EN	*Use, Installation and Maintenance Manual* *PKE-SPORT floor standing warm air heater*

ErP 2021 Compliant EU/2016/2281

Capacities from 100 to 550 kW

Efficiency up to 102.4%

Reduction of Thermal Stratification

VER. 01.2020

Dichiarazione di Conformità
Statement of Compliance

CE

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

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

Modello: ***Model:***	**Generatore 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

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
29/03/2022

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

CODE SERIAL NUMBER

code HG0325.00GB ed.E-2203

INDEX

code HG0325.00GB ed.E-2203

1. GENERAL CAUTIONS

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

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

"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."

2. SAFETY-RELATED WARNINGS

The following symbol is used in this manual to attract machine operators' attention.

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 unit is correctly sized to match required flow rate, indicated in the manual, and includes all safety and control devices required by the law;
- the inside of the 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. 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;
- call for **qualified staff.**
- call the **Fire Brigade.**

.

2.3. 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.

NOTE: It is compulsory to install, upstream of the power cable, a switch with a protection (fuses or automatic), 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.

2.4. Use

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

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

Avoid contact with hot heater surfaces. Such surfaces, generally located near the flame, overheat during operation and remain hot for some time after the burner has stopped.
If the equipment is not to be used for a certain 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, instead, the equipment is not to be used any more, perform the following operations:

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

2.5. Air Vents

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

- 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.

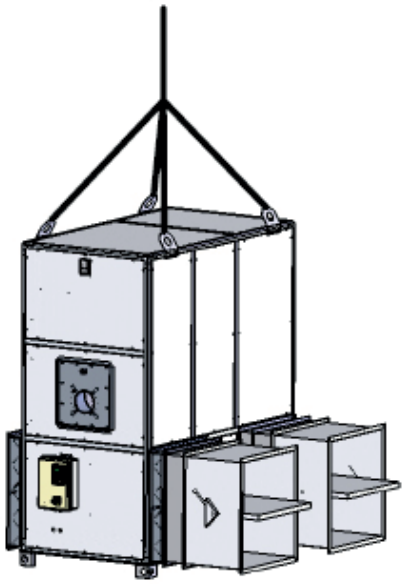
The heater, if not built for outdoor installation, shall be sheltered from rain, snow, and frost. If air is pulled from outdoor, the intake must be protected by a rain deflector or similar device that prevents water from penetrating into the heater.
The room where the heater-burner group is installed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

2.6. Maintenance

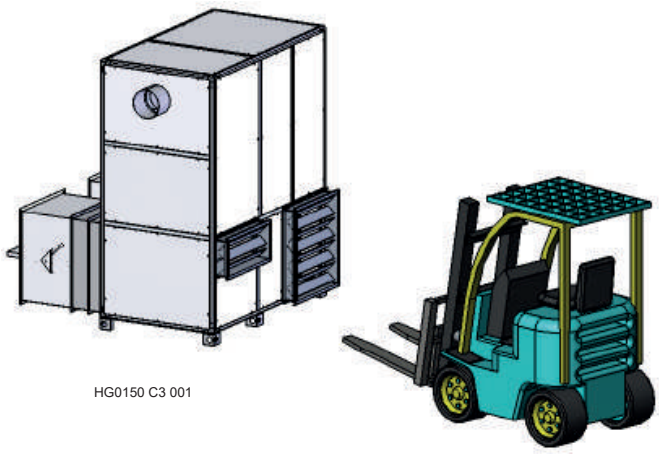
Before carrying out any cleaning and maintenance operations, isolate the boiler from the mains power supply using the switch located on the electrical system and/or on the shut-out devices.
If the equipment is faulty and/or incorrectly operating, switch it off and do not attempt to repair it yourself,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

2.7. 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.



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



HG0150 C3 001

2.8. Packaging

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.

2.9. Unpacking

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

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

2.10. Dismantling and demolition

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

Disposal of end-of-life products

This equipment is marked in compliance with European Directive 2012/19/EU on waste electrical and electronic equipment (WEEE). This Directive defines the rules for collecting and recycling waste equipments throughout the entire territory of the European Union.

WEEE contains both pollutants (that can negatively affect the environment) and raw materials (that can be reused). IT is therefore necessary to subject WEEE to appropriate treatments, in order to remove and safely dispose of pollutants and to extract and recycle raw materials. IT is forbidden to dispose of WEEE as unsorted waste. These operations facilitate recovery and recycling of the materials, thus reducing the environmental impact.

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

INFORMATION FOR DISPOSAL valid in ITALY (Legislative Decree 49/2014)

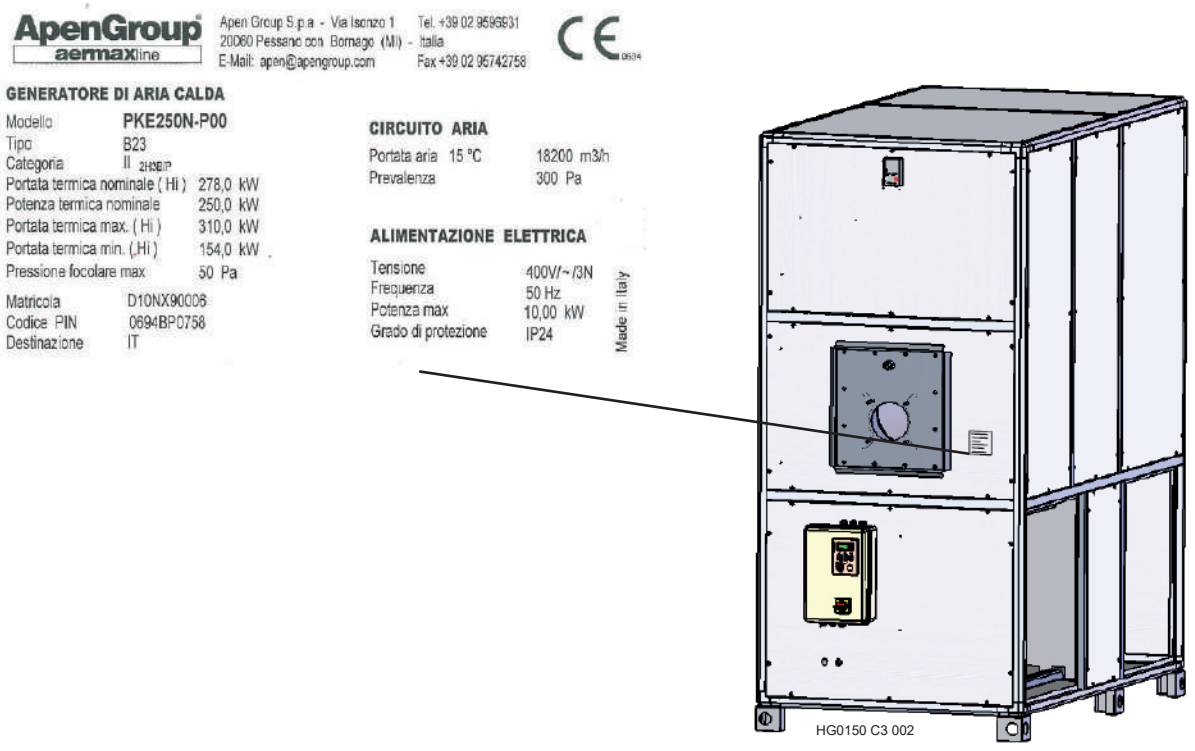
The PK series air handling units and relating accessories are considered “professional WEEE - waste electrical and electronic equipment”. According to the legislation in force in Italy, professional WEEE must be sent to treatment plants suitable for these types of waste. Please contact the Apen Group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

INFORMATION FOR DISPOSAL valid abroad (EU COUNTRIES except Italy).

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

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 required by Service Centre, **read the heater model and serial number on the nameplate**, which identify your unit.
Heater Code



PK	A	250	K	-	P

Heater

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

Capacity

Series:
Standard non-condensing N series
Condensing K series
Condensing R series

Installation:
P - Pressostatic
T - Tensostatic

3. TECHNICAL FEATURES

3.1. Main Components

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:
A- belt drive -20°C +85°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 degree 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.

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.

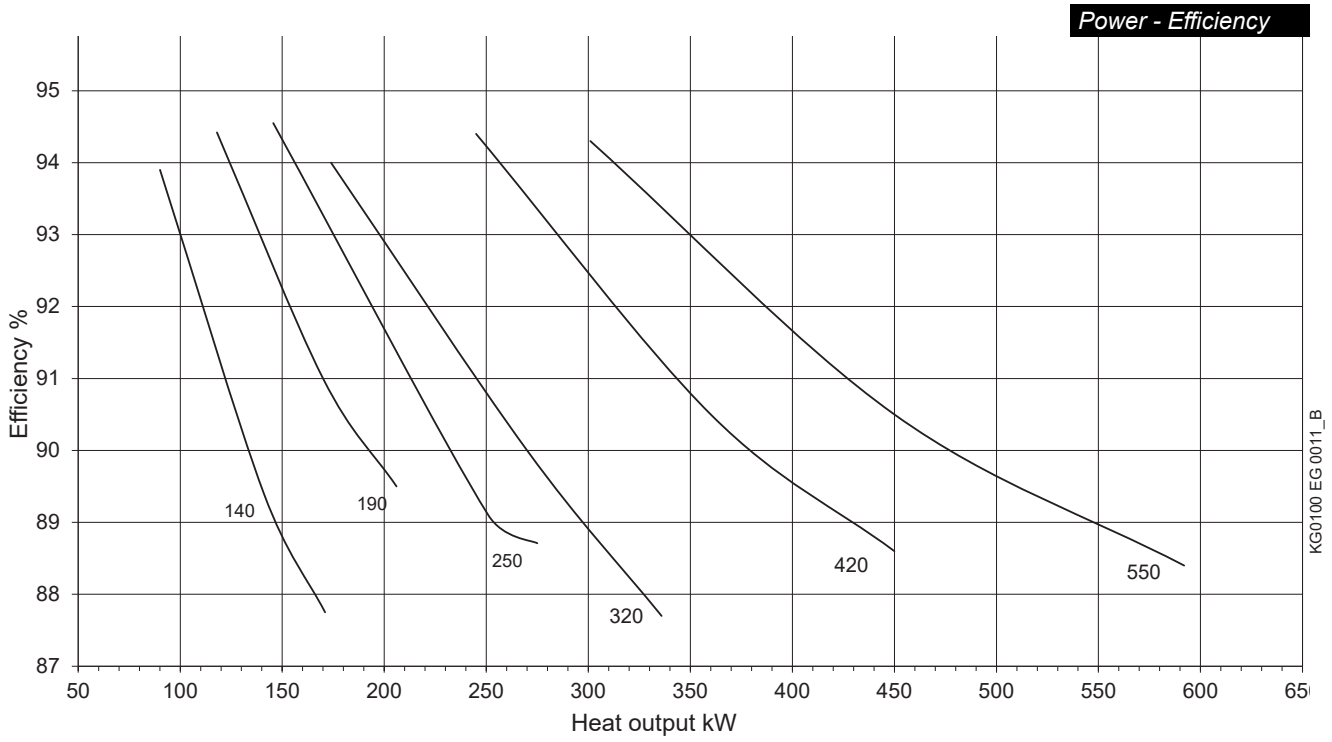
Safety Devices and Controls
All heaters are supplied with:
- STB Manual reset safety thermostat, inside the air flow, which switches off the burner immediately if the temperature is high.
- Delivery NTC NTC probe in the delivery duct, modulates and/or stops the burner operation before the safety thermostat activates.
- Ambient NTC Ambient NTC probe (to be installed indoor), modulates and/or stops the burner operation before the safety thermostat activates.
- SMARTWEB Chronothermostat with system setting functions.

3.2. Choosing the Heater

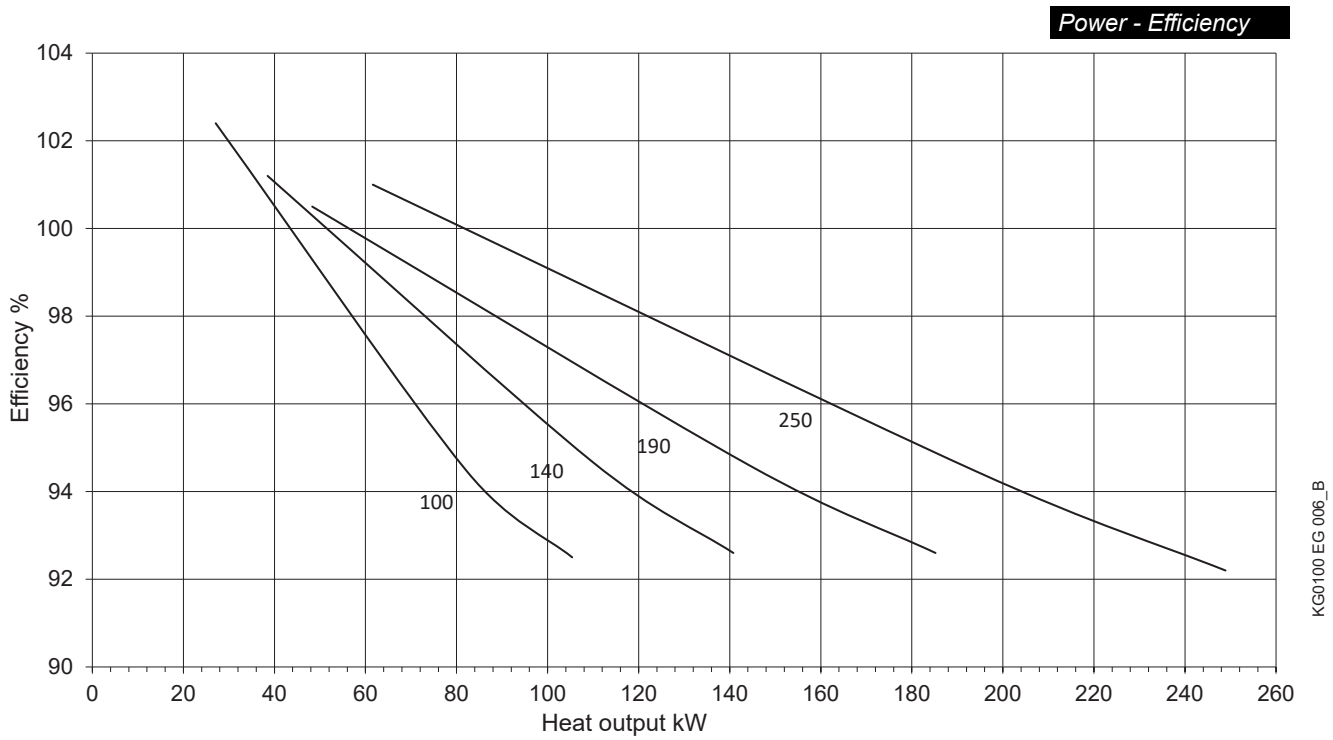
Heaters are available in condensing versions (K and R series respectively) and in non-condensing version (N series). R series meets the efficiency requests of the regional resolutions of Lombardy, Emilia Romagna and Piedmont; at European level, a matching with low NOx burners is required in order to comply with the imposed regulatory limitations.
Heaters for indoor installation (**PKA**) are supplied with exchanger, fan unit and control panel to be installed indoor or in a sheltered position; those for outdoor installation (**PKE**) are supplied with exchanger, fan unit, control panel and burner casing to be positioned outdoor.

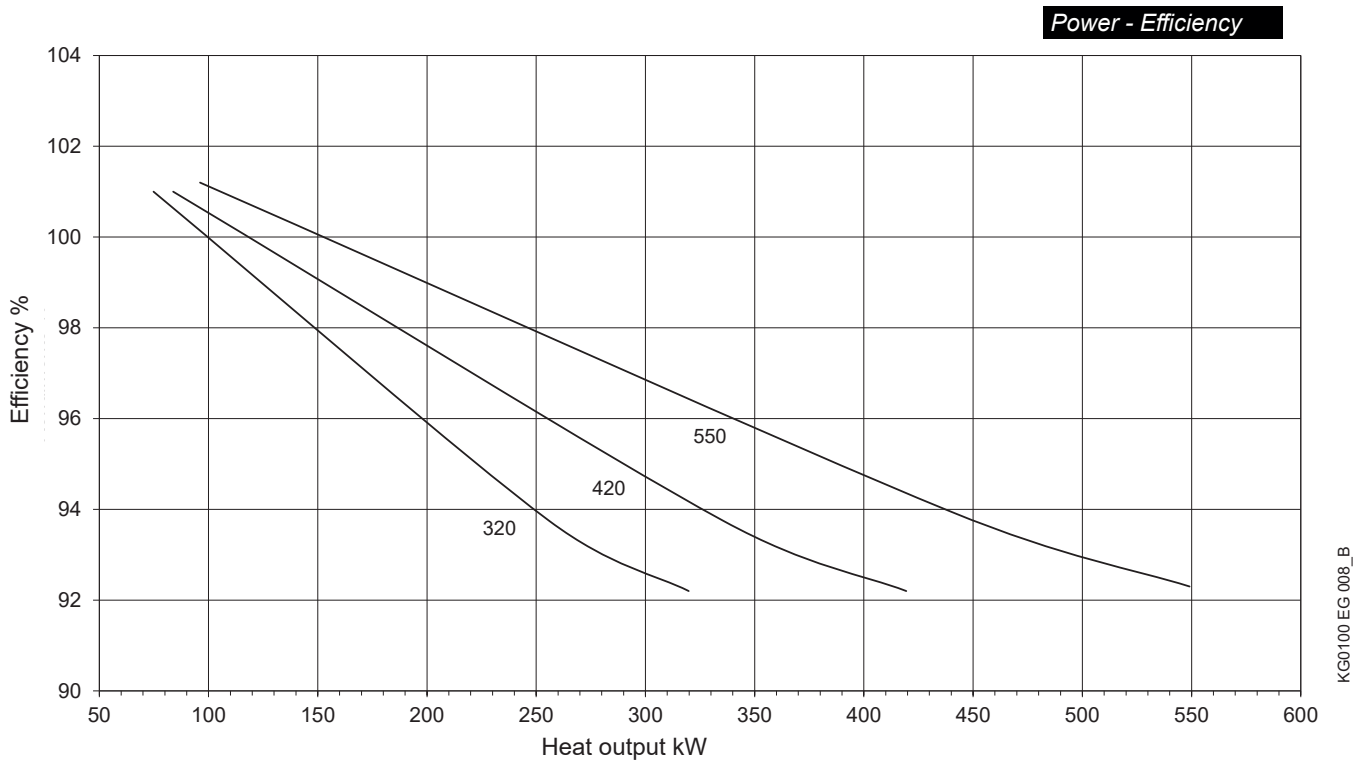
A work field has been tested and approved for each heater. This field allows the heater to be used at different power and efficiency levels based on effective output power. When choosing a heater model, the following criteria have to be taken into account: its use, service type (season or all year long), matching burner type (on-off, two stages or modulating).

