



USER INSTRUCTIONS FOR SERIES 72 FLANGE IMMERSION HEATERS USED IN HAZARDOUS LOCATIONS WHEN HIGH TEMPERATURE LIMIT SETTINGS ARE DEFINED BY THE END USER

APPLICATION

HEATREX Flange Immersion Heaters for Hazardous Locations may be marked for use in the following areas.
SEE DATA PLATE FOR COMPLETE PRODUCT RATINGS.



Class I, Divisions 1 & 2, Groups B and/or C & D
Class II, Division 1, Groups E, F, & G

CE 0539 Ex II 2 G D
SIRA 19ATEX1174 X

IECEX CSA 19.0020 X
Ex db IIB+H₂ T1-T6, Tx°C Gb
Ex Zone 1
Ex tb IIIC Tx°C Db
Ex Zone 21
IP66
Ambient: -60°C < Ta < 60°C

Heaters marked exclusively for a Division 2 area are constructed without arcing or sparking components or if arcing and sparking components are used they are installed in Division 1 enclosures.

The maximum operating temperature ignition code or temperature is stamped on the data plate. NEVER operate the heater in an atmosphere with an ignition code temperature lower than this rating. NEVER operate the heater mounted in an orientation contrary to its marking.

The explosion-proof electric immersion heater terminal enclosure is rated for a minimum and maximum operating ambient temperature from the data plate. 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 or Section 18 of the Canadian Electrical Code, Part I and/or International standards such as IEC 60079.

- A. The HEATREX Flange Immersion Heaters for Hazardous Locations are intended to be mounted to an enclosure,

tank, or a pipe line by a mounting flange that mates to the heater mounting flange. **The installation must include high temperature limit controls. Tank applications must also include a low liquid level control.** See Safety Controls section for instructions on selecting these controls.

All wiring connections to the heater must be made according to NEC, CEC, and/or International Code requirements for equipment in hazardous locations. Use rigid metal conduit or cable with an approved and properly rated explosion-proof conduit seal or cable seal located per data plate. 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 data plate 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 element area clean.
 5. Carefully read and comply with all warnings and cautions.

All of the CAUTIONS and WARNINGS are stated in the following Safety Summary and are repeated throughout these instructions.



CAUTION: HEATREX strongly recommends this heater be installed by qualified personnel familiar with the National Electrical Code and/or the Canadian Electrical Code and/or IEC 60079 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.

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

The heater must be mounted vertical or horizontal, as marked on the data plate to maintain the ignition temperature rating.

Disassembly of the unit for installation is not required or authorized.

Replacement of electrical components should only be done by authorized personnel familiar with the requirements of maintaining electrical equipment in hazardous locations.

Replacement of electrical components must be obtained from the factory to maintain the hazardous location rating.



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.

INSTALLATION

Site Selection:

1. The HEATREX Flange Immersion Heaters for Hazardous Locations are designed for use only while permanently mounted in an enclosure, tank, or pipe line in a vertical or horizontal orientation as stamped on the data plate.
2. The site must allow sufficient free space around the heater for safe, easy installation and maintenance access.
 - a.) The minimum pull space allowed should be at least equal to the heater's overall length plus 3 feet.
 - b.) Workspace for heater maintenance should be at least 3 feet all around the mounting flange and terminal box.
3. When applicable the elements extending out from the external surface of the mounting flange should not be enclosed or insulated in any manner that would prevent air circulation around the face of the flange and elements. Likewise the terminal enclosure should not be enclosed or insulated.
4. For enclosure or tank installations where sediments or solids are likely to accumulate be sure the heater is mounted above the level of highest anticipated accumulation.



CAUTION: HEATREX strongly recommends 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.

The heater must be mounted vertical or horizontal as marked on the data plate to maintain the ignition temperature rating.

Mechanical Installation:

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



CAUTION: Disassembly of the unit for installation is not required or authorized.

All installations require one or more high temperature limit controls for de-energizing the heater to prevent the media from exceeding the maximum allowed process temperature.

