GB

PKE-SPORT series floor standing warm air heater use, installation and maintenance manual

CPU with EEPROM version .03

Capacities from 100 to 550 kW

Efficiency up to 102.4%

Reduction of thermal stratification

ErP 2021 Compliant EU/2016/2281

CE

UK CA

VER. 01.2020

Dichiarazione di Conformità
Statement of Compliance

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

Modello: ***Model:***	**Generatore a basamento PK PKA-N, PKA-K, PKA-R, PKE-N, PKE-K, PKE-R** ***Floor Standing Heater PK PKA-N, PKA-K, PKA-R, PKE-N, PKE-K, PKE-R***

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

- **Regolamento Apparecchi a Gas 2016/426/UE**
  Gas Appliance Regulation 2016/426/UE
- **Direttiva Bassa Tensione 2014/35/UE**
  Low Voltage Directive 2014/35/UE
- **Direttiva Compatibilità Elettromagnetica 2014/30/UE**
  Electromagnetic Compatibility Directive 2014/30/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

Valido solo per gli accoppiamenti generatore-bruciatore indicati dal costruttore (vedere manuale)
Valid only for the heater-burner matching specified by the manufacturer (see manual)

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

- **EN17082:2020**
- **2017/C 229/01**
- **EN60335-1**
- **EN60335-2-102**

Organismo Notificato:
Notified body:
Kiwa Cermet Italia S.p.A
0476
PIN 0476CT2224
Nr. KIP-17155/G

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, 13/11/2024

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

CODE

SERIAL NUMBER

VER. 05.2023

UK Declaration of Conformity

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With this document we declare that the unit:

Model:	***Floor Standing Heater PK PKA-N, PKA-K, PKA-R, PKE-N, PKE-K, PKE-R***

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:

- **EN17082:2020**
- **2017/C 229/01**
- **EN60335-1**
- **EN60335-2-102**

Notified body:
Kiwa UK
0558
PIN 0476CT2224

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

Pessano con Bornago
10/05/2023

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

CODE SERIAL NUMBER

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1. GENERAL CAUTIONS

This manual is an integral part of the product and must always accompany it.
Should the equipment be sold or passed on to someone else, always make sure that this manual is supplied with the equipment for future consultation 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 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. 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 warm air heater must be installed in compliance with current regulations, according to the manufacturer's instructions and by qualified staff, technically specialised in the heating field.

"First ignition, conversion from one family gas
to another and maintenance 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 timing that comply with current and previous regulations in force in the country where the equipment is to be 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."

Always make an environmental impact assessment based on the power and sound pressure data listed in the technical data chapter and the noise emission limits according to the installation area of the unit, with reference to the Italian DPCM (Council of Ministers Presidential Decree) of 14/11/1997. An assessment must also be made if the unit is installed in the vicinity of workers, according to Italian legislative decree 81/2008 Art. 189 et seq.

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

The heater must be matched to a suitable burner, using the fuel chosen for the equipment.
The burner shall use the type of fuel it is set for, which is specified on the equipment plate and in technical specifications in burner's Manual.
In case of a gas burner, the pressure of the gas supplying the burner and the combustion head must be within the range of values indicated in the manual.

On K and R series condensing heaters, only gas burners can be used.

Before starting the burner/heater, check that:
- the gas mains supply data are compatible with the data stated on the nameplate;
- the combustion air is supplied in such a way as to avoid even partial obstructions of the intake grille;
- the gas seal of the feeding system has been tested and approved in compliance with the applicable standards;
- the heater burner is supplied with the same type of fuel it has been designed for;
- the system 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 heaters have been thoroughly cleaned;
- the fuel flow rate is suitable for the power required by the heater;
- the fuel supply pressure is between the range specified on the nameplate.

When connecting gas supply pipe to gas valve, do not tighten excessively in order to avoid damaging sealing gaskets.

2.2. Pressostatic Buildings

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

The pressure control inside the air dome in PK-P air heating units for pressostatic structures is not a safety feature. In the event of power failure or malfunctions of the PK-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 PK-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.

2.3. 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;
- call for **qualified staff**;
- call the **Fire Brigade.**

2.4. Power supply

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

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

It is compulsory to install a switch with a protection (fuses or automatic) upstream of the power cable, as required by existing regulations. The switch must be visible, accessible and placed at a distance lower than 3 metres from the control compartment; any electrical operation (installation and maintenance) must be performed by qualified staff.

2.5. 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.

2.6. 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

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

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 heater, 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 heater.

The room where the heater-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. Moreover dust can deposit on the back of flame stability disk in combustion head, degrading air-fuel mixing ratio.

2.7. Maintenance

Before carrying out any cleaning and maintenance operations, isolate the unit from the mains power supply using the switch located on the electrical system and/or on the shut-off devices.

If the equipment is faulty and/or incorrectly operating, switch it off and do not attempt to repair it yourself, but contact our local Technical Service Centre.

Use only original spare parts for repairs. Failure to follow above instructions could compromise the unit safety and shall void the warranty.

2.8. Transport and Handling

Vertical heaters are delivered fastened to a pallet. Horizontal heaters have their own base.

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.

KG0335_C3_0024

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

KG0335_C3_0025

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.

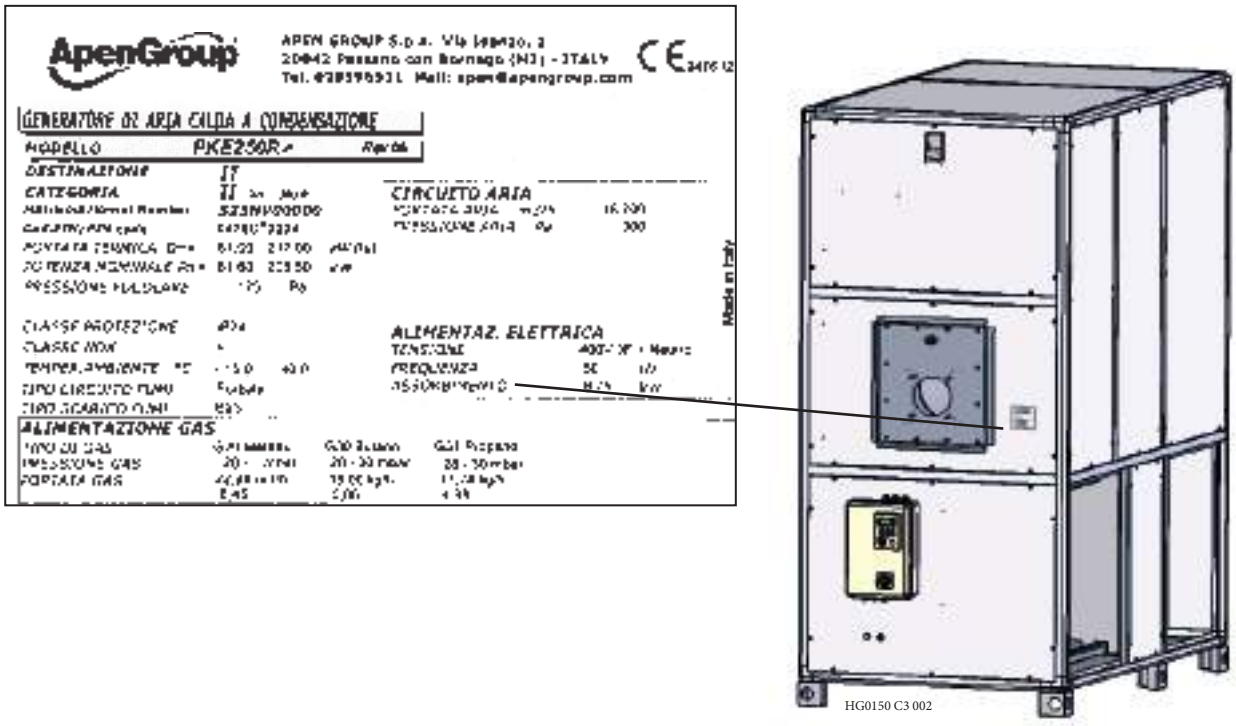
All materials recovered will be processed and disposed of according to what provided for by the laws in force in the country of use and/or according to the standards indicated in the safety sheets of the chemicals.

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

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

2.11. How to Identify the Heater

PK warm air heaters can be identified using their nameplate, stuck on the front of the unit.
The nameplate shows all the data needed for identifying the heater model.
When contacting your local Service Centre, please note the heater model and serial number indicated on the plate and use them to identify the machine you purchased.



Heater Code:

PK	E	250	R	-	P

Heater

Version:
A (indoor);
E (outdoor).

Capacity

Series:
Standard non-condensing N series
ERP2021 condensing K series
ERP2021 condensing R series and η>90+2LogPn (Italy)

Installation:
P - Pressostatic
T - Tensostatic

3. TECHNICAL FEATURES

3.1. Main Components

Warm air heaters have been designed for heating sport facilities, respectively PK-T for tensostatic sport structures and PK-P for pressostatic sport structures.
Warm air heaters include:
- stainless steel heat exchanger
- frame and body
- centrifugal fan and electrical motor
- control panel and settings
- safety devices and controls

Stainless steel heat exchanger

The innovative design and large surface of the combustion chamber and heat exchanger pipes ensure optimum efficiency and durability.
Combustion chamber and flue gas collectors are completely made of AISI 441 stainless steel with low carbon content, as well as the surfaces in contact with flue gases (tube bundle) in order to ensure a high resistance to corrosion.
Tube bundle design is patented.

Characteristics of steel types used

The following table shows naming correspondence of the steel types used to manufacture our exchangers:

USA -AISI	EN - No.	Composition
AISI 441	1.4509	X2 CrTiNb 18

Heater's heat exchanger can work also under conditions that lead to condensation (if equipped with the necessary accessories) only if the relevant burner is supplied with gaseous fuel.

Frame and body

The frame consists of solid anodised aluminium bars. The frame is assembled with demountable parts allowing, in special cases such as door crossing, to disassemble and reassemble the heater completely.
Body panels are formed by:
- on the exchanger side: double-layered panels with inner galvanized steel sheet, high-density glass fibre insulation, external painted galvanized steel sheet, all riveted to allow an easy and safe removal of the panel during maintenance.
- on the fan side: painted galvanized steel sheet with inner layer for thermal and sound isolation, securely fastened to steel panel.

All panels feature a gasket for a perfect sealing against air leaks.

Centrifugal Fan

Standard centrifugal fans installed (AT and ADH models) are made of galvanised steel sheet with forward curved blades and low noise of operation.
Fans are fixed on hermetic ball bearings which are self-aligned and assembled inside rubber dampers.
Fans for square duct are used: driven by means of fixed diameter pulleys and belts, three-phase motor.
No lubrication is required on standard fans. For special fans, check specific requirements.

Operating Temperatures:
- belt drive -20°C +45°C

The following fans are available on demand:
- backward curved blades
- fans for temperatures lower than -20°C

Electrical Motor

All motors used have the following features:
- Supply 400Vac - Three-phase - 50 Hz
- Structure B3 - with terminal board above
- Protection rating IP55
- Isolation level cl.F
- Efficiency IE3

For more model-related information on motors, see further in this Manual.
If required, motors with the following characteristics can be supplied:
- various supply voltages, electrical features and physical shapes;
- motors for low temperatures (below -30°C)
- motors with class H isolation
- tropicalised motors
- motors with internal heat protection, thermostat, or PT100 or PTC probe.

Control Panel and Settings

Standard control panel includes:
- oven-varnished metal box
- quadripolar switch-disconnector, padlockable, with door lock
- protection from overheat and short circuit for each motor
- fuse-protected wiring board to control heater, safety devices and burner.
- inverter onboard the machine. (optional for tensile structures)

The standard panel allows room temperature setting. The setting depends on the burner installed. The following types are available:
- two stages, high/low flame
- modulating.

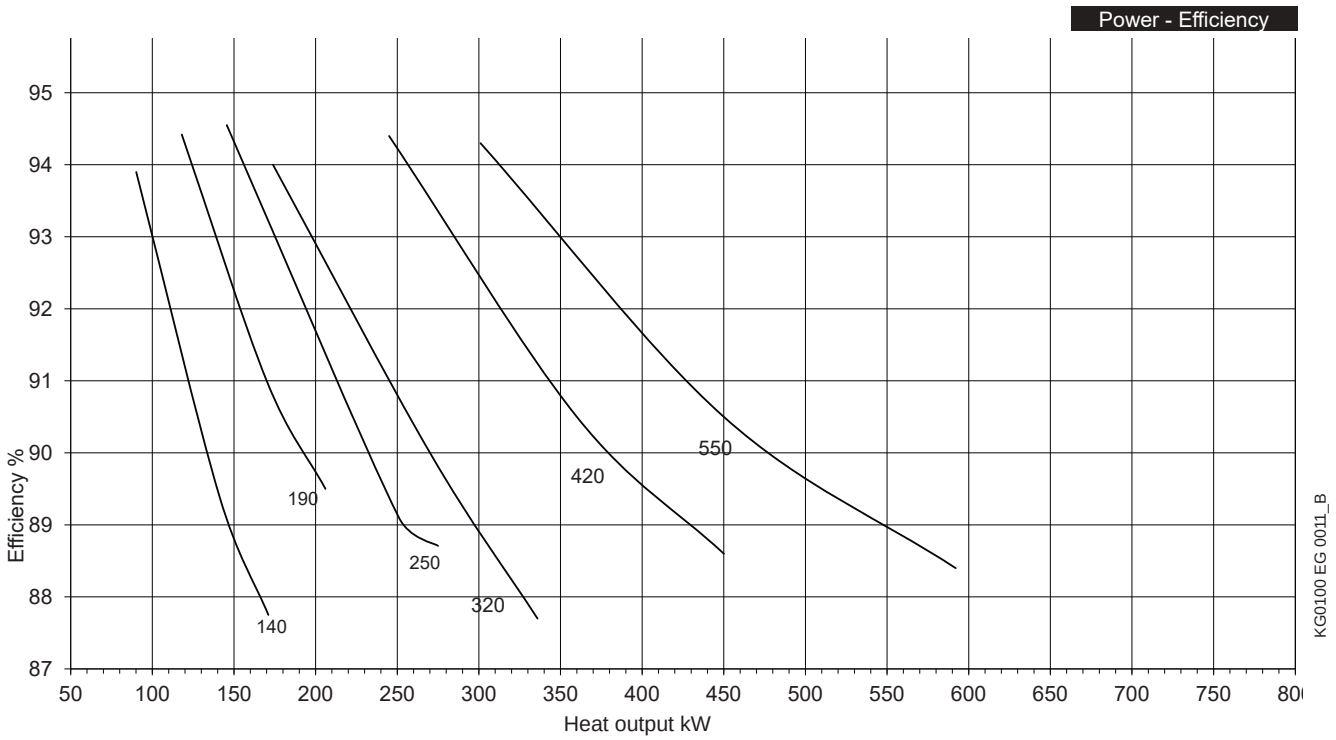
Safety Devices and Controls

All heaters are supplied with:
- STB manual reset safety thermostat, inside the air flow, which switches off the burner immediately if the temperature is high.
- NTC probe in the duct, modulates and stops the burner operation before the safety thermostat activates.
- Heat exchanger NTC probe, modulates and stops the burner operation before the safety thermostat activates.
- Ambient NTC probe (to be installed indoor), modulates and/or stops the burner operation before the safety thermostat activates.
- SMART X WEB Chronothermostat with system setting functions.

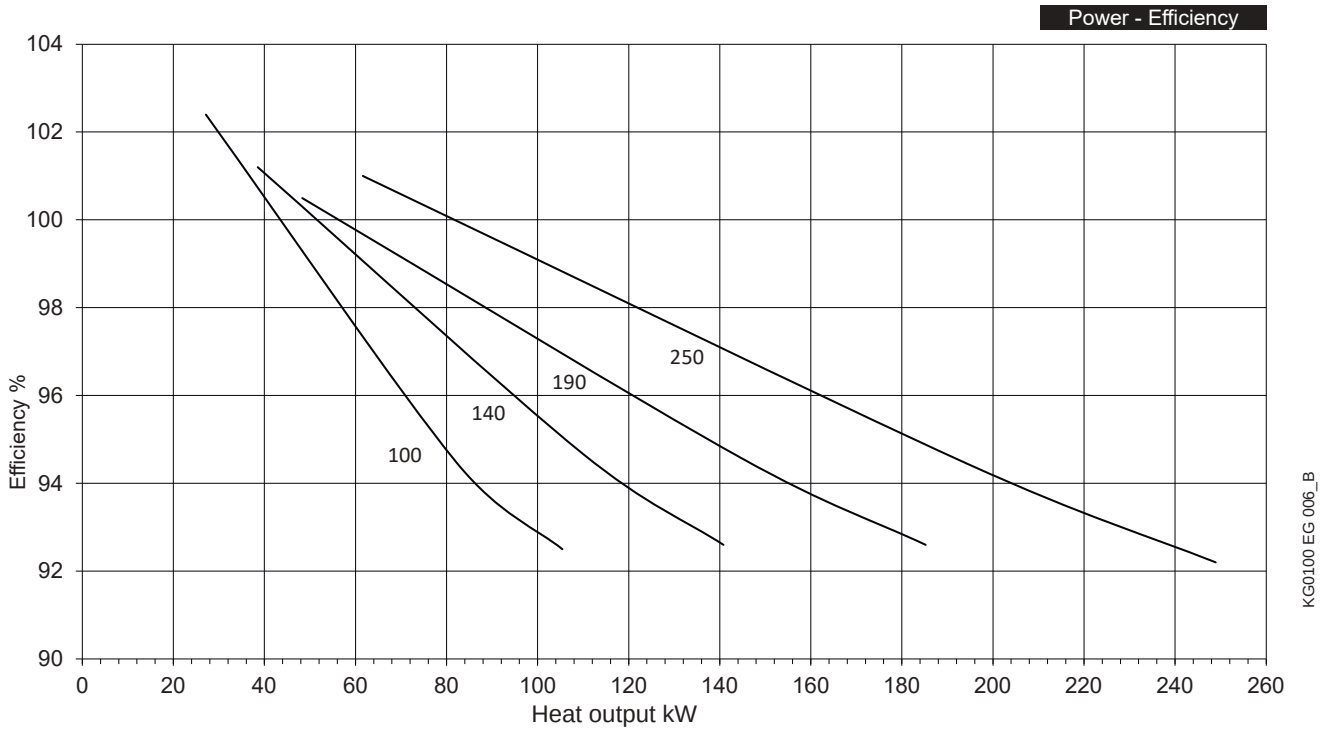
3.2. Choosing the Heater

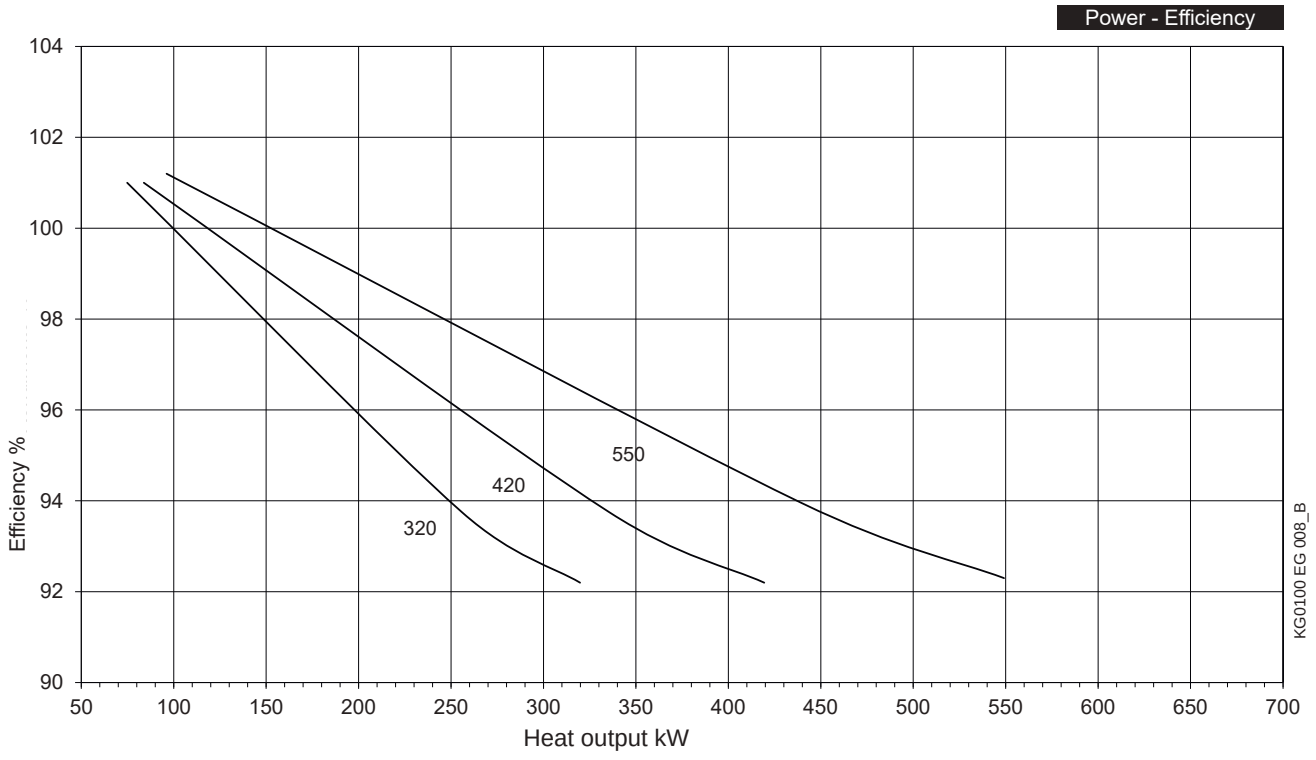
Heaters are available in condensing versions (K and R series respectively) and in non-condensing version (N series).
The R series meets the performance requirements of the regional resolutions of Lombardy, Emilia Romagna, and Piedmont, and the requirements of the Italian Ministerial Decree of 26/06/2015 as amended and supplemented for replacements. At European level, a matching with low NOx burners is required in order to comply with the imposed regulatory limitations.
Heaters are supplied with heat exchanger, fan unit and control panel to be installed indoor or in a sheltered position (PKA). Those for outdoor installation (PKE) are supplied with heat exchanger, fan unit, control panel and burner casing to be positioned outdoor.
A work field has been tested and approved for each heater. This field allows the heater to be used at different power and efficiency levels based on effective output power. When choosing a heater model, the following criteria have to be taken into account: its use, service type (season or all year long), matching burner type (two stages or modulating).

3.2.1. Diagrams of output heat/efficiency ratio of PK-N heaters

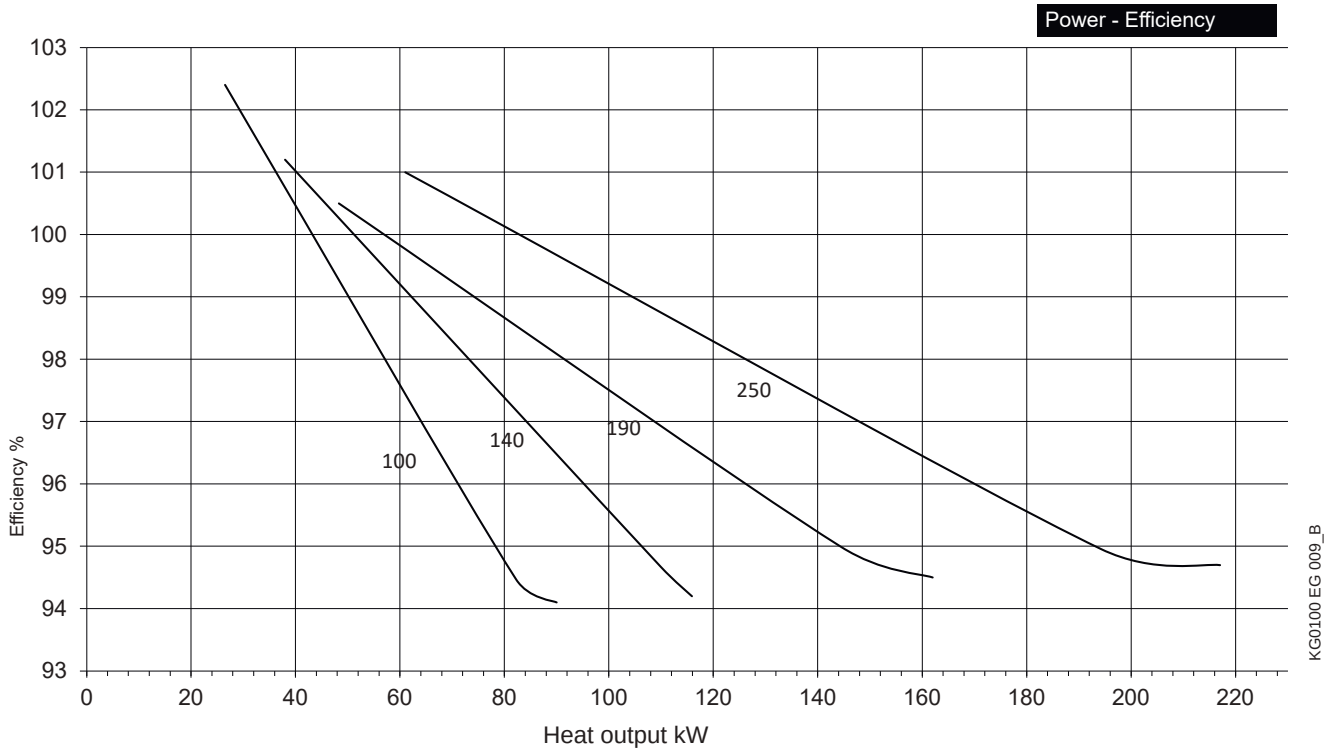


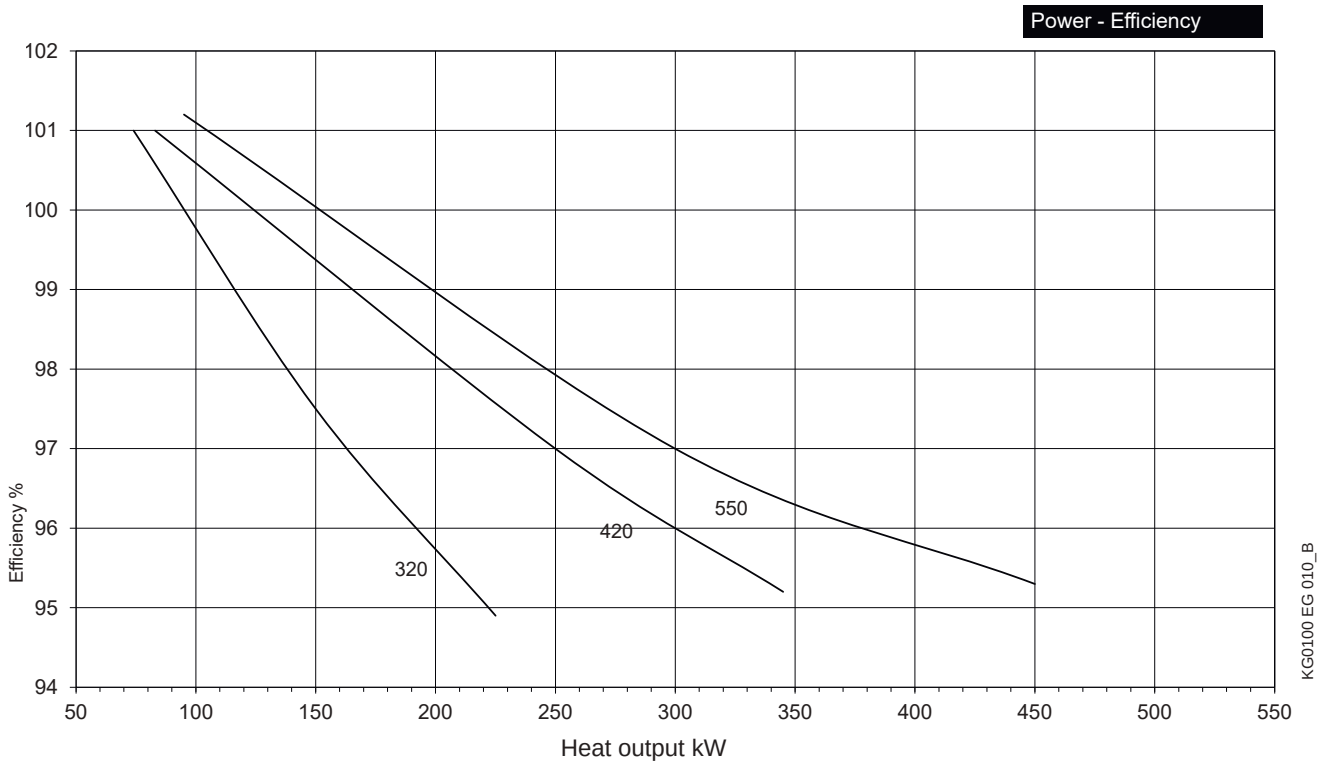
3.2.2. Diagrams of output heat/efficiency ratio of PK-K heaters





3.2.3. Diagrams of output heat/efficiency ratio of PK-R heaters





3.3. Technical Data

3.3.1. Heat input and efficiency data of PKE-N heaters

All PK vertical heaters, up to 320 included, are supplied as a single unit with assembled burner casing.

