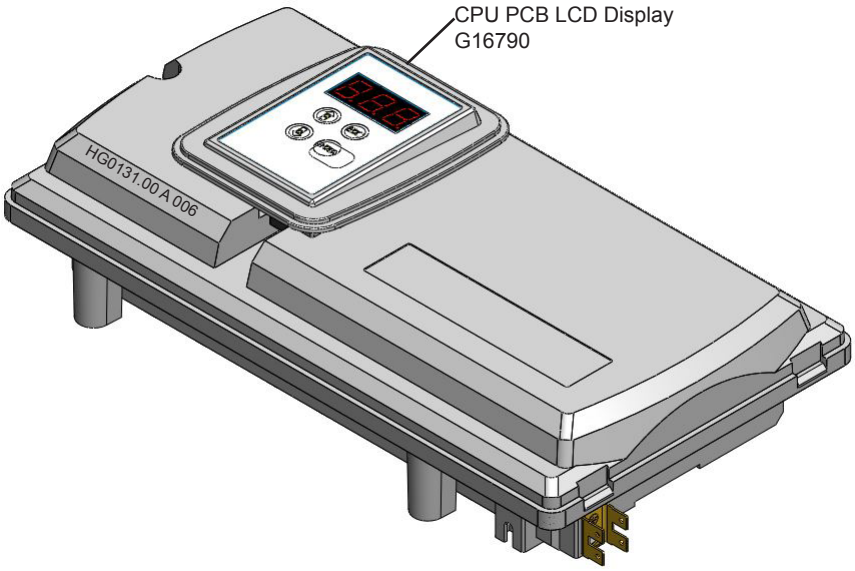


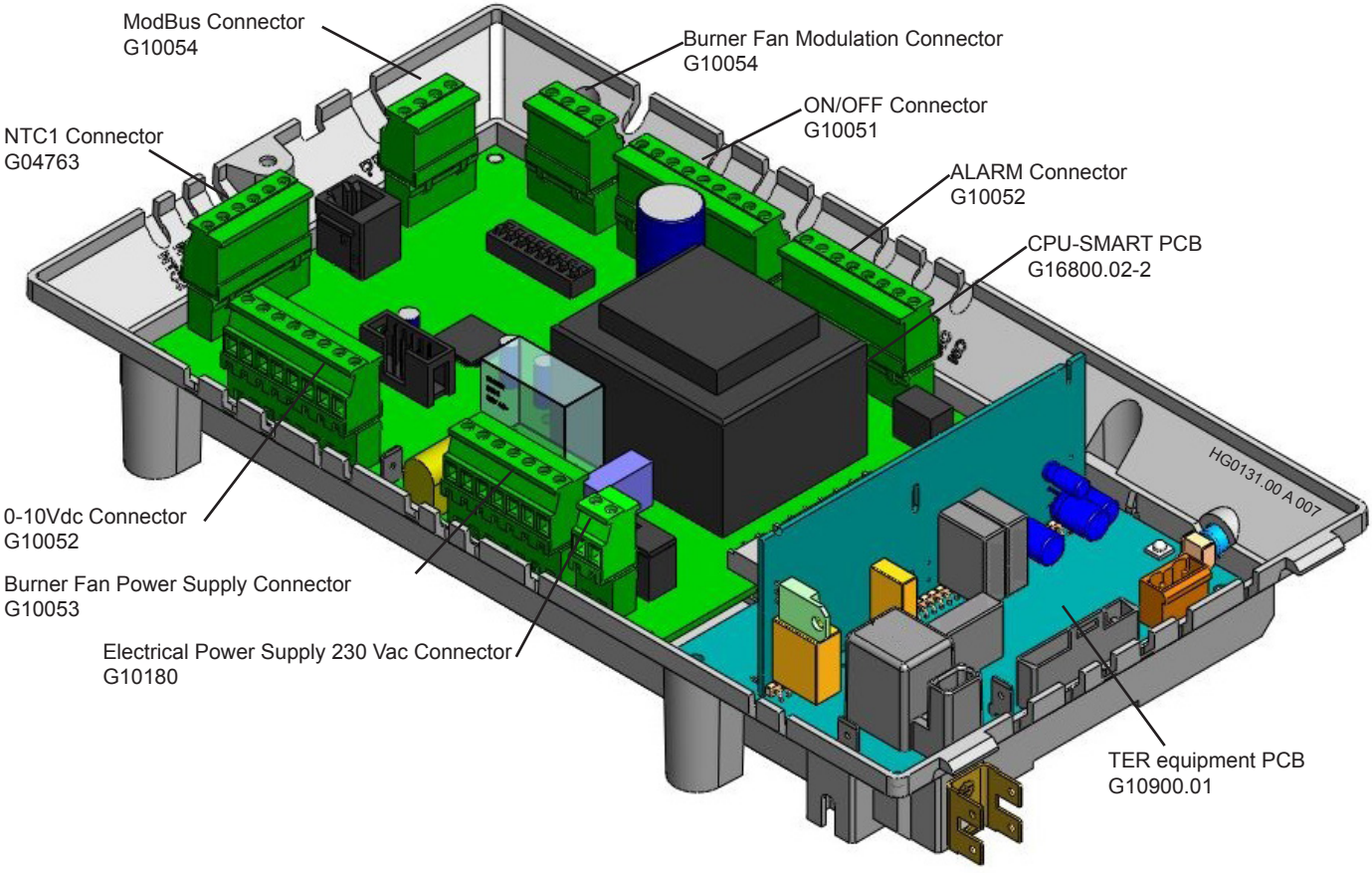
8. ANALYSIS OF FAULTS



