FRP HEATING SYSTEM

INSTALLATION, OPERATION & MAINTENANCE MANUAL

FRP.IOM.R1

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I Product Specification

Model
Type FRP (**F**iberglass **R**einforced **P**lastic) Heating Panel

Construction Description
Patented, flat foil resistive heating elements are completely molded into Fiberglass Reinforced Plastic making this electrical heater durable and waterproof.

FRP Heating Panels can be manufactured flat or curved in a variety of shapes with maximum exposure temperature of 215°F

Power (Watt) Density
Up to 100watts per square foot (standard). Higher power densities are available for special applications.

Voltage Rating
Up to 600VAC

Thermal Insulation
Up to two (2) inches of polyurethane thermal insulation may be incorporated in the construction of FRP heaters.

Cold Leads
Three (3) conductor cable, tinned copper, 16# AWG, C.S.P. rubber insulated and jacketed.

Cold lead exits through either a plastic fitting, ¾" NPT aluminum hub or explosion proof cast aluminum box.

Approvals
Factory Mutual Approved for dry, wet, ordinary and hazardous locations:
Class I, Div. 2, Groups B, C, D
Class II, Div. 1 & 2, Groups E, F, G
Class III, Div. 1 & 2
M.S.H.A. Accepted

II Handling Instructions

Type FRP Heating Systems can be of “standard” or “custom designed” FRP Heating Panels.

FRP Heaters are typically labeled with reference markings reflecting their specific installation location that corresponds with the Hotfoil, Inc. project or job drawings.

Whenever possible and practical, FRP heaters are packed in boxes according to their shapes and location destination. A listing of heaters as well as their weights usually appears on the box/carton top for quick identification.

All boxes or cartons 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).

All boxes should be stored on a flat surface or pallets in a dry location. Boxes and contents must be protected from excessive heat.

Individual FRP Heating Panels must be handled with care by heater edges, **not** by their leads, hubs or junction boxes. The FRP Heaters must not be dropped on hard surfaces (especially on their corners), crushed, cut or drilled through. They should not be exposed to heat sources above 215°F or harmful chemical solutions.

All FRP Heaters are inspected and tested prior to shipment. In addition, however, all shipments should be inspected upon receipt. It should be checked that the heaters are undamaged, complete and correct.

Any damaged FRP Heaters should be repaired or replaced by Hotfoil, Inc. prior to energization.

III Installation Instructions

1) Inspect the equipment surfaces to be heated.

A) Ensure they are smooth, even and will provide good support and surface contact between FRP Heaters and the metal 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 equipment with respect to the heater arrangement drawings to identify the heater locations.

3) Locate and center the FRP Heater in its designated location on the equipment as per Hotfoil, Inc. job drawings.

4) Mark the perimeter of each heater with chalk, etc. while holding the heater immobile.

5) Evaluate, select and mark with an "X" the best locations for the mounting studs around the heater's perimeter but locate these ½" to ¾" away from the heater edge.

6) Mark the heater area with the corresponding FRP Heater reference.

7) If necessary, grind off a small spot to bare metal at the center of the marked "X".

8) Weld the studs to the surface in the locations marked.

Note: Studs should be located around the perimeter of every FRP heater. They should be located frequently enough to assure good heater contact with the heated surface. Studs should be spaced every 12 to 18 inches (maximum) apart but more frequently if the heater shape, curvature or vibration conditions warrant it. They should be located ½" to ¾" away from the FRP Heater edge.

9) Place the mounting "Z" clip, washer and one (1) nut on each stud as per Hotfoil, Inc. drawing A-1072.

10) Place the FRP Heater in its final position; rotate the "Z" clip and wrench tighten the nut. Tighten all remaining "Z" clips.

11) Lock all nuts with a second nut to prevent loosening.

12) In areas where dust or dirt may settle between the FRP Heater and the heated surface, the FRP Heater's top or leading edge should be sealed with an RTV type sealant.

CAUTION: **Do not** drop FRP Heater. Handle FRP Heaters by their edges. **Do not** pull on heater leads. **Do not** cut, crush or drill holes in the FRP Heaters.

