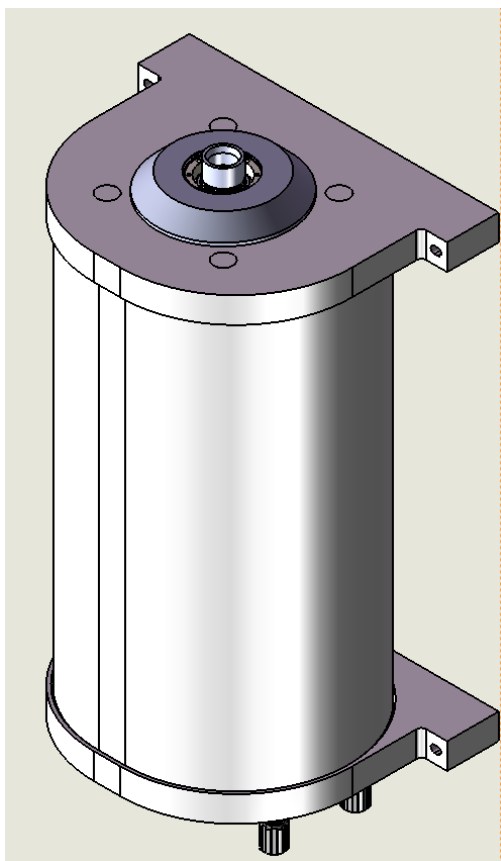


# Frontier PLUS<sub>+</sub>

## Inline Chemical Heater



## Installation Manual

Please supply your inline heater model and serial number when ordering spare parts or when requesting technical assistance.



[www.processtechnology.com](http://www.processtechnology.com)

7010 Lindsay Dr., Mentor, OH 44060 Phone: 440-974-1300 Fax: 440-974-9561 USA/CN: 800-621-1998

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## INTRODUCTION:

The following symbols and warning labels appear on the unit and in the instruction manual. The table below provides an explanation of each one.





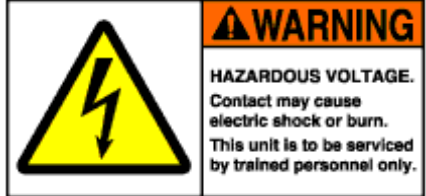



PICTORAL DESCRIPTION	DESCRIPTION
	<p><b>DANGER</b> indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.</p>
	<p><b>WARNING</b> indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.</p>
	<p><b>CAUTION</b> indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.</p>
	<p><b>DANGER: HAZARDOUS VOLTAGE ENCLOSED</b> Voltage or current hazard sufficient to cause shock, burn or death. Disconnect and lock out power before servicing.</p>
	<p><b>WARNING: HAZARDOUS VOLTAGE</b> Contact may cause electric shock or burn. This unit to be serviced by trained personnel only</p>
	<p><b>CAUTION: HOT SURFACE. DO NOT TOUCH</b> Heater column may be hot. Allow unit to cool before servicing.</p>
	<p><b>PROTECTIVE EARTH (GROUND)</b></p>

Table 1: Warning Labels

## **Introduction (Continued):**

The Frontier™ Plus heater by Process Technology is designed to safely heat process chemicals through indirect contact instead of direct immersion. Wetted surfaces of the heater are PFA and PTFE fluoropolymer. It is designed for use in either single pass or multi-pass (recirculating) flow applications.

The Frontier™ Plus heater can withstand operation at a variety of temperature and pressure conditions. The maximum operating condition for the Frontier™ Plus heater is 180°C at 2.5 bar pressure.


	<b>Safe operation of this heater requires the use of over-temperature control sensors with an approved safety switching device. Operating in excess of the maximum operating temperature (180°C) can result in conditions that can cause harm to operators and equipment.</b>
---	---

### ***This Process Technology Frontier™ Plus heater consists of:***

- \* PFA and PTFE fluoropolymer fluid path
- \* PTFE fluoropolymer insulated housing
- \* Element over-temperature sensor(s)
- \* Thermal Cut-off Device(s) (TCO) (multiple TCOs optional; internally wired in series)
- \* Fluid inlet and outlet connections

### ***The following equipment is recommended for safe operation of the Frontier™ Plus heater, and must be customer-supplied.***

- \* Process temperature controller with temperature sensor
- \* Liquid level sensor
- \* Purge gas
- \* Proper high-voltage power fusing and electrical disconnect switch
- \* Pump motor safety interlock circuit
- \* Ground fault circuit protection

	<b>The Process Technology Frontier™ Plus heater heats process fluid to temperatures as high as 180°C. However, the over-temperature protection circuit will allow the heater core to reach temperatures as high as 288°C before TCO activation. Consult the factory BEFORE attempting to heat flammable or combustible fluids.</b>
---	--

**Introduction (Continued):**

**Fluid Heating Information:**

The Frontier™ Plus heater is designed to be used in either single pass or multi-pass (recirculating) flow applications. An application is defined as single pass when the solution will enter the heating chamber only once and must be heated to the desired temperature when it exits the heater. A multi-pass application is one in which the solution will be recirculated through the process and returned to the chamber heater, and may take several cycles through the heater to reach the desired temperature.