Model			PKE140N			PKE190N			PKE250N		
Type of appliance			B23								
EC approval			0476CT2224								
NOx Class	NO_x		CLASS 5 *								
			MIN	>91%	MAX	MIN	>91%	MAX	MIN	>91%	MAX
Furnace Heat Input	P_{min}; $P_{ated,h}$	kW	96.0	131.4	195.0	115	202.5	230.0	154.0	252.0	310.0
Useful Heat Output		kW	90.2	120.3	171.0	108.1	184.7	205.9	145.0	230.2	275.0
Combustion Efficiency	η_{pl}; η_{nom}	%	94.0	91.4	87.7	94.0	91.2	89.5	94.0	91.3	88.7
Seasonal energy efficiency of heating system	$\eta_{s,h}$	%	According to the selected burner: see the “Attachment to the user-installation manual” code KG0270.xx supplied with this manual								
Output efficiency	$\eta_{s,flow}$	%	According to the selected burner: see the “Attachment to the user-installation manual” code KG0270.xx supplied with this manual								
Chimney loss - Burner ON		%	6.0	8.6	12.3	6.0	8.8	10.5	6.0	8.7	12.3
Chimney loss - Burner OFF		%	< 0.1			<0,1			<0,1		
Casing losses	F_{env}	%	1.26			1.16			1.17		
Combustion Chamber pressure		Pa	13	28	50	10	32	40	10	36	50
Combustion Chamber volume		m^3	0.37			0.52			0.76		

Model			PKE320N			PKE420N			PKE550N		
Type of appliance			B23								
EC approval			0476CT2224								
NOx Class	NO_x		CLASS 5 *								
			MIN	>91%	MAX	MIN	>91%	MAX	MIN	>91%	MAX
Furnace Heat Input	P_{min}; $P_{ated,h}$	kW	185.0	309.0	380.0	260	398	508	320	515	670
Useful Heat Output		kW	173.9	282.1	335.9	245	364	450	301	471	592
Combustion Efficiency	η_{pl}; η_{nom}	%	94.0	91.3	87.7	94.4	91.5	88.6	94.3	91.5	88.4
Seasonal energy efficiency of heating system	$\eta_{s,h}$	%	According to the selected burner: see the “Attachment to the user-installation manual” code KG0270.xx supplied with this manual								
Output efficiency	$\eta_{s,flow}$	%	According to the selected burner: see the “Attachment to the user-installation manual” code KG0270.xx supplied with this manual								
Chimney loss - Burner ON		%	6.0	8.7	12.3	5.6	8.5	11.4	5.7	8.5	11.6
Chimney loss - Burner OFF		%	< 0.1			< 0.1			< 0.1		
Casing losses	F_{env}	%	1.02			1.03			0.97		
Combustion Chamber pressure		Pa	15	45	60	28	85	120	21	80	110
Combustion Chamber volume		m^3	1.06			1.55			1.79		

* With CLASS 3 GAS BURNERS according to EN676

3.3.2. Heat input and efficiency data of PKE-K condensing heaters

Model			PKE100K		PKE140K		PKE190K		PKE250K	
Type of appliance			B23							
EC approval			0476CT2224							
NOx Class	NO_x		CLASSE 5*							
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Furnace Heat Input	P_{min}; $P_{ated,h}$	kW	26.5	114.0	38.0	152.0	48.0	200.0	61.0	270
Useful Heat Output		kW	27.1	105.4	38.5	40.8	48.3	185.2	61.6	248.9
Combustion Efficiency	η_{pl}; η_{nom}	%	102.4	92.5	101.2	92.6	100.5	92.6	101.1	92.2
Seasonal energy efficiency of heating system	$\eta_{s,h}$	%	According to the selected burner: see the “Attachment to the user-installation manual” code KG0270.xx supplied with this manual							
Output efficiency	$\eta_{s,flow}$	%	According to the selected burner: see the “Attachment to the user-installation manual” code KG0270.xx supplied with this manual							
Chimney loss - Burner ON*		%	-	8.6	-	8.6	-	8.8	-	8.7
Chimney loss - Burner OFF		%	< 0.1		< 0.1		<0,1		<0,1	
Casing losses	F_{env}	%	1.81		1.26		1.16		1.17	
Combustion Chamber pressure		Pa	14	100	13	140	10	130	10	175
Combustion Chamber volume		m^3	0.37		0.37		0.52		0.76	

Model			PKE320K		PKE420K		PKE550K	
Type of appliance			B23					
EC approval			0476CT2224					
NOx Class	NO_x		CLASSE 5*					
			MIN	MAX	MIN	MAX	MIN	MAX
Furnace Heat Input	P_{min}; $P_{ated,h}$	kW	74.0	347.0	83.0	455.0	95.0	595.0
Useful Heat Output		kW	74.8	319.8	83.8	419.4	96.1	549.1
Combustion Efficiency	η_{pl}; η_{nom}	%	101.0	92.2	101.0	92.2	101.2	92.2
Seasonal energy efficiency of heating system	$\eta_{s,h}$	%	According to the selected burner: see the “Attachment to the user-installation manual” code KG0270.xx supplied with this manual					
Output efficiency	$\eta_{s,flow}$	%	According to the selected burner: see the “Attachment to the user-installation manual” code KG0270.xx supplied with this manual					
Chimney loss - Burner ON*		%	-	8.7	-	8.5	-	8.5
Chimney loss - Burner OFF		%	< 0.1		< 0.1		< 0.1	
Casing losses	F_{env}	%	1.02		1.03		0.97	
Combustion Chamber pressure		Pa	15	225	28	275	21	365
Combustion Chamber volume		m^3	1.06		1.55		1.79	

* With CLASS 3 GAS BURNERS according to EN676

3.3.3. Heat input and efficiency data of PKE-R condensing heaters

Model			PKE100R		PKE140R		PKE190R		PKE250R	
Type of appliance			B23							
EC approval			0476CT2224							
NOx Class	NO_x		CLASS 5 *							
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Furnace Heat Input	P_{min}; $P_{ated,h}$	kW	26.5	90.0	38.0	115.9	48.0	162.0	61.0	217.0
Useful Heat Output		kW	27.1	84.8	38.5	109.2	48.3	150.6	61.6	205.5
Combustion Efficiency	η_{pl}; η_{nom}	%	102.4	94.1	101.2	94.2	100.5	94.5	101.0	94.7
Seasonal energy efficiency of heating system	$\eta_{s,h}$		According to the selected burner: see the “Attachment to the user-installation manual” code KG0270.xx supplied with this manual							
Output efficiency	$\eta_{s,flow}$		According to the selected burner: see the “Attachment to the user-installation manual” code KG0270.xx supplied with this manual							
Chimney loss - Burner ON*		%	-	7.5	-	7.4	-	7.4	-	7.8
Chimney loss - Burner OFF		%	< 0.1		< 0.1		<0,1		< 0.1	
Casing losses	F_{env}	%	1.81		1.26		1.16		1.17	
Combustion Chamber pressure		Pa	14	100	15	140	15	130	19	175
Combustion Chamber volume		m^3	0.24		0.37		0.52		0.76	

Model			PKE320R		PKE420R		PKE550R	
Type of appliance			B23					
EC approval			0476CT2224					
NOx Class	NO_x		CLASS 5 *					
			MIN	MAX	MIN	MAX	MIN	MAX
Furnace Heat Input	P_{min}; $P_{ated,h}$	kW	74.0	275.0	83.0	345.0	95.0	450.0
Useful Heat Output		kW	74.8	256.5	83.8	325.8	96.1	430.1
Combustion Efficiency	η_{pl}; η_{nom}	%	101.0	94.9	101.0	95.2	101.2	95.3
Seasonal energy efficiency of heating system	$\eta_{s,h}$		According to the selected burner: see the “Attachment to the user-installation manual” code KG0270.xx supplied with this manual					
Output efficiency	$\eta_{s,flow}$		According to the selected burner: see the “Attachment to the user-installation manual” code KG0270.xx supplied with this manual					
Chimney loss - Burner ON*		%	-	7.6	-	7.8	-	7.7
Chimney loss - Burner OFF		%	< 0.1		< 0.1		< 0.1	
Casing losses	F_{env}	%	1.03		1.03		0.97	
Combustion Chamber pressure		Pa	23	225	30	275	40	365
Combustion Chamber volume		m^3	1.06		1.55		1.79	

* With CLASS 3 GAS BURNERS according to EN676

3.3.4. Air flow rate technical data, head pressure and installed power supply

Model		PKE100	PKE140	PKE190	PKE250	PKE320	PKE420	PKE550
Version		P00	P00	P00	P00	P00	P00	P00
Air Flow Rate - 15°C	m^3/h	7000	9800	13400	18200	21800	30000	35000
Available head*	Pa	300	300	300	300	300	300	300
Heat drop Min and Max **	K	10.9 - 46.7	11.1 - 44.5	10.3 - 42.8	9.6 - 42.5	9.7 - 45.6	7.9 - 43.5	7.8 - 48.7
Power supply	V	400T						
Frequency	Hz	50						
Motor Max. capacity***	kW	3.0	4.0	4.0	7.5	7.5	11	15
Max. Absorbed power****	kW	3.51	4.61	4.61	8.45	8.45	12.19	16.48
Protection Rating	IP	PKE heater = IP24; PKE control panel = IP55						
Operating Temperature	°C	from -20°C to + 40°C (check running temperature of matching burner)						

* Chimney losses at minimum power for PK-K and PK-R heaters are zero because the efficiency, calculated on LVC (Low Calorific Value of natural gas) exceeds 100%.

** Minimum heat drop is referred to minimum heat input, while maximum heat drop refers to maximum heat input

*** Max. capacity refers to the maximum power delivered by the motor; as for the heater, the power actually delivered by the motor depends on the fan working position with respect to the air distribution system's drops (system drops)

**** Maximum absorbed power refers to the maximum power delivered by the motor considering the supplied motor efficiency (efficiency IE3); the power absorbed by the matching burner must be add to the value indicated in the table.

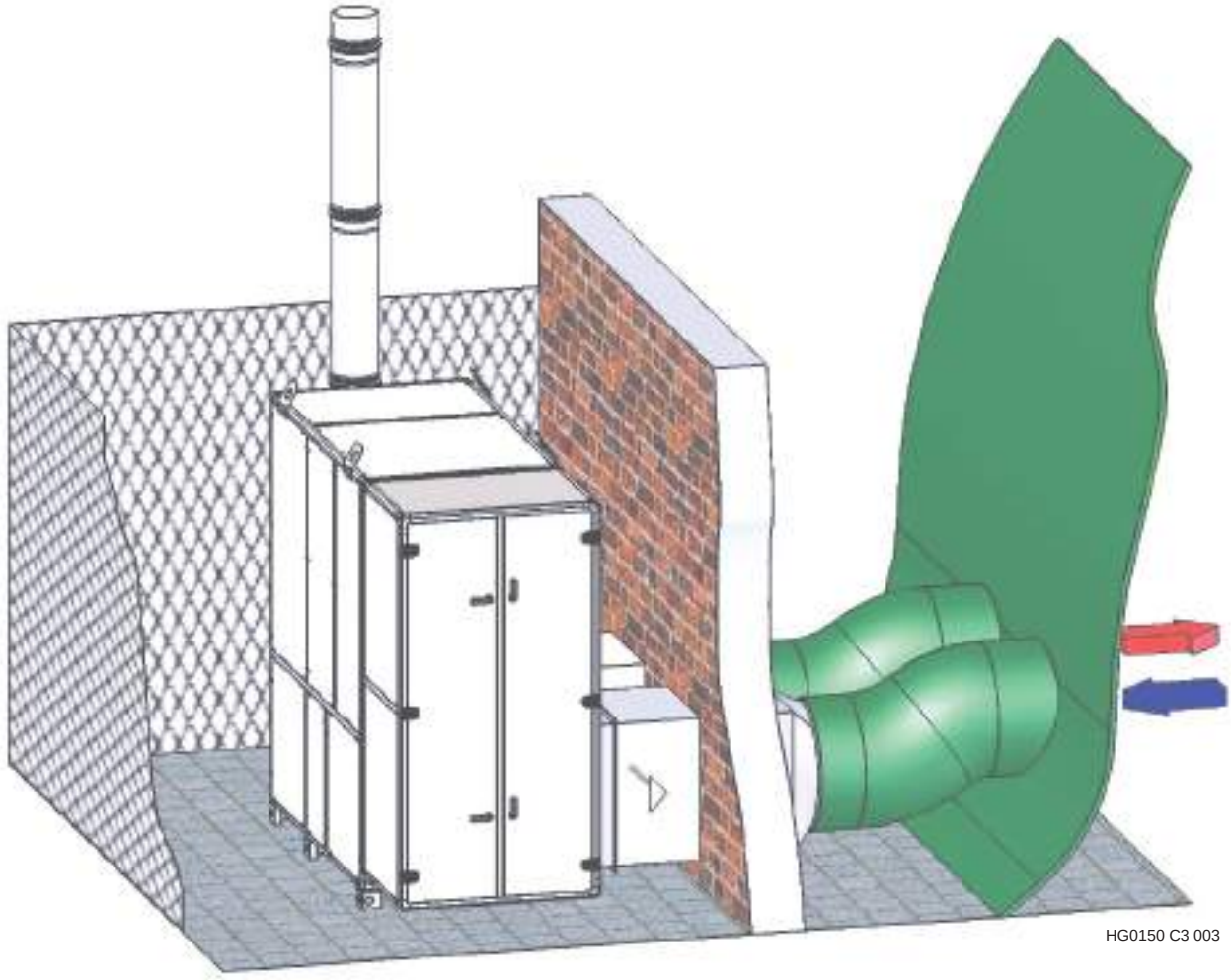
3.4. Noise

DUCTED HEATERS

The following table shows sound power values, LwA, and sound pressure values, LpA, issued by PK-SPORT heaters. The value refers to heaters with ducted intake and delivery and when the heater is installed outdoor.

For these applications the values of fan sound power, intake and delivery are added up, the resulting value is properly reduced by the sound insulation value ensured by sandwich panels.

The values in the table refer to power, LwA, which passes through the heater sandwich panels.
For the values of fan noise in ducts for air intake and delivery, contact the Technical Support.



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Heater with ducted delivery and intake											
MODEL	LwA - Sound Power Level [dB(A)]								LwA	distance	LpA
	63	125	250	500	1000	2000	4000	8000	dB(A)	metres	dB(A)
PKE100	57.3	63.4	66.1	67.4	71.5	71.4	69.0	61.2	76.9	6	56.4
PKE140	55.1	61.5	65.5	70.2	72.4	72.9	71.0	63.4	78.3	6	57.8
PKE190	59.6	61.1	66.4	68.2	72.2	72.4	70.3	60.9	77.7	6	57.2
PKE250	62.3	64.9	69.9	73.6	78.6	78.0	76.9	68.9	83.6	6	63.1
PKE320	69.5	67.4	68.2	71.3	72.3	71.7	67.9	60.0	78.7	6	58.1
PKE420	75.7	72.3	70.2	74.8	74.0	72.6	68.4	60.8	81.6	6	61.1
PKE550	74.3	70.2	71.8	72.7	75.1	72.5	67.8	59.0	81.1	6	60.5

3.5. Dimensions of PK SPORT Heater

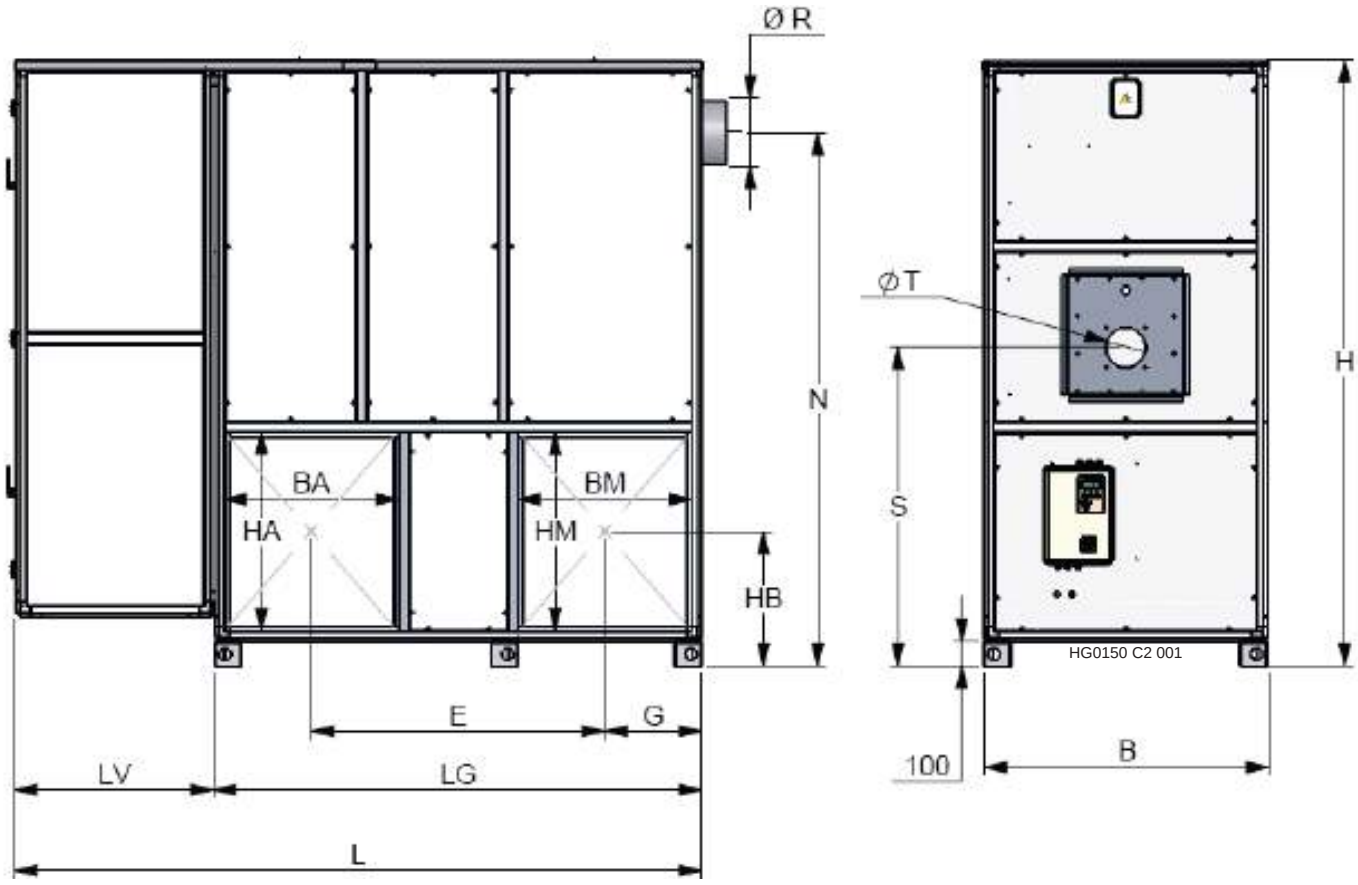
Integrated Models
All PK-SPORT heaters, up to 320 included, are supplied as a single unit with assembled burner casing.

Three-Assembly Models
From 420 model onward, heaters consist of three assemblies: fan, exchanger, and burner casing. The first two assemblies, fan and exchanger, are to be installed one on top of the other without any fixing. Fan assembly includes slots for sliding the two parts into place.
To install burner casing onto the heater, do the following:

- lay transparent silicone on the edges of burner casing
- lift the burner casing, resting it against the heater and matching aluminium bars.
- fix the support, on the casing, to the heater bars using the supplied screws.

Then fill any gaps in joint areas with silicone, in order to protect all internal parts (control panel, burner,etc.) from water.
Use the supplied polarised connector for the electrical connection between exchanger (thermostats) and control panel.

Air intake and delivery
Standard ambient air intake and air delivery are on the right side of the heater (seen from the burner). External air intake and smoke protection shutter (if any) are always positioned on the opposite side with respect to air delivery.
Upon request, it is possible to order the heater with ambient air intake and air delivery on the left side.



Model	Overall dimensions								Intake		Delivery		Chimney		Burner		Weight
	L	B	H	LG	LV	E	G	HB	BA	HA	BM	HM	N	ØR	S	ØT	kg
PKE100	1955	800	2120	1455	500	875	290	540	500	800	500	800	1760	180	1190	190	445
PKE140	2170	920	2180	1570	600	990	290	540	500	800	500	800	1800	180	1155	190	525
PKE190	2480	1060	2330	1750	730	1070	340	540	600	800	600	800	1960	250	1190	190	650
PKE250	2760	1140	2430	1960	800	1180	390	540	700	800	700	800	2020	250	1180	190	845
PKE320	3110	1140	2610	2310	800	1430	440	540	800	800	800	800	2040	250	1180	230	990
PKE420	3310	1340	3100	2460	850	1205	500	700	900	1100	900	1100	2780	300	1740	230	1200
PKE550	3600	1340	3270	2600	1000	1600	500	745	900	1190	900	1190	2900	300	1830	230	1450

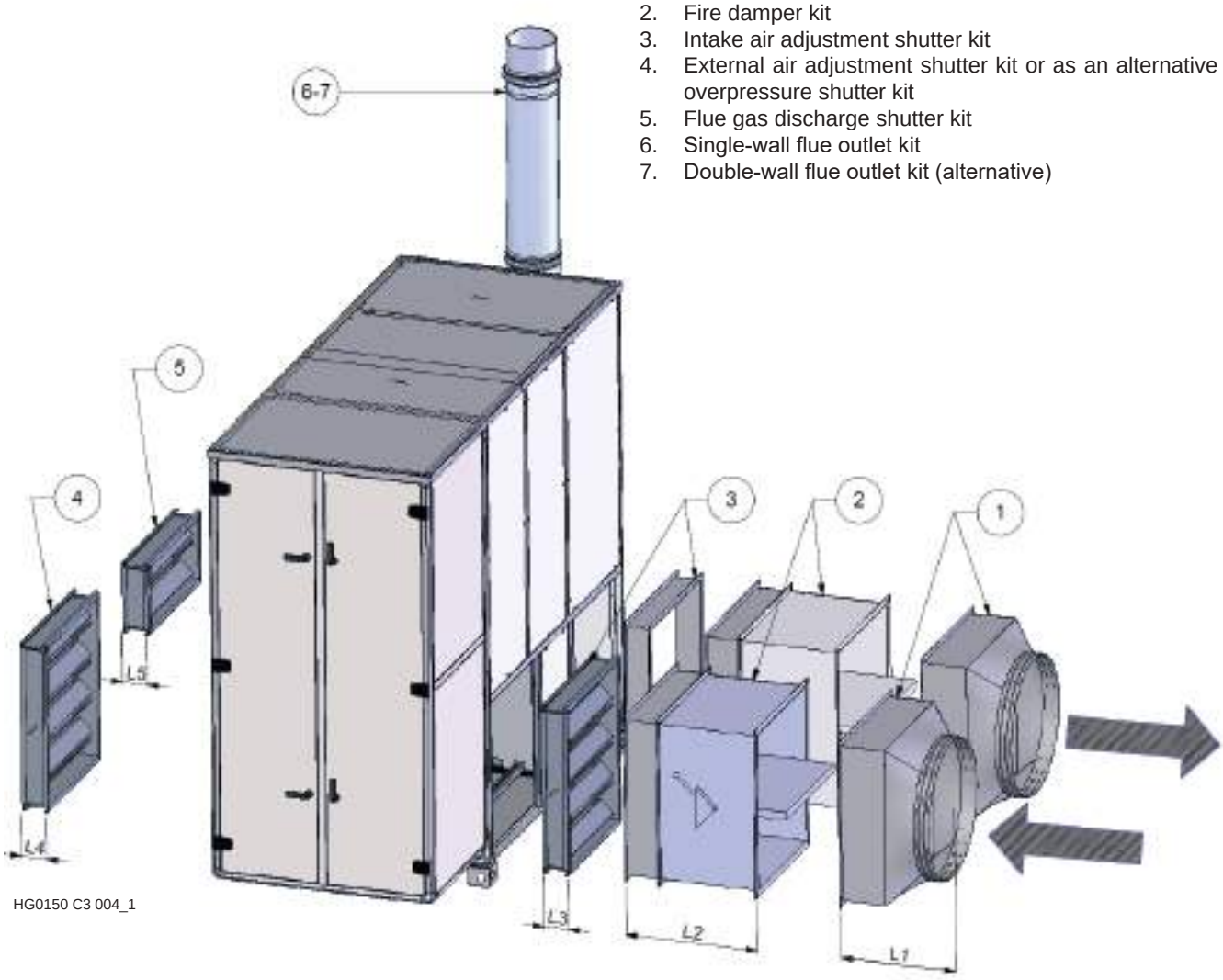
Accessory size

PK-SPORT heaters have been designed to be combined with a wide range of accessories to allow the customer to choose the optimal configuration depending on the needs of the system to which the heater must be added.

