ApenGroup
aermaxline

GB	*Maintenance and Service Manual* *PCH Condensing Warm Air Heater Module*

CE

Dichiarazione di Conformità
Declaration of Conformity

APEN GROUP S.p.A.

20060 Pessano con Bornago (MI)
Via Isonzo, 1
Tel +39.02.9596931 r.a.
Fax +39.02.95742758
Internet: http://www.apengroup.com

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

Model: PCH Condensing Warm Air Heater Module
Model: PCH condensing heater module

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

Direttiva macchine 2006/42/CE
Machinery Directive 2006/42/EC

Direttive Apparecchi a Gas 2009/142/CE (ex 90/396/CE)
Gas Appliance Directive 2009/142/CE (ex 90/396/EC)

Direttiva compatibilità elettromagnetica 2004/108/CE oppure 2014/30/UE
Electromagnetic Compatibility Directive 2004/108/EC or 2014/30/EU

Direttiva Bassa Tensione 2006/95/CE oppure 2014/35/UE
Low Voltage Directive 2006/95/EC or 2014/35/EU

Qualora la macchina dovesse essere integrata in un impianto (macchine combinate), il costruttore vieta la messa in servizio della stessa se prima, l'impianto di cui farà parte non verrà dichiarato conforme alle sopracitate disposizioni (Allegato IIB della Direttiva Macchine).
If the unit is to be installed into a system (combined), the manufacturer disclaims any responsibility if this equipment is not previously declared compliant with the requirements specified in IIB Enclosure of the above said Machinery Directive.

Pessano con Bornago

APEN GROUP S.p.A.

CODE

SERIAL NUMBER

INDEX

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 and by failure to follow the instructions contained in this manual and by operations carried out by unqualified staff.
This product must be used only for the applications it was designed for. Any other wrong or unreasonable use must be regarded as improper and therefore hazardous.
During the installation, operation and maintenance of the equipment described in this manual, the user must always strictly follow the instructions given in all the chapters of this operating and maintenance manual.

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

When first switched on, conversion between different types of gas and maintenance operations must be carried out only by staff provided by **Service Centres authorised by current and older regulations**.
APEN GROUP has a large network of authorised service centres. For more information, visit our Web site *www.apengroup.com* or contact the manufacturer directly.
The warranty conditions are specified on the warranty certificate supplied with this equipment.
The manufacturer declares that the equipment has been manufactured in compliance with UNI, UNI-CIG, CEI technical standards and with all relevant legislation, as well as with the 90/396/EEC Directive and the later *2009/142/EC* Directive.

2. SAFETY INSTRUCTIONS

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 is compatible with the data stated on the nameplate;
- the combustion air intake ducts (when fitted) and the fume exhaust pipes are those specified by the manufacturer;
- the combustion air is supplied in such a way as to avoid even partial obstructions of the intake grille (caused by leaves etc.);
- the fuel intake internal and external seal is checked during the testing stage, as required by applicable standards;
- the heater is supplied with the same type of fuel it has been designed for;
- the system is correctly sized for such flow rate and is fitted with all safety and monitoring devices required by applicable standards;
- the inside of the gas pipes and air distribution ducts for ducted heaters has been thoroughly cleaned;
- the fuel flow rate is suitable for the power required by the heater;
- the fuel supply pressure is between the range specified on the 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 higher than 60mbar 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 (CEI 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 single 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 fume exhaust duct;
- do not wet the heater with water or other fluids;
- do not place any object over the equipment;
- do not touch the moving parts of the heater:

2.5. Maintenance Operations

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

Before carrying out any cleaning and maintenance operations, isolate the heater from the mains power supply from the switch located on the electrical system and/or on the shut-out devices.
If the heater is faulty and/or incorrectly operating, switch it off and do not attempt to repair it yourself, but contact our local Technical Service Centre.
All repairs must be carried out by using genuine spare parts. Failure to comply with the above instructions could compromise the safety of the equipment and invalidate the warranty.
If the 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 removed.
It is strictly forbidden to obstruct the Venturi pipe inlet, located on the burner-fan unit, with your hands or with any other objects. Any obstruction could cause a backfire from the premixed burner.

2.6. Transport and Handling

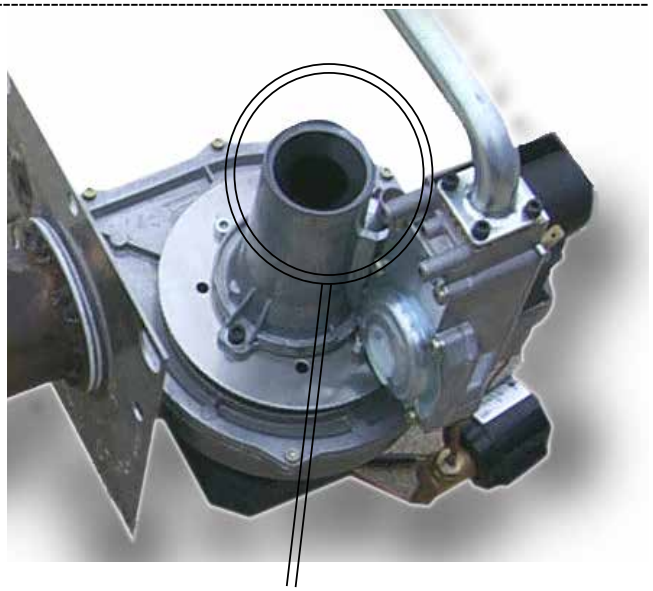
The heater is delivered fastened to a pallet and covered with a suitably secured cardboard box.
Unload the heater from the truck and move it to the site of installation by using means of transport suitable for the shape of the load and for the weight.
If the unit is stored at the customer's premises,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

If the unit is to be dismantled or demolished, the manager of the operation must make sure that:

- the electrical wiring is removed
- all plastic parts are removed.

NOTE: All recovered materials will be handled and disposed of according to provisions of current laws in the country of use and/or according to standards indicated in the technical safety sheets of chemical products.



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)
The range consists of six models each with a single heat exchanger: PCH020, 034, 045, 065, 080 and 105. The heat output ranges between 5 and 97.2 kW.
The modules may be installed having either horizontal or vertically air flow direction.

Model:		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105	
Type of equipment		B23P - B53P - C13 - C43 - C53 - C63 - C83											
EC certification	PIN.	0694CP1457											
NOx Class	Val	5											
		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	kW	4.97	18.18	8.13	33.56	8.97	40.45	13.40	62.93	17.77	80.03	22.77	97.15
Efficiency (net C.V.)	%	104.63	95.68	106.97	96.30	105.50	96.30	108.06	96.82	108.35	97.60	108.40	97.15
Efficiency (Gross C.V.)	%	94.26	86.20	96.37	86.76	95.07	86.76k	97.36	87.22	97.62	87.93	97.68	87.52
Flue losses with burner on (Hi)	%	0.4	4.3	0.6	3.7	0.5	3.7	0.2	3.2	0.3	2.4	0.2	2.8
Flue losses with burner off (Hi)	%	<0.1		<0.1		<0.1		<0.1		<0.1		<0.1	
Losses in enclosure (1)		0%		0%		0%		0%		0%		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	
Nitrogen oxides- NOx - (0% of O_2) (4)		38 mg/kWh - 22 ppm		42 mg/kWh - 24 ppm		33 mg/kWh - 19 ppm		39 mg/kWh - 22 ppm		32 mg/kWh - 18 ppm		41 mg/kWh - 23 ppm	
Available pressure at flue	Pa	80		90		100		120		120		120	
		Flue gas temperature, CO_2content and maximum flue gas flow rate: see gas tables on page 19 and on the following pages											
		Electrical Data											
Power supply	V	230 Vac - 50 Hz single-phase											
Power input	W	12	45	11	74	15	65	15	97	40	123	20	130
Power input in stand-by	W	<5											
Ingress Protection Rating	IP	IP X5D											
Operating Temperatures	°C	from -15°C a +40°C - for lower temperature, 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"	
Ø intake/exhaust pipes	mm	80/80		80/80		80/80		80/80		80/80		80/80	
		Air flow rate											
Minimum air flow rate (5)	m^3/h	1900		3500		4200		6500		8200		10.000	
Heat exchanger pressure drop	Pa	see diagram											
Max. applicable pressure	Pa	1200		1200		1200		1200		1200		1200	
		Weight											
Net weight	kg	39		48		58		72		98		118	

NOTES:
(1) Enclosure losses match those of the machine housing the PCH.
(2) Max.. condensation produced acquired from testing at 30%Qn.
(3) Value referenced to cat. H (G20)
(4) Weighted value to EN1020 ref. to class H (G20), referred to Hi (L.C.V.).
(5) The minimum air flow rate has been worked out for a Δ of 50°C, suitable for process systems or special applications. For smaller models, the air flow rates have been increases compared to the value obtained by using a Δt of 50°C ro ensure that the heat exchanger is correctly cooled.

B - PCH Horizontally combined modules (B System)
They consist of two or more heat exchangers; the burners, gas connections and combustion-air inlets/flues are the same number as the individual module 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 between 13.4 and 388.8 kW.
Module operation is cascaded by means of signal 0/10 Vdc and/or signal ON/OFF taken to the single module.
The modules can be horizontally or vertically installed, according to the air flow direction, regardless of the position of the heater .

Model:		PCH130		PCH160		PCH210		PCH320		PCH420	
Type of equipment		B23P - B53P - C13 - C43 - C53 - C63 - C83									
EC certification	PIN.	0694CP1457									
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	kW	13.40	125.86	17.77	160.06	22.77	194.30	22.77	291.45	22.77	388.60
Efficiency (net C.V.)	%	108.06	96.82	108.35	97.60	108.40	97.15	108.40	97.15	108.40	97.15
Efficiency (Gross C.V.)	%	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	
Losses in enclosure (1)		0%		0%		0%		0%		0%	
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	
Nitrogen oxides- NOx - (0% of O_2) (4)		39 mg/kWh - 22 ppm		32 mg/kWh - 18 ppm		41 mg/kWh - 23 ppm		41 mg/kWh - 23 ppm		41 mg/kWh - 23 ppm	
Available pressure at flue	Pa	120		120		120		120		120	
		Flue gas temperature, CO_2content and maximum flue gas flow rate: see gas tables on page 19 and on the following pages									
		Electrical Data									
Power supply	V	230 Vac - 50 Hz single-phase									
Power input	W	30	194	80	246	40	260	60	390	80	520
Power input in stand-by	W	<5									
Ingress 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 228/1-1xG1½"E1xG3/4"		UNI/ISO 228/1-2 x G 1½"	
Ø intake/exhaust pipes	mm	2 x 80/80		2 x 80/80		2 x 80/80		3 x 80/80		4 x 80/80	
		Air flow rate									
Minimum air flow rate (5)	m^3/h	13000		16400		20000		30000		40000	
Heat exchanger pressure drop	Pa	see diagram									
Max. applicable pressure	Pa	1200		1200		1200		1200		1200	
		Weight									
Net weight	kg	154		206		250		375		500	

NOTES:
(1) Enclosure losses match those of the machine housing the PCH.
(2) Max.. condensation produced acquired from testing at 30%Qn.
(3) Value referenced to cat. H (G20)
(4) Weighted value to EN1020 ref. to class H (G20), referred to Hi (L.C.V.).
(5) The minimum air flow rate has been worked out for a Δ of 50°C, suitable for process systems or special applications. For smaller models, the air flow rates have been increases compared to the value obtained by using a Δt of 50°C to ensure that the heat exchanger is correctly cooled.

C- PCH Vertically combined modules (C System)
They consist of two heat exchangers; the burners, gas connections and combustion-air inlets/flues are the same number as the individual module 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 between 13.4 and 194.4 kW.
Module operation is cascaded by means of signal 0/10 Vdc and/or signal ON/OFF taken to the single module.
The module can only be installed only with an horizontal air flow direction. Heaters with vertical air flow cannot be installed.

