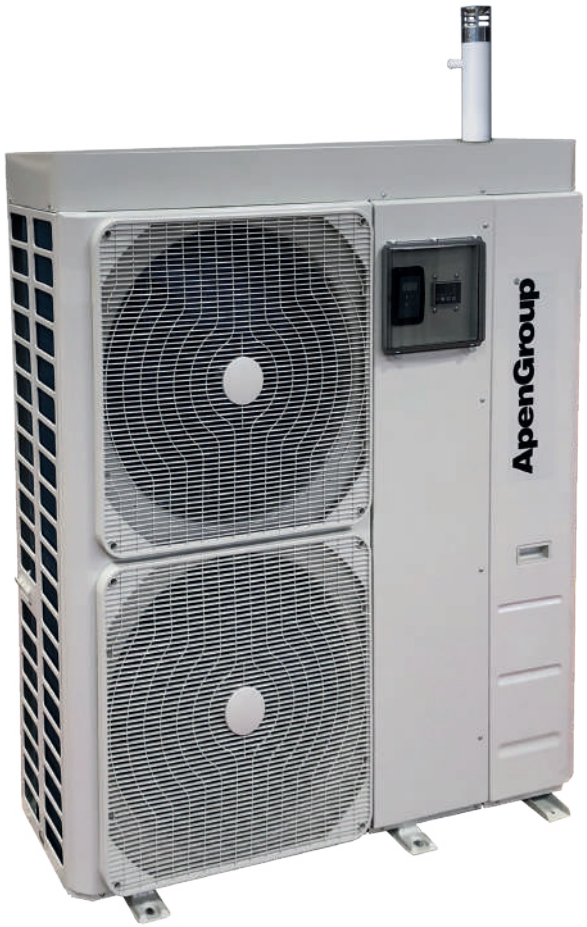
EN	*Use, Installation and Maintenance Manual* *AQUAPUMP HYBRID - HYBRID SYSTEM*

NEW VERSION
Refrigerant gas R32
CPU G26800



VER. 01.2020

Dichiarazione di Conformità
Statement of Compliance

CE

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

Modello: ***Model:***	**Sistema Ibrido AQUAPUMP HYN** **Hybrid Heater AQUAPUMP HYN**

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

- **Regolamento Apparecchi a Gas 2016/426/UE**
  Gas Appliance Regulation 2016/426/UE
- **Direttiva 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 Macchine 2006/42/CE**
  Machinery Directive 2006/42/CE
- **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:

- **EN60335-1**
- **EN60335-2-102**
- **EN60730-1**
- **EN 60068-2-1**
- **EN 60068-2-2**
- **EN 61000-6-3**
- **EN 61000-6-2**
- **EN 13857**
- **EN60204-1**
- **EN 378-1**
- **EN 378-2**
- **EN 12735-1**
- **EN 14825**

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, 22/12/2022

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

CODE SERIAL NUMBER

INDEX

1. GENERAL CAUTIONS

This manual is an integral part of the product and must always accompany it.
Should the equipment be sold or passed on to someone else, always make sure that this manual is supplied with the equipment for future reference by the new owner and/or installer.
The manufacturer shall not be held civilly or criminally responsible for injuries to people or animals or 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 staff of **Authorised Service Centres (for Italy, authorised by Apen Group Spa)**.
APEN GROUP has a large network of authorised Service Centres.
For more information, visit our web site www.apengroup.com or contact the manufacturer directly.
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 UNI, UNI-CIG, IEC, EN technical standards and with all relevant legislation, as well as with the Gas Appliances Regulation (EU) 2016/426.

2. SAFETY-RELATED WARNINGS

The following symbols are used in the 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.

Operations that must not be carried out

Before starting any type of operation on AQUAPUMP units, each operator must perfectly know the operation of the machine and of its controls and must have read and understood all information contained in this manual.

It is strictly forbidden to remove and/or tamper with any safety device.

The use of the equipment is forbidden to children and unassisted disabled people.

It is forbidden to touch the equipment with bare feet and with wet or dump body parts.

It is forbidden to perform any cleaning operation when the main electrical switch is in 'ON' position.

It is forbidden to pull, disconnect, twist electric cables that come out of the equipment, even if it is disconnected from mains.

It is forbidden to stand on top of the equipment, seat on it and/or place any type of object on it.

It is forbidden to spray or aim jets of water directly on the equipment.

The packaging material (cardboard, clips, plastic bags, etc.) must not be dispersed, abandoned or left within the reach of children as it can be a potential source of hazard.

Any ordinary or extraordinary maintenance operation must be carried out with machine stopped, without power supply.

Do not put your hands or insert screwdrivers, key or other tools in the moving parts.

The person responsible for the machine and the maintenance operator must receive suitable education and training to perform their tasks in safety conditions.

The operators must know personal protective equipment and accident prevention rules provided for by national and international laws and regulations.

2.1. Safety and health of workers

With reference to safety and health of workers, the European Community issued Directives that the employer has the obligation to comply with and enforce: 89/391/EEC, 89/686/EEC, 2009/104/EC, 86/188/EEC and 77/576/EEC, and subsequent additions and modifications.
Therefore:

It is forbidden to tamper with or replace any machine parts without express authorisation of the manufacturer. Such operations relieve the manufacturer from any civil and criminal liability.

The use of components, consumables or spare parts different from those recommended by the manufacturer and/or indicated in this manual may constitute a danger for the operators and/or damage the machine.

The operator workstation must be kept clean, ordered and free from objects that can limit his/her free movement. The workstation must be adequately illuminated for the operations provided. Poor or excessive lighting may pose risks.

Make sure that a suitable workspace ventilation is always ensured and that suction systems are always operational, in excellent conditions and in compliance with legal requirements.

The guidelines of UNI EN ISO 14738 concerning workstations on machinery have been complied with and the lifting limits imposed by UNI ISO 11228-1 have been taken into account during the design phase.
Ensure to maintain a posture that does not cause fatigue when installing and maintaining the unit. Furthermore, check the weight before handling any component.

The unit works with refrigerant R32, which is included in the list of fluorinated greenhouse gases that meet the requirements of EU Regulation 517/2014 called “F-GAS” (mandatory in the European area). This regulation, among other provisions, requires operators involved in installations operating with greenhouse gases to be in possession of a certificate, issued or recognised by the competent authority, attesting that they have passed an examination authorising them to carry out such tasks. The refrigerant R32 in gaseous form is heavier than air, if it is dispersed in the environment it tends to concentrate heavily in poorly ventilated areas. Its inhalation may cause dizziness and suffocation and, if in contact with open flames or hot objects, it may develop lethal gases (see Refrigerant Safety Data Sheet in Section 2.11).

2.2. Personal protective equipment

While using and maintaining the units, personal protective equipment must be used, i.e.:

	***Clothing: The operator that carries out maintenance or uses the system must compulsorily wear clothing compliant with the essential safety requirements in force. Moreover, he/she must wear safety shoes with non-slip sole, in particular in environments with slippery floor.***
	***Gloves: Suitable protective gloves must be used during cleaning and maintenance operations.***
	***Mask and goggles: A respiration protection mask and goggles must be used during cleaning operations.***

2.3. Safety signals

The unit is provided with the following safety signals, that the staff must necessarily respect:

	***Dangerous electrical voltage***
	***Presence of moving parts***
	***Presence of surfaces that may cause injury***
	***Presence of burning surfaces that may cause burns***
	***Risk of fire***

2.4. Fuel

Before starting up the heater, 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 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.

2.5. 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.**

2.6. Power supply

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

Cautions
- 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.

The installation of a fused omnipolar circuit breaker is mandatory upstream of the power supply cable. 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.

2.7. 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.

2.8. 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 heater 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 or the C11101 mechanical antifreeze valve kit.

It is strictly FORBIDDEN to connect a system filling circuit to the waterworks mains.

We recommend to check the water and glycol content inside the circuit 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 machines, 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

2.9. Unpacking

The unpacking operation must be carried out by using suitable tools or safety devices where required. Recovered packaging materials must be separated and disposed of according to applicable regulations in the country of use.

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

The manufacturer is not liable for any damages occurred during transport, handling and unloading.

Packing material disposal

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

2.10. Dismantling and disposal

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 HYN series hybrid machines 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.

2.10.1 Decommissioning

When the unit has reached the end of its useful life and therefore requires to be replaced, it is necessary to follow some recommendations:

- the refrigerant must be recovered by specialised personnel and sent to collection centres, in accordance with Regulation No. 517/2014 on fluorinated greenhouse gases;
- any brine solutions added to the hydraulic circuit must be recovered and disposed of properly;
- the same applies to the lubricating oil of compressors;
- electronic components such as regulators, driver PCB and inverters must be dismantled and sent to the collection points;
- if the frame and the various components are unusable, they must be dismantled and separated according to their nature, in particular copper and aluminium, that are present in moderate quantity in the machine.

These operations facilitate the recovery and recycling of substances, thereby reducing the environmental impact, in accordance with Directive 2012/19/EU on waste electrical and electronic equipment (WEEE).

The user is responsible for the proper disposal of the product in accordance with the national regulations in force in the country of destination. For further information, please contact the installation company or the competent local authorities.

 Improper decommissioning of the equipment can result in serious environmental damage and endanger the safety of persons. Therefore, to have the equipment decommissioned it is advisable to contact authorised and technically trained persons who have attended training courses approved by the relevant authorities.

 Special attention must be paid to the disposal of refrigerant gas.

 If the end user disposes of the product without being authorised, penalties will be applied in compliance with the law in the country of disposal.

2.11. Refrigerant safety data sheet

Name:	R32
	HAZARDS IDENTIFICATION
Main hazards:	Asphyxiation.
Specific hazards:	Rapid evaporation may cause frostbite.
	FIRST AID MEASURES
General information:	Do not administer anything to fainted persons.
Inhalation:	Move victim to fresh air. Use oxygen or give artificial respiration if required. Do not give adrenaline or similar substances.
Eye contact:	Immediately flush with plenty of water for at least 15 minutes and seek medical attention.
Skin contact:	Immediately wash thoroughly with water for at least 15 minutes. Apply sterile gauze. Take off contaminated clothing immediately.
	FIREFIGHTING MEASURES
Extinguishing media:	Water spray, dry powder.
Specific hazards:	Rupture or explosion of the vessel.
Specific methods:	While remaining in a protected position, cool containers with water spray jets. If possible, stop product spillage. If possible, use water spray to reduce fumes. Move vessels away from the fire area if this can be done without risk.
	ACCIDENTAL RELEASE MEASURES
Personal precautions:	Try to stop spillage. Evacuate personnel in safety areas. Eliminate sources of ignition. Provide proper ventilation. Use personal protective equipment.
Environmental precautions:	Try to stop spillage
Cleaning methods:	Ventilate the area.
	HANDLING AND STORAGE
Handling, technical measures/ precautions:	Ensure sufficient air exchange and/or exhaust system in work rooms.
Safe handling advice:	Do not breathe vapours or spray.
Storage:	Keep tightly closed in a cool, dry and well ventilated place. Store in the original containers. Incompatible products: explosives, flammable materials, Organic peroxide
	EXPOSURE CONTROL/PERSONAL PROTECTION
Control parameters:	OEL - Data not available DNEL: Derived no-effect level (workers) long-term - systemic effects, inhalation = 7035 mg/m3. PNEC: Predicted no-effect concentration water (fresh water) = 0.142 mg/l aquatic, intermittent release = 1.42 mg/l sediment, fresh water = 0.534 mg/kg dry weight
Respiratory protection:	None needed.
Eye protection:	Goggles.
Hand protection:	Rubber gloves.
Hygiene measures:	Do not smoke.
	PHYSICAL AND CHEMICAL PROPERTIES
Colour:	Colourless.
Odour:	Ethereal. Hardly noticeable at low concentrations.
Boiling point:	-51.7°C at atm. press.
Ignition point:	648 °C
Gas relative density (air=1): Liquid relative density (water=1):	1.8 1.1
Solubility in water:	280000 mg/ l
	STABILITY AND REACTIVITY
Stability:	Stable under normal conditions.
Materials to avoid: Hazardous decomposition products:	Air, oxidising agents, humidity. Under normal conditions of storage and use, no hazardous decomposition products should be generated.
	TOXICOLOGICAL INFORMATION
Acute toxicity: Local effects: Long-term toxicity:	LD/LC50/inhalation/4 hours/on= 1107000 mg/m3. No known effects. No known effects
	ECOLOGICAL INFORMATION
Global Warming Potential GWP (R11=1):	675
Ozone DepletingPotential ODP (R11=1):	0
Disposal considerations:	Refer to the supplier's gas recovery programme. Avoid direct discharge into the atmosphere.

2.11.1 Specific warnings regarding R32 gas

R32 Refrigerant gas:
- is odourless;
- is flammable, but only in the presence of flames;
- can explode, but only if it reaches a certain concentration in the air.

It is a good practice to comply with the following:
- do not smoke near the unit;
- indicate it is forbidden to smoke near the unit;
- keep the room where the unit is installed well ventilated;
- do not pierce or burn the unit;
- do not place the unit near sources of ignition, such as open flames, electric heaters, etc;
- any extraordinary maintenance or repair work on the unit must be carried out by specialised technicians or qualified personnel;
- a gas leakage test must be carried out after installation.

2.11.2 R32 gas charge

The procedures described below can only be carried out by specialised technicians or qualified personnel:
- ensure that R32 is not contaminated by other types of refrigerant;
- keep the gas cylinder upright when filling;
- apply the label to the unit after filling;
- do not fill with more refrigerant gas than necessary;
- once filling is complete, perform leak detection operations prior to the operational test;
- once all the previous operations have been completed, it is a good practice to carry out a second check for leaks.

2.11.3 Disposal of R32 gas

The procedures described below can only be carried out by specialised technicians or qualified personnel:
- do not discharge the gas in areas where the risk of forming explosive mixtures with air is present. The gas should be disposed of in a suitable torch with a flashback arrestor. Contact your supplier if you think you need instructions for use.

2.11.4 Safety regulations for R32 gas transport and storage

Before opening the unit packaging, use a gas detector to check that no gas leaks occur in the environment. Check that there are no ignition sources near the unit.
It is forbidden to smoke near the unit.
Transport and storage must be carried out in accordance with national regulations in force.

2.12. Residual risks

This section lists any residual risks that cannot be eliminated at the design stage by the manufacturer.

Handling
Handling can always involve the risk of the unit falling or tipping over. Comply with the instructions in Section 5.2 and all precautions according to regulations.

Installation
Improper installation can lead to water leaks, gas leaks, electric shocks, risk of fire, malfunction or damage to the unit. Installation should only be carried out by qualified technical personnel.
Place the unit in a suitable place where no risk of flammable gases escaping occurs. Make the installation area inaccessible to third parties.

Dust or water in the control panel
Properly fasten the panel of the control panel. Seepage may cause shocks and short circuits resulting in damage to persons/ property or the unit itself.
Special care must be given in connecting the earthing system.

Maintenance
During maintenance, which must always be carried out by authorised personnel, ensure that the isolator is in the off position and place suitable notices and a padlock to ensure that no one can accidentally change the disconnection of the equipment from the unit.

Fan
Contact with the fan can cause injury and/or death. Do not access the unit or remove the guards while the fan is running.

Refrigerant gas leakage
Wear appropriate personal protective equipment as a gas leak could cause injury and intoxication. Read Section 2.11 “Refrigerant Safety Data Sheet” carefully. Do not use heat sources near the circuit until it has been completely discharged.

Hydraulic leakage
They can cause damage to property and persons and risk of short-circuit. It is advisable to place shut-off valves.

2.12.1 Cooling circuit

The competence of all the personnel working on the cooling circuit must be certified by an organisation with validation for industry certification. Based on industry standard procedures, the certificate shall confirm that workers are suitably skilled regarding the safe handling of refrigerants.
Maintenance work can only be carried out in accordance with the manufacturer's specifications. If maintenance and repair work requires the assistance of additional personnel, the person qualified to handle flammable refrigerants must constantly supervise the work.
Before starting any work on equipment containing flammable coolant, safety checks must be carried out to minimise the risk of ignition. Take the following measures before working on the cooling circuit.

General working environment
- Inform all maintenance personnel and anybody present near the system.
- Mark off the area around the machine.
- Check for the presence of flammable materials and ignition sources in the immediate vicinity of the machine.
- Remove all flammable materials and ignition sources.

Check the presence of refrigerant
In order to identify a flammable atmosphere in time, check before, during and after work, for refrigerant leakage in the surrounding area using a refrigerant detector suitable for R32 gas and explosion-proof.
This coolant detector must not generate sparks and must be properly sealed.

Fire extinguisher
A CO_2 fire extinguisher, or powder extinguisher, must be kept on hand in cases where the coolant is filled and welding or soldering/tin brazing operations are performed.

Ignition sources
- When carrying out operations on the cooling circuit that contains, or contained, flammable refrigerant never use ignition sources, which could ignite the refrigerant.
- Remove all possible ignition sources, including cigarettes, from the area where installation, repair, dismantling or disposal work is being carried out, which may result in a refrigerant leakage.
- Before starting work, check the immediate vicinity of the machine for flammable materials and ignition sources: remove all flammable materials and ignition sources.
- Display “No smoking” signs.

Ventilate the work area
- Carry out repair work in the open air or provide adequate ventilation of the work area, before working on the cooling circuit, or starting any welding or soldering/tin brazing operations.
- Ventilation must be maintained throughout the operations. Ventilation must be capable of diluting any gas leakage and, preferably, dispersing it into the atmosphere.

Check the cooling system
- Any spare electrical components must be suitable for use and comply with the manufacturer's specifications. Replace defective components with original spare parts only.
- Carry out all component replacement operations in accordance with the guidelines. If necessary, consult the Technical Customer Service.

Check the following:
- The refrigerant filling must not exceed what is allowed for the installation environment.
- Check the correct operation of the ventilation system. Ventilation holes must not be blocked or obstructed.
- If a separate hydraulic system is used, check the secondary circuit for refrigerant.
- Symbols and labels must always be visible and clearly legible. Replace any illegible information panel.
- Refrigerant lines, and their components, must be installed in such a way that they do not come into contact with substances capable of causing corrosion, unless the refrigerant lines are made of corrosion-resistant materials, or are safely protected against corrosion.

Electrical component checks
- It is necessary to carry out safety checks for maintenance and repair work on electrical components.
- In the event of a safety-related fault, do not connect the system until the fault has been rectified.
- If it is not possible to repair the fault immediately, provide a temporary solution appropriate to the operation of the system, if necessary. Inform the system operator.

Carry out the following safety checks:
- Discharge the capacitors and ensure that no sparks are generated during discharge.
- When filling or draining refrigerant, or when emptying the refrigerant circuit, do not place any electrical components or live cables in the immediate vicinity of the device.
- Check the earth connection.

Repairs on sealed connectors
- When working on sealed components, completely cut the device from the power supply before removing the sealed covers.
- If, during operations, power supply is absolutely necessary, place a permanently operating refrigerant detector in the most critical locations, so that a warning signal is emitted in case of potentially dangerous situations.
- Take particular care that any work on electrical components does not result in changes to the connectors that could affect their protective properties. These include damage to pins; too many connections to a single terminal; connections that do not match the manufacturer's specifications; damage to seals; and incorrect installation of cable inputs.
- Make sure the device is installed correctly.
- Check that the seals are present in their places. Check to ensure that the seals effectively prevent flammable atmosphere from getting inside. Replace defective seals.

⚠ Used as a sealant, silicone can affect leak detection devices.
Do not use silicone as a sealant.
- Spare parts must comply with the manufacturer's specifications.
- Work on components suitable for flammable atmospheres: It is not imperative that these components have been cut from the power supply.

Repair works on components suitable for flammable atmospheres

- Do not connect any continuous capacitive or inductive loads to the device unless you have ensured that the permissible voltage and current are not exceeded.
- In areas with flammable atmospheres, only apply voltage to components suitable for flammable atmospheres.
- Use only original or approved parts. In the event of a leak, the use of other parts may result in the coolant got ignited.

Wiring

- Check the electrical connection for wear, corrosion, tension, vibration, sharp edges or other unfavourable environmental conditions.
- During checks, also take into account the effects of time and continuous vibration on the compressor and fans.

Refrigerant detectors

- Under any circumstances, do not use possible ignition sources to detect refrigerant escape or leak.
- Leak detector lamps or other open flame detectors must not be used.

Leak detection

Leak detection using electronic refrigerant leak detectors:

- Electronic refrigerant leak detectors may be not enough sensitive or may need to be calibrated for the relevant range. Perform calibration operations in a coolant-free area.
- The leak detector must be suitable for detecting R32 refrigerant gas.
- The leak detector must not contain any source of ignition.
- Calibrate the leak detector according to the refrigerant used. Set the response threshold to < 3 g/a, suitable for propane.

Leak detection using leak detecting liquids:

- Leak detector liquids are suitable for use with most refrigerants.

The chlorine contained in some leak detection liquids can react with the coolant. This can cause corrosion. Do not use leak detection liquids containing chlorine.

Measures required in the event of leakage from the cooling circuit:

- Immediately extinguish any open flame near the heat pump.
- If soldering/tin welding is required to repair the leak, the refrigerant circuit must be emptied of all the refrigerant. Before and during brazing/tin welding operations with oxygen-free nitrogen, drain the coolant from the area to be brazed/tin welded.

Removal and emptying

Conventional procedures must be followed when working inside the cooling circuit to carry out repairs or for any other reason. However, it is important to follow best practices as there may be the risk of flammability. The following procedure should aim to:

- remove the refrigerating liquid;
- purge the circuit with an inert gas;
- empty;
- purge again with an inert gas;
- open the circuit by cutting or brazing.

The refrigerant to be used for filling must be stored in the appropriate storage cylinders.

The system must be “washed” with OFN to obtain a safe unit. It may be necessary to repeat this process several times. Compressed air or oxygen must not be used for this work.

The system can be washed by interrupting the vacuum condition using OFN and continuing to fill until the operating pressure is reached, creating a vent to the atmosphere and finally recreating the vacuum condition.

This process must be repeated until there is no trace of refrigerant left in the system. When filling the last OFN, the system must be at atmospheric pressure to allow it to work. This operation

is of vital importance if brazing operations are to be performed on the piping network.

Ensure that for each of the ignition sources the outlet duct of the depressurisation pump is not closed and that ventilation is available.

Filling procedure

In addition to conventional filling procedures, the following requirements must be observed.

- Ensure that contamination between different refrigerants does not occur when using filling equipment. Hoses or ducts should be as short as possible to minimise the amount of refrigerant in them.
- The cylinders must be kept in an upright position.
- Ensure that the cooling system is grounded before filling the system with refrigerant.
- Label the system when charging is complete, (if not already done).
- Particular care must be taken not to overload the cooling system.

Before filling, the system must be pressure tested with OFN. The system must be subjected to a leakage test after refilling but before commissioning. An additional leak test must be performed before leaving the site.

Decommissioning

Before performing this procedure, it is essential that the technician is completely familiar with the equipment and every detail of it. It is good practice to store all refrigerants safely. Samples of oil and refrigerant must be taken before work is carried out in case analysis is required before using the refrigerant again. It is essential that electrical power is available before starting work.

- Become familiar with the equipment and its operation.
- Isolate the system electrically.
- Before attempting the procedure, make sure that:
  - a mechanical operating equipment is available, if required, to handle refrigerant cylinders;
  - all personal protective equipment is available and used correctly;
  - that the recovery process is constantly supervised by a competent person;
  - that the recovery equipment and cylinders comply with the relevant standards.
- Depressurise the cooling system if possible.
- If it cannot be depressurised, connect a manifold so that the refrigerant can be drained from various parts of the system.
- Be sure that the cylinder is placed on the scale before recovery takes place.
- Start the recovery machine and operate it according to the manufacturer's instructions.
- Do not overfill the cylinders (no more than 80 % by volume of refilling fluid).

- Do not exceed, even momentarily, the cylinder maximum operating pressure.
- When the cylinders have been properly filled and the process is complete, check that the cylinders and equipment are promptly removed from the site and that all equipment shut-off valves are closed.
- Recovered refrigerants must not be filled into another cooling system unless they have been cleaned and checked.

Identification (machine labelling)
If the heat pump is decommissioned, place a label with signature and date in a clearly visible position, which contains the following information:
- The coolant is flammable.
- The system has been decommissioned.
- The coolant has been drained

Recovery
When draining refrigerants from a system, whether for maintenance or decommissioning, it is good practice to do it safely.
When transferring refrigerant into the cylinders, ensure that only cylinders suitable for refrigerant recovery are used. Make sure that the exact number of cylinders is available to contain all the refrigerant of the system. All cylinders to be used are intended for the refrigerant being stored and labelled for that refrigerant (i.e. cylinders specifically for the refrigerant storage).
The cylinders must be complete with a pressure relief valve and associated shut-off valves, in good working order. Empty storage cylinders are withdrawn and, if possible, cooled before recovery takes place.
The recovery apparatus must be in good working order with a set of instructions pertaining to the equipment being operated and must be suitable for the recovery of flammable refrigerants. A set of calibrated weighing scales must also be available. Hoses must be fitted with disconnection fittings that do not leak and are in good working order.
Before using the recovery machine, check that it is in a satisfactory state of use, that it has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant leak. Contact the manufacturer in case of any doubt.
The recovered refrigerant must be returned to the refrigerant supplier in the appropriate recovery cylinder, with the appropriate Waste Transfer Note. Do not mix refrigerants in recovery units, and especially not in cylinders.
If compressors or their oils have to be removed, make sure they have been drained to an acceptable level to ensure that no flammable refrigerant remains in the lubricant. The emptying process must be carried out before the compressor returns to the suppliers. Only electrical heating of the compressor housing can be used to accelerate this process.
Draining oil from a system must be done safely.