The table below lists the dimensions and codes of the main accessories available. The relevant section (Para. 4.10) will describe in detail the complete range of accessories available depending on the building.

KEY

1. Square-round fitting kit
2. Fire damper kit
3. Intake air adjustment shutter kit
4. External air adjustment shutter kit or as an alternative overpressure shutter kit
5. Flue gas discharge shutter kit
6. Single-wall flue outlet kit
7. Double-wall flue outlet kit (alternative)



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Model	1 - square-round fitting		2 - fire damper		3 - intake air shutter		4 - external air shutter		4 - overpressure shutter		5 - flue gas discharge shutter		6 - single wall flue outlet	7 - double wall flue outlet
	code	L1	code	L2	code	L3	code	L4	code	L4	code	L5	code	code
PKE100	G12833	450	G12830	680	G12834	125	G12831	125	G12831-SP	125	G12832	125	G04065-180	G04065-180-DP
PKE140														
PKE190	G12843	450	G12840	680	G12844	125	G12841	125	G12841-SP	125	G12842	125	G04065-250	G04065-250-DP
PKE250	G12853	450	G12850	680	G12854	125	G12851	125	G12851-SP	125	G12852	125		
PKE320	G12863	450	G12860	680	G12864	125	G12861	125	G12861-SP	125	G12862	125		
PKE420	G12873	600	G12870	510	G12874	125	G12871	125	G12871-SP	125	G12872	125	G04065-300	G04065-300-DP
PKE550	G12883	600	G12880	635	G12884	125	G12881	125	G12881-SP	125	G12882	125		

4. USER'S INSTRUCTIONS

4.1. Operation

PK-SPORT heater operation is fully automatic; it is equipped with a heater control PCB that manages all the burner control operations and with a microprocessor based electronic PCB that controls the heat output regulation.

PK-SPORT heaters are fitted as standard with a multifunction LCD panel located on the front of the control panel, which is used to control, configure and diagnose all operating parameters of the equipment.

The panel is fitted with a red 3-digit LCD display and with four function keys: ↑ , ↓ , ESC and ENTER; the display allows the user to display the heater operating mode and its Faults.
It also allows the service centre to change the main operating parameters.
Changing parameters is protected by a password.

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

rdy	OFF FROM SUPERVISOR Unit off and waiting for ON command from the supervisor (Smart X) or the room temperature control system
Sty	REMOTE OFF Unit turned off by ID0/GND remote digital input
rOF	Temperature control OFF condition
OFF	OFF FROM LCD PANEL Unit turned off from LCD control on board of the machine
Exx	OFF FROM ALARM Unit turned off from Exx alarm. (e.g. "E10") **Any heat demands will be ignored**
HEA	UNIT RUNNING (Heating)
Air	UNIT RUNNING (Ventilation)
COO	UNIT RUNNING (Conditioning)*
SAn	UNIT RUNNING (Domestic)*

(*only in the PRESENCE of SMART X)

During normal operation, the following text will appear on the display:

HEA	when the burner is on
rdy or **Sty**	when switching off
rOF	if the delivery temperature control has been met
Air	if in ventilation (Tenso only). **When with PK-SPORT PRESSO, if the "CTRL_07" control (parameter C71=1) appears under the PAr menu, it has been enabled by mistake; change C71=0**
Axx	**PK heater address;** If the heater has an address other than Ø, the display will show, alternating it with the operation in progress, the address assigned to the heater. (e.g. "A01")

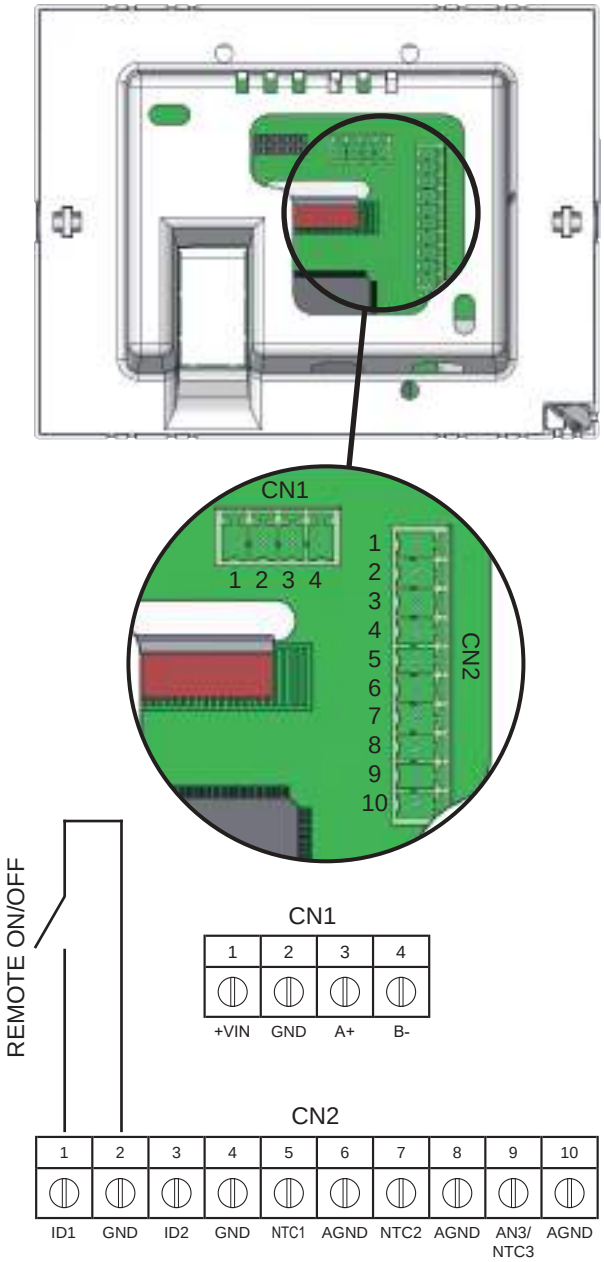
LCD

Smart X Web

4.2. Remote On/Off (optional)

Any priority ON/OFF contact can be remotely controlled from the Smart X WEB remote control, by connecting to terminals 1 (ID1) and 2 (GND) of the terminal board CN2 of the chronothermostat and removing the existing jumper, as shown in the following wiring diagram.
The remote ON/OFF contact has priority with respect to the time range heat request or the manual mode.

ELECTRICAL CONNECTION



4.3. 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 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).

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.

PRESSURE 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 and of the values set in parameters YL2 and YH2:
YL2 = Y2 output minimum voltage (Default value 2)
YH2 = Y2 output maximum voltage (Default value 10).
The air recirculation shutter will be closed

All PK-SPORT heaters are supplied already configured and with all the settings required to operate them.

4.4. Temperature Adjustment Accessories

Ambient temperature adjustment
PK-SPORT heaters are equipped with remote control / room thermostat.

- Smart X Web code G29700,

Instructions on how to operate the accessory can be found in the manual supplied with it.

Operation with Smart X WEB G29700 chronothermostat
Remote control of SMART X series operates as a chronothermostat and can be used as a monitoring device for a single zone system at the same temperature, where up to 15 heaters can be installed simultaneously, controlled by a single control.
Being a single zone system, only one ambient temperature and one calendar can be set for the entire zone being monitored.
The chronothermostat is equipped with an easy to read 4.3" touchscreen TFT colour display (480x272 pixels resolution), where all the parameters of the connected heaters can be read and set up; it also allows users to remotely control up to 3 external temperature probes (besides the onboard one) and to manage the heaters in auto or manual mode, to check the burner operation, to plan a weekly, annual calendar and to control the daily time ranges.

Smart X WEB allows the complete management of all the system functions, including heater reset, directly from a PC.
For operating instructions and installation diagrams, please refer to the manual of Smart X WEB code **HG0065 "SMART X WEB CHRONOTERMOSTAT.
Use, Installation and Programming Manual"**.

Safety thermostat
A safety thermostat with manual reset is installed on the PK-SPORT heaters; the breakage of the sensitive element corresponds to a safety intervention.
The thermostat intervention causes the burner stop through the control PCB.
The lockout of the equipment, caused by the safety thermostat triggering, is indicated on the LCD display of the CPU PCB on the machine with E38.

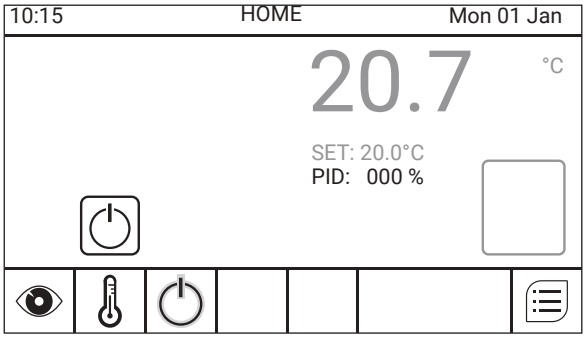
Lockouts Exx
Codes and possible causes of lockouts are listed later the manual.

4.4.1. Smart X Web

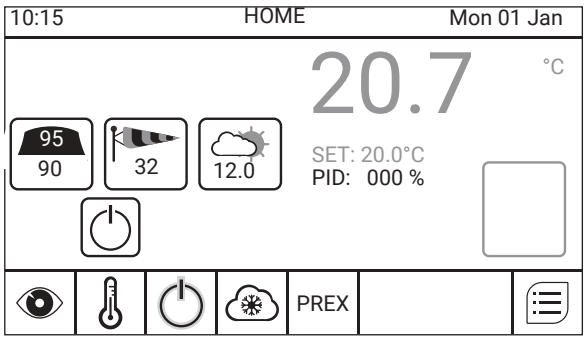
The Smart X Web remote control equipped as standard is supplied already configured with the type of system and with all the parameters necessary for the air heating unit to work to its best (except in case of particular installation and/or system conditions). If necessary, the final user only has to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

For TENSILE structures, the Smart X Web is set as "Hot air heater" system and the "HOME" page looks as follows:



In PRESSOSTATIC sport structures the Smart X Web is set as "Pressostatic Structure" system and the "HOME" page looks as follows:



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

4.5. Pressure Control (STANDARD in“P” versions)

In PRESSOSTATIC version, the PK-SPORT heaters 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.

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.

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_SNOW	200 Pa	Setpoint value sent in snow conditions (with snow control)

These setpoints may be modified in the “Setpoint” menu. See Paragraph 4.5.2 “CONTROL SETPOINT”.

The “HOME” page will display an icon showing the average pressure value inside the air dome and the current pressure setpoint sent:

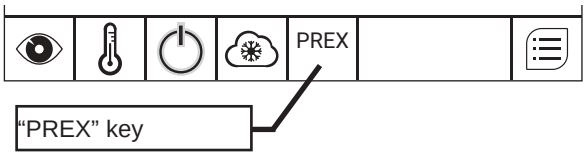
ATTENTION: Pressure control is a priority and ALWAYS ACTIVE even when the heating system is “OFF”, and/or the ID1 contact is open.

Please find here below the Pressure Control logic.

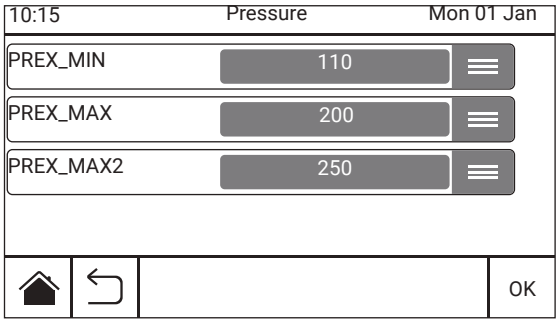
4.5.1. Manual operation (“MAN”)

It is possible to manually choose one of the 3 Setpoints (PREX_MIN; PREX_MAX; PREX_MAX2) selectable in “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:

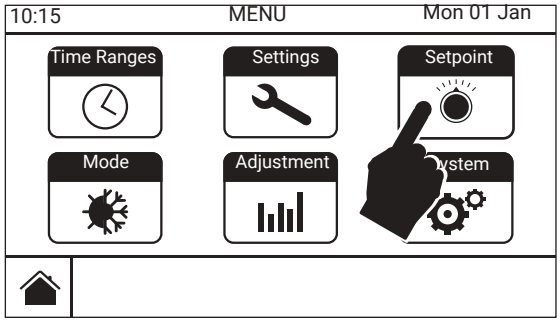


After choosing one of the 3 setpoints and pressing the “OK” key, the pressure control is managed with said setpoint as FORCED and always FIXED until it is deactivated.
In the “HOME” page the “PREX” key and the “Pressure Control” icon (showing the selected setpoint) are highlighted in yellow, as shown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

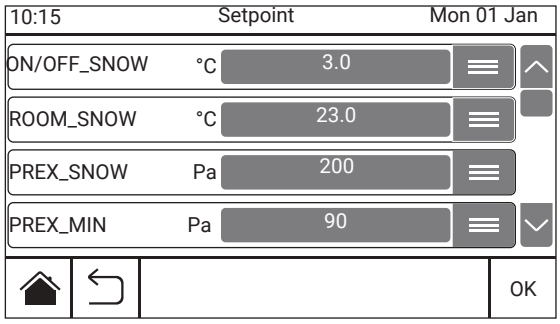
4.5.2. Control setpoints

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



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

ON/OFF_SNOW	3.0	°C	(SNOW Contr.)
ROOM_SNOW	23.0	°C	(SNOW Contr.)
PREX_SNOW	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.)



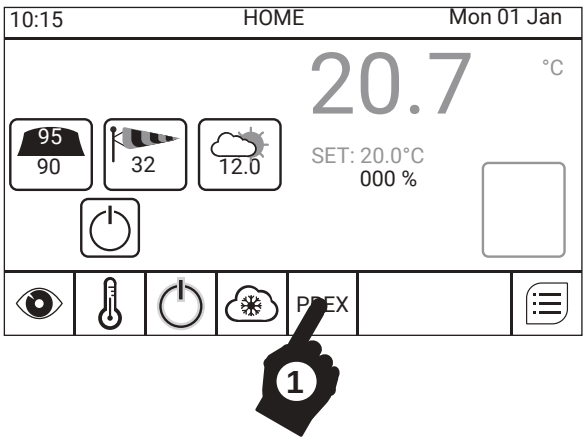
The different setpoints and their meaning are shown afterwards in the sections of the relating controls.

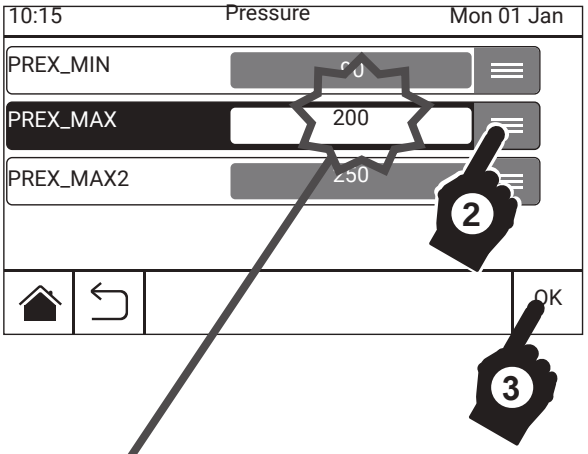
4.5.3. Automatic operation ("AUTO") (ONLY IF combined with Wind Control)

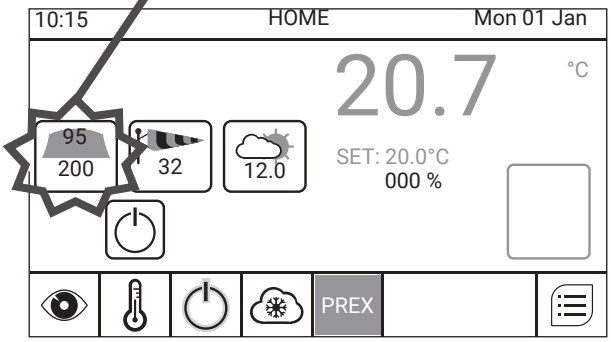
The pressure setpoint sent to CPU PCB automatically modulates the values of the two PREX_MIN (minimum value) and PREX_MAX (maximum value) setpoints according to the wind speed detected by the wind gauge.
Even when the pressure control is set to "AUTO" it is still possible to force manually one of the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

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

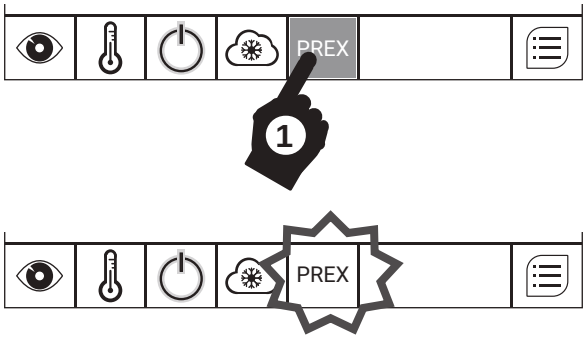
Activation of FORCED setpoint







Deactivation of FORCED setpoint



4.6. 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 X Web to “YES”.
Check the AN3 input configuration on the Smart Web PCB (See Paragraph 4.8 “AN3 input configuration”).

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.

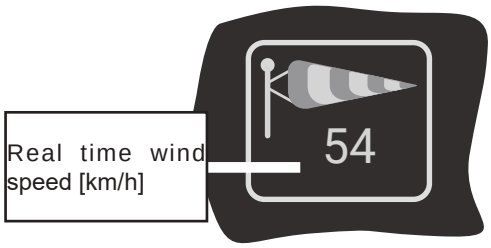
It is not possible to force or manage the function in manual mode (MAN).

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. See Paragraph 4.5.2 “CONTROL SETPOINT”.

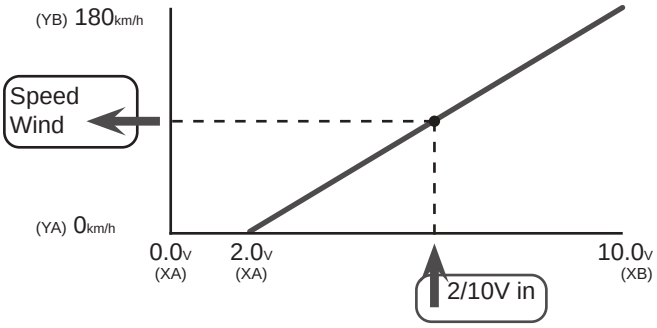
The “HOME” page displays an icon with the wind speed instantaneous value (expressed in km/h).



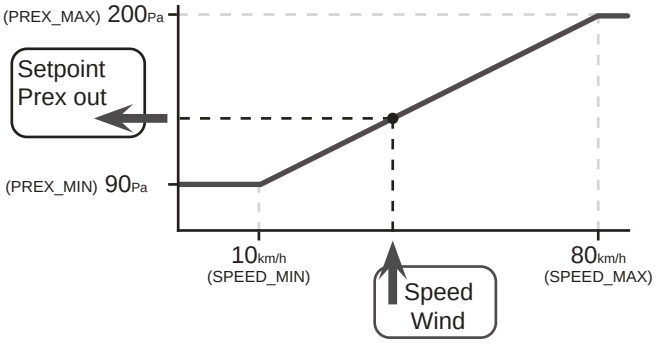
Please find here below the Wind Control logic.

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:

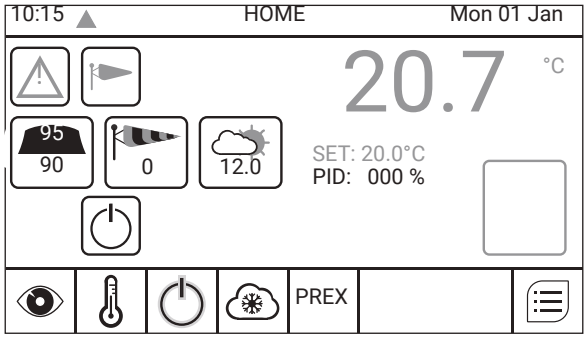


When there is wind, the Wind Speed value modifies in a linear manner the pressure setpoint value sent (included between PREX_MIN and PREX_MAX), as shown here below:



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.

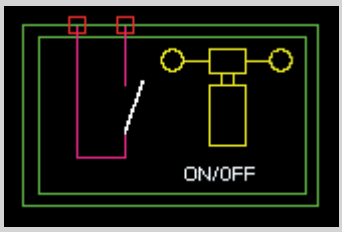
If the wind gauge is not connected or operates incorrectly, the Smart reads an input value of 0V or in any case less than 1V. In this case “HOME” page displays an alarm icon, as follows:

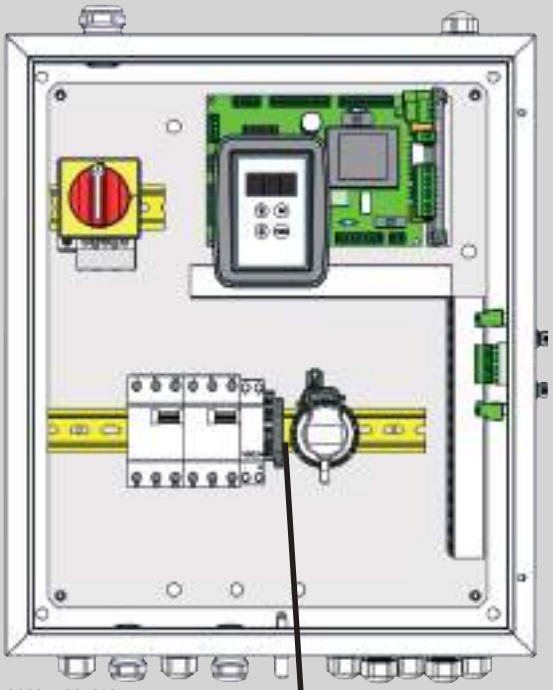


The wind speed reading has an output buffer so as to avoid a continuous variation of the sent setpoint in the event that the wind is slightly unstable.

ELECTRICAL CONNECTION

ON-OFF DIGITAL WIND GAUGE



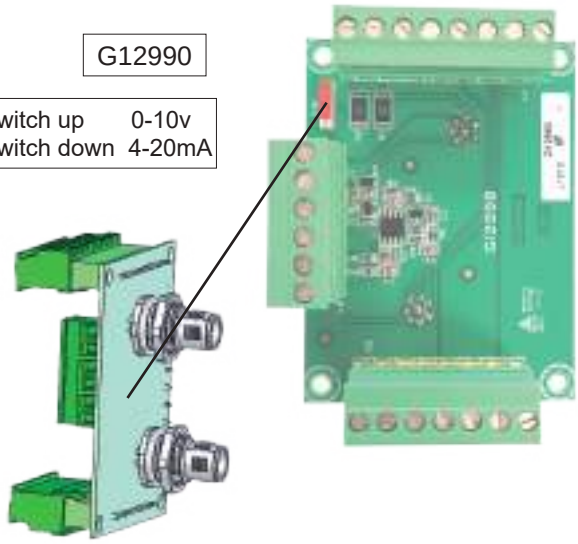


HG0335_C3_0007

X1-1 and X1-2 terminals

G12990

Switch up 0-10v
Switch down 4-20mA



WIND

ANALOGUE WIND GAUGE KIT
G05430 4-20 mA

HG0335_C3_0006

G05430

4.7. Snow Control (OPTIONAL)

The function of Snow Control (if present) is to force, in the event of snow, the internal pressure and temperature setpoint values, which are predefined 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:

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.

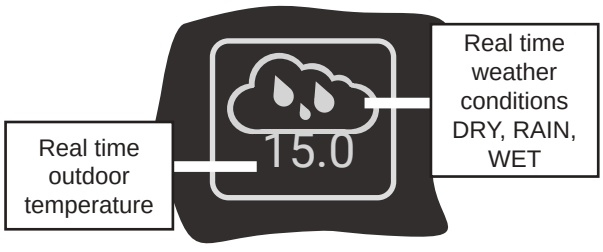
The “Snow Control” function is NOT a safety feature, but is only intended to improve stability of the system in unfavourable weather conditions. Supervision by the user or authorised personnel is always required.

Setpoints settable for Snow Control:

Setpoint	Default	Description
ON/OFF_SNOW	3.0 °C	Snow hazard limit temperature (only in “AUTO” configuration)
ROOM_SNOW	23.0 °C	Heating setpoint temperature if it snows
PREX_SNOW	200 Pa	Pressure setpoint value if it snows

These setpoints may be modified in “Set-Point” menu, please refer to Section 4.5.2 “CONTROL SETPOINTS”.

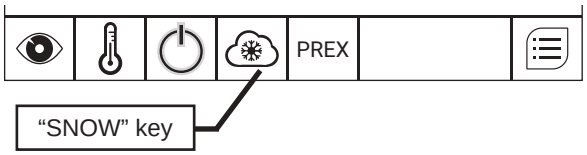
An icon displayed on the “HOME” page shows the current weather condition and the external temperature value:



Please find here below the Snow Control logic.

