

# SOLO INNOVA

Models 30 and 50

*Wood-fired central heating boiler*

## Installation and Operations Manual



236-0-05-2



UL 391-2006 "Standard for Safety for Solid-Fuel and Combination-Fuel Central and Supplementary Furnaces."

**Solo Innova Instructions**

**1-800-782-9927**

**Version 01-18**

**Tarm Biomass · 4 Britton Lane · Lyme, NH 03768**

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# 1.0 Introduction

## 1.1 Foreword

### SAVE THIS INSTRUCTION MANUAL FOR FUTURE REFERENCE

**Congratulations on your purchase of the HS Tarm Solo Innova log wood boiler from Tarm Biomass!**

The Solo Innova boiler is produced using the highest quality materials and a modern production system. The use of high technology laser cutting and robotic welding system, accompanied by time honored European design, craftsmanship and attention to detail, results in a long lasting boiler with unmatched fit and finish.

With proper installation, operation and maintenance your Tarm Biomass Solo Innova log wood boiler will provide years of safe, dependable, economic and earth friendly heating.

This manual contains paragraphs that require your special attention. These paragraphs are marked with the symbols described below:



**Warning:** there is a risk of an accident of personal injury or serious damage to the property.



**Caution:** there is a risk of damaging the boiler or its individual components.

## 1.2 Units of Measurement

Most hardware and fittings on the boiler are metric (all plumbing fittings are British Straight Thread). In this manual the convention used for dimensions is that values are presented in English units, followed by metric units in parenthesis, for example: 6" (152 mm).

Note: A conversion table between Centigrade and Fahrenheit is provided in Appendix A. In this manual temperatures are presented first as degrees Centigrade then as degrees Fahrenheit in parenthesis, for example: 80 °C (176 °F).

## 1.3 Installation and Warranty Requirements

It is strongly recommended that the installer resist the temptation to simply get started without reading this manual. Hours of time and frustration can be prevented by a simple understanding of this product. This manual has been written with much care and thought. We want the first time installer to find installation as simple as for the experienced installer. Time spent reading now will save more time in the long run.

**The Solo Innova boiler must be installed with a thermal storage system capable of absorbing the complete output of the boiler during periods when the building is not calling for heat. A means for protecting the boiler against cold return temperatures must also be provided. Further information on acceptable ways of meeting these warranty requirements is provided in Section 3.0, Installation.**

This product is provided with a limited warranty which is described in Section 7.0 of this manual. The warranty is contingent upon the successful and legal installation of the boiler. At a minimum, the installation, adjustment, start up, service, and maintenance of this product must be performed by a licensed professional heating system installer. Where applicable, the installation must be inspected and accepted by the legally responsible entity. Conditions described in the text of the warranty for keeping it in force must be followed by the owner/ system operator.

If the boiler has been purchased through a dealer, the warranty claim must be made to the dealer. Otherwise, claims may be made directly to Tarm Biomass.

Please read the literature enclosed by the manufacturer regarding the various accessory devices. These devices are warranted by the manufacturer, NOT BY Tarm Biomass. These accessory devices must be installed and used according to the recommendations of the manufacturer.

Failure to follow these instructions could result in property damage, bodily injury, or death. All boilers must be installed in accordance with national, state, and local plumbing, heating, and electrical codes and the regulations of the serving electric, water, and gas utilities. Contact local building or fire officials before installation about restrictions and installation inspection requirements in your area. This boiler is safety tested and listed. The Solo Innova boiler does not carry an ASME stamp.

The instructions in this manual and in supporting documentation (additional instructions, diagrams, and component information provided by Tarm Biomass) must be followed. If the instructions are in conflict with local code requirements, the local code requirements will prevail. When in doubt, contact Tarm Biomass.

**The manual and supporting documentation must be retained by the owner/ system operator for reference and future use.**

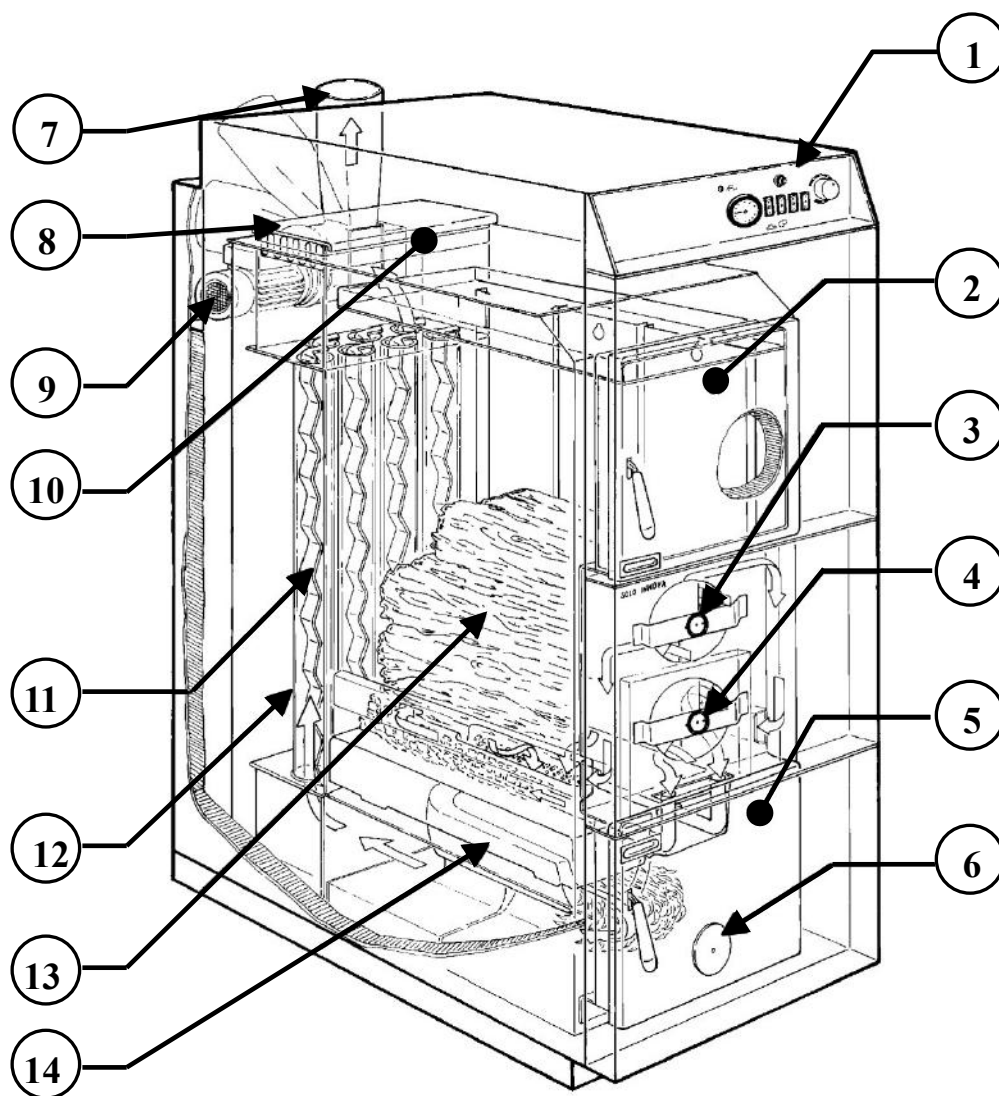
The installer is responsible for familiarizing the owner/ system operator with all aspects of boiler operations, safety procedures, monitoring and cleaning requirements, shut down procedures, and annual maintenance requirements.

## 2.0 Product Description and Requirements for Safe Operation

This section presents a general overview of the boiler and what will be required to operate it safely.

### 2.1 Boiler Overview

#### 2.1.1 Cut-away View



- |                          |                                |
|--------------------------|--------------------------------|
| 1. Control Panel         | 8. Clean-Out Cover             |
| 2. Load Door             | 9. Draft Fan                   |
| 3. Primary Air Control   | 10. Boiler Serial Number Plate |
| 4. Secondary Air Control | 11. Flue Gas Turbulators       |
| 5. Ash Door              | 12. Heat Exchanger Pipes       |
| 6. Sight Glass           | 13. Firebox                    |
| 7. Exhaust Stack         | 14. Gasification Tunnel        |

## 2.1.2 Boiler Fabrication and Testing

Your boiler was manufactured by HS Tarm, a world leader in hot water (hydronic) heating for over 80 years. The HS Tarm Solo Innova Series boiler conforms to traditional high standards for quality and reliability. It offers modern wood gasification technology with operating efficiencies at over 80% when run properly. If treated properly and operated according to the guidelines in this manual it will provide years of safe, dependable, and economical heating.

Solo Innova boilers are designed and built in accordance with European Standard CEN 303-5. Safety and performance testing and listing for U S markets have been performed by OMNI Test Laboratories, Inc., Portland, Oregon. The boiler is tested and listed to applicable UL standards. The boiler is not ASME stamped. The installer should follow local or state installation requirements.

The Solo Innova wood gasification boiler is a log wood fired boiler designed and constructed for highly efficient combustion of log wood. Do not burn other fuels in the Solo Innova boiler. The Solo Innova **is not** a self contained weather-tight boiler. It should be installed within the heated building. **Solo Innova log wood boilers must be installed with a thermal storage system capable of absorbing the complete output of the boiler during periods when the building is not calling for heat.**

## 2.1.3 Models and Applications

Two Solo Innova models are available (the model 30 and 50), covering an output range between 102,000Btu/hr (30 kW) and 170,000Btu/hr (50 kW). Specification data for each Solo Innova is provided in Section 6.3.

The boilers can be utilized as a single heat source, or in parallel with another boiler. Residential and nonresidential applications are appropriate.

## 2.2 Boiler Function

### 2.2.1 General Operation

A generalized discussion of the operation of the Solo Innova follows. Please refer to the cut-away view of the boiler in **Section 2.1.1**.

The Solo Innova boiler is an induced draft wood gasification boiler designed to efficiently burn wood as a component of a hydronic heating system.

The **control panel** (1) has the switch's, gauge, and controls for the boiler's operation.

Fuel is loaded through the **load door** (2) into the **loading chamber** (13) and the fire is kindled.

Air is controlled by the **primary air control** (3) and the **secondary air control** (4).

Secondary combustion takes place behind the **ash door** (5) and ashes are also removed through this door.

Combustion can be monitored through the **sight glass** (6).

Chimney connector is attached to the **exhaust stack** (7).

The **clean-out cover** (8) is detachable and allows access for cleaning the heat exchanger pipes.



The induced **draft fan** (9) pulls combustion air into the boiler via the primary and secondary air controls and pulls gases from combustion through the heat exchanger and exhausts them out of the boiler.

The **boiler serial number plate** (10) indicates factory no. and type and other information required to order spare parts. Factory no, and type can be noted in Section 8 On the last page of this user guide.

The **flue gas turbulators** (11) provide for turbulent flow of the flue gas in the heat exchanger, increasing heat transfer.

The heat **exchanger pipes** (12) transfers the heat from the combustion gasses to the boiler water.

The **firebox** (13) is the primary combustion chamber where the wood is loaded and the fire is started.

Secondary combustion air is injected in the nozzle just above the **gasification tunnel** (14) that serves to hold combustion gasses in a high temperature, turbulent environment to achieve high efficiency combustion.

The highly efficient wood combustion in the Solo Innova boiler is achieved by the draft fan continuously operating once wood in the boiler is ignited to achieve an efficient and clean burn of all the wood loaded in the firebox. Due to the continuous heat output once the Solo Innova is ignited the boiler must be connected to a thermal storage system.

### 2.2.2 Description of Burn Process

A key component of the Solo Innova boiler operation is the induced **draft combustion fan**. Both primary and secondary combustion air are both drawn into the boiler by the induction blower mounted on the breach of the boiler. Primary and secondary combustion air are metered through air ducts into the boiler with the precise volume necessary for proper combustion. The combustion air is drawn through **self closing flaps** into individually adjustable **primary and secondary air valves**. Primary air then is drawn into the firebox where it is dispersed behind the **firebox aprons** into the **primary combustion chamber** just above the top of the **ceramic refractory combustion stones**. Secondary air is drawn downward and then back into the center combustion stone where it enters the **combustion throat**. Here secondary air is turbulently mixed at high velocity with hot combustion gasses, which ignite and are burned very completely before being exposed to the heat exchange surfaces between the combustion chamber and the breach. The correct proportions of air for combustion from the fan and gases from the wood are a prerequisite for optimal and environmentally friendly burning of the wood with the highest possible efficiency.

A noteworthy construction feature is the special **ceramic fuel tunnel** (15) in the heart of the boiler which ensures that the combustion temperature reaches more than 1800 °F (1000 °C). Combustion is efficient, soot-free, and ensures optimal fuel use. The secondary combustion stones are essential to achieving complete combustion with log wood. The stones allow the combination of exhaust gasses and secondary air to reach very high temperatures while isolated from the quenching affect of the water jacket.

Carefully engineered **heat exchange tubes** downstream from the combustion process are fitted with removable **turbulators** to help ensure that a maximum amount of energy is transferred from the fuel to the hot water jacket. The heat exchange tubes can be accessed for cleaning through the **access panel and door** located at the top rear of the boiler. **Operation of the fan assumes that the boiler can discharge its heat continually. The Solo Innova must always be connected to a buffer tank of adequate size.**

### 2.2.3 Safety Systems

The Solo Innova comes with safety systems to prevent the following:

- Pressure in the boiler exceeding 30 psi (2 bars) (over pressure)
- Boiler water temperature exceeding 212 °F (100 °C)

To prevent an **over-pressure** condition, an ASME stamped pressure relief valve (provided) needs to be installed on the boiler which opens at 30 psi to relieve the boiler pressure (See Section 3.5.1). **Normal pressure in the boiler should be between 12-15 psi.**

On the control panel there is an overheat thermostat. If the boiler exceeds (212 °F) 100 °C it will shut off the fan to the boiler.

A gravity over-heat dump loop is also required. In the event of a power failure this loop should provide dissipation for at least 10% of the boiler's maximum rated output, assuming an ambient temperature of 65 °F. in the area heated by the loop, and a mean water temperature of 180 °F (82 °C) (See Section 3.4.2).

### 2.2.4 Accessories

The boiler is shipped with loose and installing parts. See Section 3.3.2 for a complete listing of these parts. Cleaning tools are provided with the boiler.

A **barometric damper** (draft stabilizer) is available for regulating chimney draft.

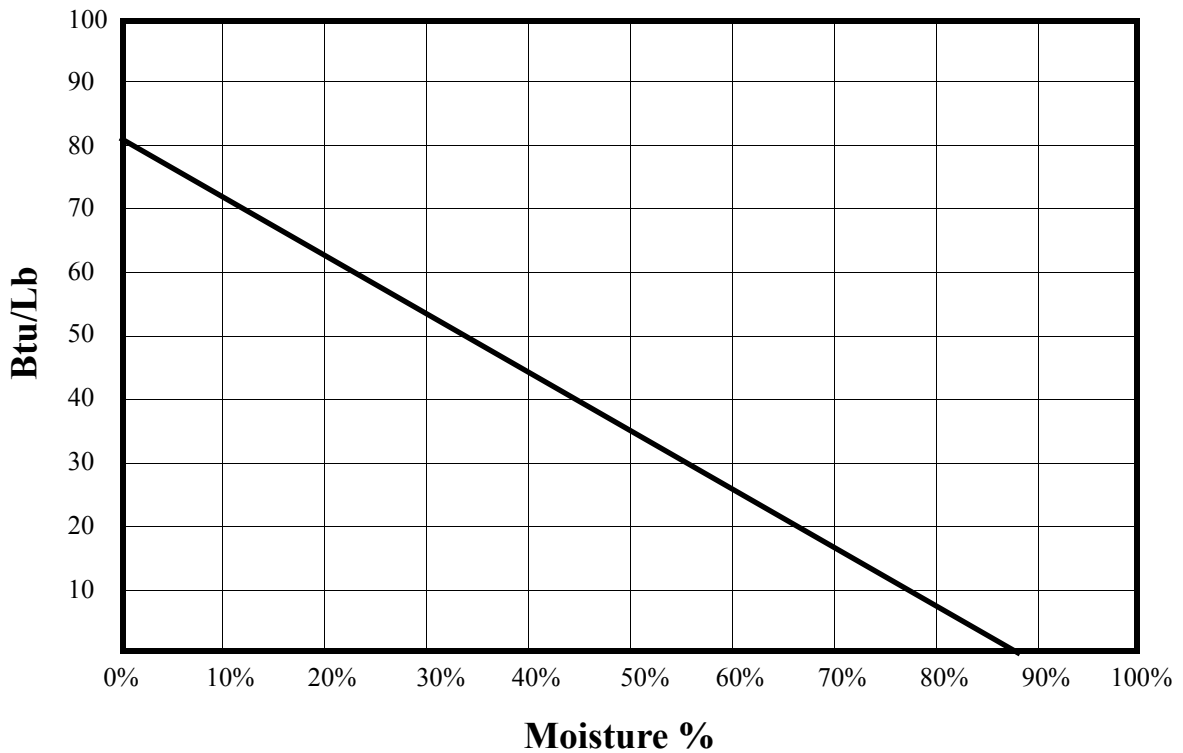
Plumbing around the boiler must include a three-port mixing valve in the orientation shown on installation drawing. The valve must be a **Termovar Model 4440A-3** or equal with a 72 °C element. Tarm Biomass provides this valve at an extra cost.

A **flue thermometer** (Part #3339N) is highly recommended to help monitor the performance of the Solo Innova. This part is available from Tarm Biomass .

A **Thermal Storage System** is available from Tarm Biomass.

## 2.3 Fuels

Chemically treated or painted wood is unsuitable as fuel. The **Solo Innova boiler is designed for burning of cord wood only.** Wood briquettes or manufactured pure wood logs can also be used as fuel provided they have a minimum cross section of 2.5 sq in. Manufactured logs should be at least 12” (0.25m) in length. Excessively small and compact pieces of wood or wood pellets are not suitable. Coal cannot be used as it becomes too compact and closes the combustion slot. The fire box can be filled to the top.



