

# Installation, start-up use and maintenance manual

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## AY Line AY 00-119 Model

High efficiency heater  
to product hot water up to 185 °F

Natural gas/LPG fired





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**NOTE**

Carefully read the information contained in this manual. It contains important instructions regarding installation, use and maintenance safety. Save this manual for any future needs. The manufacturer cannot be held responsible for any damages from improper, erroneous or irrational use.

With the aim of continuously improving the quality of our products, manufacturer reserves the right to change reported instructions and drawings without any prior notice.

## 1. GENERAL WARNINGS



**This manual is an integral and essential part of the product and must be given to the owner.**

Only qualified technicians, strictly complying with the manufacturer's instructions and the local standards, should install this product. The manufacturer will not accept responsibility for personal injuries or property damage resulting from improper installation.

Qualified technicians are those having specific technical competence in room heating and gas appliances according to international and national standards.

This appliance must be used exclusively for its intended purpose. All heating applications must be in accordance with the operating specifications of the unit. Any other use is considered improper and, therefore, dangerous. Steps must be taken to avoid improper use and potential dangers.

The manufacturer will not accept contractual or non-contractual liability for damages resulting from improper installation or misuse of the unit or intentional disregard of any of the manufacturer's instructions.

After unpacking the unit, check the unit for integrity. Due to the potential danger, keep all packaging materials (plastic bags, polystyrene foam, nails, etc.) away from children.

Before installation, it is recommended that all water and gas supply piping be flushed. If not flushed prior to installation, residual materials may be left in the piping and cause improper functioning of the unit.

The installation of the appliance must conform to the requirements of the authority having jurisdiction or in the absence of such requirements, to the latest edition of the **National Fuel Gas Code, ANSI Z223.1**.

Where required by the authority having jurisdiction, the installation must conform to the **Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1**.

The unit's electrical connections and grounding must be in accordance with the latest edition of the **National Electrical Codes, ANSI/NFPA No. 70** and with any local codes. To ensure the electrical safety of this appliance, it must be correctly connected to an efficient grounding system. The manufacturer is not responsible for any damages caused by the failure of the grounding system.

In the case of failure and/or poor unit performance, shut the unit down in the proper manner, disconnect the UNIT power supply and close the gas valve. Do not attempt any repair and call a qualified technician for service. The unit should also be disconnected when not in use for a prolonged period of time.

The manufacturer's **authorized Service Technicians** or **authorized Service Engineer (TAC)**, using only original replacement parts, must perform repairs to the product. Failure to adhere to this guideline may compromise the safety of the unit. To ensure the correct operation and efficiency of the unit, it is essential that qualified service technicians perform annual maintenance in accordance with the manufacturer's instructions.

If the unit is sold or transferred to another owner, this manual will be provided for use to the new owner and/or installer.

**Under no circumstances should the unit be operated with any safety or electrical component bypassed or defective.**

Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control, which has been under water.

Keep the boiler area clean and free from combustible materials, gasoline and other flammable vapors and liquids.

Take care not to obstruct the flow of combustion and ventilation air.

**Before starting the appliance a qualified service technician must verify that:**

- The electric and gas supplies are the same as indicated on the rating plate
- The fuel supply and water distribution systems are water tight
- The appliance is supplied with the type of fuel for which it is preset
- The gas supply pressure conforms to the pressure indicated on the rating plate
- The gas supply system is appropriately designed for the gas rate needed by the unit, and equipped with all safety and control devices prescribed by standards in force.

**WARNING**

To guarantee the correct operation of the unit and avoid possible failures, **ALWAYS** turn off the unit by means of the thermostat or any switch that controls the operation of the unit.

**NEVER turn off the unit by shutting off the power supply.**

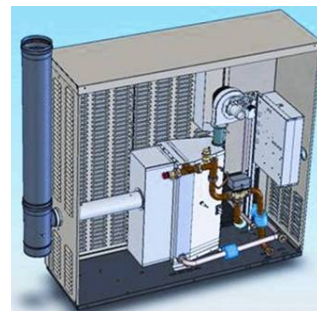
## 2. OVERVIEW AND TECHNICAL DATA

### 2.1 OVERVIEW

The AY00-119 boilers are heater modules, designed for outdoor installation; they can produce hot water up to 185 °F.

Each unit is composed by:

- a thermally insulated combustion chamber, designed for outdoor installation
- pre-mixed multi-gas burner, low emission of NO<sub>x</sub> and CO;
- heat exchanger limit thermostat;
- exhausted gases temperature limit thermostat
- ionization electronic ignition system with high discharge transformer.



The boiler is equipped with a forced draught design exhaust gases duct, with draught-breaking device for gases scavenging during the unit work; the exhaust duct is situated in the rear part of the unit.

#### NOTA

If needed, scavenging of the combustion gases can be also done by a chimney; this chimney must conform to the law in force, and in particular with natural draught chimneys construction codes.

The AY00-119 unit is equipped with an electrical box with electronic card for the unit management and operation control.

This unit's designed to work alone, or in multiple modules. For further information see next paragraph, technical data.

AY00-119 units are Natural Gas or LPG fired and supplied with 208 - 230V 60Hz single-phase electrical power.

AY00-119 units could be controlled by DDC - Direct Digital Controller (available as Optional, call Robur Corporation). DDC can control up to 16 single units.

### HEATER CONTROL AND SAFETY DEVICES

**Electronic Control Board** with integrated microprocessor controls the operation of the heater.

**Exhausted Gases Temperature Limit Switch** (manual reset) is located on the flue gas pipe near the combustion chamber; the switch opens if the exhausted gases temperature exceeds 330°F; the switch is manual reset. The switch can be reset when the temperature drops below 280°F.

**High Temperature Limit Switch** (auto reset) is located on the hot water generator wall above the combustion chamber; the switch opens if the outlet water temperature exceeds 212°F; the switch is auto reset.

**Safety Relief Valve** on the sealed circuit is set to release hot water if internal pressure exceeds 45 PSIG; the valve closes automatically when pressure is under 45 PSIG.

**Differential Air Pressure Switch** on the combustion circuit stops the burner ignition due to insufficient combustion air flow.

**Ignition Control Box** controls the burner ignition. Checks the differential air pressure switch and starts the pre-mixer blower. After 30 seconds of purging, the ignition control box opens the gas valve and starts the ignition transformer sparking at the burner for 8 seconds. If no flame is detected, the ignition control box will

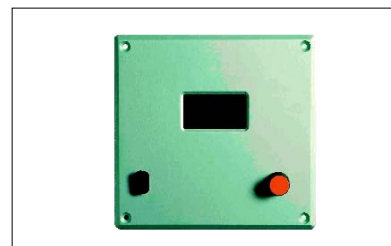


Figure 1 – Direct Digital Controller

close the gas valve and retry lighting after an inter-purge period of 30 seconds. The ignition control box will try a total of three times to light. The unit will stop if no flame has been established or detected after the 3 tries.

**Dual Gas Valve:** two gas valves in the same housing, electrically controlled, which positively stops gas flow when either closes.

**Flow Switch** monitors the chilled water flow and shuts down the unit when the water flow stops or drops to an insufficient level.



## 2.2 TECHNICAL DATA

PERFORMANCE RATINGS <sup>1</sup>		UNITS	AY00-119
Heating Capacity	Nominal	Btu/hr	110,900
Gas Input (HHV)	Nominal	Btu/hr	129,000
Ambient Operating Temperature	Maximum	°F	116.6
	Minimum	°F	-7.6
Inlet (to the unit) Hot Water Temperature	Maximum	°F	167
Outlet (to plant) Hot Water Temperature	Maximum	°F	185
Hot Water Flow	Nominal	GPM	8.81
	Maximum		14.1
	Minimum		6.60
Internal Pressure Drop		Feet of Head psi <sub>g</sub>	8.3
			3.6
ELECTRICAL RATINGS			
Required Voltage, 60 Hz, Single Phase <sup>2</sup>		V	208 - 230
Total Electrical Operating Consumption <sup>3</sup> (Unit only)		kW	.076
PHYSICAL DATA			
Unit Hot Water Volume <sup>6</sup>		Gallons	1.32
Hot Water Entering and Leaving Connections <sup>4</sup>		FPT	1" 1/4
Gas Inlet Connection		FPT	½
Electrical Entrance Knockouts, Diameter		Inches	7/8
Shipping Weight		Pounds	233
Operating Weight		Pounds	220
Dimensions	Width	Inches	15 - 1/8"
	Length		48 - 1/2"
	Height		50 - 1/2"

**Table 1 – AY00-119 TECHNICAL DATA**

**Notes:**

1. All illustrations and specifications contained herein are based on the latest information available at the time of publication approval. Robur reserves the right to make changes at any time without notice, in materials, specifications, and models or to discontinue models.
2. Units are factory-wired for 208-230 volts operation.
3. May vary by ±10% as a function of both power supply and electrical motor input tolerance.
4. Mono-ethylene glycol causes corrosion phenomenon in galvanized metal pipes.

## AY00-119 INTERNAL PRESSURE DROP

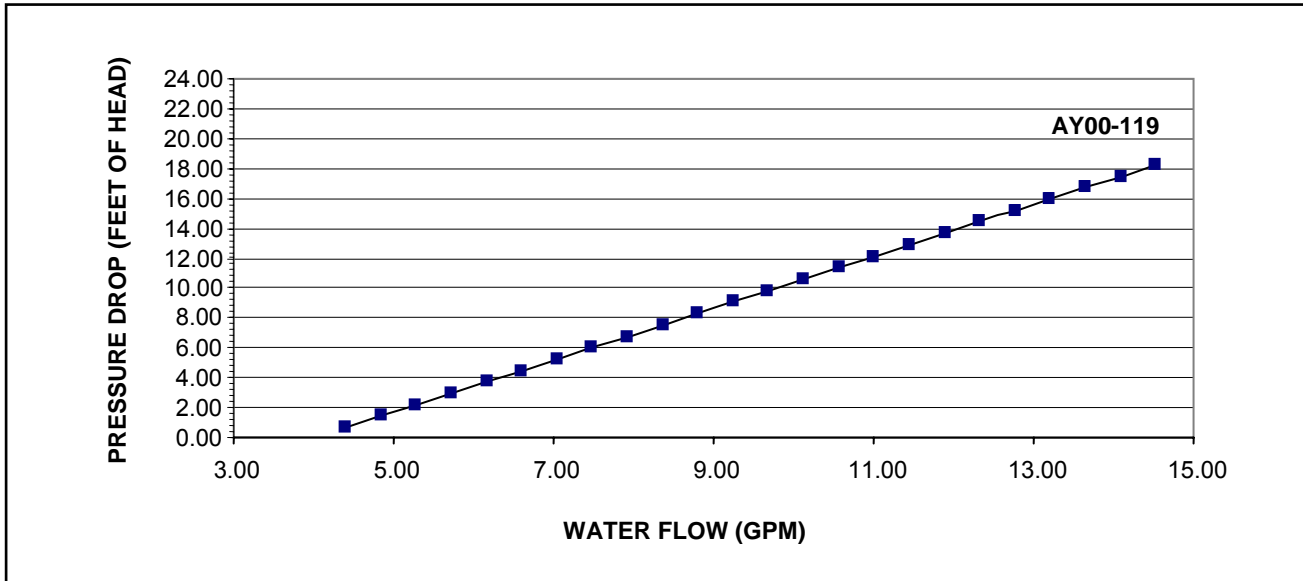


Figure 2 – AY00-119 INTERNAL PRESSURE DROP

## 2.3 DIMENSIONS

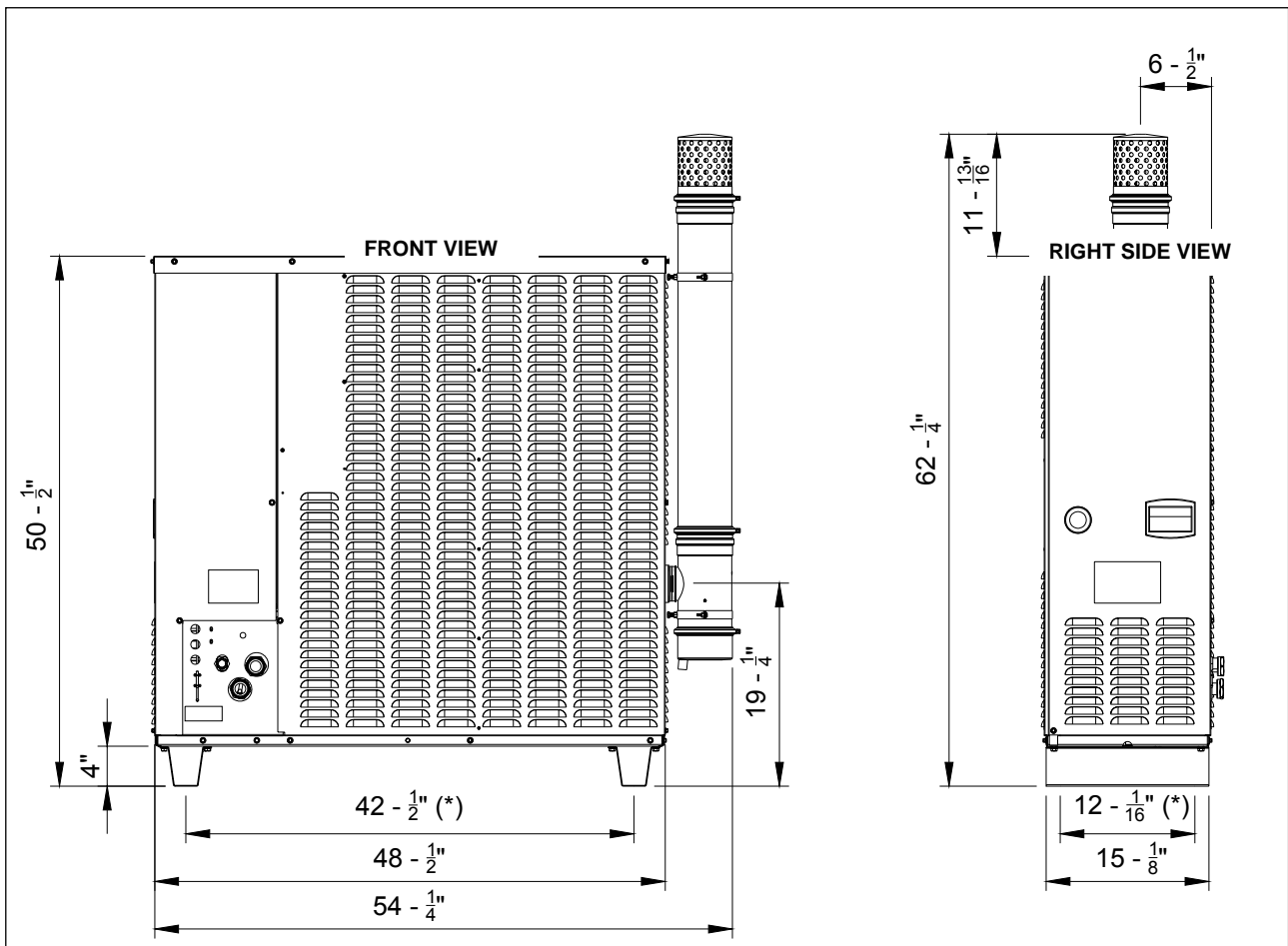


Figure 3 – AY00-119 DIMENSIONS. (\*) VIBRATION DAMPING POSITIONS

### 3. INSTALLATION

#### 3.1 GENERAL RULES

Only qualified technicians, in compliance with the manufacturer's instructions, should carry out the installation and maintenance of the AY00-119 unit. The installation of the appliance must conform to the requirements of the authority having jurisdiction or in the absence of such requirements, to the latest edition of the **National Fuel Gas Code, ANSI Z223.1**.

Where required by the authority having jurisdiction, the installation must conform to the **Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1**.

All wiring should be installed in accordance with the latest edition of the **National Electrical Codes, ANSI/NFPA No. 70**, and with any local codes.

**The manufacturer cannot be held responsible for any damages to persons, animals or goods due to improper, erroneous or irrational installation of these appliances.**

To ensure that correct installation and maximum unit performances are obtained, the following rules have to be followed:

- Unpack the unit carefully, checking that it has not suffered damage during transport. Each unit is factory tested before shipping, if damage is found report this immediately to the haulage contractor.
- **Each unit must be installed outdoors in an area of free natural air circulation** and does not require particular weather protection,  
**In no case must the unit be installed in a room.**
- The front and rear sides of the unit must have a **minimum clearance of 31-1/2" inches and 24 inches, respectively, (for safety, maintenance and servicing) from any combustible surface, walls or other stationary constructions. The left and right sides require a minimum distance of 18 inches.**
- Be sure that gas supply provided from the gas main meets the manufacturer's specifications. Inlet gas pressure to the unit must not exceed 14.0" W.C. on natural gas or propane gas. The minimum Inlet gas pressure at the unit is 5.0" W.C. on natural gas and 11.0" W.C. on propane gas.

#### WARNING

The electrical safety of the unit is obtained only when it is correctly connected to an efficient grounding system, which meets existing applicable safety standards. Never use gas supply piping to ground the appliances. The ground wire should be longer than power supply wires for safety reasons. If the power supply wires are accidentally stretched, the ground wire will be the last to break. By following this rule, good ground continuity will be assured.

## 3.2 INSTALLATION OF THE UNIT

### HANDLING OF THE UNIT ON SITE

When arriving at the installation site, visually inspect the unit for any signs of damage to the package, which may indicate possible unit damage.

Once on site, the units must remain in the factory packaging and only be unpacked at the moment before installation.

### LOCATION

The unit **must be installed outdoors** in an area of free natural air circulation; **no combustible construction shall be over the boiler.**

The boiler **shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service** (circulator replacement, condensate trap, control replacement, etc.).

**The installation inside a room or a building is not allowed.**

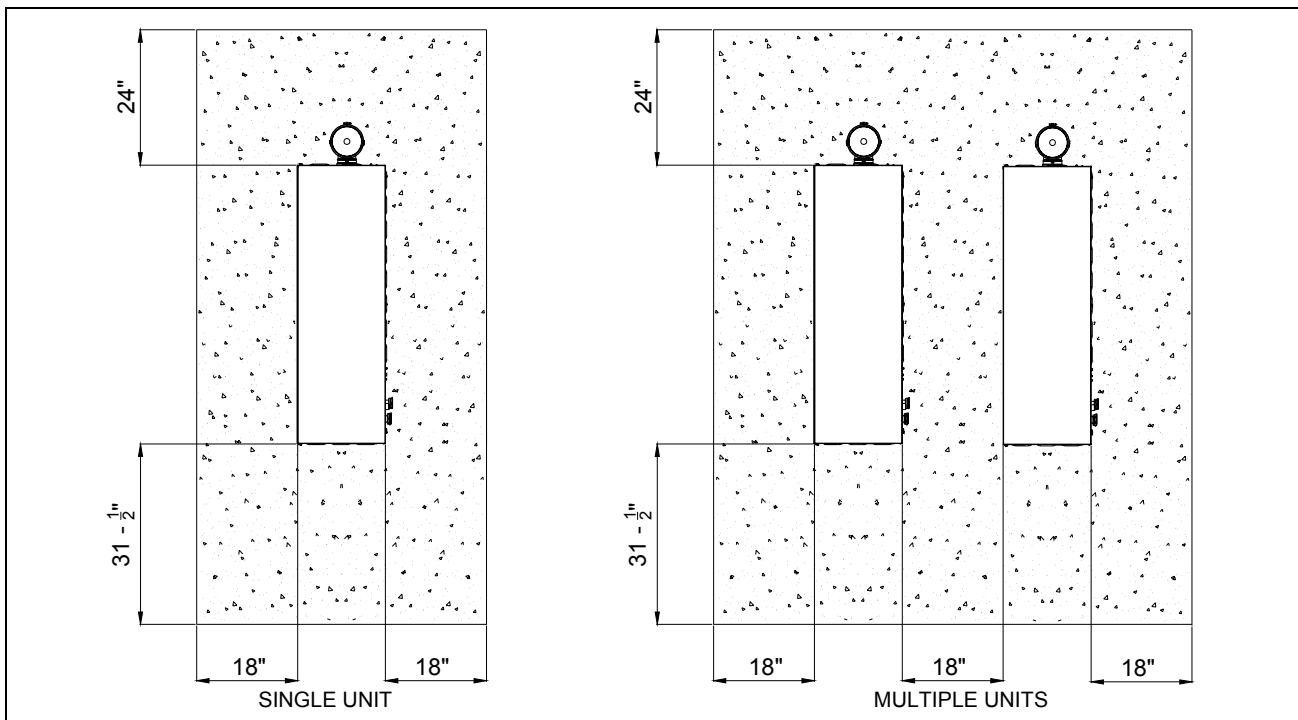
There must be a minimum clearance of 4 feet horizontally from electric meters, gas meters, regulators, and relief equipment and in no case located above or below these items unless a 4 feet horizontal distance is maintained.

**The unit can be installed at ground level, on a platform or on the roof (if it can withstand the weight).**

### CLEARANCES

A free space is to be provided around the unit to allow for servicing. The minimum clearance from walls, obstructions and other units should be as follows (see Figure 4).

