

EN

***Use, Installation and Maintenance Manual
AKN-0X00 condensing boiler***

**NEW VERSION
CPU G26800**



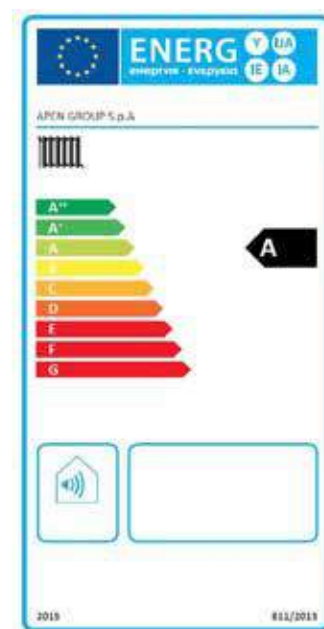
**Thermal Account for
Public Authorities**

Tax deduction

Yield up to 108%

Energy Efficiency Class A

NOx Class: 6



VER. 01.2020

**Dichiarazione di Conformità
Statement of Compliance****APEN GROUP S.p.A.**

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Il presente documento dichiara che la macchina:

With this document we declare that the unit:

Modello:	Caldaia AKN: AKN032, AKN034, AKN050, AKN070, AKN100
Model:	Hot Water Boiler AKN: AKN032, AKN034, AKN050, AKN070, AKN100

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
- **Direttive Rendimenti 92/42/CE**
Efficiency Requirements Directive 92/42/CE
- **Regolamento UE 813/2013**
EU Regulation 813/2013
- **Regolamento UE 811/2013**
EU Regulation 811/2013
- **Direttiva compatibilità elettromagnetica 2014/30/UE**
Electromagnetic Compatibility Directive 2014/30/UE
- **Direttiva Bassa Tensione 2014/35/UE**
Low Voltage Directive 2014/35/UE
- **Direttiva ROHS II 2011/65/UE e ROHS III 2015/863/UE**
ROHS II 2011/65/UE and ROHS III 2015/863/UE Directives

è stata progettata e costruita in conformità con le norme:

has been designed and manufactured in compliance with the standards:

- **EN15502-1: 2012**
- **EN15502-2-1 :2012+A1:2016**
- **EN60335-1**
- **EN60335-2-102**
- **EN60730-1**
- **EN 60068-2-1**
- **EN 60068-2-2**

Organismo Notificato:*Notified body:*

Kiwa Cermet Italia S.p.A

0476

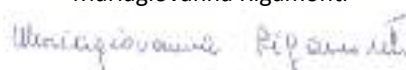
PIN 0476CR1226

La presente dichiarazione di conformità è rilasciata sotto la responsabilità esclusiva del fabbricante

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

Pessano con Bornago, 01/12/2021

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



CODE

SERIAL NUMBER

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1. GENERAL CAUTIONS

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

Should the equipment be sold or passed on to someone else, always make sure that this manual is supplied with the equipment for future 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 this use and instruction manual.

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

First start-up, conversion between different types of gas and maintenance operations must be carried out only by suitably qualified staff of Technical Service Centres complying with the requisites required by the regulations in force in their country.

Maintenance must be carried out with methods and 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.

ONLY FOR ITALY: We remind that Presidential Decree no. 74/2013 provides that annual maintenance of the equipment and check of thermal efficiency with a yearly or biennial frequency (according to the heat output of the equipment) are mandatory. The warranty conditions are specified on the warranty certificate supplied with this equipment.

The manufacturer declares that the equipment has been workmanlike manufactured in compliance with EN technical standards and with all relevant legislation, as well as with the Gas Appliances Regulation (EU) 2016/426.

For Swiss market, reference standards are:

- SSIGA G1 Directive: Directive for natural gas equipment in buildings;
- Cantonal requirements (AICAA- Firefighting directives, Thermal technical systems (2015))


SYMBOLS

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

 **Notes.**

 **Cautions.**

 **Instructions for the correct assembly.**

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

2. SAFETY-RELATED WARNINGS

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

2.1. Fuel

Before starting up the boiler, make sure that:

- the gas mains supply data are compatible with the data stated on the nameplate;
- the combustion air intake ducts and the fume exhaust pipes are only those specified by Apen Group;
- the gas seal of the feeding system has been tested and approved in compliance with the applicable standards;
- the boiler 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 internal cleaning of gas and water pipes has been correctly carried out;
- the fuel flow rate is suitable for the power required by the boiler;
- 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/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**.

2.3. Power supply

The equipment shall be properly connected to an efficient grounding system, complying with existing regulations.



- With the help of qualified personnel, check the efficiency of the earthing system;
- 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 equipment 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;
- The electric cables must be kept away from heat sources.

⚠ It is compulsory to install, upstream of the power cable, a fused omnipolar switch with contact opening greater than 3mm. The switch must be visible, accessible and positioned less than 3m away from the equipment. 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 use the gas pipes to earth electrical equipment;
- do not touch the hot parts of the equipment, such as the fume exhaust duct;
- do not place any object over the equipment;
- do not touch the moving parts of the equipment.

2.5. 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.

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



In order to ensure the correct operation of the equipment, preventing its damage or problems for persons, it is mandatory to add a percentage of glycol to the filling water, proportional to the minimum winter temperature of the area where the boiler is installed.



It is strictly FORBIDDEN to connect a system filling circuit to the waterworks mains in case of outdoor installation.



We recommend to check the water and glycol content inside the boiler by means of a refractometer on a yearly basis.



Using galvanised iron/steel pipes may bring about corrosive phenomena when using antifreeze. Therefore we DO NOT suggest using this material.



Warnings for glycol use:

In case of direct intake of high doses, the product may cause effects on the central nervous system, respiratory diseases and kidney damage. Avoid contact with skin and eyes – protect the respiratory tract.

Do not allow the product to enter sewers, surface water and groundwater, ground.

Use gloves, rubber boots and normal tight working clothing. Wear tight goggles.

For further information, refer to the safety data sheet of:

Cookson Electronics, Alpha Metals S.p.A., Via
Ghisalba 1, 20021 Bollate, Milano, Italy
Ph: +39.02.383311 Fax: +39.02.38300398
e-mail: fernox_italy@cooksonelectronics.com
www.fernox.com

For its AKN boilers, APEN GROUP tested and recommends to use ALPHI 11 glycol by Fernox or X500 glycol by Sentinel; the following KITS contain ALPHI 11 packs by Fernox with different capacity:

C07200-05	5 litres
C07200-25	25 litres

2.6. 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.

2.7. Disposal and demolition

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

Disposal of end-of-life products



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

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



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

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

The AKN series condensing boilers at the end of their life are considered "waste electrical and electronic equipment", classified as "professional WEEE". According to Decree 49/2014 the "professional WEEE" classification sets forth the obligation to dispose of the products in treatment facilities suitable for this kind of waste.

Apen Group is part of a collective system (Union Ecoped/Ridomus) for the sorted waste management of professional WEEE according to art. 13 of Legislative Decree 49/2014.

Please contact the Apen Group for end-of-life products so as to obtain all the information necessary for their correct waste disposal, which is possible thanks to the Collective System (Union) to which the company is associated.

Please remember that product disposal without complying with the mode described above is a violation liable to administrative and penal sanctions.

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

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

3. TECHNICAL FEATURES

Operation

The AKN boiler, running with natural gas or LPG, has been designed to meet heating requirements of environments such as garages, body shops, carpenter's shops, industrial and commercial buildings, etc..

The AKN system consists of a boiler module, to be installed outside the room to be heated, and one or more fan units to be positioned inside the room.

The system combustion circuit, located in the boiler, is completely outside. Therefore, both the gas circuit and the combustion fume circuit [B23P] in standard configuration are outside the room to be heated.

The system can operate independently. To start up the unit, simply connect it to the gas mains and to the mains power supply. The boiler is equipped with the antifreeze protection, which is of course operated by power supply; to prevent any frost problem in the absence of power supply, refill the system with a water-glycol mix in a percentage that varies according to external operating temperatures [see below].

AKN models are not pre-filled.

AKN boilers are compliant with regulations EN15502-1 and EN15502-2-1.

Condensing and premixing technology, together with flame modulation, allow achieving efficiency above 108%.

The boiler exchanger, made of stainless steel, ensures a high yield and a high corrosion resistance.

The burner is made entirely of stainless steel with special mechanical solutions to ensure optimal reliability and performance levels, as well as high thermal and mechanical resistance.

According to the model, the different remote controls (optional) allow operation parameter setting, ambient temperature control, time programming, working phase and fault display.

Inherent Safety

The efficiency increase at minimum power is achieved by using a sophisticated air/gas mixing technique and by regulating at the same time the combustion air flow and the fuel gas flow.

This technology increases the equipment safety as the gas valve supplies the fuel according to the air flow, based on an adjustment preset in the factory. Unlike atmospheric burners, the CO₂ content remains constant throughout the boiler operating range, allowing the boiler to increase its efficiency when the heat output reduces.

If there is no combustion air, the valve will not supply gas; if the combustion air flow reduces, the valve will automatically reduce the gas flow yet will keep its combustion parameters at optimal levels.

Low emissions

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

3.1. Models and Efficiency

AKN boilers are of condensing type with modulating burner. All the boilers are condensing type with seasonal efficiency ErP ≥90% (corresponding to a Class A Energy Efficiency). AKN series boilers are in compliance with the efficiency demand set forth by all regional resolutions, even the strictest ones.

Water operating temperature is 72°C.

Efficiency with maximum heat output is greater than 100%.

All models are supplied as standard with an electronic circulator characterised by variable speed and low electrical consumption.


Control accessories, such as ordinary remote control, Smart X, may be used with all models.


All models have been designed to achieve efficiency above 100% with respect to the lower calorific value, when the boiler supplies maximum heat output, and up to 108% with minimum heat output.

To increase the boiler's efficiency, the AB fan heaters have been designed to operate with water delivery at 72/75°C, increasing the exchange surface and allowing the boiler to be always condensing also at maximum heat output.

The boiler efficiency, with water delivery at 72/75°C, has been tested and certified by the external certification body.

By means of the Smart X remote control [optional], it is possible to use the "ambient compensation" function (PID) that allows reducing water delivery temperature, "sliding temperature", in inverse proportion to ambient temperature increase, thereby reaching boiler efficiency above 108% [Hi].

 To access the current tax bonuses, please visit the website www.apengroup.it where you can find the relevant documentation.

 For AKN032, AKN034, AKN050 and AKN070, use the "cold door" exchanger, which allows you to further reduce the heat losses in the housing, increasing the boiler yield.



3.2. Technical Data:

3.2.1. Boiler

AKY BOILER			AKN032	
Type of equipment			B23P - C63 ¹	
EC approval		P.I.N.	0476CR1226	
Seasonal space heating energy efficiency - [Reg.813/2013/EC] ²		h _s	91	
Energy efficiency class [Reg.811/2013/EC]			A	
NOx class [EN 15502-1]			6	
Boiler yields				
	Symbol*		MAX	MIN
Burner heat output [Hi]	Q _n	kW	31.0	6.4
Useful heat output [Hi] [80/60°C]	P ₄	kW	29.9	6.2
Useful heat output [Hi] [50/30°C]		kW	32.4	6.8
Useful heat output at 30% of load [Hi]	P ₁	kW	10	
Useful heat output [Hi] [72/45°C]	P _n	kW	31.1	6.7
Useful efficiency [Hi] [80/60°C]	η ₄	%	96.3	96.5
Useful efficiency [Hi] [50/30°C]		%	104.5	106.5
Useful efficiency at 30% of P _n [Hi]	η ₁	%	106.7	
Useful efficiency [Hi] [72/45°C]		%	100.4	104.2
Flue losses with burner on [Q _n ;80/60°C]		%	2.9	
Heat loss in standby [EN15502-2]	P _{stand-by}	kW	0.073	
Flue losses with burner off		%	0.1	
Housing losses [Taverage=60°C]		%	0.4	
Condensate quantity [Q _n ;72/45°C]		l/h	1.2	
Condensate quantity [Q _n ;50/30°C]		l/h	3.1	
Flue gas emissions				
Carbon monoxide - CO - [Hi] [3% of O ₂] - [80/60°C] - P _n		mg/ kWh	97	
Carbon monoxide - CO - [Hi] [0% of O ₂] ³		ppm	47	
Nitrogen oxides - NOx - [Hi] [0% of O ₂] ³			27ppm - 47mg/kWh	
Nitrogen oxides - NOx - [Hs] [0% of O ₂] ³			24ppm - 42mg/kWh	
Fumes temperature		°C	80	43
Pressure available at the flue		Pa	110	
Electrical Characteristics				
Supply voltage	V-Hz-F		230 V - 50 Hz - 1F	
Rated power		kW	0.122	0.068
Electric power of auxiliary components (excluding circulator)	el _{max}	kW	0.073	0.018
Electric power of auxiliary components at 30% of load (excluding circulator)	el _{min}	kW	0.02	
Electric power of auxiliary components in standby	P _{SB}	kW	0.005	
Operating Temperatures		°C	-15°C to +50°C	
Protection Rating		IP	IPX5D	
Hydraulic connections				
Maximum working pressure	P _{MS}	bar	3	
Boiler water content		l	4.5	
Delivery/return connections - UNI ISO 7/1		Ø	G 3/4" M	
Gas connection		Ø	G 3/4" M	
Operating weight (water excluded)		kg	32	
Weight with packaging		kg	37	

* Abbreviation compliant with reg. EU/811/2013.

1 The boiler is supplied as standard with C63 configuration; other configurations are possible using accessories available from our catalogue.

2 Reg. EU/813/2013 art.2 point 20. It is calculated starting from the weighted average of useful efficiency at the rated heat output and of the useful efficiency at 30% of rated heat output, expressed in %. For calculation purposes, the efficiency value is referred to the higher calorific value [Hs].

3 CO and NOx values refer to the average weighted value of emission between maximum and minimum rated heat output according to the product standard. Values referred to cat. H (gas G20).

BOILER			AKN034		AKN050		AKN070		AKN100	
Type of equipment			B23P - C63¹							
EC approval		P.I.N.	0476CR1226							
Seasonal space heating energy efficiency - [Reg.813/2013/EC]²		h _s	91.8		92.2		92.8		92.3	
Energy efficiency class [Reg.811/2013/EC]			A					-		
NOx class [EN 15502-1]			6							
Boiler yields										
	Symbol*		MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
Burner heat output [Hi]	Q _n	kW	34.8	6.8	49.9	8.4	69.6	11.8	96.6	16.6
Useful heat output [Hi] [80/60°C]	P ₄	kW	33.6	6.6	48.3	8.1	67.5	11.4	94.1	16.4
Useful heat output [Hi] [50/30°C]		kW	36.5	7.2	52.3	8.8	74.8	12.7	103.9	17.9
Useful heat output at 30% of load [Hi]	P ₁	kW	11.3		16.2		22.7			
Useful heat output [Hi] [72/45°C]	P _n	kW	35.4	7.0	50.6	8.5	70.5	12.3	97.6	17.3
Useful efficiency [Hi] [80/60°C]	η ₄	%	96.6	96.5	96.7	96	97	96.9	97.4	98.6
Useful efficiency [Hi] [50/30°C]		%	104.8	105.8	104.8	105.3	104.5	107.5	104.3	107.6
Useful efficiency at 30% of P _n [Hi]	η ₁	%	107.7		108		108.6		108.4	
Useful efficiency [Hi] [72/45°C]		%	101.8	103.5	101.5	101.7	101.3	104	101	104
Flue losses with burner on [Q _n ;80/60°C]		%	2.7		2.7		2.7		2.2	
Heat loss in standby [EN15502-2]	P _{stand-by}	kW	0.073		0.098		0.098		0.183	
Flue losses with burner off		%	0.1							
Housing losses [Taverage=60°C]		%	0.35		0.40		0.40		0.50	
Condensate quantity [Q _n ;72/45°C]		l/h	1.3		1.7		2.6		3.9	
Condensate quantity [Q _n ;50/30°C]		l/h	3.6		5.1		7.4		8.0	
Flue gas emissions										
Carbon monoxide - CO - [Hi] [3% of O ₂] - [80/60°C] - P _n		mg/kWh	95		93		98		97	
Carbon monoxide - CO - [Hi] [0% of O ₂]³		ppm	38		66		50		51	
Nitrogen oxides - NOx - [Hi] [0% of O ₂]³			23ppm-40mg/kWh		24ppm-42mg/kWh		29ppm-52mg/kWh		21ppm-38mg/kWh	
Nitrogen oxides - NOx - [Hs] [0% of O ₂]³			20ppm-36mg/kWh		21ppm-38mg/kWh		26ppm-47mg/kWh		19ppm-34mg/kWh	
Fumes temperature		°C	77	42	75	40	74	41	73	38
Pressure available at the flue		Pa	110		100		120		100	
Electrical Characteristics										
Supply voltage	V-HZ-F		230 V - 50 Hz - 1F							
Rated power		kW	0.125	0.048	0.177	0.074	0.186	0.07	0.378	0.18
Electric power of auxiliary components (excluding circulator)	e _{lmax}	kW	0.075	0.014	0.107	0.012	0.114	0.015	0.216	0.02
Electric power of auxiliary components at 30% of load (excluding circulator)	e _{lmin}	kW	0.015		0.015		0.02		0.025	
Electric power of auxiliary components in standby	PSB	kW	0.005							
Operating Temperatures		°C	-15°C to +50°C							
Protection Rating		IP	IPX5D							
Hydraulic connections										
Maximum working pressure	P _{MS}	bar	3.0							
Boiler water content		l	5.0		6.3		7.0		10.8	
Delivery/return connections - UNI ISO 7/1		Ø	G 3/4" M		G 1" M				G 1 1/2" M	
Gas connection		Ø	G 3/4" M							
Operating weight (water excluded)		kg	34		40		46		71	
Weight with packaging		kg	39		45		51		75	

* Abbreviation compliant with reg. EU/811/2013.

1 The boiler is supplied as standard with C63 configuration; other configurations are possible using accessories available from our catalogue.

2 Reg. EU/813/2013 art.2 point 20. It is calculated starting from the weighted average of useful efficiency at the rated heat output and of the useful efficiency at 30% of rated heat output, expressed in %. For calculation purposes, the efficiency value is referred to the higher calorific value [Hs].

3 CO and NOx values refer to the average weighted value of emission between maximum and minimum rated heat output according to the product standard. Values referred to cat. H (gas G20).

3.2.2. AB fan heaters

The fan heater consists of a multi-row copper/aluminium battery, one or two axial fans and a composite material frame.

Fan heaters are supplied as standard with:

- vent valve
- micro thermostat for activating the fan only when the water temperature is $>42^{\circ}\text{C}$ (Winter function)
- the 5-speed air flow regulator
- hydraulic connection hoses

If equipped with the "condensate collection tray" they may be used also for summer air conditioning.

The fan heater size shows the possible combination with the AKN boiler.

For further details please refer to the technical data in the dedicated manual, code HA0070.00IT.

3.2.3. AX-EC electronic fan heaters

A range of electronic fan heaters has been designed to match the AKN boiler system, with high efficiency batteries with high exchange surfaces, axial fans with automatic speed control, brushless DC motor.

The electronic fan heaters come as standard with a vent valve. The "hose" kit for the hydraulic connection can be purchased as an accessory.

If equipped with the "condensate collection tray" they may be used also for summer air conditioning.

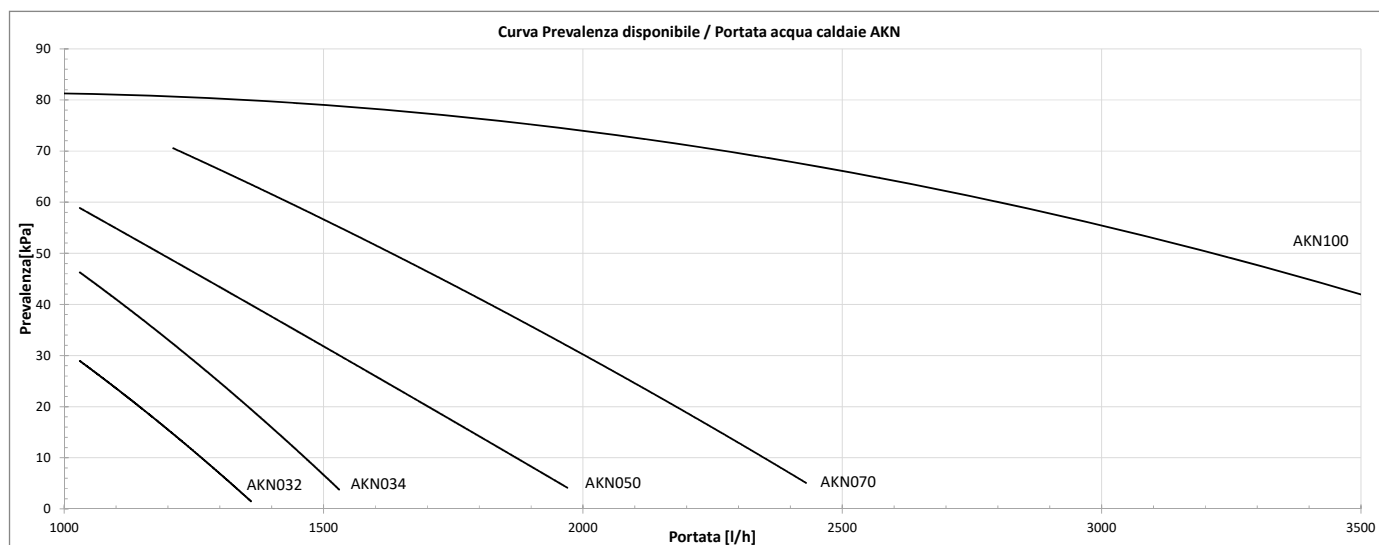
To choose the correct size to be combined, please refer to the technical data in the dedicated manual, code HA0055.00W.

3.2.4. Flow rate curve - boiler available head

For its proper operation, the AKN system requires the following water flow rates through the boiler:

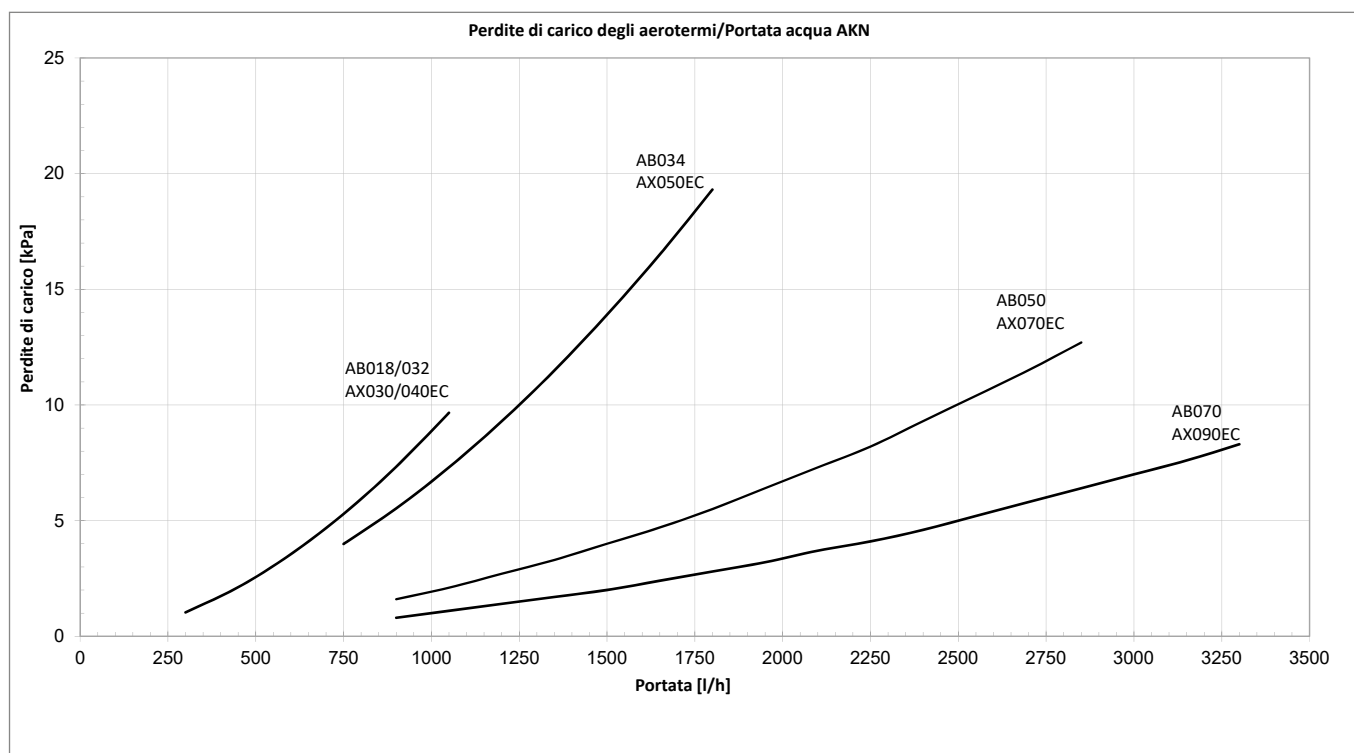
FLOW RATE RANGE										
BOILER	AKN032		AKN034		AKN050		AKN070		AKN100	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
l/h	900	1100	1000	1200	1200	1700	1700	2350	3100	3400

The boiler can operate correctly even with lower water flow rates. In this case, to reach the maximum heat output, increase fan heater delivery temperature, thereby increasing its thermal difference.



3.2.5. Fan heater pressure drop

Drops are estimated with glycol-free 72°C water; increase the drop depending on the glycol percentage according to the provided coefficients.



3.2.6. Pipe pressure drop

The table below contains pressure drop values of pipes for flow rate multiple values of fan heaters.

The drop is indicated in kPa per 1 metre of linear length; the calculation must be made by calculating the equivalent length of the pipe. The distance of the fan heater from the boiler must be duplicated. Drops are given for glycol-free 70--75°C water; for water glycol mix, multiply the drops by the factor indicated in the following tables. The last line contains the volume in litres per 1 metre of pipe.