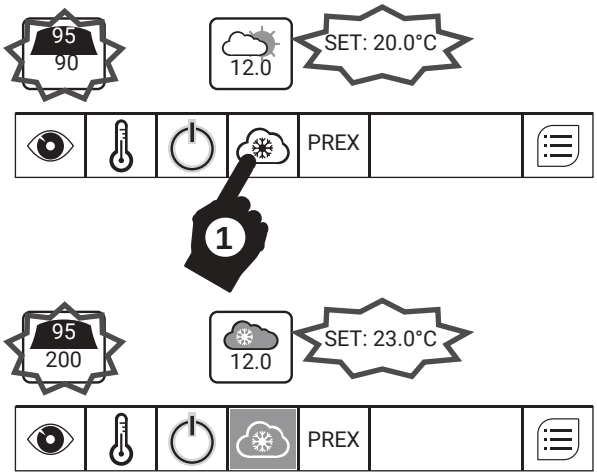
4.7.1. Manual operation (“MAN”)

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 “ROOM_SNOW” setpoint and takes the pressure to the “PREX_SNOW” setpoint value.



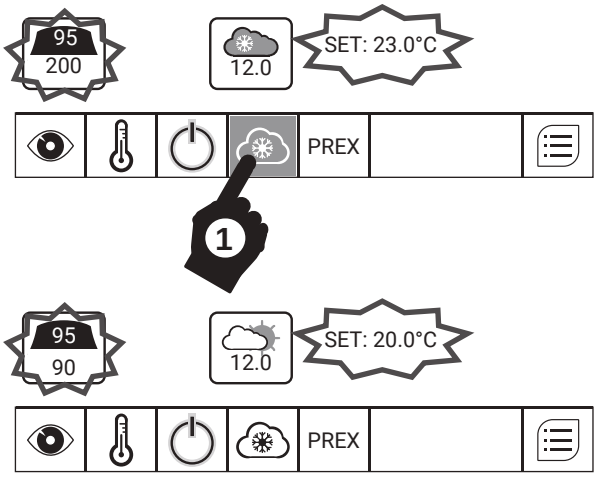
Press this key to activate the FORCED and always FIXED operation, simulating snow presence.
In the “HOME” page the “SNOW” key and the “Snow Control” icon (showing a snowflake) are highlighted in yellow, as shown here below.

FORCED Snow Manual Activation



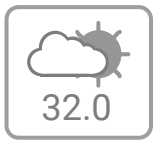
To deactivate the manual function just press the “SNOW” key again. The “Snow Control” icon and “SNOW” key now are “grey” again.

FORCED Snow Manual Deactivation



4.7.2. Automatic operation ("AUTO") (ONLY IF external sensor and probe ARE PRESENT)

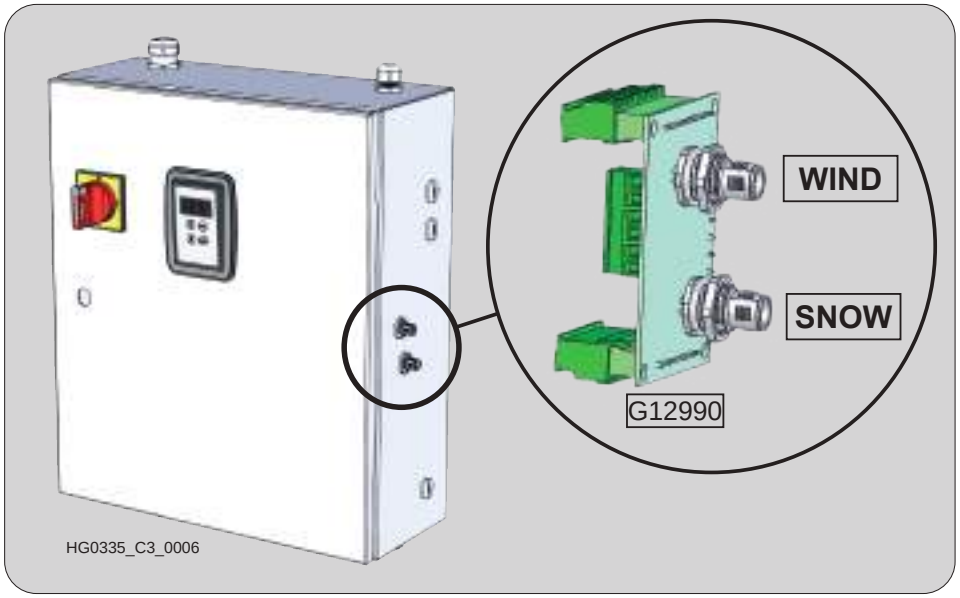
In case of rain the sensor, installed outdoor, closes contact ID2 and the rain icon is shown on Smart X display. If when it rains (thus with closed ID2 contact) the external temperature probe (connected to input AN2) measures a temperature below the "ON/OFF_SNOW" reference limit, the Smart indicates that it is possible it will rain, activates heating to "ROOM_SNOW" setpoint and takes the pressure value to the PREX_SNOW" 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.

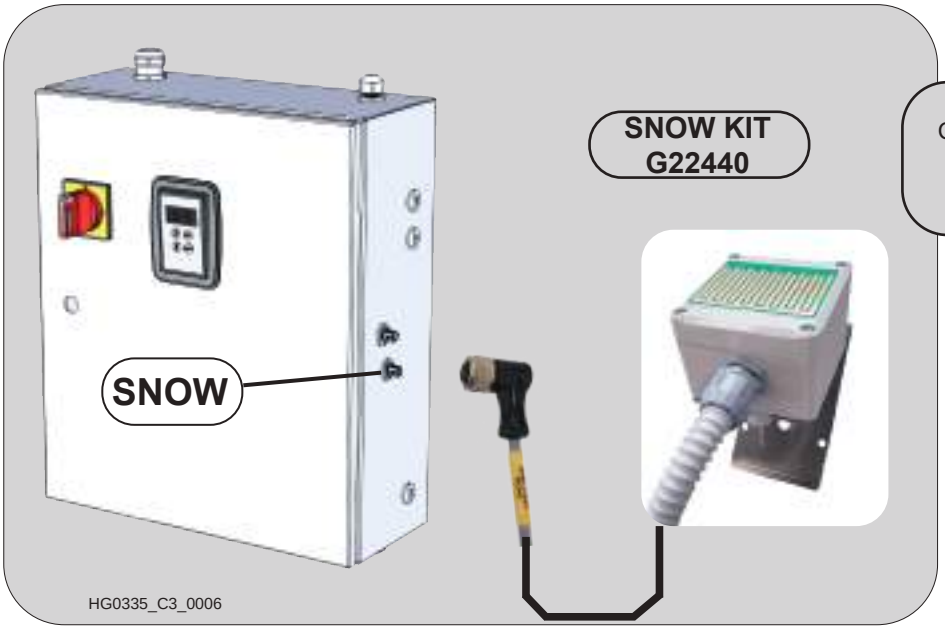
NO RAIN OR SNOW	
ID2	Open / DRY
AN2	C° > ON/OFF_SNOW
	
Snow Control OFF	

RAIN	
ID2	Closed / WET
AN2	C° > ON/OFF_SNOW
	
Snow Control OFF	

SNOW	
ID2	Closed / WET
AN2	C° < ON/OFF_SNOW
	
Snow Control ON	

ELECTRICAL CONNECTION



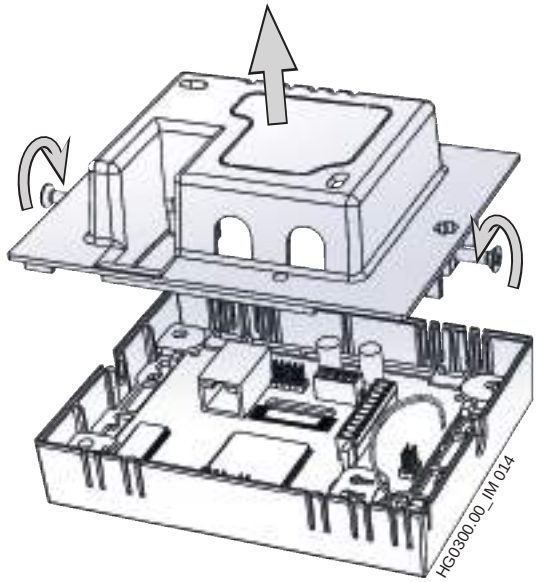


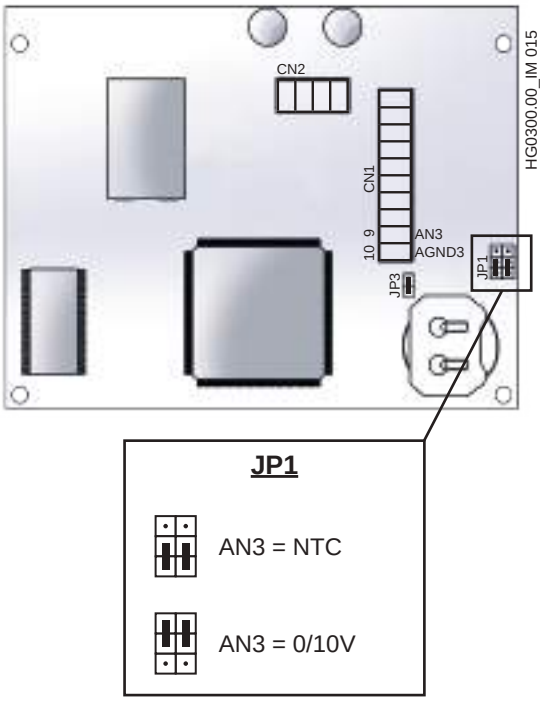
CONNECTION BOARD G12990 IS ALWAYS PRESENT IN PRESSOSTATIC VERSION

4.8. 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.

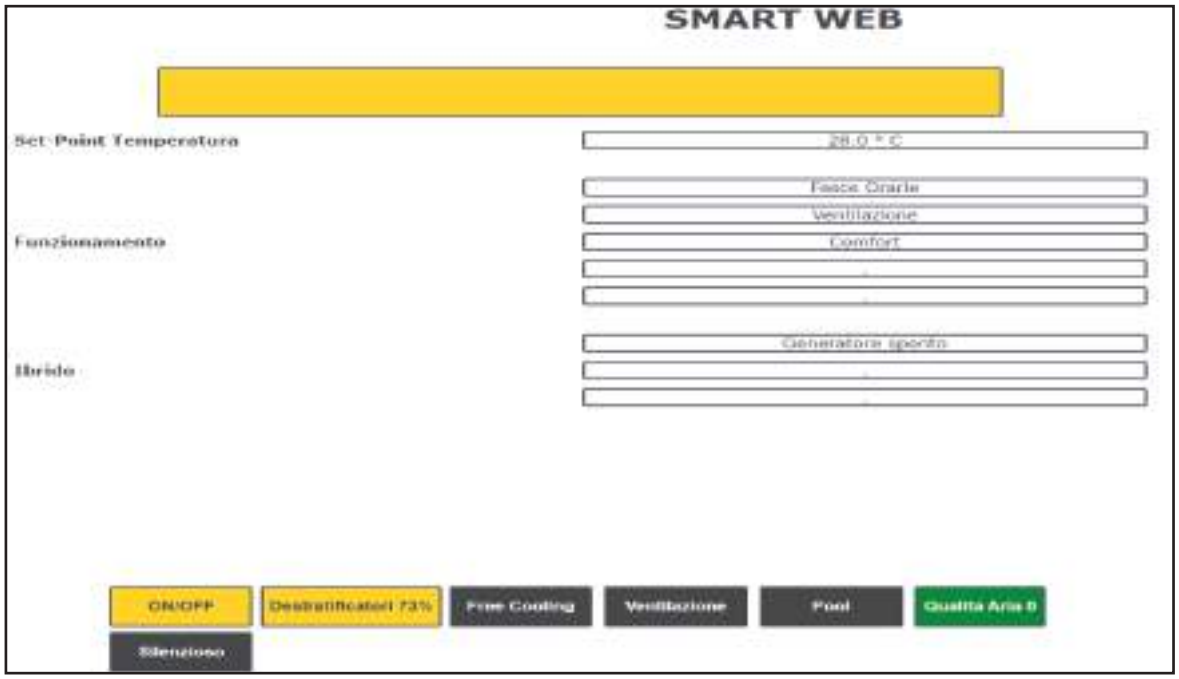




4.9. WEB configuration

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 Code HG0065.



4.10. Optional Accessories Required

APEN GROUP has provided a set of accessories to facilitate the installation of heaters according to the system requirements.

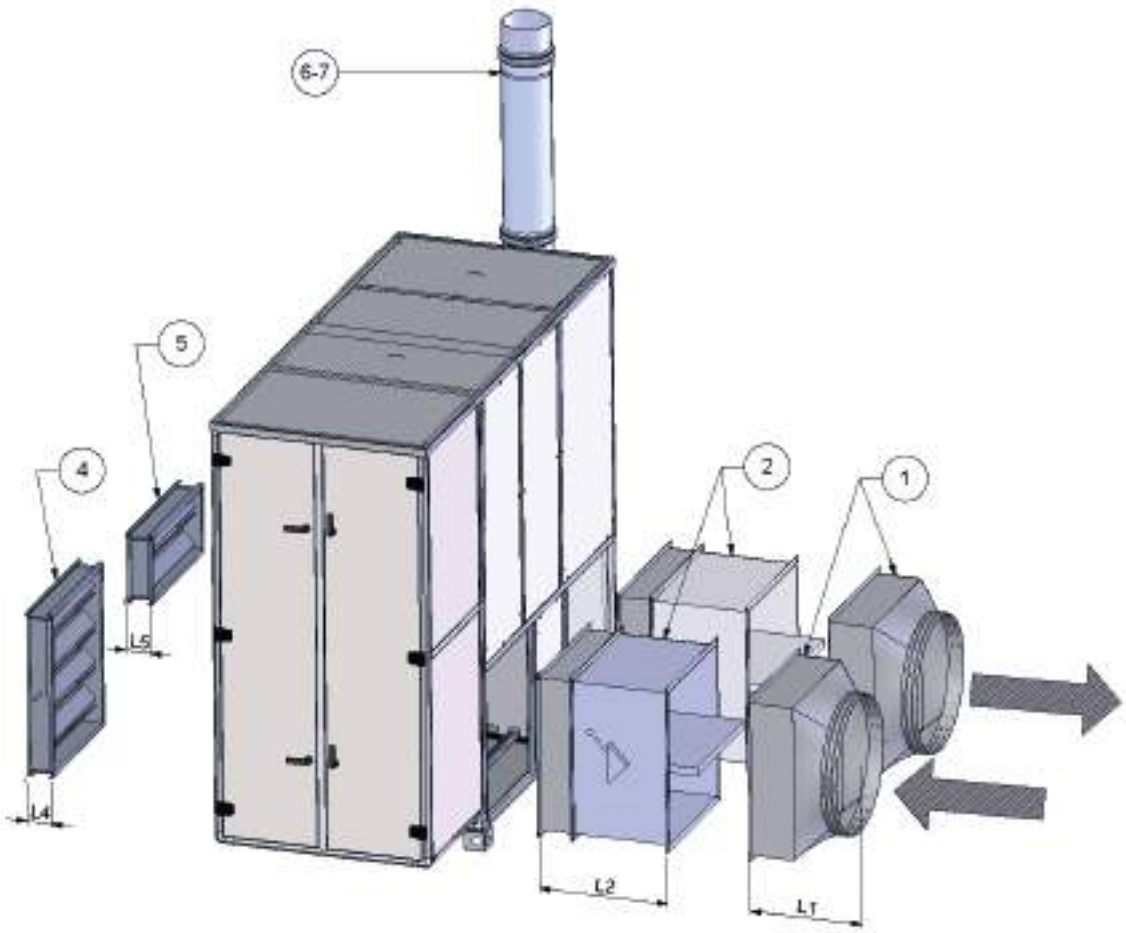
4.10.1. TENSOSTATIC buildings

For tensostatic buildings, the accessories required for the correct implementation of building-plant system are as follows:

- no.2 square-round fitting
- no.1 or 2 fire damper kits at delivery and/or at intake according to the intended use of the structure to which the heater is matched
- no.1 external air adjustment shutter kit, including the manual shutter control
- no.1 flue gas discharge shutter (mandatory if a fire damper is installed)
- no.1 single wall flue outlet kit or as an alternative no.1 double wall flue outlet kit

Further optional accessories for tensile structures are servocontrols for air shutters:

- ON/OFF, code G06642
- modulating, code G07240



KEY
1. Square-round fitting kit
2. Fire damper kit
4. External air adjustment shutter kit
5. Flue gas discharge shutter kit
6 or 7. Single wall or double wall flue outlet kit

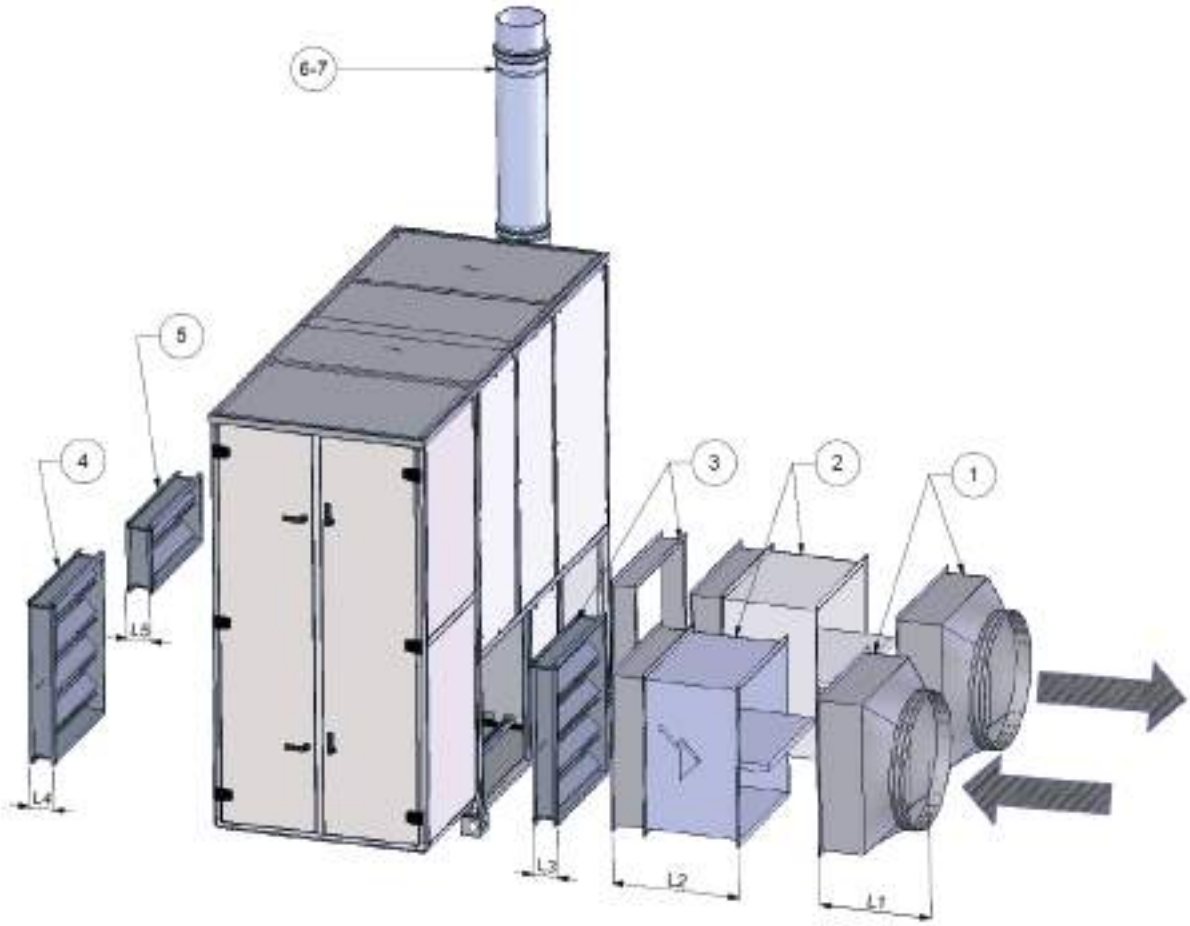
4.10.2. PRESSOSTATIC buildings

For pressostatic buildings, the accessories required for the correct implementation of building-plant system are as follows:

- n.1 servomotor for intake air adjustment shutter
- no.2 square-round fitting
- no.1 fire damper kit with delivery and/or intake according to the intended use of the structure to which the heater is matched
- n.1 intake air adjustment shutter kit
- no.1 overpressure shutter kit
- no.1 flue gas discharge shutter (mandatory if a fire damper is installed)
- no.1 single wall flue outlet kit or as an alternative no.1 double wall flue outlet kit

Further optional accessories for pressostatic buildings are:

- SNOW kit, code G22440 that activates the burner when external temperature and humidity conditions indicate probable snowfalls. The burner activation allows the snow not to easily deposit on the building tarp, preventing its overload.
- WIND GAUGE kit, code G05430 that controls the fans by requesting more internal pressure to counteract the external wind pressure, preventing an excessive overload of the horizontal forces and possible “tears” of the building from the ground.

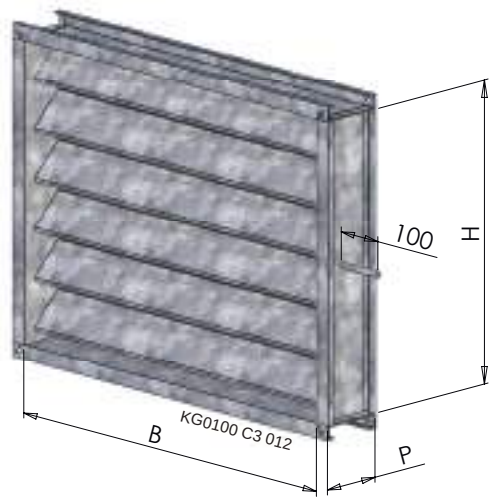


KEY
1. Square-round fitting kit
2. Fire damper kit
3. Intake air adjustment shutter kit
4. Overpressure shutter kit
5. Flue gas discharge shutter kit
6. or 7. Single wall flue outlet kit or Double wall flue outlet kit

4.11. Optional accessories

4.11.1. External Air Adjustment shutter kit

The external air adjustment shutter kit consists of an adjustment shutter fitted on the side opposite to the heater intake opening. All the shutters feature a “motorisable” control that allows the application of a manual control or, as an alternative, of a motorised control with servomotor; the manual control is supplied with the equipment, whereas the motorised control must be ordered separately



External air adjustment shutter kit

Model	Code	B	H	P	Fv*	Fh**
	shutter	[mm]	[mm]	[mm]	[mm]	[mm]
PKE100	*G12831*	500	800	125	35	30
PKE140	*G12831*	500	800	125	35	30
PKE190	*G12841*	600	800	125	35	30
PKE250	*G12851*	700	800	125	35	30
PKE320	*G12861*	800	800	125	35	30
PKE420	*G12871*	900	1100	125	35	30
PKE550	*G12881*	900	1200	125	35	30

External air adjustment shutter accessory kits are always supplied fitted to the heater.

4.11.2. Intake Air Adjustment shutter kit

The intake air adjustment shutter kit consists of an adjustment shutter fitted on the heater intake opening and a duct section with the same cross-section and depth fitted on the delivery opening.
All the shutters feature a “motorisable” control that allows the application of a manual control or, as an alternative, of a motorised control with servomotor; the manual control is supplied with the equipment, whereas the motorised control must be ordered separately.

Fv*: Vertical flange size
Fh*: Horizontal flange size

Fv*: Vertical flange size
Fh*: Horizontal flange size

Intake air adjustment shutter kit

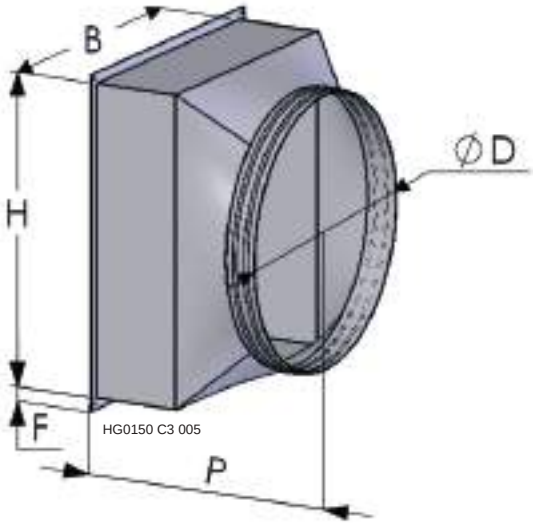
Model	Code	B	H	P	Fv*	Fh**
	shutter	[mm]	[mm]	[mm]	[mm]	[mm]
PKE100	*G12834*	500	800	125	35	30
PKE140	*G12834*	500	800	125	35	30
PKE190	*G12844*	600	800	125	35	30
PKE250	*G12854*	700	800	125	35	30
PKE320	*G12864*	800	800	125	35	30
PKE420	*G12874*	900	1100	125	35	30
PKE550	*G12884*	900	1200	125	35	30

Intake air adjustment shutter accessory kits are always supplied fitted to the heater.

4.11.3. Square-Round fitting kit

Square-Round fitting kit allows adapting delivery or intake square cross-sections of the heater to a round cross-section for textile duct mouth.

This kit consists of:
- a galvanised sheet shaped duct
- tarp clamps
- screws for duct fastening.