Model:		**PCH132**		**PCH162**		**PCH212**	
Type of equipment		B23P - B53P - C13 - C43 - C53 - C63 - C83					
EC certification	PIN.	0694CP1457					
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	kW	13.40	125.86	17.77	160.06	22.77	194.30
Efficiency (net C.V.)	%	108.06	96.82	108.35	97.60	108.40	97.15
Efficiency (Gross C.V.)	%	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	
Losses in enclosure (1)		0%		0%		0%	
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	
Nitrogen oxides- NOx - (0% of O_2) (4)		39 mg/kWh - 22 ppm		32 mg/kWh - 18 ppm		41 mg/kWh - 23 ppm	
Available pressure at flue	Pa	120		120		120	
		Flue gas temperature, CO_2 content and maximum flue gas flow rate: see gas tables on page 19 and on the following pages					
		Electrical Data					
Power supply	V	230 Vac - 50 Hz single-phase					
Power input	W	30	194	80	246	40	260
Power input in stand-by	W	<5					
Ingress Protection Rating	IP	IP X5D					
Operating Temperatures	°C	from -15°C a +40°C - for lower temperature, 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"	
Ø intake/exhaust pipes	mm	2 x 80/80		2 x 80/80		2 x 80/80	
		Air flow rate					
Minimum air flow rate (5)	m^3/h	13000		16400		20000	
Heat exchanger pressure drop	Pa	see diagram					
Max. applicable pressure	Pa	1200		1200		1200	
		Weight					
Net weight	kg	148		200		240	

NOTES:
(1) Enclosure losses match those of the machine housing the PCH.
(2) Max.. condensation produced acquired from testing at 30%Qn.
(3) Value referenced to cat. H (G20)
(4) Weighted value to EN1020 ref. to class H (G20), referred to Hi (L.C.V.).
(5) The minimum air flow rate has been worked out for a Δ of 50°C, suitable for process systems or special applications. For smaller models, the air flow rates have been increases compared to the value obtained by using a Δt of 50°C ro ensure that the heat exchanger is correctly cooled.

4. OPERATING CYCLE

Burner Operation

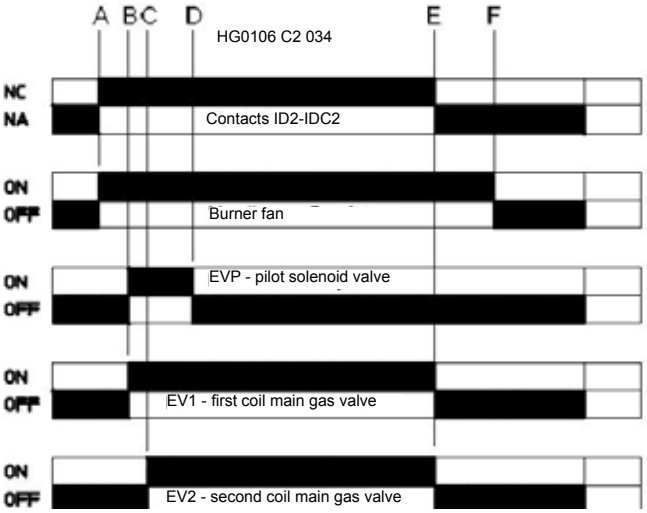
When the heat demand signal 0/10 Vdc activates terminals B1/GND in the CN06 terminal box on, the modulation PCB will start the operating cycle. The latter authorises the flame monitoring equipment to start.

Other required conditions for starting the cycle are: terminals ID2/IDC2 on terminal box CN08 closed and terminals ID1/IDC1 on terminal box CN02 jumpered.

NOTE: The terminals shown refer to a single PCB. The matches on the M1 interface terminal box are: 1=D+, 2=D-, 3=GND, 4=B1, 5=COM; 6=NO, 7=IDC2, 8=ID2.

The equipment will immediately start the ventilating burner [A] by pre-cleaning the combustion chamber for a preset length of time. After the pre-cleaning phase, the ignition phase starts: the equipment opens solenoid valve EV1 and, in parallel, solenoid valve EVP which supplies gas to the pilot burner [B].

After detecting the pilot flame, the equipment opens the main



gas valve EV2 [C] to supply gas to the main burner.

After a time of dual functioning of the two burners (pilot and main), the modulation PCB removes gas from the EVP valve and turns off the pilot burner [D].

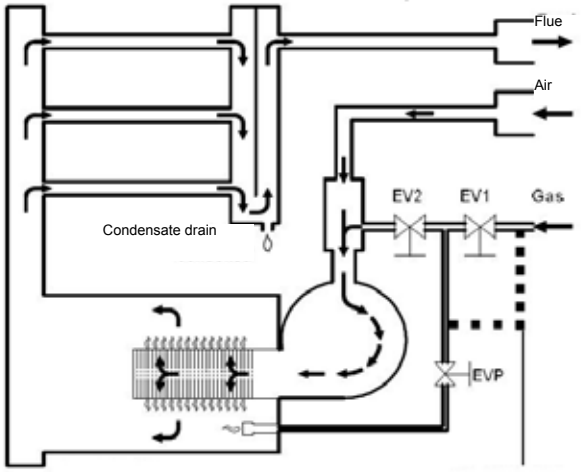
A single electrode detects the flame both for the pilot burner and the main burner.

The ignition program lights the burner to obtain an intermediate level heat output, which corresponds to about 30% of the maximum output. Once the flame is stabilised for a few seconds at ignition power, the burner begins to modulate its output to reach maximum output, if required, in a variable length of time programmed into the modulation PCB.

During operation, the modulation PCB will regulate the heat output of the burner proportionally to the voltage (0-10 Vdc) on the terminals. If there are multiple power modules, the 0/10 Vdc signal could turn off one or more modules in cascade.

The voltage reading should be sent from an external regulator which is not supplied, in the standard version, by APEN GROUP.

HG0106 C2 001



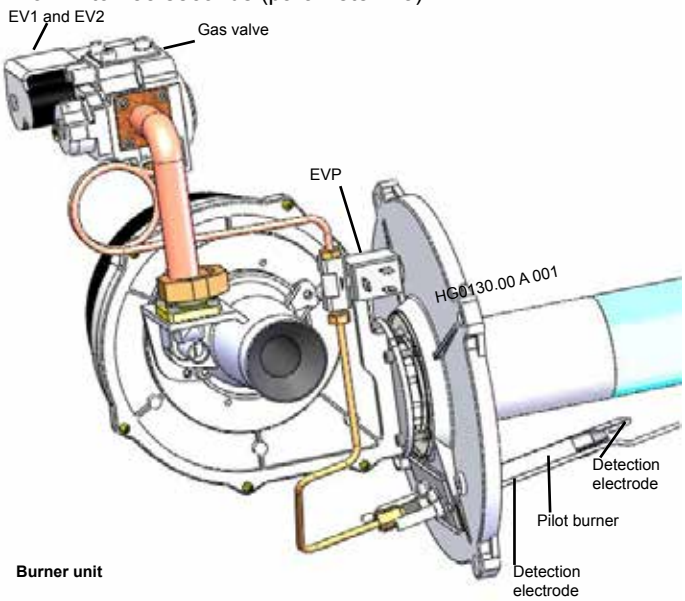
Turning off the burner

When the demand for heating ceases, signalled in a voltage lower than the preset limit (0.5 Vdc), the modulation PCB turns off the burner [E]; the fan continues to ventilate the combustion chamber, post-wash, for a preset length of time [F]. Opening the ID2/IDC2 contact (on the M1 terminal box on contacts 7 and 8) always causes the burner to stop without causing a fault. Opening the ID1/IDC1 also causes the burner to stop, but produces a fault warning signal (F21).

Cooling Fans

The start up of equipment requiring a command for the cooling fans is controlled by a timing mechanism in the APEN GROUP modulation PCB.

The length of time preset at the factory is 1 second, and can be modified from the LCD display on the CPU PCB on the machine from 1 to 255 seconds (parameter D3).



Burner unit

When the heat demand stops, low signal 0-10 Vdc, or opening the contact of the modulation PCB stops the burner, the cooling fans (if in operation) continue to function for a preset time (D4), which can be changed from the LCD display on the CPU PCB on the machine, to a time that is sufficient to cool the heat exchanger.

NOTE: In equipment where cooling fans are controlled separately, it is required to follow the timing constraints indicated in the paragraphs below.

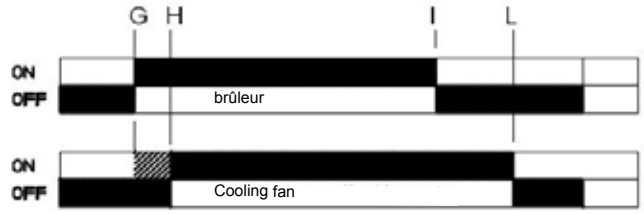
Start up
The fan can be started simultaneously with the burner [G] or it can be delayed for a maximum of 60 seconds [H], to avoid introducing cold air into the chamber. If the fan has an electrical protection monitor and/or an air flow monitor, these devices must be connected in series to the ON signal for the burner at ID2/IDC2 contacts on terminal box CN08 (on terminal box M1, contacts 7 and 8).

Shut down
When the heat demand stops, cooling ventilation must be maintained for longer than the first three minutes [L]; this allows the exchanger to cool down properly. Failure to perform the post-cooling operations on the exchanger will cause:
- a shorter lifetime of the exchanger and the warranty being voided;
- the safety thermostat to intervene, which will require a manual reset.

If, during the cooling cycle, there is a new demand for heat, the modulation PCB will wait for the cooling fans to shut down and then reset the counters to start a new cycle.
Parameter **d6** of the modulation PCB, which can be programmed from 0 to 256 seconds, manages the minimum interval between shut down and the next start up.

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

Safety thermostats
A safety thermostat with automatic reset and positive safety setting is installed on the heater module. The breaking of the sensitive element corresponds to a safety intervention.
When the thermostat clicks in, through the flame monitoring equipment, the burner stops and the flame equipment is locked out.
The flame equipment lockout, caused by the safety thermostat, is indicated on the LCD display of the CPU PCB on the machine with F20.



HG0106 C2 034

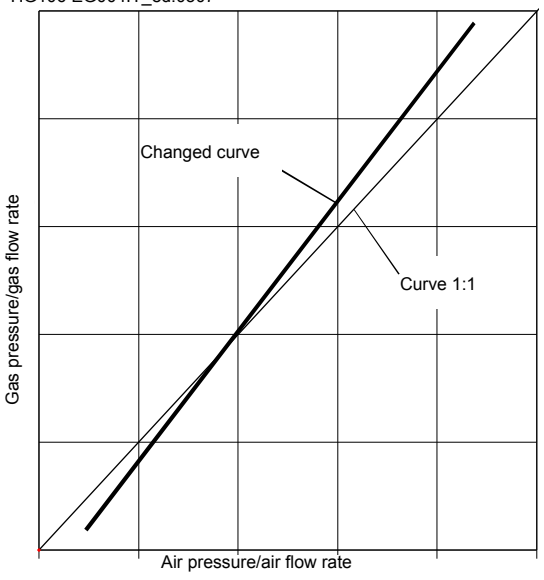
The lockout is classified as "non-volatile" and requires a manual reset.
Near the safety thermostat, there is an NTC1 probe set to the value of the ST1 parameter which "cuts" the burner's heat output independently from the incoming 0/10 Vdc signal when it reaches the set point. The probe monitors the ratio of heat output / cooling air flow.
It is not advisable to change the ST1 value without consulting the APEN GROUP Service Centre.

Lockouts Fxx
The modulation PCB can distinguish between 30 different types of lockouts. This ensures accurate diagnostics.
Also, codes and possible causes of lockouts are listed in the manual.
For more serious lockouts that require a manual reset, use the LCD display to reset the CPU PCB on the machine by pressing the arrows at the same time.

