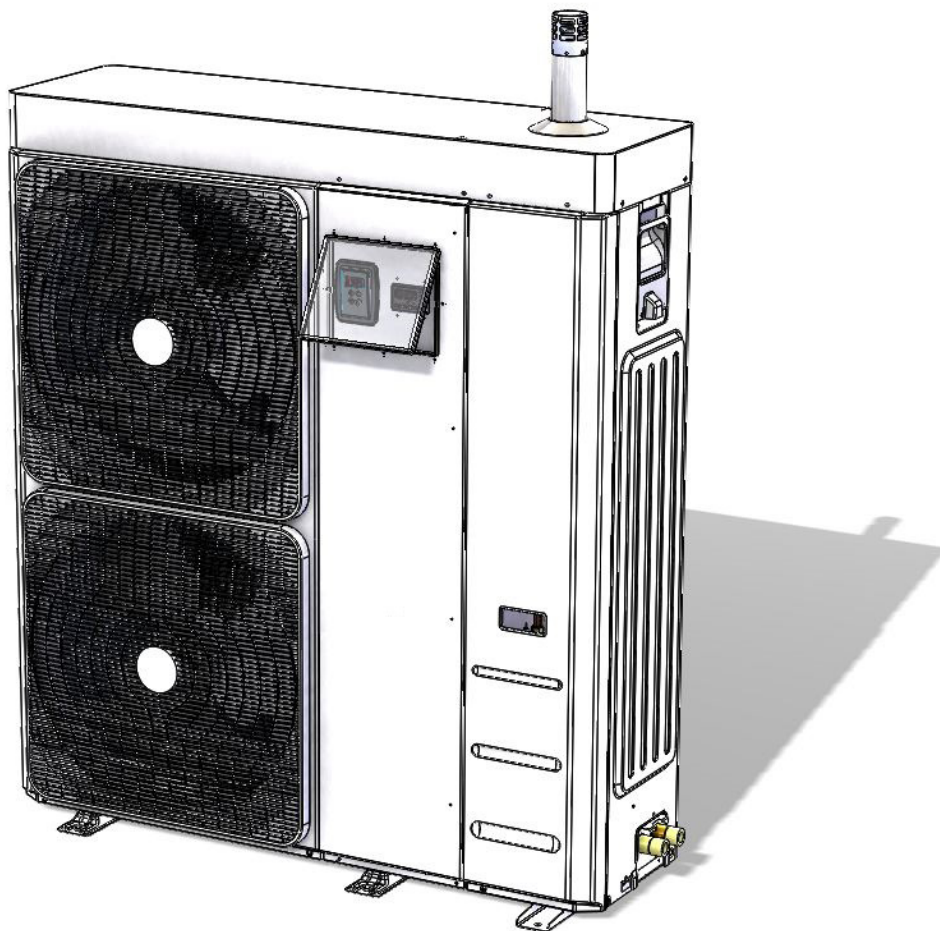


EN

**Use, Installation and Maintenance Manual
HYBRID HEATER - AQUAPUMP HYBRID**



VER. 00.00.2017

Dichiarazione di Conformità Statement of Compliance



APEN GROUP S.p.A.

20060 Pessano con Bornago (MI)
Via Isonzo, 1
Tel +39.02.9596931 r.a.
Fax +39.02.95742758
Internet: <http://www.apengroup.com>

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

Modello: Model:	Generatore Ibrido AQUAPUMP HY Hybrid Heater AQUAPUMP HY
----------------------------------	--

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**
RAEE Directive 2012/19/UE
- **Direttiva RAEE 2012/19/UE**
RAEE Directive 2012/19/UE
- **Direttiva ROHS II 2017/2012/CE**
ROHS II Directive 2017/2012/CE

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, 01/03/2018

Apen Group S.p.A.
Un Amministratore



CODE

SERIAL NUMBER

HY

3

code HC0100.01EN ed.A-1806

INDEX

1.	GENERAL CAUTIONS	6
2.	SAFETY-RELATED WARNINGS	6
2.1.	<i>Safety and health of workers</i>	7
2.2.	<i>Personal protective equipment</i>	7
2.3.	<i>Safety signals</i>	7
2.4.	<i>Fuel</i>	8
2.5.	<i>Gas Leaks</i>	8
2.6.	<i>Power supply</i>	8
2.7.	<i>Use</i>	8
2.8.	<i>Maintenance</i>	8
2.9.	<i>Refrigerant safety data sheet</i>	10
3.	TECHNICAL FEATURES	11
3.1.	<i>Technical Data</i>	14
3.2.	<i>Hydraulic/gas circuit characteristics</i>	21
3.3.	<i>Cooling circuit characteristics</i>	22
3.4.	<i>AQUAPUMP HYBRID size</i>	23
3.5.	<i>Fan heater size</i>	24
3.6.	<i>Operation</i>	25
3.7.	<i>Temperature adjustment logic</i>	26
4.	USER'S INSTRUCTIONS	27
4.1.	<i>Operation mode setting</i>	27
4.2.	<i>Setting the time ranges</i>	27
4.4.	<i>Operation monitoring</i>	28
5.	INSTALLATION INSTRUCTIONS	29
5.1.	<i>General Installation Instructions</i>	29
5.2.	<i>Transport and Handling</i>	29
5.3.	<i>Accessories for installation</i>	29
5.4.	<i>Installation of AQUAPUMP HYBRID - HY</i>	29
5.5.	<i>Fan heater installation</i>	30
5.6.	<i>AQUAPUMP/fan heater connections</i>	30
5.7.	<i>Electrical Connections</i>	31
5.9.	<i>Fan Heater Operation</i>	36
5.10.	<i>Hydraulic circuit filling</i>	36
5.11.	<i>GAS and hydraulic connections</i>	37
5.12.	<i>Connections to the Flue</i>	38
5.13.	<i>Connection to the Condensate Drain</i>	39

6.	SERVICING INSTRUCTIONS - BOILER	40
6.1.	<i>Country Table - Gas Category</i>	40
6.2.	<i>Gas Settings Table</i>	41
6.3.	<i>First start-up</i>	42
6.4.	<i>Analysis of combustion</i>	42
6.5.	<i>Conversion to LPG</i>	43
6.6.	<i>Replacing the Gas Valve and Adjusting the Offset</i>	43
6.7.	<i>Replacing the modulation PCB</i>	44
6.9.	<i>Exchanger maintenance</i>	45
6.10.	<i>Boiler PCB parameters</i>	46
6.11.	<i>Analysis of Lockouts - BOILER FAULT</i>	48
7.	SERVICING INSTRUCTIONS - HEAT PUMP	50
7.1.	<i>Start-up</i>	50
7.2.	<i>Control interface</i>	50
7.3.	<i>Menu structure</i>	51
7.4.	<i>Analogue input menu</i>	51
7.5.	<i>Display</i>	51
7.6.	<i>Signalling LEDs</i>	51
7.7.	<i>Heat pump PCB parameters</i>	52
7.8.	<i>Analysis of Lockouts - HEAT PUMP FAULTS</i>	52
7.9.	<i>Switching off for long periods</i>	53
7.10.	<i>Environmental protection</i>	53
7.11.	<i>Decommissioning</i>	53
7.12.	<i>Maintenance and periodic controls</i>	54
8.	CALCULATION OF EFFICIENCY AND ENERGY CLASS FOR AQUAPUMP HYBRID	55

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.

For Swiss market, reference standards are:

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

2. SAFETY-RELATED WARNINGS

GRAPHIC CONVENTIONS USED IN THE MANUAL

	It indicates hazardous operations for persons and/or for proper operation of the machine
	It indicates operations that must not be carried out.
	It indicates important information that the operator must necessarily follow for the proper operation of the machine in safeguard conditions.

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.

	<i>It is strictly forbidden to remove and/or tamper with any safety device.</i>
	<i>The use of the equipment is forbidden to children and unassisted disabled people.</i>
	<i>It is forbidden to touch the equipment with bare feet and with wet or damp body parts.</i>
	<i>It is forbidden to pull, disconnect, twist electric cables that come out of the equipment, even if it is disconnected from mains.</i>
	<i>It is forbidden to stand on top of the equipment, seat on it and/or place any type of object on it.</i>
	<i>It is forbidden to spray or aim jets of water directly on the equipment.</i>
	<i>Any ordinary or extraordinary maintenance operation must be carried out with machine stopped, without power supply.</i>
	<i>Do not put your hands or insert screwdrivers, key or other tools in the moving parts.</i>
	<i>The person responsible for the machine and the maintenance operator must receive suitable education and training to perform their tasks in safety conditions.</i>
	<i>The operators must know personal protective equipment and accident prevention rules provided for by national and international laws and regulations.</i>

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, 89/655/EEC, 86/188/EEC and 77/576/EEC.

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 unit works with refrigerant R410A, 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. In particular:

- up to 3 kg of total quantity of refrigerant contained in the appliance: category 2 certificate;
- 3 kg or more of total quantity of refrigerant contained in the appliance: category 1 certificate.

The refrigerant R410A 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 2.9).

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:

	General danger
	Dangerous electrical voltage
	Presence of moving parts
	Presence of surfaces that may cause injury
	Presence of burning surfaces that may cause burns

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

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

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.

IMPORTANT: it is compulsory to install, upstream of the power cable, a fused omnipolar switch with contact opening greater than 3mm. The switch must be visible, accessible and positioned less than 3m away from the equipment. All electrical operations (installation and maintenance) must be carried out by qualified staff.

2.7. 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.

	<p>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.</p> <p>It is strictly FORBIDDEN to connect a system filling circuit to the waterworks mains.</p> <p>We recommend to check the water and glycol content inside the boiler by means of a refractometer on a yearly basis.</p>						
	<p>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.</p> <p>Do not allow the product to enter sewers, surface water and groundwater, ground.</p> <p>Use gloves, rubber boots and normal tight working clothing. Wear tight goggles.</p> <p>For further information, refer to the safety data sheet of</p> <p>Cookson Electronics, Alpha Metals S.p.A., Via Ghisalba 1, 20021 Bollate, Milano, Italy Ph: +39.02.383311 Fax: +39.02.38300398 email:fernox_italy@cooksonelectronics.com www.fernox.com</p>						
	<p>For its machines, APEN GROUP tested and recommends to use ALPHI 11 glycol by Fernox; the following KITS contain packs with different capacity:</p> <table data-bbox="280 1328 663 1413"> <thead> <tr> <th>code</th> <th>capacity</th> </tr> </thead> <tbody> <tr> <td>C07200-05</td> <td>5 litres</td> </tr> <tr> <td>C07200-25</td> <td>25 litres</td> </tr> </tbody> </table>	code	capacity	C07200-05	5 litres	C07200-25	25 litres
code	capacity						
C07200-05	5 litres						
C07200-25	25 litres						
	<p>ATTENTION: Using galvanised iron pipes may bring about corrosive phenomena when using antifreeze. Therefore we DO NOT suggest using this material.</p>						

2.9. Refrigerant safety data sheet

Name:	R410A (50% Difluoromethane (R32); 50% Pentafluoroethane (R125)).
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:	Wash immediately with plenty of water. Take off contaminated clothing immediately.
FIREFIGHTING MEASURES	
Extinguishing media:	Any.
Specific hazards:	Pressure increase.
Specific methods:	Cool containers with water spray jets.
ACCIDENTAL RELEASE MEASURES	
Personal precautions:	Evacuate personnel in safety areas. Provide proper ventilation. Use personal protective equipment.
Environmental precautions:	Evaporates.
Cleaning methods:	Evaporates.
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:	AEL (8-h and 12-h TWA) = 1000 ml/m ³ for each of the two components.
Respiratory protection:	For rescue and maintenance work in storage tanks use self-contained breathing apparatus. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Eye protection:	Goggles.
Hand protection:	Rubber gloves.
Hygiene measures:	Do not smoke.
PHYSICAL AND CHEMICAL PROPERTIES	
Colour:	Colourless.
Odour:	Light.
Boiling point:	-52.8°C at atm. press.
Ignition point:	Does not ignite.
Density:	1.08 kg/l at 25°C.
Solubility in water:	Negligible.
STABILITY AND REACTIVITY	
Stability:	No reactivity if used according to the suitable instructions.
Materials to avoid:	Highly oxidising materials. Incompatible with magnesium, zinc, sodium, potassium and aluminium. Incompatibility is further aggravated if the metal is present in form of powders or if the protection has been recently removed from the surfaces.
Hazardous decomposition products:	Such products are halogenated compounds, hydrofluoric acid, carbon oxides (CO, CO ₂), carbonyl halides.
TOXICOLOGICAL INFORMATION	
Acute toxicity:	(R32) LC50/inhalation/4 hours/on rat >760 ml/l (R125) LC50/inhalation/4 hours/on rat >3480 mg/l
Local effects:	High atmospheric concentrations above TLV value may lead to anaesthetic effects. Inhalation of high concentration decomposition products may lead to respiratory failure (pulmonary oedema).
Long-term toxicity:	Carcinogenic, teratogenic and mutagenic effects have not been observed in animal experiments.
ECOLOGICAL INFORMATION	
Global Warming Potential GWP (R11=1):	2088
Ozone Depleting Potential ODP (R11=1):	0
Disposal considerations:	Usable after reprocessing.

3. TECHNICAL FEATURES

AQUAPUMP HYBRID is a monobloc unit for 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. The system adjustment flexibility allows using this technology both for high temperature and medium or low temperature systems.

In case of high temperature systems, a fan heater 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 an outdoor, 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.

The AQUAPUMP HYBRID is supplied as standard with a Smart EASY chronothermostat (also available as optional on request the SmartWEB chronothermostat).



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 R410A. The refrigerant circuit includes: 4-way reverse cycle valve, electronic expansion valve, liquid separator, liquid receiver, inspection valves for maintenance and control, safety device according to standard PED (high pressure switch), pressure transducers to precisely adjust evaporation and condensing pressure, filters to prevent thermal expansion valve clogging.

Compressors

Inverter DC compressors are of twin rotary type expressly designed for operation with R410A, 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 6 hours before commissioning.** 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. Copper pipe diameter is 9.52 mm, aluminium tab thickness is 0.1 mm. 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).

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.

Device exchangers

The device exchangers are of the welding-brazing plate type and are made of AISI 304 stainless steel, factory insulated using closed cell material. 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.



ATTENTION: The antifreeze electric resistance is a factory fitted kit and is present on all machines.

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 box with clean contacts for remote ON-OFF, 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.



ATTENTION: The INVERTER control system is able to manage minimum system water contents of 35 litres for model HY434 and 45 litres for model HY534. 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 (6 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 above 108%. The boiler exchanger, made of stainless steel, ensures a high yield and a high corrosion resistance. The burner is made entirely of stainless steel with special mechanical solutions to ensure optimal reliability and performance levels, as well as high thermal and mechanical resistance.

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 an adjustment preset

in the factory. Unlike atmospheric burners, the CO₂ content remains constant throughout the boiler operating range, allowing the boiler to increase its efficiency when the heat output reduces. If there is no combustion air, the valve will not supply gas; if the combustion air flow reduces, the valve will automatically reduce the gas flow 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).

3.1. Technical Data

GENERAL TECHNICAL DATA OF AQUAPUMP HYBRID		HY434	HY534	
Seasonal space heating energy efficiency [Reg.813/2013/EC]*		140%	140%	
Energy efficiency class [Reg.811/2013/EC]*		A++	A++	
Rated Performance				
Boiler	Burner heat output [min-max]	kW	8.0 - 34.8	8.0 - 34.8
	Useful output [min-max] (1)	kW	8.5 - 36.2	8.5 - 36.2
	Efficiency (1)	%	106.3 - 103.9	106.3 - 103.9
Heat pump	Power during heating [min-max] (2)	kW	5.5 - 15.1	5.5 - 15.1
	C.O.P. (2)	W/W	4.3	4.3
	Power during cooling [min-max] (3)	kW	5.3 - 12.05	5.3 - 12.05
	E.E.R. (3)	W/W	3.1	3.1
Absorbed power (4)		kW	3.2	3.2
Electrical Characteristics				
Power supply			230V/1/50Hz	400V/3P+N+T/50Hz
Maximum power consumption		kW	7.7	7.7
Maximum absorbed current		A	32.8	10.9
Operating Temperatures		°C	-12°C to +45°C	-12°C to +45°C
Protection Rating			IPX5D	IPX5D
Hydraulic circuit				
Maximum circulator power		kW	0.8	0.8
Expansion reservoir		l	10.0	10.0
Maximum working pressure		bar	3.0	3.0
Water content		l	5.0	5.3
Minimum system water content (5)		l	69	69
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	165	170
Noise				
Sound pressure (6)		dB(A)	57.5	57.5

(*) Package Efficiency: boiler + HP + temperature control (calculated with 1% contribution related to temperature control and HP performance at 35°C), for further details see sect. 8.

1. Calculated on L.C.V., with water 60/35°C
2. external air temp. 7°C dry bulb /6°C wet bulb; in/out water temp. 30/35°C
3. external air temp. 35°C; in/out water temp. 12/7°C
4. external air temp. 7°C dry bulb /6°C wet bulb; in/out heat pump water temp. 30/35°C
5. Calculated for a decrease of the water temperature of the system by 10°C with a defrost cycle lasting 6 minutes.
6. Sound pressure level on a free field (1 m), according to ISO 3744

	WARNING: the minimum permitted temperature for unit storage is 5°C
--	---

BOILER TECHNICAL DATA		HY434 - HY534	
Type of equipment		B23P (1)-B53P-C43-C53-C63-C83	
EC approval	P.I.N.	0476CT1226	
Seasonal space heating energy efficiency - [Reg.813/2013/EC] (2)		92.6	
Energy efficiency class [Reg.811/2013/EC]		A	
NOx class [EN 15502-1]		6	
Boiler yields			
	Symbol*	MAX	MIN
Burner heat output [Hi]	P_n kW	34.8	8.0
Useful heat output [Hi] [80/60°C]	P_4 kW	34.2	7.9
Useful heat output [Hi] [50/30°C]	kW	36.8	8.6
Useful heat output at 30% of load [Hi] [50/30°C]	P_1 kW	11.4	
Useful heat output [Hi] [72/45°C]	kW	36.2	8.3
Useful efficiency [Hi] [80/60°C]	η_4 %	98.3	98.2
Useful efficiency [Hi] [50/30°C]	%	105.8	106.9
Useful efficiency at 30% of P_n [Hi] [50/30°C]	η_1 %	108.9	
Useful efficiency [Hi] [72/45°C]	%	101.6	103.3
Flue losses with burner on [80/60°C]	%	2.6	1.4
Heat loss in standby [EN15502-2;EN15316-1-4]	$P_{stand-by}$ kW	0.112	
Flue losses with burner off	%	0.1	
Housing losses [Taverage=60°C]	%	0.35	
MAX condensation	l/h	0.8	
Flue gas emissions			
Carbon monoxide - CO - [3% of O ₂] - [80/60°C] - P_n (3)		78ppm - 97mg/kWh	
Carbon monoxide - CO - [0% of O ₂] (4)	ppm	34	
Nitrogen oxides - NOx - [Hi] [0% of O ₂] (4)		22ppm - 39mg/kWh	
Nitrogen oxides - NOx - [Hs] [0% of O ₂] (4)		20ppm - 35mg/kWh	
Fumes temperature	°C	75	48
Pressure available at the flue	Pa	120	
Electrical Characteristics			
Boiler supply voltage	V	230V-50 Hz single-phase	
Rated power	W	101	68
Electric power of auxiliary components (excluding circulator)	e_{lmax} W	48	12
Electric power of auxiliary components at 30% of load (excluding circulator)	e_{lmin} W	14	
Electric power of auxiliary components in standby	P_{SB} W	5	
Operating Temperatures	°C	-15°C to +50°C	

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

- The boiler is supplied as standard with B23P terminal; other configurations are possible using accessories
- Reg. EU/813/2013 art.2 point 20. It is calculated starting from the weighted average of useful efficiency to 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].
- Value referred to cat. H (gas G20) with Burner for Switzerland setting. For further details refer to sect. 6.2 (Gas Settings)
- 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).