Square-Round fitting kit

Model	Code	B	H	P	F	D Ø
	fitting	[mm]	[mm]	[mm]	[mm]	[mm]
PKE100	*G12833*	500	800	450	30	600
PKE140	*G12833*	500	800	450	30	600
PKE190	*G12843*	600	800	450	30	700
PKE250	*G12853*	700	800	450	30	700
PKE320	*G12863*	800	800	450	30	800
PKE420	*G12873*	900	1070	600	35	900
PKE550	*G12883*	900	1170	600	35	1000

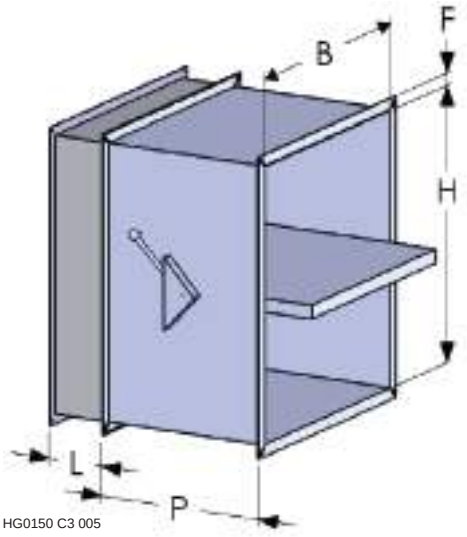
Square-Round fitting accessory kits are always supplied NOT fitted to the heater.

4.11.4. Fire damper kit

Fire damper kits can be fitted both at intake and at delivery as the dimensions of the two cross-sections are identical. 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.

800 mm high dampers have a single blade (PKE100-320), those higher than 800 mm have a double blade (PKE420/550).



HG0150 C3 005

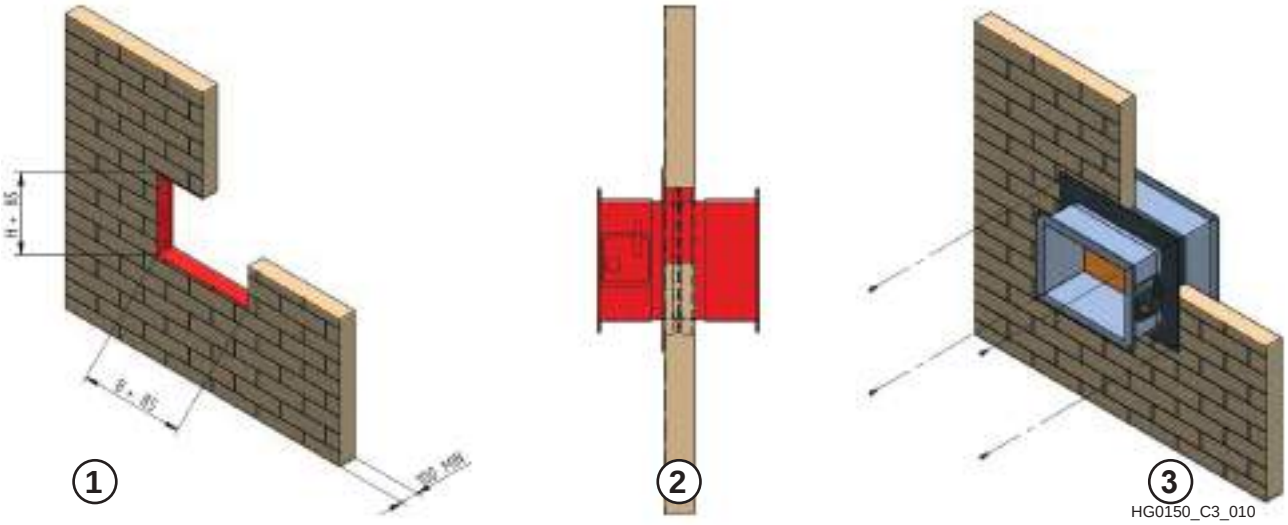
The open damper is as deep as the blade height: dampers higher than 510 mm project from both sides for a length equal to the height minus the depth (510 mm for all models) divided by two. In 800 mm high fire dampers with single blade the shutter projects 145 mm on both sides, for 1,070 mm high dampers with double blade the shutter does not project and for 1,170 mm high dampers with double blade the shutter projects 25 mm per side.
When required, fire damper kits are supplied complete with spacer pipe (L length) to allow fitting between fire damper and heater or shutter.
The geometry of square-round fitting kit always allows installing it downstream of the fire damper. For all the other types of installation it is necessary to provide a spacer pipe with “L” length downstream of the fire damper so that the blade can rotate completely.

Fire damper kit

Model	Code	B	H	P	L	F
	shutter	[mm]	[mm]	[mm]	[mm]	[mm]
PKE100	*G12830*	500	800	510	170	35
PKE140	*G12830*	500	800	510	170	35
PKE190	*G12840*	600	800	510	170	35
PKE250	*G12850*	700	800	510	170	35
PKE320	*G12860*	800	800	510	170	35
PKE420	*G12870*	900	1070	510	-	35
PKE550	*G12880*	900	1170	510	125	35

Fire damper accessory kits are always supplied fitted to the heater.

INSTALLATION OF FIRE DAMPER ON RIGID WALL



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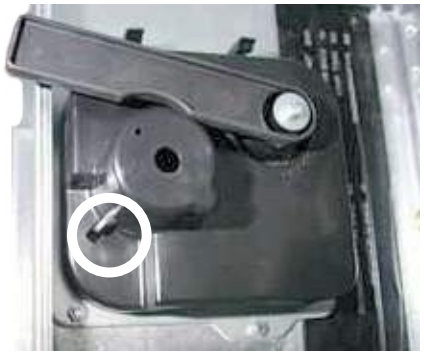
1. prepare in the wall an opening with both base and height increased by 85 mm with respect to the nominal dimensions of the damper; for walls made of concrete blocks or bricks it is recommended to provide a strengthening beam above the opening;
2. insert the damper in the opening so that the fixing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

Pay attention to the direction of rotation of the lever. In case of vigorous rotation in the wrong direction the locking device may break. After installation, check that there are no obstacles for the correct blade rotation.



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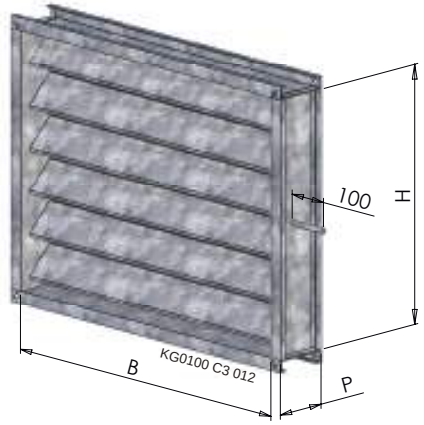
4.11.5. Flue Gas Discharge shutter kit

Flue gas discharge shutters must be used together with the fire damper kit and allow discharging flue gases outside the heater. The tabs, connected to one another by internal lever mechanisms, are kept in closed position by a servomotor electrically supplied by the wiring board (see electrical wiring on page 43).
In case of fire damper activation the servomotor forces the tabs to quickly open the damper.
The frame and the tabs are made of extruded aluminium.



Flue gas discharge shutter kit

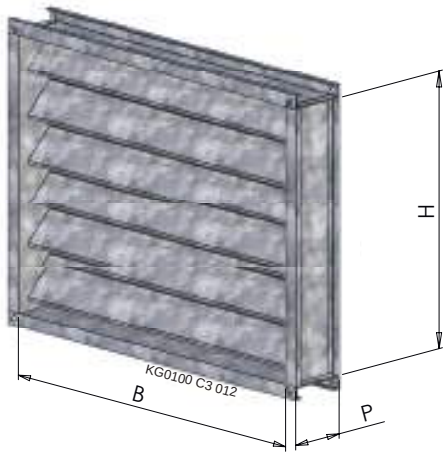
Model	Code	B	H	P	Fv*	Fh**
	shutter	[mm]	[mm]	[mm]	[mm]	[mm]
PKE100	*G12832*	500	310	125	35	30
PKE140	*G12832*	500	310	125	35	30
PKE190	*G12842*	600	310	125	35	30
PKE250	*G12852*	700	310	125	35	30
PKE320	*G12862*	800	310	125	35	30
PKE420	*G12872*	900	310	125	35	30
PKE550	*G12882*	900	310	125	35	30

Fv*: Vertical flange size
Fh*: Horizontal flange size

Flue gas discharge shutter accessory kits are always supplied fitted to the heater.

4.11.6. Overpressure shutter kit

Overpressure air shutters are positioned on the external air intake side as an alternative to the external air shutter. They do not adjust the air flow rate, but are used to ensure air renewal from the outside as long as the fans are working; when ventilation stops overpressure shutters close hermetically by gravity



Overpressure shutter kit

Model	Code	B	H	P	F	Fh**
	shutter	[mm]	[mm]	[mm]	[mm]	[mm]
PKE100	*G12831-SP*	500	800	125	35	30
PKE140	*G12831-SP*	500	800	125	35	30
PKE190	*G12841-SP*	600	800	125	35	30
PKE250	*G12851-SP*	700	800	125	35	30
PKE320	*G12861-SP*	800	800	125	35	30
PKE420	*G12871-SP*	900	1100	125	35	30
PKE550	*G12881-SP*	900	1200	125	35	30

Fv*: Vertical flange size
Fh*: Horizontal flange size

Overpressure shutter accessory kits are always supplied fitted to the heater.

4.11.7. Servocontrols for Air Shutters

The supplied air shutters are of motorised type, with manual control.
If a motor-assisted control is installed, a control is needed in addition to servomotor. This control can be of the following types:

ON-OFF
The control can be made with a simple switch/diverter that, based on the position, opens or closes the shutter (divisions can be performed with the mechanical limit switches on the servomotor).
230V power supply.
Modulating
The modulating control is provided with a controller that regulates the shutter based on the output (0-10 Vdc signal) from a value such as temperature, humidity, air flow rate, and so on. As an alternative, you can also use a potentiometer (0-10 Vdc), to manually set the shutter based on your needs.
24V power supply.

Servomotor: this picture is for reference only. Brand and model of supplied device can change without notice.

4.11.8. Inverter

The PK-Sport Pressostatic version heaters are provided as standard with Inverter fan control.

With standard motors, minimum speed must be higher than 22 Hz to guarantee cooling down motor coil. If this threshold is too high, special motors are available and can be requested to APEN GROUP Technical Support.

The main switch protecting the heater through an inverter must have a residual current to the ground of 0.3A (300 milliampere). Switches with residual current of 0.03A (30 milliampere) are not suitable.

In installations where air distribution ducts are made of textiles (or similar), it prevents the initial splash effect and guarantees longer life to ducts.

It balances motor breakaway starting current

It helps reduce belt wear and extend the life of motor and fan bearings

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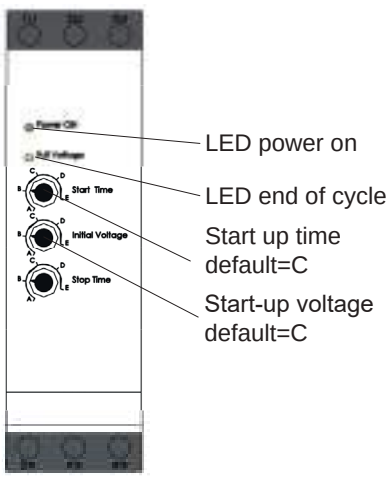
If motors with inverter are used, it is mandatory to install a two-stage or modulating burner with flame mode control depending on fan speed.

4.11.9. Soft starter

PK-SPORT TENSOSTATIC heaters are supplied as standard, for motors of 5.5 kW or more, with a soft starter.

A soft starter for 3-phase motors with capacity below 5.5 kW is also available.
G04700-06 soft starter for motors up to 2.2 kW
G04700-09 soft starter for motors up to 4.0 kW



4.11.10. Accessories for the Chimney

Components supplied for flue system are made of stainless steel AISI316L. They are single walled and suitable for indoor or outdoor installation.
If required, double-walled stainless steel chimneys can be supplied.
Components have male/female rotating facing. Clamps are only required for chimneys longer than 2 metres. Silicone rubber seals are supplied.
Running temperature with dry/wet operation and negative pressure is 400°C. In case of wet operation under pressure, the temperature is 250°C.
Chimneys are suitable for working either under pressure or negative pressure. Maximum pressure allowed is 1,000 Pa.
Flue sampling element is 300 mm long and it includes a thermometer.

FLUE OUTLET KITS

Flue outlet kits consist of:
- a Tee joint
- two straight sections with L=1,000 each
- a windproof tapered cover
- a condensate collection module
- tie rods for fastening to the upper part of the heater.

If necessary, it is possible to integrate the flue outlet kit with a single-hole flue exhaust module or with one or more straight sections with length of 1,000 mm each.

Flue outlet kit

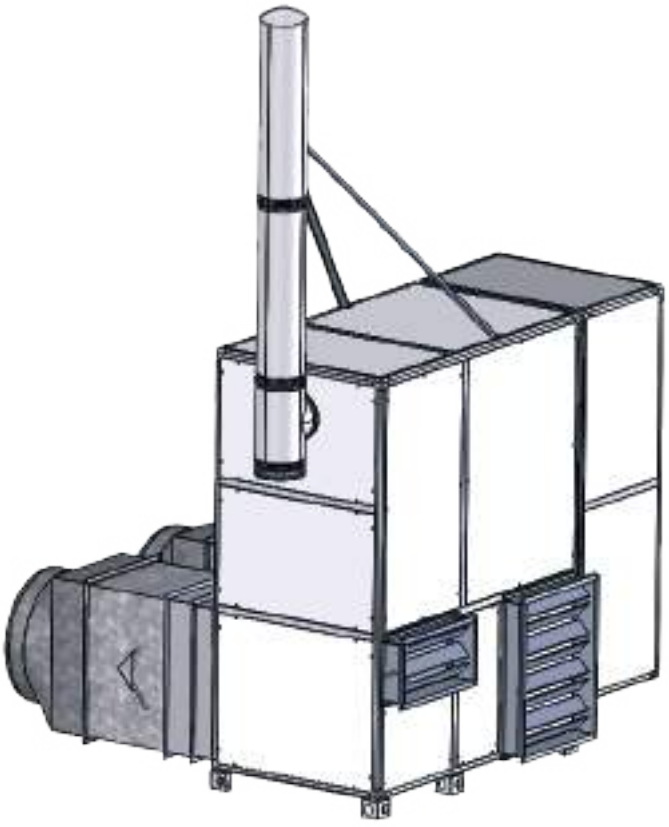
Model	Code		D Ø
	single wall	*double wall*	[mm]
PKE100-140	*G04065-180*	*G04065-180-DP*	180
PKE190-320	*G04065-250*	*G04065-250-DP*	250
PKE420-500	*G04065-300*	*G04065-300-DP*	300

Straight chimney L=1,000 mm

Model	Code		D Ø
	single wall	*double wall*	[mm]
PKE100-140	*G10852-180*	*G10852-180-DP*	180
PKE190-320	*G10852-250*	*G10852-250-DP*	250
PKE420-500	*G10852-300*	*G10852-300-DP*	300

Single-hole flue exhaust module

Model	Code		D Ø
	single wall	*double wall*	[mm]
PKE100-140	*G13857-180*	*G13857-180-DP*	180
PKE190-320	*G13857-250*	*G13857-250-DP*	250
PKE420-500	*G13857-300*	*G13857-300-DP*	300



Flue outlet accessory kits are always supplied NOT fitted to the heater.

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

0694-CPR-52976	1856-2	T600	N1	D	V2	L50050	O50
0694-CPR-52977	1856-1	T200	P1	W	V2	L50050	O70

Certificate no.

Number of the Standard

Temperature level:
T80/T100/T120/T140/T160/T200/T250/T300/T400/T450/T600

Pressure level: N=Negative,P=Positive, H=High Pressure,
1 and 2 indicate allowed loss. 1 is the most restrictive value

Condensate Resistance Class: D = dry use, W = wet use

Corrosion resistance class:
V1 - gaseous fuels, natural gas, LPG, and manufactured gas with nitrogen ≤50 mg/m³;
V2 - liquid fuels, natural gas, LPG and manufactured gas with nitrogen >50 mg/m³;
V3 - solid fuels, natural gas, LPG and manufactured gas with nitrogen >50 mg/m³, fuel oil with sulphur >0.2%
Vm - resistance category without test, only with minimum thickness of material

Material and thickness: if STAINLESS AISI316 steel 0.5 mm thick is used, category is L50050
i.e. L50=STAINLESS AISI316, 050=0.4mm thick

Inner resistance to fire (G=Yes, O=No) and distance (e.g. 50=50mm) from combustible materials

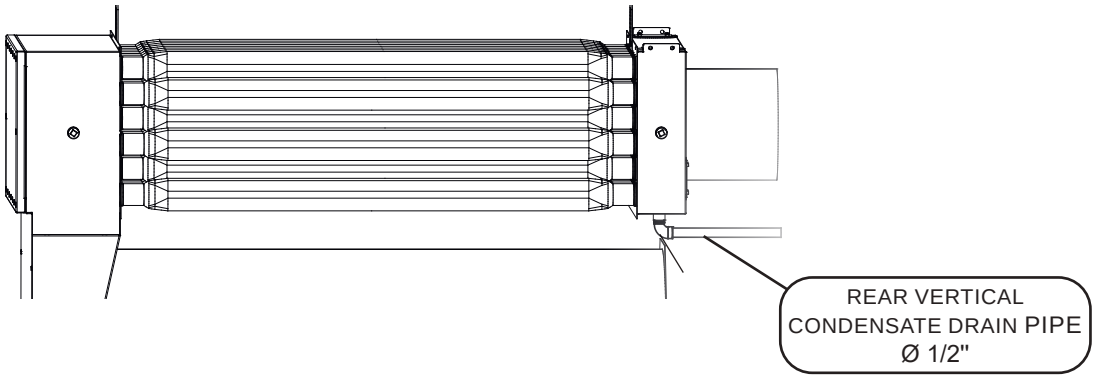
4.11.11. Accessories for Condensate Handling

If a heater with modulating and/or two-stage burner is installed, high air flow rates and low heat drop can result in condensate production. It is necessary to drain this condensate from the exchanger using a suitable system.
All PKE-N-SPORT heaters do not include a kit for condensate drain.
No condensate should form into front manifold because the gaskets installed are not waterproof. In order to avoid this, burner heat input should be adjusted to a value at least equal to heater minimum heat input (see table with technical data).
If condensation is not drained from the exchanger, it could seriously damage it. The warranty of the exchanger does not cover damage caused by condensate.
The picture below shows examples of vertical installation. It is advisable to install the heater with a slight inclination towards condensate drain in order to ease its discharge. The condensate drain is fitted as standard on condensing heaters and has its outlet on chimney side.
Condensate drains must not be changed or blocked.

Materials to be used for condensate drain
Any plastics should be avoided for condensate drain system since flue gas temperature is too high. Suitable materials are stainless steel and aluminium (only outside the heater). Galvanized steel is not recommended since it can be corroded by acid condensate.
KIT code installed as standard on condensing heaters is G00740-xxx-V
Replace xxx with heater size code.

Draining using a Siphon
If the heater is installed indoor and a condensate drain system is provided, the siphon must mandatorily be smoke proof.
Fill manually the siphon with water at first start-up

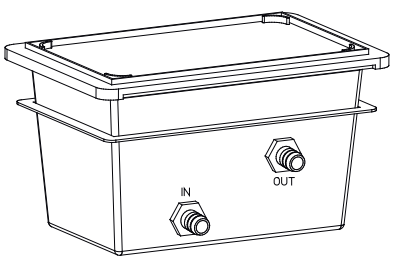
PKE-K and R heaters are provided as standard with rear condensate drain



For version “N” if an oil burner is matched, it is mandatory to prevent any condensate.

ACID CONDENSATE TREATMENT KIT

Apen has acid condensate treatment kits:
- G14303 for heaters up to PKE100
- G05750 for heaters from PKE140 to PKE550



5. INSTRUCTIONS TO THE INSTALLER

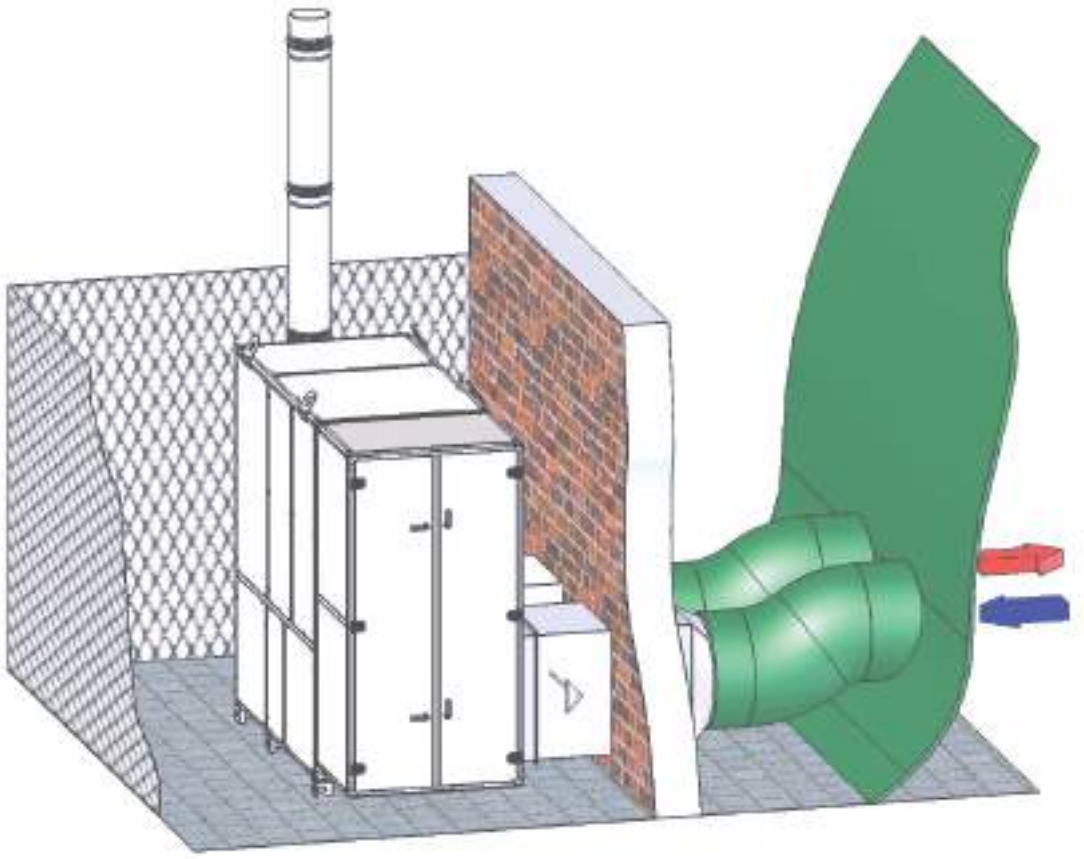
5.1. Where to Install the Heater

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 heater 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.
Fuel and power supplies shall be easily accessible.
All the heater's connecting and assembling operations must be performed only by qualified staff that is skilled for the operations required to start it.

Connecting air ductwork
Ducts for air delivery and intake shall be sized based on aeraulic performance of the unit (shown in the "TECHNICAL DATA" section of this Manual).
Special attention must be paid to the required ambient noise conditions with dimensioning and installation.

Connecting Fuel Supply
Fuel connection shall be performed by qualified personnel only.
Follow instructions in User Manual of the burner installed on the heater and comply with existing regulations.

The heater shall not be modified in any part without the manufacturer's written authorisation



For a correct installation it is mandatory to insert a mesh or another device that prevents duct shrinkage during machine operation

5.2. Wiring to Power Supply

Warm air heaters come with a main switch with door lock (IG) shown in the figure.
Wire power supply directly to that switch.
All PK-SPORT series heaters are provided with 400V+N three-phase power supply. Wiring must be carried out as follows:

Three-phase	400V+N	Wire three phases to T1, T2, and T3 terminals and Neutral to N terminal

Ground wire is mandatory. Connect it to relevant terminal or screw.

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

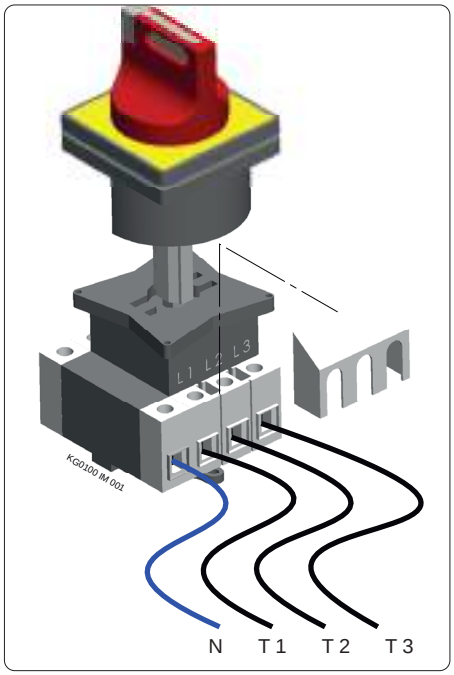
Electrical Protections

A residual-current circuit breaker must be installed before the control panel of the heater. This circuit breaker must include an automatic protection in compliance with existing regulations.

The use of switches with characteristic curve for their triggering of type "**K**" or "**D**" or "**C**" is mandatory.

With the INVERTER, a 0.30mA automatic residual-current circuit breaker with type class "B" is recommended

Automatic circuit breakers with "**A**" trigger curve are not allowed since they are not suitable for electrical motor protection.



5.2.1. Cables

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

PKE Model	Code Motor	Motor kW	Rated Current In	Cable section mm²	A protection
100	G01260-IE3	3.0	6.9	4x1.5	10
140/190	G00137-IE3	4.0	8.7	4x2.5	16
250/320	G01022-IE3	7.5	17.1	4x4.0	25
420	G00837-IE3	11.0	23.8	4x6.0	40
550	G01973-IE3	15.0	31.5	4x10.0	63

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 20mt. Rated current: current absorbed by gas or oil burner. Add ground cable to the number of cables.

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

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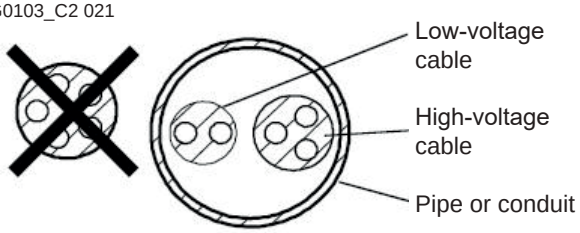


CHECKS
All APEN GROUP heaters are electronically tried and tested. Also safety devices are tested.
At first start up, the following checks are mandatory:

- fan rotation direction.
- absorption of each motor. Absorption must be lower than rated absorption (see values in "Technical Data" section).

