

GB

*Operating, Installation and Maintenance Manual
PRH Warm Air Heater Module 2 stages*



CE

Dichiarazione di Conformità Declaration of Conformity

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

Model: Modulo generatore bistadio PRH
Model: PRH 2 stages heater module

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

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

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

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

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

Qualora la macchina dovesse essere integrata in un impianto (macchine combinate), il costruttore vieta la messa in servizio della stessa se prima, l'impianto di cui farà parte non verrà dichiarato conforme alle sopracitate disposizioni (Allegato IIB della Direttiva Macchine).

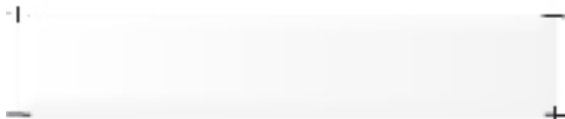
If the unit is to be installed into a system (combined), the manufacturer disclaims any responsibility if this equipment is not previously declared compliant with the requirements specified in IIB Enclosure of the above said Machinery Directive.

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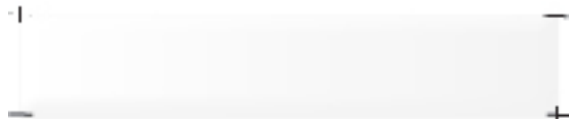
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Mariagiovanna Ripamonti

CODE



SERIAL NUMBER



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1. GENERAL CAUTIONS

This manual is an integral part of the product and must always accompany it.

Should the equipment be sold or passed on to someone else, always make sure that this manual is supplied with the equipment for future reference by the new owner and/or installer.

THE manufacturer shall not be held civilly or criminally responsible for injuries to people or animals or damages to things caused by incorrect installation, calibration and maintenance and by failure to follow the instructions contained in this manual and by operations carried out by unqualified staff.

This product must be used only for the applications it was designed for. Any other wrong or unreasonable use must be regarded as improper and therefore hazardous.

During the installation, operation and maintenance of the equipment described in this manual, the user must always strictly follow the instructions given in all the chapters of this operating and maintenance manual.

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

When first switched on, conversion between different types of gas and maintenance operations must be carried out only by staff provided by **Service Centres authorised by current and older regulations**.

APEN GROUP has a large network of authorised service centres. For more information, visit our Web site www.apengroup.com or contact the manufacturer directly.

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

The manufacturer declares that the equipment has been manufactured in compliance with UNI, UNI-CIG, CEI technical standards and with all relevant legislation, as well as with the 90/396/EEC Directive and the later 2009/142/EC Directive.

2. SAFETY INSTRUCTIONS

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

2.1. Fuel

Before starting up the heater, make sure that:

- the gas mains supply data is compatible with the data stated on the nameplate;
- the combustion air intake ducts (when fitted) and the fume exhaust pipes are those specified by the manufacturer;
- the combustion air is supplied in such a way as to avoid even partial obstructions of the intake grille (caused by leaves etc.);
- the fuel intake internal and external seal is checked during the testing stage, as required by applicable standards;
- the heater is supplied with the same type of fuel it has been designed for;
- the system is correctly sized for such flow rate and is fitted with all safety and monitoring devices required by applicable standards;
- the inside of the gas pipes and air distribution ducts for ducted heaters has been thoroughly cleaned;
- the fuel flow rate is suitable for the power required by the heater;
- the fuel supply pressure is between the range specified on the nameplate.

2.2. Gas Leaks

If you smell gas:

- do not operate electrical switches, telephones or any other object or device that could produce sparks;
- immediately open doors and windows to create an air flow to vent the gas out of the room;
- close the gas valves;
- call for **qualified staff**.

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

2.3. Power supply

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

Cautions.

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

Do not pull electric cables and keep them away from heat sources.

NOTE: It is compulsory to install, upstream of the power cable, a fused multi-pole switch with contact opening wider than 3mm.

The switch must be visible, accessible and less than 3m away from the control board.

All electrical operations (installation and maintenance) must be carried out by qualified staff.

2.4. Use

Do not allow children or inexperienced people to use any electrically powered equipment.

The following instructions must be followed:

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

2.5. Maintenance Operations

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

Before carrying out any cleaning and maintenance operations, isolate the heater from the mains power supply from the switch located on the electrical system and/or on the shut-out devices. If the heater is faulty and/or incorrectly operating, switch it off and do not attempt to repair it yourself, but contact our local Technical Service Centre.

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

If the equipment is not used for long periods, shut the gas supply off through the gas stopcock and disconnect it from the power supply.

If the heater is to be put out of service, in addition to the above operations, potential sources of hazard on the unit must be removed.

It is strictly forbidden to obstruct the Venturi pipe inlet, located on the burner-fan unit, with your hands or with any other objects. Any obstruction could cause a backfire from the premixed burner.

2.6. Transport and Handling

The heater is delivered fastened to a pallet and covered with a suitably secured cardboard box.

Unload the heater from the truck and move it to the site of installation by using means of transport suitable for the shape of the load and for the weight.

If the unit is stored at the customer's premises, make sure a

suitable place is selected, sheltered from rain and from excessive

humidity, for the shortest possible time.

Any lifting and transport operations must be carried out by

skilled staff, adequately trained and knowledgeable on the working procedures and safety regulations.

Once the equipment is moved to the correct position, the unpacking operation can be started.

The unpacking operation must be carried out by using suitable tools or safety devices where required.

Recovered packaging materials must be separated and disposed of

according to applicable regulations in the country of use.

While unpacking the unit, check that the unit and all its parts have not been damaged during transport and match the order. If damages have occurred or parts are found to be missing, immediately contact the supplier.

The manufacturer is not liable for any damages occurred

during transport, handling or unloading.

2.7. Dismantling and Scrapping

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

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

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

3. TECHNICAL DATA

There are 3 configurations of PRH, listed below:

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

A - PRH single modules (A System)

The range consists of a single heat exchanger; the range includes seven models, which are: PRH 015, 024, 034, 042, 052, 072 and 102. The heat output ranges between 12.1 and 92.3 kW.

The modules can be horizontally or vertically installed, according to the air flow direction, regardless of the position of the heater.

Model:		PRH015		PRH024		PRH034		PRH042		PRH052		PRH072		PRH102	
Type of equipment		B23P - B53P - C13 - C43 - C53 - C63 - C83													
EC certification	PIN.	0476CQ0451													
NOx Class	Val	5													
		Heater Performance													
		min	max	min	max	min	max	min	max	min	max	min	max	min	max
Thermal output (Hi)	kW	13.0	16.5	21.8	27.0	27.5	34.8	35.5	44.0	42.4	52.2	60	73.5	81.8	100.0
Useful heat output	kW	12.1	15.0	20.4	24.6	25.8	31.9	33.1	40.2	39.6	47.9	56.2	67.5	76.8	92.3
Efficiency (net C.V.)	%	93.2	90.7	93.7	91.2	93.7	91.8	93.2	91.3	93.2	91.3	93.7	91.8	93.9	92.3
Efficiency (Gross C.V.)	%	83.8	81.6	84.3	81.2	84.3	82.6	83.8	82.2	84.7	83.0	84.3	82.6	84.5	83.1
Flue losses with burner on (Hi)	%	6.8	9.3	6.3	8.8	6.3	8.2	6.8	8.7	6.6	8.2	6.3	8.2	6.1	7.7
Flue losses with burner off (Hi)	%	<0.1		<0.1		<0.1		<0.1		<0.1		<0.1		<0.1	
Losses in enclosure ⁽¹⁾		0%		0%		0%		0%		0%		0%		0%	
		Flue gas emissions													
Carbon monoxide - CO - (0% of O ₂) ⁽²⁾	ppm	<5		<5		<5		<5		<5		<5		<5	
Nitrogen oxides- NOx - (0% of O ₂) ⁽³⁾		44 mg/kWh - 25 ppm		34 mg/kWh - 19 ppm		30 mg/kWh - 17 ppm		44 mg/kWh - 25 ppm		44 mg/kWh - 25 ppm		45 mg/kWh - 26 ppm		49 mg/kWh - 28 ppm	
Available pressure at flue	Pa	80		100		120		120		130		140		140	
		Flue gas temperature, CO ₂ content and maximum flue gas flow rate: see gas tables on page 51 and on the following pages													
		Electrical Data													
Power supply	V	230 Vac - 50 Hz single-phase													
Power input	W	37	63	33	58	45	74	37	71	56	101	61	112	80	121
Power input in stand-by	W	<5													
Ingress Protection Rating	IP	IP X5D													
Operating Temperatures	°C	from -15°C to +40°C - for lower temperature, a burner housing heating kit is required													
		Connections													
Ø gas connection		UNI/ISO 228/1-G 3/4"		UNI/ISO 228/1-G 3/4"		UNI/ISO 228/1-G 3/4"		UNI/ISO 228/1-G 3/4"		UNI/ISO 228/1-G 3/4"		UNI/ISO 228/1-G 3/4"		UNI/ISO 228/1-G 3/4 "	
Intake/exhaust pipes Ø	mm	80/80		80/80		80/80		80/80		80/80		80/80		80/80	
		Air flow rate													
Minimum air flow rate ⁽⁴⁾	m³/h	1000		1600		2000		2500		3000		4200		5700	
Heat exchanger pressure drop	Pa	see diagram													
Max. applicable pressure	Pa	1200		1200		1200		1200		1200		1200		1200	
		Weight													
Net weight	kg	39		39		48		48		58		72		98	

NOTES:

(1) Enclosure losses match those of the machine housing the PRH.

(2) Value referenced to cat. H (G20)

(3) Weighted value to EN1020 ref. to class H (G20), referred to Hi (L.C.V.).

(4) The minimum air flow rate has been worked out for a Δ of 50°C, suitable for process systems or special applications. For smaller models, the air flow rates have been increases compared to the value obtained by using a Δt of 50°C to ensure that the heat exchanger is correctly cooled.

PRH Warm Air Heater Module 2 stages

B - PRH horizontally combined modules (B System)

They consist of two or more heat exchangers; the burners, gas connections and combustion-air inlets/flues are the same number as the individual module heat exchangers.

The gas and electrical connection is the same for all modules.

The range includes the two module models, PRH144 and 204, the three module models, PRH310, and the four module models PRH410.

The heat output ranges between 56.2 and 369.2 kW.

The modules can be horizontally or vertically installed, according to the air flow direction, regardless of the position of the heater .