**Single Pass Flow Application:**

For single pass applications, the Frontier™ Plus heater is designed to provide a specified temperature increase at a given flow rate. Table 2 shows the maximum temperature increase (ΔT) that can be achieved for continuous flow conditions at heater powers from 2-24 kW. Note: values based on the specific heat/weight of water.

Flow Rate (LPM)	Maximum Temperature Rise (°C)
5	8.6
10	4.3
15	2.9
20	2.1
25	1.7
30	1.4

**Table 2: Maximum Temperature Increase of water as a Function of Power vs. Flow (3kW heater)**

**Multi-Pass Flow Application:**

For a multi-pass application, the Frontier™ Plus heater will elevate and maintain the temperature of a fixed volume of solution as it is circulated. Use the following formula to estimate the heat-up time for a volume of fluid in a multi-pass system. For estimating purposes, the specific heat and weight of water are often used. However, more accurate results will be achieved using the properties of the specific solution.

$$\begin{array}{l}
 \text{Heat-up Time} \\
 \text{(minutes)}
 \end{array}
 =
 \frac{\text{Volume X Density X Temperature rise X Specific heat}}{\text{Heater Power (kW) X 60,000}}$$

(liters(L))      (kg/L)      (°C)      (J/kg x °C)

This formula does not take into account any heat losses to the surrounding environment. Other factors that must be considered include heat losses through plumbing and exposed process tank surfaces, and the load placed on the heater by the introduction of cold products and chemicals into process tanks.

## HEATER SPECIFICATIONS:

<b>Product</b>	Frontier™ Plus Inline Chemical Heater
<b>Approvals (Pending)</b>	Pending
<b>Wattage</b>	2kW to 24kW, depending upon supply voltage Refer to product model number for the wattage of a specific unit.
<b>Voltage</b>	208 VAC to 480 VAC, 50/60Hz, single phase or three phase. Refer to product model number for the voltage rating of a specific unit.
<b>Dimensions:</b>	Refer to facilities print for specific heater dimensions
<b>Wetted surfaces:</b>	PFA and PTFE fluoropolymers
<b>Operating temperatures:</b> <b>Process inlet</b> <b>Process outlet</b>	Up to process outlet temperature Up to 180°C *Maximum operating temperature is dependent upon the chemical to be heated, the inlet and outlet connections provided, and the Thermal Cutoff (TCO) devices provided.*
<b>Ambient Air Temperature</b>	-30°C (-22°F) to 60°C (140°F)
<b>Flow Rate Range</b>	“L” flow configuration: 3.3 lpm (0.87 gpm) minimum “M” flow configuration: 6 lpm (1.6 gpm) minimum “H” flow configuration: 21 lpm (5.5 gpm) minimum  *Note: Minimum flow rates depend on chemistry and pressure. Flow rates above based on DI water at 5 psi back pressure. *Maximum flow rate is dependent on the available pressure and the pressure drop across a particular heater/configuration.
<b>Pressure Rating at 180°C</b>	250 kPa (2.5 bar, 36 PSI) Note: See fitting manufacturer information for pressure ratings of customer supplied fittings
<b>Heater Core Over Temperature Sensors</b>	Qty: 1 to 3 – Refer to model number or facilities print for sensor quantity and type
<b>Thermal Cut-Off Device (TCO)</b>	Qty: 1 to 3 – (Multiple sensors internally wired in series) Refer to model number or facilities print for TCO temperature setting

**Table 3: Heater Specifications**

## **FACILITY REQUIREMENTS:**

Before installing the Frontier™ Plus heater confirm the facility requirements listed below.

### **Space Requirements:**

The Frontier™ Plus heater is designed to be installed within a tool or bench near the process tank assembly. Allow adequate space in the tool for mounting of the heater. Also provide space to make necessary power and plumbing connections to the heater.



The heater should be installed in an area free from excessive chemical or liquid exposure. The electrical junction area must not be submerged or exposed to excessive splashing or high pressure spray.