Pressure drops identified due to the various components inserted in the hydraulic system must be added up to the pipe length, according to the values indicated in the table below.

PRESSURE DROPS IN kPa FOR 1 METRE OF LINEAR LENGTH															
Water flow rate	Steel pipes					Copper pipes ⁽¹⁾					Cross-linked polyethylene pipes ⁽¹⁾				
l/h	3/4"	1"	1"1/4	1"1/2	2"	20/22	25/28	32/35	39/42	51/54	20.4/25	26.2/32	32.6/40	40.8/50	51.4/63
600	0.15	0.05				0.18	0.06	0.02							
900	0.31	0.10	0.03			0.35	0.12	0.04			0.24	0.07	0.02		
1200	0.55	0.18	0.05	0.02		0.60	0.20	0.07	0.03		0.51	0.14	0.05		
1500	0.82	0.26	0.07	0.03			0.30	0.10	0.04		0.85	0.24	0.08	0.03	
1800		0.36	0.10	0.04	0.01		0.42	0.13	0.05	0.01	1.27	0.36	0.12	0.04	
2100		0.49	0.13	0.06	0.02		0.52	0.17	0.07	0.02	1.76	0.50	0.17	0.06	
2400		0.65	0.16	0.08	0.03		0.70	0.21	0.09	0.03	2.33	0.65	0.22	0.07	
3000			0.24	0.11	0.04			0.27	0.12	0.04	2.97	0.83	0.28	0.10	0.03
3600			0.34	0.16	0.06			0.35	0.17	0.06	4.44	1.25	0.42	0.14	0.05
4200			0.45	0.21	0.07			0.53	0.22	0.07	6.17	1.73	0.59	0.20	0.06
4800			0.59	0.21	0.08				0.28	0.08	8.15	2.29	0.78	0.26	0.09
Water content [l/m]	0.37	0.59	1.20	1.39	2.22	0.31	0.49	0.80	1.19	2.04	0.31	0.53	0.83	1.24	2.05

(1) Internal measurement/external measurement



It is advisable not to use steel, galvanised steel or iron pipes, but rather to choose cross-linked polyethylene pipes.

3.2.7. Equivalent lengths of possible applications

EQUIVALENT LENGTH IN m															
Type	Steel pipes					Copper pipes ⁽¹⁾					Cross-linked polyethylene pipes ⁽¹⁾				
	3/4"	1"	1"1/4	1"1/2	2"	20/22	25/28	32/35	39/42	51/54	20.4/25	26.2/32	32.6/40	40.8/50	51.4/63
45° bend	0.3	0.3	0.6	0.6	0.6	0.3	0.3	0.6	0.6	0.6	0.3	0.3	0.6	0.6	0.6
90° bend	0.6	0.6	0.9	1.2	1.5	0.6	0.6	0.9	1.2	1.5	0.6	0.6	0.9	1.2	1.5
90° bend with wide radius	0.6	0.6	0.6	0.6	0.9	0.6	0.6	0.6	0.6	0.9	0.6	0.6	0.6	0.6	0.9
T-shaped fitting	1.5	1.5	1.8	2.4	3.0	1.5	1.5	1.8	2.4	3.0	1.5	1.5	1.8	2.4	3.0
Check valve	1.5	1.5	2.1	2.7	3.3	1.5	1.5	2.1	2.7	3.3	1.5	1.5	2.1	2.7	3.3
Gate valve	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

(1) Internal measurement/external measurement

Below we suggest some possible types of installation on the basis of a delta T of 25 K:

INSTALLATION TYPES: $m_{eq} \max$						
Pipe of	Diameter		AKN032+AB032	AKN034+AB034	AKN050+AB050	AKN070+AB070
	Øint	Øext	delivery+return+connections	delivery+return+connections	delivery+return+connections	delivery+return+connections
Steel	3/4"		10	30	-	-
	1"		30	100	30	-
	1"1/4		-	-	120	20
	1"1/2		-	-	-	50
	2"		-	-	-	130
Copper	20	22	10	30	-	-
	25	28	30	100	20	-
	32	35	-	-	110	10
	39	42	-	-	-	30
	51	54	-	-	-	130
Cross-linked PE	20.4	25	10	40	-	-
	26.2	32	30	130	30	5
	32.6	40	-	-	120	15
	40.8	50	-	-	-	50
	51.4	63	-	-	-	-



The maximum equivalent lengths indicated here take into account the pressure losses distributed throughout the pipe and the concentrated pressure losses due to the various fittings along the system.

3.2.8. Glycol

The table below contains the freezing temperatures of water and glycol mixes.

Using a water and glycol mix, it is necessary to increase pressure drops of pipes and fan heaters according to the indicated correction factors.

GLYCOL						
Quantity	10%	20%	25%	30%	35%	40%
Freezing temperature	-3°C	-8°C	-11°C	-15°C	-18°C	-22°C
Correction factor for heat loss	1.07	1.15	1.18	1.22	1.24	1.26

All data refer to a FERNOX ALPHI11 or SENTINEL X500 polypropylene glycol and water mix recommended by APEN GROUP for its AKN systems.



Other types of glycol, different from the recommended one, invalidate the product warranty.



The indicated glycol percentages refer to the parts contained in the mix (water/glycol) and not in addition to water, e.g.: a 10-litre mix with 30% glycol is composed of 7 litres of water (70%) and 3 litres of glycol (30%).



It is recommended to perform a periodical annual check of the percentage of glycol in the system and to replace the glycol and/or check the acidity level of the system liquid, considering that for 25% mixture pH value can be 6.4 to 7.4.

3.2.9. Water content of boilers and fan heaters

WATER CONTENT [l]															
AKN032	AKN034	AKN050	AKN070	AKN100	AB018	AB032	AB034	AB050	AB070	AX020 EC	AX025 EC	AX030 EC	AX040 EC	AX050 EC	AX090 EC
4.5	5.0	6.3	7.0	10.8	2.5	2.5	3.2	5.3	6.5	1.8	2.5	2.5	2.5	3.2	6.5



Refer to Section 3.2.6 for the water content of the pipes.

3.3. Hydraulic circuit characteristics

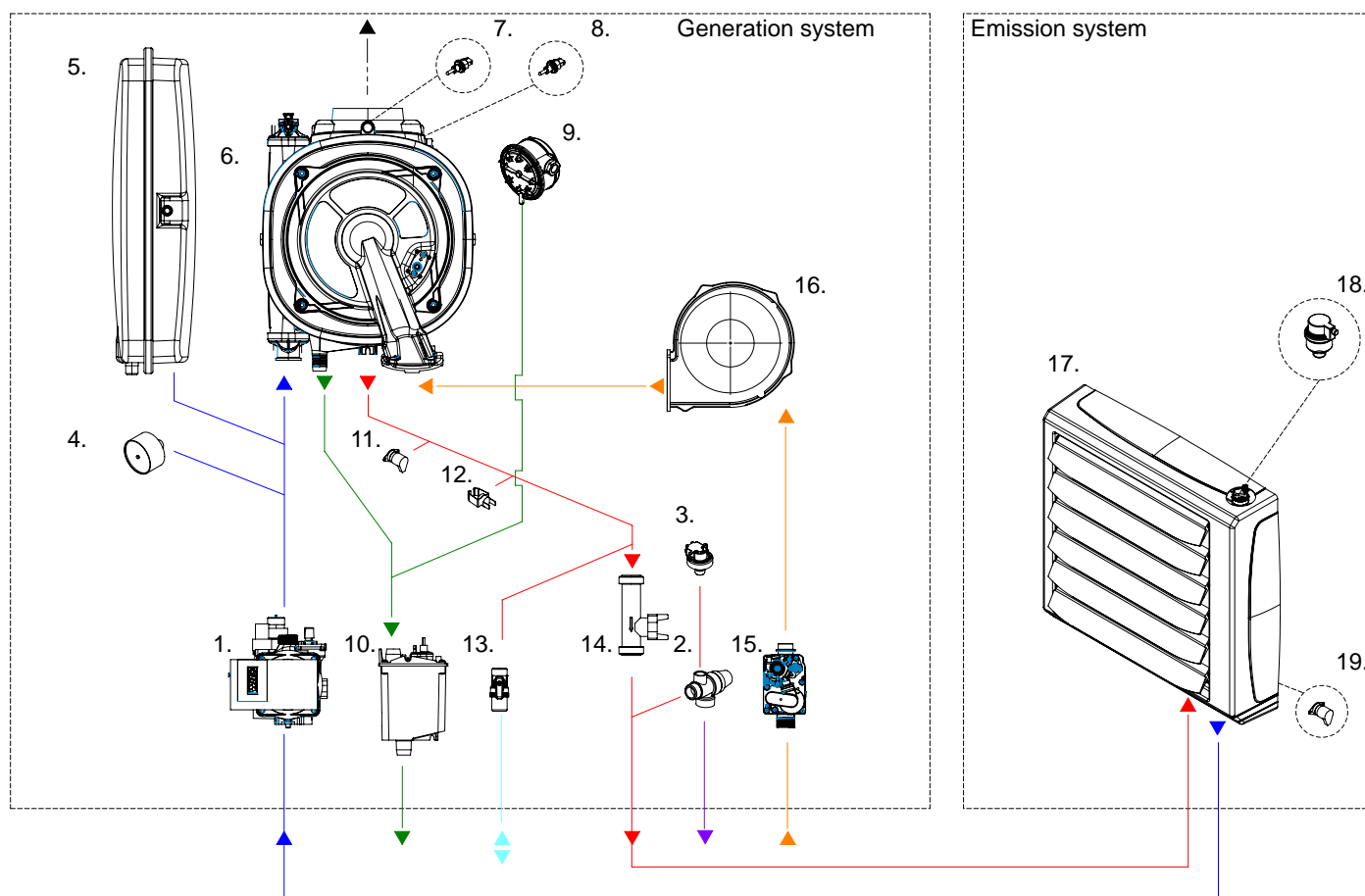
AKN boilers have similar hydraulic circuitry; AKN050/070/100 models are characterised by some additional components with respect to AKN032/034 models, which nominal heat output is below 35kW and therefore do not need INAIL declaration.

When several systems are installed, the sum of the heat outputs is allowed only if the hydraulic circuit is shared among several boilers.

AKN050/070/100 models, with rated heat output above 35 kW, are included in INAIL standard; therefore, the components of the boiler and the system must comply with this directive.

A declaration must be submitted to the competent body. We suggest sending the declaration at the time of installation.

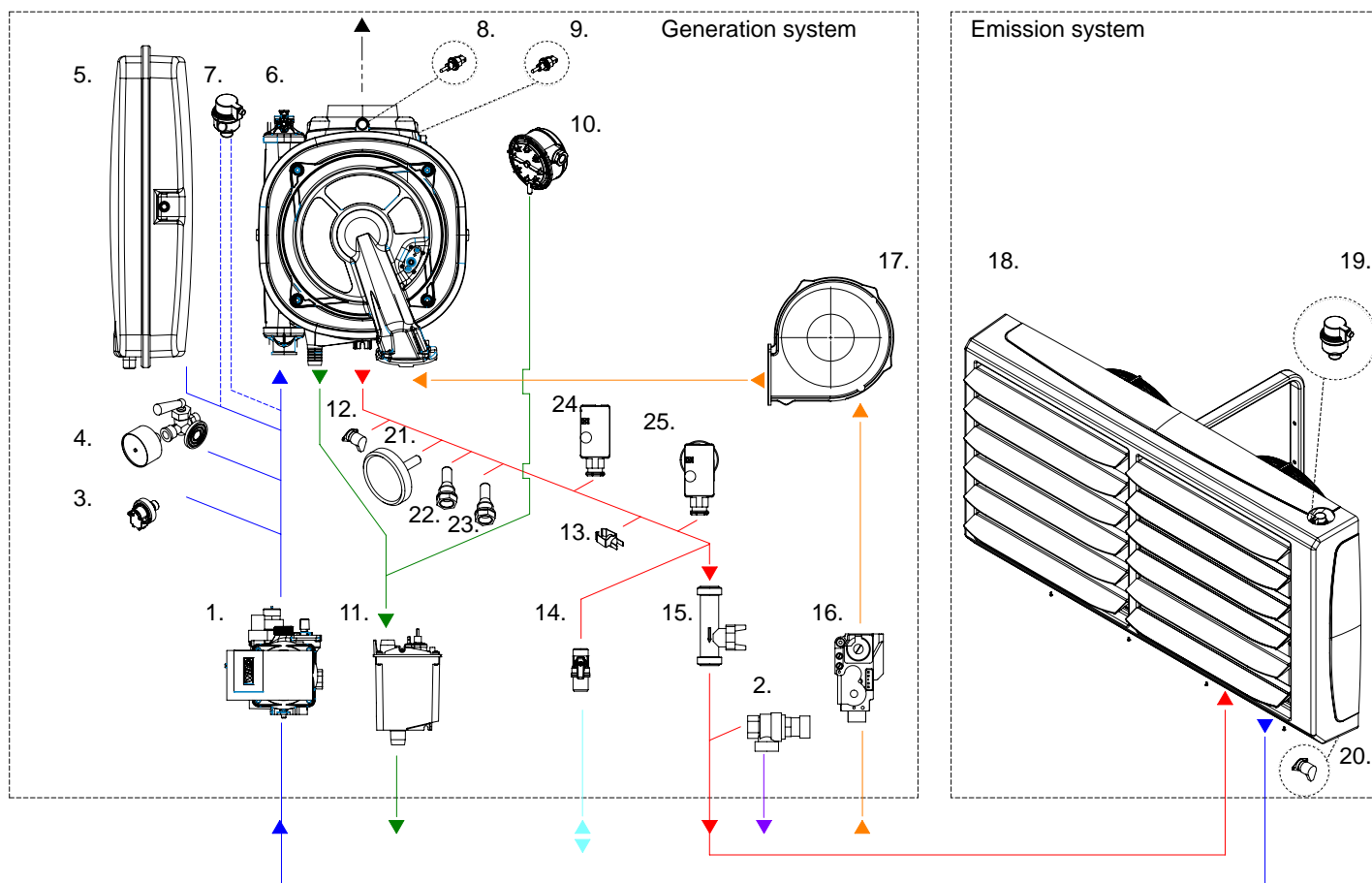
3.3.1. AKN032 and AKN034



Key

- | | | | |
|-----|---|-----|--------------------|
| 1. | system pump (circulator) | 17. | internal unit |
| 2. | safety valve | 18. | battery vent valve |
| 3. | pressure probe | 19. | fan compartment |
| 4. | hydrometer | | |
| 5. | expansion reservoir | | |
| 6. | exchanger unit | | |
| 7. | flue gas thermal fuse | | |
| 8. | exchanger protection thermal fuse | | |
| 9. | flue gas pressure switch | | |
| 10. | condensate drain trap | | |
| 11. | STB safety thermostat 90°C | | |
| 12. | NTC water delivery modulation temperature probe | | |
| 13. | filling tap | | |
| 14. | water flow gauge (flowmeter) | | |
| 15. | gas valve | | |
| 16. | burner fan | | |

3.3.2. AKN050, AKN070 and AKN100



Key

1. system pump (circulator)
2. AKN050 safety valve (2.5 bar)
AKN070 (2.5 bar), AKN100 (2.7 bar)
3. pressure probe
4. three-way control valve and hydrometer
5. expansion reservoir
6. exchanger unit
7. boiler vent valve (for AKN070 only)
8. flue gas thermal fuse
9. exchanger protection thermal fuse
10. flue gas pressure switch
11. condensate drain trap
12. STB safety thermostat 90°C
13. NTC water delivery modulation temperature probe
14. filling tap
15. water flow gauge (flowmeter)

16. gas valve
17. burner fan
18. internal unit
19. battery vent valve
20. fan compartment
21. INAIL thermometer
22. temperature inspection well
23. well for fuel cut-off valve
24. limit water pressure switch [manual reset]
25. minimum water pressure switch [manual reset]

EXTRA: For AKN100 only: TDOOR burner door thermostat

3.4. INAIL components - AKN050, AKN070 and AKN100

INAIL			
Component	Abbreviation	Model	Description
Hydrometer	IDROM	PB3204BB06 WATTS INDUSTRIES	Pressure gauge, UNI 2.5 class, scale 0-4 bar $p_{max,es.} = +25\%$ f.s., $T=20/90^{\circ}\text{C}$ compliant with INAIL
Limit pressure switch	IPMAX	B01BMX FANTINI & COSMI	Pressure switch $p=2\div 5.5$ bar PED/0497/2936/15, PED/0497/2941/15 certificates
Minimum pressure switch	IPMIN	B01FML FANTINI & COSMI	Pressure switch $p=0.5\div 2.5$ bar PED/0497/2936/15, PED/0497/2941/15 certificates
Inspection well	PIT	ITALTECNICA PGUAOTT003 WATTS INDUSTRIES	Control well $L=45$ mm, 1/2" connection, INAIL compliant INAIL approval certificate No. PS/001/10
3-way control valve	R3VIE	403R14 WATTS INDUSTRIES	Three-way valve, 1/4" connection, $T_{max, e.g.} = 90^{\circ}\text{C}$, $P_{max, e.g.} = 15$ bar Compliant with INAIL
Thermometer	TERM	PT4A507011 WATTS INDUSTRIES	Thermometer, 1/2" connection with well, $T=0-120^{\circ}\text{C}$, UNI accuracy class = 2. Compliant with INAIL
Expansion reservoir	VE	13S6001006 ZILMET	Expansion reservoir, capacity 10 l, connection 3/4", pre-charge 1.3 bar, $T_{max, e.g.} = 99^{\circ}\text{C}$, $P_{max, e.g.} = 3$ bar. Approved according to Directive 97/238/EC
Safety valve AKN100	VS	527427 CALEFFI	Safety valve, connections 1/2 "Fx3/4 "F, setting to 2.7 bar, diameter 15 mm, discharge capacity 152.2 kW, $T_{max} = 110^{\circ}\text{C}$ INAIL approval certificate no. VS/319/00
AKN050/070 safety valve	VS	527425 CALEFFI	Safety valve, connections 1/2 "Fx3/4 "F, setting to 2.5 bar, diameter 15 mm, discharge capacity 143.3 kW, $T_{max} = 110^{\circ}\text{C}$ INAIL approval certificate no. VS/319/00
Safety thermostat	TS	1NT SENSATA	Thermostat, NC contact, opening $T = 90 \pm 3^{\circ}\text{C}$, closing $T = 75 \pm 4.5^{\circ}\text{C}$. Certificate Dekra 2014531.16 rev.2



Water circuit test

According to INAIL standard, the boiler body is tested at a pressure of 4.5 bar, i.e. 1.5 times the maximum working pressure.



Distance between the expansion reservoir and the safety valve [AKN050, AKN070 and AKN100 only].

According to INAIL standard, the distance between the expansion reservoir centreline surface and the safety valve centreline surface is equal to 425 mm for AKN050 and AKN070, but it is 275 mm for AKN100.



Fuel cut-off valve [AKN050/070/100 only].

In case of equipment above 35kW, INAIL standard **compulsorily requires** that a fuel cut-off valve must be used. The boiler is equipped with the well for the sensitive component of the fuel cut-off valve: the valve kit is available as an accessory (code C09073 size 3/4" for AKN050/070 and C09464 size 1" for AKN070/100). **This well is suitable for the Caleffi fuel cut-off valve available in the indicated kits;** to use other valves it is necessary to check their coupling.

The choice of fuel cut-off valve must be made on the basis of the fuel used and its flow rate and heat loss diagrams.



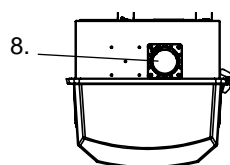
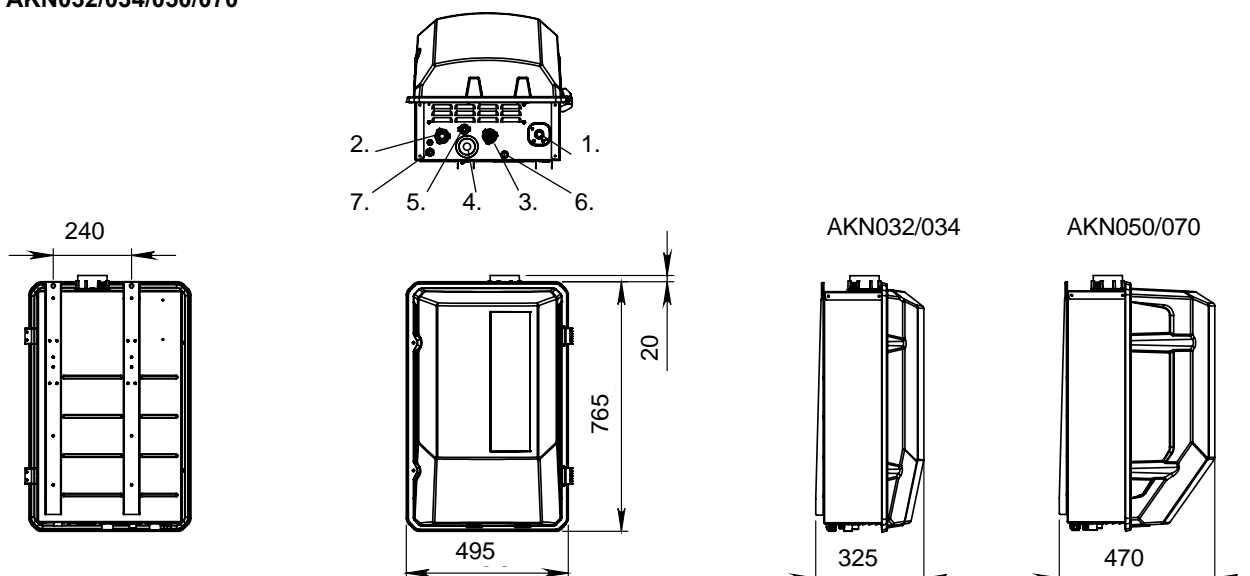
Expansion reservoir

All boilers are equipped with a 10-litre expansion reservoir, whose pre-charge is 1.3 bar for all AKN series.

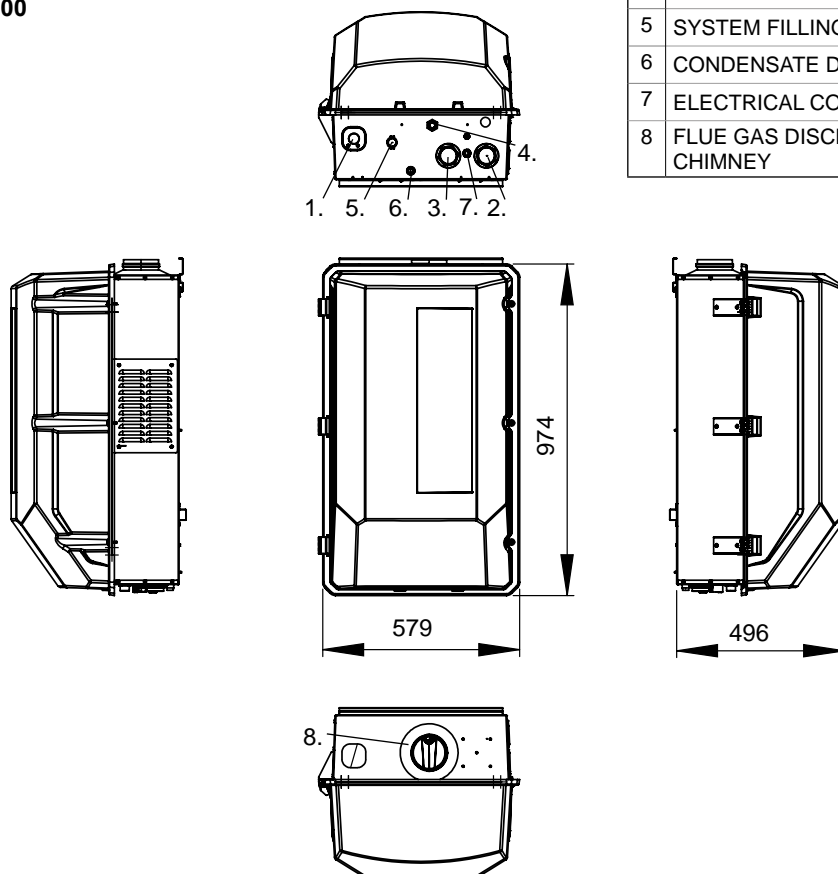
When the system water content exceeds 65-70 litres, an expansion reservoir with suitable capacity must be added.

3.5. Boiler size

AKN032/034/050/070



AKN100



AKN				
	Description	032/034	050/070	100
1	GAS SUPPLY	G3/4"		
2	WATER RETURN	G3/4"	G1"	G1 1/2"
3	WATER DELIVERY	G3/4"	G1"	G1 1/2"
4	SAFETY VALVE	G1/2"	G3/4"	G3/4"
5	SYSTEM FILLING TAP	G1/2"		
6	CONDENSATE DRAIN	Ø18 mm		
7	ELECTRICAL CONNECTIONS	PG13.5 + PG 09		
8	FLUE GAS DISCHARGE CHIMNEY	80 mm		100 mm

3.6. Operation and accessories

The boiler is fitted as standard with a multifunction LCD panel located inside it, and is used to control, configure and diagnose all operating parameters of the equipment.

Its operation is explained in Section 4.2.



This panel cannot be remotely controlled.



Ambient Temperature adjustment

The boiler is supplied without remote control and/or ambient thermostat as it can operate with different remote controls, some of which are supplied by APEN GROUP as accessories, whilst others are commercially available.

Operating modes:

- A) ordinary remote control, with a clean digital contact to be connected to the boiler ID0/GND terminals;
- B) Smart X.

This manual will describe "A" operation, providing information about AKN system modes. Instructions on how to operate the Smart X chronothermostat can be found in the manual supplied with the accessory.