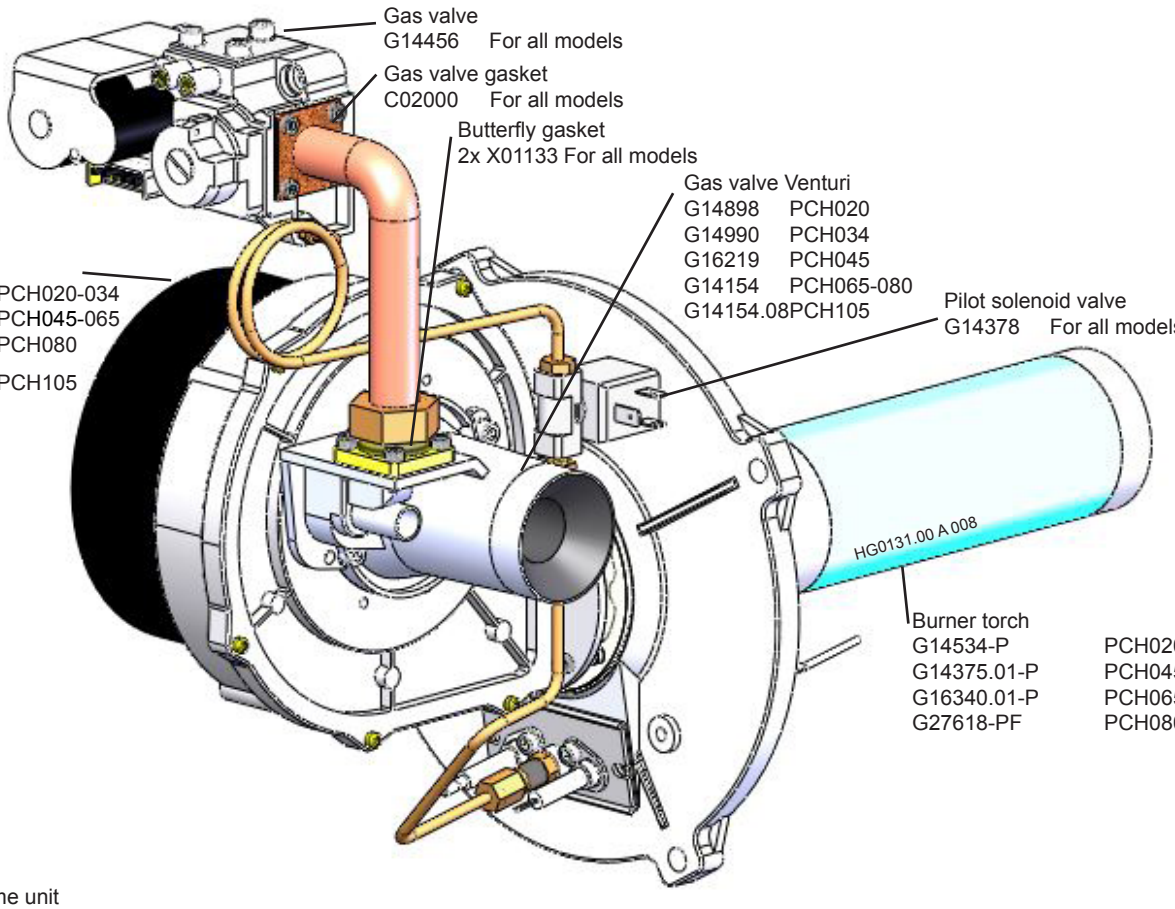
9. LIST OF SPARE PARTS

9.1. Parts for the electrical panel

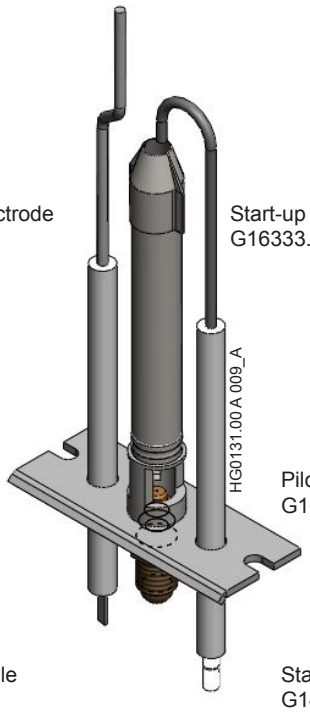