5.3. Electrical connections

All PK-SPORT warm air heater control panels use a modulation board and a wiring board which allow an easy and safe connection of parts that are usually used in warm air heating systems such as:

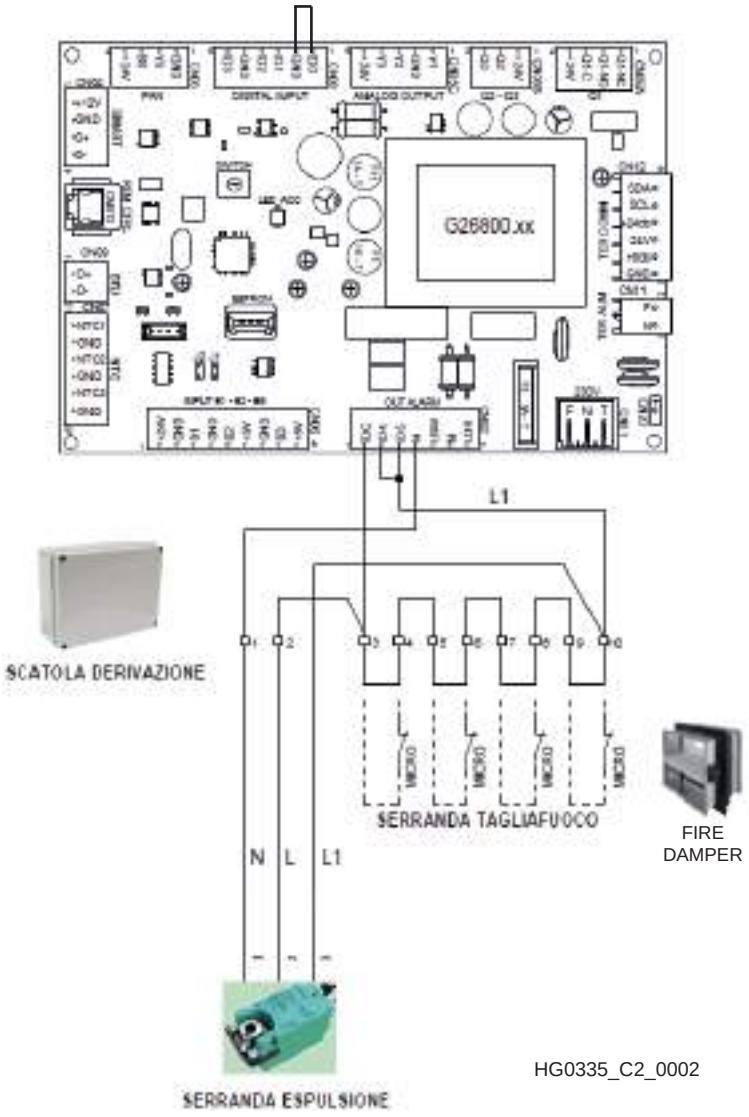
- Fire Damper
- Discharge Shutter
- Burner

Fire Damper

A dedicated junction box is installed on the machine for connecting the microswitches of the fire dampers.
It is possible to have from 1 to 4 microswitches connected. With activated damper, the N.C. contact of the microswitch is connected to the terminal board.
Microswitches will be connected in series, ensuring that the IDC and ID5 contact of the CPU's CN2 connector is closed.
If the microswitch triggers, the contact opens and the board switches to error E25, stopping the burner.
The fan keeps working to cool down the exchanger. Heat in excess will be dispersed through a discharge shutter for a time preset in the modulation board.

Discharge Shutter

Connect 230Vac power supply of servomotor to terminals 1 and 2 of the board in the junction box and ON/OFF control to terminal 10 together with fire damper microswitch return line.
With fire damper microswitch closed, servomotor ON/OFF contact is powered and the shutter remains closed.
If fire damper triggers, the servomotor opens the discharge shutter to discharge warm air outside the tensostatic or pressostatic structure.



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If no fire damper is installed, create a jumper on terminals 3 and 10 in the junction box.

The burner operates only if terminals ID0 and GND are closed, modulation board connector CN08.

In case of special configurations (with accessories) refer to the dedicated technical sheet and wiring diagram.

5.4. Wiring the Burner

A specific connector on burner control board is dedicated to connecting the burner.
The connector shows standard numbering for modulating and two-stage burners. You only need to wire the burner to the connector respecting numbering.

Three-phase Burner

On control panels of models from PK 250 onward, an automatic switch is installed that controls 3-phase burner power supply. 3-phase burners always have two supplies:

- 400V three-phase for electrical motor
- 230V single-phase for the control section.

With 3-phase motors, remember to verify that rotation sense of burner motor is correct. Installed switch has the following characteristics:

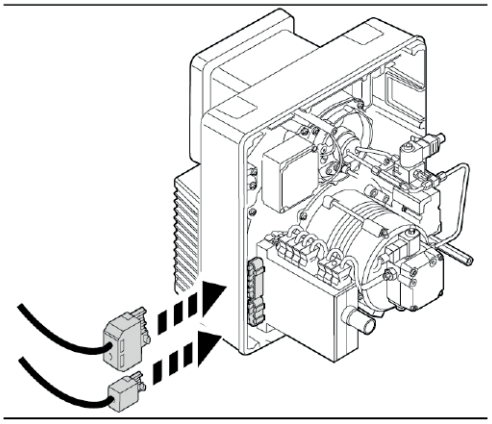
Magnetic protection 6.3 A **Tripping current 78 A** **Breaking capacity 100 kVA**

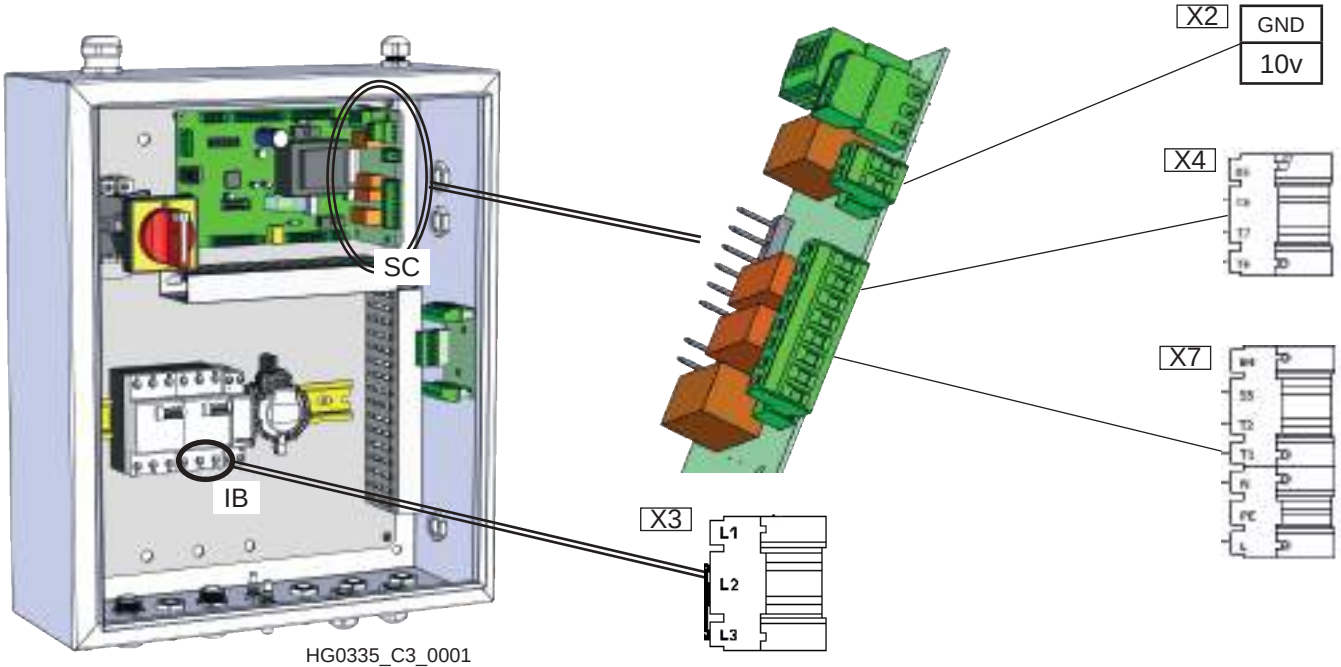
Single-phase burner

For single-phase burners which are separately powered:

- take a phase from the IB burner switch and bring it on the burner terminal board, with the other IB switch phases released;
- take the neutral from the control panel main switch.

Legend of Burner Plug		
X7	7-pole plug for burner connection	
	L1	line supply (230V)
	T	ground
	N	neutral
	T1-T2	series of thermostats
	S3	lock signal
X4	4-pole plug for high/low flame connection	
	T6-T7-T8	high/low flame thermostat.
X3	3-pole plug for 3-phase burner	
	L1-L2-L3	3-phase burner terminal board
X2	Burner modulation plug	
	0-10v	Burner modulation
SC	Burner wiring board	
IB	3-phase burner switch	





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6. SERVICING INSTRUCTIONS

6.1. Operating Cycle

The PK-SPORT heaters operation is fully automatic; they are equipped with electronic equipment with self check facility that manages all the burner control and monitoring operations and with a microprocessor based electronic PCB that controls the heat output regulation.

The heat demand depends on SMART parameter setting of the heater PCB:
SMART = 1: uses PID and ON/OFF of the SMART;

With the heater powered and not locked out, when the SMART requests ignition, the burner starts; after a time (parameter T on on the CPU PCB, default 60 sec.) the fan will start.
During heater switching off, disconnecting the power supply is prohibited, except for emergencies because, when the heater is switched off, the fan will continue to work for approximately 180 seconds to cool the combustion chamber.
Failure to perform the post-cooling operations on the exchanger will cause:

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

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

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

6.2. Interface Panel

PK-SPORT heaters are fitted as standard with a multifunction LCD panel located on the front of the control panel, which is used to control, configure and diagnose all operating parameters of the equipment.
This panel cannot be remotely controlled.

The panel is fitted with a red 3-digit LCD display and with four function keys: ↑ , ↓ , ESC and ENTER; the display allows the user to display the heater operating mode and its Faults. It also allows the service centre to change the main operating parameters.
Changing parameters requires a password.

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

6.3. Reset

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

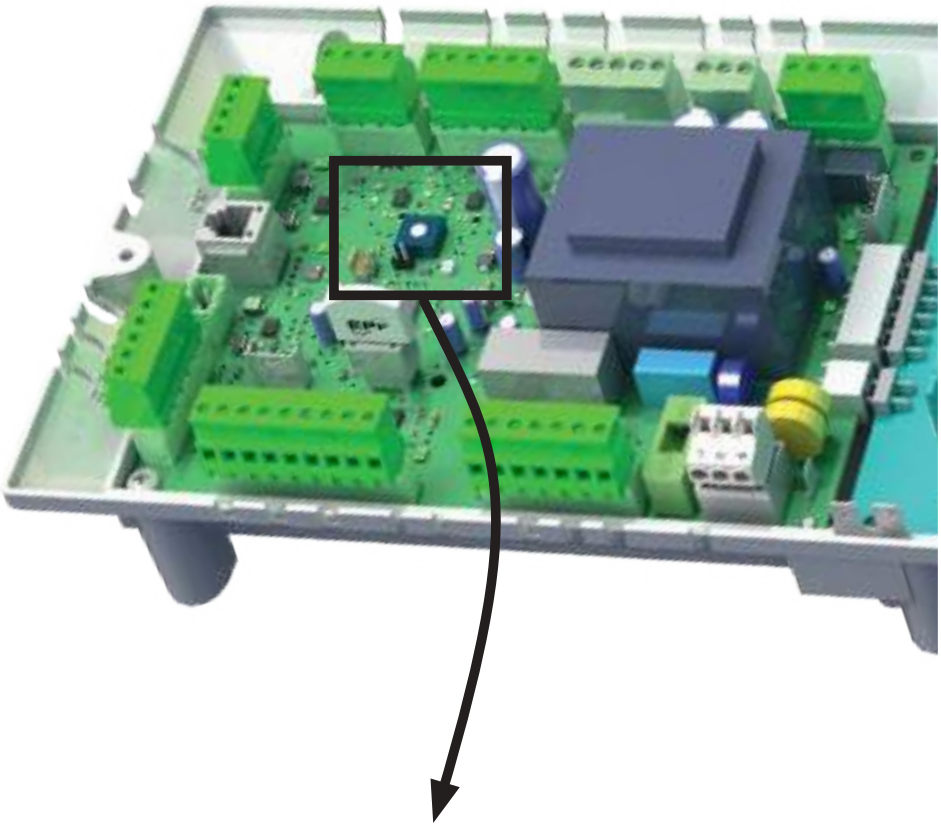
- the Smart X Web control;
- the ModBus protocol, if implemented by the manufacturer.

The lockout codes and their cause are shown in the ERRORS table in Paragraph 6.6 “Analysis of Lockouts - Exx”.

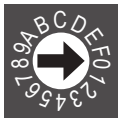
6.4. Smart X Web connection

Use the connector provided to connect the Smart X Web. Connect the power supply, making sure polarity is correct.
Connect the RS485 network to its terminals, making sure polarity is correct.
For multiple heaters, connect terminals D+ and D-, making sure polarity is correct; the network can be made both as a serial and star network.

The correct address for each PCB must then be set up. Addresses must start from 1 to N without interruptions in the numbering sequence. The address of each PCB, if different from zero, is displayed on the LCD as "Axx", where xx is the address. To program the Smart X Web, please read the operating manual supplied with the accessory Code HG0065.



Switch for CPU PCB address



Address #0

Address #2

Address #15

6.5. Modulation PCB Parameters

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

Parameters of G26800.03 CPU PCB version 8.03.xx					
Parameter Name			TENSO.	PRESSO.	
Smart	LCD	U.M.			DESCRIPTION
FUNC 00	**Fnu P00**		**Equipment operation**		
TER			0		TER presence
SMART			1		SMART presence *0 = Smart not present* *1 = uses PID and ON/OFF of the SMART* *2 = uses only ON/OFF command of the Smart*
PTH	P06		100		Maximum limit of PT%_OUT_BURNER OUTPUT, modulating models only
PTL	P07		0		Minimum limit of PT%_OUT_BURNER OUTPUT, modulating models only
FUNC 01	**Fnu P10**		**Burner operation - NOT USED**		
REG 01	**rGL R10**		**Delivery Temperature Modulation Probe NTC Control (CHANNEL)**		
REG_01	R11		1		1 = enabled
ST1	R12	°C	55		ST1 function setpoint
Xd1	R13	°C	5		ST1 hysteresis
Kp1		%	20		Proportional coefficient
Ki1		%	100		Integral coefficient
TH1	R16	°C	65		Alarm temperature for ST1 for fault E51; Autoresolve with NTC1<ST1
AC1			1		*0 = modulation only* *1 = modulation and ON/OFF*
MOD1			0		*0 = Reverse and/or Direct (changes according to the phase sent via modbus, heating, ventilation or conditioning)* *1 = Reverse only (for heating)* *2 = Direct only (for ventilation or conditioning)*
ING1A			1 (NTC1)		Defines the analogue input to be used for calculation *1 = NTC1* *2 = NTC2* *3 = NTC3*
REG 02	**rGL R20**		**Heat Exchanger Temperature Probe NTC Control**		
REG_02	R11		1		1 = enabled
ST2	R12	°C	80		ST2 function setpoint
Xd2	R13	°C	5		ST1 hysteresis
Kp2		%	20		Proportional coefficient
Ki2		%	100		Integral coefficient
TH2	R16	°C	95		Alarm temperature for ST2 for fault E52; Autoresolve with NTC2<ST2
AC2			1		*0 = modulation only* *1 = modulation and ON/OFF*
MOD2			0		*0 = Reverse and/or Direct (changes according to the phase sent via modbus, heating, ventilation or conditioning)* *1 = Reverse only (for heating)* *2 = Direct only (for ventilation or conditioning)*
ING2A			2 (NTC2)		Defines the analogue input to be used for calculation *1 = NTC1* *2 = NTC2* *3 = NTC3*

Parameters of G26800.03 CPU PCB version 8.03.xx

Parameter Name			TENSO.	PRESSO.	
Smart	LCD	U.M.			DESCRIPTION
REG 03	**rGL R30**		**Temperature Maintenance Probe NTC Control (AIR+POOL)**		
REG_03	R31		0		*0 = disabled* *1= enabled by SMART through DOMESTIC WATER request; not active in heating and/or conditioning mode* *2= enabled by the SMART "AIR+POOL" request*
BR_03	R38		0		*0 = uses automatic mode (par. REG_03)* *1= Forces mode as standard setting* *2= blocks change of par.REG_03 from SMART X*
ST3	R32	°C	30		Setpoint (it is changed by SMART)
SM3	R3A		50		Setpoint in manual mode (BR_03=1)
Xd3	R33	°C	5		ST3 adjustment hysteresis (burner OFF)
Kp3		%	20		Proportional coefficient
Ki3		%	100		Integral coefficient
TH3	R36	°C	65		Alarm temperature for ST3 for fault E53; Autoresolve with NTCx<ST3
ING3A			2 (NTC2)		Defines the analogue input to be used for calculation *1 = NTC1* *2 = NTC2* *3 = NTC3*
OUT_A			0		Digital output not used
REG 04	**rGL R40**		**Modulation Adjustment from 0/10 Vdc Control - NOT USED**		
REG_04	R41		0		*0 = disabled*
REG 05	**rGL R50**		**Air Pressure Adjustment (for pressostatic units or ductwork)**		
REG_05	R51		0	1	*0 = disabled* *1= enables REG_05 air pressure control for Pressostatic Buildings*
ST_Pair	R52		0	120	*Setpoint for ductwork pressure in Pa*
Kp_Pair			0	50	*Proportional coefficient*
Ki_Pair			0	20	*Integral coefficient*
Kd_Pair			0	15	*Derivative coefficient*
LI_Pair			0	100	*Limit in percentage of integral value*
ING_air_1			0	6 (B2)	*Defines the analogue input to be used for calculation*
REG 06	**rGL R60**		**Air Quality Adjustment - NOT USED**		
REG_06			0		*0 = disabled*
CTRL 01	**CrL C10**		**Water Pressure Control - NOT USED**		
CTRL_01	C11		0		*0 = disabled*
CTRL 02	**CrL C20**		**Water Antifreeze Control - NOT USED**		
CTRL_02	C21		0		*0 = disabled*
CTRL 03	**CrL C30**		**Burner Compartment Antifreeze Control**		
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

Parameters of G26800.03 CPU PCB version 8.03.xx

Parameter Name			TENSO.	PRESSO.	
Smart	LCD	U.M.			DESCRIPTION
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		Reset control *1 = PCB fault reset*
CTRL 09	**CrL C90**		**UNUSED AIR FILTERS control**		
CTRL_09	C91		0		*0 = disabled* *1 = enabled as ON/OFF pressure switch* *2 = enabled as pressure transducer*
FUNC 02	**Fnu P20**		**BLOWN AIR BURNER Management**		
FN_02			1		*0 = disabled* *1 = Two-Stage or Modulating Adjustment*
DT2		%	0.1		*Percentage delta for two-stage control*
OUT2A			5 (Q1)		*It defines the digital output for sending ON/OFF signal*
OUT2B			6 (Q2)		*It defines the digital output for sending HI/LOW signal*
OUT2C			1 (Y0)		*It defines the analogue output for sending PWM% signal*
TSV2		sec	30		*burner modulation servomotor stroke time*
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	180	0	Seconds of delay for fan stop
OUT3A			8 (LBW)	0	Digital output for main fan
OUT3B			3 (Y2)	0	Analogue output 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 for PRESSOSTATIC Units**		
FN_04	P41		0	1	*0 = disabled* *1 = enabled for fan pressure control*
OUT4A			0	3 (Y2)	*Analogue output for main fan*
OUT4B			0	2 (Y1)	*Analogue output for recirculation shutter*
OUT4C			0	0	*Digital output for changing operation from AIR (0) to Heat (1)*
SHUTT%			0	100	*CLOSING % of recirculation shutter in maintenance phase*
T_ON	P46	sec	0	60	*Delay time for switching from Maintenance to Heating*
T_OFF	P47	sec	0	120	*Delay time for switching from Heating to Maintenance*

Parameters of G26800.03 CPU PCB version 8.03.xx

Parameter Name			TENSO.	PRESSO.	
Smart	LCD	U.M.			DESCRIPTION
FUNC 05	**Fnu P50**		**Inverter Control Management Function and Motor Thermal Protection**		
S5	P51		0		*0 = disabled* *1 = enabled with autoreset for E85/E86* *2 = enabled without autoreset for E85/E86*
ST5	P52		300		*Live setpoint for alarm*
P5			10		*ST5 hysteresis*
ING5			7(B3)		*Analogue AN0-3 or digital ID1-3 input*
OUT5A			0		*(Digital) output*
OUT5B			0		*(Analogue) output*
OUT5C			0		*(Digital) output*
TF5		sec	5		*Delay in seconds for alarm E85*
TI5	P59	sec	5		*Delay in seconds for alarm E86*
TOFF_5	P5A	sec	180		*Switch-off delay in OFF phase*
ANT5			1		*Anti-lock function enabling*
FUNC 08	**Fnu P80**		**Damper Management Function**		
FN_08	P81		0		*0 = disabled* *1 = enables outdoor air and/or exhaust damper (ON/OFF)* *2 = enables mixture, outdoor and exhaust damper (modulating)*
FSER08	P82		30		*External damper opening percentage*
OUT08A	P83		0		*Analogue or digital output for external damper*
FUNC 10	**Fnu-PA0**		**Extractor and free cooling function - NOT AVAILABLE**		
FN_10			**0**		*0 = disabled*
	rtu		**RS485 Serial Communication Configurations**		
D_SL	SSL		0		slave serial baud rate (SMART X) *0 = baud rate 19,200 - Even Parity*
			NTC input configuration		
NTC1			1		Activates or deactivates NTC1 input (Duct air delivery)
NTC2			1		Activates or deactivates NTC2 input (heat exchanger air delivery)
NTC3			0		Activates or deactivates NTC3 input
			B0 Input Configurations		
B0			1		*0 = disabled* *1=enabled as analogue input*
			B1 Input Configurations (0 - 10V)		
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 (AIR DOME Pressure for PK SPORT)		
B2			1		*0 = disabled* *1=enabled as analogue input*
XA2			0.5		X-axis minimum value – minimum input voltage
XB2			4.5		X-axis maximum value – maximum input voltage
YA2			0		Y-axis minimum value – minimum magnitude value *
YB2			9.99		Y-axis maximum value – maximum magnitude value
CV2			1		Coefficient for PRØ displaying; value displayed on Smart and used for controls
UM2			4		1=°C; 2=bar; 3=mbar; 4=Pa; 5=%; 6=l/h; 7=mc/h; 8= V

Parameters of G26800.03 CPU PCB version 8.03.xx

Parameter Name			TENSO.	PRESSO.	
Smart	LCD	U.M.			DESCRIPTION
			B3 Input Configurations (Motor Alarm Control)		
B3			1		*0 = disabled* *1 = enabled*
XA3			5		X-axis minimum value – minimum input voltage
XB3			0		X-axis maximum value – maximum input voltage
YA3			5		Y-axis minimum value – minimum magnitude value *
YB3			0		Y-axis maximum value – maximum magnitude value
CV3			0.01		Coefficient for PRØ displaying; value displayed on Smart and used for controls
UM3			8		1=°C; 2=bar; 3=mbar; 4=Pa; 5=%; 6=l/h; 7=mc/h; 8= V
			Digital Input Configurations		
ID1			2		*0 = disabled* *1 = N.C input (Fault with input Open) with manual reset* *2 = N.C input (Fault with input Open) with Autoresolve* *3 = N.O. input (Fault with input Closed) with Autoresolve* *4 = enabled as N.O. (to enable functions, without Faults)*
TD1			20		Alarm triggering or function enabling delay time
ID2			2		See ID1 - NC BURNER ALARM control
TD2			5		Alarm triggering or function enabling delay time
ID3			2		See ID1 - STB THERMOSTAT ALARM control
TD3			3		Alarm triggering or function enabling delay time
			Y0 Analogue Output Configuration (Burner modulation PWM signal)		
YM0			1		0 = Direct: the maximum calculation value (100%) corresponds to the maximum output value 1 = Reverse: the maximum calculation value (100%) corresponds to the minimum output value
YL0			0		Minimum voltage (or PWM in %) output value
YH0			10		Maximum voltage (or PWM in %) output value
YF0			0		Fixed voltage or % output value (forced by program)
YT0			1		Voltage increase/decrease (or in %) every second*
YN0			0		Output Linearisation Mode *0 = linear output value between YL0 and YH0* *1 = output with values limited to YL0 and YH0 (for request values below YL0 the output will be YL0, for request values above YH0 the output will be YH0)*
			Y1 Analogue Output Configuration (Recirculation Shutter for Pressostatic Units)		
YM1			0		0 = Direct: the maximum calculation value (100%) corresponds to the maximum output value 1 = Reverse: the maximum calculation value (100%) corresponds to the minimum output value
YL1			1		Minimum voltage (or PWM in %) output value
YH1			9		Maximum voltage (or PWM in %) output value
YF1			10		Fixed voltage or % output value (forced by program)
YT1			1		Voltage increase/decrease (or in %) every second*
YN1			0		Output Linearisation Mode *0 = linear output value between YL1 and YH1* *1 = output with values limited to YL1 and YH1 (for request values below YL1 the output will be YL1, for request values above YH1 the output will be YH1)*

Parameters of G26800.03 CPU PCB version 8.03.xx

Parameter Name			TENSO.	PRESSO.	
Smart	LCD	U.M.			DESCRIPTION
			Y2 Analogue Output Configuration (EC Ventilation for Pressostatic Units)		
YM2			0		0 = Direct: the maximum calculation value (100%) corresponds to the maximum output value 1 = Reverse: the maximum calculation value (100%) corresponds to the minimum output value
YL2			6	2	Minimum voltage (or PWM in %) output value
YH2			10		Maximum voltage (or PWM in %) output value
YF2			8		Fixed voltage or % output value (forced by program)
YT2			0,4		Voltage increase/decrease (or in %) every second*
YN2			0		Output Linearisation Mode *0 = linear output value between YL2 and YH2* *1 = output with values limited to YL2 and YH2 (for request values below YL2 the output will be YL2, for request values above YH2 the output will be YH2)*
			Y3 Analogue Output Configuration		
YM3			0		0 = Direct: the maximum calculation value (100%) corresponds to the maximum output value 1 = Reverse: the maximum calculation value (100%) corresponds to the minimum output value
YL3			0		Minimum voltage (or PWM in %) output value
YH3			10		Maximum voltage (or PWM in %) output value
YF3			4		Fixed voltage or % output value (forced by program)
YT3			1		Voltage increase/decrease (or in %) every second*
YN3			0		Output Linearisation Mode *0 = linear output value between YL3 and YH3* *1 = output with values limited to YL3 and YH3 (for request values below YL3 the output will be YL3, for request values above YH3 the output will be YH3)*