4.1. Air/gas Premixing Operation

The PCH heater is fitted with a burner that completely premixes air and gas. The air/gas mixing occurs inside the impeller on the motor-ventilator.
The air taken into the impeller through the venturi tube, calibrated, creates a vacuum. The vacuum in the venturi is rebalanced by the gas valve, which is pneumatically controlled.
The air pressure - gas pressure ratio is 1:1. This ratio can be corrected by turning the offset adjustment screw (on the gas valve). The heater is supplied with the offset regulated and the screw sealed.
A second adjustment can be done with the screw on the venturi, which regulates the value of maximum gas capacity and determines the amount of carbon dioxide (CO_2) in the fumes. This adjustment is also made at the factory. The screw is not sealed to permit conversion to another type of gas, if desired.
To adjust the offset and CO2, see the chapter about assistance.
The modulation PCB, mounted on the heater, manages the motor rotation (in c.c.) depending on the heating power required by the environment. Varying the rotation speed of the motor changes the air flow capacity and therefore also the gas flow capacity. Minimum and maximum rotation values of the ventilator are programmed into the PCB and cannot be modified by the user and/or installer.

HG106 EG004IT_ed.0507



HG106 EG004

5. USER'S INSTRUCTIONS

Read the safety warnings described on the previous pages. Operations that the user must perform are limited to the use of controls located on the LCD display of the CPU PCB installed on the machine.

5.1. Operation of the Heater

The PCH module is installed inside a machine, on a roof-top or an air treatment unit. It is managed by a control on board the machine where it is installed.
To turn on, regulate and turn off the PCH, the user must follow the instructions in the manual of the machine where the PCH is installed.
The instructions which follow are therefore for the operator who has access to the PCH.
The heater is completely automatic. It is equipped with electronic equipment that self-verifies and manages all controlling and monitoring operations of the burner, and an electronic card with micro-processor that, through the LCD display on the CPU PCB on the machine (which also has a micro-processor), checks and regulates the level of power to supply.
The demand for ignition occurs through the adjustment of the machine where the PCH is installed.

5.2. Interface Panel

The PCH heater is fitted as standard with a multifunction LCD panel located inside the burner housing, which 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 four function keys: ↑ , ↓ , ESC and ENTER; the display allows the user to view the heater operating mode and its faults..
It allows our 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 room temperature monitoring system;

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 "operation ON";

Fxx Fault detected.

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

Air **when the EST function in the menu FUN was selected by mistake; modify FUN to ON or OFF;**

Axx **Address of the PCH unit;** If the module has a different address than Ø, the display will show, alternating with the operation in progress, the address assigned to the module.

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

Navigating the menu
The menu has three levels. The fist is visible without entering a password, the second and third require using second and third level passwords.
If the PCH PCB is connected to a Smart Control or the SMART. NET, and therefore with an address different from Ø, parameters are only visible and cannot be modified. Some menus are not available.
The Service Centre that is required to work on all menus must follow these instructions:

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

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" view.
To change the parameter, press the arrow keys: pressing ↑ (up arrow) increases the parameter by 1, pressing ↓ (down arrow) reduces it by 1. Pressing both arrow keys for at least three seconds increases the parameter scroll speed.
To confirm a change in parameters, press ENTER for at least 3 seconds. The change in the parameter is signalled by a flash of the display.
All submenus scroll from the bottom towards 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 ↑ (arrow up) and ↓ (arrow down) keys to reach the ABI function; hold down the ENTER key for 3 seconds;
- Set the password inside the menu ABI and confirm it with ENTER; hold it down per approximately 3 seconds (the flashing display will show 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 present on the first level:
machine status gives information about the operation of the PCH (ex. 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 coming into the PCH;
Pra not used;
ABI used to enter the PWD to access menus of second and third level.

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

Set Point Menu
For meaning and default values, please see the CPU-SMART PCB PARAMETERS Table at Paragraph 4.4 "Modulation PCB Parameters".

H51 Select how to work the 0/10 Vdc regulation;
H52 IS the OFF value on the 0/10 Vdc signal;
H53 IS the ON value on the 0/10 Vdc signal;
ST1 Intake air modulation temperature;
ST2 not used;
H43 not used;
H44 not used;
H45 not used;
ST5 not used;
ST6 not used;

I/O Menu - Input Output
The value measured by the sensors can be read from the **I/O** menu.
NTC1 Intake air temperature;
NTC2 Not used (shows -10);
NTC3 Not used (shows -10);
An1 Shows input voltage 0/10 V - ;
PRH Not used;
FLH Not used;
rPu FAN revolutions No.;
PU2 Not used;
uSA Not used;
IOn Measures the ionisation current; from 0/100 for currents from 0 to 2 microAmperes, 100 for over 2 microAmperes.

Entering the second password grants access to level three and, in addition to the previous menus, it is also possible to view the PAR and FLT menus.
This password is required by service and must be requested directly from Apen Group.

PAR Menu - Parameters
The submenu **Par** allows access to parameters "b" and "d":
from b1 to b15 burner parameters;
from d0 to d9 operating configuration.
For the meaning and default values, see the table CPU-SMART PCB PARAMETERSat Paragraph 4.4 "Modulation PCB Parameters".
In addition to the "b" and "d" parameters, it is also possible to modify the following parameters:
S1 Enables the modulation probe;
SP1 Hysteresis of ST1 (only if the probe is used as a temperature limit);
tH1 Maximum temperature of the modulation probe, shuts down the burner independently from other set conditions;
from S2 Not used.
to H41

Flt Menu (Fault)
Displays the fault history. The arrow keys can be used to scroll through the list of error codes. Press ENTER to view the historical value of the selected fault.
The first visible value, rst, will reset the fault history to zero. DO NOT reset. Only the assistance centre is authorised to perform this operation. The reset operation is performed by changing the **d7** parameter to 1, and then confirming by pressing ENTER for at least 3 seconds. After resetting, **d7** will show 0.
The list and meanings of all faults are shown in the FAULTS table at 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 precisely.
To reset the lockout, press both arrows simultaneously for a few seconds.
Lockouts can be remotely controlled by using:
- the digital input ID4-IDC4 - button N.O.;
- the Smart Control - optional;
- the ModBus protocol, if implemented by the manufacturer of the machine where the PCH is installed.

If ignition fails, the flame monitoring system attempts ignition four more times. After four failed attempts, it will lock out and display fault code F10.
The lockout code and cause of lockout is shown in the FAULTS table in Paragraph 4.5 "Analysis of lockouts - Faults".
If the flame monitoring equipment is locked out (faults from F10 to F20), it is also possible to reset it by using the button on the equipment itself. This lockout is also shown by a LED lighting up on the equipment.

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

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

5.4. Modulation PCB Parameters

Listed below they may be found all the values of the parameters of the board CPU-SMART for all the models of PCH heaters.
(1) it indicates that the parameters can be changed with the Password 001.
(2) it indicates that the parameters can be changed with the second level password, which has to be asked the manufacturer's Service Department.
(3) it indicates that the parameters can be changed only with Smart Control or via Modbus
values of the parameters of the CPU-SMART PCB are shown for all models of PCH heaters.

CPU-SMART PCB parameters version 7.00.xx									
PARAMETER			PCH020	PCH034	PCH045	PCH065	PCH080	PCH105	DESCRIPTION
Settings Parameters									
d0	(2)		5						Flame modulation: 2=NTC1; 5=0÷10Vdc; 7=Modbus (SmartControl and PID)
d1	(2)		5						Type of equipment: 0=heater; 2=boiler; 5=PCH
d2	(2)		1						Remote lockout output signal (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=5seconds 60=300 seconds)
d5	(2)		0						Enable monitor T fumes (NTC3): 0=disabled; 1=enabled
d6	(2)	sec	5						Interval between shut down and ignition (timer Off): 0/255
d7	(2)		0						Reset Fault counters: 0/1
d8	(2)		0						Enable boiler antifreeze (NTC1): 0=disabled; 1=enabled NOT USED
d9	(2)		0						Enable shutters: 0=disabled; Do Not Modify
Burner Parameters									
b1	(2)	rpm	213	210	177	182	172	175	MINIMUM motor revolutions value (PWM1): 90÷999 (1=10 RPM)
b2	(2)	rpm	660	710	580	651	655	635	MAXIMUM motor revolutions value (PWM1): 90÷999 (1=10RPM)
b3	(2)	rpm	320	300	345	340	355	305	IGNITION motor revolutions value (PWM1): 90÷999 (1=10RPM)
b4	(2)		2						Divider signal HALL: 2/3
b5	(2)	rpm	50						Error F3x; n° revolutions x10 (50=500rpm): 0/300
b6	(2)	sec	20						Error F3x; duration of error before fault F3x: 0/255
b7	(2)	sec	20						Duration of maximum pre-cleaning at maximum output: 0÷255 DO NOT MODIFY THE PRESET TIME.
b8	(2)	sec	10						Time of flame stabilisation (ignition): 0/255
b9	(2)	sec	90						Duration of post-washing in the combustion chamber (FAN ON): 0/255
b10	(2)	%	3						Increase % motor revolutions per each b11 seconds: 1/100
b11	(2)	sec	8						Time interval for increasing motor revolutions: 1/100
b12	(2)	%	30						Value % modulation FAN motor in antifreeze mode: 30/100
b13	(2)	pwm	65						Integral factor value (ki_pwm) for calculating PWM1- (exA36):0÷249
b14	(2)	pem	45						Proportional factor value (kp_pwm) for calculating PWM1- (exA37):0÷249
b15	(2)	sec	0						Duration of flow monitoring for start up 0÷255
b16	(2)		0						Blower-fan control: 0 = input disabled; 1 = enabled with required input N.C.; 2 = enabled with required input N.O.
b17	(2)		0						Blower-fan control: 0 = input disabled; 1 = enabled with required input N.C.; 2 = enabled with required input N.O.
Monitor NTC1 modulation probe with D0=2; as a limit value if D0=5 or 7									
S1	(2)		1						Enable NTC1 probe: 0=disabled; 1=enabled
ST1	(1)	°C	45						NTC1 Set point: -10/90
SP1	(2)	°C	5						Hysteresis SP1: 0/10
XD1	(3)	%	6						Proportional Band from 4 to 100
TN1	(3)	sec	15						Integral time: 1/255
AC1	(3)		0						0=only modulation; 1=ON/OFF if D0=5 or 7, modulation 0/10V or MODBUS
TH1	(2)	°C	60						Upper temperature limit for activation of fault F51: 10/95 auto-reset if NTC1<TH1-15°C

CPU-SMART PCB parameters version 7.00.xx					
PARAMETER			PCH020 PCH034 PCH045 PCH065 PCH080 PCH105		DESCRIPTION
Check 0/10 Vdc - D0=5					
H51	(1)		1		Active only with D0=5 (0/10V) 0=only modulation; 1=modulation and ON/OFF
H52	(1)	V	0.5		Voltage of OFF, burner shut down if H51=1: 0/10 1Module = 0.5; 2Modules = 1.5; 3Modules = 2.5; 4Modules = 3.5.
H53	(1)	V	0.5		Delta Voltage for ignition burner ON 1Module = 0.5; 2Modules = 1.0; 3Modules = 1.5; 4Modules = 1.5.
H54	(3)	sec	10		Duration of lower input: 0/255
H55	(3)	sec	10		Duration of upper input: 0/255
Monitoring of circulator output - 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		Minimum voltage output Y2: 0/10
H13	(3)	V	10.0		Maximum voltage output Y2: 0/10
H14	(3)	%	80		Minimum value PWM2: 0/100
H15	(3)	%	100		Maximum value PWM2: 0/100
H16	(3)		2		2= modulation of circulator proportional top the FAN (do not modify)
H17	(3)		1		0=output PWM (Y1) or 0/10V (Y2) according to "direct" logic; 1=output PWM (Y1) or 0/10V (Y2) according to "reverse" logic;
Monitoring of NTC2 - USED ON PCH WITH OPTIONAL PROBE					
S2	(2)		0		0=NTC2 disabled; 1=NTC2 enabled
ST2	(1)	°C	2.0		Setpoint NTC2: -10/90
P2	(2)	°C	1.0		Hysteresis ST2: 0/40
XD2	(3)		40		Neutral zone, proportional modulation band divided by 100: 4÷100
TN2	(3)	sec	5		Integration time: 1/255
ANTIFREEZE Monitoring - enabled with D8=1 - NOT USED ON PCH					
STA	(3)	°C	2.0		Antifreeze set point: -10/+20
PA	(3)	°C	1.0		Antifreeze hysteresis set point: 0/10
FUME TEMPERATURE Monitoring - enabled with D5=1 - NOT USED ON PCH					
H41	(2)	°C	5		Fume temperature (NTC3); neutral band from 1÷50
H42	(3)	sec	5		Execution time of fume monitoring cycle (15=30seconds): 0/255
H43	(1)	°C	95		Fume temperature at maximum capacity (Tmax with PT%=100):0÷140
H44	(1)	°C	85		Fume temperature at medium capacity (Tmed with PT%=50):0÷140 0/140
H45	(1)	°C	75		Fume temperature at minimum capacity (Tmin with PT%=0):0÷140 0/140
H46	(3)		0		Fume temperature operation: 0=only modulation - 1= OFF burner
TH3	(3)	°C	103		Upper temperature limit (auto-reset if NTC3<TH3): 0/140