### **Location:**

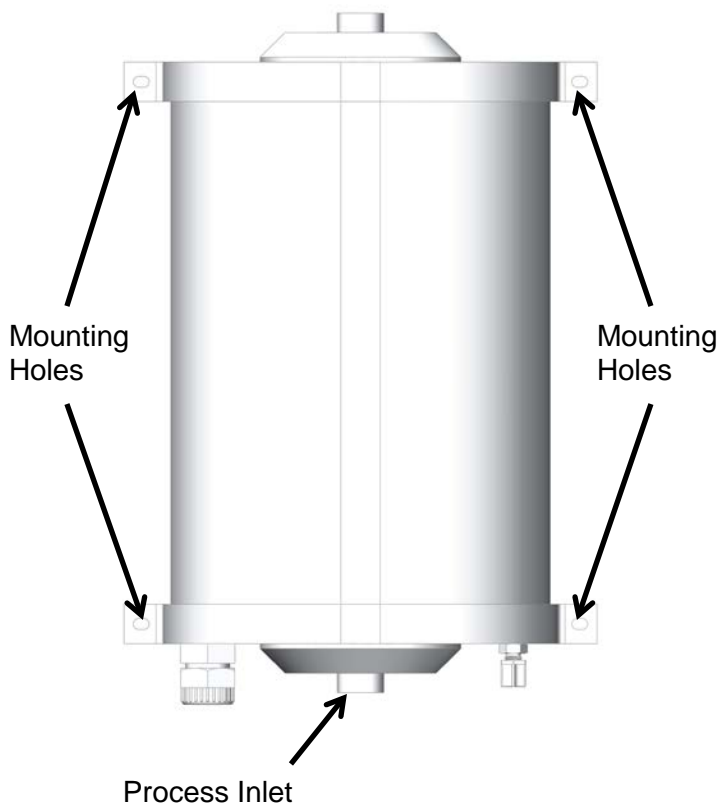
The Frontier™ Plus heater is designed to be located in areas where exposure to process chemistry is possible. The heater's external components are constructed of materials similar to the wetted components, but is not designed to be externally submerged.

### **Mounting:**

The Frontier™ Plus heater is supplied with four holes for mounting. Ensure that the mounting location will adequately support the weight of the chamber, its supporting hardware and plumbing, and the fluid in the system. When mounted, the process outlet must be above the process inlet. Refer to the facilities print of your heater for exact dimensions.

### **Plumbing Requirements:**

The Frontier™ Plus heater can be supplied with either flared tube fittings or Super 300 type Pillar™ tube fittings for the fluid inlet and outlet connections. Refer to the fitting manufacturer's specifications and instructions for proper fitting selection and installation requirements.



**Figure 1: Mounting Hole Locations**

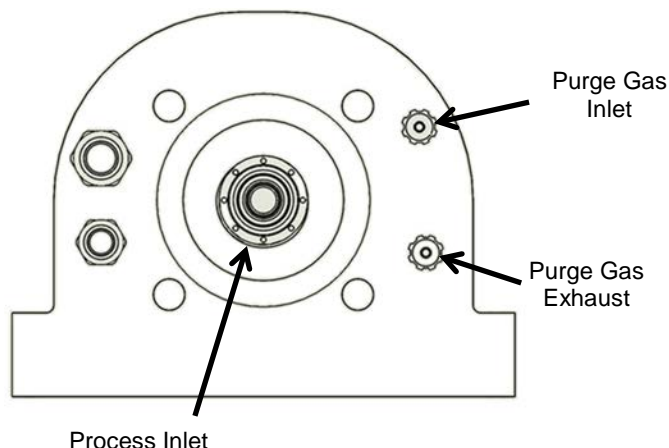
Plumbing must be compatible with process chemicals and temperatures. The inlet plumbing should also include a means to drain the unit for service.