6.6. Analysis of lockouts- faults

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

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

Alarms for safety device activation			
E24	ID4 input alarm	ID4 - ID5 (CN02) input open - No jumper	Autoresolve
E25	ID5 input alarm	ID5 - IDC (CN02) input open - No jumper •FIRE DAMPER intervention	Autoresolve
Digital input alarms			
E36	ID1 input alarm Thermal relay triggering	High Motor Consumption	Autoresolve
E37	ID2 input alarm	Blown air burner alarm. Requires manual reset of the external burner	Autoresolve
E38	ID3 input alarm	Safety thermostat (STB) triggering alarm. • Excess air temperature due to reduced air flow • Safety thermostat broken or not connected Requires manual reset of the thermostat	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	Air Pressure Probe Error	No signal from Probe or Faulty Probe	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; •The address of the CPU PCB is wrong and/or not configured	Autoresolve
Alarms for no voltage or dirty filters			
E71	Dirty air filter, preventive warning	Filters with initial signs of clogging. It does not stop the burner operating cycle. Clean or replace filters as soon as possible to prevent the system from stopping	Autoresolve
E72	Dirty air filter, lockout alarm	Dirty filters. It stops the burner operating cycle. Clean and/or replace the filters	Manual
E75	No voltage during operation cycle (excluding stand-by);	No voltage during operation	
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

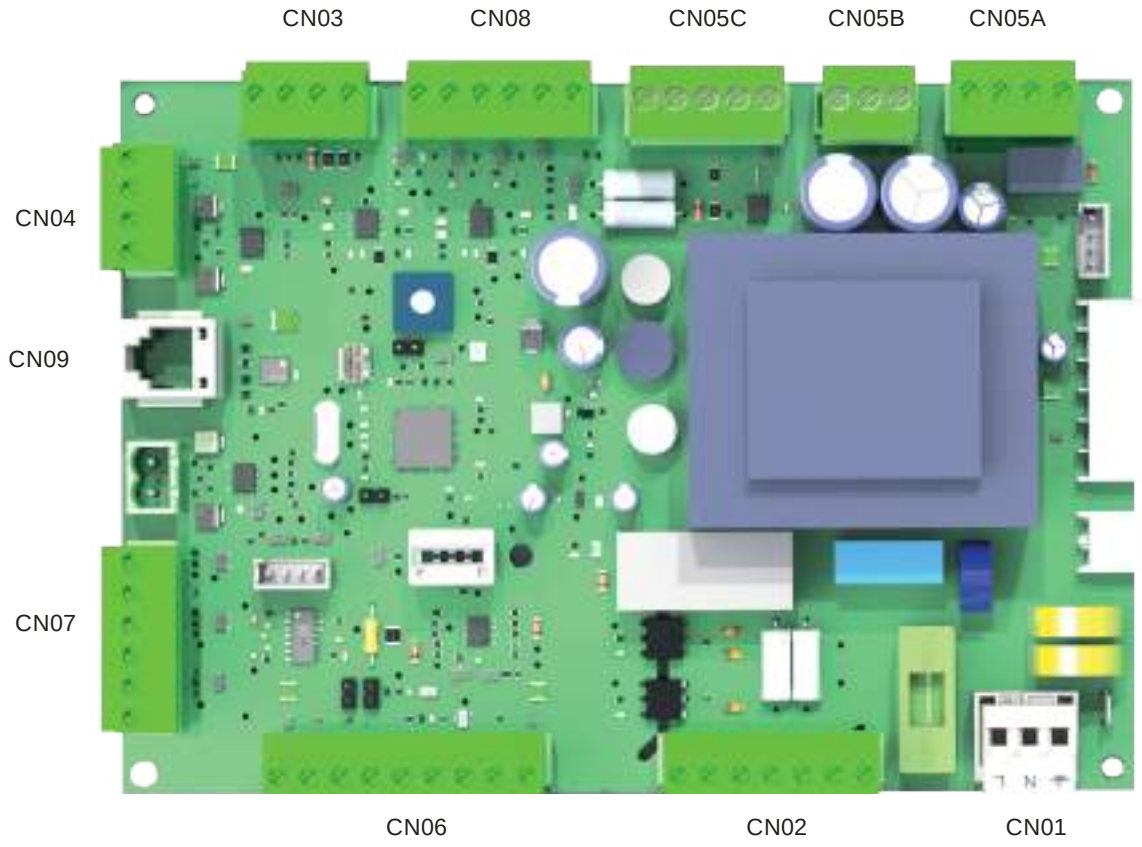
6.7. Electrical Wiring and Diagrams

The use of a CPU modulation electronic board simplifies the wiring diagram of all models.
The board includes the following connectors:

Connector	Function
CN01	Power supply input
CN02	Connector reserved for connection of fire damper(s) and control of fan motor(s)
CN03	Connector reserved for the burner PWM connection
CN04	Connector reserved for SMART X connection
CN05A/B	Connector reserved for burner control connection
CN05C	Connector reserved for the connection of fire damper and inverter controls
CN06	Connector reserved for inverter alarm, pressure probe and filter probe connection
CN07	Connector reserved for air intake probe connection
CN08	Connector reserved for burner alarm and STB triggering
CN09	RJ11 connector reserved for multifunction LCD panel connection

All heaters have the same components. Data listed in the following tables are referred to standard products.

In case of special configurations (with accessories) refer to the dedicated technical sheet and wiring diagram.



STB THERMOSTAT CONNECTION

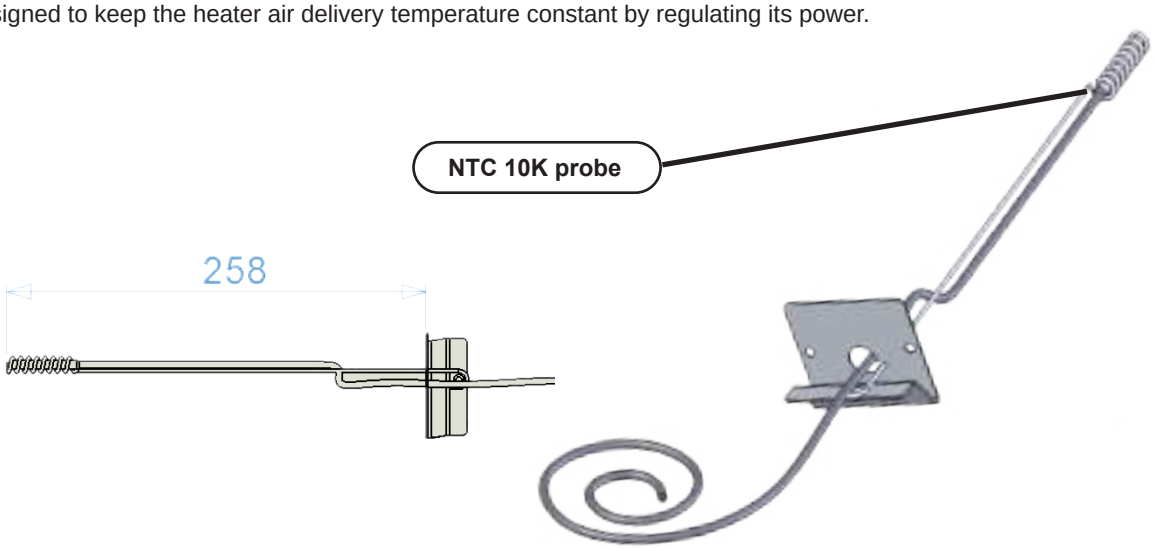
All PK series heaters (N, K and R) are certified and feature the STB thermostat.

- STB: The STB (or Limit) thermostat, (safety thermostat with manual reset) stops the burner if the exchanger reaches an excessive temperature. If STB thermostat triggers, it has to be manually reset following procedures describes in User section of this Manual.

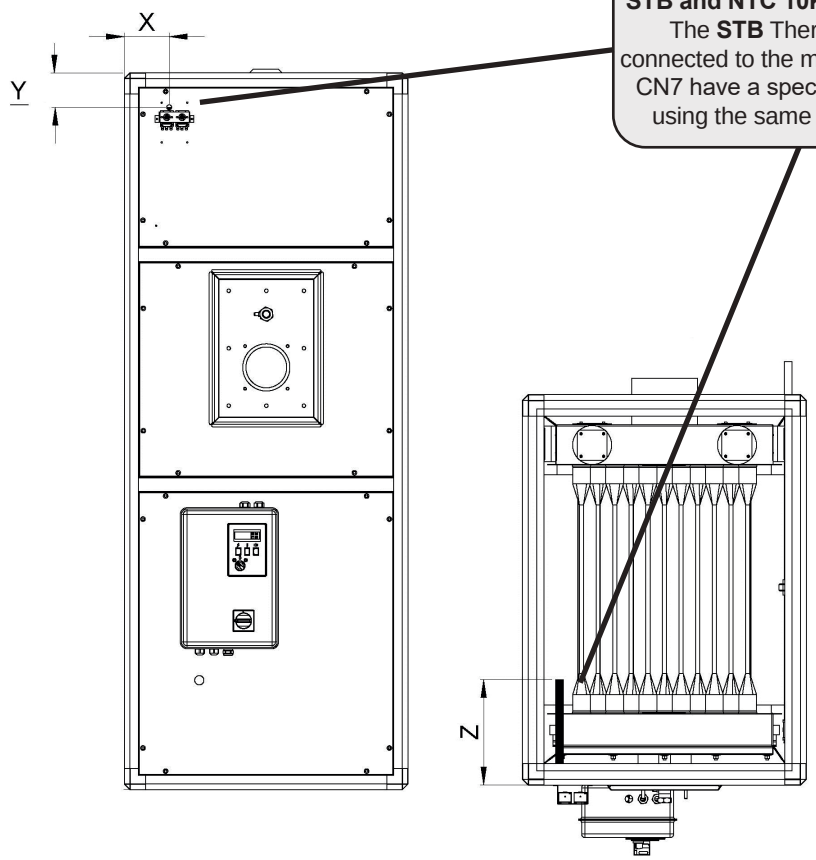
This thermostat cuts the power to the burner by controlling STB relay of burner wiring board. Furthermore, by opening contact ID3 on the modulation board, alarm E38 is displayed on the LCD.

NTC 10K TEMPERATURE PROBE

On all PK-SPORT heaters there are two NTC probes, one positioned next to the STB thermostat and one in the delivery duct, designed to keep the heater air delivery temperature constant by regulating its power.



THERMOSTAT and NTC PROBE POSITION



STB and NTC 10K HEAT EXCHANGER PROBE POSITIONING
The **STB** Thermostat and the NTC heat exchanger probe connected to the modulation board at terminals NTC2 of connector CN7 have a specific position. In case of replacement, reposition using the same holes as the replaced thermostat and probe.

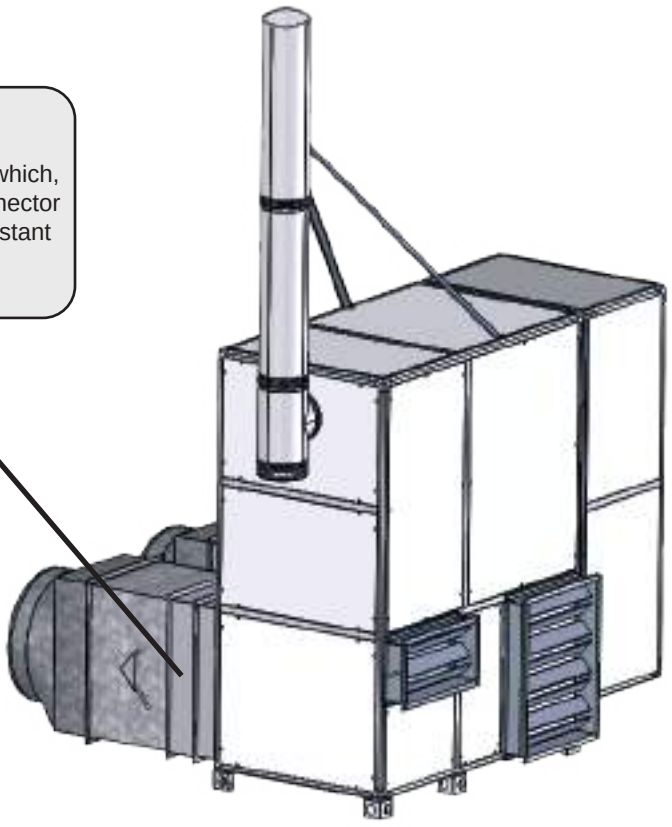
STB THERMOSTAT POSITION

PK Model	Thermostat	X	Y	Z
100/120	G12450	85	135	350
140				
190				
250				
320				
420		95	145	
550				

NTC PROBE POSITION

PKModel	Probe	X	Y	Z
100/120	G16401	95	85	258
140				
190				
250				
320				
420		105	95	
550				

NTC 10K DELIVERY DUCT PROBE POSITION
All heaters feature the NTC probe in the delivery **DUCT** which, connected in modulation board to terminals NTC1 of connector CN7, keeps the heater duct air delivery temperature constant and adjusts its power.



6.8. Burner Matching

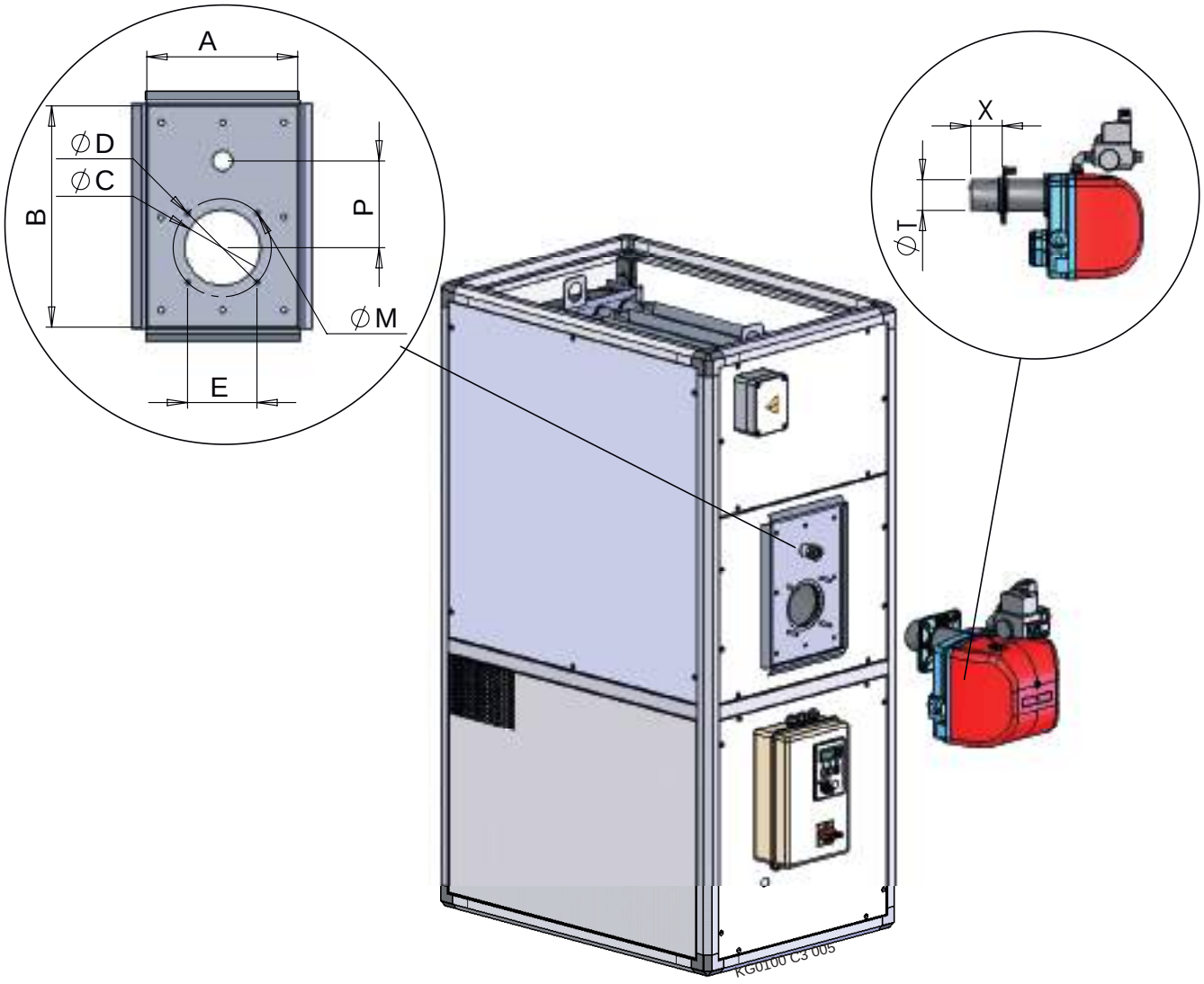
The burner nosepiece must penetrate for a length not exceeding min and max values of "X".

Shorter nosepieces could damage the exchanger and void the guarantee.

The value of "ØT" indicates the maximum nosepiece diameter for a specific heater model. If the nosepiece of the matched burner is larger, the heat exchanger will have to be changed at an extra cost.

Contact Apen Group Customer Service if you need to use a low NOx rate burner with flue gas recirculation outside the combustion head.
Standard heaters supplied include standard burner plates sized as shown in the table below. If standard burner plate is not suitable for the burner to be installed, a plate with custom holes can be ordered (specify burner brand and model).

If the hole of the gasket on the back of the burner plate is not wide enough for the assembly, it can be cut to the size required by the installer.



Type	X		ØT	P	A	B	ØC	ØD	ØM	E
PKE	min [mm]	max [mm]	max [mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
100	150	220	135	150	270	382	133	170	M8	120
140	270	350	190	175	414	454	140	175	M8	124
190-250	270	350	190	175	414	454	160	223	M8	158
320	270	350	230	230	464	484	160	223	M8	158
420-550	270	350	230	230	464	484	190	269	M8	190

KG0100 ET 011

6.9. Gas burners

PK heaters must be matched to gas burners certified by a CE mark under the Gas Appliances Regulation 2016/426/EU. Heaters can work either with natural gas, G20, G25, and G25.1, or with L.P.G., G30, and G31 gas.
PK heaters are designed, manufactured and tested to match the burners produced by main burner manufacturers on the market. The detailed list of burner models that can be matched according to the heater size is given in the following paragraph.

First start up shall be executed exclusively by authorized service centres complying with relevant laws existing in the Country where the unit is installed.
The first start-up also includes a combustion analysis, which is compulsory.

Table of PKE-N model gas flow rates in the heater work range

TYPE OF GAS G20 - Cat. E-H							
TYPE OF MACHINE		140	190	250	320	420	550
		max	max	max	max	max	max
SUPPLY PRESSURE	[mbar]	according to the burner					
GAS CONSUMPTION (0°C-1013mbar)	[Nm^3/h]	19.6	23.1	31.1	38.1	51.0	67.2
CARBON DIOXIDE -CO_2 CONTENT*	[%]	9.3	9.3	9.3	9.3	9.3	9.3
FLUE GAS TEMPERATURE	[°C]	273	230	270	285	270	270
FLUE GAS MASS FLOW RATE	[kg/h]	305.4	360.2	485.5	595.1	795.5	1049.2

Table PKE-K model gas flow rates in the heater work range

TYPE OF GAS G20 - Cat. E-H								
TYPE OF MACHINE		100	140	190	250	320	420	550
		max	max	max	max	max	max	max
SUPPLY PRESSURE	[mbar]	according to the burner						
GAS CONSUMPTION (0°C-1013mbar)	[Nm^3/h]	11.4	15.2	20.1	27.1	34.8	45.6	59.7
CARBON DIOXIDE -CO_2 CONTENT*	[%]	9.3	9.3	9.3	9.3	9.3	9.3	9.3
FLUE GAS TEMPERATURE	[°C]	183	179	178	192	184	186	187
FLUE GAS MASS FLOW RATE	[kg/h]	178.5	238.0	313.2	422.8	543.4	712.5	931.8

Table of PKE-R model gas flow rates in the heater work range

TYPE OF GAS G20 - Cat. E-H								
TYPE OF MACHINE		100	140	190	250	320	420	550
		max	max	max	max	max	max	max
SUPPLY PRESSURE	[mbar]	according to the burner						
GAS CONSUMPTION (0°C-1013mbar)	[Nm^3/h]	9.0	12.2	16.2	21.8	27.6	34.6	45.1
CARBON DIOXIDE -CO_2 CONTENT*	[%]	9.3	9.3	9.3	9.3	9.3	9.3	9.3
FLUE GAS TEMPERATURE	[°C]	151	146	142	135	130	125	125
FLUE GAS MASS FLOW RATE	[kg/h]	140.9	191.1	253.7	339.8	430.7	540.3	704.7

6.10. Burner matching tables

Burner matching has been performed according to the following criteria:
- burners in class 3 for NOx, with emissions of less than 80 mg/kWh;
- if PK heaters are to be installed outdoor or in a place different from the served one;
- compliance with ErP2021 requirements;
- compliance with ηs seasonal efficiency calculated according to standard EN 17082:2017 that implements the ERP regulation 2281/2016/EU.

The tables are shown in the "Attachment to the user-installation manual" code KG0270.xx supplied with this manual

7. MAINTENANCE

7.1. Controls at First Start Up

During first start-up, the following items need to be checked:

Electrical Controls

Supply voltage
Fan rotation direction
Motor absorption and air flow rate

Combustion Control

Length of burner nosepiece
Fuel capacity of the burner
Combustion parameters

Checks on Safety Controls

Check of safety thermostat (STB) triggering
Microswitch for fire dampers (if installed)
Room thermostat control (SMART X WEB)

Electrical Controls

Before powering the unit on, make sure actual voltage matches the rated voltage specified.
In 3-phase units it is mandatory to check fan rotation direction. If the heater has two fans, check both rotate in the required direction.
Verify each motor's absorption with a suitable amperometric analyser.
The motor absorption table contains the absorption values of each motor.
An absorption value lower (<15%) than max value means that the air flow rate is lower than rated one. To restore the rated air flow rate, it is necessary to:

- increase the fan speed by changing one of the two pulleys.
- eliminate any leaks in the air distribution system.

A higher absorption than rated value means that aeraulic circuit resistance is lower than expected. To restore rated value, local pressure drops should be created to reduce electrical absorption by the motors.

Combustion Control

We recommend checking that burner nosepiece is suitable for use (see paragraph 6.8)
A fuel capacity check must be performed:

- at the meter, in case of a gas burner;
- by comparing nozzle capacity/pressure with values in specific tables, in case of a gas oil burner.

When fuel capacity cannot be measured, adjust the burner by checking combustion parameters.

Reference values are included in tables of Paragraph 6.9.
CO2 values shown above can surely be improved without producing unburned products. However, a high quantity of excess air should be maintained in order to balance possible working variations over time.
To define the heat input refer to tables of Paragraph 6.9. If combustion efficiency is known and CO2 content is similar to that mentioned in tables of Paragraph 6.9, the diagrams of Paragraphs 3.2.1, 3.2.2 and 3.2.3 can be used reading the useful heat output in correspondence to the efficiency.

Checks on Safety Controls

All heaters and their safety devices have been electrically tested before delivery. However, their correct operation depends on how they are actually wired and installed.
when first starting the appliance, the following checks must be performed:

- Safety thermostat

The STB safety thermostat triggering is signalled by Fault E38 on the LCD screen.

- Fire Damper

If fire dampers are installed on the system, you need to check that the damper closure actually stops the burner. Damper triggering is signalled by Fault E25 on the LCD screen.

- Room Thermostat

Make sure that the SMART X turns off only the burner, not the fan. For TENSOSTATIC model, the fan stops after a time preset by the modulation board. For PRESSOSTATIC model, the fan is always running.

- Burner plate nuts

After a few hours of burner operation and the consequent drying of the relevant gaskets, check that burner plate nuts are correctly tightened to 20Nm.

7.2. Routine Maintenance

Perform routine maintenance operations using the following schedule:

Belts	after 8 hours from first start-up. Then, every 60 days.
Electrical Motor	check electrical absorption - every 90 days
Fan	check cleaning - every 90 days
Combustion Analysis	once per season
Safety thermostat	at the beginning of each season
Fire Damper	at the beginning of each season
Cleaning the Exchanger	every 5 years with gas burner
	every 3 years with fuel oil burners
Cleaning the siphon and vessel	every year

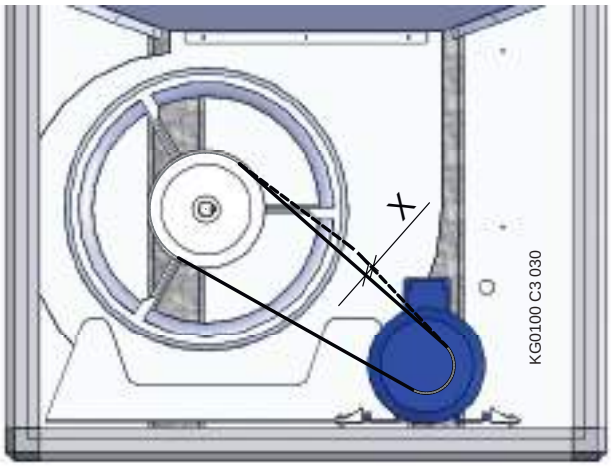
Checking Transmission Belts

About 7÷8 hours after first start up, check tension and state of belts between motor and fan. If belts are loose, stretch them.

To check correct belt tensioning, verify that in the central area between the two pulleys, belt oscillation does not exceed 20÷30mm.

To tension belts and align pulleys, adjust the endless screw on the slide.

During the tensioning operation, verify if pulleys are aligned using a straight rod long enough to join the pulleys and check the alignment.