3. TECHNICAL FEATURES

AQUAPUMP HYBRID is a monobloc unit for installation in partially protected locations or outdoor, designed for the production of hot and cold water using renewable energy for industrial, tertiary sector and/or civil environments.

This system integrates the high efficiency of the condensing technology (34 kW boiler with modulating premix burner with NOx emission class 6 according to EN15502-1) with the performance of the latest generation air-to-water heat pump with inverter technology at 15 kW power in warming operation and 12 kW power in cooling operation.

The use of INVERTER brushless compressor technology, combined with the electronic expansion valve, the pump and the variable revolution fan optimises consumptions and operating efficiency of refrigeration components.

Through the dedicated electronic board and user interface, the management system integrated in the AQUAPUMP HYBRID allows optimising in a smart way the energy production of the two systems that make up the machine, according to the external temperature conditions and instantaneous consumption demand.

The condensing boiler ensures an operation with efficiency between 101% and 108% at any operating condition, while the air-to-water heat pump is started automatically only when the conditions around the system allow taking full advantage of the renewable energy in terms of efficiency and costs.

The smart and combined use of the two systems allows the highest level of energy saving by the end user with the use of convenient renewable energy, while the presence of a high-performance boiler guarantees comfort and satisfaction of consumption demands with any outdoor weather conditions.

The research that led to the development of the AQUAPUMP HYBRID project was aimed at the study of an integrated regulation able to ensure the supply of renewable energies as long as the operating conditions are favourable in terms of costs and energy saving, ensuring continuous hot water supply, also at very low external temperatures, thanks to the latest generation high-performance boiler.

It has been designed to be matched with a Hybrid system characterised by high exchange surfaces with high efficiency coils, double fan with automatic speed control, direct current brushless motor and condensate collection tray for use in cooling operation.

The development of a plug and play monobloc unit with integrated regulation, ensures practicality and easy installation by the installer with consistent savings in terms of costs for the final user and time for the installer.

AQUAPUMP HYBRID can only be operated if it is combined with the Smart X programmable thermostat in both Easy and Web versions.

Structural work
All units are manufactured with hot-dip galvanised sheet, painted with oven-dried polyurethane powders at 180°C to ensure the best resistance to elements. Structural work is self-bearing with removable panels to facilitate inspection and maintenance of internal components. All screws and rivets for outdoor installation are made of galvanised steel.

Cooling circuit
The cooling circuit is produced using components of leading international companies and in accordance with standard UNI EN 13134 concerning welding-brazing processes. The refrigerant gas used is R32. The refrigerant circuit includes: 4-way reverse cycle valve, electronic expansion valve, liquid separator, liquid receiver, inspection valves for maintenance and control, safety device (high pressure switch), pressure transducers to precisely adjust evaporation and condensing pressure, filters to prevent thermal expansion valve clogging.
each unit is pressure tested for leaks and supplied complete with the optimised refrigerant charge for operation.
Compressors
Inverter DC compressors are of twin rotary type expressly designed for operation with R32, provided with thermal protection and installed on rubber anti-vibration elements.
Compressors are installed in a housing separated from the air flow to reduce noise. The casing resistance activates if the compressor has been turned off for at least 30 minutes and if the drain temperature is lower than 20°C (with 2.0°C hysteresis). Upon compressor restarting the casing resistance is disabled, as it is activated when the compressor is switched off. Nonetheless, the resistance works even when the unit is switched off to avoid problems during restart. **If the system is turned off completely, it is recommended that the unit be electrically powered and put into stand-by at least 12 hours before commissioning.**
The temperature of the oil container must be at least 10°C above room temperature. The inspection of the compressors is possible by removing the side and front panels of the unit, allowing maintenance even with the unit running.
Air side exchanger
Air exchangers are produced with copper pipes and aluminium tabs. Pipes are mechanically spindled in the aluminium tabs to increase the heat exchange factor. The geometry of these exchangers allows a low pressure drop value on air side and therefore the possibility to use fans with low number of revolutions (with subsequent reduction of machine noise).
Utility side exchanger
The device exchangers are of the welding-brazing plate type and are made of AISI304 stainless steel, factory insulated using insulating closed cell material and are equipped with a KA antifreeze resistor. Each evaporator is protected by a temperature probe used as an antifreeze protection probe that activates the circulator, even when the machine is switched off, in the event the conditions set on the control are met.

KA antifreeze resistor
The antifreeze electric resistance is a factory fitted kit and is present on all machines.
The water antifreeze resistors on the faces of the evaporator plates are activated even when the machine is switched off (but powered on) when the delivery water temperature falls below 4°C. The resistances are switched off when the temperature measured by the outlet water probe exceeds 6°C.
On the other hand, the heating cable on the base of the machine is activated when the external air temperature falls below 3°C. It is deactivated if the external temperature exceeds 5°C.

Outdoor unit fans
Fans are produced with plastic material, of axial type with airfoil blades. They are all statically and dynamically balanced and provided with protection grille in compliance with standard IEC EN 60335-2-80 (household and similar electrical appliances safety). Fans are installed on the unit through the interposition of rubber anti-vibration elements for noise emission reduction. All electric motors used are of 8-pole modulating brushless type (200/1000 rpm). Motors are directly coupled and equipped with integrated thermal protection. All motors have IP 44 protection rating.

Control panel
The electrical control panel is produced in compliance with the current European Regulations. The electrical control panel can be accessed by removing the front and side panel and the unit cover using an appropriate tool. The protection rating of the electrical control panel is IP24. Moreover, the panel is equipped with terminal board with clean contacts for remote ON-OFF, DHW external 3-way valve management and contacts for remote control panel.

Cooling circuit control system
All units are equipped with microprocessor with overheating control logic through the electronic thermostatic valve managed according to the signals sent by pressure transducers. Moreover, the CPU controls the following functions: adjustment of output water temperature from plate heat exchanger, antifreeze protection, compressor timer, alarm reset, alarm management and operation LED. The control system, together with INVERTER technology and on-board sensors, monitors and adjusts swiftly and continuously the performance of inverter compressor, circulator and indoor unit fans.
The INVERTER control system is able to manage minimum system water contents of 20 litres thanks to the presence of the boiler with anti-freeze system that allows the number of defrosting cycles to be limited. Litres refer to the absolute value, and not for every kW of installed power.

Hydraulic circuit
The AQUAPUMP HYBRID models are equipped with a built-in hydraulic circuit that includes: modulating circulator with high efficiency brushless motor, suitable for the use of chilled water and directly managed by the on-board machine control, plate heat exchanger, protection flow switch, expansion tank, safety valve (3 bar) to be connected to a collection system and manual air vent valve.

Adjustment of outdoor unit fan revolutions
This type of adjustment, managed by the microprocessor, is required to optimise the evaporation/condensing pressure in summer/winter operation so as to allow the correct operation of the machine.

Condensing boiler
AQUAPUMP HYBRID on-board boilers are of condensing type with modulating premixed burner with class A energy efficiency. Condensing and premixing technology, together with flame modulation, allow achieving efficiency up to 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.
The whole AQUAPUMP HYBRID series uses the "cold door" exchanger, which allows to further reduce the heat losses in the housing, increasing the boiler yield.
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 a adjustment preset
in the factory. Unlike atmospheric burners, the CO_2 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 keeping its combustion parameters at optimal levels.
Low emissions
The premixed burner, in combination with the air/gas valve, ensures "clean" efficient combustion having low emissions.

Boiler control system
The condensing boiler operation is controlled by the CPU_ SMART electronic board which, together with the integrated flame monitoring equipment, manages burner switching on and off cycles, power modulation control through temperature sensors on boiler side, water flow rate value reading through the remote flowmeter as well as all the other safety devices and any malfunction signals of the boiler itself.

Optional indoor unit - Fan heater
The fan heater that may be combined to AQUAPUMP HYBRID models consists of a multi-row copper/aluminium coil, one or two axial fans and a composite material frame.

Fan heaters are supplied as standard with:
- vent valve
- fans with automatic speed control, direct current brushless motor
- condensate collection tray for summer use

Switching on, switching off and ventilation speed adjustment are managed by the CPU_SMART board which adjusts the boiler operation.
During operation in heating mode, modulation is performed automatically according to the fan heater inlet water temperature; during operation in conditioning mode, the speed reaches a preset optimal fixed value. If AQUAPUMP HYBRID is in domestic hot water production phase, ventilation is temporarily interrupted automatically.

Control and protection devices
All AQUAPUMP HYBRID units are supplied as standard with the following control and protection devices: return water temperature probe, installed on water return pipe from the system, operation and antifreeze probe installed on water delivery pipe to the system, temperature probe positioned at the outlet of heat pump plate exchanger, safety valve with gauge on hydraulic system, high pressure transducer, low pressure transducer, inlet and outlet temperature probes from compressor, thermal protection for compressors, thermal protection for fans, flowmeter on water side to protect boiler evaporator and exchanger, HP pressure switch.

Accessories
- *Mechanical antifreeze valve kit*, which in the absence of power supply to the machine, if return water of the system drops below 3°C, disconnects the main circuit and drains it (the antifreeze valve kit must be combined with a solenoid valve to be positioned on the return pipe and with a check valve to be positioned on the delivery pipe).
- *Rubber anti-vibration elements* to be inserted in the unit base to reduce any vibrations (recommended accessory).
- *DHW diverter valve kit*, which allows automatic diversion of the heat carrier fluid between the heating/air conditioning line and the DHW line

3.1. Technical Data

3.1.1 HYN

GENERAL TECHNICAL DATA OF AQUAPUMP HYBRID		HYN432	HYN532
Seasonal space heating energy efficiency [Reg.813/2013/EC]*		150.6%	150.6%
Energy efficiency class [Reg.811/2013/EC]*		A+++	A+++
Heating performances			
Maximum rated power	kW	15.2 (HP) + 35.4 (Boiler)	
Cooling performances			
Maximum rated power	kW	14.7	
Electrical Characteristics			
Power supply		230V/1/50Hz	400V/3P+N+T/50Hz
Maximum power consumption	kW	6.6	6.6
Maximum absorbed current	A	28.6	9.5
Protection Rating		IPX4D	IPX4D
Hydraulic circuit			
Maximum circulator power	W	140 (HP) + 78 (Boiler)	
Expansion reservoir	l	10.0	
Expansion reservoir pre-charge pressure	bar	1.3	
Maximum working pressure	bar	3.0	
Water content	l	4.7	4.7
Minimum system water content (1)	l	20	20
Size and weight			
Delivery/return connections - UNI ISO 7/1	Ø	G 1" M	G 1" M
Gas connection	Ø	G 3/4" M	G 3/4" M
Dimensions (WxHxD)	mm	1258x1402x448	1258x1402x448
Max package dimensions (WxHxD)	mm	1430x1546x690	1430x1546x690
Weight with packaging	kg	187	187
Noise			
Sound pressure (2)	dB(A)	68	68

(*) Package efficiency: HP + temperature control + boiler. Under average climatic conditions at medium temperatures. For details see Section 8.

1. The presence of the boiler with anti-freeze system allows the number of defrosting cycles to be limited.
2. Sound pressure level on a free field (1 m), according to ISO 3744:2010.

The minimum permitted temperature for unit storage is 5°C

HYN432 AND HYN532 PERFORMANCES										
External air temperature	Heat pump ON			ON boiler			HYN			
	Output	T H_2O	Flow rate	Output	T H_2O	Flow rate	Output	T H_2O	Flow rate	dP H_2O
°C	kW	°C	l/h	kW	°C	l/h	kW	°C	l/h	kPa
-2	11.2	45	2330	35.4	72	970	46.6	53	3300	40
2	12.7	45	2330	35.4	72	970	48.1	53	3300	40
7	13.6	45	2330	35.4	72	970	49	53	3300	40
12	14.4	45	2330	35.4	72	970	49.8	53	3300	40

BOILER TECHNICAL DATA			HYN432	HYN532
Type of equipment			B23P - C63 (1)	
EC approval		P.I.N.	0476CR1226	
Seasonal space heating energy efficiency - [Reg.813/2013/EC] (2)			91.8	
Energy efficiency class [Reg.811/2013/EC]			A	
NOx class [EN 15502-1]			6	
Boiler yields				
	*Symbol**		Max. - Min.	
Burner heat output [Hi]	*Pn*	kW	34.8 - 6.8	
Useful heat output [Hi] [80/60°C]	*P4*	kW	33.6 - 6.6	
Useful heat output [Hi] [50/30°C]		kW	36.5 - 7.2	
Useful heat output at 30% of load [Hi] [50/30°C]	*P1*	kW	11.3	
Useful heat output [Hi] [72/45°C]	*Pn*	kW	35.4 - 7.0	
Useful efficiency [Hi] [80/60°C]	*η4*	%	96.6 - 96.5	
Useful efficiency [Hi] [50/30°C]		%	104.8 - 105.8	
Useful efficiency at 30% of Pn [Hi]	*η1*	%	107.7	
Useful efficiency [Hi] [72/45°C]		%	101.8 - 103.5	
Flue losses with burner on [Qn; 80/60°C]		%	2.7	
Heat loss in standby [EN15502-2]	$P_{stand-by}$	kW	0.073	
Flue losses with burner off		%	0.1	
Housing losses [Taverage=60°C]		%	0.35	
Condensate MAX quantity [72/45°C]		l/h	1.3	
Condensate MAX quantity [50/30°C]		l/h	3.6	
Flue gas emissions				
Carbon monoxide - CO - [3% of O_2] - [80/60°C] - Pn (3)		mg/kWh	95	
Carbon monoxide - CO - [0% of O_2] (4)		ppm	38	
Nitrogen oxides - NOx - [Hi] [0% of O_2] (4)			40ppm - 23mg/kWh	
Nitrogen oxides - NOx - [Hs] [0% of O_2] (4)			36ppm - 20mg/kWh	
Flue gas temperature (5)		°C	60	40
Pressure available at the flue		Pa	110	
Electrical Characteristics				
Boiler supply voltage		V	230V-50 Hz single-phase	
Rated power		W	125	48
Electric power of auxiliary components (excluding circulator)	*elmax*	W	75	14
Electric power of auxiliary components at 30% of load (excluding circulator)	*elmin*	W	15	
Electric power of auxiliary components in standby	P_{SB}	W	5	

(*) 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 Value referred to cat. H (gas G20) with Burner for Switzerland setting. For further details refer to the table in Section 6.2 (gas settings table).
4 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).
5 With water temperature 50°C-30°C

HEAT PUMP TECHNICAL DATA		HYN432	HYN532
Seasonal space heating energy (medium - low temperature weather conditions) [Reg.813/2013/EC]*		176%	176%
Energy efficiency class (medium - low temperature weather conditions) [Reg.811/2013/EC]*		A+++	A+++
Seasonal space heating energy (medium temperature weather conditions) [Reg.813/2013/EC]*		130%	130%
Energy efficiency class (medium temperature weather conditions) [Reg.811/2013/EC]*		A++	A++
Electrical Characteristics			
Power supply		230V/1/50Hz	400V/3P+N+T/50Hz
Maximum power consumption	kW	6.6	6.6
Maximum absorbed current	A	28.6	9.5
Maximum current consumption with antifreeze kit	A	29.2	9.7
Cooling			
Cooling capacity (1)	kW	6.87 / 12.1	
Absorbed power (1)	kW	3.53	
E.E.R. (1)	W/W	3.25	
Cooling capacity (2)	kW	9.17 / 14.7	
Absorbed power (2)	kW	2.59	
E.E.R. (2)	W/W	5.4	
Heating			
Heat output (3)	kW	7.54 / 15.2	
Absorbed power (3)	kW	2.91	
C.O.P. (3)	W/W	4.85	
Heat output (4)	kW	7.23 / 14.6	
Absorbed power (4)	kW	3.55	
C.O.P. (4)	W/W	3.82	
Compressor			
Type/Number		Twin rotary DC inverter / 1	
Refrigerant oil (type / quantity)	l	ESTER OIL VG74, 1.4	
Fan motor			
Type / Number		DC Brushless / 2	
Refrigerant			
Type / Quantity / CO_2 equivalent	[-] - kg - ton $CO_{2eq.}$	R32 / 3.20 / 2.2	
Design pressure (high/low) heating mode	bar	42.8 / 1.3	
Design pressure (high/low) cooling mode	bar	42.8 / 3.5	

(*) Relating to HP only

1. external air temp. 35°C; in/out water temp. 12/7°C
2. external air temp. 35°C, in/out water temp. 23/18°C
3. external air temp. 7°C dry bulb /6°C wet bulb; in/out water temp. 30/35°C
4. external air temp. 7°C dry bulb /6°C wet bulb; in/out water temp. 40/45°C

Operating limits

Heat Pump - Water flow rate to evaporator

The rated water flow rate refers to 5°C heat drop between the inlet and outlet of the evaporator. The maximum permitted flow rate is the value with a 3°C temperature difference, while the minimum is the value with a 8°C temperature difference at nominal conditions as stated in the technical data sheet.

Insufficient water flow rates can cause evaporation temperatures to fall too low, triggering the safety devices and shutting down the unit and, in some borderline cases, leading to ice formation in the evaporator and consequent serious faults in the cooling circuit.

Heat Pump - Chilled water production (summer operation)

The minimum permitted temperature at the evaporator outlet is 5°C.

The maximum temperature that can be maintained at the evaporator outlet is 25°C.

Heat pump - Hot water production (winter operation)

Once the system has reached full operation, the water inlet temperature must not fall below 25°C: lower values, not due to transient or start-up phases, can cause system faults and may involve compressor failure. The maximum outlet water temperature must not exceed 58°C.

Temperatures higher than the indicated values, especially in case of low water flow rates, could lead to malfunctioning of the unit, or in the most critical cases safety devices could be triggered.

BOILER		
Ambient temperature	Min. -15°C	Max. +50°C
Outlet water temperature	-	Max. +82°C

HP: Water cooling mode		
Ambient temperature	Min. -10°C	Max. +46°C
Outlet water temperature	Min. +5°C	Max. +25°C

HP: Heat pump mode		
Ambient temperature	Min. -20°C	Max. +30°C
Outlet water temperature	Min. +25°C	Max. +58°C

HP: Domestic hot water		
Ambient temperature with water at 39°C max.	Min. -20°C	Max. +40°C
Ambient temperature with water at 55°C max.	Min. -10°C	Max. +35°C
Outlet water temperature	Min. +25°C	Max. +58°C

Output table for the heat pump in HEATING MODE

HYN432 and HYN532												
External air T.	Tout											
	25 °C			30 °C			35 °C			40 °C		
°C	kWt	kWe	COP	kWt	kWe	COP	kWt	kWe	COP	kWt	kWe	COP
-15	10.9	3.72	2.92	10.8	4.05	2.66	10.8	4.05	2.66	10.8	4.78	2.25
-10	10.7	3.23	3.31	10.7	3.55	3.00	10.6	3.90	2.73	10.7	4.27	2.49
-7	10.9	3.01	3.62	10.8	3.31	3.26	10.7	3.63	2.95	10.7	4.00	2.68
-2	11.2	2.65	4.25	11.5	3.08	3.72	11.4	3.41	3.34	11.3	3.73	3.02
2	12.4	2.41	5.16	12.5	2.81	4.46	13.0	3.24	4.02	12.5	3.46	3.62
7	14.3	2.24	6.36	14.1	2.56	5.51	14.1	2.91	4.85	13.9	3.23	4.30
12	15.0	1.83	8.20	14.9	2.18	6.83	14.7	2.48	5.94	14.6	2.83	5.15
15	15.0	1.69	8.85	14.8	1.99	7.44	14.7	2.33	6.31	14.5	2.66	5.47
20	14.9	1.42	10.50	14.7	1.70	8.66	14.6	2.01	7.25	14.4	2.64	5.44
25	-	-	-	15.0	1.40	10.70	15.0	1.71	8.75	14.7	1.99	7.38
30	-	-	-	16.0	1.26	12.70	15.9	1.57	10.10	15.5	1.86	8.33

HYN432 and HYN532												
External air T.	Tout											
	45 °C			50 °C			55 °C			60 °C		
°C	kWt	kWe	COP	kWt	kWe	COP	kWt	kWe	COP	kWt	kWe	COP
-15	10.8	5.29	2.05	-	-	-	-	-	-	-	-	-
-10	10.5	4.55	2.31	10.5	4.93	2.13	10.3	5.12	2.01	-	-	-
-7	10.7	4.36	2.44	10.7	4.83	2.21	10.6	5.05	2.09	10.5	5.28	1.99
-2	11.2	4.08	2.74	11.1	4.43	2.51	11.0	4.72	2.33	10.9	5.01	2.17
2	12.7	3.92	3.24	12.4	4.21	2.95	12.4	4.57	2.71	12.4	4.93	2.52
7	13.6	3.55	3.82	13.6	4.00	3.41	13.4	4.35	3.09	13.3	4.70	2.82
12	14.4	3.19	4.52	14.1	3.53	4.00	14.0	3.92	3.56	13.8	4.30	3.20
15	14.4	3.00	4.80	14.0	3.32	4.23	14.0	3.70	3.77	16.9	4.09	3.40
20	14.4	2.64	5.44	14.0	2.92	4.80	14.1	3.32	4.24	14.1	3.72	3.80
25	14.5	2.28	6.36	14.5	2.63	5.51	14.1	2.90	4.87	13.8	3.17	4.34
30	15.3	2.18	7.02	15.1	2.52	6.02	14.8	2.84	5.23	14.5	3.16	4.60

Performance referred to instantaneous power according to EN14511:2018 without defrosting contribution.

Output table for the heat pump in COOLING mode

HYN432 and HYN532																		
External air T.	Tout																	
	5 °C			7 °C			10 °C			12 °C			15 °C			18 °C		
°C	kWt	kWe	EER	kWt	kWe	EER	kWt	kWe	EER	kWt	kWe	EER	kWt	kWe	EER	kWt	kWe	EER
20	10.4	2.02	5.14	11.3	2.05	5.53	12.3	2.02	6.08	13.1	1.87	7.04	14.4	1.64	8.81	15.6	1.61	9.71
25	10.8	2.51	4.30	11.6	2.51	4.62	12.7	2.55	5.01	13.3	2.30	5.76	14.0	1.93	7.26	15.1	1.89	7.98
30	11.2	3.07	3.65	12.0	3.19	3.77	13.1	3.23	4.05	13.3	2.85	4.69	13.7	2.27	6.05	14.8	2.26	6.53
35	10.9	3.48	3.13	11.5	3.53	3.25	12.8	3.59	3.56	12.9	3.19	4.04	13.1	2.58	5.06	14.0	2.59	5.40
40	10.3	3.80	2.70	10.9	3.88	2.82	11.9	3.96	3.02	12.1	3.53	3.43	12.4	2.89	4.28	13.3	2.91	4.55
45	9.6	4.12	2.32	10.2	4.20	2.43	11.2	4.30	2.61	11.3	3.86	2.94	11.5	3.19	3.61	12.4	3.23	3.86

Performance referred to instantaneous power according to EN14511: 2018.

3.1.2 Fan heaters

FAN HEATER		AB018IT-HY	AB034IT-HY
Max working pressure	bar	16	
Maximum air output	m	25	
Water content	l	3.2	6.5
Collector diameter		G 3/4" M	G 1" M
No. of fans and blade Ø		1 x 450	2 x 450
Supply voltage	V	230V - 50 Hz single-phase	
Rated power	W	300	600
Max speed absorbed current	A	2.05	4.1
Motor revolutions	r.p.m.	1280	
Protection Rating	IP	IP54	
Operating weight	kg	27	40
Weight with packaging	kg	30	45

Conditioning data of fan heaters combined with HYN in SUMMER mode depend on the power fed into the fan heater according to the using conditions of the machine (see performance tables of heat pump in COOLING mode).
Ventilation speed during conditioning operation phase is equal to 4V voltage value (default value of parameter YF2) which corresponds to 2,000 m3/h.