3.2.1 DIAGRAMS OF OUTPUT HEAT/EFFICIENCY RATIO OF PK-N HEATERS

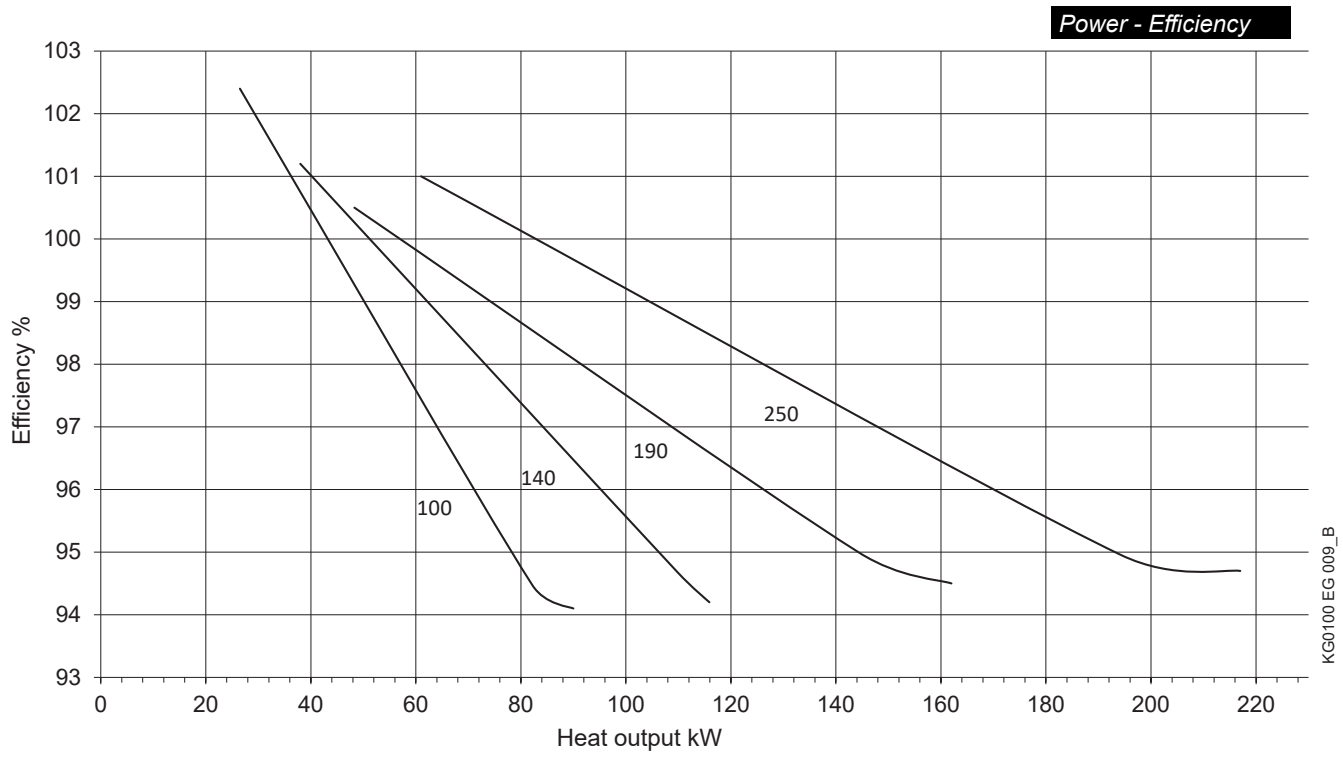


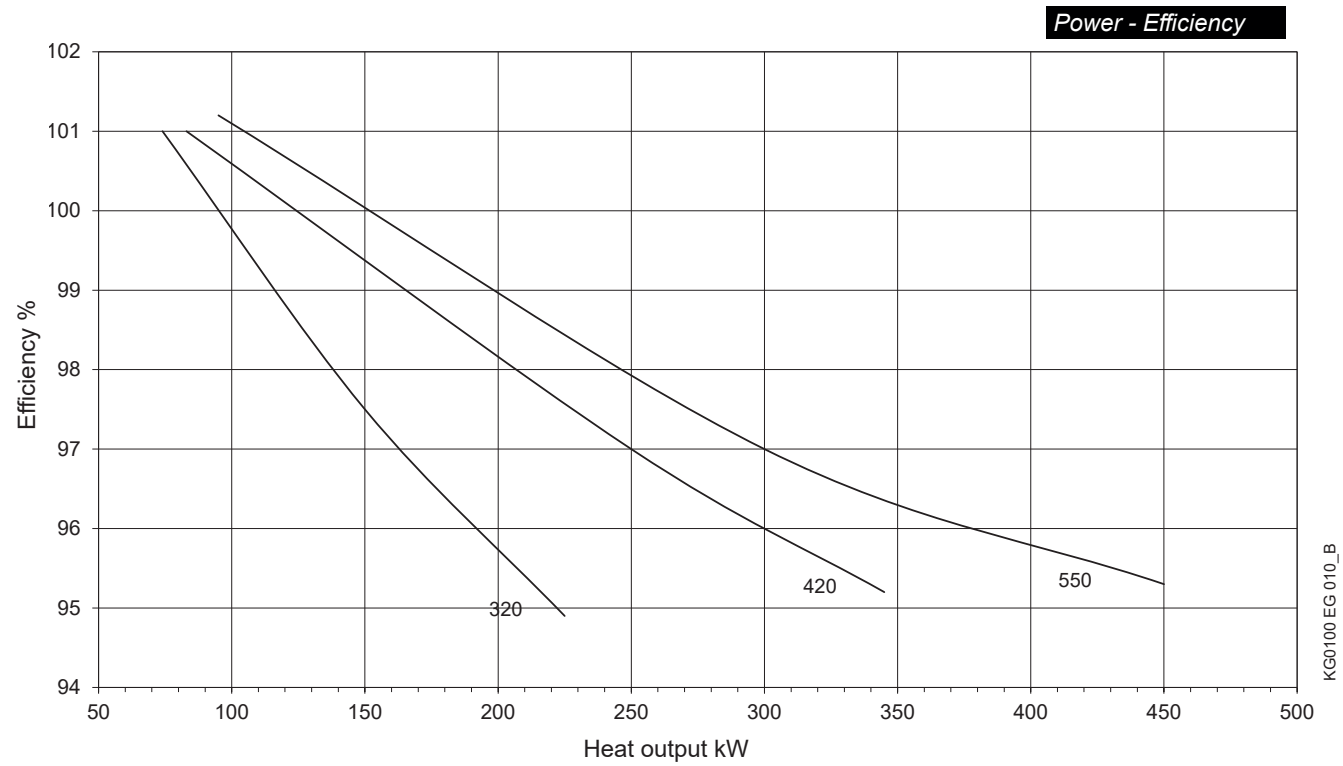
3.2.2 DIAGRAMS OF OUTPUT HEAT/EFFICIENCY RATIO OF PK-K HEATERS





3.2.3 DIAGRAMS OF OUTPUT HEAT/EFFICIENCY RATIO OF PK-R HEATERS





3.3. TECHNICAL DATA

Heat input and efficiency data of PKE-N heaters
All PK vertical heaters, up to 320N 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_{pi}; 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 chosen burner: see table in Par. 6.9								
Output efficiency	$\eta_{s,flow}$	%	According to the chosen burner: see table in Par. 6.9								
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_{pi}; 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 chosen burner: see table in Par. 6.9								
Output efficiency	$\eta_{s,flow}$	%	According to the chosen burner: see table in Par. 6.9								
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

code HG0325.00GB ed.E-2203

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 chosen burner: see table in Par. 6.9							
Output efficiency	$\eta_{s,flow}$	%	According to the chosen burner: see table in Par. 6.9							
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 chosen burner: see table in Par. 6.9					
Output efficiency	$\eta_{s,flow}$	%	According to the chosen burner: see table in Par. 6.9					
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

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 chosen burner: see table in Par. 6.9							
Output efficiency	$\eta_{s,flow}$		According to the chosen burner: see table in Par. 6.9							
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 chosen burner: see table in Par. 6.9					
Output efficiency	$\eta_{s,flow}$		According to the chosen burner: see table in Par. 6.9					
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

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	7,000	9,800	13,400	18,200	21,800	30,000	35,000
Available Head Pressure	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)

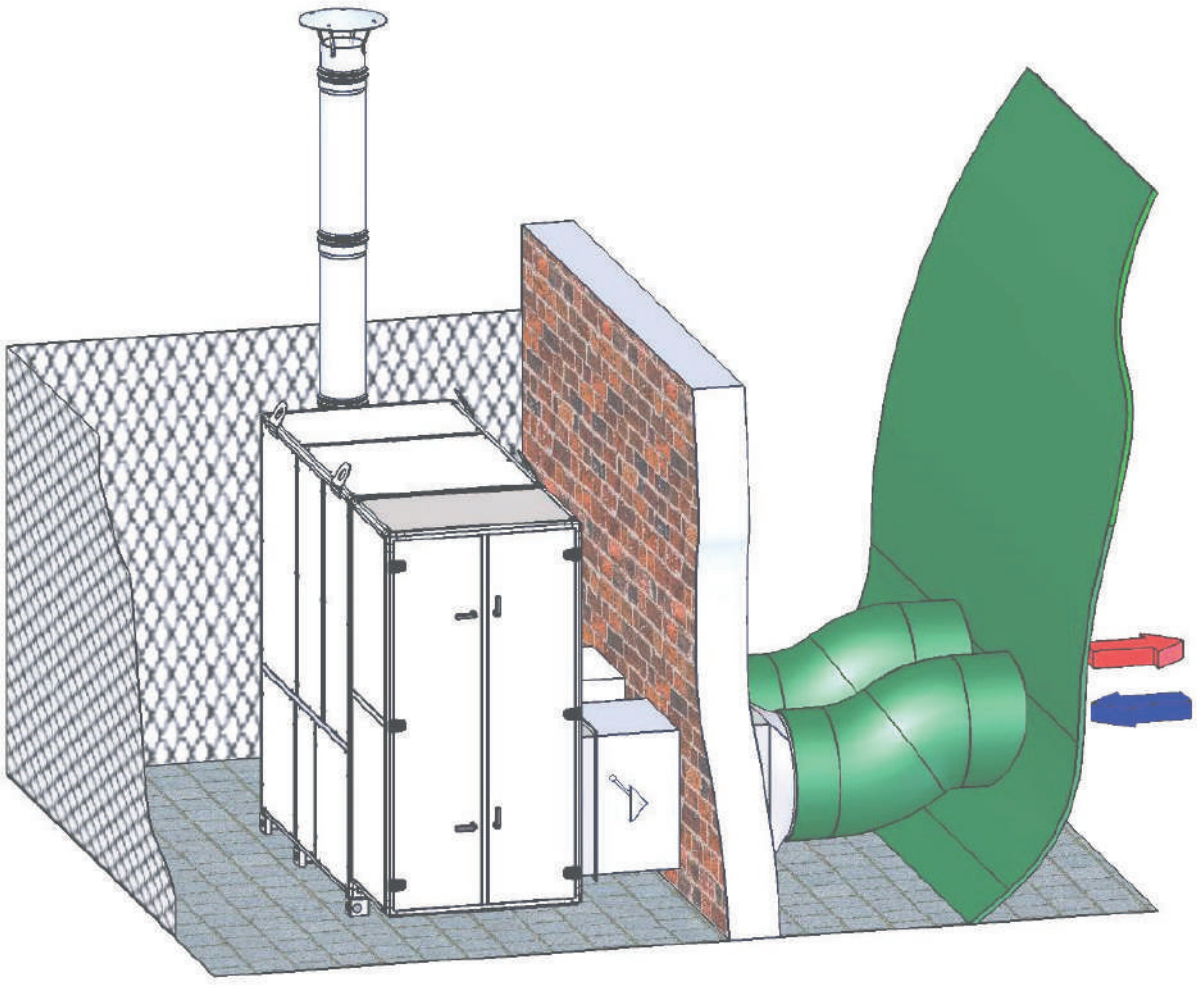
******** Maximum absorbed power refers to the maximum power delivered by the motor considering the supplied motor efficiency (efficiency IE3); the power absorbed by the matching burner must be add to the value indicated in the table.

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.



HG0150 C3 003

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

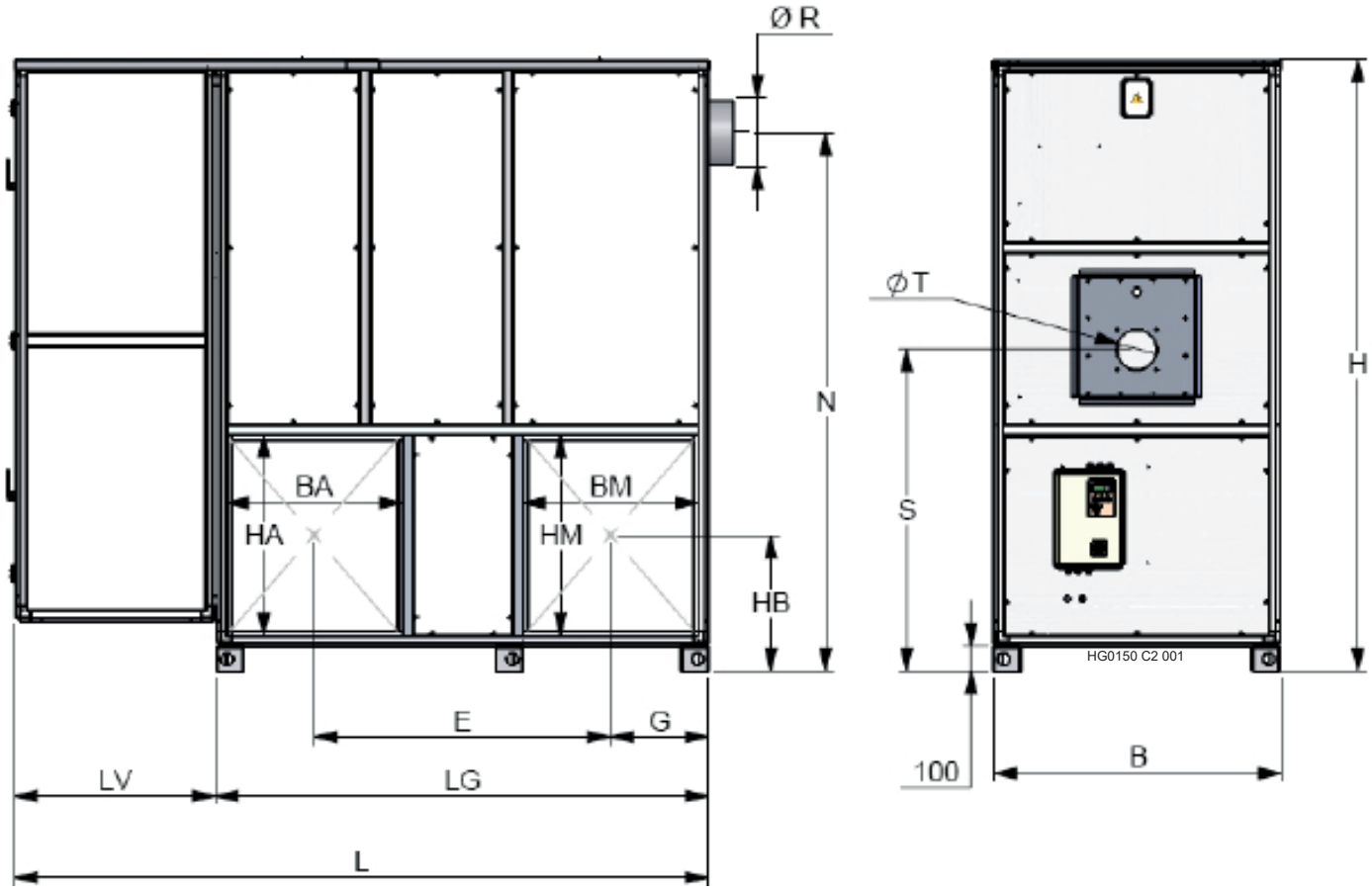
Integrated Models
All PK vertical heaters, up to 320 included, are supplied as a single unit with assembled burner casing.

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	1,955	800	2,120	1,455	500	875	290	540	500	800	500	800	1,760	180	1,190	190	445
PKE140	2,170	920	2,180	1,570	600	990	290	540	500	800	500	800	1,800	180	1,155	190	525
PKE190	2,480	1,060	2,330	1,750	730	1,070	340	540	600	800	600	800	1,960	250	1,190	190	650
PKE250	2,760	1,140	2,430	1,960	800	1,180	390	540	700	800	700	800	2,020	250	1,180	190	845
PKE320	3,110	1,140	2,610	2,310	800	1,430	440	540	800	800	800	800	2,040	250	1,180	230	990
PKE420	3,310	1,340	3,100	2,460	850	1,205	500	700	900	1,100	900	1,100	2,780	300	1,740	230	1,200
PKE550	3,600	1,340	3,270	2,600	1,000	1,600	500	745	900	1,190	900	1,190	2,900	300	1,830	230	1,450

Accessory size

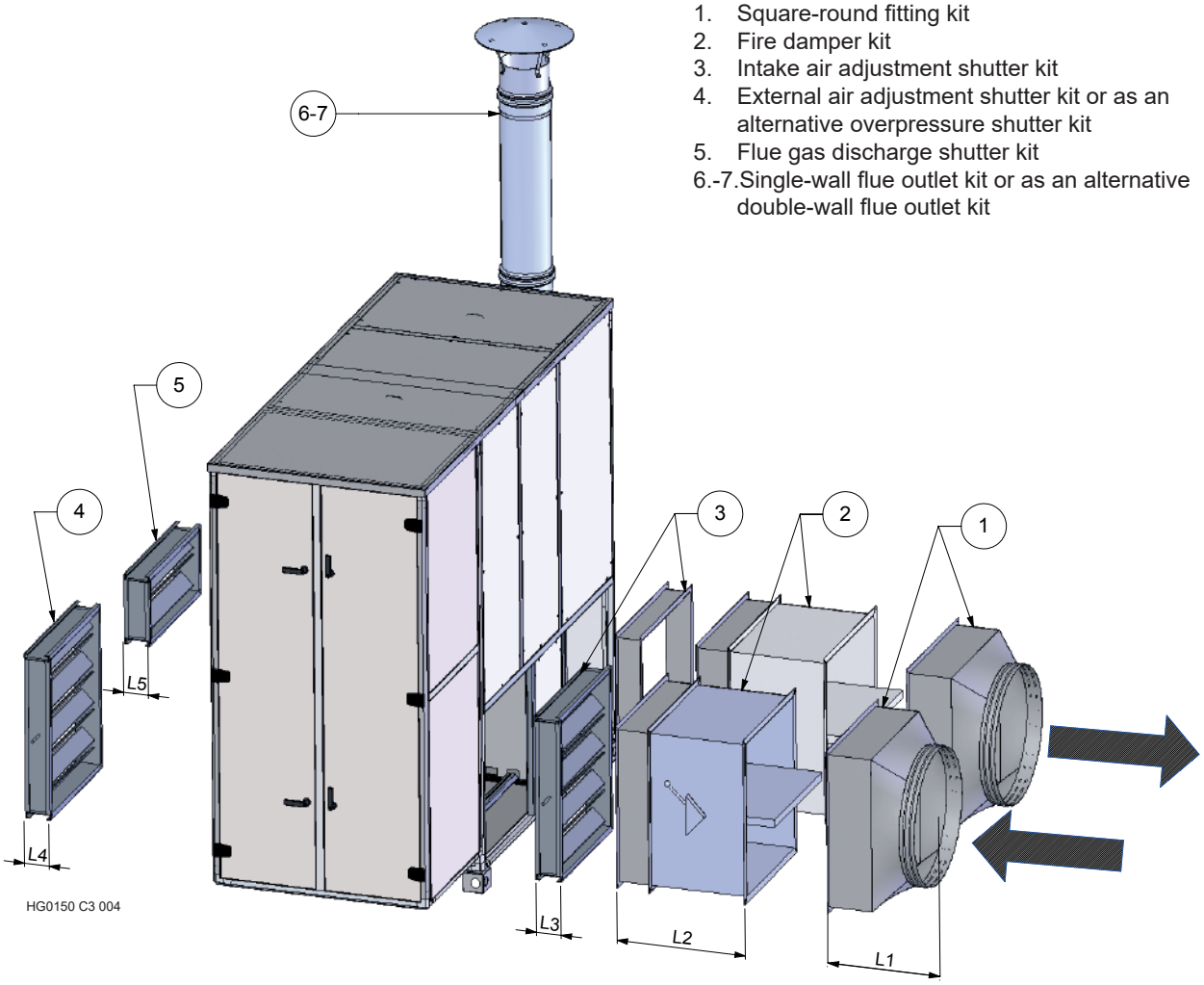
PK-SPORT heaters have been designed to be combined with a wide range of accessories to allow the customer to choose the optimal configuration depending on the needs of the system to which the heater must be added.

The table below lists the dimensions and codes of the main accessories available. The relevant section (Para. 5.7) 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.-7. Single-wall flue outlet kit or as an alternative double-wall flue outlet kit



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

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

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

Fxx Fault detected.

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

Air **the EST operation has been selected under the FUN menu; set FUN to ON or OFF;**

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.

In the event of communication problems between the CPU PCB and LCD panel, the word **CPU** will flash on the display if the problem is caused by the CPU; three flashing dots will be displayed if the problem is caused by the display PCB. If needs be, check that the display and the PCB are correctly connected and that the small cable RJ12 is securely held in the connector.

LCD

Smart Web

4.2. Temperature Adjustment Accessories

Ambient temperature adjustment
PK heaters are equipped with remote control and/or room thermostat.

- Smart Web code G23900,

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

Operation with SmartWEB G23900 chronothermostat
Remote controls of SMARTWEB series operate as a chronothermostat and can be used as a monitoring device for a single zone system at the same temperature, where up to 32 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.

SmartWEB version allows the complete management of all the system functions, including heater resets, directly from a PC.
For operating instructions and installation diagrams, please refer to the manual of SmartWEB/EASY ***HG0060.00 "SMART WEB / SMART EASY CHRONOTHERMOSTAT. Use, Installation and Programming Manual"***.

Safety thermostat
A safety thermostat with manual reset is installed on the PK 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 F38.
It is not advisable to change the ST1 value without consulting the APEN GROUP Service Centre.
.

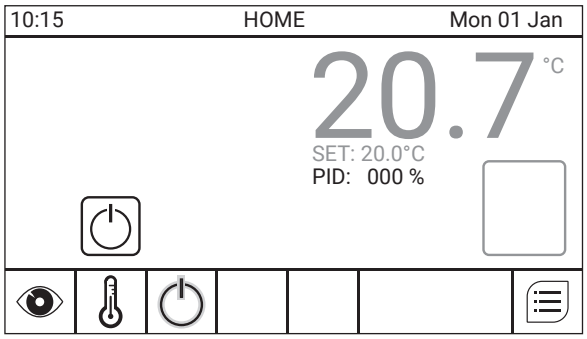
Lockouts Fxx
Codes and possible causes of lockouts are listed later the manual.

4.3. Smart Web

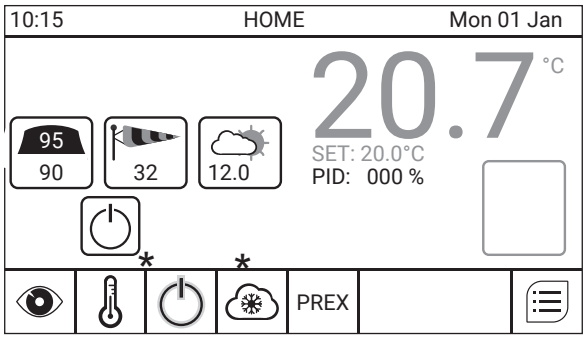
Smart Web remote control must be configured with all the necessary parameters so that the heater can operate at its best. The end user must configure setpoints and/or time ranges according to his/her needs. The type of system only if required.

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.