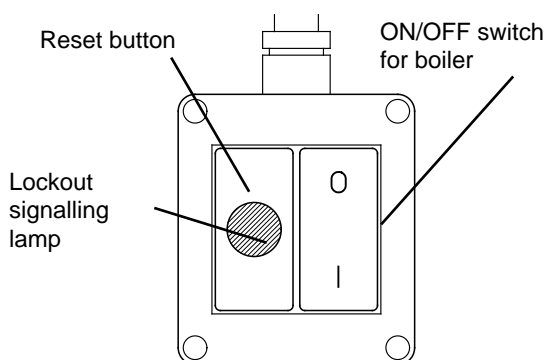
Equipment main functions

The system is equipped with the following functions:

- Circulator anti-lock and variable speed;
- Antifreeze.

A operation: C09660 ordinary remote control

By means of the ON/OFF key, the User switches the boiler on or off. The modulation occurs on the delivery water temperature, which remains fixed to the factory value pre-set to 72°C. When several fan heaters are connected and one of them is turned off, the boiler automatically reduces the heat output while keeping the delivery temperature fixed. Boiler lockout signalling and reset, available inside it, are located on the C09660 remote control.



Operation B: Smart X

Smart X touchscreen control has been designed to control several ApenGroup units for heating, ventilation and cooling. The control facilitates programming when several systems are installed (possibility to connect up to 15 systems), allows to have a view of the whole system, to reset the systems directly from the panel, as well as to control and manage lockouts.

Main features:

- Simultaneous management of all devices connected to it (switching on and switching off)
- Simplified connection by means of two modbus polarised cables and two power cables
- A temperature probe installed on the control
- Possibility to connect up to three remote temperature probes
- Multilingual 4.3" touchscreen colour display
- Complete management of the operating parameters
- Built-in or flush with the wall installation
- In the SMART X WEB version, complete management of the control and its functions through the network
- Possibility to connect an external probe for climate control

WHAT'S NEW:

- Presence of removable EEPROM that stores parameters and alarm history
- Possibility of choosing a 'Product Type' to determine the minimum mandatory controls to be activated

For operating instructions and installation diagrams, please refer to the manual of Smart X control.



Operation C: ambient thermostat

A chronothermostat with a clean contact can be connected to the ID0/GND terminals. By opening and closing the contact, the boiler is switched on and off.

4. USER'S INSTRUCTIONS



Please read the safety warnings described in the previous pages. The operations that the user must carry out are limited to the use of the controls placed in the remote control.

4.1. Boiler operation

Boiler operation is fully automatic; it is equipped with electronic equipment with self check facility that manages all the burner control and monitoring operations and with a microprocessor based electronic PCB that controls the heat output regulation. As mentioned above, the explanation focuses on the boiler without accessories; for information about Smart X operation, refer to the manuals supplied with the accessory.

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

- the boiler is powered on and has not been locked out;
 - the contact on ID0/GND terminals of the boiler PCB is closed
- In these conditions the burner circulator and fan will be immediately started; after pre-cleaning time has elapsed, the flame will light up with an ignition power equal to approximately 50% of its maximum output. Once the flame stabilising time has expired, the burner will start to modulate its heat output according to the delivery temperature: water delivery temperature setpoint is set to 72°C.

If a lockout occurs because there is no flame during the ignition phase, the boiler will make other 4 ignition attempts; at the fifth attempt, if ignition is not successful, the boiler will be locked out. The boiler will be switched off when the ID0/GND contact opens on the boiler terminal board; **disconnecting the boiler power supply is prohibited, except for emergencies**, because, when the boiler is switched off, the circulator will continue to work for approximately 3÷5 minutes so as to eliminate any residual heat in the boiler (water post-circulation); the fume fan too will continue to work for approximately 15 seconds to clean up the combustion chamber (combustion chamber post-cleaning phase).

4.1.1. Ambient temperature setting

Connecting an ambient thermostat (chronothermostat) or an ON/OFF switch is compulsory.

If a thermostat supplied by third parties is installed, the ambient temperature must be programmed on the thermostat.



In this type of installation, we recommend that a C09660 remote control is used (see Section 3.6) to allow users to check the conditions for the lockout and, if necessary, to remotely reset it without accessing the external boiler.

4.1.2. Lockout and Reset

Any operation fault is signalled on the **C09660** remote control by means of a red light.

The light indicates an alarm, but it does not indicate the type of alarm occurred. To reset, press the button below the light.

The error code, from E10 to E99, is signalled by the display located inside the boiler and/or by the Smart X, if connected.

Using the LCD panel located inside the boiler, unlock by pressing the two arrows simultaneously for a few seconds and wait for the LCD display to flash. The error codes are described below.

4.1.3. Boiler temperature setting

When the boiler is delivered, the R12/ST1 value, water delivery temperature setpoint, has already been set to 72°C; the parameter can be modified by means of the LCD panel inside the boiler or through Smart X.

4.1.4. Circulator anti-lock and variable speed

The function, which is enabled by default, starts the circulator when it fails to operate for twenty-four hours in a row; the circulator works for 120 seconds and then it stops.

The circulator modifies its speed according to the heat output; two parameters set the level under which the minimum speed is activated.

4.1.5. Degasser function

If the boiler is installed at a height exceeding the height of the fan heater, refill the circuit and degas the system using the manual degasser located inside the boiler.

If the system piping runs at a height exceeding the installation height of the boiler or fan heater, a degasser must be installed at the highest point of the system; the degasser can be either manual or automatic.

To facilitate the venting of the air trapped in the system, it is advisable to force the circulation of water in the system by activating the dEg parameter: refer to Section 4.2.4 using the LCD display.

4.2. LCD instrument panel

The AKN boiler is fitted as standard with a multifunction LCD panel located inside it, and is used to control, configure and diagnose all operating parameters of the equipment.

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

Changing parameters is protected by a password.

Viewing the machine status

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

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

(*only in the presence of Smart)

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

Air	"CTRL_07" control (parameter C71=1) under the PAr menu has been enabled by mistake; change C71=0
Axx	Unit address; If the module has an address other than Ø, the display will show, alternating it with the operation in progress, the address assigned to the module. (e.g. "A01")

If there are communication problems between CPU-SMART and LCD panel, the display will show the word **CPU** flashing. If needs be, check that the display and the PCB are correctly connected and that the small cable RJ11 is securely held in the connector. EPr will be displayed if the problem is caused by the EEPROM PCB. If so, check that the EEPROM PCB is properly inserted inside the connector.

Navigating the menu

The menu has three levels. The first and the second are accessible without entering a password, the third requires entering writing-level passwords to change the parameters. Also with modbus address other than Ø, all parameters can be viewed and/or edited through the LCD panel. Use the ↑ (up arrow) and ↓ (down arrow) buttons to scroll through the menus. To select the menu, or select the parameter, press ENTER. The parameter can be changed using the arrows:

pressing ↑ (up arrow) increases the parameter by 1, pressing ↓ (down arrow) reduces it by 1. When the arrow keys are pressed for at least three seconds, the parameter scrolling speed is increased. To confirm a change in parameters, press ENTER. A change in the parameter is indicate by the display flashing. To exit the parameter or menu, press ESC. If you exit the programming function, after about 10 minutes the program will exit the menu and go back to the "machine status" display. All submenus can be scrolled from the bottom to the top, and they start over when the end of the menu is reached.

First level menus

The following information is available on the first level:

Machine status	Provides information on unit operation (rdy/Sty/OFF/HEA/Air/COO/SAn): rdY : machine runs smoothly StY : machine in standby OFF : machine set to OFF HEA : machine runs in heating mode Air : machine runs in ventilation mode COO : machine runs in cooling mode SAn : machine in domestic demand
Axx	Shows the address assigned to the CPU OCB of the unit (1 to 15); it is displayed alternating with "Machine Status" (e.g., "A01" = address1)
Exx	In case of an alarm in progress, shows the error code (e.g. "E10")

Second level menu

The following menus are available on the second level:

Fun	Allows to choose the type of operation: Aut or OFF
rEg	Allows to force the burner at minimum or maximum output in order to perform combustion tests;
dEG	Allows to activate the system deaeration cycle; the cycle involves circulator ON 20" - circulator OFF 5", until exit from the menu
inP	Allows to display the status of inputs
Out	Allows to display the status of outputs
PAr	Allows to display and edit (after entering the password) parameters of adjustments, functions and controls

Operation - Fun Menu

Allows to select the type of operation of the CPU PCB, between AUT (automatic) and OFF (off).

OFF	Has priority also over external controls (Smart X type)
Aut	Corresponds to ON, the system sets itself up to receive inputs from the remote control (Smart X), adjustments, or external controls

Adjustment - rEg Menu

Allows to force the burner operation at maximum (Hi) or minimum (Lo) output, to carry out any combustion tests. The burner returns to the initial state automatically at the end of the set time (about 10 minutes)

Hi	Burner set to maximum output
Lo	Burner set to minimum output

Degasser - dEG Menu

Allows to activate the system deaeration function, i.e. the function to eliminate any air contained within the system itself. The cycle involves alternating between circulator ON status, for 20", and circulator OFF status, for 5", repeated until the menu is exited via the ESC key. The dEG function remains active until the item is exited via the ESC key.

- On** Activation of function
- OFF** Deactivation of function

Input - InP Menu

Allows to display the value and/or status of analogue and digital inputs. For the default values, please refer to the table CPU PCB Parameters in Section 11 "MODULATION PCB PARAMETERS".

- nt1** NTC1 probe temperature (Water delivery)
- nt2** NTC2 probe temperature (not used)
- nt3** NTC3 probe temperature (not used)
- An0** Number of flue gas fan revolutions (Premix)
- An1** B1 Analogue input voltage (0-10V)
- An2** Water pressure [bar]
- An3** Water flow rate [l/h]
- id0** Id0 digital input status (remote ON-OFF) open/closed "OPn/CLS"
- id1** Id1 digital input status (Remote Reset) open/closed "OPn/CLS"
- id2** Id2 digital input status (N.C. contact PFLUE-TFUMI) open/closed "OPn/CLS"
- id3** Id3 digital input status (Condensation detection electrode) open/closed "OPn/CLS"
- id4** Id4 230 Vac input status (1=contact closed; 0=alarm E24 in progress)
- id5** Id5 230 Vac input status (1=contact closed; 0=alarm E25 in progress)

Output - Out Menu

Allows to display the value and/or status of analogue and digital outputs. For the default values, please refer to the table CPU PCB Parameters in Section 11 "MODULATION PCB PARAMETERS".

- y0** Value of PWM (%) for flue gas fan (premix)
- y1** Value of PWM (%) sent to circulator
- y2** Value for Y2 output (0-10 Vdc) - EC fan(s)
- y3** Value for Y3 output (0-10 Vdc)
- ion** Value (%) of flame detection signal (100: value >2mA)
- U1** Q1 Output Status (Lockout signalling) open/closed "OPn/CLS"
- U2** Q2 output status open/closed "OPn/CLS"
- U3** Q3 output status open/closed "OPn/CLS"
- rL1** RL1 Relay Status (0=circulator/fan OFF; 1=circulator/fan ON)

Parameters - PAr Menu

Allows to display, and edit, the value of the main parameters of the CPU PCB. For the default values, please refer to the table CPU PCB Parameters in Section 11 "MODULATION PCB PARAMETERS".

By entering the menu, it is possible to display parameter values inside the relevant submenus

- rGL** (adjustments parameters)
- CrL** (controls parameters)
- Fnu** (functions parameters)
- rtU** (modbus serial parameters)

In order to change the value of the parameters, the password must be entered in the **Abi** submenu.

Entering the password

- From the home screen (rdy/Sty/OFF/HEA/Air/COO/SAn/Axx/Exx) press ENTER then use the ↑ (up arrow) and ↓ (down arrow) arrows to go to the PAR item; use the ↑ (up arrow) and ↓ (down arrow) arrows to go to the ABI item and press ENTER;
- Set the password inside the ABI menu and confirm it with ENTER (the flashing display will confirm that the parameter has been stored);
- Press ESC to return to the PAR menu
- Move with the ↑ and ↓ arrows to scroll within the PAR menu to the desired submenu item (rGL, CrL, Fnu, rtU);
- Press ENTER to access the submenu;
- Use the ↑ and ↓ arrow keys to select the parameters to be displayed and edited;
- Press ENTER to display the parameter value;
- Use the ↑ and ↓ arrows to edit the value;
- Press ENTER to confirm the change made;
- To exit the parameter and the menu, press ESC until the home screen is displayed.

Reset

The modulation PCB allows the operator to identify more than 30 different causes of lockouts. This makes it possible to manage each event very accurately.

To reset a lockout, press both ↑ and ↓ arrows simultaneously for a few seconds.


It is possible to operate the lockout reset remotely using one of the following solutions:


- the digital input ID1-GND - button N.O.;
- the Smart X Web/Easy control - optional;
- the ModBus protocol.

If ignition fails, the flame monitoring PCB reattempts ignition four times. After four failed attempts, it will lock out and will display the code E10.

The lockout codes and their cause are shown in the FAULT table in Section 12 "Analysis of Lockouts - Faults".

If the flame monitoring equipment has locked out (errors from E10 to E22), it can be reset by using the dedicated button on the equipment itself. This type of lockout is also shown by a warning LED that lights up.

 The flame monitoring equipment stores the number of manual resets that are performed remotely over time. If ignition fails with more than 5 resets performed in 15 minutes it switches to "timed" lockout (E13). In this case, it is required to wait another 15 minutes before remotely resetting it again. The reset button on the equipment allows to reset lockout E13 immediately.

 Should the safety thermostat (STB) be open before starting the start-up cycle (this could be caused, for example, by low temperatures), the flame monitoring equipment will be kept in "standby" indicating lockout E22.

Antifreeze control

In AKN boilers, the antifreeze control (parameter C21) is activated by default as a precaution to avoid any fuel cut-off valve activation when temperatures are near zero. Filling the system with the right amount of water and glycol is deemed the best antifreeze method (it protects the system even in case of blackout).

When the water temperature falls below the antifreeze setpoint (parameter C22), the circulator is activated to circulate the water in the system.

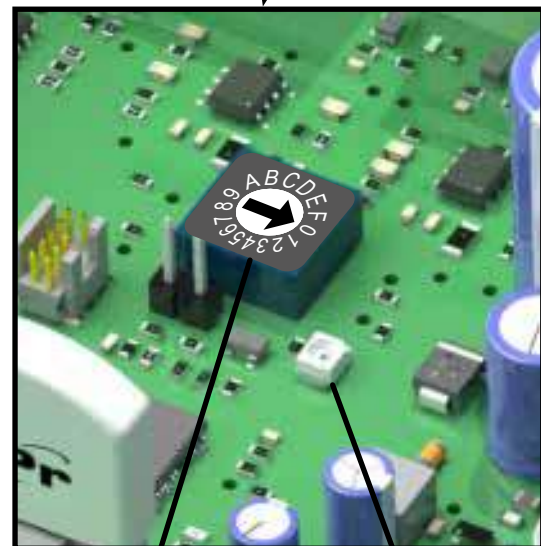
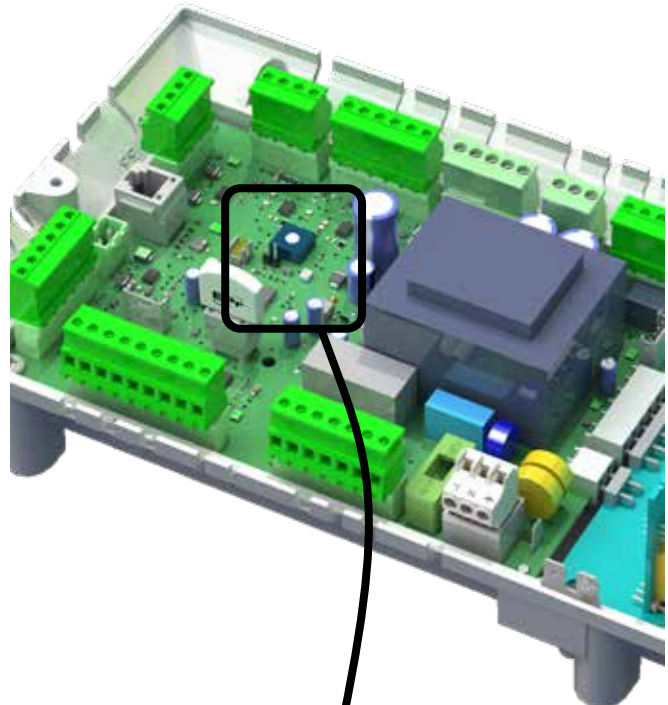
If the water temperature falls below the antifreeze setpoint (parameter C22) by more than a value above the set hysteresis (parameter C23), both the circulator and the burner are activated for the time required for the water temperature to return above the sum of antifreeze set point and hysteresis (C22+C23).

When the antifreeze function is on, the boiler behaves as follows:

$NTC1 > (C22 + C23)$:	equipment in standby;
$NTC1 < (C22)$:	water circulation on;
$NTC1 < (C22 + C23)$:	water circulation and burner on.

Flame indication LED

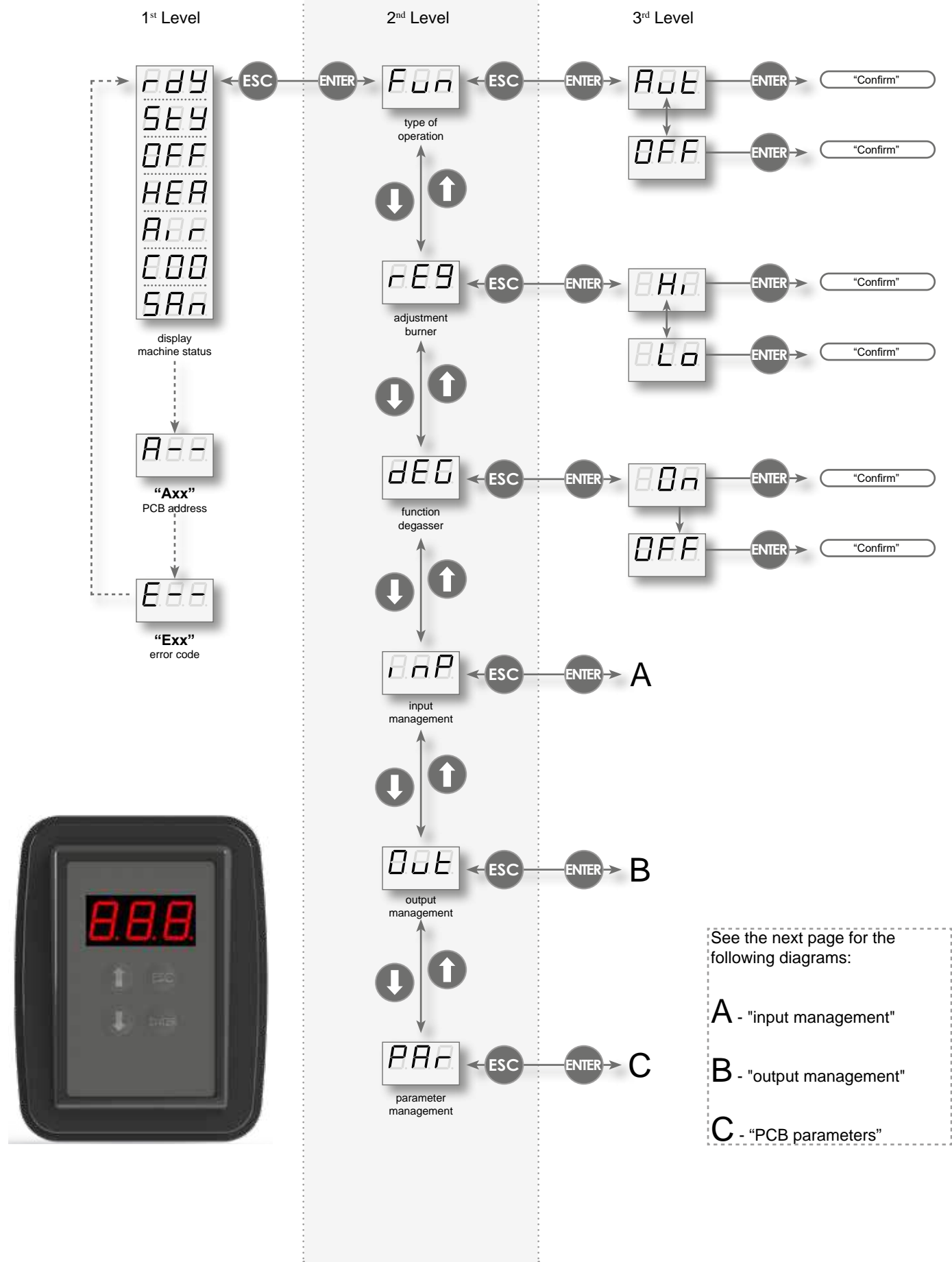
An orange LED is present on board the CPU PCB, indicating the opening of the gas valve and/or the presence of flame.



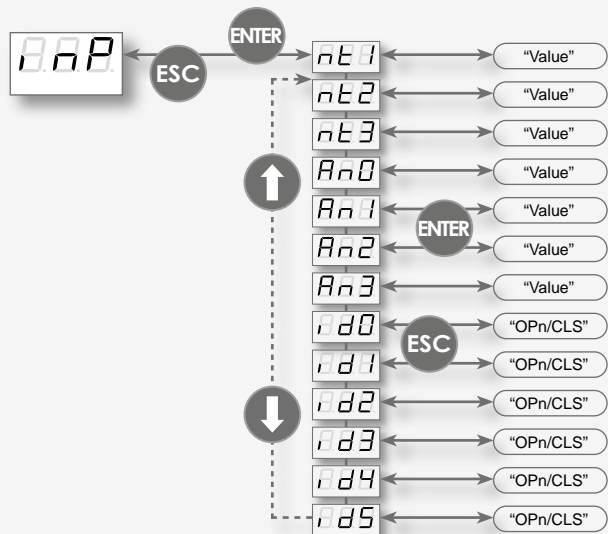
Switch for CPU PCB
address

Flame indication LED

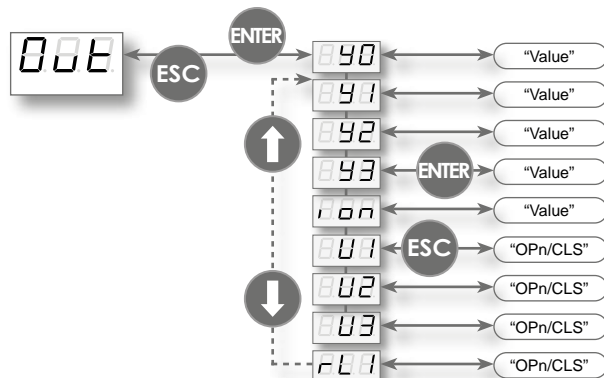
Navigation map of LCD display menu - CPU G26800



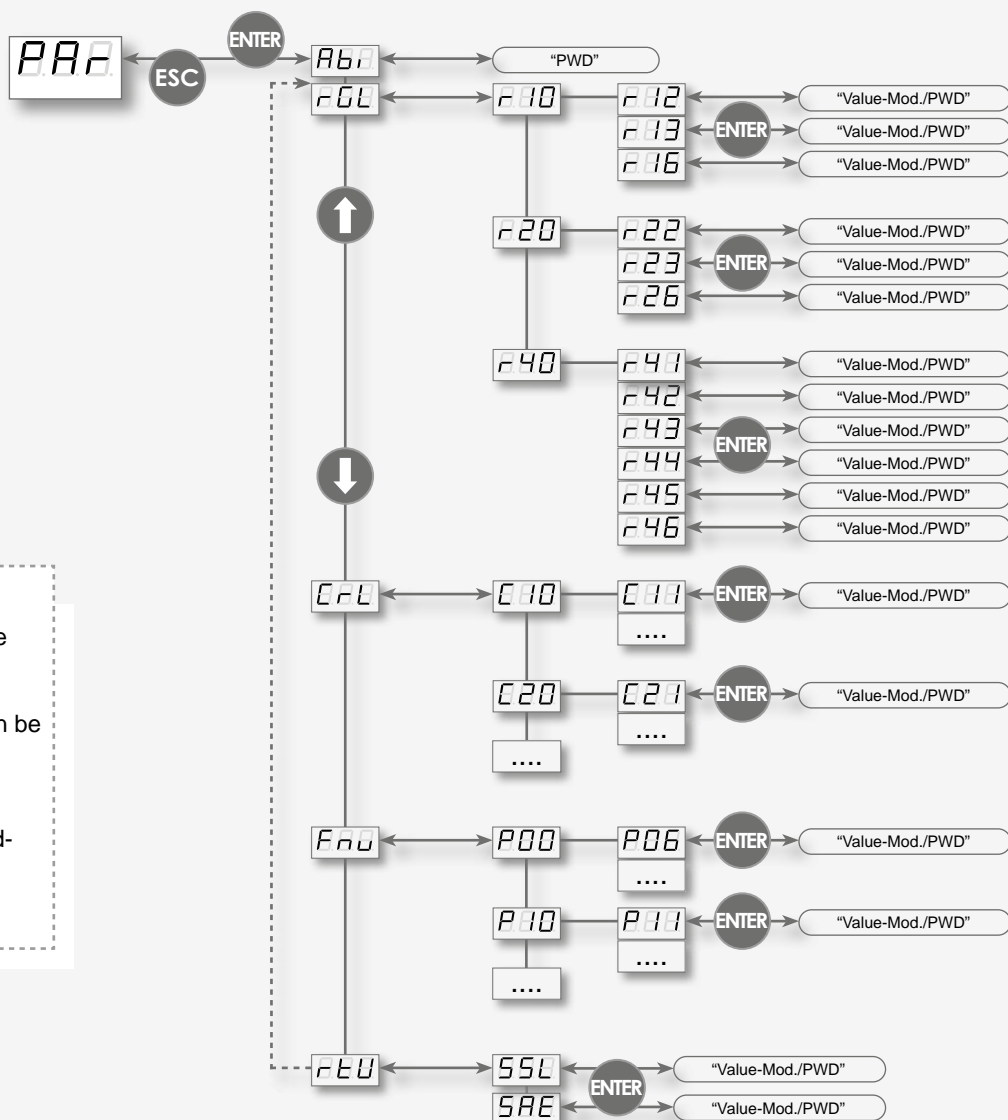
A - "input management"



B - "output management"



C - "PCB parameters"



Key:

"Value" = value which cannot be modified, read-only value


"Value-Mod." = Value which can be modified, write value

"Value-Mod./PWD" = Editable value, value in writing. Password-protected

"PWD" = Enter Password

5. INSTALLATION INSTRUCTIONS

Instructions for installing and setting the boiler are intended for suitably qualified personnel only. Please read the safety warnings.

