

# POINT OF USE INLINE CHEMICAL HEATER

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## Installation Manual



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## **RELATED DOCUMENTS:**

*The following documents are to be used in conjunction with this manual:*

**ANSI/NFPA70** – National Electric Code\*, latest edition. To be used to determine appropriate electrical service, wire sizing, routing and protection.

**SEMI S2** – Semiconductor Equipment Safety Guidelines, latest edition. To be used in conjunction with safe operation, access and decommissioning procedures.





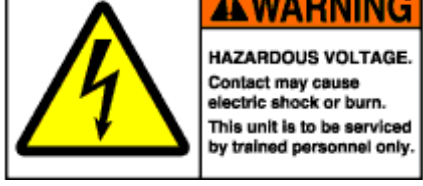


**ANY** – State or local building codes that would cover the electrical, mechanical, or physical installation of electrical heating equipment.

\*National Electric Code

NFPA 1999 Copyright  
National Fire Protection Association  
Quincy, Mass. 02269

## 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.

<u>PICTORAL DESCRIPTION</u>	<u>DESCRIPTION</u>
	<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></p> <p>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></p> <p>Contact may cause electric shock or burn.</p> <p>This unit to be serviced by trained personnel only</p>
	<p><b>CAUTION: HOT SURFACE. DO NOT TOUCH</b></p> <p>Heater column may be hot. Allow unit to cool before servicing.</p>
	<p><b>PROTECTIVE EARTH (GROUND)</b></p>

## HEATER SPECIFICATIONS:

<b>Product</b>	<b>1kW, 208 VAC Point of Use (POU) Inline Heater</b>
Wattages	1,000 W
Supply Voltage:	208VAC, 50/60Hz, single phase, (4.8 full load amps)
Dimensions:	39mm dia x 330mm long housing. 360mm overall length including plumbing connections.
External Housing Material	Stainless steel, Xylan™ and FEP covered
Operating temperatures:	
Process inlet	Up to process outlet temperature
Process outlet	Depends upon operating conditions, 180°C maximum
Maximum Pressure Rating at 180° C	1.5 bar [22 psi]
Approximate Weight	.85 kg [2.28 lbs]
Temperature sensors:	
Thermal Protector	Thermocouple, K-type, to be set 25°-30°C above steady state. (340°C maximum setting.)
Element Over-temperature sensor	Thermocouple, K-type, to be set 15°C-20°C higher than steady-state temperature. (300°C maximum setting.)
Wire Lengths:	3m (118-in.)

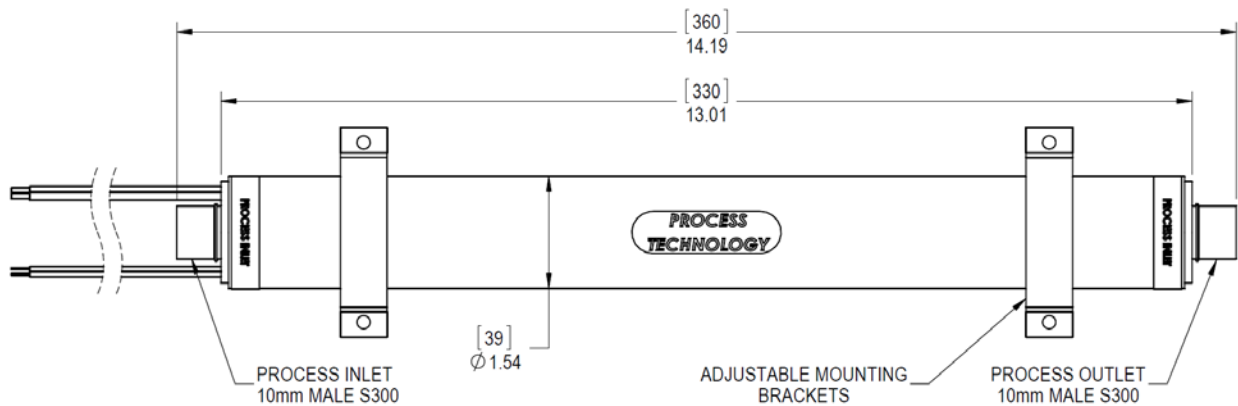


Figure 1: Heater Dimensions

## **INSTALLATION REQUIREMENTS:**

Before installing the in-line chemical heater, confirm the facility requirements listed below. Refer to this facilities print for specific requirements.

### **Space Requirements:**

This heater is designed to be installed within the production tool near the dispense point. It may be installed in a horizontal or vertical orientation. Allow adequate space in the tool for mounting of the heater. Also provide space to make necessary power and plumbing connections to the heater.

### **Electrical Requirements:**

Separate wires are provided for heater power and the various safety sensors.

