

INOV8 WASTE OIL BURNING FURNACES TECHNICAL OVERVIEW & SUBMITTAL

EQUIPMENT OVERVIEW

This equipment review covers three models of INOV8 waste oil fueled furnaces: model F125, F240 and the model F450. All furnaces are equipped with the model S200 oil burner. They all include the following features:

- Operating efficiency of 85%
- Standard parts and accessories: a floating pickup assembly for installation in the waste oil tank with a standard 2" opening, a 120 volt wall thermostat, UL listed in-line filter housing and filter, a ¾" checkvalve, space fuses, spare vapor eliminator filter, burner gasket, a barometric damper and an instruction manual.
- Patented features that enable clean and complete combustion include preheating the waste oil to a higher temperature, filtering of oil after it's been preheated, removal of water and entrained gases from the heated oil, using higher oil and air pressure to support complete combustion.
- Waste oil that can be used as fuel: used crankcase oils, transmission and hydraulic oils, crankcase oil with 10% gasoline, 90wt gear box oil, 175wt heat transfer oil, synthetic oils, commercial and military jet fuels.
- Safety devices: a Fireye industrial rated electronic burner control, an ultra-violet flame detector/sensor, a needle-valve shutoff, a solenoid for the oil, a solenoid for the air, and a 120 volt wall thermostat.
- Oil preheating & Oil Pumping capabilities: the burners contain the preheating system in an integral setup with a pump that can draw the oil 30 feet with a lift of 8 feet. If additional lift is required, INOV8 has available two different boost pumps: a diaphragm pump and a gear pump. Both come completely ready with required parts for a fully operational unit.
- The instruction manuals include three sections: 1) installation and typical usage, 2) normal operation & maintenance, and 3) troubleshooting details. They accompany the equipment and can be obtained on the INOV8 website at: www.inov8-intl.com.
- The INOV8 furnaces are listed to UL296A the Standard for Safety Oil Burners; CSA B140.0, Issue: 2003/10/01, Ed:3, General Requirements for Oil Burning Equipment General Instruction No 2-4 (R1991) by Intertek ETL-Semko, Report # 3128618CRT-002. The gas burner on the model F240 furnace is tested to ANSI Z21.17 AEI Domestic Gas Conversion Burner Issue 1998/01/01 and CSA 2.7-M98, and to UL296A, Issue 1994/06/01, Ed: 10 Rev:2006/02/24,



INOV8 Model F125 Furnace has 125,000 input and a perfect size for the small garage that has limited space and heating needs. This unit heater uses the S200 multi-fuel burner in an aluminized heat exchanger consuming .84 gallons per hour to heat about 3,500 square feet. The burner mounts onto the door that swings open to expose the combustion chamber for easy cleaning. The door also seconds as a heat exchanger for heating outside air for sealed combustion. It tested out at over 86% energy efficient and was listed as an Energy Star Product.

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The F240 furnace includes as standard a prop fan for space heating between 5,000 and 10,000 square feet. The furnace will produce 240,000 BTUs of heat from 1.68 gallons of hour per hour or from 2.4 therms of natural gas per hour. An optional squirrel-cage style blower can be added for ducting purposes. This furnace can be ordered with INOV8's model G200 gas-oil burner which is operated with a PLC – programmable logic controller for flexibility of fuels and automatic backup. A full description of how can be provided.



The model F450 furnace will be equipped with the model S200 multi-fuel burner. The counter-flow heat exchanger design allows cold air to enter the furnace without risk to damaging the steel, enabling its use for make-up air. The following list provides additional details. When used as a furnace, the model F450 can heat between 10,000 to 15,000 square feet at a consumption rate of 3.78 gallons per hour. The INOV8 F450 Waste Oil Fueled Furnace has been designed with a vertical combustion chamber and heat exchanger surfaces that prevents loss of heat transfer efficiency between cleaning of ash. Convenient access doors allow for removing the ash. Most users only clean the furnace once a year. The furnace also has these additional features:

- A squirrel cage blower is standard and allows ducting to distribute hot air.
- The INOV8 F450 furnace is constructed of high temperature aluminized and stainless steels, a heavy cycle-duty motor, and the surface is finished with industrial powder coat paint.
- On-site startup and operator training is available at a daily rate of \$575 plus travel expenses.

