GB	*Maintenance, installation and service manual* *AH-Sport condensing air heating unit*

NEW VERSION
CPU G26800

Thermal Account for Public Authorities

Tax deduction

Yield up to **108%**

For Indoor and Outdoor Use

NOx Class: **5**

HG0300.00_IM001

ErP
2021
Compliant
EU/2016/2281

CE

TRANSLATION OF ORIGINAL Manual

VER. 01.2010

Dichiarazione di Conformità
Statement of Compliance

CE

APEN GROUP S.p.A.
20042 Pessano con Bornago (MI)
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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:***	**Unità di Riscaldamento Aria a Condensazione AH** ***AH Condensing Air Heating unit***

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

- **Regolamento Apparecchi a Gas 2016/426/CE**
  Gas Appliance Regulation 2016/426/CE
- **Direttiva compatibilità elettromagnetica 2014/30/UE**
  Electromagnetic Compatibility Directive 2014/30/UE
- **Direttiva Bassa Tensione 2014/35/UE**
  Low Voltage Directive 2014/35/UE
- **Regolamento ErP 2016/2281/UE**
  ErP Regulation 2016/2281/UE
- **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 0476DL4298

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
26/05/2020

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)
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Tel +39.02.9596931 r.a.
Fax +39.02.95742758
Internet: http://www.apengroup.com

With this document we declare that the unit:

Model:	***AH Condensing Air Heating Unit***

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 0476DL4298

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

Pessano con Bornago
11/11/2022

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

CODE SERIAL NUMBER

INDEX

1. GENERAL CAUTIONS

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

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

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 in compliance with the regulations in force in the country where the appliance 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.

2. SAFETY-RELATED WARNINGS

The following symbol is used in this Manual whenever it is necessary to draw the operator's attention on a safety issue.

Safety rules for users or operators of the equipment and for nearby workers.

Please find below the safety regulations for the installation room and the air vents.

2.1. Fuel

Before starting the burner or unit, check that:
- gas supply specifications match those written on the rating 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 unit burner is supplied with the same type of fuel for which it has been designed;
- the unit is correctly sized to match required flow rate, indicated in the manual, and includes all safety and control devices required by the law;
- gas pipes and air distribution ducts for ducted units have been thoroughly cleaned;
- the fuel flow rate is suitable for the power required;
- the fuel supply pressure is between the range specified on the nameplate.

When connecting gas supply pipe to gas valve, do not tighten excessively in order to avoid damaging sealing gaskets. (See Par. 5.7 "Gas Connection")

2.2. Gas leaks

If you smell gas:
- do not operate electrical switches, the telephone 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. Power supply

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

Cautions:

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

NOTE: upstream of the power supply cable, the installation of a fused multipole circuit breaker, overvoltage category III, is mandatory. The switch must be visible, accessible and less than 3m away from the control board. All electrical operations (installation and maintenance) must be carried out by qualified staff.

2.4. Use

“The appliance may be used by children of at least 8 years of age and by persons with reduced physical, sensory or mental capabilities, or lack of experience or the necessary knowledge, provided that they are supervised or have been instructed in the safe use of the appliance and understand the dangers involved. Children must not play with the device. Cleaning and maintenance intended to be carried out by the user must not be done by unsupervised children.”

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. Such surfaces, generally located near the flame, overheat during operation and remain hot for some time after the burner has stopped.
- do not wet the unit with water or other fluids;
- do not place any object over the equipment;
- do not touch the moving parts of the unit.

If the equipment is not used for a long period of time, open the main electrical switch of the thermal station and close the manual valve on the duct which brings the fuel to the burner. If the equipment is no longer used, perform the following operations:

- a qualified person shall disconnect the power supply cable from the main switch;
- close the manual valve on the duct supplying fuel to the burner by removing or locking the control handwheel.

2.5. Air Vents

The room where gas fired heater will be installed must be provided with one or more air vents.

These air vents must be fitted:

- to the ceiling for gases with density lower than 0.8;
- flush to the floor for gases with density higher or equal to 0.8.

The air vents must be fitted to walls facing the open air. The sections must be sized according to the heat output installed.

In case of doubt, measure the CO_2 with the burner working at maximum output rate and the room ventilated only through the air vents for the burner and then measure again with the door closed. $C0_2$ value must be the same under both conditions. If in the same room there are several burners or aspirators that can work together, measure with all the equipment working at the same time.

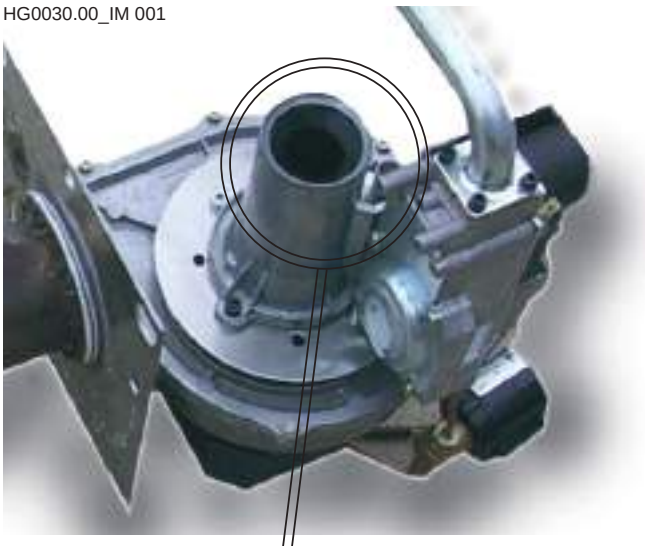
Do not obstruct the room air vents, the burner fan intake opening, any air ductwork and intake or dissipation grilles, avoiding in this way:

- stagnation in the room of any toxic and/or explosive mixture;
- smouldering combustion: dangerous, expensive, pollutant.

The unit, if not built for outdoor installation, shall be sheltered from rain, snow, and frost. If air is pulled from outdoor, the intake must be protected by a rain deflector or similar device that prevents water from penetrating into the machine.

The room where the unit-burner group is installed must be clean and deprived of volatile substances that can be drawn by the fan and obstruct burner inner hoses or combustion head. Dust itself can be a problem if it is left depositing on fan blades, thus reducing fan flow rate and making combustion polluting.

HG0030.00_IM 001



DO NOT COVER IT WITH YOUR HAND OR OTHER OBJECTS!

2.6. Installation

The unit must be used in the following conditions:

- The fuel used must have a sulphur content according to the European standard, namely: maximum peak, for short periods, 150 mg/m3, annual average lower than 30 mg/m3;
- Combustion air must not contain chlorine, ammonia, alkalis or sulphides; for example, installation near swimming pools or laundries exposes the unit to the effects of such agents; if this is the case we suggest taking air from the outside.

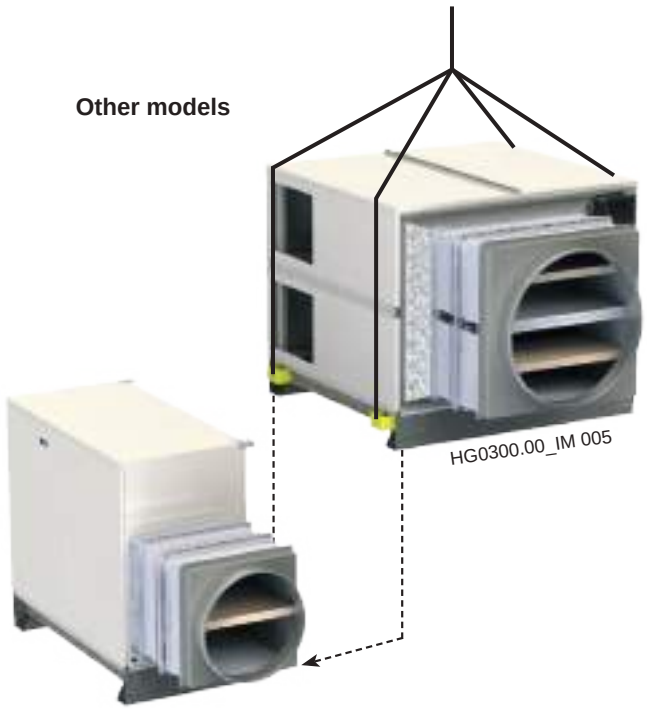
2.7. Maintenance

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

2.8. Transport and handling

The air heating unit is supplied with its own base or placed and properly fixed to a wooden pallet.
Unload the heater from the truck and move it to the site of installation by using means of transport suitable for the shape and for the weight of the load.
Any lifting and transport operations must be carried out by skilled staff, adequately trained and informed on the working procedures and safety regulations. Instructions in this Manual shall have to be followed when handling the exchanger.
Based on their weight and dimensions, heaters can be lifted with lift trucks or wheel-mounted crane.

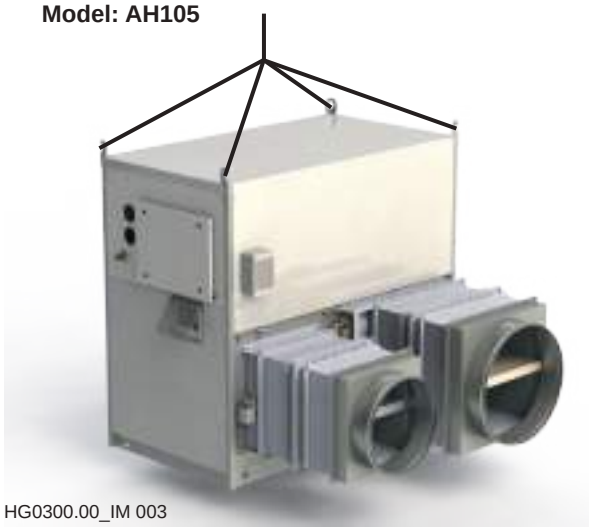
Other models



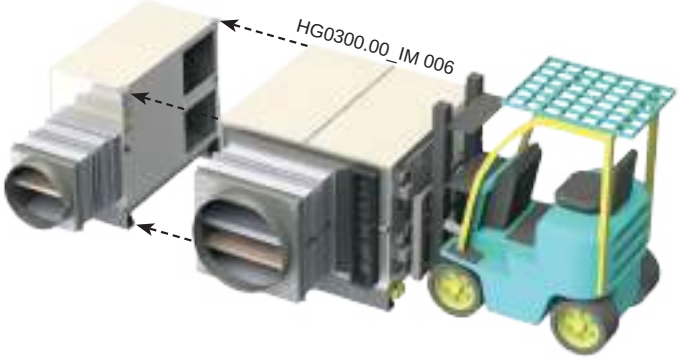
In the first case, use fork extensions as long as heater width.

Model: AH105

Model: AH105



Other models



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 demolition

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.

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

INFORMATION FOR DISPOSAL valid in ITALY (Legislative Decree 49/2014)
The AH series air heating units 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.

3. TECHNICAL FEATURES

3.1. Main Components

The air heating unit has been designed for heating sport facilities, respectively AH-T for tensile sport structures and AH-P for air-supported sport structures (sport facility cloth roofs - air domes), and consists of:

- PCH module (stainless steel condensing heat exchanger with premix burner)
- Centrifugal fans with permanent magnet electronic motor and inverter
- Frame made of Magnelis® sheet (special surface treatment)
- Pre-painted, white sheet panelling
- Safety Devices and Controls
- Smart Web

In the case of pressostatic structures, in the event of power failure, the AH-P heating unit cannot ensure proper support of the air dome.

The pressure control inside the air dome in AH-P air heating units for pressostatic structures is not a safety feature. In the event of power failure or malfunctions of the AH-P unit, this cannot ensure correct maintenance of pressure inside the air dome and thus the support of the pressostatic structure.

In accordance with the Standards and Regulations in force at the place of installation, the AH-P air heating unit must be backed up by an additional system, operated by a source of energy other than electricity, suitably sized according to the structure being served, in the event of a main power failure.

PCH module

The PCH condensing module, integrated in the machine, is made entirely of stainless steel. It is controlled by the monitoring and adjusting PCB CPU-PLUS that manages its switching on and off, burner modulation and fault indication. In the modulating operating mode 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 108% (a Net caloric value).

The heat exchanger complies with construction requirements set by standard EN17082 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 and temperature.

The following table shows the conversion of stainless steels used:

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

Ventilation

Air handling is controlled by the centrifugal fans with permanent magnet electronic motor and high-efficiency inverter, powered with direct current with integrated rotation speed control.
All motors used, direct driven to the fan, have the following characteristics:

- Supply 230V - single-phase - 50 Hz
- Supply 400V - three-phase 50HZ (AH105)
- Manufacturing Direct Drive
- Protection rating IP44
- Isolation level cl.F
- Efficiency IE5
- Operating temperature MIN = -20°C - MAX = +40°C; up to the limit of +50°C (derating from +40°C to +50°C)

Motor data for every type of machine is indicated further in this manual.

If the air flow rate decreases, the heat output shall automatically diminish.

Frame and body

The frame is made of Magnelis® sheet columns firmly linked to the main panels (intake section, fan section and delivery section), also made of Magnelis®, constituting the bearing structure. The white prepainted containment panelling finishes and completes the machine externally.

Safety Devices and Controls

All heaters are supplied with the following thermostats:

- NTC — Air probe, modules and stops the burner operation before the STB thermostat activates;
- STB — Manual reset safety thermostat, inside the air flow, which switches off the burner immediately if the temperature is too high;
- NTC FLUE GAS — Flue gas probe, modules and stops the burner operation before the safety thermostat activates;
- FLUE GAS thermostat — Manual reset flue gas thermostat for protecting the PP individual or common flues.

3.2. Technical Data

There are 2 configurations of AH-T and/or AH-P, listed below:

A Single module;
B Multiple modules.

A - Single module

the single-module AH air heating units comprise a single heat exchanger. The range includes the AH105 model for tensile or air-supported structures. The heat output ranges from 22.77 to 97.15 kW produced.

NOTES:

* Symbol in compliance with Reg.EU/2281/2016.
(1) Max. condensation produced acquired from testing at 30%Qn.
(2) Value referred to category H (G20).
(3) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to net calorific value (Hi, N.C.V).
(4) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to gross calorific value (Hs, G.C.V).
(5) Reference air flow rate for the calculation of yields and season energy efficiencies and emissions, with constant air flow rate, listed in the table. Air flow rate calculated for a ΔT of 30 °C
(6) If the burner housing heater kit is installed, add 105 W (230V) per module to the rated power value on the nameplate.

Model		AH105	
Type of equipment		B23 - B23P - C33 - C53 - C63	
EC approval	PIN.	0476DL4298	
NOx class [EN10782:2019]	Val	5	
Type of fuel		Gaseous	
		Heater Performance	
		min	max
Furnace heat input (Hi)	kW	21.00	100.00
Useful heat output [P_{min}, P_{rated}]*	kW	22.77	97.15
Hi Efficiency (N.C.V.) [η_{pl}, η_{nom}]*	%	108.40	97.15
Hs efficiency (G.C.V.) [η_{pl}, η_{nom}]*	%	97.68	87.52
Flue losses with burner on (Hi)	%	0.2	2.8
Flue losses with burner off (Hi)	%	<0,1	
Max. condensation (1)	l/h	2.7	
		Flue gas emissions	
Carbon monoxide - CO - (0% of O_2) (2)	ppm	< 5	
Nitrogen oxide emissions - *NOx** (0% of O_2) (Hi) (3)		40 mg/kWh - 23 ppm	
Nitrogen oxide emissions - *NOx** (0% of O_2) (Hs) (4)		36 mg/kWh - 20 ppm	
Pressure available at the flue	Pa	120	
		Electrical Characteristics	
Supply voltage	V	400V/3F+N - 50 Hz	
Rated power - TENSILE STRUCTURES	kW	0.020	1.644
Rated power - AIR-SUPPORTED STRUCTURES	kW	0.020	4.044
Protection Rating	IP	IP X5D	
Operating Temperatures	°C	from -15°C to +40°C [for lower temperatures, a burner housing heating kit is required (6)]	
		Connections	
Ø gas connection		UNI/ISO 228/1- G 3/4"	
Intake/exhaust pipes Ø	mm	80/80	
		Air flow rate	
Number and type of fans		1 x RDP 355	
Air flow rate (15°C)(5)	m^3/h	See diagram "air flow rates - pressure drops"	
Available Head Pressure	Pa	See diagram "air flow rates - pressure drops"	
		Weight	
Net Weight	kg	385	

B - Multiple modules

The multiple-module AH air heating units consist of two or more heat exchangers; the number of burners and gas equipment is equal to the number of heat exchangers.
The gas connection is individual for each module.
The wiring connection is on the other hand common for the entire machine.
The range includes the two-module models, AH160 and AH210 and the three-module model, AH240 and AH320.
The heat output ranges from 17.77 to 291.45 kW produced.

NOTES:

* Symbol in compliance with Reg.EU/2281/2016.
(1) Max. condensation produced acquired from testing at 30%Qn.
(2) Value referred to category H (G20).
(3) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to net calorific value (Hi, N.C.V).
(4) Weighted value to EN17082:2019 ref. to cat. H (G20), referred to gross calorific value (Hs, G.C.V).
(5) Reference air flow rate for the calculation of yields and season energy efficiencies and emissions, with constant air flow rate, listed in the table. Air flow rate calculated for a ΔT of 30 °C
(6) If the burner housing heater kit is installed, add 105 W (230V) per module to the rated power value on the nameplate.

Model		AH160		AH210		AH240		AH320	
Type of equipment		B23 - B23P - C33 - C53 - C63							
EC approval	PIN.	0476DL4298							
NOx class [EN17082:2019]	Val	5							
Type of fuel		Gaseous							
		Heater Performance							
		min	max	min	max	min	max	min	max
Furnace heat input (Hi)	kW	16.40	164.00	21.00	200.00	16.40	246.00	21.00	300.00
Useful heat output [P_{min}, P_{rated}]*	kW	17.77	160.06	22.77	194.30	17.77	240.09	22.77	291.45
Hi Efficiency (N.C.V.) [η_{pl}, η_{nom}]*	%	108.35	97.60	108.40	97.15	108.35	97.60	108.40	97.15
Hs efficiency (G.C.V.) [η_{pl}, η_{nom}]*	%	97.62	87.93	97.68	87.52	97.62	87.94	97.68	87.52
Flue losses with burner on (Hi)	%	0.3	2.4	0.2	2.8	0.3	2.4	0.2	2.8
Flue losses with burner off (Hi)	%	<0,1		<0,1		<0,1		<0,1	
Max. condensation (1)	l/h	6.6		5.4		9.9		8.1	
		Flue gas emissions							
Carbon monoxide - CO - (0% of O_2) (2)	ppm	< 5		< 5		< 5		< 5	
Nitrogen oxide emissions - *NOx** (0% of O_2) (Hi) (3)		31 mg/kWh - 18 ppm		40 mg/kWh - 23 ppm		41 mg/kWh - 23 ppm		40 mg/kWh - 23 ppm	
Nitrogen oxide emissions - *NOx** (0% of O_2) (Hs) (4)		28 mg/kWh - 16 ppm		36 mg/kWh - 20 ppm		37 mg/kWh - 21 ppm		36 mg/kWh - 20 ppm	
Pressure available at the flue	Pa	120		120		120		120	
		Electrical Characteristics							
Supply voltage	V	400V/3F+N - 50 Hz							
Rated power [el_{min} - el_{max}]* - TENSILE STRUCTURES		0.040	3.446	0.040	8.260	0.060	5.169	0.060	12.390
Rated power [el_{min} - el_{max}]* - AIR-SUPPORTED STRUCTURES	kW	0.040	8.246	0.040	8.260	0.060	12.369	0.060	12.390
Protection Rating	IP	IP X5D (Ref. PCH module)							
Operating Temperatures	°C	from -15°C to +40°C [for lower temperatures, a burner housing heating kit is required (6)]							
		Connections							
Ø gas connection		UNI/ISO 228/1- 2 x G 3/4"		UNI/ISO 228/1- 2 x G 3/4"		UNI/ISO 228/1- 3 x G 3/4"		UNI/ISO 228/1- 3 x G 3/4"	
Intake/exhaust pipes Ø	mm	2 x 80/80		2 x 80/80		3 x 80/80		3 x 80/80	
		Air flow rate							
Number and type of fans		4 x DDMP 10/10		4 x DDMP 10/10		6 x DDMP 10/10		6 x DDMP 10/10	
Air flow rate (15°C)(5)	m³/h	See diagram "air flow rates - pressure drops"							
Heat exchanger pressure drop	Pa	See diagram "air flow rates - pressure drops"							
		Weight							
Net Weight	kg	900		900		1200		1200	

B - "R" Version Modules

Single-module AH air heating units have a useful heat efficiency, at a load equal to 100% of the nominal useful heat output, greater than or equal to 93+2LogPn.

For multiple-module AH air heating units, Apen Group has an "R" version, intended only for the Italian market, which complies with the requirement mentioned above, i.e. 93+2LogPn.

NOTES:

* Symbol in compliance with Reg.EU/2281/2016.

Model		AH160 - R		AH210 - R		AH240 - R		AH320 - R	
Type of equipment		B23 - B23P - C33 - C53 - C63							
EC approval	PIN	0476DL4298							
NOx class [EN17082:2019]		5							
Type of fuel		Gaseous							
		Heater Performance							
		min	max	min	max	min	max	min	max
Furnace heat input (Hi)	kW	16.40	152.00	21.00	180.00	16.40	228.00	21.00	270.00
Useful heat output [P_{min}, P_{rated}]*	kW	17.77	148.66	22.77	176.76	17.77	223.00	22.77	265.14
Hi Efficiency (N.C.V.) [η_{pl}, η_{nom}]*	%	108.35	97.80	108.40	98.20	108.30	97.80	108.40	98.20
Hs efficiency (G.C.V.) [η_{pl}, η_{nom}]*	%	97.62	88.12	97.68	88.48	97.62	88.12	97.68	88.48

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

NOTES:

* Symbol in compliance with Reg.EU/2281/2016.

(7) Reference maximum air flow rate for the calculation of yields and season energy efficiencies and emissions, with variable air flow rate, listed in the table. Air flow rate calculated for a ΔT of 30 °C

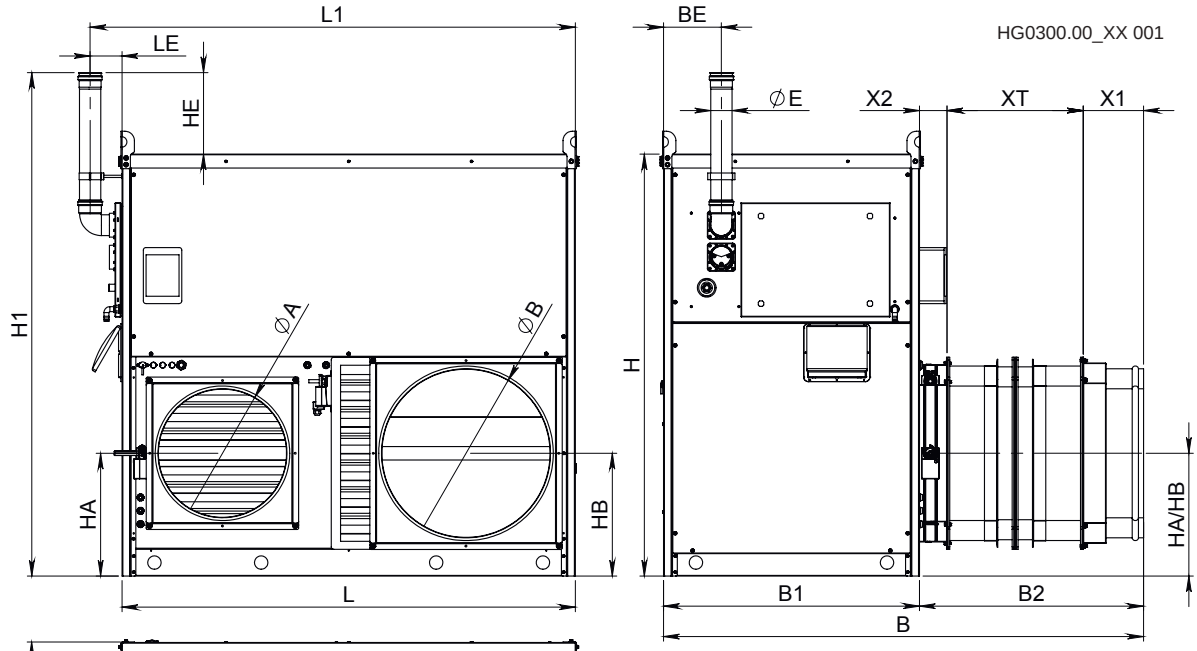
(8) Reference minimum air flow rate for the calculation of yields and season energy efficiencies and emissions, with variable air flow rate, listed in the table.

