GB	*Installation and user guide for warm air heater modules* *PCH (modulating condensing)*

H2 Ready

Ready Hydrogen 20%

CE

TRANSLATION OF ORIGINAL Manual

VER. 01.2020

Dichiarazione di Conformità
Statement of Compliance

CE

APEN GROUP S.p.A.
20042 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:

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

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

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

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

- **EN17082:2019**
- **EN60335-1**
- **EN60335-2-102**
- **EN60730-1**
- **EN 60068-2-1**
- **EN 60068-2-2**
- **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
01/10/2020

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

CODE SERIAL NUMBER

VER. 07.2022

UK Declaration of Conformity

APEN GROUP S.p.A.
20042 Pessano con Bornago (MI)
Via Isonzo, 1 - ITALY
Tel +39.02.9596931 r.a.
Fax +39.02.95742758
Internet: http://www.apengroup.com

With this document we declare that the unit:

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

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

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

has been designed and manufactured in compliance with the standards:

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

Notified body:
Kiwa UK
0558
PIN 0476CQ0451

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

Pessano con Bornago
19/07/2022

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

CODE SERIAL NUMBER

TABLE OF CONTENTS

1. GENERAL CAUTIONS

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

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

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

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

The warranty conditions are specified on the warranty certificate supplied with this equipment.

1.1. Graphic symbols used in this manual

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

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

2. SAFETY-RELATED WARNINGS

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

2.1. Fuel

Before starting up the heater, make sure that:
- gas supply specifications match those written on the nameplate;
- the combustion air intake ducts (when fitted) and the flue gas pipes are only those specified by the manufacturer;
- the combustion air is supplied in such a way as to avoid even partial obstructions of the intake grille (caused by leaves etc.);
- the gas seal of the feeding system has been tested and approved in compliance with the applicable standards;
- the heater is supplied with the same type of fuel it has been designed for;
- the system is correctly sized for such flow rate and is fitted with all safety and monitoring devices required by applicable standards;
- the inside of the gas pipes and air distribution ducts for ducted heaters have been thoroughly cleaned;
- the size of fuel supply pipes is suitable for the power required by the heater;
- the fuel supply pressure is between the range specified on the nameplate.

2.2. Gas Leaks

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

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

2.3. Personal protective equipment

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

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

2.4. Safety signals

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

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

2.5. Power supply

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

Cautions

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

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

2.6. Use

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

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

2.7. Maintenance

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

Before carrying out any cleaning and maintenance operations, isolate the boiler from the mains power supply using the switch located on the electrical system and/or on the shut-out devices.
If the heater is faulty and/or incorrectly operating, switch it off and do not attempt to repair it yourself, but contact our local Technical Service Centre.
All repairs must be carried out by using genuine spare parts. Failure to comply with the above instructions could compromise the safety of the equipment and invalidate the warranty.
If the 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.

HG0030.00_IM 001

DO NOT COVER IT WITH YOUR HAND OR OTHER OBJECTS!

2.8. Transport and Handling

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

2.9. Unpacking

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

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

2.10. Dismantling and disposal

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

Disposal of end-of-life products

This equipment is marked in compliance with European Directive 2012/19/EU on waste electrical and electronic equipment (WEEE). This Directive defines the rules for collecting and recycling waste equipments throughout the entire territory of the European Union.
WEEE contains both pollutants (that can negatively affect the environment) and raw materials (that can be reused). IT is therefore necessary to subject WEEE to appropriate treatments, in order to remove and safely dispose of pollutants and to extract and recycle raw materials. IT is forbidden to dispose of WEEE as unsorted waste. These operations facilitate recovery and recycling of the materials, thus reducing the environmental impact.

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

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

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

2.11. Installation

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

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

The PCH module must be installed inside an AHU or Roof-top unit, for protection from the outdoor weather. The standard version of the PCH module is supplied with a galvanised sheet front panel (UNSUITABLE for outdoor use) and without any door to close the burner housing. A kit consisting of a front panel and a burner housing door panel can be supplied on request.

With the front panel kit, installed as shown below, and the “B” type intake terminal supplied as standard (see below), the PCH module reaches the IPX5D protection rating.

During its normal operation, the air is heated through its passage on combustion chamber and exchanger pipe surfaces.

The heat exchanger complies with the construction requirements for equipment where combustion gases produce condensate.

The combustion chamber and the surfaces in contact with condensation (such as the pipe bundle and exhaust hood), are made of AISI 441, in order to provide high resistance to condensation.
The following table shows the conversion of stainless steels used:

USA-AIS	EN-No.	COMPOSITION
AISI 430	1.4016	X6 Cr17
AISI 441	1.4509	X2 CrTiNb 18

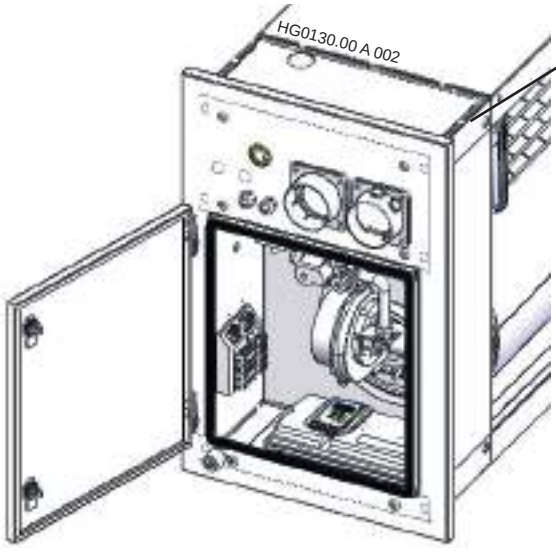
The innovative design and large surface of the combustion chamber and heat exchanger pipes ensure optimum efficiency and durability.
The burner is made entirely of stainless steel with special mechanical solutions to ensure optimal reliability and performance levels, as well as high thermal and mechanical resistance.
The control located inside the burner housing allows the service centre to check and view the working phases and identify any faults that may have occurred.

The PCH heater has a modulating mode of operation; the thermal output and, therefore, the heat output (fuel consumption) vary according to the heat demand. When the heat demand from the environment reduces, the heater uses less gas and increases its efficiency - up to 109% (a Net caloric value).

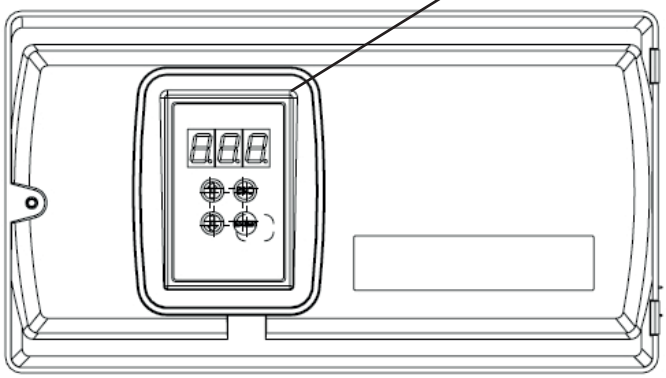
Inherent Safety
The efficiency increase at minimum power is achieved by using a sophisticated air/gas mixing technique and by regulating at the same time the combustion air flow and the fuel gas flow.
This technology increases the heater safety as the gas valve supplies the fuel according to the air flow. Unlike atmospheric burners, the CO_2 content remains constant throughout the heater operating range, allowing the heater to increase its efficiency when the heat output reduces.
If there is no combustion air, the valve will not supply gas; if the combustion air flow reduces, the valve will automatically reduce the gas flow yet will keep its combustion parameters at optimal levels.

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

Example of installation of a PCH heater with door



PCH series display



Control panel

2.12. Technical Data

There are 3 configurations of PCH, listed below:

- A Single module (A System);
- B Horizontally combined modules (B System);
- C Vertically combined modules (C System).

A - PCH single modules (A System)

They consist of a single heat exchanger; the range includes six models, i.e.: PCH020, PCH034, PCH045, PCH065, PCH080 and PCH105.

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. If the installation requires vertical air flow, the customer must ask APEN GROUP to provide a PCH heater with a code ending with -00V0 (see paragraph 3.4 Installing single or multiple modules).

Model		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105	
Type of equipment		B23P - C13 - C43 - C53 - C63											
EC approval	PIN.	0476CQ0451											
NOx class [EN17082:2019]	Val	5											
Type of fuel		Gaseous											
		Heater Performance											
		min	max	min	max	min	max	min	max	min	max	min	max
Burner heat output (Hi) (1)	kW	4.75	19.00	7.60	34.85	8.50	42.00	12.40	65.00	16.40	82.00	21.00	100.00
Useful heat output [P_{min}, P_{rated}]*	kW	4.97	18.18	8.13	33.56	8.97	40.45	13.40	62.93	17.77	80.03	22.77	97.15
Hi Efficiency (N.C.V.) [η_{pl}, η_{nom}]*	%	104.63	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	
Max. condensation (2)	l/h	0.4		0.9		1.1		2.1		3.3		2.7	
		Flue gas emissions											
Carbon monoxide - CO - (0% of O_2) (3)	ppm	< 5		< 5		< 5		< 5		< 5		< 5	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hi) (4)		29 mg/kWh - 16 ppm		51 mg/kWh - 29 ppm		36 mg/kWh - 20 ppm		45 mg/kWh - 25 ppm		31 mg/kWh - 18 ppm		40 mg/kWh - 23 ppm	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hs) (5)		26 mg/kWh - 15 ppm		46 mg/kWh - 26 ppm		32 mg/kWh - 18 ppm		41 mg/kWh - 23 ppm		28 mg/kWh - 16 ppm		36 mg/kWh - 20 ppm	
Pressure available at the flue	Pa	80		90		100		120		120		120	
		Flue gas temperature, CO_2 content and maximum flue gas flow rate: see gas tables on page 43 and on the following pages											
		Electrical Characteristics											
Supply voltage	V	230 Vac - 50 Hz single-phase											
Rated power [el_{min} - el_{max}]*	kW	0.011	0.045	0.011	0.074	0.014	0.060	0.015	0.097	0.020	0.123	0.020	0.130
Protection Rating	IP	IP X5D											
Operating Temperatures	°C	from -15°C to +40°C - for lower temperatures, a burner housing heating kit is required (7)											
		Connections											
Ø gas connection		UNI/ISO 228/1-G 3/4"		UNI/ISO 228/1-G 3/4"		UNI/ISO 228/1-G 3/4"		UNI/ISO 228/1-G 3/4"		UNI/ISO 228/1-G 3/4"		UNI/ISO 228/1-G 3/4"	
Intake/exhaust pipes Ø	mm	80/80		80/80		80/80		80/80		80/80		80/80	
		Air flow rate											
Air flow rate (15°C)(6)	m^3/h	2700		4300		4500		7800		9000		11100	
Minimum air flow rate (8)	m^3/h	1490		2750		3330		5160		6560		7960	
Maximum air flow rate	m^3/h	See diagram "air flow rates - pressure drops"											
Heat exchanger pressure drop	Pa	See diagram "air flow rates - pressure drops"											
Max. applicable pressure	Pa	1200		1200		1200		1200		1200		1200	
		Weight											
Net Weight	kg	47		56		63		75		99		107	

NOTES:

* Symbol of conformity with Reg.EU/2281/2016.

(1) With natural gas mixture with 20% hydrogen rated heat input decreased by 5%.

(2) Max. condensation produced acquired from testing at 30%Qn.

(3) Value referred to cat. H (G20).

(4) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to net calorific value (Hi, N.C.V).

(5) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to gross calorific value (Hs, G.C.V).

(6) Reference air flow rate for the calculation of yields and season energy efficiencies and emissions listed in the table

(7) If the burner housing heater kit is installed, add 105 W (230V) per module to the rated power value on the nameplate.

(8) The minimum air flow rate has been calculated for a Δ of 35°C. For process systems or special applications using a Δt > 40°C, please contact Apen Group.

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, PCH160 and PCH210; three-module models: PCH320; four-module models: 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. If the installation requires vertical air flow, the customer must ask APEN GROUP to provide a PCH heater with a code ending with -00V0 (see paragraph 3.4 Installing single or multiple modules).

Model		PCH130		PCH160		PCH210		PCH320		PCH420	
Type of equipment		B23P - C13 - C43 - C53 - C63									
EC approval	PIN.	0476CQ0451									
NOx class [EN17082:2019]	Val	5									
Type of fuel		Gaseous									
		Heater Performance									
		min	max	min	max	min	max	min	max	min	max
Burner heat output (Hi) (1)	kW	12.40	130.00	16.40	164.00	21.00	200.00	21.00	300.00	21.00	400.00
Useful heat output [P_{min}, P_{rated}]*	kW	13.40	125.86	17.77	160.06	22.77	194.30	22.77	291.45	22.77	388.60
Hi Efficiency (N.C.V.) [η_{pl}, η_{nom}]*	%	108.06	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	
Max. condensation (2)	l/h	4.2		6.6		5.4		8.1		10.8	
		Flue gas emissions									
Carbon monoxide - CO - (0% of O_2) (3)	ppm	< 5		< 5		< 5		< 5		< 5	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hi) (4)		45 mg/kWh - 25 ppm		31 mg/kWh - 18 ppm		40 mg/kWh - 23 ppm		40 mg/kWh - 23 ppm		40 mg/kWh - 23 ppm	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hs) (5)		41 mg/kWh - 23 ppm		28 mg/kWh - 16 ppm		36 mg/kWh - 20 ppm		36 mg/kWh - 20 ppm		36 mg/kWh - 20 ppm	
Pressure available at the flue	Pa	120		120		120		120		120	
		Flue gas temperature, CO_2 content and maximum flue gas flow rate: see gas tables on page 43 and on the following pages									
		Electrical Characteristics									
Supply voltage	V	230 Vac - 50 Hz single-phase									
Rated power [el_{min} - el_{max}]*	kW	0.015	0.194	0.020	0.246	0.020	0.260	0.020	0.390	0.020	0.520
Protection Rating	IP	IP X5D									
Operating Temperatures	°C	from -15°C to +40°C - for lower temperatures, a burner housing heating kit is required (7)									
		Connections									
Ø gas connection		UNI/ISO 228/1-G 1½"		UNI/ISO 228/1-G 1½"		UNI/ISO 228/1-G 1½"		UNI/ISO 228/1-1 x G 1½" e 1 x G 3/4"		UNI/ISO 228/1-2 x G 1½"	
Intake/exhaust pipes Ø	mm	2 x 80/80		2 x 80/80		2 x 80/80		3 x 80/80		4 x 80/80	
		Air flow rate									
Air flow rate (15°C)(6)	m³/h	15600		18000		22200		33300		44400	
Minimum air flow rate (8)	m³/h	10320		13120		15920		23880		31840	
Maximum air flow rate	m³/h	See diagram "air flow rates - pressure drops"									
Heat exchanger pressure drop	Pa	See diagram "air flow rates - pressure drops"									
Max. applicable pressure	Pa	1200		1200		1200		1200		1200	
		Weight									
Net Weight	kg	177		230		253		378		510	

NOTES:
* Symbol of conformity with Reg.EU/2281/2016.
(1) With natural gas mixture with 20% hydrogen rated heat input decreased by 5%.
(2) Max. condensation produced acquired from testing at 30%Qn.
(3) Value referred to cat. H (G20).
(4) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to net calorific value (Hi, N.C.V).
(5) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to gross calorific value (Hs, G.C.V).
(6) Reference air flow rate for the calculation of yields and season energy efficiencies and emissions listed in the table
(7) If the burner housing heater kit is installed, add 105 W (230V) per module to the rated power value on the nameplate.
(8) The minimum air flow rate has been calculated for a Δ of 35°C. For process systems or special applications using a $\Delta t > 40°C$, please contact Apen Group.

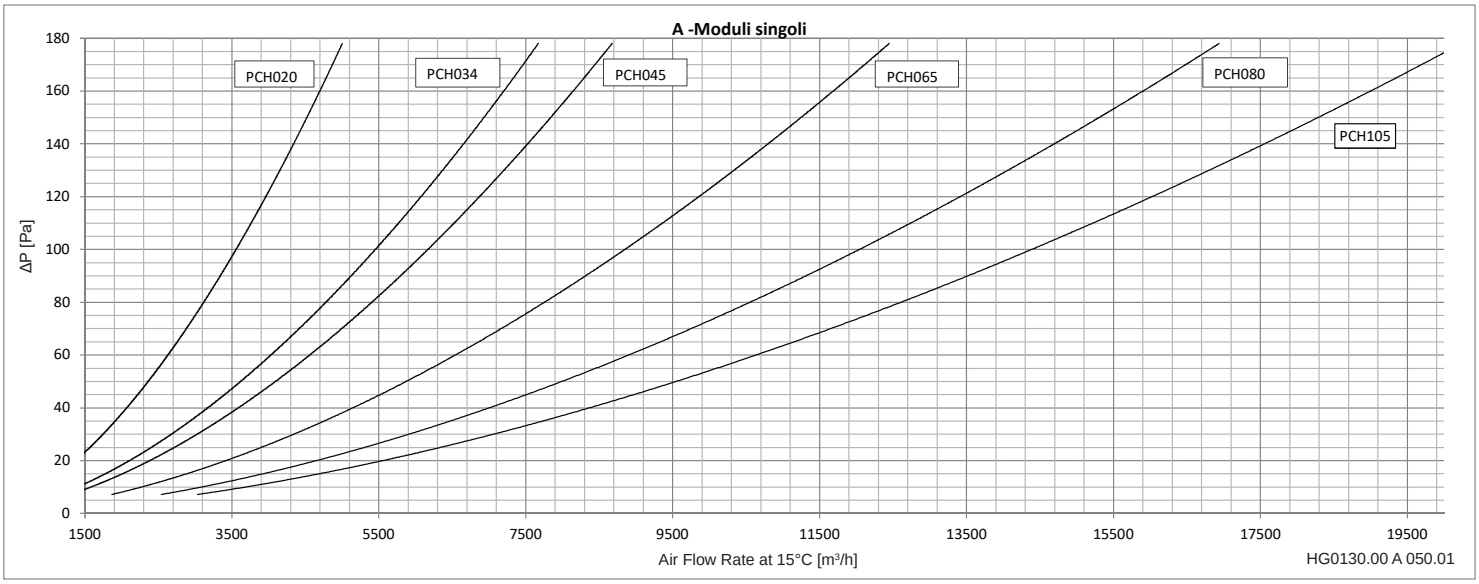
C- PCH Vertically combined modules (C System)
They consist of two heat exchangers; the number of burners, gas equipment and flues is equal to the number of heat exchangers. The gas and electrical connection is the same for all modules. These modules have a reduced width and low pressure drops when air goes through.
The range includes two-module models: PCH132, PCH162 and PCH212.

