INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR PIPE THREAD IMMERSION HEATERS USED IN HAZARDOUS LOCATIONS

I. GENERAL

Heatrex Explosion-proof Pipe Thread Mounted Immersion Heaters are CSA approved for use in hazardous areas that are classified as Class I, Division 1, Groups B, C & D. and Class II, Division 1, Groups E, F & G, or as indicated on the data plate. The heaters are approved for immersion heating applications, also as indicated on the data plate.

Heaters which are so labeled may also be suitable for Type 3, 4 and/or 4X corrosive environments. The heaters are intended only for horizontal mounting.

The maximum operating temperature ignition code is stamped on the data plate. NEVER operate the heater in an atmosphere with an ignition code temperature lower than this rating. The heaters are approved for operation in a maximum ambient temperature of 40°C, 104°F. NEVER operate the heater in a vertical mounting orientation or in an ambient temperature above 40°C, 104°F. The heaters are designed for heating specific fluids, gasses or vapors. NEVER operate the heater in a substance other than what is indicated on the data plate.

For details on the particular hazardous environments having the potential for explosion, refer to Articles 500 through 516 of the National Electrical Code, and/or Section 18 of the Canadian Electrical Code, Part I.

A. The Explosion-proof Pipe Thread Mounted Immersion Heaters are intended to be permanently mounted in a horizontal position using the integral pipe thread fitting. **The installation MUST include a high temperature limit control. Tank applications must have a low liquid level control.** See Field Installed Controls, Section III, for instructions in selecting these controls.

All wiring connections to the heater must be made using rigid metal conduit, and an approved properly rated explosion-proof conduit seal must be located immediately adjacent to the heater. All wiring must comply with all national and local codes for equipment in hazardous locations.

The heaters should be properly installed, operated and maintained for optimum service life.

B. When installing:
1. Observe all heater nameplate ratings, warnings and notes.
2.Follow the wiring diagram in making all electrical connections.
3.Keep all electrical connections tight.
4.Keep the heater terminal enclosure and heating elements clean.
5.Carefully read and comply with all warnings and cautions.

II. INSTALLATION

A. Site Selection.

1.) Explosion-proof Pipe Thread Mounted Immersion Heaters are designed for use only while permanently mounted in a horizontal orientation.

2.) The site must allow sufficient free space around the heater for safe and easy installation and maintenance access. A pull space equal to the length of the heating elements should be allowed opposite of the mounting fitting. Workspace for heater maintenance should be at least 3 feet all around the heater terminal box.

3.) The mounting fittings are tapered ANSI type NPT threads, and should only be installed in ANSI type NPT fittings.

4.) The piping or tank must be free of any obstructions, baffles or turns for a distance equal to the element length plus 3” to 6” clearance.

5.) For tank installations where sediment or solids are likely to accumulate be sure the heater is mounted above the level of highest anticipated accumulation.

6.) For tank installations with heaters having an element length over 36 inches the site should allow for element supports on minimum 36 inch centers.

=WARNING=

It is critical this heater be installed by qualified personnel familiar with the National Electrical Code and/or the Canadian Electrical Code requirements for hazardous locations as well as any local codes. It is the

responsibility of the installer to verify the safety and suitability of the installation.

=WARNING=

The heater must be mounted horizontally.

B. Mechanical Installation. Once an acceptable location has been determined, follow these instructions to complete the mechanical installation.

=WARNING=

All heater installations require a high temperature limit control to shut the heater off to prevent the process from exceeding the maximum allowed process temperature.

1.) Apply an appropriate thread sealing compound, such as Teflon tape, or pipe dope to the fitting threads.

2.)Install the heater into the threaded mounting fitting and tighten by hand.

3.)Use a pipe wrench on the hex provided on the heater fitting to wrench tighten the threaded joint .Wrench tighten until the joint is leak tight and the outlet box conduit connection hubs are in the desired orientation.

4.)Check for leaks and correct as required.