CPU-SMART PCB parameters version 7.00.xx				
PARAMETER	PCH020 PCH034 PCH045 PCH065 PCH080 PCH105			DESCRIPTION
WATER PRESSURE Monitoring in hydraulic circuit - NOT USED ON PCH				
S5	(2)		0	Enable B2 pressure probe output: 0=disabled;1=enabled as input ON/OFF; 2=enabled as analogue input without auto-reset fault F83; 3=enabled as analogue input with auto-reset fault F83
ST5	(1)	bar	0.70	Set point B2: 0/9.99
P5	(2)	bar	0.30	Hysteresis ST5: 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 corresponding to B2 probe input minimum voltage
YB5	(3)	bar	2.90	Pressure corresponding to B2 probe maximum voltage
TH5	(3)	V	2.50	Upper pressure limit for activation of fault F82: 0/9.99
WATER FLOW Monitoring in hydraulic circuit - NOT USED ON PCH				
S6	(2)		0	Enable output B3 flow sensor: 0=disabled 1=enabled as input ON/OFF without auto-reset fault of F85 2=enabled as input ON/OFF with auto-reset fault of F85 3=enabled as pulsed input without auto-reset faults of F85 and F86 4=enabled as pulsed input with auto-reset faults of F85 and F86
ST6	(1)	Dal/h	56	Flow meter set point - in l/h (x10)
P6	(2)		5	Hysteresis ST6: - in l/h (x10)
XA6	(3)	Hz	14	Minimum frequency input signal B3 pressure probe: 0/999
XB6	(3)	Hz	229	Maximum frequency input signal B3 pressure probe: 0/999
YA6	(3)	l/h	29	Flow rate corresponding to minimum frequency input signal of probe B3
YB6	(3)	l/h	500	Flow rate corresponding to maximum frequency input signal of probe B3
TR6	(3)	sec	2	Delay time signalling fault F85/F86 (1=1second): 0÷250 During ignition phase, the value b15 is used.

5.5. Lockout Analysis - Faults

The CPU-SMART manages two types of lockouts:
- preventive, it warns the client that the PCH heater requires maintenance;
- operational, it stops the PCH heater for safety reasons or to ensure its correct operation.

Some operational lockouts require manual resets; others reset themselves when the problem that caused them is solved.
A complete list of lockouts, possible causes and possible solutions is shown below.

FAULT	DESCRIPTION	CAUSE	REMEDY
Lockouts caused by Flame - Related to TER equipment			
F10	Failure to ignite flame after 4 attempts performed by the equipment.	• Phase 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. • Condensate detection electrode defective or in contact with the ground. • Low CO_2 value	Manual reset
F11	Ill-timed flame (Flame detection before the ignition of the pilot group.)		
F12	Failure of ignition; not visible. The count, displayed in the historical list, indicates whether the heater has had problems with ignition.		
F13	The TER equipment does not accept the reset command from CPU-SMART	TER has finished its 5 reset attempts in the period of 15 minutes.	Wait 15 minutes or use reset button on equipment
F14	Lack of communication between TER equipment and CPU for more than 60 seconds	TER equipment or CPU-SMART PCB broken	Auto-reset
F15	The CPU-SMART PCB sent the ignition signal to the equipment. After 300 seconds, the equipment has not yet lit the flame.	safety thermostat lockout at start up	Check contact closing
		• No mains gas pressure • Live and neutral reversed. • No or faulty earth terminals • TER equipment broken	Manual reset
F16	Generic equipment lockout	TER equipment broken	Manual reset
F17	Internal malfunction of TER equipment that does not accept reset command from CPU-SMART	TER equipment broken	Manual reset of equipment
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	Input ID1 open caused by: NOT USED - Jumped	ID1 - IDC1 jumper missing	Manual reset of CPU-SMART
FAN lockout - burner ventilator			
F30	Fan speed too low in start up phase - VAG	Burner fan broken. FAN electrical cables broken or not connected	Manual reset
F31	Fan speed too high in start up phase - VAG		
F32	Fan speed, during operation, outside minimum and maximum set parameters - VAG		Manual reset, auto-reset after 5 minutes
NTC probes broken or missing			
F41	Probe NTC1 error, intake air temperature	Absence of signal from probe or broken probe	Auto-reset

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

–

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 the modules are of a PCH condensing type; the following material 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 of at least 0,2 %.

Use sealed pipe to prevent condensation from leaking from the pipes; the seal must be adequate to withstand a flue gas temperature ranging between 25° 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;

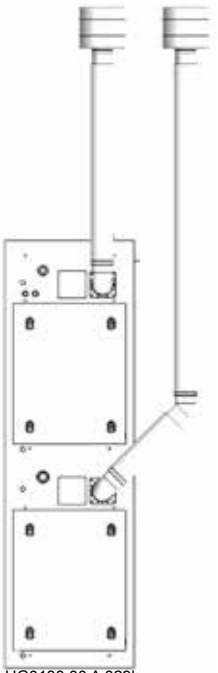
IMPORTANT: The horizontal sections of flue must be installed with a slightly incline (1°- 3°) towards the heater, in order to prevent the build of condensation in the exhaust.

Common exhausts
It is recommended that independent flues be used because the PCH modules are pressurised, so this prevents incorrect sizing/ apportionment 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 fume exhaust system with commercially available pipes can be found in paragraph 5.8 "GAS connection" within the Gas regulation settings.

The maximum recirculation percentage is 11%.

HG0130.00 A 025b



HG0130.00 A 029b

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 drop must be calculated for each component; each component has a different pressure drop value as the glue gases flow rate is different.
The pressure drops of each component identified must be added, checking that the result is no higher than the value available for the PCH heater module used; if a combustion air supply pipe is fitted, the pressure losses must be added to the fume exhaust pressure drop.
If the sum of pressure drops caused by the fittings are higher than the pressure available at the exhaust, ducting with higher diameter must be used, rechecking the calculation; a pressure drop higher than the pressure available at the fume exuahst reduces the heater module thermal output.

NOTE: If the module is installed indoor:
- using coaxial connections is prohibited for PRH heaters, whilst it is allowed for PCH heaters with a maximum length of 3 metres;
- the fume exhaust terminal must be installed in compliance with reference national regulation requirements.

If the duct routing requires the use of bends, the length required must be subtracted from the available length:

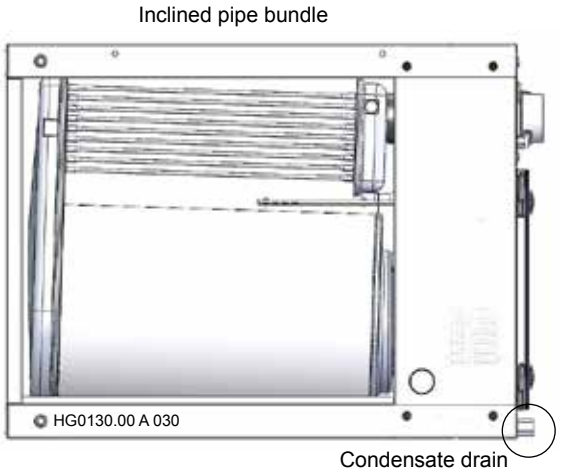
- Ø 80 wide radius bend at 90° EqL = 1.6m
- Ø 80 wide radius bend at 45° EqL = 1.1m
- Ø 100 wide radius bend at 90° EqL = 2.4m
- Ø 100 wide radius bend at 45° EqL = 0.9m

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 fumes discharged from the condensate drain.

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



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 (cod. G14303).

According to the type of installation, the module can drain the condensate in the following ways:

- free drainage;
- drain it via water pipes;
- drain it inside the unit (water trap).

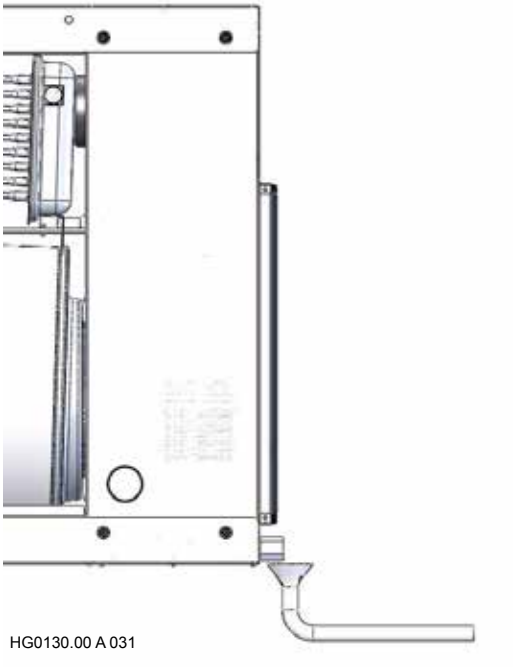
The multiple PCH heaters are fitted with a single condensate drain that collects the water drained from each internal module.

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 fumes to go through;
- for cold pipes (water pipes), PVC and any materials suitable for hot pipes.

Do not use copper nor 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 drain needs to be connected to pipes, an open type connection (socket pipe), similar to the one illustrated in picture below must be installed to prevent ice forming in the pipe from blocked condensate drainage, and the ensuing build-up of condensate in the exchanger.
If the discharge pipe is installed in an outdoor site, it may need to be heated by means of a heating cable.



Drained in water pipes
Taking the water trap to the room to be heated is a good solution to prevent ice build up; the condensate must be discharged in water pipes or collected and treated with a basic solution condensate neutralizer 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.

Drained inside the unit
This solution is also a good protection from the built up of ice on the water trap;the internal connection between the PCH module and the water trap can be made by using a silicone pipe available from 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 how the heater will be used (for example, not galvanised metal sheet).

WARNING: Not all countries allow all the condensate drain types described in this manual to be used. Please refer to the requirements set out in the local standards.

5.8. GAS Connection

Use the gas line connections only with CE certified components

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

Al components are fitted inside the burner housing.
To complete the installation, as required by current standards, the following components must be fitted
- anti-vibration joint:
- gas valve.

NOTE: A EN216 certified gas filter with filtration level lower or equal to 50 micron must be used, with no pressure governor, a wide range gas filter must be used since the filter supplied as standard, upstream of the gas valve, has a limited area.