HEAT PUMP TECHNICAL DATA		HY434	HY534
Seasonal space heating energy efficiency [Reg.813/2013/EC]*		155%	155%
Energy efficiency class [Reg.811/2013/EC]*		A++	A++
Electrical Characteristics			
Power supply		230V/1/50Hz	400V/3P+N+T/50Hz
Maximum power consumption	kW	7.70	7.70
Maximum absorbed current	A	32.8	10.9
Cooling			
Cooling capacity (1)	kW	12.05	12.05
Absorbed power (1)	kW	3.70	3.70
E.E.R. (1)	W/W	3.10	3.10
Cooling capacity (2)	kW	15.2	15.2
Absorbed power (2)	kW	2.93	2.93
E.E.R. (2)	W/W	4.70	4.70
Heating			
Heat output (3)	kW	14.9	14.9
Absorbed power (3)	kW	4.04	4.04
C.O.P. (3)	W/W	3.35	3.35
Heat output (4)	kW	15.1	15.1
Absorbed power (4)	kW	3.20	3.20
C.O.P. (4)	W/W	4.30	4.30
Compressor			
Type/Number		Twin rotary DC inverter / 1	Twin rotary DC inverter / 1
Absorbed power in cooling mode (1)	kW	3.70	3.70
Absorbed power in cooling mode (2)	kW	2.93	2.93
Absorbed power in heating mode (3)	kW	4.04	4.04
Absorbed power in heating mode (4)	kW	3.20	3.20
Refrigerant oil (type / quantity)	mL	ESTER OIL VG74, 1400	ESTER OIL VG74, 1400
Fan motor			
Type / Number		DC Brushless / 2	DC Brushless / 2
Rated power consumption	kW	0.180 (x2)	0.180 (x2)
Absorbed rated current	A	0.55 (x2)	0.55 (x2)
Speed	rpm	1000	1000
Maximum air flow rate	m ³ /h	7595	9325
Refrigerant			
Type / Quantity / CO ₂ equivalent	[-] - kg - ton CO _{2eq.}	R410A / 4.74 / 9.90	R410A / 4.74 / 9.90
Design pressure (high/low)	MPa	4.2 / 2.7	4.2 / 2.7
Operating limits			
Water cooling mode: Ambient temperature	°C	-10°C to +46°C	
Water cooling mode: Outlet water temperature	°C	+5°C to +25°C	
Heat pump mode: Ambient temperature	°C	-20	+30
Heat pump mode: Outlet water temperature	°C	+25	+58

(*) Package efficiency: HP + temperature control (calculated with class II control and HP performance at 35°C)

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

Plate data of the heat pump in HEATING MODE

External air temperature	Water delivery temperature	HY434 and HY534		
		Heat output	COP _{DC}	Electric power
°C	°C	kW	W/W	kW
+12	35	14.5	5.27	2.75
	45	14.2	3.89	3.65
	55	13.2	2.93	4.50
+7	35	13.8	4.31	3.20
	45	13.6	3.35	4.05
	55	12.5	2.57	4.85
+2	35	13.1	3.64	3.60
	45	12.8	2.87	4.45
	55	11.9	2.24	5.30
-2	35	12.3	3.37	3.65
	45	12.1	2.77	4.37
	55	11.2	2.15	5.20
-7	35	11.1	3.02	3.67
	45	11.0	2.59	4.25
	55	10.4	2.04	5.10

Performance referred to instantaneous power according to EN14511 without defrosting contribution

Plate data of the heat pump in COOLING mode

External air temperature	Water delivery temperature	HY434 and HY534		
		Cooling capacity	EER	Electric power
°C	°C	kW	W/W	kW
+20	7	9.7	4.62	2.10
	12	10.6	5.89	1.80
	18	11.6	8.28	1.40
+25	7	10.5	4.12	2.55
	12	11.5	5.11	2.25
	18	12.6	7.00	1.80
+30	7	12.0	3.63	3.30
	12	13.2	4.47	2.95
	18	14.4	5.76	2.50
+35	7	11.5	3.10	3.70
	12	12.6	3.76	3.35
	18	13.8	4.75	2.90
+45	7	10.1	2.24	4.50
	12	11.0	2.68	4.10
	18	12.1	3.45	3.50

Performance referred to instantaneous power according to EN14511

Fan heater technical data and performance

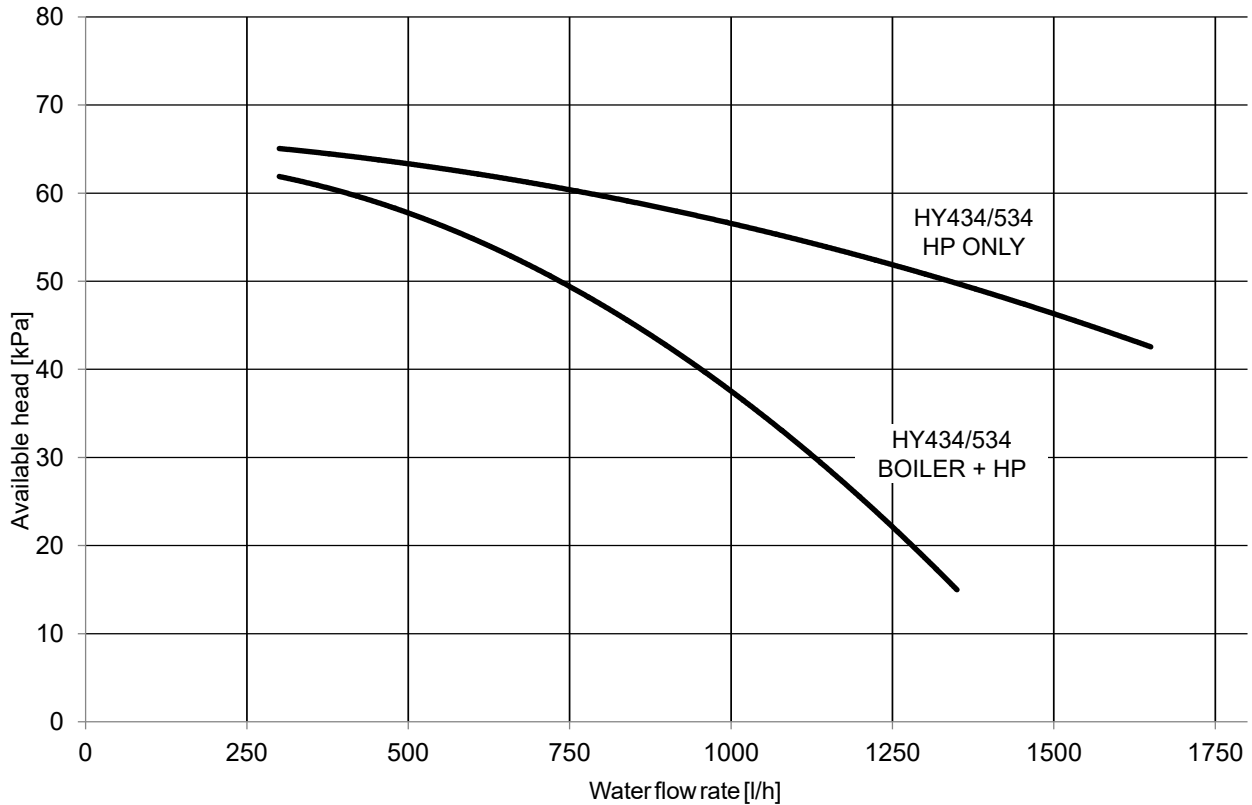
FAN HEATER		AB018-00H0	AB034-00H0
Maximum working pressure	bar	16	
Maximum air output	m	25	
Water content	l	3.2	6.5
Collector diameter		G 3/4" M	G 1" M
No. of fans and blade diameter		1 x 450	2 x 450
Supply voltage	V	230V - 50 Hz single-phase	
Rated power	W	300	600
Absorbed current at max speed	A	2.05	4.1
Motor revolutions	r.p.m.	1280	
Protection Rating	IP	IP54	
Operating weight	kg	27	40
Weight with packaging	kg	30	45

HEATING												
AB018-00H0												
Input water T.		65 (water flow rate 650 l/h)					45 (water flow rate 650 l/h)					
Input air T.		0	5	10	15	20	0	5	10	15	20	
Air flow rate 3,500 m ³ /h (MAX speed/9V)												
Heat output		kW	27.7	25.7	23.7	21.6	19.5	18.6	16.6	14.6	12.6	10.6
Output air T.		°C	23.6	26.9	30.1	33.3	36.6	15.9	19.2	22.5	25.8	29.0
Air flow rate 1,125 m ³ /h (MIN speed/3V)												
Heat output		kW	16.1	14.9	13.7	12.5	11.3	11.0	9.8	8.6	7.4	6.2
Output air T.		°C	42.7	44.6	46.4	48.3	50.1	29.1	31.0	32.8	34.7	36.5
AB034-00H0												
Input water T.		65 (water flow rate 1150 l/h)					45 (water flow rate 1150 l/h)					
Input air T.		0	5	10	15	20	0	5	10	15	20	
Air flow rate 7,000 m ³ /h (MAX speed/9V)												
Heat output		kW	55.1	51.1	47.1	43.0	38.8	37.4	33.4	29.4	25.4	21.2
Output air T.		°C	23.5	26.8	30.1	33.3	36.6	16.0	19.3	22.5	25.8	29.1
Air flow rate 2,250 m ³ /h (MIN speed/3V)												
Heat output		kW	32.4	30.0	27.6	25.2	22.8	22.2	19.8	17.4	15.0	12.5
Output air T.		°C	43.0	44.8	46.7	48.5	50.2	29.4	31.3	33.1	34.9	36.6

Conditioning data of fan heaters combined with AQUAPUMP HYBRID in SUMMER mode depend on the power fed into the fan heater according to the using conditions of the machine (see technical data table of heat pump). Ventilation speed during conditioning operation phase is equal to 4V voltage value (default value of parameter H18) which corresponds to 3,050 m³/h.

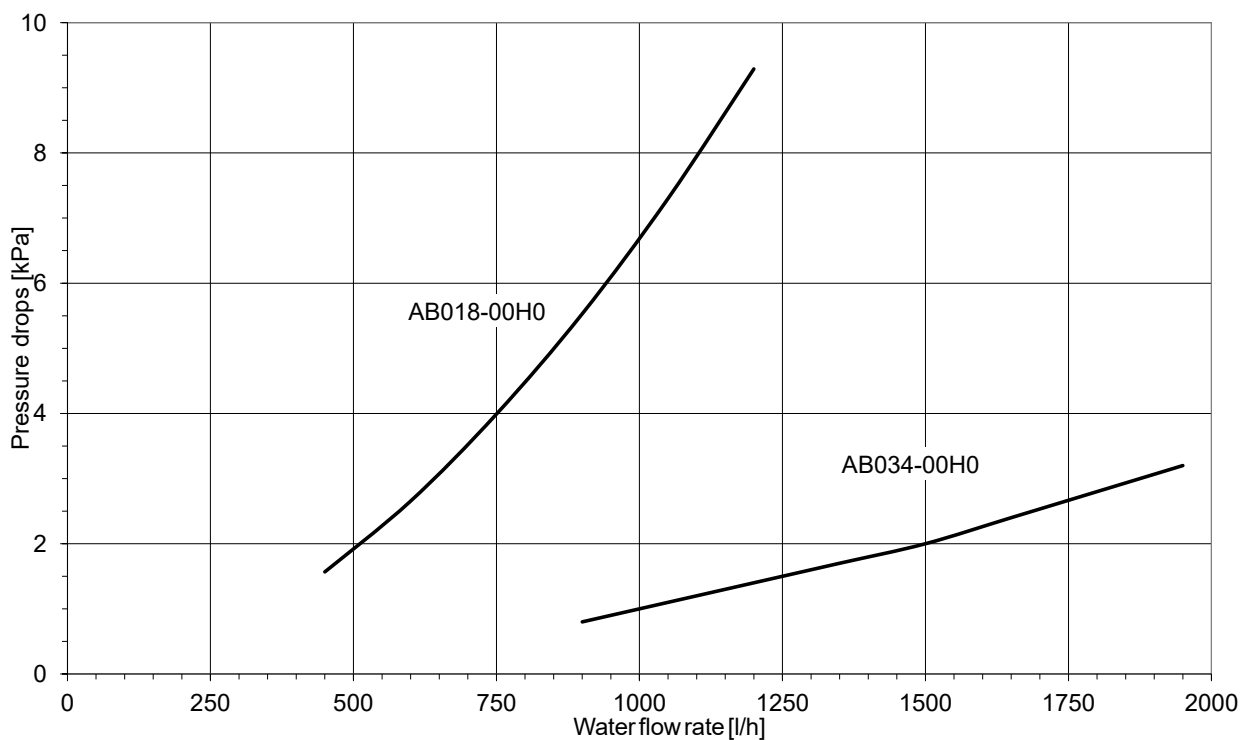
Flow rate curve - available head

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.



Fan heater pressure drop

Drops are estimated with glycol-free 65°C water; increase the drop depending on the glycol percentage according to the coefficients provided in the following page.



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 given factor. 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				
l/h	3/4"	1"	1"1/4	1"1/2	2"	20/22	25/28	32/35	39/42	51/54
600	0.15	0.05				0.18	0.06	0.02		
900	0.31	0.10	0.03			0.35	0.12	0.04		
1,200	0.55	0.18	0.05	0.02		0.60	0.20	0.07	0.03	
1,500	0.82	0.26	0.07	0.03			0.30	0.10	0.04	
1,800		0.36	0.10	0.04	0.01		0.42	0.13	0.05	0.01
2,100		0.49	0.13	0.06	0.02		0.52	0.17	0.07	0.02
2,400		0.65	0.16	0.08	0.03		0.70	0.21	0.09	0.03
3,000			0.24	0.11	0.04			0.27	0.12	0.04
3,600			0.34	0.16	0.06			0.35	0.17	0.06
4,200			0.45	0.21	0.07			0.53	0.22	0.07
4,800			0.59	0.21	0.08				0.28	0.08
Water content l/m	0.37	0.59	1.20	1.39	2.22	0.31	0.49	0.80	1.19	2.04

Equivalent length in m	Steel pipes				
	3/4"	1"	1"1/4	1"1/2	2"
45° bend	0.3	0.3	0.6	0.6	0.6
90° bend	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
T-shaped fitting	1.5	1.5	1.8	2.4	3.0
check valve	1.5	1.5	2.1	2.7	3.3
gate valve	0.3	0.3	0.3	0.3	0.3

Table of freezing temperatures				
Glycol %	25	30	35	40
Freezing temperature	-11°C	-15°C	-18°C	-22°C

	ATTENTION: check that the minimum water content of pipes for the system is 35 litre for model HY434 and 45 litres for model HY534. If this is not the case, provide for pipes with greater diameter or equip the system with a reservoir having suitable volume.
	ATTENTION: Using galvanised iron pipes may bring about corrosive phenomena when using antifreeze. Therefore we DO NOT suggest using this material.

Glycol coefficients

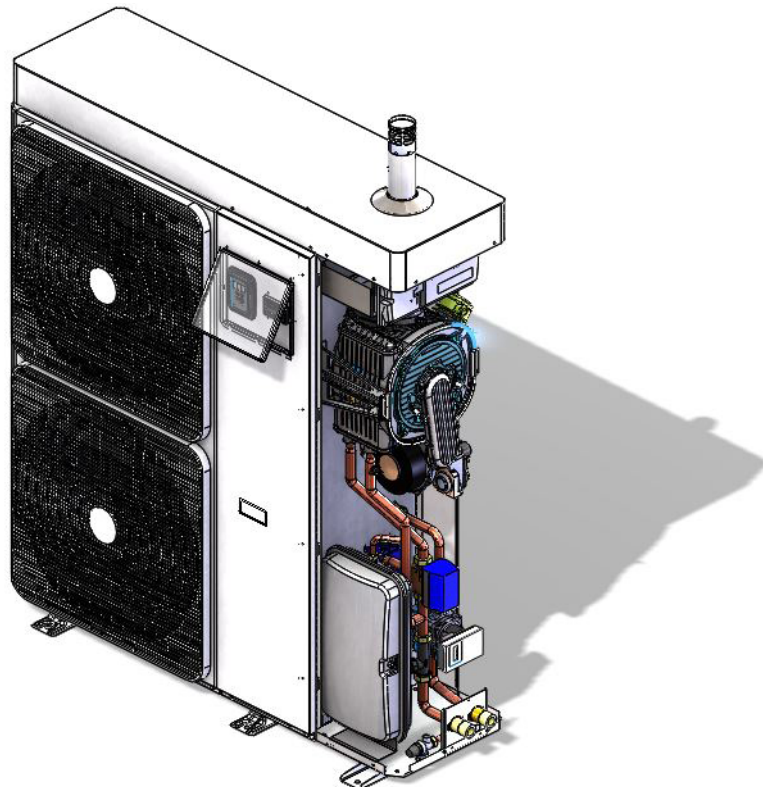
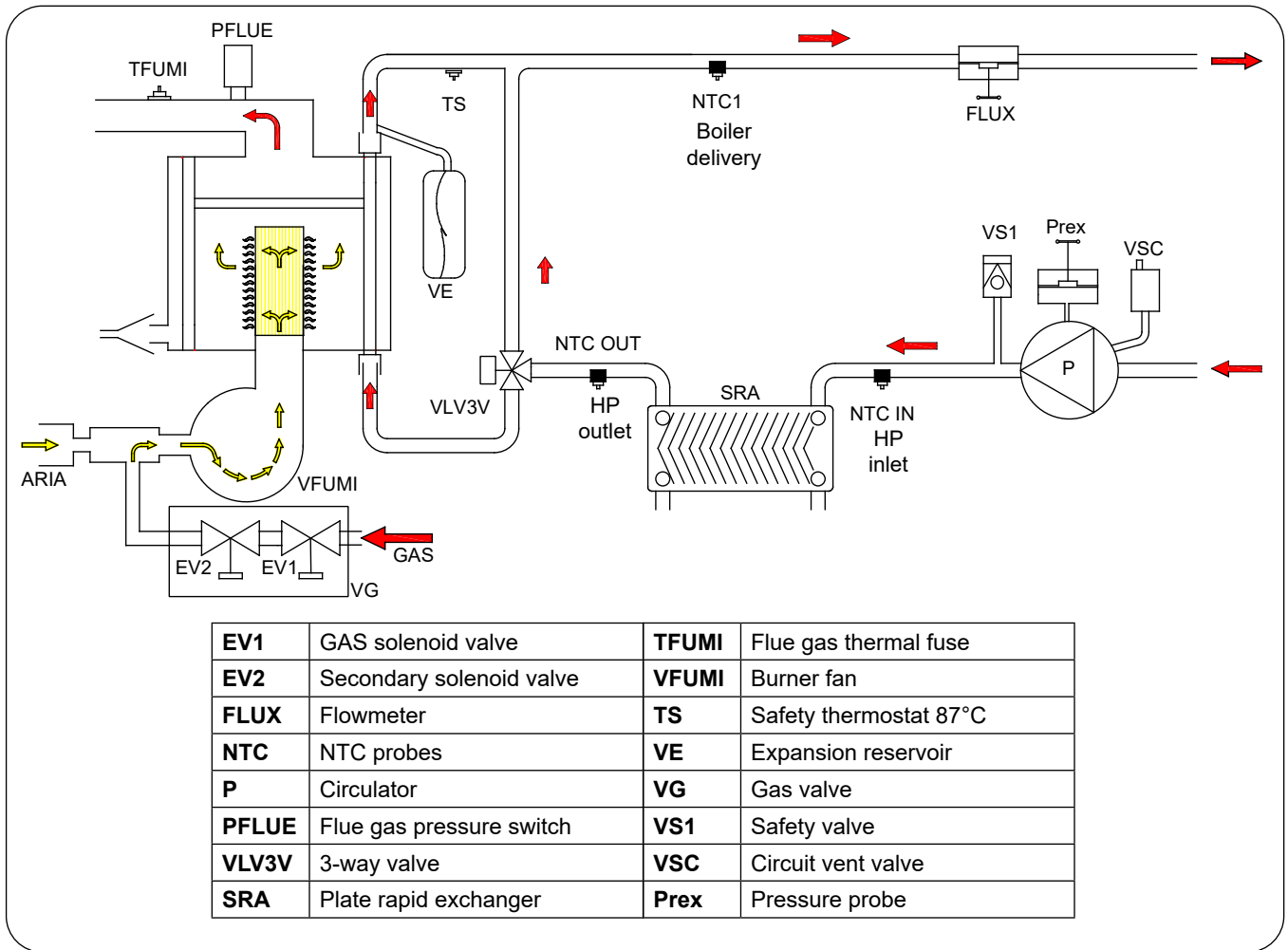
The table just above contains the freezing temperatures of water and glycol mixes.

