



***“FRP” HEATING SYSTEM***

***INSTALLATION, OPERATION & MAINTENANCE MANUAL***

***FRP.IOM.R1***

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## ***I Product Specification***

### ***Model***

Type FRP Heating Panel (FRP = Fiberglass Reinforced Polyester)

### ***Construction***

Patented flat foil resistive elements are laminated by heat and pressure in a multi-layer fiberglass construction with epoxy resin. The produced heater is a semi-flexible panel, waterproof and durable.

### ***Power Density***

The range of FRP loadings vary from 36watts to 92watts per sq.ft. depending on the size and wattage of the panel.

### ***Voltage Rating***

The standard FRP Panels are designed for use on 120 or 240 VAC, however, these may be designed for use on voltages up to 600 VAC

### ***Cold Leads***

The standard lead is 10'-0" long (longer leads can be supplied if required). The cable is #16AWG, stranded copper, 600volt rated. The sheathing is formulated rubber 105°C rated, UL and CSA Approved.

The cold leads exit the heater through an epoxy molding or a ½" NPT threaded, aluminum conduit hub. If required, other material hubs (PVC coated, stainless steel, etc.) may be used.

### ***Grounding***

To comply with the NEC para 427.23, the panels are supplied complete with an overall, aluminum grounding shield.

### ***Color***

All ELP panels are blue in color.

## *II Handling Instructions*

- 1) Whenever possible and practical, FRP Heaters are packed in reinforced corrugated cardboard according to their weight and quantity. A packing note appears on the package as to the contents. The weight of the package is shown on the exterior.
- 2) All packages must be handled with care deserving of any electrically operated piece of equipment. They should not be dropped, crushed or pierced (i.e. with forklift blades).
- 3) All packages should be stored on a flat surface or pallet and in a dry location. Packages and contents must be protected from excessive heat.
- 4) Individual FRP Heating Panels must be handled with care by the heater edges and not by their lead or hub. The FRP Heaters must not be dropped on hard surfaces (especially on their corners), crushed, cut or drilled through. They must not be exposed to heat sources above 212°F or incompatible chemical solutions.
- 5) All FRP Heaters are inspected and tested before shipment. In addition however, all heaters should be inspected and tested upon receipt to ensure that they are undamaged, complete and correct. (Follow the recommended “Inspection and Testing Procedure for FRP Heating Panels”).
- 6) FRP Heaters are individually labeled, within 3 inches of the cold lead exit point. Upon receipt of the FRP Heaters, the client must check that the supplied heaters reflect the project’s specific needs. Any supplied drawings pertaining to the project must be consulted to verify the project designs.
- 7) Any damaged or incorrect FRP heaters should be replaced or repaired by Hotfoil, Inc. prior to installation/energization.

### ***III Installation Instructions***

- 1) Inspect the equipment or vessel surfaces to be heated.
  - A) Ensure that the surface is smooth, even and will provide good support and surface contact between the FRP Heater and the vessel surface.
  - B) Ensure that the surfaces where FRP Heaters will be installed are clean and free from welds, weld spatter or any sharp points that may “wear through” the heater surface.
  - C) Ensure that the surfaces to be heated or their coatings will not be adversely effected by the operating temperatures of the FRP Heaters.
- 2) Identify a “point of reference” on the vessel or tank with respect to the heater arrangement drawings to identify the recommended heater locations.
- 3) Locate and center the FRP Heater in its designated location on the tank as per Hotfoil, Inc. job drawings.
- 4) Mark the location of each heater with the correct orientation from the drawings.
- 5) Apply loose bands of stainless steel or polyester straps around the tank’s circumference and locate the FRP Panels under the straps.

*Note: As a temporary “hold” (and step 7 requirement), adhesive aluminum tape can be used, in strips, to position the FRP Panels.*

- 6) When the heaters are correctly located, tighten down the bands/straps to ensure a snug fit to the tank. The buckles on the bands must not be installed on the panels, as this causes uneven pressure on the FRP Panels.
- 7) The edges of the FRP Panels must be sealed with adhesive aluminum tape all around. This prevents loose thermal insulation becoming trapped between the FRP Panels and the tank.
- 8) Inspect all panels to ensure that they have been installed in the correct locations as per the Hotfoil, Inc. drawing.