AB018IT-HY: HEATING										
Water T. at coil inlet	Air T. at coil inlet	INPUT voltage	Air flow rate	Output power	Current power	Blow distance	Sound pressure *	Heat output	Water flow rate	Water pressure loss
°C	°C	V	m³/h	W	A	m	dB(A)	kW	l/h	kPa
53	5	10	3900	315	2.10	21.2	53.83	24.65	1650	26
		9	3450	242	1.63	19.3	51.54	23.09		26
		8	2950	174	1.16	17.1	48.96	21.15		26
		7	2440	115	0.80	15.4	45.98	18.96		26
		6	1940	73	0.54	13.2	42.50	16.53		26
		5	1430	48	0.36	11.1	38.83	13.64		26
		4	980	31	0.22	9.0	34.12	10.58		26
		3	620	16	0.15	7.3	27.13	7.61		24
		2	350	10	0.11	5.1	18.56	4.88		24
		1	-	-	-	-	-	-		-
	10	10	3900	315	2.10	21.2	53.83	22.02	1650	26
		9	3450	242	1.63	19.3	51.54	20.6		26
		8	2950	174	1.16	17.1	48.96	18.88		26
		7	2440	115	0.80	15.4	45.98	16.93		26
		6	1940	73	0.54	13.2	42.50	14.74		26
		5	1430	48	0.36	11.1	38.83	12.15		26
		4	980	31	0.22	9.0	34.12	9.42		24
		3	620	16	0.15	7.3	27.13	6.77		24
		2	350	10	0.11	5.1	18.56	4.33		24
		1	-	-	-	-	-	-		-
	15	10	3900	315	2.10	21.2	53.83	19.3	1650	26
		9	3450	242	1.63	19.3	51.54	18.07		26
		8	2950	174	1.16	17.1	48.96	16.54		26
		7	2440	115	0.80	15.4	45.98	14.82		26
		6	1940	73	0.54	13.2	42.50	12.9		26
		5	1430	48	0.36	11.1	38.83	10.62		26
		4	980	31	0.22	9.0	34.12	8.22		24
		3	620	16	0.15	7.3	27.13	5.9		24
		2	350	10	0.11	5.1	18.56	3.77		24
		1	-	-	-	-	-	-		-
	20	10	3900	315	2.10	21.2	53.83	16.71	1650	26
		9	3450	242	1.63	19.3	51.54	15.63		26
		8	2950	174	1.16	17.1	48.96	14.32		26
		7	2440	115	0.80	15.4	45.98	12.81		26
		6	1940	73	0.54	13.2	42.50	11.14		26
		5	1430	48	0.36	11.1	38.83	9.17		24
		4	980	31	0.22	9.0	34.12	7.09		24
		3	620	16	0.15	7.3	27.13	5.08		24
		2	350	10	0.11	5.1	18.56	3.24		24
		1	-	-	-	-	-	-		-
AB018IT-HY: AIR CONDITIONING										
7	27	6	1940	73	0.54	13.2	42.50	7.72	1165	16
								5,16*		
		5	1430	48	0.36	11.1	38.83	6.57		16
								4.32*		
		4	980	31	0.22	9.0	34.12	5.3		16
								3.43*		
		3	620	16	0.15	7.3	27.13	3.98		16
								2.55*		
	30	6	1940	73	0.54	13.2	42.50	9.33	1165	16
								5.54*		
		5	1430	48	0.36	11.1	38.83	7.97		16
								4.68*		
		4	980	31	0.22	9.0	34.12	6.45		16
								3.74*		
		3	620	16	0.15	7.3	27.13	4.88		16
								2.8*		

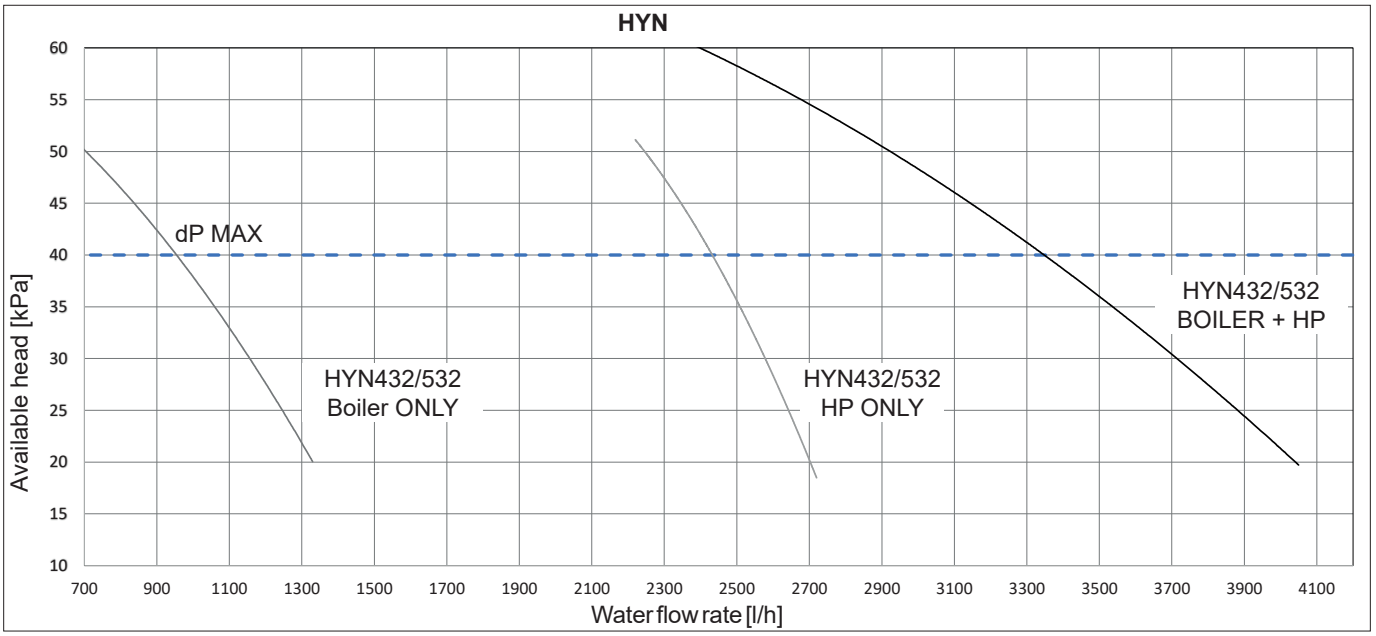
* Sensitive heat output

AB034IT-HY: HEATING										
Water T. at coil inlet	Air T. at coil inlet	INPUT voltage	Air flow rate	Output power	Current power	Blow distance	Sound pressure *	Heat output	Water flow rate	Water pressure loss
°C	°C	V	m³/h	W	A	m	dB(A)	kW	l/h	kPa
53	5	10	7950	635	4.16	22.3	56.83	50.25	3300	18
		9	7045	474	3.18	21.1	54.54	47.1		18
		8	6020	333	2.24	18.0	51.96	43.19		18
		7	4985	232	1.63	16.0	48.98	38.74		18
		6	3960	145	1.04	13.8	45.50	33.75		18
		5	2925	91	0.74	11.6	41.83	27.88		18
		4	2000	52	0.42	9.5	37.12	21.61		18
		3	1265	31	0.26	7.4	30.13	15.55		18
		2	715	15	0.17	5.2	21.56	9.98		18
		1	-	-	-	-	-	-		-
	10	10	7950	635	4.16	22.3	56.83	44.88	3300	18
		9	7045	474	3.18	21.1	54.54	42.05		18
		8	6020	333	2.24	18.0	51.96	38.53		18
		7	4985	232	1.63	16.0	48.98	34.57		18
		6	3960	145	1.04	13.8	45.50	30.1		18
		5	2925	91	0.74	11.6	41.83	24.85		18
		4	2000	52	0.42	9.5	37.12	19.24		18
		3	1265	31	0.26	7.4	30.13	13.83		18
		2	715	15	0.17	5.2	21.56	8.86		18
		1	-	-	-	-	-	-		-
	15	10	7950	635	4.16	22.3	56.83	39.35	3300	18
		9	7045	474	3.18	21.1	54.54	36.87		18
		8	6020	333	2.24	18.0	51.96	33.78		18
		7	4985	232	1.63	16.0	48.98	30.27		18
		6	3960	145	1.04	13.8	45.50	26.34		18
		5	2925	91	0.74	11.6	41.83	21.72		18
		4	2000	52	0.42	9.5	37.12	16.79		18
		3	1265	31	0.26	7.4	30.13	12.05		18
		2	715	15	0.17	5.2	21.56	7.7		18
		1	-	-	-	-	-	-		-
	20	10	7950	635	4.16	22.3	56.83	34.05	3300	18
		9	7045	474	3.18	21.1	54.54	31.89		18
		8	6020	333	2.24	18.0	51.96	29.21		18
		7	4985	232	1.63	16.0	48.98	26.17		18
		6	3960	145	1.04	13.8	45.50	22.76		18
		5	2925	91	0.74	11.6	41.83	18.75		18
		4	2000	52	0.42	9.5	37.12	14.49		18
		3	1265	31	0.26	7.4	30.13	10.38		18
		2	715	15	0.17	5.2	21.56	6.62		18
		1	-	-	-	-	-	-		-
AB034IT-HY: AIR CONDITIONING										
7	27	6	3960	145	1.04	13.8	45.50	14.07	2330	18
								9.87*		
		5	2925	91	0.74	11.6	41.83	12.18		18
								8.34*		
		4	2000	52	0.42	9.5	37.12	9.99		18
								6.68*		
		3	1265	31	0.26	7.4	30.13	7.67		18
								5.02*		
	30	6	3960	145	1.04	13.8	45.50	16.99	2330	18
								10.49*		
		5	2965	91	0.74	11.6	41.83	14.76		18
								8.94*		
		4	2000	52	0.42	9.5	37.12	12.16		18
								7.23*		
		3	1265	31	0.26	7.4	30.13	9.39		18
								5.49*		

* Sensitive heat output

Flow rate curve - available head

For its proper operation, AQUAPUMP HYBRID system with fan heater requires water flow rates between 950 and 1,650 l/h, depending on whether it is working with the hydraulic circuit passing through boiler and HP or only through HP in operation periods in which the boiler is bypassed.



3.1.3 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	DN20 3/4"	DN25 1"	DN32 1"1/4	DN40 1"1/2	DN50 2"	DN20 20/22	DN25 25/28	DN32 32/35	DN40 39/42	DN50 51/54	DN20 20.4/25	DN25 26.2/32	DN32 32.6/40	DN40 40.8/50	DN50 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.

EQUIVALENT LENGTH IN m															
Type	Steel pipes					Copper pipes(1)					Cross-linked polyethylene pipes(1)				
	DN20 3/4"	DN25 1"	DN32 1"1/4	DN40 1"1/2	DN50 2"	DN20 20/22	DN25 25/28	DN32 32/35	DN40 39/42	DN50 51/54	DN20 20.4/25	DN25 26.2/32	DN32 32.6/40	DN40 40.8/50	DN50 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

Check that the minimum water content of pipes for the system is 20 litres. If this is not the case, provide for pipes with greater diameter or equip the system with a reservoir having suitable volume, with relevant expansion reservoir.

3.1.4 Antifreeze system

Automatic antifreeze system

The hybrid system is equipped with an active automatic antifreeze function as standard. Appropriate precautions must be taken in case of power failure to the machine and in case of external temperatures below 4°C.

In order to avoid voiding the warranty, it is mandatory to install a passive antifreeze system: adding glycol into the circuit or a mechanical antifreeze valve kit.

Glycol

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

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

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

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

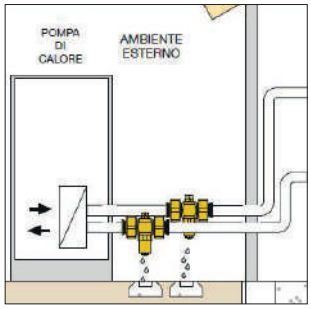
It is recommended to perform a periodical annual check of the percentage of glycol in the system and to replace the glycol and/or check the acidity level of the system liquid, considering that for 25% mixture pH value can be 6.4 to 7.4.

Mechanical antifreeze valve kit

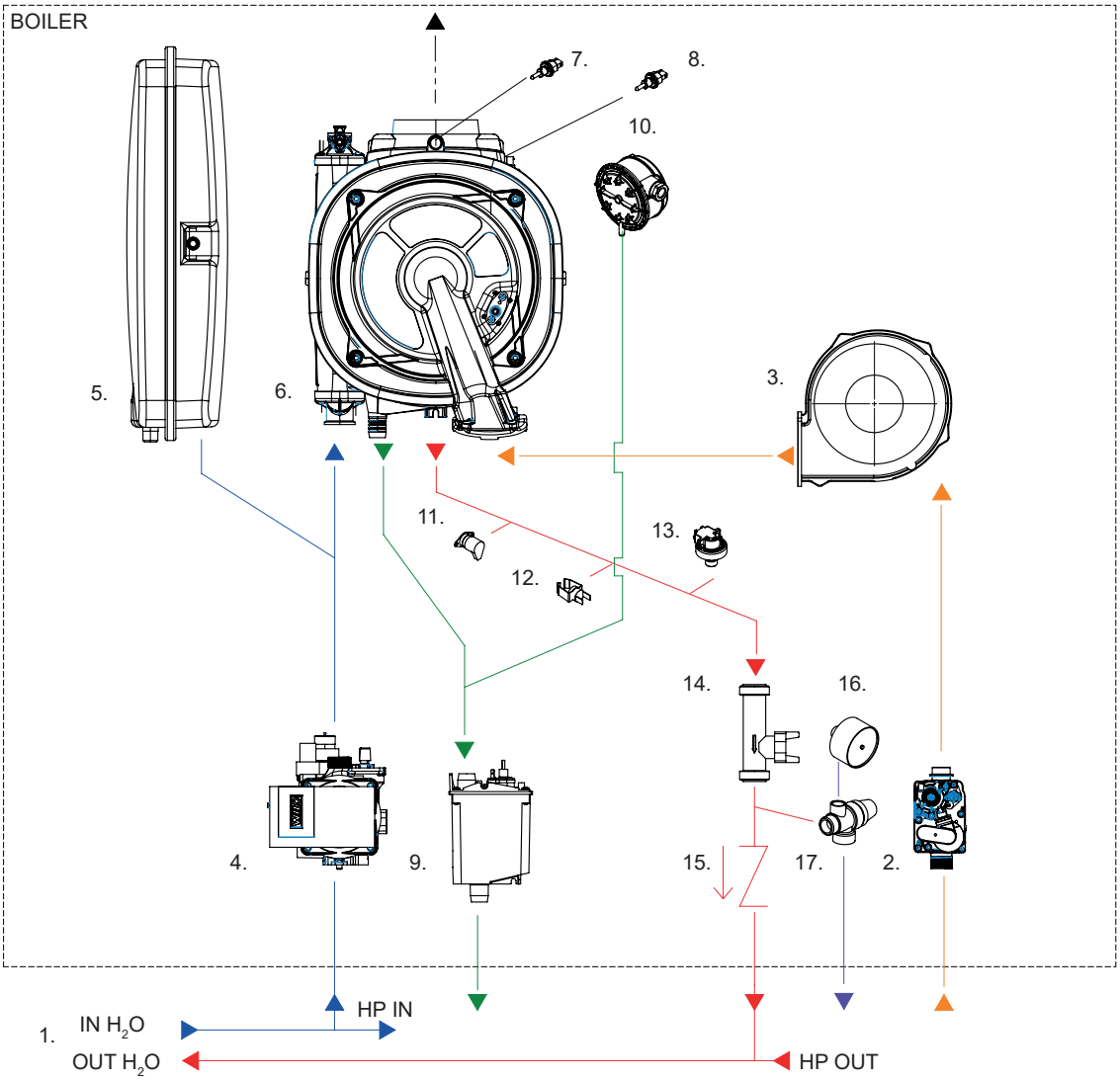
To prevent freezing of the pipes from causing damage to the system, as an alternative to glycol it is possible to install the Caleffi antifreeze valve kit Code C11101 outside on the pipes leaving the machine, both on the delivery and return lines.

The anti-freeze valve allows the circuit fluid to drain when the circuit temperature reaches an average value of 3°C. This prevents ice from forming in the system circuit and avoids possible damage to the machine and piping.

This system can be operated even in the event of a power failure.



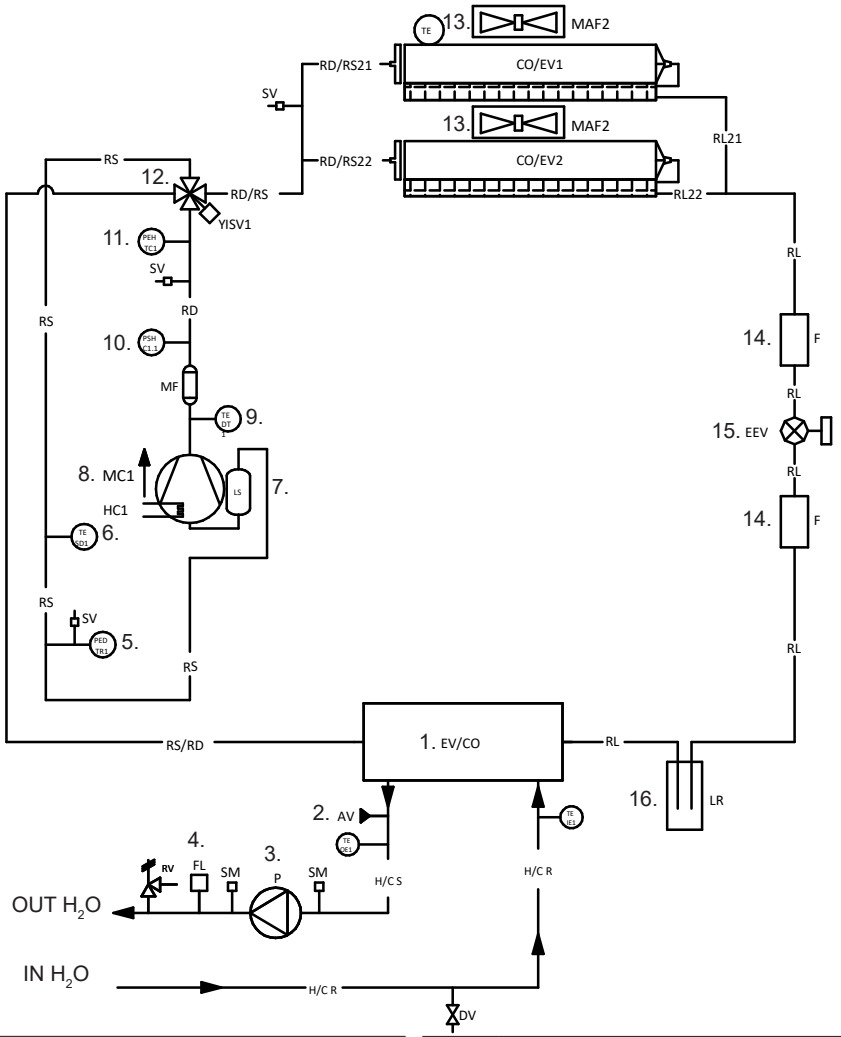
3.2. Hydraulic/gas circuit characteristics



no.	Key
1.	HYN water inlet/outlet
2.	GAS Valve
3.	Burner fan
4.	Circulator
5.	Expansion reservoir
6.	Boiler heat exchanger
7.	Flue gas thermal fuse
8.	Exchanger protection thermal fuse
9.	Trap

no.	Key
10.	Flue gas pressure switch
11.	Safety thermostat 87°C
12.	NTC probe
13.	Pressure probe
14.	Flowmeter
15.	One-way valve
16.	Hydrometer
17.	Safety valve

3.3. Cooling circuit characteristics



no.	Key
1.	Plate rapid exchanger
2.	Automatic air vent valve
3.	Circulator
4.	Flow switch
5.	Low pressure transducer
6.	Compressor inlet temperature
7.	Compressor liquid separator
8.	Compressor

no.	Key
9.	Compressor outlet temperature
10.	High pressure pressure switch (automatic)
11.	High pressure transducer
12.	4-way cycle inversion valve
13.	Exchanger and fan
14.	Filter
15.	Electronic expansion valve
16.	Liquid receiver

The unit must be installed so as to allow maintenance and repair operations. The warranty does not cover the costs for platforms or handling equipment required for any operations.

All maintenance and check operations must be carried out by QUALIFIED PERSONNEL only.

Before starting any operation on the unit, make sure that power supply is disconnected.

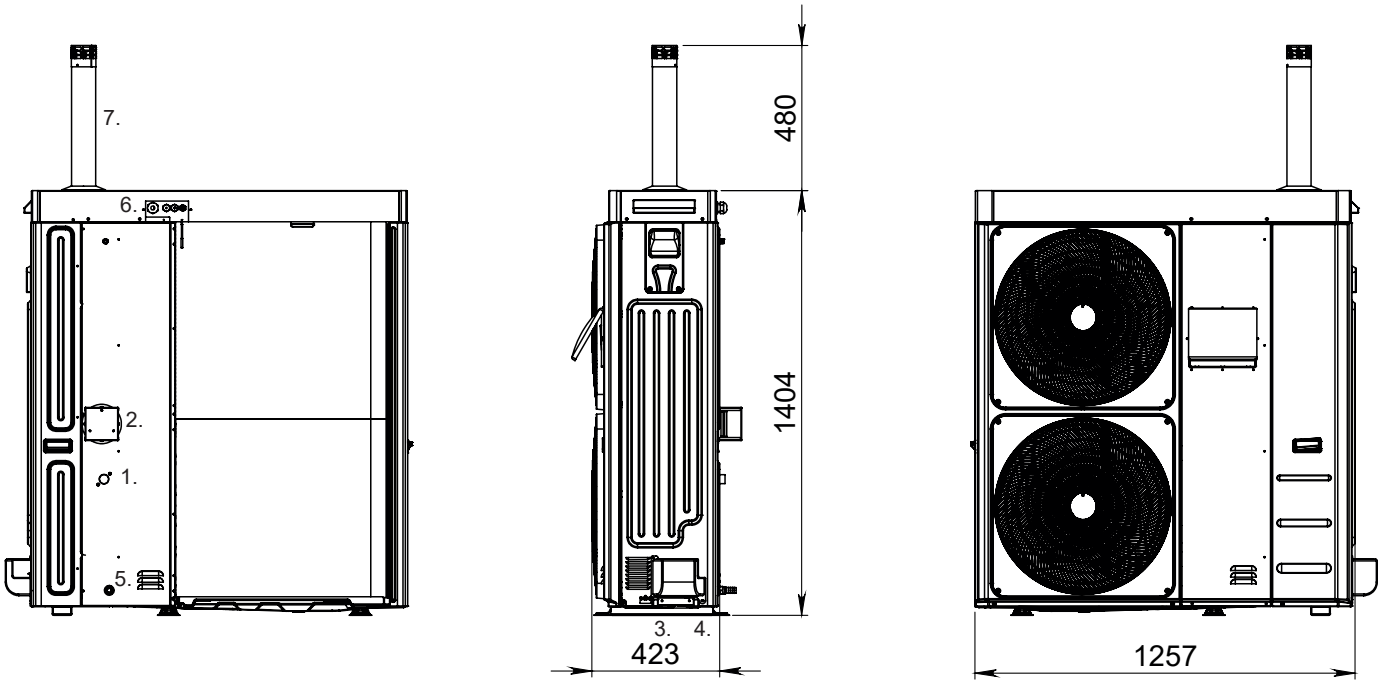
ATTENTION: The unit contains several moving parts. Be very careful while operating near them, even if power supply is disconnected.

The heads and the delivery pipe of the compressor are usually at quite high temperature. Pay special care while working near the coils.

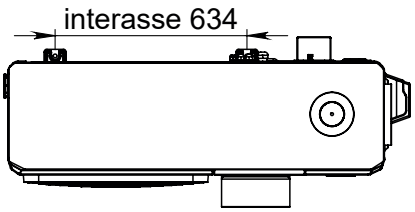
Aluminium tabs are very sharp and can cause serious injury.

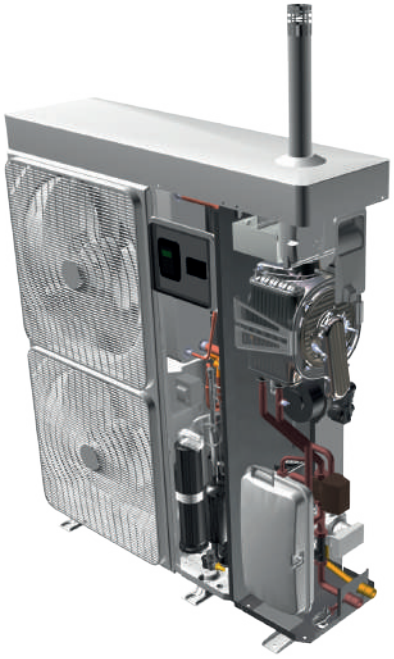
After maintenance operations, close the panels by securing them with fixing screws.

3.4. AQUAPUMP HYBRID size



no.	DESCRIPTION	DIMENSION
1	Gas supply	G3/4"
2	Combustion air intake	Ø80 mm
3	Water return	G1"
4	Water supply	G1"
5	Condensate drain	Ø19 mm
6	Electrical connections	2x PG09 + 1x PG13
7	Flue outlet chimney	80mm





3.5. Operation

AQUAPUMP HYBRID can operate only if combined with the SMART X WEB or SMART X EASY touchscreen remote control which manages the combined operation of the two technologies that compose the hybrid system through MOD-BUS RTU communication protocol.
AQUAPUMP HYBRID is equipped with two LCD multifunction panels located on the machine.
The smaller panel monitors and supervises the operation on the heat pump, whereas the larger panel is used to control, configure and diagnose all operating parameters of the condensing boiler.

The operation of AQUAPUMP HYBRID is fully managed by Smart X touchscreen remote control.
The Smart X can manage up to 15 HYN when installed to serve a single thermal zone.

It is up to the installer to configure the remote control according to the requirements of the specific installation by following the instructions contained in Section 5.10 where each type of system and the configuration procedure are explained in detail.