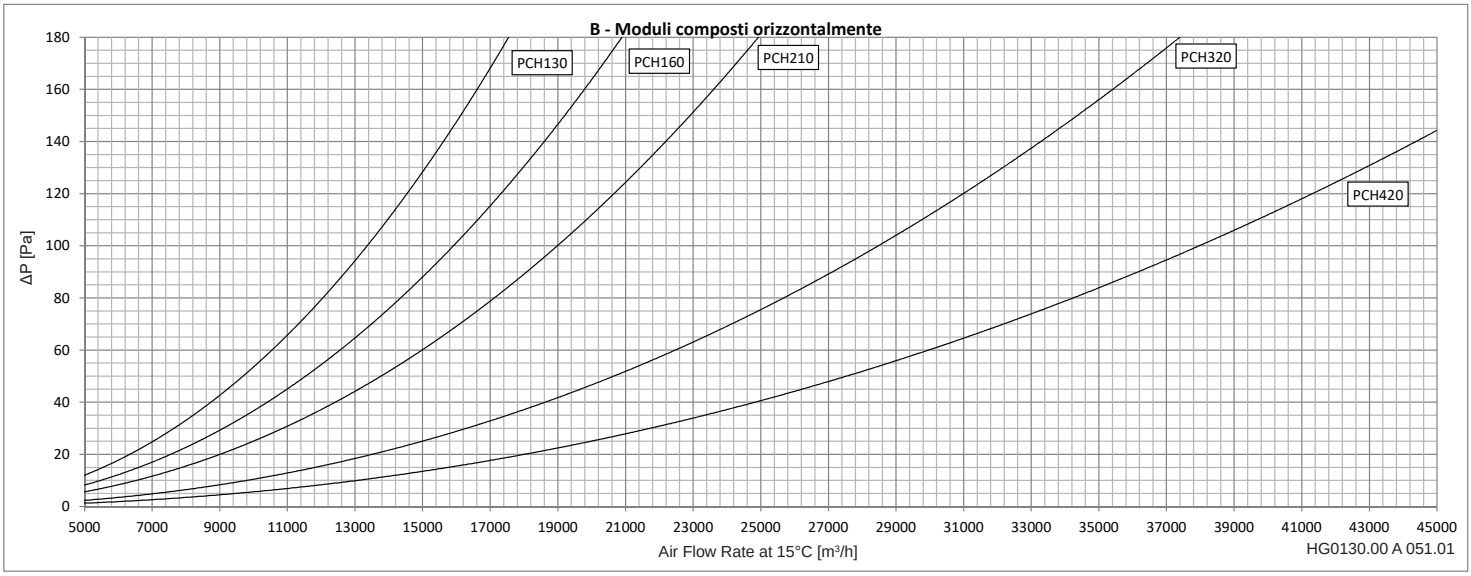
The heat output ranges from 13.4 to 194.4 kW produced. Module operation is cascaded by means of 0/10 Vdc signal and/or ON/OFF signal taken to the single module.
The modules can be installed with horizontal air flow direction only. Heaters with vertical air flow cannot be installed.

Model		PCH132		PCH162		PCH212	
Type of equipment		B23P - C13 - C43 - C53 - C63					
EC approval	PIN.	0476CQ0451					
NOx class [EN17082:2019]	Val	5					
Type of fuel		Gaseous					
		Heater Performance					
		min	max	min	max	min	max
Burner heat output (Hi) (1)	kW	12.40	130.00	16.40	164.00	21.00	200.00
Useful heat output [P_{min}, P_{rated}]*	kW	13.40	125.86	17.77	160.06	22.77	194.30
Hi Efficiency (N.C.V.) [η_{pl}, η_{nom}]*	%	108.06	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	
Max. condensation (2)	l/h	4.2		6.6		5.4	
		Flue gas emissions					
Carbon monoxide - CO - (0% of O_2) (3)	ppm	< 5		< 5		< 5	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hi) (4)		45 mg/kWh - 25 ppm		31 mg/kWh - 18 ppm		40 mg/kWh - 23 ppm	
Emissions of nitrogen oxides - *NOx** (0% of O_2) (Hs) (5)		41 mg/kWh - 23 ppm		28 mg/kWh - 16 ppm		36 mg/kWh - 20 ppm	
Pressure available at the flue	Pa	120		120		120	
		Flue gas temperature, CO_2 content and maximum flue gas flow rate: see gas tables on page 43 and on the following pages					
		Electrical Characteristics					
Supply voltage	V	230 Vac - 50 Hz single-phase					
Rated power [el_{min} - el_{max}]*	kW	0.015	0.194	0.020	0.246	0.020	0.260
Protection Rating	IP	IP X5D					
Operating Temperatures	°C	from -15°C to +40°C - for lower temperatures, a burner housing heating kit is required (7)					
		Connections					
Ø gas connection		UNI/ISO 228/1- G 1½"		UNI/ISO 228/1- G 1½"		UNI/ISO 228/1- G 1½"	
Intake/exhaust pipes Ø	mm	2 x 80/80		2 x 80/80		2 x 80/80	
		Air flow rate					
Air flow rate (15°C)(6)	m^3/h	15600		18000		22200	
Minimum air flow rate (8)	m^3/h	10320		13120		15920	
Maximum air flow rate	m^3/h	See diagram "air flow rates - pressure drops"					
Heat exchanger pressure drop	Pa	See diagram "air flow rates - pressure drops"					
Max. applicable pressure	Pa	1200		1200		1200	
		Weight					
Net Weight	kg	152		199		216	

NOTES:
* Symbol of conformity with Reg.EU/2281/2016.
(1) With natural gas mixture with 20% hydrogen rated heat input decreased by 5%.
(2) Max. condensation produced acquired from testing at 30%Qn.
(3) Value referred to cat. H (G20).
(4) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to net calorific value (Hi, N.C.V).
(5) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to gross calorific value (Hs, G.C.V).
(6) Reference air flow rate for the calculation of yields and season energy efficiencies and emissions listed in the table
(7) If the burner housing heater kit is installed, add 105 W (230V) per module to the rated power value on the nameplate.
(8) The minimum air flow rate has been calculated for a Δ of 35°C. For process systems or special applications using a $\Delta t > 40°C$, please contact Apen Group.

Air flow - pressure drop diagram





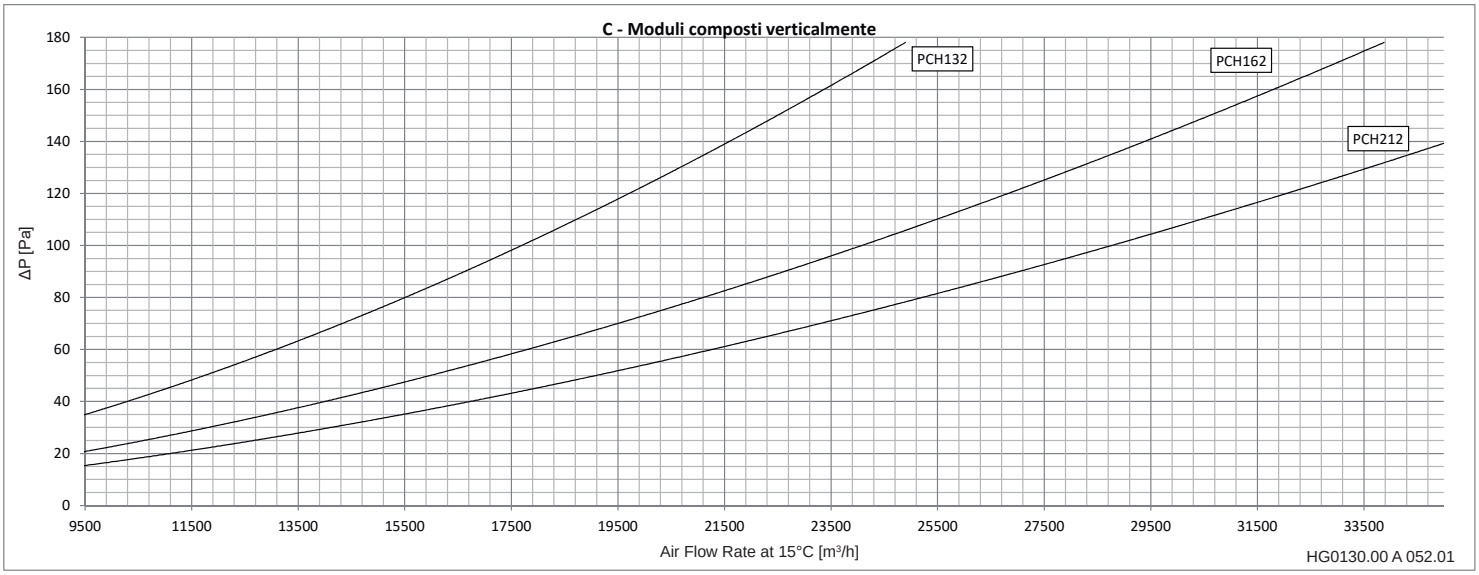
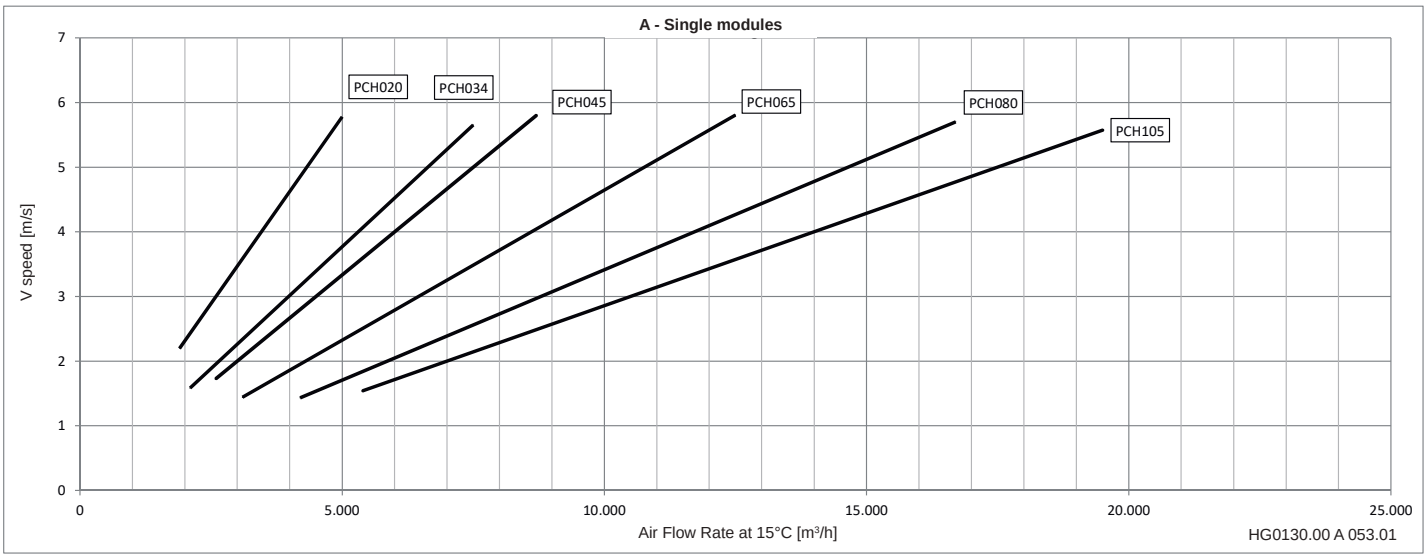
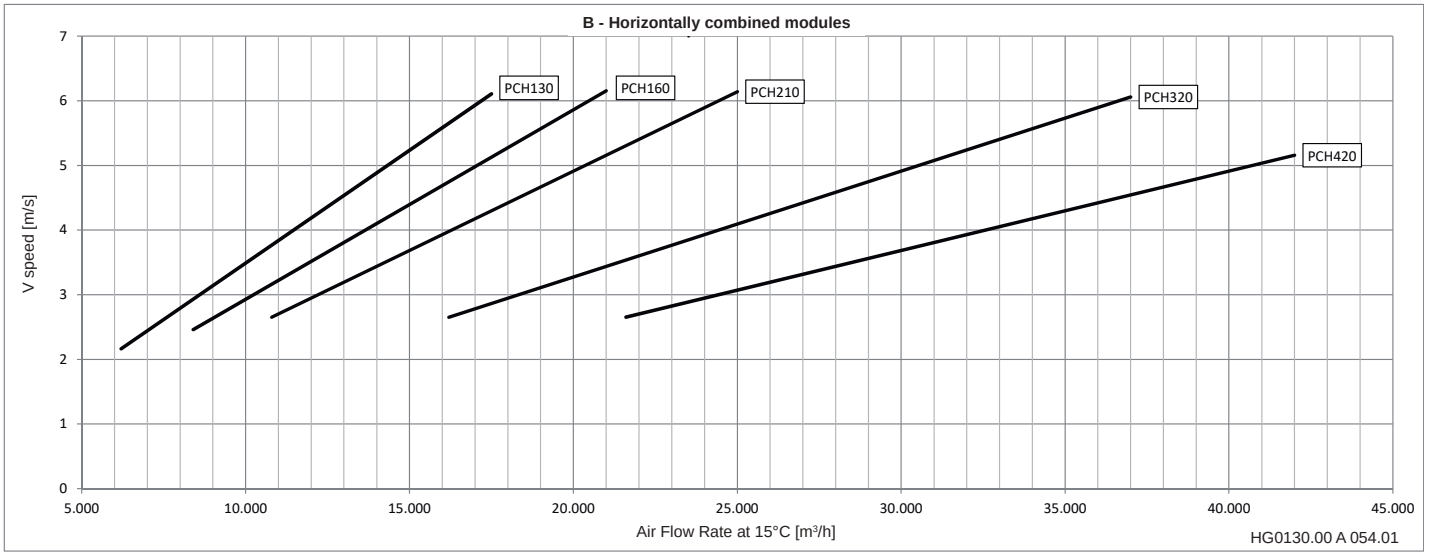
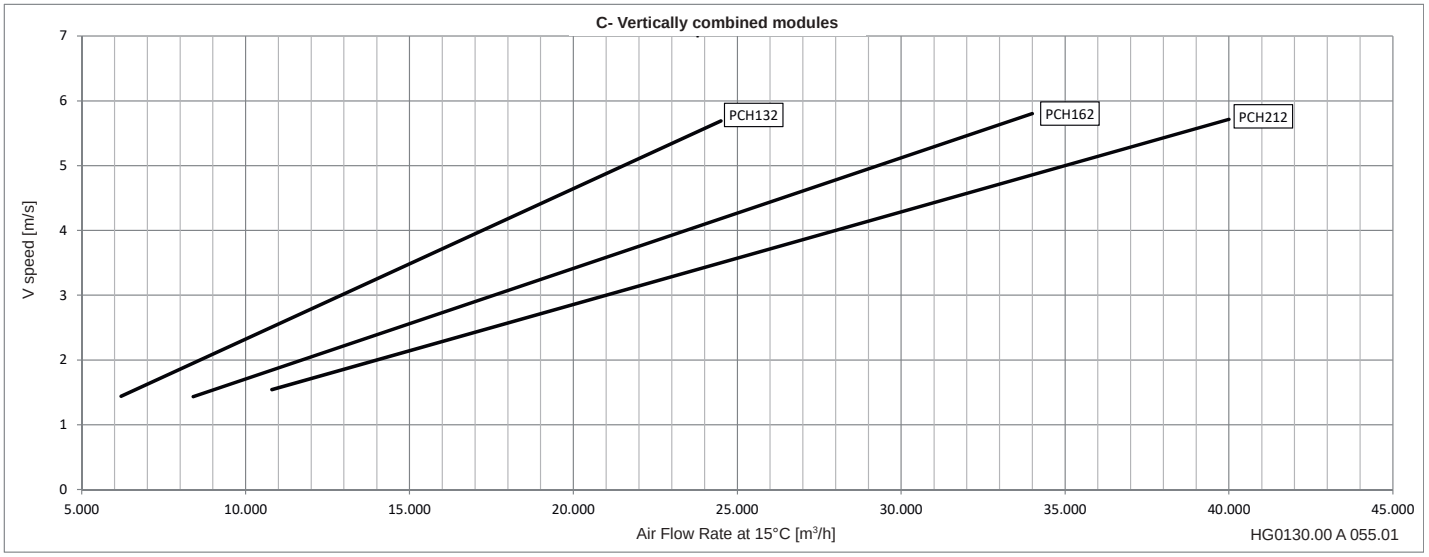


Diagram of air flow rates - air speed in the heat exchanger section

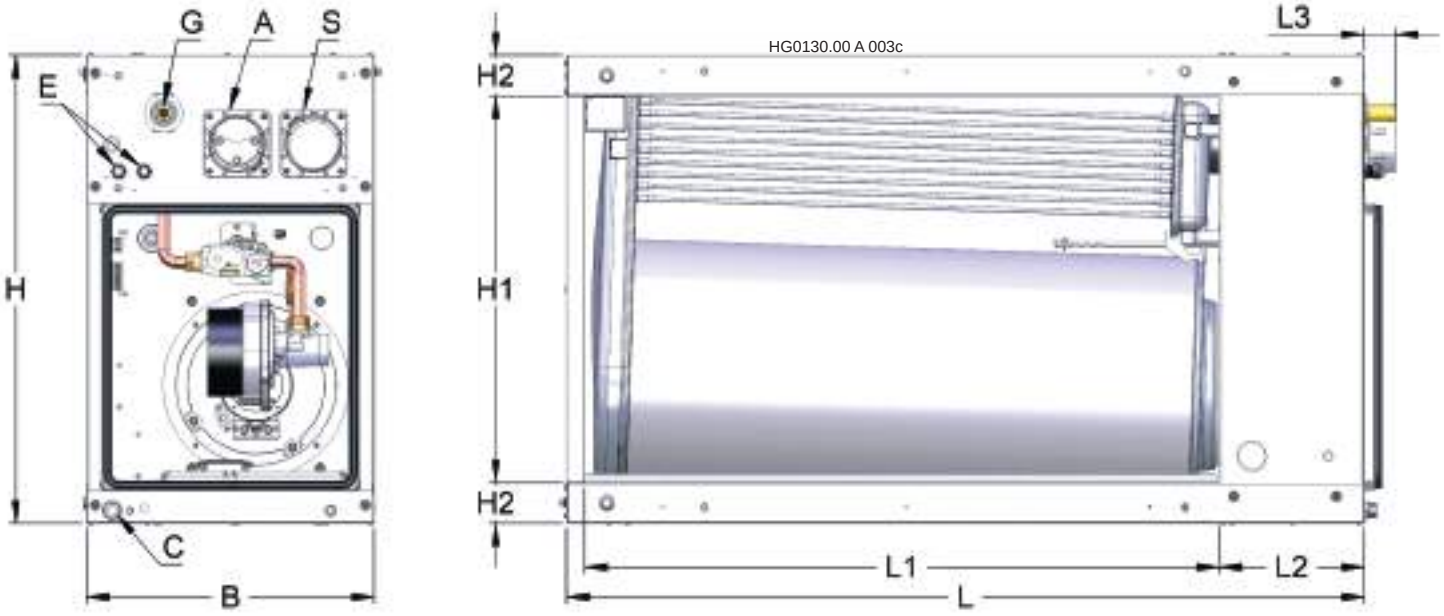






2.13. Dimensions

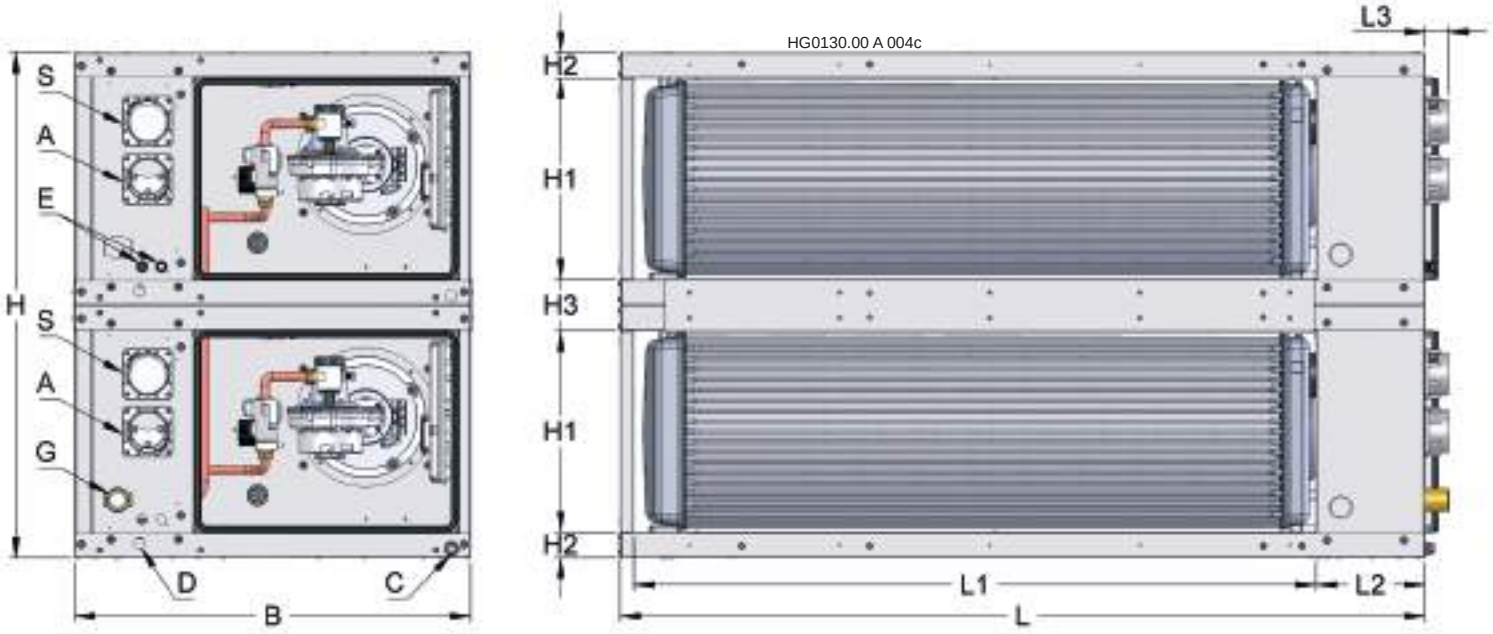
A - Single modules (A System)