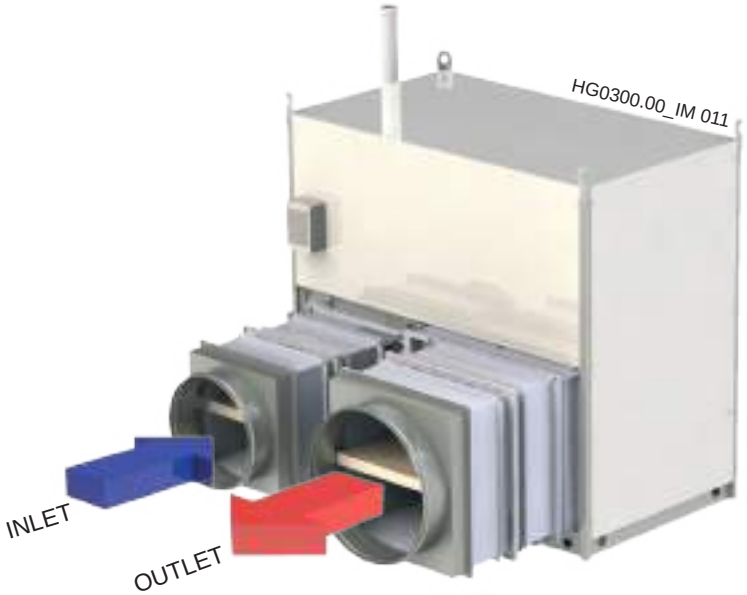
Model	Capacity		Useful efficiency		Other elements					Consumption of Power supply		
	Rated heating capacity	Minimum capacity	Useful efficiency at rated heating capacity	Useful efficiency at minimum capacity	Casing loss factor	Ignition burner consumption	Emissions of nitrogen oxides	Output efficiency	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
AH105	97.2	22.8	87.5	97.6	5.0	0.0	36	96.4	**92.5**	0.130	0.020	0.005
AH160	160.1	17.8	87.9	97.6	5.0	0.0	28	97.5	**93.6**	0.246	0.020	0.010
AH210	194.3	22.8	87.5	97.6	5.0	0.0	36	97.4	**93.5**	0.260	0.020	0.010
AH240	240.1	17.8	87.9	97.6	5.0	0.0	28	98.2	**94.3**	0.369	0.020	0.015
AH320	291.5	22.8	87.5	97.6	5.0	0.0	36	97.7	**93.8**	0.390	0.020	0.015

NOTE: The tables above refer to AH air heating units in indoor configuration and installed in the same heated space. In case of outdoor installation of AH air heating units, or in any case in a place other than the heated space, the seasonal energy efficiency values must be decreased by 5.0%.

3.3. Dimensions

Models: AH105xx-T and AH105xx-P

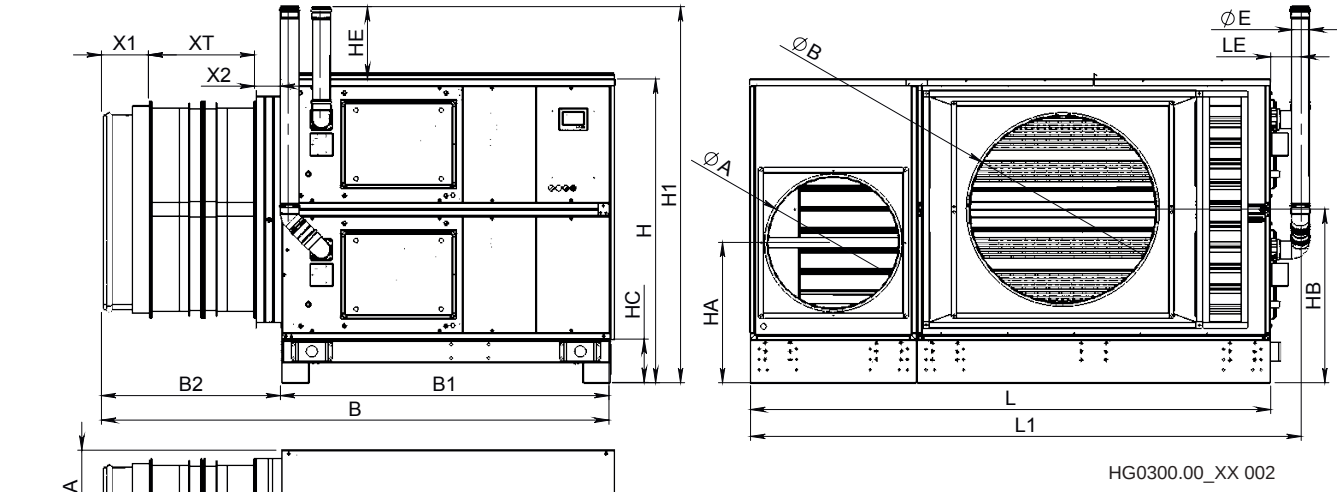




Model	Overall dimensions			Dimensions			Louvre								Chimney				Gas
									Intake			Delivery							
	B	L	H	B1	L1	H1	B2	LC	LA	HA	ØA	LB	HB	ØB	BE	LE	HE	ØE	
AH105	1800	1700	1580	960	1820	1885	840	912	378	460	483	410	460	633	217	120	305	1x80	1 x G 3/4"

	X1	X2	XT
AH105	225	105	510
AH160 / AH210	225	125	510
AH240 / AH320	225	200	510

Other models:



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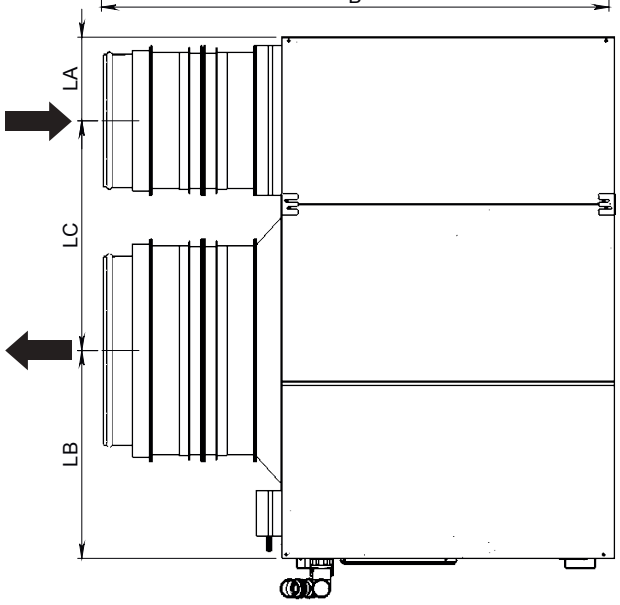

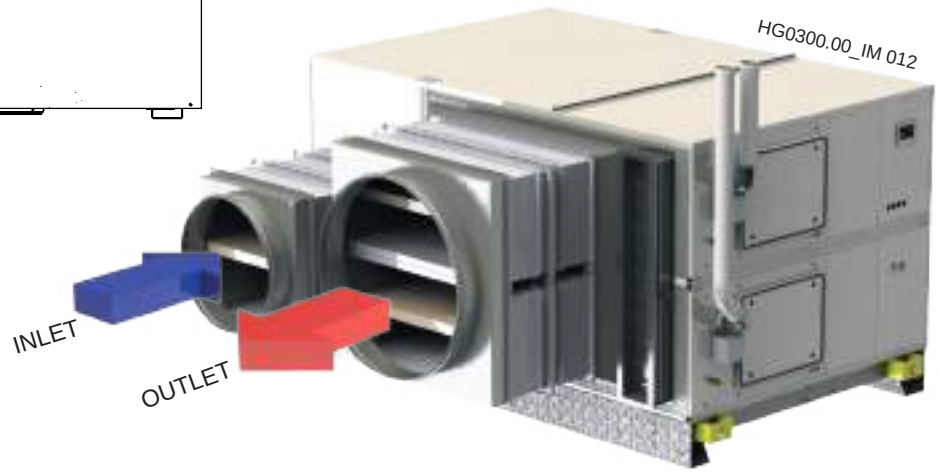

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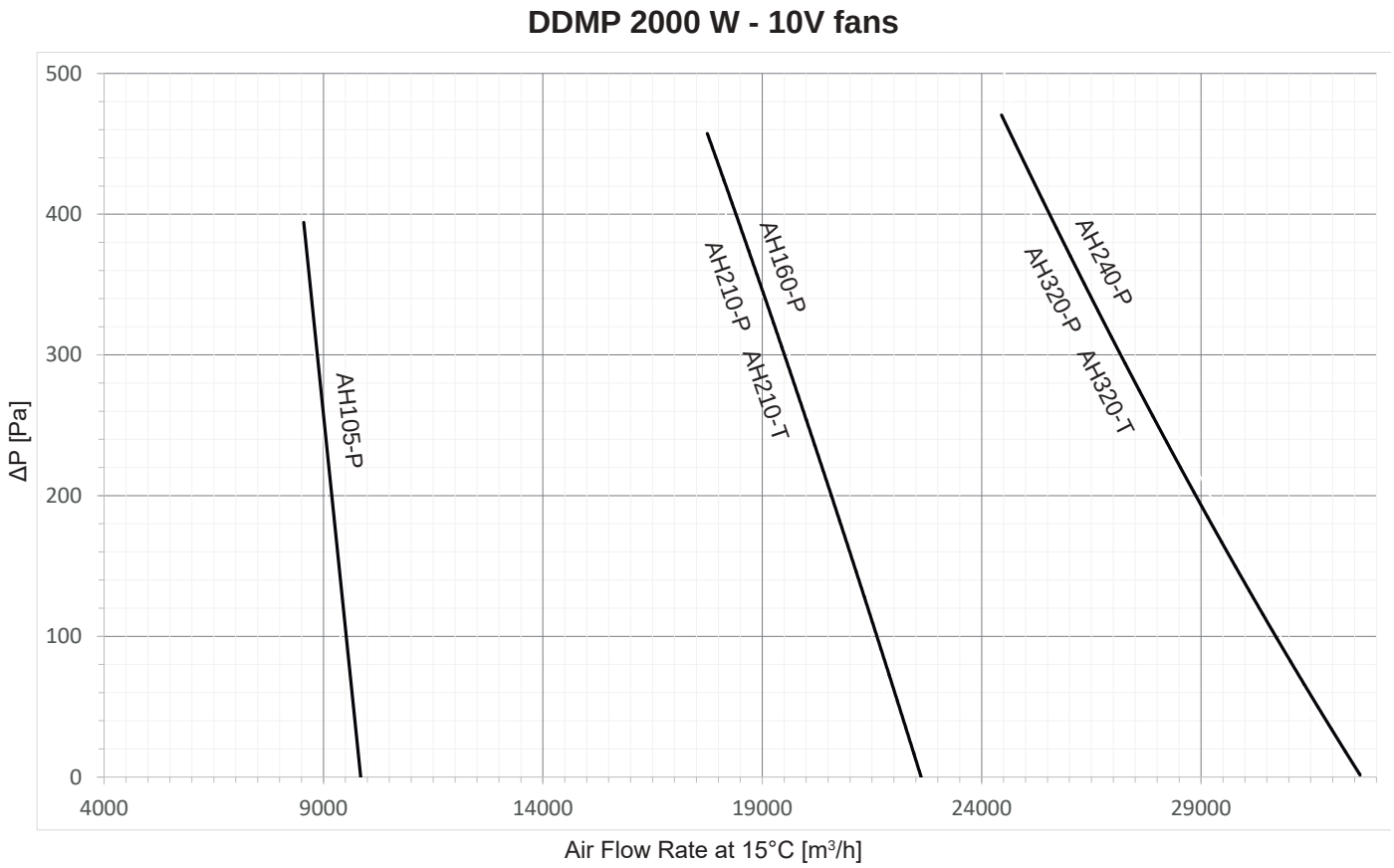
Model	Overall dimensions			Dimensions				Louvers								Chimney			Gas
										Intake			Delivery						
	B	L	H	B1	L1	H1	HC	B2	LC	LA	HA	ØA	LB	HB	ØB	LE	HE	ØE	
AH160	2460	2500	1485	1600	2650	1810	210	860	1105	400	675	633	995	835	900	145	350	2x80*	2 x G 3/4"
AH210	2460	2500	1485	1600	2650	1810	210	860	1105	400	675	633	995	835	900	145	350	2x80*	2 x G 3/4"
AH240	2535	2815	2110	1600	2965	2435	210	935	1260	560	945	900	995	1147	1200	145	350	3x80*	3 x G 3/4"
AH320	2535	2815	2110	1600	2965	2435	210	935	1260	560	945	900	995	1147	1200	145	350	3x80*	3 x G 3/4"

*Note: the flue outlet may be “independent exhaust” or “common exhaust”, please refer to par.5.5 “Chimney connections”.

3.4. Air flow rate curves - Available pressure/Power consumption



3.5. Noise

The following table shows sound pressure values, **Lp(A)**, issued by AH-SPORT air heating units. The value refers to heaters with ducted intake and delivery and when the heater is installed outdoor.

The values in the table refer to the sound pressure, **Lp(A)**, in free-field conditions, at a distance of 6 metres, at the overpressure shutter.

Heating units with ducted delivery and intake										
MODEL	LpA - Sound Pressure Level [dB(A)] [Hz]								distance	Lp(A)
	63	125	250	500	1000	2000	4000	8000	metres	dB(A)
AH105-P	33.1	43.6	54.1	56.7	54.9	55.2	48.1	38.2	6	61.7
AH160-P	27.0	51.7	65.0	59.3	60.5	60.5	56.0	49.3	6	68.3
AH210-P	27.0	51.7	65.0	59.3	60.5	60.5	56.0	49.3	6	68.3
AH240-P	28.7	53.4	66.7	61.0	62.2	62.2	57.7	51.0	6	70.1
AH320-P	28.7	53.4	66.7	61.0	62.2	62.2	57.7	51.0	6	70.1

4. USER'S INSTRUCTIONS

4.1. AH unit operation

Ventilation operating logic

TENSILE

HEATING

During operation in "Heating" mode (in winter), CPU_MASTER PCB regulates ventilation by modulating the rotation speed on the basis of the heat output (parameter FN_03=1 and OUT3B=3) and of the values set in parameters YL2 and YH2:
YL2 = Y2 output minimum voltage (Default value 6)
YH2 = Y2 output maximum voltage (Default value 10).

SUMMER VENTILATION

During operation in “Ventilation” mode (in summer), ventilation is fixed at constant speed, equal to the output of the voltage value set in parameter YF2:
YF2 = Y2 output fixed voltage (Default value 8).

NOTE: To activate operation in “Summer Ventilation” mode, for TENSILE structures only, it is necessary to change the type of system, within the Smart X Web remote control, by setting it as “Hot Air Heaters”.

AIR-SUPPORTED

HEATING

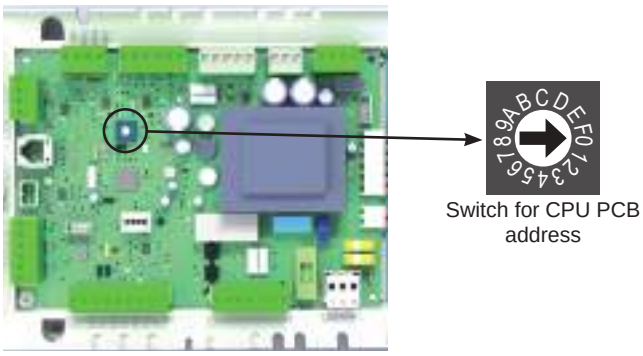
During operation in “Heating” mode (in winter), ventilation remains at constant speed, according to the value set in parameter YF2:
YF2 = Y2 output fixed voltage (Default value 8)
The air heating unit adjusts pressure inside the air dome through recirculation shutter modulation.

MAINTENANCE

During operation in "Pressure Maintenance" mode, CPU_MASTER PCB regulates ventilation by modulating the rotation speed on the basis of the pressure required inside the air dome (parameter FN_04=1, OUT4A=3 and OUT4B=2) and of the values set in parameters H12 and H13:
YL2 = Y2 output minimum voltage (Default value 2)
YH2 = Y2 output maximum voltage (Default value 10).

CPU modulation PCB hardware configuration

AH air heating units feature a CPU modulation PCB (inside the control panel), and a wiring card that allows for a simple connection on the user’s side and between the modules themselves.
An additional CPU modulation PCB is present inside the PCH module.



Switch for CPU PCB address

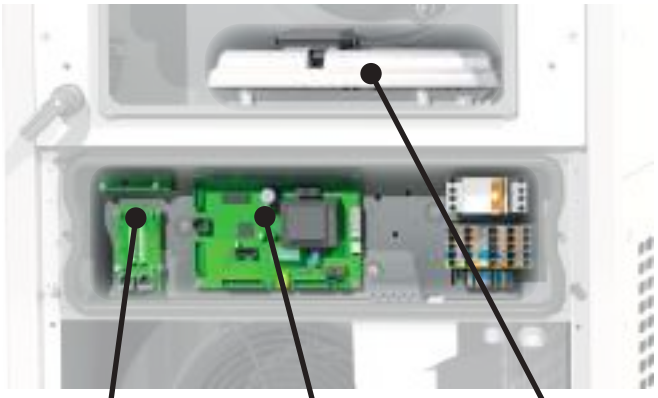
CPU modulation PCB

For AH units with single module (AH105), the modulation PCB is parametrised as “MASTER” and the card inside the PCH as “SLAVE”.
For AH units consisting of multiple modules (AH160, AH210, AH320 and AH420) the CPU modulation PCB (MASTER) is present only on the first module. The other modules have only one wiring card in addition to the SLAVE cards inside the PCH module.

MASTER, SLAVE and WIRING cards

- “MASTER” card = Manages the adjustment of the entire AH air heating unit.
- “SLAVE" card = Manages the modulation of the single PCH module referring to the "MASTER" card.
- WIRING card = user-side connections are made with the Smart X Web remote control and connections between Master and Slave modules.

NOTE: All AH air heating units are supplied already configured and with all the settings required to operate them.

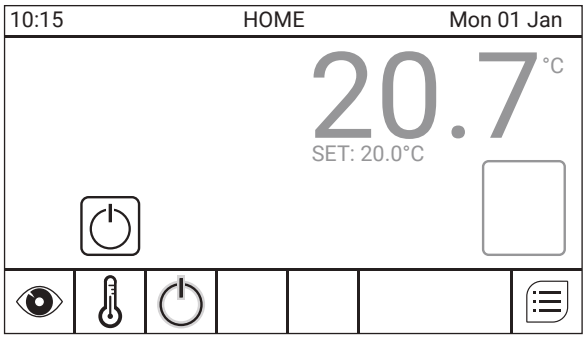


4.2. Smart X Web

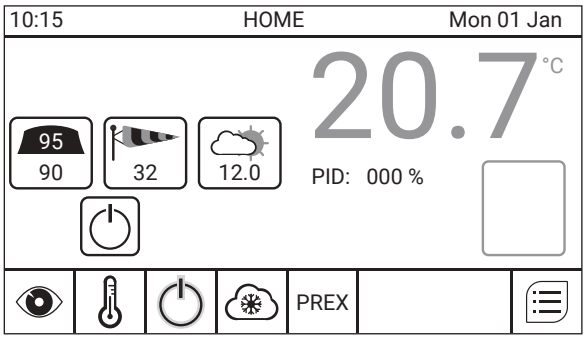
The Smart X Web remote control equipped as standard is supplied already configured with the type of system and with all the parameters necessary for the air heating unit to work to its best (except in case of particular installation and/or system conditions). If necessary, the final user only has to reconfigure some Setpoints and/or time ranges according to his/her needs.

Some pages of the main menus are described briefly below. For the other functions, or for further information, refer to the manual enclosed with the chronothermostat.

The Smart X Web is set as "Sport Structure" system and the "HOME" page for TENSILE structures looks as follows:



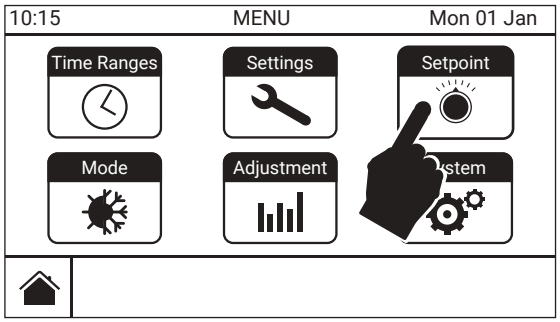
In case of AIR-SUPPORTED sport structures, the “HOME” page of Smart Web looks as follows:



Here below are shown the factory settings and parameters that the user may modify.

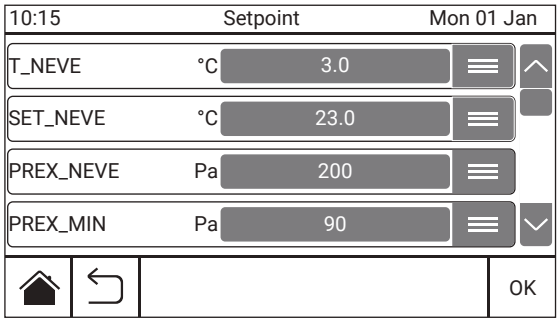
4.2.1. CONTROL SETPOINT

Inside the main "MENU" page it is possible to select the Setpoint adjustment submenu for the Air-supported sport structures.



The setpoints default settings of the different controls are the following:

- T_NEVE 3.0 °C (SNOW contr.)
- SET_NEVE 23.0 °C (SNOW contr.)
- PREX_NEVE 200 Pa (SNOW contr.)
- PREX_MIN 90 Pa (PRESSURE contr.)
- PREX_MAX 200 Pa (PRESSURE contr.)
- PREX_MAX2 250 Pa (PRESSURE contr.)
- SPEED_MIN 10 Km/h (WIND contr.)
- SPEED_MAX 80 Km/h (WIND contr.)



The different setpoints and their meaning are shown afterwards in the sections of the relating controls.

4.3. Remote On/Off (OPTIONAL)

Any priority On/Off control can be remotely controlled from the air heating unit, by connecting to the dedicated terminals, removing the existing jumper, as shown in the wiring diagram. The remote On/Off contact has priority with respect to the time range heat request or the manual mode, but not with respect to a snow function heat request, which is independent.

Wiring Diagram Code:
J00201 AH105-P model (AIR-SUPPORTED)
J00202 AH105-T model (TENSILE)
J00203 AH160-320-P models (AIR-SUPPORTED)
J00204 AH160-320-T models (TENSILE)

4.4. Pressure control (STANDARD in "P" versions)

The **AH-P** air heating units are equipped with a pressure sensor for keeping the pressure inside the air dome at a preset constant level.
Depending on the preset setpoint and the pressure measured in the air dome, the air heating unit adjusts the fan speed and the opening of the recirculation shutter to keep the pressure at the desired constant level, as shown here below:

- In "**Mode = Heating**" the fans rotate at fixed speed set in parameter YF2 (default = 8V). This parameter may be modified from 6V to 10V, depending on the system's specifications and the air heating unit adjusts the pressure by adjusting the intake recirculation shutter.
- In "**Mode = Maintenance**" (heating OFF) the intake recirculation shutter is completely closed and the air heating unit adjusts the internal pressure by modulating the fan speed through the parameters YL2 (min speed) and YH2 (max speed) set by default respectively to 2V and 10V.

NOTE: We discourage the modification of parameters YL2 and YH2 since they have been set to allow the air heating unit an ideal modulation and operation.

ATTENTION: Parameters YL2-YH2-YF2 considered are those on CPU- "MASTER" PCB. For AH105 the CPU Master PCB is located inside the electrical connection housing behind the Smart Web, in AH160-320 it is in the control panel on board the machine.

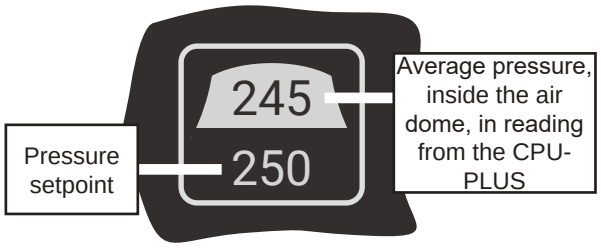
Pressure Control may be set to "**MAN**" (MANUAL operation) or to "**AUTO**" (AUTOMATIC operation - ONLY IF combined to Wind Control).