1. Lifting eyes may be provided to facilitate handling. Do not lift the heater by the heating elements.
2. Do not nick or scratch the mating surfaces of the mounting flanges.
3. Exercise care when installing the heater so as not to damage the heating elements or spacers.
4. Be sure a gasket rated for the application is installed between the sealing surfaces of the mounting flanges.
5. Be sure all flange bolts are installed and securely tightened.
6. Be sure that the heater is installed with the orientation stamping at the top and/or any temperature limit devices installed can quickly identify an abnormal condition.
7. Be sure the element bundle is adequately supported to prevent sagging. For element bundles 30" or less in length, supports are not necessary. For longer element bundles, supports are recommended within 6" from the U bend end of the bundle and on maximum 24" centers thereafter. Supports should allow for thermal expansion of the element bundle.
8. Pressure test the installation to make sure there are no leaks at any of the joints.
9. Insure the enclosure, tank, or pipe line is full, and/or the process flow rate is present before operating the heater.

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.

3. Confirm tapered threaded entries have at least 5 full threads engaged.
 4. Follow the NEC and/or CEC and/or ATEX IECEx guidelines and any local electrical and building codes related to the installation and intended use of the heater in an explosion hazard area.
 5. When doing any work on a heater, including the initial electrical connection, disconnect the electrical current at the main branch circuit switch, and lock the switch in the off (open) position and tag the circuit "Out for Maintenance" to prevent potential lethal shock hazards.
 6. Confirm that the electrical power supply matches the data plate voltage, phase, and amperage rating of the heater to be connected.
 7. Use branch circuit supply wires or cables with temperature rating as indicated on the data plate as a minimum and rated for load current to connect the heater.
 8. Proper installation of the heater requires an adequate grounding conductor be connected to the ground terminal. This terminal is painted green or marked with the letter "G" and is located on the inside of the control enclosure next to the power input terminals. An external grounding pad may also be provided on the terminal enclosure as a supplementary bonding connection where local codes or authorities permit or require such a connection.
 9. Refer to the wiring diagram to ensure all connections are as required.
 10. Check and confirm all connections are securely fastened.
 11. Ensure that input conductors and conduit have adequate strain relief at installation.
 12. 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 cover tightly.
 13. See operating instructions before energizing.
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 mineral insulated cable or copper conductors in rigid conduit with threaded connections and conduit seals or cable seals per the NEC, CEC, and/or International Code requirements to make electrical connections to the heater.

SAFETY CONTROLS



CAUTION: When making electrical connections to the heater be sure to follow the wiring diagram provided. The heater must not be operated without a 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, enclosure, or tank during abnormal conditions and thereby limit the temperature of the mounting flanges. When the element sheath is exposed to the potentially hazardous atmosphere, the safety controls will also limit the element sheath temperature below the temperature code assigned.

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, 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 or sheath temperature stamped on the heater data plate is not the limit setting. IT IS THE MAXIMUM ALLOWED TEMPERATURE THE PROCESS, OR ELEMENT SHEATH, IF EXPOSED TO THE HAZARD, CAN REACH AFTER THE LIMIT CONTROL OPERATES. In determining the setting consider that all controls have a tolerance and the heater along with the mass of the process material, piping, and/or enclosure or 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, enclosure, or tank the heater is mounted in. The piping, enclosure or tank external temperatures are typically higher than the heaters' mounting fitting temperature.

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 during 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 a 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 rapid 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 agency certified respective to the installation area, 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.

OPERATION

The HEATREX Flange Immersion Heaters for Hazardous Locations may be operated normally at ambient temperatures as marked, 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 or zone, and the hazardous ratings of the heater must match or exceed the area classification or zone.

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 at ambient temperatures above the marked maximum ambient temperature.

At higher ambient conditions the safety high temperature limit cutouts may activate. If this occurs the installation should include some means to de-energize the heater during high ambient conditions, such as an automatic temperature control thermostat or a manually operated disconnect switch to prevent excessive cycling of the limit controls.

Initial Operation: Check to make sure the mechanical and electrical installation is complete and that it is safe to operate the heater.



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

Do not open cover when heater is energized.

If equipment contains a terminal enclosure heater do not set temperature above the maximum marked ambient temperature.



CAUTION: The heater must be mounted vertical or horizontal as marked on the data plate to maintain the ignition temperature rating.

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.

Ensure all cover bolts are installed and tightened to the torque value from the data plate.

After de-energizing, wait 90 minutes before opening cover to allow internal hot spots to cool below marked temperature code.

Check to make sure the process fluid, gas or vapor is as specified on the data plate and completely surrounds the sheathed tubular elements as intended. All temperature limiting devices must be in place along with any low liquid level or low flow devices as planned for the application.