C. Electrical Installation. Follow these instructions to complete the electrical installation.:

=WARNING=

Potentially lethal voltages are present. Be sure to lock the branch circuit disconnect switch in the off position and tag the circuit "Out for Maintenance" before working on this equipment.

1.)Follow the wiring diagram and any Code recommendations in making all electrical connections.

2.)Use only an approved explosion-proof means of wiring, such as insulated copper conductors in rigid metal conduit with threaded connections per the NEC or the CEC to make the electrical connections to the heater.

3.)Determine the voltage, phase and KW rating of the heater from the heater data plate.

4.)The branch circuit voltage and phase must match the heater voltage and phase rating.

5.)Calculate the rated load current of the heater as follows:

Single phase heaters: Rated load current ,

$$(\text{Amps}) = \frac{\text{Kilowatt rating X 1000}}{\text{Branch Circuit Voltage}}$$

Three phase heaters: Rated load current ,

$$(\text{Amps}) = \frac{\text{Kilowatt rating X 1000}}{\text{Branch Circuit Voltage X 1.73}}$$

6.) Use branch circuit supply wires rated for 75°C minimum and rated for load current to connect the heater.

=WARNING=

When making electrical connections to the heater, be sure to follow the wiring diagram provided with the heater. The heater must not be operated without the safety high temperature limit cutout and low liquid level control as required, properly connected in the circuit.

7.) Pour the explosion-proof seal in the sealing fitting (not factory supplied). Installations into either Division 1 or Division 2 locations require a conduit sealing fitting installed within 18" of the enclosure or within shorter distance when identified on the enclosure.

8.)Before application of electrical power, recheck all connections to ensure compliance with the wiring diagram and any code requirements. Remove any foreign objects from the terminal enclosure. Reinstall the cover tightly.

9.)See operating instructions, Section IV, before operating the heater.

III. FIELD INSTALLED CONTROLS

=WARNING=

When making electrical connections to the heater, be sure to follow the wiring diagram provided with the heater. The heater must not be operated without the safety high temperature limit cutout and any low liquid level or process flow control properly connected in the circuit.

Every installation must have a safety high temperature control. Selecting other safety control or controls for an application, such as a liquid level or flow rate control depends on how the heater is being used, how the wattage rating was determined, how the process operates and how it is being controlled. There are an infinite number of different application possibilities, but the safety controls in each have the same purpose or function. The purpose of the field installed safety

controls is to limit the maximum process temperature inside the piping or tank during abnormal conditions and thereby limit the temperature of the exposed external fitting.

High temperature limit control. A high temperature limit control that will shut the heater off when the normal process temperature is exceeded at or near the heater is the most direct way to limit the external heater temperature. It should operate if the process overheats due to low level or no flow or low flow. The setting of the limit controls operating point should be determined in the actual process since process conditions and the type of limit control used dictate how much difference between the limit setting and the maximum allowable process temperature will be required. The maximum allowed process temperature stamped on the heater data plate is not the limit setting. IT IS THE MAXIMUM ALLOWED TEMPERATURE THE PROCESS CAN REACH AFTER THE LIMIT CONTROL OPERATES. In determining the setting consider that all controls have a tolerance and that the heater along with the mass of the process material, piping and or the tank materials have a thermal momentum that may cause external temperatures to continue to rise after the limit operates. Consideration should also be given to the external temperature of the piping or tank the heater is mounted in. The piping or tank external temperatures are typically higher than the heaters mounting fitting temperature.

Figure 1 shows the relationship of maximum process temperature to the maximum Identification Code and heater hot spot temperature. For example Temperature Identification Number T6, which has a maximum code temperature of 185°F could possibly have a maximum process temperature of 193°F with a heater hot spot temperature of 175°F in an ambient of 104°F.

Other safety controls. Application variables may make additional safety controls desirable.