Setpoints settable for Pressure Control:

Setpoint	Default	Description
PREX_MIN	110 Pa	Minimum value of the automatic pressure range (with wind control); Manual setpoint 1
PREX_MAX	200 Pa	Maximum value of the automatic pressure range (with wind control); Manual setpoint 2
PREX_MAX2	250 Pa	Manual setpoint 3
PREX_NEVE	200 Pa	Setpoint value sent in snow conditions (with snow control)

These setpoints may be modified in the "Setpoint" menu. Please refer to section 4.2 "Smart X Web".

The "HOME" page will display an icon showing the average pressure value read by the AH air heating unit and the current pressure setpoint sent:



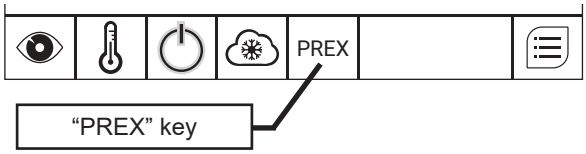
ATTENTION: Pressure control is a priority and ALWAYS ACTIVE even when the heating system is "OFF", and/or the ID1 contact is open.

Please find here below the Pressure Control logic.

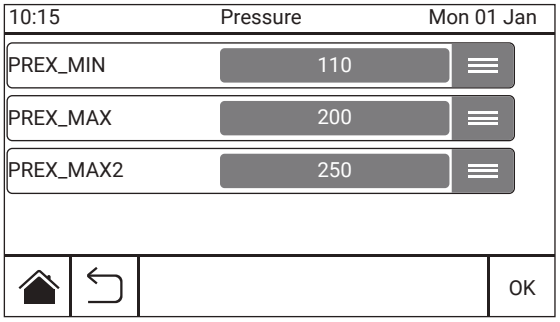
MANUAL OPERATION ("MAN")

IT is possible to manually choose one of the 3 Setpoints (PREX_MIN; PREX_MAX; PREX_MAX2) selectable in the "PREX" menu, to be sent to CPU PCB, as described below:

Press the "PREX" key inside the bottom line of the "HOME" page:



Press this key to access the quick setpoint selection menu, as follows:



After choosing one of the 3 setpoints and pressing the "OK" key, the pressure control is managed with said setpoint as FORCED and always FIXED until it is deactivated.
In the "HOME" page the "PREX" key and the "Pressure Control" icon (showing the selected setpoint) are highlighted in yellow, as shown further below.

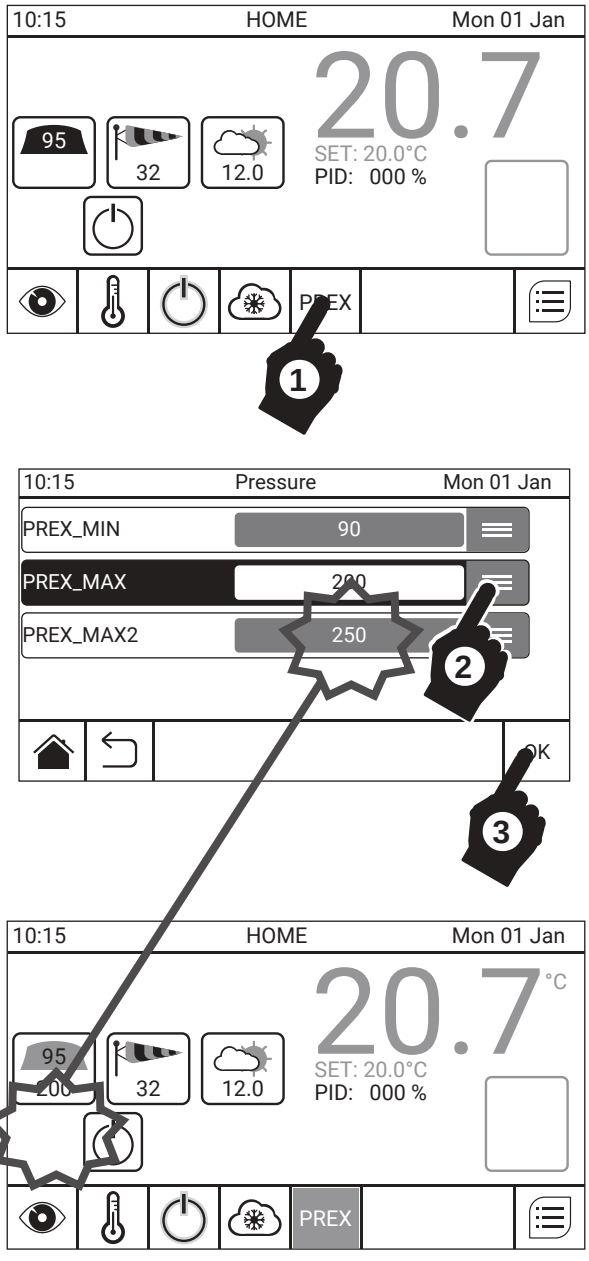
To deactivate the FORCED setpoint just press again, only once, the "PREX" key without entering the menu. The "Pressure Control" icon and "PREX" key now are "grey" again.

AUTOMATIC OPERATION ("AUTO") (ONLY IF combined with Wind Control)

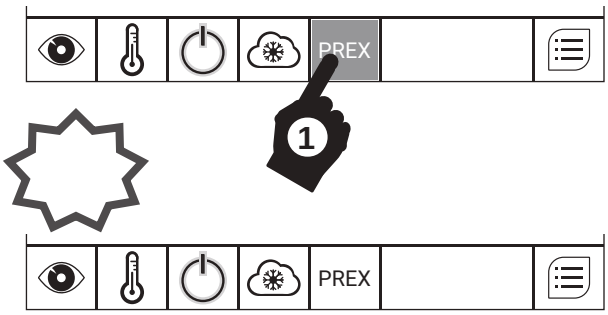
The pressure setpoint sent to CPU PCB automatically modulates the values of the two PREX_MIN (minimum value) and PREX_MAX (maximum value) setpoints according to the wind speed detected by the wind gauge.
Even when the pressure control is set to "AUTO" it is still possible to force manually one of the 3 pressure setpoints to send, as for the “MAN” operation, shown in the images below.

NOTE: If there is snow (both manually or automatically forced, with rain control) the pressure setpoint goes to the PREX_NEVE preset value.

Activation of FORCED setpoint

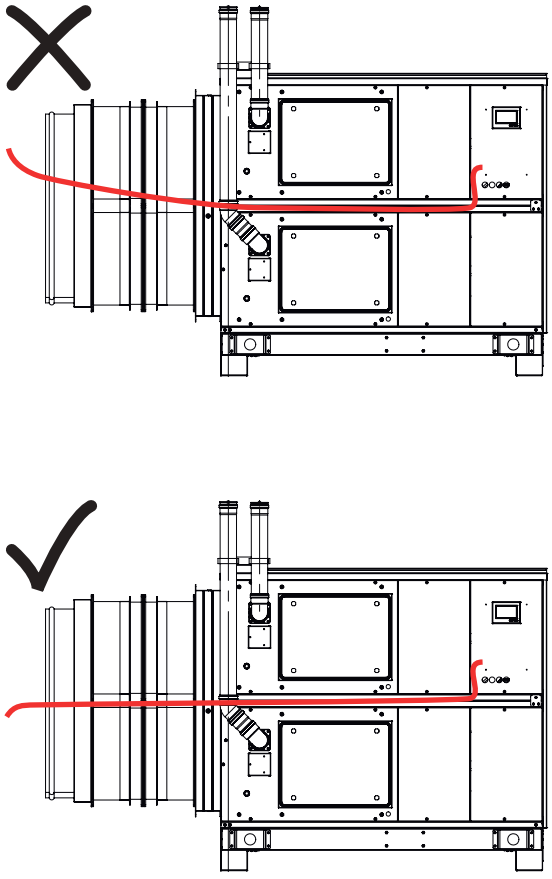


Deactivation of FORCED setpoint



PRESSURE INTAKE INSTALLATION

Install the pressure intake pipe correctly in order to avoid the creation of traps that could retain any moisture (condensation) inside it. Do not install the pressure intake pipe with the terminal pointing upwards, it is preferable to have the terminal pointing downwards.



4.5. Wind control (OPTIONAL in "P" versions)

The function of Wind Control (if present) is modulating automatically the pressure setpoint value, depending on the wind conditions. IT comprises a wind gauge for detecting wind presence and intensity (speed expressed in km/h).

If the Wind Control is purchased together with the air heating unit, it is already set and operating as soon as you connect it. Conversely, to activate the function, it is necessary to set switch SW1 to 4-20mA on the G12990 card and set this control in the "System Configuration > Sport Structures" menu of the Smart Web to "YES".
Check the AN3 input configuration on the Smart Web PCB (See Paragraph 4.7 "AN3 input configuration").

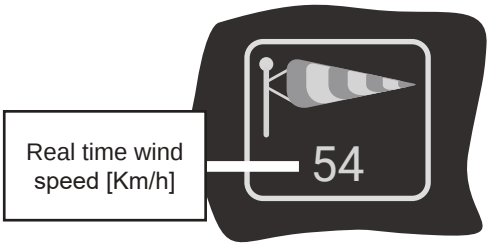
NOTE: In the "Wind Control" function there are two options "NOT" and "YES" (Not active/Active) and "ANALOGUE and DIGITAL" (2-10V / 0-1) and it may be managed only as an "AUTOMATIC" control. It is not possible to force or manage the function in manual mode (MAN).

Setpoints settable for Wind Control:

Setpoint	Default	Description
SPEED_MIN	10 Km/h	Wind minimum speed value considered in the pressure curve
SPEED_MAX	80 Km/h	Wind maximum speed value considered in the pressure curve

These setpoints may be modified in the "Setpoint" menu. Please refer to section 4.2 "Smart X Web".

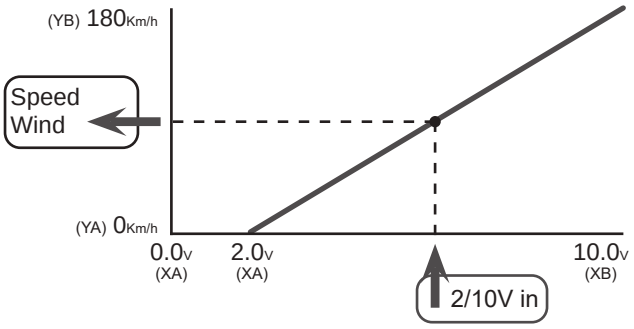
The "HOME" page displays an icon with the wind speed instantaneous value (expressed in km/h):



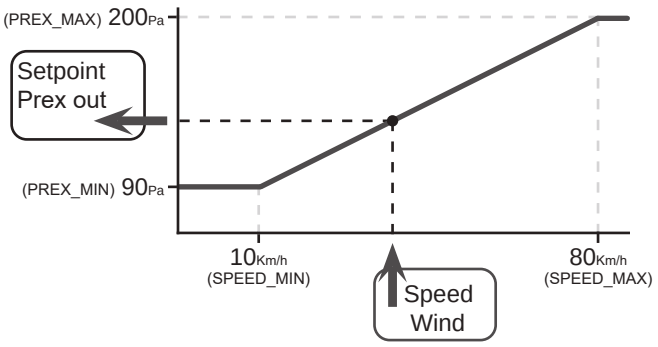
Please find here below the Wind Control logic.

ACTIVE OPERATION ("YES")

Wind control includes reading and parametrising a wind speed value sent by a wind gauge, in a range between 2 and 10V and 0 and 180 km/h (these values may change depending on the wind gauge being used). The input parametrisation is as follows:



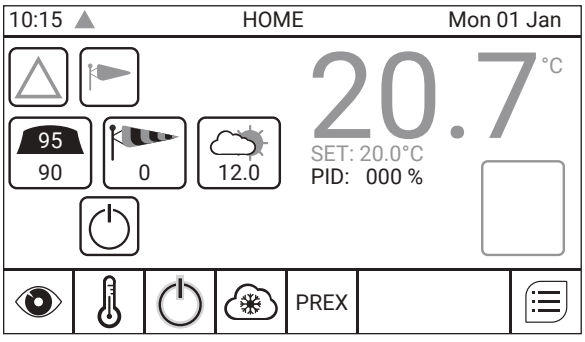
When there is wind, the Wind Speed value modifies in a linear manner the pressure setpoint value sent (included between PREX_MIN and PREX_MAX), as shown here below:



The "**Set-Point Prex out**" value is sent to the CPU board, that autonomously manages the achievement of this Setpoint.

IMPORTANT: The pressure value sent is always between the range from PREX_MIN to PREX_MAX (in this example between 90 and 200 Pa) and between SPEED_MIN and SPEED_MAX.

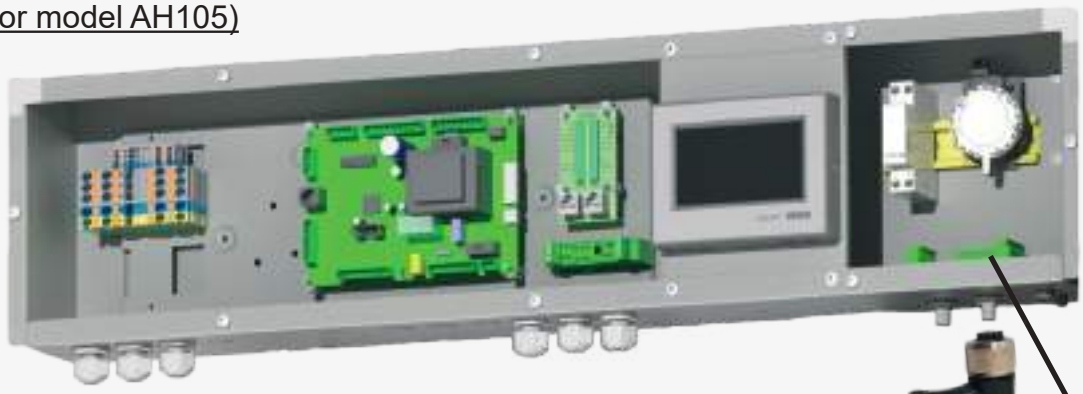
If the wind gauge is not connected or operates incorrectly, the Smart reads an input value of 0V or in any case less than 1V. In this case the "HOME" page displays an alarm icon, as follows:



NOTE: The wind speed reading has an output buffer so as to avoid a continuous variation of the sent setpoint in the event that the wind is slightly unstable.

ELECTRICAL CONNECTION

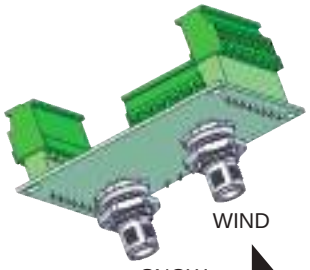
(Only for model AH105)



WIND GAUGE KIT G05430

[OPTIONAL]

G12990 PCB



(For all the other models)

WIND GAUGE KIT G05430

[OPTIONAL]

4.6. Snow control (OPTIONAL in "P" versions)

The function of Snow Control (if present) is to force, if it snows, the internal pressure and temperature setpoint values, which are preset and different. IT comprises a rain sensor (WET) and an external temperature probe for detecting the presence of precipitation and assessing the possibility that it might be snow.

Snow Control may be set to "**MAN**" (MANUAL) or to "**AUTO**" (AUTOMATIC - ONLY IF external sensor and probe ARE PRESENT).

If the Snow Control is purchased together with the air heating unit, it is already set and operating as soon as you connect it. Otherwise to activate the function you must set this control to "MAN" or "AUTO" in the "System Configuration > Sport Structures" menu and set inputs AN2=T_EXT and ID2=RAIN, in the "Probe management" menu.

NOTE: The activation of the "Snow Control" function in "AUTO" (automatic) mode configures automatically inputs AN2=T_EXT and ID2=RAIN, and "locks" them. To modify AN2 and ID2 deactivate the "AUTO" Snow Control.

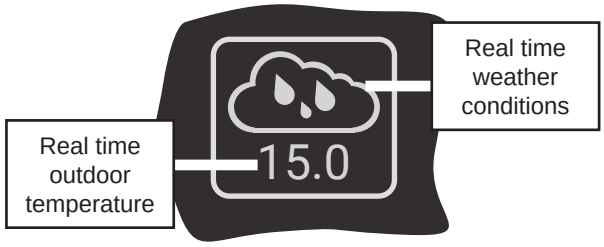
NOTE: The "Snow Control" function is NOT a safety feature, but is only intended to improve stability of the structure in unfavourable weather conditions. Supervision by the user or authorised personnel is always required.

Setpoints settable for Snow Control:

Setpoint	Default	Description
T_NEVE	3.0 °C	Snow hazard limit temperature (only in "AUTO" configuration)
SET_NEVE	23.0 °C	Heating setpoint temperature if it snows
PREX_NEVE	200 Pa	Pressure setpoint value if it snows

These setpoints may be modified in"Set-Point" menu, please refer to Section 4.2 "Smart X Web".

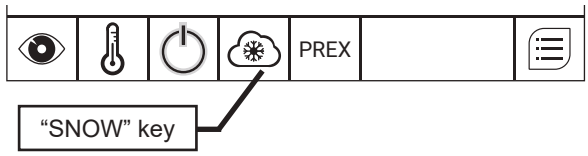
An icon displayed on the "HOME" page shows the current weather condition and the external temperature value:



Please find here below the Snow Control logic.

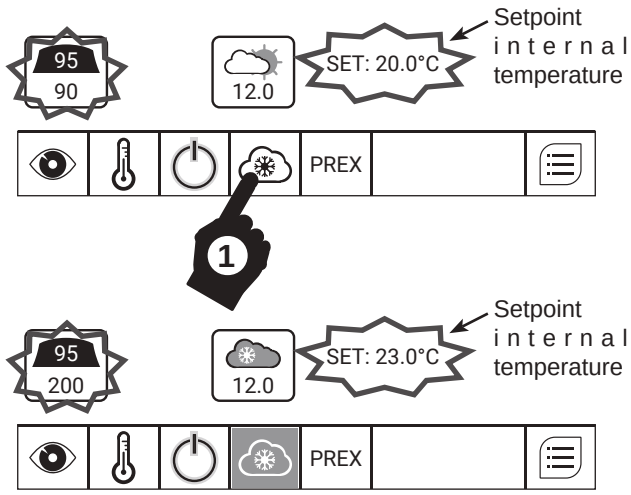
MANUAL OPERATION ("MAN")

It is possible to force manually the snow presence condition and its operation by pressing the "SNOW" key on the bottom line of the "HOME" page. The Smart activates the heating to the "SET_NEVE" setpoint and takes the pressure to the "PREX_NEVE" setpoint value.



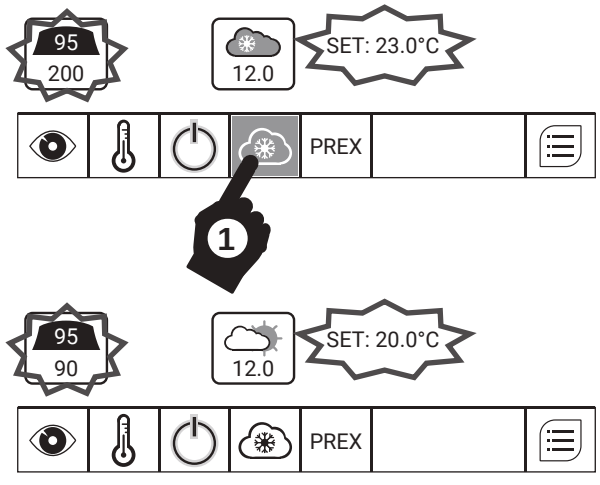
Press this key to activate the FORCED and always FIXED operation, simulating snow presence.
In the "HOME" page the "SNOW" key and the "Snow Control" icon (showing a snowflake) are highlighted in yellow, as shown here below.

FORCED Snow Manual Activation



To deactivate the manual function just press the "SNOW" key again. The "Snow Control" icon and "SNOW" key now are "grey" again.

FORCED Snow Manual Deactivation



AUTOMATIC OPERATION ("AUTO") (ONLY IF external sensor and probe ARE PRESENT)

In case of rain the sensor, installed outdoor, closes contact ID2 and the rain icon is shown on Smart X display. If when it rains (thus closed ID2 contact) the external temperature probe (connected to input AN2) measures a temperature below the “T_NEVE” reference limit, the Smart indicates that it is possible it will rain, activates heating to “SET_NEVE” setpoint and takes the pressure value to the PREX_NEVE” setpoint.
Even when the snow control is set to "AUTO" it is still possible to force manually the snow condition, as for the “MAN” operation, shown before.

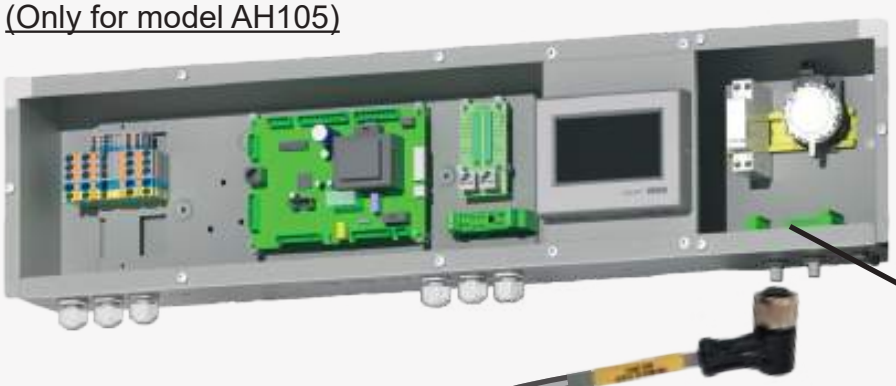
NO RAIN OR SNOW	
ID2	AN2
Open	> T_NEVE
	

RAIN	
ID2	AN2
Closed	> T_NEVE

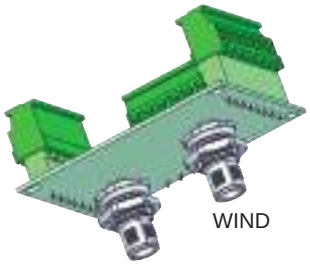
SNOW	
ID2	AN2
Closed	< T_NEVE

ELECTRICAL CONNECTION

(Only for model AH105)



G12990 PCB



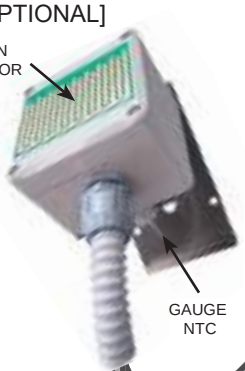
WIND

SNOW

SNOW KIT G22440

[OPTIONAL]

RAIN SENSOR



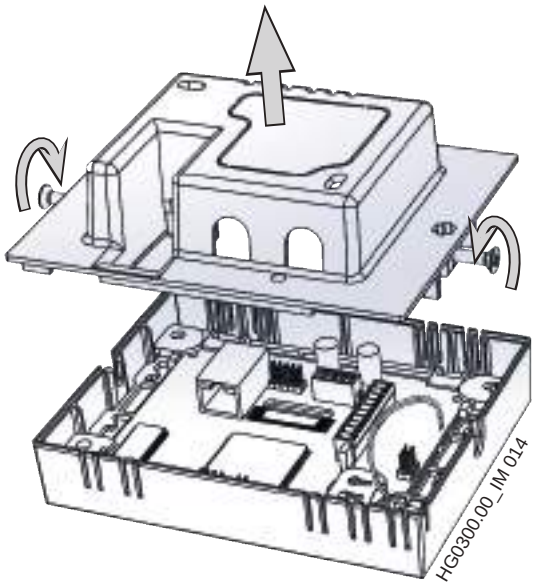
GAUGE NTC

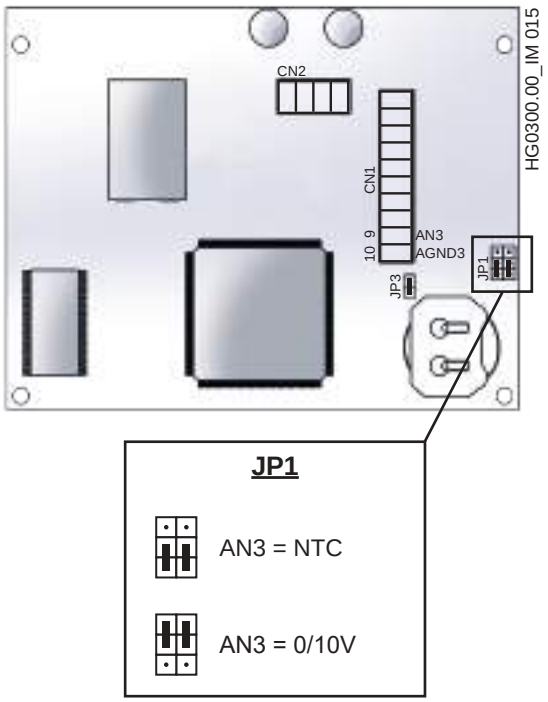
(For all the other models)

4.7. AN3 input configuration

The AN3 input is supplied already preset. In order to modify the AN3 input configuration from NTC to 0/10V (or vice versa) please proceed as follows:

- Undo the side screws and remove the chronothermostat rear cover.
- Move the jumpers indicated in the picture in the desired position ("0/10V" or "NTC").
- Place the rear cover back in its position and tighten the side screws.