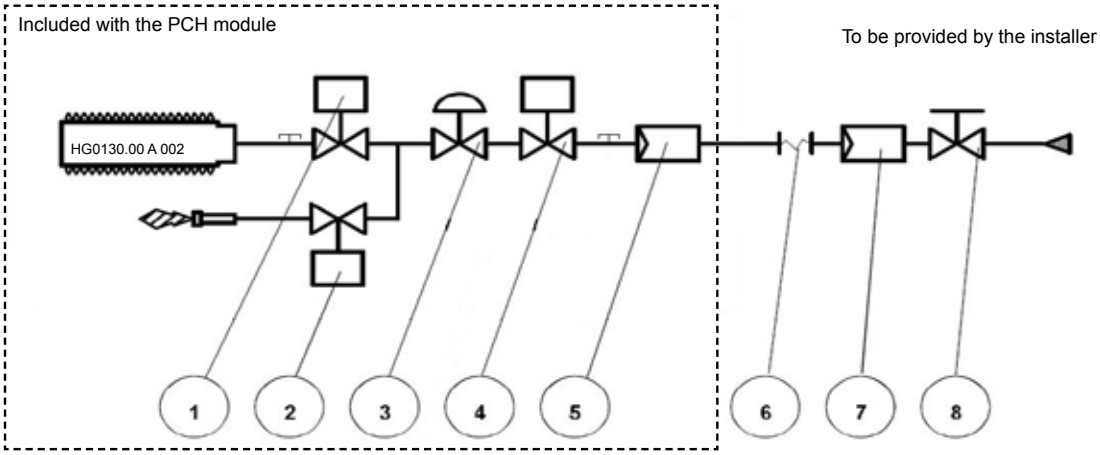
IMPORTANT: For ease maintenance, connect the PCH module by means of a seal and swivel gasket.

Avoid using threaded connected directly on the fas connection.

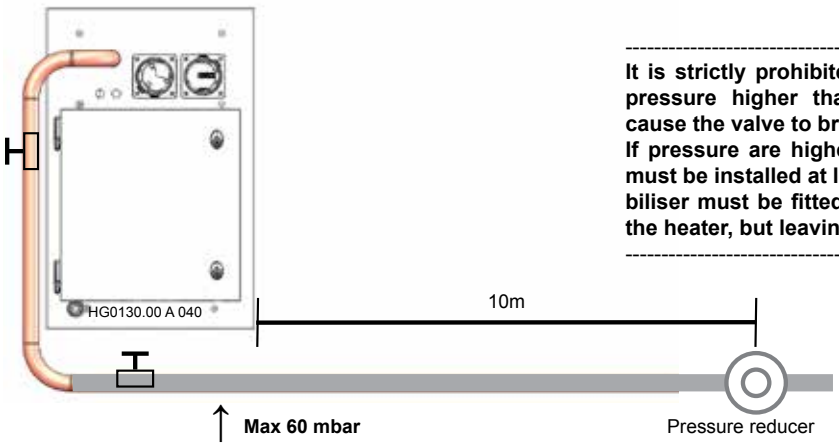
Current legislation allow a maximum pressure inside the rooms, or thermal station, of 40mbar; higher pressure must be reduced before entering the boiler room or the site where the PCH heater is installed.

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, tighten the external gas supply pipe but 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 60mbar. Such pressures could cause the valve to break.
If pressure are higher than 60mbar, a pressure reducer must be installed at least 10 m away 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	II2L3B/P	G25	25 mbar	G30/G31	50 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	II2ELwLs3B/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 to find out the factory settings.

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

Codes with no extension:

- 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];
- 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];

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

Gas settings table

TYPE OF GAS G20													
TYPE OF EQUIPMENT		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105	
Thermal		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
AIR SUPPLY PRESSURE	[mbar]	20 [min 17-max 25] *											
Ø PILOT NOZZLE	[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	1.90	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
FUMES TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26.5	70	28	80
FUME 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, the air supply pressure is 25 mbar													

TYPE OF GAS G25													
TYPE OF EQUIPMENT		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											
AIR SUPPLY PRESSURE	[mbar]	25 [min 17-max 30] *											
Ø PILOT NOZZLE	[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	8.9	8.8	9
FUMES TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26.5	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 ** For Germany (cat.LL) nozzle 0.75													

TYPE OF GAS G2.350 (only for PL-Poland)									
TYPE OF EQUIPMENT		PCH020		PCH034		PCH045		PCH065*	
Output		min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table							
AIR SUPPLY PRESSURE	[mbar]	13 [min 10-max 16] *							
Ø PILOT NOZZLE	[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
FUMES 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 **Maximum nominal heat output 75.0 kW									

NOTE: The minimum and maximum heat outputs of models PCH065, PCH130 and PCH132 will be lower compared to their operation with G20. The 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 (only for HU-Hungary)													
TYPE OF EQUIPMENT		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											
AIR SUPPLY PRESSURE	[mbar]	25 [min 20-max 33] *											
Ø PILOT NOZZLE	[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
FUMES TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26.5	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 [ex GZ41.5] (Only for PL-Poland)													
TYPE OF EQUIPMENT		PCH020		PCH034		PCH045		PCH065*		PCH080**		PCH105***	
Thermal		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
AIR SUPPLY PRESSURE	[mbar]	20 [min 16-max 23] *											
Ø PILOT NOZZLE	[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
FUMES 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 nominal heat output 57 kW ** Maximum nominal heat output 75 kW *** Maximum nominal heat output 94 kW													

TYPE OF GAS G30													
TYPE OF EQUIPMENT		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											
AIR SUPPLY PRESSURE	[mbar]	30 [min 25-max 35] - 50 [min 42,5-max 57.5]											
Ø PILOT NOZZLE	[mm]	0.51											
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	0.40	1.58	0.63	2.90	0.71	3.49	1.03	5.39	1,49	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
FUMES 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	

TYPE OF GAS G31													
TYPE OF EQUIPMENT		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105	
Thermal		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
AIR SUPPLY PRESSURE	[mbar]	30 [min 25-max 35] - 37 [min 25-max 45] - 50 [min 42.5-max 57.5]											
Ø PILOT NOZZLE	[mm]	0.51											
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	0.39	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
FUMES TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26.5	70	28	80
FUME 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 rates are twice as high as PCH065.
For PCH160 and PCH162 gas consumption and mass flow rates are twice as high as PCH080.
For PCH210 and PCH212 gas consumption and mass flow rates are twice as high as PCH105.
For PCH320 gas consumption and mass flow rates are twice as high as PCH105.
For PCH420 gas consumption and mass flow rates are twice as high as PCH105.

5.9. Starting up for the First Time

The PCH heater unit is supplied with settings entered and tested for the gas specified on the nameplate. Before turning on the PCH unit, check the following:

- make sure the gas in the mains corresponds to that for which the PCH is regulated;
- check, with the pressure intake "IN" on the gas valve, that the pressure entering the valve corresponds to that required for the type of gas being used;
- check that electrical connections match those indicated in this manual or other electrical diagrams attached to the unit;
- check that efficient earthing connections have been completed, carried out as specified by current safety regulations;
- provide power to the heater with the general switch on the machine and insert the power plug in the inside of the PCH compartment;

To turn on the heater, follow the instructions below:

- Check that RDY appears on the display. If OFF appears,, use the command, under FUN, to turn the machine to ON;
- Check the LCD display to verify that the Tin value is greater than the Von value.

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 hose. This will lock out the equipment.
You will need to reset the equipment and repeat the operation until it ignites.

5.10. Combustion Analysis

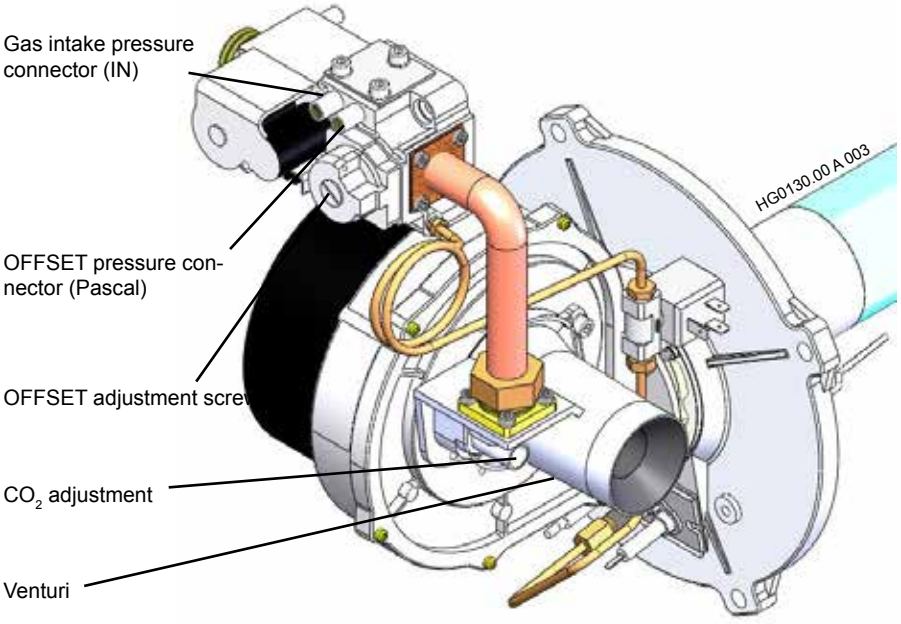
Wait until the heater is on. Check that the heater is at maximum power. There are two ways to do this:

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

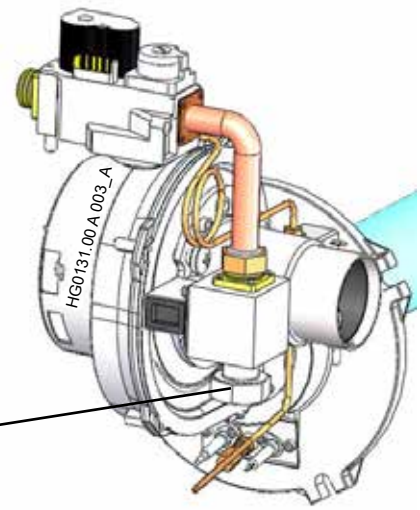
At maximum power, check again that the input pressure in the valve corresponds to that required; adjust if required.
Perform the combustion analysis to verify that the level of CO_2 corresponds to figures in the tables in Paragraph 4.6 "GAS Connections".
If the measured value is different, turn the adjustment screw on the venturi. Unscrewing the screw will raise the level of CO_2, screwing it down will lower the level.
Place the heater on minimum capacity, and verify that the level of CO_2 corresponds to figures in the tables in Paragraph 4.6 "GAS Connections". If the figures do not match, turn the offset screw (screw down to raise and unscrew to lower) to adjust the level of CO_2 and repeat the procedure.

NOTE: The heater directly supplied to function with LPG is regulated 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 tables in Paragraph 4.6 "GAS Connections".

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



For models: PCH105



5.11. Conversion to LPG

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

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

- calibrated gas butterfly;
- pilot nozzle;
- adhesive plate "Equipment converted...".