 The installer must instruct the user about the use of the machine and inform him/her about the presence, in this manual, of a chapter fully intended for the final user.

5.1. General Installation Instructions (ITALY)

The boiler installation must be carried out in compliance with the current regulations concerning design, installation and maintenance of thermal systems.

Reference standards:

- Ministerial Decree of 8/11/2019 replacing the Ministerial Decree of 12/04/1996, containing the fire prevention rules for design, construction and operation of thermal systems fired with gaseous fuels;
- Presidential Decree no.412/93 which regulates design, installation, operation and maintenance of thermal systems;
- Law no.10/91: rules for implementing the national energy plan in the field of the rational use of energy, energy savings and the development of renewable energy sources;
- Standard UNI-CIG 7129 regarding the installation of natural gas equipment;
- Standard UNI-CIG 7131 and UNI-CIG 11528 regulating the installation of LPG equipment;
- Law 186 of 01 March 1986 regarding the installation of electrical systems;
- Legislative Decree no. 192/05 of 19/08/05;
- Ministerial Decree no. 37 of 22/01/2008; and subsequent amendments and/or integrations.

5.2. Transport and Handling

The boiler and the internal units are packaged individually inside cardboard boxes.


Unload the equipment 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 its weight.

If the thermal unit is stored at the customer's premises, make sure a suitable place is selected, sheltered from rain and from excessive humidity, for the shortest possible time.

Any lifting and transport operations must be carried out by skilled staff, adequately trained and informed on the working procedures and safety regulations.

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 damage occurred during transport, handling, unloading, etc.**

5.3. Accessories for installation

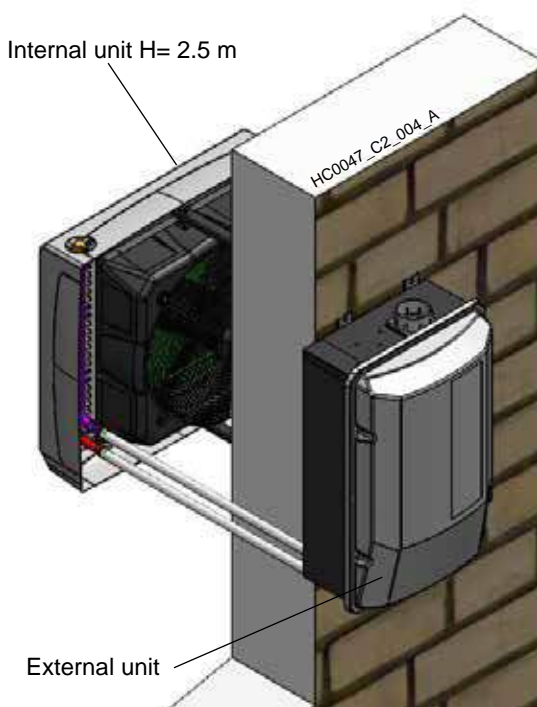
The supply of the equipment includes:

AKN boilers:

- no. 1 paper template to position the external module;
- no. 2 flexible hoses for every single boiler (G1" for AKN050/070, G3/4" for AKN032/034), length 0.5 metres, with relevant gaskets;
- no. 1 fume outlet casting Ø80 made of aluminium, complete with fume extraction intake;
- no. 1 gas tap (G3/4") complete with copper pipe and gaskets to connect it to the gas valve.

AKN100 boilers:

- no. 1 paper template to position the external module;
- no. 2 G1 taps 1/2";
- no. 1 gas tap (G3/4") complete with copper pipe and gaskets to connect it to the gas valve.



5.4. Boiler and fan heater installation

The boiler can be installed:

- **INDOOR:**
 - in a dedicated heating plant
 - inside the served environment
- **OUTDOOR:**
 - in an unprotected outdoor location
 - in a partially protected location (recommended).

In the typical installation the external and internal units are virtually linked to each other in terms of position and height from the ground.

The optimal installation height for the internal unit is about 2.5 m above ground.

A too high installation level would cause excessive upward stratification of the hot air exiting the fan unit; on the other hand, at an insufficient installation height the hot air would directly reach the people below.



We suggest installing the boiler at a height not exceeding the one of the fan heater so as to avoid air vent problems in the water circuit.



Thoroughly vent the air in case of boiler installation higher than the fan heater (see dEg function in Sections 4.2.4 and 4.1.5).



Do not place flammable material on the ground within a radius of 4 m of the installed boiler.

5.4.1. Boiler installation procedure

- Fix the template supplied to the wall and level it; make two holes to fix the boiler to the wall and a through hole for the internal unit connections.
- To hang the boiler, apply rawplugs with M8 external screws (M10 for AKN100).



Make sure that the type of plug (not supplied) is suitable for the type of wall and sufficient to support the weight of the boiler.

- Hang the boiler and secure it using star washers.
- For AKN032, AKN034, AKN050 and AKN070, connect the flexible hoses supplied with the equipment to the boiler delivery and return connections, inserting the corresponding gaskets and preventing foreign bodies from entering. The flexible hoses supplied with the equipment allow a maximum distance of 1 metre between the boiler connections and the internal unit connections.



It is compulsory to install a Y-shaped filter (installed on the return pipe from the system) with a metal mesh of no more than 1 mm on the water inlet to the boiler, to prevent the boiler heat exchanger from clogging.

To connect the boiler and the internal unit to the rigid pipe, use the flexible hoses L=0.5m supplied with the equipment both with fan heater and boiler (for AKN032, AKN034, AKN050 and AKN070 only). In case of greater lengths than those of the supplied hoses, rigid pipes having a suitable diameter are required.

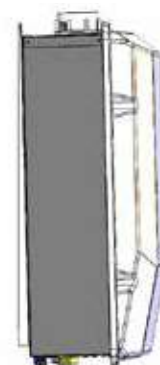
Technical data chapter contains the flow rate/head graphs available for the boiler and the fan heaters.

If the fan heater was installed at a distance from the boiler greater than the one possible with flexible hoses (1m) the piping must be sized according to the a.m. data in the drawings. Sections 3.2.4 to 3.2.9 provide information for an indicative dimensioning.



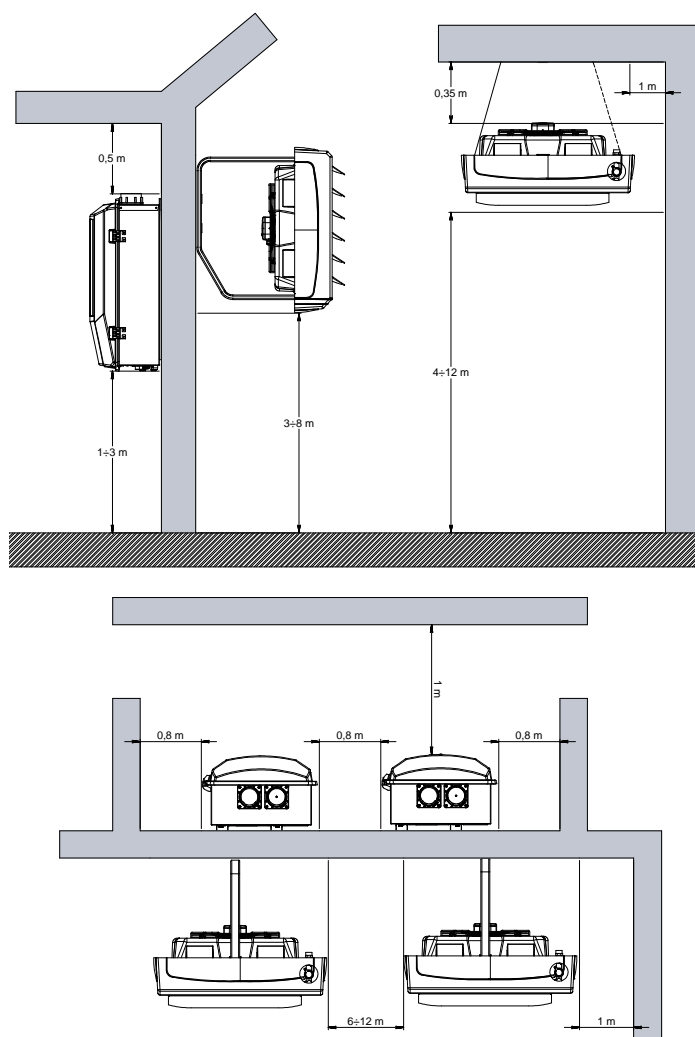
At the end of the installation, visually make sure that the boiler is slanted backwards in order to facilitate the flow of condensate and rainwater coming from the fume exhaust. Alternatively, insert a shim between the lower part of the boiler and the wall to increase the slope.

In addition to the standard application there can also be installations in which the boiler may be below the battery level and above the roof.




The installation of the fan heater is allowed in horizontal position with roof-mounting and vertical air blow; for this application it is **forbidden** to use the bracket supplied with the equipment, therefore another type of mounting, not provided by APEN GROUP, is necessary. In addition a suitable and safe fan heater air vent must be provided so as to replace the one already present on the equipment.

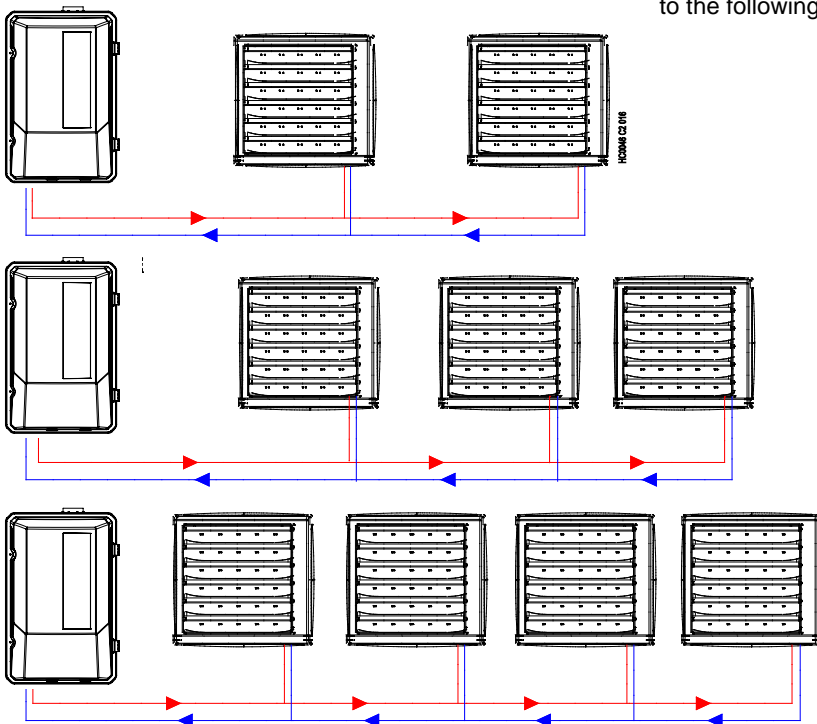
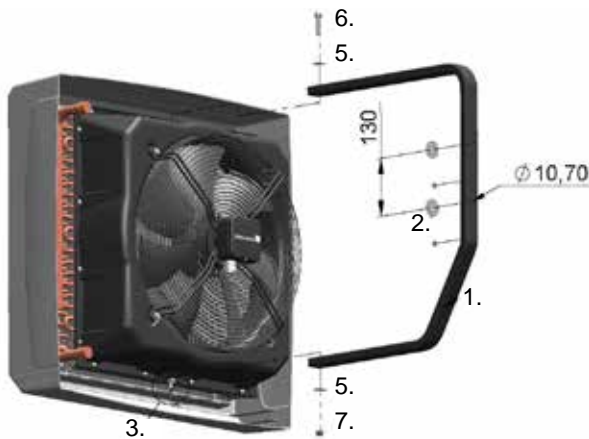
Minimum distances to be observed



AKN CONDENSING BOILER

5.4.2. Fan heater installation procedure

1. Make two holes, centre distance 130 mm, on the wall where the fan heater must be fixed.
2. To fix the shelf (1) use dowels suitable for the type of wall with maximum screw diameter of M10.
 **Make sure that the type of dowel (not supplied with the equipment) is suitable for the type of wall and sufficient to support the weight of the fan heater.**
3. Fix the shelf to the wall making sure that it is vertically aligned. During fixing, insert the two washers Ø40 (2) supplied with the fan heater
4. Screw the stud ØM8 (3) in the nut screw placed in the lower wall of the fan heater.
5. Hook the unit to the shelf by inserting the stud in the lower slot of the shelf, then fix the fan heater using the screw (6).
6. Lock the stud using the nut M8 (7)
7. Some fastening washers (5) are supplied with the fan heater: it is mandatory to use such washers to lock the fan heater.



5.5. Boiler/fan heater connections

For AKN032, AKN034, AKN050 and AKN070


Connect the two flexible hoses, previously used on the boiler, to the indoor unit using the gaskets supplied with the equipment; the boiler delivery must be connected to the indoor unit input and the boiler return to the indoor unit output (see the arrows on the fan heater);

Fix the fan heater remote control to the wall, in a comfortable position for the user's handling of the controls.

For AKN100

Connect the hydraulic circuit with flexible hoses to the indoor unit using the proper gaskets; the boiler delivery must be connected to the indoor unit input and the boiler return to the indoor unit output (see the arrows on the fan heater);

Fix the fan heater remote control to the wall, in a comfortable position for the user's handling of the controls.

 AX-EC fan heaters are not supplied with hoses, which must be supplied separately.

The AX-EC fan heaters are not equipped with a remote control, but can be connected directly to the boiler with a 0-10 Vdc connection or controlled with the G24200 or G24500 panels to be purchased separately.

5.6. Special installations

5.6.1. Fan heater remote connection

If the fan heater is installed at a distance greater than the one possible with the flexible hoses supplied with the equipment (0.5+0.5m), the piping must be sized according to the data indicated in Sections 3.2.4 - 3.2.9 based on the distance between boiler and fan heater.

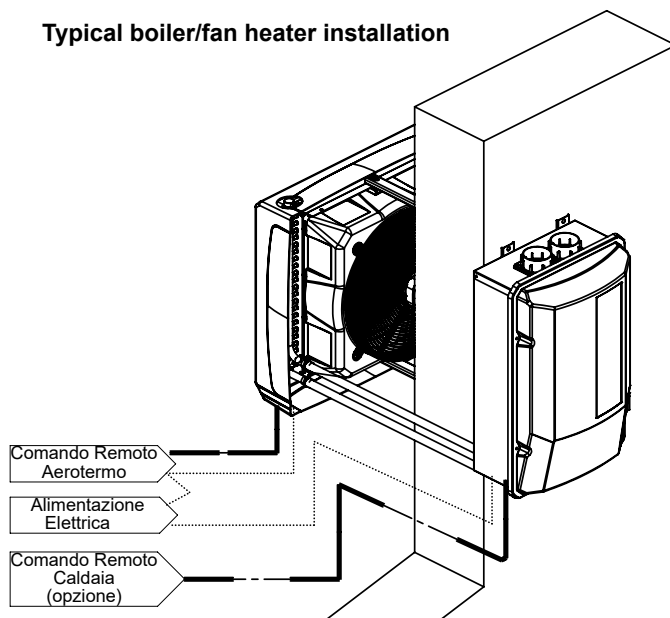
5.6.2. Connection of more than one fan heater

It is possible to connect to the boiler several fan heaters according to the following combinations:

AKN/AB and AKN/AX-EC COMBINATION		
AKN	AB	AX-EC
032	n.1 AB032	n.1 AX040EC
	n.2 AB018	n.2 AX030EC
034	n.1 AB034	n.1 AX050EC
	n.2 AB018	n.2 AX030EC
050	n.1 AB050	n.1 AX070EC
	n.2 AB032	n.2 AX040EC
	n.3 AB018	n.3 AX030EC
070	n.1 AB070	n.1 AX090EC
	n.2 AB034	n.2 AX050EC
	n.2 AB018	n.2 AX030EC
	n.1 AB034	n.1 AX050EC
100	n.4 AB018	n.4 AX030EC
	n.2 AB050	n.2 AX070EC
	n.3 AB034	n.3 AX050EC
	n.5 AB018	n.5 AX030EC

The installation of more small-size fan heaters is also possible; we suggest installing balancing valves on the piping for adjusting the fluid flow in the related fan heaters in a more balanced manner.

Typical boiler/fan heater installation



5.6.3. Ambient temperature adjustment

We can discriminate between two different types of installation and, therefore, ambient temperature adjustment:

- boiler with fan heaters installed in a single room;
- boiler with fan heaters installed in different rooms.

Temperature control

The heat output value sent to the burner is calculated from the percentage heat output associated with one or more activated settings. The burner operates at the lowest input of the set settings.

Installation in a single room

To heat a single room with more than one fan heater connected to only one boiler, only one Smart X regulator or ambient thermostat controlling boiler start-up is required.

When hot water reaches the fan heaters, they will start operating autonomously when the incoming water rises to 42°C. Similarly, when the boiler is switched off and colder water reaches the fan heaters, they will stop their operation. This is true for one or more than one fan heater connected to the boiler.

Smart X allows to manage up to 15 boilers, provided that they are located in a single zone: ambient temperature and start-up times are the same for all the boilers.

Installation in different rooms

In this case, the temperature regulator allows to either control only the fan heater ventilation or to divide the hydraulic system into several zones.

If you only want to control the ventilation of the fan heater:

- install an ambient thermostat, or chronothermostat in each room;
- use the ambient thermostat contact to control the relay coil with two free contacts;
- use a relay contact to power the fan heater;
- use the other relay contact, in parallel to the other contacts of other relays, to close the boiler ID0/GND terminals; this allows the boiler to start when a thermostat sends the heat demand. Water circulates inside all the fan heaters, partially heating also the rooms that are not involved. When all the thermostats are set to OFF, the boiler is off too;

If it is necessary to divide the hydraulic system into several zones:

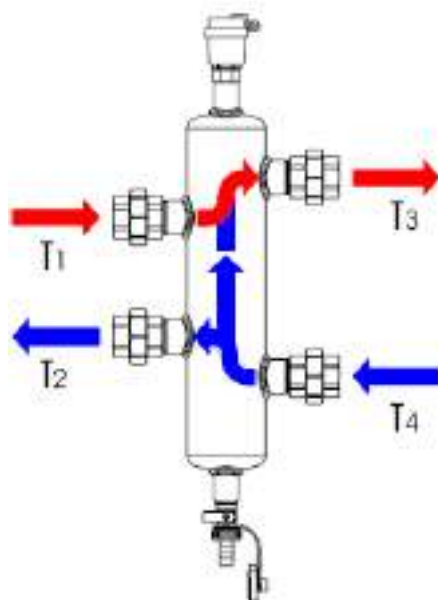
- install a zone valve and an ambient thermostat or chronothermostat for each room;
- use the zone valve limit switch, in parallel to the other zone valve contacts, to close the boiler ID0/GND terminals.

In this case, when a zone is closed, the boiler starts and water circulates only in the fan heater of the zone involved. When all the zones are open, the boiler is off.

In both cases, the boiler may be connected to Smart X paying attention not to activate the ambient thermostat function; it is therefore necessary to set the required temperature to a value that does not interfere with the other thermostats, e.g. 35°C.

If the boiler available head is not sufficient for the hydraulic system circuit, supply the system with another circulator compatible with the boiler circulator flow rate.

To install another circulator, the boiler and the circulator must be divided by a hydraulic separator between primary circuit [T1 and T2 boiler] and secondary circuit [T3 and T4 device].



AKN CONDENSING BOILER

5.7. Electrical Connections

5.7.1. Boiler power supply

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

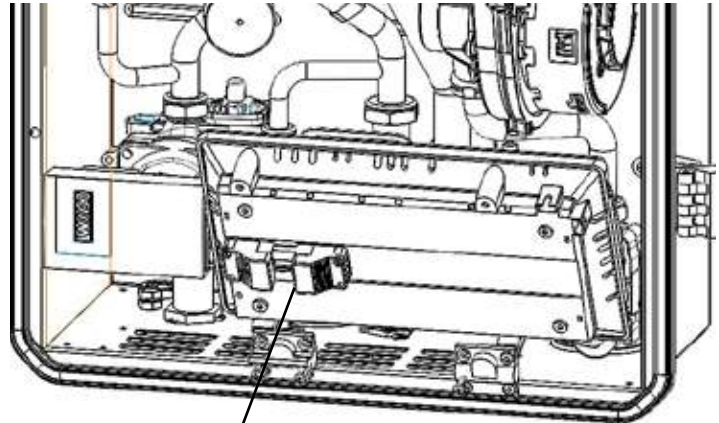
Single phase 230 Vac power supply with neutral; do not swap the neutral with the live wire. For safety reasons, if the live and neutral wires are swapped, the flame control prevents operation reaching E10.

The boiler 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 consumption (see technical features table).

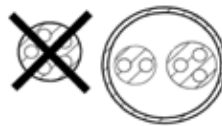
Keep electric cables away from heat sources.

IT IS compulsory to fit, upstream of the boiler, a multipole isolator fitted with a suitable electric protection element. Using a multipole cable carrying both the power supply and the control cables (different voltages) IS prohibited; furthermore, this could cause electromagnetic interference on the heater PCB.



Power supply plug

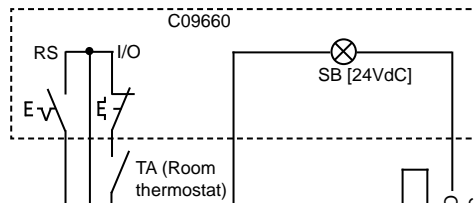
HG109 C2 021



Control panel fitted with clutch hinges. Loosen the screw to move the panel.

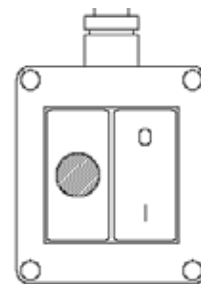
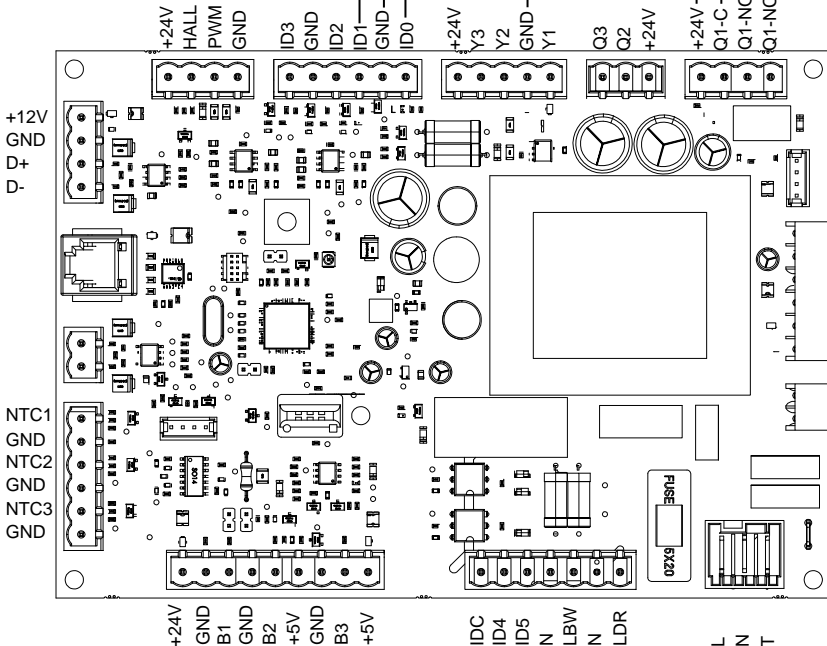
Cable section: live, neutral and ground: 1.0 mm².

5.7.2. Connecting the ambient thermostat and the C09660 remote control



SB Lockout indicator light
RS Reset button
I/O ON-OFF switch
TA Room thermostat [to be fitted by the installer]

Cable section: contact and light 0.5 mm



The boiler must be compulsorily connected to an ambient thermostat; the C09660 remote control should at least be connected to allow the customer to remotely reset.

Connect the TA ambient thermostat to the ID0/GND terminals of the boiler PCB. If used with the C09660 remote control, connect it according to the diagram above.

The thermostat, switch and lamp contacts are supplied by low voltage.


The thermostat contact must have zero voltage.

Should the installer decide to fit a lockout warning light, its power supply must be 24VDC and its maximum power input must be < 25 mA.