FURNACE SPECIFICATIONS

SPECIFICATIONS	F125	F240	F240 SC	F450
INPUT BTU	125,000	240,000	240,000	500,000
OUTPUT BTU	106,250	204,000	204,000	425,000
EFFICIENCY	85%	85%	85%	85%
FUEL USAGE, GPH	.84	1.68	1.68	3.57
HEATS AREA, SQ. FT** (AVERAGE)	3,500	6,000	6,000	12,500
BLOWER TYPE	Squirrel Cage	Propeller	Squirrel Cage	Squirrel Cage
BLOWER MOTOR HORSEPOWER	½	½	1	1 ½
AIR MOVEMENT, CFM	1,800	3,600	2,400	4,000
DUCTIBLE	Yes	No	Yes	Yes
HEAT EXCH— ALUMINIZED STEEL, GAUGE	12	14	14	14
DIMENSIONS, LENGTH/WIDTH/HEIGHT	79/21/21	44/39/42	46/39/42	79/40/54
HANGING WEIGHT, LBS	350	450	475	850
SHIPPING WEIGHT, LBS	400	475	500	900
FLUE & CHIMNEY DIAMETER, INCHES	8	8	8	8
FLUE HEIGHT – MINIMUM, FEET	10	12	12	14
ELECTRICAL SUPPLY, VOLTS	120	120	240	240

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ELECTRICAL DRAW (MAX), AMPS	17	17	17	17
COMPRESSED AIR REQUIREMENTS, CFM/PSI	2.0 / 30	2.0 / 30	2.0 / 30	3.0 / 38
MAKE-UP AIR CAPABILITY	No	No	No	Yes
SEALED COMBUSTION KIT AVAILABLE	Yes	Yes	Yes	No
SAFETY CONTROLS, STANDARD				
• Fireye Industrial Control	Yes	Yes	Yes	Yes
• Ultraviolet flame detection	Yes	Yes	Yes	Yes
• 90 second ignition pre-purge cycle	Yes	Yes	Yes	Yes
• Continual proof of atomizing air	Yes	Yes	Yes	Yes
• Continual proof of combustion air	Yes	Yes	Yes	Yes
• Safe start sequence	Yes	Yes	Yes	Yes
• Trial for ignition – 10 seconds	Yes	Yes	Yes	Yes
• Flame failure shutoff, in 3 seconds	Yes	Yes	Yes	Yes
• Main flame trial for ignition	Yes	Yes	Yes	Yes
• Safety shut-down indicator light	Yes	Yes	Yes	Yes
• Fuel shut-off by solenoid valve	Yes	Yes	Yes	Yes
• Fuel shut-off by mechanical needle	Yes	Yes	Yes	Yes
• Line voltage thermostat controls burner power	Yes	Yes	Yes	Yes
• Oil temperature lockout	Yes	Yes	Yes	Yes
• Blocked filter indicator	Yes	Yes	Yes	Yes
CONVENIENCE CONTROLS:				
• Automatic restart	Yes	Yes	Yes	Yes
• Automatic nozzle cleanout	Yes	Yes	Yes	Yes
• Ignition test switch	Yes	Yes	Yes	Yes
• Dirty filter indicator light	Yes	Yes	Yes	Yes
• Hour meter	Yes	Yes	Yes	Yes
EQUIPMENT INCLUDED:				
• Air pressure regulator	Yes	Yes	Yes	Yes
• Barometric damper	Yes	Yes	Yes	Yes
• Floating pickup assembly	Yes	Yes	Yes	Yes
• Tank filter, housing & check valve	Yes	Yes	Yes	Yes
• 120 volt wall thermostat	Yes	Yes	Yes	Yes
• Heater on/off switch	Yes	Yes	Yes	Yes

Fuels capable of burning as fuel: Used crankcase oils, Fuel oils: #2 through #6, Transmission & Hydraulic oils, 90 weight gear box oil, Mineral spirits solvents, Machine shop cutting oils, Vegetable oils – new & used (soybean, peanut, canola, corn, olive), Synthetic oils, and Commercial & Military jet fuels.

*Based on 140,000 BTU/gallon

** Dependant on heat loss of building & local climate

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FURNACE PRE-INSTALLATION CONSIDERATIONS

INOV8 International multi-fuel furnaces are specialized pieces of equipment engineered specifically to burn a wide range of used motor oils, lubricants and other fuels. For the INOV8 furnace to operate properly, it is essential that several key issues be reviewed before installation and early in the planning stages for new construction projects. This document highlights these important topics to insure you have a smooth installation and trouble-free operation.