Model:		PRH144		PRH204		PRH310		PRH410	
Type of equipment		B23P - B53P - C13 - C43 - C53 - C63 - C83							
EC certification	PIN.	0476CQ0451							
NOx Class	Val	5							
		Heater Performance							
		min	max	min	max	min	max	min	max
Thermal output (Hi)	kW	60	147.0	81.8	200.0	81.8	300.0	81.8	400.0
Useful heat output	kW	56.2	135.0	76.8	184.6	76.8	276.9	76.8	369.2
Efficiency (net C.V.)	%	93.7	91.8	93.9	92.3	93.9	92.3	93.9	92.3
Efficiency (Gross C.V.)	%	84.3	82.6	84.5	83.1	84.5	83.1	84.5	83.1
Flue losses with burner on (Hi)	%	6.3	8.2	6.1	7.7	6.1	7.7	6.1	7.7
Flue losses with burner off (Hi)	%	<0.1		<0.1		<0.1		<0.1	
Losses in enclosure ⁽¹⁾		0%		0%		0%		0%	
		Flue gas emissions							
Carbon monoxide - CO - (0% of O ₂) ⁽²⁾⁽⁵⁾	ppm	<5		<5		<5		<5	
Nitrogen oxides - NOx - (0% of O ₂) ⁽³⁾⁽⁵⁾	mg/kWh	45 mg/kWh - 26 ppm		49 mg/kWh - 28 ppm		49 mg/kWh - 28 ppm		49 mg/kWh - 28 ppm	
Available pressure at flue	Pa	140		140		140		140	
		Flue gas temperature, CO ₂ content and maximum flue gas flow rate: see gas tables on page 51 and on the following pages							
		Electrical Data							
Power supply	V	230 Vac - 50 Hz single-phase							
Power input	W	122	224	160	242	240	363	320	484
Power input in stand-by	W	<5							
Ingress Protection Rating	IP	IP X5D							
Operating Temperatures	°C	from 15°C to +40°C - for lower temperatures, a burner housing heating kit is required							
		Connections							
Ø gas connection		UNI/ISO 228/1- G 1½"		UNI/ISO 228/1- G 1½"		UNI/ISO 228/1- 1 x G 1½" E 1 x G 3/4"		UNI/ISO 228/1- 2 x G 1½"	
Intake/exhaust pipes Ø	mm	2 x 80/80		2 x 80/80		3 x 80/80		4 x 80/80	
		Air flow rate							
Minimum air flow rate ⁽⁴⁾	m³/h	8400		11400		17100		22800	
Heat exchanger pressure drop	Pa	see diagram							
Max. applicable pressure	Pa	1200		1200		1200		1200	
		Weight							
Net weight	kg	154		206		309		412	

NOTES:

(1) Enclosure losses match those of the machine housing the PRH.

(2) Value referenced to cat. H (G20)

(3) Weighted value to EN1020 ref. to class H (G20), referred to Hi (L.C.V.).

(4) The minimum air flow rate has been worked out for a Δ of 50°C, suitable for process systems or special applications. For smaller models, the air flow rates have been increased compared to the value obtained by using a Δt of 50°C to ensure that the heat exchanger is correctly cooled.

PRH Warm Air Heater Module 2 stages

C- PRH Vertically combined modules (C System)

They consist of two heat exchangers; the burners, gas connections and combustion-air inlets/flues are the same number as the individual module heat exchangers.

The gas and electrical connection is the same for all modules.

These modules have a reduced width and low pressure drops when air goes through.

The range includes two module models: PRH152 and 202.

The heat output ranges between 56.2 and 184.6 kW.

The module can only be installed only with an horizontal air direction. Heaters with vertical air flow cannot be installed.

Model:		PRH152		PRH202	
Type of equipment		B23P - B53P - C13 - C43 - C53 - C63 - C83			
EC certification	PIN.	0476CQ0451			
NOx Class	Val	5			
		Heater Performance			
		min	max	min	max
Thermal output (Hi)	kW	60	147.0	81.8	200.0
Useful heat output	kW	56.2	135.0	76.8	184.6
Efficiency (net C.V.)	%	93.7	91.8	93.9	92.3
Efficiency (Gross C.V.)	%	84.3	82.6	84.5	83.1
Flue losses with burner on (Hi)	%	6.3	8.2	6.1	7.7
Flue losses with burner off (Hi)	%	<0.1		<0.1	
Losses in enclosure ⁽¹⁾		0%		0%	
		Flue gas emissions			
Carbon monoxide - CO - (0% of O ₂) ⁽²⁾⁽⁵⁾	ppm	<5		<5	
Nitrogen oxides - NOx - (0% of O ₂) ⁽³⁾⁽⁵⁾	mg/ kWh	45 mg/kWh - 26 ppm		49 mg/kWh - 28 ppm	
Available pressure at flue	Pa	140		140	
		Flue gas temperature, CO ₂ content and maximum flue gas flow rate: see gas tables on page 51 and on the following pages			
		Electrical Data			
Power supply	V	230 Vac - 50 Hz single-phase			
Power input	W	122	224	160	242
Power input in stand-by	W	<5			
Ingress Protection Rating	IP	IP X5D			
Operating Temperatures	°C	from -15°C to +40°C - for lower temperature, a burner housing heating kit is required			
		Connections			
Ø gas connection		UNI/ISO 228/1- G 1½"		UNI/ISO 228/1- G 1½"	
Intake/exhaust pipes Ø	mm	2 x 80/80		2 x 80/80	
		Air flow rate			
Minimum air flow rate ⁽⁴⁾	m³/h	8400		11400	
Heat exchanger pressure drop	Pa	see diagram			
Max. applicable pressure	Pa	1200		1200	
		Weight			
Net weight	kg	148		200	

NOTES:

(1) Enclosure losses match those of the machine housing the PRH.

(2) Value referenced to cat. H (G20)

(3) Weighted value to EN1020 ref. to class H (G20), referred to Hi (L.C.V.).

(4) The minimum air flow rate has been worked out for a Δ of 50°C, suitable for process systems or special applications. For smaller models, the air flow rates have been increases compared to the value obtained by using a Δt of 50°C to ensure that the heat exchanger is correctly cooled.

4. OPERATING CYCLE

Burner Operation

When heating is demanded, generated by terminal contacts 34 and 35 closing, the control board (APG) will start the operating cycle.

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

After detecting the pilot flame, the equipment opens the main gas valve EV2 [C] to supply gas to the main burner.

After both the two burners (pilot and main) have operated for a

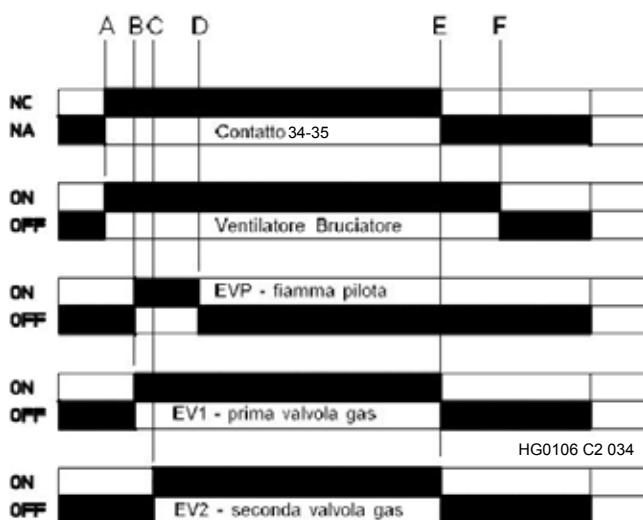
a few seconds at ignition power, the burner begins to increase its output to reach maximum output, if required, in a variable length of time programmed in the control board (APG).

During its operation, the APG control board will adjust the burner maximum output according to whether terminals 34 and 35 (ON/OFF) and/or 16 and 17 (high/low flame) are open or closed.

If there are multiple power modules, modulation from an external control could turn off one or more modules in cascade.

Turning off the burner

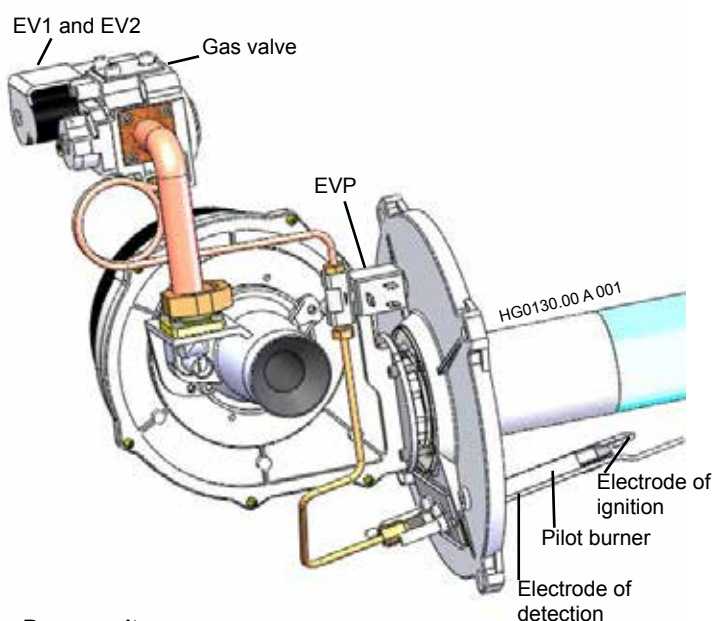
When the demand for heating ceases, the burner [E] is switched off; the fan continues to ventilate the combustion chamber, post-wash, for a preset length of time [F]. Opening the ON/OFF contact (terminals 34 and 35) always causes the burner to stop without generating a fault.



set period of time, the flame control board (APG) disconnects the power supply to the EVP solenoid valve and turns off the pilot burner [D].

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

The ignition program lights the burner to obtain an intermediate level heat production capacity, which corresponds to about 30% of the maximum capacity. Once the flame is stabilised for



Burner unit

Cooling Fans

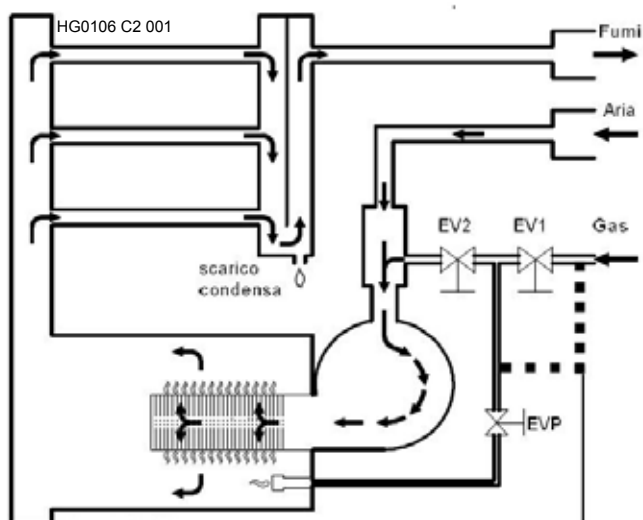
The PRH modules do not require the cooling fans control.

When the demand for heating ceases, the ON/OFF contact will open and will switch off the burner and the cooling fans must continue to operate for a preset time (60 sec.), long enough to cool the heat exchanger.