5.7.3. Smart X remote control connection

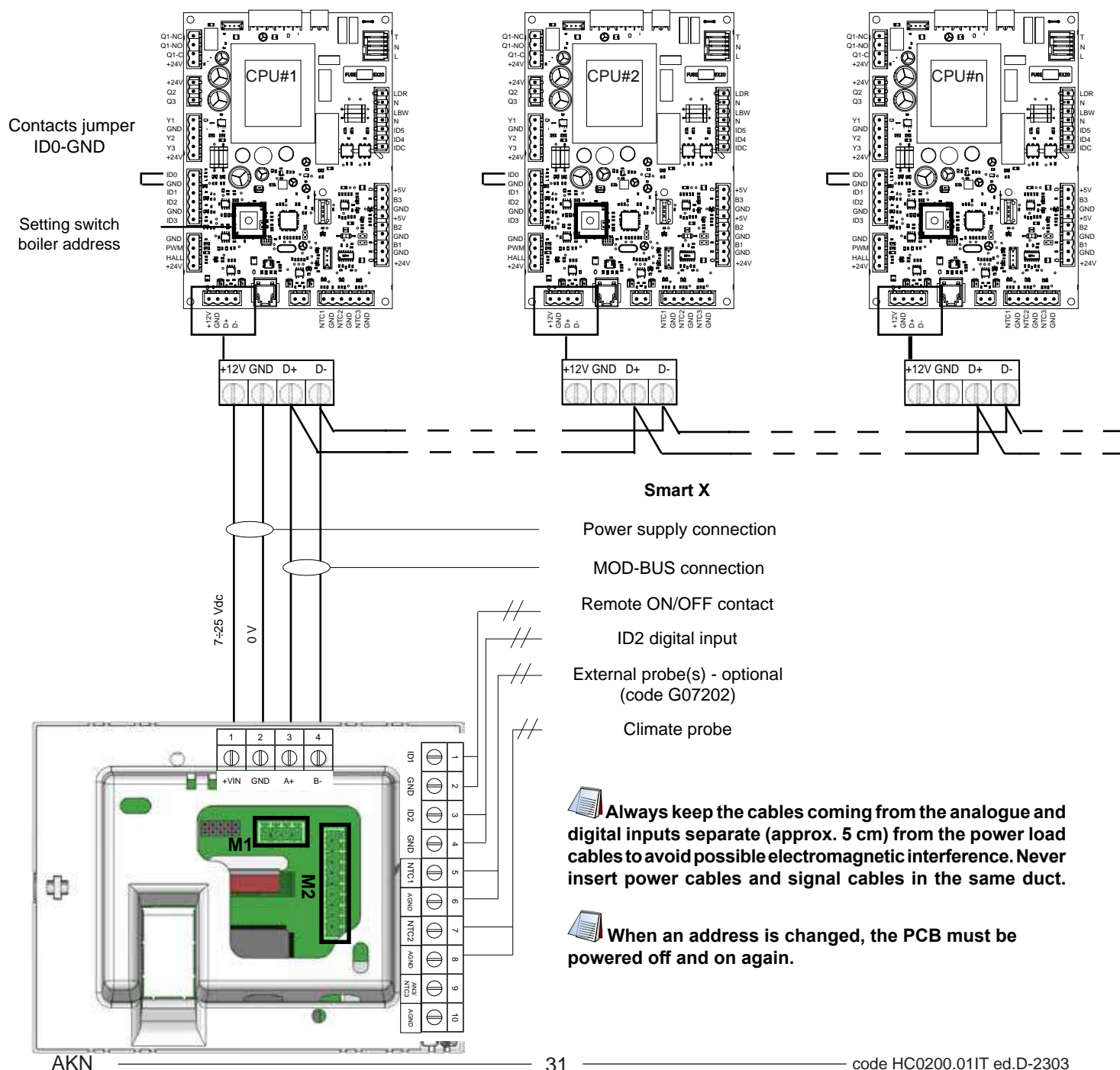
Use the connector provided to connect the Smart X. Connect the power supply, making sure polarity is correct. Connect the Modbus RS485 network to its terminals, making sure polarity is correct.

In case of several boilers, the remote control must be electrically connected to a single boiler and the D+ and D- terminals must be connected making sure polarity is correct; the network can be made both as a serial and star network.

 For multiple boiler cascading management with manifold in a single zone, it is necessary to connect a single Smart X remote control.

Use a twisted cable of the AWG20/22 type with a cross-section between 0.25 and 1.5 mm².

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



5.7.4. AB fan heater electric connection

The electrical system, and more specifically the cable section, must be suitable for the equipment maximum power consumption (see technical features table).

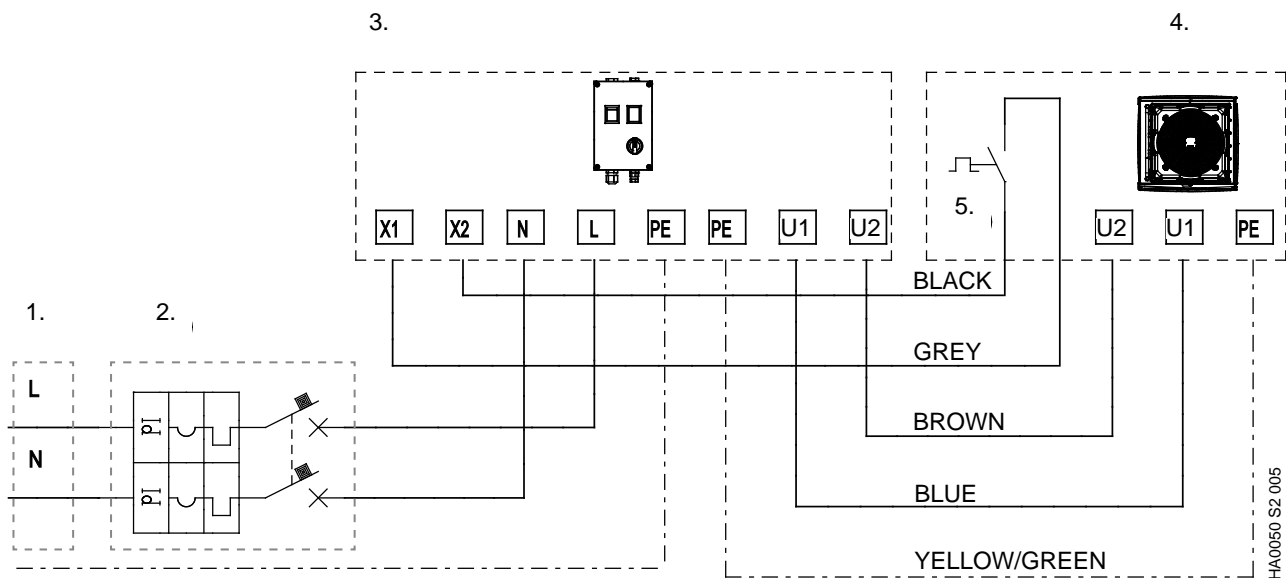
Keep electric cables away from heat sources.



It is compulsory to fit, upstream of the fan heater, a multipole isolator fitted with a suitable electric protection element.

Fan heater connection:

Carry out the connections according to the diagram below.



Key

1. Power supply 230V-50Hz;
2. Main switch with fuse;
3. Fan speed control;
4. Fan heater (fan heaters AB050/070 have no.2 fans connected in parallel);
5. Water thermostat (on the fan heater).

5-Speed regulator technical features

Power supply 230V ac $\pm 10\%$ 50/60Hz;
 5-speed adjusting switch;
 Output voltage 115/135/155/180/230V;
 IP54 protection class;
 Thermal protection;
 Operating temperature up to 40°C;
 Wall-mounting.



Do not connect more than one fan heater to the regulator. Each fan heater must have its own regulator connected.

Cable cross-section: power cables must have a minimum cross-section of 3x1.5 mm².

HC0047 IM 005



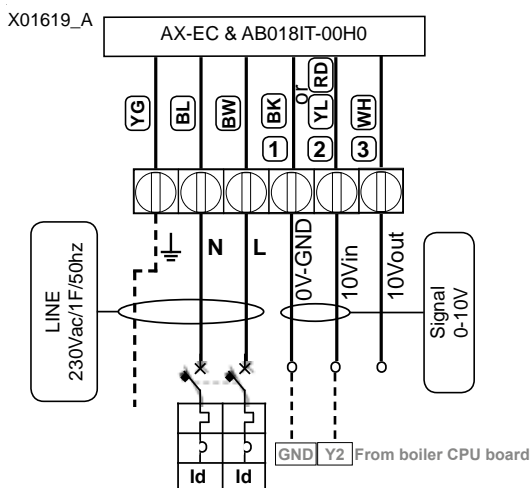
5.7.5. AX-EC electronic fan heater electric connection

AX-EC electronic fan heaters require a single-phase 230 Vac power supply.

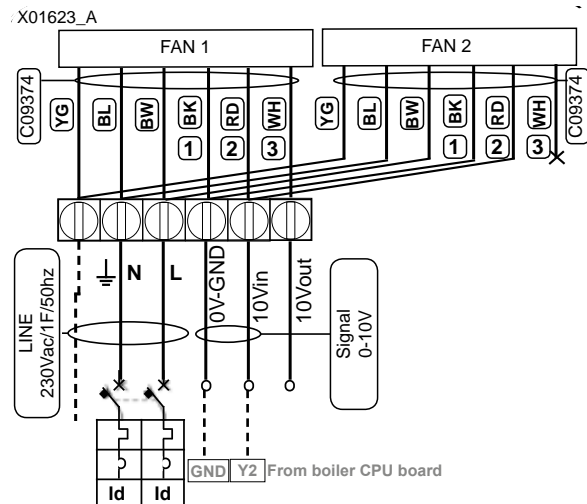
The electric system, and in particular the cable cross-section, must be suitable for the maximum power absorbed by the equipment (refer to the technical data in the dedicated manual, code HA0055.00W).

Keep electric cables away from heat sources.

AX020EC-AX050EC



AX070EC-AX090EC



Cable section: live, neutral and ground: 1.0mm².

It is compulsory to fit, upstream of the fan heater, a multipole isolator fitted with a suitable electric protection element.

The AX-EC fan heaters must be connected directly to the boiler with a 0-10 Vdc connection to terminals Y2-GND.

The CPU PCB is pre-set at the factory for operation (FUNC_03 preset for operation with electronic fan heaters with a value of 3). If the user wishes to change the fan variation speed according to the delivery temperature, the parameters P37 (TIN3) and P38 (TFN3) of FUNC_03 must be changed. The analogue output (0-10 Vdc signal) sent to the fan heaters will have a maximum value when the temperature of the reference input is ING3A ≥ TFN3 (10Vdc).

Y=0 (OFF) with ING3A < TIN3-2°C.

The Y output is activated with ING3A > TIN3.

Parameter ING3A defines the temperature probe used to calculate the analogue output. For boilers it is NTC1, the same probe used for temperature control.

5.7.6. Special installations

Fan heater remote connection

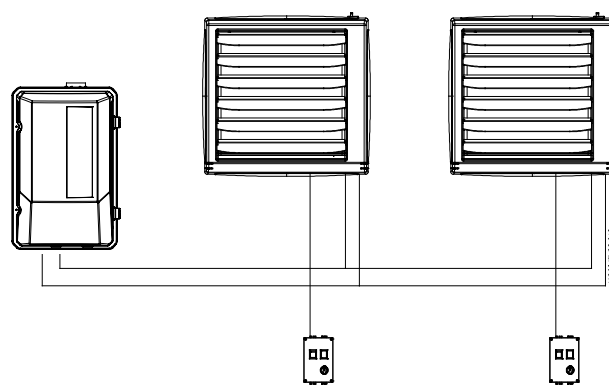
If the fan heater is installed at a distance greater than the one possible with the flexible hoses supplied with the equipment (0.5+0.5 m), the piping must be sized according to the data indicated in Sections 3.2.4 - 3.2.9 based on the distance between boiler and fan heater.

Connection of more than one fan heater

The boiler may be used in combination with two or more fan heaters.

The figure below shows an installation with two fan heaters in the same room for a better heat distribution.

We suggest installing hydraulic balancing valves on the fan heater water infeed lines for regulating the water flow rate on each fan heater.



5.8. GAS Connections

ONLY FOR ITALY: According to the current standards UNI-CIG, carry out the line for gas supply; for gas line connections, use CE certified components only.

AKN boilers are supplied with:

- Dual gas valve;
- Gas stabiliser;
- Gas tap;

All components, except for the tap, are fitted inside the boiler;

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

- Anti-vibration joint;
- Gas filter [without stabiliser].

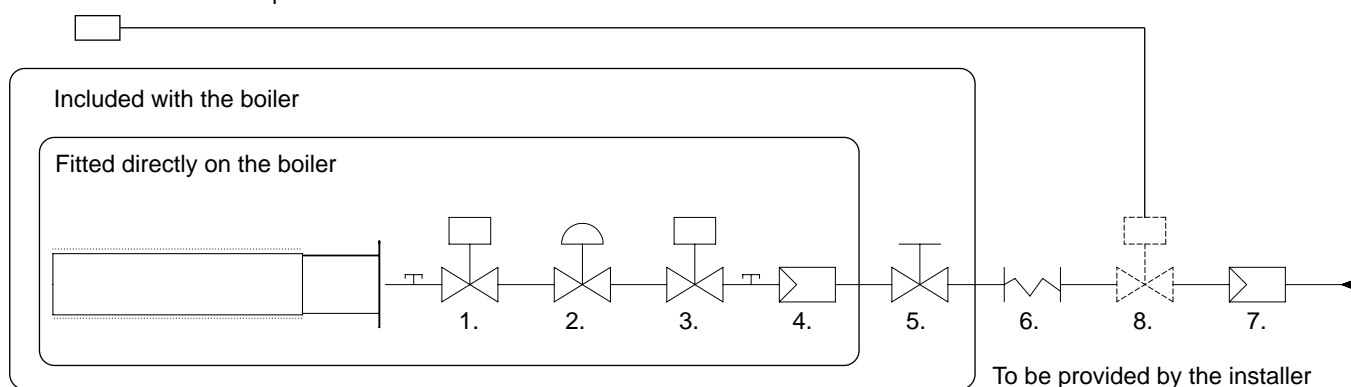


Avoid using threaded connections directly on the gas connection of the equipment.

Installation diagram

AKN050/070/100

Fuel cut-off valve - optional



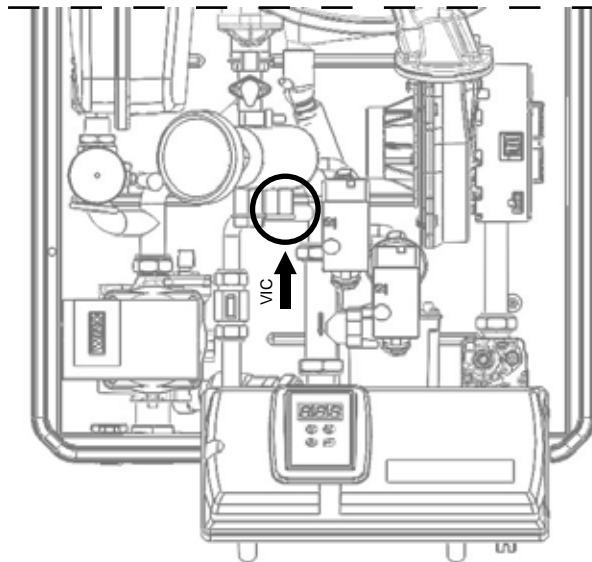
Key

1. Main burner gas solenoid valve
2. Pressure stabiliser
3. Safety gas solenoid valve
4. Gas filter - (with small section, installed in the gas valve)
5. Gas tap (supplied by APEN GROUP)
6. Vibration damping joint
7. Gas filter
8. Fuel cut-off valve - optional code **C09073** for AKN050/070 and code **C09464** for AKN100

ONLY FOR ITALY: Ministerial Decree 1-12-75 and the corresponding technical specifications ["R" collection ed. 2009] require, for boilers having burner heat output greater than 35 kW, the installation of the fuel cut-off valve with manual reset. Apen Group supplies boilers with the well to insert the sensitive component and, on request, with C09073 kit size 3/4" for AKN050/070 and C09464 kit size 1" for AKN070/100. The choice of fuel cut-off valve must be made on the basis of the fuel used and its flow rate and heat loss diagrams.



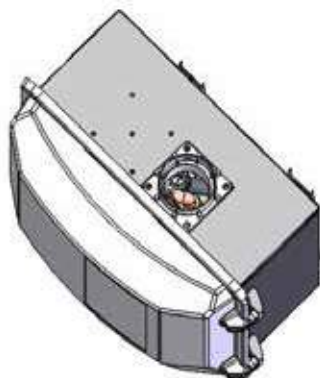
The antifreeze function of the CPU PCB (parameter CTRL_02=1) that prevents the triggering of the element sensitive to the temperatures below zero degrees is already activated by default.



5.9. Connections to the Flue

AKN boilers are supplied with an aluminium flue outlet casting with a special flue gas analysis socket and a special gasket to protect the components inside the boiler.

The combustion air is drawn in through a series of holes in the casing.



To make the fume exhaust, taking into account that AKN boilers can condense, the following must be used:

- Double wall flue duct with internal stainless steel pipe, air gap insulated with air or insulating material and external stainless steel pipe.
- Double wall flue duct with internal PP pipe, air gap insulated with air or insulating material and external stainless steel pipe.
- Single wall stainless steel flue pipe.

Use pipes equipped with the sealing gasket (suitable to withstand fume temperature) to prevent fumes from exiting the pipes.

UNIT SET FOR G20 [NATURAL GAS]			
Model	Temperature of fumes [°C]	Content of CO ₂	Flue gas flow rate [kg/h]
032	75	9.1	51.1
034	67	9.1	57.3
050	67	9.1	82.2
070	67	9.1	114.7
100	65	9.1	159.2

UNIT SET FOR G31 [LPG]			
Model	Temperature of fumes [°C]	Content of CO ₂	Flue gas flow rate [kg/h]
032	75	9.8	39.8
034	68	9.8	44.7
050	67	9.9	63.8
070	67	9.8	89.4
100	65	9.8	124.1

The boiler is provided with a thermal fuse on flue gas outlet protecting the flue and with a thermal fuse on the exchanger.

The boiler can discharge directly on the wall only if it is installed in place of another one equipped with exhaust on the wall. In the case of exhaust on the wall, it is possible to make the duct with stainless steel pipes, taking care to:

- create the correct slope of the pipes in order to allow the condensate to flow inside the boiler;
- install the terminal at a suitable distance from the boiler casing to prevent the condensate generated on the terminal from dripping on the casing itself.

New systems require exhaust on the roof.

CERTIFIED pipes and terminals must be used.

For "C"-TYPE installations

The boiler is C63 certified; therefore, accessories compliant with current regulations must be used to manufacture the customer's intake and exhaust ducts.

For this type of installation, refer to Section 5.9.1.

Selection Guide

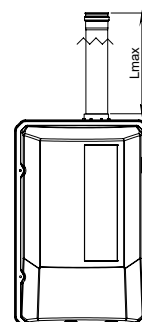
The table below shows the pressure drops for the most used terminals and exhaust ducting.

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

After establishing the routing, the pressure drop must be calculated for each component by referring to the tables below according to the boiler used; each component has a different pressure drop value as the fume flow rate is different.

Add together the pressure drops of the single components, checking that the result is not higher than the available value for the heater to be used. If a combustion air supply pipe is fitted, the pressure drops must be added to the fume exhaust pressure drops.

If the sum of the pressure drops is higher than the available pressure, ducting with higher diameter must be used, rechecking the calculation; a pressure drop higher than the pressure available at the flue gas exhaust reduces the heater heat output and could trigger the flue gas pressure switch.

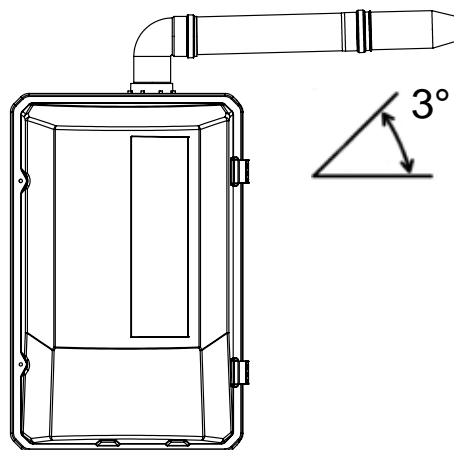


AKN: Component pressure losses [Pa]					
AKN models	032	034	050	070	100
Pressure available at the exhaust	120	120	100	150	90
Component					
SMOOTH Ø80 PIPE [l=1 m]	2.1	2.1	4.9	7.3	17.5
BEND Ø80 WIDE RADIUS 90°	3.4	3.5	7.9	11.9	28.4
BEND Ø80 WIDE RADIUS 45°	1.7	1.7	3.9	5.9	14.1
Ø80 ROOF-MOUNTED TERMINAL, WINDPROOF EXHAUST ONLY	0.1	0.2	0.8	1.4	4.4
Ø80 HORIZ. UPTAKE ONLY	2.6	2.6	4.6	6.4	13.8
SMOOTH Ø100 PIPE [l=1 m]	0.6	0.6	1.3	2.0	4.7
BEND Ø100 WIDE RADIUS 90°	1.3	1.4	3.1	4.6	11.1
BEND Ø100 WIDE RADIUS 45°	0.6	0.6	1.4	2.0	4.8
Ø100 ROOF-MOUNTED TERMINAL, WINDPROOF EXHAUST ONLY	0.3	0.3	1.2	2.0	5.9
Ø100 HORIZ. UPTAKE ONLY	1.5	1.5	2.0	2.4	4.3
ADAPTOR Ø80/100	0.7	0.8	1.7	2.6	6.2
ADAPTOR Ø100/80	0.7	0.8	1.7	2.6	6.2

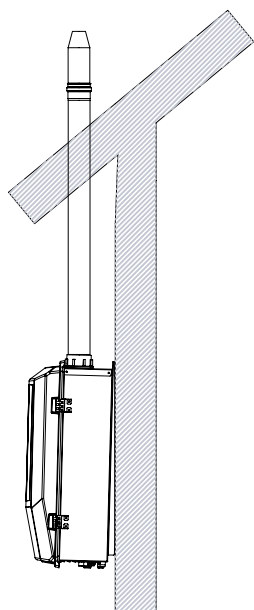
Tips for the installation



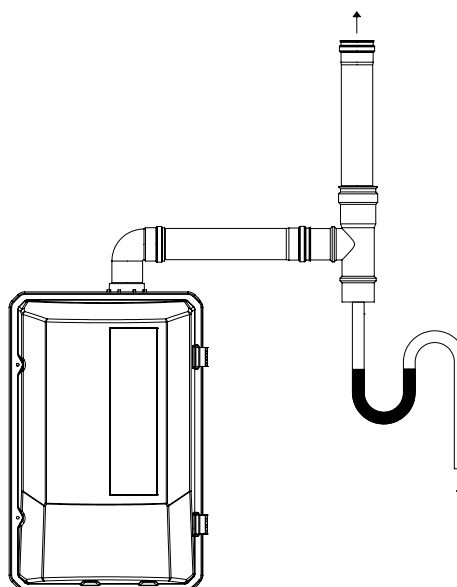
It is advisable to use the exhaust on the roof or on the wall (which can be used for simple replacements of existing equipment), moving the outlet terminal away from the boiler and keeping the horizontal section of the flue duct with a minimum slope of 3° to guarantee the correct flow and discharge of the condensation through the boiler. This prevents the condensate from dripping on the boiler.



Direct exhaust on the roof is only recommended for vertical straight sections of flue outlets that are **less than 3 m long** and for double-walled flue ducts.



If the vertical straight section of the flue outlet is longer than 3 m, it will be necessary to offset the outlet, moving it outside the external profile of the boiler, inserting a "T"-shaped element to facilitate the condensate flow, in suitable pipes, as you can see in the image.



Recommended maximum equivalent lengths

The table shows the maximum equivalent lengths for the installation of AKN boilers.

The maximum exhaust length is obtained by adding the measurement of the linear pipe to the equivalent length of each additional bend/connection.

MAXIMUM EQUIVALENT LENGTH FOR FLUE OUTLET [m]		
AKN	Ø80	Ø100
032	25	-
034	25	-
050	15	25
070	12	25
100	-	8

Elements of the flue pipe

All components for metal ducts 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	O(50)
0694-CPR-52977	1856-1	T200	P1	W	V2	L50050	O(70)

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 (200-5000 Pa), 1 and 2 indicate allowed loss. 1 is the most restrictive value.

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

Corrosion resistance class:

Vm - resistance category without test, only with minimum thickness of material;

V1 or 1 - gaseous fuels, natural gas, LPG, and manufactured gas with nitrogen ≤ 50 mg/m³;

V2 or 2- liquid fuels, natural gas, LPG and manufactured gas with nitrogen > 50 mg/m³;

V3 or 3- solid fuels, natural gas, LPG and manufactured gas with nitrogen > 50 mg/m³, diesel with sulphur $> 0.2\%$.

Material and thickness:

If STAINLESS AISI316 steel 0.5 mm thick is used, category is L50050, i.e. L50=STAINLESS AISI316 steel, 050=thickness 0.4 mm.

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

LE location class indoor/outdoor.

Fire reaction class C (in compliance with EN 13501-1).

U0 protection class.

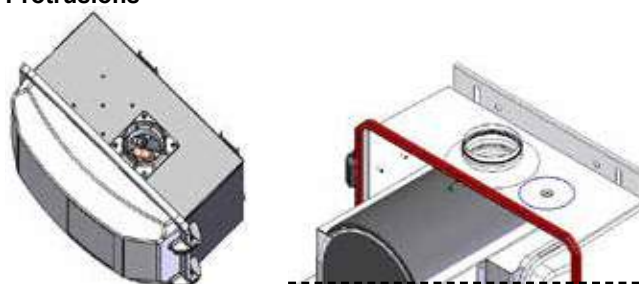
5.9.1. "C" TYPE installation

If a C type installation (sealed chamber) is required, proceed as follows:

- close the air inlet inside the boiler by means of the corresponding accessory C12033 (for AKN032, AKN034, AKN050 and AKN070) or C12035 (for AKN100);
- pierce at the protrusion
- install the air inlet terminal as required.

Ask Apen Group S.p.A. Customer Service for the documentation of the kits C12033 or C12035 or order directly the code **AKNxxxIT-0XC0** which includes the boiler with the kit already installed.