Mod. PCH	Overall dimensions													
	B	H	L	H1	H2	H3	L1	L2	L3	E	G*	A	S	C*
PCH020	450	660	710	534	63	-	450	230	47	2X Ø21	G 3/4"	Ø 80	Ø 80	G ½"
PCH034			950				690							
PCH045		730		604										
PCH065			1250				990							
PCH080		815	1440	689			1180							
PCH105			1670				1410							

LEGEND:
E electrical connections;
G gas connection;
A intake;
S flue gas drainage;
C condensate drain;
* reference ISO 228/1.

B - Horizontally combined modules (B System)



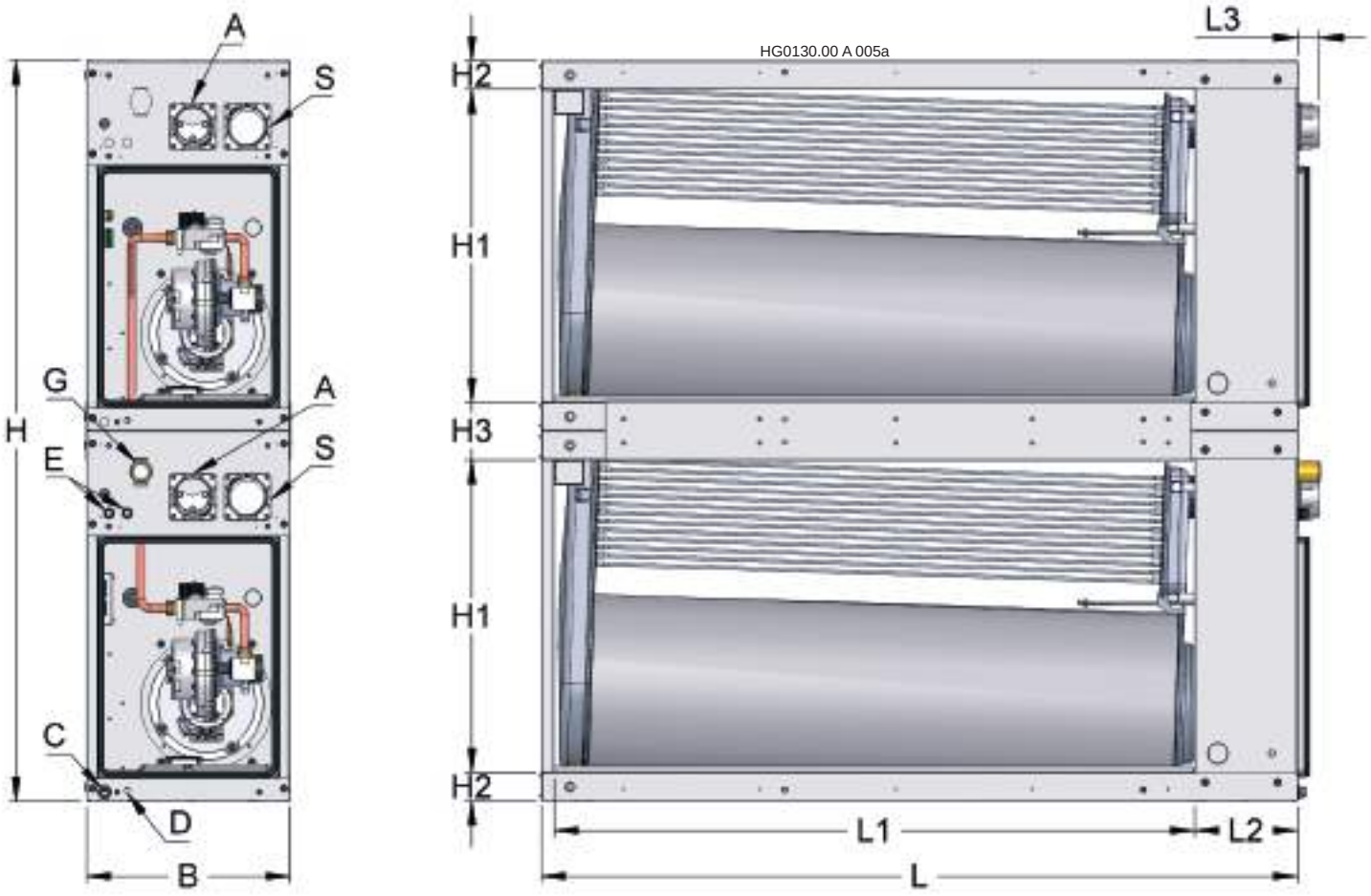
Mod. PCH-00H0	Overall dimensions														
	B	H	L	H1	H2	H3	L1	L2	L3	E	G*	A	S	C*	D
PCH034-00H0	740	525	960	418	53	-	690	230	47	2X Ø21	G 3/4"	Ø 80	Ø 80	G ½"	Ø 21
PCH045-00H0															
PCH065-00H0			1260				990								
PCH080-00H0	825		1450				1180								
PCH105-00H0			1680				1410								

Mod. PCH	Overall dimensions														
	B	H	L	H1	H2	H3	L1	L2	L3	E	G*	A	S	C*	D
PCH130	740	1050	1260	418	53	108	1000	230	47	2X Ø21	G 1½"	2X Ø 80	2X Ø 80	1 X G ½"	Ø 21
PCH160	825		1450				1190								
PCH210			1680				1420								
PCH320		1575									1XG 1½" + 1xG 3/4"	3X Ø 80	3X Ø 80		
PCH420		2100									2XG 1½"	4X Ø 80	4X Ø 80		

LEGEND:

E electrical connections;
G gas connection;
A intake;
S flue gas drainage;
C condensate drain;
D condensate vent;
* reference ISO 228/1.

C- Vertically combined modules (C System)



Mod. PCH	Overall dimensions														
	B	H	L	H1	H2	H3	L1	L2	L3	E	G*	A	S	C*	D
PCH132	450	1460	1250	604	63	126	990	230	47	2X Ø21	G 1 ½''	2X Ø 80	2X Ø 80	1 X G ½''	Ø 18
PCH162		1630	1440	689			1180								
PCH212			1670				1410								

LEGEND:

E electrical connections;
G gas connection;
A intake;
S flue gas drainage;
C condensate drain;
D condensate vent;
* reference ISO 228/1.

2.14. Regulation (EU) 2016/2281

Product Information in accordance with Annex 2 point 5 a)

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

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

2.15. Supply of PCH modules

Flue outlet - Combustion air intake

The PCH heater modules are certified for flue outlet and air intake as follows:

- type "C": sealed combustion circuit with respect to the environment where the heater is installed;
- type "B": open combustion circuit, where the combustion air is drawn in from the environment where the heater is installed.

Both air inlet ports ("C" and "B") are supplied as standard by APEN GROUP.

The difference between the two types depends on the type of port fitted on the air intake system.

In "C" version the inlet port is a fitting to be connected to the PCH heater according to the fitting instructions provided in the next page.

In "B" version the terminal is made of steel with openings on three sides and must be installed by slotting it over the "C" terminal port (supplied as standard and required for all models), leaving the side without hole facing upward to make sure water cannot get inside the heater.

"C" type intake

"B" type intake

Panelling

The PCH module must be installed inside an AHU or Roof-top unit, for protection from the outdoor weather. The standard version of the PCH module is supplied with a galvanised sheet front panel (UNSUITABLE for outdoor use) and without any door to close the burner housing. A kit consisting of a front panel and a burner housing door panel can be supplied on request.

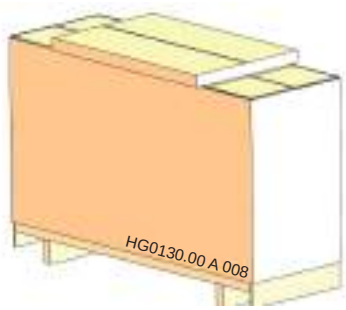
With the front panel kit, installed as shown below, and the “B” type intake terminal supplied as standard, the PCH module reaches the IPX5D protection rating.

The choice of not supplying (as standard) the front panel, allows the Customer to make it while maintaining the aesthetic/colour finish of the AHU or Roof-top unit where the module is inserted. On request, APEN GROUP will supply the digital format drawings in order to create the front and door panel.

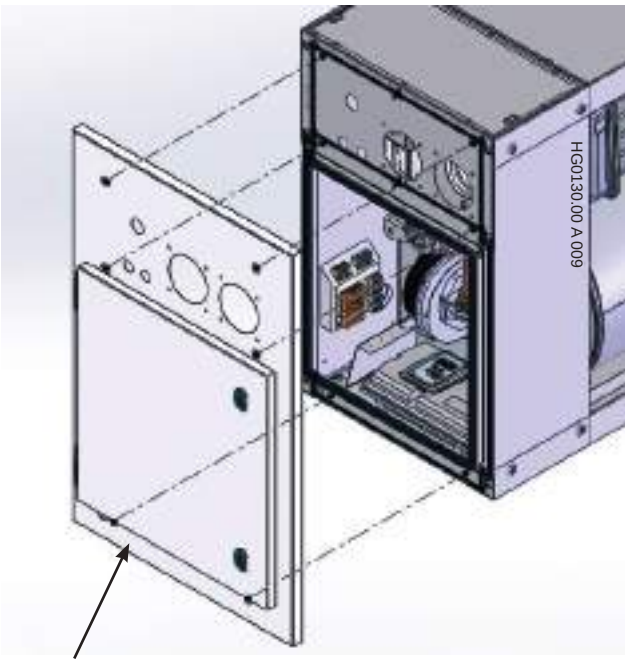
Otherwise, APEN GROUP supplies the front door and the door panel as a standard kit in a colour similar to white RAL 9003, to be ordered by using the codes listed in the table shown in the next paragraph "Accessories"; for packing and shipment reasons, the kits will be supplied unassembled.

APEN GROUP can supply on request panels of different sizes, colours and materials; the prices will be specified when placing the order.

The standard supply includes fast locks and cable clamps. The PCH heater module is supplied with an NBR rubber seal with metal core, which is pre-fitted on the burner housing.



PCH heater and front panel with door packaging



Components belonging to the front panel kit, not supplied as standard.
This installation requires cladding panels suitable to the shape of the air handling or roof-top unit where the PCH will be fitted.

Accessories

The front panel kit, as an accessory, must be ordered to APEN GROUP by using the following codes:

Model PCH	Front panel kit Code
PCH020	G28881
PCH034	
PCH045	G28882
PCH065	
PCH080	G28883
PCH105	
PCH130	G28884
PCH160	G28885
PCH210	
PCH320	G28886
PCH420	G28887
PCH132	G28888
PCH162	G28889
PCH212	

Model PCH	Front panel kit Code
PCH034-00H0	G28878
PCH045-00H0	
PCH065-00H0	
PCH080-00H0	G28879
PCH105-00H0	

The front panel kit includes the closing panel and the door to be applied to the closing panel.

For installation in environments where the air temperature drops below -15°C, we recommend to request the housing heating kit:

- G28510

Kit installation, connection and adjustment modes inside the warm air heater module are described in the installation manual.

Standard supply

Each PCH heater is supplied with some accessories, essential to ensure correct installation:

- 1 intake terminal;
- 1 intake terminal for "B23" application;
- 1 flue outlet terminal;
- no. 2 red silicone seals for flue outlet;
- 8 three-lobe M4 x 16 screws;
- 6 M6 x 16 screws;
- 6 washers;
- 6 red silicone rubber seals;
- 2 PG13.5 cable clamps;
- 1 green klin/sil seal (for gas locknut);
- 1 locknut for gas pipe;
- 4 1/4 slotted head locks.

Fitting the front panel and the door

To assemble the unit, proceed as follows:

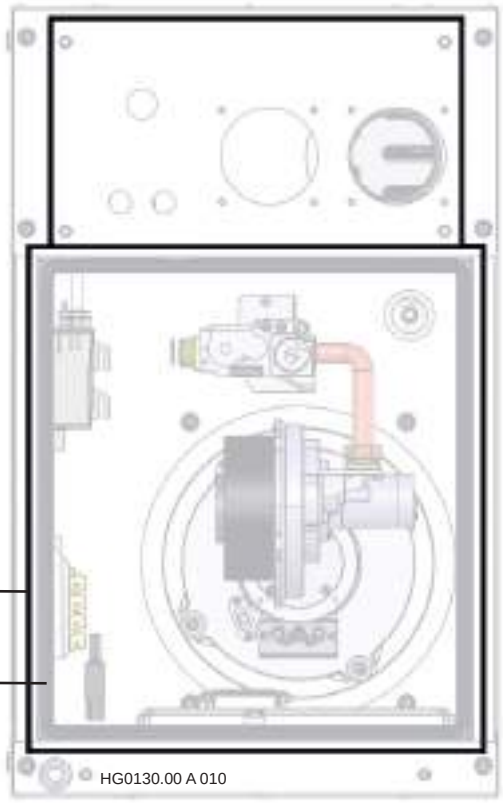
- apply, along the perimeter of the PCH housing galvanised panel, a silicone bead to make the PCH heater outer panel watertight, as shown in the figure (this application is compulsory to ensure IPX5 protection for the equipment);
- fix the front panel to the module, using the M6 x 16 front screws;
- secure the gas pipe to the front panel by using the seal and the locknut;
- fit the electrical cable clamps to the front or side panel, according to the configuration of the machine;
- fit the air intake fitting by inserting the black O-ring seal between the front panel and the fitting; use the 8 self-tapping M4 x 16 screws;
- fit the locks on the door panel.

<u>"B" type heater with combustion circuit open to the environment in which it is installed</u>

Fit the accessories for the combustion air inlet and the flue outlet directed outwards (see the picture on the next page).

<u>"C" type heater with combustion circuit sealed from the environment in which it is installed</u>

Fit the combustion air inlet and the flue outlet accessories (see the picture on the next page) which must reach a suitable external location.



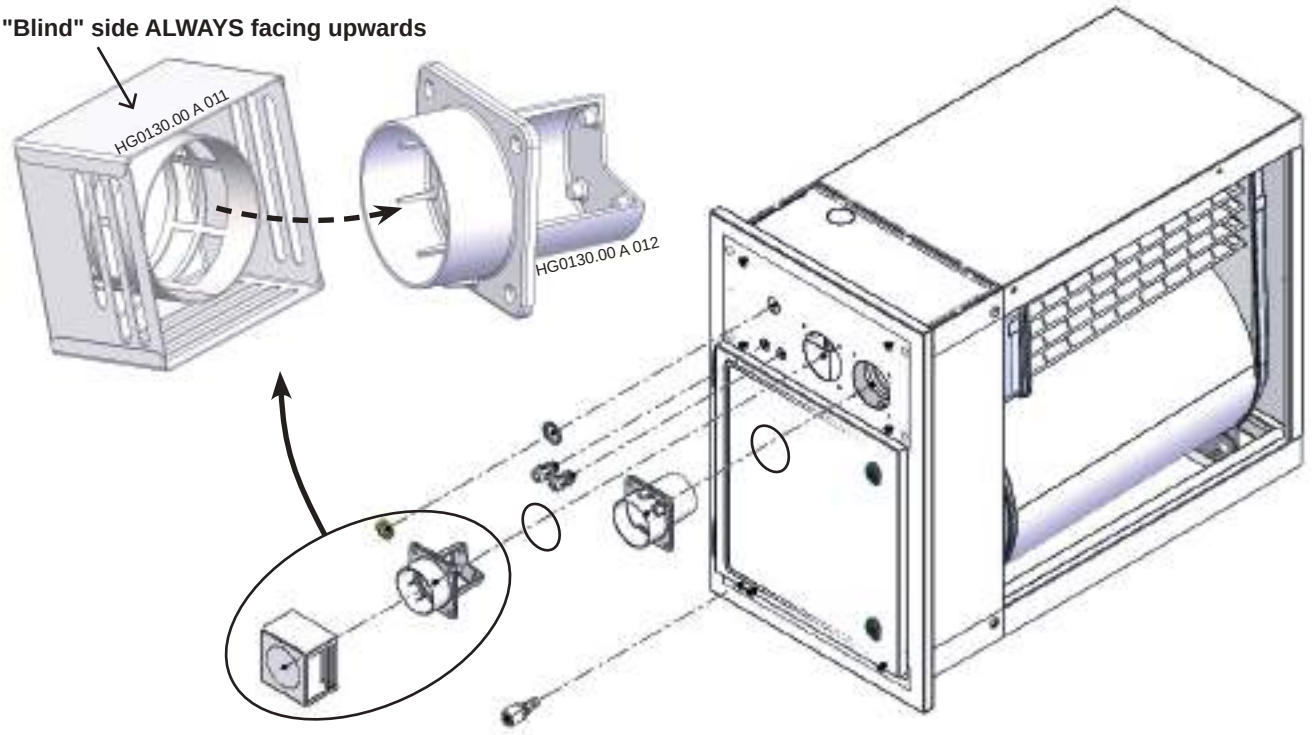
Correctly position the intake terminal for the "B23" type application by fitting the internal cylinder over the "C" type intake terminal, with the side without hole facing upward to ensure no water can directly enter into the heater (this application makes the equipment IPX5).