The cooling fans can be controlled separately, but the timing constraints indicated in the paragraphs below must be followed.

Starting Ventilation with an External Control

The air fan must be started simultaneously with the burner [G] or it can be delayed for a maximum of 60 seconds [H], to avoid introducing cool air into the chamber. If the fan has an electrical safety monitor and/or an air flow monitor, these devices must be connected in series to the ON/OFF contact.



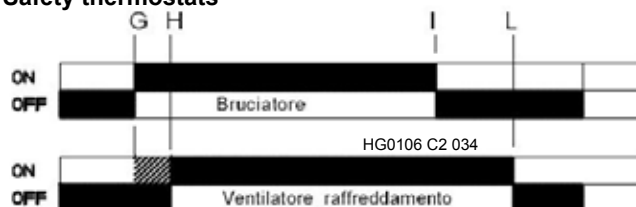
Switching off Ventilation with an External Control

When the heat demand stops, cooling ventilation must be maintained for longer than the first three minutes [L]; this allows the exchanger to cool down properly. Failure to perform the post-cooling operations on the exchanger will cause:

- a shorter lifetime of the exchanger and the guarantee will be null and void;
- the safety thermostat to intervene, which will require a manual reset.

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

Safety thermostats



A safety thermostat with automatic reset and positive safety setting (STB) is installed on the heater module. The breaking of the sensitive element corresponds to a safety intervention. Thermostat activation will cause, by means of the flame monitoring equipment (APG), the burner to stop and therefore the flame equipment to shut down.

The thermostat is automatically reset by the APG equipment. The APG equipment shutdown, caused by the safety thermostat being activated, is indicated on the interface panel by the red warning light going on.

Shutdowns

When a shutdown occurs, indicated by the red light on the interface panel going on, the PHR heater module can be manually reset directly from the machine by pressing the reset button provided on the interface panel for more than 1 second.

Make sure you leave the contactor on the winter side, otherwise the heater will appear to be switched off

The shutdown warning light can be switched on because of:

- a burner shutdown [no flame]
- safety devices shutdown

If, after two or three reset attempts, the shutdown condition still remains, it is recommended not to try further attempts, but to contact the Service Centre to have the fault repaired.

Burner Shutdown

If the flame control board (APG) detects the burner failed ignition, the ignition cycle is automatically repeated up to a maximum of 4 times. If the shutdown persists, the red warning light on the interface panel will go on.

Press the reset button on the equipment to immediately reset this shutdown condition.

NOTE: SHOULD THE SAFETY THERMOSTAT (STB) BE OPEN BEFORE STARTING THE IGNITION CYCLE (THIS COULD BE CAUSED, FOR EXAMPLE, BY LOW TEMPERATURES), THE PILOT LIGHT EQUIPMENT WILL BE KEPT IN "STANDBY" AND A SHUTDOWN CONDITION WILL BE INDICATED.

Shutdown caused by faults

To check the type of shutdown, see Paragraph 4.3 "Shutdown Analysis - Fault".

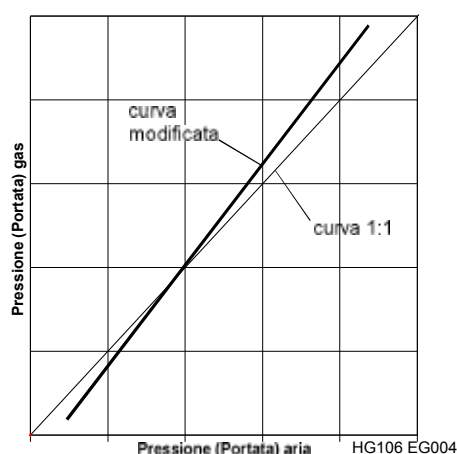
4.1. Air/gas Premixing Operation

The PRH heater is fitted with a burner that completely premixes air and gas. The air/gas mixing occurs inside the impeller on the motor-ventilator.

The air taken into the impeller through the venturi tube, calibrated, creates a vacuum. The vacuum in the venturi is rebalanced by the gas valve, which is pneumatically controlled.

The air pressure - gas pressure ratio is 1:1. This ratio can be corrected by turning the offset adjustment screw (on the gas valve). The heater is supplied with the offset regulated and the screw sealed.

A second adjustment can be done with the screw on the venturi, which regulates the value of maximum gas capacity and determines the amount of carbon dioxide (CO₂) in the fumes. This adjustment is also made at the factory. The screw is not sealed to permit conversion to another type of gas, if desired. To adjust the offset and CO₂, see the chapter about assistance.



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

5. USER'S INSTRUCTIONS

Read the safety warnings described on the previous pages. Operations that the user must perform are limited to the use of controls located on the interface panel installed on the machine.

5.1. Operation of the Heater

The PRH module is installed inside a machine, on a roof-top or an air treatment unit. It is managed by a control on board the machine where it is installed.

To turn on, regulate and turn off the PRH, the user must follow the instructions in the manual of the machine where the PRH is installed.

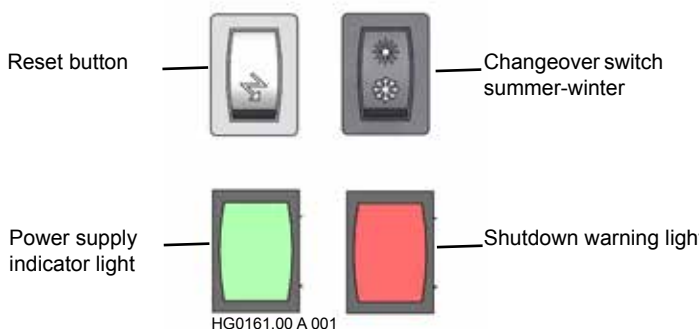
The instructions which follow are therefore for the operator who has access to the PRH.

The heater operation is entirely automatic; it is fitted with an electronic device with a self check function that controls all control and monitoring operations of the burner and adjusts the output to be supplied.

The demand for ignition occurs through the adjustment of the machine where the PRH is installed.

5.2. Interface Panel

The PRH houses an interface panel consisting of two buttons provided to reset the equipment and to switch between summer/winter and by two lights provided to show if the heater has shut down (red) and to detect if power is on (green).



5.3. Shutdown Analysis - Faults

The PRH module is fitted with a fault diagnostics, which is activated when a fault occurs. If a shutdown occurs, the red alarm warning light located on the interface panel will go on steady.

To reset the fault, press and hold down the reset key for more than 1 sec.

If the fault remains after attempting to reset it, do not try more than 3 times and call the Service Centre to have the fault repaired.

To enable the diagnostics that will identify the type of fault, hold down the reset key for more than 5 sec.; the red warning light will start flashing for a number of times according to the type of fault, with a pause of 2 sec. between cycles. The table below shows what the flashing means and therefore what caused the fault.

NOTE: SHOULD THE SAFETY THERMOSTAT (STB) BE OPEN BEFORE STARTING THE START-UP CYCLE (THIS COULD BE CAUSED, FOR EXAMPLE, BY LOW TEMPERATURES), THE PILOT LIGHT EQUIPMENT WILL BE KEPT IN "STANDBY" WITHOUT INDICATING ANY TYPE OF SHUTDOWN. THE HEATER WILL REMAIN SWITCHED OFF ALTHOUGH THERE IS DEMAND (PREMIX FAN OPERATIONAL) WITHOUT INDICATING ANY SHUTDOWN.

No. of FLASHES	CAUSE
1 Flash ●	No flame signal and board safety time exceeded: <ul style="list-style-type: none"> Detection electrode incorrectly positioned No fuel Fuel valves malfunctioning Defective ignition transformer Incorrect burner setting
2 flashes ●●	Safety thermostat open: <ul style="list-style-type: none"> Safety thermostat activated Defective safety thermostats
3 flashes ●●●	Not set
4 flashes ●●●●	Not set
5 flashes ●●●●●	Defective burner motor Hall effect sensor: <ul style="list-style-type: none"> Motor RPM lower than the set value
6 flashes ●●●●●●	Parasitic flame at ignition
7 flashes ●●●●●●●	Not set
8 flashes ●●●●●●●●	General fault

5.4. Connections to the flue

The PRH heater module is fitted with a watertight combustion circuit and with the burner fan located upstream of the heat exchanger.

Connection to the flue, according to how the heater is installed, can be made as "C" type, with combustion air being drawn from outside, or as "B" type with combustion air being drawn from the heater installation site.

If the heater is installed outdoor, a "B" type installation is also a "C" type.

More specifically, the heater is certified for the following exhausts: B23P-C13-C33-C43-C53-C63; for more information on the flue types, please refer to current regulations.

NOTE: A "C" type exhaust is compulsory for PRH heaters fitted inside an Air Handling or Roof Top unit installed indoor.

When making fume exhausts, using certified pipes and terminals is compulsory; furthermore, using the following material is recommended:

- aluminium with a thickness of at least 1.5 mm;
- stainless steel with a thickness of at least 0.6 mm; the steel must have a carbon content of at least 0,2 %.

The seals must be suitable for withstanding fumes temperature ranging between 140°C and 210°C.

Insulate the pipe if required to protect the flue from accidental contact.

For the air intake, use:

- aluminium with a thickness of at least 1.0 mm;
- stainless steel with a thickness of at least 0.4 mm;

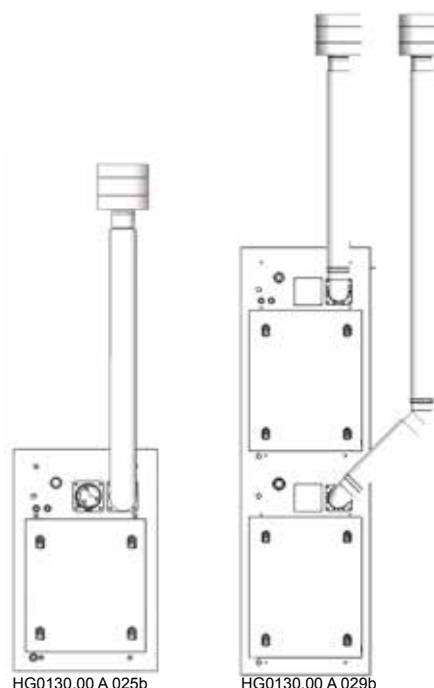
Common exhausts

Where possible, it is recommended that independent exhausts are used because the PRH module exhausts are pressurised; this would prevent incorrect sizing causing a system malfunction. When common exhausts are fitted, they must be designed by providing some anti.reflux valves (code GXXXXX) at the outlet of each flue, before the connection with the common flue, preventing a module from discharging it own combustion gases inside another module.

Flue gas data

The table to be used to calculate the fume exhaust system with commercially available pipes can be found in paragraph 5.5 "GAS connection" within the Gas regulation settings.

The maximum recirculation percentage is 11%.



Selection Guide

If the terminal is not directly connected to the heater and, therefore, extra routing is required, according to the length of the ducting, the diameter of the selected terminals, extensions and bends must be checked.