Ensure electrical facilities meet local jurisdictional requirements before operating this unit. This will include the following components:

- Electrical disconnect devices
- Over-current protection (circuit breakers or fusing)
- Isolation and switching devices
- High voltage wiring
- Temperature Controller, including circuits for over-temperature safety shutoff devices



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

### **Liquid Plumbing Requirements:**

The heater plumbing connections include fluid inlet and outlet connections.

Plumbing must be compatible with process chemicals and temperatures.



Do not exceed maximum temperature/pressure rating of this unit. Irreparable damage to the heater will result.

## **INSTALLATION REQUIREMENTS (CONTINUED):**

### **Control/Safety System Requirements:**

This in-line 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 any 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>
Fluid Flow Interlock	Monitors condition of fluid flow through the heater, immediately disrupts power to heater when fluid flow is not detected.	Latching, requires manual reset
Liquid Level Control	Monitors presence of adequate fluid inside the heater, disrupts power to heater if fluid is not present in the outlet piping.	Latching, requires manual reset
Heater Element Overtemp Safety Device (sensor included in heater)	Monitors temperature of element over temperature sensor inside the heater, disrupts power to heater when temperature rises above setpoint, which should not exceed 300°C.	Latching, requires manual reset
Thermal Protector Device (sensor included in heater)	Monitors temperature of heater, disrupts power to heater when temperature rises above 340°C.	Latching, requires manual reset
Process Temperature Control Device	Monitors temperature of fluid at or near heater outlet, disrupts power to heater when temperature rises above programmed setpoint.	momentary