In PK air heaters, the SmartWeb will be set as “Warm Air Heater” for Tensostatic systems and as “Sport Structure” for Pressostatic systems.
The “HOME” screen is as follows:



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

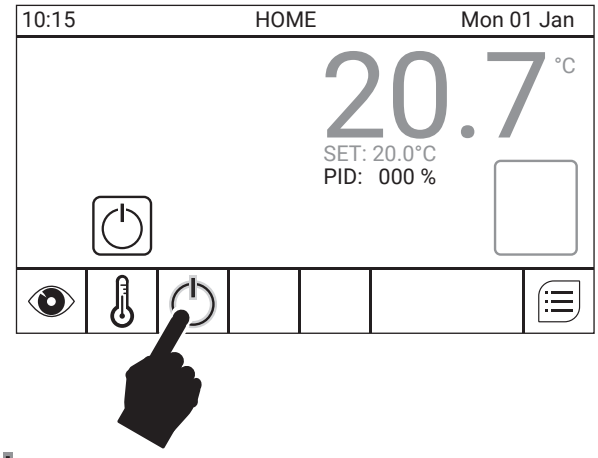


Here below are shown the factory settings and parameters that the user may modify.

* icons visible only with dedicated optional accessories

4.3.1. PRIORITY ON/ OFF

The Smart Web is supplied by default in "Priority ON". This setting may be modified directly with the ON/OFF key located in the "HOME" page as shown in the picture:



RED = System OFF **

GREEN = System ON

To switch off the system move the ON/OFF Priority switch to OFF (Red Icon).

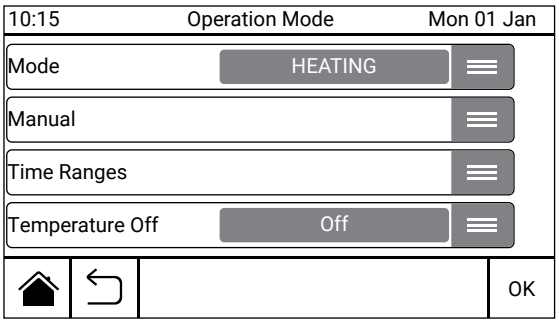
NOTE: Every time you wish to change the "ON/OFF Priority" status a message for confirming the action to be performed is displayed. Press "OK" to confirm. Press the back key to cancel

**** In PRESSOSTATIC configuration, the OFF status only involves the burner, the fan continues to run**

4.3.2. OPERATION MODE

The "Operation Mode" default settings are the following:

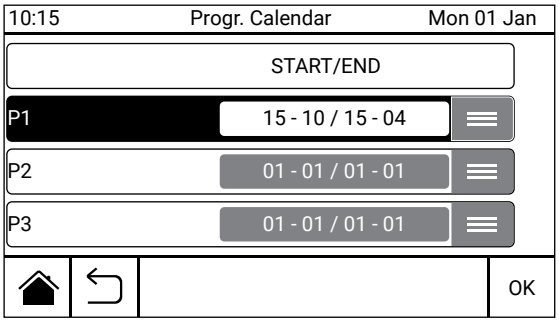
- Mode - HEATING
- Manual - ON
- Time Ranges - OFF



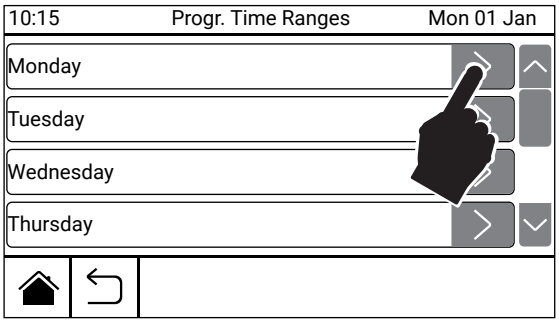
4.3.3. CALENDAR / TIME RANGES

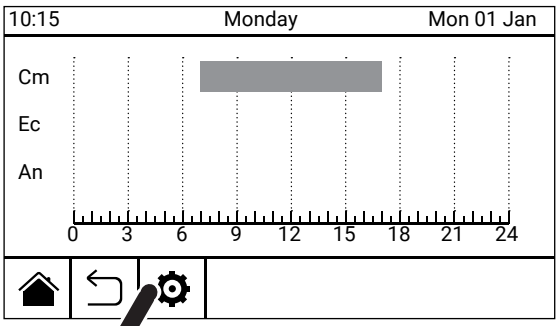
If calendar/time ranges is required, default settings are the following:

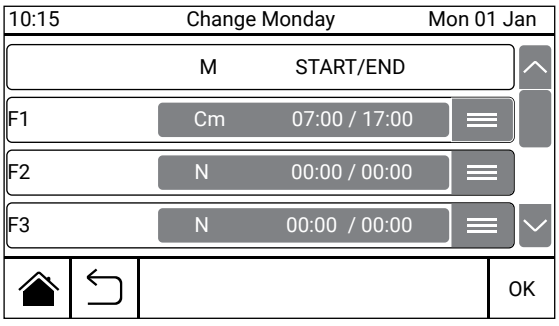
- Calendar - P1 enabled from 15-10 up to 15-04



- Time Ranges - From Monday through Friday enabled in "Comfort" from h 07.00 until h 17.00



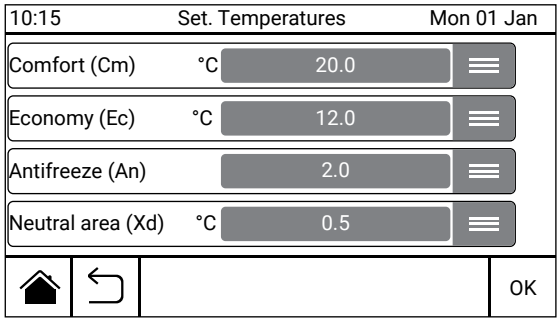




4.3.4. TEMPERATURE SETPOINTS (TIME RANGES)

The temperature setpoints are the following:

- Comfort (Cm) 20.0°C
- Economy (Ec) 12.0°C
- Antifreeze (An) 2.0°C
- Neutral Area (Xd) 0.5°C

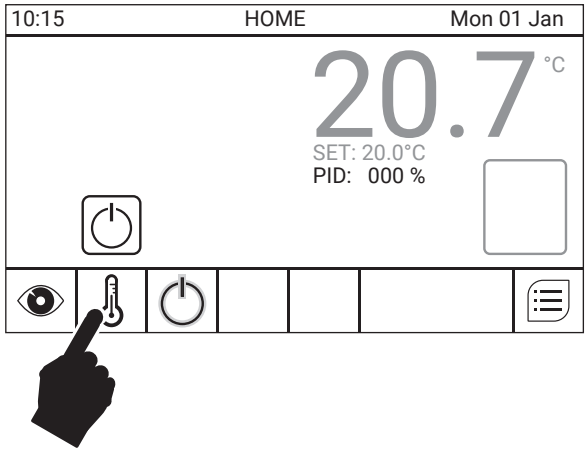


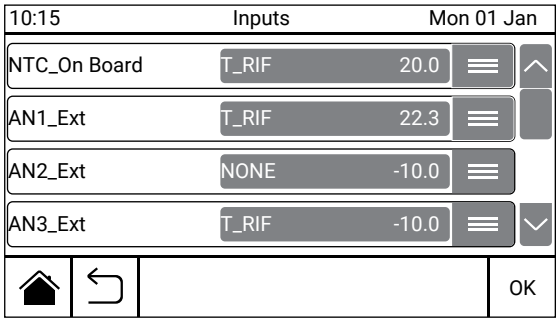
In Manual mode, the temperature is enabled 24/24h. To change it, press MANUAL key in OPERATION MODE menu, set the desired temperature and confirm

4.3.5. INPUT MENU

By entering this menu by pushing the key, it is possible to (for all inputs):

- Display the temperatures “measured” by the probes connected
- Display to which input a certain probe is connected and what reference has been associated to which probe
- Detect any reading error
- Correct the probe reading value by means of an offset parameter.

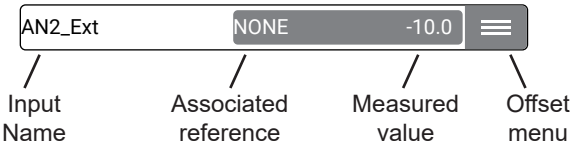




The inputs that may be displayed inside the menu are:

- NTC_On Board
- AN1_Ext
- AN2_Ext
- AN3_Ext
- ID1_Ext
- ID2_Ext

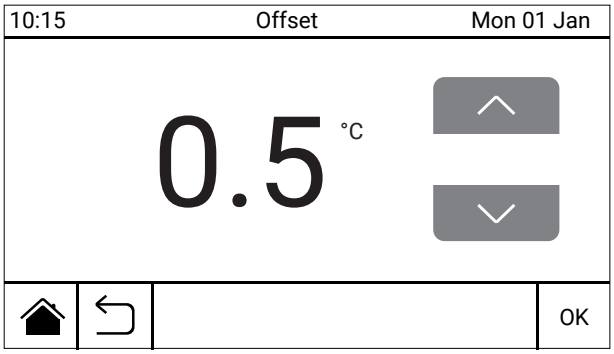
The menu comprises the following



If the probe is not connected the “NONE” indication is displayed and next to it the “-10.0” value:

If there is a probe reading error or incorrect probe connection/ configuration, the following condition is present:

By pressing the key next to an input, it is possible to access the offset adjustment menu. This menu allows to correct the reading value for that specific probe and is represented by a page as the one below:



4.4. Standard PRESSURE CONTROL in PRESSOSTATIC ("P") version

The **PK-P** 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 heater 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 H18 (default = 8V). This parameter may be modified from 6V to 10V, depending on the system's specifications and the heater adjusts the pressure by adjusting the intake recirculation shutter.
- In "**Mode = Maintenance**" (heating OFF) the intake recirculation shutter is completely closed and the heater adjust the internal pressure by modulating the fan speed through the parameters H12 (min speed) and H13 (max speed) set by default respectively to 2V and 10V.

NOTE: We discourage the modification of parameters H12 and H13 since they have been set to allow the heater an ideal modulation and operation.

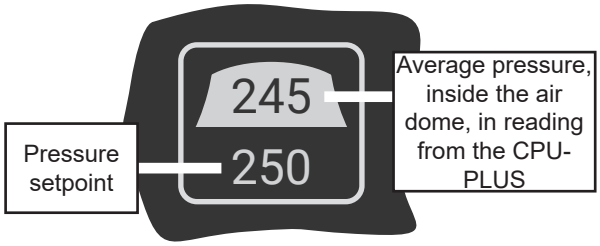
Pressure Control may be set to "**MAN**" (MANUAL operation) or to "**AUTO**" (AUTOMATIC operation - ONLY IF combined to Wind Control).

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

These setpoints may be modified in the "Setpoint" menu. Please refer to section 4.3 "Smart Web".

The "HOME" page will display an icon showing the average pressure value read by the PK heater and the current pressure setpoint sent:



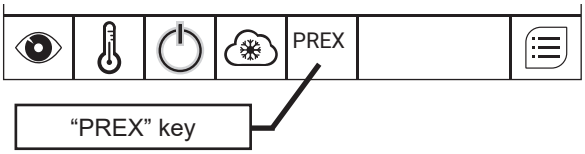
ATTENTION: Pressure control is a priority and ALWAYS ACTIVE even when the heating system is "OFF", and/or the ID1 contact is open.

Please find here below the Pressure Control logic.

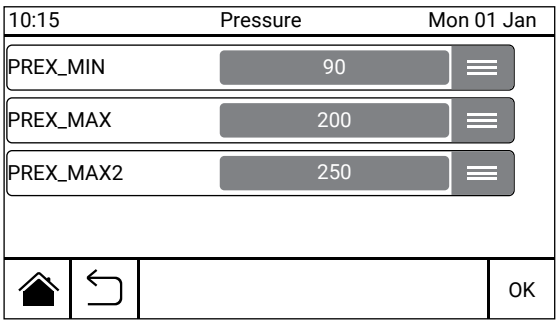
MANUAL PRESSURE CONTROL OPERATION ("MAN")

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-SMART, as described below:

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



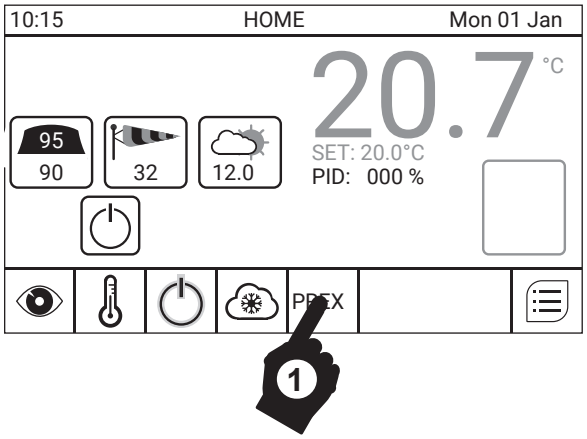
Press this key to access the quick setpoint selection menu, as follows:



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.

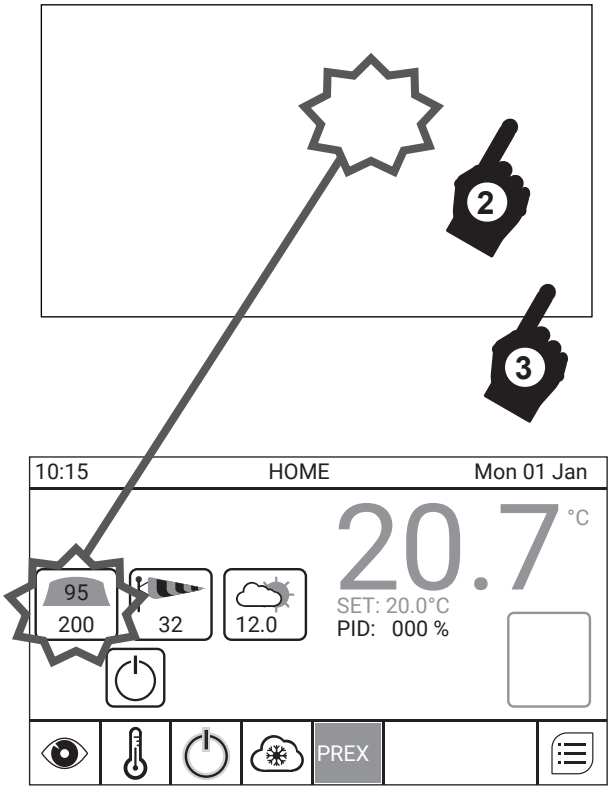
To deactivate the FORCED setpoint just press again, only once, the “PREX” key without entering the menu. The “Pressure Control” icon and “PREX” key now are “grey” again.

Activation of FORCED setpoint



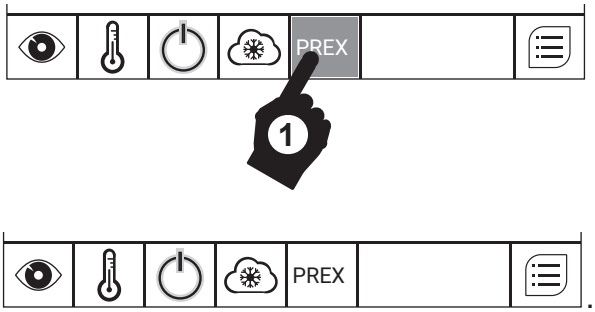
<u>AUTOMATIC PRESSURE CONTROL OPERATION</u> ("AUTO")
(ONLY IF combined with Wind Control)

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



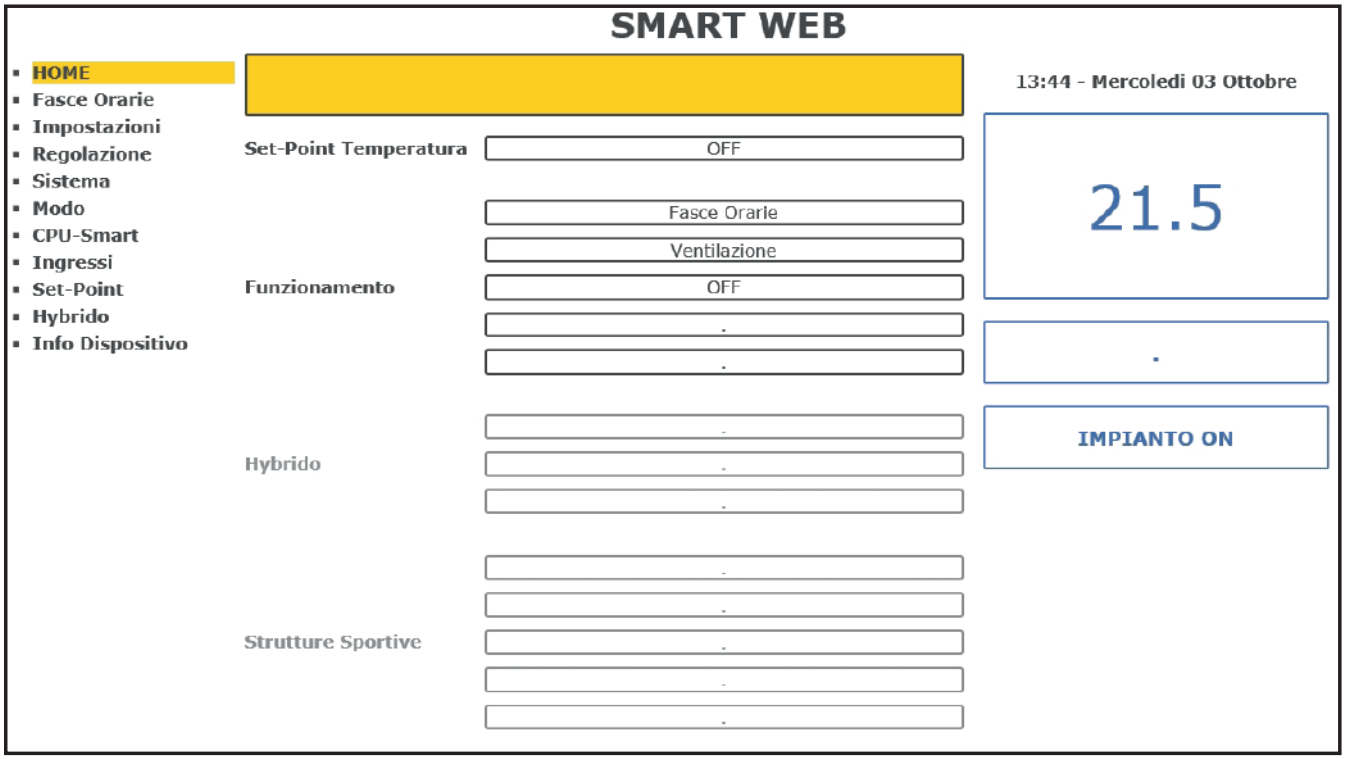
NOTE: If there is snow (both manually or automatically forced, with rain control) the pressure setpoint goes to the PREX_NEVE preset value.

Deactivation of FORCED setpoint



4.5. SMART WEB management via PC

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 Web remotely the network control must be connected with an Ethernet cable of the direct RJ45 type.



5. INSTRUCTIONS TO THE INSTALLER

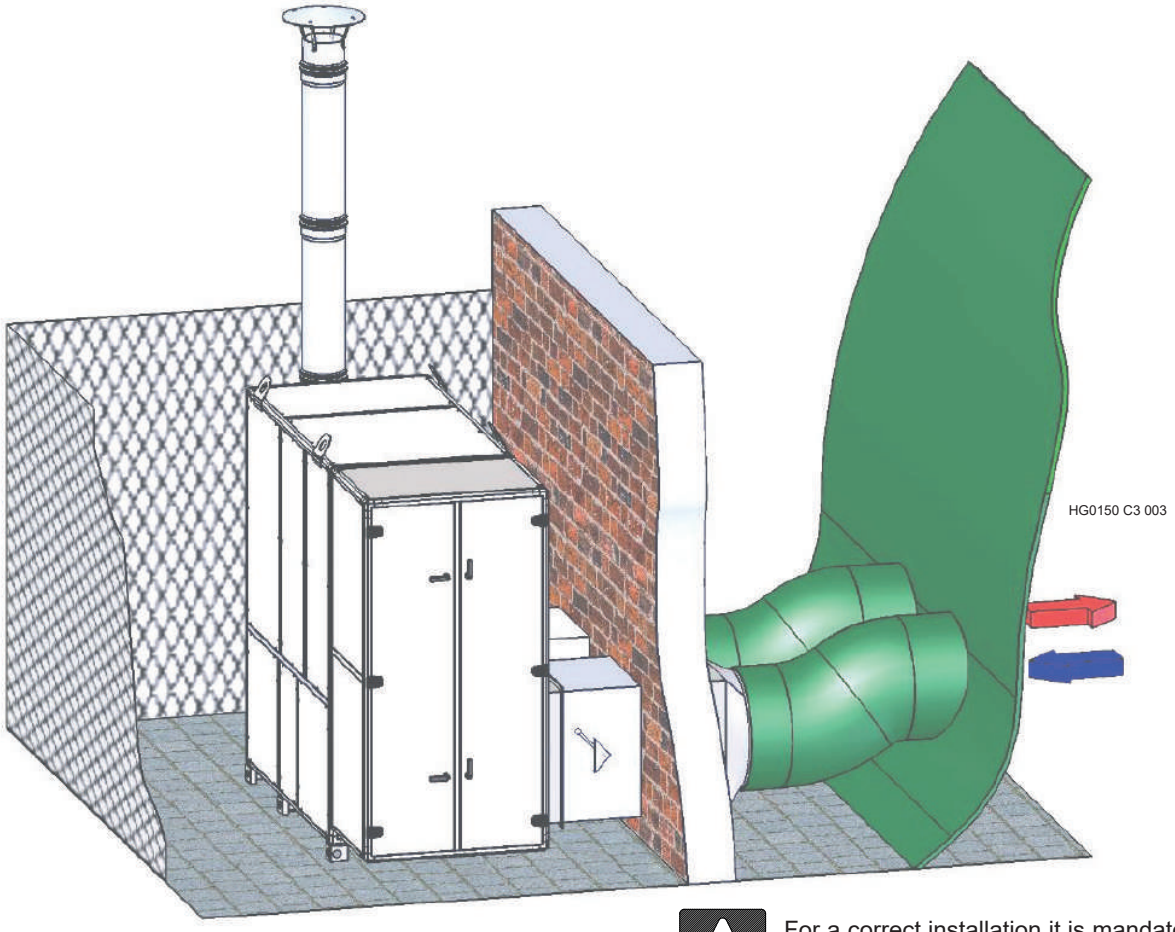
5.1. Where to Install the Heater

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 "TECHNICAL DATA" section of this Manual).
A vibration damping joint should be installed on air delivery duct so as to prevent vibration transmission from the heater to ductwork
Special attention must be paid to the noise conditions required for the room, dimensioning and installing, where necessary, silencers in the ductwork.