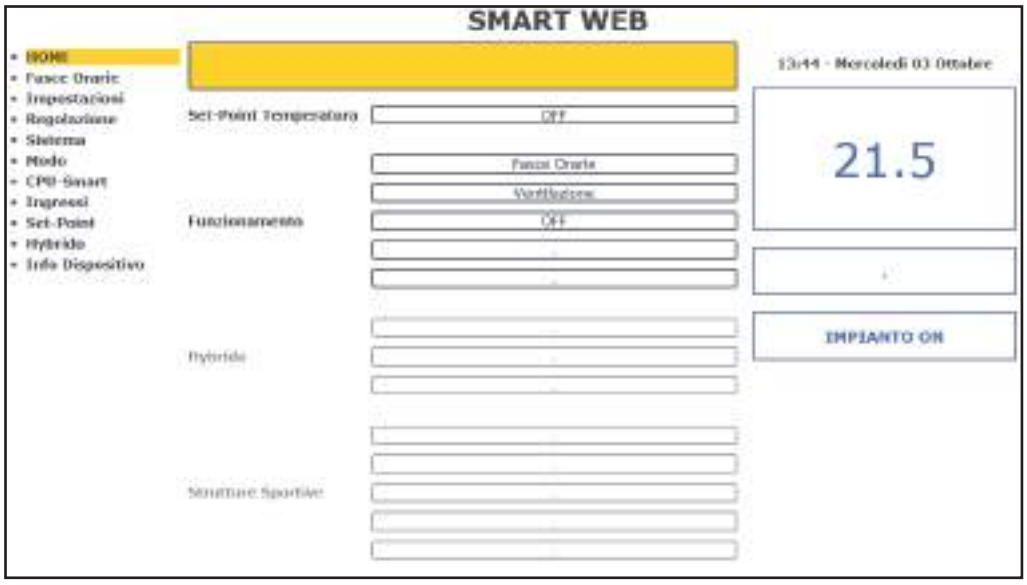




4.8. WEB configuration

IT is possible to configure the Smart Web remote control so as to manage it entirely through a PC (or other device) connected to a private local network (Intranet). In order to use the Smart X Web remotely the control must be connected to the network with an Ethernet cable of the direct RJ45 type.

For more information regarding the chronothermostat settings and configuration, please refer to the manual enclosed with the product.



5. INSTALLATION INSTRUCTIONS

Instructions for installing and setting the air heating unit are intended for suitably qualified personnel only. We recommend the installer to read safety warnings.

5.1. General installation instructions

The person in charge of the system project or a competent person shall establish where to install the heater, taking into account technical needs and existing Standards and Regulations of the place where the machine is to be installed; usually, specific authorisations must be obtained (i.e.: urban, architectonic and fire-prevention plans, plans to reduce environmental pollution,etc.).
Therefore, before installing the heater, check that all authorisations are available or have them issued.
Install the unit on a flat surface that can firmly and safely bear the weight. Minimum safety distance for correct air circulation shall be kept all around the unit. This will also ease maintenance and control operations.
In any case, and in full compliance with the rules in force in the country of installation, it is recommended to **leave at least one metre clearance around the unit**, to perform all the necessary actions of ordinary and extraordinary maintenance.
Fuel and power supplies shall be easily accessible.
All the air heating unit's connecting and assembling operations must be performed only by qualified staff that is skilled for the operations required to start it.

Condensate drain
The air heating unit is supplied with water trap for condensate drain. The water trap is an integral part of the equipment and is regarded as a safety component; therefore, replacing it with a different type, not approved by the unit's manufacturer, is prohibited.
The condensation must be drained in compliance with standards applicable in the country where the unit is installed.

THE air heating unit shall not be modified in any part without the manufacturer's written authorisation.

5.2. Installation

Connecting Air Ductwork
Ducts for air delivery and intake shall be sized based on aeraulic performance of the unit (shown in "TECHNICAL DATA" section of this Manual).
A vibration damping joint should be installed on air delivery duct so as to prevent vibration transmission from the air heating unit to air ductwork.

Special attention must be paid to the noise conditions required for the room, dimensioning and installing, where necessary, silencers in the ductwork.

Connecting Fuel Supply
Fuel connection shall be performed by qualified personnel only. Follow instructions in this Instruction Manual and comply with existing regulations.

5.3. Electrical connections

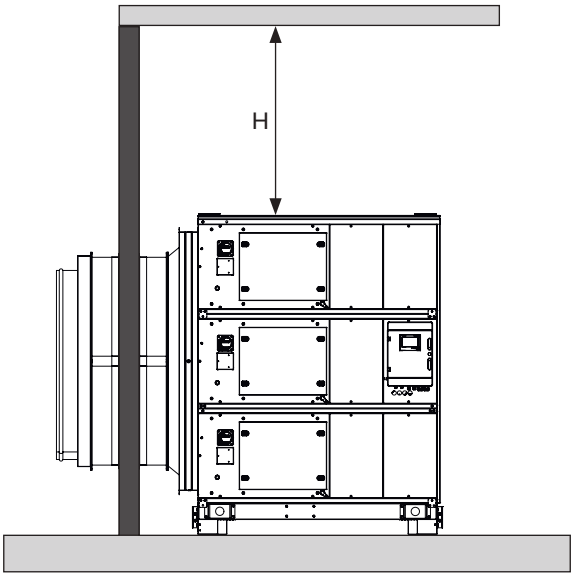
All AH air heating unit control panels use a wiring card which allows an easy and safe connection of parts that are usually used in warm air heating systems, such as:
- Remote On/Off
- Wind gauge
- Snow sensor
- Pressure gauge
- Ethernet network

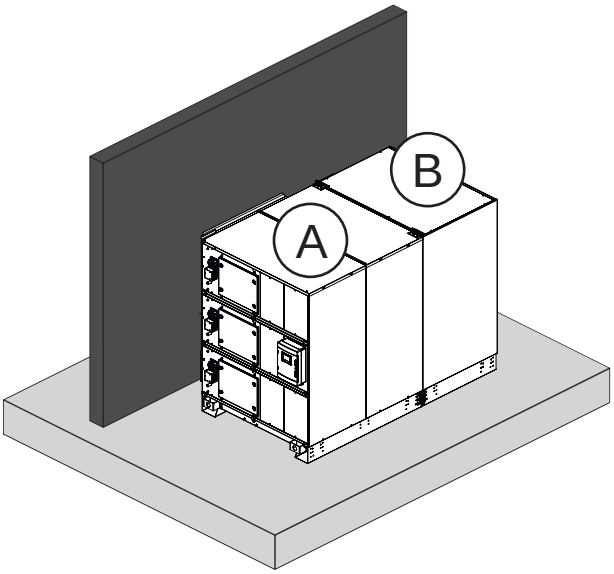
The electrical connections and the accessories that may be combined with the unit are different, depending on the configuration of the AH unit itself, for:
- Tensile Sport Structures
- Air-supported Sport Structures

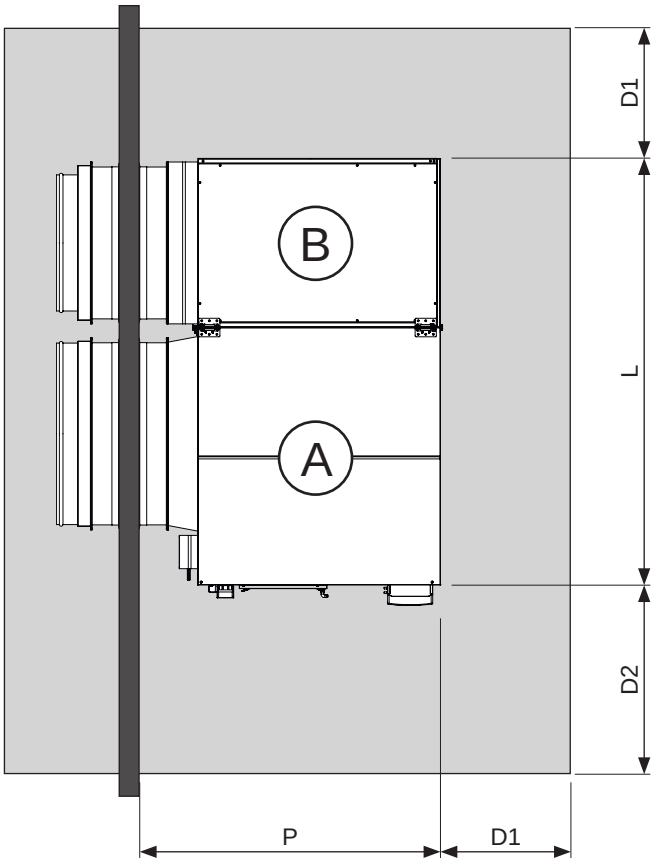
Please refer to Section 4. "USER INSTRUCTIONS" and related subsections contained in this manual.

Minimum distances to be observed

	H	D1	D2	L	P
Model	(mm)	(mm)	(mm)	(mm)	(mm)
AH105	1000	700	1000	1700	1255
AH160 / AH210	1000	700	1000	2500	1915
AH240 / AH320	1000	700	1000	2815	1990







5.4. Wiring to Power Supply

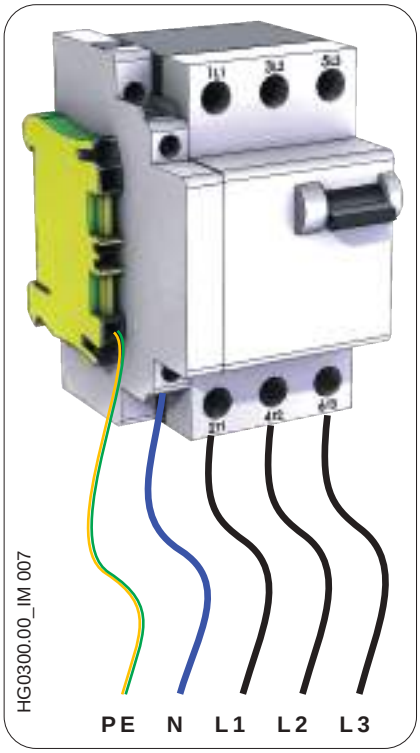
AH air heating units are supplied with a main switch, shown in the figure.
Wire power supply directly to that switch.

Three-phase	400V+N	Wire three phases to L1, L2, and L3 terminals and Neutral to N terminal

IMPORTANT: 400 Vac power supply with neutral. Do not mistake the neutral for the live wire.

Ground wire is mandatory. Connect it to relevant terminal. The air heating unit must be correctly connected to an effective earthing system, fitted in compliance with current legislation.

NOTE: In order to access terminals, unscrew white cover on the upper part of the switch. When finished, reinstall protection cover.



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.

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

NOTE: Ground wire is mandatory. Connect it to relevant PE terminal.

Electrical Protections

IMPORTANT: A main switch must be installed before the control panel of the unit. This switch must include a protection (fuses or automatic) and must comply with existing regulations.

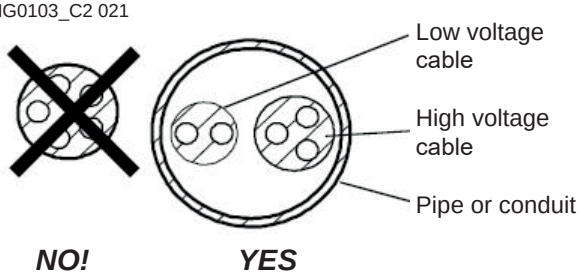
Fuse type, if used, must be rapid. If automatic switch are used, the characteristic curve for their triggering must be of type **"K"** or "**D**" or **"C"**, with breaker current *Id* ≥ *300mA*.

Automatic switches with "A" or "B" trigger curve are not allowed since they are not suitable for electrical motor protection. Residual-current device with *Id=30mA* are not suitable for being used with inverter. Residual-current devices must be of type "B".

CABLES

High voltage (230 V / 400 V) and very low voltage cables can be housed in the same conduit by using double-insulated cables.

HG0103_C2 021



Use flexible, flame-retardant, double-coating cables for the wiring. The size of the cable section must be suitable for the unit power consumption and the distance between the unit and the connection point.

AH Model	Motor kW [kW]	Cable section [mm²]	Safety trip [A]
AH105xx-T	1x2.6	5Gx2.5	16
AH105xx-P	1x2.6	5Gx2.5	16
AH160xx-T	4x0.8	5Gx4.0	25
AH160xx-P	4x2.0	5Gx4.0	25
AH210xx-T	4x2.0	5Gx4.0	25
AH210xx-P	4x2.0	5Gx4.0	25
AH240xx-T	6x0.8	5Gx10.0	40
AH240xx-P	6x2.0	5Gx10.0	40
AH320xx-T	6x2.0	5Gx10.0	40
Ah320xx-P	6x2.0	5Gx10.0	40

Notes: determine cable section in compliance with EN60204-1 and IEC60364-5-2/20001 specifications; PVC insulation; room temperature 30°C; surface temperature <70°C; length below 20m.
Add ground cable to the number of cables.

5.5. Connections to the Flue

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

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
- stainless steel
- polypropylene (PP)

The pipes and terminal must be certified according to the Regulation for building products.
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 90°C.
The flue does not need to be insulated to prevent the formation of condensation in the pipe, as this will not affect the heater, which is fitted with a water trap. Insulate the pipe if required to protect the flue from accidental contact.
For the air intake, use:
- aluminium
- stainless steel
- polypropylene (PP)

certified according to the Regulation for building products.

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

Common exhausts
Where possible, it is always preferable to use independent exhausts; AH module exhausts are pressurised, therefore in this way it is possible to prevent incorrect sizing from causing a system malfunction.
If you wish to use common flue outlets, there are KITS on the price list “Common flue outlets” pre-sized in pp as indicated further below in this section.
If you do not wish to use said KITS, the common exhausts shall be sized by the designer including non-return valves 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.

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, installation standards require the provision of suitable vents on the walls.

NOTE: It is compulsory to fit on the combustion air intake an IP20 safety mesh to prevent solids entering the combustion air intake with a diameter higher than 12mm. The mesh size must be greater 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.

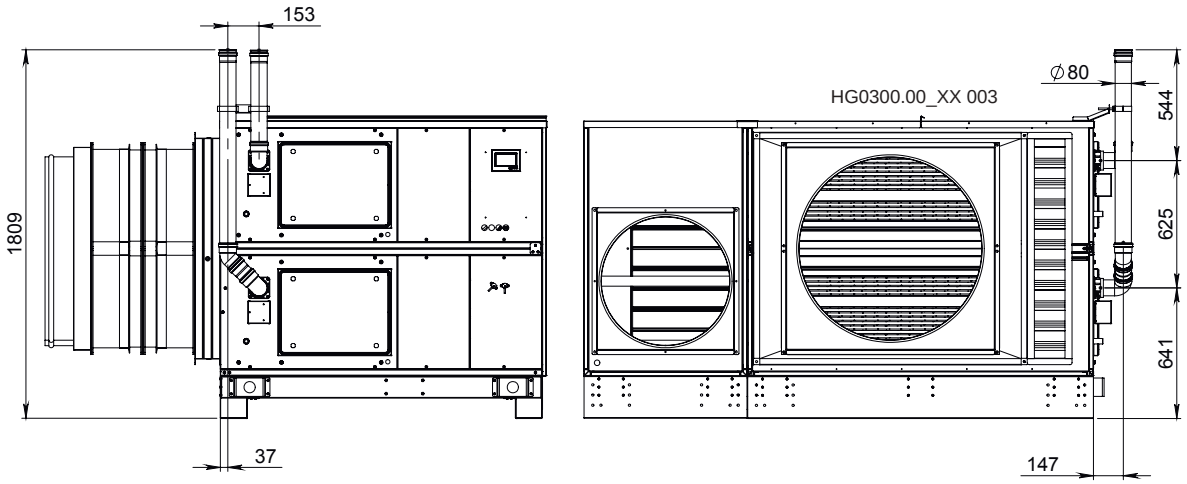
Type C53
Sealed combustion circuit (type "C") connected by means of its own separate ducts to two terminals which can end up in areas with different pressure (such as a duct connected to the roof and a second one connected to the wall).

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

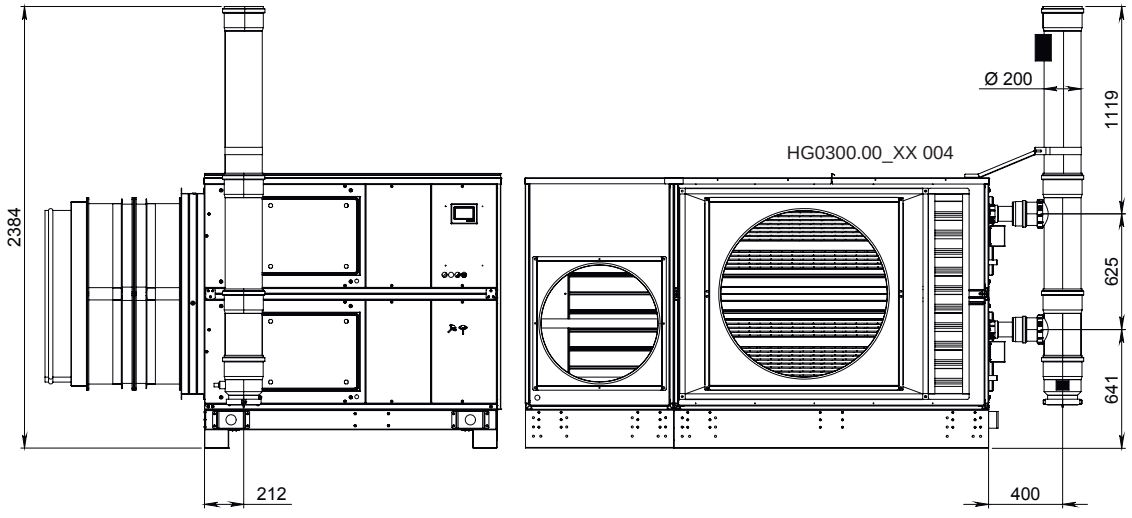
On request (with additional charge) AH heaters can be supplied with “independent flue outlet” chimneys, as shown in the image below. For multiple models, AH160, AH210, AH240 and AH320, it is possible to request the “multiple flue outlet” chimney as indicated in the following table:

Model	INDEPENDENT flue outlet kit	COMMON flue outlet kit
	Code	Code
AH105	standard equipment (1 x Ø 80)	Not available
AH160	standard equipment (2 x Ø 80)	G22155-210-P0 (1 x Ø 200)
AH210	standard equipment (2 x Ø 80)	G22155-210-P0 (1 x Ø 200)
AH240	standard equipment (3 x Ø 80)	G22155-320-P0 (1 x Ø 200)
AH320	standard equipment (3 x Ø 80)	G22155-320-P0 (1 x Ø 200)

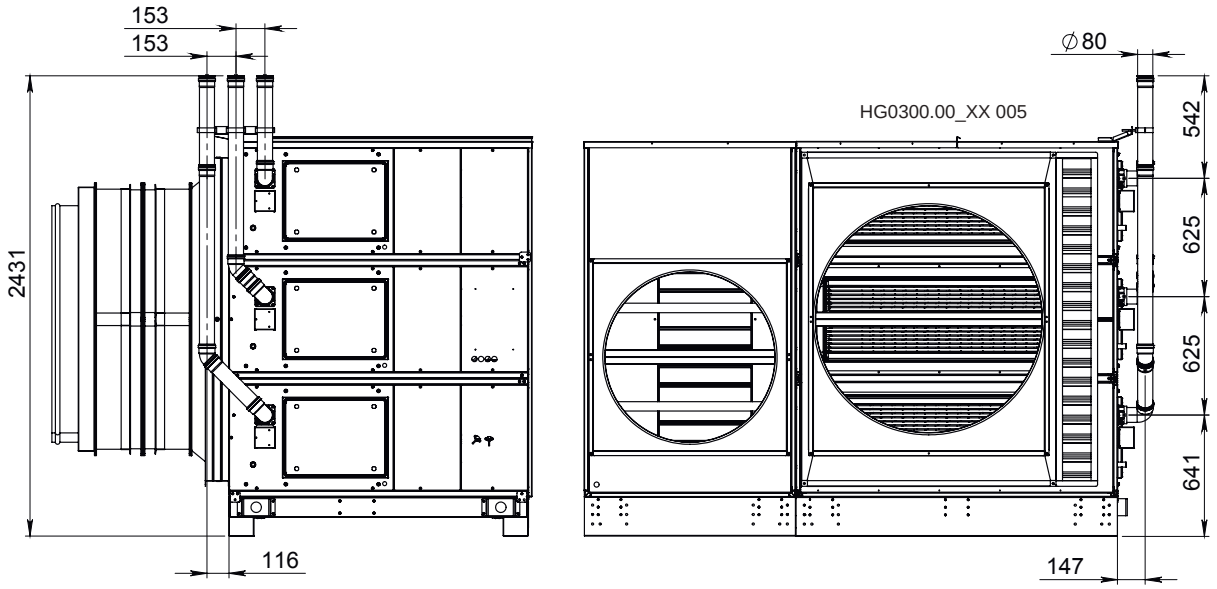
Model: AH160 / AH210 with INDEPENDENT flue outlet



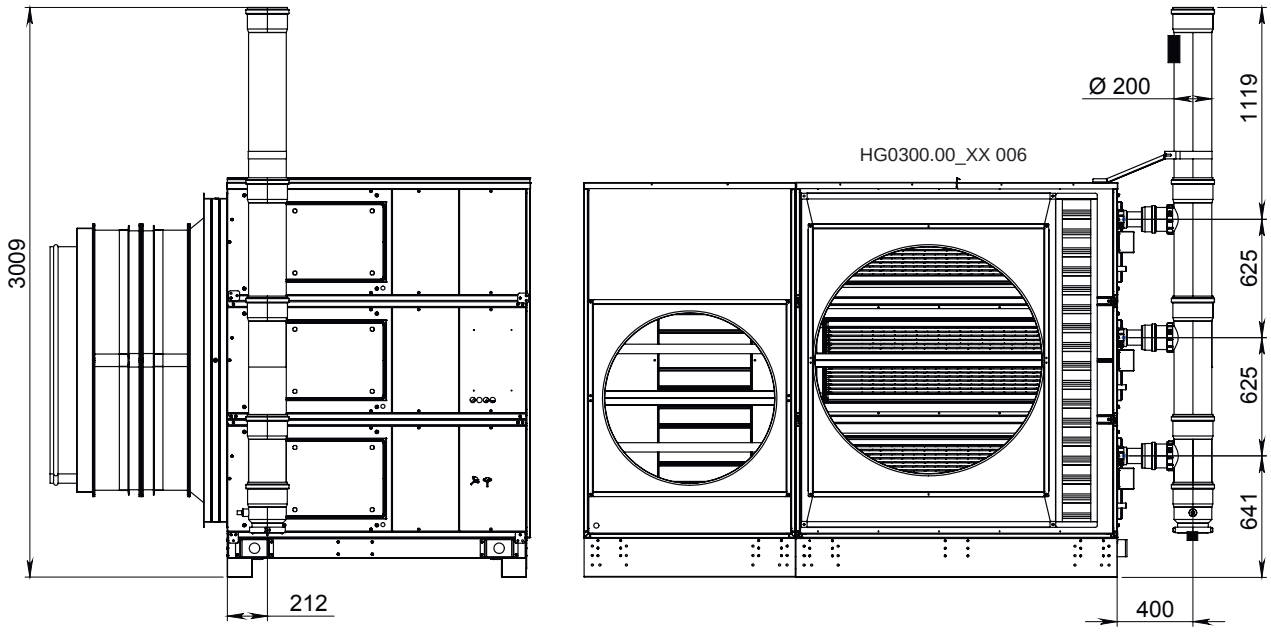
Model: AH160 / AH210 with COMMON flue outlet



Model: AH240 / AH320 with INDEPENDENT flue outlet



Model: AH240 / AH320 with COMMON flue outlet



5.6. Condensate drain

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

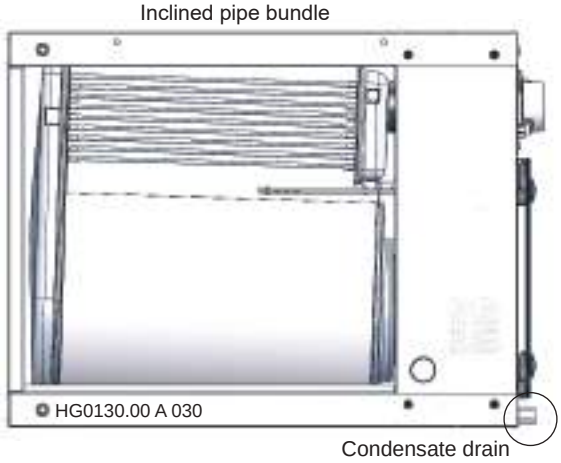
- risk of condensation build-up inside the heat exchanger;
- risk of condensation water freezing in the pipes;
- risk of flue gas discharged from the condensate drain.