**Facility Requirements (Continued):**

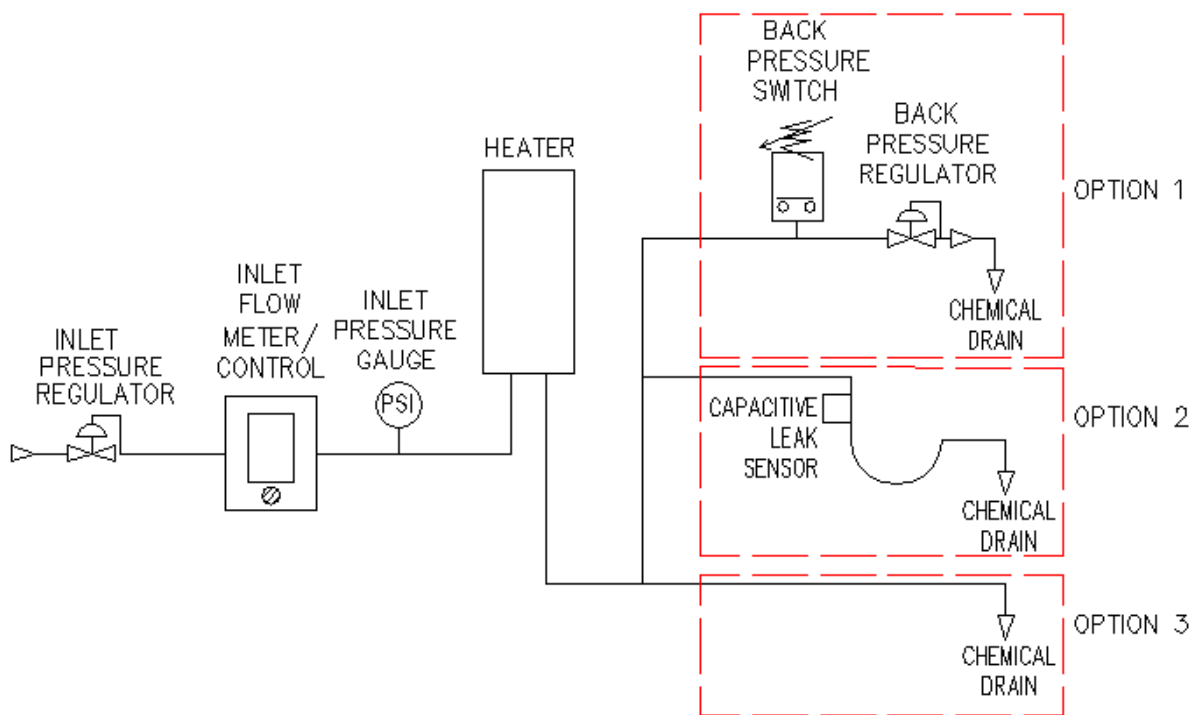
**Purge Gas Requirements:**

A source of purge gas is required, nitrogen (N<sub>2</sub>) is recommended for all applications consult factory for other gas options. This heater uses 6 mm (1/4-in) compression fittings as the purge gas inlet and outlet connections. The purge gas should be applied to the heater whenever there is chemical inside the unit.

The purge gas flow rate should be at a flow rate of 0.5-1 lpm (0.02-0.04 scfm). The purge gas supply must not exceed 35 kPa(0.35 bar, 5 psi) OR 50% of the internal fluid pressure, whichever is LOWER.



**Figure 2: Purge Gas Connections (Bottom View)**



**Figure 3: Purge Gas Plumbing Schematic (3 possible plumbing options on exhaust side)**



**Do not exceed pure gas pressure of 35 kPa (5 PSI). Irreparable damage to the heater may result.**



## **Facility Requirements (Continued):**

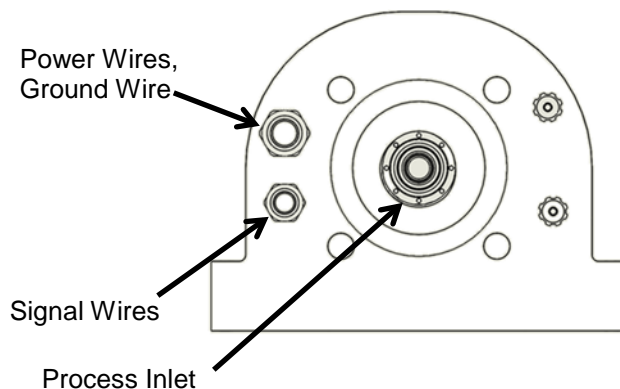
### **Electrical Requirements:**

Separate sets of power cable and sensor wires are provided. Verify that the electrical service is rated and fused for the required amperage draw.

Ensure protective measures used for isolation and switching comply with IEC 60364-4.

**Over-current Protection:** If using circuit breakers, ensure use of a circuit breaker suitable for isolation and in compliance with IEC 60947-2. If using fuses, select in accordance with IEC 60269-2 combined with a magnetic contactor in accordance with IEC 60947-4-1.

Ensure protective measures for over-current in electrical wiring is in accordance with IEC 60364-4-43 and IEC 60364-4-473.



**Figure 4: Electrical Wiring  
(Bottom View)**



**Do not exceed the rated voltage. Irreparable damage to the heater will result.**

**NOTE:** Ensure electrical power fusing and disconnects meet local jurisdictional requirements. Fuse ratings noted in this document are for reference only. Ensure external electrical components comply with local requirements before operating this unit.

### **Temperature Controller:**

The use of a temperature controller is required. The temperature controller should include a process temperature sensor to measure the fluid temperature exiting the heater and the ability to turn the heater off to maintain the desired outlet temperature setting.

### **Liquid level sensor:**

The use of a process-fluid sensor is recommended. The heater can be used with a capacitance-type Liquid level sensor connected to the outlet tube of the heater. The sensor monitors the presence of solution in the outlet piping to ensure that the heating coil remains immersed in process solution during operation.

The Liquid level sensor must be wired into the heater control circuitry in such a manner, as to shut the heater off when there is no liquid in the outlet tube of the heater.

## **INSTALLATION:**

Before installation, carefully read this entire section.

### **Uncrating and Inspection:**

- 1) Remove the Heater assembly from its shipping container.
- 2) Remove any protective packaging material and discard.
- 3) Inspect unit for any apparent physical damage.

### **Mounting Heater:**

Reference the provided facility drawing for the location and dimensions of the mounting holes.

- 1) Ensure that the chamber is mounted vertically with the outlet connection at the top.
- 2) Securely bolt chamber assembly in the desired location.

### **Process Fluid Inlet and Outlet Connections:**

#### **Flared tube inlet/outlet plumbing connections:**

- 1) Remove the protective plastic caps from the Flared fittings on the Inlet and Outlet piping of the heater assembly.
- 2) Connect properly flared tubing to the Inlet and Outlet of the heater chamber assembly.
- 3) Tighten the fitting nuts until fitting nut contacts the flared tubing. Tighten an additional ¼ turn. Then torque, fitting nut to the minimum required torque value. See **Table 2** for proper values.