IV Electrical Wiring Instructions

1) Select a suitable junction box location(s) based on the heater layout and temperature sensor location and the desired heater interconnection.

Note: A) Terminal boxes and all temperature sensors/controllers should be suitable for the existing environmental conditions at the location used.

B) If ambient temperature control is used, temperature sensor should be located in the coldest (anticipated) equipment ambient location and protected from direct sunlight or other heat sources.

C) If equipment surface temperature control is used, temperature sensor should be located in the coldest or most critical location. Temperature sensors should be securely attached directly to the equipment surface away from direct sunlight or other heat sources. In order to minimize the influence of warmer surroundings or other heat sources which may be present, temperature sensors may be covered with thermal insulation.

2) Provide, build and mount suitable mounting supports for the junction boxes and all temperature controllers.

CAUTION: When welding near FRP Heaters, first remove or protect the heaters from the resulting high temperatures. Clean off any weld spatter that may interfere with the heaters before their re-installation.

3) Mount the junction boxes and all temperature controllers in their selected locations.

4) Mount the control temperature sensors in their designated or selected locations.

5) Insert the heater high limit temperature sensor into its designated FRP Heater thermowell.

A) Insert the sensor to the end of FRP thermowell.
B) Secure the sensor's exposed capillary/wire to the FRP Heater or equipment to prevent the sensor from leaving the FRP thermowell when (if) vibrating.
C) Seal thermowell completely with RTV sealant to exclude dust, water, etc. Let RTV cure.
D) Tape over all unused (spare) thermowell entries with adhesive aluminum tape to exclude dust, water, etc. Refer to project drawings for spare thermowell locations, if applicable.

6) Route the FRP cold leads or other suitable interconnecting power wiring between the FRP Heaters and the corresponding junction boxes.

Note: All wiring should be protected and suitable for the existing environment.

IV Electrical Wiring Instructions Continued…

7) 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.

8) Check to verify that all interconnections are correctly and securely completed.

9) Megger all FRP heating circuits for 60 seconds with 500 VDC Megger. Minimum insulation resistance to ground should be 20 megohms.

10) Connect the power supply cables to the heater junction boxes.

11) Interconnect/wire all the temperature sensors or thermostats to their corresponding controller or termination points as per equipment or job drawings.

12) Verify that the entire FRP Heating System installation is in compliance with applicable local, state and national electrical regulations.

V Operation Instructions

1) Inspect the entire FRP Heating System (heaters and controls) for proper conditions, installation, wiring, electrical interconnections and ratings (voltage and current).

2) Measure and record combined FRP heating circuit insulation resistance for 60 seconds with a 500 VDC Megger. Minimum values should be 20 megohms.

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.

4) Adjust all temperature controllers to their correct set points as per job drawings (heater high-limit set points must not exceed 200°F.

5) Energize or switch on one circuit at a time.

6) Measure and record the current drawn by each heater circuit. Compare the values measured with the calculated current values for that circuit.

7) After several hours of operation, check the heater high-limit temperatures and record the results. This can be accomplished by slowly decreasing the set point temperature on the dial until the heater circuit is de-energized.

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

VI Maintenance Instructions

1) Set up permanent inspection, testing and maintenance schedule procedure and a record file system for each heating system.

2) Operating FRP Heating Systems should be visually inspected and electrically tested at regularly scheduled intervals to ensure safe, satisfactory and efficient operation.

3) The "FRP Heating System Status" check should be performed at the following times and frequencies:

Time	***Frequency***
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: 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 to reflect this.

4) Any inoperating, malfunctioning or damaged FRP Heaters or heater circuits 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 that 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.

Note: For assistance relating to the FRP Heating System contact Hotfoil, Inc. at (609) 588-0900 or a Hotfoil, Inc. local representative.

FRP Heating System Status

HEATER CIRCUIT REFERENCE: _____

DATE MEASURED: _____ BY: _____

ITEM	*DESIGN*	*MEASURED*	*DEVIATION*
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: _____

***** Megohm reading test voltage, minimum 500Vdc recommended 1000Vdc – minimum insulation resistance shall be 20 Megohms.