Note that detailed installation instructions will be found in the Owner's Manual you will receive with your new furnace. If you have questions, or need additional assistance, you may also contact the technical support team at INOV8 International. The manual is down-loadable on our website: www.inov8-intl.com.

HIGH ALTITUDE SETTINGS

For high altitudes more air for combustion is required. All settings in this manual have been obtained at approximately sea level. Special attention should be paid to air for combustion for elevations above sea level. If an increase in combustion air is insufficient, the burner must then be de-rated by approximately 4% for every 1000 feet above sea level.

REGULATIONS AND CODES

This equipment must be installed according to these national standards.

For furnace equipment:	ANSI/NFPA # 31 – <i>Standard for the Installation of Oil-Burning Equipment</i> – 2006 Edition, and in Canada to CSA Standard B139.
For chimney installation:	ANSI/NFPA # 211 – <i>Standard for Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliance</i> , 2006 Edition
For oil storage installation:	NFPA # 31 – <i>Standard for the Installation of Oil-Burning Equipment</i> – 2006 Edition
For electrical installation:	NFPA # 70 – <i>National Electrical Code</i> – 2005

CHIMNEY OPTIONS & LOCATION

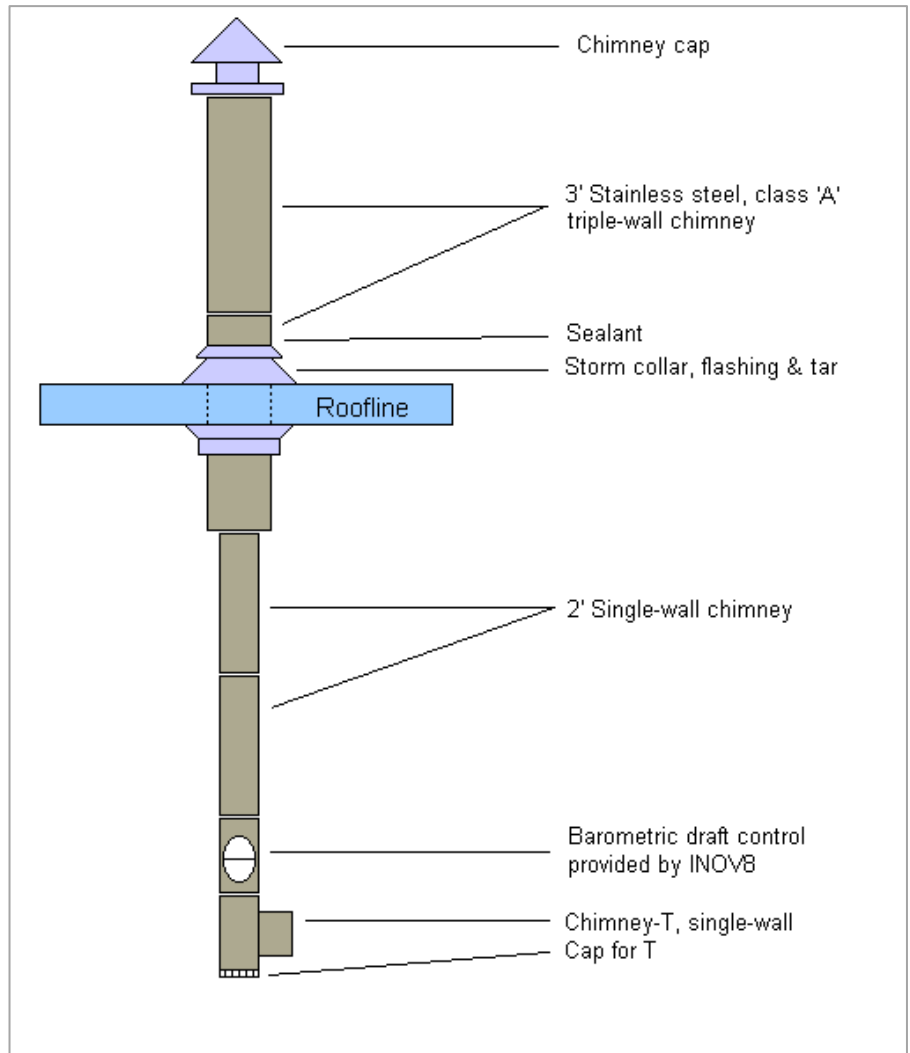
There are several key aspects of furnace location that must be considered. Each of them is very important to a successful and safe installation. While it may not be possible to optimize all factors in every installation (especially when adding a furnace to an existing building) they all must be addressed.