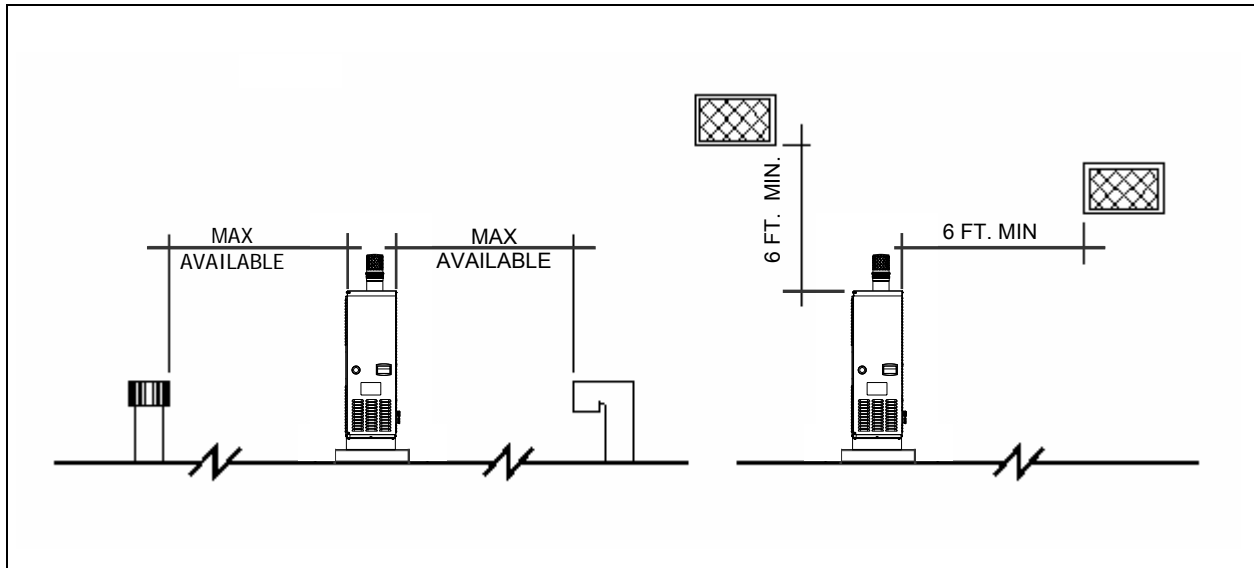
- right / left side: 18 inches
- rear side: 24 inches
- front side: 31- $\frac{1}{2}$  inches



**Figure 4 – CLEARANCES FOR CORRECT INSTALLATION OF THE UNIT**

The same clearances must be kept to combustibles for vent and hot water pipes

When the unit is installed in close proximity to buildings, keep the unit away from the roof edge drip line. In no case should the unit be placed within 6 feet of any external air intakes of the building. For installations on balconies or roofs, the unit should not be located near chimney flues, outlets and other such vents, so that the air necessary for the combustion is clean. (see Figure 5).



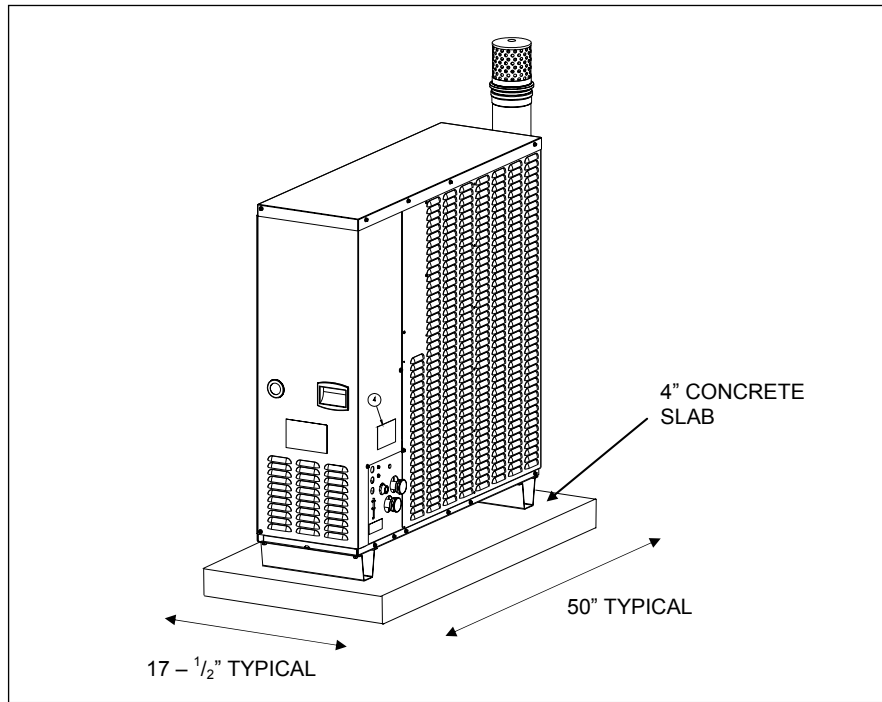
**Figure 5** – CLEARANCES FROM VENT OUTLETS, CHIMNEY FLUES AND AIR INTAKE OPENINGS

## GROUND INSTALLATION

Ground level units should be supported on a LEVEL concrete pad with a minimum thickness of 4" and slightly larger than the unit base (see Figure 6 for typical slab dimensions). Local soil conditions will actually dictate the slab thickness required to prevent shifting.

Do not allow the concrete slab touch the foundation of a structure. Unit operational noises can be transmitted inside the structure if they are connected.

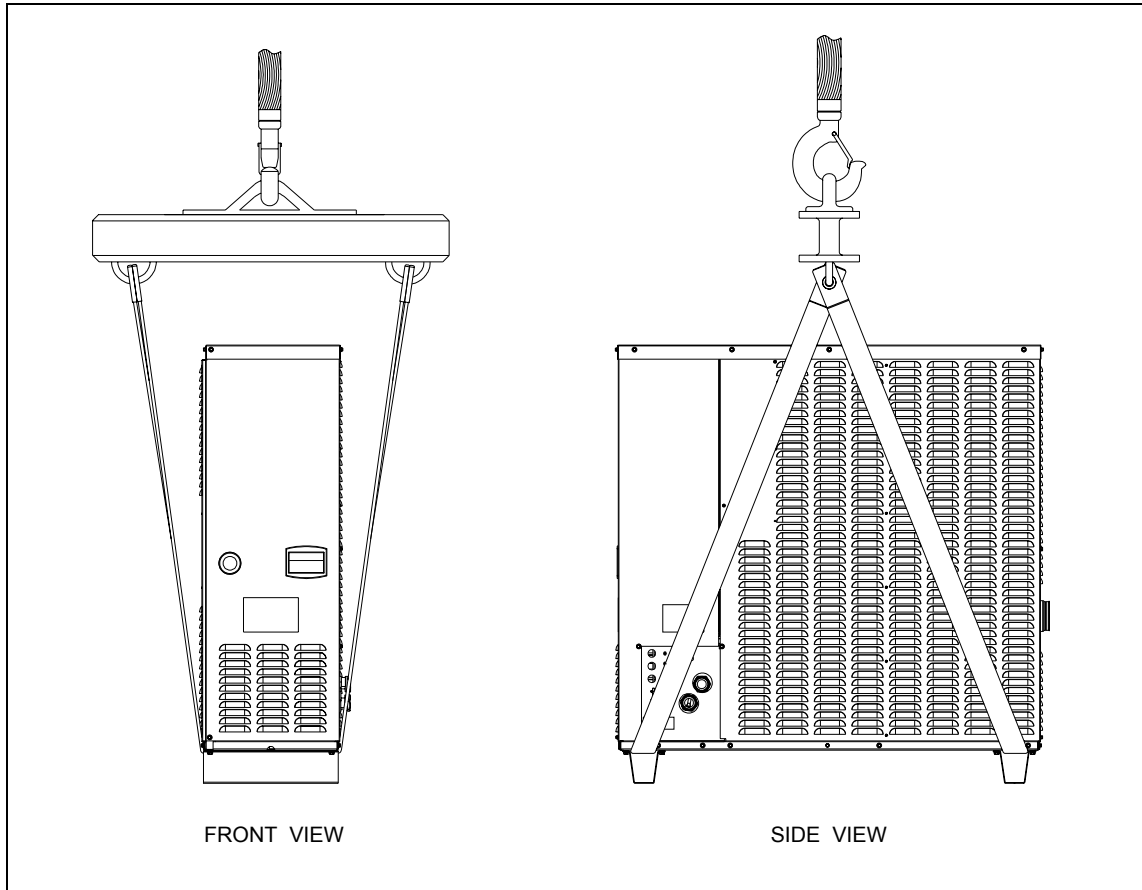
Ground level installations should use vibration-damping base supports, available from the factory. Another option is to use 4" thick concrete blocks positioned under the unit, instead of the factory base supports.



**Figure 6 – DIMENSIONS OF THE UNIT BED**

## ROOF / TERRACE INSTALLATION

If the unit must be lifted by a hoist for installation, leave it on the crate base. Attach hoist lines to the omega supports under the unit, and use spreader bars to prevent the hoist lines from damaging UNIT cabinet panels.



**Figure 7 – HANDLING OF THE AY00-119 UNIT**

Although approved for installation on a combustible base, the unit must not be installed directly on the roof surface. Use base supports for the installation (see Figure 6).

Both the unit and the supporting base weight should be sufficiently supported by the roof joists.

Provide for a gangway all around the unit for maintenance purposes.

Installation on roofs directly above sleeping quarters should be avoided if possible. If not possible, special consideration must be given to the transmission characteristics of the building structure. The use of vibration isolators under the equipment (acoustically insulated bases) and approved flexible connections (vibration-damping pipe fittings) between the unit and the system piping is recommended.

## LEVELING

The unit should be level both front to back and side to side. Place a level on the top of the unit to check for level. If the unit is not level, metal shims are recommended for use under proper corners to obtain level. If the shim(s) thickness exceeds 1/2", support shims should be inserted under the center of the unit.





## 4. HYDRONIC AND GAS INSTALLATION

### 4.1 WATER PIPING DESIGN AND INSTALLATION

Piping for the heater is to be designed and installed as a closed hydronic circuit.

#### WARNING

**A non-return valve has to be mounted just after the hydronic circuit pump, to prevent gravity circulation of the water.**

**An expansion tank must be installed on the circuit; it must be properly sized according to hydronic system size, maximum thermal expansion and maximum water pressure**

**When the boiler is used in connection with refrigeration system, it must be installed so the chilled medium is piped in parallel with the boiler, with appropriate valves to prevent the chilled medium from entering the boiler.**

The following items (not supplied) must be installed close to the unit:

- FLEXIBLE CONNECTIONS to avoid vibration transmission to the heater water lines.
- MANOMETERS to measure Inlet and Outlet pressure.
- WATER FILTER mounted in the water Inlet line to remove debris from the water line.
- WATER FLOW RATE VALVE for adjusting proper water flow rate.
- WATER PUMP properly sized for system.
- NON-RETURN VALVE just after the water pump, to prevent gravity circulation of the water.
- EXPANSION TANK properly sized according to the hydronic system size, maximum thermal expansion, and maximum water pressure.
- FILL VALVE for filling, draining or flushing the hydronic system.
- ON-OFF VALVES, on gas and water lines.
- AIR BLEED set at the highest point in the hydronic system for removal of air.

#### WATER FLOW AND ANTIFREEZE

#### WARNING

**To ensure the correct operation of the unit and to avoid the water freezing, add 10% by volume of mono-ethylene glycol (antifreeze) to the circulation water. Add more mono-ethylene glycol as needed for the minimum external temperature of the installation zone (see Table 3, page 39).**

When using an automatic water charge system, the mono-ethylene glycol percentage must be checked once a year; also, there must be correct water flow when the unit is operating and during the shut down period (600 seconds, between turning the burner off and complete shutdown of the appliance) to avoid overheating.

Piping (diameters of tubes etc.) must be sized appropriately in order to ensure the correct water flow necessary for the proper operation of the unit. The water lines should also be sized so the maximum velocity of the water/mono-ethylene glycol solution in the lines does not exceed 6 feet per second to avoid excessive noise.

When rigid pipes are used, it is recommended to use flexible connections between the unit and piping to avoid vibration transmission.

All piping must be properly insulated according to federal and local codes to avoid thermal losses. All seams and joints should be carefully made so as to be air and water tight.

For size of water connections on the unit, refer to TECHNICAL DATA sheet (2.2)

**NOTE**

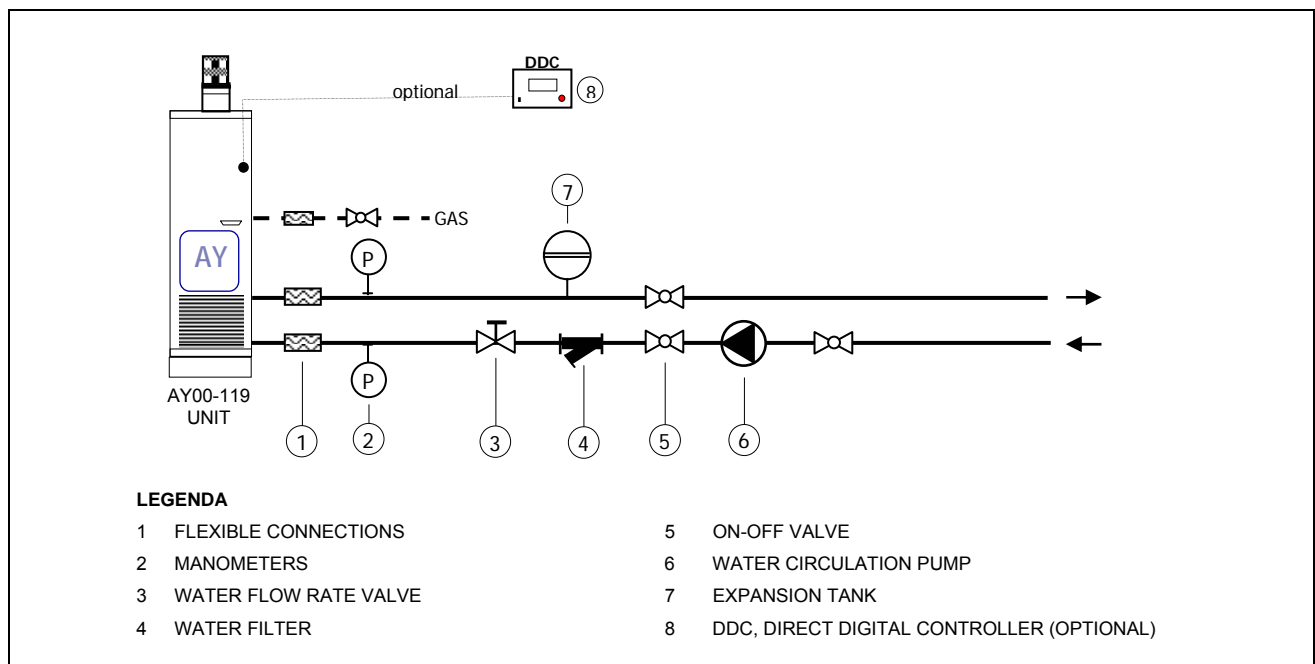
The AY00-119 unit doesn't produce directly hot sanitary water for domestic use. If the unit has to be used to produce hot sanitary water it is necessary to foresee a remote boiler with storage; glycol type in the sanitary hydronic system has to be proper for sanitary use.

It's necessary to always and steadily guarantee the requested water flow for each unit, both during unit operation and shut-off period (600s).

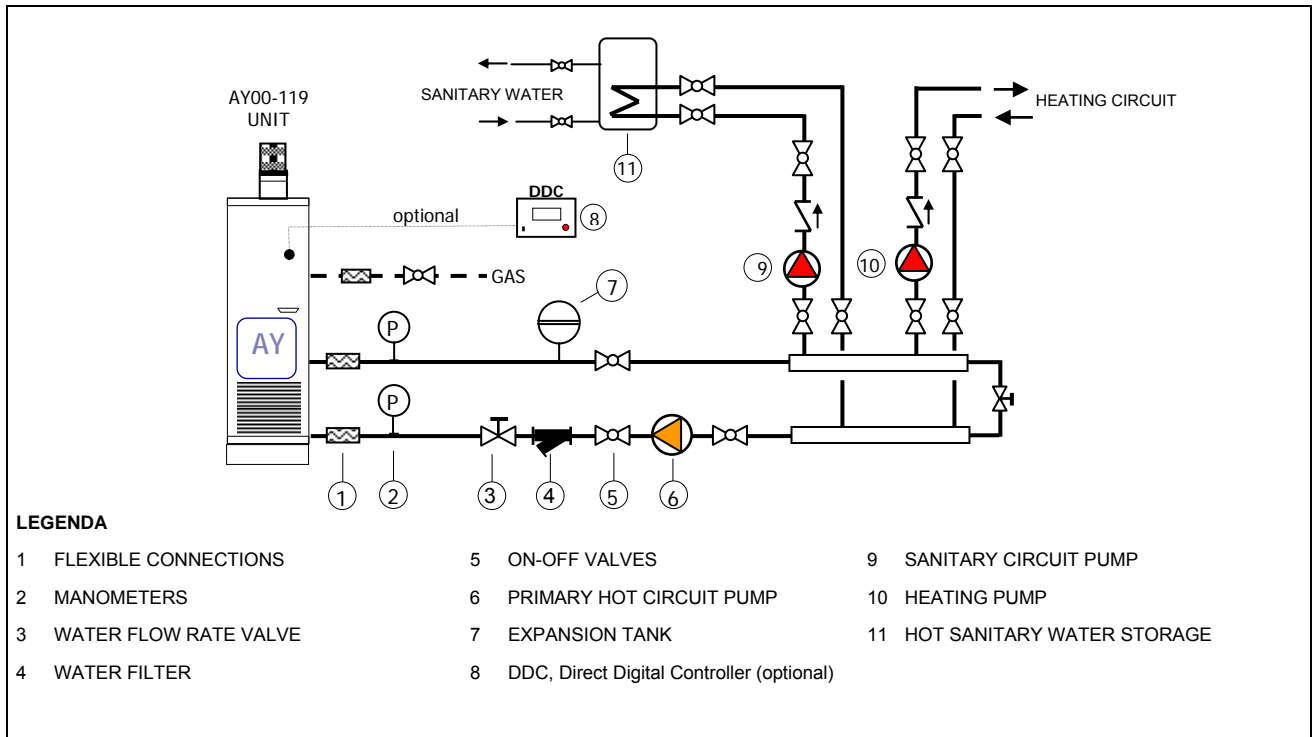
Pipes and pump dimensioning must guarantee the correct nominal water flow necessary for proper unit operation. Unit pressure drops are reported in the

Table 1, page 7.

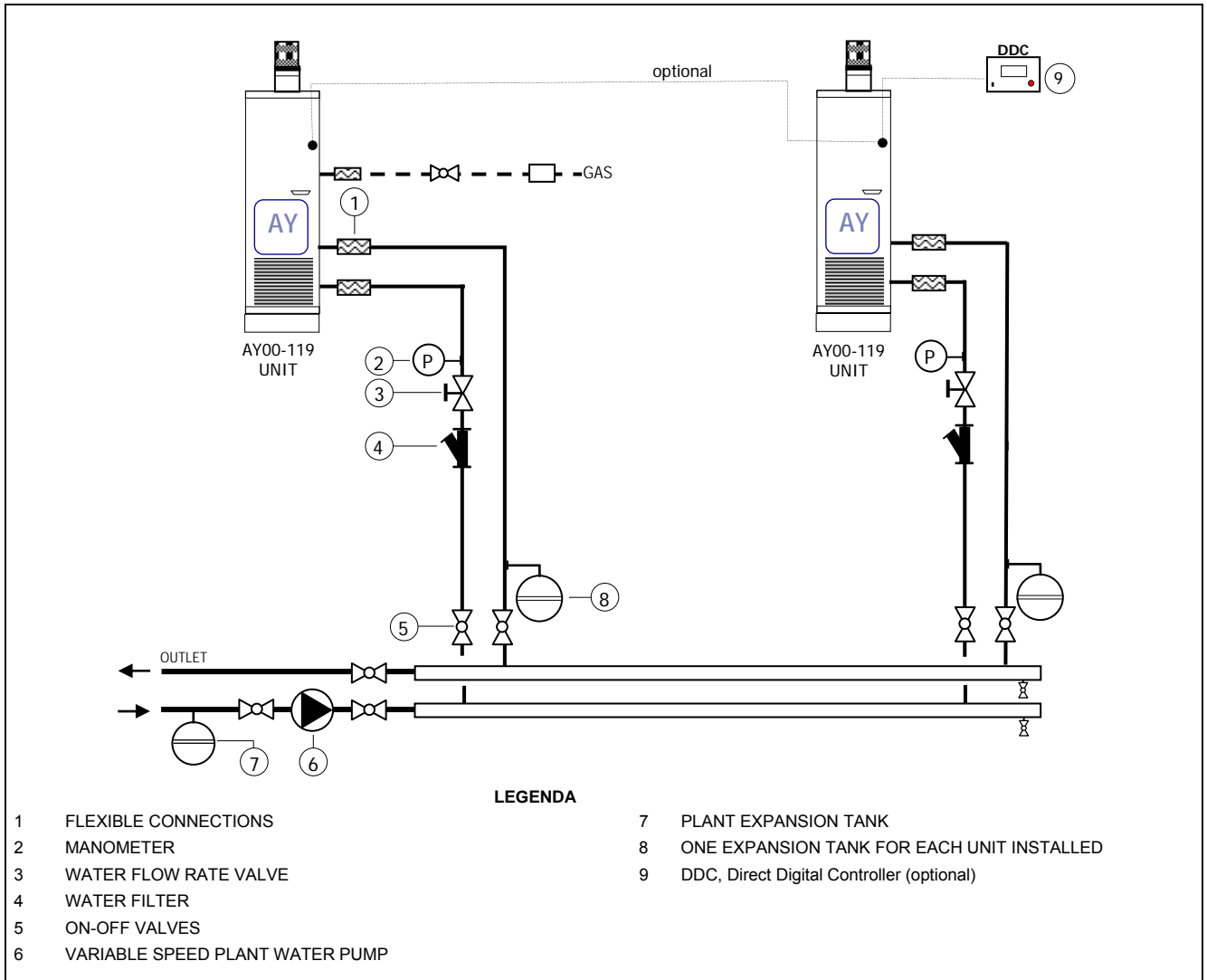
Here below the hydraulic schemes. See picture captions for details.