**Fig 2.2**  
**This chart shows how many Btu’s are lost by burning fuel with higher moisture content. We recommend fuel with a moisture content of 20% or less.**

The Solo Innova is made to burn natural **firewood**. Both hardwood and softwood are suitable, but oak should not be burned as the only source of wood for long periods because of its high acid content. For effective gasification, the wood must be dry, i.e. moisture content **15-25%**. In addition to increasing the likelihood of generating creosote in the boiler, burning wet wood uses a substantial amount of the wood energy to evaporate the water present in the wood, reducing the available energy for heat (**Fig 2.2**).

The wood will dry out most quickly if it is cut into the appropriate length and split into pieces 4”-5” (100-120mm) thick. The best length is 20” (0.5 m) for the Solo Innova 30 and 50. The wood is best stored in the open air under cover. Wood will dry most quickly if it is carefully stacked alternatively lengthwise and crosswise so that air can penetrate into the stack. Ideally the wood should be stored for at least one and a half years (two summer seasons). Do not burn small pieces of wood or wood chips in the boiler as they can block the combustion slot. Also, it can be difficult to control the combustion process effectively with small wood pieces and chips.

**WARNING**

 **If a fan is used in the fuel storage area, it should be installed so as not to create negative pressures in the room where the solid-fuel burning appliance is located.**

## 2.4 Building Requirements

- The boiler must be connected to a tile-lined masonry **chimney** or to a factory-built Type UL 103 HT approved chimney in good condition. See the details in Section 3.2
- A dedicated supply of **fresh combustion** air provided near the boiler is recommended for efficient, safe operation. This supply must not be directly connected to the boiler.
- The boiler should be installed in its own boiler room because of the noise generated by the fan motor and the combustion (it is about the same decibel level as in a modern oil-fired boiler), installing the **Solo Innova** close to a room where noise may be a problem is not recommended.
- A dedicated 240 VAC **power supply is required (See Section 3.4.9).**
- Revision of **existing heating system** piping may be appropriate to properly utilize the equipment. Although Tarm Biomass can provide advice and design detail on the integration of this boiler with the heating system of the building, the ultimate responsibility for the performance of the system rests with the installer.
- Please observe the guidelines and the various **national and local regulations.**
- **Solo Innova** boilers are designed and approved as heaters for hot water systems with permissible outflow temperatures of up to 203 °F (95 °C).

## 2.5 Owner Responsibilities

**Successful operation of this boiler will require daily involvement by the owner/system operator.** Biomass boilers operate differently from fossil fuel boilers, requiring more oversight and a diligent cleaning regimen.

- The owner/system operator is responsible for correct operation of the boiler per guidelines in Sections 4.0 and 5.0 of this manual.
- Incorrect operation can reduce the boiler life.

### DANGER



#### **Risk of Fire or Explosion!**

**Do not burn garbage, gasoline, gasoline type lantern fuel, kerosene, charcoal lighter fluid, drain oil, or other flammable liquids to start or “freshen up” a fire in the boiler.**

### WARNING



#### **Risk of Fire!**

- **Do not operate with flue draft exceeding  $-0.10$  (-2.54mm) water column.**
- **Do not operate with fuel loading or ash removal doors open.**
- **Do not store fuel or other combustible material within marked installation clearances.**
- **Inspect and clean flues and chimney regularly.**

### CAUTION



#### **Hot Surfaces!**

- **Keep children away.**
- **Do not touch during operation.**
- **Maximum draft marked on nameplate.**

**CAUTION**

☀ Safety faults or deficiencies with the boiler or installation must be rectified as quickly as possible. Either by the owner/system operator or the installer.

## 3.0 Boiler Installation & Start-up

This section describes the steps to installing and starting-up the boiler. **This section is directed at the installer.**

### 3.1 Planning

#### 3.1.1 Sizing the Boiler

It is critical to size the boiler properly. A proper, up to date heat load calculation is advised. An accurate history of building fuel usage over several years can help to calculate the proper size boiler.

**Boiler sizing is the responsibility of the installer.** Tarm Biomass bears no responsibility for boiler sizing, but can provide sizing input.

#### 3.1.2 Choosing an Installer

**Choosing a competent, licensed installer is critical to the successful installation of the boiler.** The installer is responsible for all planning, installation, start-up, troubleshooting, owner training, and annual maintenance for the boiler. Some aspects of the system piping, start-up, and operation may differ from normal practice in fossil fuel boiler installation. To be successful, the installer must study this manual, follow conceptual drawings and instructions provided, understand the installation tasks, and contact Tarm Biomass for help when necessary.

#### 3.1.3 Locating the Boiler and Boiler Clearances

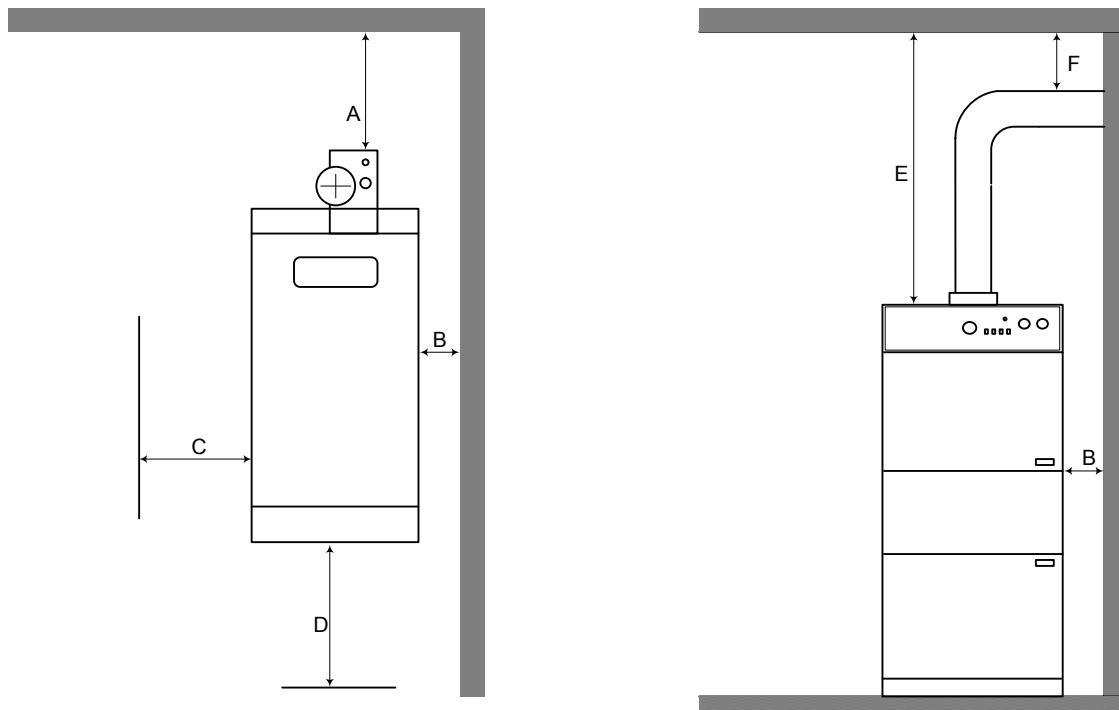
The boiler must be installed with the **minimum installation clearances** to combustible materials outlined on the next page. Clearances may only be reduced by means approved by the regulatory authorities.

- The boiler is not suitable for outdoor installation. It must be located in a weather-tight, protected space.
- The boiler must be placed on a level, non-combustible floor, such as a concrete slab on earth. If you have the boiler 8” above the floor it makes it easier to load and clean the boiler.
- If the boiler is placed near inhabited rooms, so that flue gas can easily penetrate into these rooms, a carbon monoxide alarm must be installed that can give a warning regarding possible escapes of carbon monoxide into the inhabited rooms.

**CAUTION**

**DO NOT INSTALL THIS BOILER IN A MOBILE HOME.** There is no safe way this boiler can be installed inside a mobile home.

The boiler must be installed with the **minimum installation clearances** to combustible materials outlined below. Clearances may only be reduced by means approved by the regulatory authorities.



Clearances to Combustibles		
Measurement	Minimum Distance	Notes
A-Backwall to Appliance	21"	Minimum Distance to Allow Clearance for Blower Maintenance.
B-Sidewall to Appliance	12"	Minimum Distance
C-Sidewall to Appliance	21"	Minimum Distance on Left Side to Allow Clearance for Cleaning, and Maintenance, and Easy Removal of Blower.
D-Front of Appliance	36"	Required Distance for Cleaning the Boiler.
E-Ceiling to Appliance	24"	Required Distance for Cleaning the Boiler.
F-Combustibles to Pipe	18"	Minimum Distance

### 3.1.4 Plumbing and Mechanical

The boiler must be connected to a suitable **chimney**. Chimney requirements are discussed in Section 3.2.

A dedicated supply of fresh **combustion air** should be provided near the boiler for efficient and safe operation, but must not be directly connected to the boiler. Outside combustion air is especially important for the Solo Innova due to its powerful induction blower (**See Section 3.2.1**).

For the heating system piping, it is possible to use either copper or iron piping materials. The supply and return pipe should be insulated to avoid heat loss. Included in **Section 6.5** are conceptual piping diagrams showing the correct layout for a variety of situations. Tarm Biomass can provide additional conceptual plumbing diagrams

A permanent pressurized domestic **water supply** must be provided with proper automatic filling and pressure reduction valves.

#### CAUTION

☀ Any plastic or rubber tubing used with a Tarm Biomass boiler must have an **oxygen barrier**, or boiler corrosion will occur. If radiant tubing without an oxygen barrier is installed, water in the tubing part of the heating system must be separated from the boiler. Separation of system components is typically done by using a heat exchanger. Use of radiant tubing without an oxygen barrier will void the boiler warranty.

Use of a suitable **antifreeze mix** is allowed, but will cause a loss in heat transfer efficiency.

If **water quality** is poor, water treatment additives should be considered. Boiler system water pH should be 8.0-8.6.

A **thermostatic mixing valve**, set to open at 140-160 °F (60-72 °C), is required to temper return water to prevent cold return water from reaching the boiler. This valve helps prevent boiler corrosion. Tarm Biomass can provide this valve (part # **K4440A3**), at an additional cost

A **circulator** (Size and brand to be determined by the installer (not provided)) should be installed as C3 per drawings suggested by Tarm Biomass.

An **aquastat** (Honeywell **L4008B** (provided)) must be installed to protect the boiler from over-temperature conditions by energizing a chosen heating zone.

A **tankless hot water coil** is not available for the Solo Innova.

Tarm Biomass recommends the use of the **BLTCONTROL** (available through Tarm Biomass) when burning the Solo Innova in conjunction with a back up boiler. The **BLTCONTROL** is a three position control that allows switching between wood only, wood with automatic back up, or back up only, by controlling the operation of the back up auxiliary boiler. **BLTCONTROL** takes input from a zone relay control and determines, based on the thermal storage system temperature, whether to pull heat from the thermal storage system or the back up auxiliary boiler. The **BLTCONTROL** easily integrates the Solo Innova boiler and thermal storage system with an existing fossil fuel heating system.

### 3.1.5 Electrical

For the Solo Innova boiler a **240 VAC, 60 hertz, 4-wire power supply is required**. If building power is lower (208 VAC, for example), a boosting transformer should be installed to correct the voltage. This electrical connection should be from a dedicated 15 amp, double-pole circuit breaker. A master service switch for the boiler, mounted on the wall in the proximity of the boiler, is recommended. Locally enforced electrical codes must be followed.

### 3.2 Preparing the Chimney

The chimney is one of the most critical factors in the successful operation of any solid fuel heater, including the Solo Innova boiler. A good chimney will provide a continuous and dependable draft to pull the exhaust gasses out of the building.

Follow manufacturer's installation instructions for installing and supporting any specific chimney product.

#### NOTE

**The boiler must be connected to a tile-lined masonry chimney or to a Factory-Built Type UL 103 HT approved chimney. The chimney must be in good condition. If the boiler is connected to a dirty or inadequate chimney, it can present a serious fire hazard. All chimneys and connections must conform to NFPA standard #211. No other appliance should be connected to this flue unless allowed by the local code authority. Consult your local inspector for chimney requirements and install the boiler in accordance with all applicable codes. Please review the following diagram before connecting the boiler to the chimney.**

Flue gas exhaust temperatures can be low enough to cause condensation in chimneys. Condensation will, over time, damage a masonry chimney. Accordingly, installation of a stainless steel chimney liner (made with 316 or AL-294C alloys) inside the chimney flue is strongly recommended.

At the connection to a factory-built chimney, a dripless adaptor must be used.

The chimney draft must be stable and between  $-0.025''$  ( $-0.6$  mm) and  $-0.05''$  ( $-1.25$  mm) water column.

#### WARNING



**If the draft exceeds the recommended maximum, it could cause a solid fuel fire to burn out of control.**

The top of chimney must be 3 feet (0.9 m) above the roof and 2 feet (0.6 m) above any structure within 10 feet (3.0 m) measured horizontally.

For the Solo Innova 30 and 50 best draft will be provided by a chimney which has an 6'' (152mm) ID round flue, is 20-30 feet (6.0-9.0m) in height and which is located inside the heated structure. The chimney must be capable of maintaining a breech draft of  $-0.05''$  ( $-1.25$ mm) WC during normal boiler operation.

Your Solo Innova gasification boiler is designed to burn efficiently and with virtually clear emissions, but under certain conditions creosote deposits can form in your chimney. Chimneys that are too large, are poorly insulated, or have bends in the flue passages are especially prone to problems with draft and/or creosote.



The smoke pipe connecting the boiler to the chimney flue must be black or stainless, have a minimum thickness of 24 gauge, and rise a minimum of  $\frac{1}{4}$ " per foot of run toward the chimney (**Fig3.1**). Smoke pipe sections must be attached to one another with a minimum of three sheet metal screws and sealed with high-temp silicone. The smoke pipe should not contain more than two 90° elbows (45° elbows are preferred over 90° elbows ).

**MASONRY CHIMNEYS:** Masonry chimneys must be lined, either with code-approved masonry or pre-cast refractory tiles, stainless steel pipe, or poured in place liner. Do not use an unlined chimney

**FACTORY BUILT CHIMNEYS:** Factory built chimneys must be tested and listed for use with solid-fuel burning appliances to the High Temperature (HT) Standard (2100 °F(1148 °C )), UL 103, for the United States. Factory-Built chimneys must be installed as per the manufacturers instructions.

Strong winds blowing across the top of a chimney or a chimney which has a particularly strong natural draft can cause the Solo Innova boiler to continue burning (heating) when the draft fan is off. This is an unlikely scenario, as the blower on a Solo Innova, used with a thermal storage system, should rarely be off while a fire is present. If however, an irregular or excessively high draft presents problems, the solution is the use of a barometric draft regulator or the use of a proper chimney cap that helps in the prevention of down drafts.

**Installation requirements for a barometric damper (draft regulator).**

- The diameter of the draft regulator must be equal or greater than that of the chimney connector.
- The draft regulator should be installed as close as possible to the boiler, on the chimney connection or on chimney itself.
- The draft regulator adjustment should be made with a vacuum gauge, if possible, with the boiler operating at full output. If the start-up is made in warm weather, a readjustment may be necessary in cold weather.
- If, at the maximum adjustment (maximum opening of the shutter of the draft stabilizer), the draft is always higher than -0.05" (1.25 mm) of water column, a second draft regulator may be required.
- Recommended draft regulator locations are shown in **Fig 3.1** (position 1 or 2). The optimal position is position 2.

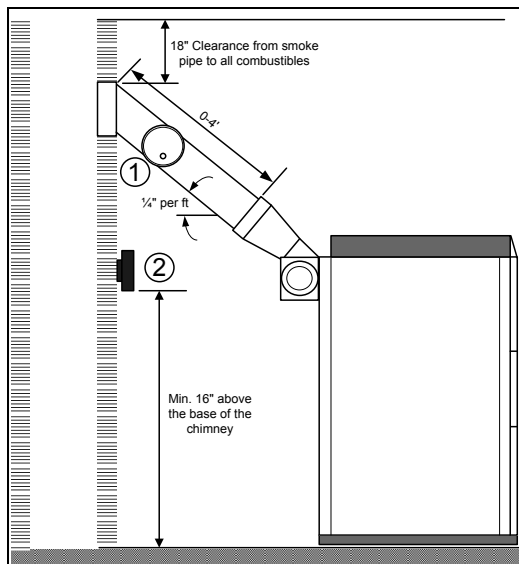


Fig 3.1

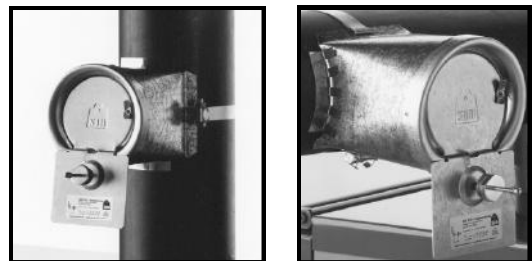


Fig 3.2 Examples of Barometric Dampers

### 3.2.1 Outside Combustion Air

Provision for outside combustion air may be necessary to ensure that fuel-burning appliances do not discharge products of combustion into the house. Guidelines to determine the need for additional combustion air may not be adequate for every situation. If in doubt, it is advisable to provide additional air. The Solo Innova, due to its powerful induction fan, needs adequate air to make up for the air being pushed up the chimney especially during start up before the chimney is warm.