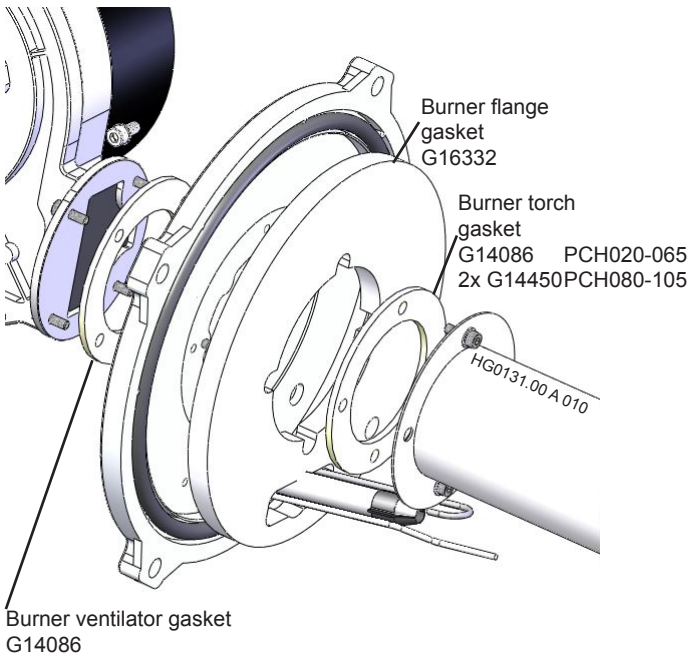


9.2. Parts for the burner unit



Pilot flame unit
G28030.01 G20.
G28030.01-1 LPG.