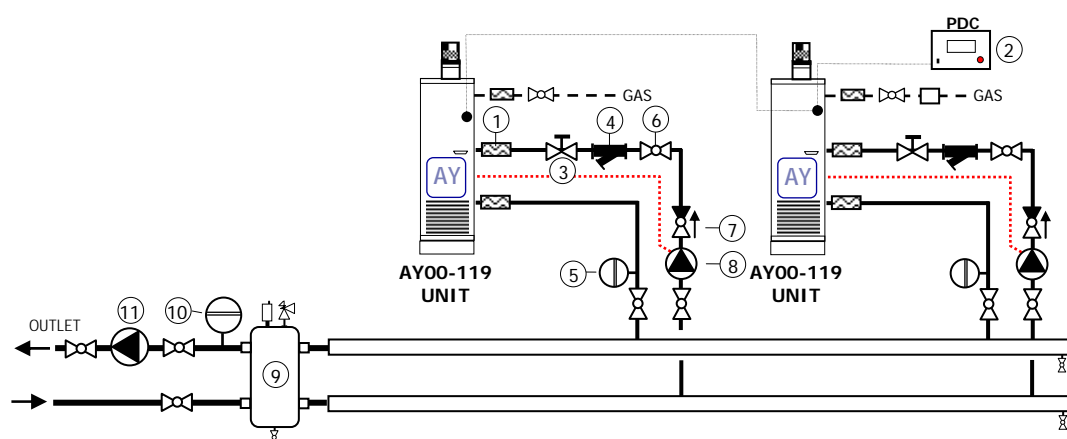
**Figure 8 – SINGLE AY00-119 UNIT, HEATING ONLY HYDRAULIC SCHEME**



**Figure 9 –** SINGLE AY00-119 UNIT, HEATING HYDRAULIC SCHEME WITH REMOTE BOILER FOR HOT SANITARY WATER PRODUCTION.



**Figure 10-** 2 AY00-119 UNIT, HEATING HYDRAULIC SCHEME WITH 1 VARIABLE SPEED PLANT WATER PUMP.



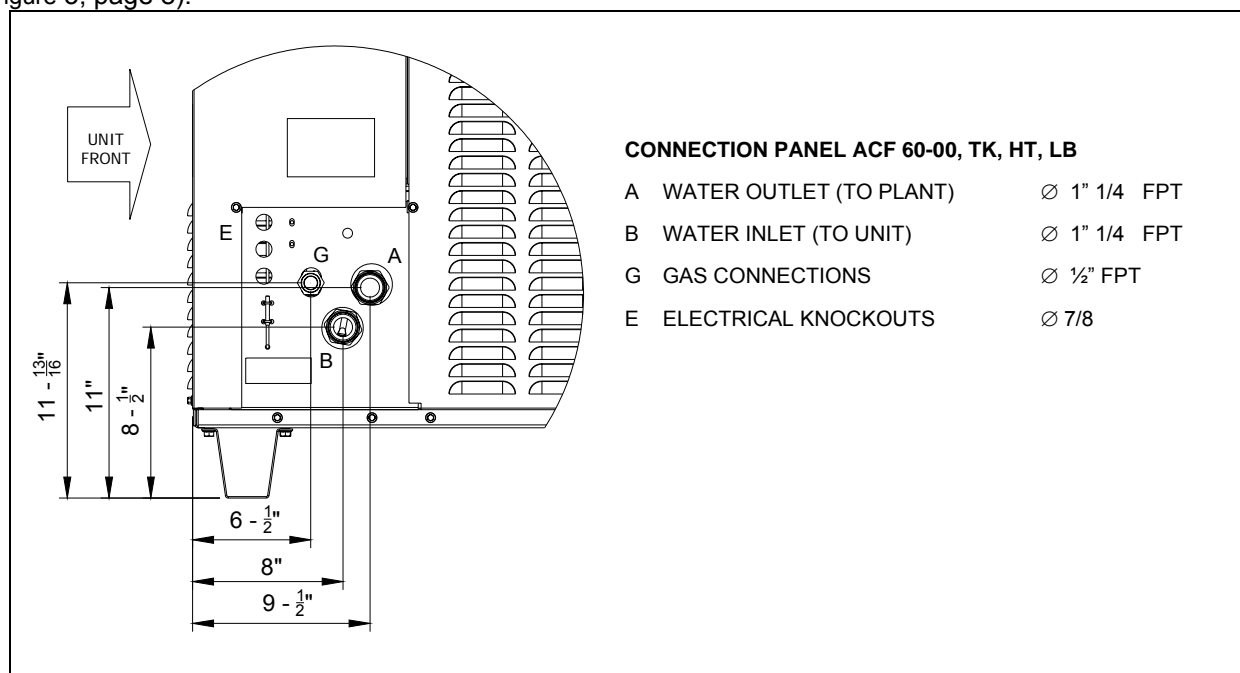
#### LEGENDA

- |  |   |
|--|---|
| 1 FLEXIBLE CONNECTIONS                             | 7 NONRETURN VALVE                           |
| 2 DDC, Direct Digital Controller (optional)        | 8 SINGLE UNIT PRIMARY CIRCUIT WATER PUMP    |
| 3 WATER FLOW RATE VALVE                            | 9 WATER STORAGE / HYDRAULIC SEPARATOR *     |
| 4 WATER FILTER (filter mesh: min 0.03"; max 0.04") | 10 SECONDARY CIRCUIT EXPANSION TANK         |
| 5 ONE EXPANSION TANK FOR EACH UNIT INSTALLED       | 11 SECONDARY CIRCUIT WATER CIRCULATION PUMP |
| 6 ON-OFF VALVES                                    |   |

\* 4 connection tank (with 43.5 PSI safety valve, air bleed and drain tap), acting as hydraulic separator

**Figure 11 – 2 AY00-119 UNIT, HEATING HYDRAULIC SCHEME WITH 2 PRIMARY PLANT WATER CIRCULATION PUMPS (one pump for each unit installed).**

The connections for water and gas piping are located at the service plate on the right-side of the heater (see Figure 3, page 8).



**Figure 12 – AY00-119 SERVICE PLATE DIMENSIONS**

## 4.2 GAS SUPPLY PIPING

All gas piping must conform to the latest edition of **National Fuel Gas Code ANSI Z223.1** and all local gas piping codes. Your gas utility must be contacted regarding local requirements, type and size of gas lines. Safe lighting and other performance criteria were met with the gas manifold and control assembly provided on the heater. For Natural Gas the minimum Inlet gas pressure to the heater is 5" W.C. and the maximum is 14" W.C. For Propane Gas the minimum Inlet gas pressure to the heater is 11" W.C. and the maximum is 14" W.C.

For size of gas connection to the unit, see Figure 12.

### WARNING

Gas supply pressure higher than those stated above could damage the gas valve, resulting in a fire hazard.

Vertical gas piping must be trapped and a means provided to drain condensate that may accumulate in the piping during the cold season. Insulation may also be necessary for the gas piping to prevent excessive accumulations of condensate.

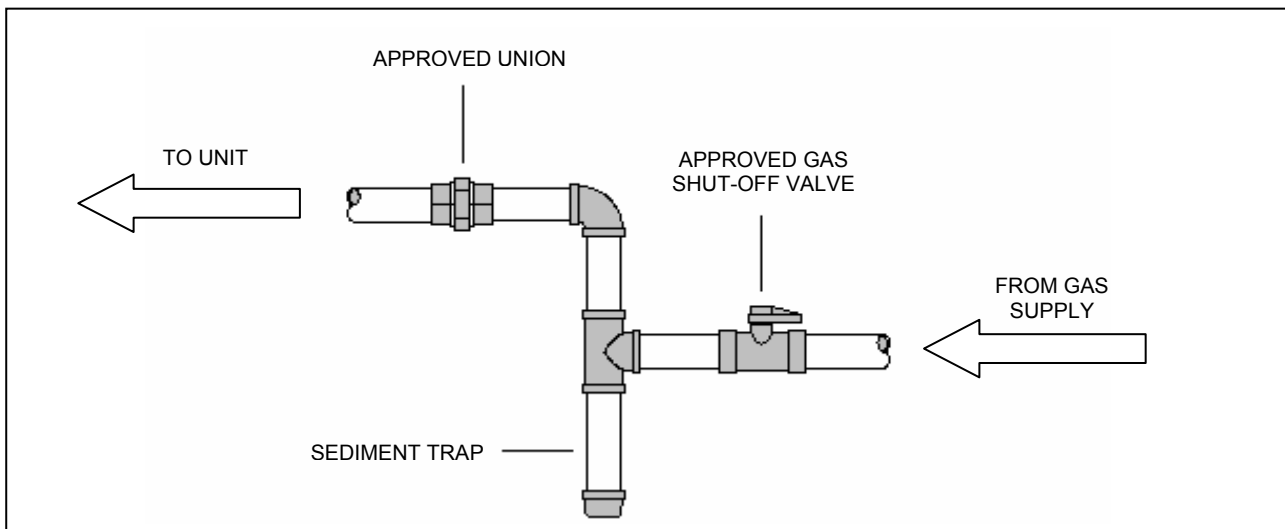
An approved union should be installed in the gas line near the unit and down stream of any external shut-off valve that may be required by local codes.

Be sure to use materials resistant to the LPG corrosive action when making pipe connections. Use an approved sealing compound resistant to propane gas on all male pipe threads.

**The heater and its gas connections must be leaked tested before placing the unit in operation.**

The heater and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of the gas piping system at test pressures **in excess of 1/2 psig.**

The heater must be isolated from the gas supply piping system by closing its individual shut-off valve during any pressure testing of the gas piping system at test pressures **equal to or less than 1/2 psig.**



**Figure 13 – TYPICAL GAS CONNECTION**

### 4.3 DUCT FLUE EXHAUST

The AY00-119 heater has a forced-draught design. When the installation requires a flue for the exhaustion of the products of combustion, this shall be done according to the standards in force.

In the following Table the necessary data for exhaust duct dimensioning:

<b>NATURAL GAS COMBUSTION</b>	Flue flow	SCF	1750
	Flue temperature	°F	293
	CO <sub>2</sub> %	—	9.2
<b>LPG COMBUSTION</b>	Flue flow	SCF	1522
	Flue temperature	°F	284
	CO <sub>2</sub> %	—	11.3

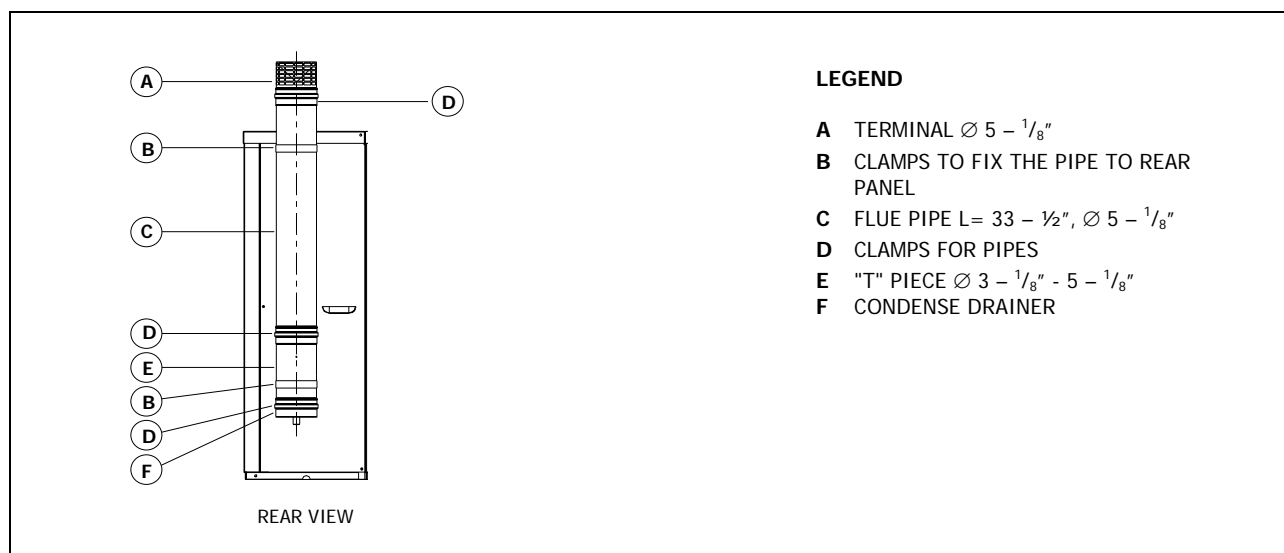
**Table 1** – AY00-119 UNIT FLUE FLOW AND TEMPERATURE

Units are supplied with Flue system Kit which is to be mounted as shown in Figure 14, page 21:

- 1 flue pipe L= 33 – 1/2"; Ø 5 – 1/8";
- 1 "T" piece Ø 3 – 1/8" - 5 – 1/8";
- 1 condense drainer Ø 5 – 1/8";
- 1 terminal Ø 5 – 1/8";
- 2 clamps to fix the pipe to rear panel;
- 3 clamps for pipes;

To install flue system proceed as follows:

- position 2 clamps that fix the pipe to the rear panel of the unit by means of holes;
- use 1 clamp for pipes and mount condense drainer to "T" piece; after that insert "T" piece in the Ø 3 – 1/8" flue pipe already mounted on the heater;
- use 1 clamp for pipes and mount exhaust flue pipe with L=33 – 1/2" to "T" piece;
- bloc "T" piece and flue pipe with 2 clamps that are already fixed to the rear panel of the unit;
- position flue terminal using a clamp for pipes;
- check the fixing of the elements;



**Figure 14** – FLUE EXHAUST TERMINAL





## 5. ELECTRICAL CONNECTION

### 5.1 POWER SUPPLY AND PUMP WIRING FOR A SINGLE AY00-119 UNIT

All wiring should be installed in accordance with the latest edition of the **National Electrical Codes, ANSI/NFPA No. 70**, and with any local codes.

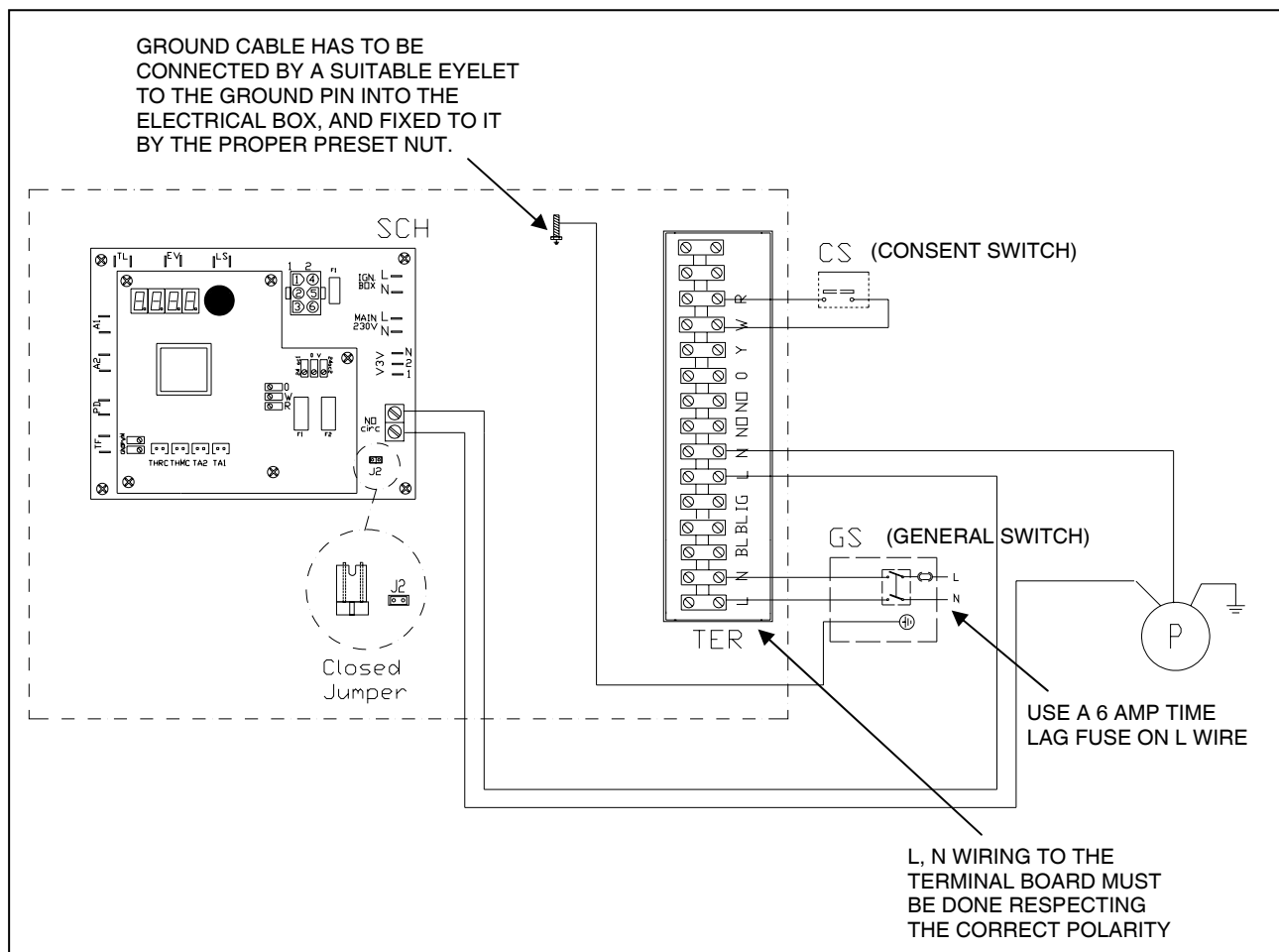
The UNIT electrical system is wired for single-phase, 208-230 volt and 60Hz operation. The electrical control box includes a 208 – 230 - 24 volt transformer to supply low voltage to the control system. The high voltage line connections to be made at the time of installation consists of connecting 208-230 volt, 60 Hz to the high voltage terminal board of the control panel. A fused disconnect switch should be installed in the 208-230 volt supply line within sight of and not over 50 feet from the unit.

#### NOTE

- An error in wiring installation could cause problems during the UNIT operation and could damage the electrical components of the appliance.
- The unit must be electrically grounded in accordance with national requirements.
- The power supply line must not be used to turn the unit "ON" or "OFF". The dedicated control switch in the R-W line is for this purpose.
- Disconnect the power supply lines only when assured that unit is completely shut off.

#### WARNING

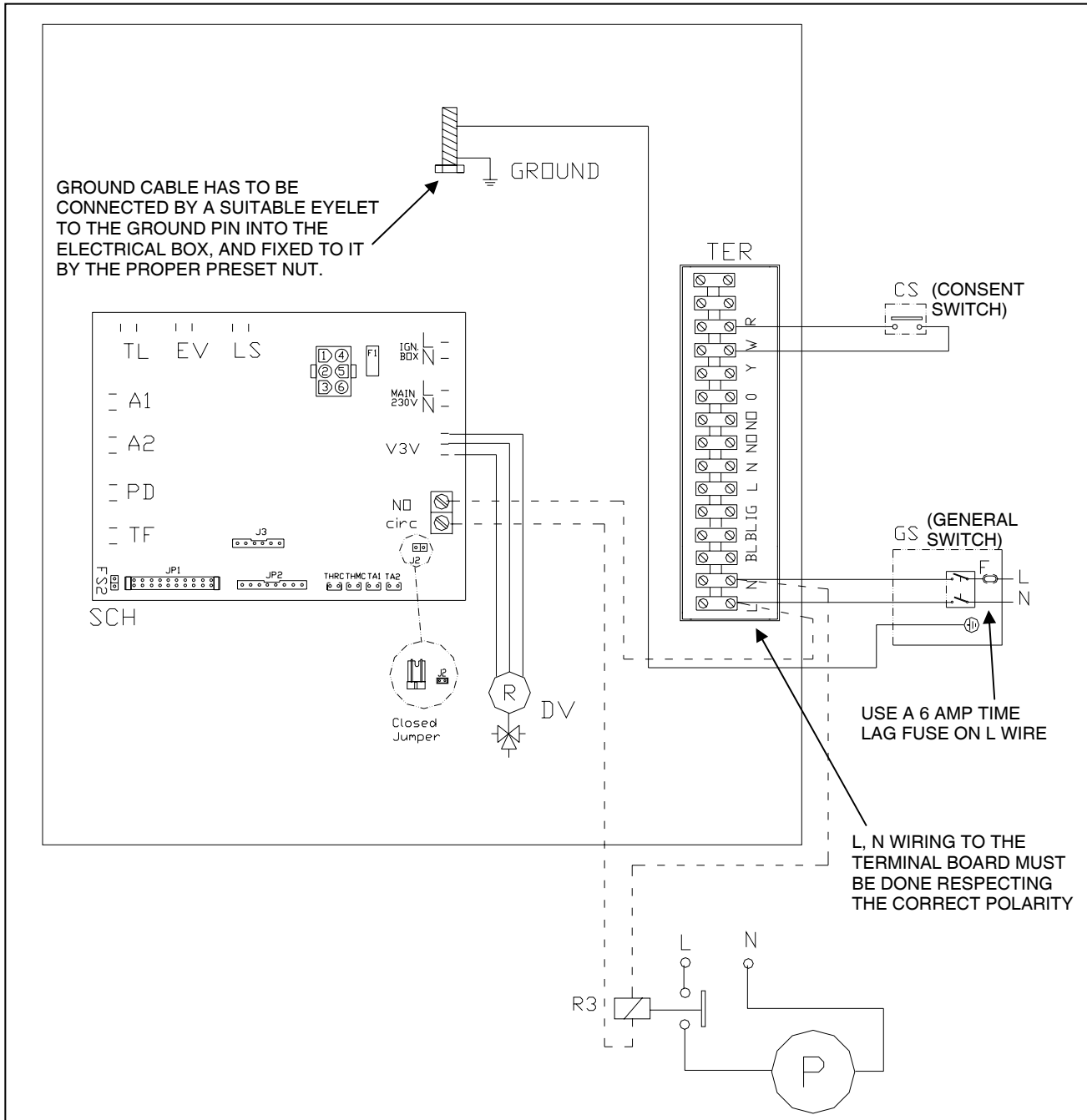
**DO NOT OPERATE** the unit unless the water system is filled with water.