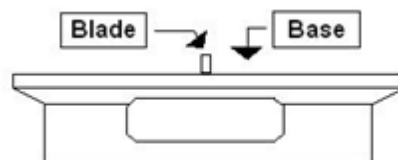
<b>Fitting Size</b>	<b>Torque Value</b>
12mm (½-in) Flared	1.24 Newton-meter (11in-lbs).
19mm (¾-in) Flared	1.58 Newton-meter (14in-lbs).
25mm (1-in) Flared	3.39 Newton-meter (30in-lbs).

**Table 4: Tightening Specifications for Flared Tube Fittings**

#### **Super 300 Type Pillar inlet/outlet plumbing connections:**

Super 300 Type Pillar™ process fluid line connections use a “gauge ring” (see figure), which is used to determine the proper tightness of the fitting connections. Check the facilities print for the connections supplied with this unit.

- 1) Remove the protective plastic caps from the Pillar fittings on the Inlet and Outlet piping of the heater assembly.
- 2) Install appropriately sized Super 300 Type Pillar “gauge ring”.
- 3) Connect properly sleeved tubing to the Inlet and Outlet of the heater chamber assembly.



**Figure 5: Super 300 Type Pillar gauge ring**

## Installation (Continued):

- 4) Tighten the Pillar fitting nut until the bosses on the union nut makes contact with the gauge ring and pulls the blade. A crunching sound will be heard at this point. Continue tightening the union nut until the bosses make full contact with the gauge ring.

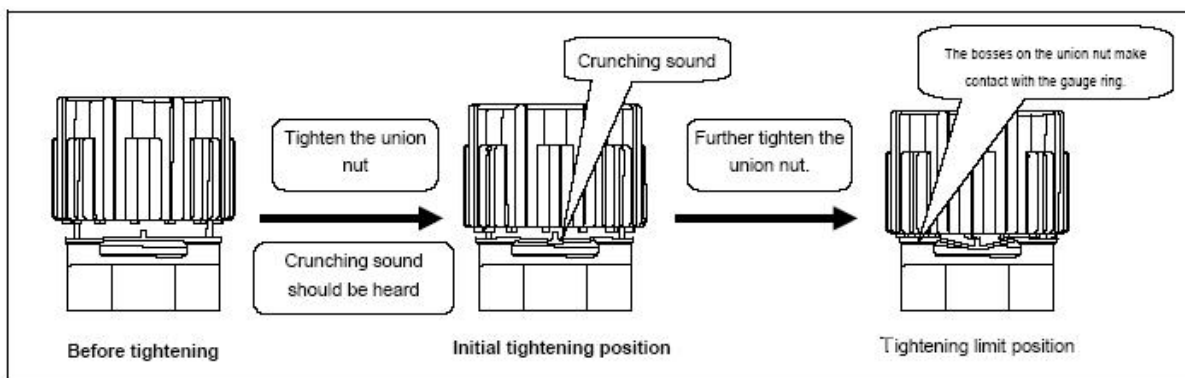


Figure 6: Super 300 Type Pillar connection procedure

### Purge Gas Connections:

The Frontier™ Plus in-line heater requires a purge gas during operation. **The purge gas flow rate should be at a flow rate of 0.5-1 lpm (0.02-0.04 scfm). The purge gas supply must not exceed 35 kPa(0.35 bar, 5 psi) OR 50% of the internal fluid pressure, whichever is LOWER.**

The purge gas connections are located next to the process inlet connection. The standard connections are 6 mm (¼-in) compression fittings.

- 1) Using 6 mm (¼-in) OD tubing, connect the purge INLET to a pressure regulator connected to the purge gas supply. Hand tighten the fitting cap until seated. Tighten an additional ¼ turn.

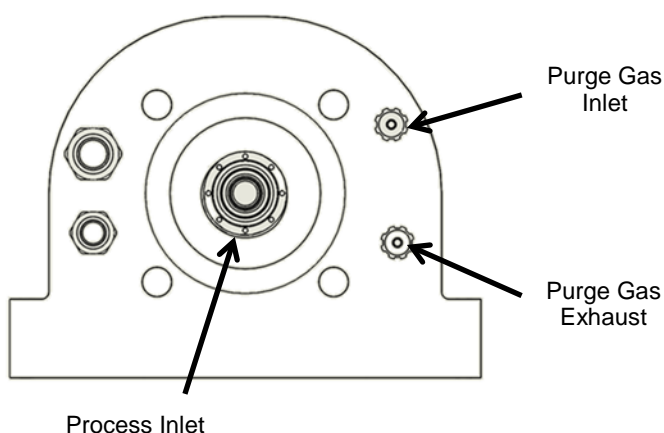


Figure 7: Purge Gas Connections (Bottom View)

- 2) Using 6 mm (¼-in) OD tubing, connect the Heater Purge Exhaust (labeled OUTLET) to an approved exhaust area. Hand tighten the fitting cap until seated. Tighten an additional ¼ turn.