The "B" type terminal fitting must be installed on the intake terminal keeping the air intake side without holes facing upwards. During installation, special attention must be paid to the air flow direction through the PCH heater after the latter is fitted inside the air handling or roof-top unit.

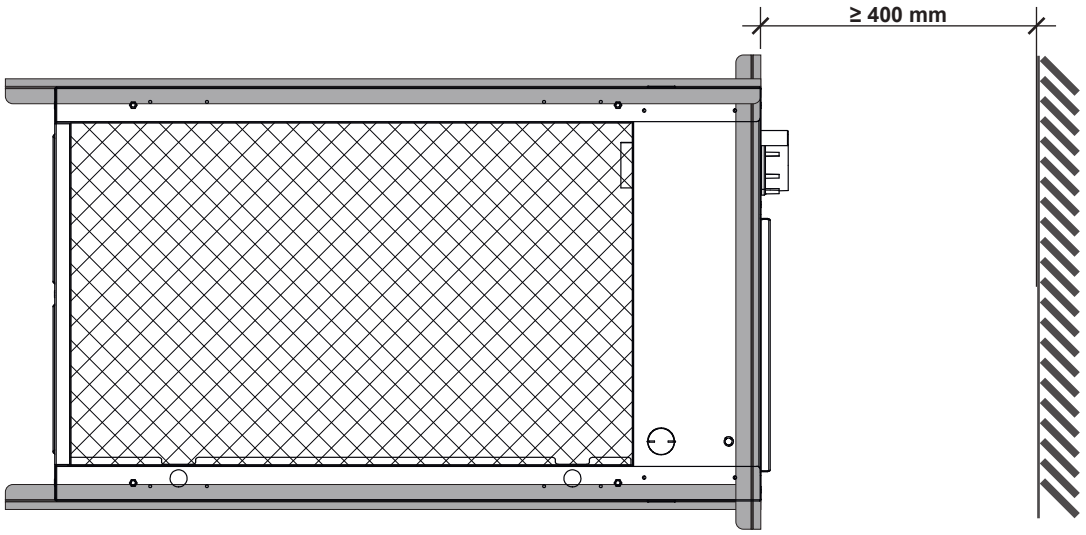
Correctly position the intake terminal, with the pipe connection notch facing upward to ensure the correct operation of the PCH heater.

Accessories supplied as standard to correctly install the PCH heater.

"Blind" side ALWAYS facing upwards



Front minimum distance for the correct installation of the PCH heater.



3. INSTALLATION INSTRUCTIONS

Instructions for installing and setting the heater are intended for suitably qualified personnel only. We recommend the installer to read safety warnings.
Installation instructions for units including a PCH module are the same as those applying to warm air heater installation because, from the regulatory point of view, they are warm air heaters.

3.1. Installing the module inside the units

The PCH heater can be fitted to air handling or roof-top units in two different ways:
OUTDOOR installation: the module outer panel is outside the unit.
INDOOR installation: the module outer panel is fitted inside the unit, creating a gap between the module and the outer panel of the unit.

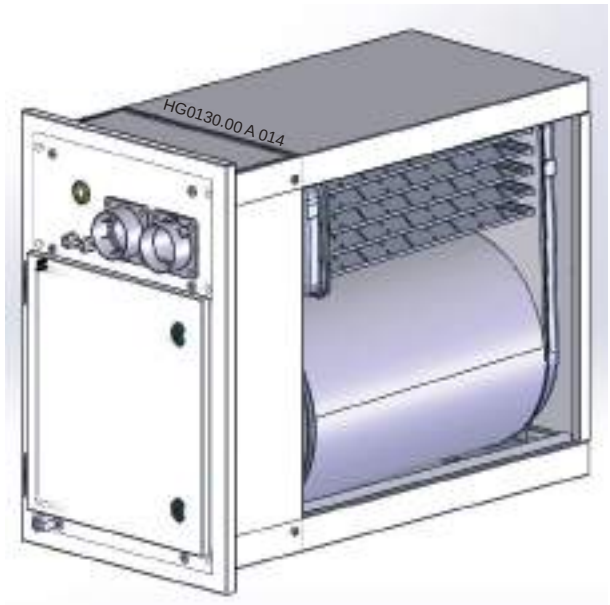
OUTDOOR Installation
Either "C" type (sealed combustion chamber) and "B" type (open combustion chamber) can be used for the OUTDOOR installation.
If the heater is installed outdoor, pay attention to correctly install the seal on the door; make sure preventive measures are taken to prevent water from entering the burner casing (see the picture showing the position of the seals in the previous pages).
In order to install a "C" type module with watertight combustion chamber, connect an air intake pipe and associated terminal to the air port.
If a "B" type installation is required (with open combustion chamber), fit to the air intake the stainless steel terminal supplied by APEN GROUP as standard.
The OUTDOOR installation must be carried out by using the front panel kit (see paragraph 2.15 "Supply of PCH modules") or by fitting a special panel to be made in compliance with the drawings (in .cad format) that APEN GROUP can supply on request.

INDOOR Installation
Both "C" type (sealed combustion chamber) and "B" type (open combustion chamber) can be used for the INDOOR installation.

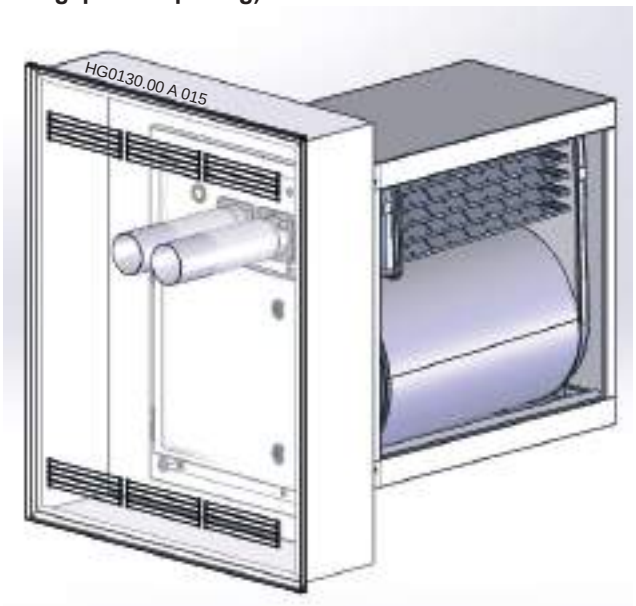
"B" type heater with combustion circuit open to the environment in which it is installed
In this case further precautions must be taken in addition to those required to prevent water from entering the burner housing. For example, the compartment where the heater will be connected to the gas supply will need to be ventilated by making some vents on the outer panel equal to 2% of the larger internal section. These vents must be equally split between the top and the bottom of the panel (EN525) and the gap must be airtight with respect to the air treatment passage. For this type of heater, the combustion air can be drawn directly from the gap; therefore great care must be taken to completely seal such gap, in particular in installations where the unit fan is located downstream of the PCH heater.

Under no circumstances should supply air be extracted from the compartment of the air handling unit or the roof-top unit by the supply-air fan as this would cause, when the burner is switched off, very hot air from the heat exchanger to pass through the burner, causing irreparable damages to the burner fan.

Outdoor installation example



Indoor installation example (with gap vent opening)



3.2. Installing the Module

In order to install a PCH heater into an air handling or roof-top unit, we recommend to prepare four support guides similar to those shown in the adjacent picture, or to make sure that the heater, located inside the housing, is placed and locked safely in place to prevent its movement and/or damage during the transport.
These guides/supports can also be totally or partially closed to reduce pressure drops, depending on air flow.
With high air flow rates, in order to avoid great pressure drops, the system designer must provide the system with a bypass section. THIS section can be calculated by following the instructions provided in paragraph 3.3 "Bypass calculation" or by using a calculation software supplied on request by APEN GROUP.

Precautions to be taken for surrounding areas
An STB safety thermostat is fitted in the PCH heater, together with a temperature control probe, installed on the heat exchanger centreline.
The thermostat may be accessed from the outside through the burner housing during maintenance and/or replacement operations.

All components belonging to the air handling or roof-top units where the PCH heater will be located (fans, filters, drop separators, etc.):

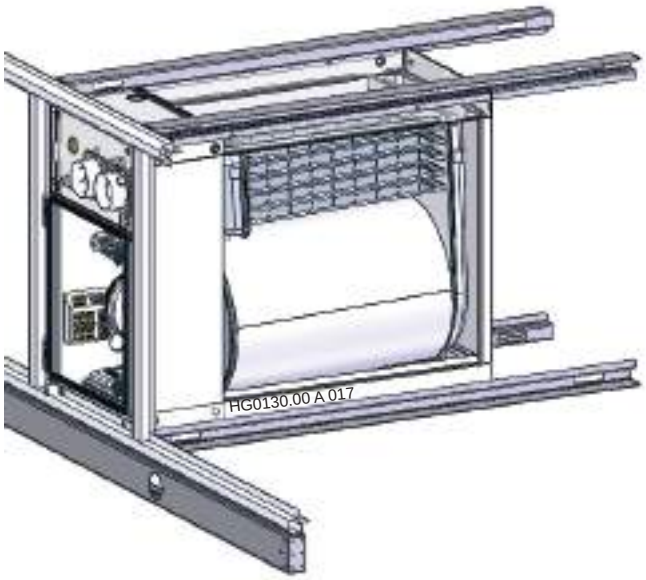
- if made of plastic, they must be installed at a distance of least 1 m, with an access grille between them

The plastic used must be of V0 UL94 type (flame retardant)

- if made of metal, they must be fitted at a distance of at least 500 mm without grille.

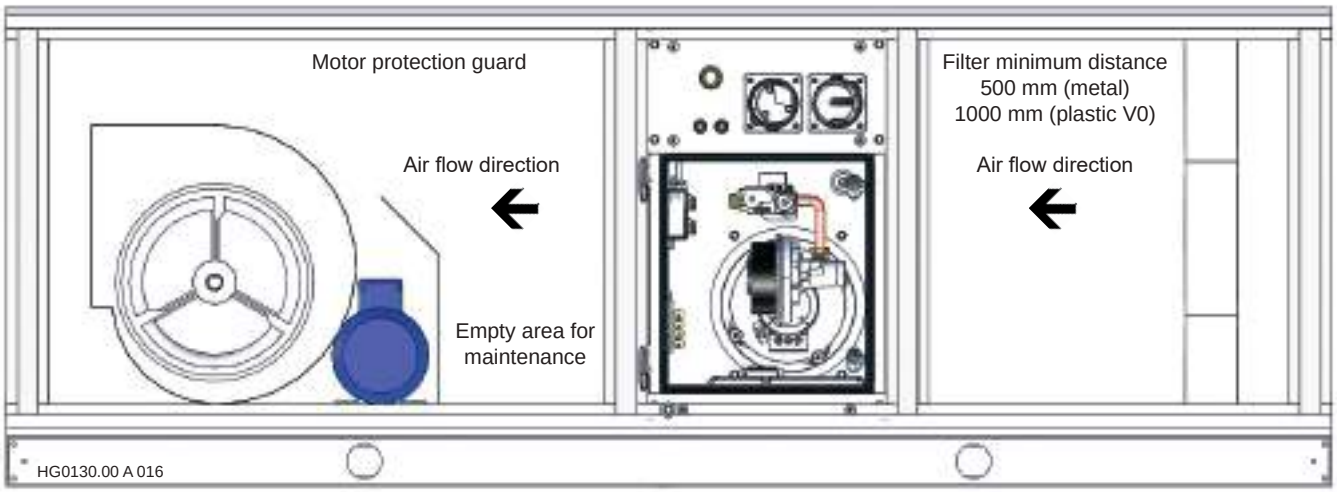
The distance is required to protect the component from the heat radiated by the exchanger in the event of a power failure, and therefore ventilation when the heat exchanger is hot.

Example of a PCH heater installation inside an air handling unit: four guides aid the installation of the PCH heater inside the unit.



Metal fibre filter or fibreglass filter should be used (Tmax 100-120°C).

If the fan motor and/or an inverter is located very close to the PCH heater module (less than 500 mm) a metal guard must be used to protect and shield the electrical components.
IT is prohibited to install any type of flammable material near the PCH heater.

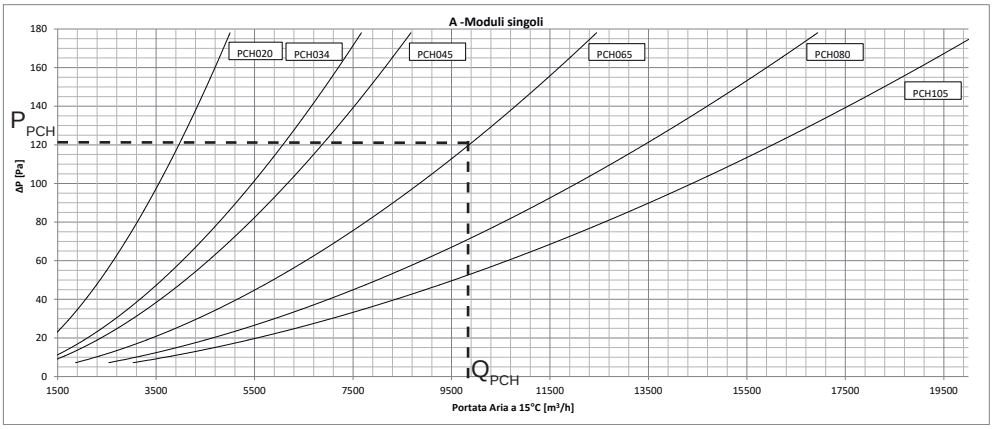


3.3. Bypass Calculation

IMPORTANT: APEN GROUP can supply on request a programme able to automatically calculate the flow rate and the size of the bypass required for the different types of installation.

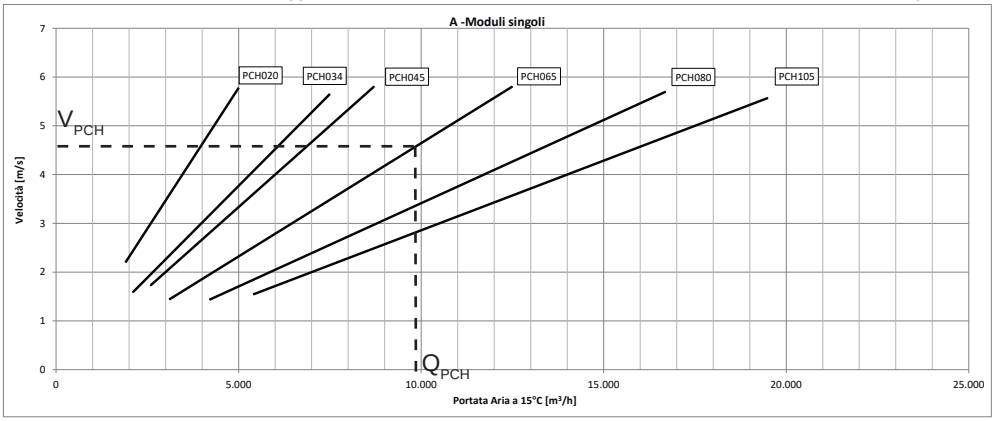
The bypass flow rate calculation can be performed by following the instructions below. As an example, the calculation procedure shown assumes that a PCH heater has been applied.

A. By using a default pressure drop (for example about 120 Pa) [P_{PCH}] through the PCH section, find out the PCH flow rate [Q_{PCH}] going through the PCH by using the AIR FLOW RATES-PRESSURE DROPS diagram;



B. From the FLOW RATE-SPEED diagram, find out, by entering the current flow rate [Q_{PCH}], the air flow through the PCH section [V_{PCH}];

C. Calculate the bypass air flow rate [Q_{BYPASS}] by subtracting from the air handling or roof-top unit [Q_{TOT}] the total air flow rate



going through the PCH [Q_{PCH}]:

$$Q_{BYPASS}\ [m^3/h] = Q_{TOT} - Q_{PCH}$$

D. Calculate the speed of the air going through the bypass section [V_{BYPASS}] using the dynamic pressure formula, considering the air density [ρ_{AIR}] as a constant equal to 1.2 kg/m³:

$$V_{BYPASS}\ [m/s] = (2*P_{PCH}/\ \rho_{ARIA})^{1/2}$$

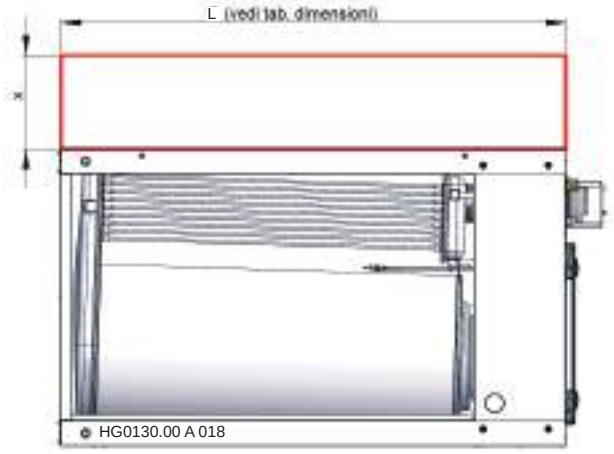
E. Calculate the bypass section area [A_{BYPASS}] by applying to the bypass section air flow rate the speed of the air going through the bypass [V_{BYPASS}]:

$$A_{BYPASS}\ [m^2] = Q_{BYPASS}\ [m^3/h] / V_{BYPASS}\ [m/s] /3600\ [s/h]$$

F. After calculating the bypass areas, it is possible to obtain the height required for the bypass if a top bypass is provided or the

width of the bypass if it is provided sideways:

TOP BYPASS: $x = A_{BYPASS} / L$
SIDE BYPASS: $y = A_{BYPASS} / H$



The bypass area, according to installation requirements, can be provided in the top section and/or in the side section.

It is advisable to install some manually adjustable shutters or movable grilles where the bypass section is located in order to ensure correct calibration of the equipment during installation.

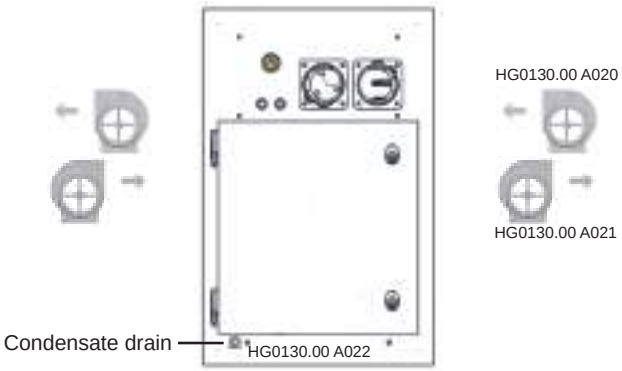
3.4. Installing single or multiple modules

MULTIPLE PCH heaters can be assembled in a single air handling or roof-top unit, in order to achieve greater heat output. The heaters can be assembled in parallel; ventilation can be provided on the right or on the left because the PRH heater uses a single safety device against air overtemperature, which works both for the right and the left air flow.
When multiple heaters are installed, safety is always ensured by the thermostat provided on each module.