Connecting Fuel Supply
Fuel connection shall be performed by qualified personnel only. Follow instructions in 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

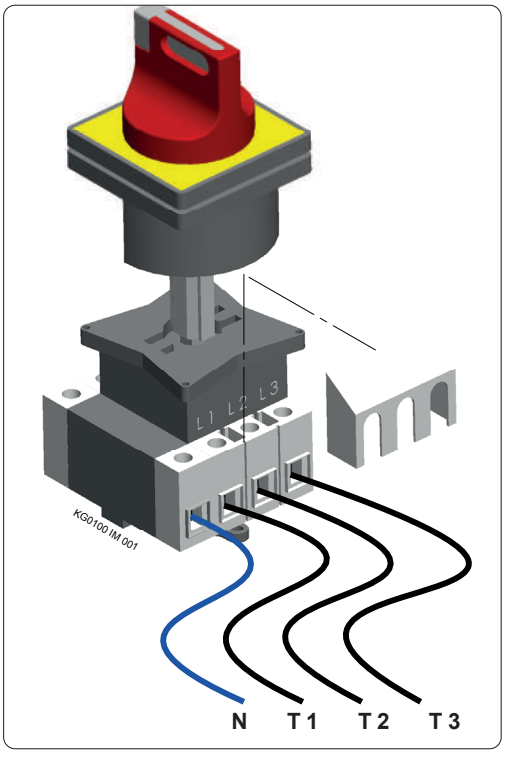
GROUND wire is mandatory. Connect it to relevant terminal or screw.

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

Electrical Protections

IMPORTANT: A residual-current circuit breaker for INVERTER (Pressostatic series) must be installed before the control panel of the heater. This circuit breaker must include an automatic protection and must comply with existing regulations.

The use of switches with characteristic curve for their triggering of type "**K**" or "**D**" or "**C**" is mandatory.
Automatic switches with "**A**" or "**B**" trigger curve are not allowed since they are not suitable for electrical motor protection.



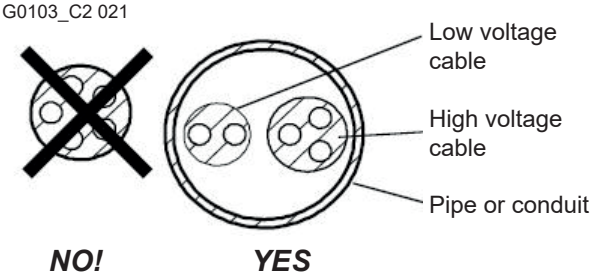
CABLES
Use flexible, flame-retardant, double-coating cables for the wiring.
The size of the cable section must be suitable for the equipment power consumption and the distance between the heater and the connection point.

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

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

G0103_C2 021



CHECKS
All APEN GROUP heaters are electronically tried and tested. Also safety devices are tested.
At first start up of three-phase models, 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 and discharge shutter, if installed
- Burner

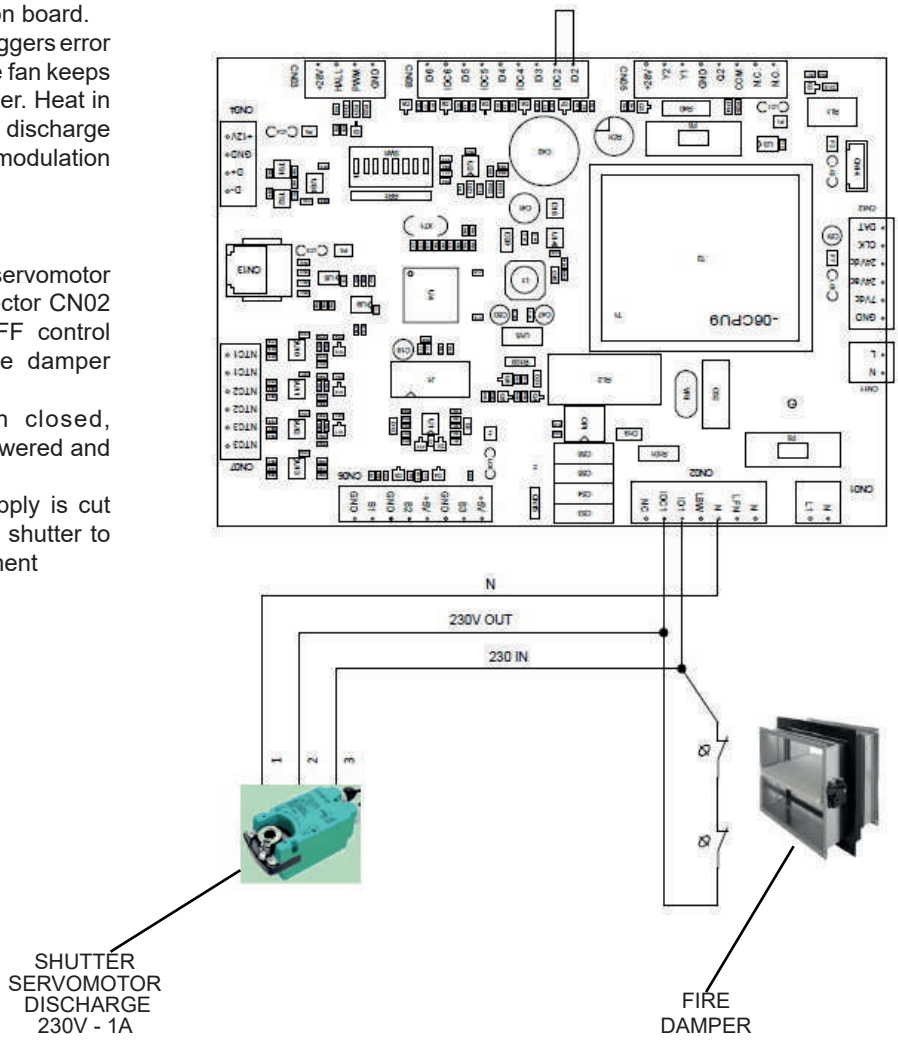
.

Fire Damper

Wire microswitch (NC contact with activated damper) to terminals IDC1 and ID1 of CN02 connector on the heater modulation board.
If microswitch triggers, the board triggers error F21 and stops the burner, while 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 IDC1 and N of connector CN02 of modulation board and ON/OFF control to contact ID1 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, power supply is cut off and the servomotor opens the shutter to discharge heat outside the equipment



Important: if no fire damper is installed, create a jumper on terminals IDC1, ID1 of connector CN02. the burner operates only if terminals IDC2 and ID2 of connector CN08 are closed

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

5.4. Wiring the Burner

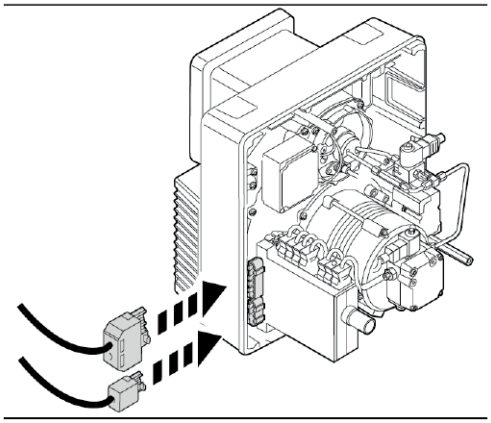
A specific connector on burner control board is dedicated to connecting the burner.
The connector shows standard numbering for modulating, one- or two-stage burners. You only need to wire the burner respecting numbering.

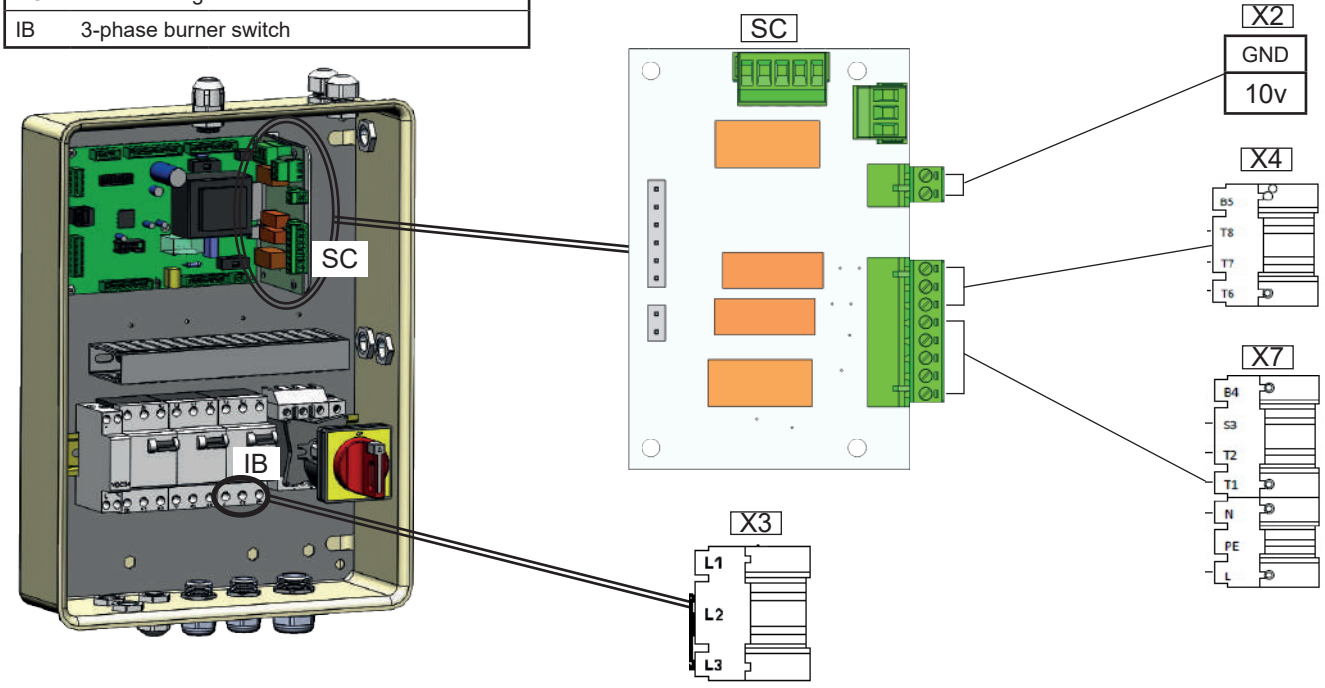
Three-phase Burner
On control panels of models from PK 250 onward, an automatic switch is installed that controls 3-phase burner power supply.
3-phase burners always have two supplies:
- 400V three-phase for electrical motor
- 230V single-phase for the control section.

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	
	0-10v	Burner modulation
SC	burner wiring board	
IB	3-phase burner switch	





5.5. Optional Accessories Required

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

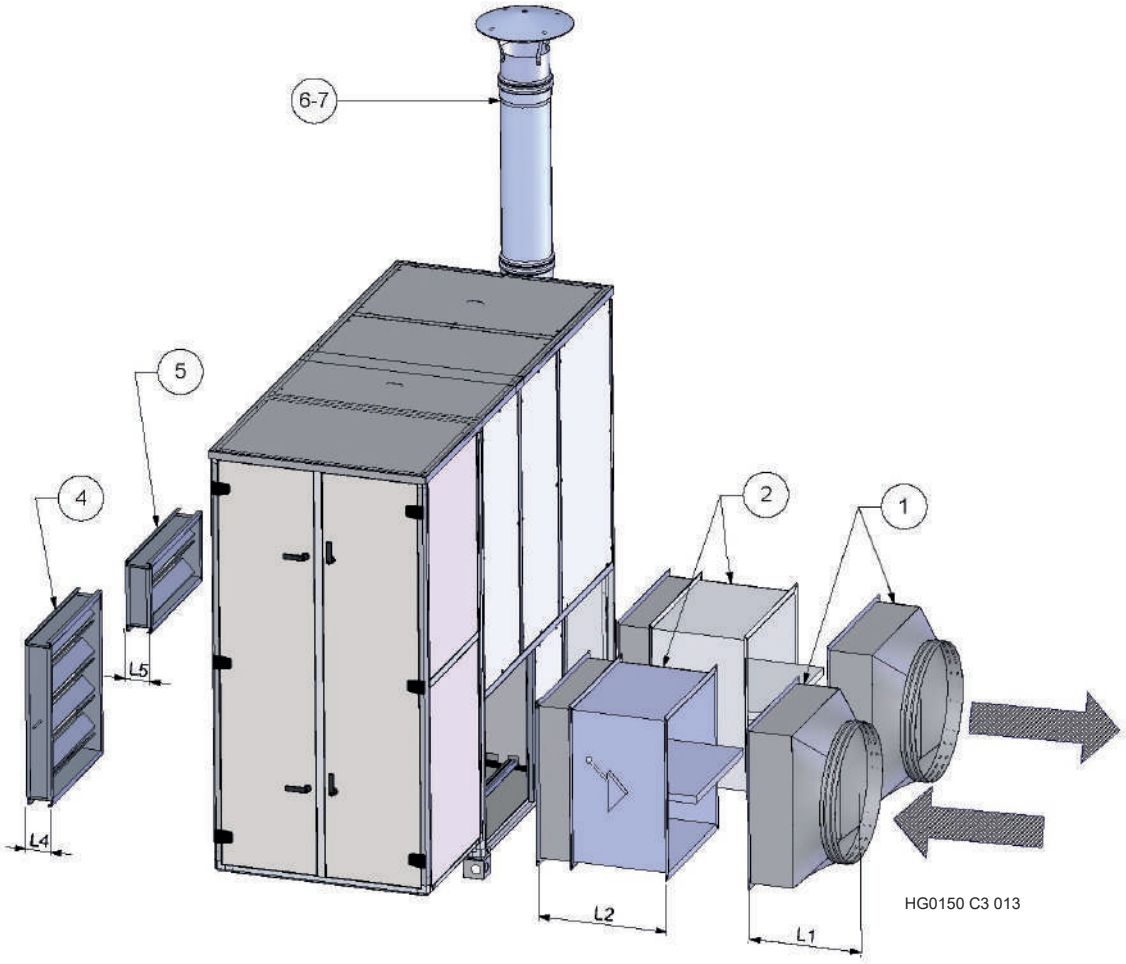
TENSOSTATIC BUILDINGS

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 tensostatic buildings 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

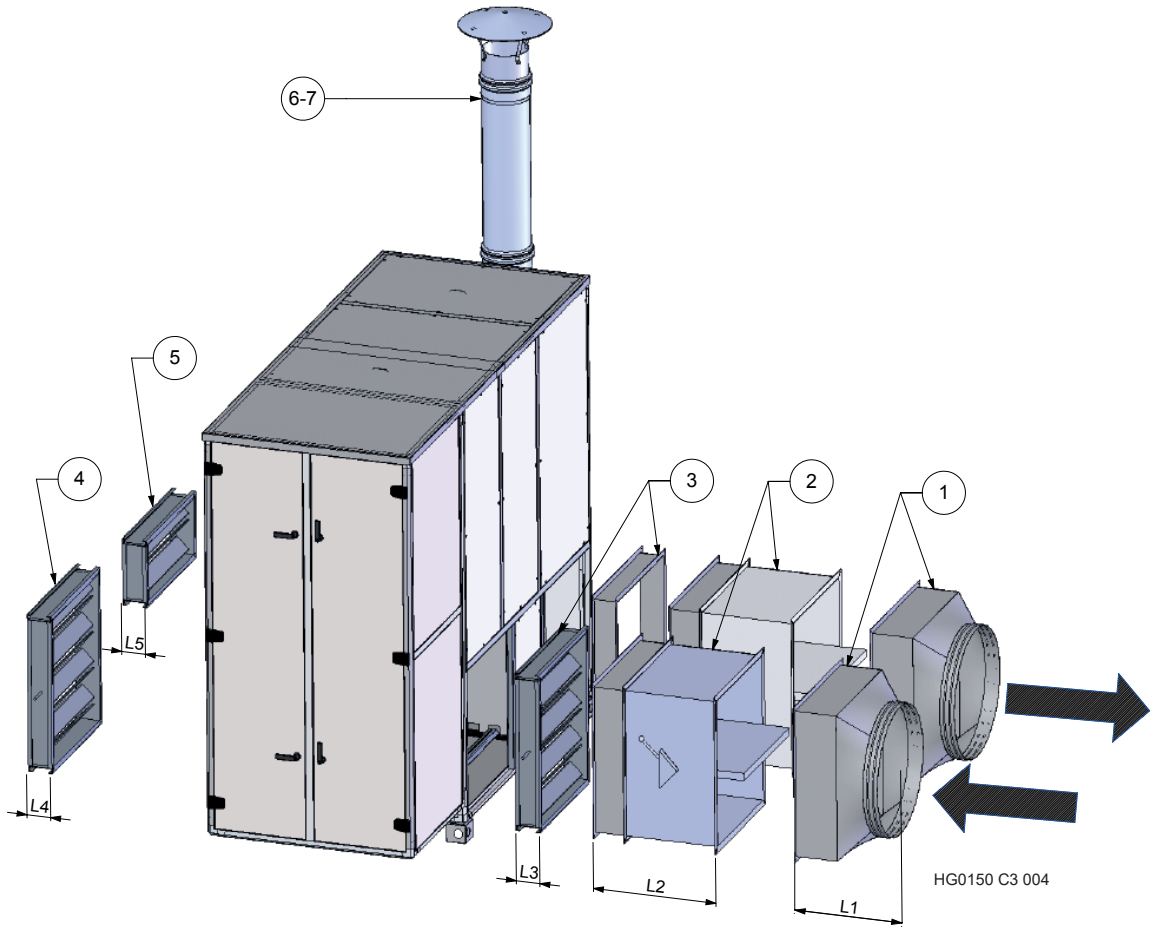
PRESSOSTATIC BUILDINGS

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. single wall flue gas drainage kit or as an alternative no.1 double wall flue gas drainage kit

Further optional accessories for pressostatic buildings are:

- SNOW kit, code G05440-W 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

5.6. SNOW CONTROL for PRESSOSTATIC versions (OPTIONAL)

The function of Snow Control (if present) is to force, if it snows, the internal pressure and temperature values, which are preset and different. It comprises a rain sensor (WET) (connected to input ID2) and an external temperature probe (connected to input AN2) for detecting the presence of rain and assess 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 heater, it is already set and operating as soon as you connect it. Otherwise to activate the function you must set this control to “MAN” or “AUTO” in the“System Configuration > Sport Structures” menu and set inputs AN2=T_EXT and ID2=RAIN, in the “Probe management” menu.

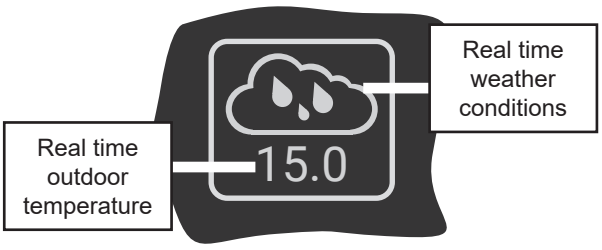
NOTE: The activation of the “Snow Control” function in “AUTO” (automatic) mode configures automatically inputs AN2=T_EXT and ID2=RAIN, and "locks" them. To modify AN2 and ID2 deactivate the “AUTO” Snow Control.

Setpoints settable for Snow Control:

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

These setpoints may be modified in“Set-Point” menu, please refer to Section 4.3 "Smart Web".

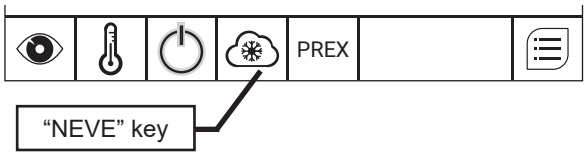
An icon displayed on the "HOME" page shows the current weather condition and the external temperature value:



Please find here below the Snow Control logic.

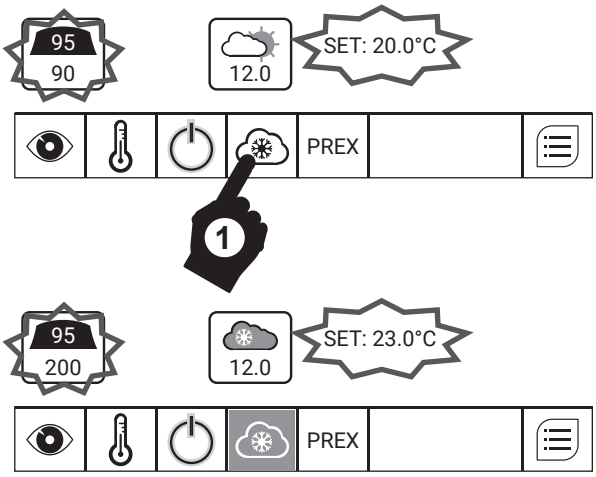
<u>MANUAL OPERATION</u> ("MAN")

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



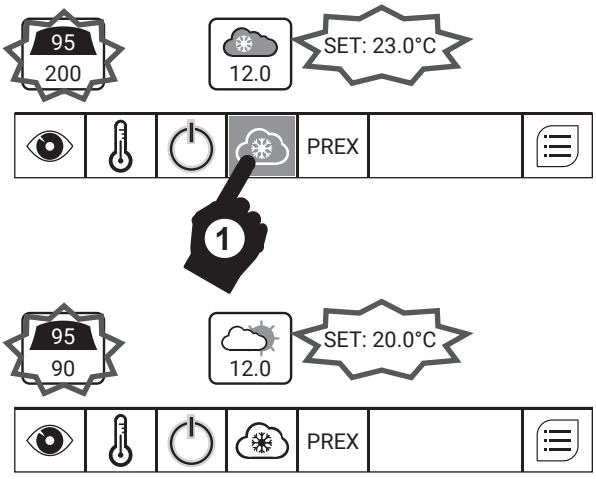
Press this key to activate the FORCED and always FIXED operation, simulating snow presence.
In the “HOME” page the “SNOW” key and the “Snow Control” icon (showing a snowflake) are highlighted in yellow, as shown here below.