**Do not exceed pure gas pressure of 35 kPa (5 PSI). Irreparable damage to the heater may result.**



**The exhaust gas should be properly vented as chemical exhaust.**

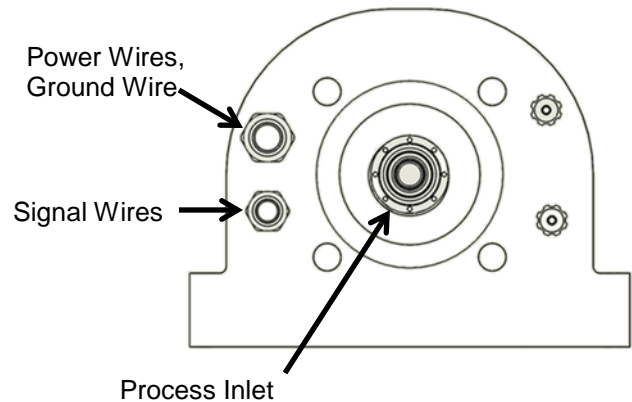
## Installation (Continued):

### Electrical Connections:

#### Main Power:

The main power cable on the Frontier™ Plus heater consist of two or three (2 or 3) black power leads, and (1) one green ground lead. All customer-provided electrical connections and safety devices must comply with local electrical code guidelines.

- 1) Refer to the model number label for the power requirements for this heater.
- 2) Fuse the incoming power supply lines for the rated amperage using an approved electrical disconnect. The electrical disconnect must meet the following minimum requirements:
  - Appropriate voltage and amperage ratings for the specific heating system. Verify that all fused electrical disconnects meet jurisdictional requirements.
  - For safety of service and maintenance personnel, this electrical disconnect must be located within sight of the equipment.
- 3) Ensure that all services are off before making connections (electrical, liquids, and gas). Lockout and Tagout as appropriate. Use only approved and properly rated wire, conduit and connectors.
- 4) Connect heater leads to an electrical disconnect device in the customer supplied controller. This electrical disconnect must have the proper electrical rating necessary for the equipment.
- 5) Connect heater ground lead to proper grounding point.



**Figure 8: Electrical Wiring  
(Bottom View)**

#### Over-temperature sensors and over-temperature control:

The Frontier™ Plus heater is supplied with redundant temperature monitoring capabilities to better ensure safe internal operating temperatures. These sensors must be installed into a customer-supplied control package to protect the equipment from accidental damage and to ensure operator safety.

Devices Include:

- One to Three (1 to 3) Heater Core Over-temperature Sensors (Refer to model number or facilities print for specific sensor information.)
- One to Three (1 to 3) Resettable Heater Element TCO (Thermal Cut-Off) Devices (multiple devices internally wired in series.)

**NOTE:** Failure to use the supplied over-temperature control devices for their intended purposes may void all or part of the equipment warranty. Consult factory for technical assistance.

### **Installation (Continued):**

The Heater Over-temperature Control Sensors measures the operating temperature of the heater core. This heater is supplied with one to three sensors for core temperature sensing.

When three sensors are included in the unit, the sensors are positioned so that each electrical phase is monitored. Should an electrical phase loss occur and two sections of the heater reduce or produce no heat output, the other sensors will still detect any over-temperature condition. Due to the heater's internal flow baffling configuration, there will be some temperature variation between the three core over-temperature sensors. If only relying on one sensor for over-temperature control, it is very important to monitor the sensor labeled **TC1**.

The core operating temperature will vary based on variables such as the flow rate, process chemistry, and the heaters flow configuration. As such, set the respective core over-temperature control 20°C above the core temperature measured when process temperature reached at normal operating conditions.



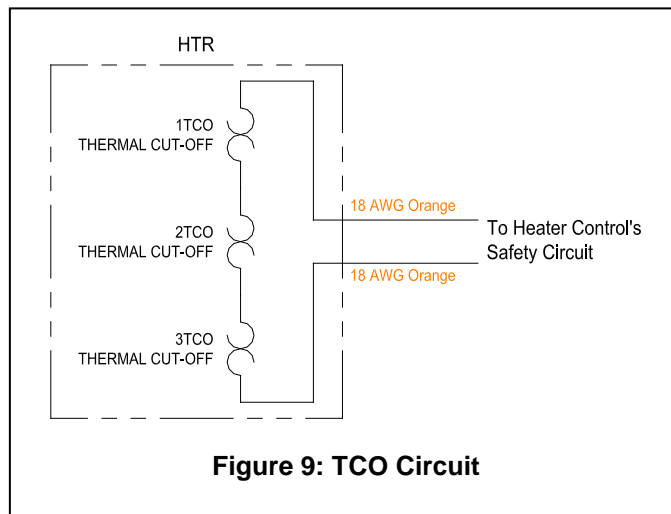
**These sensors MUST be connected to an ELV circuit.**  
**These sensors MUST be connected to an approved safety switching device.**  
**Activation of the over-temperature protection should require manual reset to enable heating.**

**NOTE:** If providing phase loss detection as part of the main power control, then it may not be necessary to monitor all 3 sensors. Refer to local jurisdictional code requirements to ensure safe operation of the heater.