After establishing the routing, the pressure drops must be calculated; each component has a different pressure drop value as the flue gases flow rate is different.

The pressure drops of each component identified must be added, checking that the result is no higher than the value available for the PRH heater module used; if a combustion air supply pipe is fitted, the pressure losses must be added to the fume exhaust pressure drop.

If the sum of pressure drops caused by the fittings are higher than the pressure available at the exhaust, ducting with higher diameter must be used, rechecking the calculation; a pressure drop higher than the pressure available at the fume exhaust reduces the heater module thermal output.

NOTE: If the module is installed indoor:

- using coaxial fittings for PRH heaters is prohibited;
- the fume exhaust terminal must be installed in compliance with reference national regulation requirements.

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

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

5.5. GAS Connection

Use the gas line connections only with CE certified components

The PRH module is supplied complete with:

- a dual gas valve;
- gas stabiliser and filter.

All components are fitted inside the burner housing.

To complete the installation, as required by current standards, the following components must be fitted

- anti-vibration joint;
- gas valve.

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

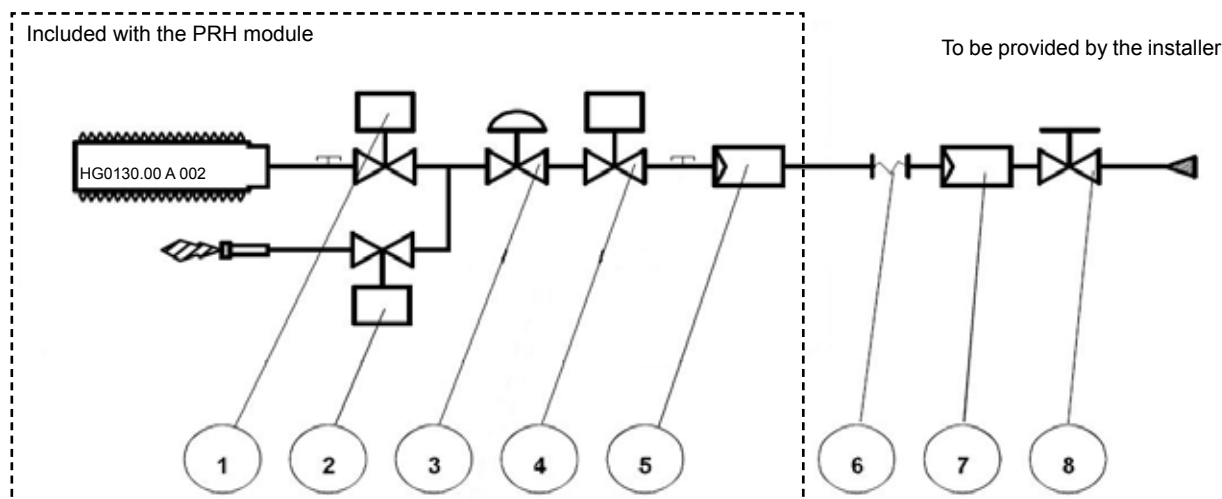
IMPORTANT: For a correct maintenance, connect the PRH module by means of a seal and swivel gasket.

Avoid using threaded connections directly on the fast connection.

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

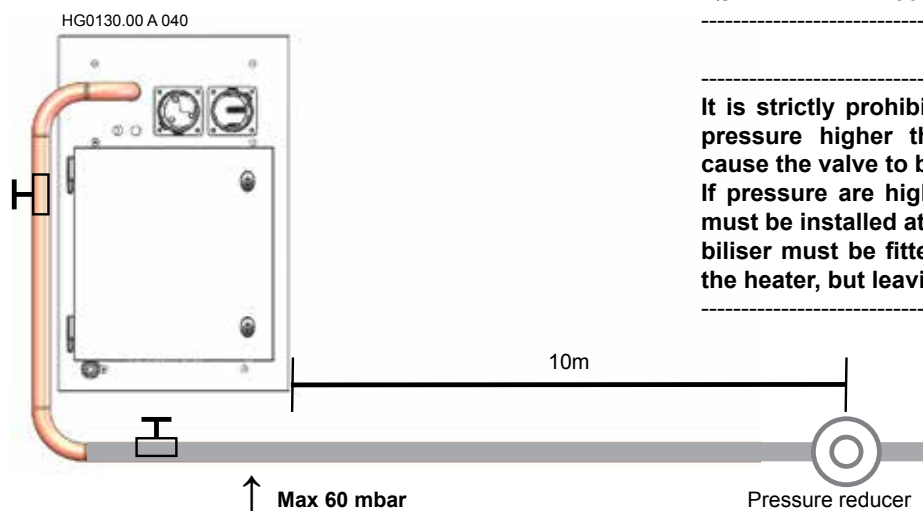
KEY

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



During the installation, tighten the external gas supply pipe but without exceeding the tightening torques shown below:

- | | |
|-------------|---------|
| - Ø 3/4": | 150 Nm; |
| - Ø 1": | 200 Nm. |
| - Ø 1 1/2": | 300 Nm. |



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

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

Country table - gas category

Country	Category	GAS	Pressure	GAS	Pressure
AT, CH	II2H3B/P	G20	20 mbar	G30/G31	50 mbar
BE <70kW	I2E(S)B, I3P	G20/G25	20/25 mbar	G31	37 mbar
BE <70kW	I2E(R)B, I3P	G20/G25	20/25 mbar	G31	37 mbar
DE	II2ELL3B/P	G20/G25	20 mbar	G30/G31	50 mbar
DK, FI, GR, SE, NO, IT, CZ, EE, LT, SI, AL, MK, BG, RO, HR, TR	II2H3B/P	G20	20 mbar	G30/G31	30 mbar
ES, GB, IE, PT, SK	II2H3P	G20	20 mbar	G31	37 mbar
FR	II2Esi3P	G20/G25	20/25 mbar	G31	37 mbar
LU	II2E3P	G20/G25	20 mbar	G31	37/50 mbar
NL	II2L3B/P	G25	25 mbar	G30/G31	50 mbar
HU	II2HS3B/P	G20/G25.1	25 mbar	G30/G31	30 mbar
CY, MT	I3B/P			G30/G31	30 mbar
LV	I2H	G20	20 mbar		
IS	I3P			G31	37 mbar
PL	II2ELwLs3B/P	G20/G27/G2.350	20/13 mbar	G30/G31	37 mbar
RU	II2H3B/P	G20	20 mbar	G30/G31	30 mbar

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

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

Codes with no extension:

- PRH015IT if there is no extension, it means that the equipment has been tested and set to run with natural gas [G20]

Codes with extension:

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

- PRH015FR-xxx0 0 indicates that the equipment has been tested and set up for natural gas [G20];
- PRH015MT-xxx1 1 indicates that the equipment has been tested and set up for LPG [G31];
- PRH015NL-xxx2 2 indicates that the equipment has been tested and set up for 'L' natural gas [G25];
- PRH015HU-xxx3 3 indicates that the equipment has been tested and set up for natural gas [G25.1];
- PRH015PL-xxx4 4 indicates that the equipment has been tested and set up for gas [G2.350];

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

PRH Warm Air Heater Module 2 stages

PRH Gas settings table

TYPE OF GAS G20															
TYPE OF EQUIPMENT		PRH015		PRH024		PRH034		PRH042		PRH052		PRH072		PRH102	
		min	max	min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table													
AIR SUPPLY PRESSURE	[mbar]	20 [min 15-max 25] *													
Ø PILOT NOZZLE	[mm]	0.7													
GAS CONSUMPTION (15°C-1013mbar)	m³/h	1.38	1.75	2.31	2.86	2.91	3.68	3.76	4.66	4.49	5.52	6.35	7.78	8.66	10.58
CARBON DIOXIDE -CO ₂ CON- TENT	[%]	8.7	8.8	8.7	8.8	8.7	8.8	8.7	8.8	8.7	8.8	8.7	8.8	8.7	8.8
FUMES TEMPERATURE	[°C]	155	204	145	191	143	182	155	194	152	187	146	184	142	177
FUME MASS FLOW RATE (MAX.)	[kg/h]	27.7		45.3		58.4		73.9		87.7		123.4		168.0	
GAS BUTTERLY VALVE	[mm]	3.9		5.7		6.4		7.7		9.4		Not required		11.2	
AIR BUTTERFLY VALVE	[mm]	15.5		Not required		Not required		Not required		Not required		Not required		Not required	
* For Hungary, the air supply pressure is 25 mbar															

TYPE OF GAS G25															
TYPE OF EQUIPMENT		PRH015		PRH024		PRH034		PRH042		PRH052		PRH072		PRH102	
		min	max	min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table													
AIR SUPPLY PRESSURE	[mbar]	25 [min 18-max 30] *													
Ø PILOT NOZZLE	[mm]	0.7													
GAS CONSUMPTION (15°C-1013mbar)	m³/h	1.60	2.03	2.68	3.32	3.38	4.28	4.37	5.41	5.22	6.42	7.38	9.04	10.06	12.30
CARBON DIOXIDE -CO ₂ CON- TENT	[%]	8.6	8.7	8.8	8.9	8.8	8.9	8.9	9.0	8.7	8.8	8.7	8.8	8.7	8.8
FUMES TEMPERATURE	[°C]	155	204	145	191	143	182	155	194	152	187	146	184	142	177
GAS BUTTERLY VALVE	[mm]	4.7		6.8		7.7		9.0		8.1		Not required		Not required	
AIR BUTTERFLY VALVE	[mm]	15.5		Not required		Not required		Not required		Not required		Not required		Not required	
* For Hungary, the air supply pressure is 20 mbar															

TYPE OF GAS G2.350 (only for PL-Poland)													
TYPE OF EQUIPMENT		PRH015		PRH024		PRH034		PRH042		PRH052		PRH072*	
		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
AIR SUPPLY PRESSURE	[mbar]	13 [min 10-max 16] *											
Ø PILOT NOZZLE	[mm]	0.75											
GAS CONSUMPTION (15°C-1013mbar)	m³/h	1.93	2.44	3.23	4.00	4.07	5.16	5.26	6.52	6.28	7.73	8.89	10.89
CARBON DIOXIDE -CO ₂ CON- TENT	[%]	8.5	8.8	8.7	8.8	8.8	8.9	8.7	8.8	8.7	8.8	8.6	8.7
FUMES TEMPERATURE	[°C]	155	204	145	191	143	182	155	194	152	187	120	152
GAS BUTTERLY VALVE	[mm]	5.8		11.0		Not required		Not required		Not required		Not required	
AIR BUTTERFLY VALVE	[mm]	15.5		Not required		Not required		Not required		Not required		Not required	
* Maximum nominal power output 63.0 kW / minimum 51.0 kW													

NOTE: The minimum and maximum output of model PRH072 will be less than when operating with G20. Model PRH102 is not suitable for operation with G2.350.
The conversion kit for G2.350 is only supplied on request.