FORCED Snow Manual Activation



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

FORCED Snow Manual Deactivation



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

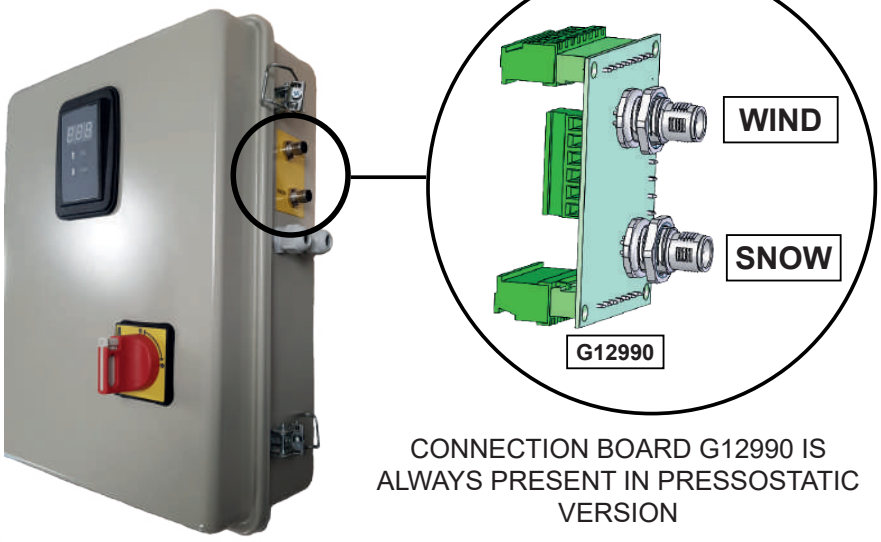
In case of rain the sensor, installed outdoor, closes contact ID2 and the rain icon is shown on Smart display. If when it rains (thus closed ID2 contact) the external temperature probe (connected to input AN2) measures a temperature below the “T_NEVE” reference limit, the Smart indicates that it is possible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

NO RAIN OR SNOW	
ID2	AN2
Open	> T_NEVE
	

RAIN	
ID2	AN2
Closed	> T_NEVE
	

SNOW	
ID2	AN2
Closed	< T_NEVE
	

SNOW CONTROL ELECTRICAL CONNECTION



CONNECTION BOARD G12990 IS ALWAYS PRESENT IN PRESSOSTATIC VERSION

5.7. WIND CONTROL for PRESSOSTATIC versions (OPTIONAL)

In PKE-SPORT Pressostatic versions, it is possible to connect and set two types of Wind Gauge for Wind control: ANALOGUE (0-10V / 4-20mA) or DIGITAL (ON-OFF).
In "System Configuration > Sport Structures" menu, it is possible to select the option according to the model purchased.

With DIGITAL Wind Control, it is possible to select the MIN or MAX setpoint value according to the outdoor wind conditions. The dry contact must be connected to terminals X1-1 and X1-2 inside the control panel.
OPEN contact: the SMARTWEB sends the setpoint to CPU with the MIN pressure value, MAX pressure value with CLOSED contact.

The function of ANALOGUE Wind Control is modulating automatically the pressure setpoint value, depending on the wind conditions. IT comprises a wind gauge (connected to AN3 input, in 0/10V configuration) for detecting wind presence and intensity (speed expressed in km/h).

If the Wind Control is purchased together with the heater, it is already configured and operating as soon as it is connected. Otherwise, in order to activate the function you must configure and set said control in the "System Configuration > Sport Structures" menu.

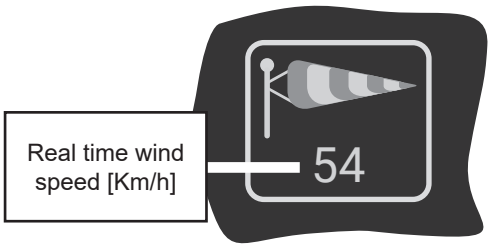
NOTE: In the SMARTWEB "Wind Control" function shows the following options in sequence: "NOT" and "YES" (Disabled/Enabled), Digital or Analogue. The latter can be managed as "AUTOMATIC" control only. It is not possible to force or manage the function in manual mode (MAN).

Setpoints that can be set on the SMARTWEB for Wind Control:

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

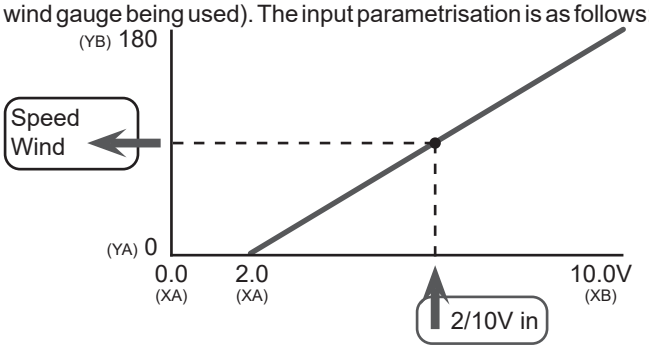
These setpoints may be modified in the "Setpoint" menu. Please refer to section 4.3 "Smart Web".

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

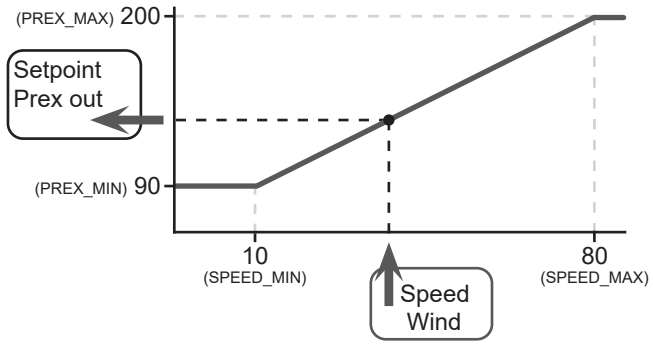


ACTIVE OPERATION ("YES")

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:



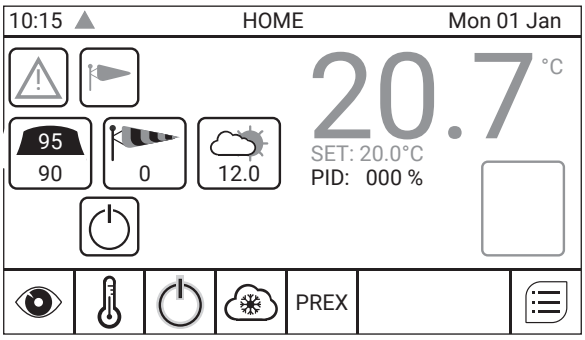
When there is wind the AN3 input value (wind speed value) modifies in a linear manner the pressure setpoint value sent (included between PREX_MIN and PREX_MAX), as shown here below:



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).

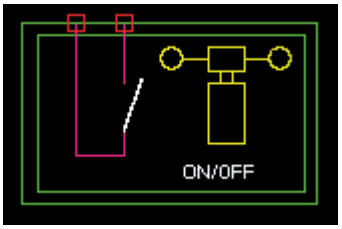
If the wind gauge is not connected or operates incorrectly, the Smart reads an input value of 0V or in any case less than 1V. In this case the "HOME" page displays an alarm icon, as follows:

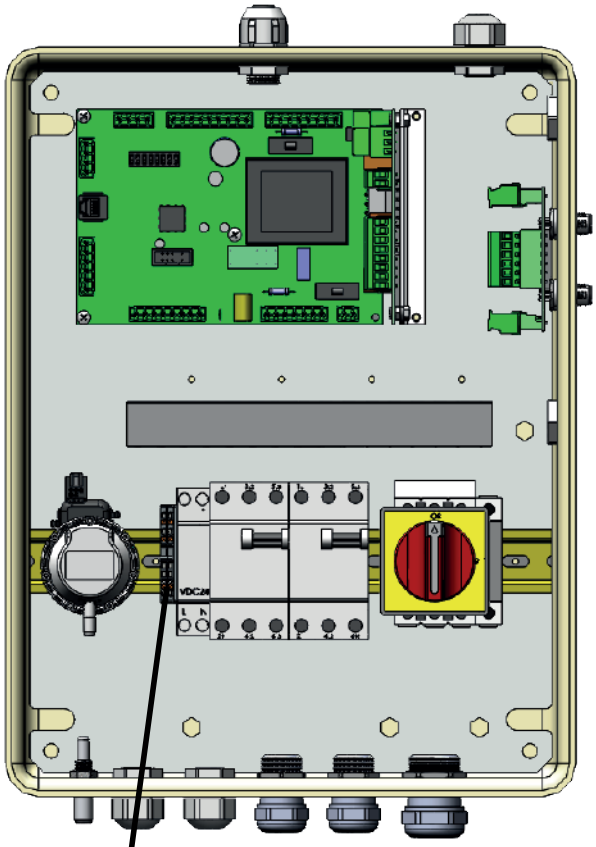


NOTE: The wind speed reading has a small output buffer so as to avoid a continuous variation of the sent pressure setpoint in the event that the wind is slightly unstable.

WIND CONTROL ELECTRICAL CONNECTION

ON-OFF DIGITAL WIND GAUGE



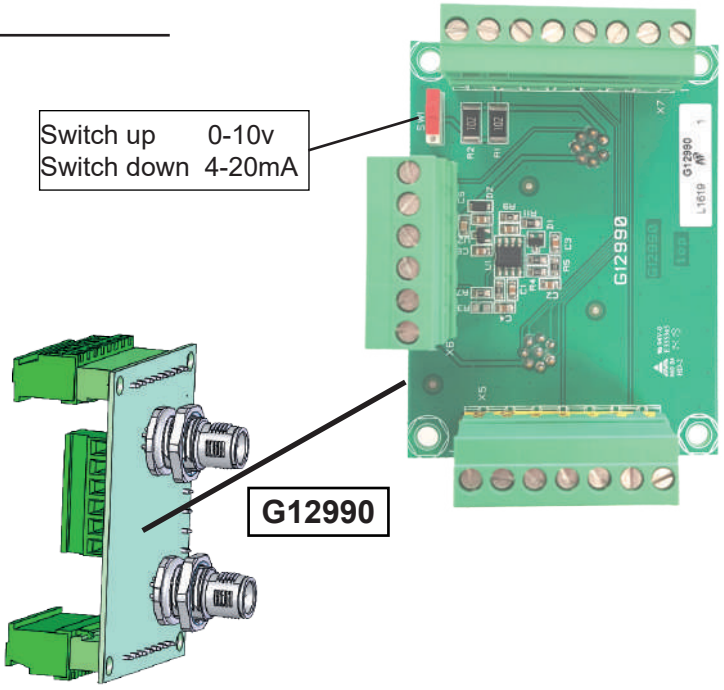


X1-1 AND X1-2 TERMINALS

ANALOGUE WIND GAUGE KIT G05430 4-20 mA

NOTE:on board G12990 there is a 500Ω resistor, necessary for transforming the 4-20mA signal of the wind gauge in a 0-10V signal.

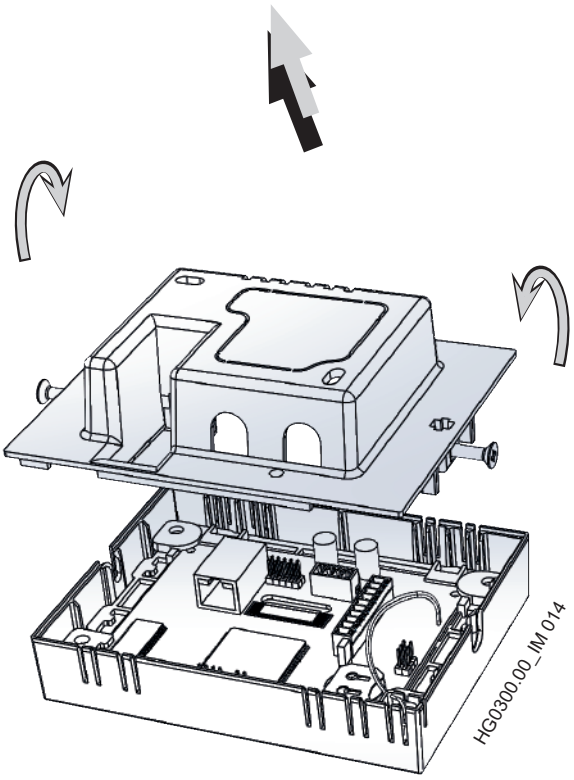
SMARTWEB requires a 0/10v signal for wind reading.
G12990 board features a switch to convert any 4-20mA signal of the anemometer into a 0/10v output
Therefore, set the switch to the type of anemometer output signal.

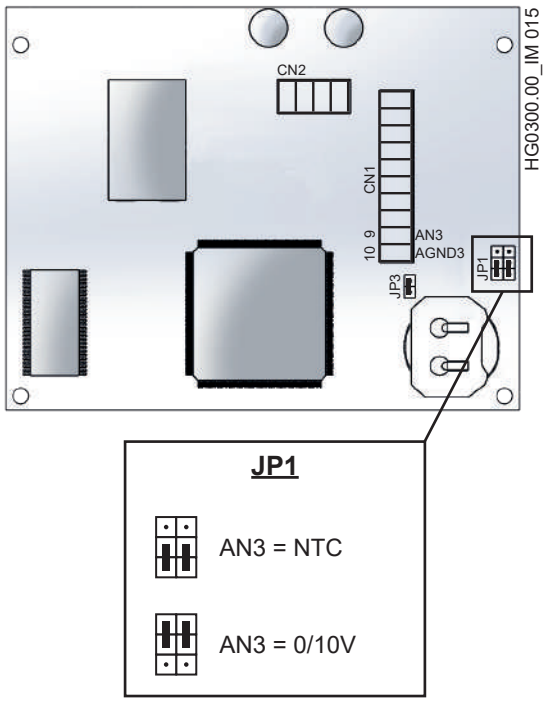


5.8. AN3 input configuration

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.

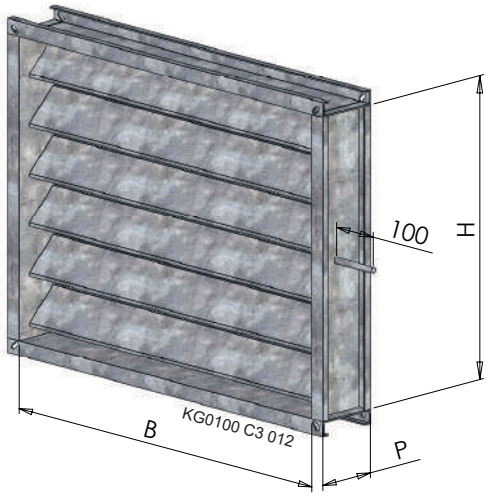




5.9. OPTIONAL ACCESSORIES

EXTERNAL AIR ADJUSTMENT SHUTTER KIT

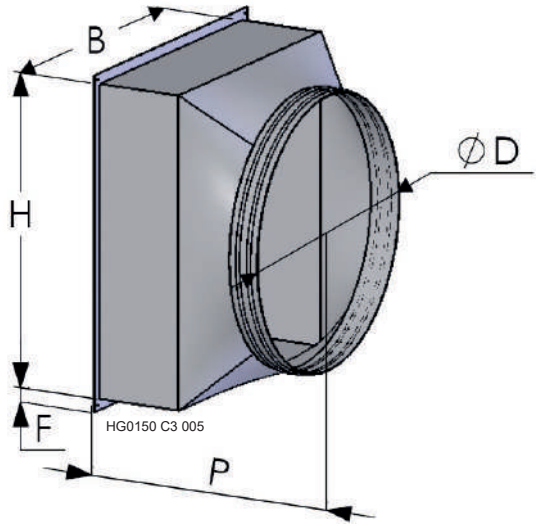
The external air adjustment shutter kit consists of an adjustment shutter fitted on the side opposite to the heater intake opening. All the shutters feature a “motorisable” control that allows the application of a manual control or, as an alternative, of a motorised control with servomotor; the manual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



RECIRCULATION 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



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	1,100	125	35	30
PKE550	*G12881*	900	1,200	125	35	30

N.B.: ***adjustment shutter accessory kits are always supplied fitted to the heater.***

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	1,100	125	35	30
PKE550	*G12884*	900	1,200	125	35	30

N.B.: ***adjustment shutter accessory kits are always supplied fitted to the heater.***

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.

N.B.: ***Square-Round accessory kits are always supplied <u>NOT</u> fitted to the heater.***

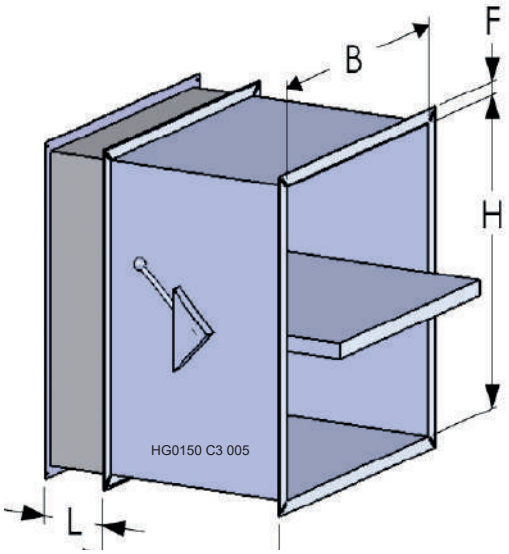
Square-Round fitting kit

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	1,070	600	35	900
PKE550	*G12883*	900	1,170	600	35	1,000

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).



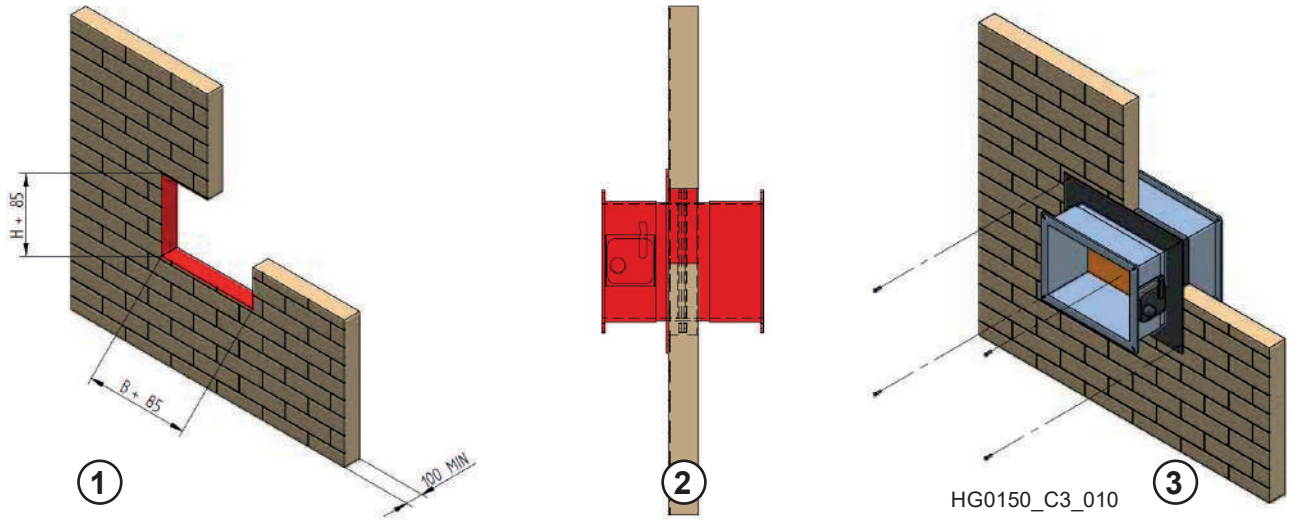
The open damper is as deep as the blade height: dampers higher than 510 mm project from both sides for a length equal to the height minus the depth (510 mm for all models) divided by two. In 800 mm high fire dampers with single blade the shutter projects 145 mm on both sides, for 1,070 mm high dampers 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	1,070	510	-	35
PKE550	*G12880*	900	1,170	510	125	35

N.B.: ***fire damper accessory kits are always supplied fitted to the heater.***

INSTALLATION OF FIRE DAMPER ON RIGID WALL



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

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

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

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

USE OF FIRE DAMPER

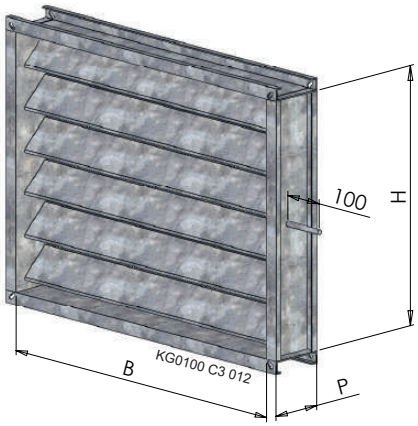
To activate the damper rotate the control lever counter-clockwise.
To release the damper press the button highlighted in the figure.