Checking the exchanger

Correct operation and long life of the exchanger depend on its design but also on proper maintenance.

the following checks must be performed at regular intervals:

- check of burner combustion;
- check of safety device operation;
- visual inspection of the exchanger,
- check that heat exchanger is clean.

Check burner combustion values

Check at least once a year burner combustion values.

Parameters to check are CO2 content, flue gas temperature and CO value. Note these values at first start up and at every subsequent maintenance check. If significant changes occur, investigate on the causes.

For fuel oil and LPG burners, also smoke density must be analysed. The test should return a value below 2 on Bacharach scale. An increase in smoke density value would require cleaning the exchanger.

Checking Safety Device Status

Check every year that safety devices are working properly.

For the procedures to follow, see “Checks on Safety Controls” above.

Visual inspection of the exchanger

Inspect every year the exchanger to make sure no component is overheated and/or damaged.

If you see any overheated areas, investigate on possible causes:

- insufficient or badly distributed ventilation;
- dirty air filters;
- partially closed dampers;
- burner capacity higher than exchanger specifications.

If any of the exchanger parts is damaged, it should be repaired and the cause of the damage removed.

Cleaning the Exchanger

It is hard to specify the period after which the exchanger must be cleaned.

A safe method to determine exchanger cleaning degree is to note the pressure value in the combustion chamber at first start up, after completing all burner settings. Near the peep-hole, a tapping point is available to make this measure.

The resulting value already includes pressure drops in the chimney, if any.

Repeat this measure every year during combustion check and compare the result with the initial value: if they differ by more than 35%, the exchanger is to be cleaned.

Generally, if natural gas burners are installed, cleaning is not required for 5-6 years. If burners are fuelled with fuel oil and/or LPG, the cleaning should occur every 3 years.

Inspection and cleaning of the trap and condensate collection tray

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.

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.

Fill the trap with clean water and reconnect the trap to the condensate drain system.

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

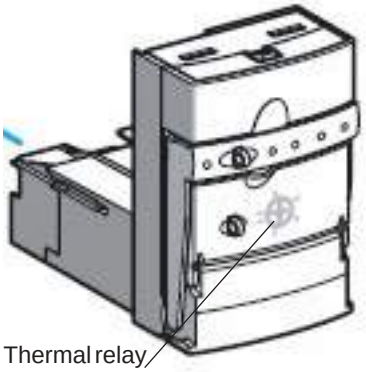
7.3. List of spare parts

PARTS FOR THE CONTROL PANEL

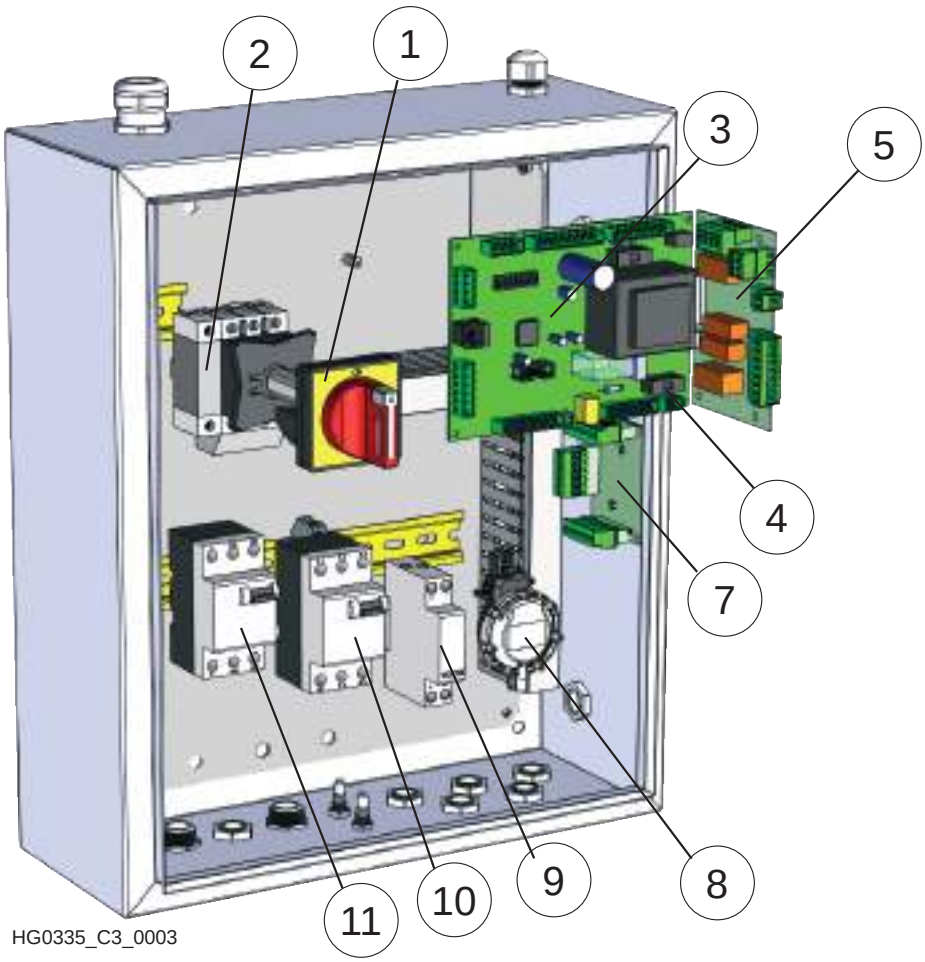
TABLE OF CONTROL PANEL COMPONENTS

POS.	Description	Code	Regulation	Use
1	Main switch with door lock	G10067	32A	Model 3, 7.5 kW
		G10068	63A	Models 11, 15 kW
2	Neutral Disconnector	G10074	20/40A	Models 3, 7.5 kW
		G10075	63/80A	Models 11, 15 kW
3	Modulation Board	G26800.03		Any heaters, any models
4	Board fuse	G03605	5A	Any heaters, any models
5	Burner PCB	G12940		Any heaters, any models
6	LCD panel	G16890		Any heaters, any models
7	WIND and SNOW control board	G12990		Pressostatic Buildings
8	Pressure Probe	G12680		Pressostatic Buildings
9	24V power supply unit	X03524		Pressostatic Buildings
10	Burner 3P automatic switch	G10078	6.3A	All models
11	Inverter 3P automatic switch	G10197	5.5 kW	Motor model from 3 to 5.5 kW
		G10198	7.5-11 kW	Motor model from 7.5 to 11 kW
		G10175	15 kW	15 kW motor model
12	Soft starter	G18034	5.5 kW	5.5 kW motor model
		G18035	7.5-11 kW	Motor model from 7.5 to 11 kW
		G18043	15 kW	15 kW motor model
13	Thermal protection	G02217	3-12 A	Motor model from 3 to 5.5 kW
		G02218	4.5-18 A	7.5 kW motor model
		G02219	8-32 A	Motor model from 11 to 15 kW
14	Remote control switch	G02215	3-5.5 kW	Motor model from 3 to 5.5 kW
		G02225	7.5-15 kW	Motor model from 7.5 to 15 kW

Motor kW		Current **In** 400V-50Hz	Number of rpm	Thermal Relay	
G01260-IE3	3.0	6.4	1450	G02217	3-12A
G00137-IE3	4.0	8.0	1450		
G01261-IE3	5.5	10.6	1460		
G01022-IE3	7.5	14.1	1460	G02218	4.5-18A
G07371-IE3	9.2	17.1	1460	G02219	8-32A
G00837-IE3	11.0	20.4	1465		
G01973-IE3	15.0	27.3	1465		



CONTROL PANEL
START UP
WITH INVERTER



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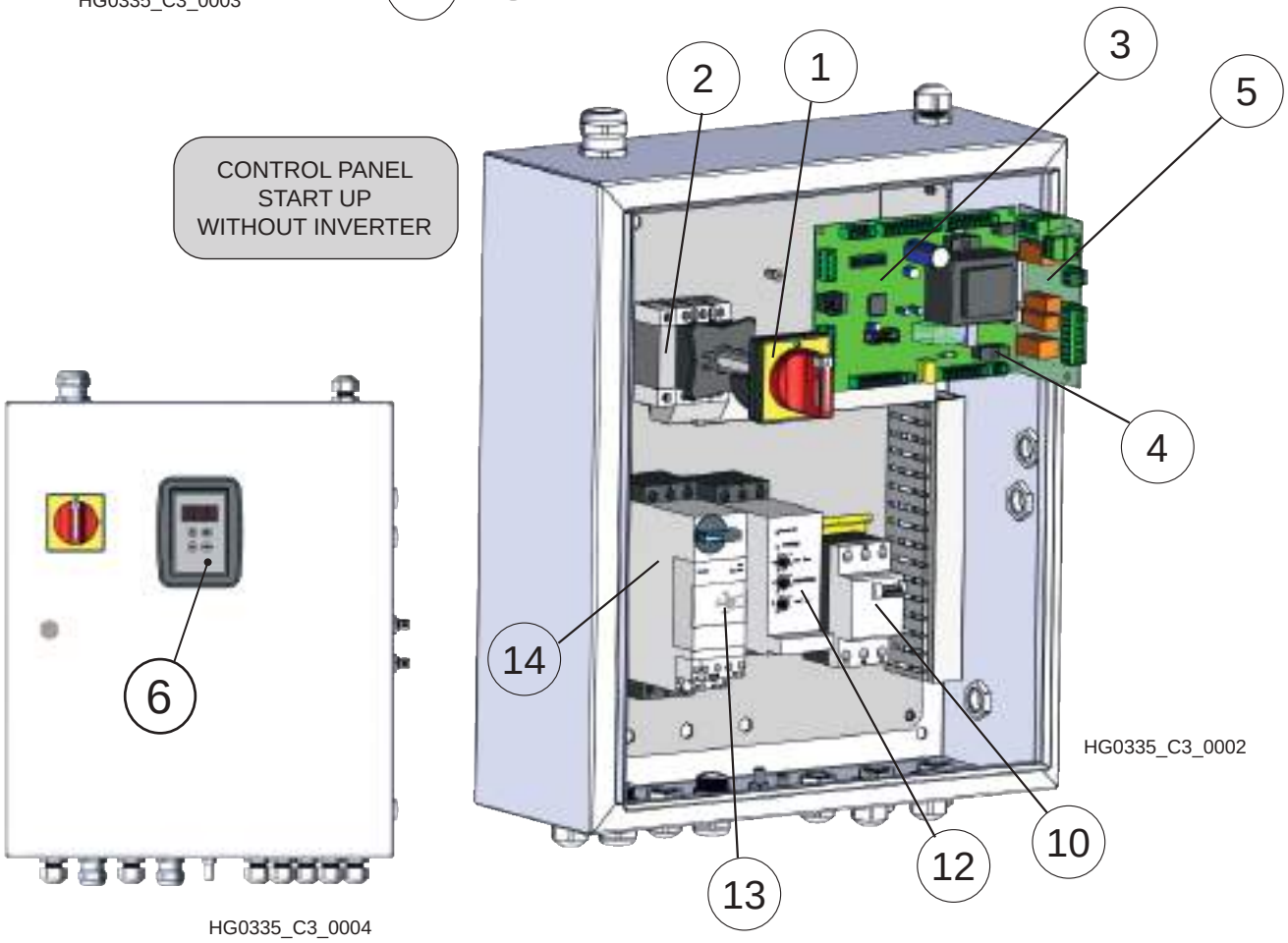
CONTROL PANEL
START UP
WITHOUT INVERTER



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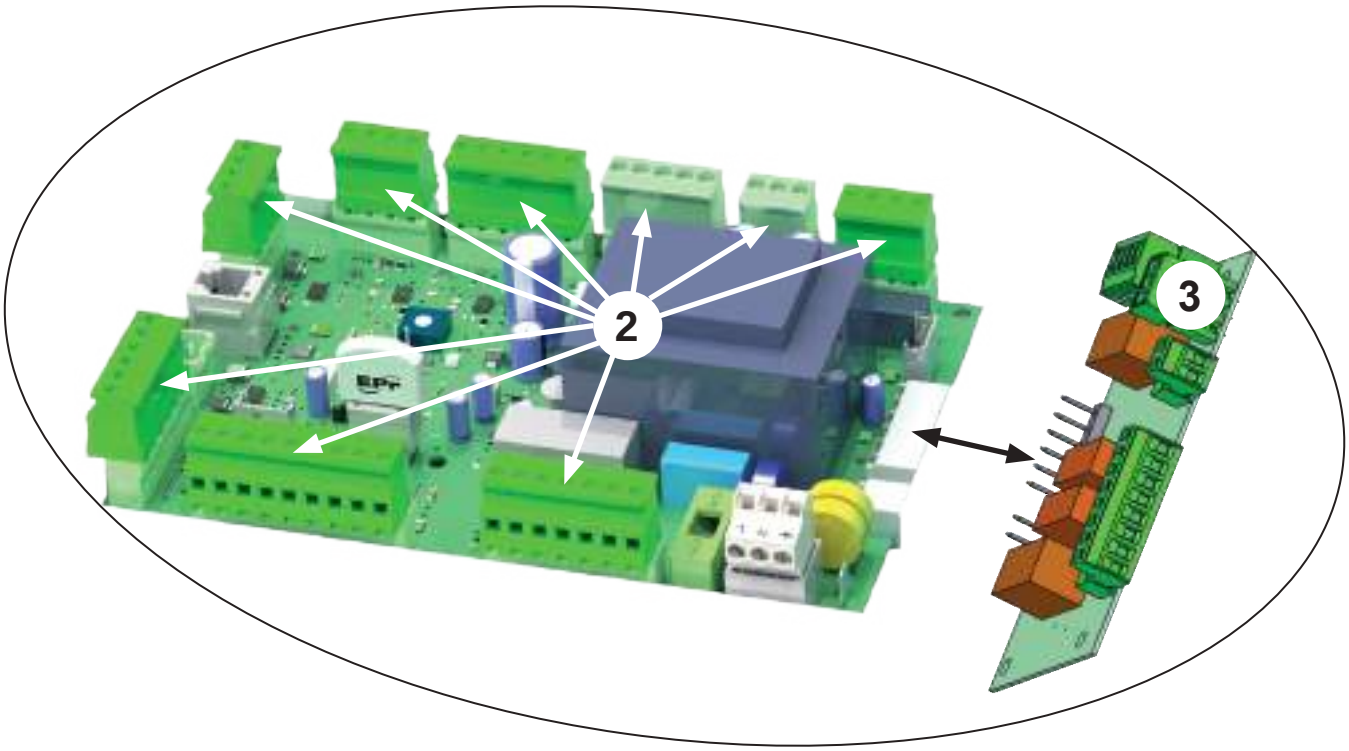
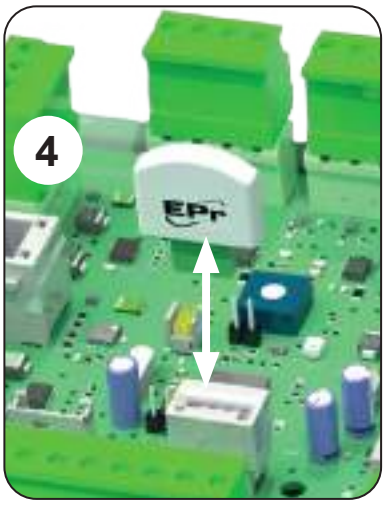
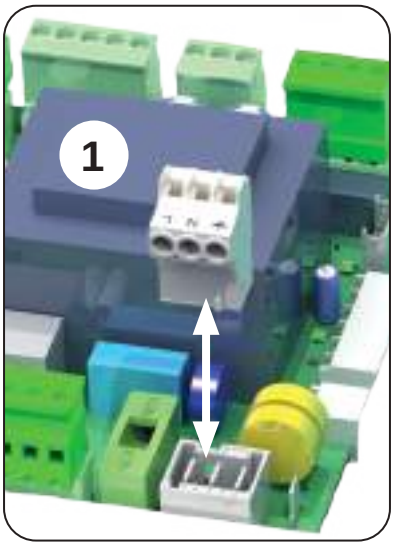
REPLACING THE MODULATION PCB

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. Disconnect the burner connection PCB
4. Remove and store the EEPROM memory card
5. Remove and replace the CPU modulation PCB
6. Reposition the new CPU PCB, insert the previously stored EEPROM memory card (step 4). The EEPROM card contains all configured parameters, by inserting it into the new CPU, there is no need to reprogram the parameters.

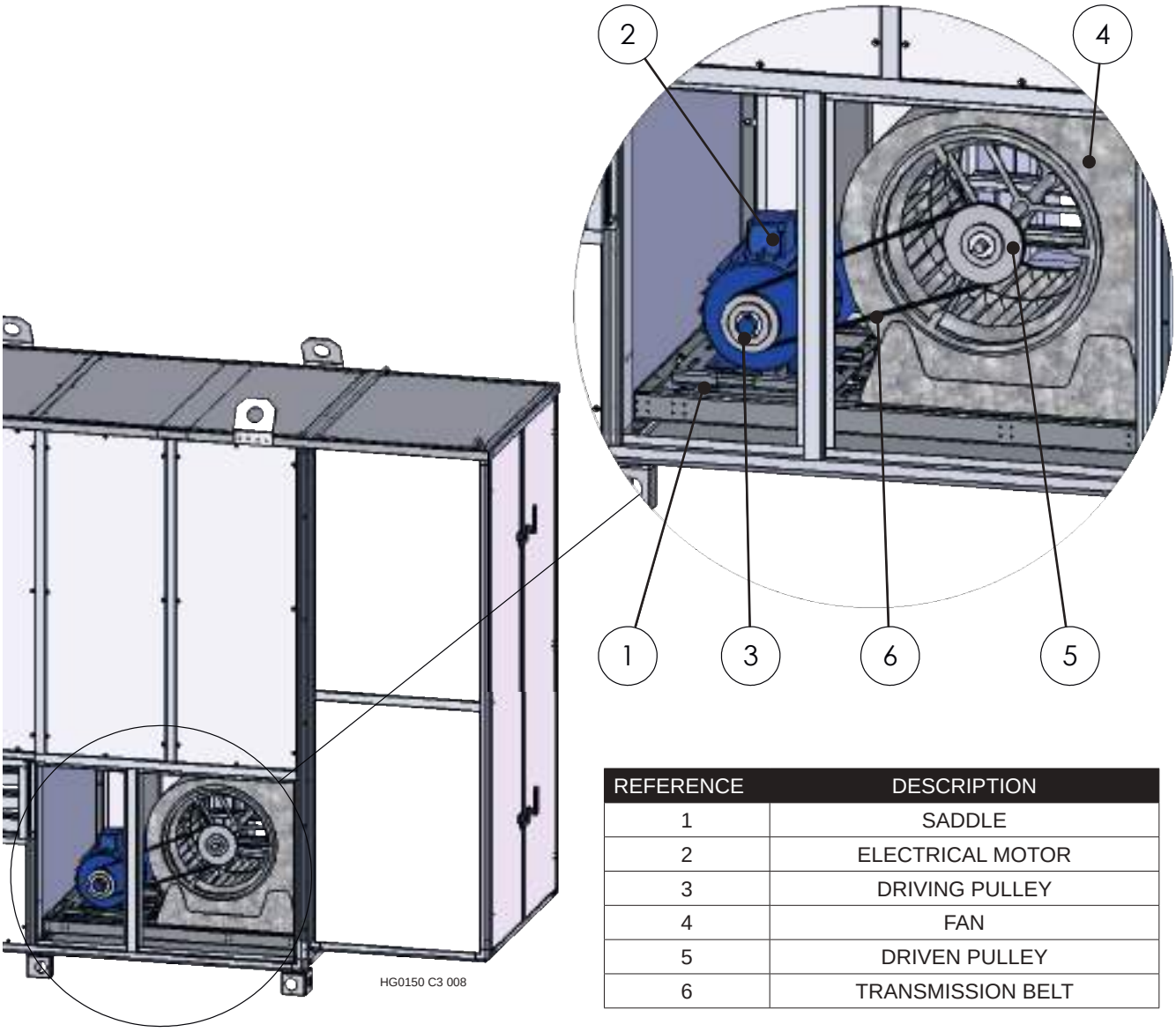






VENTILATION SPARE PARTS

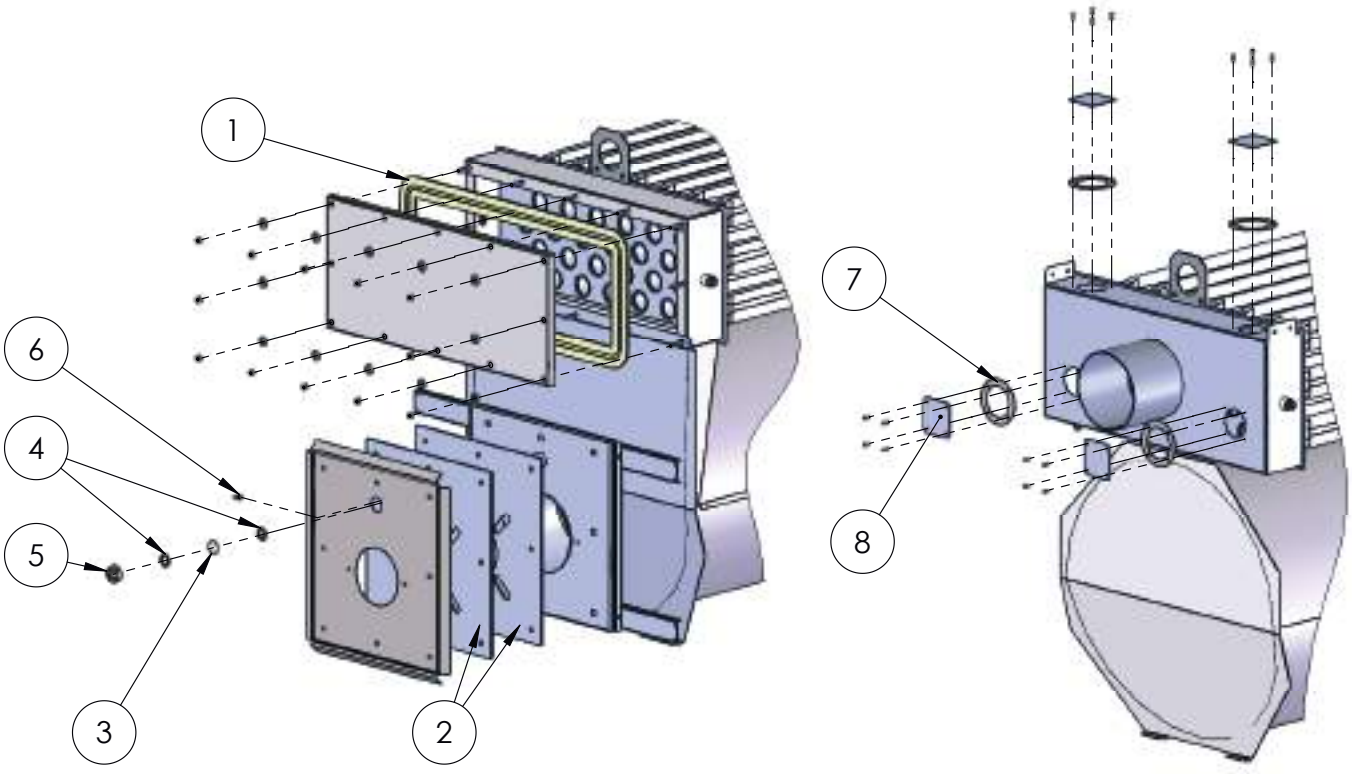
Heater Model	Fan code	No.	Driven pulley		Electrical Motor code	Driving pulley		Belt		Saddle	
			pulley	shell		pulley	shell	code	No.	code	No.
PKE100	G02324	1	G07232	G07406	G01260-IE3	G00393	G00392	G00579	2	X04045	1
PKE140	G01440		G00708	G07406	G00137-IE3	G00419	G00392	G00391	2	X04045	
PKE190	G04133		G00419	G00392		G01619	G07406	G00696	2	X04045	
PKE250			G00878	G01468	G01022-IE3	G07356	G01954	G00496	2	X04228	
PKE320	G07260		G01990	G01906		G00834	G01954	G01888	3	X04228	
PKE420	G00731		G01955	G01957	G00837-IE3	G01904	G00130	G01933	3	X04231	
PKE550	G01893		G00711	G01027	G01973-IE3	G01959	G00130	G12093	3	X04231	



REFERENCE	DESCRIPTION
1	SADDLE
2	ELECTRICAL MOTOR
3	DRIVING PULLEY
4	FAN
5	DRIVEN PULLEY
6	TRANSMISSION BELT

HEAT EXCHANGER SPARE PARTS

POS	Description	Code	Use
1	Flue system gasket	X01415	Any heaters, any models; in metres
2	Burner plate gasket* *NOTE: Enlarge the hole according to the burner head diameter	G01190	Model 100
		G07819	From model 140 to model 190 included
		G08119	From model 250 to model 550 included
3	Flame peep-hole	G02317	Any heaters, any models
4	Peep-hole gasket	X00397	Any heaters, any models
5	Peep-hole locknut	X01822	Any heaters, any models
6	Combustion chamber pressure inlet	C00060	Any heaters, any models
7	Flue inspection gasket	G14242	Any heaters, any models
8	Flue inspection panel	G11142.08	Any heaters, any models



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THERMOSTAT SPARE PARTS

POS.	Description	Code	Use
1	STB safety thermostat	G12450	All heater models
2	Probe bulb support spring	G28118	All heater models
3	Probe holder panel	G18605	All heater models
4	DELIVERY probe and NTC DUCT	G16401	All heater models

CONSIGLI PER L'INSTALLAZIONE DELLE MANICHE DI COLLEGAMENTO CON LA STRUTTURA
SOME ADVICES FOR THE INSTALLATION OF THE CONNECTION SLEEVES

SÌ
YES

DETTAGLIO: Le maniche di collegamento devono essere di misura idonea e opportunamente tese
DETAIL: The connection sleeves have to be correctly measured and stretched

NO

DETTAGLIO: Le maniche di collegamento NON devono afflosciarsi e ostruire il passaggio/ridurre l'area di transito dell'aria durante il funzionamento
DETAIL: The connecting sleeves DO NOT wilt and obstruct the area for the air transit when the system is ON.

Notes

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