During initial heating, it is recommended to slowly ramp up the process set point and inspect the heating system for problems.

Normal Operation:

1. Inspect the heater installation for loose bolts or covers, and any signs of overheating or corrosion that could impair the ability of the heater to operate safely.
2. Close the branch circuit or unit disconnect switch powering the heater.
3. If a control thermostat is used, turn the set point its desired process regulating temperature.
4. Place the heater in service.

MAINTENANCE



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.

After de-energizing, wait 90 minutes before opening cover to allow internal hot spots to cool below marked temperature code.



CAUTION: Replacement of electrical components should only be done by authorized personnel familiar with the requirements of maintaining electrical equipment in an explosion hazard area.

Replacement of electrical components should be obtained from HEATREX to maintain the hazardous location rating.

data plate rating. If they do not, one or more of the heating elements could be burned out.

Mechanical:

1. Check the terminal enclosure and conduit connections for evidence of water leaks or moisture collection. Tighten connections and check the cover gasket as required.
2. The Div. 1 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 additional gasket materials of any type at these joints.
3. Threaded joint(s) and cover joint are not intended to be repaired, contact factory for assistance.
4. Annually check the tightness of all mounting bolts and nuts. Ensure all cover bolts are installed and tightened to the torque value from the data plate.
5. Should there be any evidence of fluid or gas leakage from the mounting flange or element joints the heater should be repaired immediately. Contact the factory for instructions.
6. Where buildup of solids on the heating elements, or significant corrosion is expected, periodically remove the Immersion Heater to inspect the heating elements. If the heater is removed, it is recommended to replace the flange gasket. Do not continue using a heater with signs of damage. Before removing, note the orientation of the flange relative to the vessel. Place a reference mark on the vessel and Immersion Heater or use other methods, such as drawing a sketch showing the conduit hub orientation, to ensure proper orientation when re-installing.

Electrical:

1. Annually inspect all terminal connections and visible insulation for damage, looseness, fraying, etc., as applicable. Tighten any loose terminals 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

REFERENCE DATA

Wiring Diagram(s):

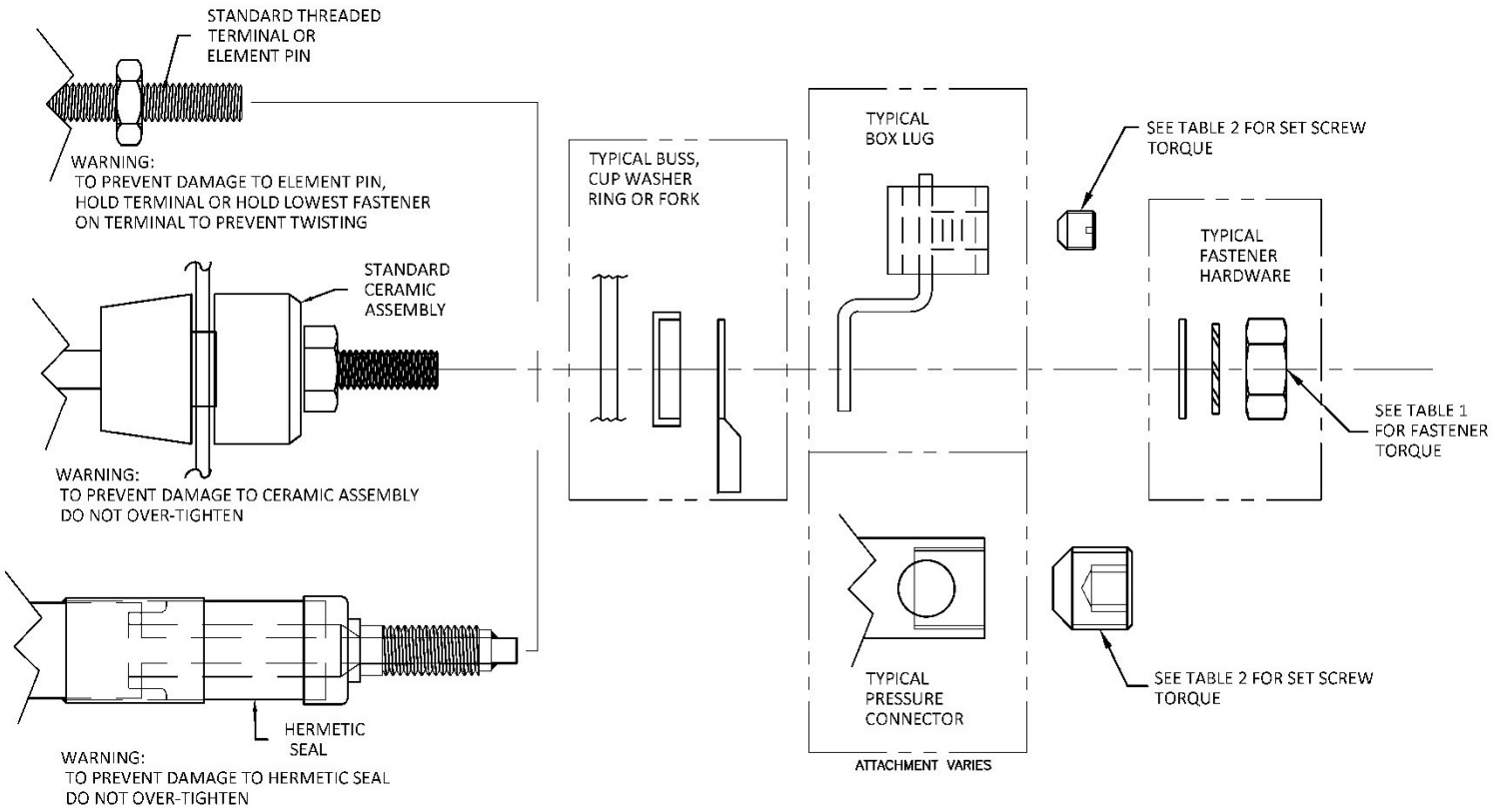
Please refer to the enclosed wiring diagram(s) in making all electrical connections to the heater and in performing any required maintenance.