PRH Warm Air Heater Module 2 stages

TYPE OF GAS G25.1 (only for HU-Hungary)													
TYPE OF EQUIPMENT		PRH015		PRH024		PRH034		PRH042*		PRH052		PRH072	
		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
AIR SUPPLY PRESSURE	[mbar]	25 [min 20-max 33] *											
Ø PILOT NOZZLE	[mm]	0.70											
GAS CONSUMPTION (15°C-1013mbar)	m³/h	1.60	2.03	2.68	3.32	3.38	4.28	4.36	5.41	5.21	6.41	7.37	9.03
CARBON DIOXIDE -CO ₂ CON- TENT	[%]	8.9	9.0	9.1	9.2	8.8	8.9	8.9	9.5	9.5	9.6	9.5	9.6
FUMES TEMPERATURE	[°C]	155	204	145	191	143	182	146	194	152	187	146	184
GAS BUTTERLY VALVE	[mm]	4.7		6.8		7.7		9.0		Not required		Not required	
AIR BUTTERFLY VALVE	[mm]	15.5		Not required		Not required		Not required		Not required		Not required	
* Maximum nominal power output 42.0 kW													

TYPE OF GAS G27 [ex GZ41.5] (Only for PL-Poland)													
TYPE OF EQUIPMENT		PRH015		PRH024		PRH034		PRH042		PRH052		PRH072	
		min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table											
AIR SUPPLY PRESSURE	[mbar]	20 [min 16-max 23] *											
Ø PILOT NOZZLE	[mm]	0.70											
GAS CONSUMPTION (15°C-1013mbar)	m³/h	1.55	1.96	2.60	3.21	3.27	4.14	4.23	5.24	5.05	6.21	7.14	8.75
CARBON DIOXIDE -CO ₂ CONTENT	[%]	8.9	9	8.8	8.9	8.8	8.9	8.8	8.9	8.8	8.9	8.7	8.8
FUMES TEMPERATURE	[°C]	155	204	145	191	143	182	146	194	152	187	146	184
GAS BUTTERFLY VALVE	[mm]	4.9		7.2		8.5		9.8		Not required		Not required	
AIR BUTTERFLY VALVE	[mm]	15.5		Not required		Not required		Not required		Not required		Not required	

TYPE OF GAS G30															
TYPE OF EQUIPMENT		PRH015		PRH024		PRH034		PRH042		PRH052		PRH072		PRH102	
		min	max	min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table													
AIR SUPPLY PRESSURE	[mbar]	30 [min 25-max 35] - 50 [min 42,5-max 57.5]													
Ø PILOT NOZZLE	[mm]	0.51													
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	1,08	1,37	1,81	2,24	2,28	2,89	2,76	3,65	3,30	4,33	4,98	6,10	6,97	8,63
CARBON DIOXIDE -CO ₂ CONTENT	[%]	9,9	10,0	9,9	10,0	9,9	10,0	9,7	9,8	9,7	9,9	10,2	10,3	10,3	10,4
FUMES TEMPERATURE	[°C]	155	204	145	191	143	182	155	194	152	187	146	184	142	177
GAS BUTTERFLY VALVE	[mm]	2.8		4.0		4.5		5.6		6.1		6.9		7.8	
AIR BUTTERFLY VALVE	[mm]	15.5		Not required		Not required		Not required		Not required		Not required		Not required	

* Nominal power output MIN 84.0 kW

* Nominal power output 104.0 kW

PRH Warm Air Heater Module 2 stages

TYPE OF GAS G31															
TYPE OF EQUIPMENT		PRH015		PRH024		PRH034		PRH042		PRH052		PRH072		PRH102	
		min	max	min	max	min	max	min	max	min	max	min	max	min	max
CATEGORY		according to the country of destination - see reference table													
AIR SUPPLY PRESSURE	[mbar]	30 [min 25-max 35] - 37 [min 25-max 45] - 50 [min 42.5-max 57.5]													
Ø PILOT NOZZLE	[mm]	0.51													
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	1.06	1.35	1.78	2.21	2.25	2.85	2.90	3.60	3.47	4.27	4.91	6.01	6.69	8.18
CARBON DIOXIDE -CO ₂ CONTENT	[%]	9.7	9.8	9.7	9.8	9.6	9.7	9.6	9.7	9.7	9.8	9.7	9.8	9.7	9.8
FUMES TEMPERATURE	[°C]	154	206	150	195	145	185	155	194	149	187	145	186	150	178
FUME MASS FLOW RATE (MAX.)	[kg/h]	21.2		34.7		45.0		56.9		67.1		94.4		128.5	
GAS BUTTERFLY VALVE	[mm]	2.8		4.0		4.5		5.6		6.1		6.9		7.8	
AIR BUTTERFLY VALVE	[mm]	15.5		Not required		Not required		Not required		Not required		Not required		Not required	

NOTE:

For PRH144 and PRH152 gas consumption and mass flow rates are twice as high as PRH072.

For PRH202 and PRH204 gas consumption and mass flow rates are twice as high as PRH102.

For PRH310 gas consumption and mass flow rates are three times higher than the PRH102.

For PRH410 gas consumption and mass flow rates are four times higher than the PRH102.

5.6. Starting up for the First Time

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

- make sure the gas in the mains corresponds to that for which the PRH is regulated;
- check, with the pressure intake "IN" on the gas valve, that the pressure entering the valve corresponds to that required for the type of gas being used;
- check that electrical connections match those indicated in this manual or other electrical diagrams attached to the unit;
- check that efficient earthing connections have been completed, carried out as specified by current safety regulations;
- power on the heater from the main switch located on the machine and insert the power plug inside the PRH chamber (green light on);
- close the ambient thermostat contact and check that the contactor located on the equipment is set to "WINTER".

After checking the above mentioned conditions, and if the heater has not shut down, a combustion chamber prewash stage is started, followed by the burner ignition and, finally, by starting up the cooling fans.

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

maximum power and make sure that the input pressure in the valve matches the required value; if not, adjust it.

Perform the combustion analysis to verify that the level of CO₂ corresponds to figures in the tables in Paragraph 4.4 "GAS Connections".

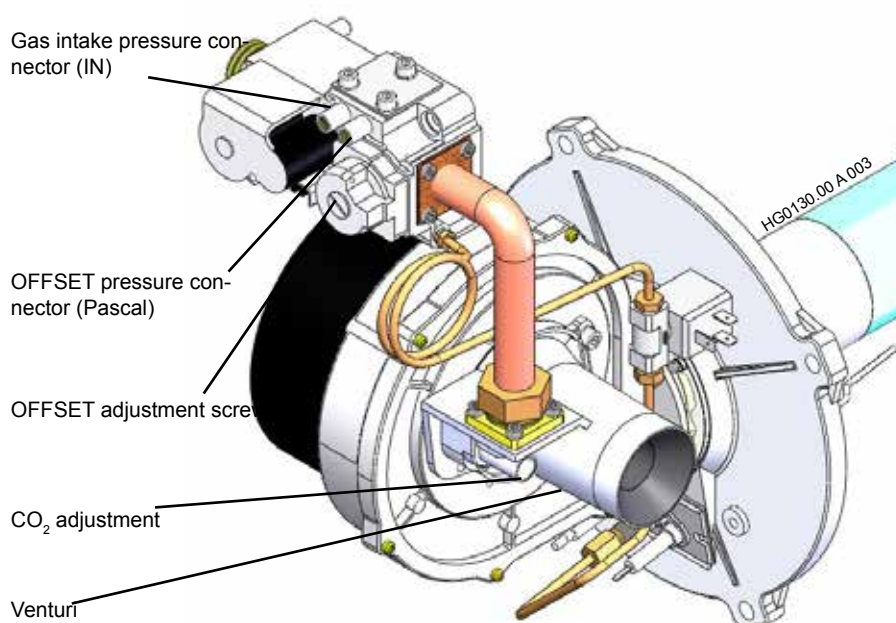
If the measured value is different, turn the adjustment screw on the venturi. Unscrewing the screw will raise the level of CO₂, screwing it down will lower the level.

Position the heater on minimum output by opening contact 16-17 on the heater; check that the level of CO₂ matches the values shown in the tables in Paragraph 4.4 "GAS Connections". If the figures do not match, turn the offset screw (screw down to raise and unscrew to lower) to adjust the level of CO₂ and repeat the procedure.

NOTE: The heater directly supplied to function with LPG is regulated for G31 gas. If the unit runs on G30 instead, it is necessary to verify and possibly adjust settings for CO₂ as shown in tables in Paragraph 4.4 "GAS Connections".

5.7. Combustion Analysis

Wait until the heater is on. Check that the heater reaches it



5.8. Conversion to LPG

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

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

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

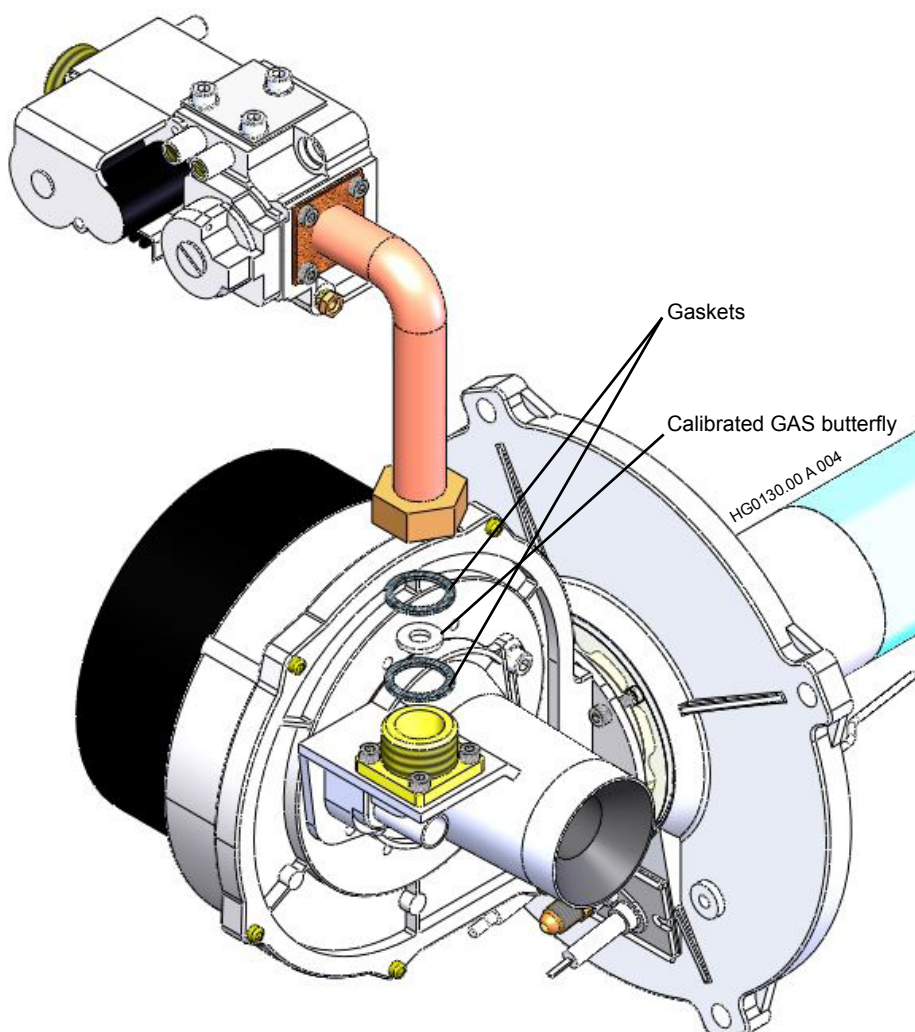
The kit is not supplied in countries where conversion is prohibited.