Horizontal or vertical positioning refers to the air flow direction

Fitting a single heater (A System)
In standard installations with a single heater, the air flow is horizontal and can have both a right or left direction. The fan can be fitted upstream or downstream of the heat exchanger.

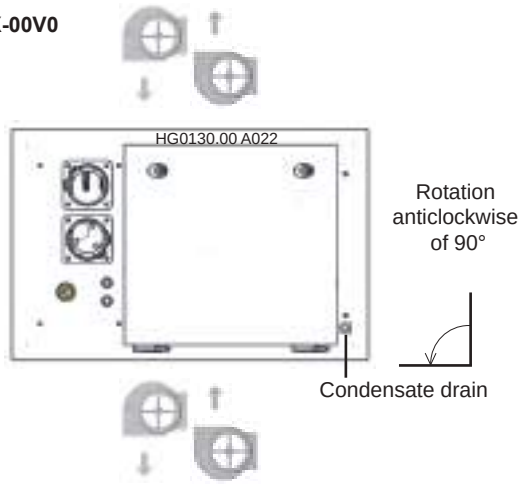
PCHXXX



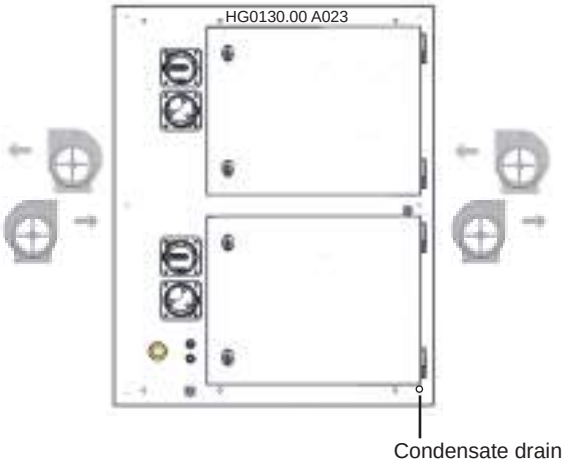
On request, the air flow can be vertical.
For PCH heaters it is necessary to order the module with code ending with "-00V0". This specification determines the correct position and orientation of the condensate drain.

ATTENTION: When the air flow is vertical, PCH heater can be made horizontal by rotating the standard vertical heat exchanger by -90° (90° anti-clockwise rotation), as shown in the picture; it is not possible to apply a rotation in the opposite direction (90° clockwise rotation).

PCHXXX-00V0



PCHXX0



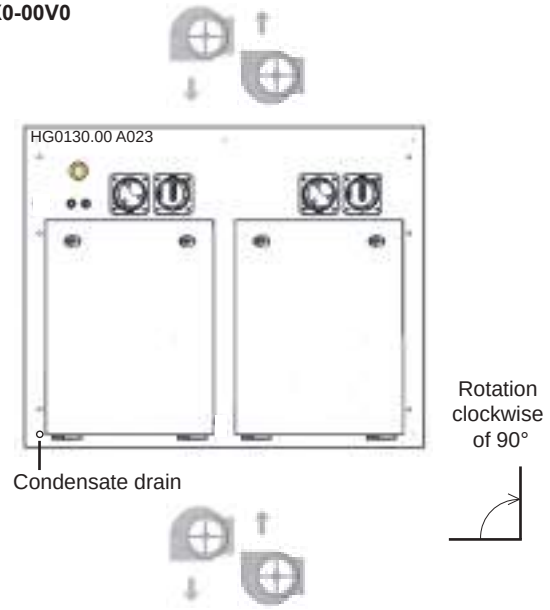
Fitting multiple heaters in parallel (B System and C System)
When high heat outputs are generated, a solution with two or more heat exchangers must be used. In this type of installation, it is necessary to check that the air flow on the heat exchangers is balanced.

<u>Horizontally combined modules (B System)</u>
In the standard configuration, the air flow going through the heat exchanger is horizontal, coming either from the right or from the left.

On request, the air flow can be vertical.
For PCH heaters it is necessary to order the module with code ending with "-00V0". This specification determines the correct position and orientation of the condensate drain.

ATTENTION: When the air flow is vertical, the horizontally assembled PCH heaters (B System) must be installed by rotating the standard version by -90° (90° clockwise rotation).

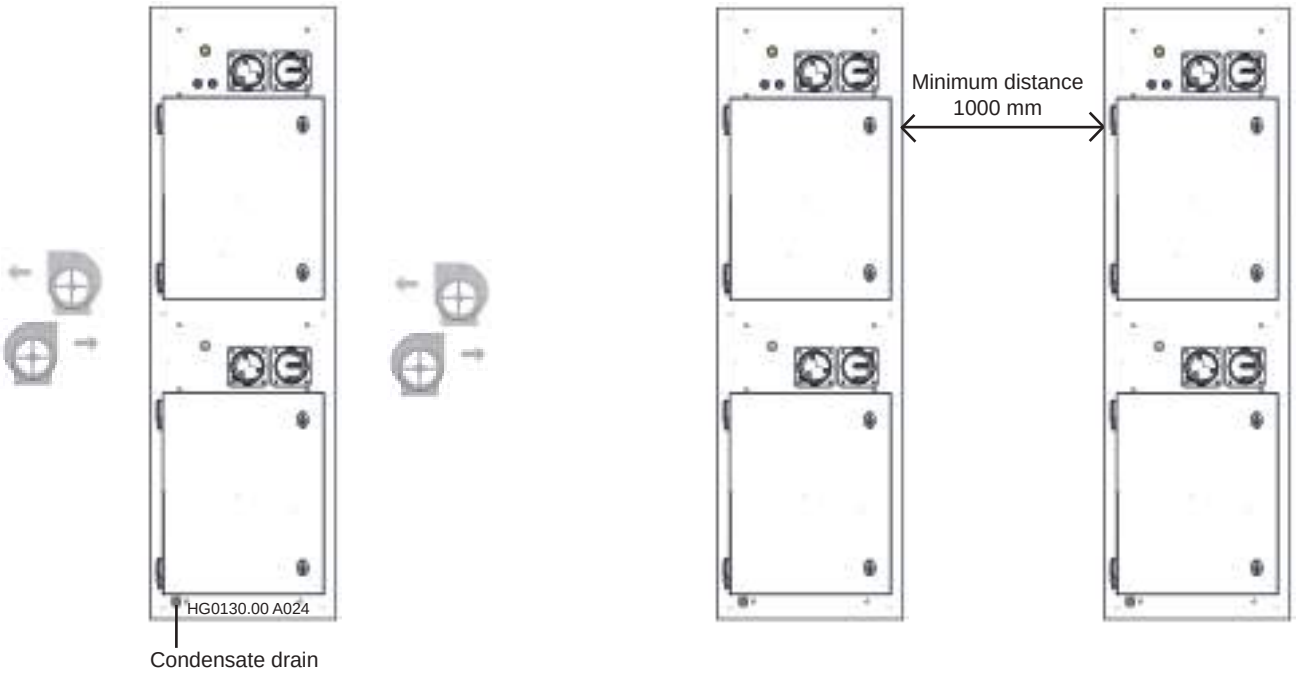
PCHXX0-00V0



Vertically combined modules (C System)
In this type of application the air flow can only be horizontal, coming from either the right or the left direction.

If the installation allows it, in case of higher outputs required, the vertically combined modules can be positioned next to each other, keeping the air flow horizontal, at a minimum distance of 1000 mm.

PCHXX2



3.5. Connections to the Flue

The PCH heater module is fitted with a watertight combustion circuit and with the burner fan located upstream of the heat exchanger.
Connection to the flue, according to how the heater is installed, should be made as "C" type, with combustion air being drawn from outside, or as "B" type with combustion air being drawn from the heater installation site.
If the heater is installed outdoor, a "B" type installation is also a "C" type.
More specifically, the heater is certified for the following exhausts: B23P-C13-C33-C43-C53-C63; for more information on the flue types, please refer to current regulations.

Flue outlet is compulsory for PCH heaters fitted inside an air handling or roof-top unit installed indoor (see paragraph "Supply of PCH modules").

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 for PCH heaters.
The flue does not need to be insulated to prevent the formation of condensation in the pipe, as this will not affect the heater, which is fitted with a water trap. Insulate the pipe if required to protect the flue from accidental contact.
For the air intake, use:
- aluminium with a thickness of at least 1.0 mm;
- stainless steel with a thickness of at least 0.4 mm.

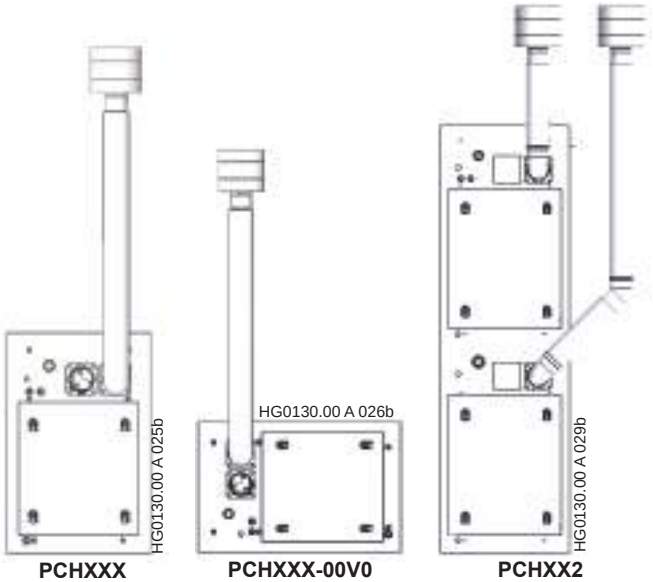
The horizontal sections of chimney must be installed with a slightly incline (1°- 3°) towards the heater, in order to prevent the build up of condensation in the exhaust.

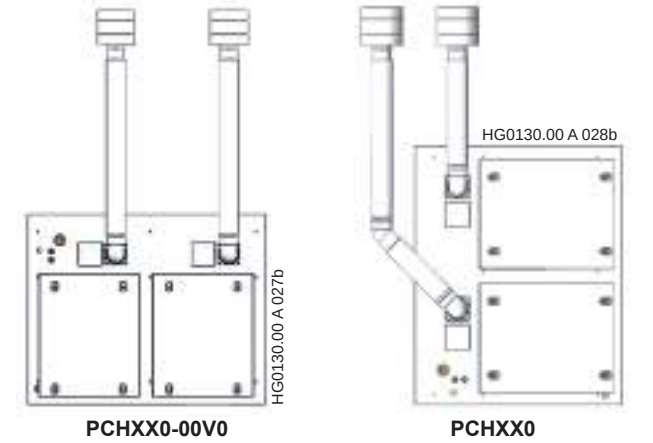
All components are certified in compliance with EN 1856-1 and EN1856-2 standards. They are identified by an ID plate showing their features. Below is an *example*:

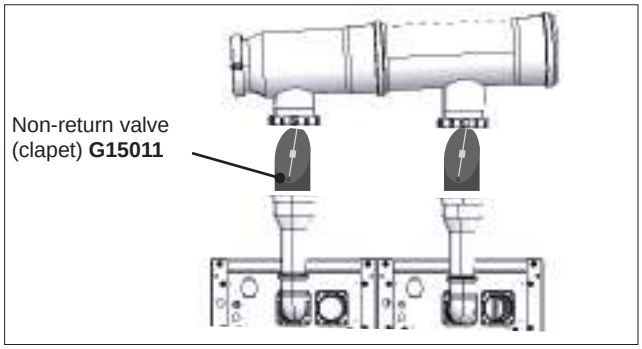
0694-CPR-52977	1856-1	T200	P1	W	V2	L50050	O70
Certificate no.							
Number of the Standard							
Temperature class							
Pressure level (N=negative, P=positive, H=high pressure, 1 and 2 = permissible loss, value 1 more restrictive)							
Condensation resistance class (D = dry use, W = wet use)		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

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

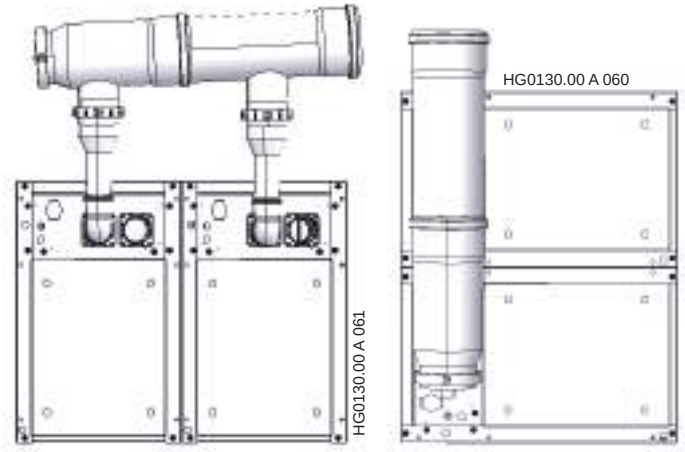
Common exhausts
Where possible, it is always preferable to use independent exhausts; PCH module exhausts are pressurised, therefore in this way it is possible to prevent incorrect sizing from causing a system malfunction.
When common exhausts are fitted, they must be designed by providing some anti-reflux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







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



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

Flue gas data
The table to be used to calculate the flue gas exhaust system with commercially available pipes can be found in paragraph 3.15 "GAS connection" within the Gas regulation data.

The maximum permitted recirculation percentage is 10%.

Selection Guide
The tables below show the pressure drop for Ø 80 and Ø 100 terminals and exhaust ducting.
If the terminal is not directly connected to the heater and, therefore, extra routing is required, according to the length of the ducting, the diameter of the selected terminals, extensions and bends must be checked.
After establishing the routing, the pressure drop must be calculated for each component by referring to the table below according to the PCH module used; each component has a different pressure drop value as the gas flow rate is different.
Then the pressure drops of each component identified must be added, checking that the result is not higher than the value available for the PCH heater module used; if a combustion air supply pipe is fitted, losses must be added to the flue pressure drops.
If the sum of pressure drops caused by the fittings is higher than the pressure available at the exhaust, ducts with greater diameter must be used, rechecking the calculation; a pressure drop higher than the pressure available at the flue reduces the heater module thermal output.

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

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

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

Terminal configuration

B23P type
Open combustion circuit: gases produced by the combustion are discharged outside, on a wall or on the roof, and the combustion air is directly drawn from the site where the equipment is installed. In this case, standards UNI-CIG 7129 and UNI-CIG 7131 require the provision of suitable vents on the walls.

IT is compulsory to fit an IP20 safety mesh to prevent solids with a diameter higher than 12mm from passing through the combustion air intake. The mesh size must be lower than 8mm.

Type C13
Sealed combustion circuit (type "C") connected to a horizontal terminal on the wall by means of its own ducts.

Type C33
Sealed combustion circuit (type "C") connected to a vertically installed terminal (on the roof) by means of its own ducts.

Type C53
Sealed combustion circuit (type "C") connected by means of its own separate ducts to two terminals which can end up in areas with different pressure (such as a duct connected to the roof and a second one connected to the wall).

Type C63
Sealed combustion circuit (type "C") connected to an approved and separately sold combustion air supply and combustion products exhaust system.

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

PCH model	020	034	045	065	080	105	
Pressure available at the exhaust	80	90	100	120	120	120	[Pa]
Component	*Pressure drop [Pa]*						*Code*
Ø130 SMOOTH PIPE [l=1m]	0.1	0.2	0.3	0.6	0.8	1.2	G15820-13-XXX
BEND Ø130 WIDE RADIUS 90°	0.2	0.4	0.7	1.1	2.0	2.9	G15810-13-90
BEND Ø130 WIDE RADIUS 45°	0.1	0.2	0.3	0.5	0.9	1.3	G15810-13-45
Ø130 WALL-MOUNTED TERMINAL FROM SEPARATE TO COAX	3.1	4.6	5.9	12.7	20.5	31.1	TC13-13-HC5
Ø130 ROOF-MOUNTED TERMINAL FROM SEPARATE TO COAX	1.4	4.4	6.3	14.7	23.0	34.0	TC33-13-VC5K
Ø130 ROOF-MOUNTED TERMINAL, WINDPROOF EXHAUST ONLY	-	0.3	0.6	2.0	3.7	5.9	TB23-13-VSW
Ø100 SMOOTH PIPE [l=1m]	0.3	0.7	1.0	2.1	2.9	4.4	G15820-10-XXX
BEND Ø100 WIDE RADIUS 90°	0.5	1.4	1.9	4.1	5.8	8.8	G15810-10-90
BEND Ø100 WIDE RADIUS 45°	0.2	0.6	0.9	1.9	2.6	4.0	G15810-10-45
Ø100 WALL-MOUNTED TERMINAL FROM SEPARATE TO COAX	4.7	14.1	20.0	46.5	73.1	107.9	TC13-10-HC2
Ø100 ROOF-MOUNTED TERMINAL FROM SEPARATE TO COAX	3.8	12.2	17.7	42.5	67.8	101.0	TC33-10-VC2K
Ø100 ROOF-MOUNTED TERMINAL, WINDPROOF EXHAUST ONLY	-	0.3	0.6	2.0	3.7	5.9	TB23-10-VSW
SMOOTH Ø80 PIPE [l=1 m]	0.8	2.0	2.8	5.8	8.8	12.4	G15820-08-XXX
BEND Ø80 WIDE RADIUS 90°	1.3	3.4	4.8	9.8	14.9	21.1	G15810-08-90
BEND Ø80 WIDE RADIUS 45°	0.6	1.6	2.2	4.6	7.0	9.9	G15810-08-45
Ø80 WALL-MOUNTED TERMINAL FROM SEPARATE TO COAX	9.0	25.3	34.3	70.2	103.4	144.9	TC13-08-HC1
Ø80 ROOF-MOUNTED TERMINAL FROM SEPARATE TO COAX	9.2	29.6	42.0	95.9	149.2	218.2	TC33-08-VC1K
Ø80 ROOF-MOUNTED TERMINAL, WINDPROOF EXHAUST ONLY	-	0.1	0.4	1.4	2.7	4.4	TB23-08-VSW
ADAPTOR Ø80/100	0.2	0.7	1.2	2.6	4.1	6.2	G15815-08-10
ADAPTOR Ø100/80	0.2	0.7	1.2	2.6	4.1	6.2	G15815-10-08
ADAPTOR Ø100/130	0.2	0.6	0.9	2.0	3.2	4.8	G15815-10-13
ADAPTOR Ø130/100	0.1	0.4	0.6	1.2	2.0	3.0	G15815-13-10
COMBUSTION AIR UPTAKE ONLY							
Ø80 HORIZONTAL AIR UPTAKE ONLY	0.6	2.5	4.1	9.2	14.8	22.2	TB23-08-HS0
Ø100 HORIZONTAL AIR UPTAKE ONLY	0.4	1.3	2.0	4.3	6.8	10.0	TB23-10-HS0

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

Vertical B23 terminal
Open combustion circuit, combustion air intake from the room and exhaust to the outdoor.

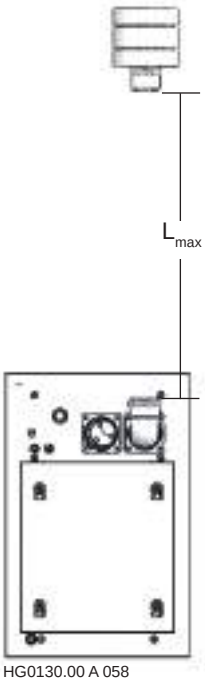
L_{max} of the pipe routing made with the Ø shown, excluding the terminal.
The terminal consists of:
- Adaptor from PCH outlet to exhaust Ø (where necessary);
- Wide radius 90° bend;
- Roof-mounted terminal, only windproof exhaust.