IMPORTANT: pay attention to the direction of rotation of the lever: in case of vigorous rotation in the wrong direction the closing device may break.
IMPORTANT: After installation, check that there are no obstacles for the correct blade rotation.

HG0150_C3_011

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 30).
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.



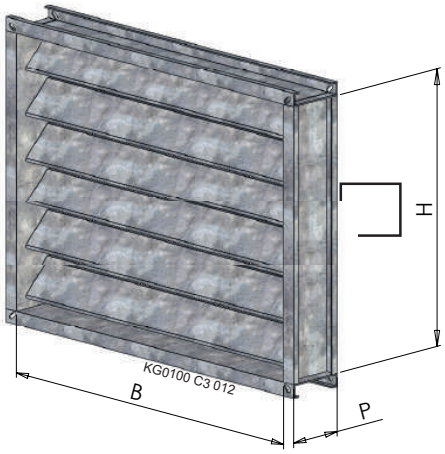
Flue gas discharge shutter kit

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
N.B.: ***flue gas discharge shutter accessory kits are always supplied fitted to the heater.***

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	1,100	125	35	30
PKE550	*G12881-SP*	900	1,200	125	35	30

Fv*: Vertical flange size
Fh*: Horizontal flange size
N.B.: ***overpressure shutter accessory kits are always supplied fitted to the heater.***

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.

INVERTER

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

NOTES:
- 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.

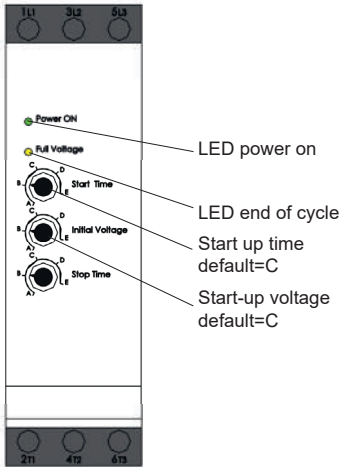
- In installations where air distribution ducts are made of textiles (or similar), it prevents the initial splash effect and guarantees longer life to ducts.
- It balances motor breakaway starting current
- It helps reducing belt wear and extending the life of motor and fan bearings.

Note: 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.

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



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 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

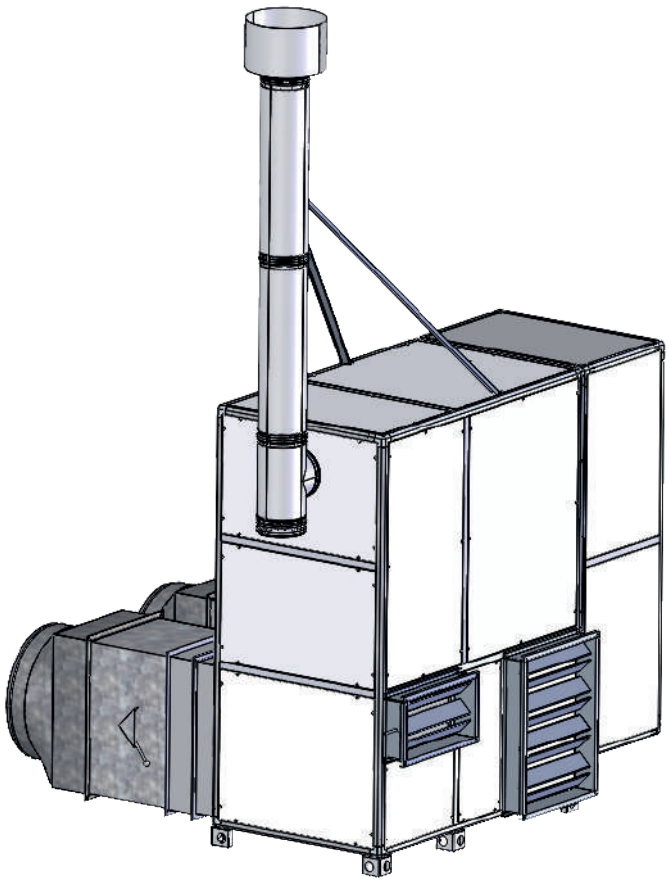
Model	Code		D Ø
	single wall	*double wall*	[mm]
PKE100-140	*G04065-180*	*G04065-180-DP*	180
PKE190-320	*G04065-250*	*G04065-250-DP*	250
PKE420-500	*G04065-300*	*G04065-300-DP*	300

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



N.B.: ***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 ≤50 mg/m³;
V2 - liquid fuels, natural gas, LPG and manufactured gas >50 mg/m³;
V3 - solid fuels, natural gas, LPG and manufactured gas >50 mg/m³, gas 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 (in mm) from combustible materials

CALCULATING THE FLUE GAS WEIGHT

Below are the equations for calculating the flue gas weight according to kW for natural gas combustion.

x = combusted kW
y = flue gas weight in kg.

G20 - Natural gas $y = 1.566x - 2*10^{-13}$
These equations are valid for:
• N series: flue gas temperature of approx. 270°C and efficiency of approx. 89%;
• K series: flue gas temperature of approx. 190°C and efficiency of approx. 92%;
• R series: flue gas temperature of approx. 140°C and efficiency of approx. 94%.

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.

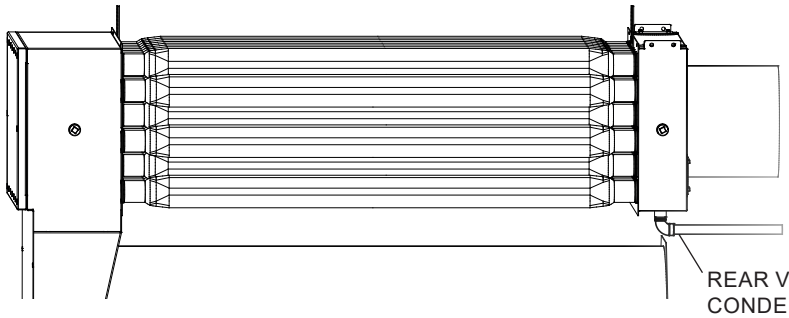
Materials to be used for condensate drain

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.

N.B.: PKE-K and R heaters are provided as standard with rear condensate drain



IF AN OIL BURNER IS MATCHED, IT IS MANDATORY TO PREVENT ANY CONDENSATE.

Draining using a Siphon

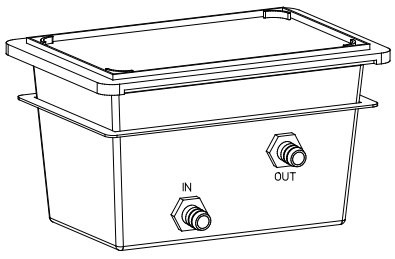
If the heater is installed indoor and a condensate drain system is provided, the siphon must mandatorily be smoke proof.

Fill manually the siphon with water at first start-up

ACID CONDENSATE TREATMENT KIT

Apen has acid condensate treatment kits:

- G14303 for heaters up to PKE100
- G05750 for heaters from PKE140 to PKE550



6. SERVICING INSTRUCTIONS

6.1. Operating Cycle

The heat demand depends on the parameter d0 setting of the heater PCB:

- d0=2: input ID2-IDC2 closed and NTC1<ST1;
- d0=5: input ID2-IDC2 closed and input 0-10Vdc>Von;
- d0=7: input ID2-IDC2 closed and control from Modbus ON.

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

- the heater is powered on and has not been locked out;
- when the contact is closed on terminals ID2/IDC2 of the heater PCB.

In these conditions the burner starts; after a time D3 (delay time of fan ON, parameter on CPU-PLUS) the fan(s) will start.
I
The heater will be switched off when the ID2/IDC2 contact opens on the terminal board; 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 (D4 fan delay time OFF, parameter CPU-PLUS) 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.
Parameter **d6** of the modulation PCB, which can be programmed from 0 to 256 seconds, controls the minimum interval between the time the equipment is switched off and restarted.

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

6.2. Reset

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

- N.O. button connected on digital contact ID4-IDC4;
- the Smart Web.

Faults are classified according to the type of error; the list and meanings of all faults are shown in the FAULT table in Paragraph 6.6 “Analysis of lockouts - faults”
All values of the parameters of the CPU-SMART PCB are shown for all PK heater models.

- (1) parameters that could be modified with "001” Password via remote LCD control (even with modbus address ≠ 0).
- (2) parameters that could be modified with a second level Password which can be requested to the manufacturer's Service Centre (even with modbus ≠ 0 address).
- (3) parameters that could be modified only with a Smart Web or via modbus.

6.3. MODULATION PCB PARAMETERS

Parameters of CPU-SMART PCB version 7.04.xx				
PARAMETER			PK HEATER	DESCRIPTION
Control parameters				
d0	(2)	-	7	Flame modulation: 2=NTC1; 5=0÷10Vdc; 7=Modbus (SmartWeb in PID mode)
d1	(2)	-	8	Type of equipment: 0=heater; 2=boiler; 5=PCH; 8=PKA/E; 10=Queen; 12=Fan heater
d2	(2)	-	2	Remote lockout signal output (Q1): 0=disabled; 1=enabled; 2 = Q1 and Q2 control the high/low flame external burner
d3	(2)	sec	60	Fan delay time ON (RL2): 0÷255
d4	(2)	sec	36	Fan delay time OFF (RL2): 0÷255 (1=5sec. 60=300 sec.)
d5	(2)	-	0	Flue gas T control enabling (NTC3): 0=disabled; 1=enabled NOT USED
d6	(2)	sec	5	Interval between switching off and on (Off timer): 0÷255
d7	(2)	-	0	1= Fault reset counter; 2= Burner hour-meter reset
d8	(2)	-	0	Boiler antifreeze enabling (NTC1): 0=disabled; 1=enabled NOT USED
d9	(2)	-	0	Dampers enabling: 0=disabled; Do Not Change
d10	(2)	-	1 PRESSOSTATIC 0 TENSOSTATIC	Continuous ventilation: 0= disabled; 1= enabled (fans always active); 2= enabled with delay par.d3 upon remote heat request - active in Fault in case of heat request
Burner parameters - NOT USED				
b1	(2)	rpm	195	Motor RPM MINIMUM value (PWM1): 90÷999 (1=10 RPM)
b2	(2)	rpm	635	Motor RPM MAXIMUM value (PWM1): 90÷999 (1=10RPM)
b3	(2)	rpm	240	Motor RPM START-UP value (PWM1): 90÷999 (1=10RPM)
b4	(2)	-	2	HALL signal divider: 2÷3
b5	(2)	rpm	50	Error F3x; no. of revolutions x10 (50=500rpm): 0÷300
b6	(2)	sec	20	Error F3x; error dwell time before fault F3x: 0÷255
b7	(2)	sec	20	Pre-cleaning time with maximum output: 0÷255. DO NOT CHANGE THE PRESET VALUE.
b8	(2)	sec	10	Flame stabilisation time (ignition): 0÷255
b9	(2)	sec	90	Combustion chamber post-cleaning time (FAN ON): 0÷255
b10	(2)	%	5	Motor rpm % increase for each b11 seconds: 1÷100
b11	(2)	sec	2	Time interval for motor rpm increase: 1÷100
b12	(2)	%	30	Antifreeze mode FAN motor modulation % value: 30÷100
b13	(2)	pwm	65	Integral factor value (ki_pwm) for PWM1 calculation - (exA36):0÷249
b14	(2)	pem	45	Proportional factor value (kp_pwm) for PWM1 calculation - (exA37):0÷249
b15	(2)	sec	0	with d1=0 or 5: delay time ON flame control equipment (TER); with d1=2 (boiler): F85/F86 water flow delay alarm at start-up
b16	(2)	-	3	ID5 - Blower fan control: 0=input disabled; 1=enabled with N.C. input required; 2=enabled with N.O. input required; 3= enabled with N.C. input required with auto-reset;
b17	(2)	-	3	ID6 - Blower fan control: 0=input disabled; 1=enabled with N.C. input required; 2=enabled with N.O. input required; 3= enabled with N.C. input required with auto-reset;

Heat input and fuel instantaneous consumption calculation parameters - NOT USED				
Qmin	(3)	kW	21.0	Minimum heat input (ref. Lower calorific value - Hi)
Qmax	(3)	kW	99.9	Maximum heat input (ref. Lower calorific value - Hi)
LCV	(3)	kW/m³	see table of "Gas-type parameters" here below	Lower calorific value (Hi)

PARAMETER			G20	G25	G25.3	G25.1	G27	G2.350	G30 G31	DESCRIPTION
LCV	**(3)**	**kW/m3**	**9.45**	**8.13**	**8.31**	**8.14**	**7.75**	**6.75**	**12.4**	**LOWER CALORIFIC VALUE (Hi)**

Parameters of CPU-SMART PCB version 7.04.xx

PARAMETER			PK HEATER	DESCRIPTION
Limit NTC1 control (with D0=5 or 7)				
SEL	(2)	-	1	Modulation probe 1=NTC probe1; 3=NTC3 probe
S1	(2)	-	1	NTC1 probe enabling: 0=disabled; 1=enabled
ST1	(1)	°C	55	NTC1 setpoint: -10÷140
SP1	(2)	°C	5	SP1 hysteresis: 0÷10
XD1	(3)	%	5	Proportional band from 4 to 100
TN1	(3)	sec	100	Integral coefficient: 1÷255
AC1	(3)	-	1	0=only modulation; 1= modulation and ON/OFF
TH1	(2)	°C	65	Upper Temperature limit for fault F51 activation: 10÷95 autoreset if NTC1<TH1-15°C
S3	(2)	-	0	NTC3 probe enabling: 0=disabled; 1=enabled
TH3	(2)	°C	90	Upper temperature limit for F53 fault activation (auto-reset if NTC3<TH3): 0÷140
Control 0/10 Vdc - D0=5				
H51	(1)	-	0	Active only with D0=5 (0/10V) 0=modulation only; 1=modulation and ON/OFF
H52	(1)	V	0.5	OFF voltage, burner switching off if H51=1: 0÷10 1st. Module = 0.5; 2nd. Module = 1.5; 3rd. Module = 2.5; 4th. Module = 3.5.
H53	(1)	V	0.5	Voltage Delta with burner ignition ON 1st. Module = 0.5; 2nd. Module = 1.0; 3rd. Module = 1.5; 4th. Module = 1.5.
H54	(3)	sec	5	Lower input dwell time: 0÷255
H55	(3)	sec	5	Upper input dwell time: 0÷255
Fan and damper output control				
H11	(2)	-	2 TENSOSTATIC 4 PRESSOSTATIC	0=output disabled; 1=analogue output Y1 enabled (PWM); 2=analogue output Y2 enabled (0÷10Vdc); 3=outputs Y1 (PWM) and Y2 (0÷10Vdc) enabled; 4=outputs Y1 (PWM) and Y2 (0÷10Vdc) enabled for pressostatic structures; 5=analogue output Y2 (0÷10Vdc) enabled for operating mode d1=10/12; 6=outputs Y1 (PWM) and Y2 (0÷10Vdc) enabled for boiler summer ventilation with EC fan heater
H12	(1)	V	2	Y2 output minimum voltage: 0÷10
H13	(1)	V	10	Y2 output maximum voltage: 0÷10
H14	(3)	%	0	PWM minimum value: 0÷100
H15	(3)	%	100	PWM maximum value: 0÷100
H16	(3)	-	2 TENSOSTATIC 4 PRESSOSTATIC	0, 1=not used; 2=blower modulation proportional to FAN (do not change); 3=blower modulation proportional to B1 input (0-10V); 4 proportional to B2 input for pressure check in pressostatic structures; 5= proportional NTC1 for checking Queen/Fan heaters (only output Y2)
H17	(3)	-	2 TENSOSTATIC 0 PRESSOSTATIC	0=PWM (Y1) or 0/10V (Y2) output according to "direct" logic; 1=PWM (Y1) or 0/10V (Y2) output according to "reverse" logic; 2= PWM (Y1) "reverse" and 0/10V (Y2) "direct" output; 3= PWM (Y1) "direct" and 0/10V (Y2) "reverse" output
H18	(1)	-	8	Y2 output fixed voltage
H19	(3)	-	32	Reading of NTC1 to which the minimum value of Y2 output corresponds - NOT USED
H20	(3)	-	65	Reading of NTC1 to which the maximum value of Y2 output corresponds - NOT USED

NTC2 control - NOT USED				
S2	(2)	-	0	0=NTC2 disabled; 1=NTC2 enabled; 2=blower output activation for compartment heating function (only with d1=5)
ST2	(1)	°C	5	NTC2 setpoint: -10÷90
P2	(2)	°C	2	ST2 hysteresis: 0÷40
XD2	(3)	-	40	Neutral area, proportional modulation band divided by 100: 4 ÷100
TN2	(3)	sec	5	Integration time: 1÷255
ANTIFREEZE control - active with D8=1 - NOT USED				
STA	(3)	°C	2	Antifreeze setpoint: -10÷+20
PA	(3)	°C	1	Antifreeze setpoint hysteresis: 0÷10
FLUE GAS TEMPERATURE control - active with D5=1 - NOT USED				
H41	(2)	°C	5	Flue gas temperature (NTC3); neutral band from 1÷50
H42	(3)	sec	10	Run time for flue gas control cycle (15=30 seconds): 0÷255
H43	(1)	°C	100	Flue gas temperature at maximum capacity (Tmax with PT%=100): 0÷140
H44	(1)	°C	75	Flue gas temperature at medium capacity (Tmed with PT%=50): 0÷140
H45	(1)	°C	50	Flue gas temperature at minimum capacity (Tmin with PT%=0): 0÷140
H46	(3)	-	0	Flue gas temperature operation: 0=modulation only - 1=burner OFF
PRESSURE control - FILTERS				
S5	(2)	-	0 TENSOSTATIC 5 PRESSOSTATIC	Pressure probe B2 output enabling: 0=disabled; 1=enabled as ON/OFF input; 2=enabled as analogue input without F83 fault auto-reset; 3=enabled as analogue input with F83 fault auto-reset; 4=enabled as air pressure control analogue input without F80 auto-reset; 5=enabled as air pressure control analogue input with F80 fault auto-reset; 6=enabled read only (no Fault) for pressure control via Modbus
ST5	(1)	mbar	1.2	B2 setpoint: 0÷9.99 (setpoint sent by the Smart Web)
P5	(2)	mbar	0.5	ST5 hysteresis: 0÷9.99
XA5	(3)	V	0.5	B2 pressure probe signal input minimum voltage: 0÷9.99
XB5	(3)	V	4.5	B2 pressure probe signal input maximum voltage: 0÷9.99
YA5	(3)	bar	0	Pressure matching the B2 probe input minimum voltage
YB5	(3)	bar	9.99	Pressure matching the B2 probe input maximum voltage
TH5	(3)	V	9.99	Upper pressure limit for fault F82 activation: 0÷9.99

Alarm Control Thermal Protection				
S6	(2)	-	1	Flow sensor B3 output enabling: 0=disabled 1=enabled as ON/OFF input without F85 fault autoreset 2=enabled as ON/OFF input with F85 fault autoreset 3=enabled as pulsed input without F85 and F86 fault autoreset 4=enabled as pulsed input with F85 and F86 fault autoreset
ST6	(1)	From l/h	10	Flowmeter setpoint - in l/h (x10)
P6	(2)	-	5	ST6 hysteresis: - in l/h (x10)
XA6	(3)	Hz	5	B3 pressure probe signal input minimum frequency: 0÷999
XB6	(3)	Hz	14	B3 pressure probe signal input maximum frequency: 0÷999
YA6	(3)	l/h	229	Flow rate matching the B3 probe inlet minimum frequency
YB6	(3)	l/h	29	Flow rate matching the B3 probe inlet maximum frequency
TR6	(3)	sec	2	Fault F85/F86 indication time delay (1=1second): 0÷250. During the ignition stage, the b15 value is used.
PRESSURE control - PID parameters for ventilation of Pressostatic structures				
kp	(3)	%	50	Proportional Gain
ki	(3)	%	20	Integral Gain
kd	(3)	%	15	Derivative Gain
li	(3)	%	60	Maximum limit of integral part

6.4. 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.