Using a water and glycol mix, it is necessary to increase pressure drops of pipes and fan heaters according to the following coefficients:

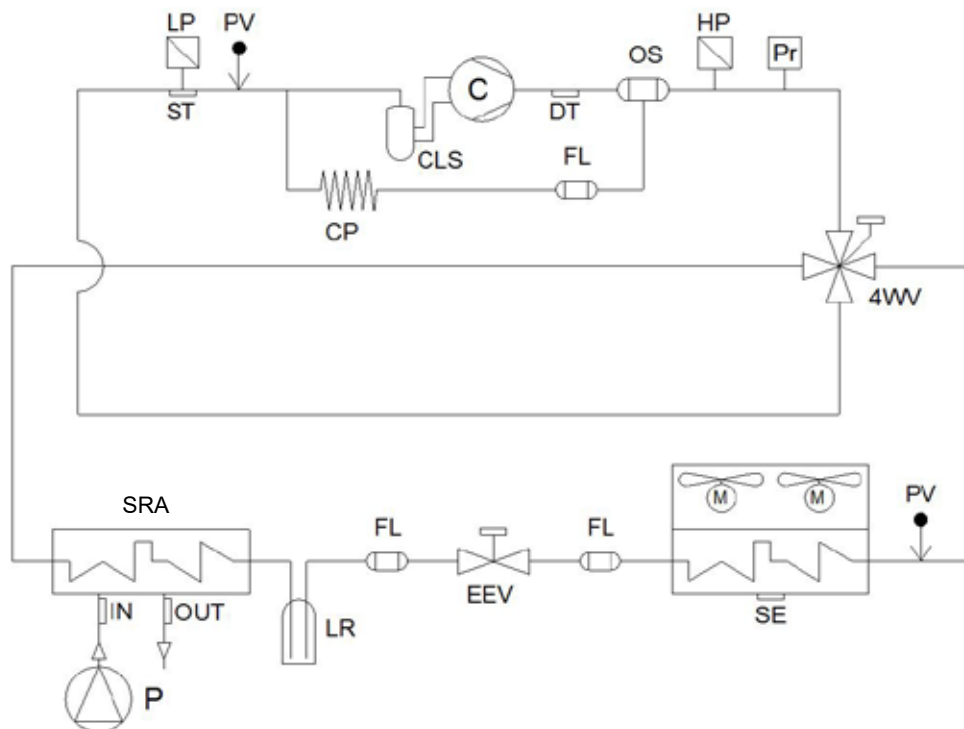
- for a glycol mix equal to **10%** of volume multiply by **1.07**
- for a glycol mix equal to **20%** of volume multiply by **1.15**
- for a glycol mix equal to **30%** of volume multiply by **1.22**

All data refer to a FERNOX ALPHI11 monopropylene glycol and water mix recommended by APEN GROUP
Other types of glycol, different from the recommended one, invalidate the product warranty.

3.2. Hydraulic/gas circuit characteristics



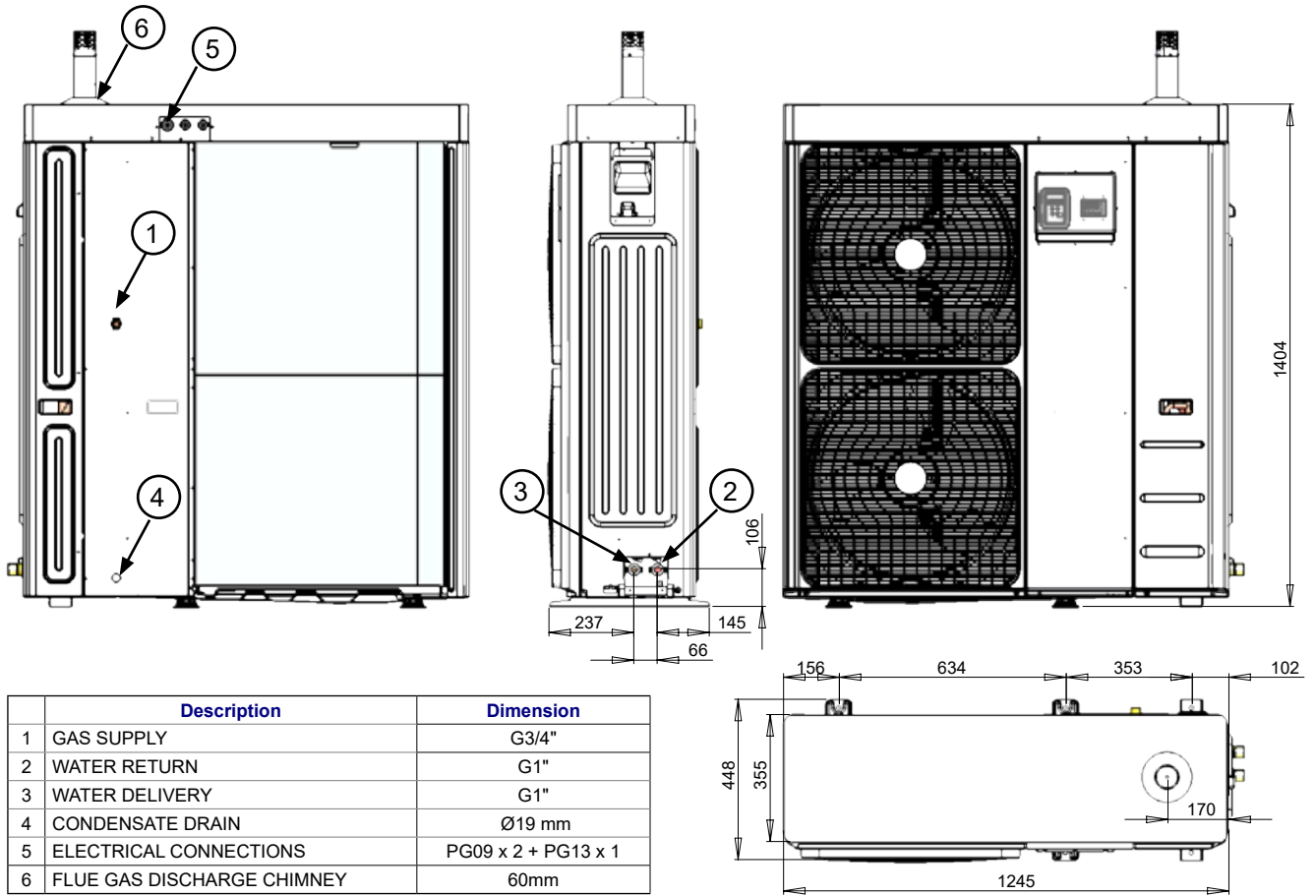
3.3. Cooling circuit characteristics



C	Compressor	EEV	Electronic expansion valve
CLS	Compressor liquid separator	FL	Filter
OS	Oil separator	M	Axial fan
ST	Compressor inlet temperature	SE	External air temperature
DT	Compressor outlet temperature	SRA	Plate rapid exchanger
HP	High pressure transducer	P	Circulator
Pr	High pressure switch	CP	Capillary
LP	Low pressure transducer	IN	Water inlet temperature
4WV	Cycle inversion valve	OUT	Water outlet temperature
LR	Liquid receiver		

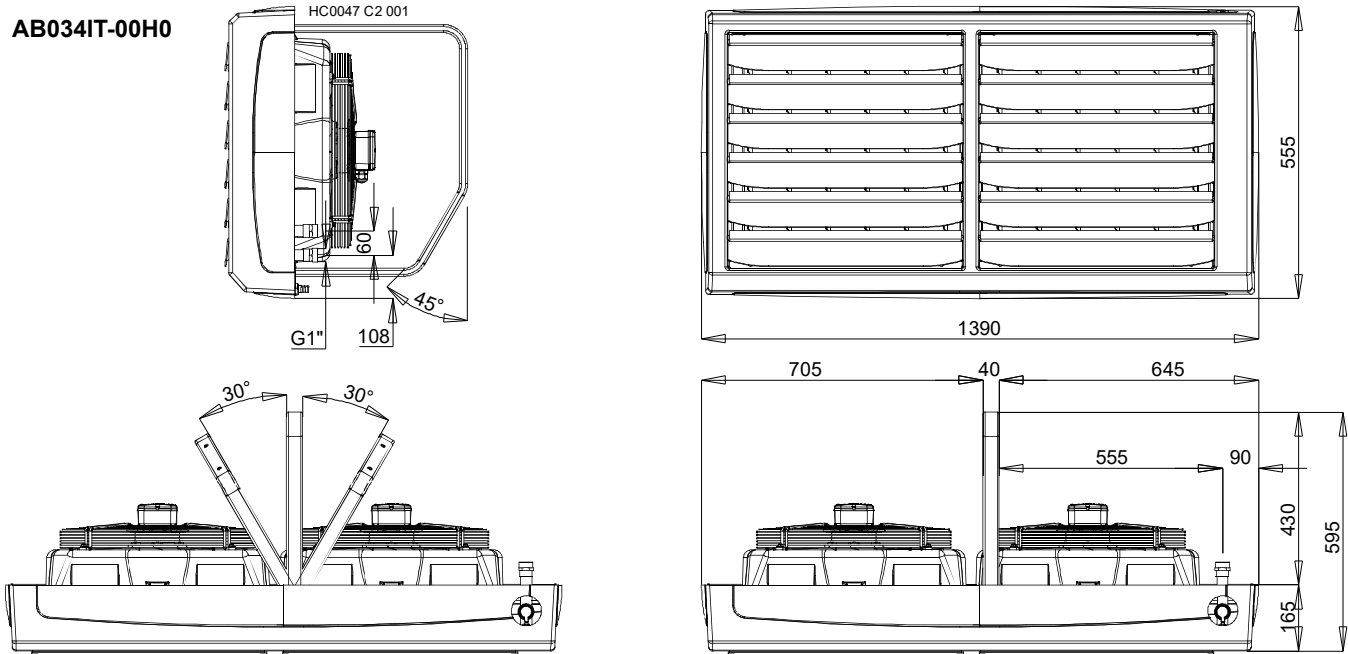
	ATTENTION: The unit must be installed so as to allow maintenance and repair operations. The warranty does not cover the costs for platforms or handling equipment required for any operations.
	All maintenance and check operations must be carried out by QUALIFIED PERSONNEL only.
	Before starting any operation 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

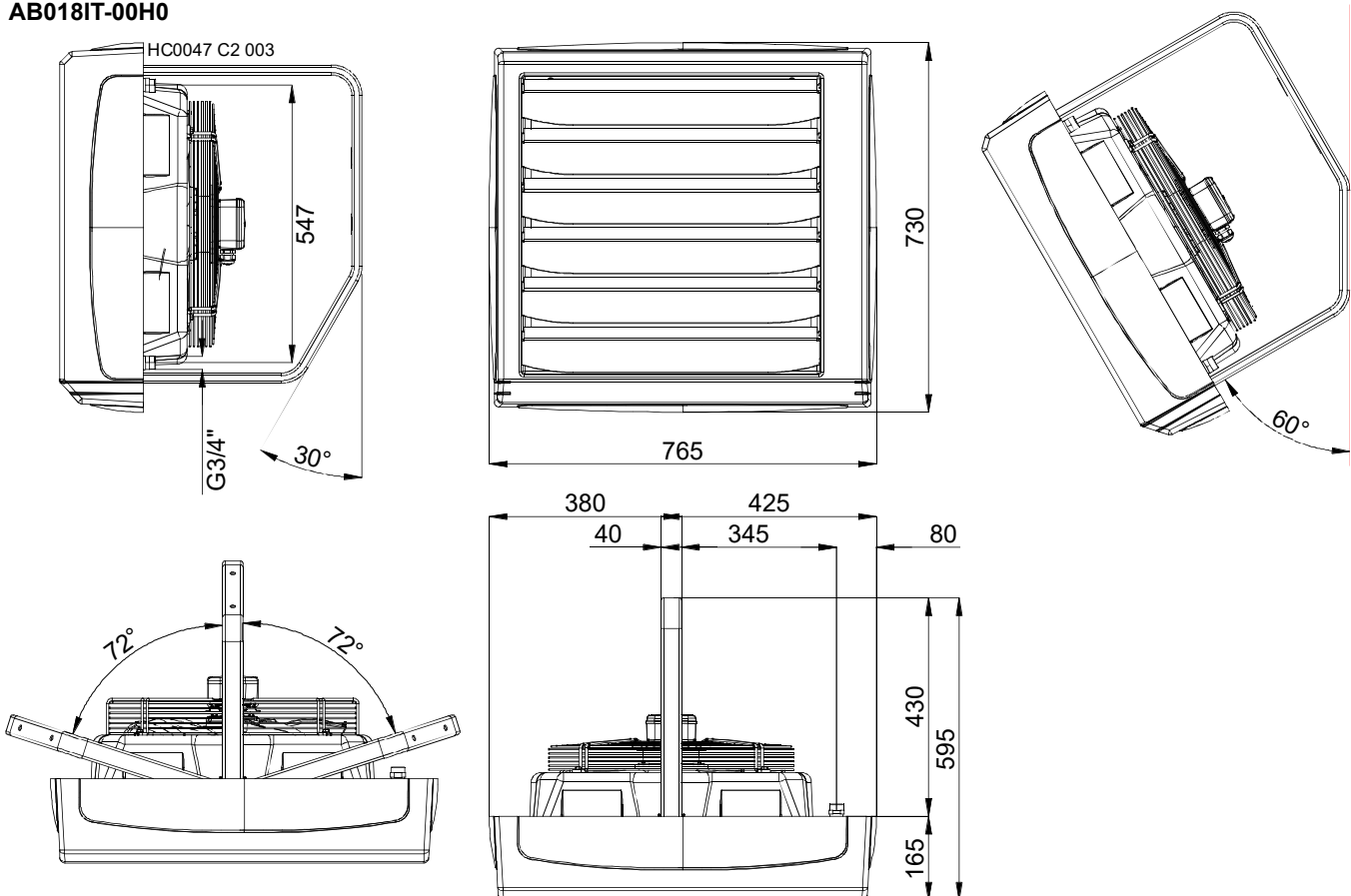


3.5. Fan heater size

AB034IT-00H0



AB018IT-00H0



3.6. Operation

AQUAPUMP HYBRID can operate only if combined with the SMARTWEB or SMARTEASY touchscreen remote control which manages the combined operation of the two technologies that compose the hybrid heater through MOD-BUS RTU communication protocol.



REMOTE CONTROL
SMARTWEB/SMARTEASY

The operation of AQUAPUMP HYBRID is fully managed by SmartWEB/EASY touchscreen remote control. SmartWEB/EASY can manage AQUAPUMP in several modes according to the 4 possible types of systems with which the hybrid heater can work.

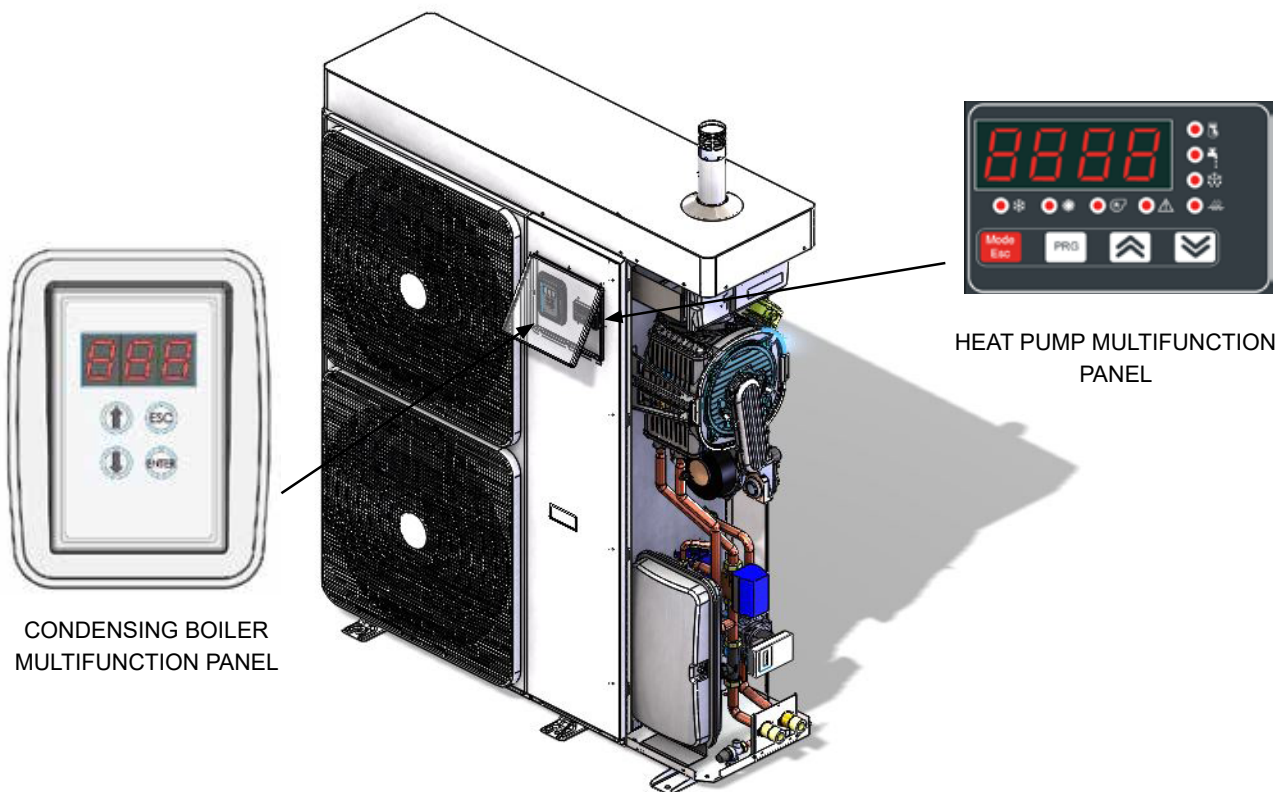
These different types of system depend on the type of fluid that the reference temperature must control (ambient air or water) and on the presence or absence of a Domestic Hot Water (DHW) temperature control as shown in the table below.