### **Heater Element TCO (Thermal Cut-Off):**

The Heater Element TCOs are bimetallic switches that opens when they reach a preset temperature. These are resettable devices which must be connected to interrupt the operation of the control circuit if it is activated by an element over-temperature condition.

This heater is supplied with One to Three internal TCO devices (multiple devices wired in series), which must be wired to the control's safety circuit. The TCOs are positioned so that each electrical phase is monitored. Should an electrical phase loss occur and only 1/3 of the heater produce full power, one of the three TCOs will still detect any over-temperature condition.



**Figure 9: TCO Circuit**



**Do not connect the TCOs in series with the heating element/main load. They are designed to be wired into the heater's control circuit, connected in series with the coil of the magnetic contactor for the main load.**  
**Protection of the circuit shall be done with a fuse, according to IEC or EN 60691 or a circuit breaker according to IEC 60947-2.**

## **SAFETY FEATURES:**

### **Safety System Network:**

This Frontier™ Plus heater is supplied without a Temperature Control package. Certain safety interlocks must be incorporated into the control package to prevent damage to the heater and ensure the safety of the operator. Each interlock circuit monitors a critical operating parameter of the heater. The control system is designed so that if a "fault condition" is detected by one of the sensors, the power to the heating element is disengaged. The shutdown mechanism may be momentary or latching; refer to table below.

<b>Safety device</b>	<b>Operation</b>	<b>Type of Shutdown</b>
Pump Interlock (Customer-Supplied)	Monitors condition of pump, disrupts power to heater when pump is not in operation.	latching
Liquid Level Control (Customer Supplied)	Monitors presence of adequate fluid in heater vessel, disrupts power to heater if fluid is not present in the outlet piping.	latching
Process Temperature Control Device (Customer Supplied)	Monitors temperature of fluid, disrupts power to heater when temperature rises above setpoint.	momentary
Process Over-Temperature Control Device (Customer Supplied)	Monitors temperature of fluid, disrupts power to heater when temperature rises above setpoint.	momentary or latching
Heater Core Over-Temperature Control Device (Sensors Included with Heater) (Control Customer Supplied)	Monitors temperature of heating element, disrupts power to heater when temperature rises above setpoint. The setpoint should be no lower than 20°C above the desired core control set point.	latching
Heater Element TCO (Included)	Monitors temperature of heating element, disrupts power to heater when temperature rises above melt point of TCO.	latching

**Table 5: Safety System Network**

## **OPERATION:**

### **Start Up Procedure:**

- 1) Start process fluid flow. Allow solution to flow for several minutes to remove any air from the heating chamber.
- 2) Turn on the main power to the system.
- 3) Turn on the control module.
- 4) Verify proper reading of the process temperature.
- 5) Engage the control system's safety relay, if applicable.
- 6) Turn on the heater.

### **Shut-Down Procedure:**

- 1) Turn OFF electrical power to the heater.
- 2) Allow heater to cool. The heater may be damaged if the heater is allowed to operate in air or if residual heat is not allowed to dissipate before draining. Before the chamber is drained, the outlet temperature must be allowed to cool to within 1°C of the inlet temperature. Then, wait an additional 10 minutes.
- 3) Turn OFF process fluid flow through the heater.
- 4) Turn OFF process controller.
- 5) Turn OFF Main Electrical Power.
- 6) For extended shut down periods, drain the system.

### **Draining Procedure:**

Open the drain valve and allow any solution in the chamber to drain from the unit. For proper draining, ensure that the outlet plumbing is NOT obstructed to allow proper "venting" to the chamber.



**Small amounts of process chemistry may remain in the unit after draining. The unit should be flushed with hot water then drained several times to eliminate any residual chemistry.**

## **MAINTENANCE:**

### **Preventative Maintenance of the Heater Chamber:**

The Process Technology Frontier™ Plus heater requires minimal preventive maintenance.

The process inlet/outlet fittings should be checked for leaks every Six Months or at the interval recommended by the fitting manufacturer – whichever comes first.

### **Cleaning:**

This Process Technology Frontier™ Plus heater was cleaned before shipment. However, cleaning is typically required to remove any contaminants remaining after installation. The times required for cleaning of the system are dependent on DI water quality, flow rates, and installation techniques, and will vary. Additional steps may be indicated for some applications.

**NOTE:** Components of the heater are constructed of PFA and PTFE fluoropolymers. Verify chemical compatibility before sanitizing the unit.