Ø80 pipes and bends: TB23-08-VSW + G15810-08-90

Mod. PCH	020	034	045	065	080	105
L_{max} [m]	30	30	25	14	-	-

Ø100 pipes and bends: TB23-10-VSW + G15810-10-90 + G15815-08-10

Mod. PCH	020	034	045	065	080	105
L_{max} [m]	-	-	-	30	30	20



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C33 type coaxial roof-mounted terminal
Combustion circuit watertight to the environment. The ducts are connected to the outside with a coaxial terminal.

L_{max} of the pipe routing made with the Ø shown, excluding the terminal.
The terminal consists of:
- Adaptor from PCH outlet to exhaust Ø (where necessary);
- Adaptor from PCH outlet to intake Ø (where necessary);
- Wide radius 90° bend on the exhaust;
- Wide radius 90° bend on the intake;
- Roof mounted terminal from separated to coaxial.

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

Ø80 pipes and bends: TC33-08-VC1 + 2xG15810-08-90

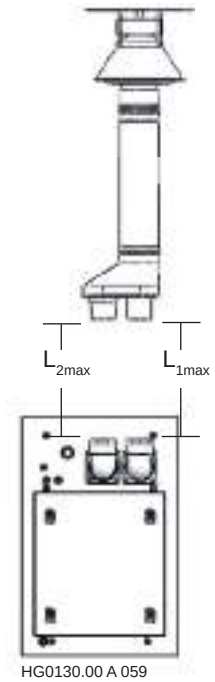
Mod. PCH	020	034	045	065	080	105
L_{max} [m]	30+30	13+13	6+6	-	-	-

Ø100 pipes and bends: TC33-10-VC2 + 2xG15835-08-10 + 2xG15810-10-90

Mod. PCH	020	034	045	065	080	105
L_{max} [m]	-	30+30	30+30	15+15	5+5	-

Ø130 pipes and bends: TC33-13-VC5K + 2xG15815-10-13 + 2xG15810-10-90 + 2xG15810-13-45

Mod. PCH	020	034	045	065	080	105
L_{max} [m]	-	-	-	-	30+30	20+20



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3.6. Condensate drain

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

SINGLE MODULE HEATERS

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

MULTIPLE MODULE HEATERS

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

Precautions

The drain pipe must be sized according to the maximum amount of condensate produced by the appliance (see Par. "Technical Data"), and made of a material suitable for the passage of hot condensate. Use:

- for hot pipes (water and flue gas passage), aluminium, stainless steel, silicone or Viton or EPDM;
- for cold pipes (water pipes), PVC and any materials suitable for hot pipes.

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

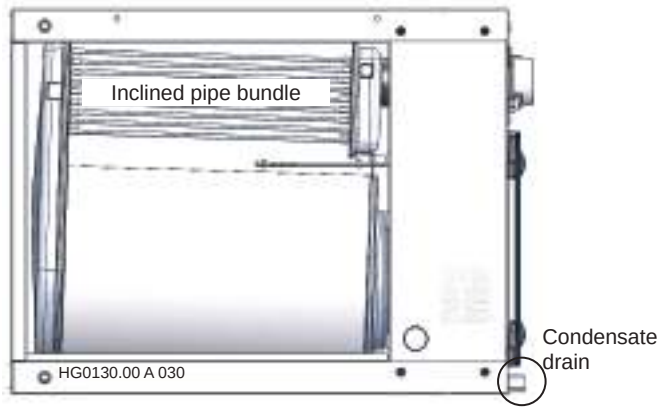
Neutralising the condensation

According to the applications, Apen Group can supply a condensate neutralisation kit (code G14303).

Build up of condensation in the heat exchanger

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

CAUTIONS



Special attention must be paid to the condensate drain; an incorrectly installed drain, in fact, could jeopardize the correct operation of the equipment. The factors to be taken into account are:

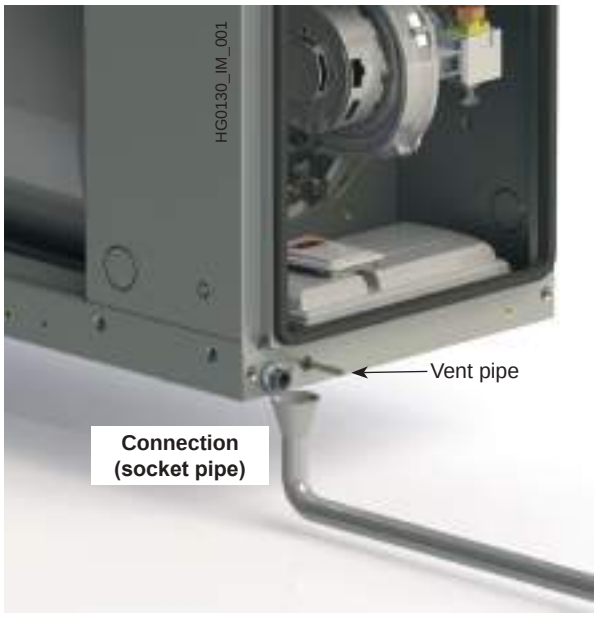
- risk of condensation build-up inside the heat exchanger;
- risk of condensation water freezing in the pipes;
- risk of flue gas discharged from the condensate drain.

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

- free drainage;
- drainage to water pipes;
- drainage inside the unit (water trap).

Free drainage

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



Drainage into water courses

Taking the condensation drain inside the heated room is a good solution in order to avoid the formation of ice; condensation can be drained into water courses or can be collected and treated with alkaline solutions (condensate neutralisation kit).
The pipe must be routed inside the unit (in warm conditions) up to the point where it enters the site, avoiding external routing.

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

Additional cautions

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

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

3.7. Electrical connections

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

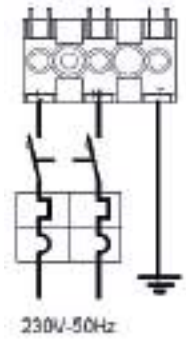
IMPORTANT: Single phase 230 Vac power supply with neutral. Do not mistake the neutral for the live wire.

For safety reasons, if the live and neutral wires are swapped, the flame control prevents operation by signalling Bloc E10.
If power is supplied from a 400V three-phase line, an insulating transformer must be used, connecting a pole to earth and using this pole as neutral.
The electrical system and, more specifically, the cable section, must be suitable for the equipment maximum power consumption (see table to the side).
Keep power cables away from heat sources.

It is compulsory to fit a multipolar disconnector with suitable electrical protection upstream of the PCH module. Using a multipole cable carrying both the power supply and the control cables is prohibited, both because of different voltages and since this could cause electromagnetic interference on the heater PCB.

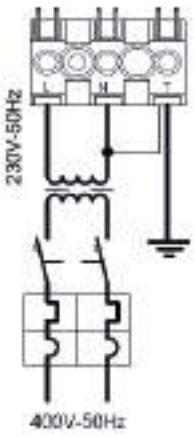
Powering off the unit before completing the cooling cycle and with machine set to ON is strictly prohibited. Failure to follow these instructions shall invalidate the warranty and cause early deterioration of the heat exchanger.

230 V connection



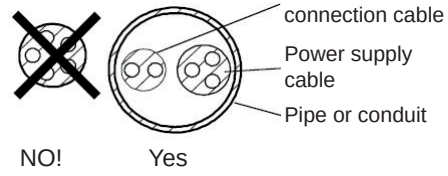
HG106_C2 024

400 V connection with 400/230 V transformer



High voltage (230 V) and low voltage cables can be housed in the same conduit by using double-insulated cables.

HG0103_C2 021



Electrical cable section
Connection must be made using flexible, flame retardant, double-insulated cables.
The size of the cable section must be suitable for the equipment power consumption and the distance between the heater and the connection point.

Model	Rated Current [A]	Inrush current Is/In [-]	Cable section [mm²]	Safety trip [A]
PCH020	0.2	2.2	(2+1)x1.5	4
PCH034	0.3	2.2	(2+1)x1.5	4
PCH045	0.4	2.2	(2+1)x1.5	4
PCH065	0.5	2.2	(2+1)x1.5	4
PCH080	0.6	2.2	(2+1)x1.5	4
PCH105	0.6	2.2	(2+1)x1.5	4
PCH130 - PCH132	0.9	2.2	(2+1)x1.5	6
PCH160 - PCH162	1.2	2.2	(2+1)x1.5	6
PCH210 - PCH212	1.2	2.2	(2+1)x1.5	6
PCH320	1.9	2.2	(2+1)x1.5	6
PCH420	2.5	2.2	(2+1)x1.5	6

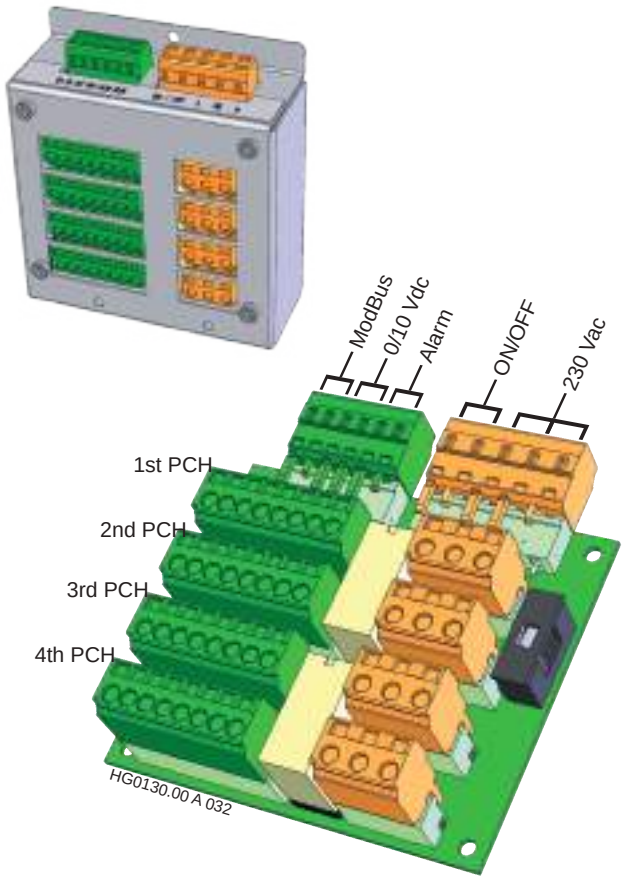
Keep electric cables away from heat sources.

3.8. Interface terminal board

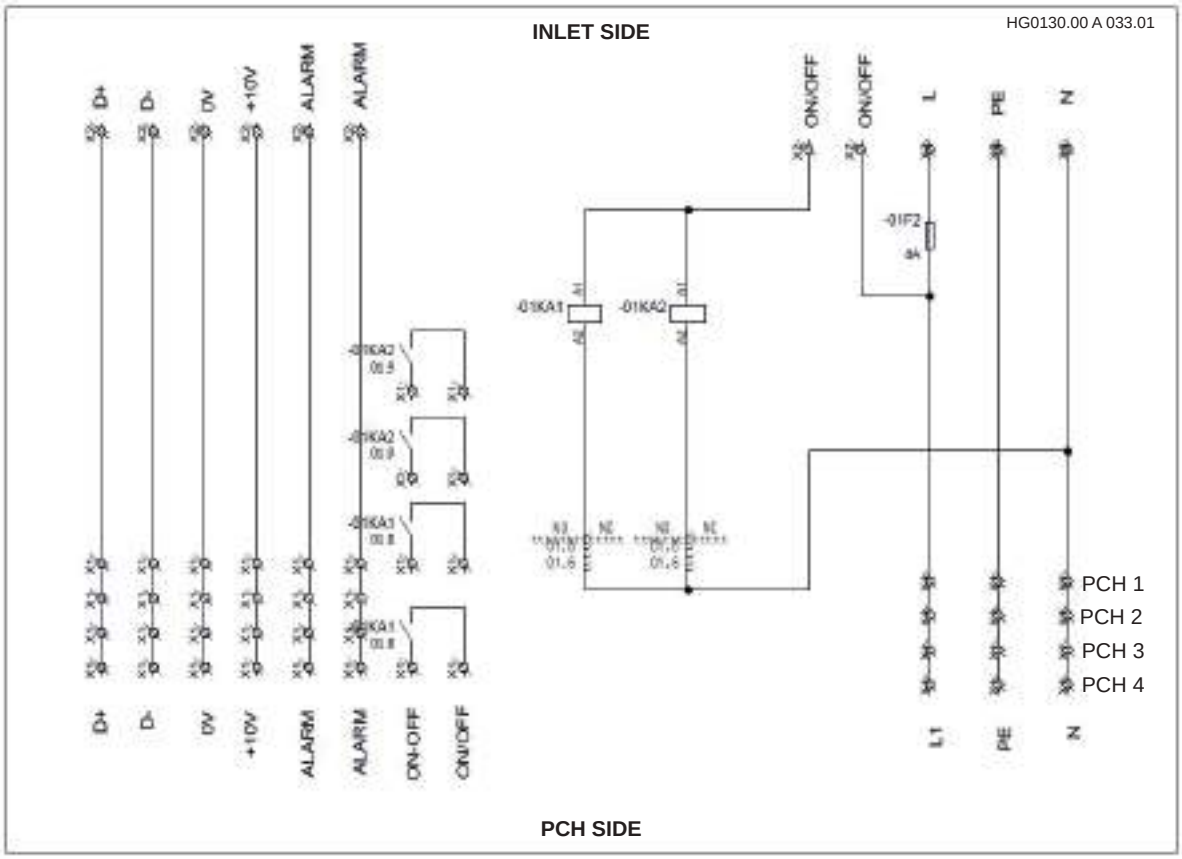
The PCH heater is supplied with a built-in CPU modulating PCB. The electrical connection to the PCH heater, both single and multiple, is performed via a terminal box located inside the housing. This terminal box contains the connections to the pre-wired module(s) and interfaces with the final user by means of the following connections:

power supply	Power to 230 Vac - see table for power absorptions
ON/OFF control	Powered at 230 Vac ~ 50Hz - Connect dry contact
common alarm	Dry contact - Power to max. 24V (Ac or Dc) 0.5 A
0-10 Vdc modulating signal	Dry contact - Power with 0-10 Vdc
ModBus	ModBus connection

Interface terminal box

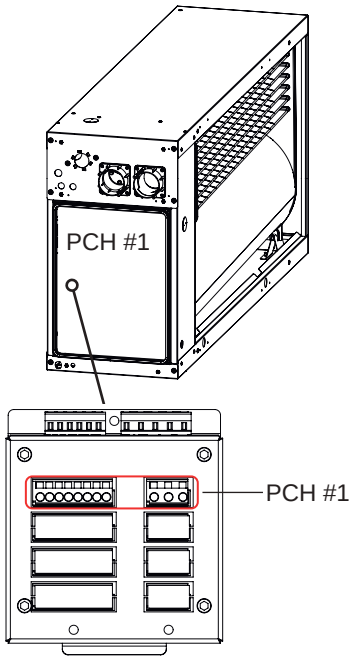


Interface terminal box wiring diagram

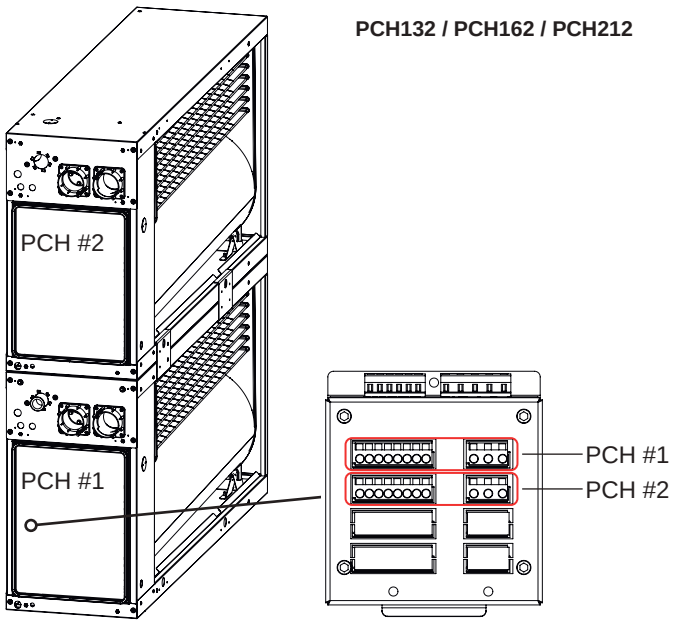


Interface terminal board position and numbering of modules

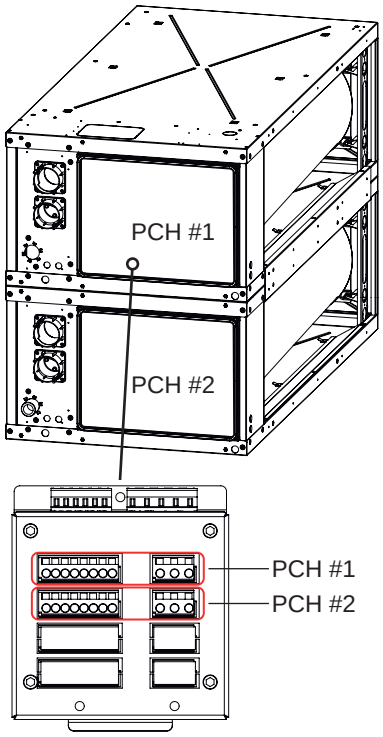
PCH020 / PCH034 / PCH045
PCH065 / PCH080 / PCH105



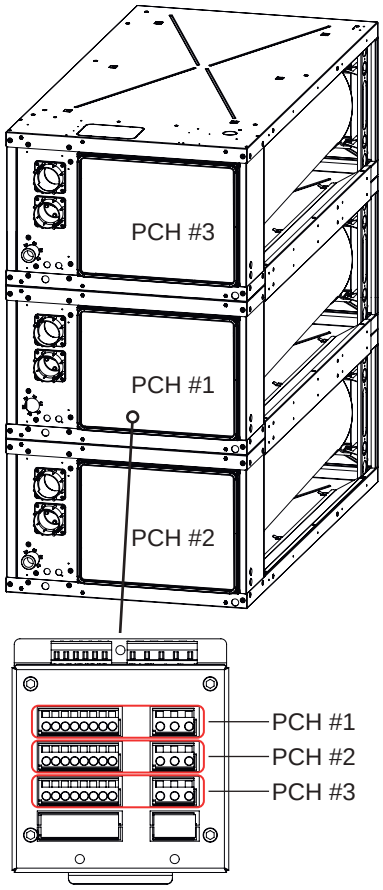
PCH132 / PCH162 / PCH212



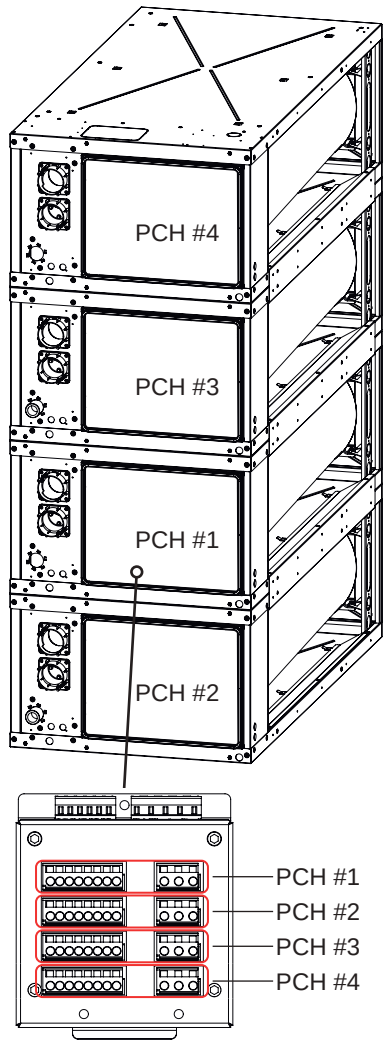
PCH130 / PCH160 / PCH210



PCH320



PCH420



3.9. ON/OFF control

The ON/OFF control (ON/OFF terminals) protects the Air Handling or Roof Top unit operation by stopping the burner(s) when required.
The ON/OFF control provides the OK signal applied to ALL PCH heater modules to which it is connected.
All the other safety devices must be connected in series to this control (fire dampers, fan control, temperature alarms...) to protect the system operation by stopping the burner.
Acting as a monitoring device for the heater, this control must always be closed.