Outside air may be required if:

1. The solid fuel fired appliance does not draw steadily; experiences smoke roll out from the loading door, burns poorly, or back-drafts whether or not there is combustion present.
2. Existing solid fuel fired equipment in the house, such as fireplaces or other heating appliances smell, do not operate properly, suffer smoke roll out when opened, or back-draft whether or not there is any combustion present.
3. Any of the above symptoms are alleviated by opening a window slightly on a calm (windless day).
4. The house is built very tightly with a well sealed vapor barrier or foam type insulation and tight fitting windows and/ or has any powered devices which exhaust in the house.
5. There is excessive condensation on windows in the winter.
6. A non-balancing ventilation system is installed in the house.
7. Where fans are used in the fuel storage area, they should be installed so as not to create negative pressures in the room where the boiler is located.

If these, or other indications, suggest that infiltration air is inadequate, additional combustion air should be provided from the outdoors.

Solo Innova boilers are not suitable for direct connection to outside air. Outside air should be ducted to no closer than 12" (305mm) from the boiler. A 6" (152mm) duct should be large enough for all sizes unless the duct run is over 25 feet (7.6m).

If a mechanical ventilation system (air exchange or heat recovery) is already present in the home it may be able to provide sufficient combustion make-up air for the solid fuel fired appliance. The ventilation system may need to be re-balanced after installation of the Solo Innova.

## 3.3 Setting the Boiler

### 3.3.1 Receiving the Boiler

Boilers are shipped on a single skid. Loose materials are consolidated into boxes strapped to the skid or placed inside the combustion area of the boiler. Please unpack the boxes and verify that the items on the checklist have been supplied with the boiler (separate checklist is located **Section 3.3.2**). Make certain that any damage or shortage is noted to the shipping receiver.

To move the unit into the boiler room the lift ring on the top of the boiler can be used.

To move the boiler around the inside of the boiler room rollers can be used under the boiler.

### 3.3.2 Boiler Checklist

Solo Innova Boiler Kit Checklist		
Item Description	Quantity	Included
Solo Innova 30/50	1	
Solo Innova Manual	1	
Boiler Pressure Relief Valve-30psi/525K BTU	1	
AMTEK Pressure/Temperature Indicator	1	
¾"X2" Black Iron Nipple	1	
¾"X¾"x¾" Black Iron Tee	1	
¾"X¼" Black Iron Reducer	1	
Relief Valve Mounting Flange	1	
Honeywell Aquastat L4008B	1	
½" Immersion Well	1	
Unipac Hemp and pipe Dope Kit	1	
Blower Housing	1	
Blower 30/50	1	
Blower Mounting Gasket	1	
Blower Mounting Hardware (1 Bag)	1	
Panel-Front	1	
Panel-Left	1	
Panel-Right	1	
Panel-Rear Lower	1	
Panel-Rear Upper	1	
Panel-Top	1	
Blower Insulation Housing	1	
Zip Strips	4	
Insulation Blanket-Top	1	
Insulation-Top Rear	1	
Cover Plate-Top Rear	1	
Clean-Out Cover	1	
Control Panel	1	

Please contact your dealer or Tarm Biomass immediately if any of the above items are missing! Tarm Biomass reserves the right to substitute equivalent equipment for any of the accessories listed above.

### 3.3.3 Temporary Storage

If the boiler installation is going to take place at a later date the boiler and components need to be stored in a safe, dust-free, dry location.

Moisture can damage the insulation, electrical components, and ceramics. If boiler is subjected to this kind of environment, it could void the warranty.

### 3.3.4 Moving the Boiler

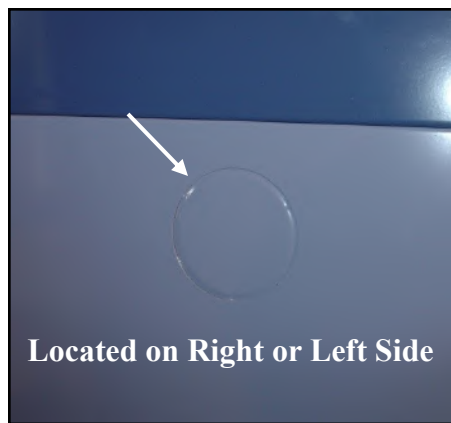
See **Section 6.3** Specification Data for weights and measurements of the Solo Innova boiler. **The boiler is heavy and large!** Moving the boiler into place requires planning and resources. The boiler may be unloaded using a pallet jack or forklift. Alternately, it can be lifted from above by utilizing the lifting rings welded to the top of the boiler.

### 3.3.5 Boiler Set-up

After the packaging is removed and the boiler is set into place, it should be checked to assure that it is level and securely placed. Loose parts and accessories shipped with the boiler should be removed and stored in a safe place. A copy of this manual is shipped with the boiler for reference during installation. The boiler can be set using leveling bolts located on each corner.

It is not necessary to remove the wooded shipping braces and wedges located within the boiler. They will burn away within a few hours of initial firing.

Before assembling the insulated jacket, determine which side of the boiler will be most convenient for mounting the pressure relief valve. Remove the appropriate jacket knockouts as shown on **Fig. 3.3**.



**Fig 3.3 Pressure Relief Valve Knockout**

### 3.3.6 Boiler Assembly

This section covers the step by step instructions for assembling the boiler.



**Bare Boiler**



**Mount Fan Housing**



**Remove Coil Plate on Either the Right or Left Side and Install Pressure Relief Valve Flange**



**Install Front Panel**



**Install Front Panel Mounting Bolt and Washer**



**Hang Left Panel**

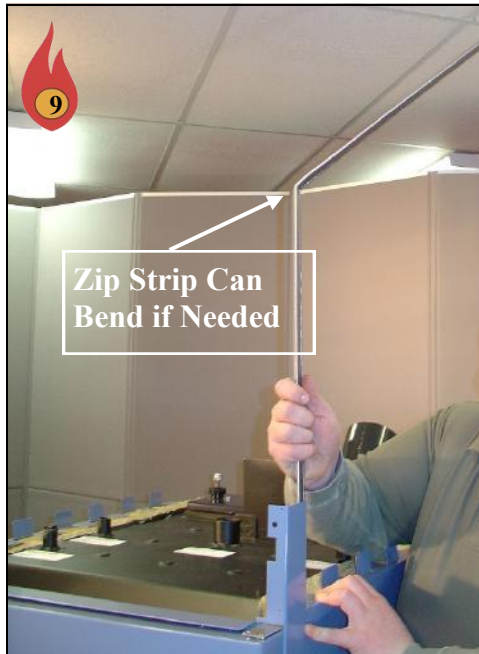


**Install Left Front Corner Zip Strip**



**Hang Right Panel**

If the junction Box is already mounted;  
Please skip to Step 13.



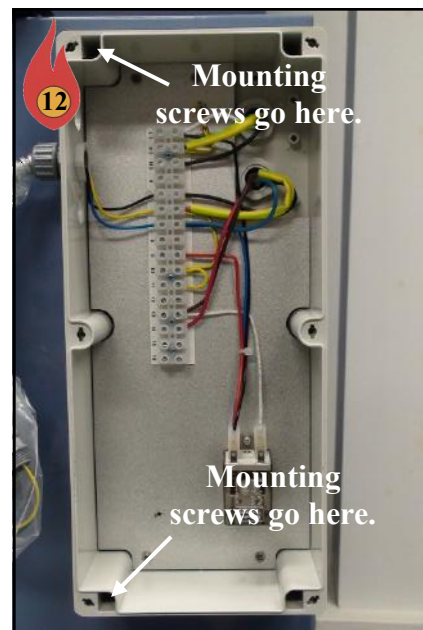
Install Right Front Corner Zip Strip



Remove the connector panel and wire harness on the back of the boiler by removing the four screws.



This shows the back panel with the connector panel removed.



Mount the new electrical box over the connector slot. Fish the connector wires through the slot.



Place Rear Panel into Place (Electrical box not shown)



Place Upper Rear Panel into Place



Install Left Rear Corner Zip Strip



Install Right Rear Corner Zip Strip





**Place Power and Control Wires  
In Side Wire Channel**



**Leave Fan Wire Hanging in Front of  
Front Panel**



**Install Ground Wire for Control Panel**



**Remove Insulation for Lo-Limit Temperature  
Probe on Fan Insulation Box**



**Install Fan Insulation Box**



**Cut Holes for Immersion Wells**



**Cut Out Square Above Clean-Out Cover. This will be used Later**

**Install Insulation Blanket**



**Remove Supply Pipe Assembly from Boiler**



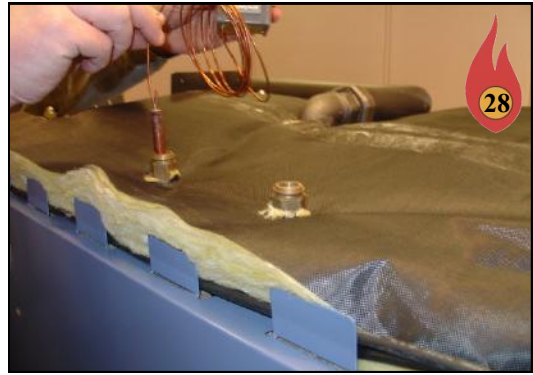
**Install Supply Pipe Assembly. It can be Installed on the Right or Left Hand Side.**



**Install Lo-Limit Probe Use Right Wire Channel to Hide Tubing**



**Install 3 Control Panel Sensors into Port #23. Make sure they are pushed all the way to bottom.**



**Install Sensor and 1/2" Well for Overheat Aquastat into Port #27.**



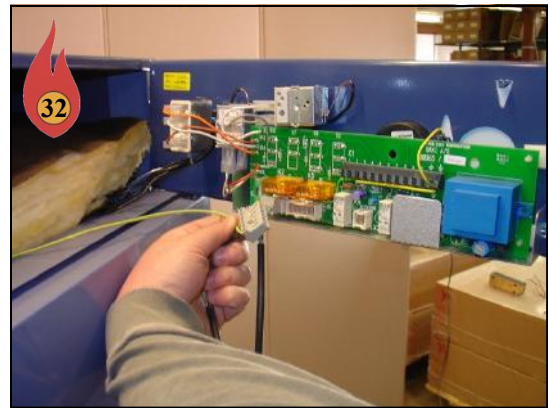
**Install Insulation on back of top panel.**



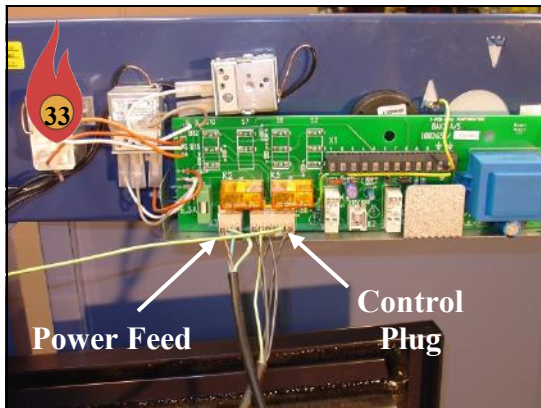
**Install Cover Plate**



**Install Top Cover**



**Plug-in supply and Control Plugs.**



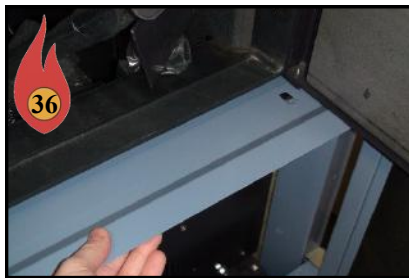
**Control Panel Connections**



**Fasten Control Panel**



**Place Insulation over Clean-out Cover (Removed Earlier)**



**Install Ash Shelf below the Load Door**



**Place Clean-out cover lid over the Clean-out Opening. Bend the 4 tabs on the Cover in the Downward Position**



**Place Fan Gasket on Housing**



**Mount Fan on Housing**



**Completed Boiler**

## 3.4 Connections to the Boiler

The following connections must be made to the boiler, in order for it to function:

- The boiler flue gas exhaust collar must be connected to the chimney system.
- The heating system piping must be connected to the boiler supply and return connections.
- Electrical power must be provided at the boiler electrical terminal box.

### 3.4.1 Chimney Connection

#### CAUTION

- ☀ Do not install a flue damper in the exhaust venting system of this unit.
- ☀ Do not connect this unit to a chimney flue serving another heating appliance, unless approved by the local code authority.
- ☀ Do not connect the boiler to any air distribution duct or system.
- ☀ Install vent at clearances specified by the vent manufacturer.

The connection between the boiler and the chimney system should be single wall 24 gauge (minimum) stainless or black pipe, unless prohibited by the local code authority.

- The single wall chimney connector must not pass through an attic, roof space, closet or similar concealed space, or a floor, or ceiling.
- Where passage through a wall or partition of combustible construction is desired, the installation must conform to NFPA 211.
- The chimney connection pipe must be placed over the outside of the boiler's flue gas exhaust pipe (**Fig. 3.4**). A boiler flue with an internal dimension of 5.8" (149mm) is used – see specification data in **Section 6.3**.
- The chimney connector sections must be attached to the boiler and to each other with the crimped (male) end pointing away from the boiler. All joints, including the connection at the boiler collar, must be secured with three sheet metal screws. All joints need to be sealed with a Hi-Temp silicone.
- A barometric regulator (draft damper), if used, should be incorporated into the connector (Refer to page 13 for more information).



**Fig. 3.4** Flue Gas Exhaust Pipe

### 3.4.2 Safety Plumbing

**NOTE**

**SYSTEM DESIGN:** Consider first provisions for handling excess heat produced by an over-heating boiler both with electricity and during a power failure.

**OVERHEAT LOOP: NO ELECTRICITY:** The piping and controls must be connected to the boiler in such a way that in the event of a power failure there is one loop of radiation available for gravity circulation. This loop must not be obstructed by any valves or other accessories which would prevent gravity circulation during a power failure. The piping is plumbed in such a way that excessive pressure will not be developed in any portion of the boiler or system. The loop must be large enough to dissipate at least 10% of the boiler's maximum rated heat output, assuming an ambient temperature of 65 °F (18 °C) and a mean water temperature of 180 °F (82 °C).

The minimum pipe size for this loop is ¾" and if possible, the loop should be located and pitched to maximize natural thermal convection of the water. The loop must be positioned above the boiler. The design of the loop must be such that it can be made inoperative only in a deliberate manual action. If large enough, an existing heating radiation zone may be used for the over-heat loop. The loop must be equipped with zone valves which will open automatically during a power failure. We recommend AUTOMAG zone valves for this application (offered as an accessory).

**OVERHEAT LOOP: WITH ELECTRICITY:** The HONEYWELL L4008B aquastat provided with this boiler must be wired in parallel with the thermostat on the zone with the most heating capacity in the main living area (dump zone). Upon reaching the aquastat set point, the dump zone will be activated, pulling heat away from the boiler. The home owner is alerted to a potential problem with the boiler by an overly warm living space.

Do not use self contained, non electric zone valves in the zone controlled by the overheat control! Such valves would prevent the overheat control system from the cooling the boiler when necessary.

**NOTE**

**THE THERMAL STORAGE SYSTEM MAY NOT BE USED AS A DUMP ZONE!**

One potential for overheating the boiler is if the boiler operator were to load too much wood into the firebox for the thermal storage system to absorb all of the heat produced by the load of wood. With minimal experience, most Solo Innova owners will learn to operate their boilers and thermal storage system so over-heating problems are rare.

### 3.4.3 System Plumbing

There are numerous possibilities for connecting your Solo Innova and thermal storage system to your home heating system. Tarm Biomass provides diagrams (**located in appendix**) as concept diagrams only. Final design, installation, and code compliance details are the responsibility of the designer/installer of the system.

**NOTE**

**Any radiant tubing used with the Solo Plus boiler must have an oxygen barrier! Non oxygen barrier tubing must be separated from the boiler using a heat exchanger.**

**NOTE**

**The Normal Operating pressure is between 12-15psi.**

### 3.4.4 Pipe Connections – Choice of Material

A copper/steel mixture can be used for the heating side. Copper followed by galvanized piping (in the direction of the water flow) should be avoided for hot water for reasons of corrosion protection. However, galvanized cold water piping and copper piping can be used for hot water. The supply and return flows must be carefully insulated to avoid heat loss.

### 3.4.5 Immersion Tubes and Wells

Remember to install the immersion tube provided in the corresponding well. (Immersion tubes are supplied with the boiler regulator.) **Remember to plug wells which are not used in the chosen form of installation.**

### 3.4.6 Expansion Tank

The size of the expansion tank is determined by the total water content of the heating system.

### 3.4.7 Pump Size

The size of the circulation pump is determined by the size of the system and the pipe dimensions.

### 3.4.8 Installing the 339N Probe Thermometer

The 339N Probe Thermometer (Part # 339N) is to be installed just downstream of the boiler's flue collar. Drill a 1/4" hole in the side of the pipe and insert the probe all the way in (see **Fig. 3.5**). This thermometer indicates of how well the wood is burning and when to clean the heat exchange tubes. If burning dry wood that is split, it should achieve temperatures of 350-450 °F (176-232 °C) or more on the probe thermometer.

If operation of the boiler is not achieving temperatures this high, check the following things:

1. Does the chimney have proper draft (see **Section 3.2**)?
2. Is there proper make-up air into the room (see **Section 3.2.1**)?
3. Are the vanes on the draft fan clean and not filled with ash or dust (see **Section 4.11.4**)?
4. Are the primary air channels open (see **Section 4.11.6**)?
5. Is the wood dry (<20%) and split to the proper size?
6. What is the condition of the firebox ceramics?

In most instances, low stack temperatures are an indication that the wood is not dry.

If boiler operations have been producing consistent temperatures and the flue temperature has been creeping upward, this is an indication that it is time to clean the heat exchange tubes by brushing.