9.3. Other spare parts available

Supply
EPDM round seal
G27195

Exhaust casting
G27816

Flue gas drainage casting
G27815

Type "B" terminal
G28814

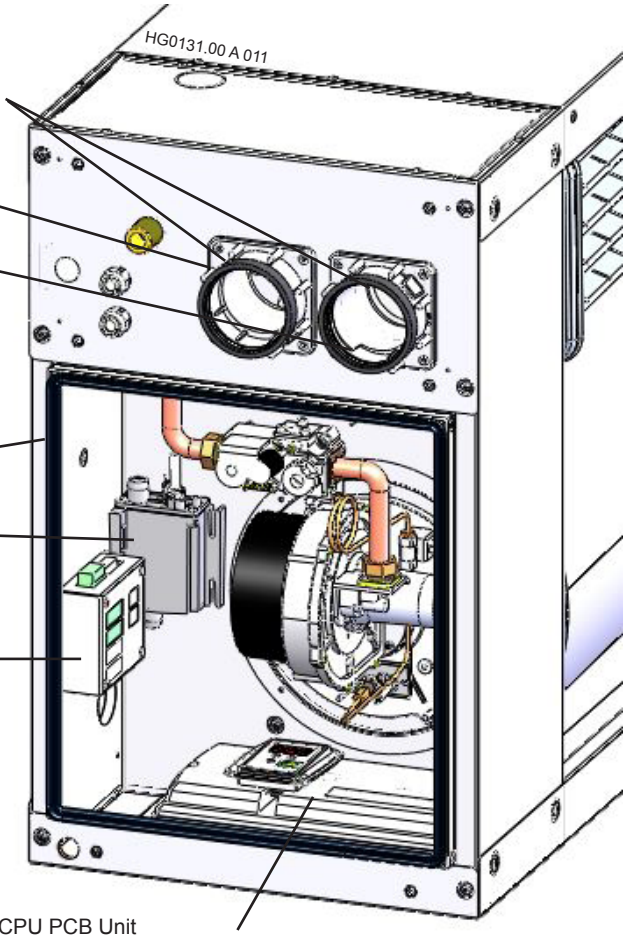
Door closure
X04511

Housing black seal
X01495

Trap
C09385 For all models

Condensate drain pipe
G27576 For all models

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

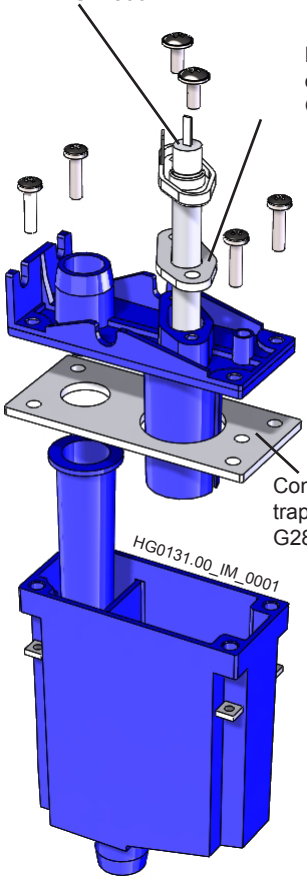


CPU PCB Unit
G28301.03 PCH020-065
G28302.03 PCH080-105

Condensation detection electrode
G27806

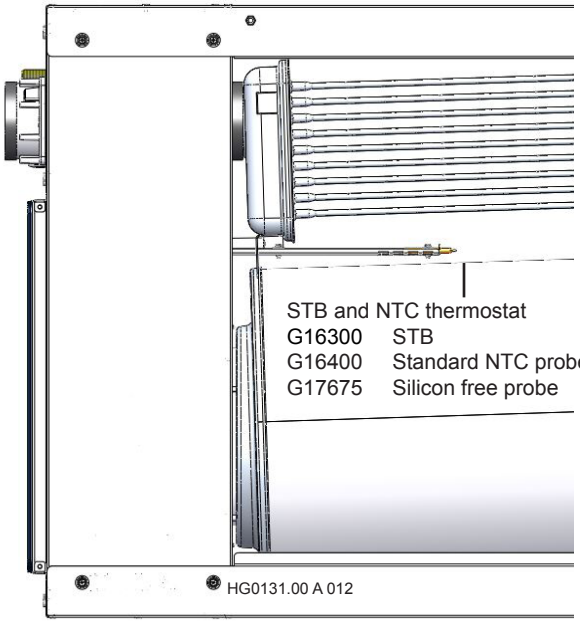
Detection electrode gasket
G28826

Condensate trap gasket
G28827



Water trap complete with condensation detection electrode
C09385

Remote control (OPTIONAL)
Smart Web G23700
Smart Easy G23500



STB and NTC thermostat
G16300 STB
G16400 Standard NTC probe
G17675 Silicon free probe

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