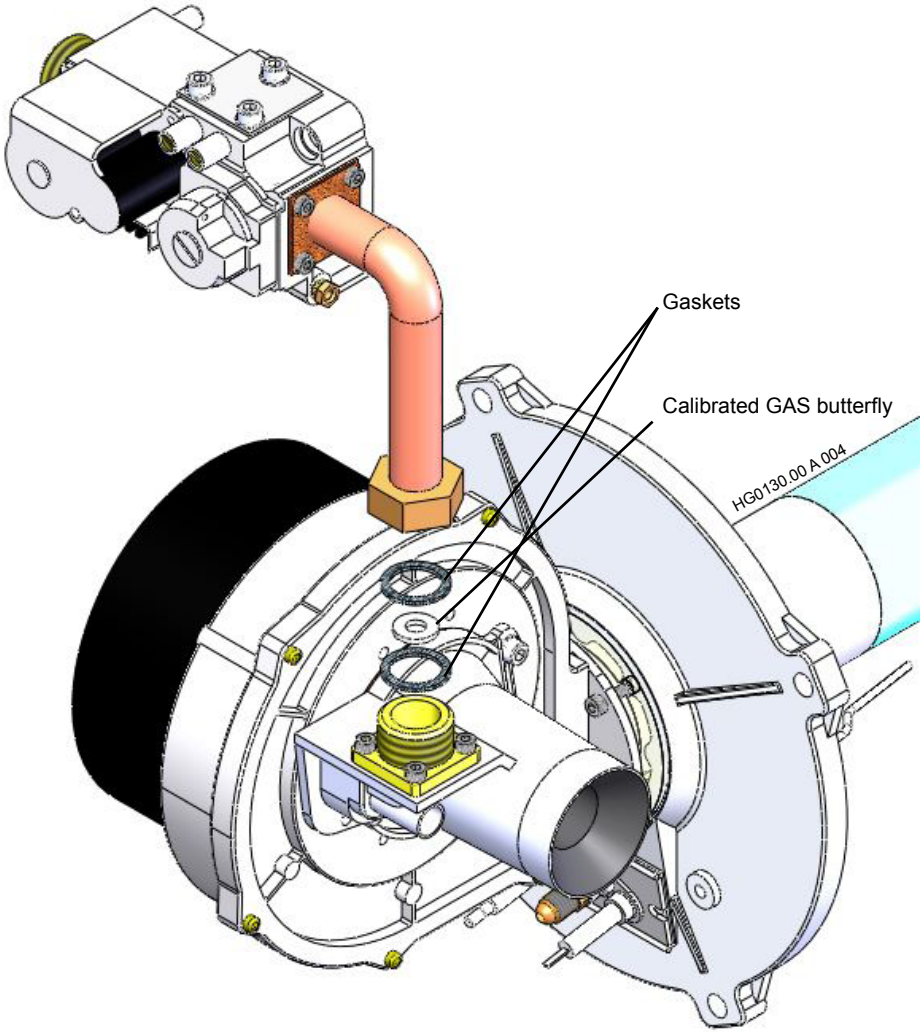
The kit is not supplied in countries were conversion is prohibited. To convert the unit, follow these instructions:

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

When the burner is lit and working at maximum 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 "Analysis of Combustion";
- 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 lowers the level of CO_2, unscrewing it raises the level.
- that there the venturi gas valve connector does not leak.

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



5.12. Conversion to gas G25 - G25.1

Conversion for gasses from G20 to G25 is allowed only in countries of category II2ELL3B/P [Germany] and category II2HS3B/P [Hungary].
For countries in category II2L3B/P [Netherlands] the unit is supplied and already regulated for G25.
Conversion from one type of gas to another can only be done at authorised assistance centres.
Conversion to G25 and/or G25.1 and/or G27, where possible, consists in:

- insertion of butterfly.

After the conversion, relight the burner and:

- verify that the intake pressure to the gas valve corresponds to the level required for the type of gas [see tables in Paragraph 4.6 "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: screwing it down decreases the value, unscrewing it raises the value.

Stick the nameplate "Equipment converted for gas G25...." in place of the one that says "Equipment regulated 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 is supplied on request

5.13. Conversion to Gas G2.350

Conversion is allowed only for Poland.
Conversion from one type of gas to another can only be carried out by authorised service centres.
Conversion involves:

- for all models: replacement of pilot nozzle.
- only for models PCH065: fit a a calibrated orifice plate on the air intake of the venturi [see tables in Paragraph 4.6 "GAS Connection"].

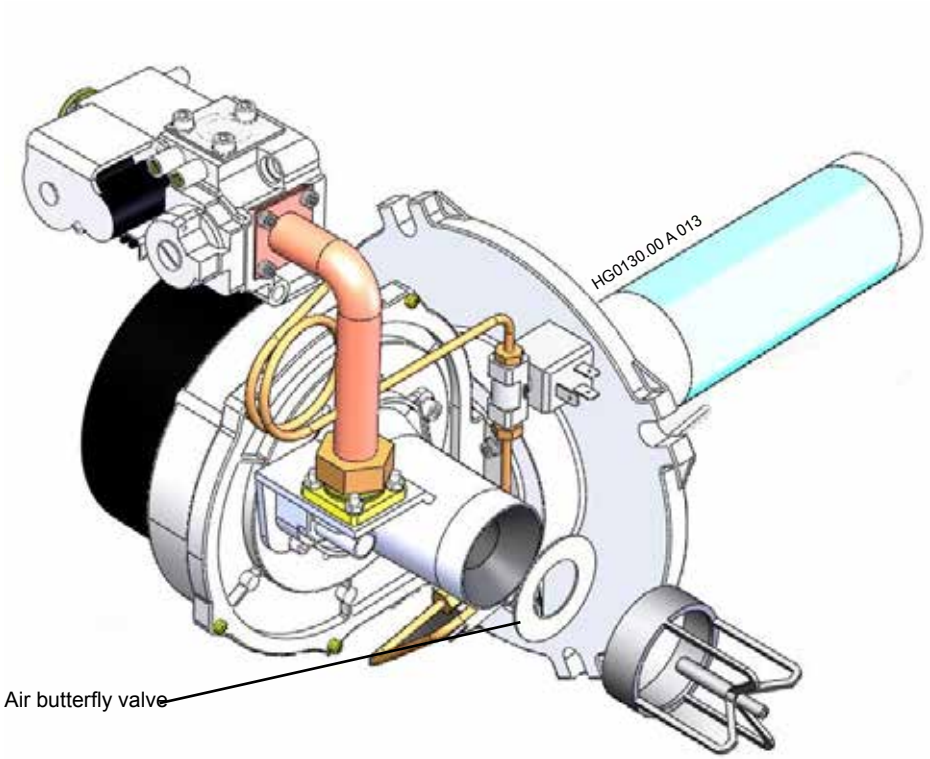
After the conversion, relight the burner and:

- verify that the intake pressure to the gas valve corresponds to the level required for the type of gas [see tables in Paragraph 4.6 "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: screwing it down decreases the value, unscrewing it raises the value.

Affix the plate "Equipment converted to gas...." in place of the plate "Equipment set up for .....".

NOTE: The minimum and maximum heat outputs of models PCH065, PCH130 and PCH132 are lower compared to their operation with gas G20. The 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.
It is advisable to not calibrate the offset: the manufacturer is responsible for calibrating the valve.
If necessary, carry out the combustion analysis procedure as described in Paragraph 4.8 "Analysis of combustion".
It is recommended to always carry out the fumes analysis after replacing the gas valve.

5.15. Replacing the modulation PCB

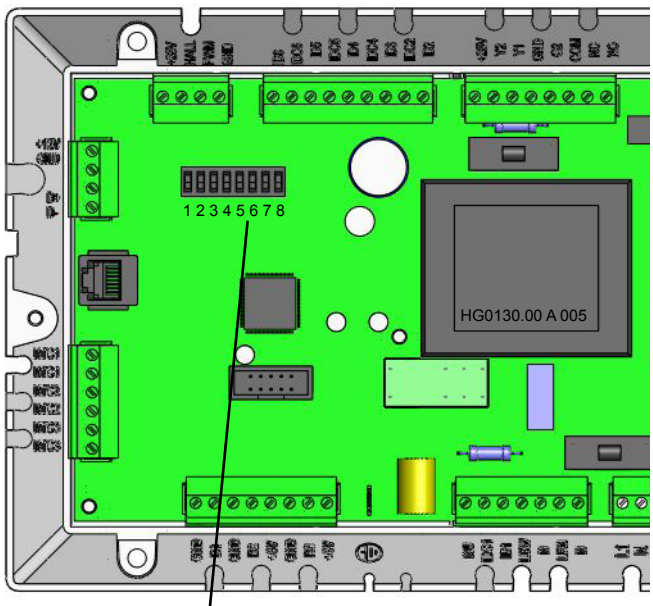
When replacing the PCB, it is required to carry out a few checks and set a few parameters through the LCD command or Smart Control.
Every PCH heater has a list of pre-programmed default values. It is advisable to update the list at every change performed on site in order to be able to reprogram a spare PCB if needed.
* The following information is only for PCH heaters. Refer to the relative manuals for other equipment that uses the same type of modulation PCB.

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

Programming 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 fume 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 - if the electrical compartment is heated.

Programming parameters - Operating mode
Parameters can be modified from the LCD display on the machine, or also from the Smart Control.

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



Switch for Smart Control

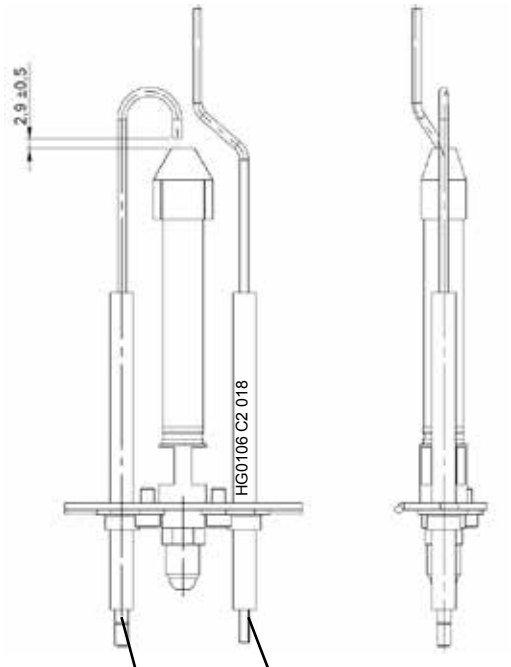
6. MAINTENANCE OPERATIONS

To keep the machine in efficient condition and guarantee a long lifetime of the heater, it is advisable to run some inspections every year, before turning it on for the season:
1) check the status of the start-up electrodes, detection electrodes and pilot flame;
2) check the status of fume exhaust and air intake ducts and terminals;
3) check the status of the venturi;
4) check and clean the exchanger and burner are clean;
5) check and clean the water trap
6) check the intake pressure at the gas valve;
7) check the function of the flame monitoring equipment;
8) check the safety thermostat(s);
9) check the ionization current.

NOTE: Operations at points 1, 2, 3, 4 and 5 must be performed after powering off the heater and closed the gas shut-off valve. Operations at point 6, 7, 8 and 9 must be carried out with the heater on.

---

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



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

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

2) Inspection of fume exhaust and air intake ducts
Visually inspect where possible or examine with specific tools to learn the status of the ducts.
Remove dust that forms on the air intake terminal.

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

4) Inspection and cleaning of the exchanger and burner
Perfect 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 sizeable 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 of the gaskets mounted 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.

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

7) Inspection of flame monitoring equipment
With the heater operating, close the gas shut-off valve and check that the machine is locked out; this is indicated on the LCD display on the CPU PCB on the machine with code F10. Reopen the gas shut-off valve, 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 operational and the burner on.
Open the set of thermostats with an insulated tool [230 V], remove the fast-on from the safety thermostat, wait for the F20 lockout signal to appear on the LCD display on the CPU PCB on the machine. Close the set of thermostats again, then reset the lockout.