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 and/or on the ambient.
Please refer to the contents of the "User, Installation and Programming Manual for the SMART X WEB / SMART X EASY series PROGRAMMABLE THERMOSTAT", code HG0065.00Wper:

- Operation mode setting
- Setting the time ranges
- Fault reset
- Operation monitoring

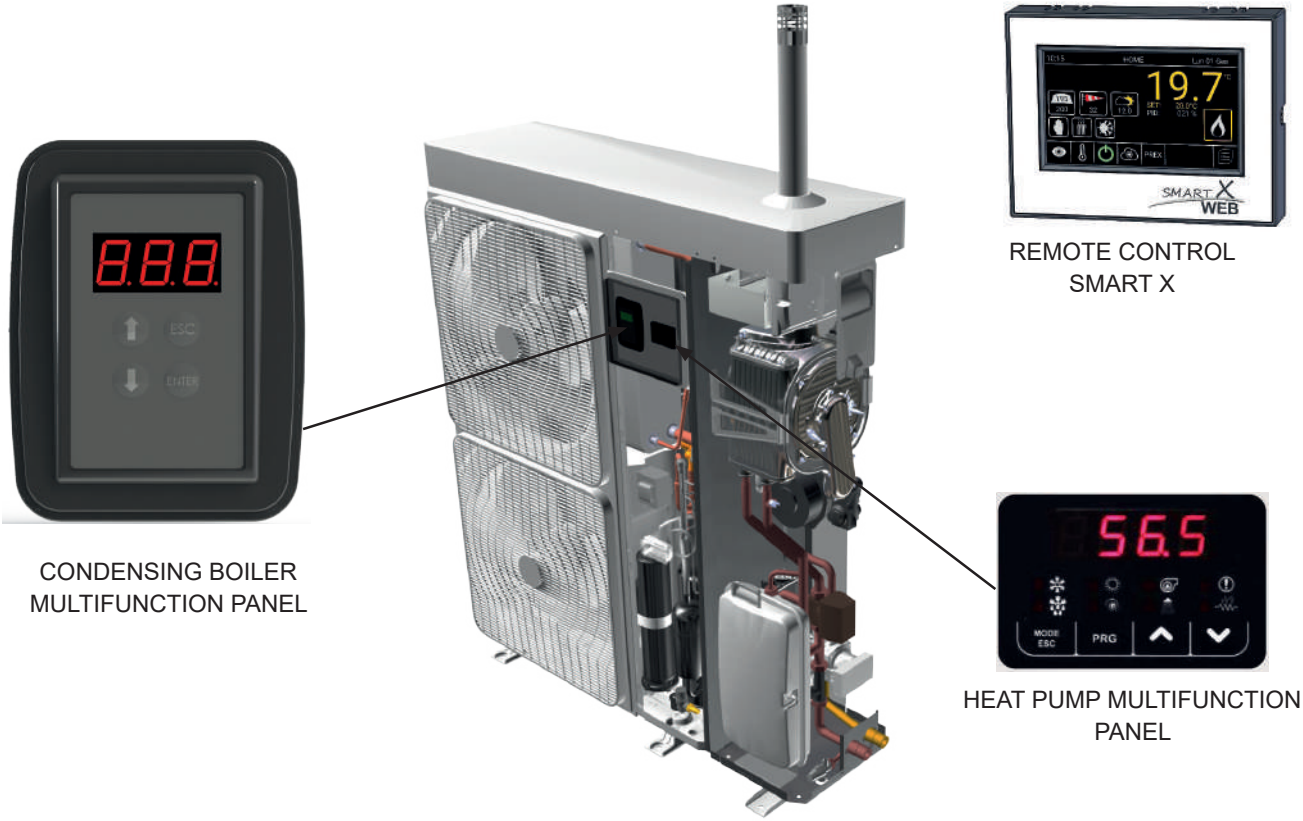
The HYN hybrid system can be operated in combination with different types of systems.
The most commonly installed systems are:

- Hybrid system with fan heater
- Hybrid system with technical tank
- Hybrid system with DHW tank

The hybrid system can remotely control three probes for the correct management of the system.
Usually, the three available probe inputs are configured as follows:

- AN1: used for the reference temperature which can be the heating tank temperature or ambient temperature
- AN2: used for external temperature (cut off)
- AN3: used for the DHW reference temperature to be placed in the DHW tank

Please refer to Section 5.10 "Configuring Smart X and LCD HP" for the correct setting of probes.



REMOTE CONTROL SMART X

CONDENSING BOILER MULTIFUNCTION PANEL

HEAT PUMP MULTIFUNCTION PANEL

5. INSTALLATION INSTRUCTIONS

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

N.B.: 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

The AQUAPUMP HYBRID installation must be carried out in compliance with the current regulations concerning design, installation and maintenance of thermal systems.
Reference standards (valid for Italy only):

- Ministerial Decree of 08/11/2019 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 regarding the installation of LPG equipment;
- Law 186 of 01 March 1986 regarding the installation of electrical systems;
- Ministerial Decree no. 37 of 22/01/2008;
- Legislative Decree no. 192/05 of 19/08/05,

and subsequent amendments and/or integrations.

5.2. Transport and Handling

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.
During unit unloading and positioning, special attention should be paid to prevent sudden or violent movements in order to protect the inner components. The units can be lifted by using a lift truck or, as an alternative, through belts, paying attention not to damage the side and upper panels of the unit.
During these operations, the unit must always be kept in vertical position.

The lifting methods to be used are:

- forklift
- ropes/chains + sling bar

Ensure that the lifting ropes are gradually tensioned and check that they are correctly positioned.

The manufacturer is not liable for any damage occurred during transport, handling, unloading, etc.

5.3. Accessories for installation

Installation includes at least:

- one or more HYN;
- one Smart X;
- one external probe;
- one or more ABXXXIT-HY fan heaters, if for direct heating;
- water and/or DHW tank, if for indirect heating.

The supply of the equipment includes:

AQUAPUMP HYBRID HYN

- no. 1 fume exhaust terminal Ø80 made of plastic material complete with fume extraction intake;

Programmable thermostat Smart X

- no. 1 Smart X EASY or Smart X WEB programmable thermostat for remote control to manage the system

ABXXXIT-HY fan heaters

- no. 2 flexible hoses for every single fan heater (G1"x AB034xx-HY,G3/4" for AB018xx-HY), length 0.5 metres, with relevant gaskets;
- no.1 shelf for indoor unit support;
- no.1 condensate collection tray.

5.4. Installation of AQUAPUMP HYBRID - HYN

Before starting any operation on the unit, make sure that power supply is disconnected. Also ensure that the power cannot be accidentally switched on again until all operations have been completed, by using suitable locking devices.

AQUAPUMP HYBRID series models have been designed and manufactured for partially protected installations; therefore it is necessary to avoid the coverage with roof near the machine or the positioning near trees or walls in order to prevent air recirculation.

In the place of installation there must be no risk of fire and the ambient temperature must not exceed 46°C under any circumstances. Beyond this value, the unit is no longer covered by the regulations in force for the safety of pressure equipment. All necessary measures must therefore be taken to prevent the risk of fire at the installation site. The equipment must not be placed near open flames and sources of ignition or heat. The masonry of the buildings near the unit must have an adequate fire resistance class to contain any fire that may develop in the inside. It is good practice, however, to keep a
fire extinguisher near the unit.

The heads and the delivery pipe of the compressor are usually at quite high temperature.

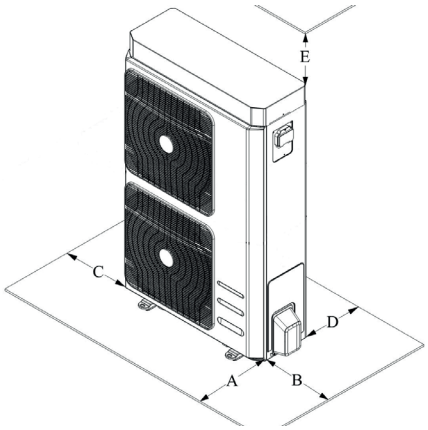
The unit must be installed so as to allow maintenance and repair operations.

It is good practice to create a support slab of a size appropriate to the dimensions of the unit. The units transmit a low level of vibrations to the ground: anyway, it is necessary to place some anti-vibration supports between the base frame and the bearing plane. It is very important to prevent recirculation phenomena between intake and delivery, to avoid the deterioration of unit performance or even the interruption of the standard operation. For this purpose it is necessary to ensure the minimum clearances indicated below.

To facilitate maintenance operations, it is advisable to install the machine on the ground.

For installations at height, appropriate equipment must be provided to allow safe maintenance operations.

The machine must be installed with all three feet touching the contact surface.
It is prohibited to install the machine supported only by the outermost feet.



MODEL	A	B*	C	D	E**
HYN432IT and HYN532IT	1500	500	400	400	500

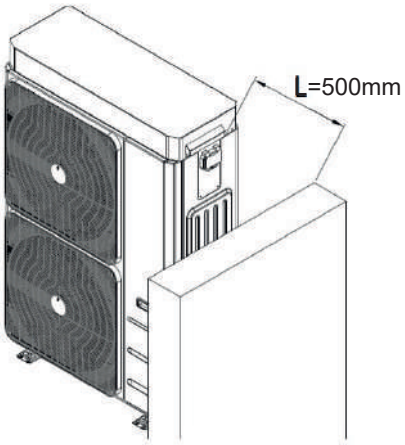
* Clearance recommended for installation and maintenance
** Clearance recommended for service, maintenance, fume exhaust installation.

In the case of suspended installation, it is necessary to ensure that the wall is made of solid brick, concrete or materials with similar strength features. The load-bearing capacity of the wall must be sufficient to support at least four times the weight of the unit.

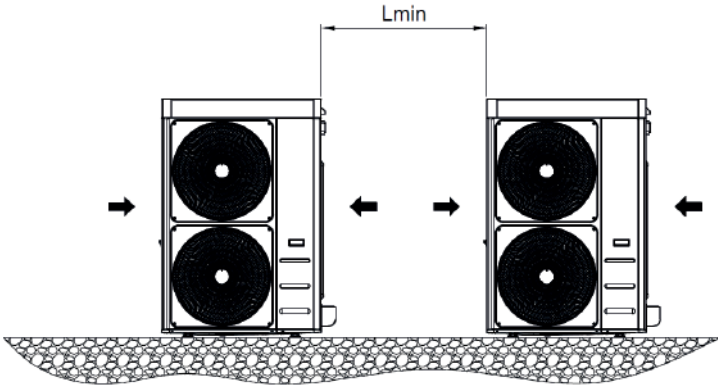
The supporting surface must have sufficient load-bearing capacity to support the weight of the unit. The supporting surface must not be tilted in order to ensure proper operation of the unit and to prevent it from tipping over.
The installation surface of the unit must not be smooth, to avoid water/ice deposits, potential sources of danger.

The place where the unit is installed must be free of foliage, dust, etc., which could clog or cover the coils. Installation in areas prone to stagnation or falling water, e.g. from gutters, should be avoided.
Also avoid places prone to snow accumulation (such as corners of buildings with pitched roofs). When installing in areas prone to snowfall, mount the unit on a plinth raised 20-30 cm above the ground to prevent snow build-up around the machine.

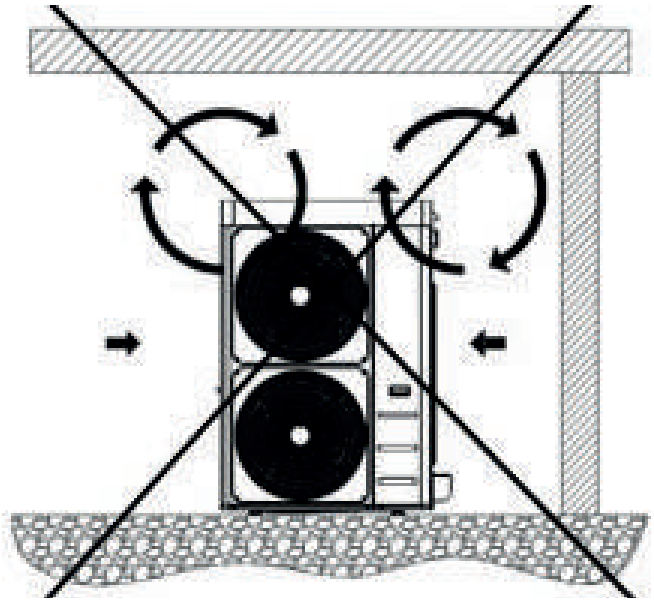
It is recommended to ensure sufficient air exchange to dilute R32 gas in the event of an accidental leakage of the gas, thus preventing the formation of explosive atmospheres. For this reason, a minimum distance of 1 metre must be maintained from gas vents or manholes, in which gas could accumulate.



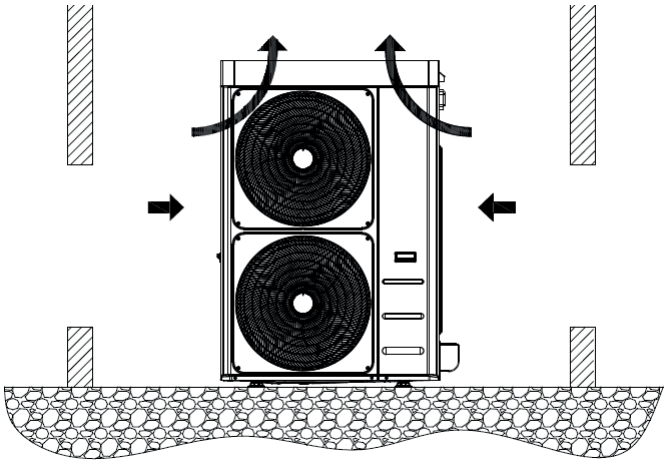
Obstruction or covering of the ventilation openings on the top cover must be avoided.



In the case of side-by-side units, the minimum distance Lmin to be observed between them is 1 m.



Coverage with roof or positioning near trees or walls is to be avoided in order to prevent air recirculation.



In the case of wind speeds faster than 2.2 m/s, the use of windbreaks is recommended.

5.5. Hydraulic connections

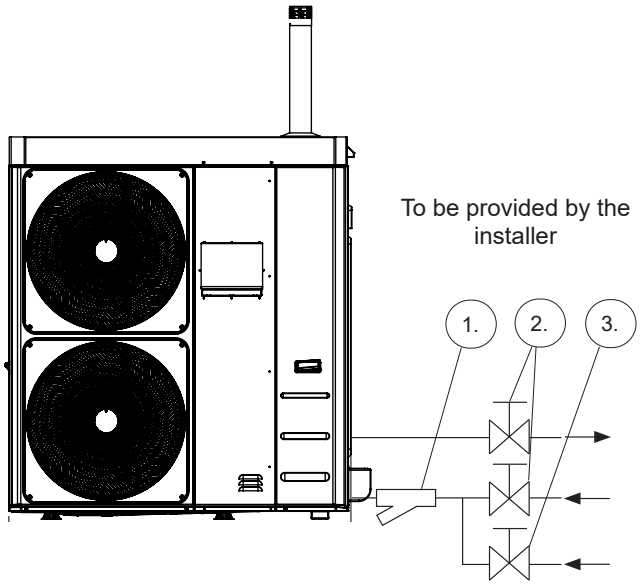
Hydraulic connections must be carried out in compliance with national or local regulations; pipes can be made of steel or PVC. Pipes must be carefully sized according to the rated water capacity of the units and the pressure drops of the hydraulic circuit. All hydraulic connections must be insulated using closed cell material with suitable thickness. The machine must be connected to the pipes using flexible joints.

We recommend to install the following components in the hydraulic circuit:

- thermowell thermometers for measuring the temperature in the circuit;
- manual gate valves to insulate the refrigerator from the hydraulic circuit;
- Y-shaped metallic filter (installed on the return pipe from the system) with metal mesh not greater than 1mm;
- loading unit and exhaust valve where required.

Section 3.1 shows the available flow rate/available head pressure graphs of the machine and fan heaters and the table that provides an indicative dimensioning of the diameter of the pipes needed.

IT is mandatory to install a Y-shaped filter on water input of the boiler, to prevent clogging of hybrid system exchangers.



LEGEND:

1 Y-shaped metallic filter (metal mesh not greater than 1mm)
2 Manual gate valves for system sectioning
3 System loading/draining unit

AQUAPUMP HYBRID, on heat pump side, is made so that the base of the unit works as condensation collection tray. A plastic fitting is supplied as standard; it must be connected under the base, in the proper provision that allows to connect a pipe to channel condensation.

Preset for condensate drain fitting

Condensate drain fitting

Fitting connected to the unit

Hydraulic connection with the fan heater

Connect the two flexible hoses to the indoor unit using the gaskets supplied with the equipment; AQUAPUMP HYBRID delivery must be connected to the indoor unit input and AQUAPUMP HYBRID return to the indoor unit output (see the arrows on the fan heater and the indications on the outdoor unit).

5.6. System filling and emptying

Before filling/topping up the system, disconnect the power supply to the units.
The system must always be filled/topped up under controlled pressure conditions. Ensure that a pressure reducer and safety valve have been installed on the filling/topping up line.

The water on the filling/topping up line must be properly pre-filtered from any impurities and suspended particles. **Ensure that a removable cartridge filter and a desludging device are installed.**
Periodically check and vent the air that accumulates in the system. An automatic air vent valve must also be provided at the highest point of the system
It is recommended that an external tap be used to fill the system. It is up to the installer to provide for it.

System filling

- Make sure that connections between indoor unit/system and AQUAPUMP HYBRID 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.
- Using an effective filling system, connect the system to a pump for system test with reservoir filled with water or water and glycol. Load the mix until a the pre-charge pressure of the expansion reservoir.
- Vent the pipe;
- When venting operation is over look at the display and check that the pressure inside the circuit is higher; low pressure values will cause an E80 because of the activation of water minimum pressure sensor [calibration 0.6bar].

Water 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 or water-glycol mix by following the instructions described above.

Glycol

For their machines, 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

The use of glycol having different chemical composition shall invalidate the exchanger warranty.

Glycol percentages and limit temperatures indicated in Section 3.1 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.

Manual operation of the circulator

To start the manual operation of the circulator, choose the menu "dEG" on the LCD control panel of the boiler.
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.

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

Emptying the system

If it is necessary to empty the unit completely, first close the manual inlet and outlet gate valves (not supplied) and then disconnect the hoses fitted externally on the water inlet and outlet in order to drain the liquid contained inside the unit (to make this operation easier, it is advisable to install two drain cocks to be placed between the unit and the manual gate valves externally on the water inlet and outlet).

5.7. Electrical connections

Check that power supply corresponds to the rated data of the unit (voltage, phases, frequency) specified on the nameplate.
Electrical connection must be carried out according to the wiring diagram enclosed with the unit and in compliance with local and international regulations (provide magneto-thermal main switch, earth leakage switches for single line, suitable system earthing, etc.).
Power cables, electrical protections and line fuses must be sized according to the wiring diagram of the unit and the electric data contained in the technical features table.

ATTENTION: The control panel is located under the roof cover.

ATTENTION: Power supply voltage must not undergo fluctuations greater than ±10% of the rated value. If this tolerance is not respected, please contact our technical department.

ATTENTION: Any equipment placed in the vicinity can make/receive electromagnetic interference to/from the unit. Take this risk into account at the installation site. It is recommended to power the unit with a suitable line and protection devices and to use an independent cable duct.

ATTENTION: Power supply must respect the above mentioned limits: if this is not the case, the warranty is invalidated immediately. Before starting any operation, make sure that power supply is disconnected.

WARNING: it is compulsory to fit, upstream of HYN, a multipole isolator fitted with a suitable electric protection element.

ATTENTION: Never use jumpers on flowmeter and flow switch connections in the terminal board. The warranty is invalidated in flowmeter connections are modified or incorrectly connected.

ATTENTION: The remote control panel is connected to the cooler by no. 4 0.5 mm² cross-section shielded cables. The power supply cables must also be shielded, but separated from the remote control cables (cross-section 3x0.75mm²). Maximum distance 50 metres.

Be sure to install a proper earth connection. An incomplete earth connection can lead to electric shocks. The manufacturer cannot be held liable for any damage caused by non- or ineffective earthing.

Use a dedicated power supply line: do not supply the device through a line to which other services are connected. Fasten the power cables securely and ensure that they do not come into contact with sharp edges. Use double-insulated cables with copper wires.
The earth connection must be made first when connecting, and must be removed last when disconnecting the unit.
In the event of any loosening of the power cable, it must be ensured that the active conductors are tensioned before the earth cable.
A main switch or disconnecting device with adequate breaking capacity, featuring contact separation at all poles, must be installed on the supply line. The earth leakage circuit breaker must be compatible with inverter devices, it is recommended to install a type B earth leakage circuit breaker. The installation of a different type of circuit breaker could result in untimely tripping.
Depending on the type of laying, the physical location and the length of the cables (whether longer or shorter than 30m), it will be the responsibility of the electrical system designer to make an appropriate choice.

Connection terminal box

Connections to the terminal box must be carried out by qualified personnel only.
The connection terminal board is located under the machine cover.

ELECTRICAL CONNECTIONS	
Connection	**Type**
HYN432: Power supply	3 x 6.5 mm² unshielded
HYN532: Power supply	5 x 2.5 mm² unshielded
Smart X	6 x 0.5 mm² shielded
External probe	2 x 0.5 mm² unshielded
Fan heater with 0-10Vdc control	2 x 0.5 mm² unshielded
DHW diverter	3 x 0.5 mm² unshielded

For electric system details, refer to wiring diagrams code JC0199.00IT [HYN432] and code JC0195.00IT [HYN532] supplied with the machines.

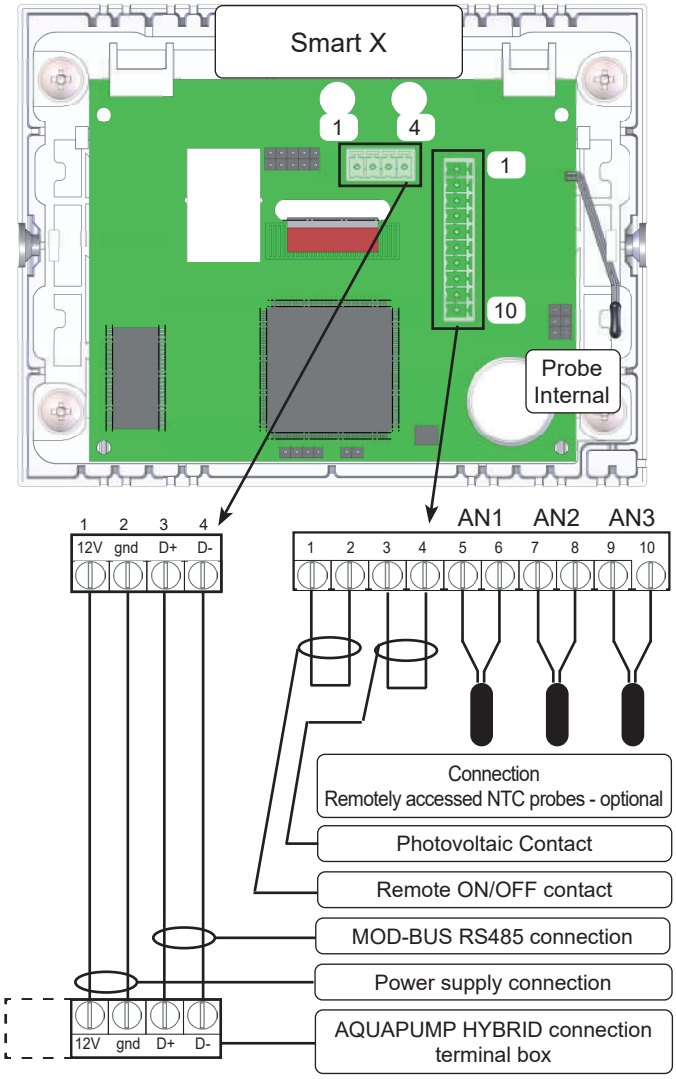
To remove the cover and access to the terminal board and the control panel it is necessary to:
- Undo the screws that hold the cover in place and lift the cover.
- Proceed with wiring to the terminal board.
- Insert the cables in the PGs provided on the side of the machine to take them outside the unit.
- Close the control panel and the machine cover with the screws previously removed.

The above operations must be carried out when the machine is switched off and disconnected from the power supply (by means of a special disconnecting switch provided by the installer).
Operations carried out by qualified staff.

Remove the cover without removing the cable gland support plate.

After completion of the work, close all the removed covers with all the screws provided and the gaskets.

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



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.