**Figure 15 – WIRING FOR A SINGLE AY00-119 UNIT WITH PUMP ABSORBED CURRENT LESS THAN 4 AMP.**

**WARNING**

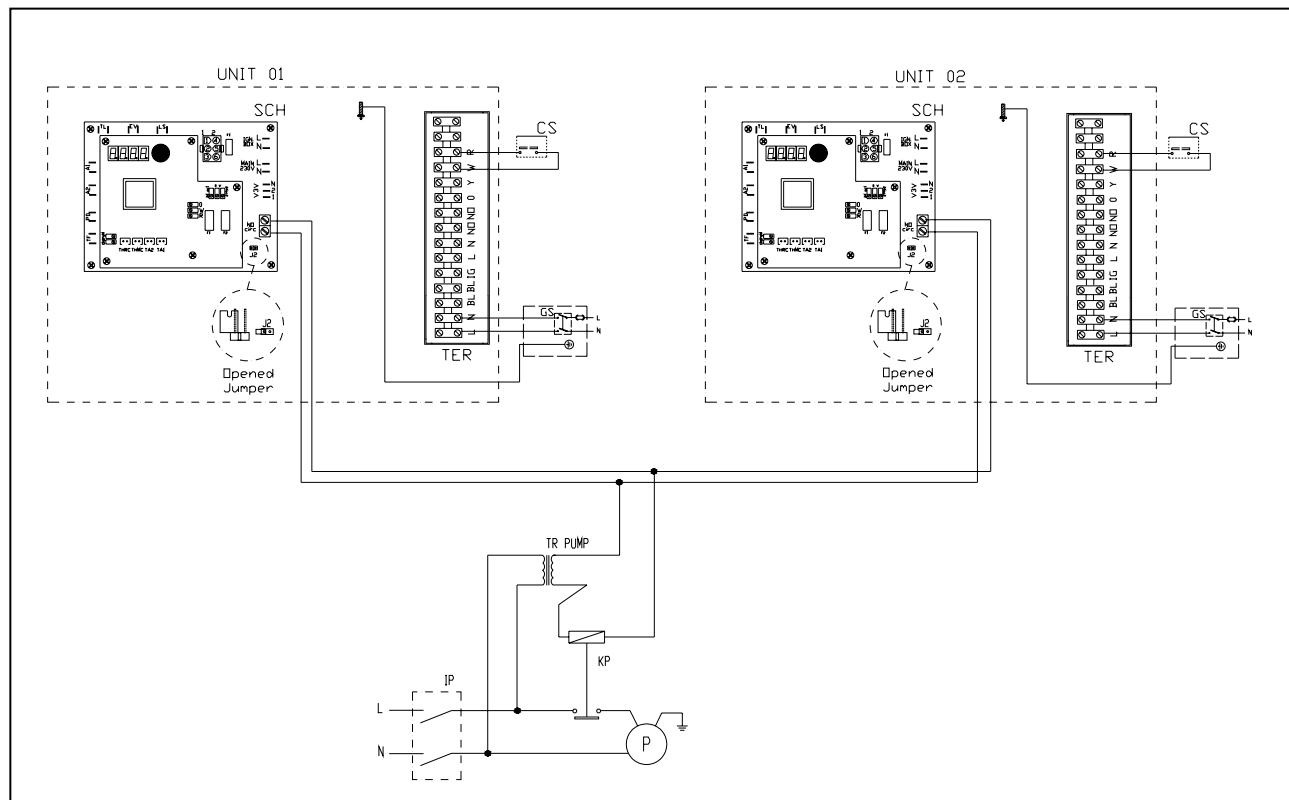
If power for the water pump is taken from the high voltage terminal block located in the electrical control box, the minimum circuit Ampacity for the unit must be increased to accommodate the additional current draw of the water pump installed. **The maximum current carrying capacity of the N.O. Contact is 4A.** If the current is above 4A, use an additional relay controlled by N.O. contact on the control board.



**Figure 16 – WIRING FOR A SINGLE AY00-119 UNIT WITH PUMP ABSORBED CURRENT MORE THAN 4 AMP.**

## 5.2 POWER SUPPLY AND PUMP WIRING FOR 2 OR MORE AY00-119 UNITS

The figure shows typical wiring for 2 or more AY00-119 units. The transformer is required to feed N.O. contacts with low voltage current; this is done for safety reasons: when doing maintenance and a unit is shut off, these contracts could still remain fed. In this case, no matter if pump current absorption is more or less than 4 amp.



**Figure 17 – PUMP WIRING FOR 2 AY00-119 UNITS WITH LOW VOLTAGE TRANSFORMER**

### 5.3 CONSENT SWITCH WIRING AND THERMOSTAT LOCATION

#### CONSENT SWITCH WIRING

If no DDC is used, a consent switch that provides an ON/OFF function is to be connected to the R and W on the terminal board in the control box. This wiring will carry 24-volt current and it is recommended to use a cable with the correct number of color-coded 18 AWG wires.

#### WARNING

**An isolation relay MUST be used to separate the heater's transformer from any additional equipment having a transformer or damage to the AY10 board will occur.**  
**Isolation relays must have a 24-volt AC coil, which does not present more than a 0.25 amp load to the control circuit.**

#### THERMOSTAT LOCATION

If the control switch is a thermostat, the thermostat should be located on an inside wall about 54 inches above the floor. It should be located so that it will not be affected by any of the following items:

- Discharge air from a supply grille
- Drafts
- Direct sunlight through a window or glass door
- Electrical Appliances such as television, radio or lamps.

The thermostat should be located so that it senses the average temperature of the conditioned space. The thermostat should be mounted according to the manufacturer's instructions (packaged with the thermostat).

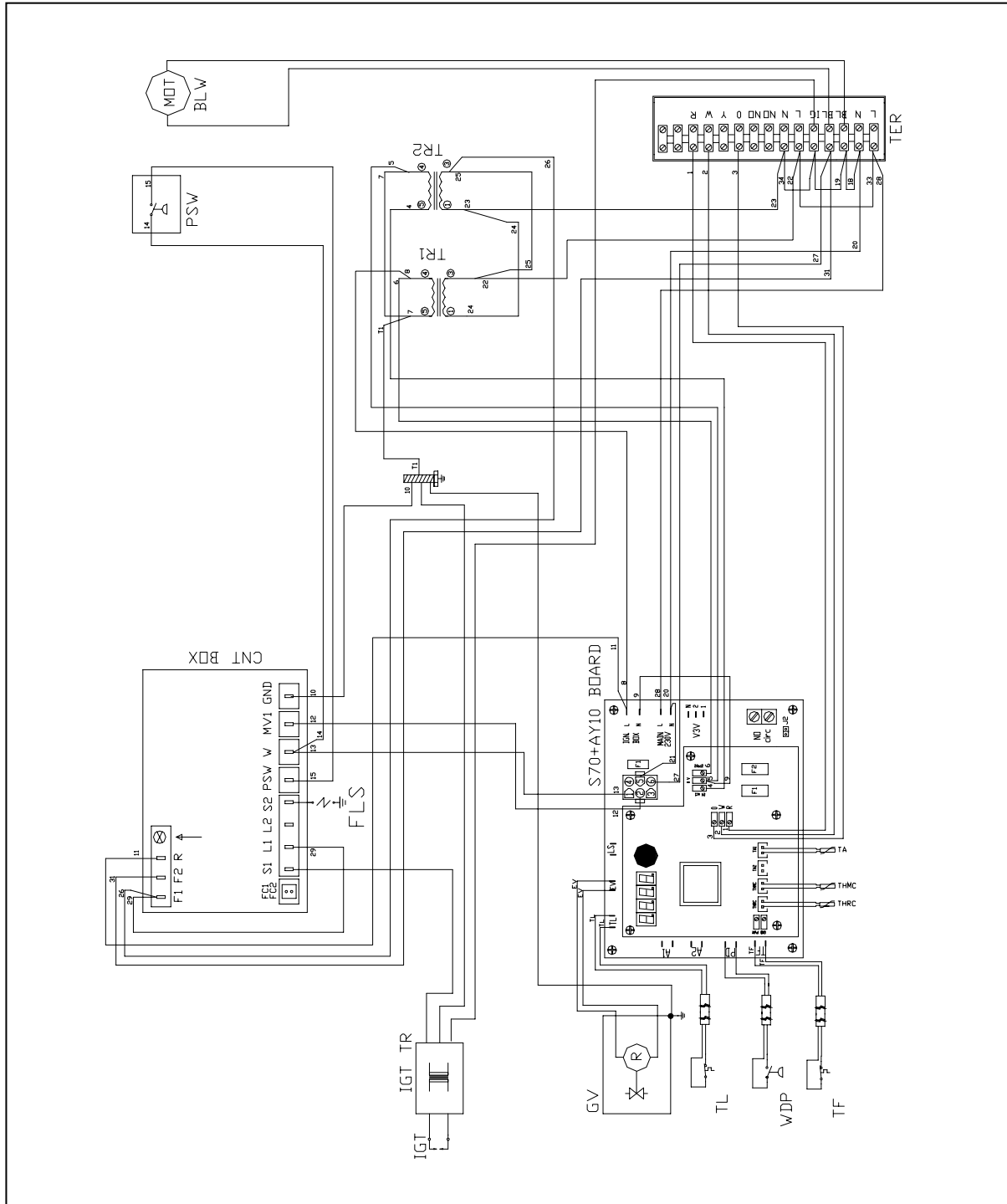
**THERMOSTATS USING A MERCURY BULB SWITCH MUST BE LEVEL.** If the thermostat has a built-in heating anticipator, this must be set as required by the heating unit load.

## 5.4 AY00-119 WIRING DIAGRAM

If any of the original wire as supplied with the unit must be replaced, it must be replaced with thermoplastic 221°F wire, except ground, high temperature and pressure switch wires 392°F or equivalent.

Igniter and flame sensor wire have to be replaced with Robur spare parts (see Section 9, page 46).

**Label all wires prior to disconnection when servicing the controls.** Wiring errors can cause improper and dangerous operation.



**Figure 18 – WIRING DIAGRAM FOR AYF00-119.**

## 5.5 CONNECTION WITH DDC

### WARNING

For further details and/or information on the DDC, please refer to the specific DDC installation, programming and use manual.

To well manage one or more AY00-119 units connected to the same hydronic system, it is important to use the DDC, available as accessory. In such a case It is necessary to:

- Connect the DDC to the power supply (see “DDC: Electric supply wire connection”)
- Use a CAN-BUS wire to make a connection between the units and the DDC (see “Connection of DDC to the unit”)

### DDC: Electric supply wire connection

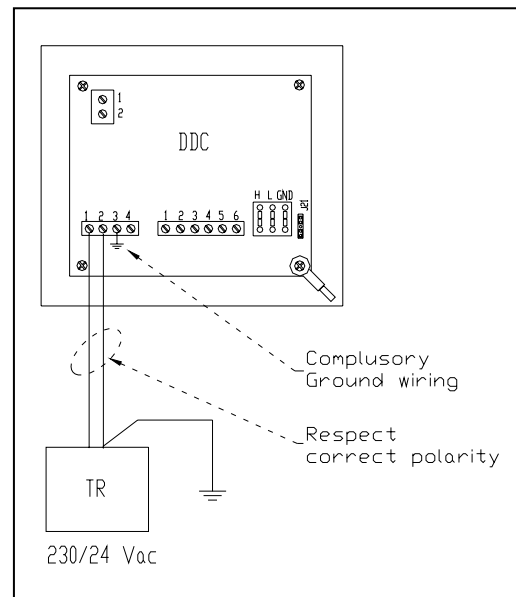
The DDC should be electrically supplied through a safety transformer 230 /24 V.a.c. – 60 Hz. With minimum power equal to 20 VA.

Use an electric supply wire (min. 2x18 AWG) and the 4 terminals connector of the DDC (placed at bottom left, back side) to make the connection as in Figure 1, respecting the following polarity:

- terminal 1 = 24 V;
- terminal 2 = 0 V;
- terminal 3 = ground

**Warning:** in all cases terminal 3 of the DDC terminals connector should be connected to one safety ground ( $\leq 0,1\Omega$ ).

The DDC is also equipped with a plug battery which, in case of black out, stores in its memory the programmed values; **the plug battery lasts approximately 7 years**, then it should be changed by **authorized Service Engineer (TAC)**.



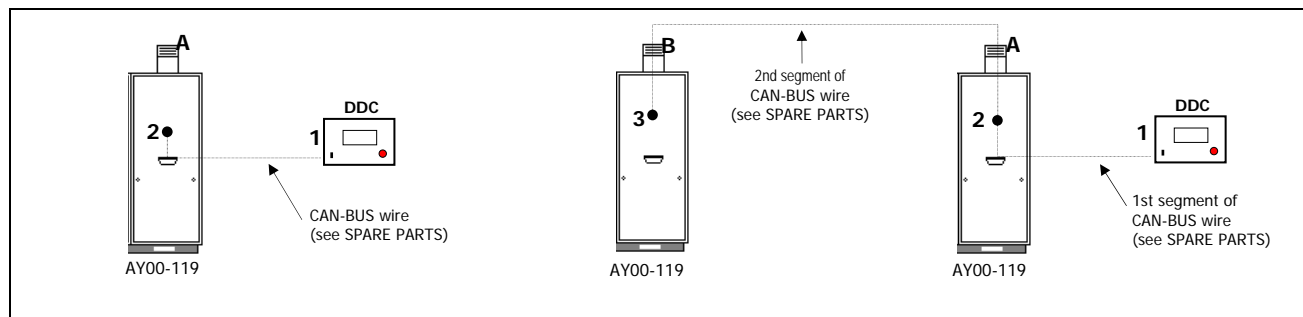
**Figure 1 – ELECTRICAL SUPPLY WIRE CONNECTION**

### Connection of DDC to the unit

The connection between DDC and the unit (or more units) is made through a CAN-BUS wire, in a way to create a parameters communication network, characterized by one series of “n” nodes (see Figure 2). The parameters communication network can connect max 3 DDC.

### NOTE

Every single object (AY00-119 unit or DDC) at its connection to the communication network is intended to be a *node*. Every network is composed of 2 *terminal nodes* and of a certain number of *intermediate nodes*.



**Figure 2 –** EXAMPLE: CONNECTION OF DDC TO SINGLE AY00-119 UNIT (2 nodes network) AND TO N.2 AY00-119 UNITS CONNECTED ON THE SAME HYDRONIC SYSTEM (3 nodes network).

### CAN-BUS wire connection

If the network connection is max 650 ft cable long and has max 6 nodes (e.g.: 5 AY00-119 + 1 DDC) a simple shielded wire 3 x 18 AWG is required.

For major lengths, the CAN-BUS wire should be compatible with **Standards Honeywell SDS**.

The next Table shows some examples of these wires, according to the total length of the wire itself:

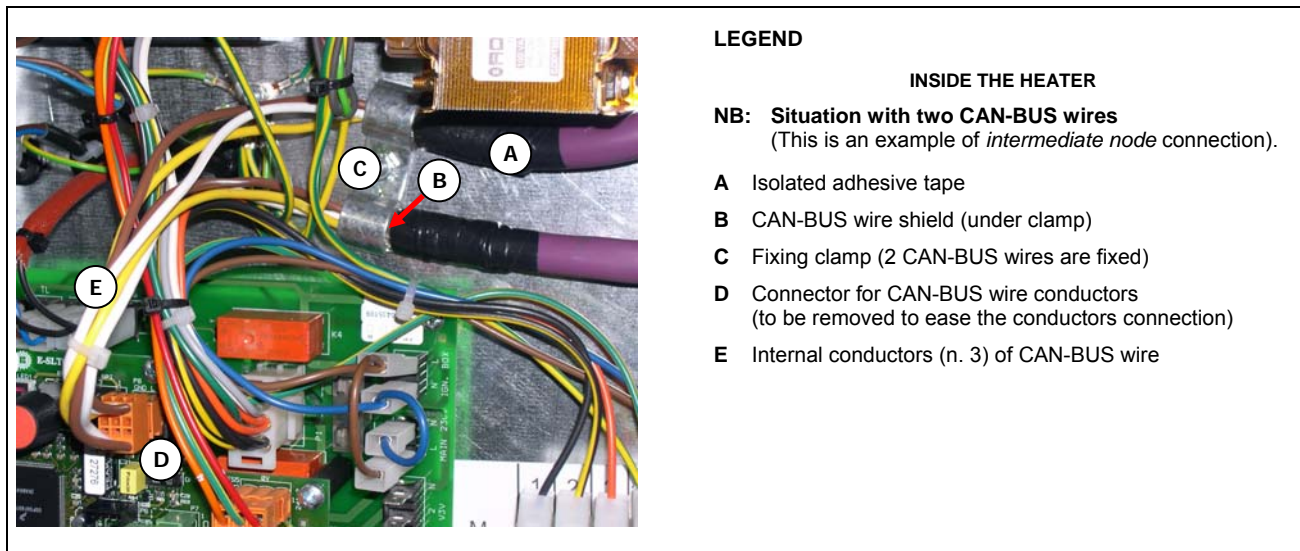
CABLE TYPE AND MODEL	COLOR AND SIGNAL			MAX DISTANCE COVERED ft
ROBUR NETBUS	BLACK = H	WHITE = L	BROWN = GND	1475
Honeywell SDS 1620				
BELDEN 3086A	BLACK = H	WHITE = L	BROWN = GND	1475
TURCK type 530				
DeviceNet Mid Cable				
TURCK type 5711	BLUE = H	WHITE = L	BLACK = GND	1475
Honeywell SDS 2022				
TURCK type 531	BLACK = H	WHITE = L	BROWN = GND	656

**Table 2 -** EXAMPLE OF TYPES OF WIRES USED FOR CAN-BUS

**NOTE: “GND” is the common signal wire, and NOT a ground connection.**

Take the CAN-BUS wire of suitable length for the connection between DDC and the unit and, for each network or CAN-BUS wire segment (from a node to another) cut wire sheath from both terminals for about 3” and connect them to the proper nodes, on the electronic control board (AY10) or on DDC.

• **CAN-BUS wire connection to Electronic Control Board**



**Figure 3 – EXAMPLE OF CAN-BUS CONNECTION TO ELECTRONIC CONTROL BOARD (EXAMPLE WITH TWO CAN-BUS WIRES)**

1. Turn over the whole CAN-BUS shield (the aluminum part or the metal braiding) of the cut sheath part and fix it to the clamp (details B and C, Figure 3)

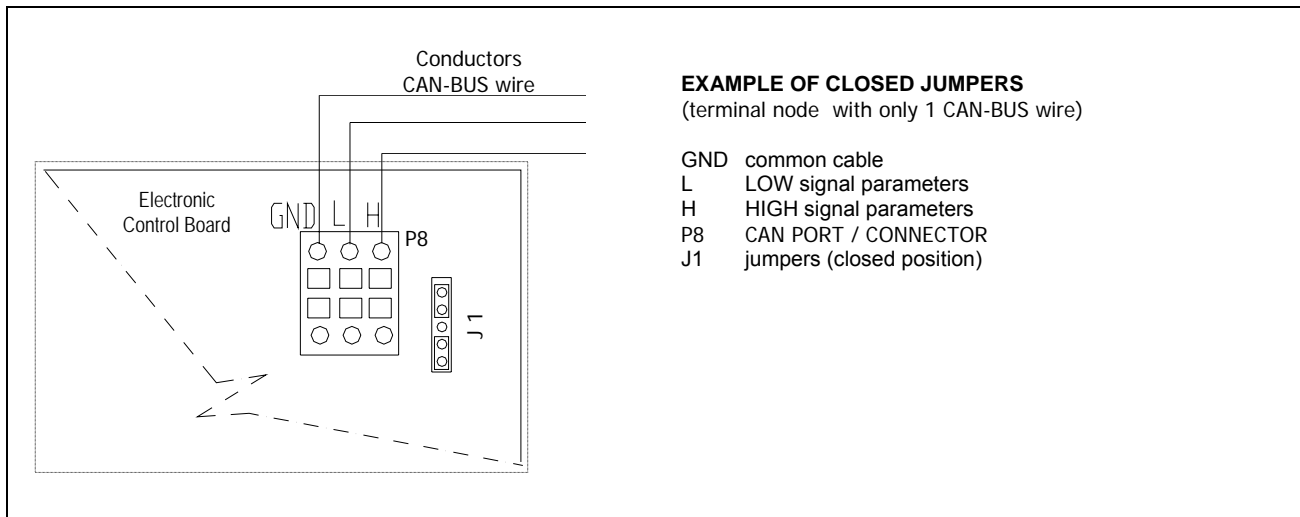
**WARNING**

Isolate the whole shielded part of CAN-BUS wire after fixing clamp to avoid any contact between the shield and the electronic control board (Particular A, Figure 3).

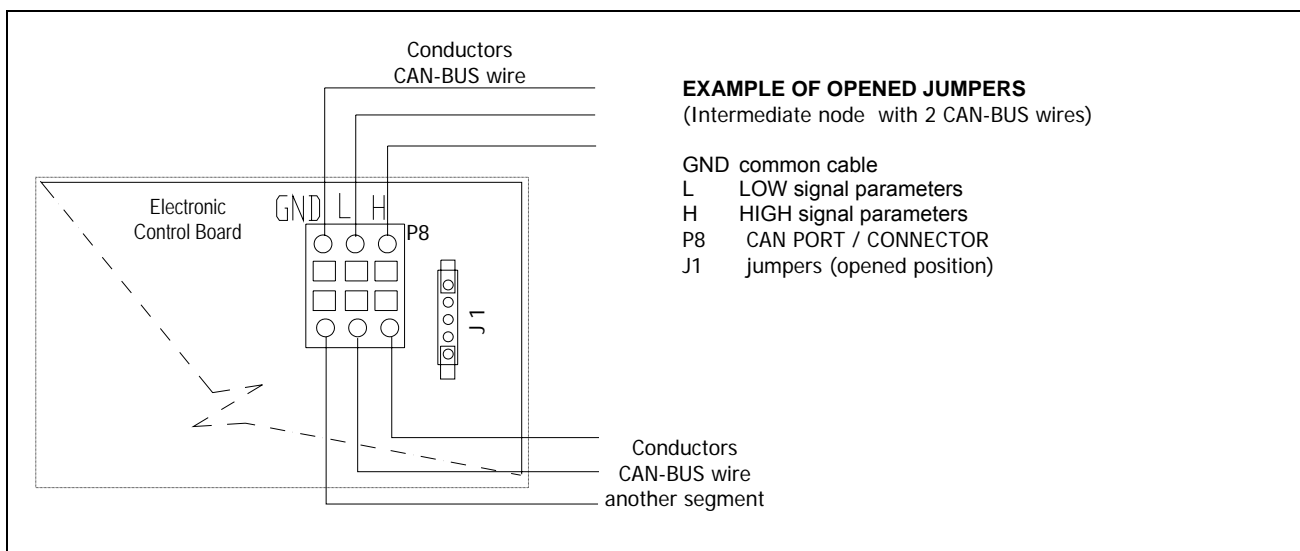
2. Extract from the electronic control board the orange color connector from its CAN Port (placed in right top angle of ECB: particular D Figure 3) and proceed with the following instructions of point 3.
3. If one intermediate node of PARAMETERS COMMUNICATION NETWORK is under connection, follow all the next instructions (points **3a**, **3b**, **3c**, **4** and **5**); if instead one terminal node of PARAMETERS COMMUNICATION NETWORK is under connection, follow the instructions at points **3a**, **4** and **5** only.
  - 3a** Connect the 3 conductors of CAN-BUS wire (particular E, Figure 3) respecting the signal/color indications as in Table 2, page 29 with 3 inlets H, L, GND of the same connector as in Figure 3 (see also details of Figure 4).
  - 3b** Repeat the same procedure of point 1 when connecting the 2nd CAN-BUS wire segment by fixing the 2<sup>nd</sup> wire to the same clamp (particular F, Figure 3).
  - 3c** Connect 3 conductors of the 2nd CAN-BUS wire, respecting the signal/color indications as in Table 2, page 29 with the other 3 inlets H, L, GND of the other connector as in Figure 5.
4. Engage the connector to the electronic control board.
5. Adjust the Jumpers according to the following cases:
  - 1st CASE: on the orange connector of CAN port, there are three conductors (terminal nodes): in this case the 2 jumpers existing beside the orange connector of CAN Port, should be adjusted as indicated in Figure 4 (detail J1).
  - 2nd CASE: on the orange connector of CAN Port, there are 6 conductors (intermediate nodes): in this case the 2 Jumpers existing beside the orange connector of CAN Port, should be adjusted as indicated in Figure 5 (details J1).