Build up of condensation in the heat exchanger

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

An electrode fitted in the burner compartment internal trap checks and stops the burner operation before the water reaches a potentially dangerous level inside the flue gas collection hood.

When positioning the unit on the floor, it is essential to make sure that the heater, and therefore the heat exchanger, are perfectly level to maintain the typical incline of the tube bundle.



Connection to the condensate drain

AH units are supplied with a condensate drain on the module outer panel.

According to the applications, two condensate neutraliser kits are available (code G14303 up to 120kW; code G05750 above).

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

- free drainage;
- drainage in drain wells;
- drainage inside water traps.

AH air heating units are supplied with a condensate drain with open type connection (socket pipe) to prevent ice forming in the pipe from blocking correct condensate drain, with consequent accumulation of water in the heat exchanger.

Multiple-module AH air heating units are equipped with a condensate drain of open, collective type, as shown below.

ATTENTION: Fill the condensate drain trap before the first start-up.

Precautions

Materials to be used for the condensation drainage system: aluminium, stainless steel, silicone or Viton or EPDM for hot pipes that allow the flue gas to go through in case of malfunction; for cold pipes (water pipes), PVC and any materials suitable for hot pipes.

Do not use copper or galvanised iron pipes.

Free drainage

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

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

Drainage into water courses

Condensate drain may be through water channels and/ or collected and treated with basic solutions (condensate neutralisation kit, cod. G14303 or G05750).

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

5.7. GAS Connection

Use the gas line connections only with CE certified components.

AH-P and AH-T are supplied with:
- dual gas valve;
- stabiliser and gas filter.

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

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

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

Avoid using threaded connections directly on the gas connection.

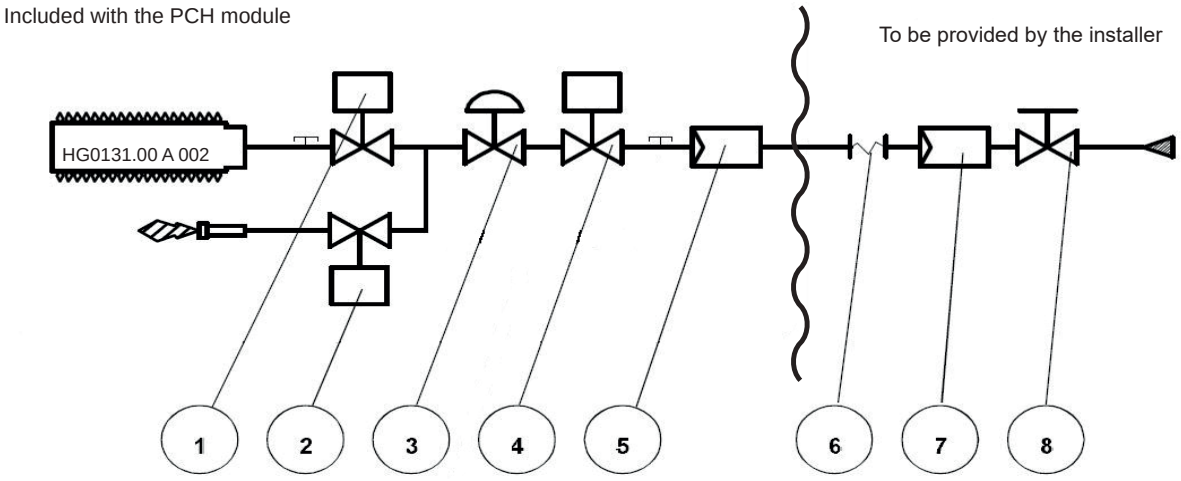
Current legislation allows a maximum pressure inside the rooms, or thermal stations, of 40 mbar; higher pressure values must be reduced before entering the boiler room or the site where the AH module is installed.

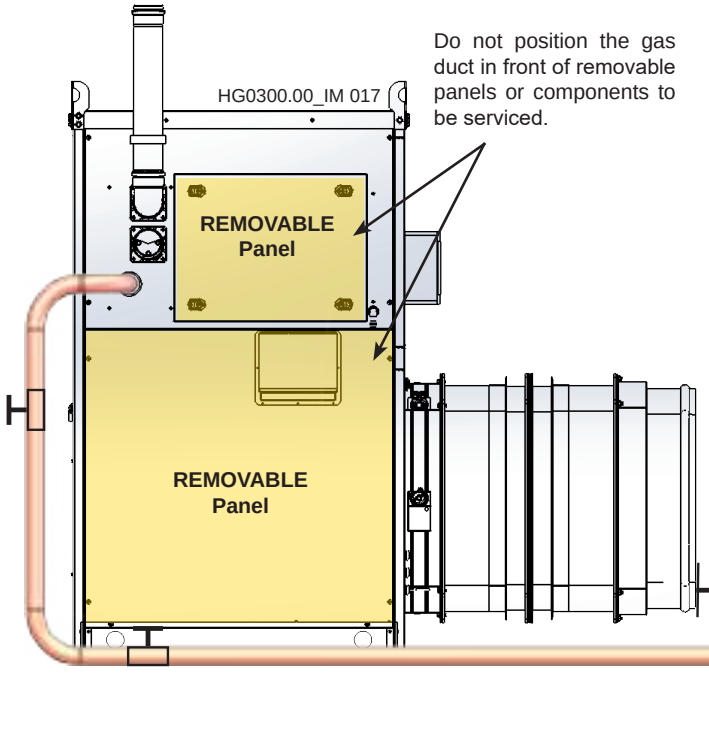
KEY

1 Main burner gas solenoid valve
2 Pilot burner gas solenoid valve
3 Pressure stabiliser
4 Safety gas solenoid valve
5 Gas filter (small section)

---

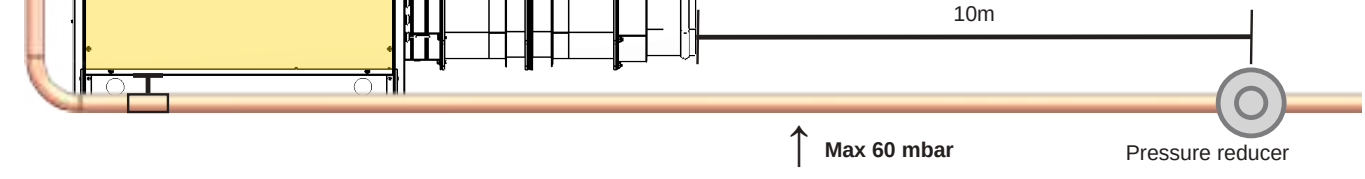
6 Anti-vibration joint
7 Gas filter (large section)
8 Gas valve





During the installation, we recommend 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.

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 unit, but leaving the gas filter.



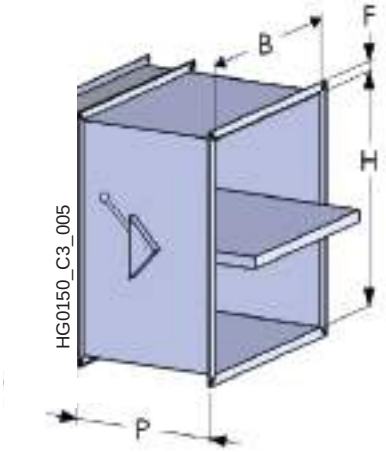
5.8. Fire damper installation

The fire damper is installed as standard equipment both at intake and delivery.
Fire dampers consist of a galvanised iron sheet frame, the compartmentalisation and sealing blade and the blade closing device.
All dampers have the following specifications:

- reaction to fire EI120S
- thermal cut-out with fuse set on 72°C;
- microswitch, IP55, supplied as a standard and installed on damper
- supplied dampers are certified.

Fire damper kit

Model	Code		B	H	P	F
	shutter		[mm]	[mm]	[mm]	[mm]
AH105	*Delivery*	*G10624-CE*	650	650	510	35
	Intake	*G10721-CE*	500	500	510	35
AH160 AH210	*Delivery*	*G12140-CE*	1000	970	510	35
	Intake	*G10624-CE*	650	650	510	35
AH240 AH320	*Delivery*	*G12150-CE*	1200	1370	510	35
	Intake	*G12140-CE*	1000	970	510	35



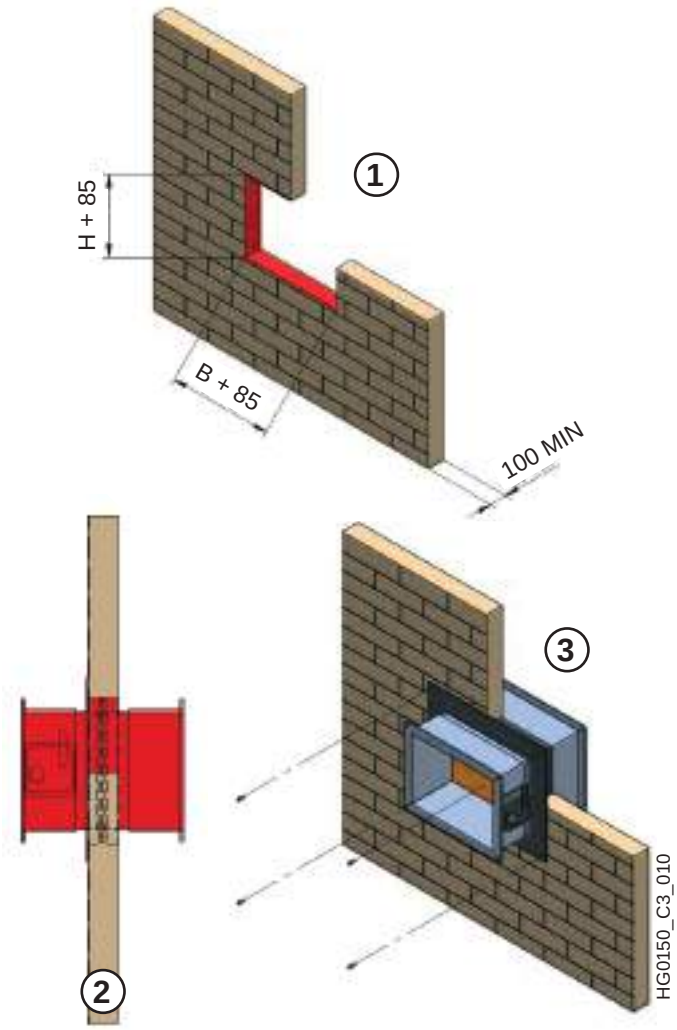
INSTALLATION OF FIRE DAMPER ON RIGID WALL

① Prepare in the wall an opening with both base and height increased by 85 mm with respect to the nominal dimensions of the damper; for walls made of concrete blocks or bricks it is recommended to provide a strengthening beam above the opening;

② Insert the damper in the opening so that the fixing flange rests on the wall surface;

③ Fasten the damper to the wall through the holes present in the fixing flange using self-tapping screws or screw anchors with 6 mm diameter.

For further information, refer to the manual supplied with the dampers.



USE OF FIRE DAMPER

To activate the damper rotate the control lever counter-clockwise.
To release the damper press the button highlighted in the figure.

IMPORTANT: Pay attention to the direction of rotation of the lever: in case of vigorous rotation in the wrong direction the closing device may break.

IMPORTANT: After installation, check that there are no obstacles for the correct blade rotation.

IMPORTANT: When the heater is disconnected from the structure, close or protect ductworks to prevent atmospheric elements from entering.

HG0150_C3_011

6. SERVICING INSTRUCTIONS

6.1. Operating Cycle

The operation of AH-T and AH-P air heating units is fully automatic; they are equipped with electronic equipment with self-check function that manages all the burner control and monitoring operations, with a microprocessor-based electronic PCB that controls the heat output regulation and with an interface PCB for connecting and managing the accessories to the Smart X Web remote control.

The boiler is switched on when the following two conditions are met:

- unit powered on and not locked out;
- Smart X Web remote control set to the “heating” operation mode with the necessary conditions for starting.

In these conditions the burner fan starts immediately, pre-washing the combustion chamber for a set time. After the pre-wash time, the ignition phase will begin: the equipment opens the solenoid valve EV1 and in parallel the solenoid valve EVP that supplies the pilot burner. After detecting the pilot flame, the equipment opens the main gas valve EV2 supplying the main burner.
After the operation overlapping time of the two burners (pilot and main) has elapsed, the modulation PCB cuts off the solenoid valve EVP supply and turns the pilot burner off.
Flame detection is carried out by a single electrode for both the pilot burner and the main burner.
The ignition program turns the burner on at an intermediate heat output, which corresponds to approx. 30% of the maximum output. Once the flame stabilising time has expired, the burner will start to modulate its heat output according to the CPU board configuration.
If there is no flame during the ignition phase, the equipment will make other 4 ignition attempts; at the fifth attempt, if ignition is not successful, the heater will be locked out (Fault E10).

Once the heat request is over the modulation PCB will turn off the burner; the fan will continue to ventilate the combustion chamber, after the wash, for a set time.

SWITCHING off the power supply is prohibited, except for emergencies because, when the unit is switched off, the flue gas fan must continue to operate for approximately 90 seconds to clean the combustion chamber (combustion chamber post-cleaning phase) and cool it down.
Failure to perform the post-cooling operations on the exchanger will cause:

- a shorter lifetime of the exchanger and the guarantee will be null and void;
- the safety thermostat to operate and the associated requirement to manually reset the heater.

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

6.2. Interface Panel

The CPU PCB is connected to a Smart X Web where it is possible to display and modify all the parameters.
The service centre requiring to work on such parameters must enter the relevant level password.

AH units are fitted as standard also with a multifunction LCD panel located inside the burner housing and used to control, configure and diagnose all operating parameters of the PCH equipment.
The multifunctional 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 operating mode of the PCH unit and any Faults.
It also allows the service centre to change the main operating parameters.
Changing parameters requires a password.

For further information on operation and management of the user interface panel, contact ApenGroup sales office.

6.3. Reset

The modulation PCB allows the operator to identify more than thirty different causes of lockouts. In case of lockout, the type of problem occurred is indicated with a code allowing for a precise management of the event.
To reset the fault and unlock the AH unit, just press the two arrow keys of the LDC panel simultaneously for at least 3 seconds or directly operate on the installed Smart X Web.
Lockouts may be remotely controlled by using:

- the digital input ID1-GND (MASTER board) - button N.O.;
- the Smart X Web control.

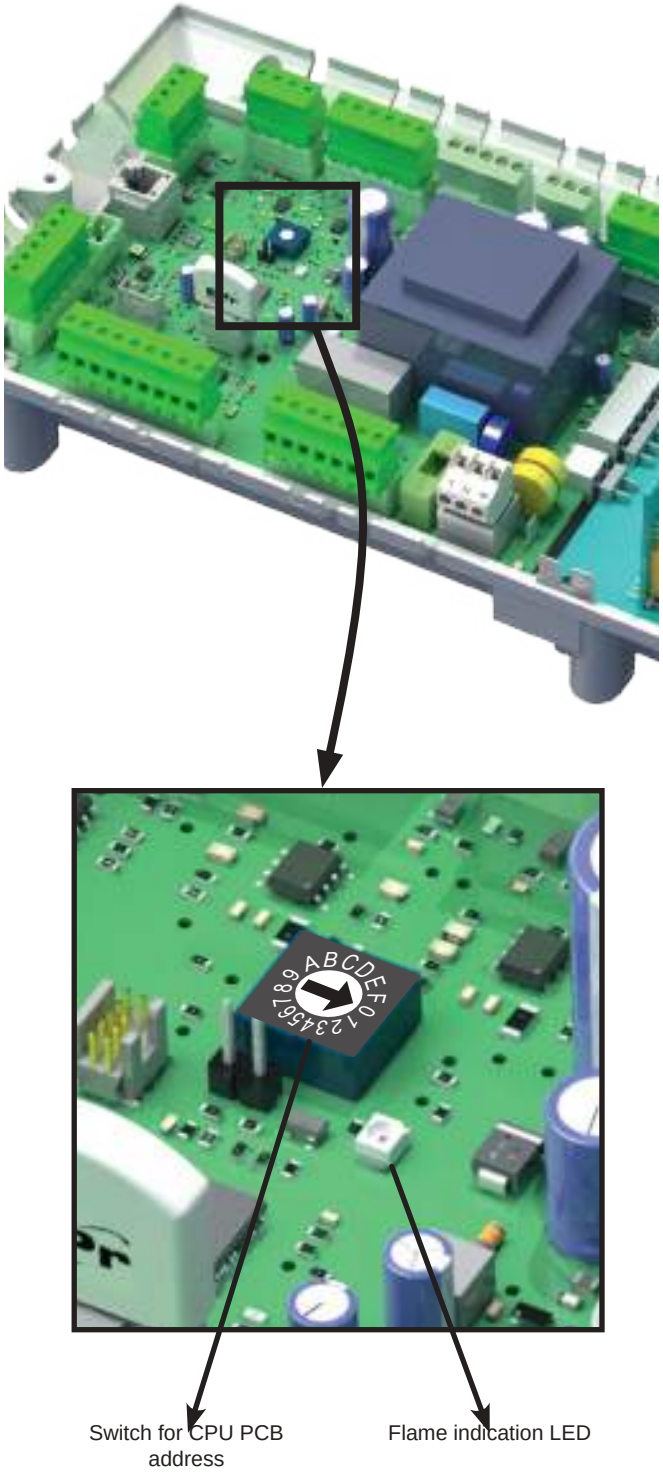
Faults are classified according to the type of error; the list and meanings of all faults are shown in the FAULT table in Paragraph 6.5 "Analysis of lockouts - faults".
If the flame monitoring equipment has locked out (codes from E10 to E22), it can be reset by using the button on the equipment itself. This lockout is shown by a LED that lights up on the equipment.

ATTENTION: The flame monitoring equipment memorises the number of manual resets that are performed during its lifetime. In case of five resets performed in a period of 15 minutes, without a flame being ignited and detected, the equipment will go into a "timed" lockout (E13). In this case, it is required to wait another 15 minutes before resetting it again. Press the reset button on the equipment to immediately reset this lockout condition.

NOTE: SHOULD THE SAFETY THERMOSTAT (STB) BE OPEN BEFORE STARTING THE START-UP CYCLE (THIS COULD BE CAUSED, FOR EXAMPLE, BY LOW TEMPERATURES), THE FLAME MONITORING EQUIPMENT WILL BE KEPT IN "STAND-BY" INDICATING LOCKOUT E22.

6.4. Flame indication LED

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

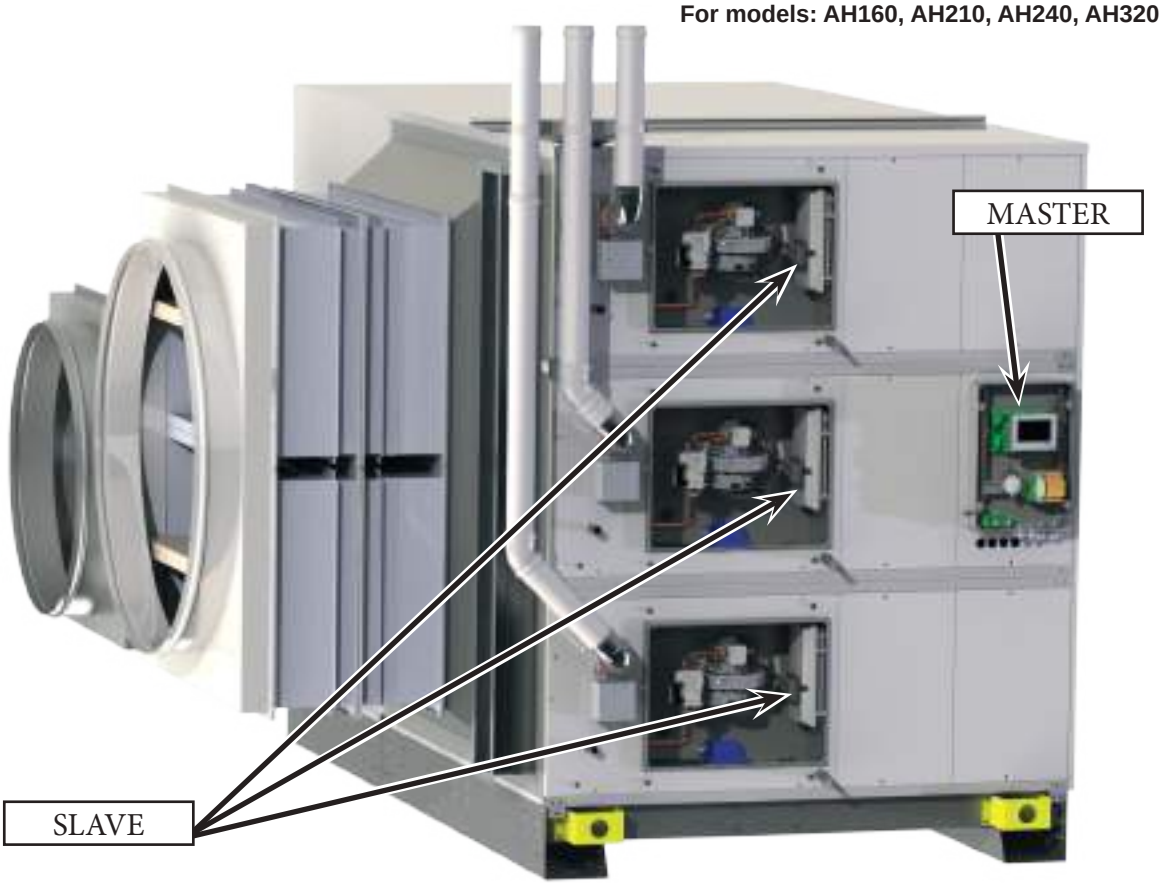


6.5. Parameters of MASTER and SLAVE modulation PCBs

In all AH machines, in addition to the CPU board fitted in each PCH module, a further CPU board is installed, named MASTER.
The CPU board fitted in the PCH housing is named SLAVE.
The AH105 models feature 1 Master board e 1 SLAVE board
The AH160-210 models feature 1 MASTER board e 2 SLAVE boards
The AH240-320 models feature 1 MASTER board e 3 SLAVE boards.
All operations for AH start/stop, heat output and fan air flow rate modulation are managed by the MASTER board together with the Smart X Web.
The SLAVE boards in the PCHs manage alarms and modulation of the single PCH, adjusting the burner power according to the flue gas temperature and the 0-10v signal received by the MASTER board.
Operation:
The Smart X Web sends an ON signal to the MASTER board with a 0-100% PID signal.
The Master board, in turn, sends (depending on the PID signal received) a 0-10v power voltage to the SLAVE board.
When voltage exceeds 1v, the PCH starts. In addition, the Master board sends a 0-10v signal to the fans proportional to the PID percentage.