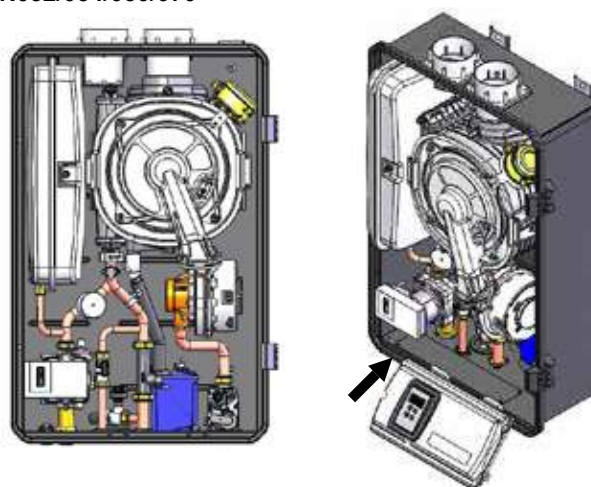
Protrusions



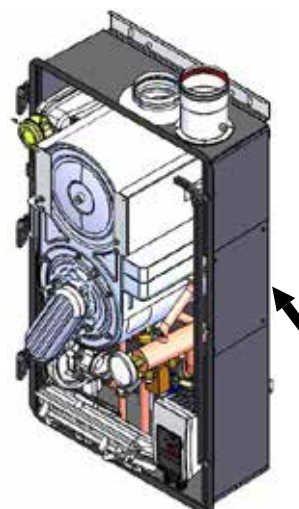
AKN032/034/050/070

AKN100

Suction terminal and closing panel AKN032/034/050/070



Suction terminal and closing panel AKN100



5.9.2. Connection to the condensate drain

AKN boilers are condensing systems and, therefore, they are equipped with a connection for pipe Ø18 for condensate drain.

Precautions

Condensation water outflow takes place at temperatures lower than or equal to 50°C. For condensate drain, use pipes made of PVC and/or all the materials suitable for use with hot pipes: stainless steel, silicone pipes, etc.

Do not use galvanised iron/steel or copper pipes.

Neutralising the condensation

The condensation produced by the combustion of natural gas has an acid pH of 3.5-3.8.

On request, Apen Group can supply the kit (cod. G14303) required to neutralise the condensation; the kit consists of:

- Plastic tank for the collection of condensation;
- Calcium carbonate.

For more information, contact Apen Group Customer Service.

Protection from frost

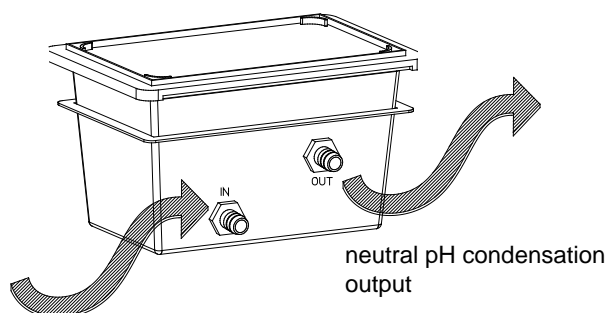
In case of outdoor installations in very cold places, with the risk of condensation freezing, we recommend to protect the condensation drain system.

We recommend that the condensation collection system is located inside heated rooms.

If the system is located outdoors, the pipe must have an open type connection to make sure that any ice formed inside the external system does not prevent the condensation from being drained away.

In any case, it is recommend that the longest pipe should be laid inside the heated room, for example by collecting the condensation flush to the floor with the down pipe located inside the room.

KIT G14903 to neutralise acid condensation



acid pH condensation input

CAUTIONS

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

- risk of condensation build-up inside the heat exchanger;
- risk of condensation water freezing in the pipes;

During normal operation, condensate must not be allowed to accumulate within the heat exchanger. An electrode fitted in the heater internal water trap checks and stops the burner from operating before the condensate reaches a potentially dangerous level inside the fume collection hood.



Additional cautions

- DO NOT use copper or galvanised iron/steel pipes to connect the condensate drain fitting;
- For the condensate drain pipe linear sections, provide for a slope of min. 1%, i.e. 1 cm for each metre (otherwise provide for a booster pump);
- Install the condensate neutralisation kit in the rooms, near the condensate drain fitting of the heater, to prevent condensate water from freezing inside the container;
- do not drain the condensate in pipes made with materials incompatible with the condensate acidity: risk of corrosion.



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

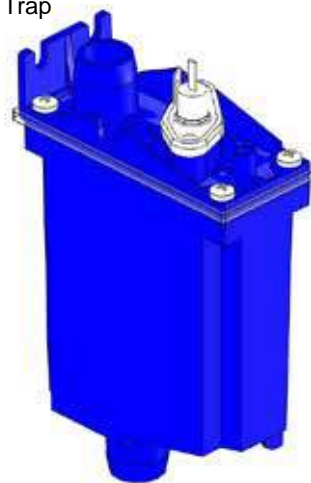
Exhaust with Sealed fume trap

The trap, code C09385.01, prevents the flue gases from coming out also when there is no water.

The trap is equipped with a detection electrode.

- To connect the trap to the condensation drain system, use PVC or silicone pipes.
- Condensation collection pipe water tightness must be guaranteed.

C09385.01 KIT Trap



5.10. Hydraulic circuit filling



AKN boiler models are not pre-filled (check the capacity of the expansion reservoir according to the water content of the system).

The type of glycol required is the same for all models: see the specifications below.

For the specifications concerning the use of glycol, please refer to Section 3.2.9.

Filling or water replenishment operations are the same for all models, as indicated below.

Filling



To identify the delivery, return and filling position, refer to Section 3.5 Boiler dimensions.

Make sure that connections between the internal and external units have been carried out correctly, respecting delivery and return direction;

- Make sure that automatic vent valves, placed on the circulator or on the boiler and on the fan heater coil(s) are open.
- Connect the filling tap, by means of a 1/2" flexible hose, to a pump for system test with reservoir filled with water and glycol. Load the mix until a pressure of approx. 2 bar is reached.
- Vent the pipe;
- When venting operation is over check, through the display, that the pressure inside the circuit is greater than 1 bar; lower values will cause an E80 or E25 (for AKN050/070/100) because of the activation of minimum water pressure sensor [calibration 0.6 bar].



It is compulsory to perform an adequate air bleed inside the hydraulic circuit, especially if the boiler is installed higher with respect to the corresponding fan heater. See dEg menu in Section 4.2.5.

Water-glycol mix restoration

In the event of water leakage and/or need to refill the hydraulic circuit, after having detected and solved any leakages, it is necessary to restore water-glycol mix by following the instructions described in the previous Section.

Glycol

For its AKN boilers, APEN GROUP tested and recommends to use **ALPHI 11** glycol by Fernox or **X500** glycol by Sentinel; the following KITS contain ALPHI 11 packs by Fernox with different capacity:

code	capacity
C07200-05	5 litres
C07200-25	25 litres



OTHER TYPES OF GLYCOL, DIFFERENT FROM THE RECOMMENDED ONE, INVALIDATE THE PRODUCT WARRANTY.



The indicated glycol percentages refer to the parts contained in the mix (water/glycol) and not in addition to water, e.g.: a 10-litre mix with 30% glycol is composed of 7 litres of water (70%) and 3 litres of glycol (30%).



Glycol percentages and limit temperatures indicated in Section 3.2.9 have information purposes; we remind that the boiler is certified for use with external temperatures up to, and not exceeding, -15°C.

Expansion reservoir

- The reservoir pre-charge must be equal to the system's filling value;
- Before refilling the circuit check the expansion reservoir pre-charge pressure.

5.11. Precautions for use

AKN boiler heat exchanger must be used in the following conditions:

- The fuel used must have a sulphur content according to the European standard, namely: maximum peak, for short periods, 150 mg/m³, annual average lower than 30 mg/m³;
- Combustion air must not contain chlorine, ammonia or alkalis, sulphur powder, sulphides; installation near swimming pools or laundries exposes the boiler to the effects of such agents;
- Water hardness, TA, must be within 5°F and 15°F;
- During the first start-up, the air in the hydraulic system must be accurately removed; subsequently, do not close the automatic vent valves installed as standard on the boiler;
- The use of inhibitors to prevent the exchanger steel oxidation is absolutely necessary. The antifreeze recommended by APEN, ALPHI 11 glycol by FERNOX (or X500 by Sentinel), serves as inhibitor and preserves the exchanger from oxidation.

6. SERVICING INSTRUCTIONS

The first start-up must be carried out only by authorised service centres.

The first start-up also includes a combustion analysis, which is compulsory.

The equipment is certified in the EC and non-EC countries, according to the gas categories shown below.

6.1. Country Table - Gas Category

Country	Category	Gas	Pressure	Gas	Pressure
AT	II2H3B/P	G20	20 mbar	G30/G31	50 mbar
BE	I2E(S)B, I3P	G20/G25	20/25 mbar	G31	37 mbar
CH	I2H	G20	20 mbar		
DE	II2ELL3B/P	G20/G25	20 mbar	G30/G31	50 mbar
	II2E3B/P (AKN100 only)	G20	20 mbar	G30/G31	50 mbar
DK, FI, GR, SE, NO, IT, CZ, EE, LT, SI, AL, MK, BG, HR, TR	II2H3B/P	G20	20 mbar	G30/G31	30 mbar
ES, GB, IE, PT, SK	II2H3P	G20	20 mbar	G31	37 mbar
FR	II2Er3P	G20/G25	20/25 mbar	G31	37 mbar
LU	II2E3P	G20/G25	20 mbar	G31	37/50 mbar
NL ¹	II2EK3B/P (only for AKN032 to AKN070)	G20/G25.3	20/25 mbar	G30/G31	30 mbar
	I3B/P (AKN100 only)			G30/G31	30 mbar
HU	II2H3B/P	G20	25 mbar	G30/G31	30 mbar
CY, MT	I3B/P			G30/G31	30 mbar
LV ³	II2H3B/P	G20	20 mbar	G30/G31	30 mbar
IS	I3P			G31	37 mbar
PL	II2E3B/P	G20/G2.350	20/13 mbar	G30/G31	37 mbar
RO	II2H3B/P	G20	20 mbar	G30/G31	30 mbar
	II2L3B/P ²	G25	20 mbar	G30/G31	30 mbar

¹ Category only valid for AKN 032-034-050-070; HYN432-HYN532 models. The AKN100 model is sold in the Netherlands only for LPG.

² Category only valid for AKN 032-034-050-070; HYN432-HYN532 models. The AKN100 model is not suitable for installation in Romania in areas where G25 gas is distributed.

³ Gas Category in accordance with the declaration of the Member State pursuant to Art. 4, paragraph 1 of Regulation (EU) 2016/426 (ref. Official Journal EU 2018/C 206/01)

The following information is clearly printed on the equipment packaging: country of destination, gas category and equipment code, all translated into the language of the destination country.

The code allows finding out the factory settings:

Codes with no extension

- AKN070IT 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:

- AKN070FR-xxx0 0 indicates that the equipment has been tested and set up for natural gas [G20]
- AKN070MT-xxx1 1 indicates that the equipment has been tested and set up for LPG [G31]
- AKN070DE-xxx2 2 indicates that the equipment has been tested and set up for 'L' natural gas [G25]

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

6.2. Gas Settings Table

TYPE OF GAS G20											
TYPE of MACHINE		AKN032		AKN 034		AKN 050		AKN 070		AKN 100	
CATEGORY		According to the country of destination - see previous table									
SUPPLY PRESSURE	[mbar]	20 [min 17 - max 23]									
Ø GAS ORIFICE PLATE	[mm]	5.9		5.9		8.2		12.5		10.0	
CARBON DIOXIDE CO ₂	(Q _{max}) [%]	9.1± 0.2		9.1± 0.2		9.1± 0.2		9.1± 0.2		9.1± 0.2	
	(Q _{min}) [%]	8.7± 0.2		8.7± 0.2		8.7± 0.2		8.7± 0.2		8.7± 0.2	
OXYGEN [± 0.3%]	(Q _{max} -Q _{min}) [%]	4.7	5.4	4.7	5.4	4.7	5.4	4.7	5.4	4.7	5.4
AIR EXCESS	I (Q _{max} -Q _{min}) [%]	1.22	1.26	1.22	1.26	1.22	1.26	1.22	1.26	1.22	1.26
GAS VALVE OFFSET	Pa (Q _{max} -Q _{min})	-10	-3	-9	-3	-11	-4	-4	0	-17	-1
GAS CONSUMPTION (15°C-1013mbar)	[m³/h]	3.28	0.68	3.68	0.72	5.28	0.89	7.37	1.25	10.22	1.76

TYPE OF GAS G25									
TYPE of MACHINE		AKN032		AKN 034		AKN 050		AKN 070*	
CATEGORY		According to the country of destination - see previous table							
SUPPLY PRESSURE	[mbar]	25 [min 20 - max 30]							
Ø GAS ORIFICE PLATE	[mm]	6.6		6.6		9.8		nn	
CARBON DIOXIDE CO ₂	(Q _{max}) [%]	9.1± 0.2		9.1± 0.2		9.1± 0.2		8.6 ± 0.1	
	(Q _{min}) [%]	8.7± 0.2		8.7± 0.2		8.7± 0.2		8.3± 0.1	
OXYGEN [± 0.3%]	(Q _{max} -Q _{min}) [%]	4.4	5.1	4.4	5.1	4.4	5.1	5.3	5.8
AIR EXCESS	I (Q _{max} -Q _{min}) [%]	1.21	1.24	1.21	1.24	1.21	1.24	1.25	1.28
GAS VALVE OFFSET	Pa (Q _{max} -Q _{min})	-9	-3	-6	-1	-12	-3	-15	0
GAS CONSUMPTION (15°C-1013mbar)	[m³/h]	3.81	0.79	4.28	0.84	6.14	1.03	8.56	1.45

* Rated heat input 67.4 kW

TYPE OF GAS G25.3									
TYPE of MACHINE		AKN032		AKN 034		AKN 050		AKN 070*	
CATEGORY		According to the country of destination - see previous table							
SUPPLY PRESSURE	[mbar]	25 [min 20 - max 30]							
Ø GAS ORIFICE PLATE	[mm]	6.6		6.6		9.8		nn	
CARBON DIOXIDE CO ₂	(Q _{max}) [%]	9.1± 0.2		9.1 ± 0.2		9.1± 0.2		8.6± 0.1	
	(Q _{min}) [%]	8.7± 0.2		8.7± 0.2		8.7± 0.2		8.3 ± 0.1	
OXYGEN [± 0.3%]	(Q _{max} -Q _{min}) [%]	4.4	5.1	4.4	5.1	4.4	5.1	5.3	5.8
AIR EXCESS	I (Q _{max} -Q _{min}) [%]	1.21	1.24	1.21	1.24	1.21	1.24	1.25	1.28
GAS VALVE OFFSET	Pa (Q _{max} -Q _{min})	-9	-3	-6	-1	-12	-3	-15	0
GAS CONSUMPTION (15°C-1013mbar)	[m³/h]	3.73	0.77	4.19	0.82	6.00	1.01	8.38	1.42

* Rated heat input 67.4 kW

TYPE OF GAS G30*											
TYPE of MACHINE		AKN032**		AKN 034		AKN 050		AKN 070		AKN 100	
CATEGORY		According to the country of destination - see previous table									
SUPPLY PRESSURE	[mbar]	30 [min 25 - max 35] - 37 [min 25 - max 45] - 50 [min 42.5 - max 57.5]									
Ø GAS ORIFICE PLATE	[mm]	4.6		4.6		6.1		7.9		7.0	
CARBON DIOXIDE CO ₂	(Q _{max}) [%]	11.5± 0.2		11.6± 0.2		11.5 ± 0.1		11.5 ± 0.1		11.5 ± 0.1	
	(Q _{min}) [%]	11.1± 0.2		11.2± 0.2		11.3± 0.1		11.3± 0.1		11.3± 0.1	
OXYGEN [± 0.3%]	(Q _{max} -Q _{min}) [%]	3.8	4.4	3.6	4.2	4	4.1	3.8	4.1	3.8	4.1
AIR EXCESS	I (Q _{max} -Q _{min}) [%]	1.18	1.21	1.17	1.20	1.18	1.19	1.18	1.19	1.18	1.19
GAS VALVE OFFSET	Pa (Q _{max} -Q _{min})	-5	-3	-5	0	-6	-0.5	-14	1	-8	8
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	2.57	0.56	2.89	0.56	4.14	0.70	5.78	0.98	8.02	1.38

* Modification of the modulation PCB b1-b2 parameters required: see below.

** Rated heat input 6.7 kW

b1	172	166	132	123	137
b2	674	682	606	576	652

TYPE OF GAS G31											
TYPE of MACHINE		AKN032		AKN 034		AKN 050		AKN 070		AKN 100	
CATEGORY		According to the country of destination - see previous table									
SUPPLY PRESSURE	[mbar]	30 [min 25 - max 35] - 37 [min 25 - max 45] - 50 [min 42.5 - max 57.5]									
Ø GAS ORIFICE PLATE	[mm]	4.6		4.6		6.1		7.9		7.0	
CARBON DIOXIDE CO ₂	(Q _{max}) [%]	9.8± 0.2		9.8± 0.2		9.9 ± 0.2		9.8± 0.2		9.8± 0.2	
	(Q _{min}) [%]	9.5 ± 0.2		9.5± 0.2		9.5 ± 0.2		9.4 ± 0.2		9.4 ± 0.2	
OXYGEN [± 0.3%]	(Q _{max} -Q _{min}) [%]	6.0	6.4	6.0	6.4	5.8	6.4	6.0	6.6	6.0	6.6
AIR EXCESS	I (Q _{max} -Q _{min}) [%]	1.28	1.31	1.28	1.31	1.28	1.38	1.31	1.31	1.28	1.31
GAS VALVE OFFSET	Pa (Q _{max} -Q _{min})	-10	-3	-5	1	-8	0	-15	0	-16	6
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	2.44	0.50	2.74	0.54	3.94	0.66	5.49	0.93	7.62	1.31

6.3. First start-up


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

- make sure the gas being supplied matches the gas for which the boiler has been set up;
- check, with the pressure intake "IN" on the gas valve, that the valve input pressure corresponds to that required for the type of gas being used;
- check that the pressure inside the hydraulic circuit is between 1.2 and 1.6 bar;
- check that electrical connections correspond to those indicated in this manual or other wiring diagrams enclosed with the machine;
- check that efficient earthing connections have been completed, carried out as specified by current safety regulations;

To turn on the boiler, follow the instructions below:

- provide voltage to the fan heater and, in case of fan heaters equipped with a speed regulator, set the switch to winter position and select maximum speed (5);
- make sure that an ambient thermostat or Smart X is connected to the boiler.
- provide voltage to the boiler using the main switch after having ensured that the three-pin plug is connected to the boiler;
- when power voltage is provided to the boiler and ID0-GND contact is closed on boiler PCB, the ignition cycle starts;
- if APEN or Smart X remote control is connected, refer to the relevant manual for the ignition cycle start procedure, then continue with the following instruction.

Sometimes, when turned on for the first time, the burner cannot ignite because there is air in the gas pipe. This will lock out the boiler. You will need to reset the equipment and repeat the operation until it ignites (for unlocking operations use the buttons on boiler display).

 **The presence of a flame is indicated by the LED on the CPU board base.**

6.4. Analysis of combustion

Wait until the boiler reaches the maximum output.

Check again that the input pressure in the valve corresponds to the value required; adjust if necessary.

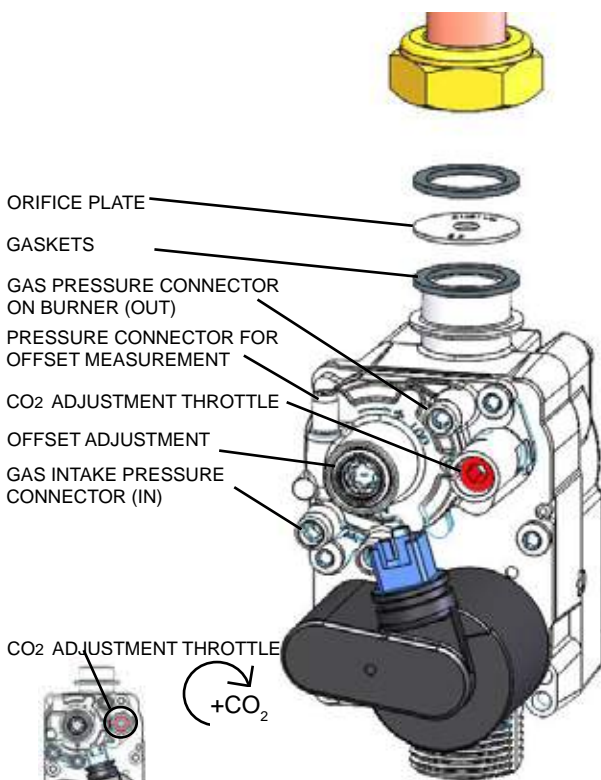
Perform the combustion analysis to verify that the level of CO₂ corresponds the values contained in the table "GAS SETTINGS". If the measured value is different, turn the CO₂ adjustment throttle:

- For AKN 032/034/050: to **increase** the CO₂ value turn the screw **clockwise**, and counterclockwise to decrease it.
- For AKN 070/100: to **increase** the CO₂ value turn the screw **counterclockwise**, and clockwise to decrease it.

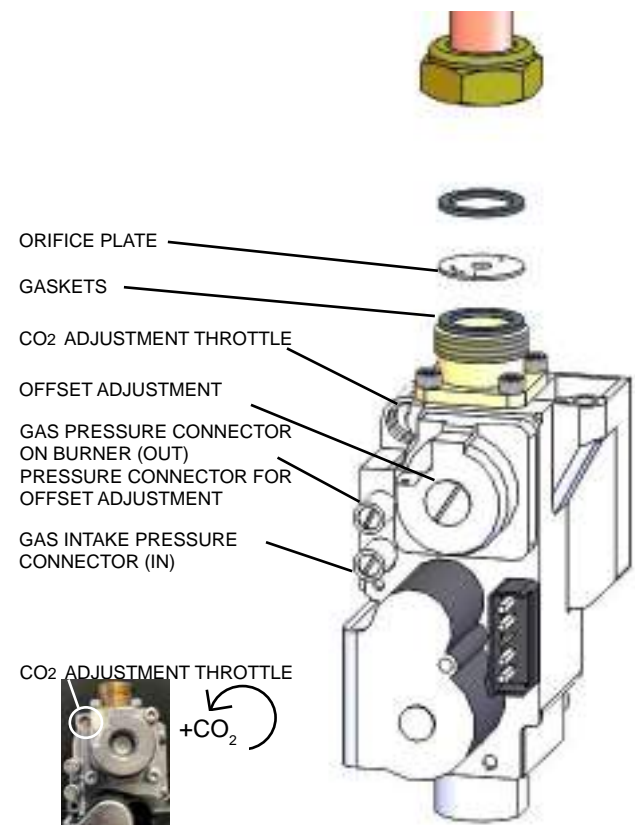
Set the boiler to minimum output, and verify that the level of CO₂ corresponds to the figures in the "GAS SETTINGS" table. If the values do not match, screw or loosen the offset adjustment screw respectively to increase or decrease the CO₂ level and repeat the procedure.

Flue cleaning function

The boiler can be forced to the maximum or minimum capacity with the flue cleaning function. This function can be carried out from the LCD display in rEg menu with Hi (maximum heat input) or Lo (minimum heat input) function.



AKN032/034/050



AKN070/100

6.5. Conversion to LPG

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

Conversion from one type of gas to another can only be performed by authorised service centres.

The equipment is supplied already set for natural gas and with the kit for conversion to LPG, including:

- calibrated gas orifice plate;
- adhesive plate "equipment converted..."

To convert the unit, follow these instructions:

- disconnect boiler from power supply;
- **replace the gas orifice plate fitted with the one supplied with the kit;**
- restore power supply and set the boiler up for ignition;
- while the start-up electrode is sparking, make sure there are no gas leaks.

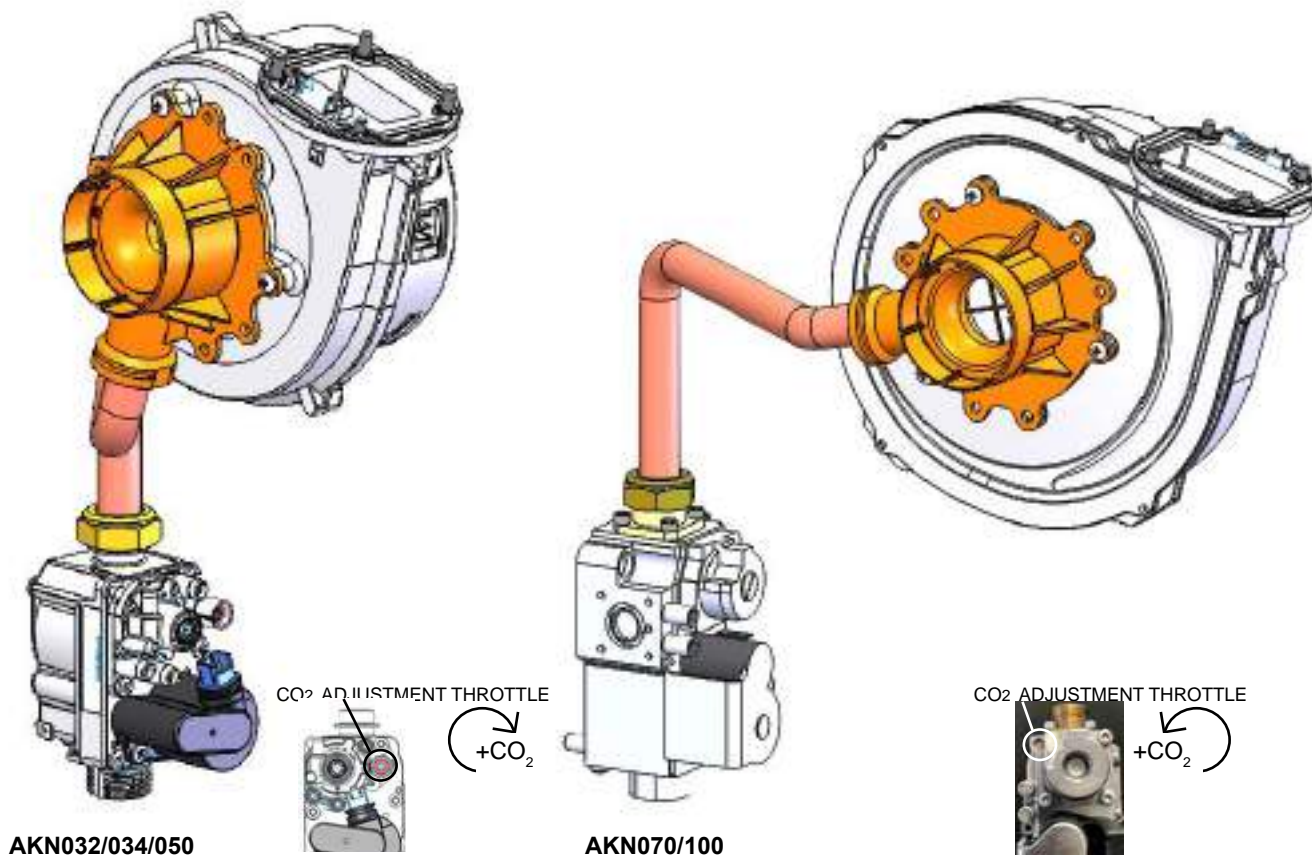
When the burner is lit and working at maximum capacity, verify that:

1. the valve intake pressure corresponds to the value required for the type of gas that you are using;
2. the combustion analysis procedure is performed as described in Section 6.4;
3. the CO₂ level is within the values indicated for the type of gas used. If the detected value is different, change it using the CO₂ adjustment throttle:
 - For AKN 032/034/050: to **increase** the CO₂ value turn the screw **clockwise**, and counterclockwise to decrease it.
 - For AKN 070/100: to **increase** the CO₂ value turn the screw **counterclockwise**, and clockwise to decrease it.
4. that the gas valve Venturi pipe connector does not leak. After converting and regulating the unit, replace the nameplate indicating "Equipment regulated for natural gas" with the one in the kit that indicates "Equipment converted ...".