IMPORTANT:
- Do not use jumpers on terminals where the ON/OFF control is connected;
- Connect the safety devices to the ON/OFF terminals;
- The control has priority over the adjustment signals;
- The ON/OFF control is powered at 230 V.

3.10. Adjustment

The PCH heater allows three power adjustment modes:
- 0-10 Vdc;
- ModBus;
- NTC1 temperature probe.

To correctly set the adjustment parameters, REG_01, REG_04 or SMART parameter must be programmed, which identify the type of adjustment associated with the PCH heater.

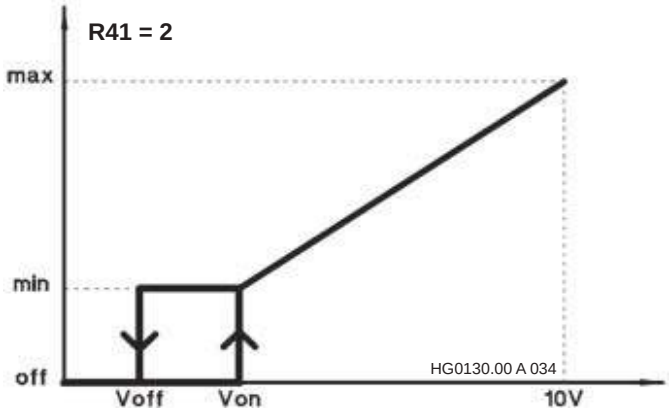
Function	Adj./Par.	PCH heater
Flame modulation	REG_01	NTC1
	REG_04	0-10Vdc
	SMART	Modbus

PCH 0-10 Vdc modulating signal
The PCH module is supplied ready to carry out the adjustment with a 0-10 Vdc power modulation signal, by connecting to 0Vdc and +10Vdc terminals (terminals 3 and 4 of terminal board M1).

ATTENTION: Do not exceed the voltage limit value of 24V.

This type of adjustment can be carried out directly from the CPU PCB, by setting REG_04, through the LCD interface panel by setting parameter R41=2 (default value set).

Modulating function and ON/OFF
The default operation type is shown in the diagram below.



Modulation operation and ON/OFF

The burner linearly modulates the output percentage between V_{ON} and 10Vdc, but:
- as the input voltage increases: if it is lower than V_{ON} the burner remains off; when it exceeds V_{ON} value, it switches on and starts modulating.
- as input voltage decreases: if it is lower than V_{ON} the burner will run at minimum power until its value is higher than V_{OFF} and if it drops below V_{OFF}, the burner will be switched off;

Through parameters R42 and R43, V_{OFF} and V_{ON} values can be changed.

EXAMPLE:

V_{OFF} = R42

V_{ON} = R42 + R43 = V_{OFF} + R43

The default parameters are:

R42 = 0.5 V

R43 = 0.5 V

Therefore

V_{OFF} = 0.5 V

V_{ON} = 1.0 V

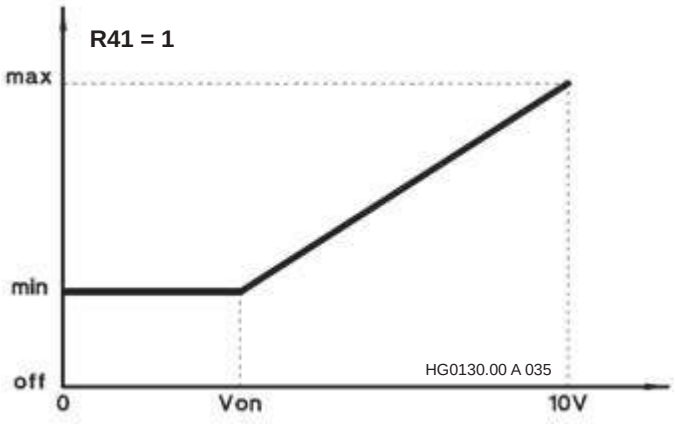
This means that the burner will stay on when the input voltage is higher than 1.0 V and will switch off when the input voltage is lower than 0.5 V.

Other two parameters (R44 and R45) determine how long the above described conditions will be kept (the default time set is 5 s.)

Modulation function only

IT is possible to change modulation behaviour by changing parameter R41:

- R41=2 - default value that allows to carry out modulation and ON/OFF functions;
- R41=1 - allows modulation only.



Modulation only operation

By setting R41=1 the burner linearly modulates the power percentage between V_{ON} and 10 Vdc, as shown in the diagram below.

If the input voltage is lower than V_{ON} the burner will run at minimum power. To switch the burner off, the ON/OFF contact must be opened.

Controlling the cascading operation of multiple modules

When multiple modules are installed, the signal 0-10 Vdc can be used to switch on and off the single modules in cascade.

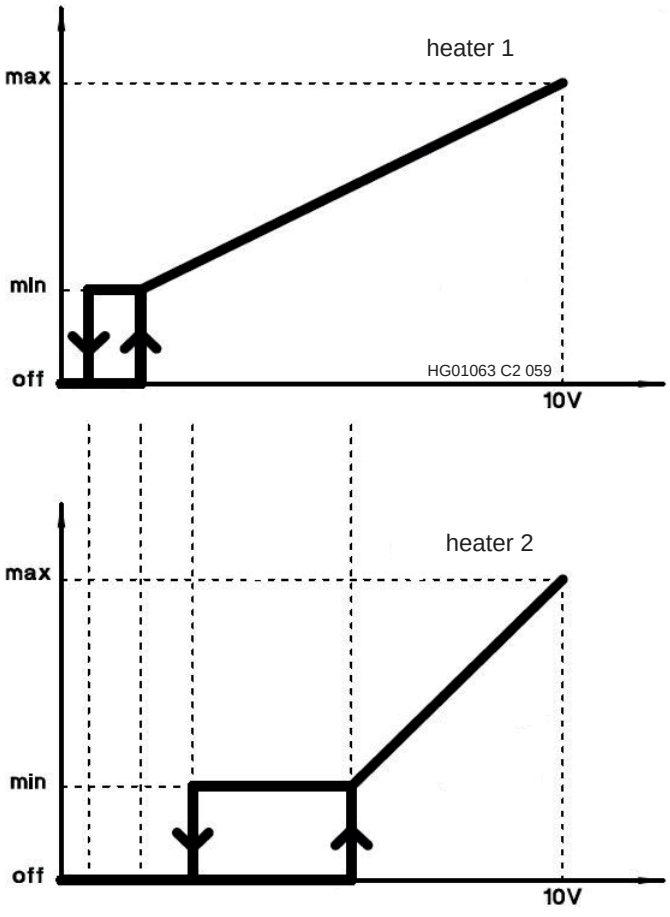
The 0-10 Vdc signal will be connected in parallel to the modules, whose operation can be cascaded by expanding the PCH module modulation field.

The modules are configured according to the following diagram:

Par.	Module 1	Module 2	Module 3	Module 4
R42	0.5	1.5	2.5	3.5
R43	0.5	1.0	1.5	1.5
Switches on at	1.0 V	2.5 V	4.0 V	5.0 V
Switches off at	0.5 V	1.5 V	2.5 V	3.5 V

The PCH modules total power consumption must be checked to make sure that it does not exceed the current value available from the regulator output.

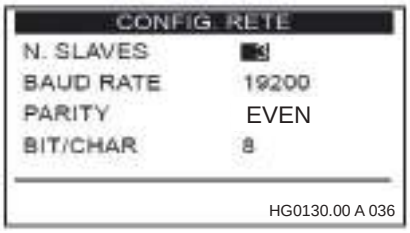
The operation type is shown in the diagram below:



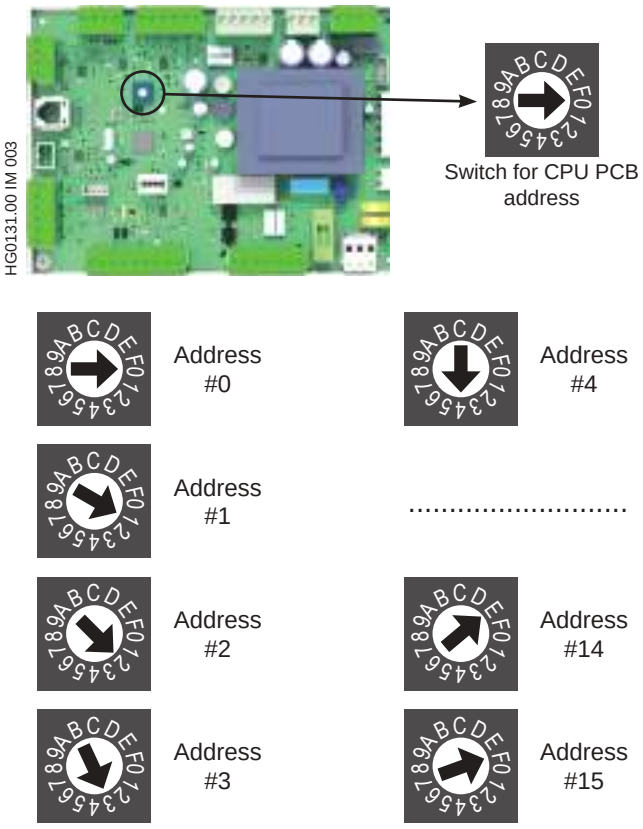
Cascading operation

3.11. ModBus adjustment and management

All PCH heaters are equipped with a modulation PCB, featuring a serial Bus (RS485) with RTU-slave ModBus protocol.
To use management with ModBus, it is necessary to change the modulation PCB address, setting it other than 0, and to change the "SMART" parameter, default value of 0 by setting it to 1, 2 or 3.
The network must be configured by entering the number of machines connected to the remote control (No. of SLAVES) and the relevant data.



BY using the selector, a unique address can be assigned to each PCH heater module, as follows.



Address assigned by means of selector

The serial connection can be used to control the burner start-up, the percentage of modulation, alarms and resets.

APEN GROUP will supply on request the logs to be used to write and read the parameter and the required information.

Remind that, if the ModBus is used to control the modules, the system safety devices must be connected to the ON/OFF contact, which has priority over the ModBus.

3.12. Setting with NTC1 probe

Only for installation with a single PCH heater, the NTC1 probe can be used to modulate.
The probe is installed as standard on all PCH heaters.
APEN GROUP uses the probe as a safety device (temperature limiter). To use the probe as temperature control, simply disable REG_04 by setting parameter R41 to 0.
THE ST1 (set point) value can be changed by lowering the required value by accessing the LCD panel of the PCH heater and setting parameter R12.

NOTE. The LCD panel cannot be remotely accessed; maximum distance 0.5 m.

By adjusting the equipment with the NTC1 probe, a "delivery fixed point" operation can be achieved.
The burner can be switched on and off using ON/OFF control.

IMPORTANT: For all types of adjustment
- Do not move the NTC1 probe from its default position.
- Do not override, via software, the use of the probe as a safety device (temperature limiter).
- Before increasing ST1 value, contact APEN GROUP for approval.

3.13. Smart X (Web/Easy) controls

The PCH heater controls can be operated remotely with the Smart X Web or Easy chronothermostat (OPTIONAL code G29700 - Web, G29500 - Easy), that uses the ModBus protocol and can control up to 15 heaters.

To use the Smart X Web/Easy as a temperature control, simply change the SMART parameter on each PCH heater, with a default value of 0, setting it to 1 or 2 (ModBus control).
The Smart X Web/Easy can be used:

- as a supervisor/display;
- as a supervisor/display and controller (active adjustment part).

When the Smart X (Web or Easy) panel is used as a supervisor/display, an electrical resistance must be connected instead of the ambient probe to leave the Smart X always demanding heating and address the modules.

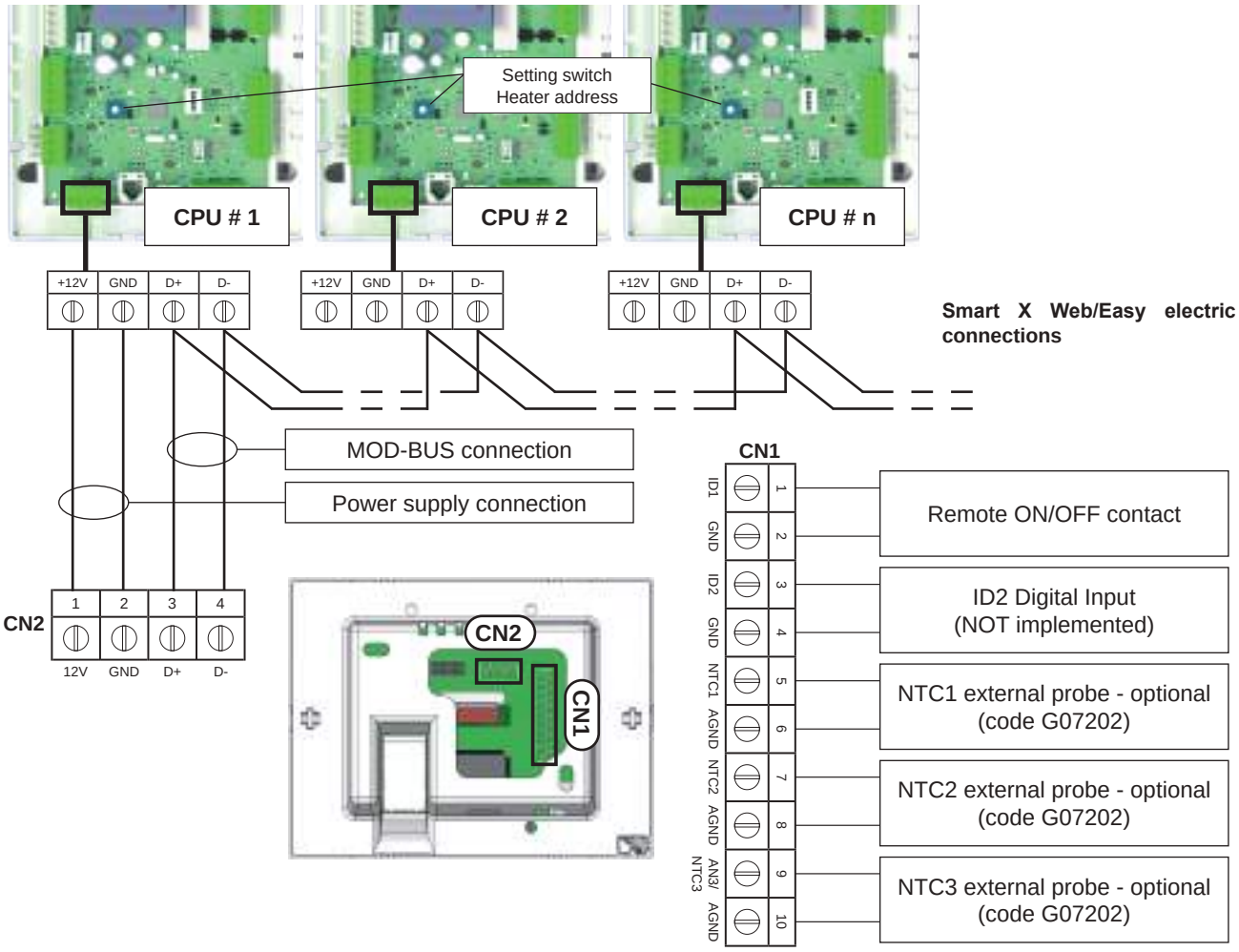
When the Smart X (Web or Easy) panel is used to control the setting, you must:

- address the PCH heater modules from 1 to 15 by entering the address of each module through the switch selector;
- connect one or more NTC probes to the Smart X;
- set the control parameters on the PCB and the Smart X.

The NTC probe which can be connected must be of 10 KΩ, β 3435 type.
The probe must be connected to the terminals 5/6, 7/8 or 9/10 and can be placed locally or elsewhere, according to the setting needs.

This probe is not the NTC1 probe, but an optional external probe (code G07202).

The Smart X (Web or Easy) is powered through 12 Vdc voltage. To enable the demand for heat, close the Smart X ID1 input (terminals 1 and 2 of connector CN1).



Smart X Web/Easy electric connections

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

On the Smart X it is necessary to:
- specify that the probe is external (remote);
- change the number of slaves according to requirements;
- set cascaded adjustment (setting: "cascade") and the relevant PID values.
- set the heating mode (mode: "heating") and the desired set point value, locally or remotely.
- set the xd cascade differential value.

For more information on how to remotely operate the controls with the Smart X, please refer to the manual ***"Use, installation and programming manual of the SMART X WEB / SMART X EASY series CHRONOTHERMOSTAT"***.

Cascading operation
The Smart X (Web or Easy), through its PID setting, calculates the modulation percentage and compares the calculated value with the operation percentage of each module, and thus turns on the required modules.
The xd cascading differential is applied when the module is switched on and off to avoid continuous module activations and deactivations.
The modulation percentage sent to the modules is always the same.

3.14. Interface panel

The PCH heater is fitted as standard with a multifunction LCD panel located inside the burner housing, and is used to control, configure and diagnose all operating parameters of the equipment.
The instrument panel is fitted with a red 3-digit LCD display and with four function keys: ↑, ↓, ESC and ENTER; the display allows the user to display the heater operating mode and its Faults.
It also allows the service centre to change the main operating parameters.
Changing parameters is protected by a password.

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

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

(**only in the presence of Smart)*

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

If there are communication problems between CPU PCB and LCD panel, the display will show flashing:
"**CPU**" if the problem lies with the CPU;
"**...**" if the problem lies in the display board.
If needs be, check that the display and the PCB are correctly connected and that the small cable RJ11 is securely held in the connector. "**EPr**" will be displayed if the problem is caused by the EEPROM PCB, check that it is properly inserted inside the connector.

The parameters and faults are reported in the manual provided in a paper copy for each PCH:
- ***HG0131.xx "PCH condensing warm air heater module maintenance and service manual"***.

3.15. GAS Connection

Use the gas line connections only with CE certified components.