For models: AH105

For models: AH160, AH210, AH240, AH320



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

Main modulation PCB configuration: **MASTER**

Parameters of CPU G26800 PCB vers. 8.02.xx

Parameter Name			TENSO	PRESSO	DESCRIPTION
Smart	LCD	U.M.			
FUNC 00	**Fnu P00**		**Equipment operation**		
TER			0		*0 = TER not present* *1 = TER present*
SMART			1		*0 = Smart not present* *1 = uses PID and ON/OFF of the SMART* *2 = uses only ON/OFF command of the Smart*
FR_C			0		Reserved - not used
PTH	P06		100		Maximum limit of PT%_OUT_BURNER OUTPUT
PTL	P07		12		Minimum limit of PT%_OUT_BURNER OUTPUT
FUNC 01	**Fnu P10**		**Burner operation (Not used on MASTER PCB)**		
REG 01	**rGL R10**		**Modulation Probe NTC Adjustment**		
REG_01	R11		1		*0 = disabled* *1 = enabled*
ST1	R12	°C	48		ST1 function setpoint
Xd1	R13	°C	5		ST1 hysteresis
Kp1		%	10		Proportional coefficient
Ki1		%	5		Integral coefficient
TH1	R16	°C	65		Fault temperature for ST1 (E51; Autoresolve with NTCx<ST1)
AC1			1		*0 = modulation only* *1 = modulation and ON/OFF*
MOD1			0		*0 = Reverse / Direct (changes according to the phase sent via modbus, heating, ventilation or conditioning)* *1 = Reverse only (for heating)* *2 = Direct only (for ventilation or conditioning)*
ING1A			1		*1 = NTC1*
REG 02	**rGL R20**		**FLUE GAS Temperature Probe NTC Adjustment (Not used on MASTER PCB)**		
REG_02	R21		0		*0 = disabled*
REG 03	**rGL R30**		**Probe NTC Control for Temperature Maintenance Function (in Ventilation mode)**		
REG_03	R31		0		*0 = disabled* *2 = enabled by the SMART request*
ST3		°C	30		ST3 function setpoint
Xd3		°C	5		ST3 hysteresis
Kp3		%	10		Proportional coefficient
Ki3		%	5		Integral coefficient
TH3		°C	65		Fault temperature for ST3 (E53; Autoresolve with NTCx<ST3)
ING3A			1		*1 = NTC1*
OUT3_A			0		*0 = disabled*
REG 04	**rGL R40**		**Modulation from 0/10 Vdc Control (Not used on MASTER PCB)**		
REG_04	R41		0		*0 = disabled*
REG 05	**rGL R50**		**Air pressure adjustment (pressostatic units or ductwork)**		
REG_05	R51		0	1	*0 = disabled* *1 = enabled for air pressure control* *2 = enabled for variable flow rate systems*
ST_Pair	R52	Pa	1	120	Setpoint for ductwork pressure
Kp_Pair		%	0	50	Proportional coefficient
Ki_Pair		%	0	20	Integral coefficient
Kd_Pair		%	0	15	Derivative coefficient

Main modulation PCB configuration: **MASTER**

Parameters of CPU G26800 PCB vers. 8.02.xx

Parameter Name			TENSO	PRESSO	DESCRIPTION
Smart	LCD	U.M.			
LI_Pair		%	0	100	Limit in percentage of integral value
ING_air_1			0	6 (B2)	Analogue input enabled
REG 06	**rGL R60**		**(Not used on AH UNITS)**		
REG_06			0		*0 = disabled*
CTRL 01	**CrL C10**		**(Not used on AH UNITS)**		
CTRL_01	C11		0		*0 = disabled*
CTRL 02	**CrL C20**		**(Not used on AH UNITS)**		
CTRL_02	C21		0		*0 = disabled*
CTRL 03	**CrL C30**		**Burner Compartment Antifreeze Control (Not used on MASTER PCB)**		
CTRL_03	C31		0		*0 = disabled*
CTRL 04	**CrL C40**		**No Voltage Control**		
CTRL_04	C41		1		*0 = disabled* *1 = enabled*
T4_V	C42	sec	45		Time in seconds of post-ventilation
CTRL 05	**CrL C50**		**Remote Reset Control from Digital Input**		
CTRL_05	C51		0		*0 = disabled* *1 = enabled*
ING05	C52		0		Digital input enabled as RESET
CTRL 06	**CrL C60**		**Remote alarm or flame presence signal control**		
CTRL_06	C61		0		*0 = disabled* *1 = enabled as lockout signal* *2 = enabled as flame signal*
OUT06	C62		0		Digital output enabled
CTRL 07	**CrL C70**		**Summer ventilation control from digital input**		
CTRL_07	C71		0		*0 = disabled* *1 = enabled*
ING07	C72		0		Digital input enabled
CTRL 08	**CrL C80**		**Counter and reset control**		
HOURS	C81		1		Burner operating hours counter
CYCLES	C82		1		Ignition cycles counter
FAULT			1		Fault counter
RESET	C84		0		*1 = PCB fault reset*
CTRL 09	**CrL C90**		**AIR FILTER Control**		
CTRL_09			0		*0 = disabled* *1 = enabled as ON/OFF pressure switch* *2 = enabled as pressure transducer*
ST_FLT			100	0	Preventive alarm setpoint (E71); value in Pa
TH_FLT			150	0	Triggering alarm setpoint (E72); value in Pa
ING_FLT			6 (B2)	0	Analogue or digital inputs
FUNC 02	**Fnu P20**		**MASTER PCB MANAGEMENT**		
FN_02			1		*0 = disabled* *1 = enabled as Two-Stage or Modulating*
DT2		%	0.1		Not used on AH
OUT2A			0		Not used on AH
OUT2B			0		Not used on AH
OUT2C			4 (Y3)		Analogue output enabled for sending PWM % signal
TSV2		sec	30		Not used on AH
FUNC_03	**Fnu-P30**		**Ventilation Management Function (EC-AC Fans)**		
FN_03	P31		1	0	*0 = disabled* *1 = proportional POT%_OUT enabled* *2 = proportional enabled to PID%_PRESS, value of REG_04_05* *3 = start and modulation with temperatures TIN3, TFN3 and TCD3* *4 = proportionally enabled to analogue input ING3A*
T_ON	P32	sec	60	0	Seconds of delay for fan start
T_OFF	P33	sec	150	0	Seconds of delay for fan stop

Main modulation PCB configuration: **MASTER**

Parameters of CPU G26800 PCB vers. 8.02.xx

Parameter Name			TENSO	PRESSO	DESCRIPTION
Smart	LCD	U.M.			
OUT3A			0		Digital output enabled for main fan
OUT3B			3 (Y2)	0	Analogue output enabled for main fan
ING3A			0		Reference analogue input
TIN3	P37	°C	35		Heating fan ON temperature
TFN3	P38	°C	65		Temperature for output linearisation
TCD3	P39	°C	20		Conditioning fan ON temperature
FUNC_04	**Fnu-P40**		**Ventilation Function**		
FN_04	P41		0	1	*0 = disabled* *1 = enabled for fan pressure control*
OUT4A			0	3 (Y2)	Analogue output enabled for main fan
OUT4B			0	1 (Y0)	Analogue output enabled for recirculation shutter
OUT4C			0	6 (Q2)	Digital output enabled for switching from AIR (0) to HEAT (1)
SHUTT%			0	100	Opening % of recirculation shutter in maintenance phase
T_ON	P45	sec	0	60	Delay time for switching from Maintenance to Heating
T_OFF	P46	sec	0	120	Delay time for switching from Heating to Maintenance
FUNC_05	**Fnu-P50**		**(Not used on AH UNITS)**		
S5	P51		0		*0 = disabled*
FUNC_08	**Fnu-P80**		**Damper Management Function**		
FN08	P81		1	0	*0 = disabled* *1 = ON/OFF enabled* *2 = modulation enabled*
FSER08	P82		30	0	External damper opening percentage
OUT08A	P83		8 (LBW)	0	Analogue or digital output enabled for shutter
FUNC_10	**Fnu-PA0**		**(Not used on AH UNITS)**		
FN_10			0		*0 = disabled*
	rtu		**RS485 Serial Communication Configurations**		
D_SL	SSL		0		*0 = baud rate 19,200 - Even Parity*
			NTC input configuration		
NTC1			1		*0 = NTC1 input enabled* *1 = NTC1 input disabled*
NTC2			0		*0 = NTC2 input enabled* *1 = NTC2 input disabled*
NTC3			0		*0 = NTC3 input enabled* *1 = NTC3 input disabled*
			B0 Input Configurations		
B0			1		*0 = disabled* *1= enabled as analogue input*
			B1 Input Configurations		
B1			0		*0 = disabled* *1= enabled as analogue input*
XA1			0		X-axis minimum value – minimum input voltage
XB1			9.99		X-axis maximum value – maximum input voltage
YA1			0		Y-axis minimum value – minimum magnitude value
YB1			9.99		Y-axis maximum value – maximum magnitude value
CV1			1		Coefficient for PRØ displaying; value displayed on Smart and used for controls
UM1			8		*1=°C; 2=bar; 3=mbar; 4=Pa; 5=%; 6=l/h; 7=mc/h; 8= V*
			B2 Input Configurations (Filter Pressure for TENSO of Air pressure for PRESSO)		
B2			1	1	*0 = disabled* *1= enabled as analogue input*
XA2			0.5	0.5	*X-axis minimum value – minimum input voltage*
XB2			4.5	4.5	*X-axis maximum value – maximum input voltage*
YA2			0	0	*Y-axis minimum value – minimum magnitude value*
YB2			9.99	9.99	*Y-axis maximum value – maximum magnitude value*

Main modulation PCB configuration: **MASTER**

Parameters of CPU G26800 PCB vers. 8.02.xx

Parameter Name			TENSO	PRESSO	DESCRIPTION
Smart	LCD	U.M.			
CV2			1	1	Coefficient for PRØ displaying; value displayed on Smart and used for controls
UM2			4	4	*1=°C; 2=bar; 3=mbar; 4=Pa; 5=%; 6=l/h; 7=mc/h; 8= V*
			(Not used on AH UNITS)		
B3			0		*0=disabled*
			Digital Input Configurations		
ID1			0		*0 = disabled* *1 = N.C. input with manual reset (Fault with input Open)* *2 = N.C. input with autoresolve (Fault with input Open)* *3 = N.O. input with autoresolve (Fault with input Closed)* *4 = N.O. input without alarm signalling*
TD1			0		*Alarm triggering or function enabling delay time*
ID2			0		See par. ID1
TD2			0		*Alarm triggering or function enabling delay time*
ID3			0		See par. ID1
TD3			0		*Alarm triggering or function enabling delay time*
			Y0 Analogue Output Configuration		
YM0			1		*0 = direct (maximum calculation value (100%) = maximum output value)* *1 = Reverse (maximum calculation value (100%) = minimum output value)*
YL0			1		*Minimum voltage (or PWM in %) output value*
YH0			9,5		*Maximum voltage (or PWM in %) output value*
YF0			4		*Fixed voltage or % output value (forced by program)*
YT0			3		*Voltage increase/decrease (or in %) every second*
YN0			0		*0 = linear output value between YLx and YHx* *1 = output values limited to YLx and YHx (for values < YLx the output is YLx, for values > YHx the output is YHx)*
			Y1 Analogue Output Configuration		
YM1			0		See par. YM0
YL1			0		See par. YL0
YH1			10		See par. YH0
YF1			10		See par. YF0
YT1			1		See par. YT0
YN1			0		See par. YN0
			Y2 Analogue Output Configuration		
YM2			0		See par. YM0
YL2			6	2	See par. YL0
YH2			10		See par. YH0
YF2			8		See par. YF0
YT2			1		See par. YT0
YN2			0		See par. YN0
			Y3 Analogue Output Configuration		
YM3			0		See par. YM0
YL3			2		See par. YL0
YH3			10		See par. YH0
YF3			4		See par. YF0
YT3			1		See par. YT0
YN3			0		See par. YN0

Secondary modulation PCB (PCH) configuration: **SLAVE**

Parameters of CPU G26800 PCB vers. 8.01.xx

Parameter Name			AH160 AH240	AH105 AH210 AH320	DESCRIPTION
Smart	LCD	U.M.			
FUNC 00	**Fnu P00**		**Equipment operation**		
TER			1		*1 = TER present*
SMART			0		*0 = Smart not present*
FR_C			0		Reserved - not used
PTH	P06		100		Maximum limit of PT%_OUT_BURNER OUTPUT
PTL	P07		0		Minimum limit of PT%_OUT_BURNER OUTPUT
FUNC 01	**Fnu P10**		**Burner operation (Not used on MASTER PCB)**		
b1	P11	rpm	172	195	Motor RPM MIN value (Y0): 90÷999 (1=10 RPM)
b2	P12	rpm	655	635	Motor RPM MAX value (Y0): 90÷999 (1=10RPM)
b3	P13	rpm	355	240	Motor RPM START-UP value (Y0): 90÷999 (1=10RPM)
b4	P14		2		TACH signal divider
b5	P15	rpm	50		Error E3x; no. of revolutions x10 (50=500rpm): 0÷999
b6	P16	sec	20		Error E3x; error dwell time before fault F3x: 0÷999
b7	P17	sec	15		Pre-cleaning time with maximum output
b8	P18	sec	10		Flame stabilisation time (ignition)
b9	P19	%	45		Proportional factor value (kp_pwm) for PWM1 calculation
b10	P1A	%	20		Integral factor value (ki_pwm) for PWM1 calculation
b11	P1B	sec	90		Combustion chamber post-washing time
b12		sec	0		Flame monitoring equipment ON delay time (TER)
b13		kW	16 (1)	21 (1)	MIN heat input value
b14		kW	82 (1)(4)	100 (1)(3)	MAX heat input value
REG 01	**rGL R10**		**Modulation Probe NTC Adjustment (Not used on SLAVE PCB)**		
REG_01			1		*1 = enabled*
ST1	R12	°C	55		ST1 function setpoint
Xd1	R13	°C	5		ST1 hysteresis
Kp1		%	10		Proportional coefficient
Ki1		%	5		Integral coefficient
TH1	R16	°C	65		Fault temperature for ST1 (E51; Autoresolve with NTCx<ST1)
AC1			1		*1 = modulation and ON/OFF*
MOD1			1		*1 = Reverse only (for heating)*
ING1A			1		*1 = NTC1*
REG 02	**rGL R20**		**FLUE GAS Temperature Probe NTC Adjustment**		
REG_02			1		*1 = enabled*
ST2	R12	°C	75		ST2 function setpoint
Xd2	R13	°C	5		ST2 hysteresis
Kp2		%	25		Proportional coefficient
Ki2		%	10		Integral coefficient
TH2	R16	°C	85		Fault temperature for ST2 (E52; Autoresolve with NTCx<ST2)
AC2			1		*1 = modulation and ON/OFF*
MOD2			1		*1 = Reverse only (for heating)*
ING2A			2		*2 = NTC2*
REG 03	**rGL R30**		**Probe NTC Control (Not used on SLAVE PCB)**		
REG_03			0		*0 = disabled*
REG 04	**rGL R40**		**Modulation from 0/10 Vdc Control**		
REG_04	R41		2		*2 = enabled as modulation and burner ON/OFF*
V4_OFF	R42	V	0.5		Voltage value for burner OFF
V4_DIF	R43	V	0.5		Differential for burner ON
T4_ON	R44	sec	5		Signal dwell time for ON
T4_OFF	R45	sec	5		OFF signal dwell time
ING4A	R46		5		Defines the analogue input to be used for calculation

Secondary modulation PCB (PCH) configuration: **SLAVE**

Parameters of CPU G26800 PCB vers. 8.01.xx

Parameter Name			AH160 AH240	AH105 AH210 AH320	DESCRIPTION
Smart	LCD	U.M.			
REG 05	**rGL R50**		**Air Pressure Adjustment (Not used on SLAVE PCB)**		
REG_05			0		*0 = disabled*
REG 06	**rGL R60**		**(Not used on AH UNITS)**		
REG_06			0		*0 = disabled*
CTRL 01	**CrL C10**		**(Not used on AH UNITS)**		
CTRL_01	C11		0		*0 = disabled*
CTRL 02	**CrL C20**		**(Not used on AH UNITS)**		
CTRL_02	C21		0		*0 = disabled*
CTRL 03	**CrL C30**		**Burner Compartment Antifreeze Control**		
CTRL_03	C31		0		*0 = disabled*
ST_Van	C32	°C	0		Burner compartment antifreeze setpoint
P3	C33	°C	2		Hysteresis on antifreeze setpoint
ING_Van	C34		0		Compartment temperature analogue input
OUT_Van	C35		8		Digital output for resistance control
CTRL 04	**CrL C40**		**No Voltage Control**		
CTRL_04	C41		1		*1 = enabled*
T4_V	C42	sec	45		Time in seconds of post-ventilation
CTRL 05	**CrL C50**		**Remote Reset Control from Digital Input**		
CTRL_05	C51		0		*0 = disabled*
ING05	C52		0		Digital input enabled as RESET
CTRL 06	**CrL C60**		**Remote alarm or flame presence signal control**		
CTRL_06	C61		1		*1 = enabled as lockout signal*
OUT06	C62		5 (Q1)		Digital output enabled
CTRL 07	**CrL C70**		**Summer ventilation control from digital input**		
CTRL_07	C71		0		*0 = disabled*
ING07	C72		0		Digital input enabled
CTRL 08	**CrL C80**		**Counter and reset control**		
HOURS	C81		1		Burner operating hours counter
CYCLES	C82		1		Ignition cycles counter
FAULT			1		Fault counter
RESET	C84		0		*1 = PCB fault reset*
CTRL 09	**CrL C90**		**AIR FILTER Control (Not used on SLAVE PCB)**		
CTRL_09			0		*0 = disabled*
FUNC 02	**Fnu P20**		**MASTER PCB MANAGEMENT (Not used on SLAVE PCB)**		
FN_02			0		*0 = disabled*
FUNC_03	**Fnu-P30**		**Ventilation Management Function (EC-AC Fans) (Not used on SLAVE PCB)**		
FN_03			0		*0 = disabled*
FUNC_04	**Fnu-P40**		**Ventilation Function**		
FN_04			0		*0 = disabled*
FUNC_05	**Fnu-P50**		**(Not used on AH UNITS)**		
S5			0		*0 = disabled*
FUNC_08	**Fnu-P80**		**Damper Management Function**		
FN08			0		*0 = disabled*
FUNC_10	**Fnu-PA0**		**(Not used on AH UNITS)**		
FN_10			0		*0 = disabled*
	rtu		**RS485 Serial Communication Configurations**		
D_SL	SSL		0		*0 = baud rate 19,200 - Even Parity*
			NTC input configuration		
NTC1			1		*1 = NTC1 input disabled*
NTC2			1		*1 = NTC2 input disabled*
NTC3			0		*0 = NTC3 input enabled*

Secondary modulation PCB (PCH) configuration: **SLAVE**

Parameters of CPU G26800 PCB vers. 8.01.xx					
Parameter Name			AH160 AH240	AH105 AH210 AH320	DESCRIPTION
Smart	LCD	U.M.			
			B0 Input Configurations		
B0			1		*1= enabled as analogue input*
			B1 Input Configurations		
B1			1		*1= enabled as analogue input*
XA1			0		X-axis minimum value – minimum input voltage
XB1			9.99		X-axis maximum value – maximum input voltage
YA1			0		Y-axis minimum value – minimum magnitude value
YB1			9.99		Y-axis maximum value – maximum magnitude value
CV1			0.01		Coefficient for PRØ displaying; value displayed on Smart and used for controls
UM1			8		*1=°C; 2=bar; 3=mbar; 4=Pa; 5=%; 6=l/h; 7=mc/h; 8= V*
			B2 Input Configurations (Not used on SLAVE PCB)		
B2			0		*0 = disabled*
			(Not used on AH UNITS)		
B3			0		*0 = disabled*
			Digital Input Configurations		
ID1			0		*0 = disabled*
TD1			0		*Alarm triggering or function enabling delay time*
ID2			0		See par. ID1
TD2			0		*Alarm triggering or function enabling delay time*
ID3			0		See par. ID1
TD3			0		*Alarm triggering or function enabling delay time*
			Y0 Analogue Output Configuration		
YM0			1		*1 = Reverse (maximum calculation value (100%) = minimum output value)*
YL0			0		*Minimum voltage (or PWM in %) output value*
YH0			100		*Maximum voltage (or PWM in %) output value*
YF0			40		*Fixed voltage or % output value (forced by program)*
YT0			100		*Voltage increase/decrease (or in %) every second*
YN0			0		*0 = linear output value between YLx and YHx*
			Y1 Analogue Output Configuration (Not Used on SLAVE PCB)		
			Y2 Analogue Output Configuration (Not Used on SLAVE PCB)		
			Y3 Analogue Output Configuration (Not Used on SLAVE PCB)		

6.6. Analysis of lockouts- faults

The CPU-SMART manages two types of lockouts:
- preventive, it warns the customer that the AH heaters require maintenance;
- operational, it stops the AH air heating unit for safety reasons or to ensure its correct operation.

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

CODE	DESCRIPTION	CAUSE	RESET
Flame Safety Alarms - Caused by the flame monitoring equipment (TER)			
E10	Failure to ignite the burner after 4 attempts performed by the equipment.	• No gas • Phase and neutral reversed; • Earth wire not connected; • Phase-Phase connection without neutral; • Ignition electrode failed or badly positioned; • Detection electrode failed or badly positioned; • Detection electrode that moves or disperses to the earthing system when hot; • Low CO2 value; • Gas supply pressure too high (>60mbar)	Manual
E11	Untimely (parasitic) flame. The equipment detects a flame presence signal with burner off	• Loss of insulation of TER equipment; • Loss of insulation of the detection cable or electrode	Manual
E12	Ignition failure; not visible. The count, displayed in the event log, indicates problems with ignition	Check the causes as indicated in fault E10	
E13	TER equipment does not accept the reset from CPU (max 5 reset attempts in 15 minutes)	Check the causes as indicated in fault E10. Disconnect and restore power supply	Manual
E14	Lack of communication between TER equipment and CPU for more than 60 seconds	• TER equipment or CPU PCB fault; • Connections on the STB thermostat to earth; • Capillary of the STB thermostat that discharges on the earth faston of the thermostat body	Autoresolve
E15	The flame monitoring equipment (TER) does not reach the "Running" status after 300 seconds from the heat request by the CPU	• Faulty TER equipment; • No gas or wrong burner adjustment; • Insufficient gas pressure; • Total or partial obstruction of the fume outlet	Manual or Autoreset (every 5')
E16	General lockout of the flame monitoring equipment (TER)	• Reports a safety burner switching off following uninterrupted operation >24h; • Faulty TER equipment	Manual or Autoreset (every 5')
E17	Internal fault of TER equipment, that does not accept reset command from CPU	Faulty TER equipment	Manual or Autoreset (every 5')
E18	Flame loss with TER equipment in running phase. The count, which can be displayed in the event log, indicates that the burner will turn off after flame stabilisation time or when the maximum Heat Input is reached	• Reduced gas flow rate on the line or excessive pipeline heat loss; • Incorrect burner setting (CO2 too low)	
Alarms for safety device activation			
E20	Activation of safety thermostat STB	• Excess air temperature due to lack of air circulation/ flow; • Safety thermostat broken or not connected	Manual
E22	STB safety thermostat activation in ignition phase	• Frost or temperature below -20°C; • Safety thermostat or flue gas thermostat broken or not connected	Autoresolve
E24	ID4 input alarm	• ID4 - ID5 (CN02) input open • no jumper	Autoresolve
E25	ID5 input alarm	• ID5 - IDC (CN02) input open • Fire damper activation	Autoresolve
Flue Gas Fan Fault Alarms (VAG)			

CODE	DESCRIPTION	CAUSE	RESET
E30	No flue gas fan (VAG) start-up or speed too low in start-up phase	• Flue gas fan (VAG) power supply interrupted; • Flue gas fan (VAG) fault; • CPU PCB fault. • To check possible CPU failure, disconnect 4-wire connector (PWM) from flue gas fan (VAG) and check ABSENCE of voltage between GND-Y0 (HALL) and B0-Y0 contacts of terminal board CN03. The presence of voltage indicates a failure of the CPU PCB	Manual
E31	Flue gas fan speed (VAG) too high in stand-by phase	Check the causes as indicated in fault E30	Manual
E32	Flue gas fan speed (VAG), during operation, outside minimum and maximum set parameters	• VAG electric cables interrupted, not connected or wrongly connected; • Flue gas fan (VAG) fault	Manual or Autoreset (every 5')
		Digital input alarms	
E36	ID1 input alarm	Programming error of par. ID1. Set par. ID1=0 (if not used for connection with remote controls) or ID1=4	Manual or Autoresolve
E37	ID2 input alarm	Programming error of par. ID2. Set par. ID2=0 (if not used for connection with remote controls) or ID2=4	Manual or Autoresolve
E38	ID3 input alarm	• Clogged condensate drain (ice or impurities) - clean siphon and/or exhaust duct; • Condensate detection electrode grounded or faulty	Manual or Autoresolve
		Alarms of analogue inputs and NTC probes	
E41	NTC1 probe error	No signal from NTC probe or faulty NTC probe	Autoresolve
E42	NTC2 probe error	No signal from NTC probe or faulty NTC probe	Autoresolve
E49	Pressure probe error, air or filters, faulty	No probe signal or faulty probe (Input signal B2 < 0.3 Vdc)	Autoresolve
		Overtemperature Alarms	
E51	NTC1 probe temperature > TH1	• Air flow rate insufficient; • Cooling fan(s) inoperative; • Wrong parameter TH1 adjustment	Autoresolve with NTC1< ST1
E52	NTC2 probe temperature > TH2	• Air flow rate insufficient; • Cooling fan(s) inoperative; • Wrong parameter TH2 adjustment	Autoresolve with NTC2 < ST2
		Modbus communication alarms	
E60	Modbus Slave serial network communication error (CN04)	• Modbus serial network disconnected; • CPU PCB address wrong and/or not configured	Autoresolve
		Voltage failure alarms	
E75	No voltage during operating cycle (excluding standby); fault is not visible on remote control but only counted	No voltage during operation	
E80	Pressure gauge error	Programming error of par. CTRL_01. Set par. CTRL_01=0	
E81	Pressure less than ST_H2O setpoint	Check the causes as indicated in fault E80	
E82	Pressure higher than TH_H2O limit	Check the causes as indicated in fault E80	
		Parameter configuration error alarms	
E98	Input configuration error	No input enabling for functions or controls (e.g. no activation of NTC1 input combined with REG_01)	Autoresolve
E99	Function configuration error	No activation of compulsory functions for the product type (e.g. no activation of CTRL_04 for product type "PCH")	Autoresolve
E100 (CPU)	Eeprom access error	Eeprom missing or inserted in the opposite direction	Autoresolve
E101 (EPr)	Eeprom data error	Eeprom removed during operation or damaged	Autoresolve

6.7. Country Table - Gas Category

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

The following information is clearly printed on the 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:

- AH105IT 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:

- AH105FR xxx**0** 0 indicates that the equipment has been tested and set up for natural gas [G20];
- AH105MT-xxx**1** 1 indicates that the equipment has been tested and set up for LPG [G31];
- AH105NL-xxx**2** 2 indicates that the equipment has been tested and set up for 'L' [G25] or 'K' [G25.3] natural gas;
- AH105HU xxx**3** 3 indicates that the equipment has been tested and set up for natural gas [G25.1];
- AH105PL 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.