FAULT	DESCRIPTION	CAUSE	UNLOCK
Lockouts caused by temperature (safety lockouts)			
F21	Input ID1 open	• Fire damper activation	Manual reset
F35	Input ID5 open	• Burner alarm	Auto-reset
F38	Input ID6 open	• STB alarm	Auto-reset, with thermostat manual reset
NTC probes broken or missing			
F41	Probe NTC1 error, air intake temperature	No signal from probe or broken probe	Auto-reset
Over-temperature			
F51	The temperature of the air intake probe NTC1>TH1 (NOT used)	• Check the TH1 parameter - air intake set point. • Cooling fan(s) inoperative • Air flow rate insufficient	Auto-reset when NTC1< TH1-15
Check ModBus communication			
F60	Communication error between CPU-SMART PCB and Modbus network, Smart Web	• ModBus network is disconnected. • The address of the PCB is wrong and/or not configured in the ModBus network.	Auto resolve
Voltage presence control			
F75	No voltage during operation cycle (excluding stand-by); the fault is not visible on remote control but only counted.	• No voltage during operation	Auto resolve
Air presence and flow control			
F80	Pressure gauge error	• Pressure gauge at fault or not connected • Input signal at B2 is < 0.2 Vdc	Auto-reset
F81	Pressure less than B2 setpoint	• Input signal at B2 is < ST5 setpoint	Auto resolve
F82	Higher pressure at B2 setpoint	• Input signal at B2 is < ST5 setpoint + TH5	Auto resolve
F85	Input B3 open	• Thermal protection or inverter protection triggering	Manual reset
Parameter configuration error			
F99	CPU parameter programming error	• S1=0 with SEL=1 and D0=2 • S3=0 with SEL=3 and D0=2 • D2≠0 and D9=1 • D10=1 with D8=1	Auto resolve
Internal malfunction of CPU-SMART PCB			
F00	Internal malfunction of CPU-SMART PCB	• One or more parameters of the CPU PCB have a value outside of the expected range.	Perform a manual reset of the PCB by interrupting the power supply
CPU	CPU-SMART PCB communication error	• RJ12 cable disconnected or faulty	Auto resolve
...	CPU-SMART PCB communication error	• RJ12 cable disconnected or faulty	Auto resolve

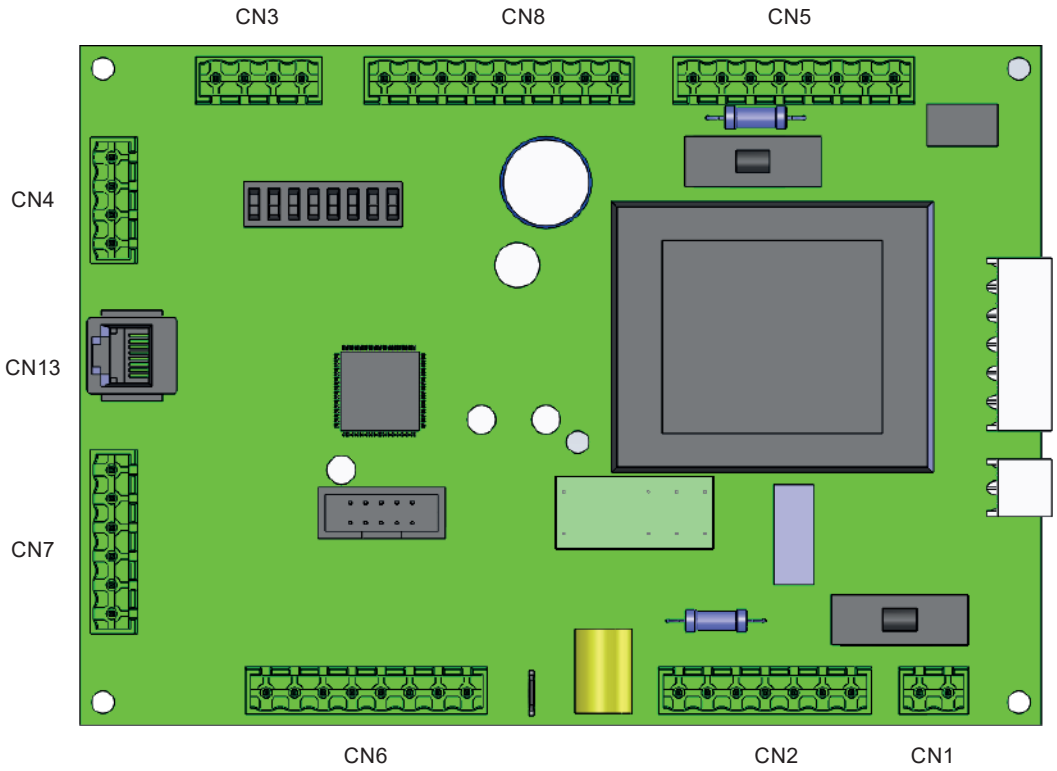
6.5. Electrical Wiring and Diagrams

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

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

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

Connector	Function
CN1	Power supply input
CN2	Connector reserved for connection of fire damper(s) and control of fan motor(s)
CN3	Connector reserved for the burner PWM connection
CN4	Connector reserved for SMART EASY/WEB connection
CN5	Connector reserved for burner control connection
CN6	Connector reserved for inverter alarm, pressure probe and filter probe connection
CN7	Connector reserved for air intake probe connection
CN8	Connector reserved for burner alarm and STB triggering
CN13	RJ12 connector reserved for multifunction LCD panel connection

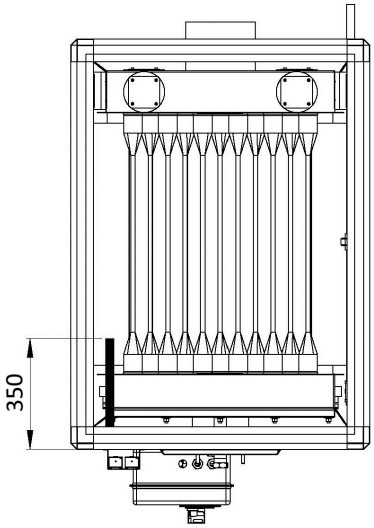


STB THERMOSTAT CONNECTION

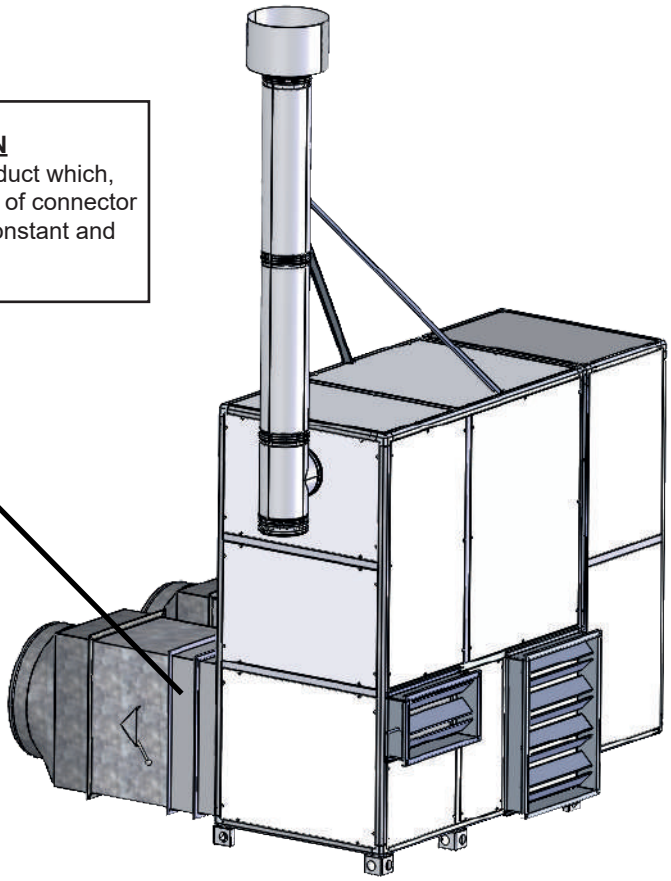
All PK series heaters (N, K and R) are certified and feature the STB thermostat.
- STB: The STB (or Limit) thermostat, (safety thermostat with manual reset) stops the burner if the exchanger reaches an excessive temperature. If STB thermostat triggers, it has to be manually reset following procedures 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 ID6 on the modulation board, alarm F38 is displayed on the LCD.

THERMOSTAT POSITION

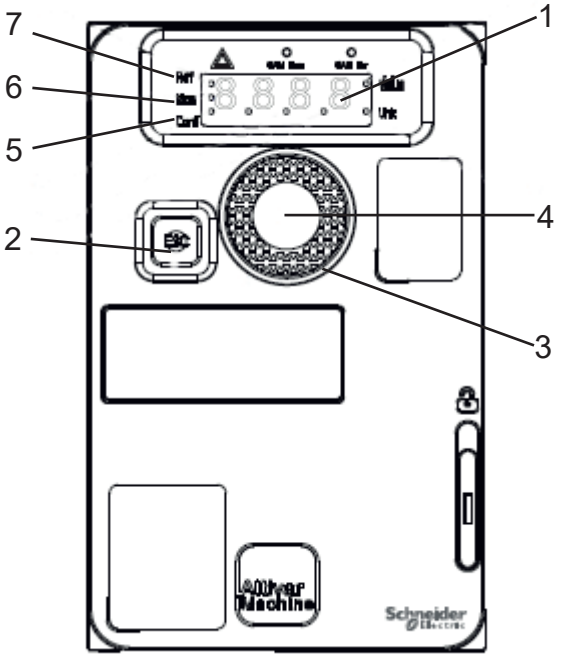
THERMOSTAT POSITIONING
The STB thermostat has a specific position, in case of replacement reposition the thermostat using the same holes as the replaced thermostat.



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



6.6. SCHNEIDER INVERTER PARAMETER CONFIGURATION



	Element	Specifications
1	Display	4 x 7 segment display
2	ESC key	It allows the user to exit a menu or a parameter or to delete the value displayed and return to the stored value
3	Rotary switch	It is used to scroll through the items if turned clockwise or counter-clockwise
4	ENTER key	If pressed is used to select or confirm an information [ENTER]
5	CONF LED	ON if [CONF-] menus are enabled
6	MON LED	ON if [MON-] menu is enabled
7	REF LED	ON if [REF-] menu is enabled

Analogue signal 0-10V

The PKE-SPORT heater inverter modulates speed through an analogue signal 0-10Vdc received from CPU-PLUS modulation board.

For this type of operation, no parameters need to be changed.
If necessary, change speed adjustment parameters, see the table:

LSP and HSP parameters define the inverter operating range.
LSP and HSP values cannot exceed the limits of 22 and 55 Hz, respectively.

Menu	Parameter	Description	Values
drC	tFr	Maximum motor frequency	60
SEt	LSP	Minimum operation frequency	30
SEt	HSP	Maximum operation frequency	50

INVERTER PARAMETERS

Menu	Parameter	Description	Value
CONF/FCS	GFS	Inverter reset	GFS (press enter for 2 s)
CONF/FULL	LAC	Makes all parameters visible	ADU (press enter for 3 s)

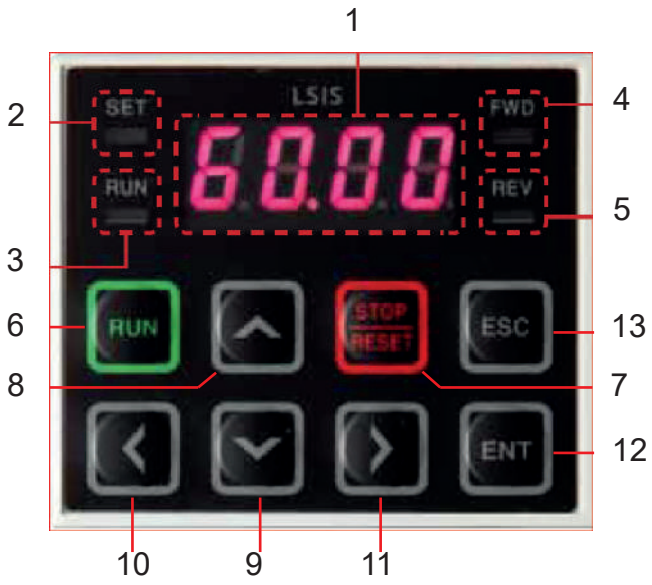
Menu	Parameter	Description	Values
CONF/FULL/SIM	UnS	Motor voltage value	400 (*default*)
CONF/FULL/SIM	nCr	Motor current value	[ref table]
SEt	ItH	Thermal protection tripping current	[ref table]
SEt	SFr	Switching frequency	16
SEt	LSP	Minimum frequency	30
SEt	HSP	Maximum frequency	50 (*default*)
SEt	ACC	Acceleration time (seconds) between 0 and HSP	25
SEt	DEC	Deceleration time (seconds) between HSP and 0	25
SEt	CLI	Current limitation value	[ref table]
FLt	Atr / Atr	Automatic motor restart (autoreset) after Fault	Yes
FLt	Atr / TAr	[only with Atr=Yes] autoreset time	5 min (*default*)
drC	tFr	Maximum motor frequency	60 (*default*)
drC	bFr	Reference frequency	50 (*default*)
I-O	tCC	2-wire control setting	2C (*default*)
I-O	tCt	Restart setting with power supply reactivation	LEL
I-O	R2 / R2	R2 relay assignment	Flt
I-O	A01 / A0It	Analogue output type	10U
I-O	A01 / A01	Signal output with reference to the frequency	OFr
I-O	BSP	Start/stop threshold activation	BNSO
I-O	BSP	for PKExxx-PG models	BSD
I-O	AI1 / U1L1	Start/stop threshold value setting	1.5V
CtL	Fr1	Reference channel	AI1 (*default*)
CtL	CHCF	Control profile	SEP
CtL	CD1	Control 1 channel	TER (*default*)

Standard heater motor parameters

Output motore		Rated current	Thermal protection tripping current	Limit current
[kW]	*Menu*	drC	SEt	SEt
	Parameter	nCr	ItH	CLI
3.0		6.2	7.5	6.3
4.0		8.0	9.6	8.0
5.5		11.1	13.3	11.1
7.5		14.3	17.1	14.3
11.0		20.4	24.4	20.4
15.0		27.3	32.7	27.3

•

6.7. LS-S100 LG INVERTER PARAMETER CONFIGURATION



	Element	Specifications
1	Display	4 x 7 segment display
2	SET	The SET LED flashes when parameters are entered
3	RUN	The RUN LED is lit during operation; it flashes during acceleration phases.
4	FWD	the LED is lit during forward operation
5	REV	the LED is lit during reverse operation
6	RUN key	When pressed on the keyboard it allows to start the inverter
7	STOP key	When pressed on the keyboard it allows to stop the inverter; it allows for reset in the presence of a lock-out condition
8	Key UP ARROW	It allows to scroll through parameters It increases the parameter values
9	Key D O W N ARROW	It allows to scroll through parameters it decreases the parameter values
10	Key LH ARROW	used to skip from one parameter menu to another and to move the cursor to the left
11	Key RH ARROW	used to skip from one parameter menu to another and to move the cursor to the right
12	ENT key	Used to save the parameter value during the modification phase
13	ESC key	Used to exit the menu.

Inverter menus are organised as follows:

Menu	Description
DRV	inverter controls group
BAS	basic functions group
ADV	advanced functions group
CON	control functions group
INP	input functions group
OUT	output functions group
COM	serial communication functions group
APP	application functions group
PRT	protection functions group
M2	motor functions group

If necessary, change speed adjustment parameters; see table below

Menu	Parameter	Description	Values
INP	IN-09	Minimum frequency with input signal V1>0 -in % of IN-01	50
INP	IN-11	Maximum frequency with input signal V1>0 -in % of IN-01	85

Example:
IN-01 = 60 Hz
IN-09 = 50% (50% of 60) = 30 Hz, Minimum speed
IN-11 = 85% (85% of 60) = 51 Hz, Maximum speed

Motor Power	Rated current
[kW]	
3.0	6.5
4.0	8.1
5.5	10.2
7.5	14.6
9.2	17.4
11.0	20.2
15.0	27.8

Menu	Parameter	Description	Values
	Frq	Reference channel V1 - speed switch	2
	DRv	Rotation control from terminals	1
	ACC	Acceleration time (seconds)	30
	DEC	Deceleration time (seconds)	30
DR	DR-14	Motor power - enter line number of table below in Kw	ref. table
	DR-18	Motor rated frequency in Hz	50
	DR-20	Maximum motor frequency	60
IN	IN-01	Maximum frequency associated with the maximum V1 input voltage value	60
	IN-08	Minimum stop voltage	1.5
	IN-09	Minimum frequency with input signal V1>0 -in % of IN-01	50
	IN-11	Maximum frequency with input signal V1>0 -in % of IN-01	85
OU	OU-31	A1-B1-C1 digital output - inverter alarm	29
	OU-33	Q1-EG output Activation	13
	OU-52	NC Logic Q1-EG output	(ab) (▀▄)*
BA	BA-10	Mains frequency (0=60Hz; 1=50Hz)	1
	BA-11	Number of motor poles, usually 4	4
	BA-13	Motor rated current	ref. table
	BA-15	Motor rated voltage in Volts	400
	BA-19	Supply voltage	400
	BA-70	Acceleration time 1	10
	BA-71	Deceleration time 1	10
PR	PR-08	Restart upon Alarm reset: 0-disabled, 1 enabled	1
	PR-09	Number of automatic restart attempts in case of fault	4
	PR-10	Waiting time for autoreset, in seconds	10
	PR-12	Action to be performed when analogue reference is lost	2 (Dec)
	PR-13	Analogue reference loss time	1
	PR-15	Input voltage reference loss	1 (below x1)
	PR-20	Action to be performed when an overload alarm occurs	2 (Dec)
	PR-21	Overload alarm level (%)	180
	PR-22	Overload alarm delay (sec)	60
	PR-50	Stall prevention activation (thermal protection)	(bbbab)(▄▄▀▄) *
	PR-51	Stall activation frequency 1 -Hz	50
	PR-52	Stall prevention level 1 (30-250%)	110
AD	AD-10	Start selection at start-up (0=disabled, 1=enabled)	1
	AD-24	Frequency limitation activation: (0=disabled, 1=enabled)	1
	AD-25	Low limit frequency Hz	30
	AD-26	High limit frequency Hz	60
	AD-60	Frequency limit for acceleration/deceleration changes	30
CN	CN-04	Carrier frequency in kH	10
	CN-71	Restart after voltage drop	(babb) (▄▀▄▄)*

* a=dash
b=underscore

6.8. Burner Matching

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

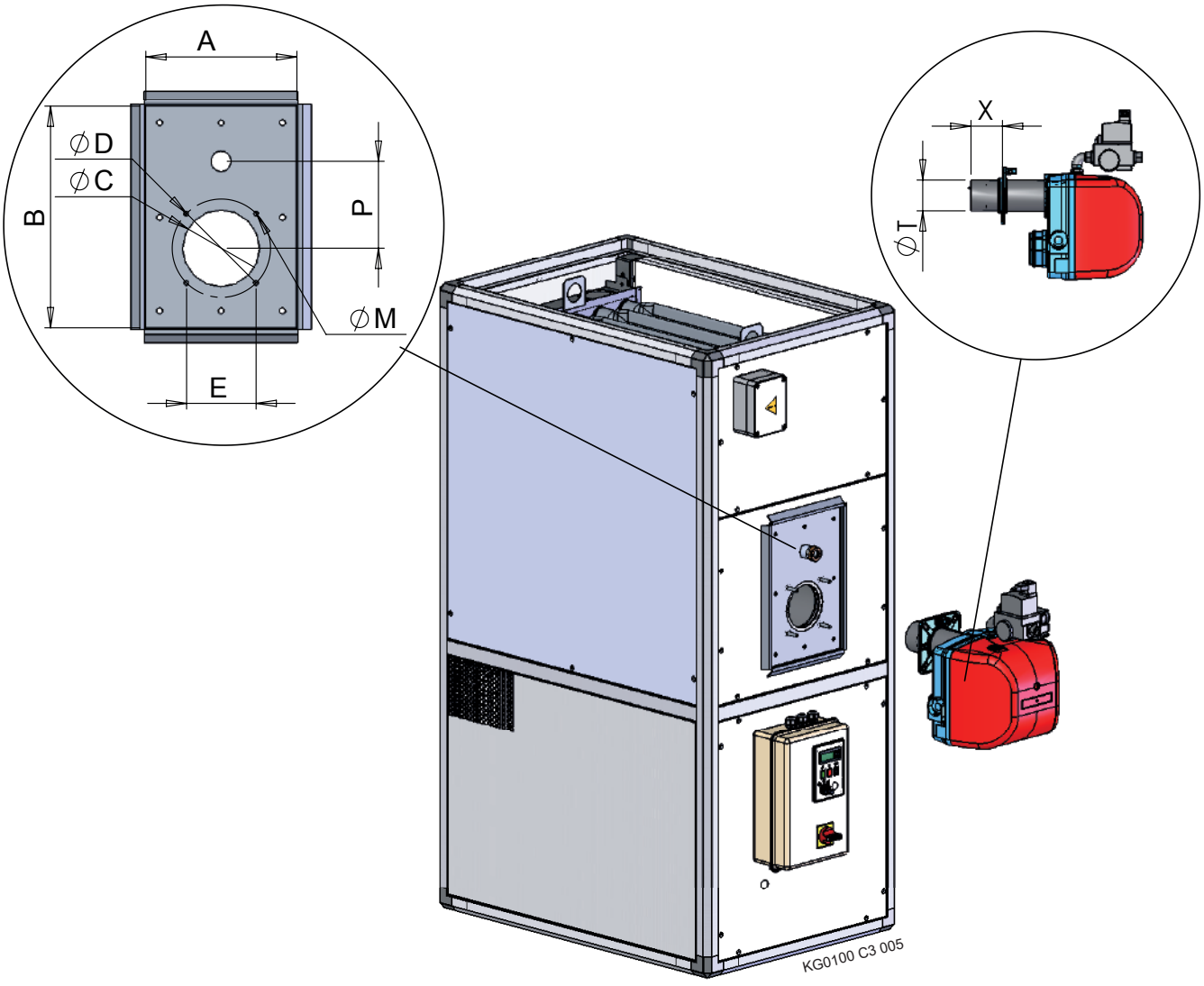
Important. Nosepiece length must be greater than "X" min value. Shorter nosepieces could damage the exchanger and void the guarantee.

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)	[Nm³/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)	[Nm³/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)	[Nm³/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

* Refer to Para. 7 Combustion control

6.10. Burner matching tables

Burner matching has been performed according to the following criteria:
• burner 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 prEN 17082:2017 that implements the ERP regulation 2017-C229/ UE.

The tables are shown in the "Attachment to the user installation manual" code KG0270.00 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

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.
Verify motor's absorption with a suitable amperometric analyser.
The motor absorption table contains the absorption values.
An absorption rate lower (<15%) than max value means that air flow rate is lower than rated. Restore air flow rate by eliminating any drops in 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
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.
CO_2 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 APEN machine burner matching
During first start up, the following checks are recommended:
If combustion efficiency is known and CO_2 content is similar to that mentioned in the tables, the diagrams can be used reading the useful heat output "regulated" by the heater 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 F38 on the LCD screen of the control panel and the SMART WEB screen.