Carry out the connections according to the diagram below

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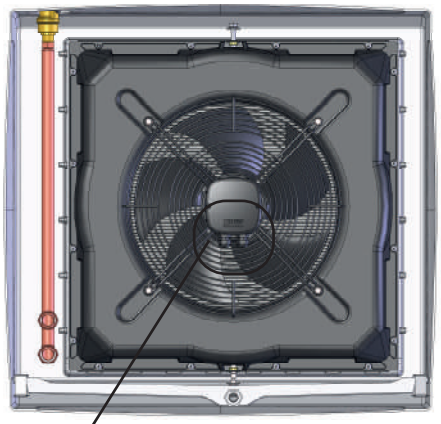

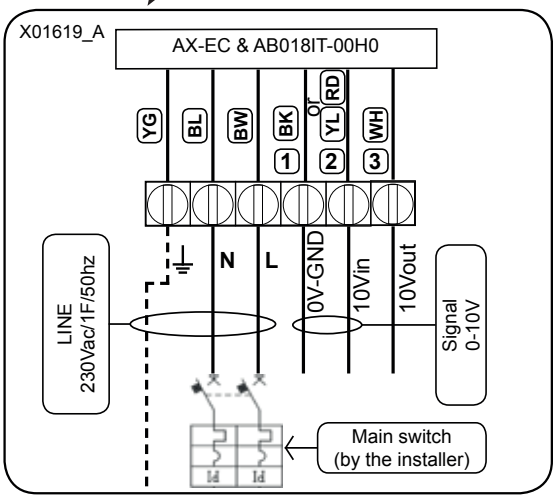

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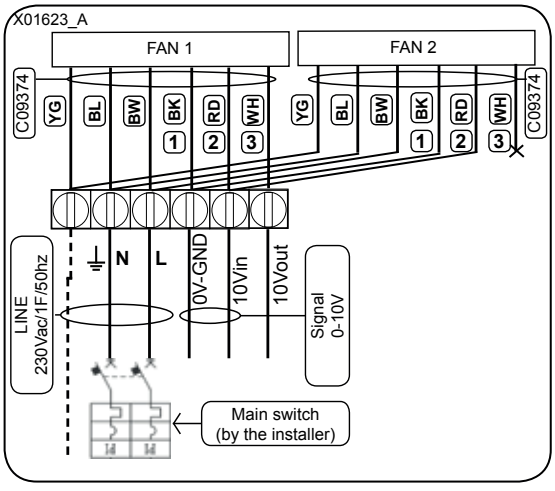


5.8. LCD instrument panel

The AQUAPUMP HYBRID 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 system operating mode and Errors. It also allows the service centre to change the main operating parameters.
Changing parameters is protected by a password.

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/rOF/OFF/HEA/Air/COO/SAn): **rdY**: machine runs smoothly - OFF from Smart X **StY**: machine in standby - OFF from ID0 contact (ON/OFF from CPU) **rOF**: only active in the absence of Smart X indicates OFF condition from ID0 contact from temperature control (room, delivery, ...) **OFF**: machine OFF mode, indicates a stop not caused by Smart X **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")

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

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.

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 for boiler)
nt2	NTC2 probe temperature (not used)
nt3	NTC3 probe temperature (system delivery)
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” (external diverter valve supply ACS-DHW)
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, go to the PAR menu and then select the Abi item;
- Set the password 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;
- 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 Error table in Section 6.11 “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 AQUAPUMP HYBRID, 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).

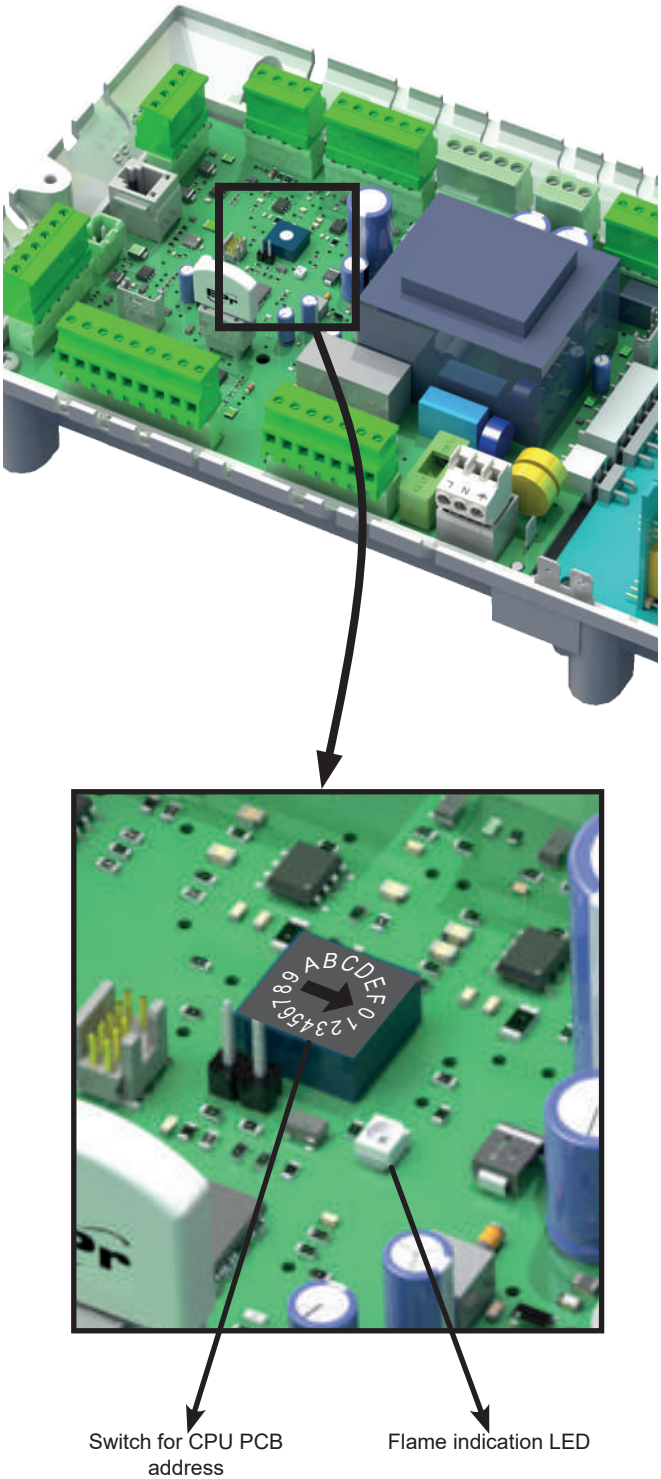
When the water temperature falls below the antifreeze setpoint (parameter C22), the circulator is activated to circulate the water in the system.

If the water temperature falls below the antifreeze setpoint (parameter C22) by more than 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).

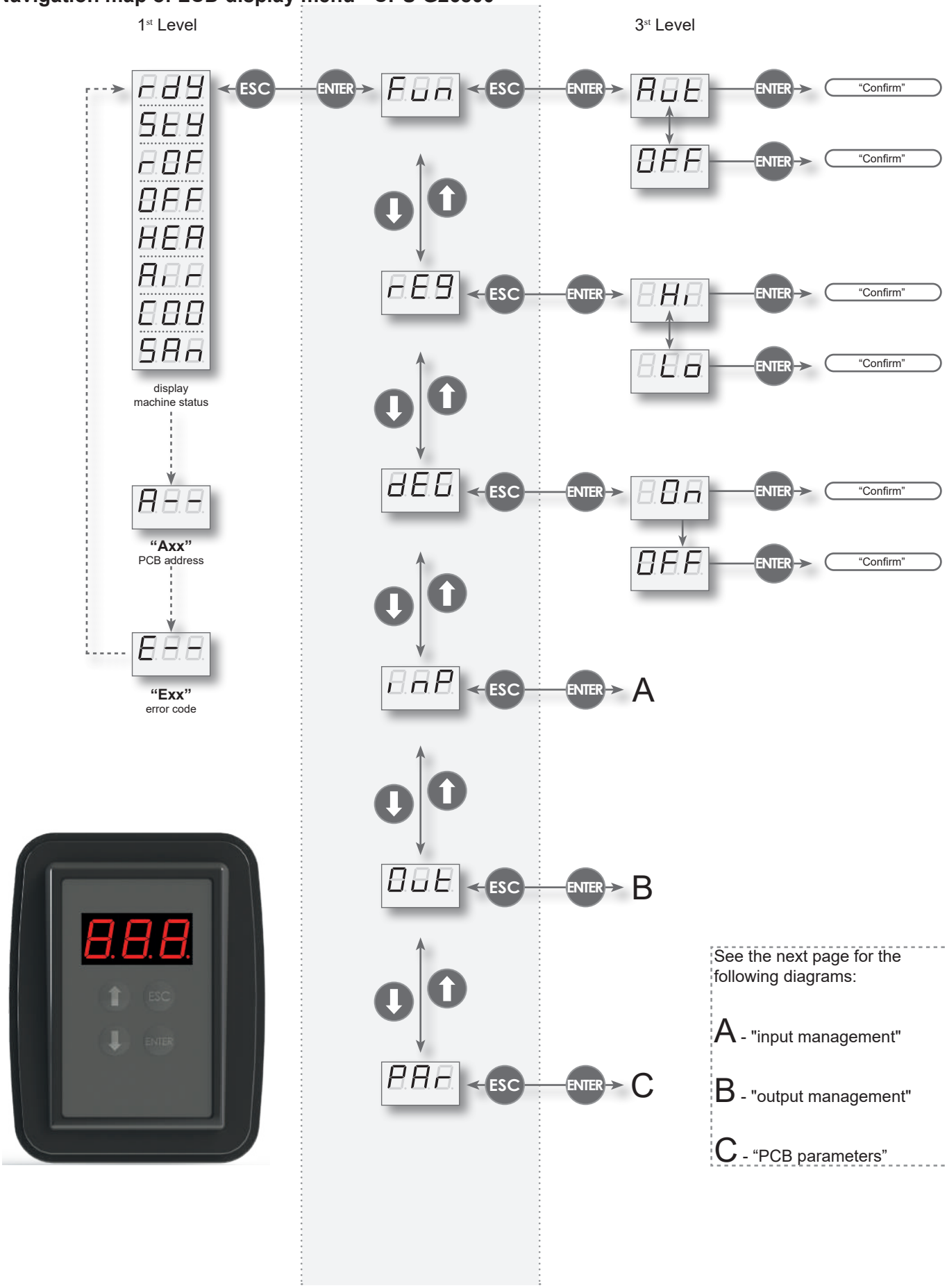
When the antifreeze function is on, the boiler behaves as follows:

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.



Navigation map of LCD display menu - CPU G26800

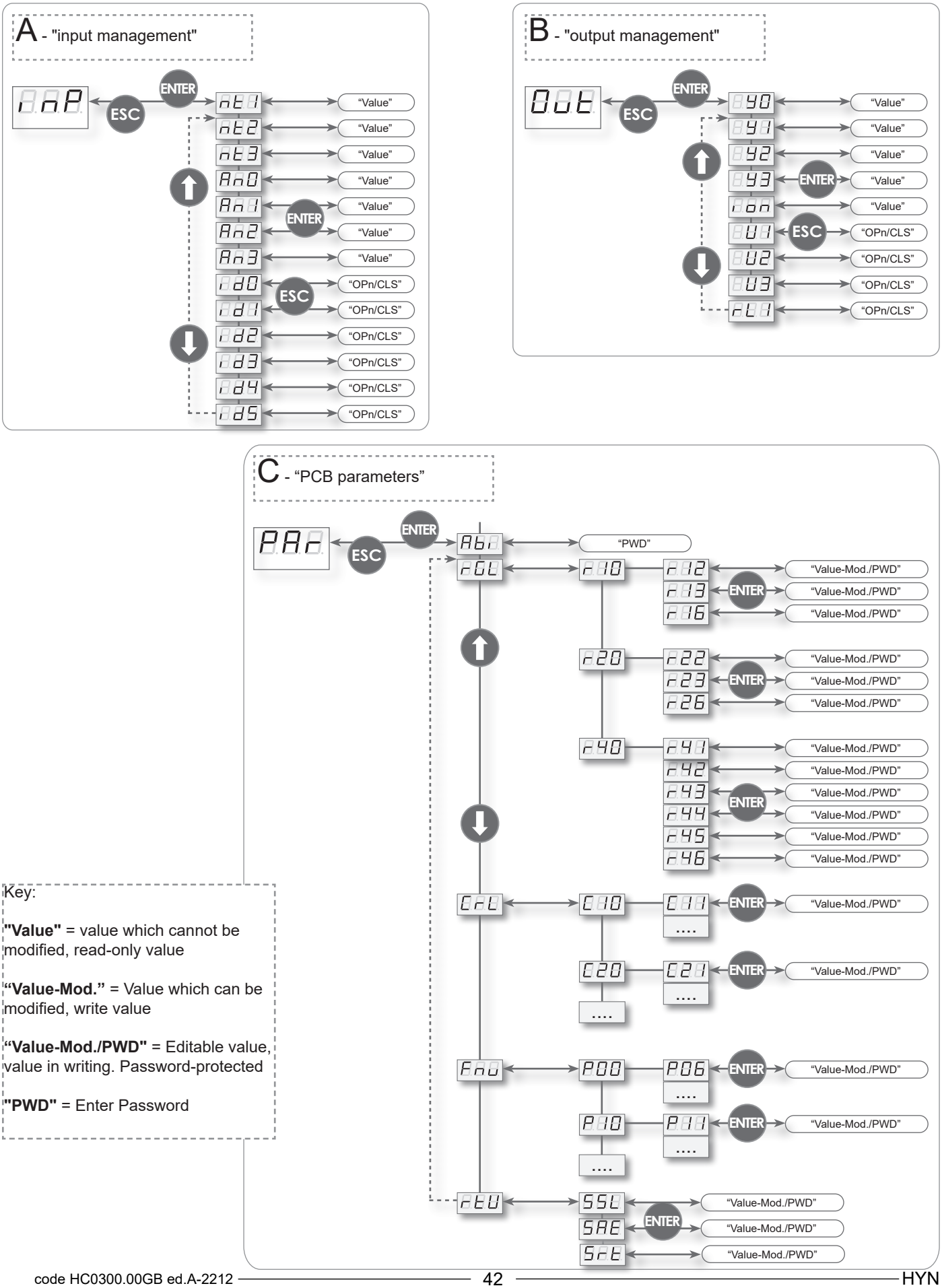


See the next page for the following diagrams:

A - "input management"

B - "output management"

C - "PCB parameters"


A - "input management"
ESC
ENTER
"Value"
"OPn/CLS"
B - "output management"
"Value-Mod./PWD"
C - "PCB parameters"
"PWD"
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

5.9. Temperature adjustment logic

AQUAPUMP HYBRID allows operation with the following conditions:

- Heat Pump only/Chiller
- Heat Pump + Condensing boiler
- Condensing Boiler only.

The modulation of the operating power of both technologies is regulated so that the delivery temperature of both systems remains fixed.

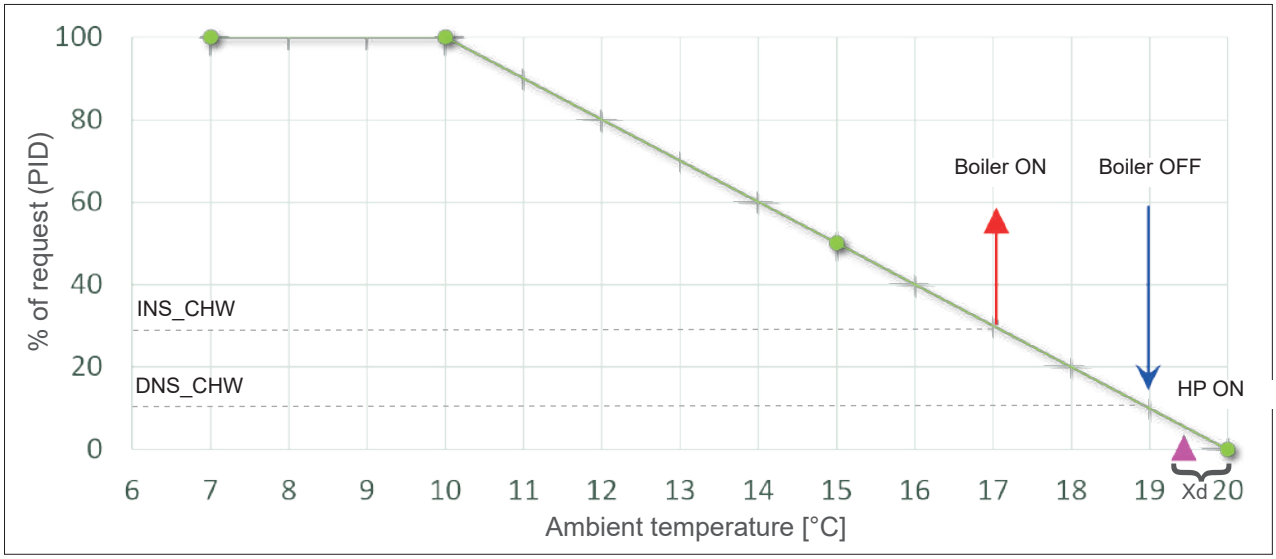
Winter setup

The parameters that can be set on the Smart X remote control for adjusting the various operating options are described in Section 5.10.

The variables involved for understanding the operation are:

- TEMP_EXT external temperature;
- T_RIF setpoint, room temperature;
- Xd ON/OFF differential;
- SET_PDC_HEAT heat pump setpoint in heat;
- INS_CHW boiler activation percentage on T_RIF;
- DNS_CHW boiler deactivation percentage on T_RIF;
- SET_CUT_OFF heat pump exclusion setpoint.

The operation of the device during the heating phase provides that under normal operating conditions the heat pump switches on when the temperature of the room to be heated is lower than T_RIF-Xd. The heat pump switches off when the temperature of the room to be heated is higher than or equal to T_RIF.
The heat pump starts if TEMP_EXT ≥ SET_CUT_OFF, otherwise the boiler starts immediately.
The boiler is switched on when the PID is higher than INS_CHW and switched off when the PID is lower than DNS_CHW. Boiler is modulated based on the PID.
The PID value (%) is calculated by the Smart X control.



Summer setup

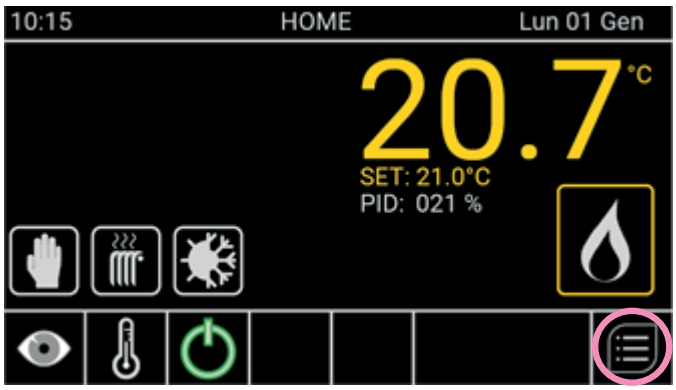
Operation during the summer phase of chilled water production is very simple: a simple ON/OFF control of the heat pump with chiller operation is implemented
based on:

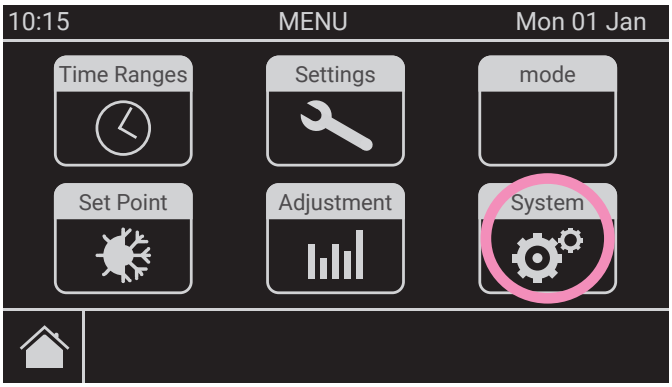
- SET_PDC_COOL Heat pump setpoint in cool.

5.10. Smart X and LCD HP configuration

AQUAPUMP HYBRID can operate only if combined with the Smart X touchscreen remote control.
Smart X touchscreen control has been designed to control several ApenGroup units for heating, ventilation and cooling. When used for control and parametrisation of AQUAPUMP HYBRID it must be configured for this purpose.

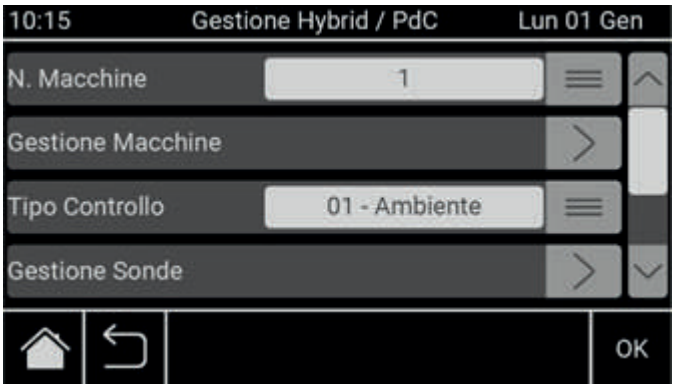
Preliminary Operations
Press the “MENU” icon on the SmartX main screen and then the “SYSTEM” icon.



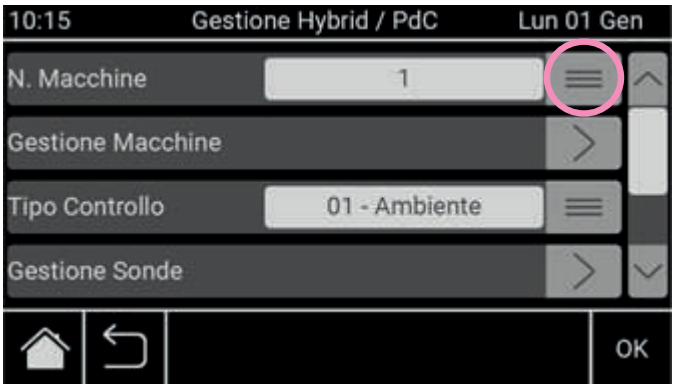


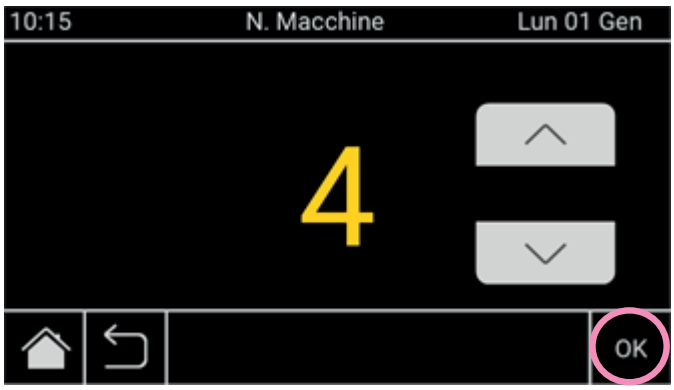
By accessing the system type “Hybrid / HP” it will be possible to select and configure:

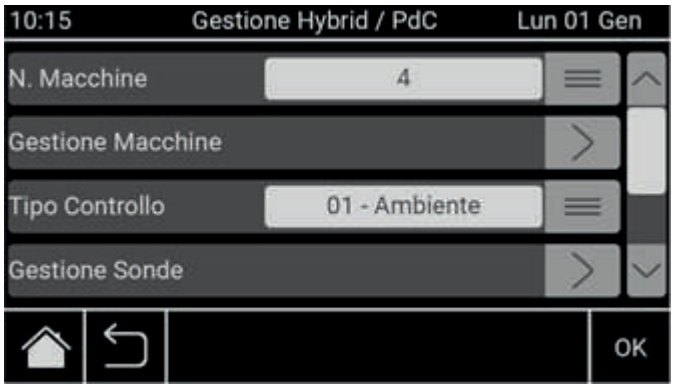
- the number of machines connected to the Smart
- the type of machines connected
- the presence and management of DHW
- the type of control (environment or tank)
- the management of probes connected to the Smart
- the Setpoint adjustment
- the presence of photovoltaic system



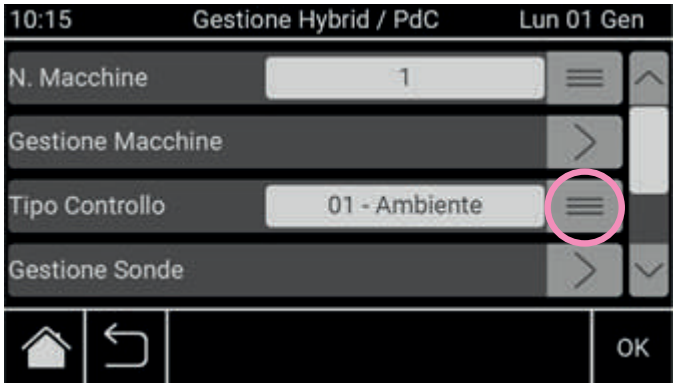
The “No. Machines” menu allows you to select the number of machines connected to the Smart (Hybrid, HP or Boilers).