6.8. Gas Settings Table

TYPE OF GAS G20 - Cat. E-H											
TYPE OF MACHINE		AH105		AH160		AH210		AH240		AH320	
Output		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]	1 x 0.7		2 x 0.7		2 x 0.7		3 x 0.7		3 x 0.7	
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	2.22	10.58	1.74	17.36	2.22	21.16	1.74	26.04	2.22	31.74
CARBON DIOXIDE -CO_2 CONTENT	[%]	8.5	9.1	8.7	9.1	8.5	9.1	8.7	9.1	8.5	9.1
FLUE GAS TEMPERATURE	[°C]	28	80	26	70	28	80	26	70	28	80
FLUE GAS MASS FLOW RATE (MAX.)	[kg/h]	165		270		330		405		495	
GAS ORIFICE PLATE	[mm]	1 x 15.8		2 x 9.8		2 x 15.8		3 x 9.8		3 x 15.8	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required	
* For Hungary, supply pressure is 25 mbar											

TYPE OF GAS G25 - Cat. LL											
TYPE OF MACHINE		AH105		AH160		AH210		AH240		AH320	
Output		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]	1 x 0.7		2 x 0.7		2 x 0.7		3 x 0.7		3 x 0.7	
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	2.21	12.30	2.02	20.20	2.21	24.60	2.02	30.3	2.21	36.90
CARBON DIOXIDE -CO_2 CONTENT	[%]	8.8	9	8.6	9.1	8.8	9	8.6	9.1	8.8	9
FLUE GAS TEMPERATURE	[°C]	28	80	26	70	28	80	26	70	28	80
GAS ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required	
* For Germany, supply pressure is 20 mbar											

TYPE OF GAS G25.3 - Cat. K (Only the Netherlands)											
TYPE OF MACHINE		AH105		AH160		AH210		AH240		AH320	
Output		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]	1 x 0.7		2 x 0.7		2 x 0.7		3 x 0.7		3 x 0.7	
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	2.53	12.03	1.97	19.74	2.53	24.06	1.97	29.61	2.53	36.09
CARBON DIOXIDE -CO_2 CONTENT	[%]	8.8	9.4	8.7	9.1	8.8	9.4	8.7	9.1	8.8	9.4
FLUE GAS TEMPERATURE	[°C]	28	80	26	70	28	80	26	70	28	80
GAS ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required	
* For Germany, supply pressure is 20 mbar											

TYPE OF GAS G25.1 - Cat. S (Only for HU-Hungary)											
TYPE OF MACHINE		AH105(1)		AH160		AH210 (2)		AH240		AH320 (3)	
Output		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]	1 x 0.7		2 x 0.7		2 x 0.7		3 x 0.7		3 x 0.7	
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	2.21	12.29	2.01	20.2	2.21	24.58	2.01	30.3	2.21	36.87
CARBON DIOXIDE -CO_2 CONTENT	[%]	9.4	9.6	9.8	10.3	9.4	9.6	9.8	10.3	9.4	9.6
FLUE GAS TEMPERATURE	[°C]	28	80	26	70	28	80	26	70	28	80
GAS ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required	

(1) Maximum rated heat input 94.0 kW
(2) Maximum rated heat input 188.0 kW
(3) Maximum rated heat input 282.0 kW

TYPE OF GAS G27 - Cat. Lw [former GZ41.5] (Only for PL-Poland)											
TYPE OF MACHINE		AH105(1)		AH160(2)		AH210(3)		AH240(4)		AH320(5)	
Output		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]	1 x 0.7		2 x 0.7		2 x 0.7		3 x 0.7		3 x 0.7	
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	2.50	11.90	1.95	19.52	2.50	23.80	1.95	29.28	2.50	35.70
CARBON DIOXIDE -CO_2 CONTENT	[%]	8.5	8.7	8.7	9.1	8.5	8.7	8.7	9.1	8.5	8.7
FLUE GAS TEMPERATURE	[°C]	28	74	26	67	28	74	26	67	28	74
GAS ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required	
AIR ORIFICE PLATE	[mm]	Not required		1 x 30.5		Not required		3 x 30.5		Not required	

(1) Maximum rated heat input 94 kW
(2) Maximum rated heat input 150 kW
(3) Maximum rated heat input 188 kW
(4) Maximum rated heat input 225 kW
(5) Maximum rated heat input 282 kW

TYPE OF GAS G30 - Cat. 3B-P											
TYPE OF MACHINE		AH105(1)		AH160(2)		AH210(3)		AH240(2)		AH320(3)	
Output		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]	1 x 0.51		2 x 0.51		2 x 0.51		3 x 0.51		3 x 0.51	
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	1.70	8.30	1.49	13.60	1.70	16.60	1.49	20.40	1.70	24.90
CARBON DIOXIDE -CO_2 CONTENT	[%]	10.4	10.6	10.1	10.3	10.4	10.6	10.1	10.3	10.4	10.6
FLUE GAS TEMPERATURE	[°C]	28	80	26.5	70	28	80	26.5	70	28	80
GAS ORIFICE PLATE	[mm]	1 x 9.3		2 x 7.0		2 x 9.3		3 x 7.0		3 x 9.3	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required	
(1) Minimum rated heat input 24 kW (2) Minimum rated heat input 18 kW (3) Minimum rated heat input 24 kW											

TYPE OF GAS G31 - Cat. 3P											
TYPE OF MACHINE		AH105		AH160		AH210		AH240		AH320	
Output		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]	1 x 0.51		2 x 0.51		2 x 0.51		3 x 0.51		3 x 0.51	
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	1.47	8.18	1.34	13.40	1.47	16.36	1.34	20.10	1.47	24.54
CARBON DIOXIDE -CO_2 CONTENT	[%]	9.5	9.8	9.3	9.6	9.5	9.8	9.3	9.6	9.5	9.8
FLUE GAS TEMPERATURE	[°C]	28	80	26.5	70	28	80	26.5	70	28	80
FLUE GAS MASS FLOW RATE (MAX.)	[kg/h]	130		214		260		321		390	
GAS ORIFICE PLATE	[mm]	1 x 9.3		2 x 7.0		2 x 9.3		3 x 7.0		3 x 9.3	
AIR ORIFICE PLATE	[mm]	Not required		Not required		Not required		Not required		Not required	

6.9. Starting up for the first time

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

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

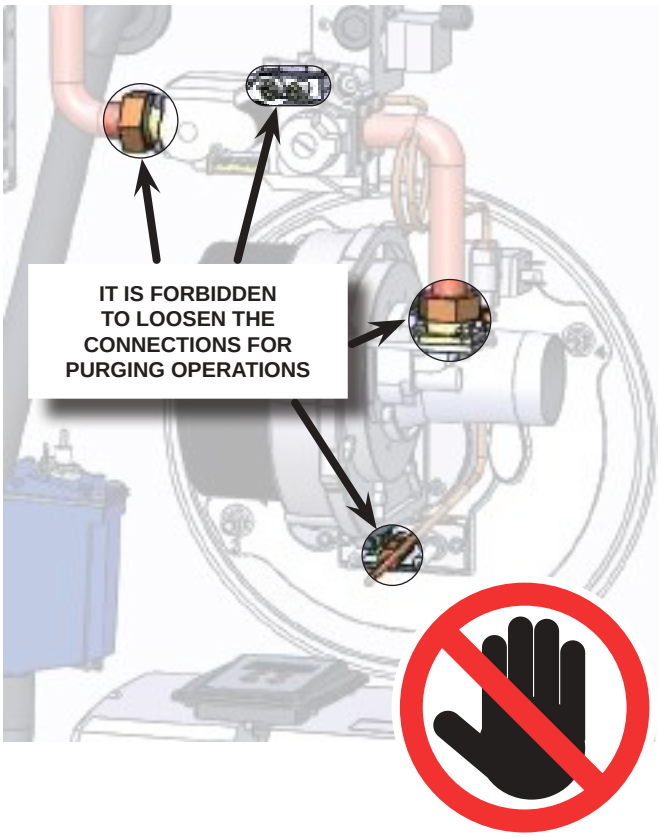
To turn on the heater, follow the instructions below:

- Check that the display shows RDY; if OFF is displayed instead, work on the control Smart X Web to set the device to ON**;**
- Check that the An1 value is higher than the Von = R42+R43 value on the LCD screen.

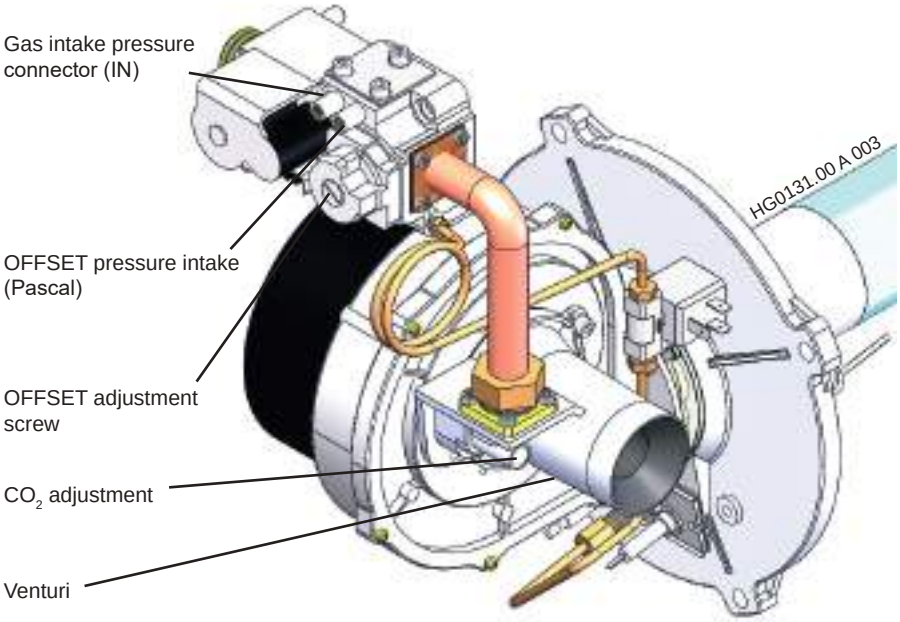
When HEA appears on the LCD display, the heater starts the ignition cycle.

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

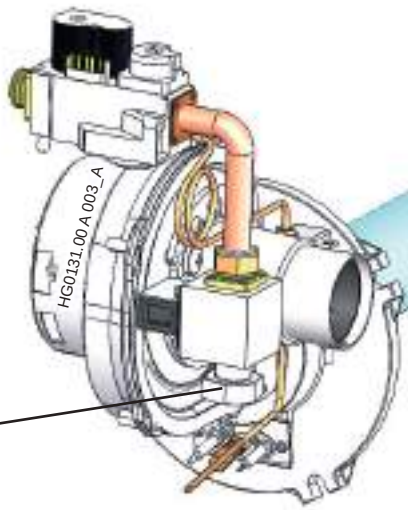
ATTENTION: IT IS FORBIDDEN to loosen the gas connections, the pressure connectors, the pilot burner duct, or any other gas connection point located inside the burner housing, to purge the air or inert gas that may be present inside the main feeding piping. The purging of air or inert gas from gas feeding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



For models: AH160, AH240



For models: AH105, AH210, AH320



6.10. Analysis of combustion

Wait until the heater is switched on and reaches the maximum output:

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

At maximum output, check again that the input pressure in the valve corresponds to the value required; adjust if necessary.
Perform the combustion analysis to verify that the level of CO_2 corresponds to the figures in the tables in Paragraph 5.7 "GAS Connection".
If the measured value is different, turn the adjustment screw on the Venturi pipe. Loosening the screw will increase the CO_2 level, screwing it down will decrease the level.
Set the heater to minimum output, and verify that the level of CO_2 corresponds to the figures in the tables in Paragraph 5.7 "GAS Connection". If the values do not match, screw or loosen the offset screw respectively to increase or decrease the CO_2 level and repeat the procedure.

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

6.11. Conversion to LPG

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

The unit is supplied already set for natural gas and equipped with the kit for conversion to LPG, which comprises:

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

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

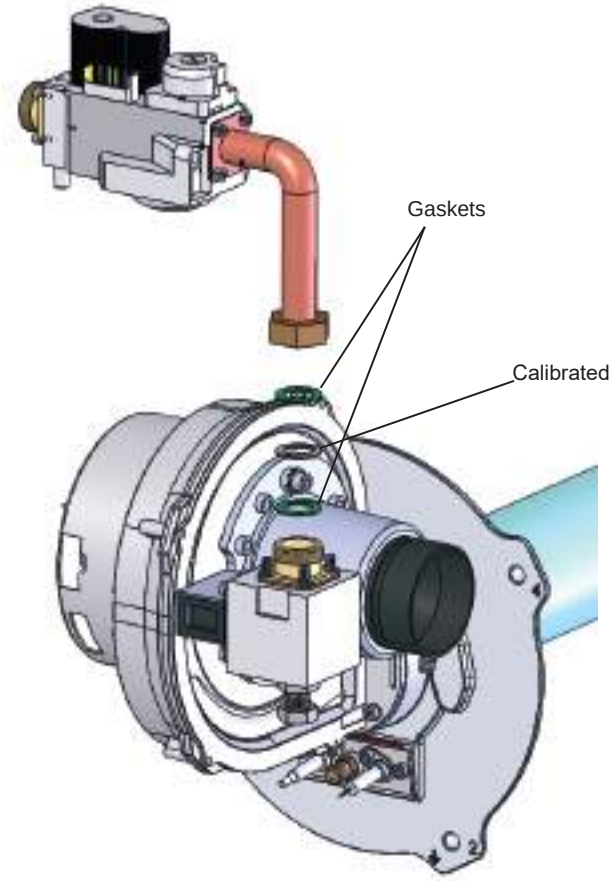
- disconnect from power supply;
- between the gas pipe and the Venturi, replace the gas orifice plate fitted (natural gas) with the one supplied with the kit (for LPG);
- replace the pilot nozzle (natural gas) with the one in the kit (LPG);
- restore power supply and set the heater up for ignition;
- while the start-up electrode is sparking, make sure there are no gas leaks.

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

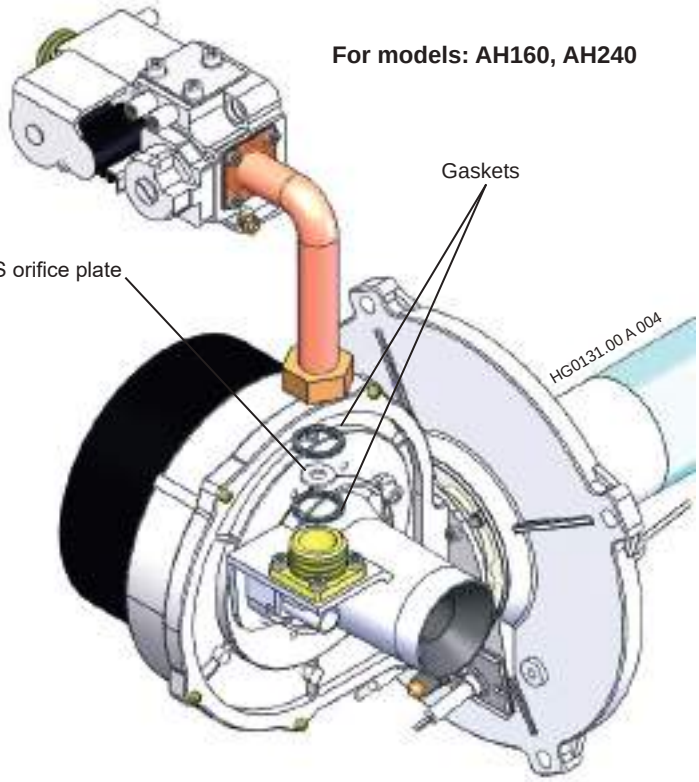
- the valve intake pressure corresponds to the value required for the type of gas that you are using;
- the combustion analysis procedure is performed as described in Paragraph 6.10 "Combustion Analysis";
- the level of CO_2 is within the limits indicated for the type of gas being used (tables in Paragraph 5.7 "GAS connection"). If a different value is detected, change it by turning the adjustment screw: screwing it down decreases the CO_2 level, loosening it increases the level.
- that the gas valve Venturi pipe connector does not leak.

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

For models: AH105, AH210, AH320



For models: AH160, AH240



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

Conversion for gasses from G20 to G25 or G25.1 or G25.3 or G27 is allowed only in countries of category II2ELL3B/P [Germany], II2Esi3P [France], II2E3P [Luxembourg] and category II2HS3B/P [Hungary] and category II2ELwLs3B/P [Poland]. For countries in category II2EK3B/P [Netherlands from 01/01/2018] the unit is supplied already set up and regulated for G25.3.
For category I2E countries, where conversion from G20 to G25 is not permitted [Belgium], the unit is supplied set for operation with G20 gas.
Conversion from one type of gas to another can only be performed by authorised service centres.
Conversion to G25 and/or G25.1, G25.3, G27 where possible, consists in:

- insertion of orifice plate (according to the gas type and the equipment model)

After the conversion, relight the burner and:

- check that the intake pressure to the gas valve corresponds to the level required for the type of gas [see tables in Paragraph 6.8 "GAS Connection Tables"];
- check that the level of CO_2, at maximum and minimum heat output, is between the values indicated for the type of gas. If the value is different, change it by turning the adjustment screw on the Venturi pipe: screwing it down decreases the value, loosening it increases the value.

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

NOTE: Always pay close attention to the level of CO_2 in G25.1; for G25.1 minimum and maximum heat output in the AH105, AH210 and AH420 models will always be lower than when used with G20.

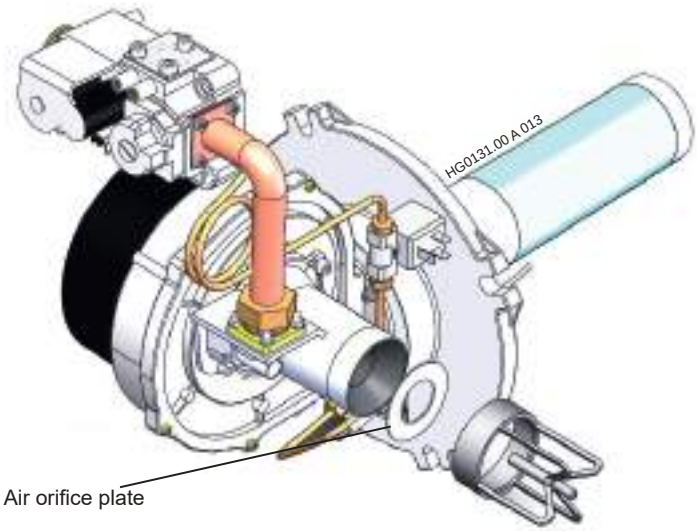
NOTE: The conversion kit to G25 , G25.1 and G27 is only supplied on request. The conversion kit to G25 is included in the standard supply for France, Germany and Luxembourg.

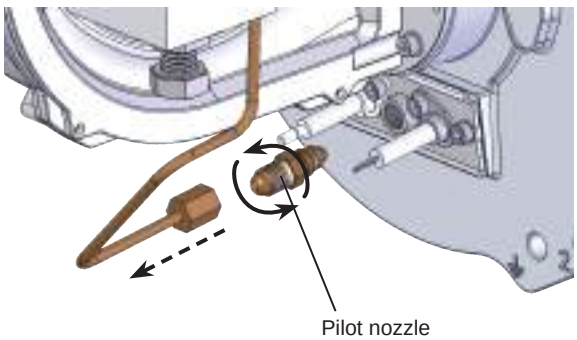
6.13. Conversion to gas G2.350

NOTE: Models AH105, AH160, AH210, AH240, AH320 are not suitable for operation with gas G2.350.

6.14. Replacing the Gas Valve

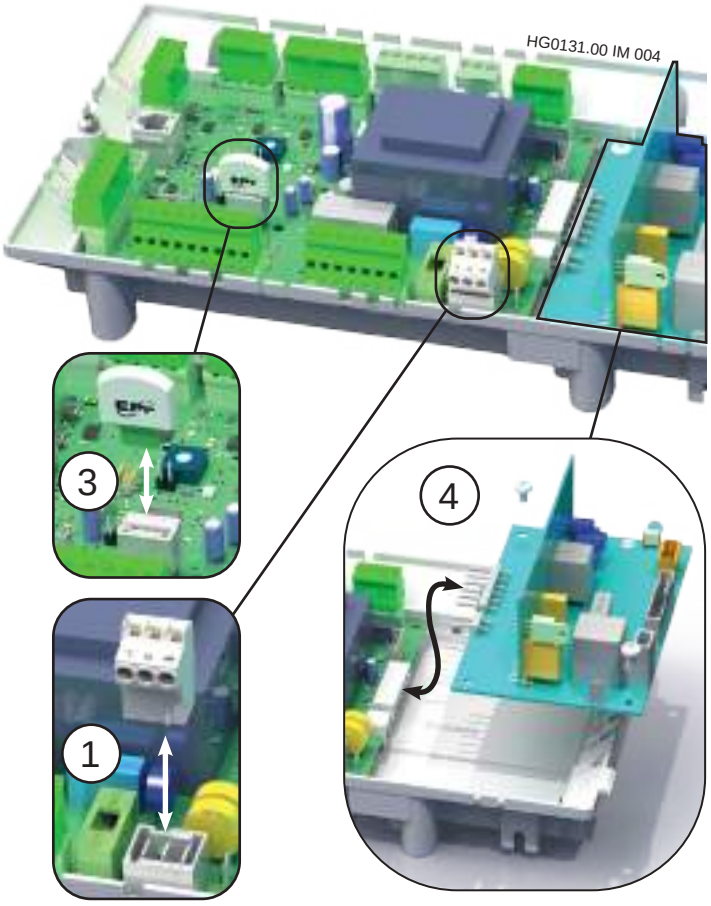
If the gas valve must be replaced, it is required to proceed with an inspection and possibly calibrate the CO_2 level through the adjustment on the Venturi pipe.
It is advisable not to calibrate the offset: the valve calibration is performed by the manufacturer.
If necessary, carry out the combustion analysis procedure as described in Paragraph 6.10 "Analysis of combustion".
It is recommended to always carry out the flue gas analysis after replacing the gas valve.