#### **CAUTION**

**DO NOT DROP THE FRP HEATERS. HANDLE THE HEATERS BY THEIR EDGES – DO NOT PULL ON THE HEATER LEADS. DO NOT CUT, CRUSH OR DRILL HOLES IN THE FRP PANELS.**

## ***IV Electrical Wiring Instructions***

- 1) Select a suitable junction/terminal/control box location based on the heater layout and the Hotfoil, Inc. drawings. This location is also based on the heater layout, temperature sensors location and the desired heater interconnection.

***Note:***

- A) Terminal boxes and all temperature controllers' sensors should be suitable for the existing environmental conditions at the location used.
  - B) The tank temperature controller sensor (or product controller) should be located as per the Hotfoil, Inc. drawing. The sensor must be correctly and securely attached to the tank wall by adhesive aluminum tape and straps. If strapping is used, care must be taken to avoid unnecessary pressure on the sensor as this could effect calibration and accuracy.
  - C) Heater high-limit/sensor must be located on the heater as its shown on the Hotfoil, Inc. drawing and securely attached as the tank/product sensor.
- 2) Route the FRP cold leads to the junction/control box ensuring that the cold leads are not pinched or trapped under the bands securing the FRP panels, or cross over the heater surfaces.
  - 3) Secure the cold leads along their length by adhesive aluminum tape or other appropriate means..
  - 4) Secure the sensor leads/capillaries along their full length by adhesive aluminum tape or equal. No kinking of the leads/capillaries should occur at any point on the length.
  - 5) Interconnect the FRP Heaters on the terminal blocks or by properly splicing the conductors.

***Note:*** All electrical interconnections should be made in accordance with the pertinent schematic diagram on the Hotfoil, Inc. job drawings.

- 6) Check to verify that all interconnections are correctly and securely completed.
- 7) Megger all FRP heating circuits for 60 seconds with 1,000VDC megger. Minimum insulation resistance to ground should be 20 megohms.
- 8) Interconnect/wire all the temperature sensors or thermostats to their corresponding controller or termination points as per equipment instruction or job drawings.
- 9) Verify that the entire FRP heating system installation is in compliance with all applicable local, state and national electrical code regulations.
- 10) Connect the power supply and control circuit cables to the heater junction or control boxes.

## V *Operation Instructions*

- 1) Inspect the entire FRP heating system (heaters, temperature sensors, temperature controls and control/distribution panels) for proper condition, installation, wiring, electrical interconnections and ratings (voltage and current).
- 2) Measure and record combined FRP heating circuit insulation resistance for 60 seconds with a 1,000VDC MEGOHM Tester. Minimum values should be 20 Megohms between heater conductors and ground.
- 3) Check all temperature controllers for proper operation and calibration. For a given temperature input at the sensor, the temperature controller should close/energize the circuit if the input temperature is below the set point and open/de-energize the circuit if the input temperature is higher. Please note ambient and product temperatures during this test.
- 4) Adjust or program all temperature controller parameters to their correct or desired settings as per job requirements. Heater high-limit set points must not exceed 200°F or maximum safe temperature for the vessel, insulation or contents, whichever is lower.
- 5) Inspect all power distribution or switching gear and control panels, junction boxes, etc. for proper wiring, ratings, electrical integrity, etc.
- 6) Energize or switch on one circuit at a time.
- 7) Measure and record the voltage and current drawn by each heater circuit. Compare the values measured with the calculated design current values for that circuit.
- 8) After several hours of operation, check the heater temperatures and record the results.