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

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

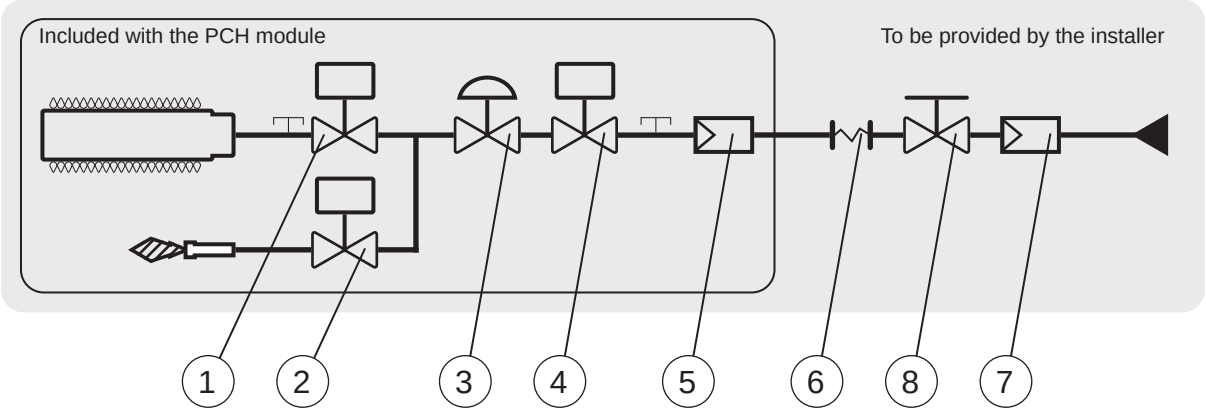
NOTE: AN EN126 certified gas filter with filtration level lower than or equal to 50 microns must be used, with no pressure stabiliser, with great capacity, since the filter supplied as standard, upstream of the gas valve, has a limited surface.

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

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

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

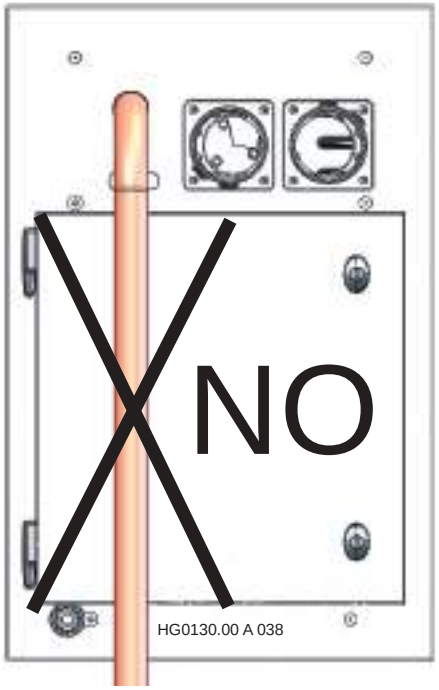
Current legislation allows a maximum pressure inside the rooms, or thermal stations, of 40 mbar; higher pressure must be reduced upstream of the boiler room or the site where the PCH module is installed.

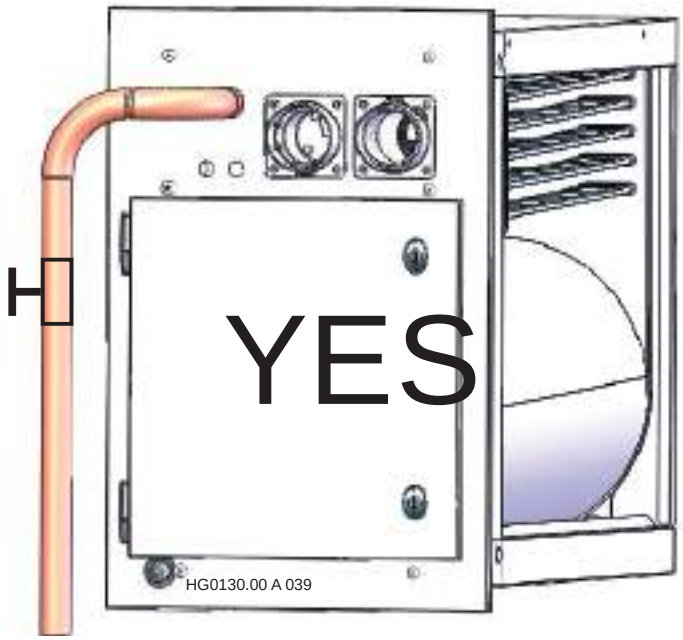


KEY

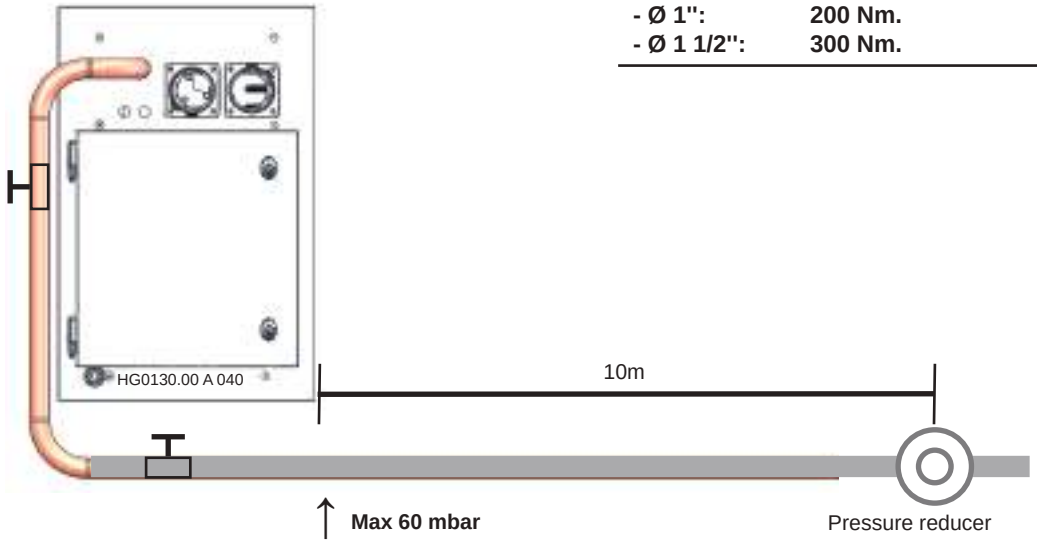
1	Main burner gas solenoid valve	5	Gas filter (small section)
2	Pilot burner gas solenoid valve	6	Anti-vibration joint
3	Pressure stabiliser	7	Gas filter (large section)
4	Safety gas solenoid valve	8	Gas valve

Gas pipe installation
Special attention must be paid when fitting the gas supply pipes to allow the burner housing door to open, as shown in the figures below.





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



3.16. Country Table - Gas Category

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

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

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

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

Codes with no extension:

- PCH020IT if there is no extension, it means that the equipment has been tested and set to run with natural gas [G20].

Codes with extension:

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

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

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

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

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

3.17. Gas Settings Table

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

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

TYPE OF GAS G20 - Cat. E-H													
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105	
Output		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
SUPPLY PRESSURE	[mbar]	20 [min 17-max 25] *											
PILOT NOZZLE Ø	[mm]	0.7											
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	0.51	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	[%] ±0.2	8.8	9.1	8.7	9.1	8.7	9.1	8.7	9.1	8.7	9.1	8.5	9.1
OXYGEN	[%] ±0.4	5.3	4.7	5.3	4.7	5.3	4.7	5.3	4.7	5.3	4.7	5.3	4.7
AIR EXCESS		1.34	1.29	1.34	1.29	1.34	1.29	1.34	1.29	1.34	1.29	1.34	1.29
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26	70	28	80
FLUE GAS MASS FLOW RATE (MAX.)	[kg/h]	33.0		60.6		73.0		113.0		142.5		173.8	
GAS ORIFICE PLATE	[mm]	4.4		6.2		7.5		10.3		9.8		15.8	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	
* For Hungary, supply pressure is 25 mbar													

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

TYPE OF GAS G25.3 - Cat. K													
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105	
Output		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
SUPPLY PRESSURE	[mbar]	25 [min 20-max 30] *											
PILOT NOZZLE Ø	[mm]	0.7											
GAS CONSUMPTION (15°C-1013mbar)	[m³/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
OXYGEN	[%] ±0.4	5.1	4.4	4.9	4.6	4.9	4.4	4.7	4.4	5.1	4.4	4.9	3.8
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26	70	28	80
GAS ORIFICE PLATE	[mm]	5.4		7.7		8.9		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	

TYPE OF GAS G2.350 - Cat. Ls (Only for PL-Poland)									
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065*	
Output		min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table							
SUPPLY PRESSURE	[mbar]	13 [min 10-max 16]							
PILOT NOZZLE Ø	[mm]	0.75							
GAS CONSUMPTION (15°C-1013mbar)	[m³/h]	0.70	2.79	1.12	5.13	1.25	6.18	1.82	8.38
CARBON DIOXIDE -CO_2 CONTENT	[%]	8.4	9	8.4	9	8.6	9	8.4	8.8
OXYGEN	[%] ±0.4	5.4	4.3	5.4	4.3	5.0	4.3	5.4	4.6
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86
GAS ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		30.5	
* Maximum nominal heat output 57.0 kW									

NOTE: 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 approved 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)	[m³/h]	0.58	2.33	0.93	4.28	1.04	5.16	1.52	7.99	2.01	10.07	2.58	11.55
CARBON DIOXIDE -CO_2 CONTENT	[%]	9.3	9.5	9.1	9.6	9.4	9.6	9.3	9.7	9.8	10.3	9.4	9.6
OXYGEN	[%] ±0.4	6.3	6.0	6.6	5.8	6.2	5.8	6.3	5.7	5.5	4.7	6.2	5.8
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26	70	28	80
GAS ORIFICE PLATE	[mm]	7.4		8.9		8.9		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	
* Maximum nominal heat output 94.0 kW													

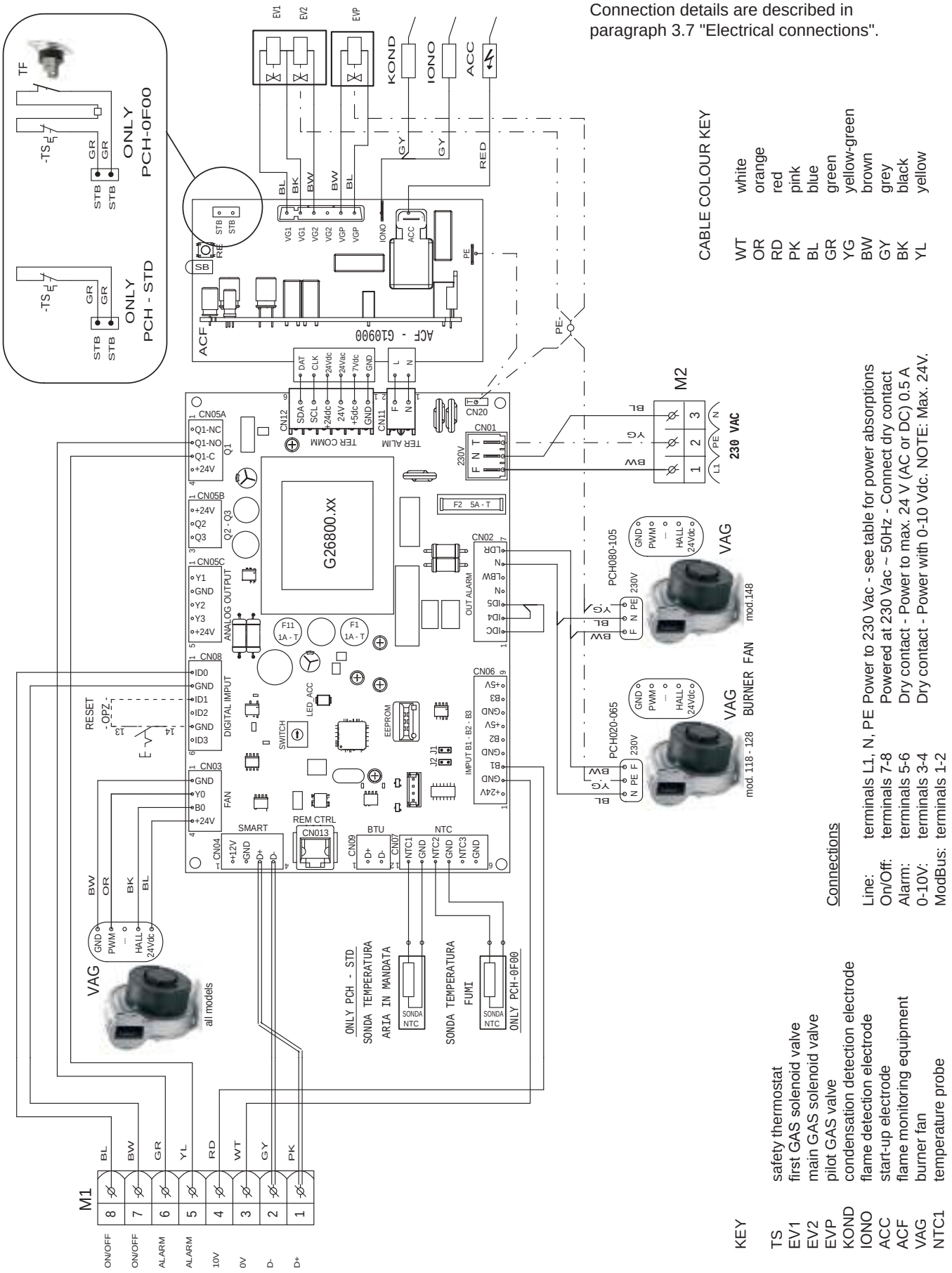
TYPE OF GAS G27 - Cat. Lw [former GZ41.5] (Only for PL-Poland)													
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065*		PCH080**		PCH105***	
Output		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
SUPPLY PRESSURE	[mbar]	20 [min 16-max 23]											
PILOT NOZZLE Ø	[mm]	0.70											
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	0.61	2.45	0.98	4.50	1.10	5.43	1.60	7.36	2.12	9.69	2.71	12.14
CARBON DIOXIDE -CO_2 CONTENT	[%]	8.7	9.2	8.7	9.1	8.6	9.1	8.6	8.8	8.7	9.1	8.5	8.7
OXYGEN	[%] ±0.4	5.0	4.1	5.0	4.2	5.2	4.2	5.2	4.8	5.0	4.2	5.3	5.0
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26	70	28	80
GAS ORIFICE PLATE	[mm]	8.3		11.4		10.3		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		30.5		Not required	
* Maximum rated heat output 57 kW ** Maximum rated heat output 75 kW *** Maximum nominal heat output 94 kW													

TYPE OF GAS G30 - Cat. 3B-P*													
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065		PCH080**		PCH105***	
Output		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
SUPPLY PRESSURE	[mbar]	30 [min 25-max 35] - 37 [min 25-max 45] - 50 [min 42.5-max 57.5]											
PILOT NOZZLE Ø	[mm]	0.51											
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	0.37	1.50	0.60	2.75	0.67	3.31	1.42	5.13	1.89	6.47	1.66	7.89
CARBON DIOXIDE -CO_2 CONTENT	[%]	10.8	11.4	10.8	11.5	10.8	10.9	10.7	11.3	10.1	10.3	10.4	10.6
OXYGEN	[%] ±0.4	4.8	3.9	4.8	3.8	4.8	4.7	5.0	4.1	5.9	5.6	5.4	5.1
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26.5	70	28	80
GAS ORIFICE PLATE	[mm]	3.2		4.4		5.2		6.5		7.0		9.3	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	
* Change of CPU board parameters b1-b2 required:													
	Par. b1	165		183		120		130		135		110	
	Par. b2	580		610		540		555		560		490	
** Minimum rated heat output 18 kW *** Minimum rated heat output 24 kW													

TYPE OF GAS G31 - Cat. 3P													
TYPE OF MACHINE		PCH020		PCH034		PCH045		PCH065		PCH080		PCH105	
Output		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
SUPPLY PRESSURE	[mbar]	30 [min 25-max 35] - 37 [min 25-max 45] - 50 [min 42.5-max 57.5]											
PILOT NOZZLE Ø	[mm]	0.51											
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	0.37	1.48	0.59	2.71	0.66	3.26	0.96	5.05	1.27	6.37	1.63	7.77
CARBON DIOXIDE -CO_2 CONTENT	[%]	9.3	9.8	9.2	9.7	9.3	9.4	9.4	9.6	9.3	9.6	9.5	9.8
OXYGEN	[%] ±0.4	6.7	6.0	6.9	6.1	6.7	6.6	6.6	6.3	6.7	6.3	6.4	6.0
FLUE GAS TEMPERATURE	[°C]	39	113	31	94	30	94	31	86	26.5	70	28	80
FLUE GAS MASS FLOW RATE (MAX.)	[kg/h]	38.80		71.55		87.65		134.18		169.27		204.19	
GAS ORIFICE PLATE	[mm]	3.2		4.4		5.2		6.5		7.0		9.3	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required		Not required	

4. WIRING DIAGRAM

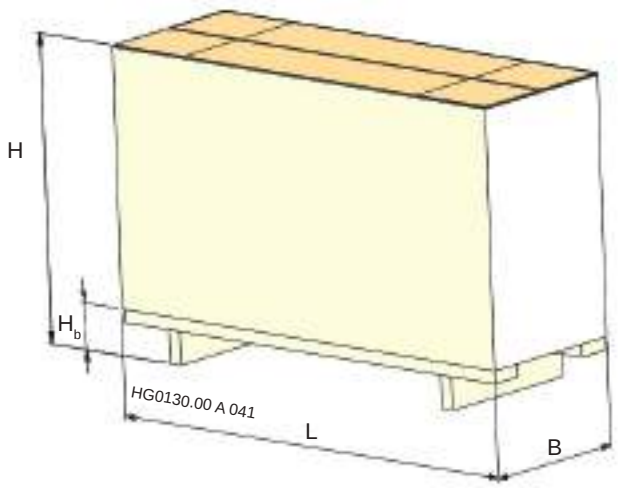
Single PCH wiring diagram: PCH020 - PCH105 (code JG0386.01)



5. PACKAGING

PCH heaters will be transported on wooden pallets and packaged with cardboard or polystyrene and bubble wrap.

Model	PACKAGING SIZE				
	Base - B [mm]	Depth - D [mm]	Height - H [mm]	Base height- Bh [mm]	Gross weight [kg]
PCH020	470	800	800	123	53
PCH034	470	1040	800	123	64
PCH045	470	1040	870	123	71
PCH065	470	1340	870	123	83
PCH080	470	1530	955	123	108
PCH105	470	1760	955	123	118
PCH130	760	1350	1190	123	187
PCH160	845	1540	1190	123	142
PCH210	845	1770	1190	123	266
PCH320	845	1770	1715	123	293
PCH420	845	1770	2240	123	523
PCH132	760	1350	1600	123	163
PCH162	845	1540	1770	123	211
PCH212	845	1770	1770	123	230



Notes

Apen Group S.p.A.
Via Isonzo, 1
Casella Postale 69
20042 Pessano con Bornago (MI) Italia
Tel. +39 02 9596931
Fax +39 02 95742758

Cap. Soc. Euro 928.800,00 i.v.
Cod. Fisc. - P.IVA 08767740155
Registro AEE N. IT18080000010550
www.apengroup.com
apen@apengroup.com
apen@pec.apengroup.com