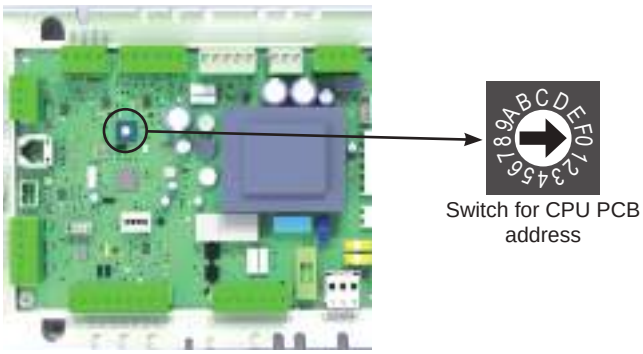


6.15. Replacing the modulation PCB

When replacing the CPU modulation PCB, it is required to carry out some essential operations, described below.
1. Disconnect voltage to the module
2. Disconnect all terminals from the CPU PCB
3. Remove and store the EEPROM memory card (point3)
4. Disconnect the TER safety PCB
5. Remove and replace the CPU modulation PCB
6. Position the new CPU PCB, insert the previously stored EEPROM memory card (point 3.)
(**The EEPROM card contains all the configured parameters, by inserting it into the new CPU, it is not necessary to reprogram the parameters**)
7. Reconnect the TER safety PCB and all terminals respecting the original positions.



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



Switch for CPU PCB address

6.16. Replacing the TER equipment

In case of replacement of TER equipment, it is recommended to carry out the operation by disconnecting power supply to the machine.
Remove the connection terminals, unscrew the box fixing screws and extract the equipment.
Replace the equipment by repeating the operations in reverse order.
No hardware or programming adjustments are required.

7. MAINTENANCE

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

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

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

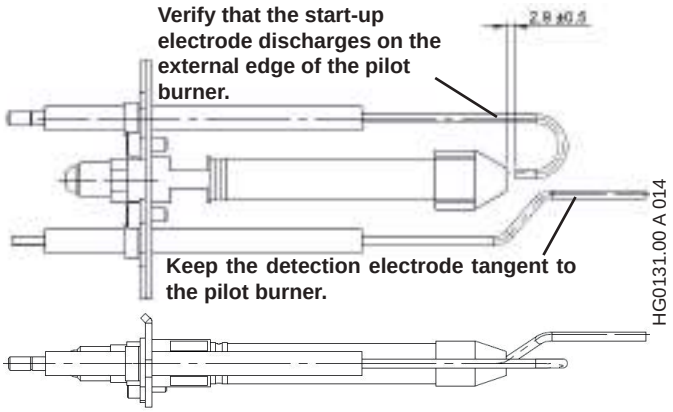
Maintenance interval chart

Maintenance	every 1 year	Extraordinary
1) Electrodes and Pilot	●	
2) Flue gas/Air Terminals	●	
3) Venturi pipes	●	
4) Exchanger/Burner		●
5) Condensate collection trap	●	
6) Condensate neutralisation vessel	●	
7) Gas valve	●	
8) Flame Equipment	●	
9) Safety thermostat(s)	●	
10) Ionization current	●	
11) Fan compartment	●	
12) Air fan grille	●	
13) Air intake plenum	●	
14) Air intake shutter	●	

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

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

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



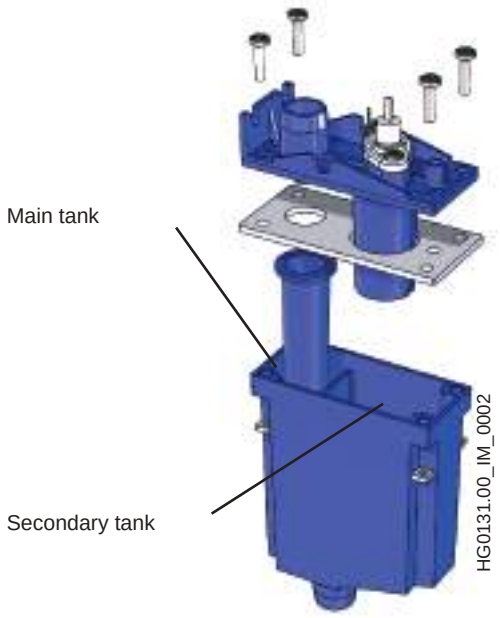
2) Inspection of flue gas exhaust and air intake ducts
Visually inspect where possible or use specific tools to check the status of the ducts.
Remove dust that forms on the air intake terminal.

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

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

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

5) Inspection and cleaning of the water trap
Clean the trap every year, and check the connections. Make sure there are no traces of metallic residue. If metallic residue has formed, increase the number of inspections.
Remove the cover retaining screws and clean the internal part of the trap (it is possible to clean the trap under running water) by checking that all ducts are free. Check the seal conditions. Check the integrity of the detection electrode and use sandpaper to remove any oxidation on the metal part.



Fill in the main tank with clean water and close the cover. Reconnect the trap to the condensate drain system. Should it become necessary to clean the condensate collection trap, all the gaskets inside it must be replaced.

6) Condensate neutralisation vessel
To check that the salts inside the vessel are
still active, use litmus paper to check that the pH level of water flowing out of it is greater than 6. If the pH is lower, replace the calcium carbonate present in the vessel.

7) Inspection of intake gas pressure
Check that the intake pressure at the valve corresponds to the value required for the type of gas that you are using.
Verification to be performed with the burner on at the maximum heat capacity.

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

9) Inspection of the safety thermostat(s)
Operation to be performed with the AH unit operating and the burner ON.
Open the thermostat series with an insulated tool [230 V], remove the fast-on from the safety thermostat, wait for the F20 block signal to appear on the LCD display on the CPU PCB on the machine. Close again the thermostat series, then reset the lockout.
As an alternative:
Operation to be preformed with AH unit OFF.
Disconnect the thermostat series with an insulated tool [230 V], remove the fast-on from the safety thermostat, start the ignition cycle and wait for the F22 block signal to appear on the LCD display on the CPU PCB on the machine. Close the thermostat series and check the fault reset.

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

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

11) Inspection and cleaning of the fan compartment
Remove the rear access panel to the fan compartment and clean any dirt accumulated inside the compartment itself.

12) Inspection and cleaning of the air fan protection grilles
Remove the rear access panel to the fan compartment and clean any deposits around the fan intake protection grilles to allow the air to flow well.

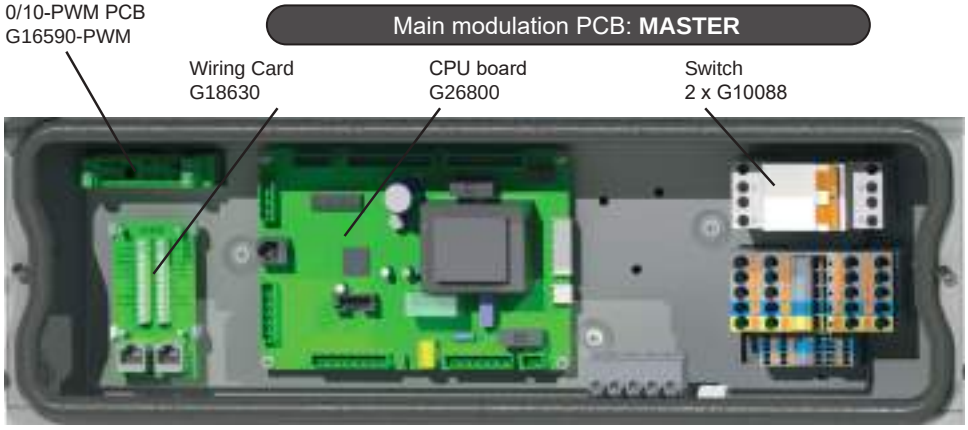
13) Inspection and cleaning of outdoor air intake plenum
Remove the rear access panel to the outdoor air intake plenum and remove any dirt accumulated inside the plenum itself.

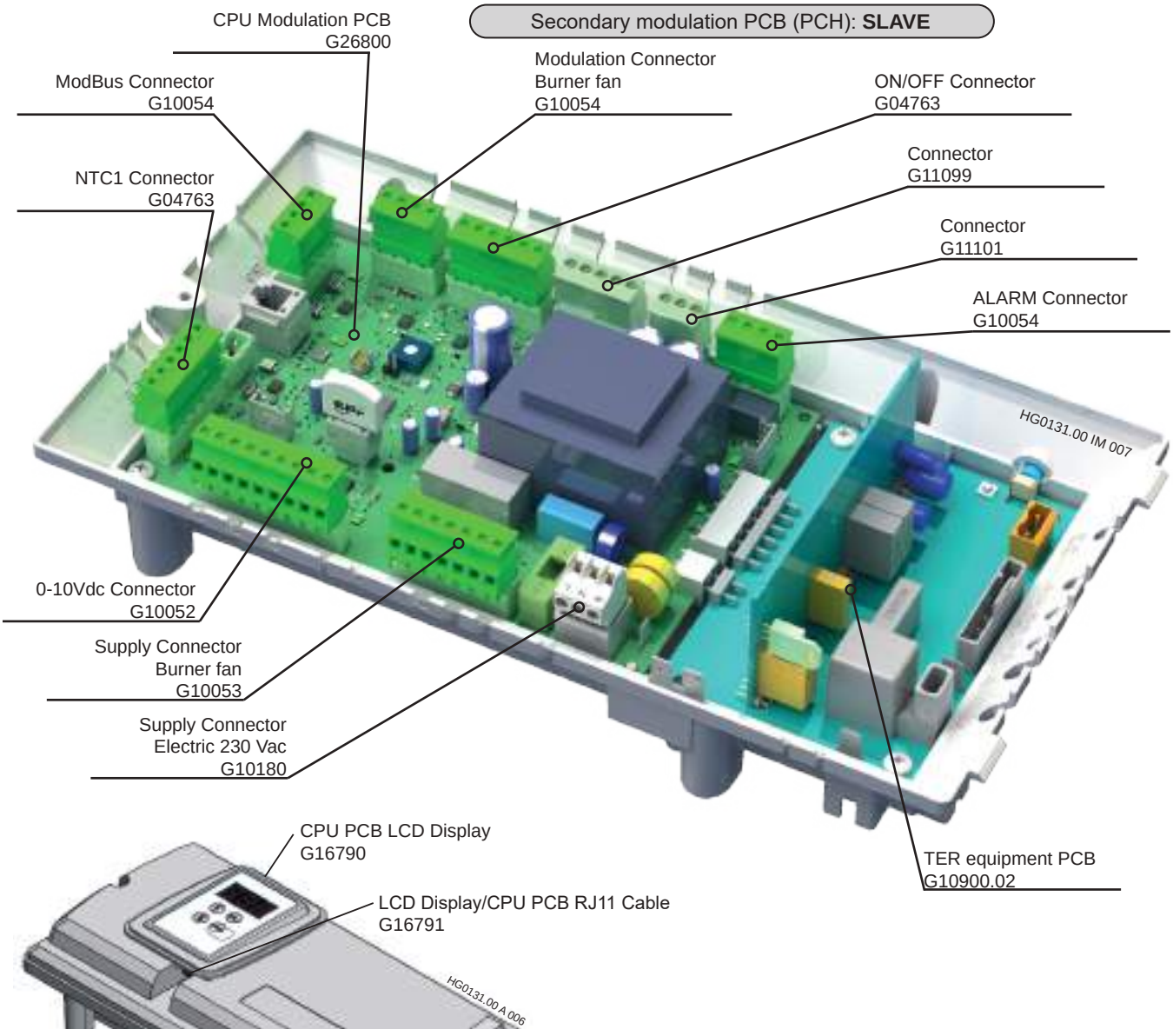
14) Inspection and cleaning of the outdoor air intake shutter
Use a brush to remove any deposit around the outdoor air intake shutter protection mesh and around the shutter itself to allow the air to flow well.

8. LIST OF SPARE PARTS

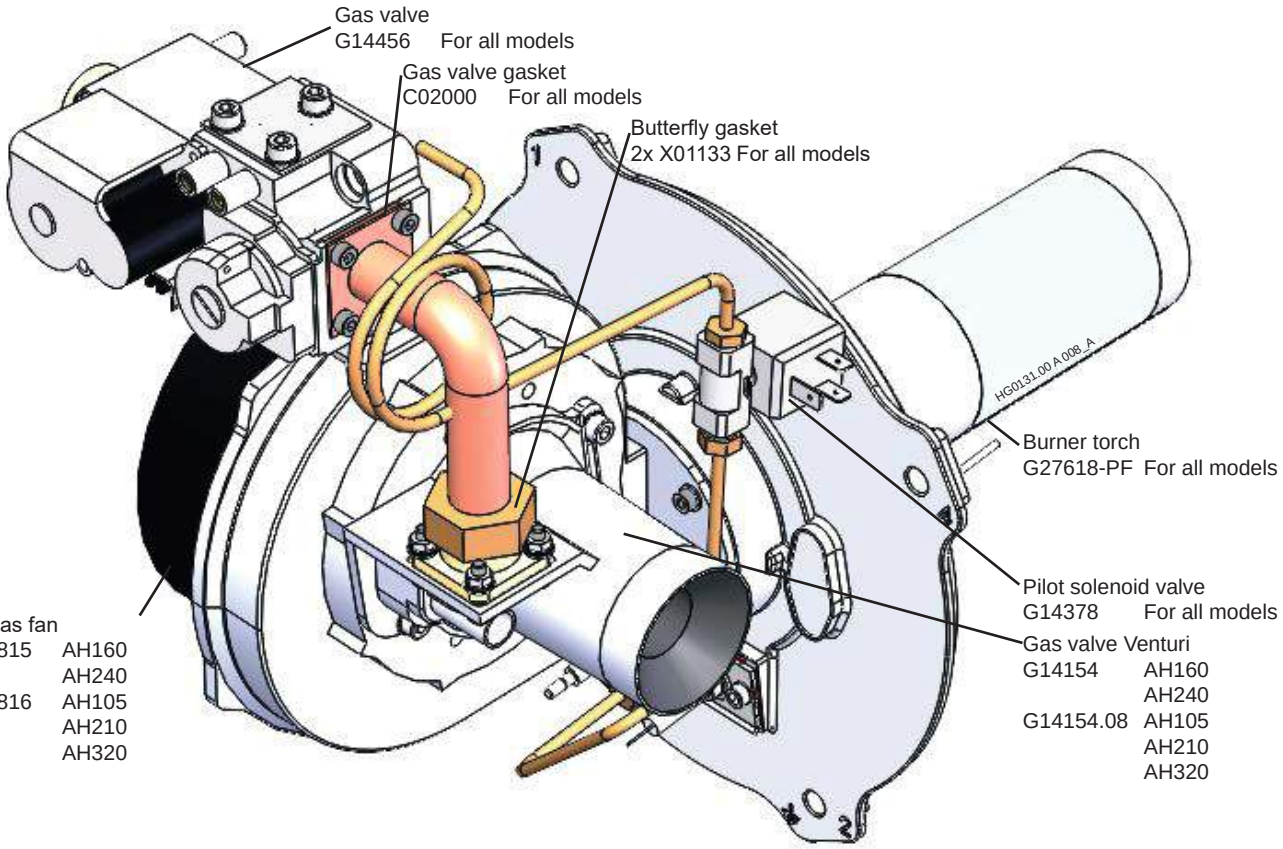
Smart Web remote control
G23707.04

8.1. Parts for the control panel

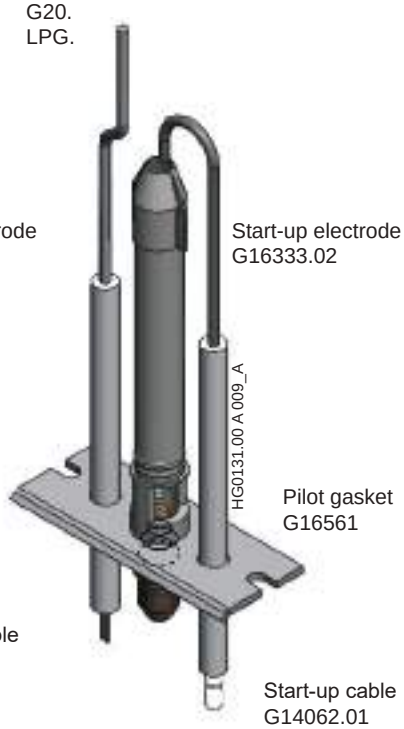




8.2. Parts for the burner unit



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



Detection electrode
G16334.02

Start-up electrode
G16333.02

Pilot gasket
G16561

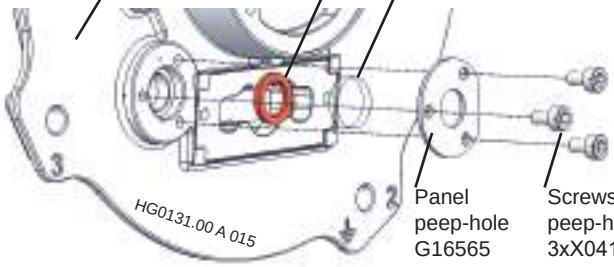
Detection cable
G27511

Start-up cable
G14062.01

Casting of the flange of the burner
G16560

Gasket peep-hole
G16563

Peep-hole
G16564



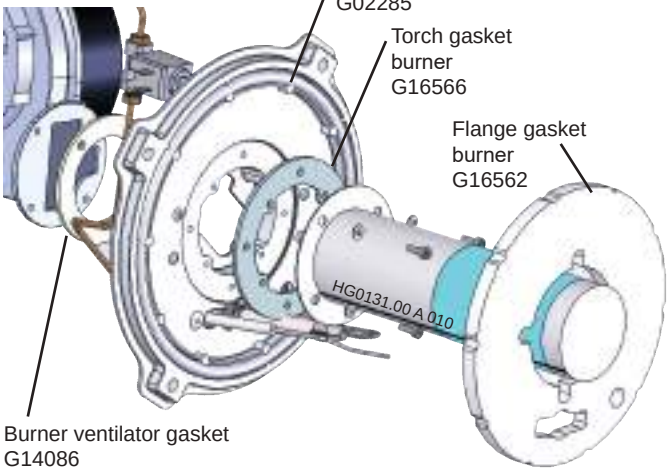
Panel peep-hole
G16565

Screws peep-hole
3xX04197

Rope gasket
G02285

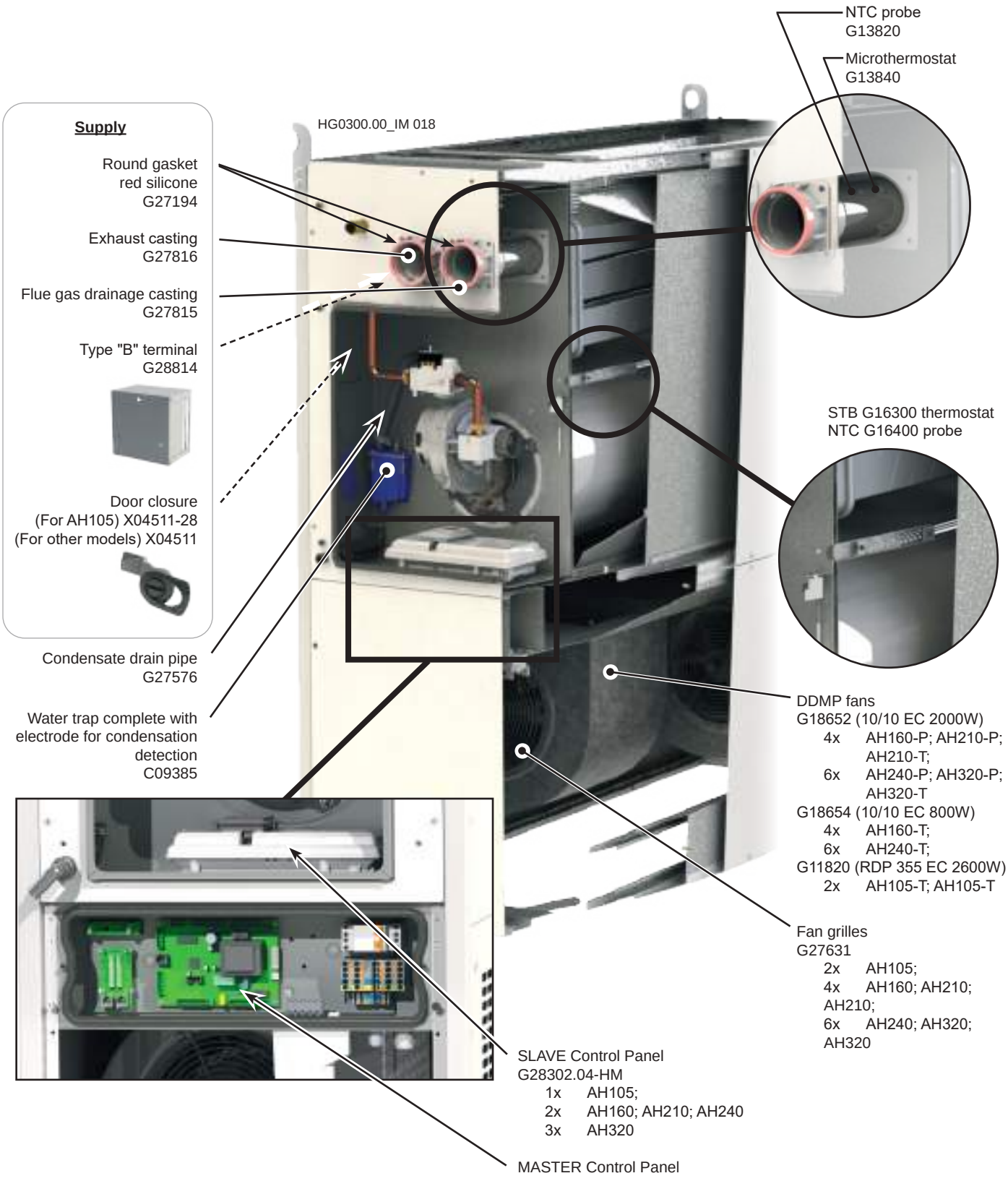
Torch gasket burner
G16566

Flange gasket burner
G16562

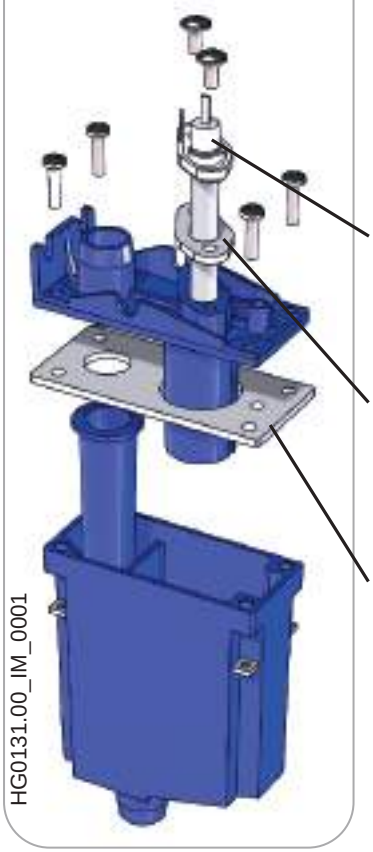


Burner ventilator gasket
G14086

8.3. Other spare parts available



Water trap complete with electrode for condensation detection
C09385



Smart Web remote control
G23707.04

HG0300.00_IM 019

Air temperature probe
G17675

HG0300.00_IM 020

Notes

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