**Fig. 3.5** 339N Thermometer Installed



### 3.4.9 Control Logic

#### TYPICAL CONTROL LOGIC FOR USE WITH BLADDER LINED COIL-TYPE THERMAL STORAGE SYSTEMS (Refer to Plumbing Diagram STSS1 or STSS2):

The process begins when a fire is lit in the boiler and the boiler's control is reset. Water within the boiler begins to warm. Hot water from the boiler will begin to circulate to the heating system when the water temperature reaches approximately 165 °F (74 °C). Depending on the return water temperature at the **4440A3** Termovar valve (**TV1**), water will either circulate back into the return of the boiler or will continue on to the supply manifold.

**TV1** is a three way thermostatic tempering valve. Port 3, which is the return to the boiler, always stays open. Port 1 remains open until it senses 165 °F (74 °C) water. At temperatures above 165°F (74 °C), Port 1 on **TV1** begins to close and Port 2 begins to open. Port 2 is fully open when the return water reaches 172 °F (78 °C).

The thermostatic element in the Termovar prevents cold water returning to the boiler until the boiler reaches operating temperature. The Termovar then gradually opens, blending hot boiler supply water with the cold return water. Once system temperature equalizes, the Termovar opens fully to allow full flow to and from the heating load (the house and/or a heat storage system). Please note: The balancing valve shown as a 1 ¼" ball valve upstream from port 1 is essential. Start with this valve closed ½ way and adjust more open or closed as necessary. Never fully close or fully open this valve. For customers who have chosen the **LOADING UNIT TERMOVAR 4832S** the balancing valve is built in and balances automatically.

Assuming that **TV1** is hot, the water being circulated by **C3** is now heading for the supply manifold. If no zones are calling for heat the Honeywell **V8043F1101** zone valve (**ZV1**) will remain closed. All of the hot supply water being moved by **C3** must travel through the heating coils in the thermal storage system moving from top to bottom and then back through Port 2 of the Termovar and back to the boiler.

Tarm Biomass recommends the use of the **BLTCONTROL** (available through Tarm Biomass) where the Solo Innova boiler is used with another backup boiler. **BLTCONTROL** is a three position control that allows switching between wood only, wood with automatic back-up, or back-up only, by controlling the operation of the back-up auxiliary boiler. **BLTCONTROL** takes input from a zone relay control and determines based on thermal storage system temperature or second stage thermostat reading, whether to pull heat from the thermal storage system or the back up auxiliary boiler. **BLTCONTROL** simply integrates the Solo Innova boiler and thermal storage system with an existing fossil fuel heating system.

If at any point while the boiler is in operation, a zone calls for heat, **ZV-1** opens and circulator **C1** is energized. Heat flows directly from the boiler to the supply manifold. If the boiler has burned through its wood and has cooled, Port 2 of the **TV1** valve will close and **C3** will stop. Flow through the boiler will cease. Once the boiler is eliminated from the plumbing circuit, any zone that calls must pull heat through the thermal storage system. Return water passes into the bottom of the heating coils and exits the top of the coils, re-heated by the thermal storage system, and moves to the supply manifold. If however, upon a call for heat, the temperature in the thermal storage system is below the aquastat (**HONEYWELL L4008A** or equivalent) set point, **C1** will cease operation and **ZV-1** will close. The back up boiler will be energized through the switch control to meet the heat demand.

Tarm Biomass recommends the use of an additional Termovar valve model **6440AF (TV2)** for most installations. Without **TV2** it is possible that when a small zone is the only zone calling, a master bathroom zone for instance, all of the heat the boiler is producing is drawn to the small zone. The result is that a 100,000 – 175,000 Btu (30-50 kW) boiler is sending all of its output to 2,500 Btu (0.73 kW) load. The boiler could quickly reach operating temperature and shut off, which must be avoided. **TV2** solves this problem. It operates much the same way that **TV1** operates except that it is a diverting valve. Port 1 of **TV2** receives water from the return manifold. Port 2 of **TV2** is connected to the supply manifold. Port 3 of **TV2** is connected to the return to the boiler and to the thermal storage system. When the **TV2** senses water 165 °F (74 °C). and above, it shunts water from Port 1 to Port 2 (back to the supply manifold). Because water returning to the boiler from the return manifold is diminished, the remaining flow from the boiler is forced through the heating coils in the thermal storage system. The result is that both the zone and the thermal storage system receive hot water and the boiler may continue to burn with a demand equal to or greater than its output. The end result is that the heating load is always prioritized over the thermal storage system, but heat not used will be stored in the thermal storage system for later use.

Please note the use of two opposing weighted check valves on the same pipe leading from the top of the heating coils in the thermal storage system. Their purpose is to act as a thermal trap preventing heated water from migrating out of the thermal storage system by convection. A “U” shaped pipe trap usually will not have a useful effect. If check valves are used, we recommend that they be cast iron bodied universal style flow checks. They **must not** be swing type check valves, as natural gravity flow of water will push swing check valves open.

**TYPICAL CONTROL LOGIC FOR USE WITH PRESSURE TANK THERMAL STORAGE SYSTEMS (Refer to Plumbing schematic PT1 or PT2):**

The process begins when a fire is lit in the boiler and the boiler’s control is reset. Water within the boiler begins to warm. Hot water from the boiler will begin to circulate to the heating system when the water temperature reaches approx. 165 °F (74 °C). Depending on the return water temperature at the **4440A3** Termovar valve (**TV1**), water will either circulate back into the return of the boiler or will continue on to the supply manifold.

**TV1** is a three way thermostatic tempering valve. Port 3, which is the return to the boiler, always stays open. Port 1 remains open until it senses 165 °F (74 °C) water. At temperatures above 165 °F (74 °C), Port 1 on **TV1** begins to close and Port 2 begins to open. Port 2 is fully open when the return water reaches 172 °F (78 °C).

The thermostatic element in the Termovar prevents cold water returning to the boiler until the boiler reaches operating temperature. The Termovar then gradually opens, blending hot boiler supply water with the cold return water. Once system temperature equalizes, the Termovar opens fully to allow full flow to and from the heating load (the house and/or a heat storage system). Please note: The balancing valve shown as a 1¼” ball valve upstream from port 1 is essential. Start with this valve closed ½ way and adjust more open or closed as necessary. Never fully close or fully open this valve. For customers who have chosen the **LOADING UNIT TERMOVAR 4832S** the balancing valve is built in and balances automatically.

Assuming that **TV1** is hot, the water being circulated by **C3** is now heading for the supply manifold. If no zones are calling for heat the **C1** pump will be off (If used, **ZV-1** will also be closed). All of the hot supply water being moved by **C3** must travel through the thermal tanks from top to bottom and then back through Port 2 of the Termovar and back to the boiler.

Tarm Biomass recommends the use of the **BLTCONTROL** (available through Tarm Biomass) where the Solo Innova boiler is used with another backup boiler. **BLTCONTROL** is a three position control that allows switching between wood only, wood with automatic back up, or back up only, by controlling the operation of the back up auxiliary boiler. **BLTCONTROL** takes input from a zone relay control and determines based on thermal storage system temperature or second stage thermostat reading, whether to pull heat from the thermal storage system or the back up auxiliary boiler. **BLTCONTROL** simply integrates the Solo Innova boiler and thermal storage system with an existing fossil fuel heating system.

If at any point while the boiler is in operation, a zone calls for heat circulator **C1** is energized (If used, **ZV-1** will open). Heat flows directly from the boiler to the supply manifold. If the boiler has burned through its wood and has cooled, Port 2 of the **TV1** valve will close and **C3** will stop. Flow through the boiler will cease. Once the boiler is eliminated from the plumbing circuit, any zone that calls must pull heat through the thermal storage system. Return water passes into the bottom of the thermal tanks and exits the top of the tanks, re-heated by the thermal storage system, and moves to the supply manifold. If however, upon a call for heat, the temperature in the thermal storage system is below the aquastat (**HONEYWELL L4008A** or equivalent) set point, **C1** will cease operation (If used, **ZV-1** will close). The back up boiler will be energized through the **BLTCONTROL** to meet the heat demand.

Tarm Biomass recommends the use of an additional Termovar valve model **6440AF (TV2)** for most installations. Without **TV2** it is possible that when a small zone is the only zone calling, a master bathroom zone for instance, all of the heat the boiler is producing is drawn to the small zone. The result is that a 100,000 – 175,000 Btu (30-50 kW) boiler is sending all of its output to 2,500 Btu (0.73 kW) load. The boiler could quickly reach operating temperature and shut off, which must be avoided. **TV2** solves this problem. It operates much the same way that **TV1** operates except that it is a diverting valve. Port 1 of **TV2** receives water from the return manifold. Port 2 of **TV2** is connected to the supply manifold. Port 3 of **TV2** is connected to the return to the boiler and to the thermal storage system. When the **TV2** senses water 165 °F (74 °C). and above, it shunts water from Port 1 to Port 2 (back to the supply manifold). Because water returning to the boiler from the return manifold is diminished, the remaining flow from the boiler is forced through the thermal tanks in the thermal storage system. The result is that both the zone and the thermal storage system receive hot water and the boiler may continue to burn with a demand equal to or greater than its output. The end result is that the heating load is always prioritized over the thermal storage system, but heat not used will be stored in the thermal storage system for later use.

### 3.4.10 Electrical Connections

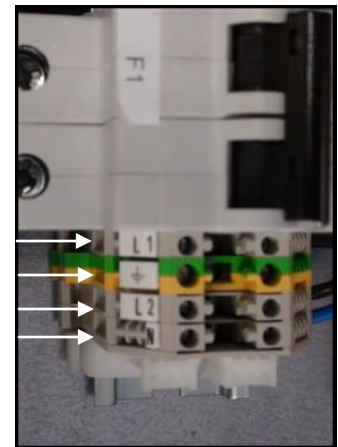
Electrical connections to the boiler are made to the boiler on block X4 in the large electrical junction box located on the rear of the boiler (**Fig. 3.6**). See the connection diagram in **section 6.4.3**. L1 and L2 are the two “hot” legs and the third leg is the ground wire (**Fig. 3.7**). The boiler requires a dedicated 240V 60 hertz 15 amp circuit. Check local codes for wire type and size. Shielded cable is usually required. All wires should be fastened to the junction box using the proper connectors. The boiler’s circulator pump (120 Volt) is connected to Terminals 9, 10 and 11 on Block X4 using the same guidelines above.



**Fig. 3.6 Junction Box**

Incoming Power

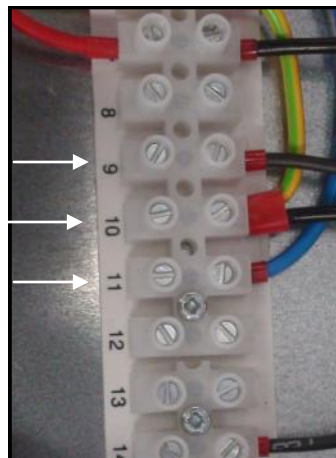
- L1
- G
- L2
- N



**Fig. 3.7 X4 Power Connections**

Circulator Power

- L1
- G
- N



**Fig. 3.8**

**Circulator Connections**



**Fig. 3.9**

#### Fan Connections

The white wire connects to (L), the red wire connects to (N), and the ground wire connects to the fan’s grounding screw (**Fig. 3.9**).

**\*Please refer to Section 6.4.5**

### 3.4.11 Boiler Control Panel Connections

Make sure the control panel is secured properly on the front of the boiler (Section 3.3.5).

Install the 2 sensors bulbs from the control panel in well # 27 (Shown in Section 6.1). Sensor bulbs need to be pushed all the way to the bottom of well. Capillary tubes should be bent carefully over lip of well and clipped into place (Section 3.3.5). Verify that the thin sensor for the Lo-Limit thermostat is installed in the dry well located on the blower box (Section 3.3.5). Set the Lo-Limit thermostat to 90 °C (194 °F) (Section 4.1).

### 3.4.12 Description of Functions

Note in brackets (Section 4.1).

To start the boiler from cold, the reset switch (N) must be pressed, after which a relay closes and remains active. The relay switches the fan and circulator on. When the boiler temperature reaches the minimum thermostat setting (P). Boiler thermostat (I) regulates the boiler. If the boiler temperature falls below minimum thermostat setting (P), the fan and the circulator pump is switched off.

### 3.4.13 Operating Thermostat

The operating thermostat regulates the fan and must be set high, possibly at max. There is a stop screw behind the thermostat knob corresponding to the setting for a minimum operating temperature of about 85°C (185 °F). The stop for the knob must be on the left side of the stop screw so that the boiler temperature is kept above 80°C (176 °F) (see Section 4.1).

### 3.4.14 Lo-Limit Thermostat

There is a Lo-Limit thermostat B15 on the boiler control panel which switches off the fan and the circulation pump M7 if the wood has burned out. Set the dial to 90°C (194 °F), the thin sensor must be placed in the flue gas collection box (Blower box) immersion tube. This ensures that the fan is switched off relatively quickly after the boiler has run out of fuel (see Section 4.1).

### 3.4.15 Circulator Pump

The boiler control panel controls the circulator pump M7. The pump must be connected to M7. Pump M2 is not used and has no thermostatic function. Circulator pump M7 is regulated by the Lo-Limit thermostat (see Section 4.1).

## 3.5 Commissioning the Boiler

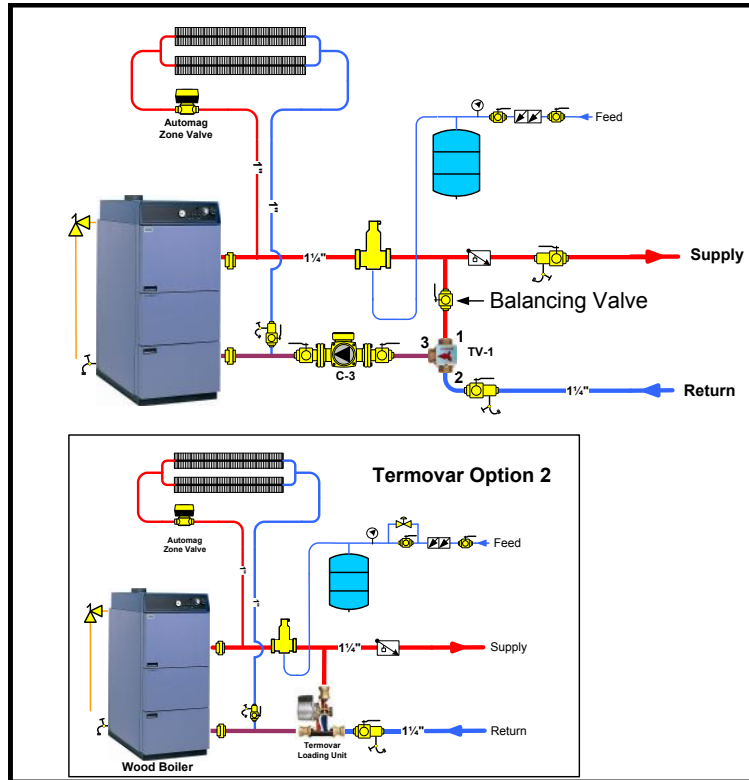
### 3.5.1 Safety Plumbing

The temperature /pressure indicator (provided. Part # PT1088), boiler pressure relief valve (provided, part # 1040705), must be installed as shown in Fig. 3.10. A 3/4" nipple, 3/4" Tee, and 3/4"X 1/4" reducer is provided to ease installation.



Fig. 3.10 Installed Relief Valve

A thermostatic mixing valve (accessory, part # **K4440A3** or **4832S**), and boiler circulator (included with the 4823S) should be incorporated into the heating system piping as shown in **Fig. 3.11**. When the **K4440A3** is used a ball valve (not provided) must be installed upstream of Port 1 of valve **TV-1**. The valve should be set at half open (and the handle removed), in order for the tempering loop to function correctly. If accessory **K4440A3** Termovar mixing valve is provided for use as **TV-1**, the unions supplied with the valve have internal valves which must be fully open.



**Fig. 3.11 Typical Plumbing Schematic**

**NOTE**

**The heating system main supply and return piping will need to be at least 1.25" (32 mm) for correct boiler heat output distribution. All field-run piping should be back-flushed to clean and remove debris. Adequate filling and venting ports should be added so that air can be removed from the system. The system should be pressure tested before being placed into service.**

### 3.5.2 Filling and Venting

**NOTE**

**If water quality is poor or PH unsatisfactory, the installer should consider water treatment additives during filling and water testing as part of annual maintenance.**

The best connection for filling the boiler with water is at the boiler drain. During filling the circulation pump is switched off. Filling takes place through a hose which is screwed onto the boiler drain and connected to a water supply faucet. Fill the hose prior to filling the boiler, otherwise air in the hose will be pushed into the boiler system. Remove the hose after filling up. High quality air elimination equipment is recommended in the heating system installation.

### 3.5.3 Final Installation Checklist

This final installation checklist should be reviewed before starting up the boiler for the first time:

- **General Boiler Installation**
  - Boiler set and level.
  - Clearances to Combustibles maintained.
  - Combustion make-up air provided.
  
- **Chimney**
  - Appropriate chimney connector installed.
  - Chimney and termination meet requirements.
  - Proper chimney draft.
  
- **Plumbing**
  - Plumbing fittings tight.
  - Termovar mixing valve or loading unit installed and orientated correctly.
  - Pressure relief valve installed and tested.
  
- **Electrical**
  - Boiler connected to dedicated 240V, 60 hertz 15 amp power supply.
  - Functional testing performed satisfactory.
  - Dump zone connected.

### 3.5.4 Combustion and Performance Testing

The boiler should be fired to test for performance, using **Section 4.0** as a guideline.

- Provision should be made for dissipating the heat generated.
- Have enough fuel to complete an entire testing program.
- Verify control strategy

Check that the boiler thermostat is functioning. Check the overheat thermostat, a temporary connection is made between terminals 6 and 7 on terminal strip XI (see **circuit diagrams Section 6**). The fan must switch off when the boiler reaches the temperature at which the overheating thermostat is triggered. (The temporary connection between terminals 6 and 7 must be removed when the overheating thermostat has been checked). The overheat thermostat can be switched on again when the temperature has fallen by about 60 °F (15 °C) (about 10-15 minutes). The unlocking knob (H) (see **Fig. 4.1**) is located under a protective cap.