The Jumpers are pre-adjusted (in the factory) as in 1st CASE, that is closed.





**Figure 4** – DETAILED EXAMPLE OF THE CONNECTION OF ONLY ONE CAN-BUS WIRE WITH THE ELECTRONIC CONTROL BOARD



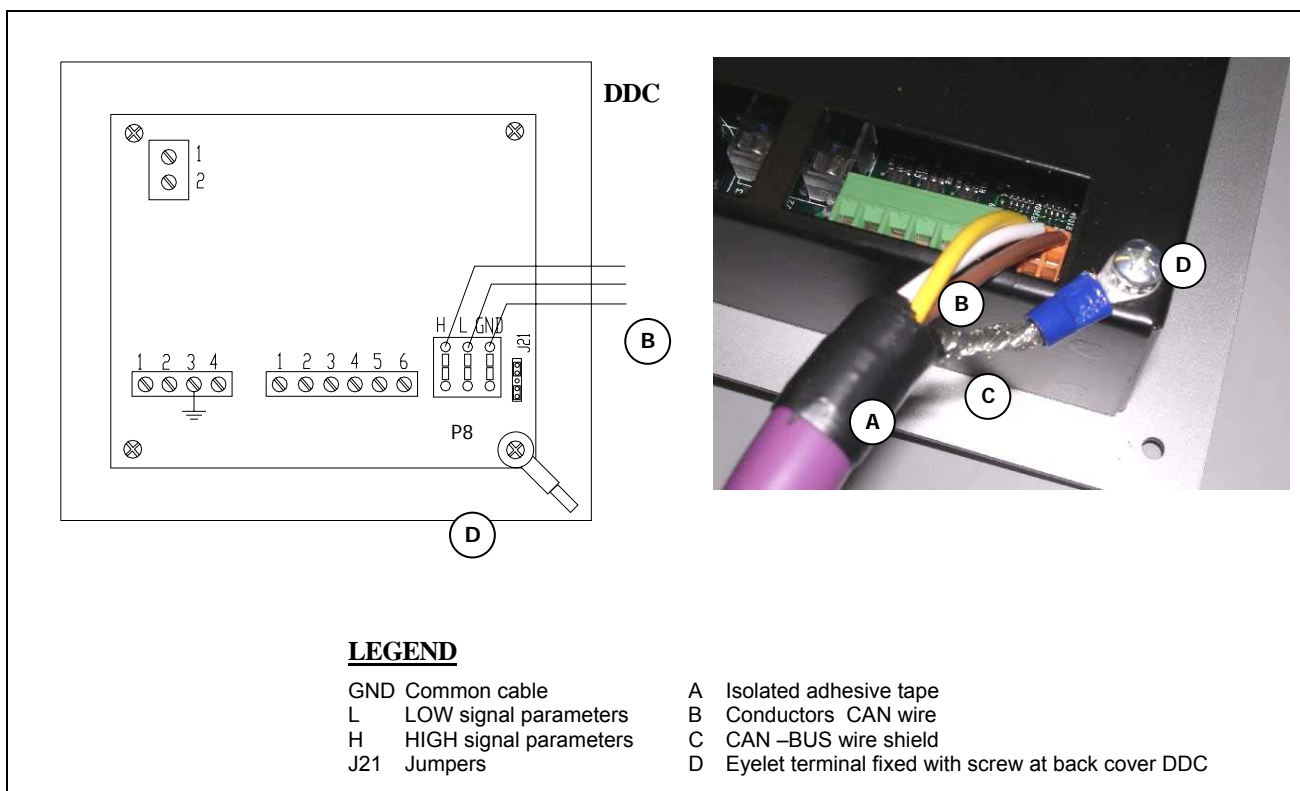
**Figure 5** – DETAILED EXAMPLE OF THE CONNECTION OF TWO CAN-BUS WIRES WITH THE ELECYTRONIC CONTROL BOARD

• **CAN-BUS wire connection to Direct Digital Controller (DDC)**

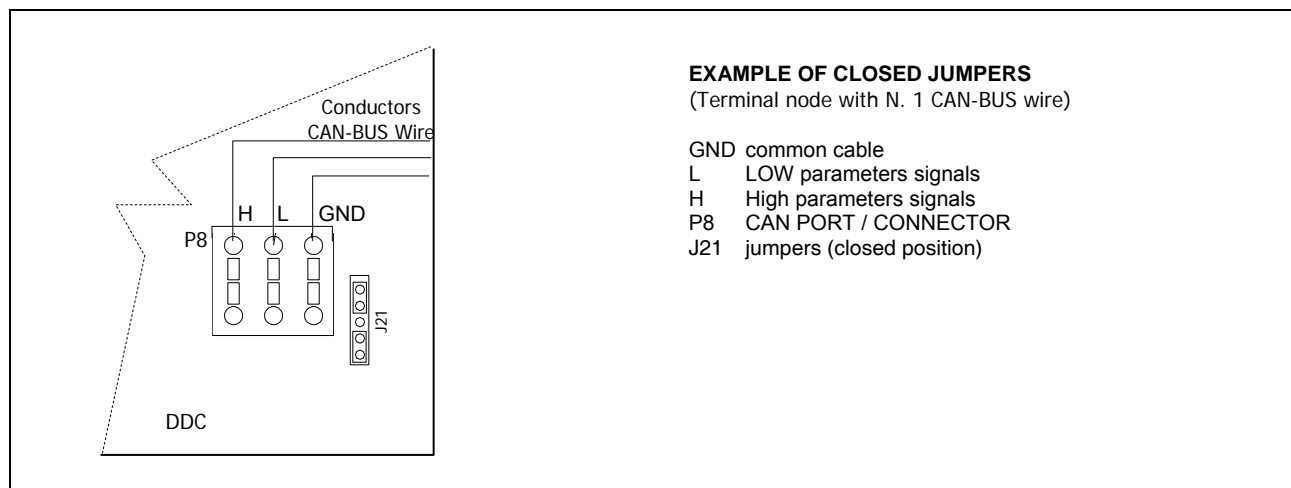
**WARNING**

Like the orange connector of the electronic control board, the DDC connector, too, has two different situations of connection (see **Figure 7/Figure 8**). The Jumpers (J21) are closed in the factory as in 1<sup>st</sup> CASE.

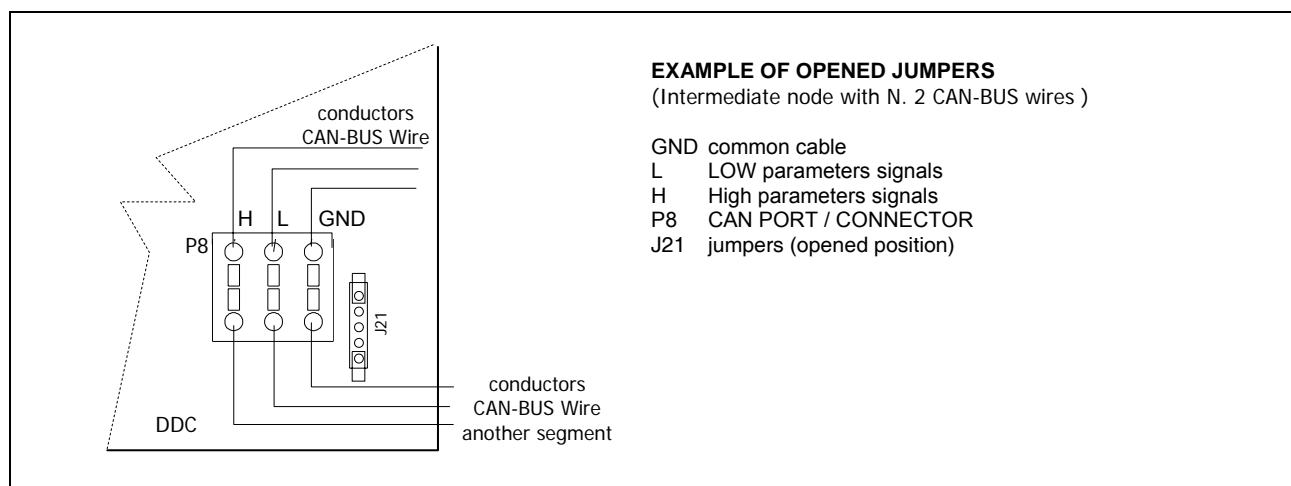
1. Take from the supplied bag the orange connector of CAN Port.
2. Connect 3 conductors of CAN-BUS wire (Particular B, Figure 6) respecting the signal/color indications as in Table 2, page 29 with three inlets H, L, GND of the connector as in Figure 6.
3. **If one intermediate node** of parameters communication network is under connection, follow the instructions of points **3a, 3b, 3c, 3d**; but **if one terminal node** of parameters communication network is under connection, go directly to point **4**.
  - 3a** Connect 3 internal conductors of the other segment of CAN-BUS wire (after cutting the sheath from terminals) with 3 inlets H, L, GND of the DDC connector as in Figure 8, Page 33.
  - 3b** Remove the back cover of the DDC unscrewing the 4 fixing screws.
  - 3c** In the electronic control board of DDC, adjust the Jumpers (J21) placed beside the orange connector of CAN Port (P8) as in Figure 8, Page 33.
  - 3d** Fix the back cover of the DDC using 4 screws
4. Engage – from the back cover hole of DDC – the orange connector of CAN Port to the DDC electronic control board.
- 5a Roll up the cut shield of the above mentioned CAN-BUS wire and connect it with an eyelet terminal of 0.15" (particular C&D, Figure 6).
- 5b **(only for intermediate node)** roll up the cut shield of the other CAN-BUS wire and connect it with eyelet terminal of 0.15" (particular C&D, Figure 6).
6. Unscrew the right bottom screw of the DDC back cover (particular D, Figure 6) and insert it to the eyelet terminal (s) and screw it down again.
- 7 Isolate – with suitable adhesive tape – the shield part of the wire (particular A, Figure 6).



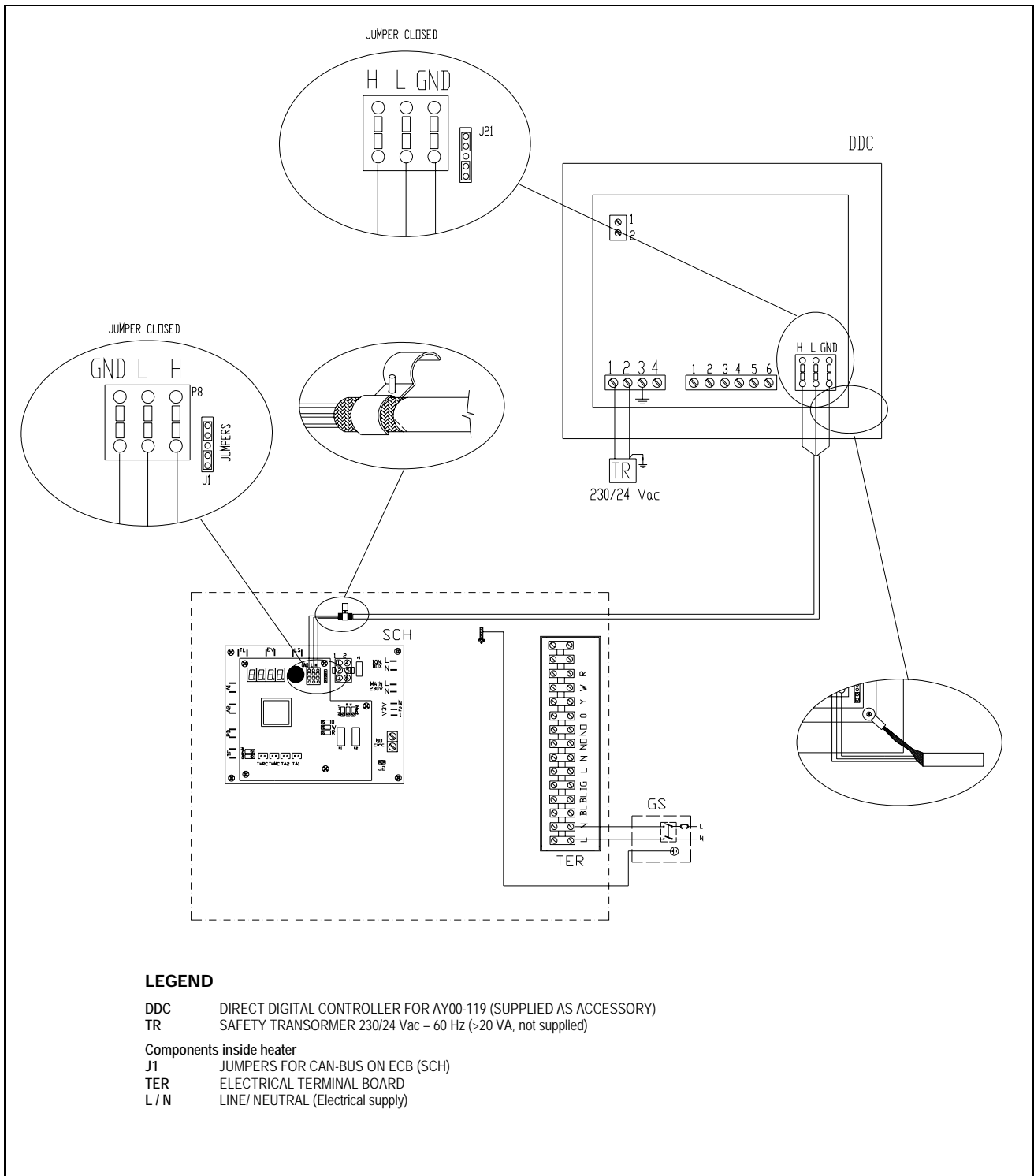
**Figure 6 – EXAMPLE OF CAN-BUS WIRE CONNECTION TO DDC (only one entry CAN-BUS wire)**



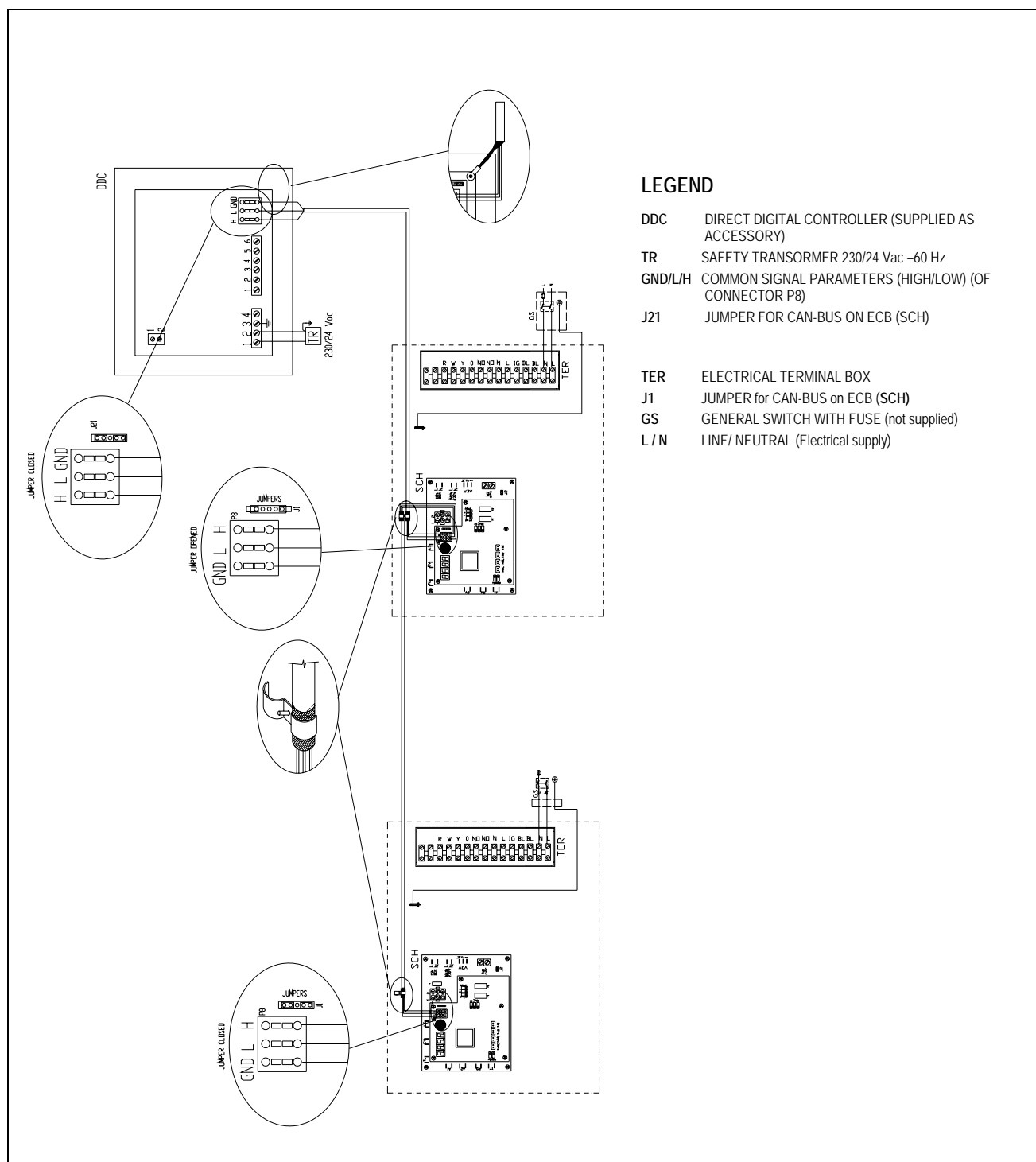
**Figure 7** – DETAILED EXAMPLE OF ONE CAN-BUS WIRE CONNECTION TO DDC



**Figure 8** – DETAILED EXAMPLE OF TWO CAN-BUS WIRES CONNECTION TO DDC



**Figure 9 – CONNECTION OF DDC TO 1 SINGLE AY00-119.**



**Figure 10 –** CONNECTION OF DDC TO N. 2 AY00-119.

## 6. START-UP AND ADJUSTMENT

### WARNING

This unit should be started-up by Authorized Engineers (TAC) according to the manufacturer's instructions. The end-user is not authorized to perform start-up and adjustment operations.

Immediately after placing the boiler in operation, the ignition system safety shutoff device must be tested: proceed as follows:

- With unit switched off, close gas valve.
- Start the unit by closing the consent switch (see paragraph 5.3 on page 26)
- Check for the presence of a flame control box error (see "IGNITION CONTROL BOX" on page 60)
- Shut-off the unit by opening the consent switch
- Open gas valve
- Start the unit by closing the consent switch and check unit proper operation

If during the first start-up (in site) a DANGEROUS or ANOMALOUS situation is met due to non-conform system, the start-up operations won't be completed. The user/installer must perform the proper adjustments indicated by authorized engineers (TAC), who will carry out the start-up.

The positive result of the first start-up (in site) is only reflecting the good operation of the unit and DDC (if used), but doesn't involve any responsibility concerning the correct execution of the system.

**The length of the warranty is dependent upon the installation and START-UP of the unit by Authorized Technicians (TAC). See warranty card for complete details.**

### DANGEROUS SITUATIONS FOR THE UNIT AND/OR PERSONS

If up on performing the 1<sup>st</sup> start-up one of the following conditions is found **don't proceed with the start-up**:

- Unit installed indoors or in position unsafe for servicing and maintenance.
- The unit turned on and off by using the main electrical switch (not using control switch).
- Antifreeze mono-ethylene glycol not added to the water
- Unit damaged or defective due to transport and/or installation



### ANOMALOUS INSTALLATION CONDITIONS FOR THE UNIT AND/OR PERSONS

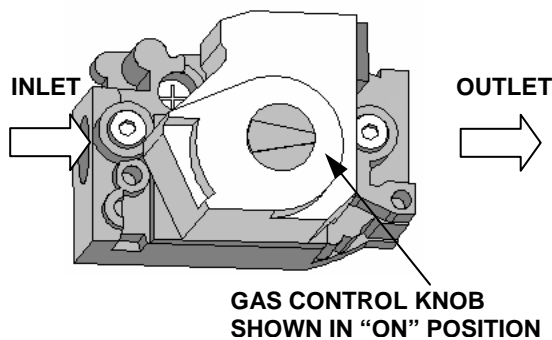
The authorized Robur service (TAC) can carry out the 1st start-up, but **the unit will be kept switched off** until the user/installer fully follows the manufacturer's directions/instructions. Anomalous installation conditions:

- Installations which show situations in contradiction to the directions/instructions of the manufacturer in part or fully;
- Installations which show situations which result or may result as a defective unit operation.


## 6.1 INSTRUCTIONS ON HOW TO START AND SHUT-OFF THE UNIT

### OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information on the label "For your safety read before operating" on the electric panel of the unit.
2. Set the control switch to "OFF" position.
3. Turn off all electric power to appliance.
4. This appliance is equipped with an ignition device with automatically lights the burner. Do not try to light the burner by hand.
5. Remove control access panel.
6. Push in gas control knob slightly and turn clockwise  to "OFF".  
NOTE: Knob cannot be turned to "OFF" unless knob is pushed in slightly. Do not force.
7. Wait (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to the next step.
8. Turn gas control knob counterclockwise  to "ON".
9. Replace control access panel.
10. Turn on all electric power to the appliance.
11. Set thermostat to desired setting.
12. If the application will not operate, follow the instructions "To Turn Off Gas Of Appliance"



### INSTRUCTIONS TO TURN OFF GAS TO APPLIANCE

1. Set the control switch to "OFF" position.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove control access panel.
4. Push in gas control knob slightly and turn clockwise  to "OFF". Do not force.
5. Replace control access panel.

## 6.2 FILLING THE WATER PIPING

### WARNING

To ensure correct operation of the unit and to avoid the water freezing, add 10% by volume of inhibited mono-ethylene glycol (antifreeze) to the circulation water. Add more mono-ethylene glycol as needed for the minimum external temperature of the installation zone (see Table 3, page 39).

The method described below is **only one of several ways** that can be used to fill the hydronic circuit. A container to mix water and mono-ethylene glycol and a water pump to drive the mixture into the hydronic system is required; 2 valves are placed on the circuit as shown in Figure 19.