The boiler supplied to function with LPG is set up for G31 gas [Propane].

If the unit runs on G30 [Butane], it is necessary to verify and possibly adjust settings for CO₂ value as shown in the table in Section 6.2.



6.6. 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.

To carry out the calibration, refer to the paragraph concerning the combustion analysis: See Section 6.4 and the table in Section 6.2.

6.7. Replacing the modulation PCB

When replacing the CPU modulation PCB, it is required to carry out some essential operations, described below.

1. Disconnect voltage to the module
2. Disconnect all terminals from the CPU PCB
3. Remove and store the removable EEPROM memory card
4. Disconnect the TER safety PCB
5. Remove and replace the CPU modulation PCB
6. Reposition the new CPU PCB, insert the previously stored EEPROM memory card (point 3.)
7. Reconnect the TER safety PCB and all terminals respecting the original positions.

EEPROM board

The G26800 CPU PCB is equipped with a removable EEPROM card, a type of non-volatile memory, used to store functions, settings and controls, which are retained when the power supply is disconnected.

This CPU PCB avoids having to reprogram system parameters due to electrical or CPU PCB malfunctions.



In order to correctly install the EEPROM, it is necessary to insert the card into the slot provided, taking care to face the smooth side of the card towards the nearest green terminals, or, if the EEPROM card is fitted with a cap, having the writing on the cap facing the nearest green terminals.

Programming the parameters

In the case of a new EEPROM, the parameters required to be programmed are shown in the table below:

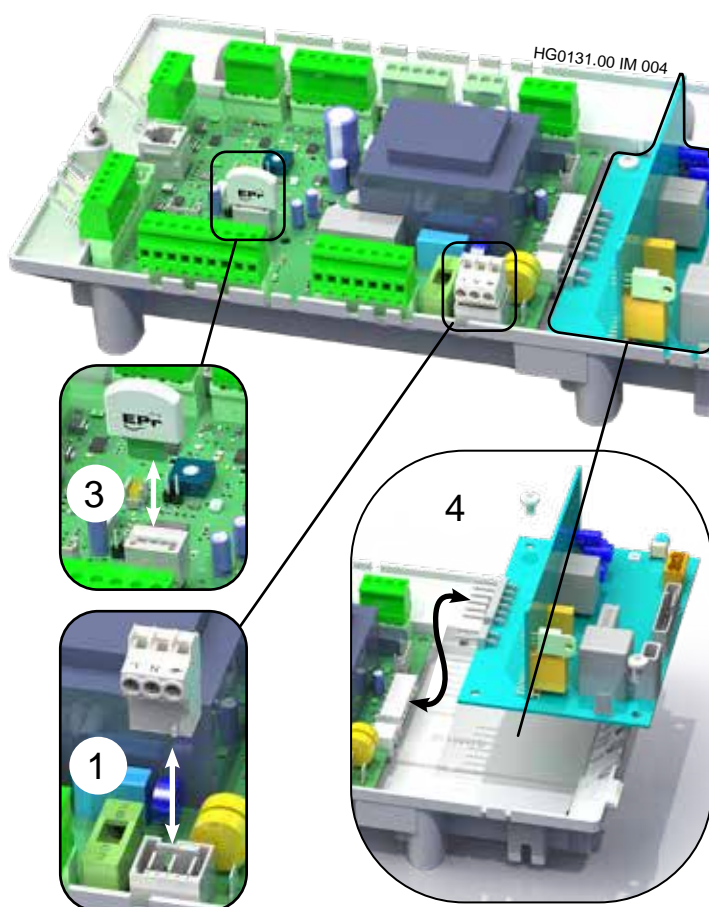
Par.	Command	Error	Description
TER	yes	E99	TER=1, the TER is present
REG01	yes	E99	Enables REGUL_01 - calculation of PT%_RIF
REG02	Optional		Enables REGUL_02 - calculation of PT%_FLUE
REG03	Optional		Enables REGUL_03 - calculation of PT%_SAN
REG04	Optional		Enables REGUL_04 from analogue input
CTRL01	yes	E99	Enables CTRL_01 - water pressure control
CTRL02	yes		Enables CTRL_02 - water-side antifreeze control
CTRL04	Optional		Enables CTRL_04 - power failure control
CTRL05	Optional		Enables CTRL_05 - remote CPU and TER reset
CTRL06	Optional		Enables CTRL_06 - lockout or flame presence signalling
FUNC01	yes	E99	Enables FUNC_01 - burner with TER
FUNC03	Optional		Enables FUNC_03 - electronic fan control or STD (Blower)
FUNC05	yes	E99	Enables FUNC_05 - water flow and circulator control

Programming the parameters - Operating mode

Parameters can be modified from the LCD display on the machine or, alternatively, from the Smart X.

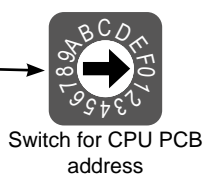
The Smart X can be used to access all parameters [see table on following pages]; parameters have passwords, which are issued by the APEN GROUP Customer Service.

Please refer to the Smart X manual for instructions for the procedure for access and modification of functional parameters. Please remember that all changes to parameters must be done with the burner OFF (boiler in standby).



Check the hardware configuration of the PCB

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



6.8. Programming with LCD Display

The parameters can be changed only if they have been enabled by entering the password from **Abi** menu.

Abi (enabling change of parameters)

The **Abi** function has the following password:

- 007: enables the change of boiler parameters under **Par** menu.

Once the password is enabled, if no key is pressed for 10 minutes, the programme automatically returns to the machine status.

Move using the menu arrows, select the parameter or setpoint to be displayed with ENTER, change the parameter by pressing the arrow keys (↑ to increase ↓ to decrease) until the desired value, then press and hold ENTER for at least 3 seconds; the display flashes to indicate that the value has been stored.

6.9. Exchanger maintenance

The experience gathered over time about the exchanger by Apen Group demonstrates that the annual maintenance of the exchanger would not be necessary, however the safety regulations require to perform the following checks on a yearly basis:

- **Combustion chamber:** If, during the annual inspection, some deposits inside the combustion chamber are observed, it is necessary to aspirate them; if the deposits are strongly attached, the pipes must be brushed. It is forbidden to use sharp objects and acid or alkaline substances.
- **Insulation:** The insulation of the combustion chamber must be inspected on a yearly basis; if signs of deterioration are detected, it must be compulsorily replaced. In this case the condensation drain must be checked, because the damage causes the stagnation of the condensation inside the exchanger.
- **Fume pressure switch activation:** The pressure switch has an adjustable activation value set to 5 mbar. To make sure that the pressure switch electrical contact is not stuck on N.C. position:
 - open the pressure switch and move the wheel from 5 mbar to 1 mbar;
 - switch the boiler on normally and wait until the burner is switched off immediately and the "E37" non-volatile safety lockout is signalled for all models.
 - move the pressure switch wheel back to 5 mbar.
 If these conditions do not occur (stuck contact), replace the pressure switch.
 After the activation test, the pressure switch calibration value must be restored to the original factory value (identifiable by the red lacquer).

Checks

During annual maintenance, the following components must be checked:

- **Burner flange gaskets**

If gaskets are damaged, they must be replaced.

The silicone seal of burner flange (cod. C12026) must be compulsorily replaced every two years and whenever the combustion chamber is inspected.

- **Burner**

No maintenance is required. If the burner surface is damaged, replace the burner door

- **Electrodes**

Check the position, the absence of alumina deposits and the integrity of the ceramic. In case of damage, replace the electrode and the relevant sealing gasket.

- **Trap**

Clean the plastic trap on a yearly basis.

Make sure there are no traces of metallic residue. If metallic residue has formed, increase the number of inspections.

Remove the cover retaining screws and clean the internal part of the trap (it is possible to clean the trap under running water) by checking that all ducts are free. Check the seal conditions. Check the integrity of the detection electrode and use sandpaper to remove any oxidation on the metal part.

Fill in the main tank with clean water and close the cover. Reconnect the trap to the condensate drain system.

To check that the salts inside the condensation tray are still active, use litmus paper to check that the pH level of water flowing out of it is greater than 6.

If the pH is lower, replace the calcium carbonate present in the tray.



Use APEN original spare parts only.

- **Control panel**

Check closing of the tightening screws of control panel terminals.

6.10. Spare parts

Spare parts are available in the exploded views manual supplied with the machine.

7. MODULATION PCB PARAMETERS

All values of the parameters of the CPU PCB are shown for all boiler models.

(1) parameters that could be modified with "007" Password via remote LCD control (even with modbus address ≠ 0).

(2) parameters that could be modified only with a Smart X.

Parameters of G26800 CPU PCB version 8.01.xx												
Smart X	LCD	Mod.	U.M.	AKN 032	AKN 034	AKN 050	AKN 070	AKN 100	DESCRIPTION			
FUNC_00	Fnu-P00			Equipment operation								
TER		(2)		1					TER presence (flame monitoring equipment)			
HP		(2)		0					HP presence (heat pump)			
SMART		(1)		0					SMART presence 0= Smart not present 1= uses PID and ON/OFF of SMART; 2= only uses ON/OFF control of Smart			
PTH	P06	(1)		100					Maximum burner output limit PT%_OUT			
PTL	P07	(1)		0					Minimum burner output limit PT%_OUT			
FUNC_01	Fnu-P10			Burner operation								
b1	P11	(1)	rpm	188	176	145	135	156	Motor RPM MINIMUM value (Y0): 90÷999 (1=10 RPM)			
b2	P12	(1)	rpm	724	737	656	626	749	Motor RPM MAXIMUM value (Y0): 90÷999 (1=10RPM)			
b3	P13	(1)	rpm	346	334	324	374	305	Motor RPM START-UP value (Y0): 90÷999 (1=10RPM)			
b4	P14	(1)		2					TACH signal divider			
b5	P15	(1)	rpm	50					Error E3x; no. of revolutions x10 (50=500rpm): 0÷999			
b6	P16	(1)	sec	20					Error E3x; error dwell time before fault F3x: 0÷999			
b7	P17	(1)	sec	15					Pre-cleaning time with maximum output			
b8	P18	(1)	sec	30					Flame stabilisation time (ignition)			
b9	P19	(1)	%	45				20	Proportional factor value (kp_pwm) for PWM1 calculation			
b10	P1A	(1)	%	20				10	Integral factor value (ki_pwm) for PWM1 calculation			
b11	P1B	(1)	sec	30					Combustion chamber post-washing time			
b12		(2)	sec	0					Flame monitoring equipment ON delay time (TER)			
b13		(2)	kW	6	7	8	12	17	MIN. value Heat output			
b14		(2)	kW	31	35	50	70	97	MAX. value Heat output			
REG_01	rGL R10			Modulation Probe NTC Control								
REG_01		(2)		1					Adjustment enabling (0=disabled; 1=enabled)			
ST1	R12	(1)	°C	72					ST1 function setpoint			
Xd1	R13	(1)	°C	4					ST1 hysteresis			
Kp1		(2)	%	10					Proportional coefficient			
Ki1		(2)	%	5					Integral coefficient			
TH1	R16	(1)	°C	82					Alarm temperature for ST1 for fault E51; Autoresolve with NTC1<ST1			
AC1		(2)		1					Modulation and/or ON/OFF (0=modulation only; 1= modulation and ON/OFF)			
MOD1		(2)		1					Modulation configuration 0= Reverse and/or Direct: changes according to the phase sent via modbus, for heating, ventilation or conditioning; 1= Reverse only, for heating; 2= Direct only, for ventilation or conditioning			
ING1A		(2)		1					Defines the analogue input to be used for calculation (1= NTC1, 2= NTC2, 3=NTC3)			
REG_02	rGL R20			Flue Gas Temperature Probe NTC Control - NOT USED ON AKN								
REG_02		(2)		0					Adjustment enabling 0=disabled			

Parameters of G26800 CPU PCB version 8.01.xx

Smart X	LCD	Mod.	U.M.	AKN 032	AKN 034	AKN 050	AKN 070	AKN 100	DESCRIPTION
REG_03	rGL R30			Probe NTC Control for ACS (DHW) Function - NOT USED ON AKN					
REG_03				0				Adjustment enabling 0=disabled; 1= enabled "on request" by FUNC_10_07 - Hybrid in heating 2= enabled by SMART via "Domestic" request; disabled in heating and/or conditioning. 3= enabled by the smart "POOL" request	
REG_04	rGL R40			Modulation from 0/10 Vdc Control - NOT USED ON AKN					
REG_04	R41	(1)		0				Adjustment enabling 0=disabled; 1= enabled as modulation only 2= enabled as modulation and burner ON/OFF	
V4_ON	R42	(1)	V	1.0				Voltage value for burner OFF	
V4_DIF	R43	(1)	V	0.5				Differential for burner ON	
T4_ON	R44	(1)	sec	5				Signal dwell time for ON	
T4_OFF	R45	(1)	sec	5				OFF signal dwell time	
ING4A	R46	(1)		5				Defines the analogue input to be used for calculation	
REG_05	rGL R50			Air pressure Adjustment (for pressostatic or ducted units) - NOT USED ON AKN					
REG_05		(2)		0				Adjustment enabling 0=disabled	
REG_06	rGL R60			Adjustment 06 - NOT USED ON AKN					
REG_06		(2)		0				Adjustment enabling 0=disabled	
REG_07	rGL R70			Adjustment 07 - NOT USED ON AKN					
REG_07		(2)		0				Adjustment enabling 0=disabled	
CTRL_01	CrL C10			Water pressure control					
CTRL_01	C11	(1)		1				Control enabling 0= disabled; 1=water control enabled;	
ST_H20	C12	(1)	bar/100	60				Pressure setpoint	
TL_H20	C13	(1)	bar/100	30				Lower pressure limit value: alarm E80	
PT_H20	C14	(1)	bar/100	20				Hysteresis for alarm E82	
ING_H20	C15	(1)		6 (B2)				Analogue input	
MD5	C16	(1)		2		3		Alarm mode: 0 = no alarm ST_H20 (E81) and/or TH_H2O (E82) 1 = alarm ST_H20 (E81) real and TH_H2O (E82) early 2 = alarm ST_H20 (E81) early and TH_H2O (E82) real 3 = alarms ST_H20 (E81) and TH_H2O (E82) real	
TH_H20		(2)	bar/100	250	250	230	230	250	Upper pressure limit value; alarm E82
CTRL_02	CrL C20			Water Antifreeze Control					
CTRL_02	C21	(1)		1				Control enabling 0= disabled; 1=water control enabled;	
ST_Ant	C22	(1)	°C	4				Water antifreeze setpoint:	
P2	C23	(1)	°C	2				Hysteresis on antifreeze setpoint	
ING_Ant		(2)		1				Analogue input	
MD2		(2)	%	30				Percentage burner heat output	
CTRL_03	CrL C30			Burner compartment antifreeze control - NOT USED ON AKN					
CTRL_03	C31	(1)		0				Control enabling 0= disabled	

Parameters of G26800 CPU PCB version 8.01.xx									
Smart X	LCD	Mod.	U.M.	AKN 032	AKN 034	AKN 050	AKN 070	AKN 100	DESCRIPTION
CTRL_04	CrL C40			No voltage control					
CTRL_04	C41	(1)		1			Control enabling 0= disabled; 1=enabled		
T4_V	C42	(1)	sec	45			Time in seconds of post-ventilation		
CTRL_05	CrL C50			Remote Reset from Digital Input					
CTRL_05	C51	(1)		1			Control enabling 0= disabled; 1=enabled		
ING05	C52	(1)		9 (ID1)			Digital input enabled as RESET		
CTRL_06	CrL C60			Remote alarm or flame presence signal					
CTRL_06	C61	(1)		1			Control enabling 0=disabled; 1=enabled as lockout signalling 2=enabled as flame signalling		
OUT06	C62	(1)		5 (Q1)			Digital output enabled		
CTRL_07	CrL C70			Summer ventilation from digital input - NOT USED ON AKN					
CTRL_07	C71	(1)		0			Control enabling 0= disabled		
ING07	C72	(1)		0			Digital input enabled		
CTRL_08	CrL C80			Counter and reset control					
HOURS	C81	(1)		1			Burner operating hours counter		
CY-CLES	C82	(1)		1			Ignition cycles counter		
FAULT		(2)		1			Fault counter		
RESET	C84	(1)		0			Reset control 1=board fault reset		
CTRL_09	CrL C90			Air Filter Control - NOT USED ON AKN					
CTRL_09	n.a	(2)		0			Control enabling 0= disabled		
FUNC_02	Fnu-P20			Blown air Burner Control - NOT USED ON AKN					
FN_02		(2)		0			Control enabling 0=disabled		
FUNC_03	Fnu-P30			Ventilation Management Function (EC-AC Fans)					
FN_03		(2)		3			Function enabling 0=disabled; 1=proportional POT%_OUT enabled; 2=enabled proportional to PID%_PRESS, value of REG_04_05; 3=start-up and modulation with TIN3, TFN3 and TCD3 temperatures 4=proportionally enabled at analogue input ING3A		
T_ON	P32	(1)	sec	0			Seconds of delay for fan start		
T_OFF	P33	(1)	sec	0			Seconds of delay for fan stop		
OUT3A		(2)		7 (Q3)			Digital output for main fan		
OUT3B		(2)		3 (Y2)			Analogue output for main fan		
ING3A		(2)		1 (NTC1)			Reference analogue input		
TIN3	P37	(1)	°C	35			Heating fan ON temperature		
TFN3	P38	(1)	°C	65			Temperature for output linearisation		
TCD3	P39	(1)	°C	18			Conditioning fan ON temperature		
FUNC_04	Fnu-P40			Ventilation Function for PRESSOSTATIC Units - NOT USED ON AKN					
FN_04		(2)		0			Function Enabling 0= disabled		

Parameters of G26800 CPU PCB version 8.01.xx

Smart X	LCD	Mod.	U.M.	AKN 032	AKN 034	AKN 050	AKN 070	AKN 100	DESCRIPTION
FUNC_05	Fnu-P50			Circulator Management and Water flow rate Function					
S5		(2)		1					Function enabling 0=disabled 1=enabled with autoreset for E85/86 2=enabled without autoreset for E85/86
ST5	P52	(1)	From l/h	56	56	70	80	130	Set-point in l/10/m'
P5		(2)	From l/h	5					10 ST6 hysteresis in l/10/m
ING5		(2)		7 (B3)					Analogue AN0-3 or digital ID1-3 input
OUT5A		(2)		8 (LBW)					Circulator control (digital) output
OUT5B		(2)		2 (Y1)					Circulator modulation control (analogue) output
OUT5C		(2)		0					Alarm (digital) output
TF5		(2)	sec	2					Delay in seconds for flow alarm E85
TI5	P59	(1)	sec	20					Delay in seconds for flow alarm E86
TOFF_5	P5A	(1)	sec	300					Circulator switch-off delay in OFF phase
ANT5		(2)		1					Anti-lock function enabling
FUNC_08	Fnu-P80			Damper Management Function - NOT USED ON AKN					
FN_08		(2)		0					Function Enabling 0=disabled
FUNC_09	Fnu-P90			Extractor and free cooling Management Function - NOT USED ON AKN					
FN_09		(2)		0					Function Enabling 0=disabled
FUNC_10	Fnu-PA0			Conditioning - NOT USED ON AKN					
FN_10		(2)		0					Function Enabling 0=disabled

All values of the parameter of the CPU PCB that can only be changed by Smart X are shown below

(1) parameters that could be modified with "007" Password via remote LCD control (even with modbus address ≠ 0).

(2) parameters that could be modified only with a Smart X.

Parameters of G26800 CPU PCB version 8.01.xx									
Smart X	LCD	Mod.	U.M.	AKN 032	AKN 034	AKN 050	AKN 070	AKN 100	DESCRIPTION
	rtU								RS485 Serial Communication Configurations
D_SL	SSL	(1)				0			Slave serial baud rate (SMART X) 0= 19200 baud rate – Even Parity 1= 9600 baud rate – Even Parity 2= 19200 baud rate – Odd Parity 3= 9600 baud rate – Odd Parity 4= 19200 baud rate – No parity Parity 5= 9600 baud rate – No parity Parity
									NTC input configuration
NTC1		(2)				1			Activates or deactivates NTC1 input
NTC2		(2)				0			Activates or deactivates NTC2 input
NTC3		(2)				0			Activates or deactivates NTC3 input
									NTC input configuration
B0		(2)				1			B0 analogue input enabling 0=disabled 1=enabled
									B1 Input Configurations - NOT USED ON AKN
B1		(2)				0			B1 analogue input enabling 0=disabled 1=enabled as analogue input
XA1		(2)				0			X-axis minimum value – minimum input voltage
XB1		(2)				9.99			X-axis maximum value – maximum input voltage
YA1		(2)				0			Y-axis minimum value – minimum magnitude value
YB1		(2)				9.99			Y-axis maximum value – maximum magnitude value
CV1		(2)				1			Coefficient for PRØ displaying; value displayed on Smart and used for controls
UM1		(2)				8			1=°C; 2=bar; 3=mbar; 4=Pa; 5=%; 6=l/h; 7=mc/h; 8= V
									B2 Input Configurations (Pressure Probe)
B2		(2)				1			B2 analogue input enabling 0=disabled 1=enabled as analogue input
XA2		(2)				0.4			X-axis minimum value – minimum input voltage
XB2		(2)				2.8			X-axis maximum value – maximum input voltage
YA2		(2)				0			Y-axis minimum value – minimum magnitude value
YB2		(2)				4			Y-axis maximum value – maximum magnitude value
CV2		(2)				0.01			Coefficient for PRØ displaying; value displayed on Smart and used for controls
UM2		(2)				2			1=°C; 2=bar; 3=mbar; 4=Pa; 5=%; 6=l/h; 7=mc/h; 8= V
									B3 Input Configurations (Water Flowmeter)
B3		(2)				2			B3 analogue input enabling 0=disabled 1=enabled as analogue input 2=enabled as frequency input
XA3		(2)				0.14	0.12		X-axis minimum value – minimum input voltage
XB3		(2)				2.29	2.02		X-axis maximum value – maximum input voltage
YA3		(2)				0.29	0.54		Y-axis minimum value – minimum magnitude value
YB3		(2)				5	9		Y-axis maximum value – maximum magnitude value
CV3		(2)				0.01			Coefficient for PRØ displaying; value displayed on Smart and used for controls
UM3		(2)				7			1=°C; 2=bar; 3=mbar; 4=Pa; 5=%; 6=l/h; 7=mc/h; 8= V

Parameters of G26800 CPU PCB version 8.01.xx

Smart X	LCD	Mod.	U.M.	AKN 032	AKN 034	AKN 050	AKN 070	AKN 100	DESCRIPTION
Digital Input Configurations									
ID1		(2)				4			ID1 digital input enabling 0=disabled 1= N.C input (Fault activated with Open input) with manual reset 2= N.C input (Fault activated with Open input) with autoresolve 3= N.O. input (Fault activated with Closed input) with autoresolve 4= enabled as N.O. (open input to enable functions, without alarm signalling)
TD1		(2)				0			Alarm triggering or function enabling delay time
ID2		(2)				2			ID2 digital input enabling 0=disabled 1= N.C input (Fault activated with Open input) with manual reset 2= N.C input (Fault activated with Open input) with autoresolve 3= N.O. input (Fault activated with Closed input) with autoresolve 4= enabled as N.O. (open input to enable functions, without alarm signalling)
TD2		(2)				10			Alarm triggering or function enabling delay time
ID3		(2)				3			ID3 digital input enabling 0=disabled 1= N.C input (Fault activated with Open input) with manual reset 2= N.C input (Fault activated with Open input) with autoresolve 3= N.O. input (Fault activated with Closed input) with autoresolve 4= enabled as N.O. (open input to enable functions, without alarm signalling)
TD3		(2)				10			Alarm triggering or function enabling delay time
Y0 Analogue Output Configuration									
YM0		(2)				1			Direct/reverse output configuration 0= direct output: the maximum calculation value (100%) corresponds to the maximum output value. 1 = reverse output: the maximum calculation value (100%) corresponds to the minimum output value
YL0		(2)				0			Minimum voltage (or PWM in %) output value
YH0		(2)				100			Maximum voltage (or PWM in %) output value
YF0		(2)				40			Fixed voltage or % output value (forced by program)
YT0		(2)				3			Voltage increase/decrease (or in %) every second
YN0		(2)				0			Output Linearisation Mode 0= linear output value between YL0 and YH0 1= output with values limited to YL0 and YH0 (for request values below YL0 the output will be YL0, for request values above YH0 the output will be YH0)
Y1 Analogue Outputs Configuration									
YM1		(2)				1			Direct/reverse output configuration 0= direct output: the maximum calculation value (100%) corresponds to the maximum output value. 1 = reverse output: the maximum calculation value (100%) corresponds to the minimum output value
YL1		(2)				80			Minimum voltage (or PWM in %) output value
YH1		(2)				100			Maximum voltage (or PWM in %) output value
YF1		(2)				0			Fixed voltage or % output value (forced by program)
YT1		(2)				1			Voltage increase/decrease (or in %) every second
YN1		(2)				0			Output Linearisation Mode 0= linear output value between YL1 and YH1 1= output with values limited to YL1 and YH1 (for request values below YL1 the output will be YL1, for request values above YH1 the output will be YH1)

Parameters of G26800 CPU PCB version 8.01.xx									
Smart X	LCD	Mod.	U.M.	AKN 032	AKN 034	AKN 050	AKN 070	AKN 100	DESCRIPTION
				Y2 Analogue Outputs Configuration					
YM2		(2)		0				Direct/reverse output configuration 0= direct output: the maximum calculation value (100%) corresponds to the maximum output value. 1 = reverse output: the maximum calculation value (100%) corresponds to the minimum output value	
YL2		(2)		4				Minimum voltage (or PWM in %) output value	
YH2		(2)		10				Maximum voltage (or PWM in %) output value	
YF2		(2)		8				Fixed voltage or % output value (forced by program)	
YT2		(2)		1				Voltage increase/decrease (or in %) every second	
YN2		(2)		0				Output Linearisation Mode 0= linear output value between YL2 and YH2 1= output with values limited to YL2 and YH2 (for request values below YL2 the output will be YL2, for request values above YH2 the output will be YH2)	
				Y3 - Analogue Outputs Configuration - Not Used on AKN					
YM3		(2)		0				Direct/reverse output configuration 0= direct output: the maximum calculation value (100%) corresponds to the maximum output value. 1 = reverse output: the maximum calculation value (100%) corresponds to the minimum output value	
YL3		(2)		4				Minimum voltage (or PWM in %) output value	
YH3		(2)		10				Maximum voltage (or PWM in %) output value	
YF3		(2)		8				Fixed voltage or % output value (forced by program)	
YT3		(2)		1				Voltage increase/decrease (or in %) every second	
YN3		(2)		0				Output Linearisation Mode 0= linear output value between YL3 and YH3 1= output with values limited to YL3 and YH3 (for request values below YL3 the output will be YL3, for request values above YH3 the output will be YH3)	

8. ANALYSIS OF LOCKOUTS - ERRORS

The CPU manages two types of lockouts:

- preventive, it warns the customer that the boiler requires maintenance
- operational, it stops the boiler for safety or warranty reasons.