## **SERVICE:**

Process Technology supports its product line with a strong technical support and field service program. If your Frontier™ Plus heater fails to perform properly, follow the outlined steps for resolution.



**There are no user serviceable or replaceable parts inside the heater. Do not attempt any field repairs as this will void the warranty.**

- 1) Verify connections and program parameters.
- 2) Contact the Process Technology Technical Service Group. When placing this call, please have available the model number and serial number of the unit (located on the system tag), information about the application of the equipment, and information regarding the chemical constituents of the process fluid. The Service Technician will evaluate the situation and determine a course of action for troubleshooting and repair.
- 3) If the Technician determines that the unit should be returned to the factory for evaluation, a Returned Materials Authorization (RMA) Number will be issued. A return will not be accepted without prior authorization.

To protect the safety of Process Technology's workers and any others that may come in contact with the Frontier™ Plus heater in the course of transport, evaluation, and repair, Process Technology requires that these practices be followed in returning the equipment to the factory:

- 1) Rinse the equipment until it is free of any chemical residuals. This is required for safe transport and handling of the equipment.
- 2) Wrap the unit in plastic and secure. Make sure that it does not leak. (Process Technology is not responsible for damage caused by leakage during shipping.)
- 3) Carefully package the unit for shipment.
- 4) Indicate the type of chemical that was in use at the time of failure. Include this information on the packing slip or place the information on the outside of the box. Process Technology will not risk exposure of its personnel to unknown chemicals. A return will not be evaluated until chemical information is received.

**NOTE:** It is possible that process fluid residues may remain even after thorough rinsing. Chemical information must be included even when a unit is believed to be clean so that Process Technology may protect its workers from exposure to these residues.

- 5) Clearly mark the outside of the box with the RMA number.
- 6) Ship the component prepaid to Process Technology.  
Upon receipt of a returned unit, Process Technology will follow these steps:
  - 1) The equipment will be carefully unpacked, inspected and cleaned, and an evaluation will be done.
  - 2) A Process Technology technician will contact you with information regarding the scope of work to be performed, the cost, and the amount of time needed.
  - 3) After a purchase order and authorization to perform the repair are received, the repairs will be completed and the unit returned.

## **WARRANTY:**

All PROCESS TECHNOLOGY equipment, heaters and controls have been carefully inspected before shipping and are warranted to be free from defects in workmanship and materials for a period of one year from date of purchase on a pro-rated basis. At its option, PROCESS TECHNOLOGY will repair or replace any defects that are exhibited under proper and normal use. PROCESS TECHNOLOGY disclaims any responsibility for misuse, misapplication, negligence or improper installation of equipment, tempering or other operating conditions that are beyond its control (such as excessively high or low purge gas supply pressure). PROCESS TECHNOLOGY makes no warranty or representation regarding the fitness for use or the application of its products by the customer.

All products and components not manufactured by PROCESS TECHNOLOGY will carry the original manufacturer's warranty, copies of which are available upon request. PROCESS TECHNOLOGY makes no warranty or representation, expressed or implied, with respect to the products not manufactured by PROCESS TECHNOLOGY.

Products must be installed and maintained in accordance with PROCESS TECHNOLOGY instructions.

PROCESS TECHNOLOGY is not liable for labor costs incurred in removal, reinstallation, or unauthorized repair of the product or for damage of any type including incidental or consequential damage.

PROCESS TECHNOLOGY neither assumes nor authorizes any representative of PROCESS TECHNOLOGY or any other person to assume for it any other liabilities in connection with the sale of the products. This warranty may not be verbally changed or modified by any representative of PROCESS TECHNOLOGY.

### **Shipping Damages:**

Claims against freight carriers for damage in transit must be filed by the customer at the time of delivery or as soon as possible.

### **Returns:**

No product shall be returned to PROCESS TECHNOLOGY without first obtaining a return material authorization (RMA) number from a PROCESS TECHNOLOGY representative. All returns must be freight prepaid. Freight collect or shipments without authorization will be refused.

### **Information:**

PROCESS TECHNOLOGY will endeavor to furnish such advice as it may be able to supply with reference to the use by buyer of any material purchased, but PROCESS TECHNOLOGY makes no guarantees and assumes no obligation or liability for advice given verbally or in print or the results obtained. Buyer assumes all risk and liability that may result from the use of any material, whether used by itself or in combination with other products. No suggestion for product use shall be construed as a recommendation for its use in infringement on any existing patent.

### **Conflict Between Documents:**

Acceptance of this offer is expressly conditioned upon agreement to all terms and conditions contained herein. In the event of a conflict between the terms and conditions of purchaser's purchase order, and PROCESS TECHNOLOGY's terms and conditions, proposal or offer, the latter shall govern.

# History of Revisions

Rev	Description of Revision	Date
00	Revision 00 is original release.	10/24/17

Approvals: \_\_\_\_\_

**Product Manager** **Date**

\_\_\_\_\_  
**Engineering** **Date**

\_\_\_\_\_  
**Quality Assurance Manager** **Date**