Data Plate Information:

The data plate contains the catalog number and rating information. Please copy this information and have it available when communicating with the factory.

KEEP THESE INSTRUCTIONS FOR FUTURE REFERENCE.

ELECTRICAL CONNECTION TORQUE REQUIRMENTS



**TABLE 1
FASTENER TORQUE RECOMMENDATIONS**

Application	Thread Size	Torque (in-lbs)	Torque (Nm)
Standard	#10-32	20	2.3
Hermetic	1/4-28	30	3.4

**TABLE 2
GENERAL TORQUE RECOMMENDATIONS (REF. UL STD 486)**

Wire GA (AWG)	HEX INTERNAL SOCKET (ALLEN)		SLOTTED: SMALLER THAN 3/64" X 1/4" (1.19mm X 6.35mm)		SLOTTED: SMALLER THAN 3/64" X 1/4" (1.19mm X 6.35mm)	
	Torque (in-lbs)	Torque (Nm)	Torque (in-lbs)	Torque (Nm)	Torque (in-lbs)	Torque (Nm)
14-10	60-75	6.8-8.5	15-20	1.7-2.3	25-35	2.8-3.9
8	60-75	6.8-8.5	20-25	2.3-2.8	30-40	3.4-4.5
6-4	90-110	10.2-12.4	25-35	2.8-3.9	35-45	3.9-5.1
3	125-150	14.1-16.9	25-35	2.8-3.9	40-50	4.5-5.6
2	125-150	14.1-16.9	30-40	3.4-4.5	40-50	4.5-5.6
1	125-150	14.1-16.9	N/A	N/A	40-50	4.5-5.6

HEATING ELEMENT TEMPERATURE LIMITS

1. The following table must be followed to maintain equipment certification.
2. Temperatures shown are not settings, but absolute maximums allowed.

Excerpt from Table 2 located in CSA C22.2 No. 72

Element Sheath Material	Maximum Temperature °C (°F)
Copper	177 (350)
Aluminum	280 (536)
300 Series Stainless Steel*	760 (1400)
Incoloy Nos. 800, 840**	927 (1700)
Inconel No. 600	982 (1800)
Monel No. 400	482 (900)
Steel (not for water immersion)	399 (750)
Titanium	399 (750)
Copper Nickel	177 (350)
Brass	399 (750)
Copper Plated Steel	399 (750)

* Includes Carpenter 20

**Includes Hastelloy & 334 Stainless Steel

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