Test fan by activating reset switch and by having the fan switch in the I position. If the fan does not turn; insure that the squirrel cage (fan blades) are not hitting mounting bolts located on the inside of fan housing. Re-adjust the squirrel cage if needed.

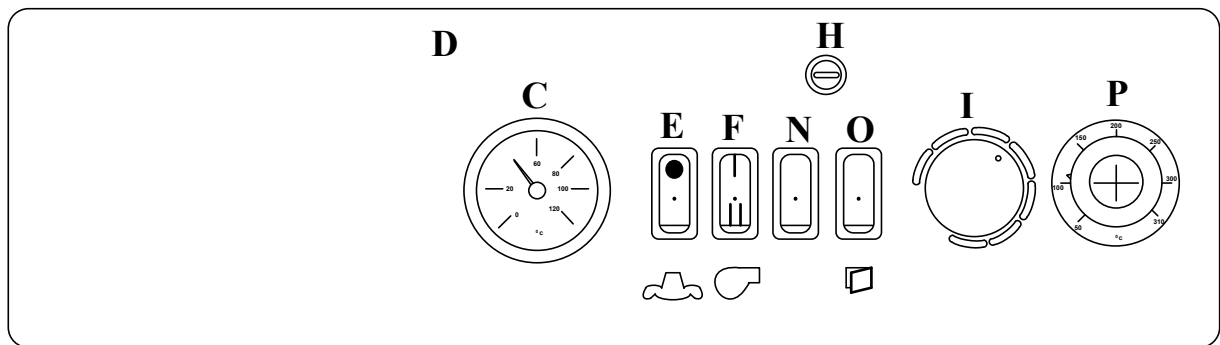
## 4.0 Boiler Operation, Maintenance, and Service

### Maintenance

It is also the responsibility of the user that the boiler be cleaned and maintained according to:

- Normal practice.
- The instructions of this manual.
- Instructions for the controls or equipment from other manufacturers.
- Other circumstances described in the written warranty.

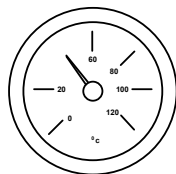
### 4.1 Control Panel Orientation



**Fig 4.1**

Letters in brackets ( ) in this section refer to the button with the corresponding letter on the control panel. All temperature values are in degrees Centigrade.

#### (C) Thermometer



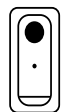
The thermometer shows the boiler temperature. The boiler temperature is adjusted via the Operating Thermostat (I).

#### (D) Fuse max. 6.3A (5X20 mm).

The Fuse is located on circuit board behind control panel.

#### (E) Switch for Circulator Pump

This switch is not used in the North American Market.





**(F) Fan Switch**



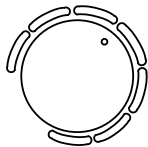
During operation the fan switch is always set at I. Position II will close the K5 relay and circulator pump (M7) will operate without blower control.

**(H) Overheat Thermostat**



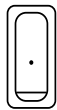
The overheat thermostat switches off the fan when the boiler temperature is approximately 100 °C (212 °F). wait until the boiler temperature has fallen to 75 °C (165 °F). To switch on again, unscrew the protective cap and push in the ejected pin.

**(I) Operating Thermostat**



Operating thermostat 85-93 °C (185-200 °F). The recommended set-point temperature is 85-90 °C (185-194 °F). To ensure that the temperature is not below 80 °C (176 °F), a stop screw is mounted under the knob. The knob must be to the left side of the stop screw and resting against it.

**(N) Reset Switch**



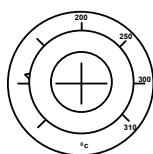
The fan switches off automatically if the boiler has burned out and the boiler/flue gas temperature falls. In units with a thermal storage tank, the fan switches off when the temperature at the sensor in the flue gas has reached 90 °C (195 °F). If the temperature at the sensor falls below 90 °C (195 °F) the reset switch (N) must be pressed to restart combustion in the boiler.

**(O) Door Open Switch**



The Door Open Switch will power timer relay K4. The timer will activate the blower for two minutes. This switch can be used if the boiler is at operating temperature and the loading door needs to be opened. It will turn on fan to exhaust combustible gases for two minutes.

**(P) Lo-Limit Thermostat**



The Lo-Limit Thermostat switches off the fan and the pump when the wood has burned out. It is set to 90 °C (195 °F).

## 4.2 Items to Check Before Using

1. Check the heating system water pressure before using the system. **NOTE: Water may not be added to the boiler while it is running.**
2. Ensure that the chimney connector pipe is connected to the chimney and that the chimney is free of obstructions
3. Ensure that all circulators are connected and operational.
4. Turn on the main electrical service switch.
5. Open any valves that may have been closed temporarily during set-up.
6. The transport protectors for the ceramic bricks are made of wood and will quickly burn. Do not try to remove them.
7. Check the Operating Thermostat for proper setting. The stop on the underside of the knob should be on the left hand side of the stop screw. The knob should be resting against stop screw.
8. Confirm that the setting on the Honeywell **L4008B** (overheat aquastat) is set to 200°F (94°C).

## 4.3 Starting the Boiler

1. Switch on the fan by pushing the rocker switch on the control panel (**F**) to the upper position marked "I".
2. Press the fan reset switch (**N**) to start the fan. Starting the fan will help to eliminate ash and smoke emissions in the boiler room during loading.
3. Lay 6-12 pieces of dry 1" X 1" X 18" (ideal size) kindling in a mild cross hatch pattern over the slot in the base of the firebox. Place paper or cardboard on top of the kindling and light with a match.
4. Close the door (It might help to keep the door slightly ajar).
5. Wait about 1 minute. Open the loading door slowly, about 1 inch (2.5 cm) with the left hand allowing the smoke to dissipate about 20 seconds. Load firebox neatly and evenly with firewood then close the door. At this point the boiler will operate on its own. Combustion will be stable after about 10-15 minutes.

## 4.4 Adding Wood

It is very important not to add more wood than is needed to raise the thermal storage system to its temperature limit. The maximum heat storage vessel temperature should only be reached when all the wood in the firebox has burned.

### NOTE

**THE FAN SHOULD ONLY SWITCH OFF FOR SHORT PERIODS OF TIME DURING A BURN-CYCLE. MAKE THE BEST POSSIBLE USE OF THE THERMAL STORAGE SYSTEM AND DO NOT ADD TOO MUCH WOOD.**

\*Standby time and starting/stopping of the fan do not give clean combustion. Furthermore, condensation will occur in the filling chamber, causing corrosion in the steel walls.

1. If the fan is on go to step 3.
2. Press the Door Open Switch (**O**).
3. Open the filling door 1 inch (2 cm) with the left hand.
4. Wait about 20 seconds.
5. Slowly open the door.
6. Add wood. Try to stack the wood as evenly as possible.
7. Close the door.
8. Switch on the fan switch (**F**).
9. Press the reset switch (**N**).

**NOTE**

**If wood is stored in the boiler room, ensure that it is not stored within the clearances to combustibles or in a way that will impede daily firing or maintenance.**

## 4.5 Daily Firing

The boiler should not be started nor should more wood be added until the thermal storage system is cool enough to absorb the heat produced by an additional firing. For most applications the tank should be able to rise 40 °F (20 °C) per load of wood. Depending on the load placed on the heating system, a single firing of wood during the non-heating season may produce enough energy to last from 5 to 10 days. During the heating months, most owners will find that loading each 12 or 24 hours with a fresh load of wood is adequate. **If loading within a 12 hour interval, it may be possible to re-ignite the fire by placing fresh wood in on top of red coals.** Kindling may not be necessary. It is good practice to clean out the “U” shaped tunnel stone, accessed through the ash door, before each firing. If black cinders are present, leave them between the U stone and door, they will be burned. Only remove the ash if possible.

**WARNING**

**It is important to keep the load and ash doors closed during operation and to maintain the door seals in good condition.**

## 4.6 Shutting Down the Boiler

Switch off the boiler by turning off the fan switch on the control panel. The circulating pump will shut off when the boiler is cool. Take care not to shut off power to the boiler circulator if there is any chance that the boiler may heat up again.

## 4.7 Operation with Thermal Storage System

Tarm Biomass requires that the Solo Innova be permanently connected to a Thermal Storage System. The boiler will always be able to discharge its heat resulting in better combustion, less depositing of soot and tar, and longer boiler life. Operation is simplified as the filling chamber can be completely filled. The boiler can be fired when you have time and the house can be supplied with heat as required from the thermal storage system. An added benefit is that domestic hot water can also be created in the reservoir. Keep in mind that the amount of wood placed in the boiler’s filling chamber depends on the size and the temperature of the heat storage reservoir. The boiler should not be fired beyond the reservoir’s heat storage capacity. Do not add wood until the temperature in the thermal storage system has fallen to 140-160 °F (60-72 °C). so that the reservoir will again be able to absorb heat. Set the boiler temperature to a maximum temperature of 180° F (82 °C).

## 4.8 Creosote

Tar deposits are not normally a problem in a Solo Innova which is fired as directed. If soft or tar like creosote is found in the firebox can be a symptom that the boiler is being filled with more wood than is necessary. Glazed, crunchy and scaly creosote in the main firebox is common and expected. Glazed, crunchy, or scaly creosote should never be found in the lower combustion chamber, heat exchange tubes, or in the chimney. When wood is burned slowly, it produces tar and organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. The chimney and chimney connector should be inspected at least twice monthly during the heating season to determine if a creosote build-up has occurred. If creosote has accumulated it should be removed to reduce the risk of a chimney fire.

## 4.9 Adjusting Combustion

The Solo Innova features adjustable primary and secondary air controls for optimal burning. The controls are located behind the hinged panel on the front of the boiler between the loading and ash doors (Fig. 4.2). The primary control is the upper control (3) and the secondary air control (4) is the lower control. Both controls are normally set 75% open. Combustion is stable after about 45 minutes of operation and the secondary air may be turned off. Typically, these controls are left in one position, but if so desired, the secondary air can be turned off. An observation glass is located in the center of the ash door (6). The glass is located in a wheel, which can be rotated until the glass is at the 6:00 position to view the combustion chamber. The flame should be yellow and pale bluish, and the flame length should be as pictured below with flame just starting to pour out the front of the “U” or tunnel stone. **Do not open the lower door while actively burning!** It is normally only necessary to adjust the settings if the fuel is changed (for instance if moisture content or wood species vary dramatically). If full output is required, both air controls can be opened 100%.

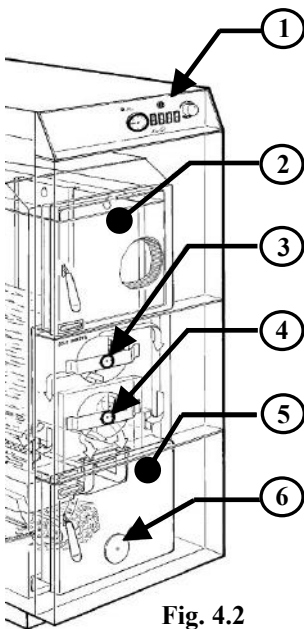
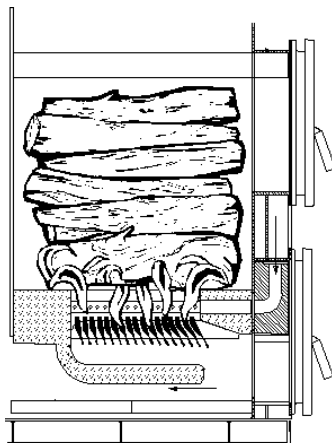
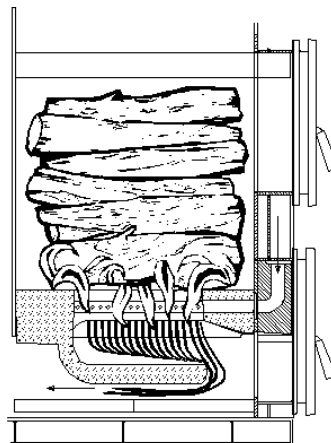


Fig. 4.2

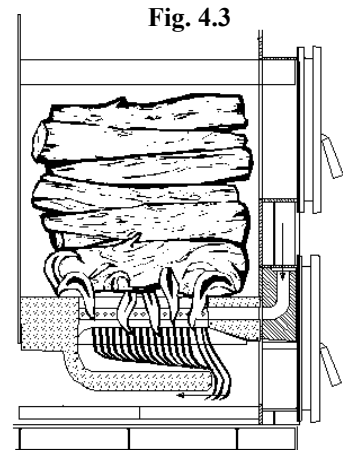
Manual Air Setting-Standard Values		
Boiler Type	Primary Air (Damper 3)	Secondary Air (Damper 4)
<b>Hardwood (Maple and Birch)</b>		
Solo Innova 30	50%	50%
Solo Innova 50	75-100%	75-100%
<b>Softwood (Spruce and Pine)</b>		
Solo Innova 30	100%	0-10%
Solo Innova 50	100%	20%



Too Much Air  
Flame too short and bluish  
Reduce Secondary air.



Too little Air  
Flame too long and reddish yellow  
Increase Secondary air.



Correct setting  
The flame is yellow and pale bluish.

Fig. 4.3

## 4.10 Firing Tips

It is important to use wood of an appropriate size (length and diameter) and to stack it properly so that there are no “holes” and “hanging pieces” in the wood stack, which must then be regularly stirred with the poker to form it into a compact mass. The diameter of the wood ideally should not exceed 4-6 inches (10-12 cm) as “holes” would then form more easily in the wood layer, creating a risk of reduced heating output. Thick pieces of wood ideally should be split to a diameter of 4-6 inches (10-12 cm).

See **Figure 4.3** for correct flame length.

## 4.11 Cleaning and Maintenance

### 4.11.1 Ash Removal

#### WARNING



**Before performing any cleaning or maintenance on the boiler, allow boiler to completely burn through all fuel and to normally cool down and shut off.**

#### NOTE

**Turn off power to the boiler before performing any cleaning or maintenance.**

The boiler must be cleaned regularly. Lack of cleaning can result in loss of boiler efficiency, malfunctioning and reduced boiler life.

Most ash produced during boiler operation will be drawn down into the gasification chamber where it can be removed. Ash should be cleaned out of the gasification chamber, from both the combustion tunnel and the refractory floor, through the ash door as needed, typically every 3-5 days.

Clean the firebox once or twice a month. Ash remaining in the firebox can be worked from the sides of the firebox to the slot at the center of the refractory where it can fall down to the lower gasification chamber with the tool provided - use care not to damage the refractory slot. Do not allow a deep build up (more than 2” (51 mm)) of ash on the surface of the refractory.

For ash removal, open the insulating door and the ash door, place your ash pan on the floor in front of the ash door and pull the ash in this area into the pan using the ash removal tool. Be sure to remove ash buildup under the heat exchange tubes behind the combustion tunnel □ The amount of ash produced by the boiler will depend on the type of fuel used.

#### WARNING



**Ashes removed from the boiler should be placed in a metal container with a tightly fitting lid. The closed container of ashes should be placed on a non-combustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled. Other waste should not be placed in this container.**

**WARNING**



**Solid-fuel burning appliances need to be cleaned frequently because soot, creosote and ash may accumulate. If there is a soot or creosote fire, please do the following:**

- **Establish a routine for the storage of fuel, care of the appliance, and firing techniques.**
- **Check daily for creosote buildup until experience shows how often cleaning is necessary.**
- **Be aware that the hotter the fire, the less creosote is deposited, and that weekly cleanings may be necessary in mild weather, even though monthly cleanings may be enough in the coldest months.**

### 4.11.2 Cleaning Firebox Aprons

Firebox aprons are fitted along the sides of the firebox (Fig.4.4). These firebox aprons should be taken off once a month and any ash or creosote deposits behind them cleaned. The ventilation holes in each side should be kept open (Fig.4.6). Remember to be careful when working around the refractory.

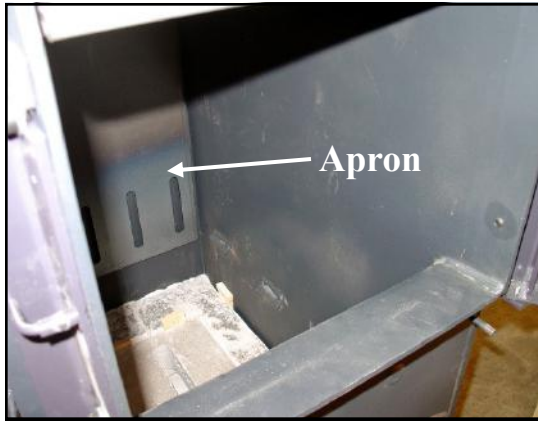


Fig. 4.5 Firebox with Aprons Removed

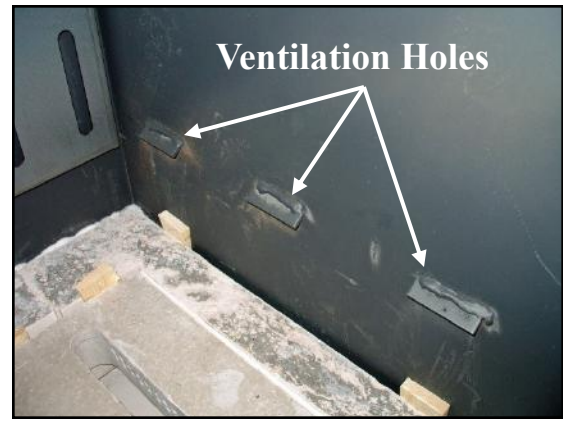


Fig. 4.6 Primary Air Ventilation Holes

### 4.11.3 Smoke Box and Heat Exchange Tube Cleaning

The smoke box, the flue outlet and the heat exchange tube areas should be cleaned twice a month with the boiler brush. Let the boiler cool and shut off the power to the boiler. Remove the upper insulating cover, smoke box cover plate and the turbulators from the heat exchange tubes. Insert the brush into each heat exchanger pipe and work back and forth thoroughly. Push the brush all the way through, but be careful not to damage the bottom plate underneath. Remove fly-ash from the smoke box area above the heat exchange tubes. Ash that falls down to the bottom of the heat exchanger tubes during cleaning can be removed through the ash door as described above.