The most critical factor in the installation of your INOV8 furnace is a properly designed, located, and functioning chimney. A good draft (air movement up the chimney) is essential to the safe and reliable operation of the furnace. While we cannot address all possible chimney installation options, these are some key points to consider:

- Chimney diameter must be 8 inch.
- Class A" insulated chimney must be used from a point 18 inches below the ceiling to the top of the chimney. Single wall can be used from the ceiling connection to the furnace connection. Note that the use of "Class A" chimney is not only to protect combustible materials from 500° temperatures, it also assists draft and helps minimize condensation inside the chimney.
- A minimum of 12 feet of vertical chimney is required above the flue exit of the furnace for chimneys that go straight up (without bends, offsets etc).

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- If at all possible, run your chimney straight up from the furnace and out through the roof. This will provide the best draft.
- If you must offset the chimney to avoid an obstruction, use a mild angle and keep the chimney running as vertically as possible (no 90 degree angles or horizontal runs).
- I installing a gas burner, a double-acting barometric damper must be used rather than a single-acting damper.
- Note that using any angles, offsets, or elbows will slow flue gasses and require additional chimney height to compensate.
- Use only a short (less than 3 foot) horizontal section of chimney to exit through an exterior wall as a last resort. Avoid this if at all possible.
- While it may be possible to use an existing chimney, including masonry with an 8" insert, we strongly recommend installing a new chimney dedicated to your INOV8 furnace.
- If the facility has exhaust fans or exhaust systems of any kind that blow inside air to the outside, negative building pressure could result. This can cause a back draft down the chimney with carbon monoxide fumes and furnace shut down. In this case, you will need either a make-up air unit or an optional sealed combustion kit on your furnace.



ACCESSIBILITY FOR SERVICE AND MAINTENANCE

The burning of waste oil products is very different than typical furnace applications burning home heating oil or natural gas. Due to the additives and contaminants typically found in waste oils, more frequent cleaning and servicing of a waste oil furnace is required. As a result, it is important to locate the furnace where there is good access on the burner end. Suggestions include:

- Don't run hard pipe for oil or air delivery lines all the way to the burner. The furnace is constructed to allow the burner to be swung out on a hinged arm for servicing and that can't happen with rigid plumbing. Run at least the last few feet of oil delivery and vent return line through reinforced plastic hose with enough slack to allow the swing-out.

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- Using an INOV8 workbench tank will locate your furnace at a convenient 8 feet above the floor (which also satisfies regulatory requirements – see prior section).
- If you are using your own tank or are not subject to the 8-foot requirement, you can mount the furnace lower for improved access.
- Do not mount the furnace high above the floor up in the rafters. You will not have good (or safe) access to it there. Also, remember that you will need a minimum of 12 feet of chimney above the flue exit of the furnace. Placing the furnace up near the ceiling could cause you to have a large amount of chimney sticking above the roofline that will require support cables.
- Locate the furnace and tank as close to each other as possible. To avoid the need for an auxiliary oil pump, the furnace should be less than 50 feet from the tank and not more than 8 feet above the tank. Note that these are approximate distances only. Actual limits will depend greatly on line size, viscosity of fuel, temperature of fuel, desired flow rate.
- For ease of venting the storage tank (required in most areas), it is desirable to locate the tank on an outside wall.
- To keep the furnace and tank close together, accessible, and yet still make good use of floor space, some customers have located both units on an overhead mezzanine. Check local codes for requirements on this and other installation issues.

COMPRESSED AIR REQUIREMENTS

A continuous supply of compressed air is required at all times for furnace operation. The furnace includes an air pressure regulator rated at 160 PSI that has a ¼" NPT inlet fitting. Install flexible hose the last few feet before the air regulator in order to swing out the burner. It is also a good idea to install a quick-disconnect where the air line joins to the burner's air regulator. Your furnace will need the following requirements of compressed air:

- Minimum 3.0 CFM and 30 PSI of air are required.
- Minimum of 3/8" reinforced hose or copper tubing.

Note! The furnace requires this air supply at all times when it is in operation. Be sure that your compressor is of sufficient size and duty cycle to supply these continuous needs.

ELECTRICAL REQUIREMENTS

- 120-volt service.
- Dedicated circuit with 20-amp fuse or circuit breaker (unit will draw a maximum of 17 amps when operating).
- Minimum of 12-gauge wiring.