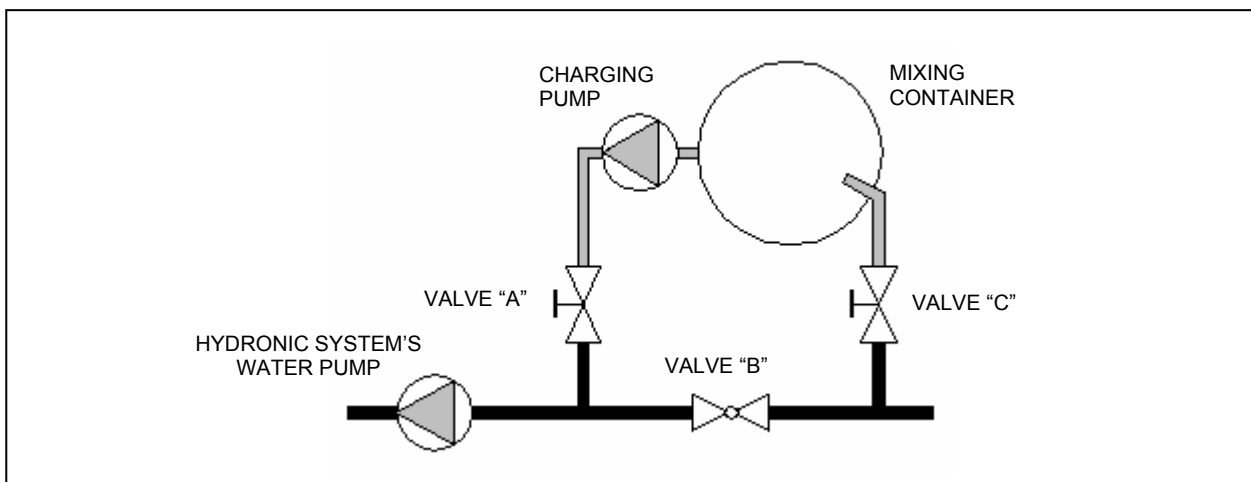
1. Open air bleed(s) located at the highest point in the system.  
Connect a hose between the charging pump and Valve A. Connect a hose to Valve C and place the other end of this hose into the mixing container (see Figure 19).

2. Mix the desired concentration and volume of water/mono-ethylene glycol in the container. If the container will not hold the volume required to fill hydronic circuit, multiple "batches" must be made.
3. Close Valve B. Open Valve A and Valve C. Start charging pump to push the water/ mono-ethylene glycol mixture into the hydronic system. Air will be removed through the hose on Valve C as the hydronic system fills. Continue to fill the system until the water/ mono-ethylene glycol mixture returns to the mixing container via the hose on Valve C.
4. If the volume in the mixing container is adequate to fill the hydronic system, skip to Step 14. If the volume in the mixing container is inadequate to fill the hydronic system, close Valve A prior to air entering the charging pump and shut the charging pump off.
5. Make a new container of water/mono-ethylene glycol mixture.
6. Start the charging pump and open Valve A to continue filling hydronic system. Repeat Steps 4 through 6 as needed until hydronic system is filled or until charging pump is incapable of adding any additional mixture due to pump discharge head limitations.
7. If the system is filled, skip to Step 14. If the system is not full, turn on the hydronic system's pump but do not start the unit. Jumping the N.O. CIRC. contacts on the electronic control board can start the hydronic system's pump.
8. "Throttle" Valve B, if necessary to continue filling the hydronic system if the system does not start filling after the hydronic system pump was started.
9. If the volume in the mixing container is not sufficient to fill the hydronic system, close Valve A prior to air entering the charging pump and shut both pumps off.
10. Mix new container of water and mono-ethylene glycol mixture.
11. Start both pumps and open Valve A.
12. Repeat Steps 9 through 11 until the system is filled and all air is removed from the hydronic system.
13. Close Valve A and Valve C. Shut off all pumps. Open Valve B.
14. Close any manual air bleed valves.
15. Start pumps and open Valve A.
16. Add additional mono-ethylene glycol/water mixture until the highest point in the hydronic system has a pressure of at least 4 psig. If the unit is located at the highest point in the system, then pressure at the high point of system should be least 10 psig.
17. Close Valve A and shut down both pumps.
18. Disconnect the charging pump and the mixing container.
19. The hydronic system is now charged.

One way to determine the pressure at the high point of the system is as follows:

1. Shut the pump off and wait for the water/mono-ethylene glycol mixture to stop flowing.
2. Measure the water pressure at the unit using the pressure/temperature taps.
3. Measure the vertical distance between the pressure taps and the highest point in the system.
4. Divide the vertical distance (measured in Step 3) by 2.3. (1psig = 2.3 ft.)

Take the pressure measured at the taps and subtract the answer from Step 4. This equals the pressure at the high point of the system.



**Figure 19 – COMPONENTS USED IN FILLING THE HYDRONIC SYSTEM**



TYPE OF ANTIFREEZE	APPROXIMATE PERCENTAGE OF ANTIFREEZE BY VOLUME			
	20	30	40	50
MONO-ETHYLENE GLYCOL	16°F	4°F	-12°F	-35°F

**Table 3** – FREEZING POINTS OBTAINED BY VARIOUS CONCENTRATIONS OF MONO-ETHYLENE GLYCOL ANTIFREEZE

As other hydronic appliances, Robur heating and cooling systems operate with grid-water of good quality. In order to prevent any possible problem of operation or reliability caused by filling or top-up water, please refer to codes and norms about water treatment for thermo-hydraulic installations in civil or industrial applications. Parameters indicated in Table 4 must be complied with.

CHEMICAL AND PHYSICAL PARAMETERS OF WATER IN HAETING/COOLING SYSTEMS		
PARAMETER	UNIT OF MEASUREMENT	ALLOWABLE RANGE
pH	\	> 7 <sup>(1)</sup>
CHLORIDES	ppm	< 125
TOTAL HARDNESS (CaCO <sub>3</sub> )	°f	< 15
IRON	ppm	< 0.5 <sup>(1)</sup>
COPPER	ppm	< 0.1 <sup>(1)</sup>
ALUMINIUM	ppm	< 1
LANGELIER'S INDEX	\	0 – 0.4
HARMFUL SUBSTANCES		
FREE CHLORINE	ppm	< 0.2 <sup>(1)</sup>
FLUORIDES	ppm	< 1
SULPHIDES		ABSENT

(1) In accordance and respecting current and local regulation

**Table 4** – CHEMICAL AND PHYSICAL PARAMETERS OF WATER.

Water quality can be measured through parameters like acidity, hardness, conductivity, chlorides content, chlorine content, iron content and the like.

**WARNING !!!** The presence of active chlorine in the water, in particular, can jeopardize parts of the installation and Robur units. Therefore, please make sure that active chlorine content and total hardness are compliant with the allowable ranges reported in Table 4.

The way the installation is operated can be the cause of possible degradation of water quality. Moreover, abnormally massive water top-up or reintegration can cause a drift of chemical or physical above-mentioned parameters. Reintegration should not exceed 5% per year of the total amount of water. It is advised to check regularly the water quality, especially in case of automatic or periodic top-up. In case water treatment is needed, this operation should be carried out by a professional or competent person, following strictly the instructions by the manufacturer or supplier of the chemical substances for the treatment, since dangers could arise for health, for the environment and for Robur appliances. Several products for water treatment are available on the market.

In case washing of the pipes is needed, this operation should be carried out by a professional or competent person, following strictly the instructions by the manufacturer or supplier of the chemical substances for the washing, avoiding the use of substances aggressive for stainless steel or containing/releasing active chlorine.

Please make sure the pipes are properly rinsed in order to remove any residue of chemical substances from the pipes.

Robur is not liable for ensuring that water quality is always compliant with what reported in Table 4 is not's. Non-compliance with indications above may jeopardize the proper operation, integrity and reliability of Robur appliances, invalidating the warranty.

For any further detail, please contact directly Robur Corporation Evansville, IN  
Phone (812) 424-1800; Fax (812) 422-5117.

### 6.3 GAS PRESSURE ADJUSTMENT

The manufacturer supplies the units already adjusted for a particular type of gas. The type of gas can be checked and easily identified by looking at the marking label inside the unit. Nevertheless, before starting the unit it is necessary to check and adjust if necessary the Gas Input (HHV) to the burner. Using the table below, arrange the proper manifold pressure according to the local gas heating value (BTU content per cubic foot) and specific gravity. This table is based on the correct natural Gas Input (HHV) for the model by manifold pressure in inches of water column (in WC).

MJ CONTENT PER CU.Meter	BTU CONTENT PER CU.FT.	SPECIFIC GRAVITY OF NATURAL GAS			
		0,55	0,6	0,65	0,7
35,40	950	3,05	3,32	3,60	3,88
36,33	975	2,89	3,16	3,42	3,68
37,26	1000	<b>2,75</b>	3,00	3,25	3,50
38,19	1025	2,62	2,86	3,09	3,33
39,12	1050	2,49	2,72	2,95	3,17
40,05	1075	2,38	2,60	2,81	3,03
40,98	1100	2,27	2,48	2,69	2,89
41,92	1125	2,17	2,37	2,57	2,77

Our reference:

MJ CONTENT PER CU.Meter	BTU CONTENT PER CU.FT.	SPECIFIC GRAVITY OF NATURAL GAS	
		0,555	
37,78	1014	2,7	

**Table 5** - MANIFOLD PRESSURE in WS inches BASED ON GAS INPUT (HHV) OF 129,000 Btu/hr USING 0.25" ORIFICE.

The conditions referred to by the table above are for the guidance of the installer and the CSA design certification does not cover the conditions described therein.

Note: for Propane Gas Models, follow the same instructions as given below for natural gas. The manifold pressure for propane gas should be 4.8" W.C. and adjustment is made at the gas valve regulator. Manifold pressure at 129,000 Btu/hr. input using 0.17" orifice.

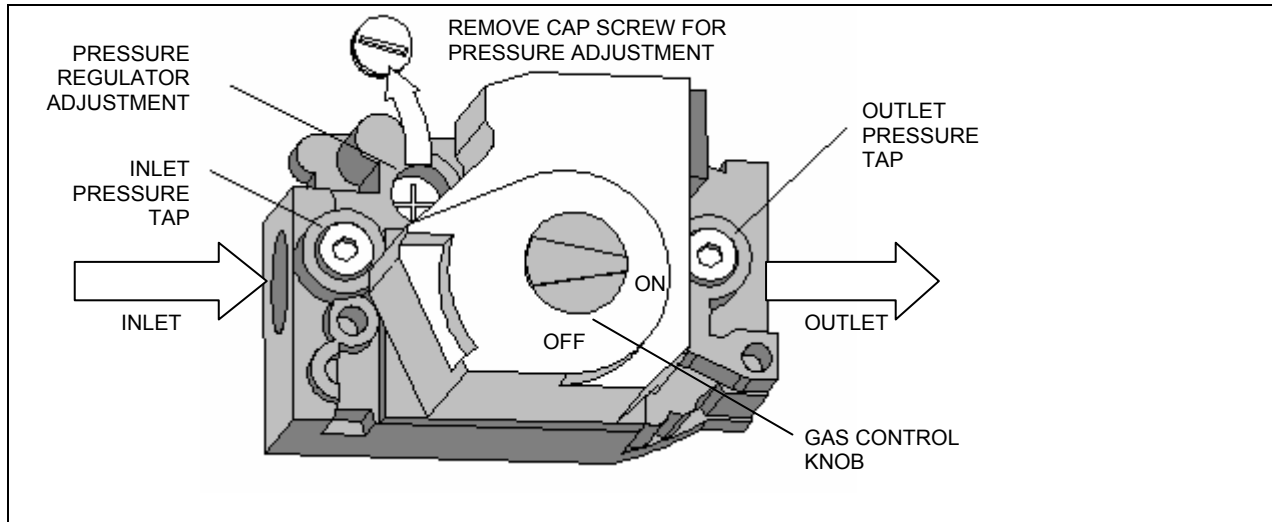
The manufacturer supplies the units already adjusted for the type of gas they have been requested for. It can be checked and easily identified by looking at the label inside the unit.

To adjust manifold pressure:

1. Turn main gas valve knob to the "OFF" position.
2. Remove the plug on Outlet end of gas valve and attach pressure tap and manometer.
3. Turn power "ON," and close control switch.
4. Wait for the burner to start up. Due to the presence of air inside the piping, it may be that the burner does not start at the first three attempts and failing to do so the ignition system is locked out. If this happens reset the ignition system (see dedicated procedure, end of Appendix). Repeat until all the air is purged from the piping and the burner ignites.
5. When the burner ignites read the manometer and compare to the required pressure in Table 5.
6. If necessary change the manifold pressure using the gas valve regulator. The regulator is built into the gas valve. Remove the seal screw and turn adjusting screw clockwise to increase pressure or counter clockwise to reduce pressure. Replace seal screw after adjustment.
7. Open control switch and make sure unit is off.
8. Remove manometer and pressure tap. Replace plug in gas valve.
9. Turn unit on by closing control switch. Check all gas connections with soap for leaks.

GAS TYPE	NATURAL GAS	LP GAS
MANIFOLD PRESSURE	2.7 W.C. Inches	4.8 W.C. Inches
NOZZLE DIAMETER	0.25"	0.17"

**Table 6** – MANIFOLD PRESSURE AND NOZZLE DIAMETER



**Figure 20** – GAS VALVE

## 6.4 HOT WATER TEMPERATURE REGULATION

### WARNING

When DDC is used, the following menu3 set-up is not to be done. It's necessary to consult "Installation and Programming manual of DDC - Direct Digital Controller".

If the unit isn't connected to a DDC, hot water temperature regulation can be set up from menu 3 of the AY10 card (see APPENDIX: AY10 electronic card).

MENU 3 – End User Adjustment	
MENU SIGNALS	DESCRIPTION OF MENU SIGNALS
3.160	Hot water thermostat action
3.161	Hot water set point
3.162	Hot water temperature difference $\Delta T$
3.E	Exit

**Table 7 – MENU 3 PARAMETERS**

The **thermostat action** parameter can assume 2 values: 0 and 1. When 0 is set, temperature to drive the unit is read by the INLET probe; when 1 is set, the temperature is read by the OUTLET probe.

The **set-point** is intended to be the pre adjusted water temperature (in/out), when being achieved, the unit will start the switching off cycle as (since) the heating request is met. This parameter can assume values from a minimum value of 104 °F to a factory set value.

The **temperature difference** is intended to be a value, which should be summed up by the pre adjusted set point temperatures. This parameter can assume values from -36 °F up to -1.8 °F.

The obtained value represents the water temperature. According to which, the heating request will be re activated and then the unit will start-up again.

For example, let us suppose the following adjustments :

- Thermostat action: unit operation with outlet temperature
- set-point **+122 °F** (suggested value for residential and commercial use plants);
- Temp. difference **-3.6 °F** ;

The unit behaves as follows :

- One time during the unit operation, the water of HYDRONIC system is getting hot until the outlet water temperature reaches **+122 °F** (set-point temperature);
- Up on achieving that temperature, the unit will be switched off automatically.
- When the water temperature starts getting low, reaches **+118.4 °F** (that is **+122 °F** plus the temp difference of **-3.6**) the unit will start-up again to heat the water once more until reaching **+122 °F**, and so on.

Then, according to these adjustments the unit switches off at **+122 °F** and starts-up at **+118.4 °F**.

To set up the parameters use the encoder knob:

- To select a menu, a parameter or a value rotate the knob.
- To enter a value press the knob

(see APPENDIX: Electronic system of the AY00-119 unit).

## 7. SERVICING AND MAINTENANCE

This manual is an integral and essential part of the product and must be given to the owner.

Performing correct preventive service and maintenance will help to guarantee long life of the unit with high efficiency and low maintenance costs.

### WARNING

**ONLY Authorized Technicians (TAC) strictly complying with the manufacturer's instructions and the local standards should perform maintenance and service on the UNIT internal components.**

Lubrication of pre-mixer motor is not recommended.

The operations described below must be performed **once a year**. If the unit is installed on a heavy-duty installation (industrial plants, 24hr operation etc.), it is necessary **to increase the frequency** of checks and services.

Maintenance to be performed on the unit:

- Venting system and vent terminal have to be periodically examined and cleaned
- Check functioning of combustion and thermal exchange circuit:
  - burner and exhaust gas flue
  - igniter and flame sensor system
- Check functioning of regulation and safety devices
- Analysis of combustion products, according to in-force standards and laws.
- Flue gas inspection and cleaning
- Cleaning of the burner

### FLUE GAS PASSAGE INSPECTION AND CLEANING

Early in the year before operating the unit, complete the following instructions:

1. Turn off gas and electric supply to the unit.
2. Remove front panel.
3. Remove top panel.
4. Clean the base pan around the generator housing of any debris.
5. Look down the flue opening at the back of the generator housing and clear any debris that may be obstructing the opening (see Figure 23).
6. Look down the air intake chute for combustion air and clear any debris that may be obstructing the opening.
7. Reinstall top panel.
8. Reinstall front door.
9. Turn on gas and electric supply to the unit.
10. Start unit to check for correct operation.

It is recommended that **at least once a year** a qualified service technician perform routine maintenance on the equipment.

### CLEANING OF THE BURNER

Tools Needed:

Fiber Bristle Brush  
Dust Mask (3M #8710 or equal)  
Safety Goggles  
Hand Tools

**WARNING****ALWAYS wear safety goggles!**

1. Shut off gas and electric supply to unit.
2. Remove front panel.
3. Remove bolts and nuts securing pre-mixer blower housing to burner tube flange.
4. Remove screws holding burner and insulation retaining straps.  
**Note:** Wear a dust mask (3M #8710 or equal NOISH/MSHA TC-21C mask) during burner removal, cleaning, and assembly operations.
5. Pry bottom of burner tube out to clear bottom of generator housing. Pull burner down and out to remove from generator housing.  
**Note:** Be careful not to distort or damage the burner tube or the igniter and sensor assemblies in the generator housing.
6. Position burner tube with open end down.
7. Clean burner tube ports with fiber bristle brush and shake any debris out of the tube.
8. Inspect burner tube gasket that seals the burner tube to the generator housing and the burner flange gasket that seals burner to pre-mixer blower housing. Replace either gasket if damaged during burner removal process. (Burner tube gaskets – Kit No. 16009-716)
9. Replace burner tube in reverse order of removal.  
**Note:** Make sure the two gaskets are positioned correctly and that generator housing is properly sealed.
10. Turn on gas and electric supply to unit.
11. Start unit and check for correct operation.

**NOTE**

**Before any type of service is performed, ALWAYS shut-off the power supply at the main switch.**

**Caution: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.**

**Verify proper operation after servicing.**

## 8. ADAPTING TO ANOTHER GAS

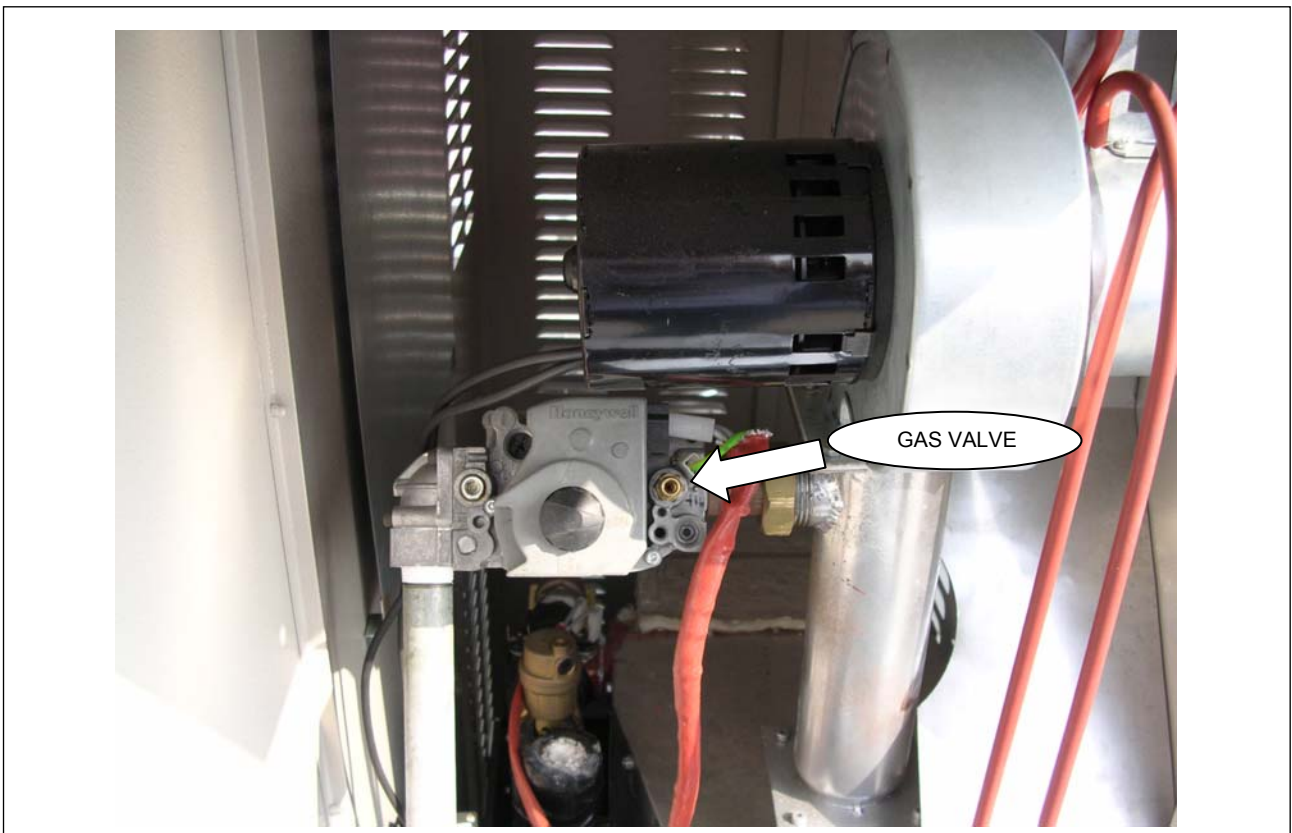
### NOTE

ONLY an Authorized Technician can perform the operation described in this section.

**If the type of gas indicated does not correspond to the type to be used (natural or propane gas) by unit, it must be converted and adapted to the type of gas to be used.** The gas orifice (nozzle) must be changed and the manifold pressure must be adjusted.