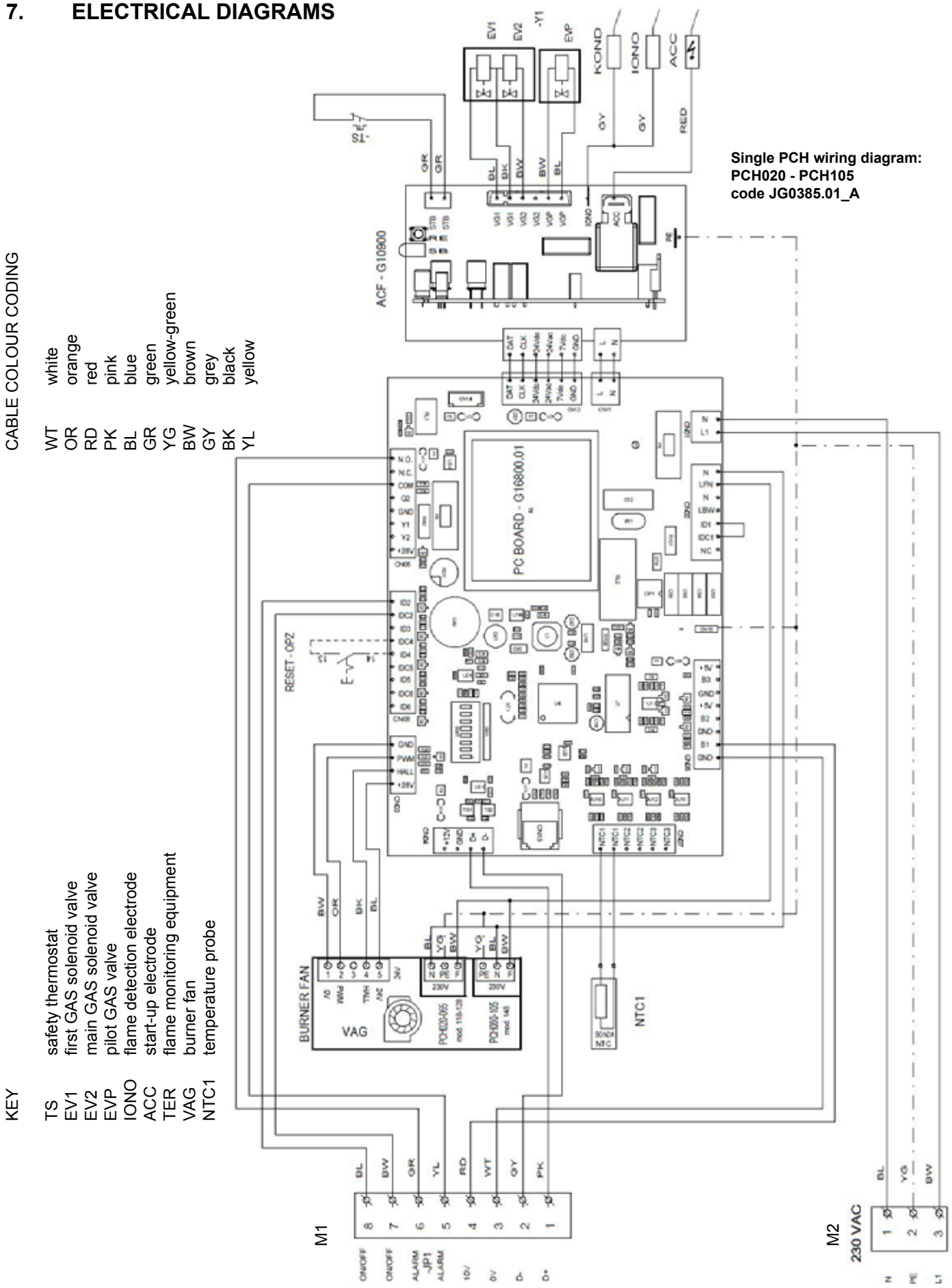
9) Inspection of the ionization current
This procedure can be done directly from the LCD display by entering the I/O menu. The IOn parameter indicates the value of the ionization current, and the reading is as follows:

- 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.

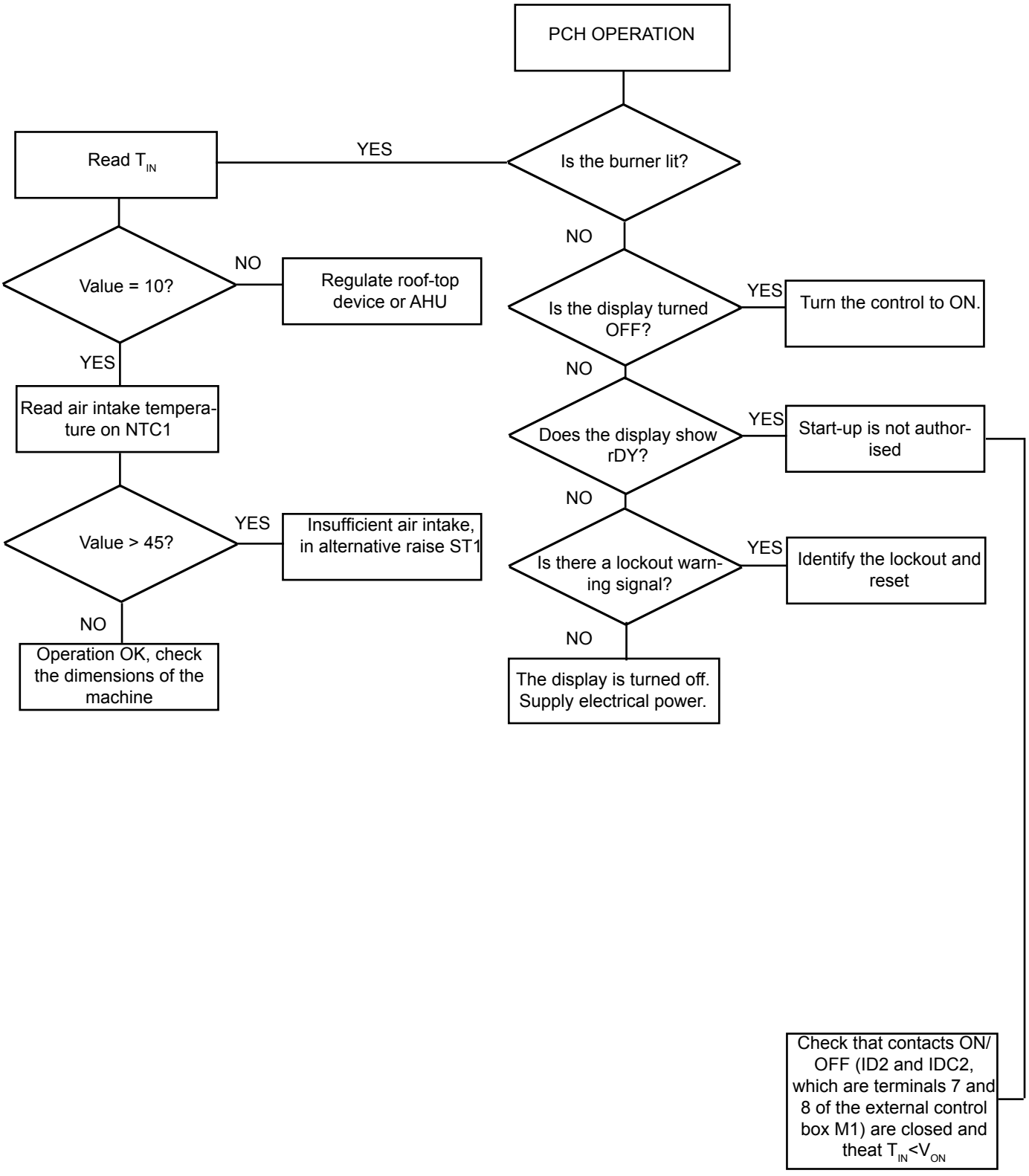
The value of the ionisation current must not be below 2 microAmperes. Lower values indicate: the detection electrode in a bad position, an rusted electrode or one about to fail.