TANK FEATURES

With the ONLY built-in containment system of its kind in our industry, this tank is engineered specifically for waste petroleum oil. The smaller 30 gallon inner containment where new oil is first placed provides time to settle out water and sludge. Used with the "supplied" floating pickup assembly, the best possible oil is provided to your waste oil burner. Four top openings and two bottom openings allow for annual drainage. Heavy duty support brackets hold your waste oil burning furnace for an attractive and convenient turn-key installation. In addition, each tank comes with these additional features:

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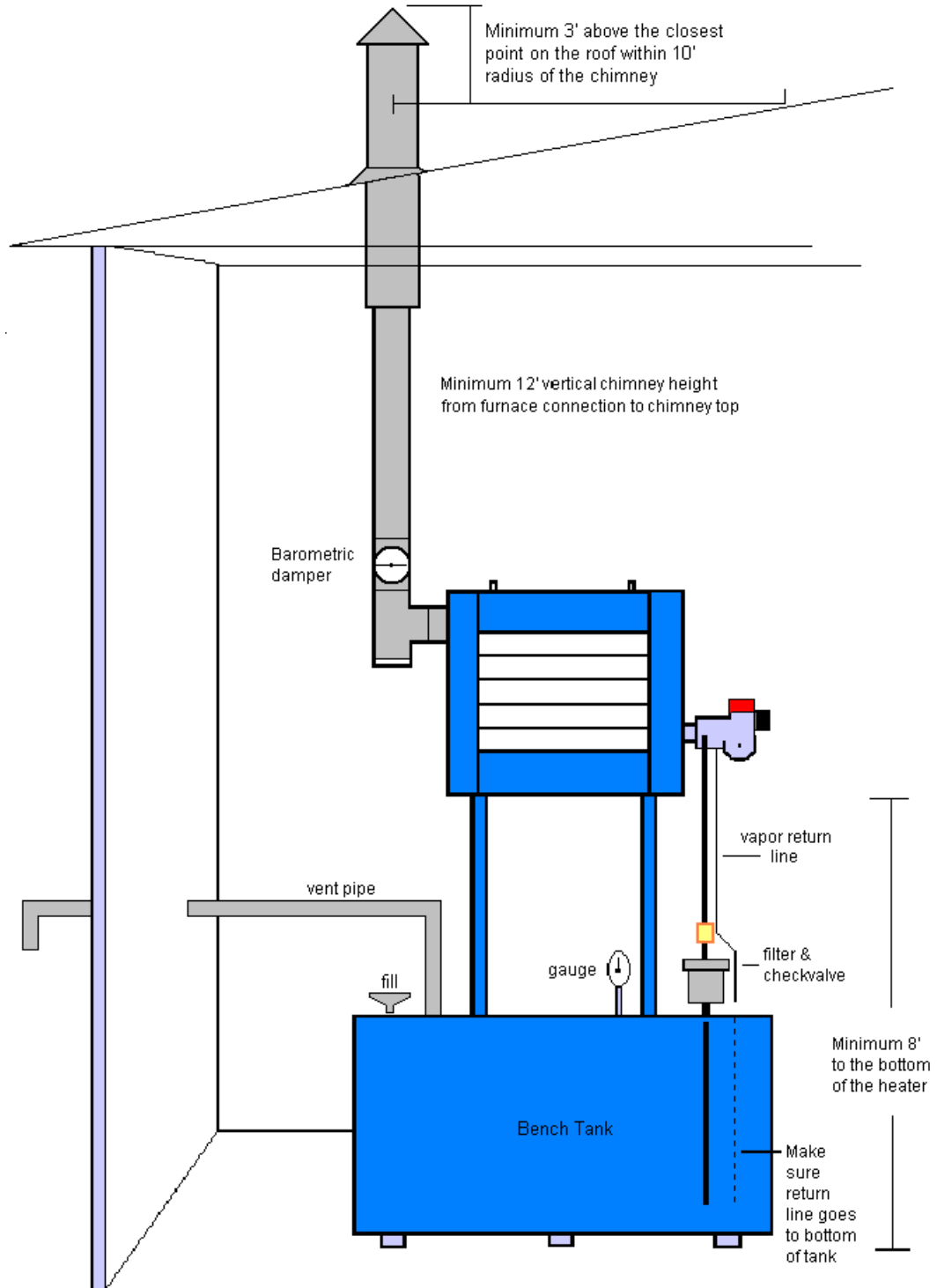
- Attractive and durable industrial powder coat finish applied to all external surfaces.
- Easy to read oil level gauge and oil supply and return lines that connect to the INOV8 burner are included.
- Facilitates easy installation of INOV8 furnaces—all that is needed is the chimney, compressed air and electrical hookups.
- Integrated furnace support brackets, made of heavy gauge 2" square steel tubing to position furnace at desired 8' above floor.
- Constructed of heavy duty 11 gauge on the sides and 10 gauge on the top of the tank.
- Four 2" openings on top to accommodate: vent pipe, oil fill, oil level gauge and burner supply line.
- Two 3/4" threaded cleanouts on lower side of tank allows for convenient draining of accumulated sludge and water. One for each portion of the tank.
- Recently re-certified to US & Canadian Tank Safety Standards by Intertek ETL-Semko