Fire Damper

If fire dampers are installed, you need to check that the damper closure actually stops the burner. Damper triggering is signalled by Fault F21 on the LCD screen and on the SMART WEB screen.

Room Thermostat

Make sure that room thermostat and/or the timer turn off ONLY the burner, not the cooling fan. The fan stops after a time preset by the modulation board.

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.

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 gas 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.

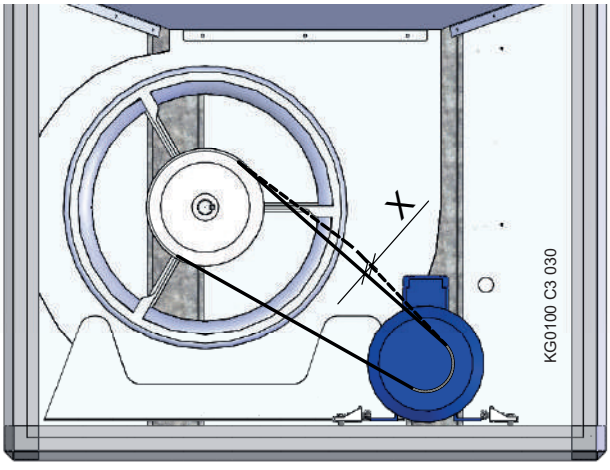
To check correct belt tensioning, verify that in the central area between the two pulleys, belt oscillation does not exceed 20÷30mm.

To tension belts and align pulleys, adjust the screw on the motor slide. Turn clockwise to tighten and counter-clockwise to loose.

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 of burner combustion values

Check at least once a year burner combustion values.

Parameters to check are CO_2 value, 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 gas 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 gas 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.

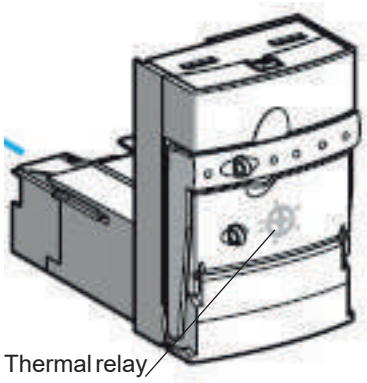
7.3 Spare Part List

Parts for the control panel

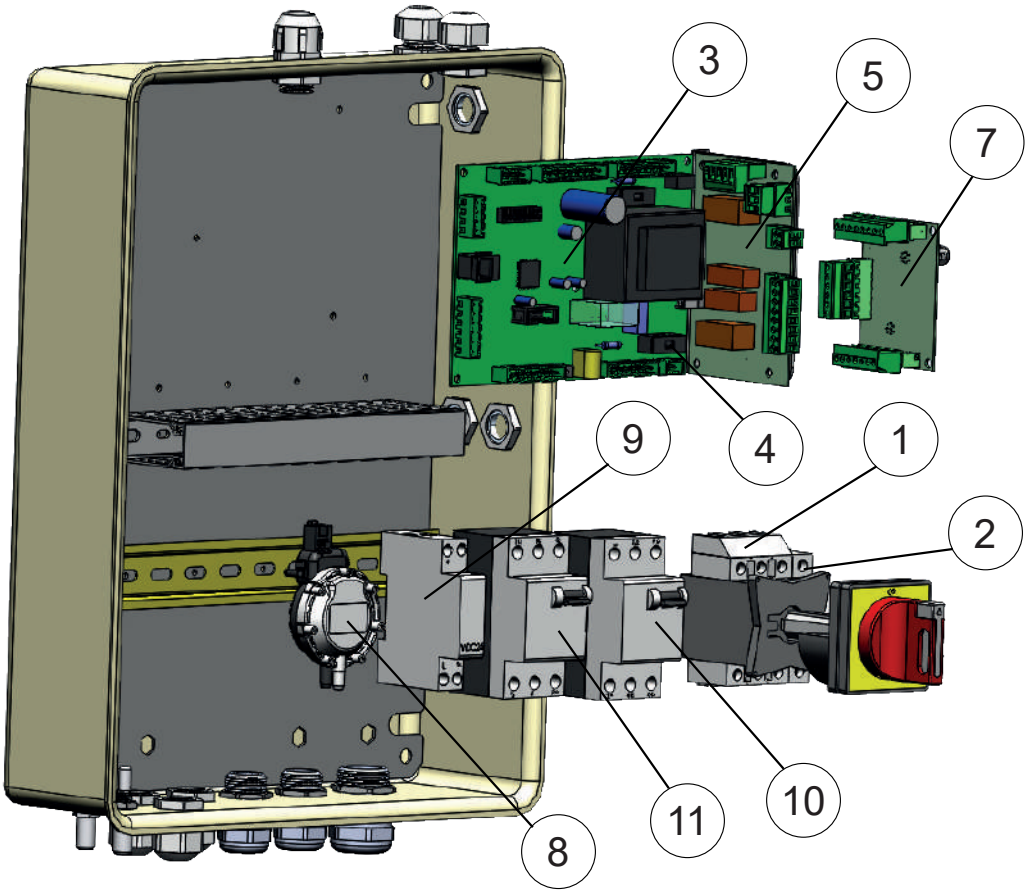
TABLE OF CONTROL PANEL COMPONENTS

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	Disconnector Neutral	G10074	20/40A	Models 3, 7.5 kW
		G10075	63/80A	Models 11, 15 kW
3	Modulation Board	G18600.04		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	1,450	G02217	3-12A
G00137-IE3	4.0	8.0	1,450		
G01261-IE3	5.5	10.6	1,460		
G01022-IE3	7.5	14.1	1,460	G02218	4.5-18A
G07371-IE3	9.2	17.1	1,460	G02219	8-32A
G00837-IE3	11.0	20.4	1,465		
G01973-IE3	15.0	27.3	1,465		



CONTROL PANEL
START UP
WITH INVERTER



CONTROL PANEL
START UP
WITHOUT INVERTER

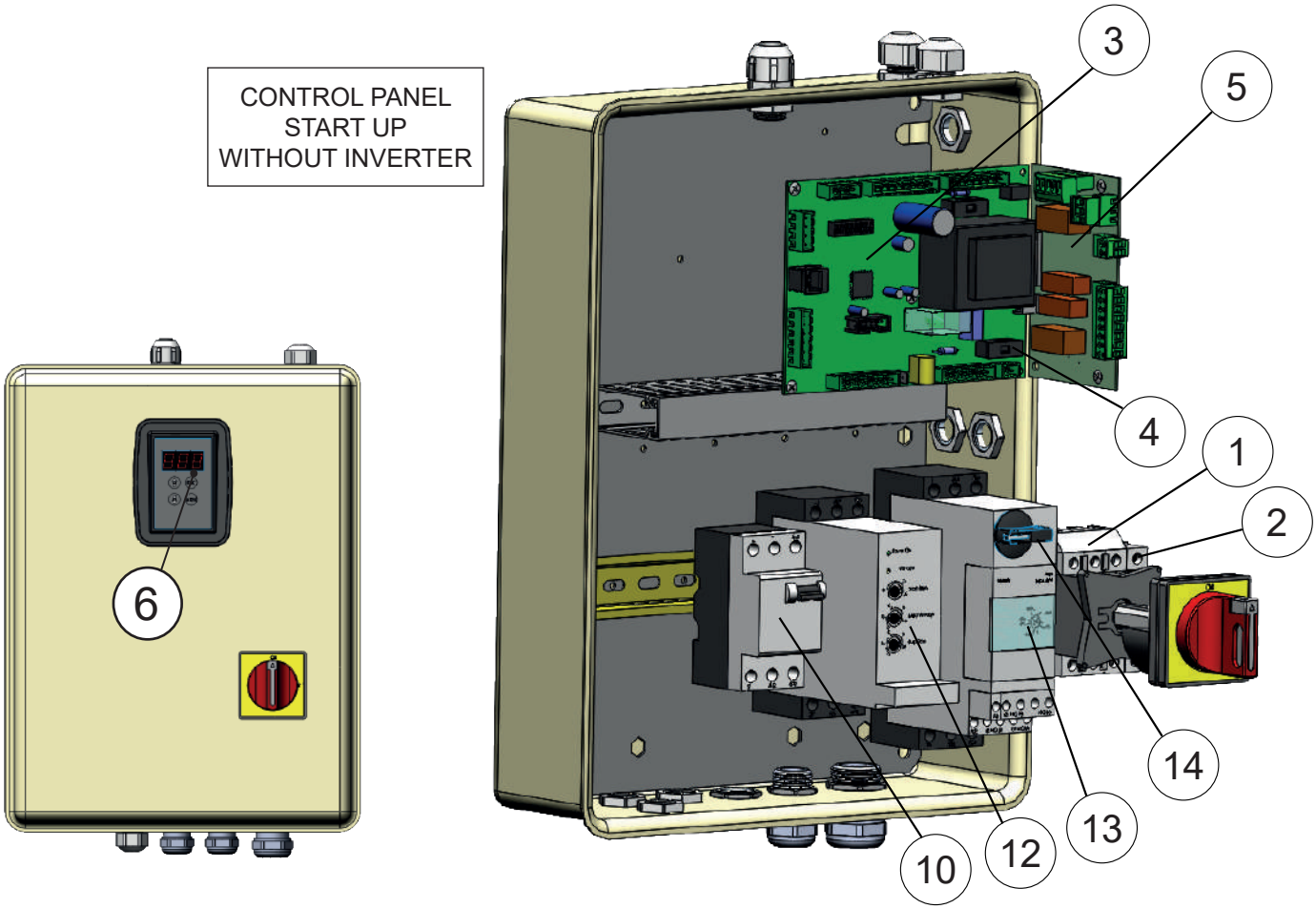
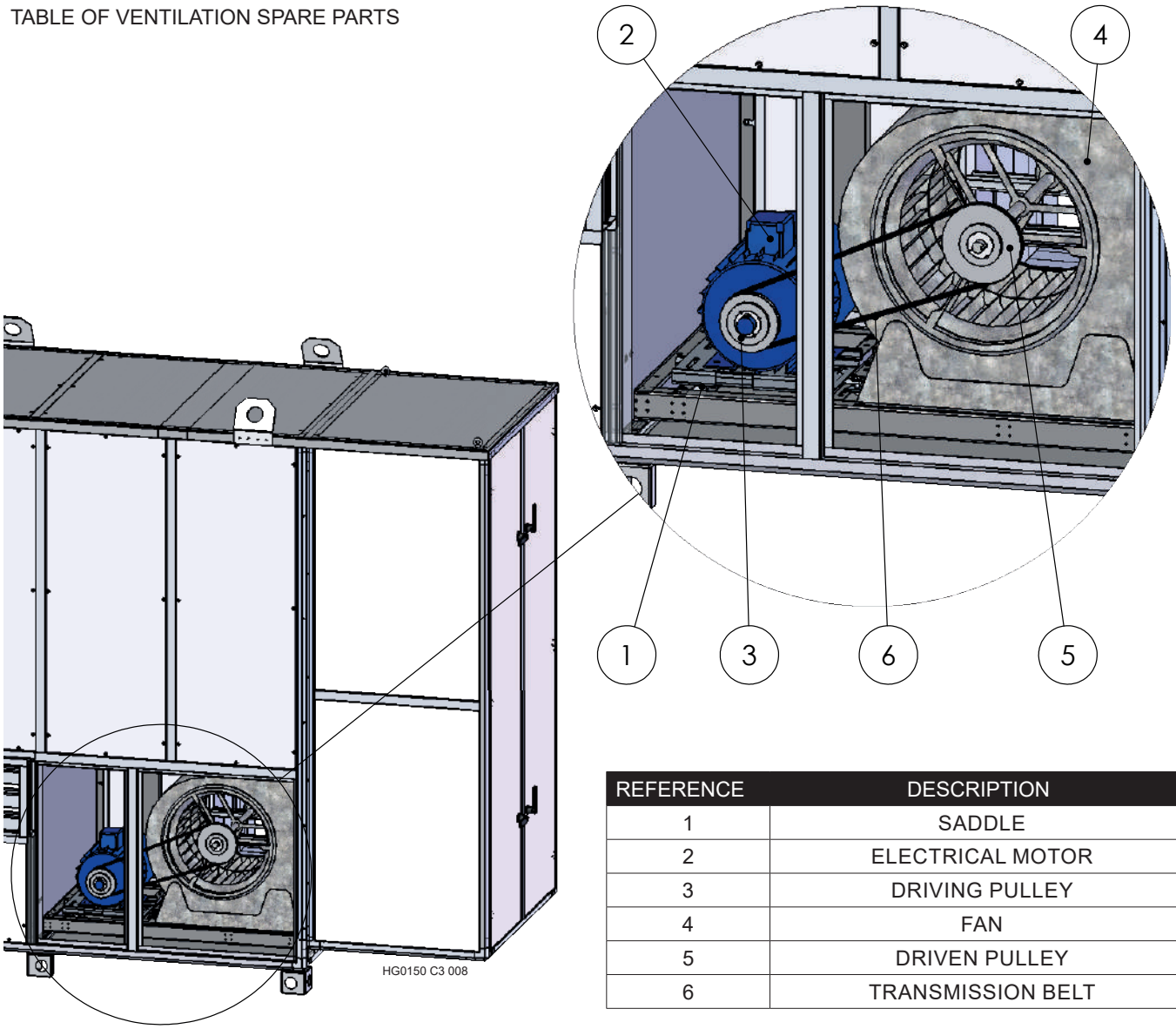


TABLE OF VENTILATION SPARE PARTS



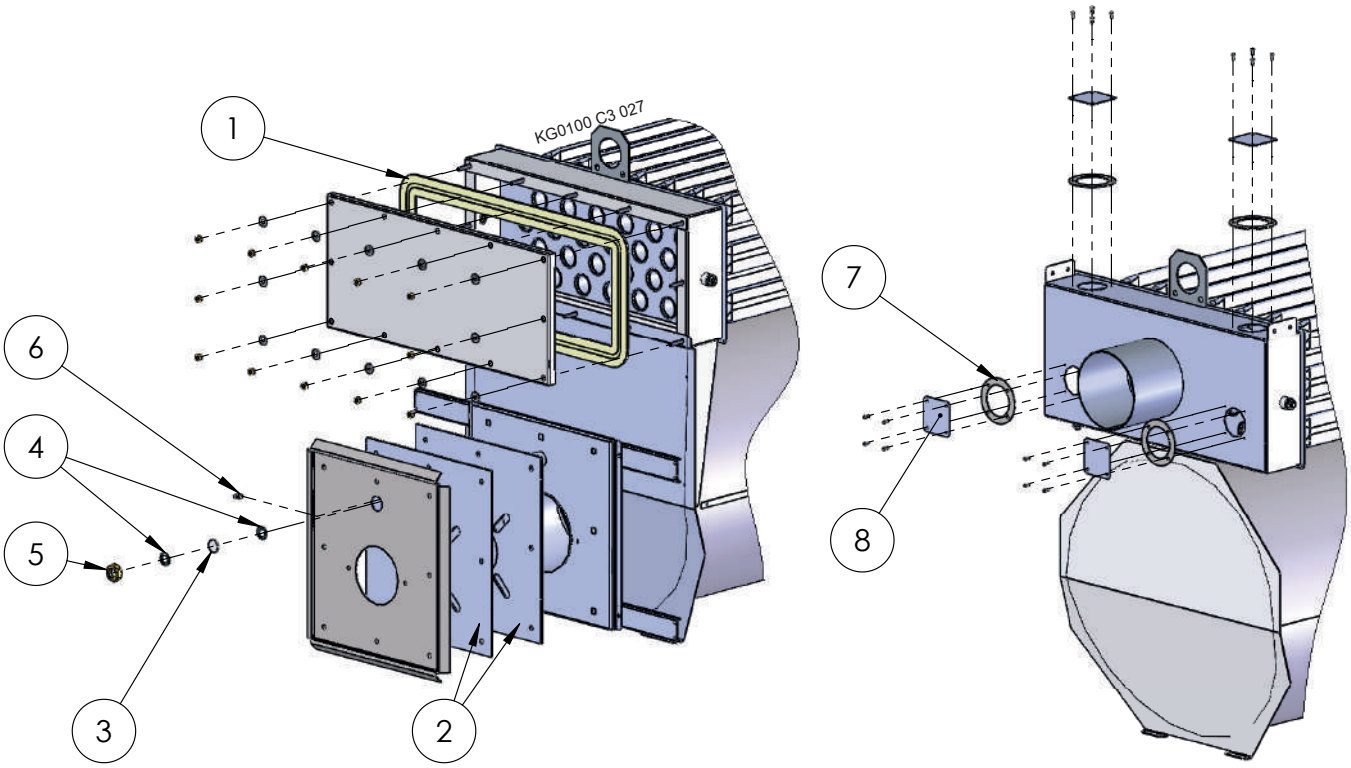
REFERENCE	DESCRIPTION
1	SADDLE
2	ELECTRICAL MOTOR
3	DRIVING PULLEY
4	FAN
5	DRIVEN PULLEY
6	TRANSMISSION BELT

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	

EXCHANGER SPARE PARTS

POS.	Description	Code	Use
1	Flue system gasket	X01415	Any heaters, any models; in metres
2	Burner plate gasket*	G01190	Model 100
		G07819	From model 140 to model 190 included
	*NOTE: To be cut according to the burner head diameter	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

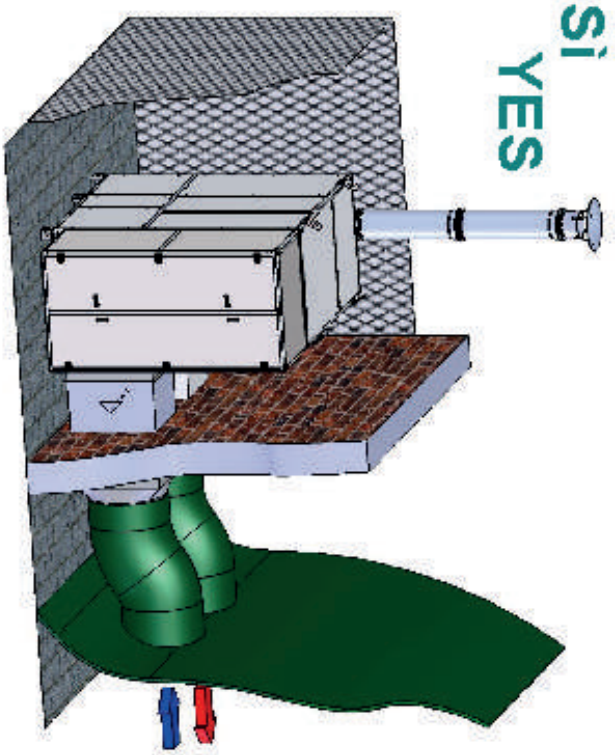


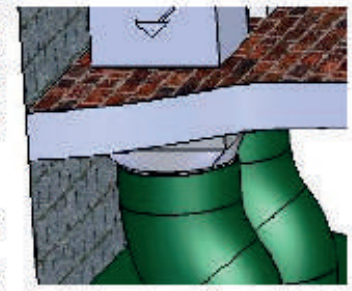
THERMOSTAT SPARE PARTS

POS.	Description	Code	Use
1	STB safety thermostat	G12450	All heater models
2	NTC probe	G16401	All heater models

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

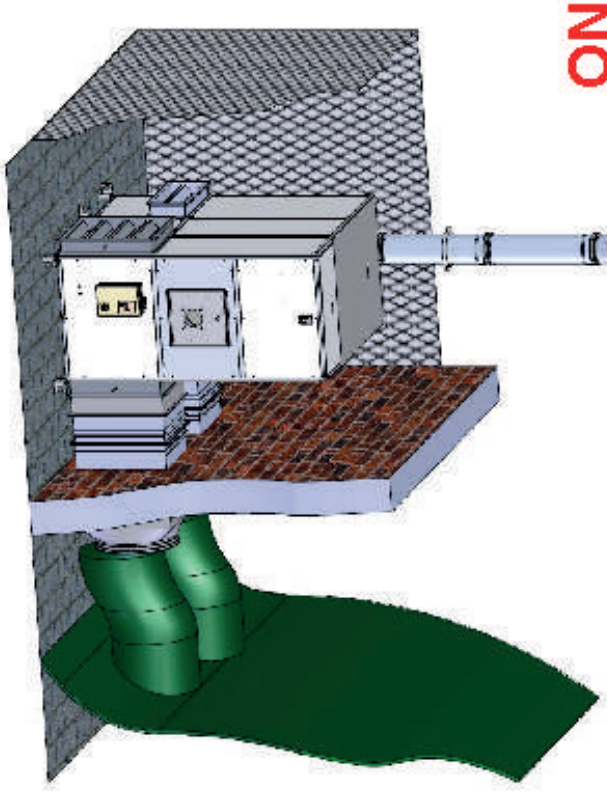
SÌ
YES

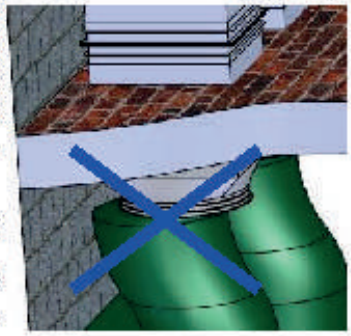




DETTAGLIO: Le maniche di collegamento devono essere di misura idonea e opportunamente tese
DETAIL: The connection sleeves have to be correctly measured and stretched

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.

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

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