To convert the unit, follow these instructions:

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

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

- the valve intake pressure corresponds to the value required for the type of gas that you are using;
 - the combustion analysis procedure is performed as described in Paragraph 4.6 "Combustion Analysis";
 - the level of CO₂ is within the limits indicated for the type of gas being used (tables in Paragraph 4.4 "GAS Connection"). If a different value is detected, change it by turning the adjustment screw: screwing it down lowers the level of CO₂, unscrewing it raises the level.
 - that there the venturi gas valve connector does not leak.
- After converting and regulating the unit, replace the nameplate with that says "Equipment regulated for methane gas" with the one in the kit that says "Equipment converted ...".



5.9. Conversion to gas G25 - G25.1 - G27

Conversion for gasses from G20 to G25 is allowed only in countries of category II2ELL3B/P [Germany] and category II2HS3B/P [Hungary].

For countries in category II2L3B/P [Netherlands] the unit is supplied and already regulated for G25.

Conversion from one type of gas to another can only be done at authorised assistance centres.

Conversion to G25 and/or G25.1 and/or G27, where possible, consists in:

- insertion of butterfly.

After the conversion, relight the burner and:

- verify that the intake pressure to the gas valve corresponds to the level required for the type of gas [see tables in Paragraph 4.4 "GAS Connection"];
- check that the level of CO₂, at maximum and minimum heat capacity, is between the values indicated for the type of gas. If the value is different, change it by turning the adjustment screw on the venturi: screwing it down decreases the value, unscrewing it raises the value.

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

NOTE: Always pay close attention to the level of CO₂ in G25.1; for G25.1 maximum power output of model PRH042 will always be lower than during its operation with G20.

NOTE: The conversion kit is supplied on request

5.10. Conversion to Gas G2.350

Conversion is allowed only for Poland.

Conversion from one type of gas to another can only be done at authorised assistance centres.

Conversion involves:

- for all models: replacement of pilot nozzle.

After the conversion, relight the burner and:

- verify that the intake pressure to the gas valve corresponds to the level required for the type of gas [see tables in Paragraph 4.4 "GAS Connection"];
- check that the level of CO₂, at maximum and minimum heat capacity, is between the values indicated for the type of gas. If the value is different, change it by turning the adjustment screw on the venturi: screwing it down decreases the value, unscrewing it raises the value.

Stick the nameplate "Equipment converted for gas...." in place of the one that says "Equipment regulated for".

NOTE: The minimum and maximum output of model PRH072 will be less than when operating with G20. Model PRH102 is not suitable for operation with G2.350.

NOTE: The conversion kit is supplied on request

5.11. Replacing the Gas Valve

If the gas valve must be replaced, it is required to proceed with an inspection and possibly calibrate the CO₂ level through the adjustments on the venturi.

It is advisable to not calibrate the offset: the manufacturer is responsible for calibrating the valve.

If is necessary, do the combustion analysis procedure as described in Paragraph 4.6 "Analysis of combustion".

6. MAINTENANCE OPERATIONS

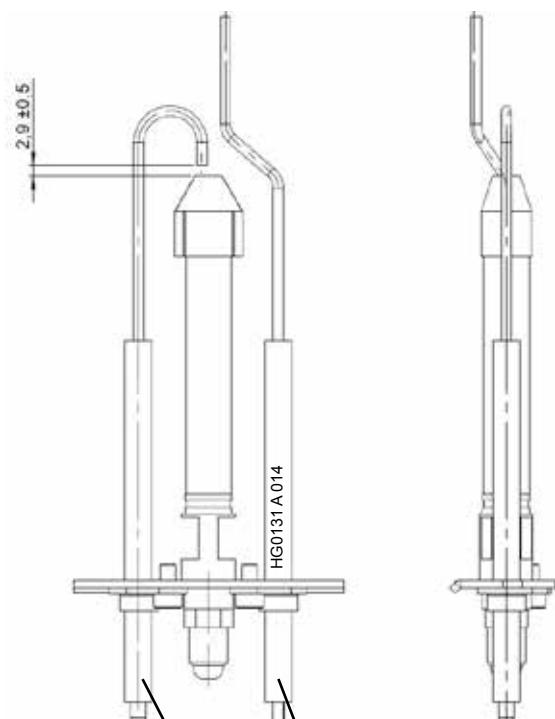
To keep the machine in efficient condition and guarantee a long lifetime of the heater, it is advisable to run some inspections every year, before turning it on for the season:

- 1) check the status of the start-up electrodes, detection electrodes and pilot flame;
- 2) check the status of fume exhaust and air intake ducts and terminals;
- 3) check the status of the venturi;
- 4) check and clean the exchanger and burner are clean;
- 5) check and clean the water trap
- 6) check the intake pressure at the gas valve;
- 7) check the function of the flame monitoring equipment;
- 8) check the safety thermostat(s);
- 9) check the ionization current.

NOTE: Operations at points 1, 2, 3, 4 and 5 must be performed after disconnecting the heater from the electrical mains and closed the gas intake. Operations at point 6, 7, 8 and 9 must be done with the heater on.

1) Inspection of electrodes

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



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

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

2) Inspection of fume exhaust and air intake ducts

Visually inspect where possible or examine with specific tools to learn the status of the ducts.

Remove dust that forms on the air intake terminal.

3) Inspection and cleaning of the venturi

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

4) Inspection and cleaning of the exchanger and burner

Good combustion in PRH heaters prevents dirt, which is normally caused by bad combustion. It is advisable, therefore, to not clean the exchanger and burner unless there are exceptional circumstances.

An accumulation of dirt inside the exchanger could be revealed by a sizeable variation in the gas capacity that is not caused by improper functioning of the gas valve.

Should it become required to clean the burner and/or exchanger, all of the gaskets mounted between the burner and the exchanger must be replaced.

5) Inspection of intake gas pressure

Verify that the intake pressure at the valve corresponds to the value required for the type of gas that you are using.

This verification must be done with the heater on at the maximum heat capacity.

6) Inspection of flame monitoring equipment

With the heater operational, close the gas tap and check that the machine shuts down, indicated by the red light going on on the interface panel. Reopen the gas tap, reset the shutdown and wait for the heater to restart.

7) Inspection of the safety thermostat(s)

This procedure must be done with the heater operational and the burner on.

Open the sets of thermostats with an insulated tool [230 V], remove the faston from the safety thermostat and wait until the shutdown condition is indicated. Reclose the set of thermostats, then reset the shutdown.

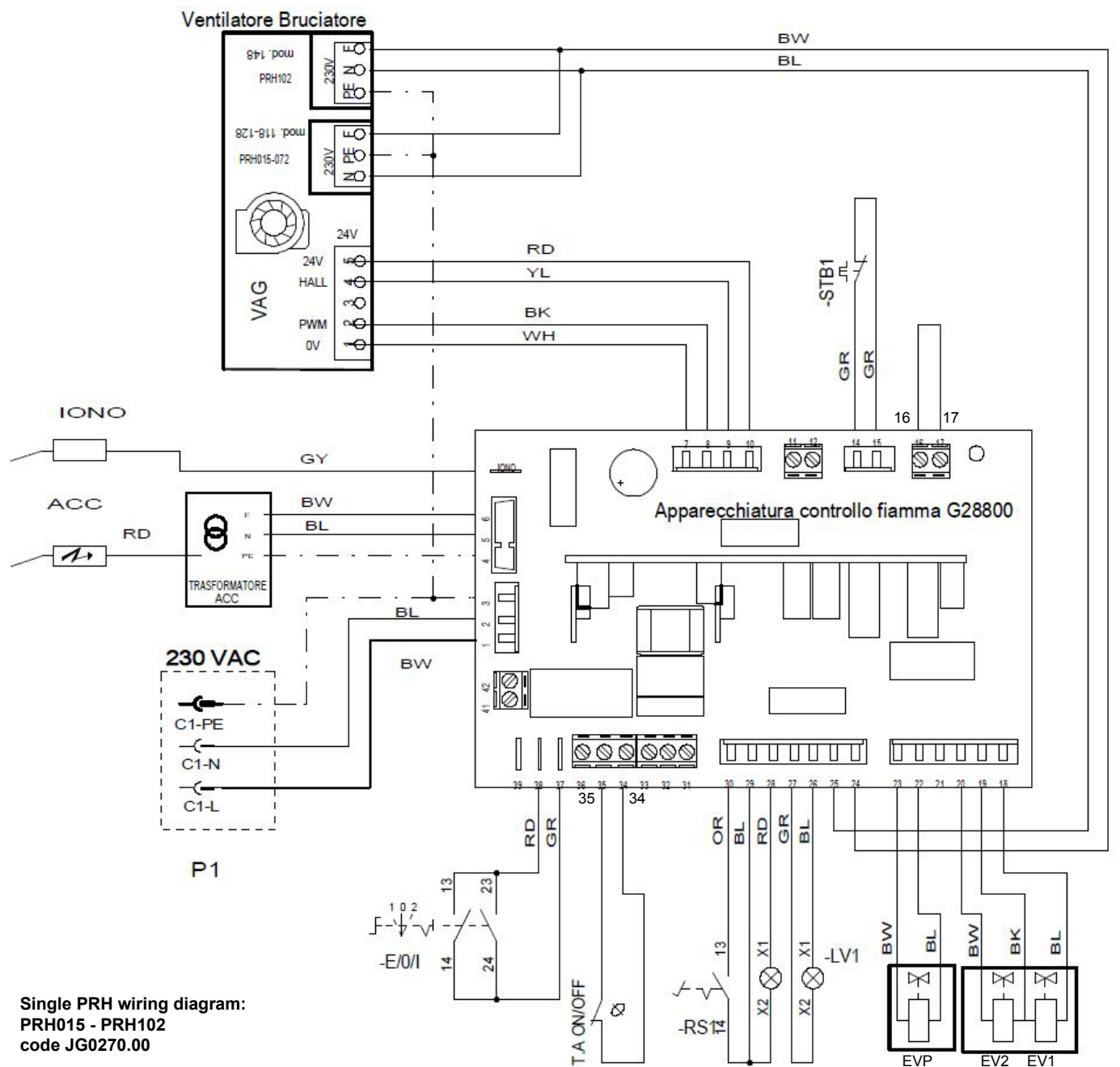
8) Inspection of the ionization current

Operation to be carried out with a tester able to measure the micro Ampere in direct current; proceed as follows:

- Disconnect the heater from the power supply.
- Disconnect the flame monitoring equipment detection cable and connect it to the tester - pole.
- Connect a cable between the tester + pole and the flame monitoring equipment.
- Power on the heater and wait until the burner is ignited.
- Check the ionization value.