1.) Low liquid level control. A LOW LIQUID LEVEL CONTROL MUST BE PROVIDED FOR ALL TANK APPLICATIONS. If the fluid level drops below the heating elements in operation they will overheat, becoming a possible ignition source for the hazardous atmosphere in open tank applications or a possible ignition source for any volatile fumes in closed tank application. A low liquid level control is recommended if there is a chance that the fluid level can drop below the level of the high temperature limit sensing element resulting in a false low temperature indication.

2.) Process flow control. In an application where the wattage rating was determined based on heating a flowing process it may be that excessive temperatures could occur if the process was not flowing or was flowing but at a low flow rate. A process flow control is also recommended if there is a chance of a very fast heater temperature rise requiring an impractical high temperature limit setting difference if the flow stops.

It is recommended that the field installed safety controls are CSA or UL approved controls and that they are used in their intended manner, and within their ratings. Adequate checks and tests of the controls should be performed to ensure that hazardous temperatures do not develop under normal and possible abnormal conditions.

IV. OPERATION

The Explosion-proof Pipe Thread Mounted Immersion Heater may be operated normally with ambient temperatures of 104°F (40°C) or less, and in atmospheres containing less than 21% oxygen by volume. The temperature classification of the heater must be less than the ignition temperature of the area hazard classification, and the hazardous group classification of the heater must match or exceed the area classification. All of these conditions must be met before attempting to operate the heater. The heater should never be operated in an oxygen-enriched atmosphere or with an ambient temperature above 104°F.

=WARNING=

NEVER operate the heater in an atmosphere with an ignition temperature lower than the heater marking.

=WARNING=

The heater must be mounted horizontally to maintain the ignition temperature rating.

=WARNING=

The heater must not be operated without the safety high temperature limit cutout and low liquid level control (as required) properly connected in the circuit.

Operation. Check to make sure that it is safe to operate the heater.

a.) Close the branch circuit or unit disconnect switch servicing the heater.

b.) If a control thermostat is used turn the temperature set point above the process temperature.

c.) The heater should operate.

V. MAINTENANCE

A. Electrical

=WARNING=

Potentially lethal voltages are present. Be sure to lock the branch circuit disconnect switch in the off position and tag the circuit "Out for Maintenance" before working on this equipment.

1.) Annually inspect all wiring connections and visible insulation for damage, looseness, fraying, etc., as applicable. Tighten any loose wiring connections and replace or repair damaged or deteriorated insulation.

2.) If reduced heat output is suspected verify the condition of the heating elements by using an ammeter to check the current draw of each input line. All input lines should draw approximately equal current which should agree with calculated rated load current. If they do not, one or more of the heating elements could be burned out.

B. Mechanical

1.) Check the terminal enclosure, and conduit connections for evidence of water leaks or moisture collection. Tighten connections and check covers as required.

2.) The explosion-proof control box is designed with threaded joints and metal-to-metal contact at the cover joint to prevent an explosion. Do not attempt to install gasket material of any type at these joints.

VI. REFERENCE DATA

1.) Wiring Diagrams. Please refer to the enclosed wiring diagrams in making all electrical connections to the heater and in performing any required maintenance.

2.) Data Plate Information. The data plate contains the catalog number and rating information. Please copy this information down and have it available when communicating with the factory.