For this operation proceed as follows:

1. Turn off the gas and electrical supply, unscrew front panel screws and remove it.
2. Remove the wires from the gas valve.
3. Remove the ring nut from the threaded gas nozzle.
4. Remove the gas nozzle. Put the o-ring and the gasket in a safe place, to be re-used with the new nozzle.
5. Place the new gas nozzle. Be sure to put the o-ring and the gasket in the proper site.
6. Tighten the ring nut and re-attach wires to the valve.
7. Turn on the gas and electrical supply.
8. Adjust the gas pressure for the gas to be used following the instructions reported in SECTION 6.3 "GAS PRESSURE ADJUSTMENT".
9. Replace the stickers indicating the type of gas for which the unit is preset with the new one, which indicates the type actually being used.



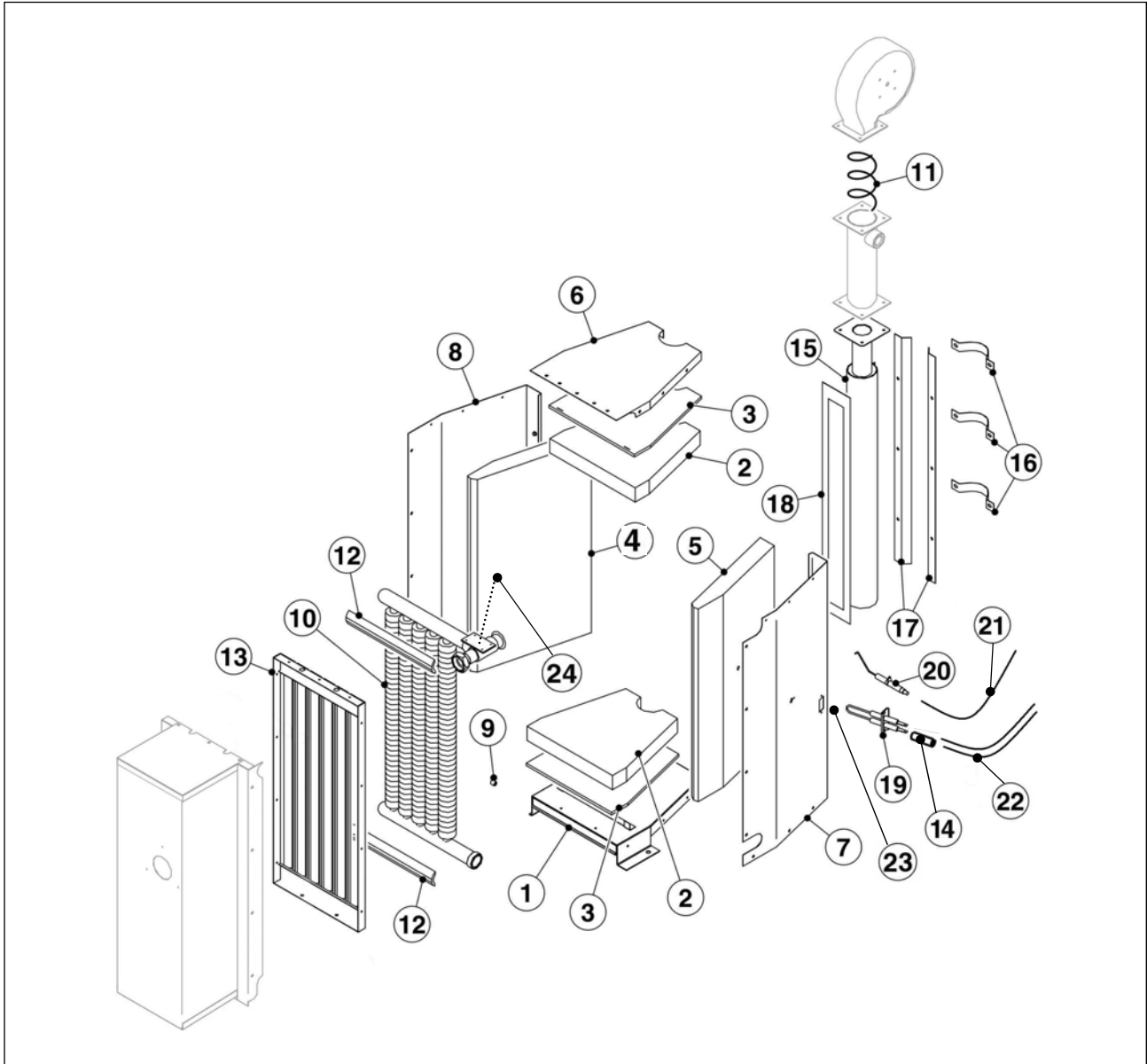
**Figure 21 – GAS VALVE**

## 9. SPARE PARTS

Below are the lists of the spare parts for AY00-119, AY00-119/2 and AY00-119/4 appliance. Each list comes after the respective exploded drawing, which pictures each part in the list with its progressive number.

Spare parts can be ordered from Robur Corporation.

Exploded drawing n.1: COMBUSTION CHAMBER ASSY



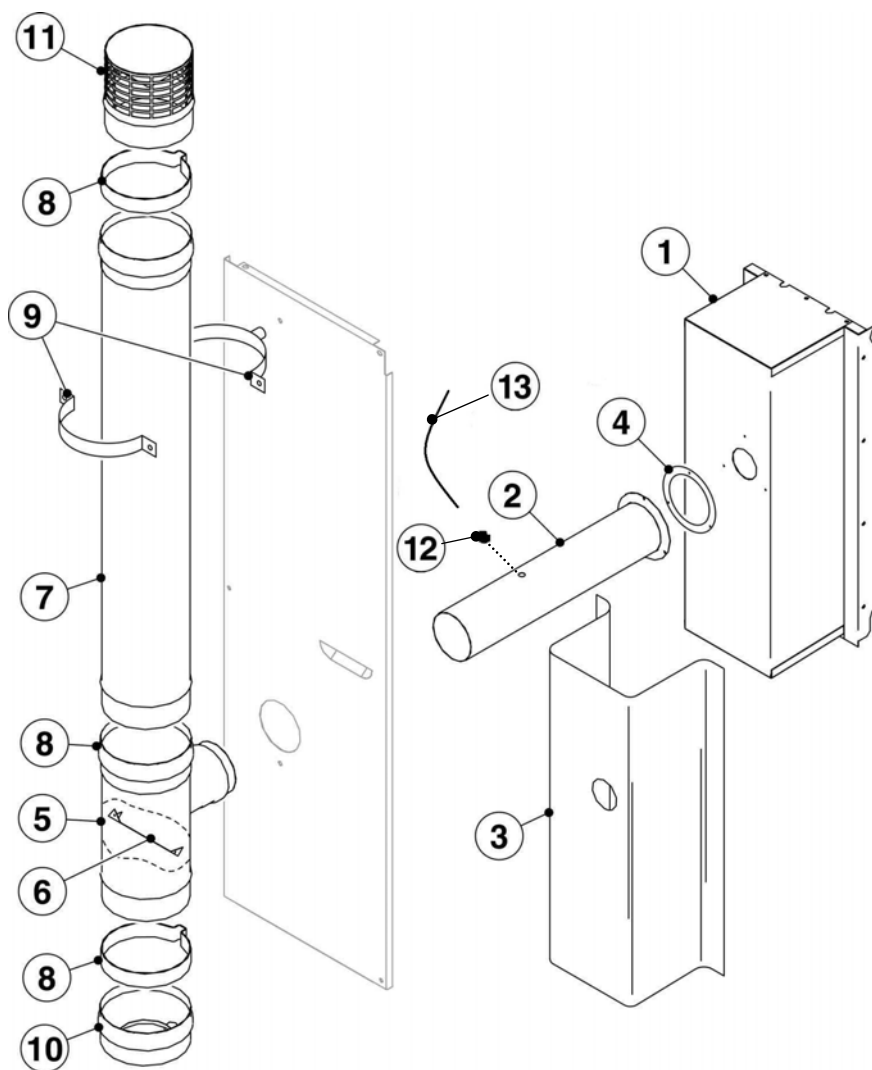
**Figure 22 – EXPLODED DRAWING N.1 – SEE Table 8, PAGE 47 FOR THE RELATIVE PARTS LIST.**



Ref.	Code			Description	Q.tà
	AY00-119	AY00-119/2	AY00-119/4		
	J-CMB140			<i>Complete combustion chamber</i>	
1	L-BSM012	L-BSM012	L-BSM012	<i>Combustion chamber base</i>	1
2	C-CBN044	C-CBN044	C-CBN044	<i>Rigid upper/lower insulation</i>	2
3	C-CBN043	C-CBN043	C-CBN043	<i>Upper/lower insulation</i>	2
4	C-CBN078	C-CBN078	C-CBN078	<i>Right lateral insulation assembly</i>	1
5	C-CBN123	C-CBN123	C-CBN123	<i>Left lateral insulation assembly</i>	1
6	P-CPR051	P-CPR051	P-CPR051	<i>Combustion chamber cover</i>	1
7	L-PNN083	L-PNN083	L-PNN083	<i>Complete left panel</i>	1
8	L-PNN084	L-PNN084	L-PNN084	<i>Complete right panel</i>	1
10	J-SCM006	J-SCM006	J-SCM006	<i>Heat exchanger assembly</i>	1
12	C-CBN047	C-CBN047	C-CBN047	<i>AY00-119 intercooler collectors insulation</i>	2
13	L-GRG000	L-GRG000	L-GRG000	<i>Flow Grid</i>	1
15	J-BRC000A	J-BRC000A	J-BRC000A	<i>AY00-119 burner</i>	1
16	L-MFS000	L-MFS000	L-MFS000	<i>Clip burner tube</i>	3
17	L-STF120	L-STF120	L-STF120	<i>Retainer burner</i>	2
18	J-CBN029	J-CBN029	J-CBN029	<i>Burner insulation gasket</i>	1
19	J-LTT047	J-LTT047	J-LTT047	<i>Sparkling electrode</i>	1
20	J-LTT035	J-LTT035	J-LTT035	<i>Ignitor/sensor</i>	1
23	J-GRN054	J-GRN054	J-GRN054	<i>Sparkling electrode gasket</i>	1
9	N-BCC009	N-BCC009	N-BCC009	<i>Bush</i>	1
11	L-MS002	L-MS002	L-MS002	<i>Mixer spring</i>	1
14	J-CSL000	J-CSL000	J-CSL000	<i>Ceramic insulation</i>	1
21	J-CVO199	J-CVO199	J-CVO199	<i>AY00-119 FLS cable</i>	1
22	J-CVO124	J-CVO124	J-CVO124	<i>Transformer sparking cable</i>	2
24	J-TLT017	J-TLT017	J-TLT017	<i>Module AY00-119 limit thermostat</i>	1

**Table 8** – SPARE PARTS PICTURED IN Figure 22 on page 46: COMBUSTION CHAMBER ASSY

Exploded drawing n.2: EXHAUSTED GASES ASSY



**Figure 23** – EXPLODED DRAWING N.2 – SEE Table 9, PAGE 49 FOR THE RELATIVE PARTS LIST.

	Code				
Ref.	AY00-119	AY00-119/2	AY00-119/4	Description	Q.tà
1	L-CMN004	L-CMN004	L-CMN004	<i>Chimney</i>	1
	J-SCR002			<i>Kit exhausted gases flue</i>	
2	R-TBO413	R-TBO413	R-TBO413	<i>Flue gas pipe</i>	1
3	J-CBN048	J-CBN048	J-CBN048	<i>Flue gas hood insulation</i>	1
4	J-GRN072	J-GRN072	J-GRN072	<i>Nosepiece gasket</i>	1
	J-FMI002			<i>Kit exhausted gases</i>	
5	R-TBO417	R-TBO417	R-TBO417	<i>T pipe M/F/M</i>	1
6	L-DFL024	L-DFL024	L-DFL024	<i>Chimney baffle plate</i>	1
7	J-TBO271	J-TBO271	J-TBO271	<i>Gas pipe Ø 130</i>	1
8	O-FSC001	O-FSC001	O-FSC001	<i>Closing clamp Ø 130</i>	3
9	N-SPP005	N-SPP005	N-SPP005	<i>Wall bearing racket for pipe Ø 130</i>	2
10	J-SCR000	J-SCR000	J-SCR000	<i>Condensate drain for Ø 130 pipe</i>	1
11	J-TRM000C	J-TRM000C	J-TRM000C	<i>Ø 130 pipe terminal for AY00-119</i>	1
12	J-TLT015	J-TLT015	J-TLT015	<i>Limit thermostat for generator</i>	1
13	J-CVO198	J-CVO198	J-CVO198	<i>AY00-119 TF cable</i>	1

**Table 9** – SPARE PARTS PICTURED IN Figure 23 on page 48: EXHAUSTED GASES ASSY

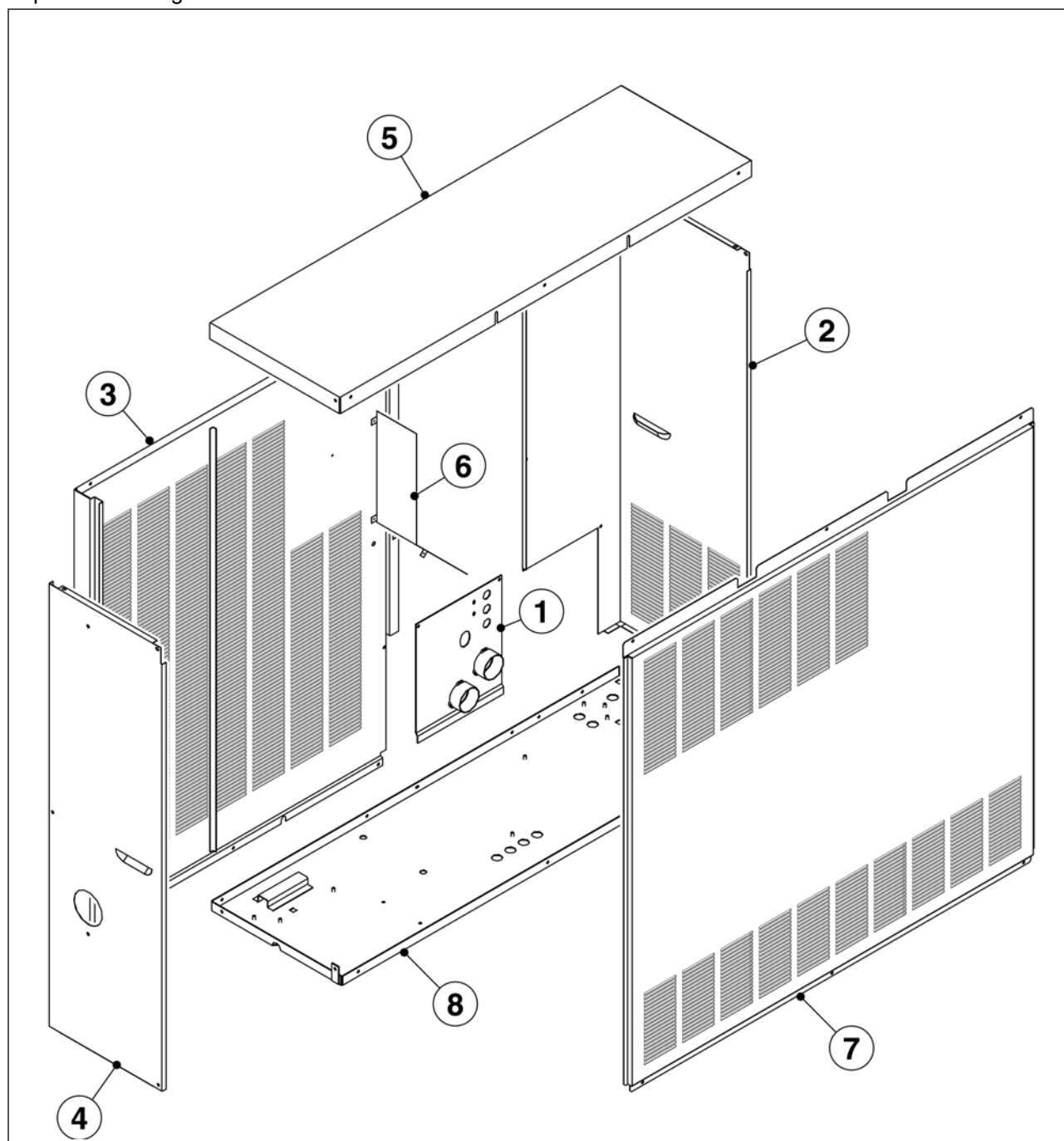
This exploded view diagram illustrates the assembly of a mechanical device, likely a pump or actuator. The components are numbered 1 through 21. The assembly starts with a vertical shaft (1) passing through a base plate (2). A spring (3) is positioned above the shaft. A motor or actuator (4) is mounted on the shaft, with a gear (5) and a pulley (6) attached. A bracket (7) and a nut (8) are used to secure the assembly. A battery (9) is connected to the motor via a cable (10) and a terminal block (11). The motor is connected to a pump (12) via a hose (13). The pump is connected to a valve (14) and a pipe (15). The pipe is connected to a manifold (16) and a control valve (17). The control valve is connected to a pipe (18) and a valve (19). The valve is connected to a pipe (20) and a valve (21).

**Figure 24 – EXPLODED DRAWING N.3 – SEE Table 10, PAGE 51 FOR THE RELATIVE PARTS LIST.**

Ref.	Code			Description	Q.tà
	AY00-119	AY00-119/2	AY00-119/4		
1	R-DFF006	R-DFF006	R-DFF006	Air gas mixer	1
	J-SFF047			AY00-119 blower assembly	
2	J-GRN028	J-GRN028	J-GRN028	Burner union trimming	2
3	E-MTR054	E-MTR054	E-MTR054	Blower motor 60 Hz 1/50 HP	1
4	V-CCL017	V-CCL017	V-CCL017	Scroll housing	1
5	V-VNT010	V-VNT010	V-VNT010	Blower wheel	1
6	L-DFR057	L-DFR057	L-DFR057	Air diaphragm 36.5 mm	1
7	L-BCC020	L-BCC020	L-BCC020	Air intake	1
8	J-SND018	J-SND018	J-SND018	Air probe	1
	J-SPA001			Air pressure switch baking	
9	L-CPR007	L-CPR007	L-CPR007	Air pressure switch cover	1
10	L-STF132	L-STF132	L-STF132	Air pressure switch bracket	1
11	J-PRA016	J-PRA016	J-PRA016	193 Pa air pressure switch	1
12	J-GLL156	J-GLL156	J-GLL156	Nozzle Ø6,30 (Nat.)	1
	J-GLL107	J-GLL107	J-GLL107	Nozzle Ø4,30 (LP)	1
13	J-GRN040	J-GRN040	J-GRN040	Gasket for nut 1"	1
14	R-NPP032	R-NPP032	R-NPP032	½" NPT gas nipple	1
15	J-VLV052	J-VLV052	J-VLV052	Gas control valve	1
	K-GAS 281	K-GAS282		Gas tube	
16	G-FLN019	G-FLN019	G-FLN019	Gas valve flange	1
17	R-TBO703	R-TBO703	R-TBO703	Gas tube vertical component	1
18	R-TBO702	R-TBO702	R-TBO702	Gas tube horizontal component	1
19	R-RCC102	R-RCC102	R-RCC102	½" T connection	1
20	N-TPP069			Galvanized steel NPT ½" plug	1
21		R-NPP033	R-NPP033	NPT/G nipple	1

**Table 10** – SPARE PARTS PICTURED IN Figure 24 on page 50: BLOWER AND GAS SYSTEM ASSY

Exploded drawing n.4: PANELS KIT

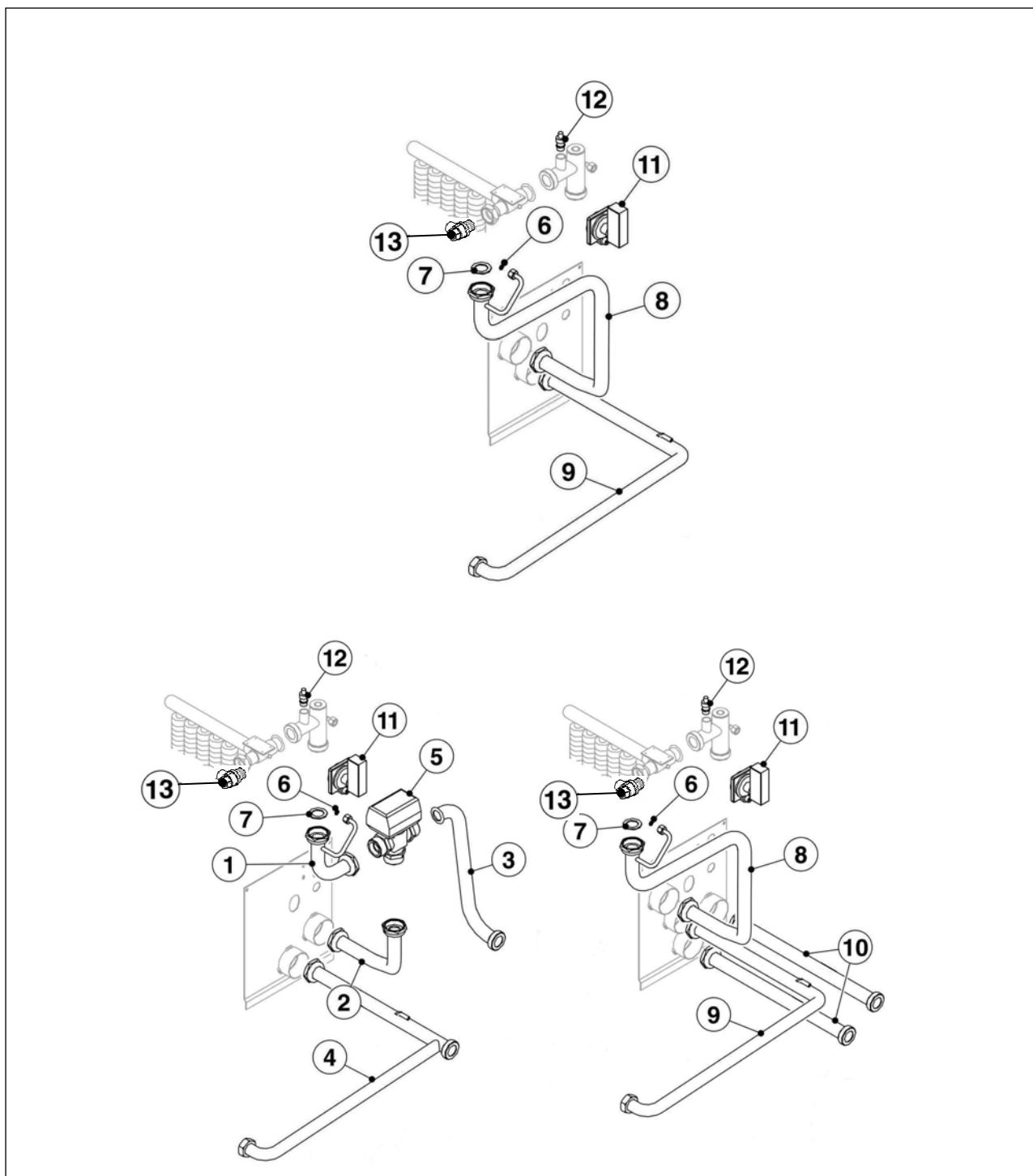


**Figure 25** – EXPLODED DRAWING N.4 – SEE Table 11, PAGE 53 FOR THE RELATIVE PARTS LIST.

	Code				
Ref.	AY00-119	AY00-119/2	AY00-119/4	Description	Q.tà
1	L-PST129	L-PST085	L-PST086	<i>Silk-screened service plate</i>	1
2	L-PNN087	L-PNN087	L-PNN087	<i>Painted front panel</i>	1
3	L-PNN093	L-PNN093	L-PNN093	<i>Painted right panel</i>	1
4	L-PNN026	L-PNN026	L-PNN026	<i>Painted rear panel</i>	1
5	P-PSP069	P-PSP069	P-PSP069	<i>Painted superior panel</i>	1
6	L-DFL041	L-DFL041	L-DFL041	<i>Baffle protecting nozzle</i>	1
7	L-PNN090			<i>Painted left panel</i>	1
8	L-BSM011	L-BSM011	L-BSM011	<i>Complete base</i>	1