When reinstalling the smoke box cover, make sure that the Bakelite tightening knobs on the “L” bolts that secure the cover in place have been loosened sufficiently to allow the “L” bolts to be rotated to fully engage the lug on the boiler body (Fig. 4.7 and Fig. 4.8). If the bolts do not fully engage the lug on the boiler, the cover may not fully seal the smoke box allowing for an air leak through the smoke box, decreasing the efficiency of the draft fan.

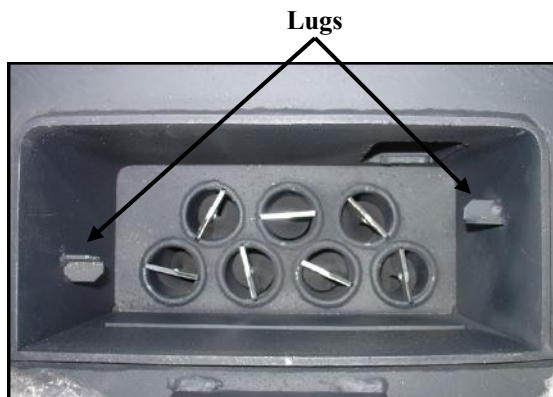


Fig. 4.7 Smoke Box and Heat Exchangers

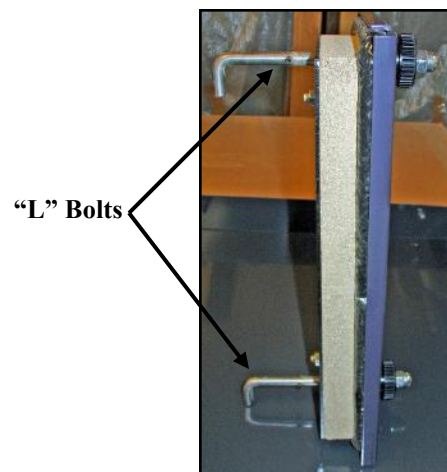


Fig. 4.8 Smoke Box Cover

**NOTE**

Clean heat exchanger tubes and smoke box mean better heat transfer from the flue gas to the water and thus better operating economy.

**NOTE**

Elevated flue gas temperatures above 500 °F (260 °C) may indicate the need to brush the heat exchange tubes.

#### 4.11.4 Cleaning the Induced Draft Fan

The induced draft fan (Fig. 4.9) must be inspected regularly (about four times a year) and cleaned as necessary. Dust and ash buildup on the fan blades can significantly reduce fan performance.

For inspection and cleaning, remove the induced draft fan on the back side of the boiler. Check for build-up and damage and at least once a year clean the draft fan wheel inside and out using a stiff brush. Remove ash deposits from the induced draft fan housing using a putty knife, and vacuum loosened material from the housing and draft fan.

When the chimney connector is connected vertically directly under the chimney, the fan must always be removed and cleaned after each cleaning of the chimney.

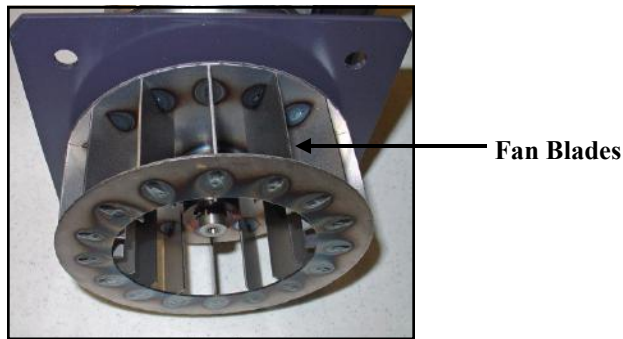


Fig. 4.9 Removed Fan

**NOTE**

Please inspect the draft fan carefully – even a thin coating of ash significantly reduces the air flow and must be removed.

**NOTE**

If the fan motor is blocked because of lack of cleaning, the motor can be ruined.



### 4.11.5 Maintaining Door Seals

It is very important to maintain tight seals on the doors. Check the loading door and ash door gaskets regularly to insure that they are sealing well and that there is no unwanted air leakage into the boiler. Poor seals can result in air leakage into the boiler and lead to inefficient burning of the boiler or the escape of smoke and gasses from the boiler. The rope seal used to on doors should be inspected regularly.

Check the seal for alignment on the door frame by examining the imprint made by the frame on the seal.

#### Steps to Replace the Door Seals:

1. Remove the two pins and take off the door.
2. Remove the old sealing with a screwdriver or a chisel.
3. Clean the sealing groove.
4. Press new sealing into the groove. When half the sealing has been inserted, adjust the end and press in the rest.
5. Secure the sealing by gently tapping with a hammer.
6. Replace the door.
7. Close the door and check its seal.

### 4.11.6 Cleaning the Primary Air Channels

The primary air channels (on both sides of the boiler) can occasionally become blocked reducing the primary air flow to the firebox.

#### Checking the Primary Air Openings:

1. Open the outer door and firebox door.
2. Unhinge the firebox aprons (**Fig.4.10**).
3. Check the Primary Air Ventilation Holes (**Fig.4.11**) for unobstructed airflow.
4. If necessary, clean the openings and air channels.

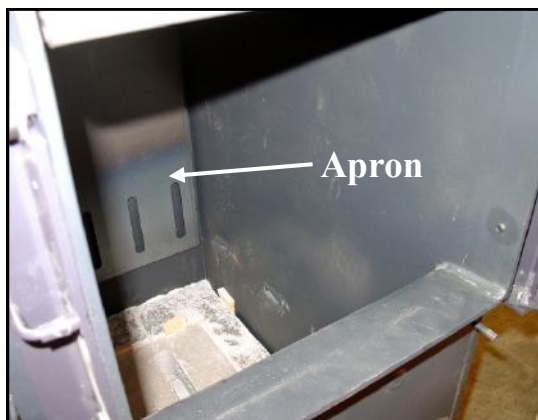


Fig. 4.10 Firebox with Aprons Removed

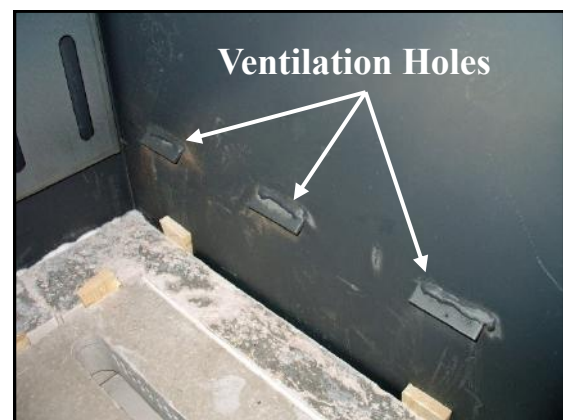
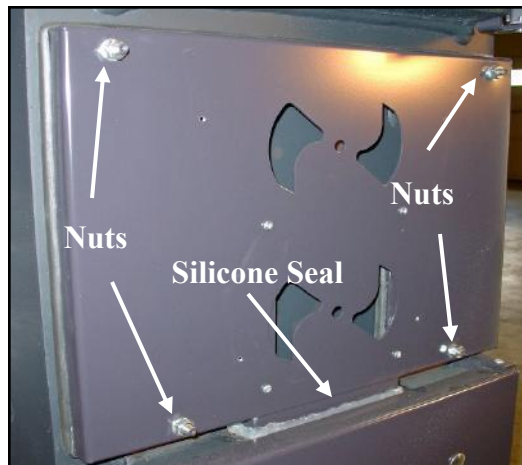


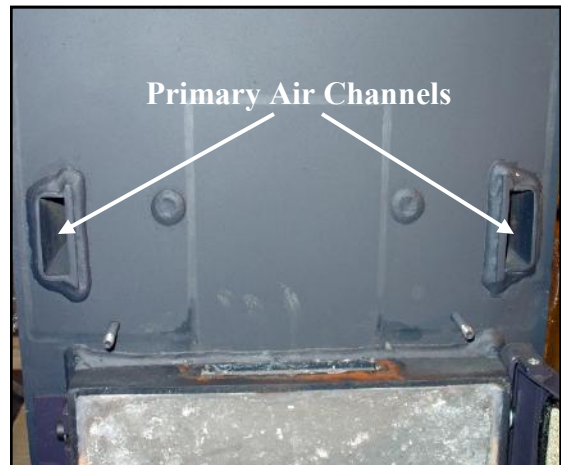
Fig. 4.11 Primary Air Ventilation Holes

**How to Clean the Primary Air Channels (some clear 100% silicone will be needed):**

1. Remove the diffuser which is located between the loading and ash doors (**Fig.4.12**). This is performed by removing the 4 corner nuts and carefully breaking the silicone seal on bottom of diffuser.
2. The air channels (**Fig. 4.13**) can then be cleaned with brush provided.
3. After cleaning the channels the diffuser can be reinstalled. Remove old silicone on bottom of diffuser before reinstalling.
4. Place a new bead of silicone at base of diffuser around air channel.



**Fig. 4.12 Diffuser Panel (Air Controls not Shown)**



**Fig. 4.13 Primary Air Channels**

#### **4.11.7 Cleaning the Smoke Duct**

The smoke duct is located at the top of the firebox, and when the load door is opened, any smoke from the firebox is drawn by the draft induction fan through the smoke duct and exhausted out the flue. To check the smoke duct open the insulating door and fuel loading door. The area above the baffle that forms the smoke duct should be inspected for any debris or ash. Any material in the smoke duct can be removed with a small brush.

#### **4.11.8 Smoke Pipe Inspection and Cleaning**

The chimney and the chimney connector must be inspected and cleaned annually. Annually disassemble the stove pipe and clean ash accumulation and inspect for corrosion. If any pipe is substantially corroded, this section must be replaced. Cleaning the connecting pipe between the boiler and the chimney is very important for horizontal smoke pipes!

**NOTE**

**Chimney inspection and maintenance is a critical part of any wood-burning maintenance schedule. Make sure that the chimney connection is secure and airtight. Inspect chimney regularly and clean as needed.**

### **4.11.9 Chimney Fires**

Chimney fires are caused when excessive buildup of creosote in the chimney connector pipe or the chimney is ignited by a racing fire, or when a burning piece of material is swept out of the firebox into the chimney. If you have a chimney fire, you will hear a roaring sound in your chimney, almost like a jet airplane. In addition, sparks may be seen flying from the chimney outside the house. Chimney fires can set fire to the interior of your house or roof. They are potentially very dangerous, and the following procedure should be followed if you think you have a chimney fire:

1. Call the fire department.
2. Shut all doors and close all air inlets on your boiler.
3. Evacuate your house.
4. If possible, wet your entire roof with the garden hose.

Chimney fires can be avoided by following the recommendations in this manual for minimizing ash formation, by maintaining your chimney in good condition, and by cleaning your chimney regularly. **A chimney fire should never happen with a Solo Innova boiler.**

### **4.11.10 Checking the Barometric Damper**

Annually check the barometric damper flap for ease of operation. The barometric damper flap should operate freely and maintain a chimney draft between -0.04 to -0.06 inches water column.

### **4.11.11 Cleaning the Jacket**

Soot on the jacket and the doors can be removed with a cleaner containing ammonium chloride and acetic acid. Clean the jacket regularly as required to preserve the boiler's appearance.

### **4.11.12 Check for Creosote Build-up**

Check for creosote buildup in the heat exchange tubes, the smoke pipe and the chimney twice a month. If during cleaning and maintenance a buildup of creosote is noted anywhere besides the firebox, something is wrong with the boiler operation. Check the seal of the door gaskets, the load door to the smoke duct and the smoke box cover.

### **4.11.13 Seasonal Shutdown Procedure**

If the boiler is not being used during the summer season, it is important that the boiler be properly cleaned. The upper and lower combustion chambers, heat exchanger tubes and upper smoke baffle should all be cleaned. After the boiler is cleaned, keep all doors and air dampers closed. Remove the flue pipe and stuff insulation into the flue collar. If you notice condensation forming on the inside of boiler, hang a 15-25 watt light bulb inside boiler.

### **4.11.14 Checking the Pressure Relief Valve**

The pressure relief valve protects the system from dangerously high pressure by opening at a preset pressure rating to allow fluid to be safely released. The pressure relief valve should be seated properly and not drip system water. The pressure relief valve should be inspected and maintained according to the manufacturer's recommendations.

#### 4.11.14 Checking System Pressure

The system expansion tank in a closed system allows for the thermal expansion of the fluid in the heating system. See the expansion tank’s operating instructions for maintenance requirements.

#### 4.11.15 Heat Storage System Maintenance

As described above, the Solo Innova boiler needs to be installed with a thermal storage system or other heat storage system. Please follow the recommended maintenance schedule for these parts of the heating system. Specific maintenance items for the heat buffer will be specified by the system manufacturer, but items may include checking any safety valves, anode in any connected hot water reservoir, or system water level and system PH in static water storage systems.

### 4.12 Power Outages

The boiler will not operate in the event of a power failure. Do not open the loading or ash doors until power is reestablished. The fan needs to be able to operate to remove combustible gasses. It is good practice to close the primary and secondary air dampers (move the dials counter-clockwise to first position). Remember to open the dampers before the next firing.

## 5.0 Troubleshooting

### 5.1 Troubleshooting Guide

Solo Innova Troubleshooting Guide		
PROBLEM	ROOT CAUSE	Solution
No Heat in the System	Thermostat (I) set too low	Set Thermostat higher
	Fan cut out because the min. thermostat temperature has fallen below 90 °C (194 °F).	Press Reset Switch (N)
	Overheat thermostat triggered	Reset thermostat
	Termovar (Mixing Valve) is closed or defective	Check valve for proper operation Check balancing valve for proper position which is half open
	Circulator pump is not running	Switch on or replace pump
	Insufficient water in the system	Add water to the system Note: Never add water to an overheated boiler. Wait until the boiler has cooled down
	Air in the system	Bleed air from system
Combustion will not stop	Fuse (D) is blown	Replace fuse in boiler control
	Excessive chimney draft	Have a serviceman install a draft regulator
Loss of pressure in the system		Bleed the system and add water
The fan does not switch off when the fire burns out	If the boiler is operated from cold, the flue gas temperature must reach normal operating temperature (above 90 °C (194 °F)) to switch over the min. thermostat. If normal operating temperature is not reached, the fan will not switch off but continue to run, even though the wood has burned out and the min. thermostat temperature has fallen below 90 °C (194 °F).	Ensure that the boiler is brought to normal operating temperature (about 85-90 °C (185-194 °F)) each time it is used.

# 6.0 Data and Drawings

## 6.1 Measurement Data

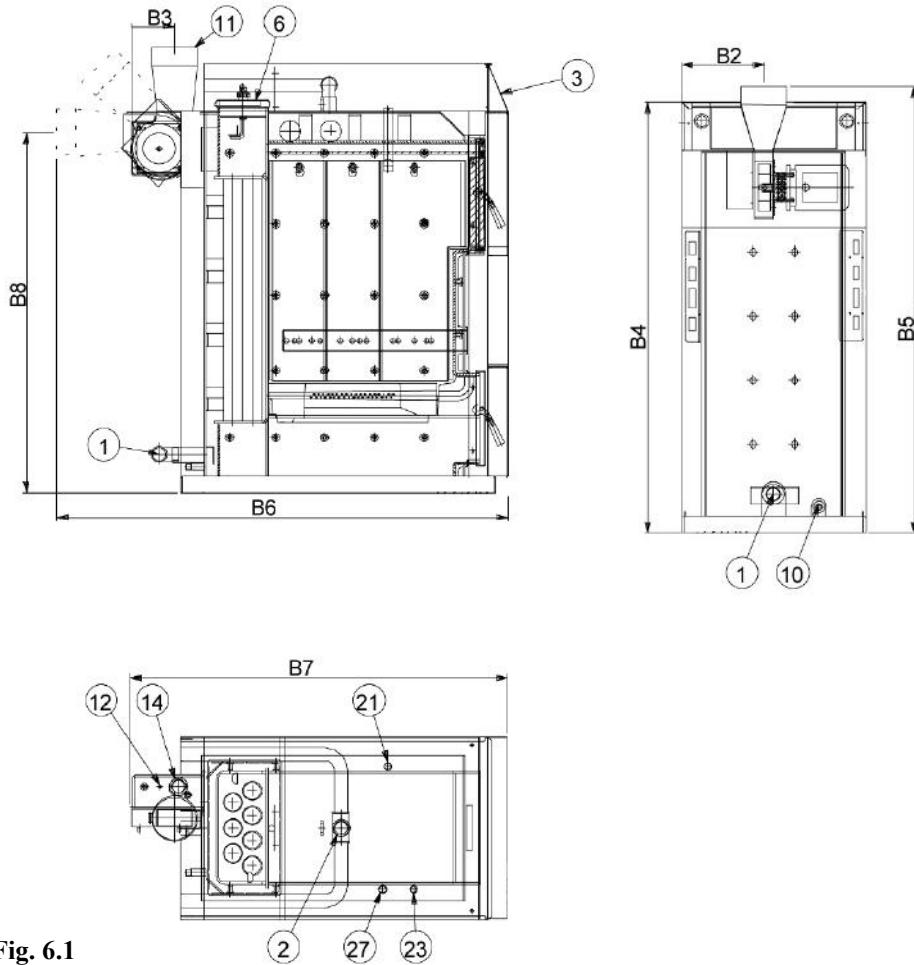


Fig. 6.1

Description	Units	30	50
1. Return Connection	inches	1.250	1.250
2. Supply Connection	inches	1.250	1.250
10 Drain/Fill	inches	½	½
11 Flue Pipe, External Diameter	inches	6	6
21 Dry Well	-	-	-
23 Sensor Well-Control Panel	inches	½	½
27 Sensor Well- Overheat Aquastat	inches	½	½
B2 Measurement	inches	10.43	14.17
B3 Measurement	inches	5.71	5.71
B4 Measurement	inches	54.13	54.13
B5 Measurement	inches	56.10	56.10
B6 Measurement	inches	56.69	56.69
B7 Measurement	inches	46.77	46.77
B8 Measurement	inches	45.28	45.28