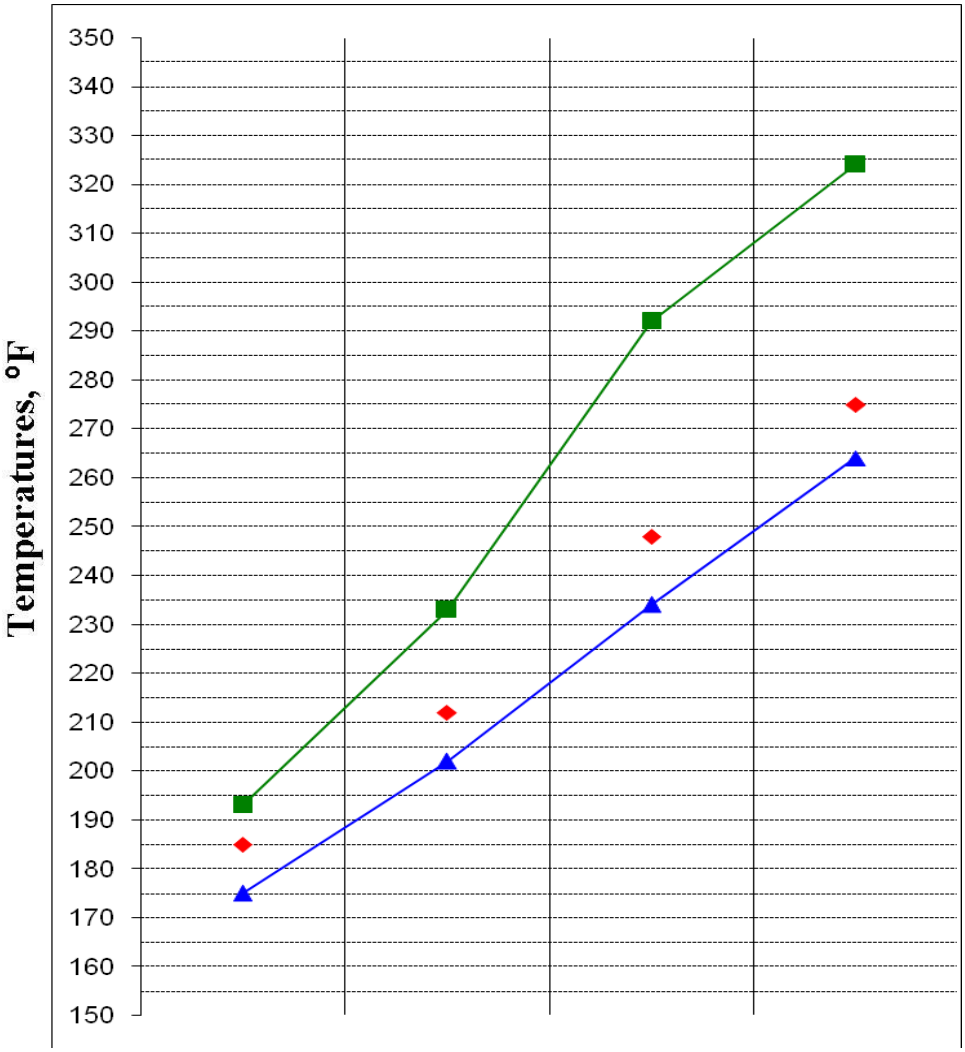
KEEP THESE INSTRUCTIONS WITH THE HEATER FOR FUTURE REFERENCE.

Maximum Temperature, 40° C, 104° F Ambient
Explosion-Proof Pipe Thread Mounted Immersion Heater

Maximum Temperatures, Figure 1.

This figure shows the relationship of the process temperature to the temperature identification code number temperature and the heater hot spot temperature for typical installations. Each installation should be checked and tested to determine actual hot spot temperatures. To use Figure 1 do the following:

1. Find the maximum process temperature on the "Y" axis, such as 250°F.
2. Make a line straight across until it crosses the maximum process temperature line, (the top line), then make a line straight down from this point to the table below the graph.
3. For a 250°F process temperature this line falls between Temperature Identification Numbers T5 and T4A. Since it is above T5, T4A is the lowest Identification number you could use for this process.
4. Where this line crosses the heater hot spot temperature line, (the bottom line), draw a straight line back to the "Y" axis to estimate the heater hot spot temperature. For this 250°F process example it would be about 210°F.



Temperature Identification Number	T6	T5	T4A	T4
■ Maximum Process Temp.,°F	193	233	292	324
♦ Maximum Code Temp., °F	185	212	248	275
▲ Heater Hot Spot Temp., °F	175	202	234	264

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