Tank Model #	Weight	Length, Width, Height
T300 HB	500 lbs.	60", 34", 37"



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Typical Installation Diagram



LIMITED WARRANTY

This warranty gives you specific legal rights. You may have other rights which vary from state to state or province to province.

Warrantor

INOV8 INTERNATIONAL, INC
67 Kraft Street
La Crosse, WI 54603

Subject to the limitations stated in this warranty, we warrant the applicable INOV8 product to the first buyer, when installed, operated and maintained as required by this warranty and the INOV8 Instruction Manual, to be free of defects in workmanship or material for a period of one year from the date the warranty begins. We will replace any defective component without cost or expense to you except for the costs of delivery and labor for removal and replacement of the defective component. Please refer to the Limited Warranty Period Table for information specific to your unit.

Warranty Begins

The warranty coverage is based on the date of delivery, and the warranty period begins one month following the date of sale. You must be able to verify this date whenever a warranty claim is made. Original bill of sale, installer's invoice or other similar document will suffice. If the warranty beginning date cannot be verified in accordance with the above, we will consider warranty coverage to begin one month after the delivery date.

EXCLUSIVE WARRANTY AND EXCLUSION OF IMPLIED WARRANTIES:

“THIS WRITTEN LIMITED WARRANTY IS THE ONLY WARRANTY MADE BY THE WARRANTOR AND IS IN LIEU OF ALL IMPLIED WARRANTIES INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR USE. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.”

What Is NOT Covered

1. Scratches or discoloration of decorative finishes.
2. Normal maintenance items such as filters, fan belts, nozzles, fuses or other consumable items.
3. Damage caused by misuse, failure to maintain properly, accident or acts of God.
4. External wiring, piping, venting or attachment of accessory products not integral to our product, including without limitation, draft inducers, vent dampers, thermostats or other mechanical devices not manufactured by the warrantor.
5. Products that have been operated in a corrosive atmosphere where a concentration of acids, halogenated hydrocarbons or other corrosive elements causes deterioration to metal surfaces or integral components. Corrosion related to normal operating conditions is not intended by this exclusion.
6. Products that have NOT been installed in accordance with:
 - Our published installation instructions
 - Applicable local, state/provincial or national codes
7. Products that have NOT been installed by competent, qualified installers.
8. Products that have been moved from their original place of installation.
9. Products that have been modified in the field without written authorization by INOV8 International, Inc.

Warranty on Replacement Components

Any replacement component furnished by INOV8 under warranty provisions will assume the remaining (unused) portion of the limited warranty.

Consequential Damages

The warrantor shall not be responsible for any consequential damages caused by any defects in the product.

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Additional Warranty Period Provisions

In addition to your standard limited warranty there are additional limited warranty periods. See table below. After the first year, in the event that a heat exchanger is no longer being manufactured by the warrantor, the warrantor will allow a credit equal to the then current price of an equivalent heat exchanger towards the purchase of a new INOV8 heat exchanger or furnace.

Warranty Period Table

Category	Model #	Warranty Period
Furnaces – (heat exchangers are prorated 10% per year for 10 years)	F125, F200, F200 SC & F450	Two Years – parts only Limited Warranty on Cabinet
Boilers Systems - (boiler castings are prorated 10% per year for 10 years)	B120, B175, B225, B275, B325, B400, B275, B650, B750, & B1050	Two Years – parts only Limited Warranty on Boiler
Oil Storage Tanks	T300 HB T300 FB	One Year – parts only
Evaporator Systems (tank is prorated 33% per year for 3 years)	EV20, EV30, EV40 & EV60	Burner and Evaporator Controls - One Year parts only Limited Warranty on EV tank for 3 years