System type	Temperature Reference	Domestic hot water
0 - Fan heater	Air	Absent
1 - Tank	Water	Absent
2 - Tank + DHW	Water	Present
3 - Fan heater + DHW	Air	Present

Section 5.8 explains in detail every type of system and the configuration procedure.

The installer has the task of configuring the remote control according to the requirements of the specific installation by following the instructions contained in Section 5.8 in this manual.

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.



CONDENSING BOILER
MULTIFUNCTION PANEL

HEAT PUMP MULTIFUNCTION
PANEL

3.7. 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 adjusted to keep the delivery temperature of both systems fixed, each system works with a dedicated adjustment ramp and different delivery setpoints according to the operating mode selected (see Section 4.1).

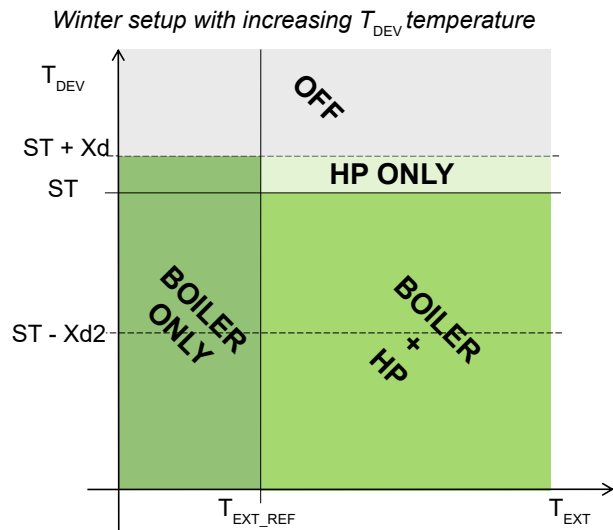
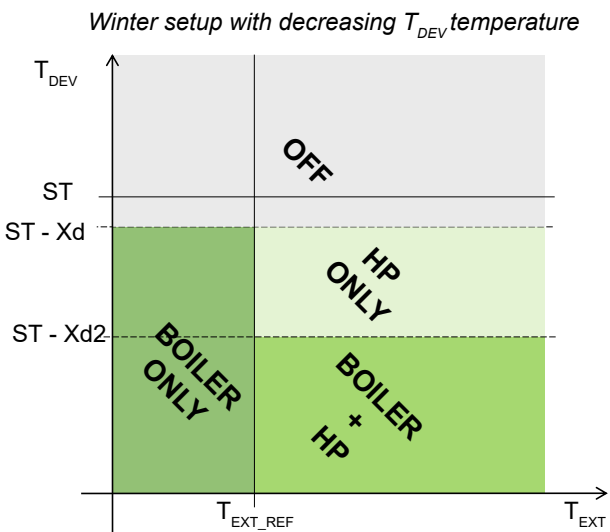
The parameters that can be set on the SmartWEB/EASY remote control for the adjustment of the different operating modes are the following:

- ST = Setpoint of the user. It is the setpoint to be checked to distinguish the heating/cooling demand request of the device. As the case may be, it can be the ambient air temperature or the water temperature of a tank (T_{REF}) or even the domestic hot water temperature (T_{DOM}) when configured.
- T_{EXT_REF} = External temperature setpoint (for winter operation only). When the external temperature drops below this value the heat pump is turned off. This setpoint has a fixed ON/OFF differential value of $\pm 1^\circ\text{C}$.
- Xd = ON/OFF differential for ST
- $Xd2$ = Differential (for winter operation only) to distinguish the limit T below which the boiler must be activated as well.

WINTER SETUP

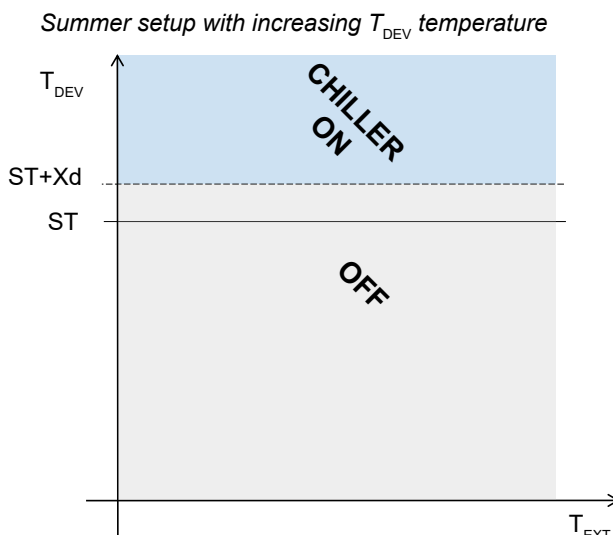
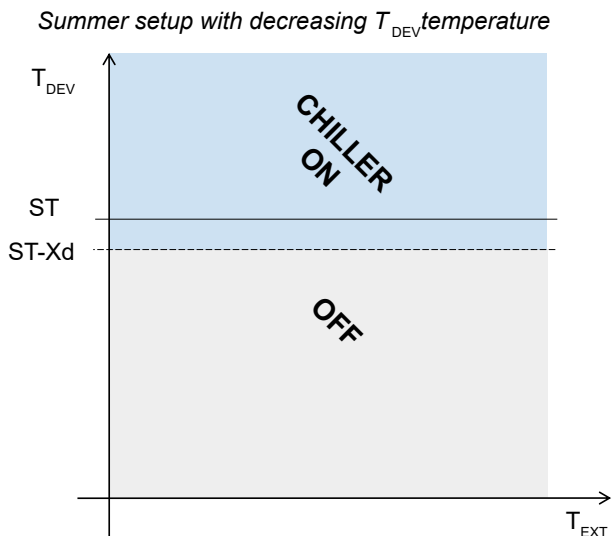
The equipment operation during the heating phase requires that with standard use conditions (when the external temperature is greater than the settable limit T_{EXT_REF}) the heat pump is always activated with operation priority over the condensing boiler, the boiler is activated and deactivated according to the distance from the reference temperature setpoint.

The adjustment logic with decreasing T_{DEV} and increasing T_{DEV} is described in the graphs below:



SUMMER SETUP

The operation during the summer for production of chilled water is very easy; in this case T_{EXT_REF} and $Xd2$ are not involved and a simple ON/OFF setting of the HP with "chiller" operation in the T_{DEV} control is required, as described in the following graphs.

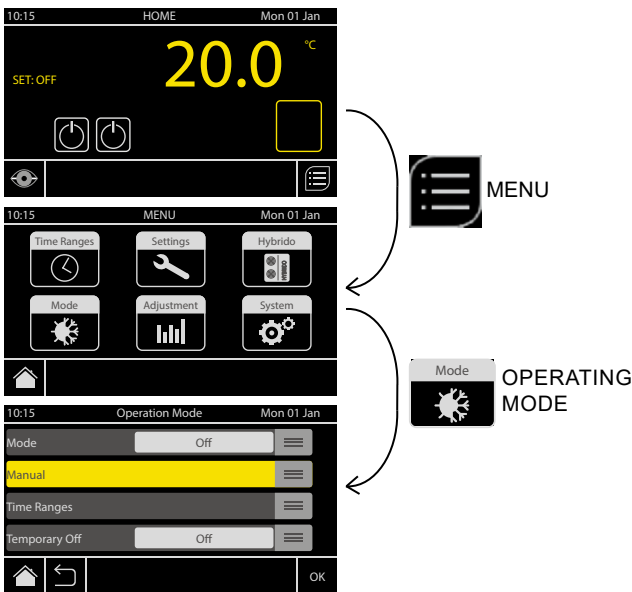


4. USER'S INSTRUCTIONS

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.

4.1. Operation mode setting

To set the adjustment mode desired it is necessary to press the "MENU" icon in the main screen of SMARTWEB/EASY and then the "OPERATION MODE" icon.



Once inside the OPERATION MODE menu, it is possible to select the AQUAPUMP operation mode among the following options:

- OFF
- HEATING
- AIR CONDITIONING

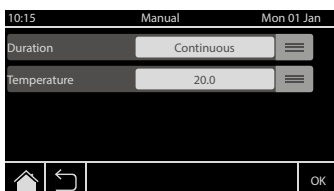


After having selected the desired mode, it is possible to select whether to work in one of the following modes:

- MANUAL
- TIME RANGES



By pressing near the MANUAL mode the following screen is available:



through which it is possible to select the duration time of the selected mode and to set the reference temperature setpoint (T_{REF}).

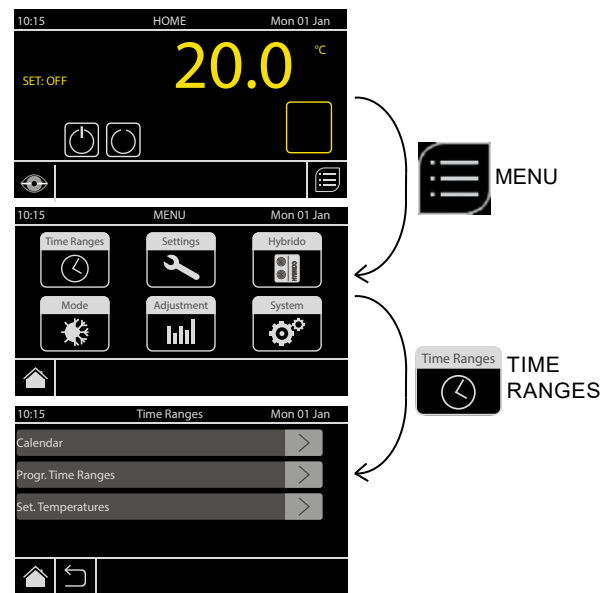
By pressing near TIME RANGES the mode managed by the annual/weekly calendar specific for this option is activated (for details see the following section).

By selecting TEMPORARY OFF item it is possible to set a forced OFF period having priority on the mode previously selected. For TEMPORARY OFF duration the following icon is displayed on the main screen:



4.2. Setting the time ranges

To programme the time ranges it is necessary to press the "MENU" icon in the main screen of SMARTWEB/EASY and then the "TIME RANGES" icon.



Once inside the TIME RANGES menu the following can be set:

- CALENDAR (annual)
- PROGR. TIME RANGES (daily/weekly)
- TEMPERATURE SET

By selecting CALENDAR you access the submenu through which you can program the operating period in which the programmed time ranges will be in operation (PROG. CALENDAR) and the period of operation (PROG. HOLIDAYS) during which you will keep 24/7 different set-points; the following symbol will be displayed on the main screen:



Through the PROG. TIME RANGES you can set up to 5 time ranges per day for each day of the week and also copy and paste settings from one day to all others or from one day to another specific day.

Select SET. TEMPERATURES to set the 3 programmable temperatures within the time ranges and the value of the neutral zone (Xd) of the T_{REF} reference temperature.

- Comfort (Cm)
- Economy (Ec)
- Antifreeze (An)
- Neutral area (Xd)

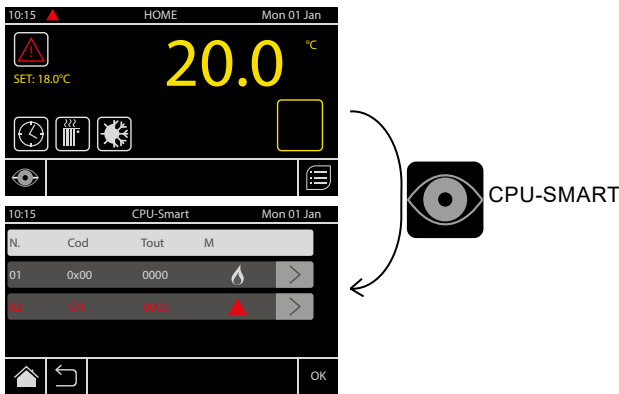
The setpoint defined by the time ranges is used as T_{REF} for AQUAPUMP operation setting.

4.3. Fault reset

If a fault occurs, the main screen of SMARTWEB/EASY will display the symbol:



Press "CPU SMART" to access the enquiry page of heat pump and boiler PCBs:



the heat pump corresponds to line 01, whereas the boiler corresponds to line 02.

In the event of a fault, the fault code will be displayed in the "Cod" column.

By pressing the line concerning the machine in alarm status, it is possible to access the reset procedure through the "ALARM RESET" menu.

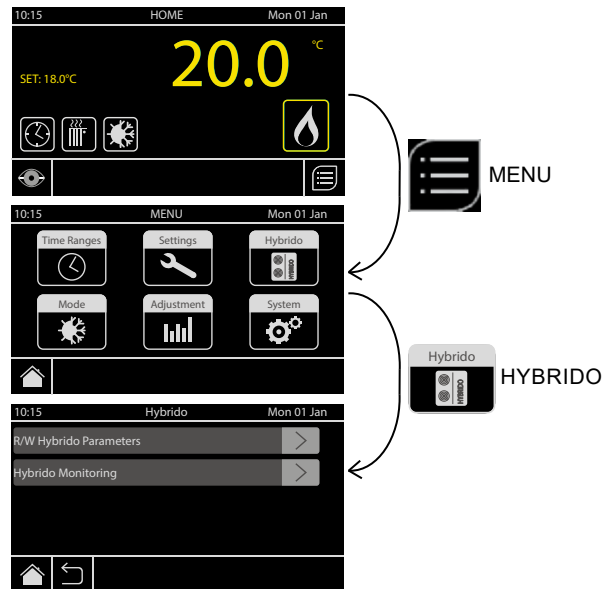
For further details on the types of Faults and their diagnostics, refer to Sections 6.11 (boiler) and 7.8 (heat pump).

If AQUAPUMP is configured also to operate in domestic hot water mode, the following icon is displayed in the main screen when the conditions of use provide for the production of DHW:



4.4. Operation monitoring

To access AQUAPUMP operation monitoring it is necessary to press the "MENU" icon in the main screen of SMARTWEB/EASY and then the "HYBRIDO" icon.



The "HYBRIDO" menu has two submenus through which it is possible to check the several active setpoints for the type of configured system (HYBRIDO PARAMETERS) and to monitor the operation parameters of the machine in real time (HYBRIDO MONITORING) through the control of the following items:

- ON/OFF Boiler
- HP OFF/SUMM/WINT
- R1/R2 outputs command*
- HP Return Temp.
- HP Delivery Temp.
- Boiler Delivery Temp.
- Water flow rate l/h
- External Temp.
- Reference Temp.
- DHW Temp. (if configured)

(*) 4 possible values (0, 32, 64 e 96) correspond to "R1/R2 outputs command", which are the positions of the contacts for the two relay outputs. The operation logic of the outputs is explained in the following table:

Value	R1 Output SAN activation	R2 Output Boiler activation
0	NO1 - Open Bypass	NO2 - Open <i>Boiler bypassed</i>
32	NO1 - Closed	NO2 - Open <i>Boiler bypassed</i>
64	NO1 - Open Bypass	NO2 - Closed <i>Boiler NOT bypassed</i>
96	NO1 - Closed	NO2 - Closed <i>Boiler NOT bypassed</i>

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 12 April 1996 containing the fire prevention rules for design, construction and operation of thermal systems fired with gaseous fuels;
- Presidential Decree no.412/93 which regulates design, installation, operation and maintenance of thermal systems;
- Law no.10/91: rules for implementing the national energy plan in the field of the rational use of energy, energy savings and the development of renewable energy sources;
- Standard UNI-CIG 7129 regarding the installation of natural gas equipment;
- Standard UNI-CIG 7131 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.

Note: The manufacturer is not liable for any damages occurred during transport, handling, unloading, etc.

5.3. Accessories for installation

The supply of the equipment includes:

AQUAPUMP HYBRID HY:

- no. 1 fume exhaust terminal Ø60 made of plastic material complete with fume extraction intake;
- no. 1 SmartEASY remote control (SmartWEB as optional)

Fan heaters ABXXXIT-00H0:

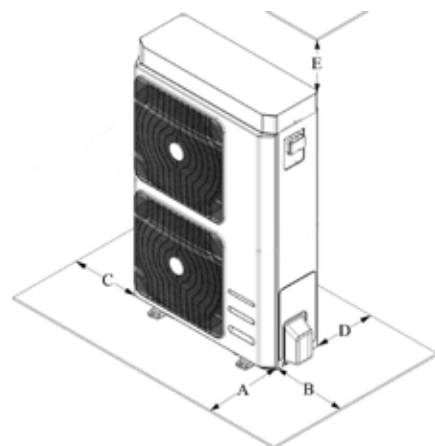
- no. 2 flexible hoses for every single fan heater (G1" for AB034, G3/4" for AB018), length 0.5 metres, with relevant gaskets;
- no.1 shelf for indoor unit support;
- no.1 condensate collection tray.

5.4. Installation of AQUAPUMP HYBRID - HY

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

The place of installation must be at low risk of fire and the outdoor 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. 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.



MODEL	A	B*	C	D	E**
HY434IT and HY534IT	1500	500	400	400	500

* Clearance recommended for installation and maintenance


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

Hydraulic connections must be carried out in compliance with national or local regulations; pipes can be made of steel, galvanised 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 boiler 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 heater exchangers. See installation diagram in Section 5.11.