Some operational faults require manual reset; others reset themselves when the problem that caused them is solved.

Alarm Code	DESCRIPTION	CAUSE	TYPE OF RESET	AKN 032 034	AKN 050 070	AKN 100
Flame Safety Alarms - Caused by the flame monitoring equipment (TER)						
E10	Failure to ignite the burner after 4 attempts performed by the equipment.	<ul style="list-style-type: none"> - Phase and neutral reversed - Ground not connected - Phase-to-phase connection without neutral - Faulty or incorrectly positioned ignition electrode - Low CO₂ value - Gas supply pressure too high (> 60mbar) 	Manual	x	x	x
E11	Untimely (parasitic) flame. The equipment detects a flame presence signal with burner off	<ul style="list-style-type: none"> - Loss of insulation of the safety module (SRM) of TER equipment - Loss of insulation of ignition cable or single-electrode (ignition/detection) 	Manual	x	x	
E11	Untimely (parasitic) flame. The equipment detects a flame presence signal with burner off	<ul style="list-style-type: none"> - Loss of insulation of the safety module (SRM) of TER equipment - Loss of insulation of the detection cable or detection electrode 	Manual			x
E12	Ignition failure; not visible. The count, displayed in the event log, indicates whether the boiler has had problems with ignition	See E10		x	x	x
E13	TER equipment does not accept the reset from CPU (max 5 reset attempts in 15 minutes).	Disconnect and restore power supply. Check the causes as indicated in fault E10	Manual	x	x	x
E14	Lack of communication between TER equipment and CPU for more than 60 seconds	TER equipment or CPU PCB broken	Autoresolve	x	x	x
E15	The flame monitoring equipment (TER) does not reach the "Running" status after 300 seconds from the heat request by the CPU	<ul style="list-style-type: none"> - TER equipment broken - Flame failure immediately after safety time (spark) due to lack of gas or incorrect burner adjustment 	Manual or Autoreset (every 5')	x	x	x
E16	General lockout of the flame monitoring equipment (TER)	<ul style="list-style-type: none"> - TER equipment broken - Signals a safety shutdown of the burner following an uninterrupted operation >24h 	Manual or Autoreset (every 5')	x	x	x
E17	Internal fault of TER equipment, that does not accept reset command from CPU	TER equipment broken, replace	Manual or Autoreset (every 5')	x	x	x
E18	Flame loss when TER equipment is already in running phase. The count, which can be displayed in the event log, indicates that the burner will turn off after flame stabilisation time or when the maximum Heat Input is reached.	<ul style="list-style-type: none"> - Reduced gas flow rate on the line or excessive piping pressure drop; - Incorrect burner adjustment (CO₂ too low) 		x	x	x

Alarm Code	DESCRIPTION	CAUSE	TYPE OF RESET	AKN 032 034	AKN 050 070	AKN 100
Alarms for safety device activation						
E20	Activation of safety thermostat STB	<ul style="list-style-type: none"> - Excess of air or water temperature due to lack of water/air flow circulation - Safety thermostat faulty or not connected 	Manual	x	x	
E20	Activation of safety thermostat STB or burner door thermostat (TDOOR)	<ul style="list-style-type: none"> - Excess of air or water temperature due to lack of water/air flow circulation - Safety thermostat faulty or not connected - Closed flue/fume exhaust clogging/ Flue pressure drop greater than the permitted value - Burner flange gasket worn/wrongly fitted/absent 	Manual			x
E22	Activation of STB Safety Thermostat in ignition phase	<ul style="list-style-type: none"> - Frost or temperature below -20°C - Safety thermostat or flue gas thermostat broken or not connected 	Autoresolve	x	x	
E22	Activation of STB Safety thermostat or Burner door Thermostat (TDOOR) in ignition phase	<ul style="list-style-type: none"> - Frost or temperature below -20°C - Safety thermostat or Burner Door thermostat broken or not connected 	Autoresolve			x
E24	Activation of heat exchanger thermal fuse - TF	The water temperature inside the heat exchanger has exceeded the safety limit of the thermal fuse. Disassemble the heat exchanger and check for damage, otherwise replace it	Autoresolve	x	x	x
E25	Activation of INAIL PRESSURE SWITCHES (IPMIN or IPMAX)	<ul style="list-style-type: none"> - Increase of the pressure value in the hydraulic circuit beyond the setpoint of the IP MAX INAIL pressure switch --> check that there are no closed taps on the water circuit; check the size of the vessel and its condition (precharge value, diaphragm seal) - Decrease of the pressure value within the water circuit below the setpoint of the IP MIN INAIL pressure switch (0.5 bar) --> check that there are no water leaks in the circuit and restore the minimum pressure 	Autoresolve		x	x
Flue Gas Fan Fault Alarms (VAG)						
E30	Flue gas fan speed (VAG) too low in start-up phase or failure to start the FLUE GAS fan	<ul style="list-style-type: none"> - Electrical FAN cables interrupted, not connected or incorrectly connected - Faulty burner fan or CPU board not receiving speed signal from the flue gas fan (HALL). To check possible CPU failure, disconnect 4-wire connector (PWM) from flue gas fan and check ABSENCE of voltage between GND-Y0 (HALL) and B0-Y0 contacts of terminal board CN03. If there is voltage between these contacts, fault E30 is caused by a failure in the CPU board. Otherwise, fault E30 is caused by a failure in the flue gas fan 	Manual	x	x	x

Alarm Code	DESCRIPTION	CAUSE	TYPE OF RESET	AKN 032 034	AKN 050 070	AKN 100
E31	Flue gas fan speed (VAG) too high in stand-by phase	<ul style="list-style-type: none"> - Electrical FAN cables interrupted, not connected or incorrectly connected - Faulty burner fan or CPU board not receiving speed signal from the flue gas fan (HALL). <p>In order to check for any Flue gas fan failure:</p> <ul style="list-style-type: none"> a) Keep the cables connected to the flue gas fan; b) Make sure that stand-by mode is active ("Rdy" or "Sty" signal on the LCD display); c) Check the direct voltage value (Vdc) between GND vs. B0 terminals in the terminal board CN03. <p>If a voltage of approx. 5-6 Vdc is detected, it means that the fan inverter is faulty (it is not receiving the PWM signal from CPU board).</p>	Manual	x	x	x
E32	Flue gas fan speed (VAG), during operation, outside minimum and maximum set parameters	<ul style="list-style-type: none"> - Electrical FAN cables interrupted, not connected or incorrectly connected - Flue gas fan failure or mechanical failure of the flue gas fan impeller. <p>Replace the flue gas fan (VAG)</p>	Manual or Autoreset (every 5')	x	x	x
Digital input alarms						
E36	ID1 input alarm	Programming error of par.ID1. Set par. ID1=0 (if not used for connection with remote controls) or ID1=4	Manual or Autoresolve	x	x	x
E37	Alarm for ID2 Flue Gas Thermostat (TFUMI) or Flue Gas Pressure Switch (PFLUE) activation	<ul style="list-style-type: none"> - The gas flow rate might exceed the boiler adjustment parameters (Overload) - Check that the exchanger is clean. - Total or partial obstruction of the flue gas outlet - Flue pressure drop greater than the permitted value 	Manual or Autoresolve	x	x	x
E38	Alarm for D3 Condensate control electrode activation	<ul style="list-style-type: none"> - Condensation detection electrode to grounding or failure - Clogged condensate drain (by impurities or frozen drain) --> clean siphon and/or drain outlet 	Manual or Autoresolve	x	x	x
Alarms of analogue inputs and NTC probes						
E41	NTC1 probe error	No signal from probe or broken probe	Autoresolve	x	x	x
Overtemperature Alarms						
E51	The temperature of the water delivery probe NTC1>TH1	<ul style="list-style-type: none"> - Minimum heat output of the boiler over-sized compared to the heat output required by the environment - Check parameter TH1 - water delivery setpoint 	Autoresolve with NTC1<ST1	x	x	x
Modbus communication alarms						
E60	Communication error between CPU PCB and Modbus Slave, Smart (CN04) network	<ul style="list-style-type: none"> - ModBus network is disconnected - The address of the PCB is wrong and/or not configured in the Modbus network - Smart X control not configured - Smart X control faulty 	Autoresolve	x	x	x

Alarm Code	DESCRIPTION	CAUSE	TYPE OF RESET	AKN 032 034	AKN 050 070	AKN 100
Alarms for no voltage or dirty filters						
E71	Dirty air filter, first alarm	Not used;		x	x	x
E72	Dirty air filter, second alarm	Not used;		x	x	x
E75	"No voltage during operating cycle (excluding standby); fault is not visible on remote control but only counted."	No voltage during operation		x	x	x
Water flow and water pressure alarms						
E80	Insufficient water pressure in the hydraulic circuit. Water pressure is <ST_H20 - TL_H20	Decrease of the pressure value within the water circuit below the Pressure and Hysteresis set (ST_H20 and TL_H20). If this happens frequently, check the presence of leakages in water circuit	Autoresolve	x	x	x
E81	Water pressure inside hydraulic circuit <ST_H20 (Preventive alarm)	Decreasing hydraulic pressure value inside water circuit. It does not stop the burner cycle. Restore water pressure value of the hydraulic circuit	Autoresolve	x	x	x
E82	Excessive water pressure inside hydraulic circuit, > TH_H20 (Preventive alarm)	Excessive pressure inside water circuit, check the hydraulic circuit load or the expansion reservoir. It does not stop the burner cycle	Autoresolve when ING_H20<TH_H20-PT_H20	x		
E82	Excessive water pressure inside hydraulic circuit, > TH_H20 (Actual Alarm)	Excessive pressure inside water circuit, check the hydraulic circuit load or the expansion reservoir. It stops the burner cycle	Autoresolve when ING_H20<TH_H20-PT_H20		x	x
E85	No water circulation, the water flow value (FLH) is equal to zero	- Water circuit clogged, taps closed or circulator not operating, dirty filters - Flowmeter not connected or faulty	Manual or Autoreset (every 5')			
E86	Water flow rate lower than minimum setpoint. The FLH flow value FLH < ST5 - P5	-Check water circuit length and diameters - Dirty filters	Manual or Autoreset (every 5')	x	x	x
Parameter configuration error alarms						
E98	Input configuration error	No input enabling for functions or controls (e.g. no activation of NTC1 input combined with REG_01)	Autoresolve	x	x	x
E99	Function configuration error	No activation of compulsory functions for the planned product (e.g. no activation of FUNC_05 for product type "Boiler")	Autoresolve	x	x	x
EEPROM alarms						
E100	Eeprom access error	Eeprom missing, inserted in the opposite direction or partially inserted	Autoresolve	x	x	x
E101	Eeprom data error	Damaged eeprom	Autoresolve	x	x	x

If there are communication problems between CPU PCB and LCD panel, the display will show the word **CPU** flashing.
If needs be, check that the display and the PCB are correctly connected and that the small cable RJ11 is securely held in the connector.

9. WIRING DIAGRAMS

Connection details are described in the installation chapter.

AKN boilers have the same wiring diagram and operating principle. Differences concern some points indicated in the notes below.

IP	AKN050/070/100 boilers have an additional protection located on water maximum pressure. The activation of this device causes error E25.
STB	Safety thermostat with automatic reset; the activation causes an error E20, detected by the PCB, and requires PCB manual reset by means of the reset key located on the ACF flame monitoring equipment.
ON/OFF	we remind that all boilers compulsorily require ambient thermostat connection. If Smart X control is used, use jumpers between ID0/GND terminals.

9.1. Fan heater electric connection

Refer to Section 5.7.4. for AB fan heaters and Section 5.7.5 for AX-EC fan heaters.

9.2. AKN electrical connection

Key of the components in the following wiring diagrams

ACF	Flame monitoring equipment
ACC	Start-up electrode
F1	1 AT fuse on the PCB (delay - 24 V side) NOT REPLACEABLE
F2	5.0 AT fuse on the PCB (delay - 230 V side)
FLUX	Water flowmeter
IPMIN	MIN INAIL pressure switch (AKN050/070/100 only)
IPMAX	MAX INAIL pressure switch (AKN050/070/100 only)
KOND	Condensation detection electrode
LED_ACC	Flame detection LED - ON THE CPU PCB
NTC	Water delivery temperature probe
P	Hydraulic circuit pump [Circulator]
PFLUE	Flue gas pressure switch
PREX	Circuit minimum pressure control switch
RE	ACF equipment lockout signalling LED - ON ACF
SB	ACF equipment reset button - ON ACF
TDOOR	Burner door thermostat (AKN100 only)
TF	Exchanger protection thermal fuse 167°C
TFUMI	Flue gas thermal fuse
TS	Safety thermostat
VAG	Burner fan
VG	Gas solenoid valve

Cable colour key

BK:	black
BN:	brown
BU:	blue
GN:	green
GY:	grey
OG:	orange
PK:	pink
RD:	red
TQ:	turquoise
VT:	violet
WH:	white
YE:	yellow



In the following wiring diagrams, the codes at the terminal output indicate the corresponding terminal-to-component connection.

JC0300.00IT_A

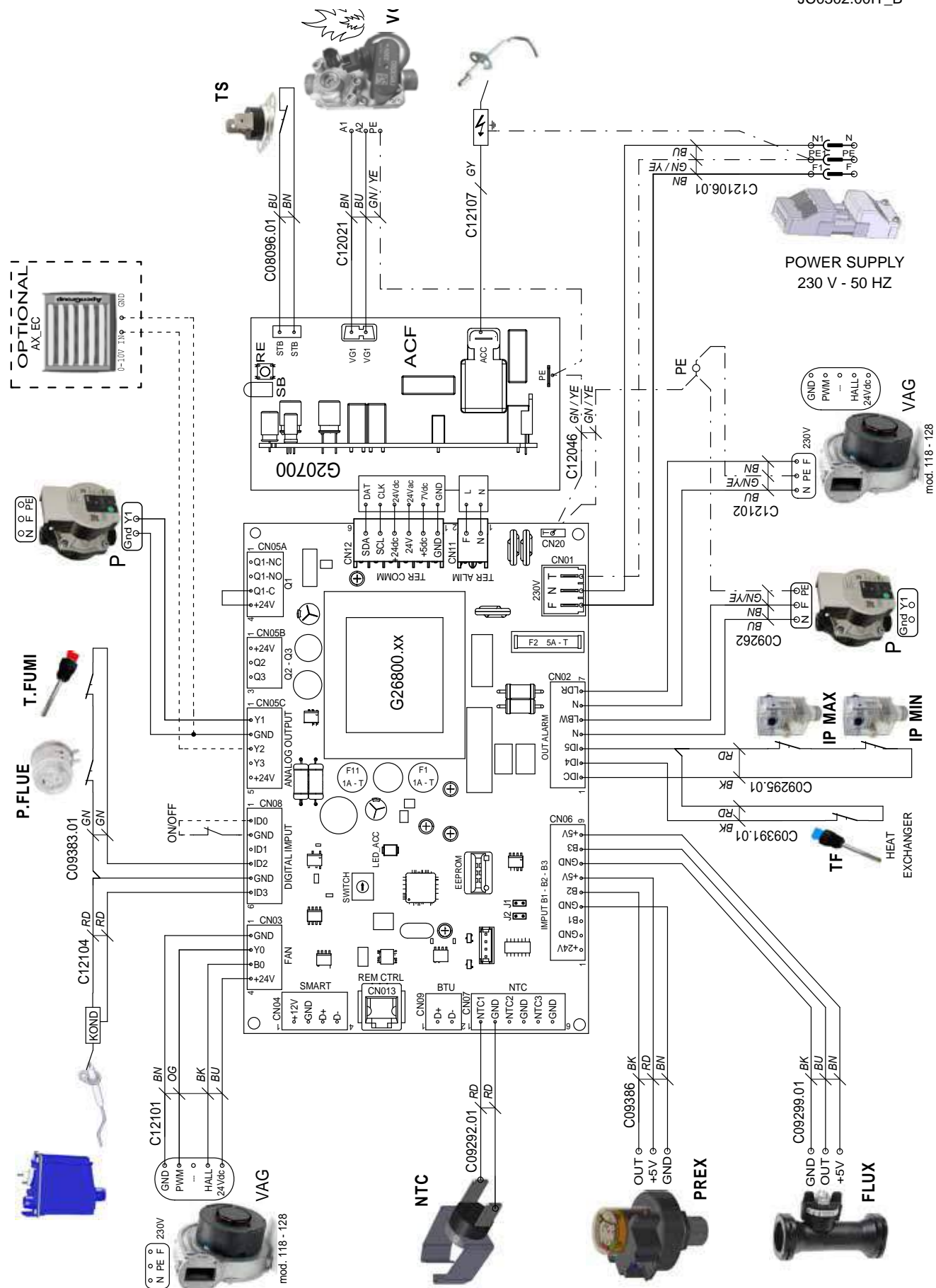


JC0301.00IT_B



9.2.3. AKN050 electric connection

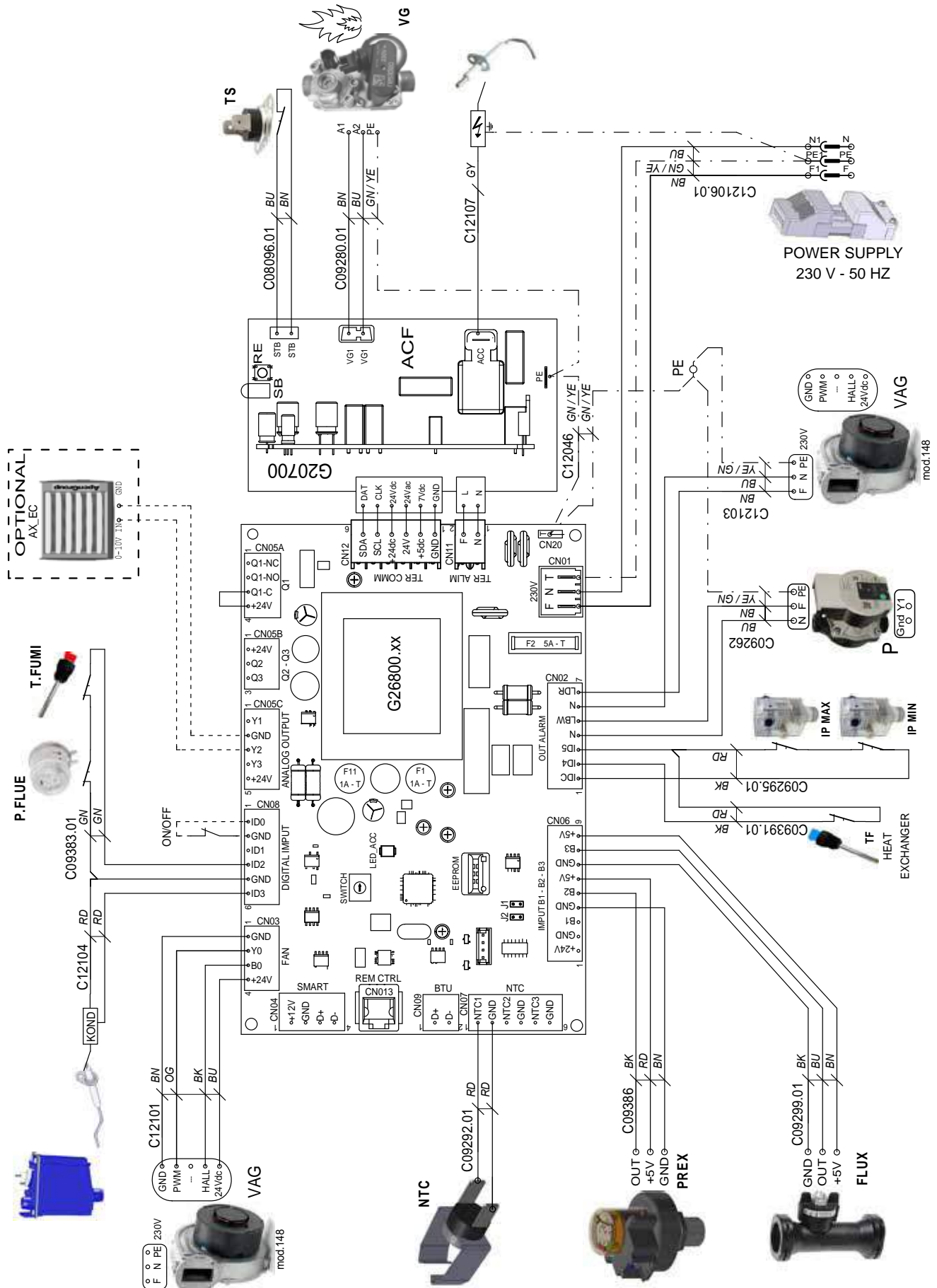
JC0302.00IT_B



AKN CONDENSING BOILER

9.2.4. AKN070 electric connection

JC0303.00IT_A



JC0304.00IT_A



DICHIARAZIONE DEL COSTRUTTORE

ai sensi del DM 06/08/2020 - Allegato A – par. 4.1

*“Requisiti tecnici per l'accesso alle detrazioni fiscali per la riqualificazione energetica degli edifici - cd. Ecobonus”
[G.U n.246 del 5-10-2020]*

Costruttore: Apen Group S.p.A. – Via Isonzo, 1 – 20042 Pessano con Bornago (MI)

Tipologia di intervento: Sostituzione di impianti di climatizzazione invernale esistenti con impianti dotati di generatore di calore a condensazione [art.2 comma 1 lett. e)].

Tipologia di generatore di calore: Caldaia a gas a condensazione

Nome Commerciale: AKN

Apen Group S.p.A. dichiara che:

i modelli di caldaia a gas a condensazione di propria produzione, appartenenti alla serie **AKN**:

- presentano un valore *dell'efficienza energetica stagionale del riscaldamento d'ambiente* (η_s) maggiore o uguale a 90%¹, corrispondente alla **classe A** di prodotto prevista dal Regolamento UE n.811/2013

Per gli interventi di sostituzione di impianti di climatizzazione invernale con impianti aventi potenza nominale del focolare **maggiori od uguali a 100 kW**, ai fini dell'asseverazione di un tecnico abilitato, si specifica che le caldaie AKY/AKN:

- sono dotate di un bruciatore di tipo modulante e di una pompa di tipo elettronico a giri variabili;
- sono idonee al funzionamento con regolazione climatica. Tale regolazione è disponibile sul Cronotermostato Smart Easy/Web e agisce direttamente sul bruciatore;

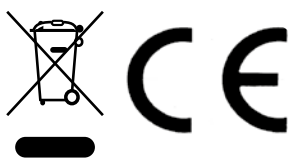
Apen Group S.p.A dichiara inoltre che :

I modelli di caldaia a condensazione serie AKN sono in grado di funzionare con i seguenti DISPOSITIVI DI TERMOREGOLAZIONE EVOLUTI di propria produzione:

- Cronotermostato Smart X – versione Easy;
- Cronotermostato Smart X – versione Web;

I suddetti dispositivi, disponibili come accessorio, appartengono alla classe V secondo la comunicazione della Commissione EU n.2014/C 207/02

Apen Group S.p.A.
Un Amministratore



¹ Il valore *“dell'efficienza energetica stagionale del riscaldamento d'ambiente”* è determinato in funzione del *Rendimento Termico utile* indicato nel Rapporto di Prova n. 151201226 emesso da Kiwa Cermet Italia, in qualità di Ente Notificato Direttiva BED (Boiler Efficiency Directive), come previsto dal Regolamento 2013/813/UE.