## 6.2 Positioning Data

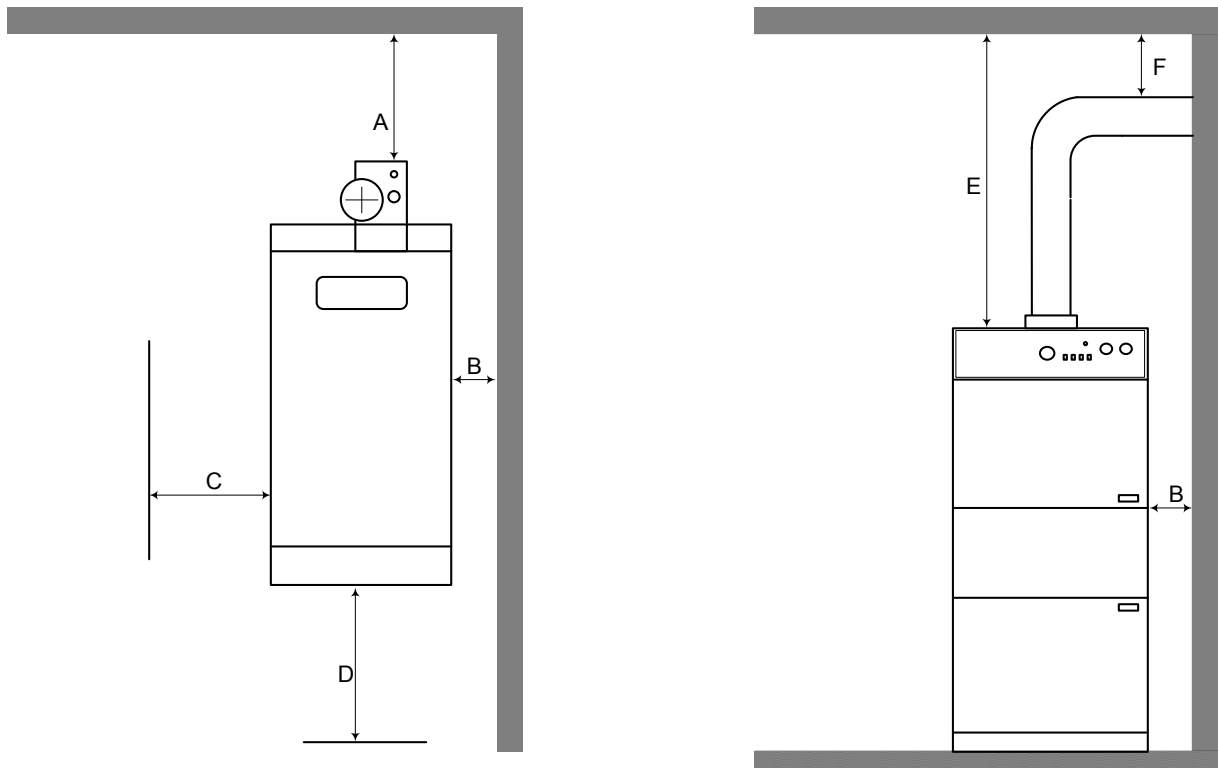


Fig. 6.2

Clearances to Combustibles		
Measurement	Minimum Distance	Notes
A-Backwall to Appliance	21"	Minimum Distance to allow clearance for blower maintenance.
B-Sidewall to Appliance	12"	Minimum Distance
C-Sidewall to Appliance	21"	Minimum Distance on left side to allow clearance for Cleaning and Maintenance Tasks.
D-Front of Appliance	36"	Required Distance for Cleaning the Boiler.
E-Ceiling to Appliance	24"	Required Distance for Cleaning the Boiler.
F-Combustibles to Pipe	18"	Minimum Distance

## 6.3 Specification Data

Fig. 6.2

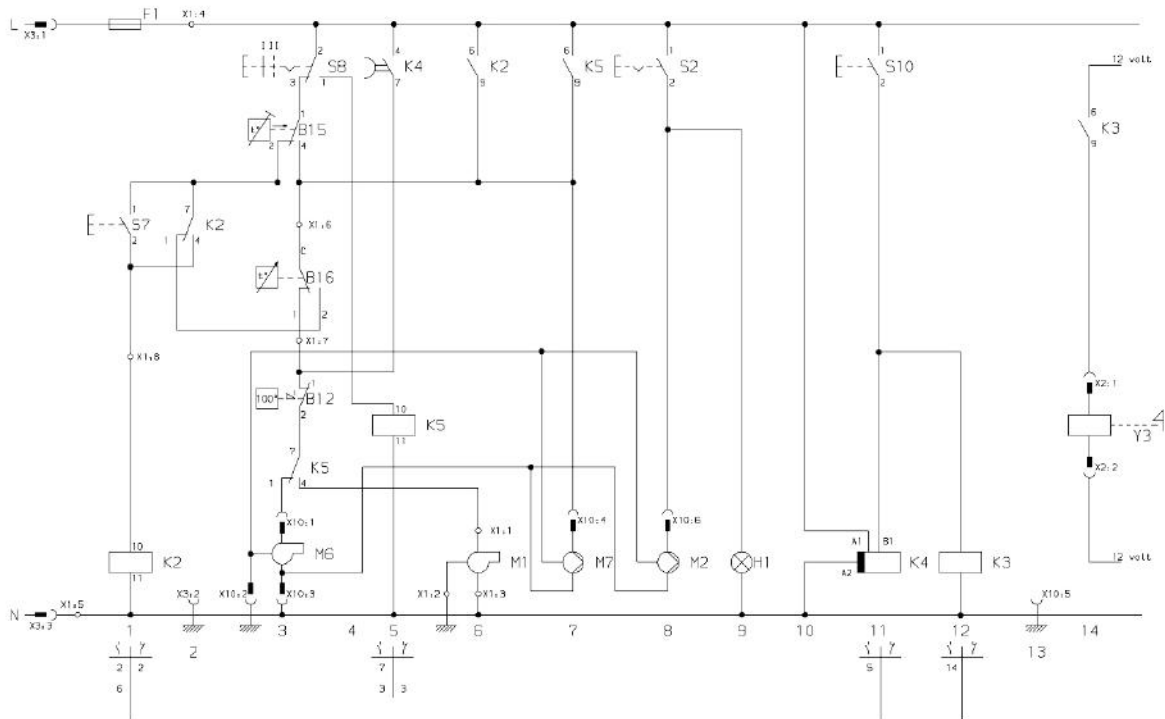
Technical Data	Units	30	50
<b>MEASUREMENTS</b>			
Depth- Boiler -Total	inches	46¼"	46¼"
Width- Boiler -Total	inches	23"	27¼"
Height to Chimney Connection	inches	54"	54"
Smoke Pipe Stub outside diameter	inches	6"	6"
Weight- Empty	lbs	1113	1213
Water Contents	gallons	34	48
Loading Door	inches	14" X 12"	14" X 12"
Combustion chamber Depth	inches	21½"	21½"
Combustion Chamber Volume	gallons	35.66	48.87
Wood Length	inches	20	20
Wood Diameter (Max)-Softwood	inches	4	4
Wood Diameter (Max)-Hardwood	inches	6	6
<b>OPERATING DATA</b>			
Operating Temperature-Water	F°	180-190	180-190
Nominal Output	Btu/hr	102,000	171,000
Flue Gas Temperature at Nominal Output	F°	262	213
Dust in Flue Gas	lbs/MBtu	.053	.06
CO in Flue Gas	lbs/MBtu	.43	.46
NO <sub>z</sub>	lbs/MBtu	.30	.23
Required Draft	inch WC	-.025" to -.05"	-.025" to -.05"
Safety Listings	-	<b>UL 391-2006</b>	<b>UL 391-2006</b>
<b>ELECTRICAL DATA</b>			
Boiler Power Requirement	-	240V-60Hz/15A	240V-60Hz/15A
Blower	kW	.24	.24
<b>PIPING DATA</b>			
Boiler Test Pressure	psi	65	65
Boiler Relief Valve Setting	psi	30	30
Supply & Return pipe stub size (male npt)	inch	1¼"	1¼"
Minimum Boiler Loop size	inch	1¼"	1¼"
Fill/ drain valve size	inch	.5	.5
Mixing Valve Opening Setting	F°	140	140
Internal Overheat Aquastat Setting	F°	212	212

## 6.4 Electrical Diagrams

### 6.4.1 Legend (For Reference to all Circuit Diagrams and Section 4.1):

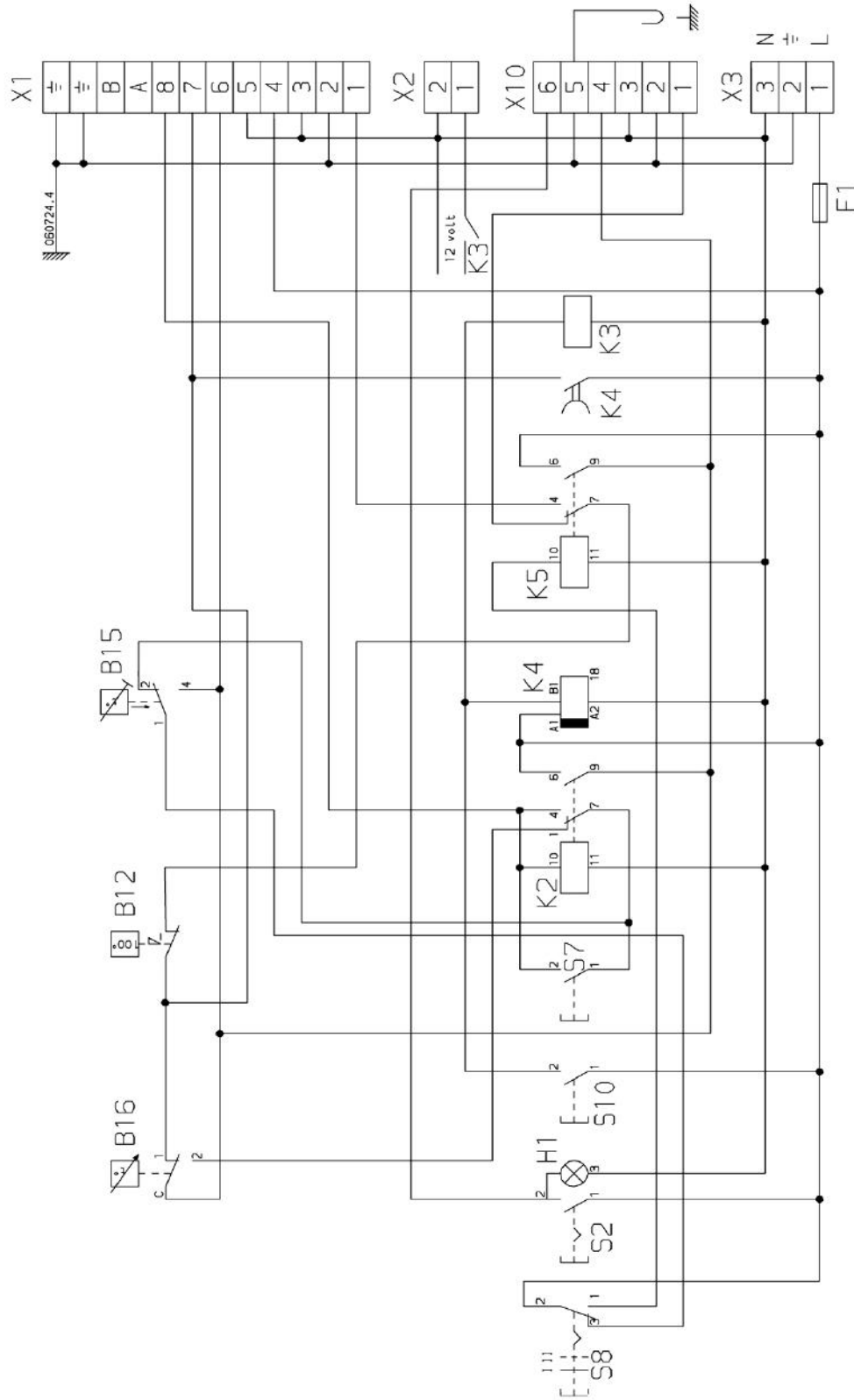
Fig.	Fig.	Description	Fig.	Fig.	Description
B12	H	Overheating Thermostat 212 °F (100 °C)	N	-	Neutral
B12	-	Minimum Thermostat 194 °F (90 °C)	S2	E	Switch for Circulator Pump
B16	I	Thermostat 185-200 °F (85-93 °C)	S4	F	Fan Switch
L	-	Line	S7	N	Reset Switch for Fan
F1	D	Fuse 6.3 A (5 X 20mm)	W1	-	Connection Cable
H2	-	Light, Circulator Pump (S2)	W3	-	Cable for M2 Pump
H4	-	Light, Fan Switch (S4)	W7	-	Cable for Fan
K2	-	Aux. Relay Holding Current Circuit	W10	-	Earth Cable
K4	-	Time Relay	W11	-	Cable for M7 Pump
K10	O	Switch for Door Interlock	W13	-	Cable for door Interlock- <b>Not Used</b>
M2	-	Circulator Pump- <b>Not Used</b>	X1	-	Terminal Strip
M6	-	Fan	Y3	-	Solenoid Coil
M7	-	Circulator Pump-C3			

### 6.4.2 Wiring Diagram A (Boiler Circuit Ladder Diagram)

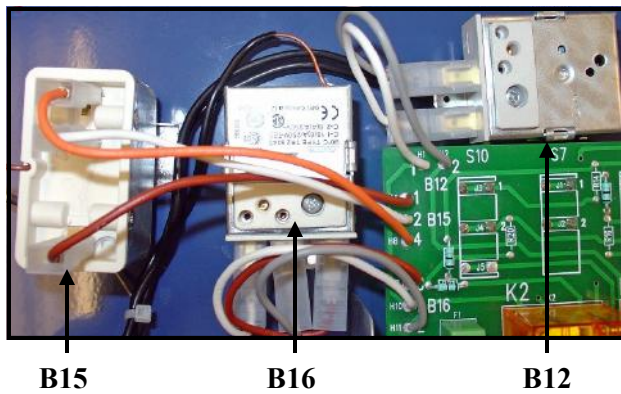
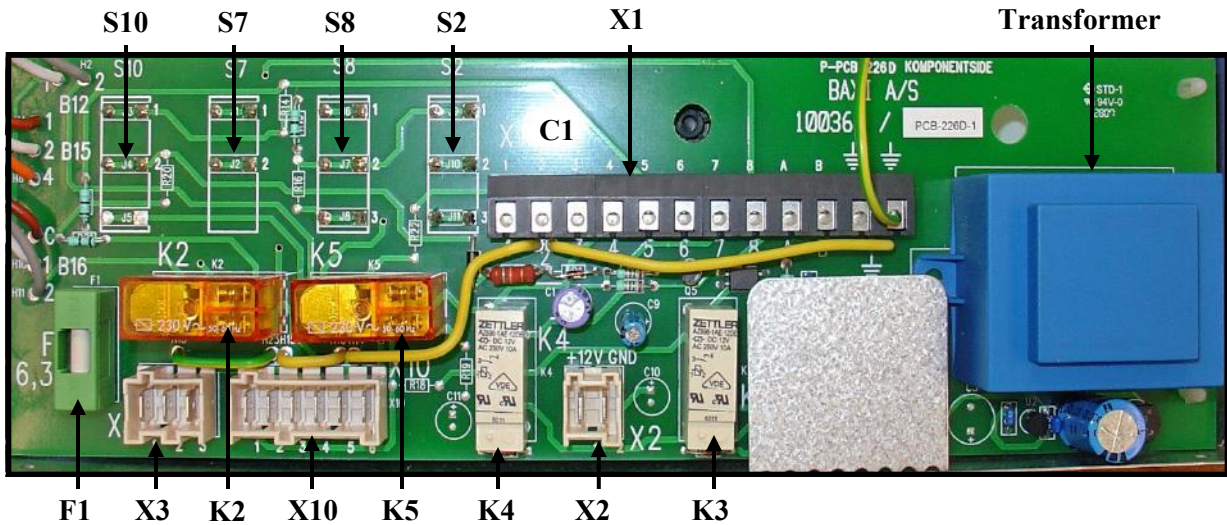