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



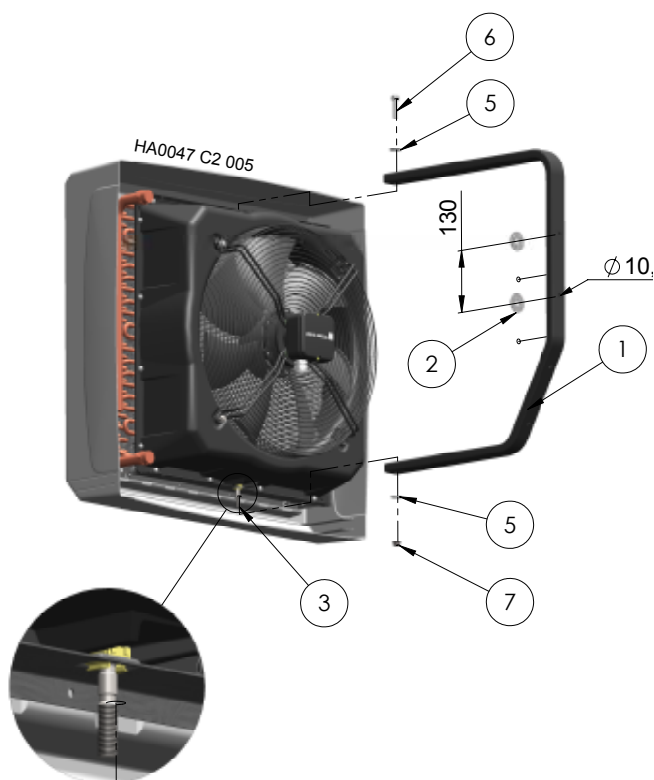
Condensate drain fitting



Fitting connected to the unit

5.5. Fan heater installation

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



5.6. AQUAPUMP/fan heater connections

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).

5.7. 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 flow switch (FLUX in the previous hydraulic diagram, and component installed in the factory) must ALWAYS be connected according to the instructions contained in the wiring diagram. Never use jumpers on flowmeter connections (DI1) in the terminal box. The warranty is invalidated in flowmeter connections are modified or incorrectly connected.
--	--

	ATTENTION: Power supply voltage must not undergo fluctuations greater than $\pm 10\%$ of the rated value. If this tolerance is not respected, please contact our technical department.
	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 the boiler, a multipole isolator fitted with a suitable electric protection element.

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.

The terminals highlighted in bold are free, available for connection by the installer.


For electric system details, refer to wiring diagrams code JC0170.00 [HY434] and code JC0180.00 [HY534] supplied with the machines.

TERMINAL	TYPE	CONNECTION
PE	Input for power supply 1-Ph/ N/PE, 230V, 50Hz (HY434)	Connect the earthing cable
N		Connect the neutral cable coming from the mains
L		Connect phase cable coming from the mains
PE	Input for power supply 3-Ph/N/PE, 400 Vac, 50Hz (HY534)	Connect the earthing cable
N		Connect the neutral cable coming from the mains
L1		Connect the L1 phase cable coming from the mains
L2		Connect the L2 phase cable coming from the mains
L3		Connect the L3 phase cable coming from the mains
NC1	Changeover contact, single- phase voltage 230Vac, 50Hz, 5A resistive, 1A inductive.	Normally Closed Terminal (230Vac).
N		Neutral terminal (230Vac).
NO1		Normally Open Terminal (230Vac).
NC2	Changeover contact, single- phase voltage 230Vac, 50Hz, 5A resistive, 1A inductive.	Normally Closed Terminal (230Vac).
N2		Neutral terminal (230Vac).
NO2		Normally Open Terminal (230Vac).
R+	Modbus communication	Modbus signal connection + for remote keyboard
R-		Modbus signal connection – for remote keyboard
GNDR		Modbus earthing reference connection for remote keyboard
12V+	Output for power supply 12Vac, 50Hz	Remote keyboard power supply (12V, 50Hz, 500mA)
12V-		Remote keyboard power supply (12V, 50Hz, 500mA)
SE/SE	Analogue or digital input	Analogue input configurable with an NTC-10kΩ probe at 25°C β 3435. Alternatively Voltage-free digital input
AEHN	Single-phase voltage output 230Vac, 50Hz, 5A resistive, 1A inductive.	Neutral terminal (230Vac).
AEH		Phase terminal (230Vac).
SAN/SAN	Analogue or digital input	Analogue input configurable with an NTC-10kΩ probe at 25°C β 3435. Alternatively Voltage-free digital input.

DO4N	Single-phase voltage output 230Vac, 50Hz, 5A resistive, 1A inductive. NOT USABLE	Neutral terminal (230Vac).
DO4		Phase terminal (230Vac).
DO5N	Single-phase voltage output 230Vac, 50Hz, 5A resistive, 1A inductive. NOT USABLE	Neutral terminal (230Vac).
DO5		Phase terminal (230Vac).
SW/SW	Voltage-free digital input	Remote summer/winter mode change input (to activate the function see the relevant section in the MCO manual)
onoff /onoff	Voltage-free digital input	Remote on/off input (closed=machine on / open=machine off)
0-10V+	Analogue input (ST10)	Signal input 0-10V (+) for set point modification
0-10V-		Signal input 0-10V (-) for set point modification

Removal of the cover for access to the terminal board and the control panel

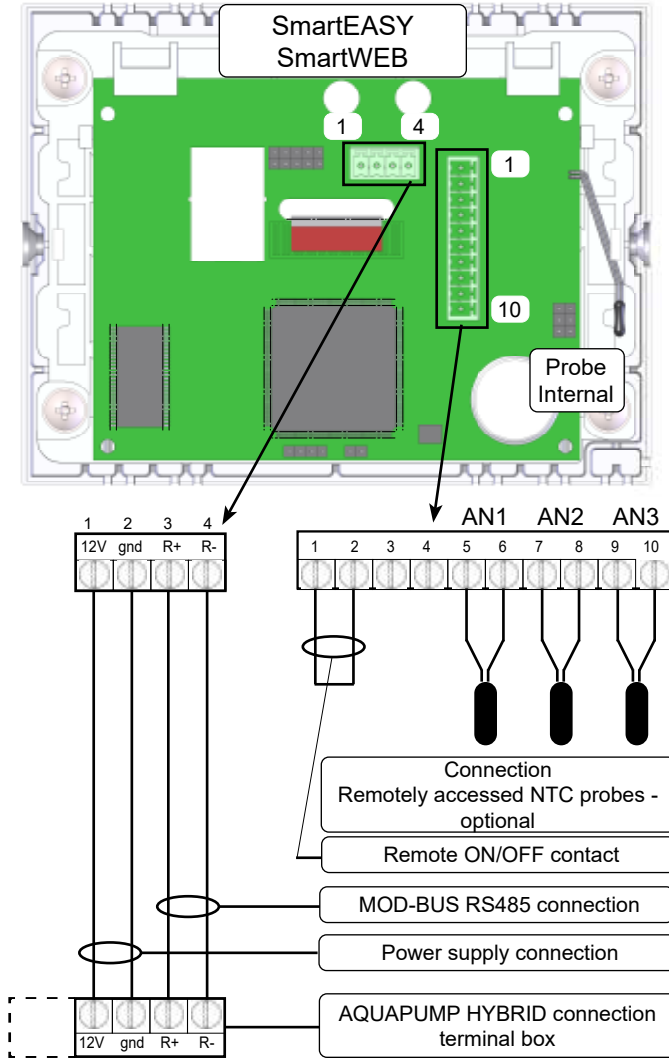
1. Undo the screws that hold the cover in place and lift the cover.
2. Proceed with wiring to the terminal board.
3. Insert the cables in the PGs provided on the side of the machine to take them outside the unit.
4. Close the control panel and the machine cover with the screws previously removed.

	<p><i>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.</i></p>
	<p><i>Remove the cover without removing the cable gland support plate.</i></p>
	<p><i>After completion of the work, close all the removed covers with all the screws provided and the gaskets.</i></p>

SmartWEB/EASY remote control connection

The Smart EASY/WEB must be connected by using the connector provided.

Connect the power supply, making sure polarity is correct.
Connect the RS485 network to its terminals, making sure polarity is correct.



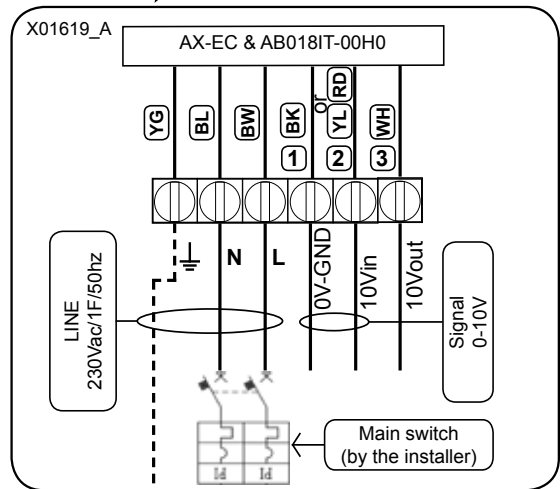
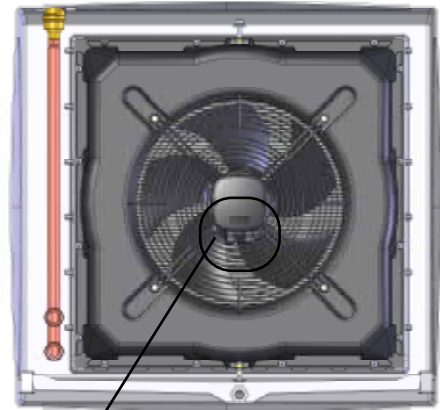
Fan heater electric connection

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

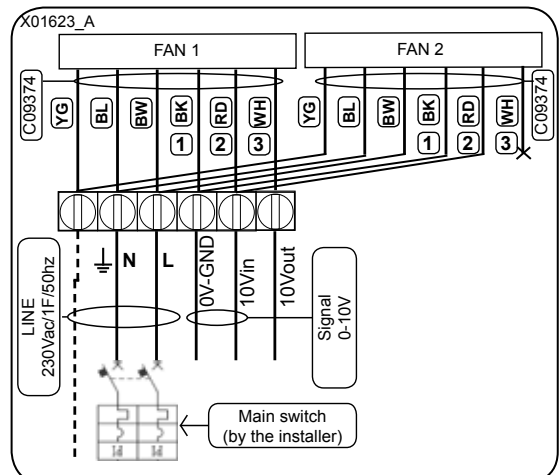
Keep electric cables away from heat sources.

Note: it is compulsory to fit, upstream of the fan heater, a multiple isolator fitted with a suitable electric protection element.

Carry out the connections according to the diagram below
AB018IT-00H0



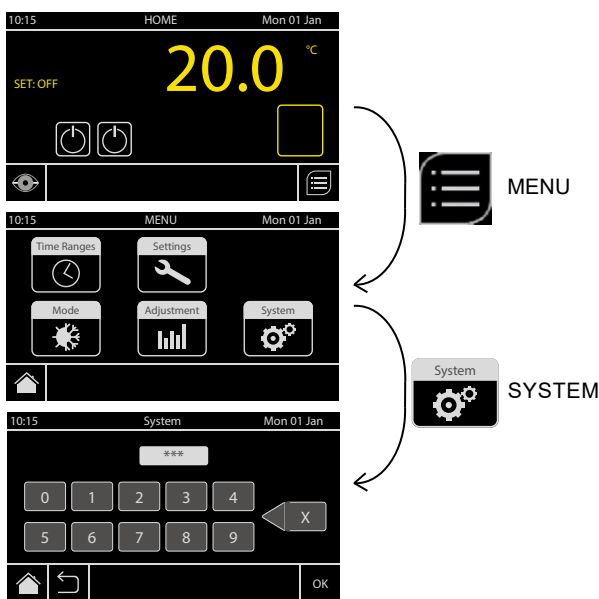
AB034IT-00H0



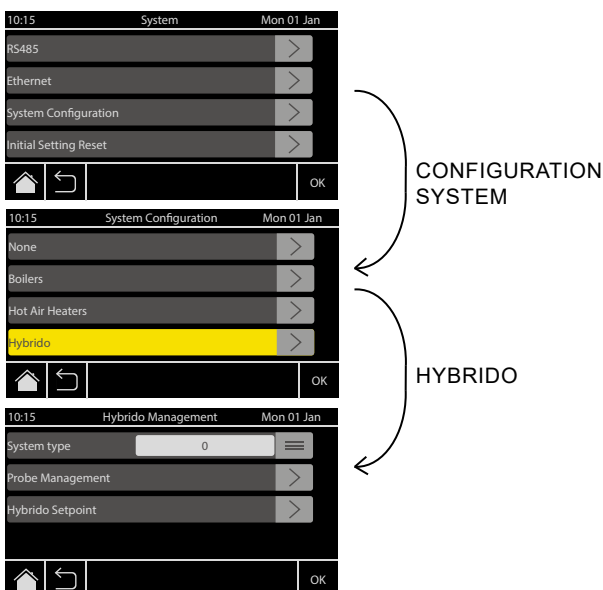
5.8. SmartWEB/EASY configuration

AQUAPUMP HYBRID can operate only if combined with the SMARTEASY or SMARTWEB touchscreen remote control.

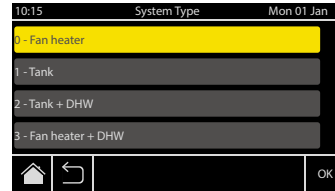
SmartWEB/EASY touchscreen control has been designed to control several ApenGroup equipment for heating, ventilation and cooling. When used for control and parametrisation of AQUAPUMP HYBRID it must be configured for this purpose. This operation is simple and quick. Press "menu" on the main screen, then press "system" icon to enter the first level password (111).



Once the first level password has been entered, select "system configuration" menu and then "Hybrido" option.



Now from "Hybrido Management" menu, select "System type" menu to define AQUAPUMP HYBRID mode by choosing among the 4 types of system available:



0 - Fan heater

This type of system must be selected to use AQUAPUMP HYBRID together with one or more fan heaters code ABXXXIT-00H0.

In this case the reference temperature (T_{REF}) controlled by SmartWEB/EASY is the ambient air temperature.

1 - 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 this case the reference temperature (T_{REF}) controlled by SmartWEB/EASY is the device water temperature.

2 - Tank + DHW

This type of system must be selected to use AQUAPUMP HYBRID together with a technical water tank, a hydraulic separator or a reservoir and, at the same time, to control a domestic water boiler with a second setpoint for domestic hot water supply.

In this case the reference temperature (T_{REF}) controlled by SmartWEB/EASY is the device water temperature and the domestic temperature (T_{DOM}) is the reading of the probe positioned in the domestic water boiler.

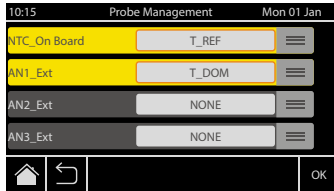
3 - Fan heater + DHW

This type of system must be selected to use AQUAPUMP HYBRID together with one or more fan heaters code ABXXXIT-00H0 and, at the same time, to control a domestic water boiler with a second setpoint for domestic hot water supply.

In this case the reference temperature (T_{REF}) controlled by SmartWEB/EASY is the ambient air temperature and the domestic temperature (T_{DOM}) is the reading of the probe positioned in the domestic water boiler.

In type 2 and 3 systems the production of domestic hot water has always priority over T_{REF} control. When in DHW production mode, the relay output is activated for the control of a diverting valve to be positioned in the system by the installer.

Once selected the type of system, it is necessary to access the "Probe Management" menu to define to which of the 4 NTC inputs available the probe that measures the reference temperature (T_{REF}) and, possibly, the probe that measures the domestic water temperature (T_{DOM}) will be connected.

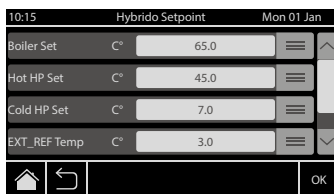


Possibilities are:

- NTC_On_board: reading of NTC probe integrated in the SmartWEB/EASY
- AN1_ext: reading of remotely accessed NTC probe (optional) connected to terminals 5-6 of SmartWEB/EASY
- AN2_ext: reading of remotely accessed NTC probe (optional) connected to terminals 7-8 of SmartWEB/EASY
- AN3_ext: reading of remotely accessed NTC probe (optional) connected to terminals 9-10 of SmartWEB/EASY

If more than one probe is associated to the same temperature reading (T_{REF} or T_{DOM}) SmartWEB/EASY provides the arithmetical average of readings of the configured probes.

After having defined the probes to be used it is possible to access "Set-Point Hybrido" menu in which the following editable setpoints are displayed:



- Boiler Set* = Boiler delivery temperature setpoint [used for operation modes 0 and 3 only].
- Hot HP Set* = Heat pump delivery temperature setpoint in winter operation [used for operation modes 0 and 3 only].
- Cold HP Set* = Heat pump delivery temperature setpoint in summer operation.
- Temp. EXT_Ref** = External air temperature setpoint, this is the value under which HP is not activated (fixed differential value of $\pm 1^\circ\text{C}$).
- Xd2 Boiler** = Differential value that distinguishes the reference temperature value (T_{REF}) under which also the boiler is activated.
- Domestic Set** (ST_{DOM}) = Domestic hot water temperature setpoint [displayed for operation modes 2 and 3 only].

- Domestic Xd** = Differential value that distinguishes the domestic request activation or deactivation with reference to ST_{DOM} value [displayed for operation modes 2 and 3 only].
- Domestic Xd2** = Differential value that distinguishes the domestic temperature value (T_{DOM}) under which also the boiler is activated [displayed for operation modes 2 and 3 only].
- Boiler CF* = Correction factor for boiler setpoint calculation [displayed for operation modes 1, 2 and 3 only].
- HP CF* = Correction factor for heat pump setpoint calculation in winter [displayed for operation modes 1, 2 and 3 only].

(*) for further details about the use of these values to define the operation setpoints, see the following table.

(**) for further details about the use of these values in the adjustment logic, see Section 3.7

The choice of the different operation modes also implies a different management of the operation setpoints for boiler and heat pump according to the operation mode.

The following table describes the details of the setpoint values according to the operation mode chosen:

Set Type	Set-point	Heating	Conditioning	DHW
0	Boiler	Boiler set		
	HP	Hot HP Set	Cold HP Set	
1	Boiler	$ST_{REF} + CF_{BLR}$		
	HP	$ST_{REF} + CF_{HP}$	Cold HP Set	
2	Boiler	$ST_{REF} + CF_{BLR}$		$ST_{DOM} + CF_{BLR}$
	HP	$ST_{REF} + CF_{HP}$	Cold HP Set	$ST_{DOM} + CF_{HP}$
3	Boiler	Boiler set		$ST_{DOM} + CF_{BLR}$
	HP	Hot HP Set	Cold HP Set	$ST_{DOM} + CF_{HP}$

Once the system is configured, it is possible to monitor its operation through HYBRIDO MONITORING menu as described in Section 4.4.

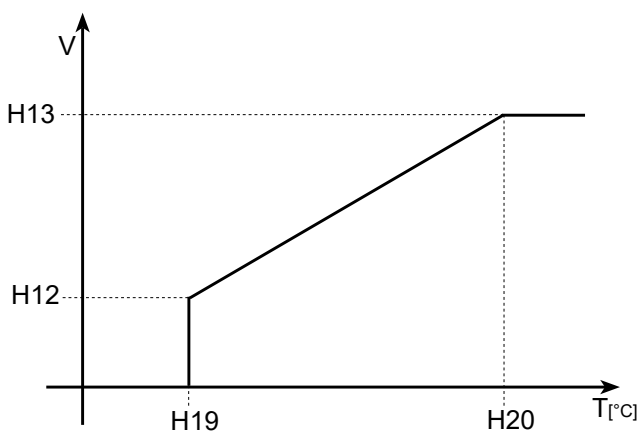
5.9. Fan Heater Operation

For operation modes 0 and 3, that provide for the combination with one or more fan heaters code ABXXXIT-00H0, 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_SMART PCB.