**Table 11** - SPARE PARTS PICTURED IN Figure 25 on page 52: PANELS KIT

Exploded drawing n.5: WATER PIPING



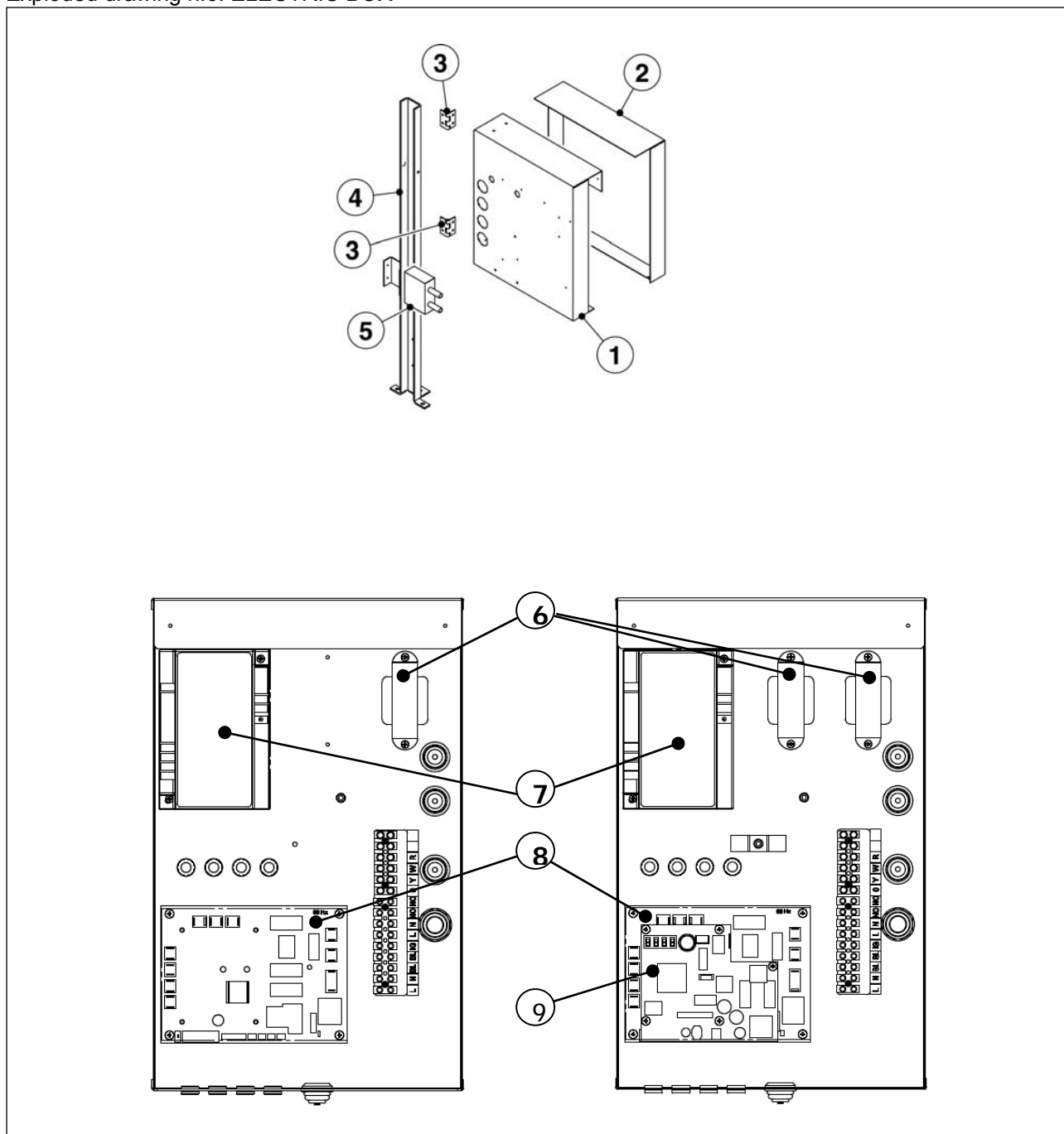
**Figure 26** – EXPLODED DRAWING N.5 – SEE Table 11, PAGE 53 FOR THE RELATIVE PARTS LIST.



Ref.	Code			Description	Q.tà
	AY00-119	AY00-119/2	AY00-119/4		
1		R-TBO267		Water heat exchanger output pipe	1
2		R-TBO526		Water 3 ways valve output pipe	1
3		R-TBO264		Water 3 ways valve input pipe	1
4		K-TBI046		Water inlet pipe AY00-119/2	1
5		J-VDV000		3 ways valve	1
6	N-RND028	N-RND028	N-RND028	Teflon washer 8 mm	1
7	J-RND017	J-RND017	J-RND017	Teflon washer 1"1/4	1
8	R-TBO538		R-TBO538	Water outlet pipe	1
9	K-TBI045		K-TBI045	Water inlet pipe	1
10			R-TBO542	Chiller water inlet/outlet piping	2
11	J-FLS007	J-FLS007	J-FLS007	H2O differential flow switch	1
12	J-VLV000	J-VLV000	J-VLV000	Automatic leak air valve	1
13	J-VLV010	J-VLV010	J-VLV010	ASME overpressure valve	1
14	J-MNM003			Pressure Gauge	1

**Table 12** - SPARE PARTS PICTURED IN Figure 25 on page 52: WATER PIPING

Exploded drawing n.6: ELECTRIC BOX



**Figure 27** – EXPLODED DRAWING N.6 – SEE Table 13 on PAGE 57 FOR THE RELATIVE PARTS LIST.

	Code				
Ref.	AY00-119	AY00-119/2	AY00-119/4	Description	Q.tà
	J-QLT218	J-QLT219		<i>Electric box</i>	
1	L-BQD022	L-BQD022	L-BQD022	<i>Electric box basement</i>	1
2	J-CQD012	J-CQD012	J-CQD012	<i>AY00-119 box cover kit</i>	1
3	N12913046	N12913046	N12913046	<i>Electric box hinge</i>	2
5	J-TRS015	J-TRS015	J-TRS015	<i>Ignition transformer</i>	1
6	J-TRS013	J-TRS013	J-TRS013	<i>Transformer 208-240/24V</i>	1
7	J-CNT031	J-CNT031	J-CNT031	<i>24 VAC ignition control box</i>	1
8	J-SLT032	J-SLT032	J-SLT032	<i>Electronic card S70CF24</i>	1
9	J-SLT028			<i>Electronic card AY10</i>	1
4	L-SPP016	L-SPP016	L-SPP016	<i>Electric box support</i>	1

**Table 13** - SPARE PARTS PICTURED IN Figure 27 on page 56: ELECTRIC BOX

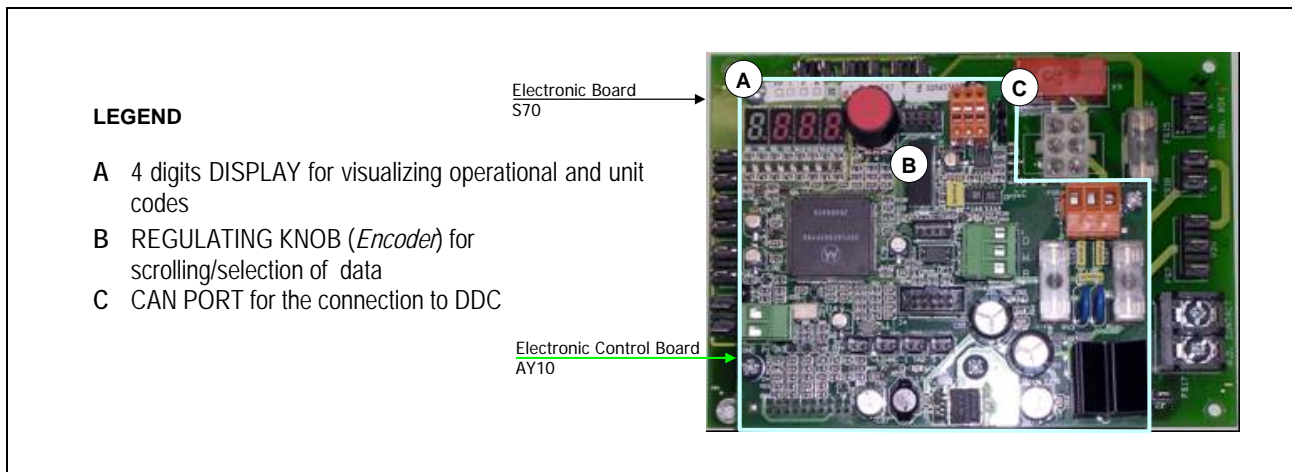
## 10. APPENDIX

### ELECTRONIC SYSTEM OF THE AY00-119 UNIT

The **electronic control board of the unit** is composed by two different cards: the S70 and the AY10, placed inside the electrical box. While the S70 is a input-output card, used for the electrical connections inside the unit, the AY10 is a microprocessor controlled card, equipped with a 4 digits display, a regulating knob (*encoder*) and a terminal set (CAN PORT) for the remote connection.

The DISPLAY (particular **A**) shows the operation data (example: water temperature) and possible anomalies, through the visualization of the unit codes.

Besides, It is possible to visualize all relative available information (data, parameters, values, etc.).



**Figure 28 – ELECTRONIC CONTROL BOARD AND INPUT-OUTPUT BOARD**

Rotating and pressing the REGULATING KNOB (particular **B**) allows the scrolling and selection of the information on the display.

Through the regulating knob and Display, operation management and control take place.

The CAN PORT (particular **C**) allows the connection, by one can-bus wire, between the electronic control board and DDC (available as accessory). When such connection is made, the operation management and control of the unit takes place only through the DDC.

#### NOTE


The electronic control board is placed inside the electrical box of the unit.

To interact with the regulating knob (*encoder*) of the electronic control board, it is necessary to remove the front panel of the unit and, without opening the electrical box, to act on the encoder by the supplied tube of about 4-3/4".


## Operation Management And Control

The Display of the electronic control board, during the normal operation, shows in alternative mode the following information:

- Water inlet temperature (after the symbol  $t_i$  )
- Water outlet temperature (after the symbol  $t_e$  )
- Temperature difference  $\Delta T$  (after the symbol  $t_d$  )


If anomalies are found, the electronic control board will show them on the display visualizing the relative flashing unit codes. (i.e. ).

Until the unit code is not deactivated, display will show the unit code flashing. When there are more than one unit code deactivated, they will be visualized in alternative mode and flashing.

To enter the menu of electronic control board (visualization menu) press its ENCODER once: on the display the 1st menu entry will be visualized (menu 0, shown as ).

### NOTE

If any information (menu, menu entries, parameters and/or values, etc.) is visualized on the display in flashing mode, it means that this information couldn't be entered.

When an information is not available, the display visualizes: .



Rotating the encoder, all the other menu will be visualized on the display.

To exit and return to the precedent level, it is necessary to select the letter "E"

() and press the encoder.


To enter in menu and visualize menu entries it's necessary to stop on the desired menu and press the encoder: on the display the first menu entry of the same menu will be visualized.

### NOTE

The menu entries will be identified on the display of the electronic control board through a number, where its maximum value is 3 digits (lined up at right). The visualization is characterized by the presence (on the 1st digit of display) of the menu identification number (example:  indicates menu entry 0, menu 0;  indicates menu entry 2, menu 0).








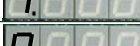


By **rotating the encoder**, all the other menu entries of the same menu will be visualized on the display.

To exit and return to the precedent level (default visualization), it is necessary to select the letter "E"

() by pressing the encoder.

## MENU DESCRIPTION

The electronic control board presents nine menu (from 0 to 8), as follows:

Menu 0: Data Visualization	
Menu 1: Parameter Visualization	
Menu 2: Actions	
Menu 3: End User Adjustment	
Menu 4: Installer menu	
Menu 5: Adjustment (by Installer)	
Menu 6: Unit Type Adjustment (by Assistance Centers)	
Menu 7: Digital Inlet Visualization	
Menu 8: Set Password (not manageable)	
"E": Exit	

**Table 14 – AY10 MENUS**

MENU 0, 1 and 7 are “Visualization Menu” (data and parameters are read-only). In menu 0 it’s possible to visualize the unit operation data detected from the electronic control board; In menu 1 it’s possible to real-time visualize the unit operation data and the unit management data. In menu 7 a number will represent the state of digital Inlet.

MENU 2 is an “Execution Menu”; through this menu it’s possible execute actions like reset ignition control box and reset errors, as consequence of anomalies detected by the unit. The code will be visualized on the display of the electronic control board.

MENU 3, 4, 5 e 6 are “Adjustment Menu”, to adjust the contained information. Menu 3 is relative to the end-user, who can eventually (if allowed) modify the value of parameters; example are hot water set point and the water temperature difference setup.

MENU 4, 5 e 6 are only to be managed by Robur Technical Assistance authorized Centers (TAC).

#### WARNING

The **maximum** current carrying capacity of the N.O. Contact is **4A**. Refer to Section 5.1 or 5.2, Pump Wiring.

#### WARNING

An isolation relay **MUST** be used to separate the UNIT transformer from additional equipment having a transformer or damage to the AY10 board will occur. Refer to Section 5.3, Control Switch Wiring.

### IGNITION CONTROL BOX

When power is supplied to the unit (to the “R” terminal on the ignition control box), ignition control will reset, perform a self check routine, flash the diagnostic LED, and enter thermostat scan state.

When the control switch is closed, the electronic control board will energize the ignition control box starting the ignition sequence (24 volts applied to the “W” terminal on the ignition box).

The ignition control box will check the differential air pressure switch for open contacts.

- If the differential air pressure switch contacts are closed and stay closed for 30 seconds, an air flow fault will be appear The diagnostic LED on the ignition control box indicates this fault. In this mode, the ignition control box pre-mixer blower will not start.

If the pressure switch contacts are open, the ignition control box pre-mixer blower will instead start.

- An air flow fault will occur if the air pressure switch contacts remain opened for 30 seconds after the pre-mixer blower start. The diagnostic LED on the ignition control box indicates this fault. In this mode, the ignition control box will keep the pre-mixer blower energized.

If the air pressure switch contacts close after the pre-mixer blower starts (normal operation), a pre-purge delay begins and the ignition sequence continues.

Next, the ignition control box energizes an ignition transformer that generates a high intensity spark at the igniter to ignite the gas/air mixture. Simultaneously, the gas valve is energized, allowing the flow of gas to the burner.

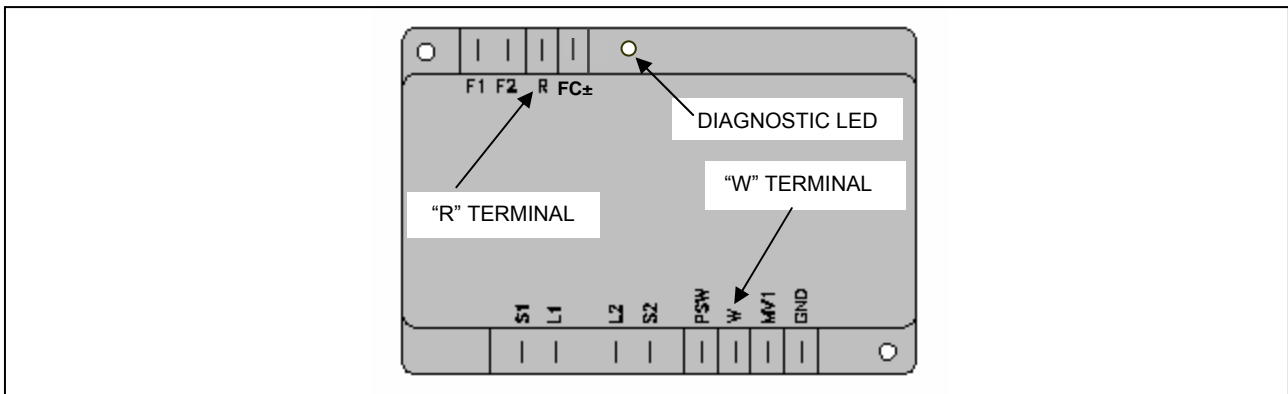
As soon as the ignition period ends, the flame sensor checks for flame presence. If the flame is detected, the gas valve and pre-mixer blower remain energized.

Should the burner fail to light, flame is not detected during the first trial for ignition: the gas valve and ignition transformer are de-energized and the ignition control box begins an inter-purge delay before another ignition attempt. The control will attempt two additional ignition trials (total of 3 ignition trials) before going into lockout. In lockout, the gas valve will de-energize immediately and the pre-mixer blower will turn off. Ignition control box requests a reset operation to restart.

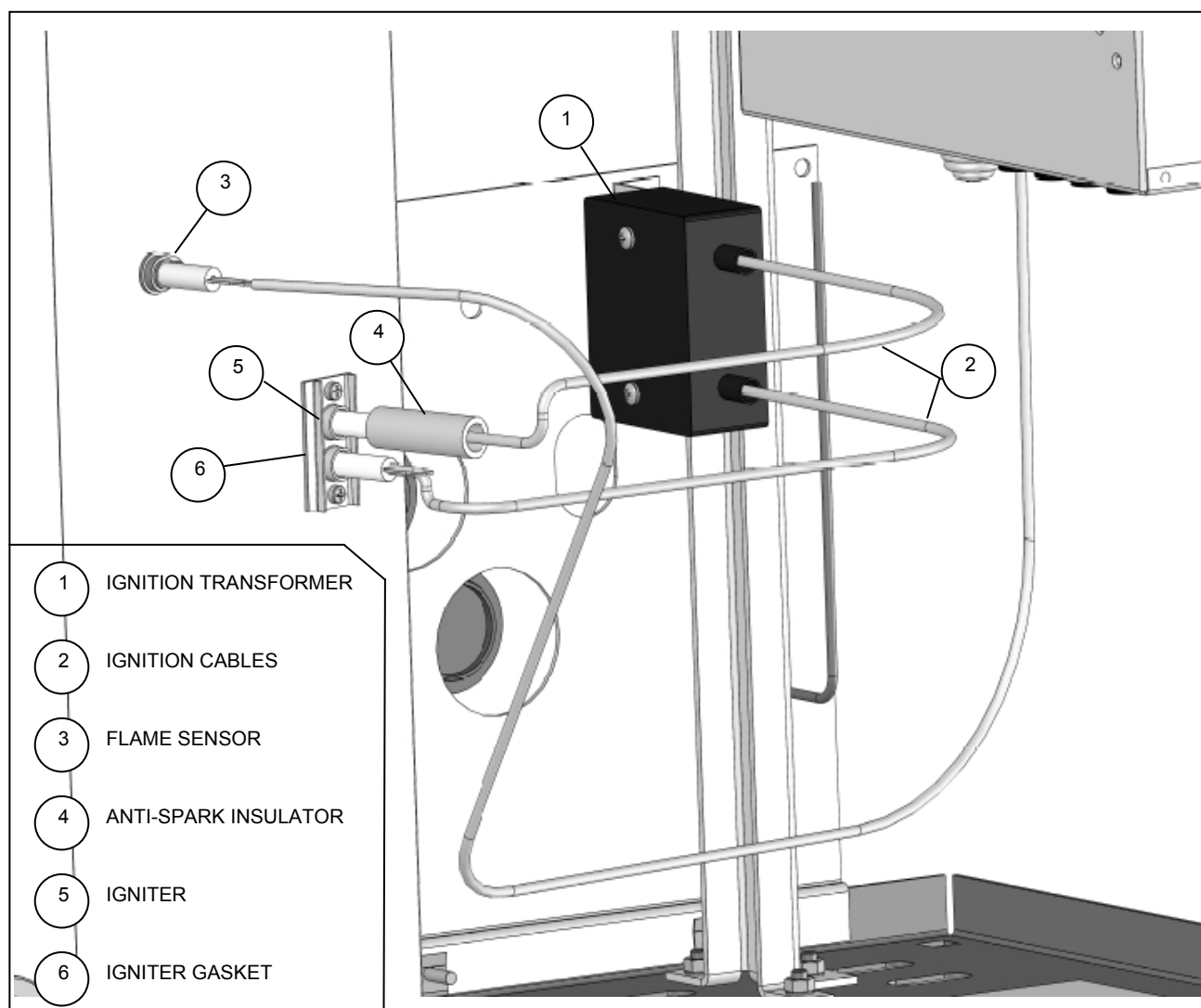
The thermostat ("W" terminal), air pressure switch and burner flame are constantly monitored to assure proper system operation. When the call for heat has ended (24 volts removed from "W" terminal on ignition control), the gas valve is de-energized immediately. The ignition control then senses loss of flame and de-energizes the pre-mixer blower.

To reset the ignition box from menu2:

- To enter menu2, proceed as indicated above.
- In menu2, push the *encoder* on *menu signal 20* to enter the *reset ignition control box option*, visualized by the flashing code "reS0" (**FE50**); push the *encoder* to confirm the reset operation.
- After confirmation, the display visualizes again the *menu signal 2.820* (**2.820**).
- To exit, select the letter "E" (**EE88**) and push the encoder.



**Figure 29** - IGNITION CONTROL BOX



**Figure 30 – IGNITION TRANSFORMER, IGNITER ASSEMBLY, AND FLAME SENSOR**









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