The ionization current value must be higher than 2 microAmpere. Lower values indicate that the detection electrode is incorrectly positioned, has oxidised or is about to fail.

7. ELECTRICAL DIAGRAMS



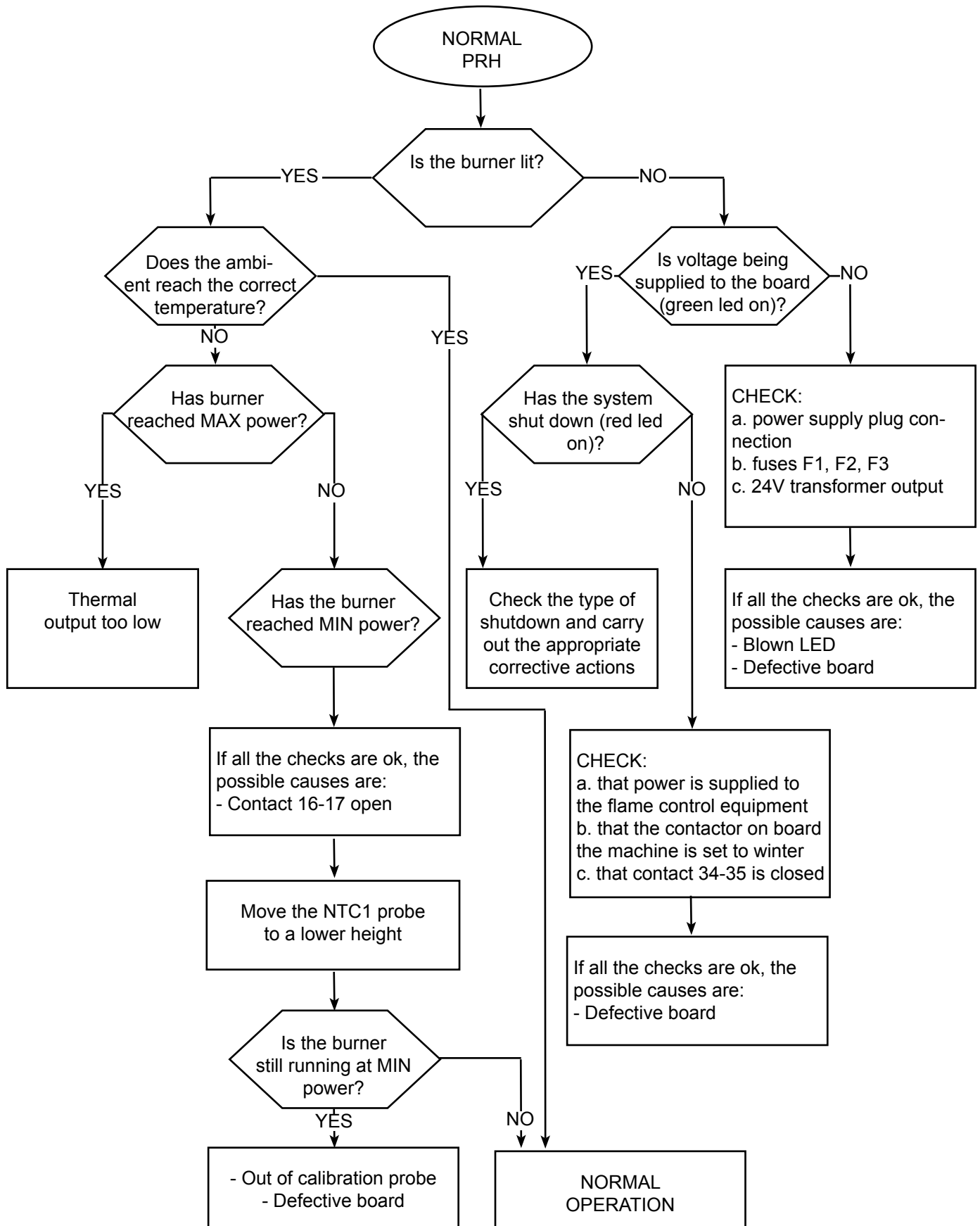
KEY

P1	connections plus/socket
STB	safety thermostat
EV1	first GAS solenoid valve
EV2	main GAS solenoid valve
EVP	pilot GAS valve
IONO	flame detection electrode
ACC	start-up electrode
VAG	burner fan

Connections

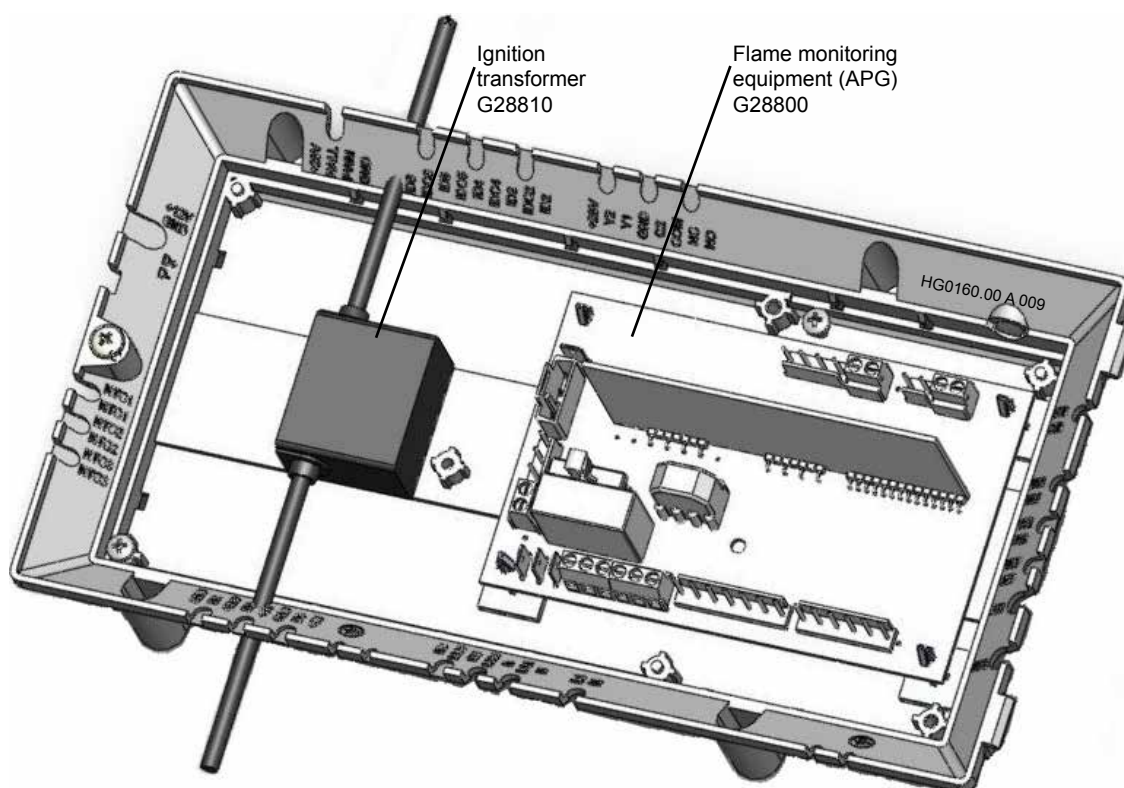
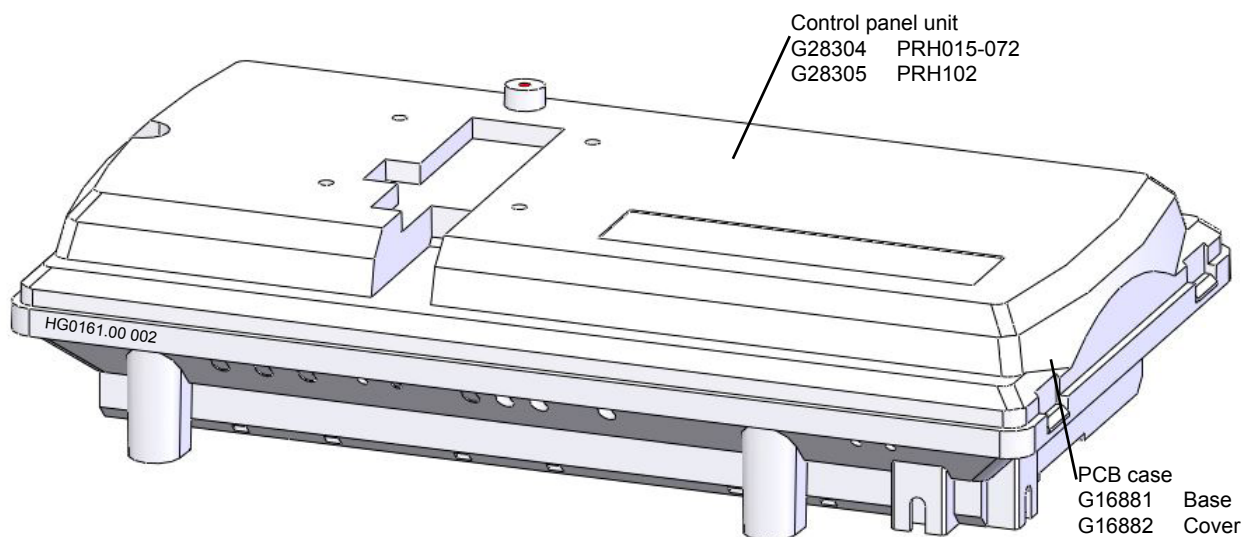
- Line: to terminals L, N, PE.
 - ON/OFF: to terminals 34-35. 230Vax power supply
 - High/low flame (Hi-Low): to terminals 17-17. 24Vac power supply.
- If no Hi/Low, make a jumper between terminals 16 and 17.