Par.	Description	Default value
H12	Minimum speed voltage	4 V
H13	Maximum speed voltage	10.0 V
H18	Conditioning voltage	4 V
H19	Minimum speed temperature	38°C
H20	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 (NTC1 probe - boiler delivery probe) and varies linearly between the minimum voltage value (par.H12) at the temperature corresponding to the minimum speed (par.H19) and the maximum voltage value (par.H13) at the temperature corresponding to the maximum speed (par. H20) 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. H18.

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 DHW production is required.

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

5.10. Hydraulic circuit filling

Filling or water replenishment operations are the same for all models.

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 and glycol (if required). Load the mix until a pressure of approx. 2 bar is reached.
- Vent the pipe;
- When venting operation is over check, through the display, that the pressure inside the circuit is greater than 1bar; lower values will cause an F80 because of the activation of minimum water pressure sensor [calibration 0.6bar].

Water-glycol mix restoration

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

GLYCOL

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

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

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

Note: 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%).

Note: 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.

MANUAL OPERATION OF THE CIRCULATOR

To start the manual operation of the circulator, choose the first level menu "FRC" on the LCD control panel of the boiler. FRC allows to operate the circulator manually. Selecting the key for 3 sec will provide access to BLO submenu. Pressing the UAR key (up arrow ↑) starts the circulator. Releasing the UAR key (up arrow ↑) stops the circulator.



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

5.11. GAS and hydraulic 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;

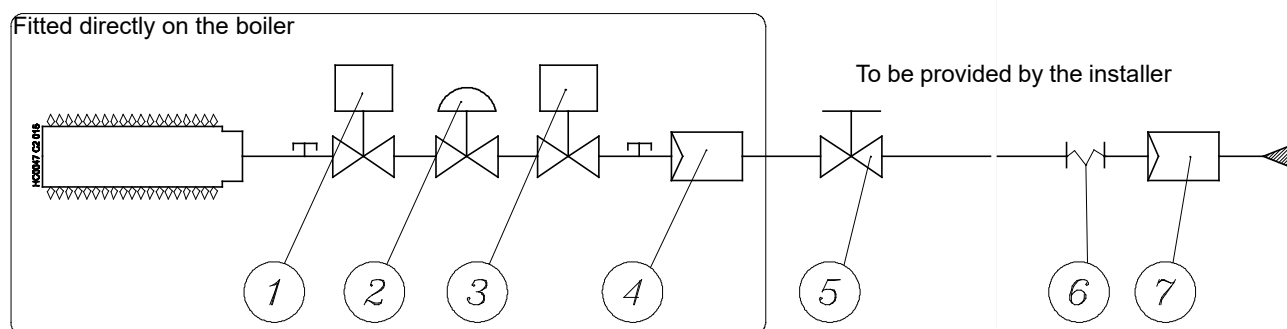
All components are fitted inside the machine;

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].

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

Installation diagram HY434/HY534

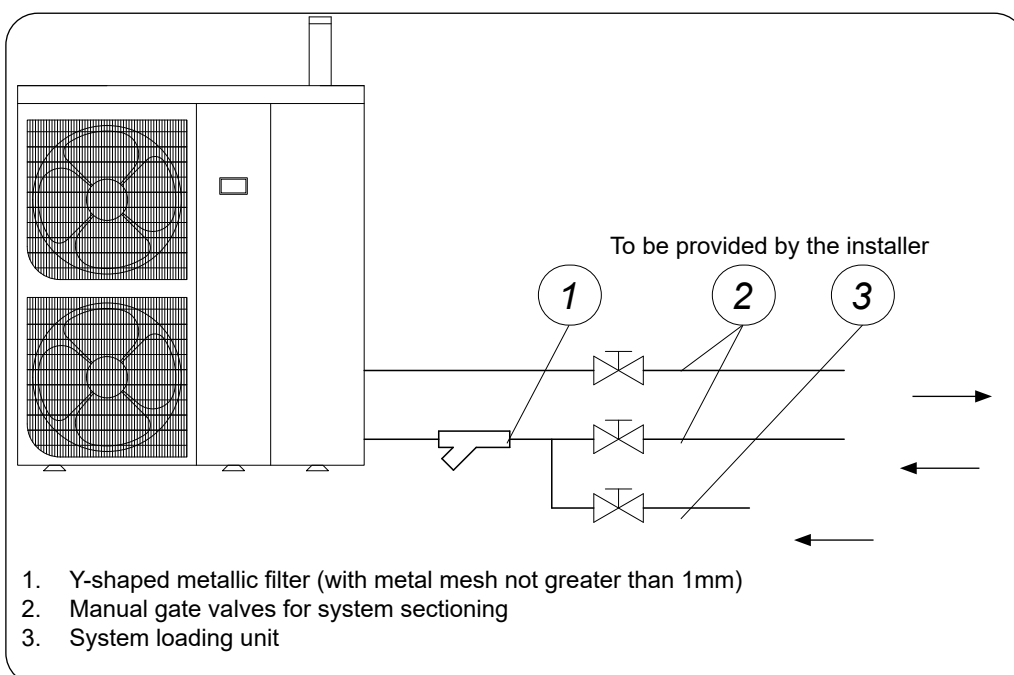


LEGEND

- | | |
|---|------------------------|
| 1 Main burner gas solenoid valve | 5 Gas valve |
| 2 Pressure stabiliser | 6 Anti-vibration joint |
| 3 Safety gas solenoid valve | 7 Gas filter |
| 4 Gas filter - (with small section, installed in the gas valve) | |

Hydraulic connections

Following the instructions in section 5.4, prepare the hydraulic system as shown in the figure.



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

5.12. Connections to the Flue

AQUAPUMP HYBRID is supplied with B23P fume exhaust, made of plastic material [polypropylene], white, composed of a fume exhaust terminal Ø60 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 Technical features].

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

G15821-06-100	PIPE 60 L=1000 TH.2.0
G15811-06-90	BEND Ø60-90° TH.2.0
G15811-06-45	45° BEND Ø60 TH.2.0
G15816-06-08	M-F REDUCTION Ø60-80
G15821-08-100	PIPE Ø80 L=1000 TH.2.0
G15811-08-90	BEND Ø80-90° TH.2.0
G15811-08-45	45° BEND Ø80 TH.2.0

The maximum length that can be achieved with polypropylene Ø60 smooth pipe is 4 m, for a linear path.

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

- 1.5m for each bend Ø60 PP, 90° with wide radius;
- 1.0m for each bend Ø60 PP, 45° with wide radius.

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

UNIT SET FOR G20 [NATURAL GAS]			
Model	Flue gas temperature [°C]	CO ₂ level	Flue gas flow rate [kg/h]
HY434	85	9.2	60.4
HY534	85	9.2	60.4

UNIT SET FOR G31 [LPG]			
Model	Flue gas temperature [°C]	CO ₂ level	Flue gas flow rate [kg/h]
HY434	85	9.6	53.6
HY534	85	9.6	53.6

In case of flue outlet longer than 4 metres, it is necessary to use the 60M/80F adapter, code G15816-06-08, and the flue outlet with Ø80. With PP Ø80 smooth flue outlet, the maximum length is 8 m.

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.

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

HY models		
Pressure available at the exhaust	120	[Pa]
Component		Code
Ø80 SMOOTH PIPE [l=1m]	2.1	G15821-08-100
BEND Ø80 WIDE RADIUS 90°	3.5	G15811-08-90
BEND Ø80 WIDE RADIUS 45°	1.7	G15811-08-45

5.13. Connection to the Condensate Drain

The AQUAPUMP HYBRID heater is an equipment in which a condensing boiler is installed, therefore it is provided with a pipe Ø19 for condensation 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.

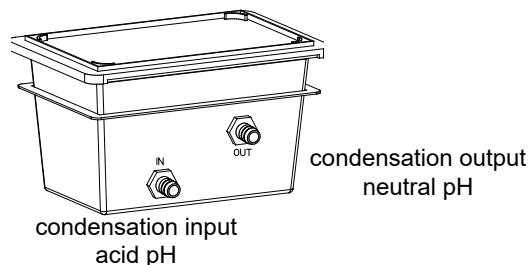
Neutralising the condensation

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;

KIT G14303 to neutralise acid condensation



- Calcium carbonate.

For more information, contact Apen Group Service centre.

Protection from frost

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

We recommend that the condensation collection system is located inside heated rooms, using the sealed trap. If the system is located outdoors, 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.

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	I12H3B/P	G20	20 mbar	G30/G31	50 mbar
BE <70kW	I2E(S)B, I3P	G20/G25	20/25 mbar	G31	37 mbar
CH	I12H3B/P	G20	20 mbar	G30/G31	50 mbar
DE	I12ELL3B/P	G20/G25	20 mbar	G30/G31	50 mbar
DK, FI, GR, SE, NO	I12H3B/P	G20	20 mbar	G30/G31	30 mbar
ES, GB, IE, PT, SK	I12H3P	G20	20 mbar	G31	37 mbar
IT, CZ	I12H3B/P	G20	20 mbar	G30/G31	30 mbar
FR	I12Esi3P	G20/G25	20/25 mbar	G31	37 mbar
LU	I12E3P	G20/G25	20 mbar	G31	37/50 mbar
HU	I12HS3B/P	G20/G25.1	25 mbar	G30/G31	30 mbar
CY, MT	I3B/P			G30/G31	30 mbar
EE, LT, SI, AL, MK	I12H3B/P	G20	20 mbar	G30/G31	30 mbar
LV	I2H	G20	20 mbar		
IS	I3P			G31	37 mbar
BG, RO, HR, TR	I12H3B/P	G20	20 mbar	G30/G31	30 mbar
PL	I12E3B/P	G20	20 mbar	G30/G31	37 mbar

NOTE: Starting from 1 January 2018 only cat. K certified equipment in The Netherlands K'.

In the Netherlands, HY units can be installed only with LPG (G30/G31) since they are not cat. K certified.

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

The code allows finding out the factory settings:

Codes with no extension:

- HY434IT 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:

- HY434FR-xxx0 0 indicates that the equipment has been tested and set up for natural gas [G20]
- HY434MT-xxx1 1 indicates that the equipment has been tested and set up for LPG [G31]
- HY434NL-xxx2 2 indicates that the equipment has been tested and set up for 'L' natural gas [G25]

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

6.2. Gas Settings Table

FOR ALL TYPES OF GAS		
TYPE of MACHINE		HY434/534
Gas valve offset values	Pa	-1.0±0.8

TYPE OF GAS G20		
TYPE of MACHINE		HY434/534
CATEGORY		According to the country of destination - see previous table
SUPPLY PRESSURE	[mbar]	20 [min 17 - max 23] [for Hungary 25 mbar]
Ø GAS ORIFICE PLATE	[mm]	7.5
CARBON DIOXIDE CO ₂	[%]	9.1 ±0.2 [cat. H] - 9.4 ±0.2 [cat. E]
GAS CONSUMPTION (15°C-1013mbar)	[m ³ /h]	3.71±0.80

TYPE OF GAS G20 - Switzerland		
TYPE of MACHINE		HY434/534
CATEGORY		According to the country of destination - see previous table
SUPPLY PRESSURE	[mbar]	20 [min 17 - max 23]
Ø GAS ORIFICE PLATE	[mm]	7.5
CARBON DIOXIDE CO ₂	[%]	8.6
GAS CONSUMPTION (15°C-1013mbar)	[m ³ /h]	3.71±0.80

TYPE OF GAS G25 [LL cat.]		
TYPE of MACHINE		HY434/534
CATEGORY		According to the country of destination - see previous table
SUPPLY PRESSURE	[mbar]	25 [min 20 - max 30] - [for Germany 20 mbar]
Ø GAS ORIFICE PLATE	[mm]	-
CARBON DIOXIDE CO ₂	[%]	9.1 ±0.2
GAS CONSUMPTION (15°C-1013mbar)	[m ³ /h]	4.21±0.88

TYPE OF GAS G30		
TYPE of MACHINE		HY434/534
CATEGORY		According to the country of destination - see previous table
SUPPLY PRESSURE	[mbar]	30 [min 25 - max 35] - 50 [min 42.5 - max 57.5]
Ø GAS ORIFICE PLATE	[mm]	5.4
CARBON DIOXIDE CO ₂	[%]	10.5 ±0.2
GAS CONSUMPTION (15°C-1013mbar)	[Kg/h]	2.26±0.54

TYPE OF GAS G31		
TYPE of MACHINE		HY434/534
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]	5.4
CARBON DIOXIDE CO ₂	[%]	9.6 ±0.2
GAS CONSUMPTION (15°C-1013mbar)	[Kg/h]	2.15±0.50

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:

- energise the fan heater;
- make sure that an ambient thermostat or SmartEASY/WEB is connected to the boiler.
- provide voltage to the machine, using the main switch, after having ensured that power supply is connected to the terminals, as shown in the wiring diagram;
- when power voltage is provided to the boiler and ID2-IDC2 contact is closed on boiler PCB, the ignition cycle starts.
- if Smart EASY/WEB 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 button on boiler display).

6.4. Analysis of combustion

Wait until the boiler reaches the maximum output.

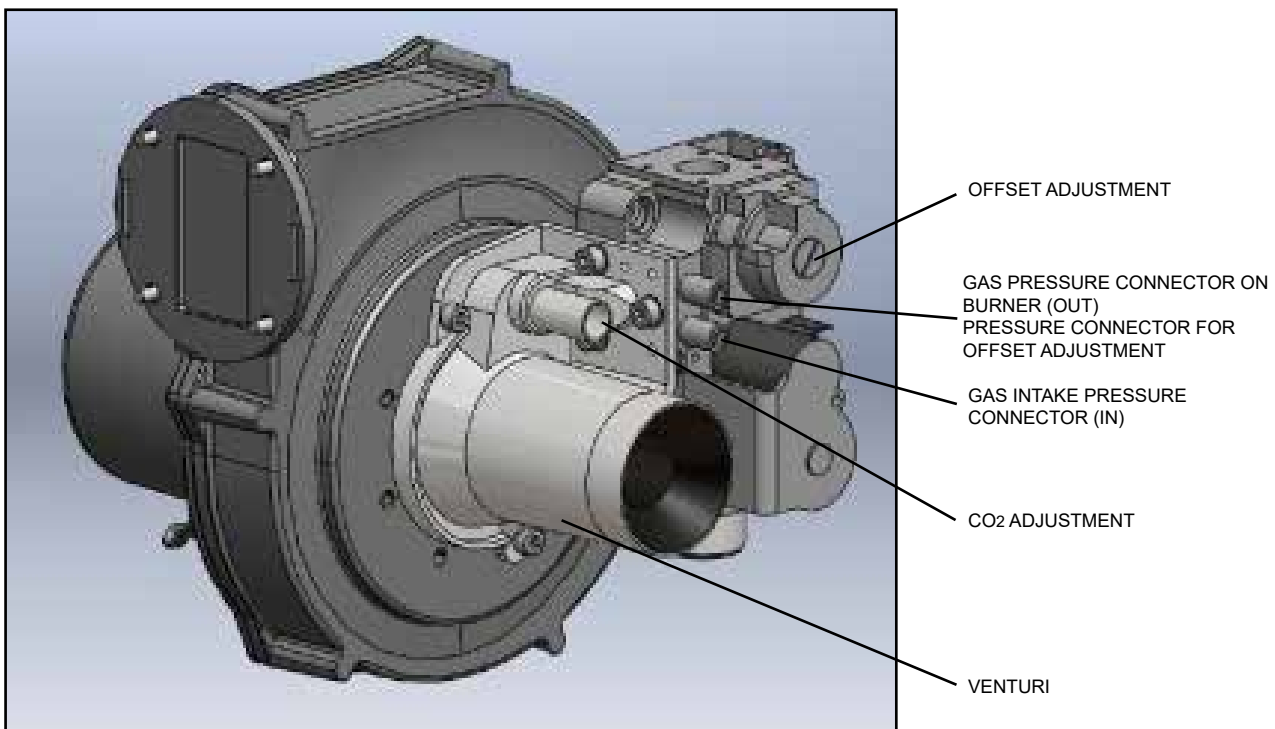
Check again that the input pressure in the valve corresponds to the value required; adjust if necessary.

Perform the combustion analysis to verify that the level of CO₂ corresponds the values contained in the table "GAS SETTINGS". If the measured value is different, turn the adjustment screw on the Venturi pipe. Loosening the screw will increase the CO₂ level, screwing it down will decrease the level.

Position the boiler at minimum capacity, check that CO₂ is equal to or slightly lower than the value detected at maximum capacity (up to -0.3%). If the values do not match, screw or loosen the OFFSET screw respectively to increase or decrease the CO₂ level and repeat the procedure.

Flue cleaning function

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

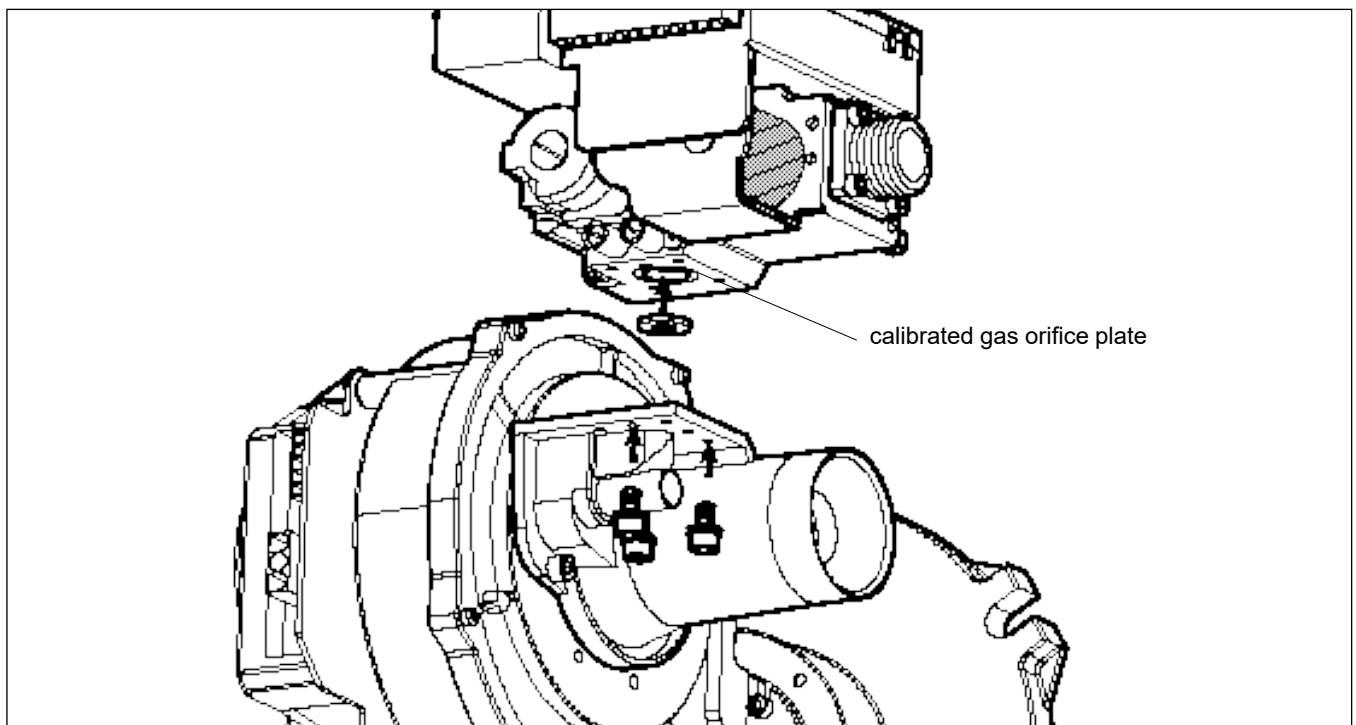
- disconnect boiler from power supply;
- between the gas valve and the Venturi, replace the gas orifice plate fitted with the one supplied with the kit;
- restore power supply and set the boiler up for ignition;
- while the start-up electrode is sparking, make sure there are no gas leaks.