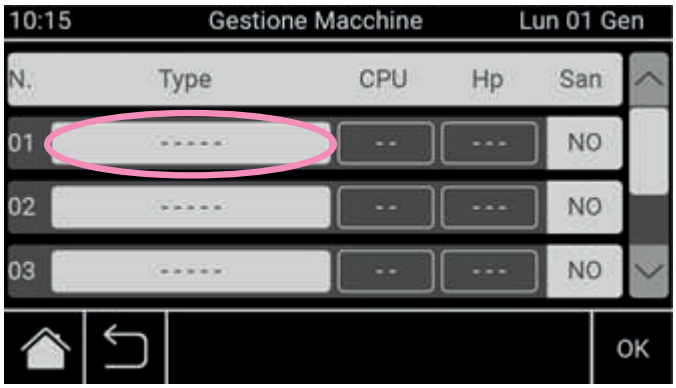


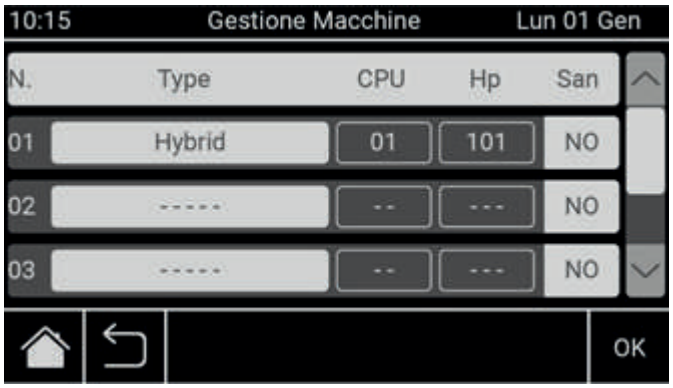




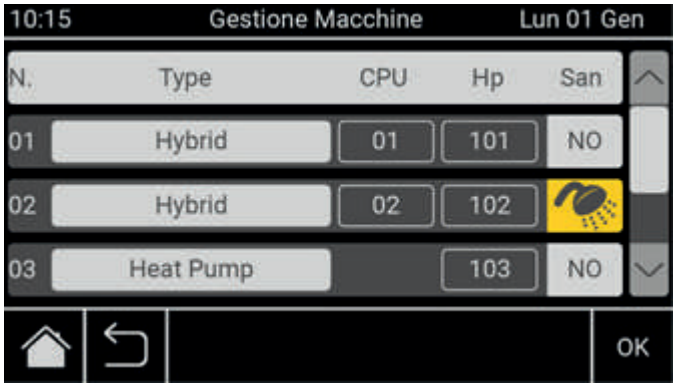
The “Machine Management” menu allows selecting the type of machine connected to the Smart X (Hybrid, HP or Boilers) for each line in the menu. Once the machine type has been selected, Smart X will automatically associate the slave (or slaves, in the case of a Hybrid machine).
From this menu it is also possible to activate the DHW check function and select the machines that are to perform this check. The Smart X will only send the DHW command (if conditions require it) to the relevant slaves.





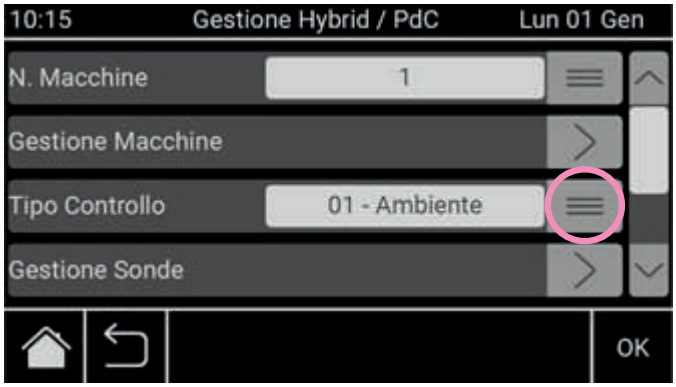


The Smart X will automatically associate the two addresses 01 to the CPU and 101 to the heat pump.The allocation of heat pump address 101 must be chosen manually on the heat pump LCD panel.
This will be done for all available rows.
Depending on the type of machine selected, the Smart X will display one or two slaves, in the correct position, for example:



By pressing the button under the “San” column, you can enable DHW check management for that specific machine. The “San” button will change from grey with the word “NO” to yellow with the shower symbol, indicating that the check has been activated. DHW check can be activated for one or more machines simultaneously.

The “Check Type” menu allows selecting the type of check that will be carried out for the system, i.e. if the probe is in room System type 01 (T_RIF=ambient temperature), if the probe is in water System type 02 (T_RIF= tank water temperature).

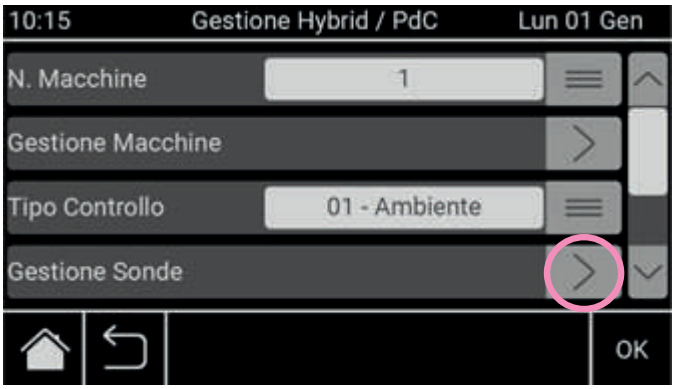


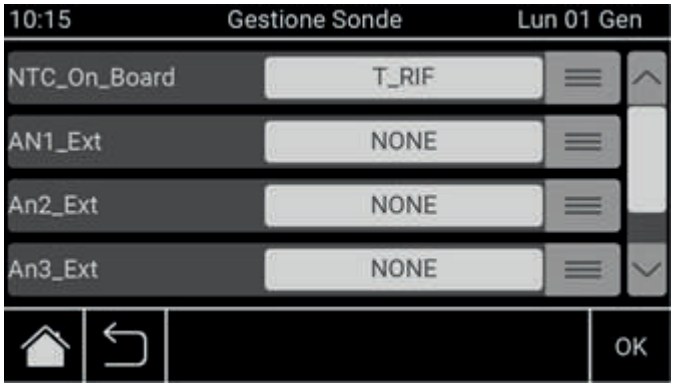
In the “Probe Management” menu, the input type can be configured.
Smart X can remote 3 probes:

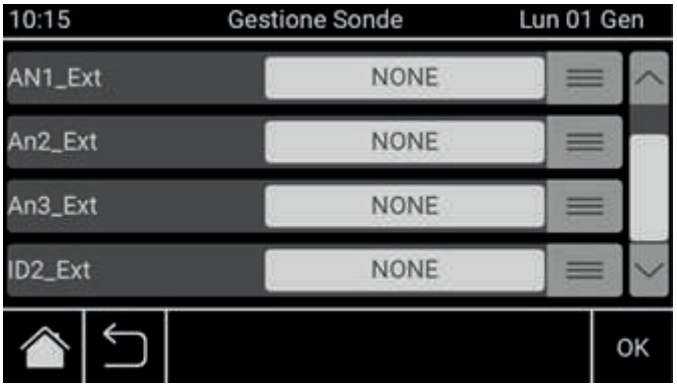
- external temperature;

It is mandatory to install an external probe connected to Smart X;

- ambient temperature set;
- DHW temperature set.







In the “Setpoint Management” menu, setpoints can be parametrised for the type of system

The parameters to be set for the system setting are listed below:

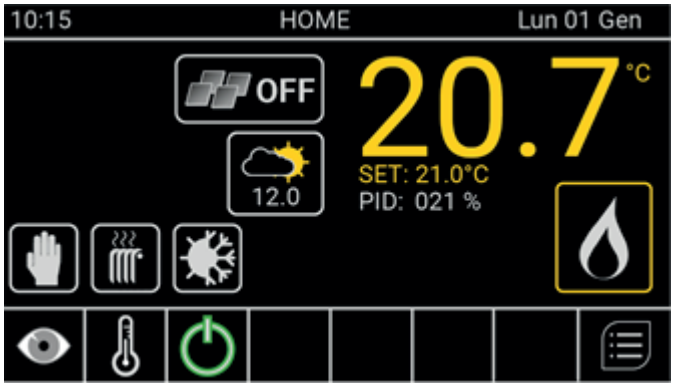
SMART X PARAMETERS						
Parameter	**DEF.**	**Min.**	**Max.**	**Step**	**U.M.**	**Description**
SET_CUT_OFF	3	-15	20	1	°C	HP exclusion setpoint
SET_ACC_HEAT	45	5	80	0.1	°C	Tank heating setpoint
SET_ACC_COOL	9	5	30	0.1	°C	Tank air conditioning setpoint
SET_ACC_SAN	50	5	80	0.1	°C	DHW tank setpoint
DT_HEAT	5	-10	15	0.1	°C	heating setpoint delta with tank
DT_COOL	-2	-10	15	0.1	°C	air conditioning setpoint delta with tank
DT_SAN	5	-10	15	0.1	°C	DHW setpoint delta with tank
SET_PDC_HEAT	48	25	60	1	°C	HP setpoint for heating
SET_PDC_COOL	7	5	30	1	°C	HP setpoint for air conditioning
SET_PDC_SAN	48	25	55	1	°C	HP setpoint for DHW

INS_CHW	30	1	100	1	%	Heating boiler activation, percentage value of PT%_ SMART_RIF and/or PT%_SMART_SAN
DNS_CHW	10	1	100	1	%	Heating boiler deactivation, percentage value of PT%_SMART_RIF and/or PT%_SMART_ SAN

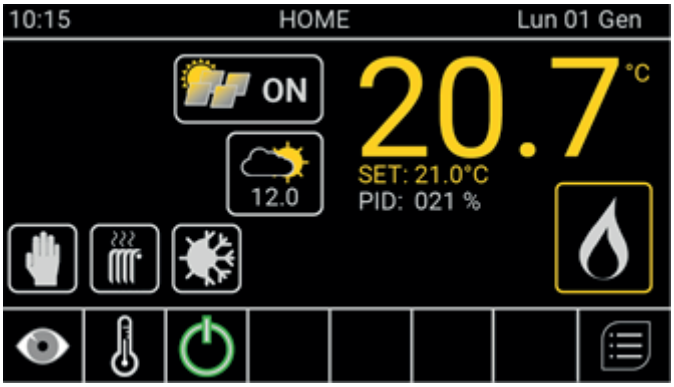
The “Photovoltaic system” menu allows the photovoltaic function to be activated and configured.
The photovoltaic system enabling overrides the SET_CUT_OFF of the heat pump. If ID2 is closed the heat pump will also operate with T_EXT< SET_CUT_OFF.

If the photovoltaic check is active, this will be marked by a new icon in Home, indicating whether the ID2 contact is open (no photovoltaic contribution) or closed (presence of photovoltaic contribution).

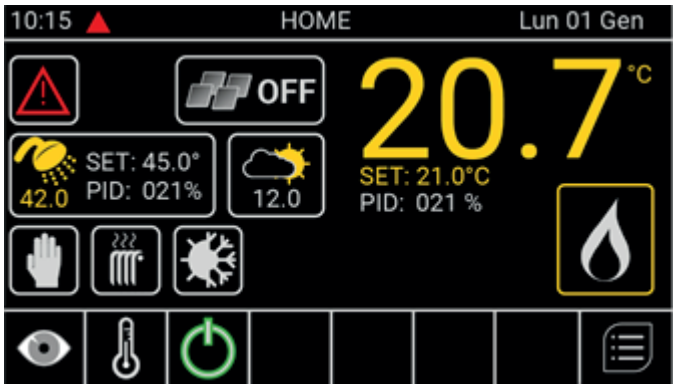
Icon present, photovoltaic function active - No photovoltaic contribution.



Icon present, photovoltaic function active - Photovoltaic contribution present.

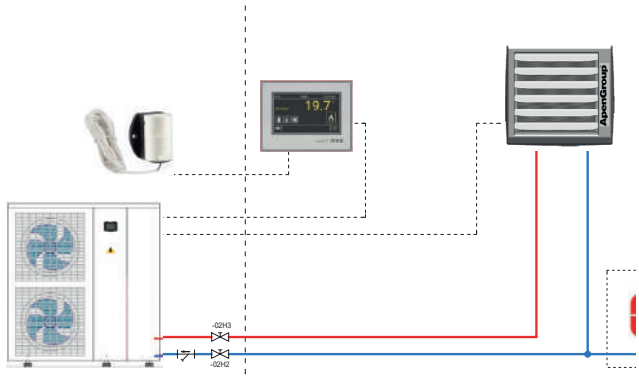


The HOME screen will include the icon for the domestic hot water production control (if present), which will show the temperature reading, setpoint and PID calculation.



When the HYN goes into cut-off, the icon indicating the external temperature takes on the following configuration:

Installation with fan heater



This type of system must be selected to use AQUAPUMP HYBRID together with one or more fan heaters code ABXXXIT-HY.
This programming is to be made:

- T_RIF: room temperature setpoint, comfort;
- XD: differential which is 0.5°C by default, the minimum adjustable value is 0.1°C;
- PID parameters which are by default:
  - KP = 3: proportional coefficient,
  - indicates that with a temperature 3°C lower than the setpoint, the output demand is 100%,
  - KI integral coefficient,
  - KD derivative coefficient,
  - LI = 50%: limit of the integral value which serves to avoid loading the heat output in rooms with long full capacity output times;
- SET_PDC_HEAT = 48°C: heat pump delivery water setpoint in HEAT;
- SET_PDC_COOL = 7°C: HP delivery water setpoint in COOL.

The delivery temperature value in HEAT can be increased up to 55°C at the expense of HP performance.
Boiler set ST1 should be kept at 70°C.
If HP and boiler sets are kept at 48°C and 70°C respectively, the temperature of the water leaving the HP, with HP and boiler at 100%, will be approximately 52/53°C, with return at 43°C and a power output of approximately 42kW with environment at 15°C, 46kW with environment at 12°C and 38kW with environment at 18°C.
Under these conditions, water flow rate should be 4,400 l/h with an available head of 30kPa, 15kPa coil loss, and an air flow rate of 7,000 m^3/h.

The boiler does not modulate based on temperature, but based on PID calculated by Smart X and referred to ambient temperature.

Two additional parameters must be set for the boiler to enter hybrid operation:

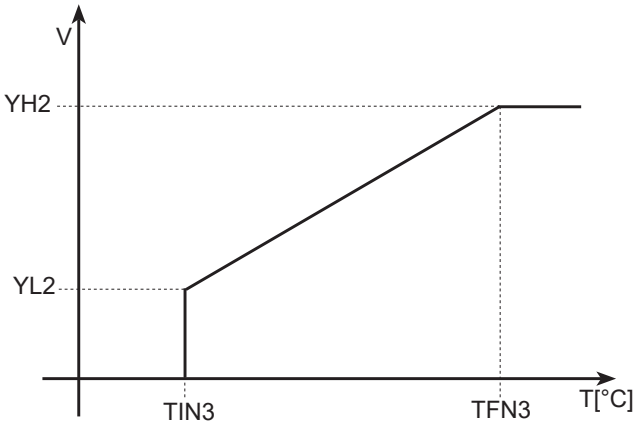
- INS_CHW = 30%: boiler activation percentage value;
- DNS_CHW = 10%: boiler deactivation percentage value.

The boiler is switched on when the ambient temperature PID calculation requires a higher percentage than INS_CHW (>30%).
Similarly, the boiler is switched off when ambient PID falls below the value DNS_CHW (<10%).
When the boiler is switched off, the HP continues operation until the T_RIF setpoint is reached.
The system is switched on again when the ambient temperature is XD lower than the set T_RIF:T_AMB < T_RIF - XD.

For fan heater type system, in addition to the management of boiler and heat pump operation, a 0-10V signal is sent to the fan heater for the automatic management of the rotation speed of fans.

The rotation speed is controlled according to the following parameters that can be set on boiler CPU PCB.

Par.	Description	Default value
YL2	Minimum speed voltage	4 V
YH2	Maximum speed voltage	10.0 V
YF2	Conditioning voltage	4 V
TIN3	Minimum speed temperature	38°C
TFN3	Maximum speed temperature	60°C



During operation in heating mode, the value of 0-10V signal sent to the fan heater depends of the reading of AQUAPUMP water delivery temperature probe (NTC3 probe - HYN delivery probe) and varies linearly between the minimum voltage value (par. YL2) at the temperature corresponding to the minimum speed (par. TIN3) and the maximum voltage value (par. YH2) at the temperature corresponding to the maximum speed (par. TFN3) as described in the graph below.
During operation in conditioning mode, the voltage value sent to the fan heater is a value corresponding to sect. YF2.

During operation in domestic hot water production mode, the voltage value sent to the fan heater is 0V, therefore ventilation will be interrupted as long as domestic hot water production is required.

To change fan heater speed adjustment parameters, refer to Section 6.10.

Beware of circuit heat drops. Use pipes of a suitable diameter to meet the remaining available head.

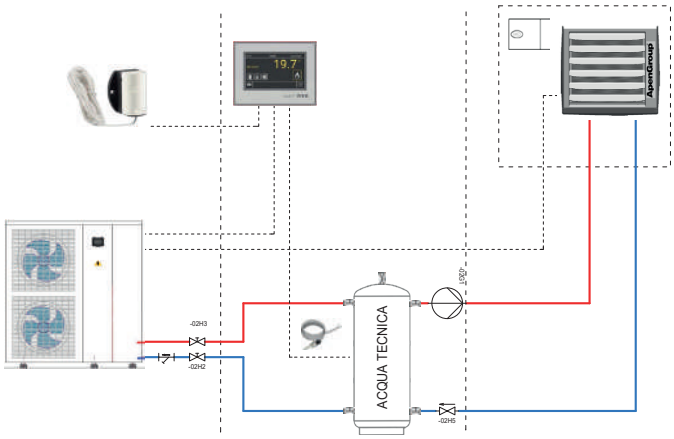
Air conditioning with fan heaters (heat pump only)
In the case of air conditioning with fan heaters, the ambient setpoint (Ventil/Cond (Cm)) must be programmed and the HP must be set:

- SET_PDC_COOL = HP water delivery temperature set.
  SET_PDC_COOL = SET_ACC_COOL - DT_COOL

System operation is ON/OFF and the HP is started when T_AMB > T_RIF + XD.

On the CPU, the fan heater start temperature has been added, to be based on the temperature reaching the coil. Set at 18°C allows fan starting when the temperature is lower and shutdown when it is higher.
In conditioning mode, the fan heater works at a fixed speed (par. YF2) without modulation.

Installation with Tank



This type of system must be selected to use AQUAPUMP HYBRID together with a technical water tank, a hydraulic separator or a reservoir.

In addition to the parameters listed for installation with fan heater, the following parameters must also be programmed.

Heating

- SET_ACC_HEAT = 45°C: temperature inside the tank;
- DT_HEAT = 5°C: increment value to achieve SET_ACC_HEAT.

The value of the tank temperature depends solely on the type of system (emitters) implemented: in case of an underfloor system, the value could be lower (<40°C), whereas in case of radiators, the value could probably be as high as 50°C.
The DT_HEAT value depends on the type of exchange in the tank: if the exchange is direct, 3°C is enough, whereas with one or more exchangers, the required delta may be higher.

In a HP system, both SET_ACC_HEAT and DT_HEAT should be as low as possible in order to achieve maximum HP efficiency. Obviously, however, this depends EXCLUSIVELY on the type of system used and not on the HP.

The SET_PDC_HEAT value is the heat pump setpoint, i.e. the value of the water temperature at the outlet of the HP. This value is fixed and the HP modulates to keep this value constant. In practice, three conditions can occur:

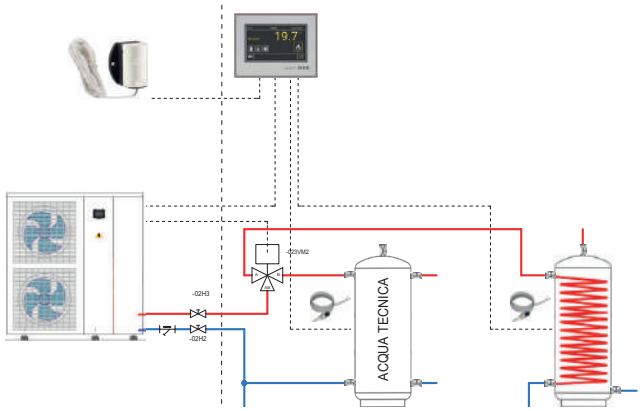
- return to the HP has a low temperature and the HP works at 100 % without reaching SET_PDC_HEAT;
- return to the HP has a high temperature and the HP modulates to stay in SET_PDC_HEAT;
- if the return is at too high a temperature, the HP shuts down.

HYBRID operation
The Smart X calculates the delivery temperature of the hybrid system as follows:

SET_MAND_HEAT = SET_ACC_HEAT + DT_HEAT
45°C + 5°C = 50°C

- When SET_MAND_HEAT is higher than SET_HP_HEAT (48°C) the boiler will ALWAYS switch on, at the same time as the HP.
  In case of a system with tank, the setpoint used by the boiler is SET_MAND_HEAT (par. ST3-R31).
- When SET_MAND_HEAT is lower than SET_PDC_HEAT the Smart will only switch on the boiler when the calculated PID demand conditions exceed the values of INS_CHW.

Installation with DHW tank
This type of system uses the AQUAPUMP HYBRID combined with a domestic hot water tank (SAN=1) with another setpoint for the supply of domestic hot water.



The Smart X NTC1 probe must be placed inside the heating tank.

The Smart X NTC3 probe must be placed inside the DHW tank.

In addition to the parameters listed for installation with fan heater, the following parameters must also be programmed.

DHW
- SET_ACC_SAN 50°C: temperature inside the DHW tank;
- DT_SAN 5°C: increase value estimated to be needed to reach SET_ACC_SAN;
- SET_PDC_SAN 48°C: value of the HP delivery temperature.

The value of the tank temperature depends solely on the type of system implemented.
The DT_SAN value depends on the type of exchange in the tank.
HYBRID operation
The Smart X calculates the delivery temperature of the hybrid system as follows:

SET_MAND_SAN = SET_ACC_SAN + DELTA_SAN
50°C + 5°C = 55°C

- When SET_MAND_SAN is higher than SET_HP_HEAT the boiler will ALWAYS switch on at the same time as the HP.
  The setpoint used by the boiler is SET_MAND_SAN (par. ST3-R31).
- When SET_MAND_SAN is lower than SET_PDC_HEAT the Smart will only switch on the boiler when the calculated PID demand conditions exceed the values of INS_CHW.

In DHW mode the HYBRID works with its own setpoint (SET_MAND_SAN).
The LCD panel will therefore display the type of operation. When DHW operation is activated, the control of the DHW diverter valve will be activated accordingly.

Air conditioning with tank (heat pump only)
The following parameters must be programmed in conditioning with tank:
- SET_ACC_COOL = 9°C: temperature inside the tank:
- DT_COOL = -2°C: increment value to achieve SET_ACC_COOL;
- SET_PDC_COOL = HP water delivery temperature set.
  SET_PDC_COOL = SET_ACC_COOL + DT_COOL

SET_PDC_COOL has a lower limit of 5°C.
Changing SET_ACC_COOL or DT_COOL automatically changes SET_PDC_COOL.

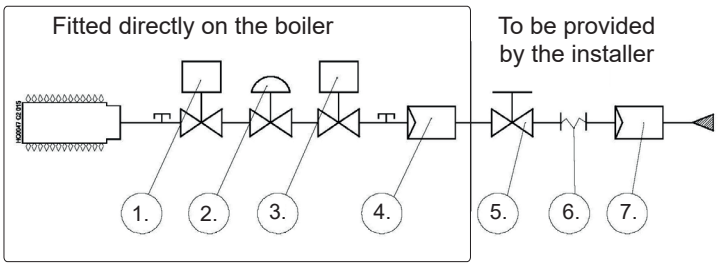
5.11. GAS Connections

GAS Connections
According to the current standards UNI-CIG, carry out the line for gas supply; for gas line connections, use CE certified components only.
AQUAPUMP boiler is supplied with:
- Dual gas valve;
- Gas stabiliser;

All components are fitted inside the machine;
To complete the installation, as required by the current regulations, the following components must be fitted:
- Gas tap
- Anti-vibration joint;
- Gas filter [without stabiliser].

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

Installation diagram HYN432/HYN532



LEGEND:
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 valve
6 Anti-vibration joint
7 Gas filter

5.12. Connections to the Flue

AQUAPUMP HYBRID is supplied with B23P flue outlet, made of plastic material [polypropylene], black, composed of a fume exhaust terminal Ø80 with a trap for fume analysis.

The boiler is provided with thermal fuse on fume outlet and with a thermal fuse on the heat exchanger, protecting the polypropylene chimney.
The boiler (for Italian market) can discharge directly on the wall, as per Presidential Decree no.412/93 5 p.9, as it is classified as low NOx emission equipment [see Section 3].

In the event of fume exhaust on the roof, the following accessories can be used:

G15821-08-100 PIPE 80 L=1000 TH.2.0
G15811-08-90 90° BEND Ø80 TH.2.0
G15811-08-45 45° BEND Ø80 TH.2.0

The maximum length that can be achieved with polypropylene Ø80 smooth pipe is 8 m, for a linear path.

If bends are used, it is necessary to subtract from the maximum length:

- 0.7m for each bend Ø80, 90° with wide radius;
- 0.3m for each bend Ø80, 45° with wide radius.

WARNING: **Check the correct positioning of the protection on the flue outlet, otherwise, in case of rain, some water can get inside the equipment.**

The presence of a fume analysis intake on the chimney at a distance not greater than 1m from the machine is mandatory.

UNIT SET FOR G20 [NATURAL GAS]			
Model	**Temperature of fumes [°C]**	**Content of CO_2**	**Flue gas flow rate [kg/h]**
HYN432	67	9.1	57.3
HYN532	67	9.1	57.3

UNIT SET FOR G31 [LPG]			
Model	**Temperature of fumes [°C]**	**Content of CO_2**	**Flue gas flow rate [kg/h]**
HYN432	68	9.8	44.7
HYN532	68	9.8	44.7

5.13. Connection to the condensate drain

The AQUAPUMP HYBRID system includes a heat pump in which a condensing boiler is installed. It is provided with a Ø19 pipe for condensate drain.

The machine is equipped with a sealed fume trap with internal float that prevents fume outflow from condensate drain also if water is missing.