### 6.4.3 Wiring Diagram B (Boiler Circuit Diagram)



### 6.4.4 Control Panel

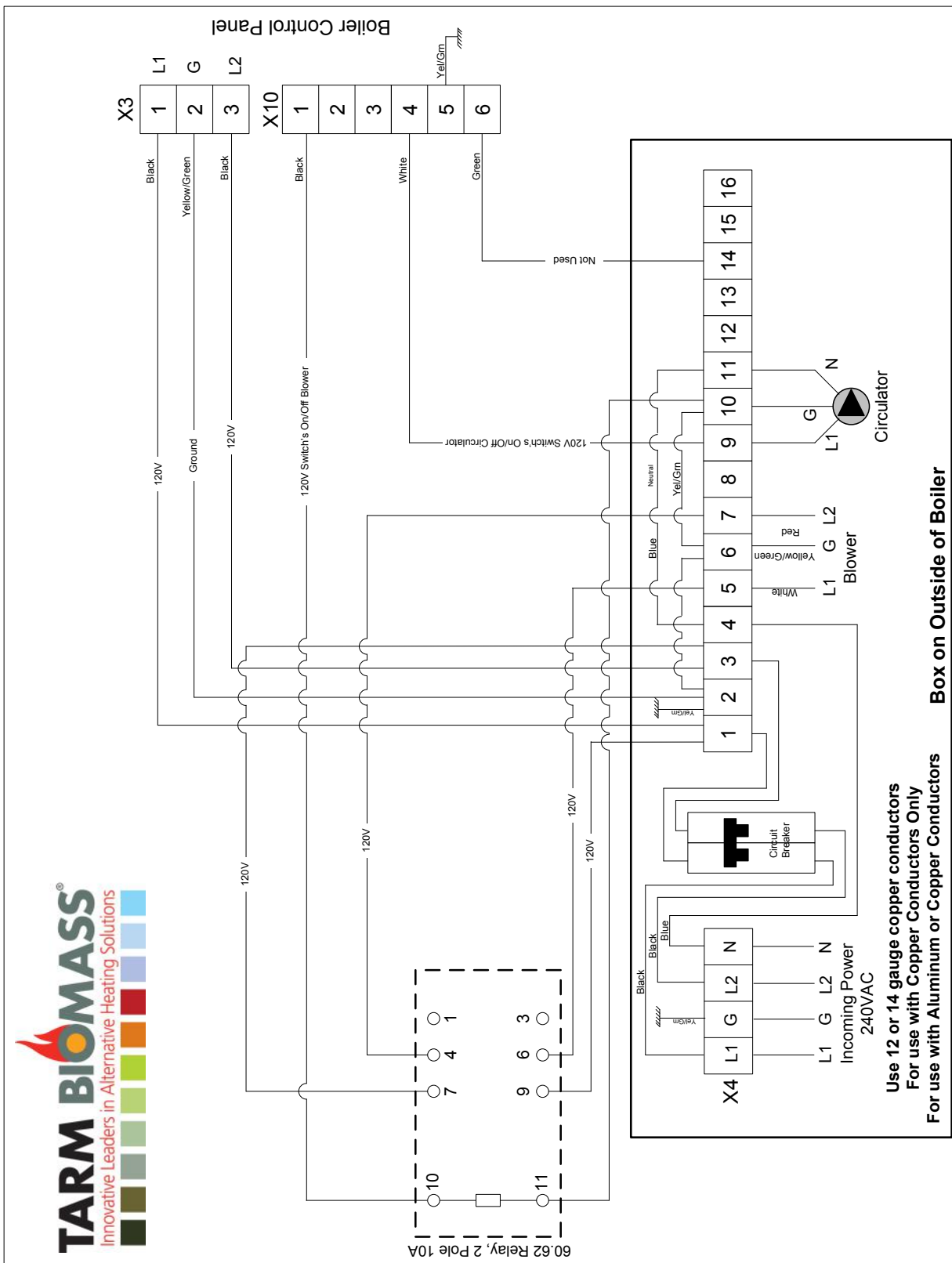


#### Explanation for Control Panel

- B12-Overheat Aquastat/Circuit Breaker (Part #08007)
- B15-Lo-Limit Aquastat (Part #080104)
- B16-Operating Thermostat (Part # 080063)
- C1-Boiler Control Board
- F1-Fuse 6.3 A Protects Control Board
- K2-Relay
- K3-Timer Relay
- K4-Timer Relay for Door Open Switch
- K5-Relay
- S2-Circulator Switch-**Not used in North America**
- S7-Reset Switch
- S8-Fan Switch
- S10-Door Open Switch
- X1-Terminal Block-Used for misc. Connections
- X2-Door Safety Terminal Block-**Not used in North America**
- X3-Supply Terminal
- X10-Fan and Circulator Terminal Block

### 6.4.5 Wiring Connections

External connections to the boiler.



# 6.5 Parts List

## 6.5.1 Solo Innova 30 Parts List

Pos	Delning	Best.nr/veksel	Emn	Mjæl
1	051033	SAFETYKILDE 8,8 FZ8 M12 X 80 NM	STK	4
2	051033	SAFETYKILDE 8,8 FZ8 M12 X 80 NM	M2	0,6
3	012104	ISOL. INDBUATT 80 1000/60/50/40	M2	0,3
4	053038	ISO-STIFT Ø38X38,1X2,7	M2	2
5	012353	ISOL. CONLIT 1000/60/50/40	STK	1
6	218574	BUNDELTUSE 340X280X30	STK	1
7	050471	ISOL. 330X60X2	STK	1
8	050471	ISOL. 330X60X2	STK	1
9	060717	UNDERPART STEN 345X10X150	STK	1
10	091023	INDLØBSSTEN 345X127X123	STK	1
11	05489	TRÆKLE 6-18	STK	6
12	072707	PAKKNINGSPLEK 8	STK	9
13	072707	PAKKNINGSPLEK 8	STK	9
14	072707	PAKKNINGSPLEK 8	STK	9
15	072707	PAKKNINGSPLEK 8	STK	9
16	072707	PAKKNINGSPLEK 8	STK	9
17	091051	PAKKNING FIBER 365X100X11	STK	1
18	091049	PAKKNING FIBER 365X100X11	STK	1
19	091027	PAKKNING FIBER 346X30X2	STK	1
20	012281	PLADE 603X345X13X3	STK	1
21	091019	PLADE 700X268X20X3	STK	1
22	091019	PLADE 700X268X20X3	STK	1
23	012280	PLADE 700X268X20X3	STK	1
24	012282	PLADE 346X227X65M13X3	STK	1
25	091110	TURBULATOR Ø60 L=150 STIGN. 75	STK	7
26	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
27	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
28	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
29	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
30	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
31	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
32	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
33	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
34	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
35	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
36	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
37	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
38	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
39	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
40	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
41	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
42	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
43	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
44	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
45	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
46	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
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95	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
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97	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
98	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
99	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1
100	091016	ROGKASSEDÆKSEL 378X178 KPL	STK	1

# 6.5 Parts List

## 6.5.2 Solo Innova 50 Parts List

Pos.	Del nr.	Becknr./tekst	Eh.	Mængd.
10	050976	SOLO INNOVA 50 MALET	STK	4
20	051033	SAFTSKRUE 8.6 FZB M12 X 80 MM	STK	9
40	053038	ISO-STIFT Ø30X26 1X2.7	M2	0.32
51	012363	ISO-COILIT 1000X600X200	STK	1
60	012364	ISO-COILIT 1000X600X200	STK	1
70	091025	BUNDFLISE 34X107X30	STK	2
80	091045	BUNDFLISE 145X 65X30	STK	2
90	092471	ISOL 330X60X2	STK	0.9
100	090717	UNDERPART STEN 345X210X150	STK	1
130	091023	INDLØBSSTEN 345X171X123	STK	1
140	091024	INDLØBSSTEN 345X171X123	STK	1
160	012317	GLASSKOR-FLET Ø 6	STK	0.5
170	091049	PAKNING FIBER 365X100X11	STK	1
180	091051	PAKNING FIBER 365X100X11	STK	1
190	091052	PAKNING FIBER 345X100X11	STK	1
200	091027	PAKNING FIBER 348X60X2	STK	1
210	091028	PAKNING FIBER 348X60X2	STK	1
220	091047	PLADE 663X183X20X3	STK	4
230	091048	PLADE 663X214X20X3	STK	2
240	091007	PLADE VENSTRE 370X227X13X3	STK	1
250	091008	PLADE 370X227X13X3	STK	1
260	091053	RØRGÅSEDAKSEL 488X78 KPL	STK	1
280	090914	PAKNING FIBER 104X137X4	STK	1
300	057004	SKIVE PLAN FZB Ø 8	STK	9
310	056004	MØTRIK FZB M 8	STK	2
320	090964	LØKKEBESLAG 280X35X35 KPL	STK	2
330	090965	LØKKEBESLAG 280X35X35 KPL	STK	2
340	056005	INDEFYNGSLØSKE SVANNE SØRT CH M10X16	STK	8
370	091017	INDEFYNGSLØSKE 424X261 KPL	STK	1
390	091018	ASKELAGE 424X261.5 KPL	STK	1
400	040027	HANDTAG TIL LÅGER	STK	2
410	020050	PLASTPØSE 9025 X 230 X 0.025	STK	1
420	216103	ASKELØSKE 400X225 SOLO INNOVA	STK	1
430	216103	ASKELØSKE 400X225 SOLO INNOVA	STK	1
440	090470	SKRABER L=800	STK	1
455	210214	RENSEBØRSTE 85X30 L=1100	STK	1
460	141177	RØRGAET SOLO INNOVA 50	STK	1
470	092123	BYPASS SOLO INNOVA 655X546	STK	1
480	040115	LABEL RØR	STK	1
490	040115	LABEL RETUR	STK	1
500	091054	LØFTKASSE STD. SI 50	STK	1
510	033333	TYPESKILT BASIS 50LVPOLYESTER	STK	1
520	092095	STEN - VENSTRE 540X70X125 M05	STK	1
530	092096	STEN - HØJRE 540X70X125 M05	STK	1
540	092097	STEN - MIDT 540X70X125 M05	STK	1
550	070534	PAKNING FIBER 345X75X5	STK	2
560	070535	PAKNING FIBER 195X75X3 - 2XØ35	STK	1
580	091402	RØRGÅSEDAKSEL RØRGAET MOUNT KPL	STK	1
590	082266	MOTOR KPL 50 STD.	STK	1
600	210869	KEDELSTYRING 919 STD	STK	1
610	018459	EMBALL. SPEC. SOLO INNOVA 50/SOLOP40	STK	1

# 7.0 Warranty Information

## 7.1 Warranty

### LIMITED WARRANTY - FOR USE ONLY IN UNITED STATES

Tarm Biomass warrants the steel boiler identified below and its component hot water tank or coil and cast iron doors and ceramic refractory against defects in material and workmanship under normal use and service **TO THE ORIGINAL PURCHASER AT THE ORIGINAL INSTALLATION SITE** in the United States under the following terms.

**WARRANTY IS VOID** if the boiler is installed without adequate thermal storage.

**BOILER BODY -- LIMITED 20 YEAR WARRANTY:** Subject to the below limitations, Tarm Biomass warrants the steel boiler body (not including cast iron doors, coil, or other components) against defects in materials or workmanship causing breaks or leaks that significantly impair the boiler's performance. During the first five years of the warranty period Tarm Biomass will pay for all required labor at the usual and customary rate paid by Tarm Biomass for similar labor performed in Lyme, NH, and provide or pay the cost of all materials for the repair of the warranted unit. In years six through twenty Tarm Biomass will pay the below stated percentage multiplied times the retail price of the warranted unit on the date of purchase to the original purchaser toward of the cost of repair of the warranted item or, if Tarm Biomass and the original purchaser agree, use the resultant sum as a partial allowance toward Tarm Biomass's replacement of the warranted item. The original purchaser shall be responsible for all shipping and installation charges in connection with any replacement or repair.

<u>Warranty Year (beginning from date of purchase)</u>	<u>Percentage Tarm Biomass will pay</u>
1-5	100%
6	60%
7	50%
8	40%
9	30%
10-20	20%

Example 1: Repair costing \$250.00 in year 7, Tarm Biomass will pay \$125.00 (50% of this repair).

Example 2: Boiler (original retail \$4,000.00) needs major repair in year 9. Tarm Biomass will pay \$1,200 (30% of \$4,000) toward replacement with similar warranted unit or up to 30% of the repair cost (\$1,200 maximum).

### OTHER COMPONENTS -- LIMITED THREE YEAR WARRANTY

Subject to the application of the following percentages to parts and/or labor, Tarm Biomass provides the following limited warranty on its firebox cladding plates, doors, ceramic refractory and turbulators against defects in material and workmanship causing breaks or leaks that significantly impair the boiler's performance.

<u>Warranty Year (beginning from date of purchase)</u>	<u>Percentage Tarm Biomass will pay</u>
1	100% of parts and labor
2	100% of parts ONLY
3	50% of parts ONLY

### OTHER COMPONENTS -- ONE YEAR WARRANTY

Motors, electronic controls and other electrical components have a one year warranty.

***TARM BIOMASS' LIMITED EXPRESS WARRANTY IS ONLY EXTENDED TO AND COVERS THE TARM USA PRODUCT'S END USER WHO OWNS THE BUILDING IN WHICH THE TARM USA PRODUCT IS INSTALLED, AND COVERS ONLY REPAIRS OR REPLACEMENTS RESULTING FROM DEFECTS IN MATERIALS AND WORKMANSHIP. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION IN THIS LIMITED WARRANTY, AND Tarm Biomass' LIMITED WARRANTY IS IN LIEU OF AND TO THE EXCEPTION OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY OR WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. EXCEPT AS OTHERWISE PROVIDED BY THIS LIMITED WARRANTY, TARM BIOMASS TAKES NO RESPONSIBILITY FOR THE QUALITY OF Tarm Biomass PRODUCTS OR THAT THE GOODS WILL BE FIT FOR ANY PARTICULAR PURPOSE FOR WHICH YOU MAY BE BUYING THESE GOODS. UNDER NO CIRCUMSTANCES SHALL TARM USA BE SUBJECT TO INCIDENTAL, CONSEQUENTIAL, INDIRECT, SPECIAL, PUNITIVE, ENHANCED COMPENSATORY, OR CONTINGENT DAMAGES, WHETHER A CLAIM IS BASED ON CONTRACT, TORT, STRICT LIABILITY, OR ANY OTHER THEORY OF LAW, ALL SUCH DAMAGES AND CLAIMS BEING SPECIFICALLY DISCLAIMED.***

Tarm Biomass' limited warranty is void if a Tarm Biomass product is installed by someone other than a qualified contractor whose principal occupation is the sale or installation of plumbing and heating equipment, or if the original purchaser fails to have the boiler serviced or inspected at least once every two years by an experienced and qualified service person. Repairs or replacements under this limited warranty must be performed by your dealer or someone authorized by him. You may be required to present this limited warranty to the dealer before any work is performed. You must pay for any work performed that is not covered by this limited warranty or that is not authorized by the dealer. Tarm Biomass' limited warranty shall be construed under the laws of New Hampshire. Any dispute arising out of this warranty shall be tried only in a court in the State of New Hampshire, including the United States District Court for the State of New Hampshire. If any legal action is brought in connection with this limited warranty, the prevailing party shall be entitled to recover all reasonable expenses it incurs in the action, including its reasonable attorneys' fees, from the nonprevailing party.

***TARM USA'S LIMITED WARRANTY EXPRESSLY EXCLUDES COVERAGE FOR THE FOLLOWING:***

1. Ordinary wear and tear and repairs or replacements necessitated by normal use.
2. Repairs or replacements arising from corrosion including, but not limited to, the effects of a corrosive water supply or corrosive by-products of combustion formed when a boiler is run during warm weather temperatures or under other conditions that do not permit the boiler to reach necessary operating temperatures on a frequent basis as described in the Owner's Manual provided by Tarm Biomass.
3. Repairs or replacements of fittings, motors, fuel units, oil and gas burners, any and all controls, relief or regulating valves, transformers, and accessories.
4. Repairs or replacements to repair damage caused by (i) operation with inadequate draft, (ii) having installed a boiler model that is incorrectly sized for the application (too few or too many BTU's under normal operating conditions) or that is otherwise inappropriate for the application, (iii) excessive boiler internal temperature from burning improper materials as fuel or operating the boiler without appropriate draft control (for example, burning the boiler too hot when the boiler is coming up to temperature from a cold start), or (iv) any similar use that violates or is not recommended in the Owner's Manual provided by Tarm Biomass.
5. The repair or replacement of any component furnished by any other manufacturer or damage caused by the functioning or malfunctioning of any such component.

This warranty gives you specific legal rights. You may also have other rights that vary from state to state. This warranty shall not be construed as inconsistent with any federal, state, or municipal law, regulation, or code that was applicable to the original installation site on the date the Tarm Biomass product was installed.

Questions regarding this warranty may be referred to:

Tarm Biomass, 4 Britton Lane, Box 285, Lyme, NH 03768 U.S.A. (603) 795-2214

***KEEP THIS INFORMATION FOR YOUR RECORDS:***

**Model:** \_\_\_\_\_ **Place of Purchase:** \_\_\_\_\_

**Serial No.:** \_\_\_\_\_ **Installation Date:** \_\_\_\_\_ **Installer** \_\_\_\_\_

## 8.0 Installation Report for Boiler System

Installation Performed by: \_\_\_\_\_

Solo Innova Model / Serial No. \_\_\_\_\_ / \_\_\_\_\_

Boiler System Installed and Adjusted: \_\_\_\_\_  
Date

Warranty Certificate Filled and Sent: \_\_\_\_\_  
Date

### Measured and Adjusted Values

	Date	Date	Date	Date
Fuel Type				
Fuel Moisture Content				
Secondary Air Setting				
Primary Air Setting				
Pump Speed (C-3)				
Other Data/Adjustments				
Setting Done By: Signature				



## Appendix A-Temperature Conversion

### Temperature Conversion Table

°C	°F		°C	°F		°C	°F		°C	°F
40	104		80	176		135	275		220	428
45	113		82	179.6		140	284		225	437
50	122		84	183.2		145	293		230	446
52	125.6		86	186.8		150	302		235	455
54	129.2		88	190.4		155	311		240	464
56	132.8		90	194		160	320		245	473
58	136.4		92	197.6		165	329		250	482
60	140		94	201.2		170	338		255	491
62	143.6		96	204.8		175	347		260	500
64	147.2		98	208.4		180	356		265	509
66	150.8		100	212		185	365		270	518
68	154.4		105	221		190	274		275	527
70	158		110	230		195	383		280	537
72	161.6		115	239		200	392		285	545
74	165.2		120	248		205	401		290	554
76	168.8		125	257		210	410		295	563
78	172.4		130	266		215	419		300	572

**Notes:**