# INSTALLATION REQUIREMENTS (CONTINUED):

## Safety Circuit Flow Chart:

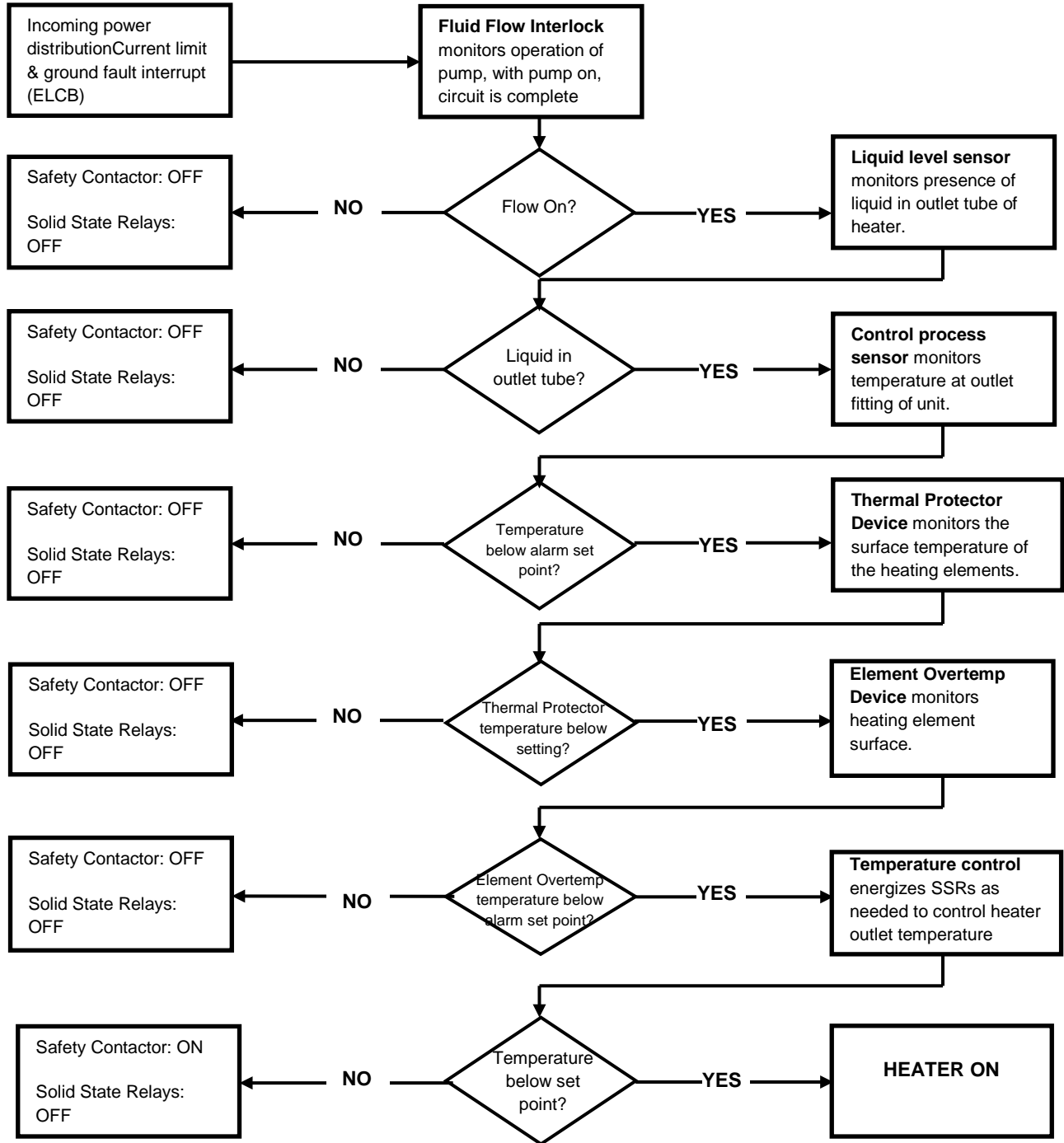


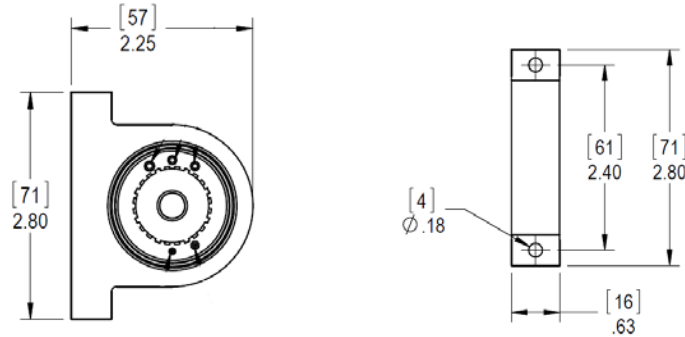
Figure 2: Safety Circuit Flow Chart



## **INSTALLATION:**

### **Mounting:**

This heater may be installed in a vertical or horizontal orientation. The two adjustable mounting brackets should be used to mount the heater.



**Figure 3: Adjustable Mounting Bracket**

This heater is not intended to support the weight of plumbing or fixtures on the inlet or outlet side of the unit. Physical support for the plumbing on the inlet and outlet sides of this unit must be provided by the installer.

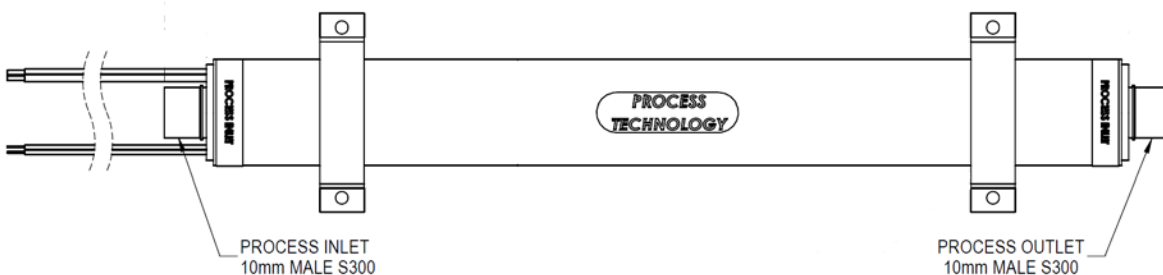
### **Mounting Bracket Installation Procedure:**

- 1) Slide mounting brackets along the heater body to the desired position.
- 2) Secure the mounting brackets to the support surface by installing a fastener through the mounting hole. Fastener not provided.

### **Plumbing Connections:**

The heater is intended to be installed in an open system. The outlet pipe/tubing should be plumbed directly to an open tank or dispense point. Ensure there are no valves or devices intended to restrict flow between the heater outlet and the open tank.

This heater is provided with 10mm (3/8-inch) male Super 300 Type Pillar™ connections.

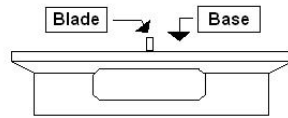


**Figure 4: Fluid Inlet and Outlet Connections**

## INSTALLATION (CONTINUED):

The 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.

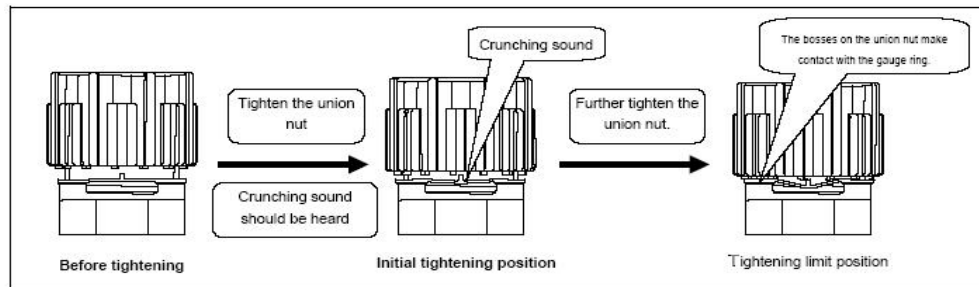
- 1) Remove the protective plastic caps from the Pillar fittings on the Inlet and Outlet piping of the heater assembly.
- 2) Install appropriately sized Super 300 Type Pillar “gauge ring”.