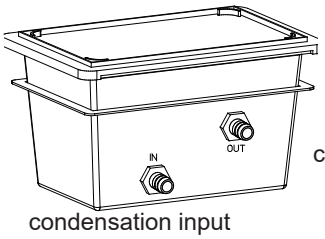
Precautions
Condensation water outflow takes place at temperatures lower than or equal to 50°C. For condensate drain, use pipes made of PVC and/or all the materials suitable for use with hot pipes: stainless steel, silicone pipes, etc.
Do not use galvanised iron or copper pipes.

Free Drainage
Where permitted, the drainage can be carried out directly outdoor without condensation collection system.
In these cases we recommend to run the condensation drain directly to the ground, without using the certified trap.

Neutralising the condensation
The condensation produced by the combustion of natural gas has an acidity of 3.5-3.8 pH.
On request, Apen Group can supply the kit (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 Service centre

KIT G14303 to neutralise acid condensation



condensation output
neutral pH

condensation input
acid pH

Protection from frost
In case of partially protected 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, using the sealed trap. If the system is installed in partially protected locations, the pipe, after the water trap, 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.

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.

6. SERVICING INSTRUCTIONS - BOILER

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
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	IIEr3P	G20/G25	20/25 mbar	G31	37 mbar
LU	II2E3P	G20/G25	20 mbar	G31	37/50 mbar
NL	II2EK3B/P	G20/G25.3	20/25 mbar	G30/G31	30 mbar
HU	II2H3B/P	G20	25 mbar	G30/G31	30 mbar
CY, MT	I3B/P			G30/G31	30 mbar
LV	I2H	G20	20 mbar		
IS	I3P			G31	37 mbar
PL	II2E3B/P	G20/G2.350	20/13 mbar	G30/G31	37 mbar
RO	II2H3B/P	G20	20 mbar	G30/G31	30 mbar
	II2L3B/P	G25	20 mbar	G30/G31	30 mbar

The following information is clearly printed on the HYN 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:
- HYN432IT — 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:

- HYN432FR-xxx**0** — 0 indicates that the equipment has been tested and set up for natural gas [G20]
- HYN432MT-xxx**1** — 1 indicates that the equipment has been tested and set up for LPG [G31]
- HYN432NL-xxx**2** — 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		**HYN432-HYN532**
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
CARBON DIOXIDE CO_2	(Q_{max}) [%]	9.1± 0.2
	(Q_{min}) [%]	8.7± 0.2
OXYGEN [± 0.3%]	(Q_{max}-Q_{min}) [%]	4.7± 5.4
AIR EXCESS	I (Q_{max}-Q_{min}) [%]	1.22± 1.26
GAS VALVE OFFSET	Pa (Q_{max}-Q_{min})	-9#-3
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	3.68± 0.72

TYPE OF GAS G25		
TYPE of MACHINE		**HYN432-HYN532**
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
CARBON DIOXIDE CO_2	(Q_{max}) [%]	9.1± 0.2
	(Q_{min}) [%]	8.7± 0.2
OXYGEN [± 0.3%]	(Q_{max}-Q_{min}) [%]	4.4± 5.1
AIR EXCESS	I (Q_{max}-Q_{min}) [%]	1.21± 1.24
GAS VALVE OFFSET	Pa (Q_{max}-Q_{min})	-6± -1
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	4.28± 0.84

TYPE OF GAS G25.3		
TYPE of MACHINE		**HYN432-HYN532**
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
CARBON DIOXIDE CO_2	(Q_{max}) [%]	9.1 ± 0.2
	(Q_{min}) [%]	8.7± 0.2
OXYGEN [± 0.3%]	(Q_{max}-Q_{min}) [%]	4.4÷ 5.1
AIR EXCESS	I (Q_{max}-Q_{min}) [%]	1.21÷ 1.24
GAS VALVE OFFSET	Pa (Q_{max}-Q_{min})	-6÷ -1
GAS CONSUMPTION (15°C-1013mbar)	[m^3/h]	4.19÷ 0.82

TYPE OF GAS G30*		
TYPE of MACHINE		**HYN432-HYN532**
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
CARBON DIOXIDE CO_2	(Q_{max}) [%]	11.6± 0.2
	(Q_{min}) [%]	11.2± 0.2
OXYGEN [± 0.3%]	(Q_{max}-Q_{min}) [%]	3.6± 4.2
AIR EXCESS	I (Q_{max}-Q_{min}) [%]	1.17± 1.20
GAS VALVE OFFSET	Pa (Q_{max}-Q_{min})	-5± 0
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	2.89± 0.56

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

b1	682
b2	166

TYPE OF GAS G31		
TYPE of MACHINE		**HYN432-HYN532**
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
CARBON DIOXIDE CO_2	(Q_{max}) [%]	9.8± 0.2
	(Q_{min}) [%]	9.5± 0.2
OXYGEN [± 0.3%]	(Q_{max}-Q_{min}) [%]	6.0± 6.4
AIR EXCESS	I (Q_{max}-Q_{min}) [%]	1.28± 1.31
GAS VALVE OFFSET	Pa (Q_{max}-Q_{min})	-5± 1
GAS CONSUMPTION (15°C-1013mbar)	[kg/h]	2.84± 0.56

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.

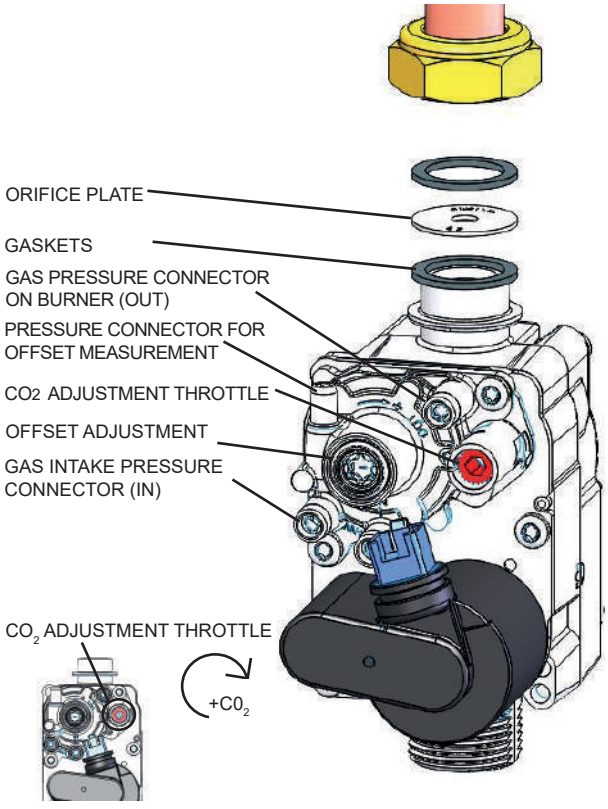
6.4. Analysis of combustion

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 CO_2 corresponds the values contained in the table "GAS SETTINGS".
If the measured value is different, turn the CO_2 adjustment throttle:

- In order to **increase** the CO_2 value turn the screw **clockwise**, and anti-clockwise to decrease it.

Set the boiler to minimum output, and verify that the level of CO_2 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 CO_2 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.



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 CO_2 level is within the values indicated for the type of gas used. If the detected value is different, change it using the CO_2 adjustment throttle:
   - In order to **increase** the CO_2 value turn the screw **clockwise**, and anti-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].

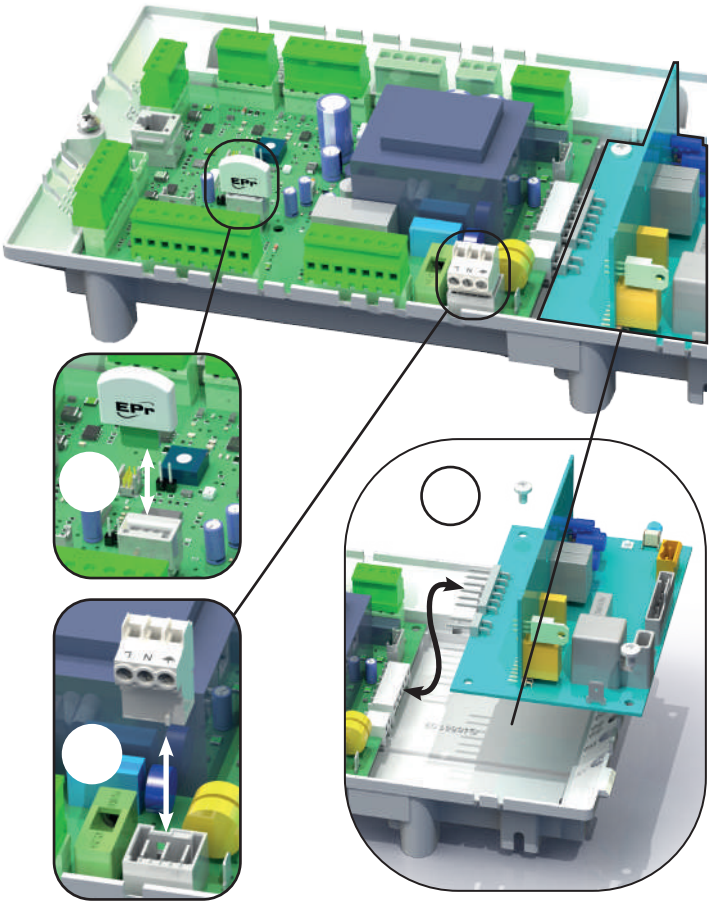
If the unit runs on G30 [Butane], it is necessary to verify and possibly adjust settings for CO_2 value as shown in the table in Section 6.2.

6.6. Replacing the Gas Valve and Adjusting the Offset

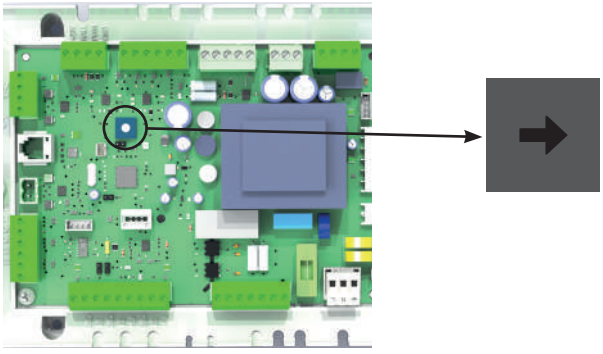
If the gas valve must be replaced, it is required to proceed with an inspection and possibly calibrate the CO_2 level through the offset adjustment.
To carry out the calibration, refer to the paragraph concerning the combustion analysis Section 6.4 and to table in Section 6.2.

6.7. Replacing the modulation PCB

When replacing the CPU modulation PCB, it is required to carry out some essential operations, described below.
- Disconnect voltage to the module
- Disconnect all terminals from the CPU PCB
- Remove and store the removable EEPROM memory card
- Disconnect the TER safety PCB
- Remove and replace the CPU modulation PCB
- Reposition the new CPU PCB, insert the previously stored EEPROM memory card (point 3.)
- Reconnect the TER safety PCB and all terminals respecting the original positions.



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



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 Section 6.10.

Programming the parameters - Operating mode
Parameters can be modified via Smart X; parameters are password-protected and password is 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).

6.8. Exchanger maintenance

Precautions for use
The 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/m^3, annual average lower than 30 mg/m^3;
- Combustion air must not contain chlorine, ammonia or alkalis; 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 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 serves as inhibitor and preserves the exchanger from oxidation.

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, placed in the lower area, 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 gasket**

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

- **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.

- **Water-glycol mix**

The pH should be checked annually with litmus paper or a pH tester. For pH values, refer to Section 3.1.4.

Use APEN original spare parts only.

6.9. Spare parts

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

6.10. Boiler PCB parameters

All values of the parameters of the CPU PCB are shown for all boiler models.
(1) parameters that could be modified with 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 8.02.xx						
Smart X	LCD	Mod.	U.M.	HYN 432	HYN 532	DESCRIPTION
FUNC_00	Fnu-P00					**Equipment operation**
TER		(2)		1		TER presence (flame monitoring equipment)
HP		(2)		0		HP presence (heat pump)
EXP		(2)		0		Number of expansion CPUs
SMART		(1)		1		SMART presence 0= Smart as display, to modify parameters and reset; 1 = uses PID and ON/OFF of SMART; 2 = uses only ON/OFF control of Smart
FR_C		(2)		0		Enables or disables acceptance of Night FREE COOLING phases
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	176		Motor RPM MINIMUM value (Y0): 90÷999 (1=10 RPM)
b2	P12	(1)	rpm	737		Motor RPM MAXIMUM value (Y0): 90÷999 (1=10RPM)
b3	P13	(1)	rpm	334		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		Proportional factor value (kp_pwm) for PWM1 calculation
b10	P1A	(1)	%	20		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	7		MIN. value Heat output
b14		(2)	kW	35		MAX. value Heat output
REG_01	rGL R10					**Modulation Probe NTC Control**
REG_01	R11	(2)		1		Adjustment enabling 0=disabled; 1=enabled
ST1	R12	(1)	°C	65		ST1 function setpoint
Xd1	R13	(1)	°C	8		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, 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)

Parameters of G26800 CPU PCB version 8.02.xx						
Smart X	LCD	Mod.	U.M.	HYN 432	HYN 532	DESCRIPTION
REG_02	rGL R20			Flue Gas Temperature Probe NTC Control - NOT USED ON HYN		
REG_02	R21	(2)		0		Adjustment enabling 0=disabled
REG_03	rGL R30			System Delivery Probe NTC Control		
REG_03	R31	(2)		0		Enabling adjusting (adjusting enabled by Smart according to request) 0=disabled; 1= enabled “on demand” by SMART for both heating and DHW; 2= enabled by SMART “AIR+POOL” request
ST3		(2)	°C	55		Setpoint (it is changed by Smart according to the phase in progress)
Xd3		(2)	°C	5		ST3 adjustment hysteresis (burner OFF)
Kp3		(2)	%	10		Proportional coefficient
Ki3		(2)	%	5		Integral coefficient
TH3		(2)	°C	65		Alarm temperature for ST3 for fault E53; Autoresolve with NTCx<ST3
ING3A		(2)		3 (NTC3)		It defines the analogue input to be used for calculation (1= NTC1, 2= NTC2, 3=NTC3)
OUT3A		(2)		7 (Q3)		It defines the digital output to be activated in case of DHW request
REG_04	rGL R40			Modulation from 0/10 Vdc Control - NOT USED ON HYN		
REG_04	R41	(1)		0		Adjustment enabling 0=disabled; 1= enabled as modulation only; 2= enabled as modulation and burner ON/OFF
REG_05	rGL R50			Air pressure adjustment (for pressostatic or ducted units) - NOT USED ON HYN		
REG_05	R51	(2)		0		Adjustment enabling 0=disabled; 1= enables REG_05 air pressure control for BALLOONS; 2= enables REG_05 for variable flow rate systems
REG_06	rGL R60			Air quality adjustment - NOT USED ON HYN		
REG_06		(2)		0		Adjustment enabling 0=disabled; 1= enables air quality with analogue input ING_QA; 2= enables air quality with reading from SMART
REG_07	rGL R70			Dry System adjustment - NOT USED ON HYN		
REG_07		(2)		0		Adjustment enabling 0=disabled; 1= enabled in stand-by phases; 2= enabled as relative humidity check
CTRL_01	CrL C10			Water pressure control		
CTRL_01	C11	(1)		1		Control enabling 0=disabled; 1=water check enabled
ST_ H20	C12	(1)	bar/100	60		Pressure setpoint: E81 alarm
TL_ H20	C13	(1)	bar/100	30		Lower pressure limit value: alarm E80
TH_ H20		(2)	bar/100	250		Upper pressure limit value; alarm E82
PT_ H20	C14	(1)	bar/100	20		Hysteresis for alarm E82
ING_ H20	C15	(1)		6 (B2)		Analogue input
MD5	C16	(1)		2		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

Parameters of G26800 CPU PCB version 8.02.xx

Smart X	LCD	Mod.	U.M.	HYN 432	HYN 532	DESCRIPTION
CTRL_02	**CrL C20**			**Water Antifreeze Control**		
CTRL_02	C21	(1)		1		Control enabling 0=disabled; 1=water check 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 HYN**		
CTRL_03	C31	(1)		0		Control enabling 0= disabled
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 - NOT USED ON HYN**		
CTRL_05	C51	(1)		0		Control enabling 0=disabled; 1=enabled
ING05	C52	(1)		0		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 HYN**		
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
CYCLES	C82	(1)		1		Ignition cycles counter
FAULT		(2)		1		Fault counter
RESET	C84	(1)		0		Reset control 1=PCB fault reset; 2=operating hours reset; 3=ignition cycles reset; 4=all counters reset
CTRL_09	**CrL C90**			**Air Filter Control - NOT USED ON HYN**		
CTRL_09	n.a	(2)		0		Control enabling 0=disabled
FUNC_02	**Fnu-P20**			**Blown air Burner Control - NOT USED ON HYN**		
FN_02		(2)		0		Control enabling 0=disabled
FUNC_03	**Fnu-P30**			**Ventilation Management Function (EC-AC Fans)**		
FN_03	P31	(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)		0		Digital output for main fan

Parameters of G26800 CPU PCB version 8.02.xx						
Smart X	LCD	Mod.	U.M.	HYN 432	HYN 532	DESCRIPTION
OUT3B		(2)		3 (Y2)		Analogue output for main fan
ING3A		(2)		3 (NTC3)		Reference analogue input
TIN3	P37	(1)	°C	30		Heating fan ON temperature
TFN3	P38	(1)	°C	56		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 HYN**		
FN_04		(2)		0		Function Enabling 0= disabled
FUNC_05	**Fnu-P50**			**Circulator Management and Water flow rate Function**		
S5	P51	(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		Set-point in l/10/m’
P5		(2)	From l/h	5		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 HYN**		
FN_08	P81	(2)		0		Function Enabling 0=disabled
FUNC_09	**Fnu-P90**			**Extractor and free cooling Management Function - NOT USED ON HYN**		
FN_09		(2)		0		Function Enabling 0=disabled
FUNC_10	**Fnu-PA0**			**Conditioning - NOT USED ON HYN**		
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 8.02.xx						
Smart X	LCD	Mod.	U.M.	HYN 432	HYN 532	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
D_SM				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)		1		Activates or deactivates NTC3 input
						B0 Input Configurations (flue gas fan speed)
B0		(2)		1		B0 analogue input enabling 0=disabled; 1=enabled
						B1 Input Configurations - NOT USED ON HYN
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 flow rate flowmeter)
B3		(2)		2		B3 analogue input enabling 0=disabled; 1=enabled as analogue input; 2=enabled as frequency input
XA3		(2)		0.14		X-axis minimum value – minimum input voltage

Parameters of G26800 CPU PCB version 8.02.xx						
Smart X	LCD	Mod.	U.M.	HYN 432	HYN 532	DESCRIPTION
XB3		(2)		2.29		X-axis maximum value – maximum input voltage
YA3		(2)		0.29		Y-axis minimum value – minimum magnitude value
YB3		(2)		5		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
				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: maximum calculation value (100%) corresponds to maximum output value; 1= reverse output: maximum calculation value (100%) corresponds to 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)

Parameters of G26800 CPU PCB version 8.02.xx

Smart X	LCD	Mod.	U.M.	HYN 432	HYN 532	DESCRIPTION
				Y1 Analogue Outputs Configuration		
YM1		(2)		1		Direct/reverse output configuration 0= direct output: maximum calculation value (100%) corresponds to maximum output value; 1= reverse output: maximum calculation value (100%) corresponds to 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)
				Y2 Analogue Output Configuration (Fan heater ventilation)		
YM2		(2)		0		Direct/reverse output configuration 0= direct output: maximum calculation value (100%) corresponds to maximum output value; 1= reverse output: maximum calculation value (100%) corresponds to minimum output value
YL2		(2)		3		Minimum voltage (or PWM in %) output value
YH2		(2)		10		Maximum voltage (or PWM in %) output value
YF2		(2)		4		Fixed voltage or % output value (forced by program) - In conditioning mode
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 HYN		
YM3		(2)		0		Direct/reverse output configuration 0= direct output: maximum calculation value (100%) corresponds to maximum output value; 1= reverse output: maximum calculation value (100%) corresponds to 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)

6.11. 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
Flame Safety Alarms - Caused by the flame monitoring equipment (TER)			
E10	Failure to ignite the burner after 4 attempts performed by the equipment.	- No gas - Phase and neutral reversed - Ground not connected - Phase-to-phase connection without neutral - Faulty or incorrectly positioned ignition electrode - Low CO_2 value - Gas supply pressure too high (>60mbar)	Manual
E11	Untimely (parasitic) flame. The equipment detects a flame presence signal with burner off	- Insulation loss of the safety module (SRM) of TER equipment - Insulation loss of the ignition cable or single-electrode (ignition/detection)	Manual
E12	Ignition failure; not visible. The count, displayed in the event log, indicates whether the boiler has had problems with ignition	See E10	Manual
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
E14	Lack of communication between TER equipment and CPU for more than 60 seconds	TER equipment or CPU PCB broken	Autoresolve
E15	The flame monitoring equipment (TER) does not reach the "Running" status after 300 seconds from the heat request by the CPU	- TER equipment broken - Flame failure immediately after safety time (spark) due to lack of gas or incorrect burner adjustment	Manual or Autoreset (every 5')
E16	General lockout of the flame monitoring equipment (TER)	- TER equipment broken - Signals a safety shutdown of the burner following an uninterrupted operation >24h	Manual or Autoreset (every 5')
E17	Internal fault of TER equipment, that does not accept reset command from CPU	TER equipment broken, replace	Manual or Autoreset (every 5')
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.	- Reduced gas flow rate on the line or excessive pipeline heat loss; - Incorrect burner setting (CO_2 too low)	
Alarms for safety device activation			
E20	Activation of safety thermostat STB	- Excess of air or water temperature due to lack of water/air flow circulation - Safety thermostat faulty or not connected	Manual
E22	Activation of STB safety thermostat or flue gas thermostat in ignition phase	- Frost or temperature below -20°C - Safety thermostat or flue gas thermostat broken or not connected	Autoresolve
E24	Activation of heat exchanger thermal fuse - TF	The 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

Alarm Code	DESCRIPTION	CAUSE	TYPE OF RESET
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	- FAN electric cables interrupted, not connected or wrongly 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
E31	Flue gas fan speed (VAG) too high in stand-by phase	- 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). In order to check for any Flue gas fan failure: 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. 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).	Manual
E32	Flue gas fan speed (VAG), during operation, outside minimum and maximum set parameters	- FAN electric cables interrupted, not connected or wrongly connected - Smoke fan failure or mechanical failure of the smoke fan impeller. Replace the flue gas fan (VAG)	Manual or Autoreset (every 5')
Digital input alarms			
E36	ID1 input alarm	Programming error of par.ID1. Set par. ID1=0 (if not used for connection with remote controls) or ID1=4	Manual or Autoresolve
E37	Alarm for ID2 Flue Gas Thermostat (TFUMI) or Flue Gas Pressure Switch (PFLUE) activation	- The gas flow rate might exceed the boiler adjustment parameters (Overload) - Check that the exchanger is clean. - Total or partial obstruction of the flue outlet - Flue heat loss greater than the permitted value	Manual or Autoresolve
E38	Alarm for D3 Condensate control electrode activation	- Condensation detection electrode to ground or faulty - Clogged condensate drain (by impurities or frozen drain) --> clean siphon and/or drain outlet	Manual or Autoresolve

Alarm Code	DESCRIPTION	CAUSE	TYPE OF RESET
Alarms of analogue inputs and NTC probes			
E41	NTC1 probe error	No signal from probe or broken probe	Autoresolve
E43	NTC3 probe error	No signal from probe or broken probe	Autoresolve
Overtemperature Alarms			
E51	The temperature of the boiler water delivery probe NTC1>TH1	- 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
E53	The temperature of the system water delivery probe NTC3>TH3	- Minimum heat output of the unit over-sized compared to the heat output required by the environment - Check parameter TH3 - water delivery setpoint	Autoresolve with NTC3<ST3
Modbus communication alarms			
E60	Communication error between CPU PCB and Modbus Slave, Smart (CN04) network	- ModBus network is disconnected - The address of the PCB is wrong and/or not configured in the Modbus network	Autoresolve
Alarms for no voltage or dirty filters			
E71	Dirty air filter, first alarm	Not used. Programming error of par. CTRL_09. Set par. CTRL_09 = 0	
E72	Dirty air filter, second alarm	Not used. Programming error of par. CTRL_09. Set par. CTRL_09 = 0	
E75	No voltage during operating cycle (excluding standby); fault is not visible on remote control but only counted.	No voltage during operation	
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
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
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
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')

Alarm Code	DESCRIPTION	CAUSE	TYPE OF RESET
Parameter configuration error alarms			
E98	Input configuration error	No input enabling for functions or controls (e.g. no activation of NTC1 input combined with REG_01)	Autoresolve
E99	Function configuration error	No activation of compulsory functions for the product (e.g. no activation of FUNC_05 for product type "Boiler")	Autoresolve
EEPROM alarms			
E100	Eeprom access error	Eeprom missing, inserted in the opposite direction or partially inserted	Autoresolve
E101	Eeprom data error	Damaged eeprom	Autoresolve

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.