8. TROUBLESHOOTING

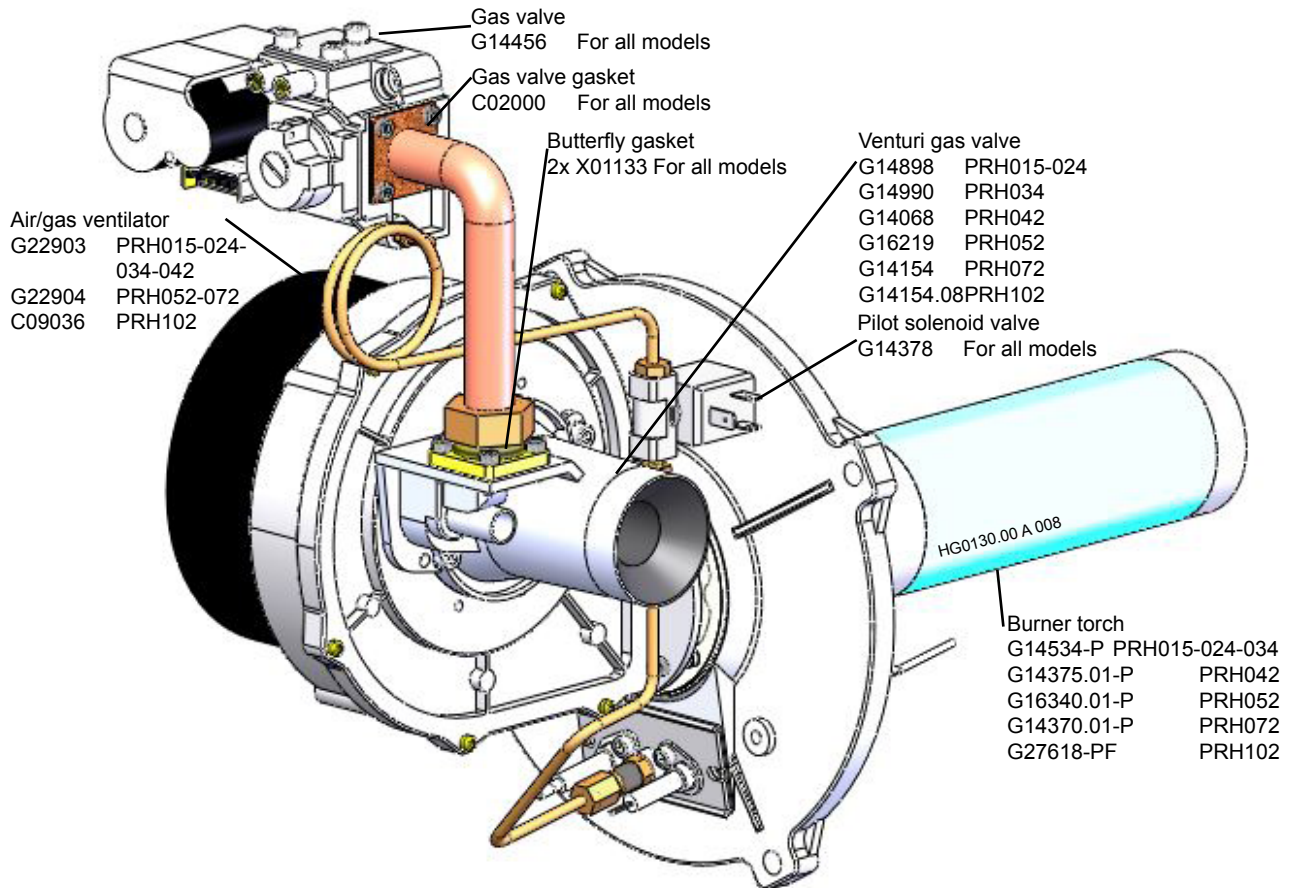


9. SPARE PARTS LIST

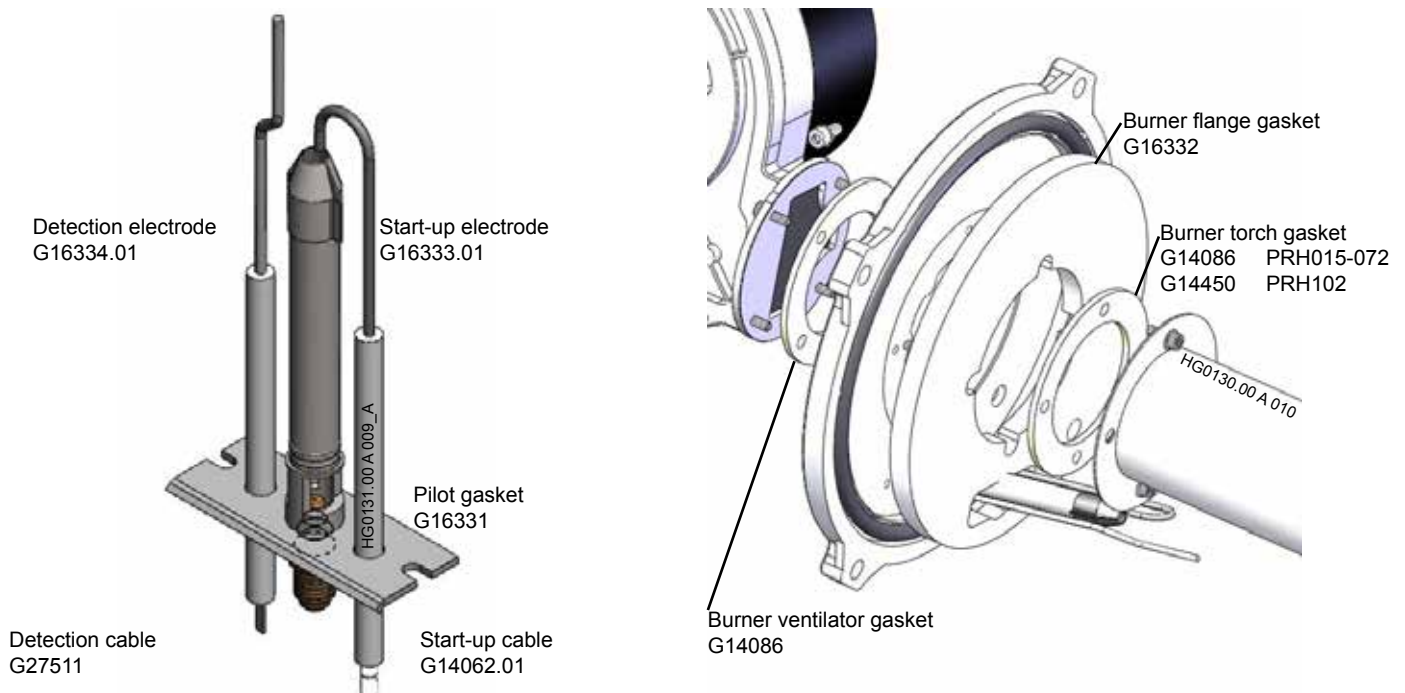
9.1. Electrical control panel spare parts



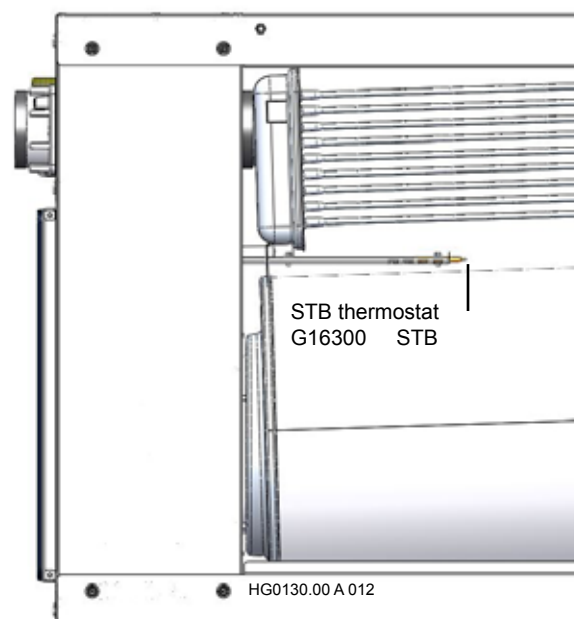
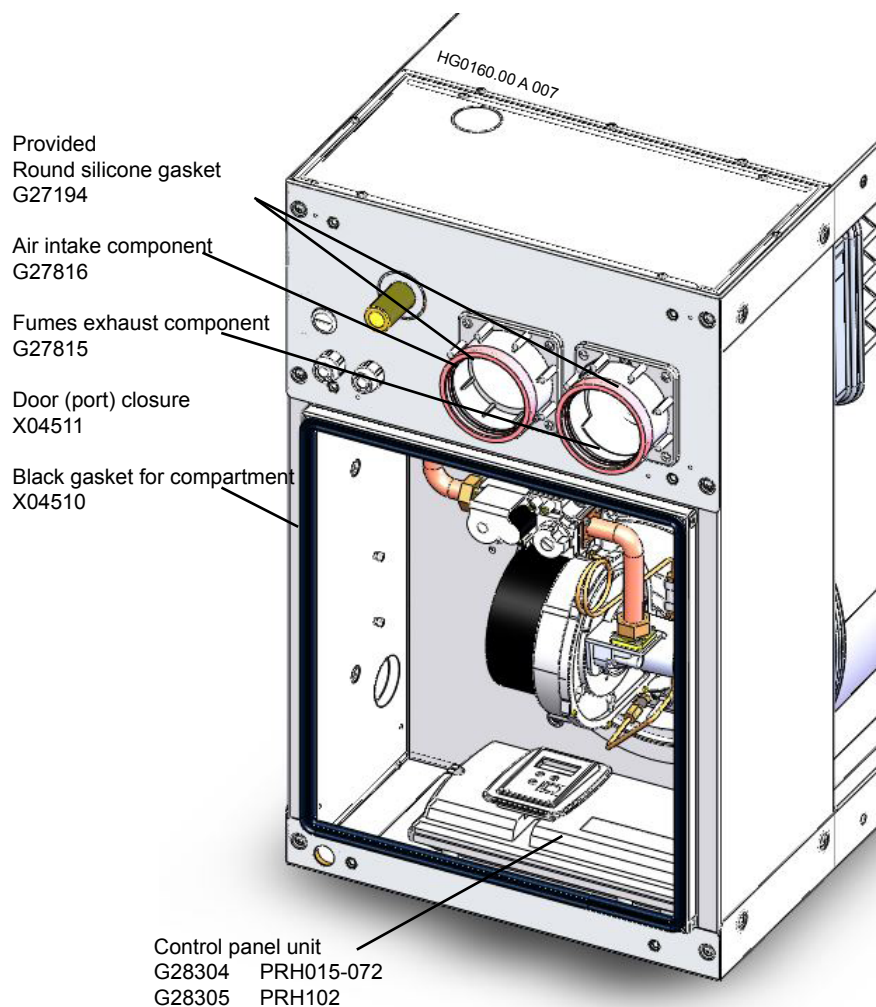
9.2. Burner unit spare parts



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



9.3. Other available spare parts



Notes

[illegible]

PRH Warm Air Heater Module 2 stages



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