**Note:** Sample form of the “FRP Heating System Status” as attached may be used for this purpose.

## **VI                      *Maintenance Instructions***

- 1) Set up permanent and routine inspection, testing and maintenance schedule procedure and a record file for each heating system.
- 2) Operating FRP heating systems should be visually inspected and electrically tested at regularly scheduled intervals to ensure safe, correct and efficient operation.
- 3) The “FRP Heating System Status” check at a minimum should be performed at the following times and frequencies:

<b><i>Time</i></b>	<b><i>Frequency</i></b>
At Start Up	Once
First Week of Operation	Daily
First Month of Operation	Weekly
First 6 Months of Operation and Subsequently	AFTER and BEFORE the next Heating Season

***Note:*** For process heating – monthly or as required.

***Note:*** Particular on-site operation or application conditions at different locations may require more heating system inspections than stated above. Revise the above recommended inspection schedule as necessary.

- 4) Any inoperating, malfunctioning or damaged FRP Heater should be de-energized and replaced immediately.

***CAUTION:*** Do not operate any multiple heater, series circuit with a removed or by-passed heater (i.e. several heaters connected in a series circuit on full voltage).

- 5) Clean off or remove any excessive build up of dirt, dust or other material which may adversely effect the operation of the FRP heating system.
- 6) For information regarding temperature controllers and other associated control system components refer to the equipment manufacturer’s instructions.
- 7) Inspect all temperature controllers, sensors, control/distribution panels, junction boxes, etc. at regular intervals for safe and proper operation and component wear.

***Note:*** For assistance relating to the FRP Heating Systems, contact Hotfoil, Inc. at 609.259.4118 or a local Hotfoil, Inc. representative.



**VII            FRP Heating System Status**

HEATER CIRCUIT REFERENCE: \_\_\_\_\_

DATE MEASURED: \_\_\_\_\_            BY: \_\_\_\_\_

<i>ITEM</i>	<i>DESIGN</i>	<i>MEASURED</i>	<i>DEVIATION</i>
Wattage			
Voltage			
Current			
Combined Heater Circuit D.C. Resistance			
Control Temperature			
Heater High-Limit Temperature			
Insulation Resistance to Ground			

HEATER INSPECTION RESULTS:

\_\_\_\_\_

\_\_\_\_\_

ACTION REQUIRED:

\_\_\_\_\_

\_\_\_\_\_

REVIEWED BY: \_\_\_\_\_            DATE: \_\_\_\_\_

## ***VIII Troubleshooting***

During the operating life of the system, periodic maintenance checks are to be carried out – see section VI – Maintenance Instructions.

As a simple procedure of the periodic checking, the amperage should be read with the aid of suitable instruments.

A reduction in current or amp draw may indicate a possible loss of a heating panel.

Should a reduction in the current be noted, the following procedure should be followed:

- 1) De-energize the whole system by isolating voltage to the control/junction box.
- 2) Expose the terminals/cold leads at the terminal block.
- 3) With the aid of suitable instruments, check the individual heaters by measuring the ohmic value of the heaters. Any variation to the declared should be noted to identify the suspected problematic heater.
- 4) Carefully identify the location of the heater and remove the thermal insulation to expose the heater.
- 5) Replace the suspect heater with another heater, wire up to the control/junction box, check to ascertain the integrity of the system, replace the thermal insulation, re-energize the system and follow the procedures in section V et al.

System checks should be carried out on the controls as to their function to the frequency in Section V.

To check the operation of the thermostat(s):

- 1) Include an ammeter into the system or use a clamp meter around the incoming power supply cable. Note the reading.
- 2) If amperage is displayed, turn the thermostat dial to decrease the temperature. A discernible click may be heard and the thermostat contacts will open. This will de-energize the system and the ammeter will indicate 0 amps.
- 3) Turn up/increase the dial's setting and a click should be heard at the product/tank temperatures maintain setting. The ammeter/clamp meter will display the system current draw again.
- 4) The thermostat dial setting can be checked by the known product/tank temperature for accuracy.

All junction box/control box/thermostat covers should be replaced to maintain the integrity/NEMA rating of the enclosure.