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

1. the valve intake pressure corresponds to the value required for the type of gas that you are using;
2. the combustion analysis procedure is performed as described in Section 6.4;
3. the CO₂ level is within the values indicated for the type of gas used. If the detected value is different, change it using the adjustment screw: screwing it down decreases the CO₂ level, loosening it increases the level.
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 ...".

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

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

To carry out the calibration, refer to the section concerning the combustion analysis 6.4 and to table 6.2.

6.7. Replacing the modulation PCB

When replacing the PCB, it is required to carry out a few checks and set a few parameters through the Smart EASY/WEB command.

Every HY equipment has a list of pre-programmed default values. It is advisable to update the list at every change performed on site in order to be able to reprogram a spare PCB if needed.

* The following information only applies to HY boilers; for the other equipment using the same modulation PCB, refer to the relevant manual.

Check the hardware configuration of the PCB

Modify the address of the PCB with the switches, copying the exact configuration of the PCB that was just replaced.

Programming the parameters

The parameters that must be programmed are the following:

- from d0 to d9 identify the type of equipment;
- b1, b2, b3 - regulate the motor revolutions of the flue fan;
- S1 - enables the NTC1 hot water delivery probe;
- S2 - enables the NTC2 ambient temperature probe;
- S5 - enables B2 probe for water pressure control;
- S6 - enables B3 probe for water flow rate control.
- H11 - enables Y1 output (PWM2) for water circulator modulation and Y2 for fan heater speed control;
- H16 circulator modulation;
- H17 PWM (Y1) or 0/10V (Y2) output according to "direct"; or "reverse" logic;
- b16 ID5 input management (not used);
- b17 ID6 input management for controlling the flue gas pressure switch and flue gas thermal fuse.

Programming the parameters - Operating mode

Parameters can be modified from the LCD display on the machine or, alternatively, from SmartWEB/EASY.

SmartWEB/EASY can be used to access all parameters [see tables on following pages]; parameters have passwords, which are issued by the APEN GROUP service centre.

Please refer to SmartWEB/EASY 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.

6.8. Programming with LCD Display

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

To perform the change, the PCB address must be 0, otherwise the PCB address must be changed.

Abi (enabling change of setpoint)

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

(-) enables the change of boiler setpoints in **Set** menu; the password is one (001);

(-) enables the change of boiler parameters in **Par** menu; this password is used by Service Centres and must be requested to APEN GROUP SPA.

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

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

Setpoint Menu

For the meaning and the default values, please refer to the parameter table.

H51	Not used
H52	Not used
H53	Not used
St1	Modulation temperature
St2	Ambient temperature
St5	Hydraulic circuit water pressure
St6	Hydraulic circuit water flow rate

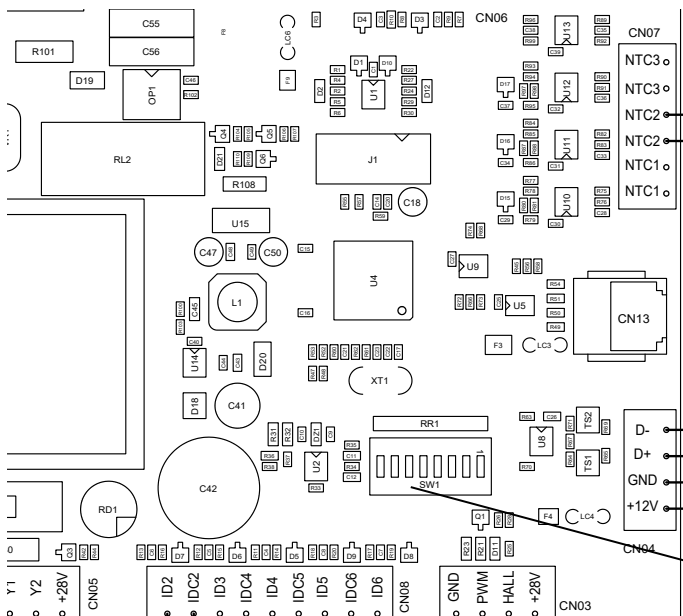


Parameter Menu

The **Par** submenu allows the access to "b" and "d" parameters:
from b1 to b15 burner parameters
from d0 to d9 boiler operation configuration.

For the meaning and the default values, please refer to the parameter table. Besides "b" and "d" parameters, the following parameters can be changed:

S1	Modulation probe enabling
SP1	ST1 hysteresis (only if the probe is used as temperature limit)
tH1	Maximum temperature of the modulation probe, switches the burner off regardless of the other conditions set
S2	Enables the NTC2 (ambient) probe
P2	ST2 hysteresis
S5	Activates water circuit pressure control
P5	Hysteresis on ST5 value, water pressure.
S6	Activates water flow control
P6	Hysteresis on ST6 value, water flow
H11	Enables the analogue outputs.



I/O menu - Inputs outputs

From I/O menu it is possible to display the values measured by the sensors.

NTC1	Water delivery temperature
NTC2	Ambient temperature
NTC3	Flue gas temperature - not used
An1	0/10V input - if used
PrH	Water pressure in the circuit
FLH	water flow in the circuit (multiply by 10)
rPu	no. of FAN revolutions
Pu2	circulator output % value (only if electronic)
uSA	Not used
IOn	Measures the ionization current; 0 to 100 for currents 0 to 2 microamperes, 100 above 2 microamperes

Fit Menu (Fault)

It displays the fault event log; use the arrow keys to scroll the list of error codes and press **ENTER** to display the historical value of the selected fault.

The first visible value, **rst**, is used to reset the fault event log; this operation must not be performed by the user but by the service centre. The reset operation can be carried out by changing the parameter to 1 and confirming it by pressing and holding **ENTER** for at least 3 seconds.

After the reset, **rst** returns to 0.

The list and the meaning of all faults is contained in FAULT table

6.9. 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/m³, annual average lower than 30 mg/m³;
- 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 pH must be within the following limits: 8.2 < pH < 9.5; if the heating system includes aluminium parts, pH must be lower than 8.5;
- 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, FERNOX11, serves as inhibitor and preserves the exchanger from oxidation.

Maintenance

The experience gathered overtime about the exchanger by APEN 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.
- **Pressure switch activation:** The pressure switch has an adjustable activation value set to 3 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 3 mbar to 1 mbar;
 - switch the boiler on normally and wait until the burner is switched off immediately and the "F20" non-volatile safety lockout is signalled.
 - move the pressure switch wheel back to 3mbar.If these conditions do not occur (stuck contact), replace the pressure switch.

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 must be compulsorily replaced every two years and whenever the heat exchanger door is opened.

• 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 every year, and check the connections. Make sure there are no traces of metallic residue. If these residues 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.

Note: Use APEN original spare parts only.

6.10. Boiler PCB parameters

Please find below all parameter values of boiler CPU-SMART PCB.

Parameters of CPU-SMART PCB version 7.02.xx			
PARAMETER		HY434/534	DESCRIPTION
d0		2	Flame modulation: 2=NTC1; 5=0÷10Vdc; 7=Modbus (SmartControl and PID)
d1		2	Type of equipment: 0=heater; 2=boiler; 5=PCH
d2		1	Remote lockout signal output (Q1): 0=disabled; 1=enabled
d3	sec	1	Circulator delay time ON (RL1): 0÷255
d4	sec	20	Circulator delay time OFF (RL1): 0÷255 (1=5seconds 60=300 seconds)
d5		0	Flue gas T control enabling (NTC3): 0=disabled; 1=enabled
d6	sec	15	Interval between switching off and on (Off timer): 0÷255
d7		0	Fault counters reset: 0÷1
d8		1	Boiler antifreeze enabling (NTC1): 0=disabled; 1=enabled
d9		3	Hybrido enabling; Do Not Change
Motor parameters			
b1	rpm	173	Motor RPM MINIMUM value (PWM1): 90÷999 (1=10 RPM)
b2	rpm	595	Motor RPM MAXIMUM value (PWM1): 90÷999 (1=10RPM)
b3	rpm	260	Motor RPM START-UP value (PWM1): 90÷999 (1=10RPM)
b4		2	HALL signal divider: 2÷3
b5	rpm	50	Error F3x; no. of revolutions x10 (50=500rpm): 0÷300
b6	sec	20	Error F3x; error dwell time before fault F3x: 0÷255
b7	sec	0	Pre-cleaning time with maximum output: 0÷255
b8	sec	30	Flame stabilisation time (ignition): 0÷255
b9	sec	15	Combustion chamber post-cleaning time (FAN ON): 0÷255
b10	%	5	Motor rpm % increase for each b11 seconds: 1÷100
b11	sec	2	Time interval for motor rpm increase: 1÷100
b12	%	30	Antifreeze mode FAN motor modulation % value: 30÷100
b13	pwm	65	Integral factor value (ki_pwm) for PWM1 calculation - (exA36):0÷249
b14	pem	45	Proportional factor value (kp_pwm) for PWM1 calculation - (exA37):0÷249
b15	sec	60	Flow control time at start-up 0÷255
b16		0	ID5 input control: 0=input disabled; 1=enabled with N.C. input required; 2=enabled with N.O. input required
b17		1	ID6 input control: 0=input disabled; 1=enabled with N.C. input required; 2=enabled with N.O. input required
Modulation probe NTC1 control with limit D0=2 in case of D0=5 or 7			
S1		1	NTC1 probe enabling: 0=disabled; 1=enabled
ST1*	°C	72	NTC1 setpoint: -10÷90
SP1	°C	4	SP1 hysteresis: 0÷10
XD1	%	40	Proportional band from 4 to 100
TN1	sec	5	Integral time: 1÷255
AC1		1	0=modulation only; 1=ON/OFF if D0=5 or 7, modulation 0/10V or MODBUS
TH1	°C	82	Upper Temperature limit for fault F51 activation: 10÷95 autoreset if NTC1<TH1-15°C
Control 0/10 Vdc - D0=5 - not used			
H51		0	Active only with D0=5 (0/10V) 0=modulation only; 1=modulation and ON/OFF
H52	V	0.5	OFF voltage, burner switching off if H51=1: 0÷10
H53	V	0.5	Voltage Delta with burner ignition ON
H54	sec	5	Lower input dwell time: 0÷255
H55	sec	5	Upper input dwell time: 0÷255
Electronic fan heater speed control			
H11		3	0=output disabled; 1=analogue output Y1 enabled (PWM2); 2=analogue output Y2 enabled(0÷10Vdc); 3=outputs Y1 (PWM2) & Y2(0÷10Vdc) enabled
H12	V	4.0	Y2 output minimum voltage: 0÷10
H13	V	10.0	Y2 output maximum voltage: 0÷10

Parameters of CPU-SMART PCB version 7.02.xx

PARAMETER		HY434/534	DESCRIPTION
H14	%	100	PWM2 minimum value: 0÷100
H15	%	100	PWM2 maximum value: 0÷100
H16		2	2=circulator modulation proportional to FAN (do not change)
H17		0	0=PWM (Y1) or 0/10V (Y2) output according to "direct" logic; 1=PWM (Y1) or 0/10V (Y2) output according to "reverse" logic
H18	V	4	Y2 output voltage in conditioning mode
H19	°C	38	Reading of NTC1 to which the minimum value of Y2 output corresponds
H20	°C	60	Reading of NTC1 to which the maximum value of Y2 output corresponds
NTC2 control - Ambient temperature			
S2		1	0=NTC2 disabled; 1=NTC2 enabled
ST2	°C	5.0	NTC2 setpoint: -10÷90
P2	°C	2.0	ST2 hysteresis: 0÷40
XD2		40	Neutral area, proportional modulation band divided by one hundred: 4 ÷100
TN2	sec	5	Integration time: 1÷255
ANTIFREEZE control - active with D8=1			
STA	°C	2.0	Antifreeze setpoint: -10÷+20
PA	°C	1.0	Antifreeze setpoint hysteresis: 0÷10
FLUE GAS TEMPERATURE control - active with D5=1 - not used			
H41	°C	5	Flue gas temperature (NTC3); neutral band from 1÷50
H42	sec	5	Run time for flue gas control cycle (15=30 seconds): 0÷255
H43	°C	95	Flue gas temperature at maximum capacity (Tmax with PT%=100): 0÷140
H44	°C	85	Flue gas temperature at medium capacity (Tmed with PT%=50): 0÷140
H45	°C	75	Flue gas temperature at minimum capacity (Tmin with PT%=0): 0÷140
H46		0	Flue gas temperature operation: 0=modulation only - 1=burner OFF
TH3	°C	103	Temperature upper limit (autoreset if NTC3<TH3): 0÷140
Hydraulic circuit WATER PRESSURE control			
S5		3	Pressure probe B2 output enabling: 0=disabled; 1=enabled as ON/OFF input; 2=enabled as analogue input without fault F83 autoreset; 3=enabled as analogue input with fault F83 autoreset
ST5	bar	0.60	B2 setpoint: 0÷9.99
P5	bar	0.30	ST5 hysteresis: 0÷9.99
XA5	V	0.40	B2 pressure probe signal input minimum voltage: 0÷9.99
XB5	V	2.80	B2 pressure probe signal input maximum voltage: 0÷9.99
YA5	bar	0	Pressure matching the B2 probe input minimum voltage
YB5	bar	4	Pressure matching the B2 probe input maximum voltage
TH5	V	2.50	Upper pressure limit for fault F82 activation: 0÷9.99
Hydraulic circuit WATER FLOW control			
S6		3	Flow sensor B3 input enabling: 0=disabled 1=enabled as ON/OFF input without F85 fault autoreset 2=enabled as ON/OFF input with F85 fault autoreset 3=enabled as pulsed input without F85 and F86 fault autoreset 4=enabled as pulsed input with F85 and F86 fault autoreset
ST6	From l/h	56	Flowmeter setpoint - in l/h (x10)
P6		5	ST6 hysteresis: - in l/h (x10)
XA6	Hz	14	B3 pressure probe signal input minimum frequency: 0÷999
XB6	Hz	229	B3 pressure probe signal input maximum frequency: 0÷999
YA6	l/h	29	Flow rate matching the B3 probe inlet minimum frequency
YB6	l/h	500	Flow rate matching the B3 probe inlet maximum frequency
TR6	sec	2	Fault F85/F86 indication time delay (1=1second): 0÷250. During the ignition stage, the b15 value is used.

6.11. Analysis of Lockouts - BOILER FAULT

The CPU-SMART 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.

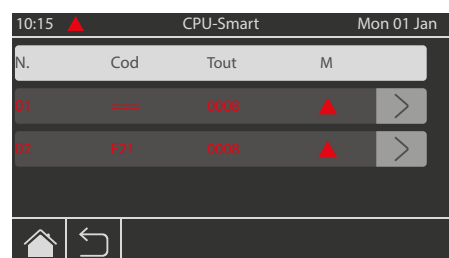
Some operational faults require manual resets; others reset themselves when the problem that caused them is solved.

Below is a complete list of faults, possible causes and possible solutions.

FAULT	DESCRIPTION	CAUSE	UNLOCK
Lockout caused by Flame - Caused by the ACF equipment			
F10	Failure to ignite flame after 4 attempts performed by the equipment.	<ul style="list-style-type: none"> • Live and neutral reversed • Earth wire not connected • Phase-phase connection without neutral • Start-up electrode failed or badly positioned • Detection electrode failed or badly positioned • Detection electrode that moves or disperses to the earthing system when hot • Low CO₂ value • Condensation detection electrode defective or earthed 	Manual reset
F11	Untimely flame (parasitic flame detection, faulty ionization)		
F12	Ignition failure; not visible. The count, displayed in the event log, indicates whether the boiler has had problems with ignition		
F13	The ACF equipment does not accept the reset command from CPU-SMART	<ul style="list-style-type: none"> • ACF has finished its 5 reset attempts in the period of 15 minutes. 	Wait for 15 minutes or use the equipment reset device
F14	Lack of communication between ACF equipment and CPU for more than 60 seconds	<ul style="list-style-type: none"> • ACF equipment or CPU-SMART PCB broken 	Auto-reset
F15	The CPU-SMART PCB sent the ignition signal to the equipment which, after 300 seconds, has not lit the flame yet.	<ul style="list-style-type: none"> • blocked safety thermostat at start up 	Check contact closing - TS
		<ul style="list-style-type: none"> • faulty ACF equipment • Flame detachments immediately after the safety time (spark) • Failure to detect the flame 	Auto-reset
F16	Generic equipment lockout	<ul style="list-style-type: none"> • faulty ACF equipment • It indicates that if the heat request has remained active for more than 24 consecutive hours, the TER equipment has performed a control cycle switching temporarily to stand-by mode 	Auto-reset
F17	Internal malfunction of ACF equipment that does not accept reset command from CPU-SMART	<ul style="list-style-type: none"> • faulty ACF equipment 	Auto-reset
Lockouts caused by temperature (safety lockouts)			
F20	Activation of safety thermostat STB	<ul style="list-style-type: none"> • Excess water temperature due to lack of circulation • Safety thermostat broken or not connected • Faulty NTC1 water delivery temperature probe 	Manual reset of the CPU-SMART or TER (RE red LED on)
F21	Input ID1 open - causes: <ul style="list-style-type: none"> • Activation of heat exchanger thermal fuse - TF 	<ul style="list-style-type: none"> • The water temperature inside the exchanger has exceeded the safety limit of the thermal fuse; disassemble the exchanger and check that there are no damages, otherwise replace it. • Empty, small or broken expansion reservoir. 	CPU-SMART manual reset
FAN lockout - burner fan			
F30	Fan speed too low in start up phase - VAG	<ul style="list-style-type: none"> • Burner fan broken. • FAN electric cables wrongly connected or not connected 	Manual reset
F31	Fan speed too high in start up phase - VAG		
F32	Fan speed, during operation, outside minimum and maximum set parameters - VAG		Manual reset, auto-reset after 5 minutes
F38	Flue gas temperature greater than 102°C	<ul style="list-style-type: none"> • Fume thermal fuse (TFUMI) activation • The gas flow rate might exceed the boiler adjustment parameters • Check the exchanger cleaning 	Manual reset
	PFLUE activation	<ul style="list-style-type: none"> • Closed flue/Flue gas exhaust clogging/Flue pressure drop greater than the permitted value • If contact ID6 inverts (PFLUE activation) fault F38 is signalled after the flame stabilisation time (sect. b8) 	Manual reset