7. ELECTRICAL DIAGRAMS

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

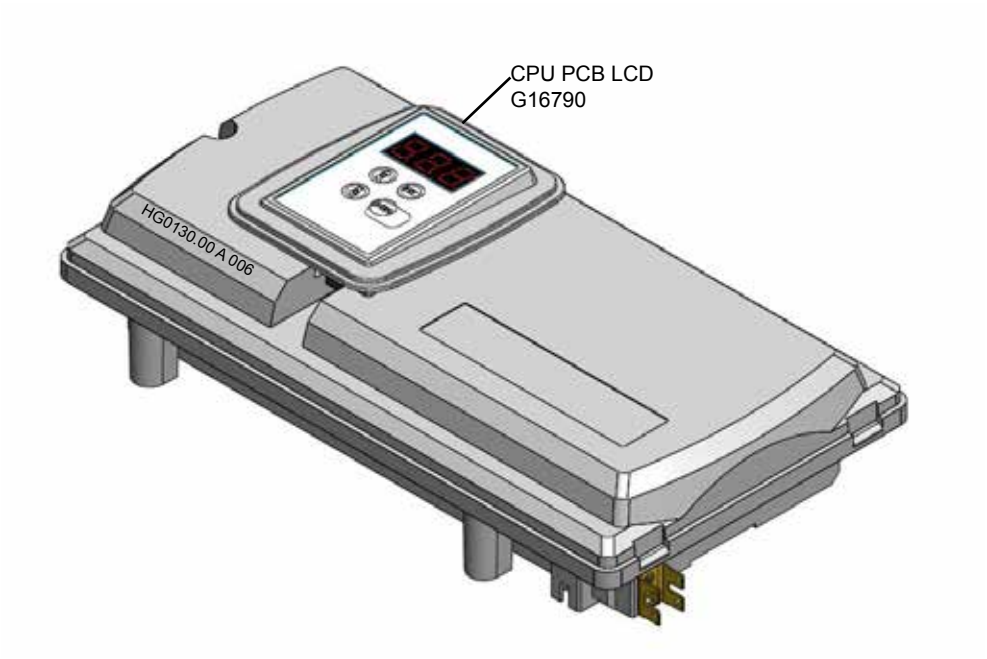


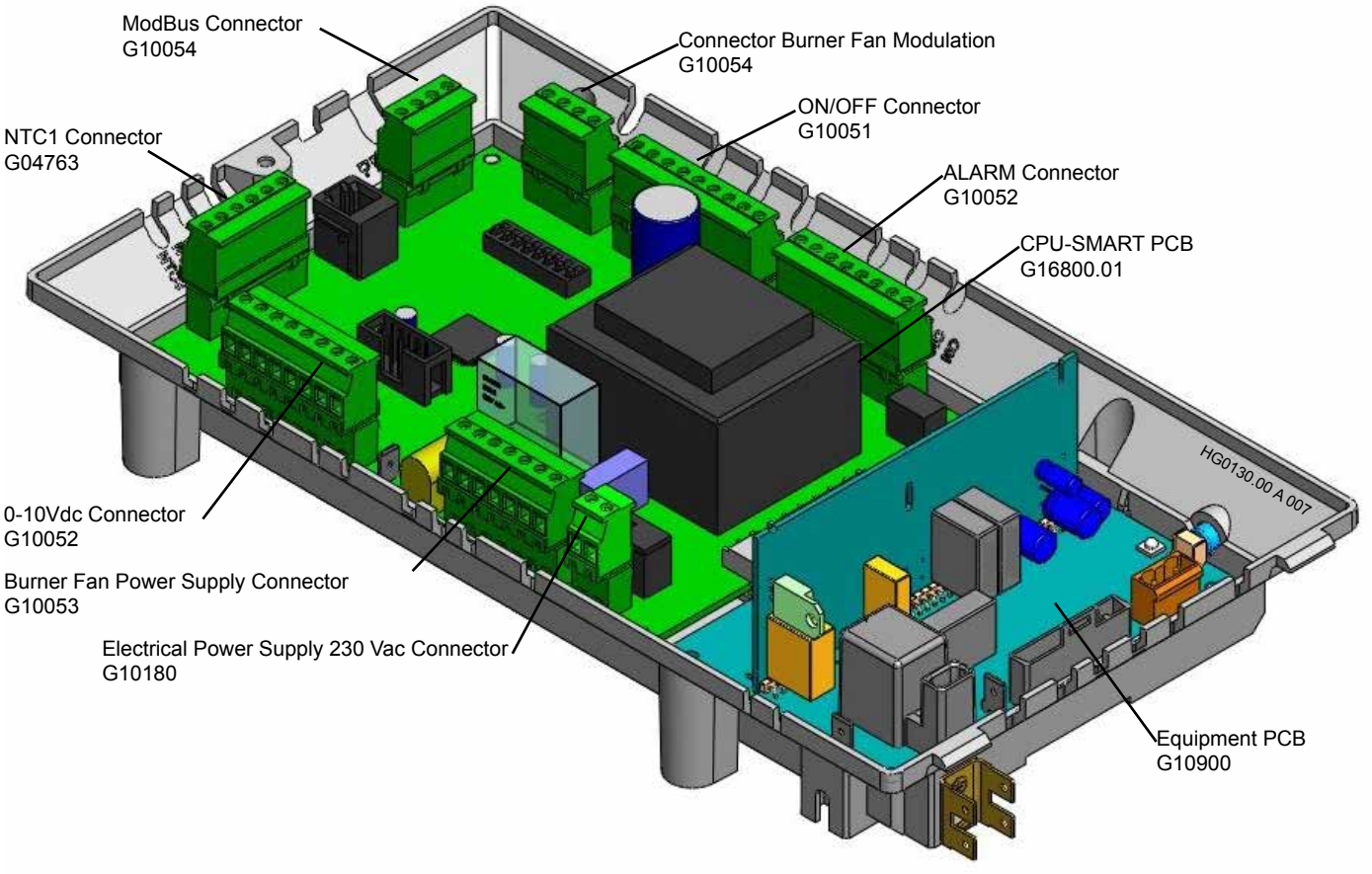
8. TROUBLESHOOTING



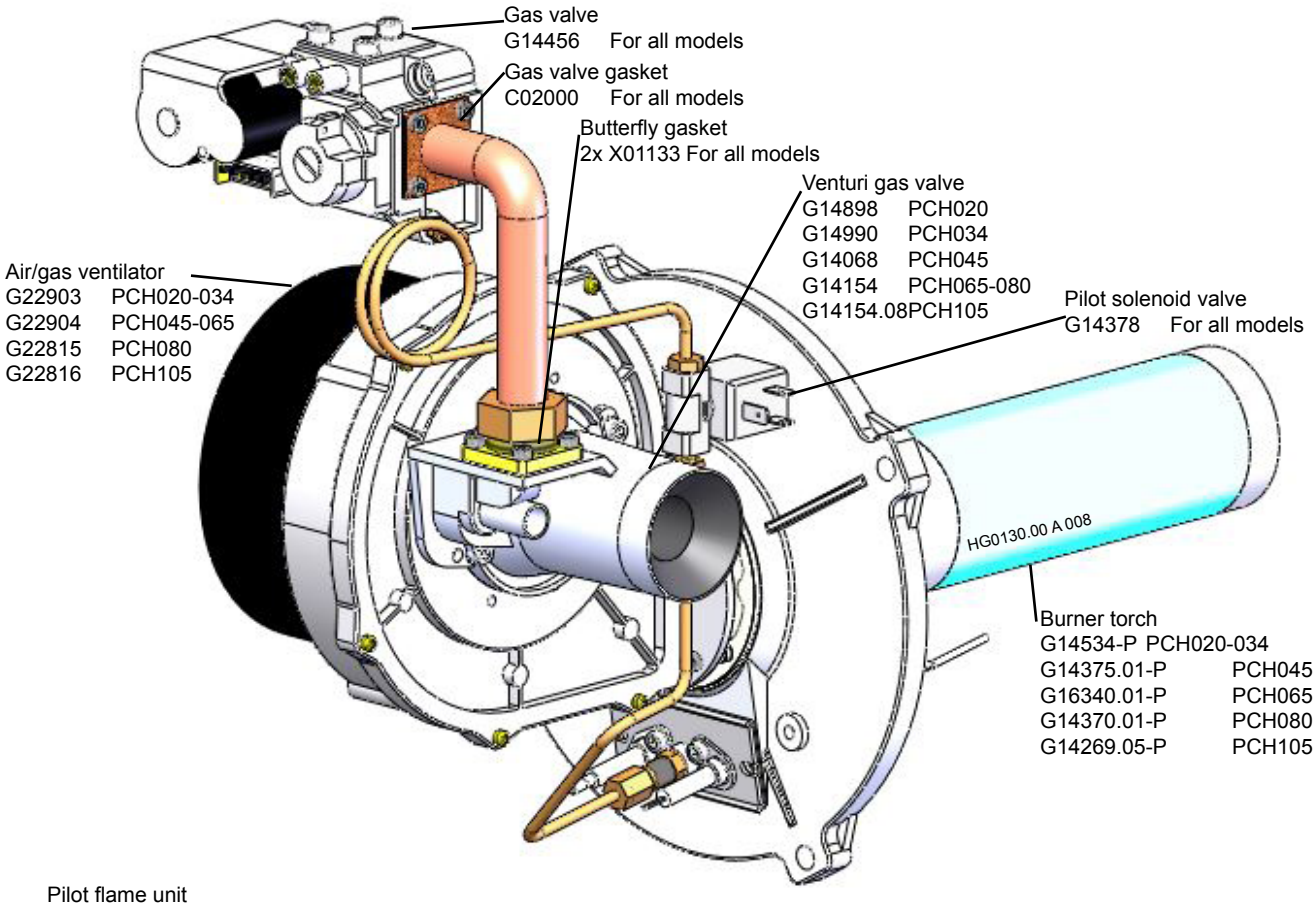
9. LIST OF SPARE PARTS

9.1. Electrical control panel spare parts

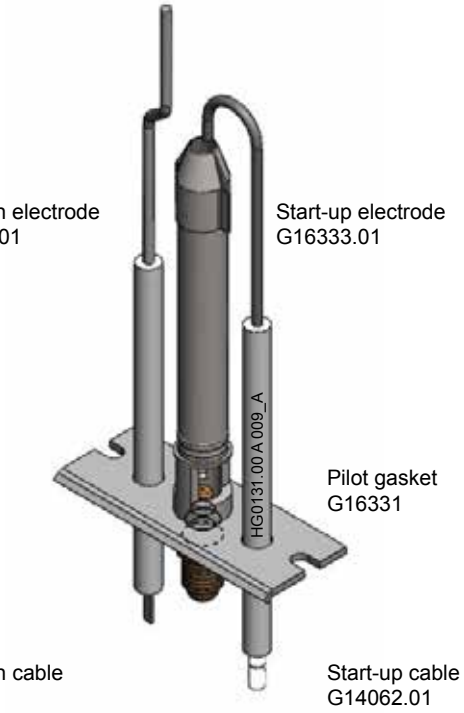


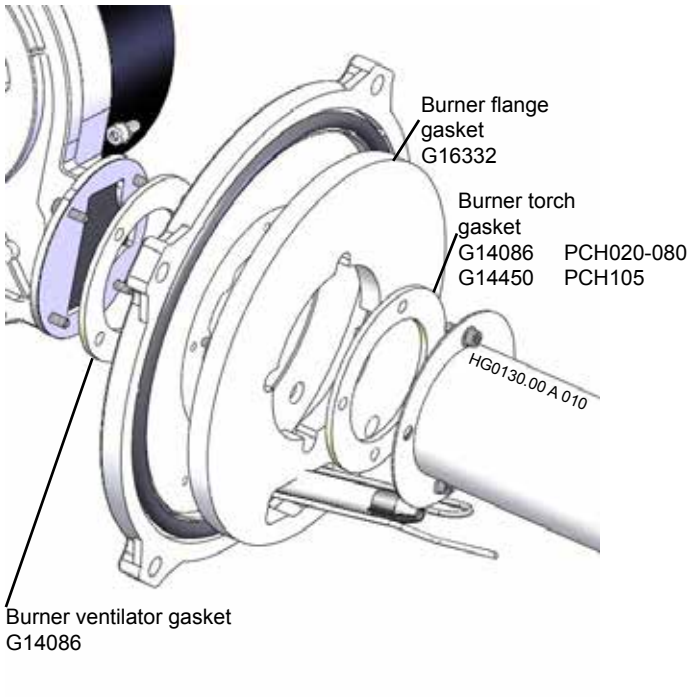


9.2. Burner unit spare parts

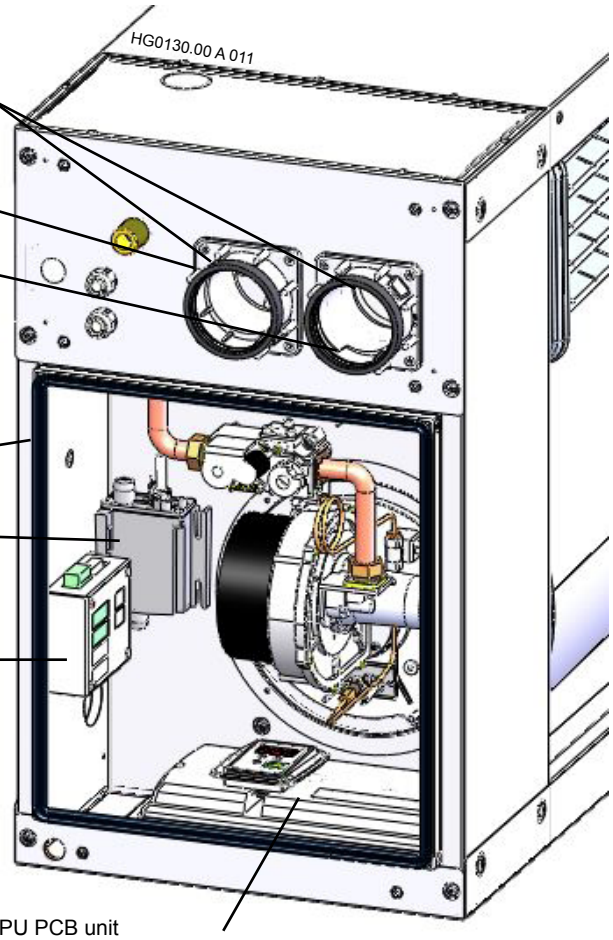


Pilot flame unit
G28030 for all gas categories.
G28030-0001 LPG





9.3. Other available spare parts



Provided
Round EPDM gasket
G27195

Air intake component
G27816

Fumes exhaust component
G27815

"Type C" terminal component
G28812

Door (port) closure
X04511

Black gasket for compartment
X01495

Trap
G27810 For all models

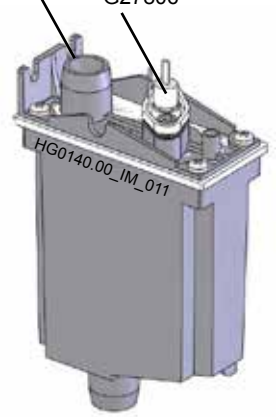
Condensate drain pipe
G27576 For all models

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

CPU PCB unit
G28301.01 PCH020-065
G28302.01 PCH080-105

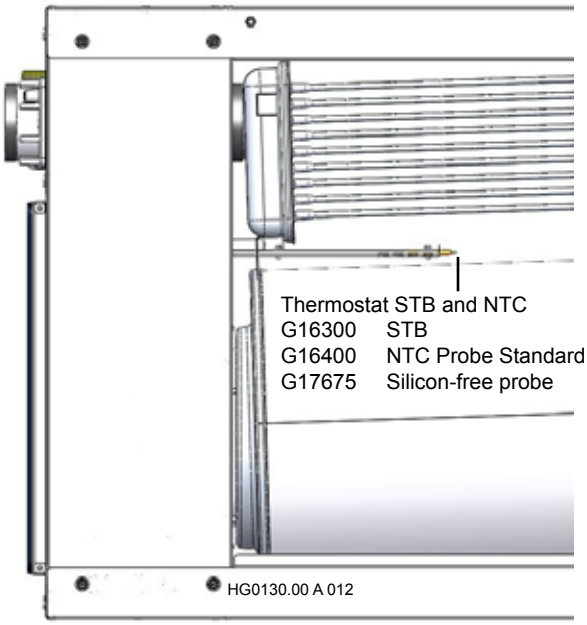
Condensate drain pipe
G27576

Condensate detection electrode
G27806



Siphon with Condensate detection electrode.
G27810

Smart Control remote control (OPTIONAL)
G20800IT



Thermostat STB and NTC
G16300 STB
G16400 NTC Probe Standard
G17675 Silicon-free probe

Notes

Apen Group S.p.A.
20060 Pessano con Bornago (MI) - Italia
Casella Postale 69
Via Isonzo, 1 (ex Via Provinciale, 85)
Tel. +39 02 9596931
Fax +39 02 95742758

Cap. Soc. Euro 928.800,00 i.v.
Cod. Fisc. - P. IVA IT 08767740155
www.apengroup.com
apen@apengroup.com