7. SERVICING INSTRUCTIONS - HEAT PUMP

7.1. Start-up

Before start-up:

- Check the availability of diagrams and manuals of the machine installed;
- Check the availability of wiring and hydraulic diagrams of the system to which the machine is connected;
- Check that cut-off taps of hydraulic circuits are open;
- Check that the hydraulic circuit has been pressurised and vented from air;
- Check that all hydraulic connections have been correctly installed and that all nameplate instructions are respected;
- Make sure that condensate drain devices are provided;
- Check electrical connection and the correct fastening of all terminals;
- Check that electrical connections are carried out according to the current regulations, including earthing;
- Voltage must be as indicated in the unit nameplate;
- Make sure that electric voltage is within tolerance limits (±5%);
- Check that electric resistances of compressors are correctly powered;
- Check that no gas leaks occur;
- Before start-up, check that all closing panels are positioned and fastened with the proper screws.

ATTENTION: The unit must be connected to the mains power supply and set in STAND-BY mode (powered) by closing the main switch at least 12 hours before its start-up, to allow the resistances to suitably heat the compressor casing (the resistances are automatically powered when the switch is closed). The resistances work correctly if after several minutes the compressor casing temperature is 10÷15°C higher than ambient temperature.

ATTENTION: Check that the weight of the piping is not supported by the machine structure.

ATTENTION: For temporary stop of the unit, never disconnect power supply through the main switch, this operation must be used only to disconnect the unit from power supply in case of long downtime (e.g. seasonal stops, etc.). Moreover, if power supply is missing, casing resistances are not powered, resulting in risk of compressor break upon unit start-up.

ATTENTION: Do not change the electric connections of the unit, otherwise the warranty is invalidated immediately.

ATTENTION: Summer/winter operation must be selected at the beginning of the relevant season. Frequent and sudden changes of this operation must be avoided in order to prevent compressor damages.

ATTENTION: Upon first installation and start-up, make sure that the machine operates correctly both in heating and in cooling mode.

7.2. Control interface

The normal display shows the water outlet temperature in tenths of a Celsius degree or the alarm code if at least one is active. If several alarms are activated, the first one is displayed, while the second one will be displayed once the first one has been reset. In menu mode, viewing depends on the current position.

SYMBOL	DESCRIPTION
	Cooling mode LED: lit if COOL or COOL+SAN mode is selected.
	Heating mode LED: lit if HEAT or HEAT+SAN mode is selected.
	Pump LED: lit if the pump is active.
	Alarm LED: lit if there are active alarms.
	Defrosting LED: flashes to enter defrosting mode, lit when defrosting is in progress.
	Compressor LED: flashes if the compressor is starting, is lit if the compressor is active.
	DHW LED: flashes if DHW production is in progress, is lit if COOL+SAN or HEAT+SAN mode is selected and DHW production is not in progress.
	KA heating elements LED: lit if antifreeze heating element is enabled.

The buttons feature specific functions as shown below:

SYMBOL	DESCRIPTION
	It selects the operation mode and resets the alarms with manual reset. Each time you press the key, the following sequence is available: OFF -> COOL -> COOL+SAN* -> HEAT -> HEAT+SAN* -> OFF (*= if DHW is enabled). During parameter setting it operates as one level BACK key.
	This allows entering the selected menu to view sub-folders or to set a value (e.g. summer, winter and DHW set-points or various parameters).
	UP key allows navigating to an upper menu or increasing a parameter value.
	DOWN key allows navigating to a lower menu or decreasing a parameter value.

The normal display shows the water outlet temperature in tenths of a Celsius degree or the alarm code if at least one is active. If several alarms are activated, the first one is displayed, while the second one will be displayed once the first one has been reset. In menu mode, viewing depends on the current position.

7.3. Menu

The main functions of menu navigation is described below, particularly when there are non-self explanatory functions. The main menu manages the following items:

MENU	LABEL	PASSWORD LEVEL	OTHER CONDITIONS
Setpoint	Set	User	Not accessible when connected to Hi-t2
Probes	tP	Installer	---
Alarms	Err	User	Only if alarms are active
Digital inputs	Id	Installer	---
Parameters	Par	Installer	---
Password	PSS	User	---
Hours operation	oHr	Installer	---
USB	USb	Installer	Only in the presence of pendrives with corresponding update files
Version Firmware	Fir	Installer	Version, Revision And Sub
Alarm log	Hist	Installer	Only if data are present in the log

The PSS menu is accessed to enter the maintenance technician password and to enable higher privilege access. Once you exit the menus completely, you lose the password privilege and must enter it again.

7.4. Setpoint Menu [Set]

The various setpoints can be displayed and changed.

SET POINT	DESCRIPTION	UNIT	DEFAULT	RANGE
Coo	First summer setpoint	°C	7.0	5 ÷ Coo2
Hea	First winter setpoint	°C	45.0	25 ÷ 60
*San	DHW setpoint	°C	48.0	25 ÷ 60
Coo2	Second summer setpoint	°C	18.0	Coo ÷ 25
Hea2	Second winter setpoint	°C	35.0	25 ÷ Hea
**rCoo	Mixing valve summer setpoint	°C	15.0	0.0 ÷ 80
**rHEA	Mixing valve winter setpoint	°C	30.0	0.0 ÷ 80

* If DHW is enabled
** If Gi accessory is present, it can only be accessed by means of installer password.

7.5. Probe menu [tP]

The value of the various probes is displayed. The number of visible probes depends on the presence or absence of I/O expansion modules.
Special cases:

- Err = probe in error
- --- = probe not used (no function associated with this probe)

By entering the analogue input menu 'tP' by means of the installer password, the values of the probes present can be read.

tP	DESCRIPTION	UNIT
t01	Inlet water temperature	°C
t02	Outlet water temperature	°C
t03	Compressor inlet temperature	°C
t04	Compressor drain temperature	°C
t05	External air temperature	°C
*t06	DHW probe temperature	°C
*t07	System remote probe temperature	°C
t09	Low pressure	°C
t10	High pressure	bar
t11	Water flow rate	bar
**t15	Mixing probe temperature	l/min

* If enabled

7.6. Alarm menu [Err]

The menu is only displayed if there are active alarms and lists the list of errors present.

ERROR	DESCRIPTION	LOCKOUT
E00	Remote off	Machine
E001	High pressure alarm	Machine
E002	Low pressure alarm	Machine
E005	Antifreeze alarm	Machine
E006	Flow switch alarm	Machine

ERROR	DESCRIPTION	LOCKOUT
E008	Compressor driver limitation alarm	Machine
E009	Drain high temperature alarm	Machine
E010	Solar collector high temperature alarm	Heat pump
E018	High temperature alarm in cooling	Machine
E020	Reversed pressure transducer alarm	Machine/ DHW
E041	Inconsistent temperature alarm	Machine
E050	DHW tank high temperature alarm	-
E101	Communication timeout with slave 1	Machine
E611	Input water probe failure	Machine
E621	Output water probe failure	Machine
E631	Compressor intake probe failure	Machine
E641	Compressor drain probe failure + high pressure switch	Machine
E651	External air probe failure	Machine
E661	Domestic hot water probe failure	Machine
E671	External air remote probe for climate adj. failure	Machine
E691	Low pressure transducer failure	Machine
E701	High pressure probe failure	Machine
E711	0-10V DC voltage input failure	Machine
E801	Pressure inverter time-out	Compressor
E851	Hardware problem in the inverter	Compressor
E861	Compressor current too high	Compressor
E871	Inverter dissipator high temperature	Compressor
E881	Supply voltage exceeding limits (DC bus)	Compressor
E891	Compressor not connected to power supply	Compressor
E901	Compressor driver and model mismatch	Compressor
E911	Overload protection	Compressor
E921	PFC-POE overcurrent	Compressor
E931	Internal communication error	Compressor
E941	PFC converter fault	Compressor
E951	Dissipator and/or ambient temperature sensor failure	Compressor
E961	Abnormal condition	Compressor
E971	EEPROM error	Compressor

E000 - remote ON/OFF
If the machine is controlled by a remote digital input.

E001 - High pressure
The alarm is activated when the pressure transducer of the machine detects a pressure higher than 41.5 bar. In this case the compressor is blocked immediately. The alarm resets automatically when the pressure drops below 32.5 bar. If it occurs more than 3 times per hour, the alarm must be manually reset.

E002 - Low pressure
In chiller mode, the alarm is active if the pressure transducer of the machine detects a pressure higher than 3.5 bar. In heat pump mode, the alarm is active if pressure transducer of the machine detects a pressure higher than 1.3 bar. Each time the compressor is activated, a bypass time of 60 seconds is counted. When the alarm is active, the circuit compressor is blocked. The alarm automatically resets when the pressure rises 2.0 bar above the triggering threshold. If it occurs more than 3 times per hour, the alarm
must be manually reset.

E005 - Antifreeze
The alarm is activated if the value of output water probe is lower than 3°C. Deactivation occurs if the temperature detected by this probe increases to +6°C or more.
The alarm is bypassed for 120 seconds from start-up in heating mode.

E006 - Flow switch
The flow switch on water side is already installed inside the unit and MUST NOT be tampered with or bypassed in any way. The flow switch is bypassed for a time of 10 seconds from the start of the machine. After the bypass time has expired the status of the digital input is evaluated, if it is active the flow presence is checked. In case of 5-second no-flow, the alarm is activated for 120 seconds.
If the alarm occurs more than 3 times per hour, the alarm must be manually reset.
The alarm is not active for 10 seconds after pump activation, during domestic hot water production and during the system venting cycle function.

E008 - Driver limitation
If the compressor does not reach the speed at the expected ramp value within 30 minutes, the alarm becomes active and the compressor is switched off for safety reasons. If the number of alarms-per-hour reaches 3, it must be reset manually.

E018 - High temperature
If the output water probe detects a value greater than 65°C for at least 50 seconds, the alarm is activated. Deactivation takes place when the temperature drops below 62°C.

E020 - Reversed transducers
When compressors have been running for more than 150 seconds, if the suction pressure probe measures a higher pressure than the condensation pressure probe, then alarm E020 is signalled. This alarm cannot be reset (power must be cut to the machine to delete the alarm).
This alarm is not handled during defrosting.

E041 - 4-way valve
Alarm to be manually reset. It refers to an alarm due to malfunction of the 4-way valve for reversing. The alarm is not active for a by-pass time of 180 seconds after a compressor is switched on.
In heating or DHW mode, the alarm is active when the bypass time has elapsed and the water delivery temperature is lower than the water return temperature of the heat pump.
In cooling mode, the alarm is active when the bypass time has elapsed and the water delivery temperature is higher than the water return temperature of the heat pump + 1°C.

E611 to E671 - Probe alarms
The alarm is activated if any probe connected and enabled is short-circuited or interrupted.
The alarm is activated also if the upper limit (100°C) or the lower limit (-50°C) of probes is exceeded.
A probe configured as probe for domestic water does not activate any alarm if domestic water is not enabled.

If the pressure switch on the machine detects a pressure higher than 42.8 bar, the driver and compressor are de-energised and probe error E641 (Compressor drain probe failure) appears. The alarm deactivates when pressure drops below 34 bar.

E641 - HP pressure switch (in series with compressor delivery probe)
If pressure switch of the machine detects a pressure higher than 44 bar the alarm is activated.
In this case the compressor is blocked immediately. The alarm resets when pressure drops below 31 bar.
If the number of alarms-per-hour reaches 3, it must be reset manually.

E801 - Inverter time-out
If the controller does not communicate with compressor driver PCB, a time-out alarm is activated to prevent loosing system control.

7.7. Digital input Menu [Id]

The status of the digital inputs is displayed:
0=deactivated
1=activated
----= input not configured
The menu access is password-protected.

7.8. Parameter Menu [Par]

The parameters are grouped, each group is identified by a three-digit code, while the index of each parameter is preceded by a letter.

DESCRIPTION	CODE GROUP	INDEX PAR.	VISIBILITY
Configuration	CnF	H01-	Installer
Compressor	CP	C01-	Installer
Alarms	ALL	A01-	Installer
Adjustment	rE	b01-	Installer
Pump	PUP	P01-	Installer
Electrical heating elements	FrO	r01-	Installer
Defrosting	dFr	d01-	Installer
Hz min/max	LbH	L0-	Installer

To access the installer parameters: PRG -> PSS -> PRG -> (enter maintenance technician password) ->PRG ->PAr -> PRG.
The menu access is password-protected.

Setting the heat pump address of the HYN system:
Within the Par menu, select CnF and press PRG;
Scroll with the arrow keys to par. H126 and press PRG.
Set H126=101 (modbus address given as an example) and then PRG.

In this way, the machine will be programmed to communicate with address 101. The Smart X, programmed as HYBRID (Boiler + Heat Pump), will automatically communicate with the heat pump addressed to 101.

7.9. Operating hours Menu [oHr]

The operating hours of the compressor (oH1) and circulator (oHP1) can be displayed.
Pressing the ESC key for 3 seconds resets the currently displayed count.
The menu access is password-protected.

7.10. Switching off for long periods

If the system is expected to be idle for a long period of time, hydraulic emptying of the system is recommended unless an adequate amount of glycol is present.
To shut down the unit completely after emptying the system:
- Switch off the units by turning the switch of each equipment to "OFF".
- Close the water taps
- Set the main earth leakage switch to "OFF" (if it has been installed upstream of the system)

If the temperature drops below 0°C, there is a real risk of frost: provide for a water-glycol mix in the system, otherwise empty the hydraulic system and the hydraulic circuits of the heat pump.

ATTENTION: Operation, although transitory, with water temperature below +5°C is not guaranteed on the basis of the operating limits set out in Section 3.1. Before switching the unit back on after a long shutdown, make sure that the temperature of the water-glycol mixture is above or at least +5°C.

7.11. Environmental protection

Laws governing the use of substances detrimental to the ozone layer prohibit the dispersal of refrigerant gases in the environment. Such gases, in fact, must be recovered and returned, at the end of their useful life, to specific collection centres.

We recommend to pay special attention during maintenance operations in order to reduce as far as possible refrigerant leaks.

7.12. Maintenance and periodic controls

ATTENTION: All operations described in this chapter MUST ALWAYS BE CARRIED OUT BY QUALIFIED PERSONNEL. Before carrying out any operation on the unit or accessing internal parts, make sure that power supply is disconnected.

ATTENTION: Before starting work, safety checks must be carried out to ensure that the risk of combustion is minimised. Work must be undertaken following a controlled procedure to minimise the risk of flammable gases or vapours being present while work is being performed. The area must be checked with a suitable refrigerant gas detector before and during work.

Maintenance should only be carried out in weather conditions suitable for the planned operations.

CAUTION: It is possible for a certain amount of compressor oil to be deposited in the refrigerant circuit piping, especially at bends. In the case of maintenance operations in which it is necessary to desolder pipes, it is strongly recommended to proceed by cutting the pipes and not desoldering with a torch, as the flame will ignite any oil present.

It is forbidden to refill cooling circuits with a refrigerant different from the one indicated in the nameplate. The use of a different refrigerant can seriously damage the compressor.

It is forbidden to use oils different from those specified in this manual. The use of a different oil can seriously damage the compressor

The heads and the delivery pipe of the compressor are usually at quite high temperature.

Pay special care while working near the coils. Aluminium tabs are very sharp and can cause serious injury. Always use appropriate personal protective equipment.

After maintenance operations, close the panels by securing them with fixing screws. Pay particular attention to the correct closing of the control panel box.

After maintenance operations, pay attention to the correct tightening of the cable gland for the passage of the power cable.

It is advisable to have the checks and periodic maintenance carried out by specialised personnel. EU Regulation n.517/2014 establishes that users must have regular checks of the installations carried out, verifying their tightness and eliminating any leaks as soon as possible. Check the obligatory nature and the necessary documentation on Regulation n.517/2014 and its subsequent amendments or repeal.

It is good practice to carry out periodic controls to check the correct operation of the unit:

OPERATION	1 month	4 months	6 months	12 months
Water circuit filling.	x			
Presence of bubbles in water circuit.	x			
Check the correct operation of control and safety devices.	x			
Check that no oil leaks from the compressor occur.	x			
Check that no water leaks in the hydraulic circuit occur.	x			
Check that the flow switch operates correctly.	x			
Check that casing resistances are powered and operational.	x			
Clean metallic filters of hydraulic circuit.	x			
Clean the coil with tabs using compressed air or jet of water.		x		
Check that the electric terminals both inside the electric panel and in the terminal boxes of the compressor are properly fixed.		x		
Tightening of hydraulic connections.		x		
Check fan fastening and balancing.		x		
Correct electrical voltage and phase imbalance (no load and under load).			x	
Correct power consumption.			x	
Check of refrigerant charge and leaks, if any.			x	
Check of working pressure, overheating and subcooling.			x	
Circulation pump efficiency.			x	
Check of expansion reservoir.			x	

OPERATION	1 month	4 months	6 months	12 months
If the unit is not used for a long period, drain water from pipes and from heat exchanger. This operation is essential if, during the period of inactivity, ambient temperatures lower than the freezing point of the fluid used are expected.			x	
Check for corrosion/oxidation.				x
Check panel fixing.				x
Check water quality and glycol concentration, if necessary.			x	
Check the heat drop of any filter driers on the liquid line.			x	
Check safety valve.			x	

7.13. Cleaning the finned coil

To carry out proper cleaning, follow the instructions below:

- Remove surface dirt. Deposits such as leaves, fibres, etc. must be removed using a hoover (use a brush or other soft accessory, carefully avoiding rubbing against metal or abrasive parts). If you decide to use compressed air, care must be taken to keep the air flow always perpendicular to the surface of the coil to avoid bending the aluminium fins. Take care not to bend the fins with the nozzle of the compressed air lance.
- Rinse. Rinse with water. Chemicals (specific cleaners for finned coils) can be used. Rinse by running water through the fins until they are perfectly clean. Take care to direct the water jet perpendicularly to the surface of the coil to avoid bending the aluminium fins. Avoid hitting the coil with the water hose. It is advisable to place your thumb on the end of the rubber hose to obtain the desired water jet pressure instead of using nozzles that could hit the coil and damage it.

The anti-corrosion treatment applied to the finned coils guarantees protection against aggressive atmospheres.
The frequency of cleaning depends on environmental conditions and is left to the common sense of the maintenance personnel. When dust particles or grease of an oxidising nature are observed on the surface of the coils, cleaning is recommended. In principle,
in a slightly polluted atmosphere, it is recommended to carry out the cleaning treatment every three months.
Washing should be carried out with preferably warm water (40-60°C) and neutral pH detergent, while rinsing can be done with plenty of fresh water (50 l/m^2).
If maintenance personnel observe a lack of protective cover on the edge of the fins, the nearest service centre must be contacted in order to reapply the cover and fully restore the corrosion protection.

Do not use high-pressure cleaners to clean the coil to prevent excessive pressure from causing irreparable damage. Damage caused by cleaning using unsuitable chemicals or excessive water pressure will not be accepted.

ATTENTION: The aluminium fins are thin and sharp. Take great care to use appropriate PPE to avoid cuts and abrasions. Protect your eyes and face appropriately to avoid splashes of water and dirt during blowing. Wear waterproof shoes or boots and clothing that covers all parts of the body.

For units installed in an aggressive atmosphere with a high rate of fouling, coil cleaning must be part of the routine maintenance programme. On this type of installation, all dust and particles deposited on the coils must be removed as soon as possible by periodic cleaning in accordance with the above instructions.

7.14. Cleaning of external surfaces

The sheets of the outer casing must be properly cleaned to prevent the accumulation of dust/dirt and thus prevent the onset of corrosion. The paint provides resistance to atmospheric agents, but it is good practice to ensure that any dirt present is removed by cleaning the surfaces with a neutral detergent and water, especially if the unit is installed in locations with an aggressive atmosphere (high level of pollution, salty air, etc.).

7.15. Extraordinary maintenance

All extraordinary maintenance work must be carried out by an authorised service centre.

8. CALCULATION OF EFFICIENCY AND ENERGY CLASS FOR AQUAPUMP HYBRID

The assessment of seasonal efficiency for AQUAPUMP HYBRID, according to EU Regulation no. 811/2013, is intended as packaging of one boiler + one heat pump + one temperature control device.
The following considerations refer to fig. 1 of Annex IV of the above mentioned regulation, which applies to the following type of assembly:

For preferential space heater boilers and preferential combined boilers, element of the fiche for a package including a space heater, temperature control and solar device and a package including a combination heater, temperature control and solar device, respectively, indicating the seasonal space heating energy efficiency of the package offered.

MODEL AQUAPUMP HYN432 and HYN532

Seasonal space heating energy efficiency of the preferential HP		'I'	176.0 %	❶
Temperature check [1]		+	3.0 %	❷
Additional boiler	(91.8 [2] - 'I') x 'II' =	±	-28.4 %	❸
Solar contribution	('III' x [3] + 'IV' x [4]) x 0.45 x ([5] / 100) x [6] =	+	0.0 %	❹
Seasonal space heating energy efficiency of the package in average weather conditions			**150.6** %	❺

Seasonal space heating energy efficiency class of the package in average weather conditions

☐ G	☐ F	☐ E	☐ D	☐ C	☐ B	☐ A	☐ A+	☐ A++	☑ A+++
<30%	≥30%	≥34%	≥36%	≥75%	≥82%	≥90%	≥98%	≥125%	≥150%

Seasonal space heating energy efficiency in colder and warmer weather conditions

Colder 150.6 [7] - 'V' = 127.3 % Warmer 150.6 [7] + 'VI' = 193.5 %

The energy efficiency of the package of products provided for in this sheet may not correspond to its actual energy efficiency once installed in a building, as the efficiency is influenced by further factors such as the heat loss in the distribution system and the dimension of the products in relation to building size and characteristics

Notes to the calculation table:

1. Value of temperature control contribution according to the class, Smart X Class V (Class I=1%; Class II=2%, Class III=1.5%, Class IV=2%, Class V=3%, Class VI=4%, Class VII=3.5%, Class VIII=5%);
2. Seasonal space heating energy efficiency in %;
3. Collector size in $m^{2;}$
4. Reservoir volume in $m^{3;}$
5. Collector efficiency in %;
6. Reservoir classification (A^{+}=0.95; A=0.91; B=0.86; C=0.83; D-G=0.81);
7. Value ❺.

Indexes in the calculation table relevant to Figure 3 Annex IV or EU Regulation no. 811/2013:

- "I" = the value of the seasonal space heating energy efficiency of the preferential heater, expressed in %;
- "II" = the factor for weighing the heat output of preferential and supplementary heaters of a package as set out in *Table 6 of Annex IV of EU Regulation no. 811/2013* (see below);
- "III" = the value of the mathematical expression: 294/(11 x P_{rated}), whereby P_{rated} is related to the preferential space heater;
- "IV" = the value of the mathematical expression 115/(11 x P_{rated}), whereby P_{rated} is related to the preferential space heater;
- V: the value of the difference between the seasonal space heating energy efficiency in average and colder climatic conditions, expressed in %;
- VI the value of the difference between the seasonal space heating energy efficiency in warmer and average climatic conditions, expressed in%.

Index	Value for HYN432	Value for HYN532
'I'	176	
'II'	0.34* / 0.22**	
'III'	2.22	
'IV'	0.87	
'V'	23.3	
'VI'	42.9	

* package without hot water reservoir
** package with hot water reservoir

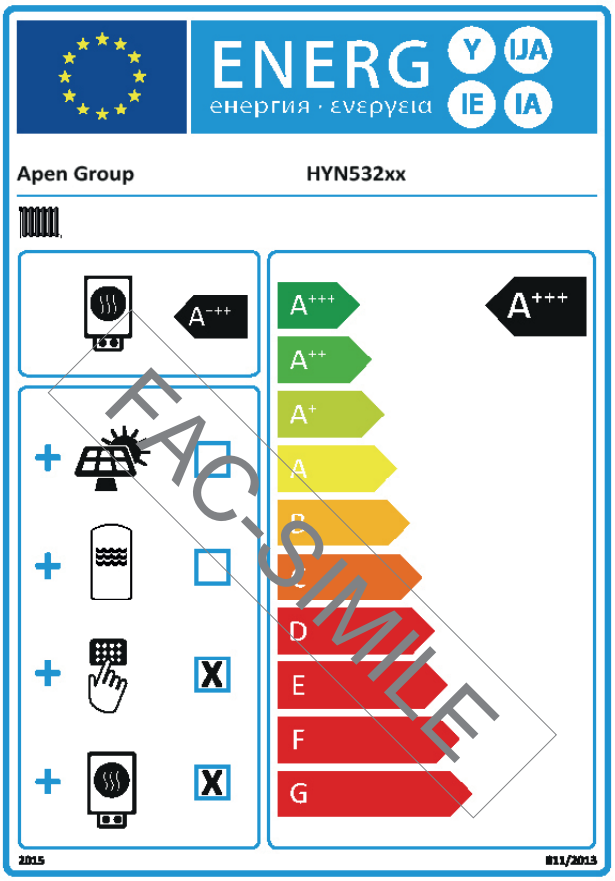
Table 6 of Annex IV of EU Regulation no. 811/2013:

For the purposes of figure 1, weighing of the heat pump appliance for space heating or preferential heat pump combined heating appliance and the supplementary heater*

$P_{sup}/(P_{sup}+P_{rated})$**	II assembly without hot water reservoir	II, assembly with hot water reservoir
0.00	1.00	1.00
0.10	0.70	0.63
0.20	0.45	0.30
0.30	0.25	0.15
0.40	0.15	0.06
0.50	0.05	0.02
0.60	0.02	0.00
≥ 0.70	0.00	0.00

* The intermediate values are calculated by linear interpolation between two adjacent values.
** Prated is related to the preferential space heater or combination heater.

Facsimile of AQUAPUMP HYBRID energy labels



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