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

- 3) Connect properly sleeved tubing to the Inlet and Outlet of the heater chamber assembly.

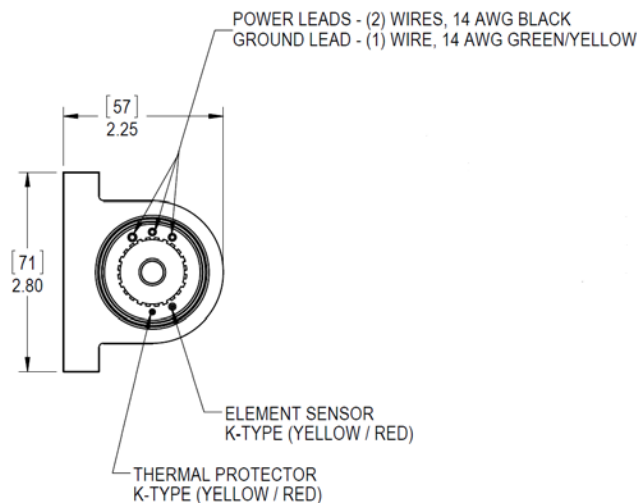
Tighten the Pillar fitting nut until the bosses on the union nut make contact with the gauge ring and pulls the blade. A crunching sound will be heard at this point. Continue tightening the union nut until the bosses make full contact with the gauge ring. If necessary, support the heater’s outer housing while tightening these connections.



**Figure 6: Super 300 Type Pillar connection procedure**

## Electrical Connections:

The in-line heater has separate wires for heater power and various sensors.



**Figure 7: Heater Wires (End View, Inlet Side Shown)**

## **INSTALLATION (CONTINUED):**

### **Electrical Connections (Continued):**

#### Ground Wire:

The green ground wire must be connected to an earth ground.

#### Power Wires:

The two black power wires should be connected to the output of the temperature control system.



### **CAUTION**

An improperly torqued wire connection may overheat during operation, resulting in melted wires and heater damage.

#### Thermal Protector, K-type Thermocouple:

One sensor cable labelled “Thermal Protector” containing one red and one yellow wire is for a K-type temperature sensor. This sensor is for measuring the temperature at the hottest part of the heating element. This sensor should be wired to a safety device that is able to shut off the heater if the sensor detects a temperature above the programmed setting. This setting should be adjusted to a value that is 25° to 30°C above the steady state temperature of this sensor during normal operation. The overtemp setpoint should be set no higher than 340°C.

#### Element Sensor:

One sensor cable labelled “Element Overtemp” containing one red and one yellow wire is for a K-type temperature sensor. This sensor is for measuring the temperature on the outside of the heating element. This sensor should be wired to a safety device that is able to shut off the heater if the sensor detects a temperature above the programmed setting. This setting should be adjusted to a value that is 15° to 20°C above the steady state temperature of this sensor during normal operation. The element should not be operated above 280°C with the overtemp setpoint set no higher than 300°C.

## **OPERATION:**

### **Start Up Procedure:**



During operation, the surface temperature of the heater may exceed 100°C. Avoid contact with the heater surface. Serious personal injury may result.

- 1) Start process fluid flow. Allow fluid to remove any air from the heater fluid tube.
- 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.

### **Procedure to determine the setting for the *Element Overtemperature* and *Thermal Protector* safety shutoff devices:**

The following procedure should be performed upon initial startup, or every time the output temperature setting of this heater has been changed.

- 1) Follow the above *Start Up Procedure* to turn on the heater.
- 2) Allow the heater adequate time to heat the fluid to the desired temperature.
- 3) Observe the temperature of the *Element Overtemp* sensor and the *Thermal Protector* sensor.
- 4) Adjust the Heater *Element Overtemp* Safety Shutoff device setting to a value 15° to 20°C higher than the temperature noted in step 3. Do not adjust this setting higher than 300°C.
- 5) Adjust the Heater *Thermal Protector* Safety Shutoff device setting to a value 25° to 30°C higher than the temperature noted in step 3. Do not adjust this setting higher than 340°C.

## **Service:**



### **CAUTION**

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

If your in-line chemical heater fails to perform properly, follow the outlined steps for resolution.

- 1) Verify the plumbing 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 (if applicable), information about the application of the equipment, and information regarding the process chemical.
- 3) The Service Technician will evaluate the situation and determine an appropriate course of action.
- 4) 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 product in the course of transport, evaluation and repair, the following procedure must be followed for 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 with the appropriate SDS information. 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.
- 5) Clearly mark the outside of the box with the RMA number.
- 6) Ship the component prepaid to PROCESS TECHNOLOGY.

## **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.