FAULT	DESCRIPTION	CAUSE	UNLOCK
NTC probes broken or missing			
F41	Probe NTC1 error, water delivery temperature	<ul style="list-style-type: none"> No signal from probe or broken probe 	Auto-reset
F42	NTC2 probe error, external temperature	<ul style="list-style-type: none"> No signal from probe or broken probe 	Auto-reset
Over-temperature			
F51	The temperature of the water delivery probe NTC1>TH1	<ul style="list-style-type: none"> The minimum heat output of the boiler is oversized compared to the heat output required by the environment. Check the TH1 parameter - water delivery maximum temperature. Reduced heat exchange: e.g. terminals not working (fans stopped, fan coils switched off or at reduced speed) 	Auto-reset if NTC1< TH1-15
Check Modbus communication			
F60	Communication error between CPU-SMART PCB and Modbus network, Smart EASY/WEB	<ul style="list-style-type: none"> ModBus network is disconnected The address of the PCB is wrong and/or not configured in the Modbus network 	Auto-reset
No voltage			
F75	No voltage during operation cycle (excluding stand-by); the fault is not visible on remote control but only counted.	<ul style="list-style-type: none"> No voltage during operation 	Auto-reset
Pressure control and water circulation in the circuit			
F80	No water pressure, water pressure PRH < ST5 - P5	<ul style="list-style-type: none"> If this happens frequently, check the presence of leakages in water circuit. 	Auto-reset
F81	Preventive alarm, water pressure PRH < ST5	<ul style="list-style-type: none"> Restore water pressure value of the hydraulic circuit 	Faults are displayed on LCD panel, without stopping the equipment
F82	Preventive alarm, water pressure PRH > TH5	<ul style="list-style-type: none"> Excessive pressure inside water circuit, check the hydraulic circuit load or the expansion reservoir 	
F85	No water circulation, FLH value is equal to zero	<ul style="list-style-type: none"> Water circuit clogged, taps closed or circulator not operating Flowmeter not connected or faulty 	Auto-reset
F86	Water flow rate lower than minimum setpoint FLH < ST6 - P6	<ul style="list-style-type: none"> Check water circuit length and diameters Check the cleanliness of the Y filter Bleed the air pipes by activating the circulator manually as described in Section 5.10 	
Parameter configuration error			
F99	Wrong programming of CPU-SMART PCB parameters	Check: <ul style="list-style-type: none"> S1 (NTC1 probe enabling) = 1 S5 (B2 water pressure switch enabling- PREX) = 3 S6 (B3 flowmeter enabling - FLUX) = 3 	Auto-reset when S1, S5 and S6 parameters are ≠ 0
Internal malfunction of CPU-SMART PCB			
F00	Internal malfunction of CPU-SMART PCB	<ul style="list-style-type: none"> Perform a manual reset of the PCB; replace the CPU-SMART PCB if the problem persists 	Manual reset

If in the Smart EASY/WEB screen you find the two slaves fixed in red or intermittently switched on (constantly changing condition), check the modbus connection and that the polarity is correct. If the communication block is not restored, it is possible to assume either that the Smart EASY/WEB chronothermostat has been programmed incorrectly or that the interface panel of the heat pump or its PCB has failed. In this case, neither boiler nor heat pump will display Fault or Errors.



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 ($\pm 10\%$).
- 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.

	<p>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 $10 \pm 15^\circ\text{C}$ higher than ambient temperature.</p>
	<p>ATTENTION: Check that the weight of the piping is not supported by the machine structure.</p>
	<p>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.</p>
	<p>ATTENTION: Do not change the electric connections of the unit, otherwise the warranty is invalidated immediately.</p>
	<p>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.</p>
	<p>ATTENTION: Upon first installation and start-up, make sure that the machine operates correctly both in heating and in cooling mode.</p>

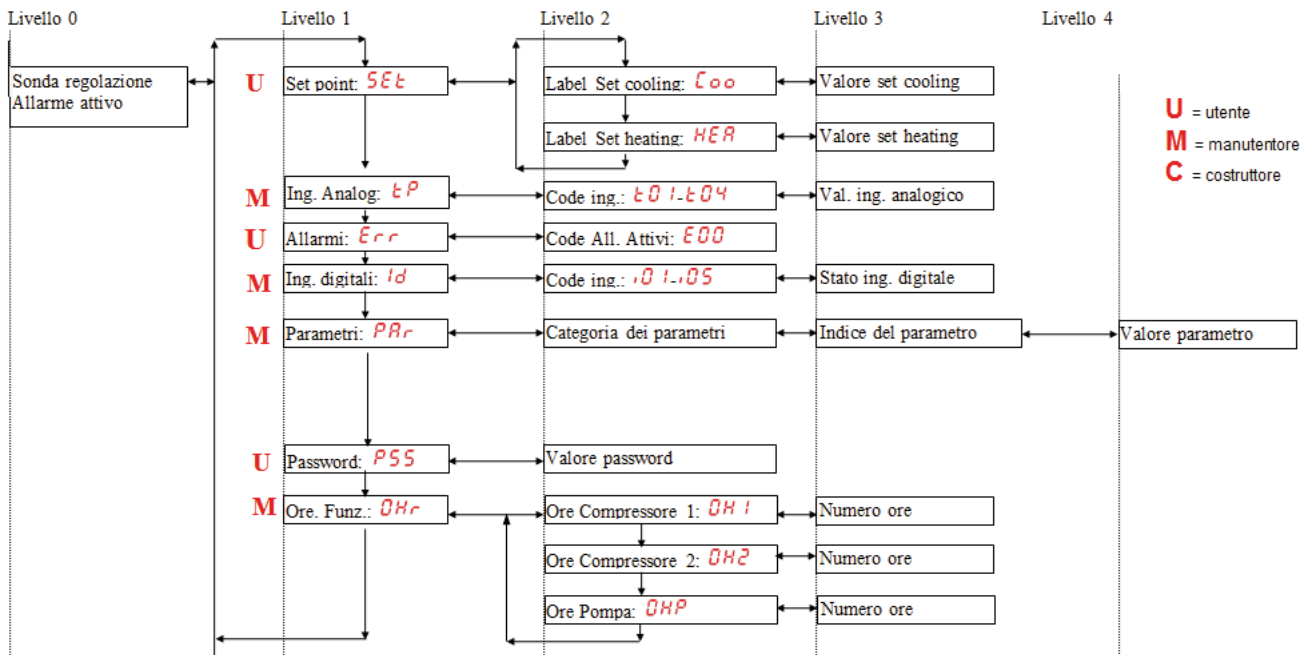
Note: In the three-phase machine HY534IT if phases L1, L2 and L3 are reversed, the heat pump control display does not start.

7.2. Control interface



	<p>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 → heat → off During parameter setting it operates as one level BACK key.</p>
	<p>It allows to enter parameter setting menu and to set the value of summer, winter and domestic water setpoint</p>
	<p>UP key. In parameter setting mode, it allows to go to an upper menu or to increase a parameter value when in "change" mode.</p>
	<p>DOWN key. In parameter setting mode, it allows to go to a lower menu or to decrease a parameter value when in "change" mode.</p>

7.3. Menu structure



Level 0 (U) = always visible

Level 1 (M) = visible if maintenance operator password (H80) or manufacturer password has been entered

Level 2 (C) = visible if manufacturer password has been entered

Level 3 (A) = visible through Modbus only

7.4. Analogue input menu

By accessing with maintenance operator password to "tP" analogue input menu, at level 1 of machine on-board control menu, it is possible to read the values of probes present on the heat pump:

- t01: inlet water temperature (°C)*
- t02: outlet water temperature (°C)*
- t03: compressor intake temperature (°C)
- t04: compressor drain temperature (°C)
- t05: high pressure (bar)
- t06: low pressure (bar)
- t07: external air temperature (°C)**
- t08: system remote probe temperature (if enabled) (°C)
- t09: DHW temperature (if enabled) (°C)

(*) values corresponding to "HP return temp." and "HP delivery temp." read by SMARTWEB/EASY in the Monitoring Operation menu (see Section 4.4).

(**) value different from "External temp." read by SMARTWEB/EASY in the Monitoring Operation menu (see Section 4.4).

7.5. Display

Standard viewing displays water outlet temperature from plate exchanger of the heat pump (therefore before being post-heated by the boiler if the latter is operating) in tenths of a degree Celsius or the alarm code if at least one is activated.

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.

7.6. Signalling LEDs

	Compressor LED	<ul style="list-style-type: none"> ON if the compressor is on OFF if the compressor is off FLASHING if timings for compressor start wait are in progress
	DHW LED	<ul style="list-style-type: none"> ON if domestic mode is enabled OFF if domestic mode is disabled FLASHING if domestic water production is in progress (domestic water valve enabled)
	Defrost LED	<ul style="list-style-type: none"> ON if defrosting is enabled OFF if defrosting is disabled or finished FLASHING if defrost interval time count is in progress
	Antifreeze resistance LED	<ul style="list-style-type: none"> LED ON if antifreeze resistance is enabled.
	Pump LED	<ul style="list-style-type: none"> NOT USED
	Alarm LED	<ul style="list-style-type: none"> LED ON if an alarm is on.
	Heating mode LED	<ul style="list-style-type: none"> LED ON if the unit is in heating mode.
	Cooling mode LED	<ul style="list-style-type: none"> LED ON if the unit is in cooling mode.

7.7. Heat pump PCB parameters

Please find below the main parameter values of heat pump PCB.

Heat Pump PCB Parameters					
PARAMETER	HY434	HY534	DESCRIPTION	RANGE	Lev.
A16*	Bar	according to the model	Low pressure set in cooling mode	-50.0÷80.0	I
b01*	°C	2.0	Band in cooling mode	0÷255.0	I
b02*	°C	2.0	Band in heating mode	0÷255.0	I
F08*	Bar	according to the model	Pressure set at fan minimum speed in cooling mode	-50.0÷80.0	I
F09*	Bar	according to the model	Proportional band for fan modulation in cooling mode	0.0÷25.5	I
F10*	Bar	according to the model	Fan cut-off delta	0.0÷25.5	I
F11*	Bar	according to the model	Cut-off hysteresis	0.0÷25.5	I
F12*	sec	according to the model	Cut-off bypass time	0.0÷255	I
F14*	Bar	according to the model	Pressure set at fan maximum speed in cooling mode	-50.0÷80.0	I
F17*	Bar	according to the model	Pressure set at fan minimum speed in heating mode	-50.0÷80.0	I
F18*	Bar	according to the model	Proportional band for fan modulation in heating mode	0.0÷25.5	I
F20*	Bar	according to the model	Pressure set at fan maximum speed in heating mode	-50.0÷80.0	I

(*) in case of doubts on the value to be set, contact the manufacturer; values different from the default ones can compromise the proper operation of the machine.

NOTE: U=user, I=installer

Not all configurations can be simultaneously selected. For more information, contact the manufacturer.

7.8. Analysis of Lockouts - HEAT PUMP FAULTS

FAULT	DESCRIPTION
E00	Remote off
E01	High pressure
E02	Low pressure
E05	Antifreeze alarm
E06	Flow switch
E08	Driver limitation
E18	High temperature
E41	4-way valve
E42	Hot water protection
E61	Input water probe
E62	Output water probe
E63	Compressor intake probe
E64	Compressor delivery probe + HP pressure switch
E65	High pressure transducer
E66	Low pressure transducer
E67	External air probe for climate adj.
E68	SE /SE probe (if enabled)
E69	SAN / SAN probe (if enabled)
E80	Inverter time-out
E85	Hardware problem in the inverter
E86	Compressor current too high
E87	Inverter dissipator high temperature
E88	Supply voltage exceeding limits
E89	Compressor not connected to power supply
*E891	Compressor not connected to the driver
*E901	Wrong compressor model
*E911	Driver overload protection

FAULT	DESCRIPTION
*E921	Driver overcurrent
*E931	Driver communication error
*E941	PFC driver
*E951	Driver temperature sensor error
*E961	Driver anomaly
*E971	EEPROM driver

E00 - remote ON/OFF

If the machine is controlled by a remote digital input.

E01 - High pressure

If pressure transducer of the machine detects a pressure higher than 41 bar the alarm is activated.

In this case the compressor is blocked immediately. The alarm resets when pressure drops below 37 bar.

If the alarm occurs more than 3 times per hour, the alarm must be manually reset.

E02 - Low pressure

If pressure transducer of the machine detects a pressure lower than the value set in the control (A16=5 bar by default, 1.5 bar in "heat" mode) the alarm is activated. In this case the compressor and the condenser fans are blocked immediately. The alarm resets when pressure increases above an hysteresis of 2.0 bar. If the alarm occurs more than 3 times per hour, the alarm must be manually reset.

The alarm is not active for 60 seconds after a compressor is switched on.

When the heat pump is switched off, all the alarms are reset, as well as the alarms-per-hour counters relating to the alarms that manage this mode.

E05 - Antifreeze

The alarm is activated if the value of output water probe is lower than 13°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.

E06 - 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 equal to 10 seconds from machine start-up. The alarm signal occurs after 5 seconds of continued error (no water flow, air in the circuit, etc.). The alarm is automatically reset for the first 2 times and is disabled after 5 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.

E18 - 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.

E61 to E67 - 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.

E64 - 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.

E80 - Inverter time-out



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

7.9. 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)

	<i>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.</i>
	<i>ATTENTION: Operation, although transitory, with water temperature below +5°C is not guaranteed on the basis of the 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.</i>

7.10. 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. Refrigerant R410A is included among the substances submitted to a special control regime provided for by the law and therefore must comply with the obligations mentioned above.

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








7.11. 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 points; we recommend to pay special attention during maintenance operations in order to reduce as far as possible refrigerant leaks;
- 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 recovery and recycling of the substances, thus reducing the environmental impact.

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. 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.
	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.
	After maintenance operations, close the panels by securing them with fixing screws.
	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	4months	6months
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 electric voltage.			X
Correct power consumption.			X
Check of refrigerant charge.			X
Check of working pressure, overheating and subcooling.			X
Circulation pump efficiency.			X
Check of expansion reservoir.			X
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

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.

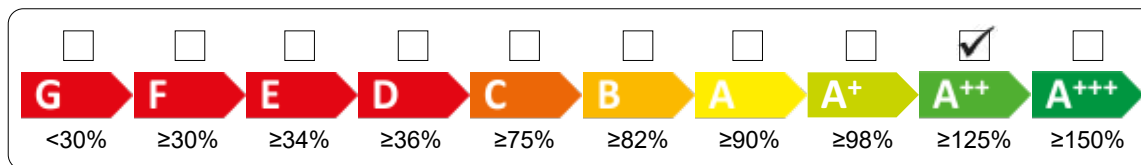
The following considerations refer to fig. 1 of Annex IV of the above mentioned regulation, which applies to the following type of assembly:

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.

figure 1 **AQUAPUMP HY434-V4 MODEL**

Seasonal space heating energy efficiency of the boiler	"I"	<input type="text" value="92.6"/>	%	①
Temperature check ¹	+	<input type="text" value="1.0"/>	%	②
Additional boiler	$(\text{input}^2 - \text{'I'}) \times 0.1 =$	\pm	<input type="text"/>	% ③
Solar contribution	$(\text{'III'} \times \text{input}^3 + \text{'IV'} \times \text{input}^4) \times 0.9 \times (\text{input}^5 / 100) \times \text{input}^6 =$	+	<input type="text"/>	% ④
Additional heat pump	$(155^7 - \text{'I'}) \times \text{'II'} =$	+	<input type="text" value="46.8"/>	% ⑤
Solar contribution AND additional heat pump	$(0.5 \times \text{input}^8) =$	-	<input type="text"/>	% ⑥
Seasonal space heating energy efficiency of the package		<input type="text" value="140"/>	%	⑦

seasonal space heating energy efficiency class of the package



Boiler and heat pump installed with low temperature heat emitters at 35°C?

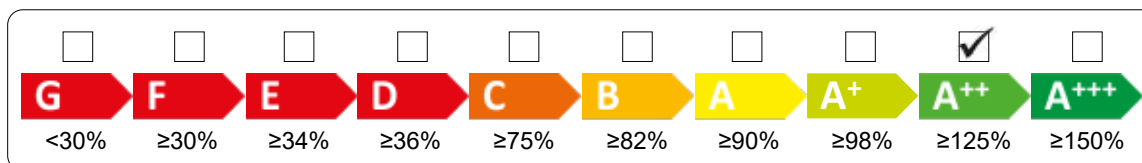
⁹⁺ (50 x 'II') = %

The energy efficiency of the package of products provided for in this fiche 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

figure 1 **AQUAPUMP HY534-V4 MODEL**

Seasonal space heating energy efficiency of the boiler	"I"	<input type="text" value="92.6"/>	%	1
Temperature check ¹	+	<input type="text" value="1.0"/>	%	2
Additional boiler	$(\text{III}^2 - \text{I}) \times 0.1$	=	\pm <input type="text"/>	% 3
Solar contribution	$(\text{III}' \times \text{III}^3 + \text{IV}' \times \text{III}^4) \times 0.9 \times (\text{III}^5 / 100) \times \text{III}^6$	=	+	<input type="text"/> % 4
Additional heat pump	$(155^7 - \text{I}) \times \text{II}'$	=	+	<input type="text" value="46.8"/> % 5
Solar contribution AND additional heat pump	$(0.5 \times \text{III}^8)$	=	-	<input type="text"/> % 6
Seasonal space heating energy efficiency of the package			<input type="text" value="140"/>	% 7

seasonal space heating energy efficiency class of the package



Boiler and heat pump installed with low temperature heat emitters at 35°C?

$$\text{III}^{9+} (50 \times \text{II}') = \text{III}^{\%}$$

The energy efficiency of the package of products provided for in this fiche 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 figure 1 Annex IV or EU Regulation no. 811/2013:

- Value of temperature control contribution according to the class, SMARTWEB/EASY Class I (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%)
- Seasonal space heating energy efficiency in %
- Collector size in m²
- Reservoir volume in m³
- Collector efficiency in %
- Reservoir classification (A+=0.95; A=0.91; B=0.86; C=0.83; D-G=0.81)
- Seasonal space heating energy efficiency in %
- Lower value between **4** and **5**
- 7** value

Indexes in Figure 1 Annex IV or EU Regulation no. 811/2013: Facsimile of AQUAPUMP HYBRID energy labels

- "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 5 of Annex IV of EU Regulation no. 811/2013:
- "III" = the value of the mathematical expression: $294 / (11 \times P_{\text{rated}})$, whereby P_{rated} is related to the preferential space heater
- "IV" = the value of the mathematical expression $115 / (11 \times P_{\text{rated}})$, whereby P_{rated} is related to the preferential space heater

Index	Value for HY434	Value for HY534
'I'	92.6	
'II'	0.75* / 0.85**	
'III'	0.74	
'IV'	0.29	

(*) package without hot water reservoir
 (**) package with hot water reservoir

Table 5 Annex IV or EU Regulation no. 811/2013:

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

$P_{\text{sup}} / (P_{\text{rated}} + P_{\text{sup}})^{**}$	II assembly without hot water reservoir	II, assembly with hot water reservoir
0	0	0
0.1	0.30	0.37
0.2	0.55	0.70
0.3	0.75	0.85
0.4	0.85	0.94
0.5	0.95	0.98
0.6	0.98	1.00
≥ 0.7	1.00	1.00

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

