THORNE & DERRICK INTERNATIONAL
Thorne & Derrick
+44 (0) 191 410 4292
www.heatingandprocess.com

EX HEAT INDUSTRIAL

Installation, Operation & Maintenance Instructions Manual

FP Type Flameproof Immersion Heaters

Contents

EXHEAT Industrial can provide versions of this manual in German, French, Italian, Spanish, Portuguese, Polish, Chinese and Russian. These versions can be requested at support@exheat-industrial.com

To maintain the equipment warranty and, if applicable, the Hazardous Area Certification, the instructions contained within this manual must be complied with in full.

Fitting any other device invalidates the hazardous area certification.

1. Contact Details

Sales Enquiries

EXHEAT Industrial Ltd

Threxton House
Threxton Road Industrial Estate
Watton, Thetford
Norfolk, IP25 6NG

Tel: +44 (0) 1953 886 210

Fax: +44 (0) 1953 883 853

Email: sales@exheat-industrial.com
Website: www.exheat-industrial.com

Technical Support

EXHEAT Industrial Ltd

Threxton House
Threxton Road Industrial Estate
Watton, Thetford
Norfolk, IP25 6NG

Tel: +44 (0) 1953 886 269

Fax: +44 (0) 1953 883 853

Email: support@exheat-industrial.com
Website: www.exheat-industrial.com

2. Description of Equipment

The EXHEAT Industrial Ltd 'FP' type flameproof Immersion Heater is designed to work within Air, Water, Oils and any other medium depending upon its design which is undertaken at the sales stage.

Certification

- EXHEAT Industrial Ltd holds approvals from North America, Europe and globally through the IECEx scheme for the manufacture of electrical heating and control equipment for use in potentially explosive atmospheres.

Enclosure

- The enclosure can be stainless steel or mild steel, which can be painted, or powder coated. Painted to an EXHEAT Industrial Ltd. standard paint specification or a paint specification that suits the client requirements can also be offered. A minimum of 2 off M20x1.5 cable entries are provided (FP4) and cable entries to suit can be provided on the larger models.

Connections

- The power supply is connected via the use of terminals within the terminal box, these can be at a size to suit the client's requirements. Please confirm the size as on the Wiring Diagram sent with the product.
- The thermostat connections are also made within the same terminal box, unless a separate junction box is used for the connection of RTDs or Thermocouples.
- The earth connections are made by using either the installed terminals or earth stud bolts. These are located internally and externally of the terminal box, also on the flange on larger 'flanged' heaters. See the General Arrangement drawings for the size of these earth points.

WARNING – Ensure the correct crimping tool is used for each crimp especially for the internal 'ground/earth' connections.

Controls

- A choice of thermostats/RTDs/Thermocouples are available to suit the client's requirements and the T-Class requirements. Please refer to the GA and Wiring Diagram sent with this product for the type installed.
- A minimum requirement of an over temperature limit thermostat and a box cut out are required and provided on all FP types.

Mounting

- A wide range of industrial and bespoke flanges are available, and industrial fixing bosses are also available. Please confirm the flange/fixing boss used by referring to the General Arrangement drawings sent with this product.

Voltage

- Thermostats: These have a MAX 240V AC switching capacity.
- RTD / Thermocouple: Please refer to the client supplied control.
- Heaters: These can have up to 690V, single or three Phase 50/60 Hz supply. Please confirm on the GA and Wiring drawings as supplied, also the nameplate for the heater supply voltage.

CAUTION – Check that the voltage and current of the power supply is compatible with the ratings of the heater nameplate before energising.

3. Markings

Please refer to the General Arrangement Drawings and Certificates sent with the product.

4. Safety Notices

General

Electrical equipment must be designed, tested and installed such that, when it is used correctly, health and safety risks are kept to a minimum. The client must be provided with information about any necessary safety conditions, warned of any possible hazards that may arise during normal operation and told how to avoid them.

The client must ensure that:

- any employees working on the equipment are authorized & competent in the proper working procedures in order to ensure their safety. The plant must be maintained in a safe condition.
- safety interlocks are provided and maintained to ensure that the heater may only be energised when the design flow rate through the heater is attained and that the heater is de-energised should this flow rate be reduced or stopped.
- heater terminal enclosure covers are not removed whilst any precipitation, airborne dust or moisture is in the vicinity or when grinding, welding or similar activities are taking place nearby.

Providing the above conditions are adhered to, the equipment will be safe for use under normal operating conditions.

Safety hazards may arise when authorised and competent persons need to remove covers from the heaters to carry out maintenance, testing or setting up to work. Fully de-energise the heater prior to opening the terminal box cover.

It is virtually impossible to achieve conditions which are completely hazard-free when working on energised circuits. Responsibility for safe conduct of the authorised and competent person or persons operating on the equipment rests with those under whose authority they act.

Installation

Should deviation from original design parameters occur, or change of original design structure be required, please refer back to EXHEAT Industrial Ltd. for consultation prior installation.

Ensure that the equipment is correctly installed in a suitable location by authorised and competent persons.

Before operating the equipment, have the installation approved by the site authorised person to ensure that the system is safe for operation.

Ensure compliance with any instructions and information provided in this manual and on the drawings supplied.

It is the client's responsibility to ensure that safe systems of work are used by all personnel operating and maintaining the equipment.

Normal use

Observing the following points will minimise the risk of accidents to personnel using electrical equipment:

- Ensure that all persons operating the equipment are fully trained. This includes training in emergency shutdown procedures.
- Train operators to recognise signs of maloperation of the equipment and to know what actions to take in these circumstances.
- Keep all control cubicle doors closed and locked whilst the equipment is in operation and comply with any safety warning notices.
- Restrict access to heater terminal enclosures and keys for control cubicle doors to competent authorised personnel. Issue them only as part of a written safe system of work to ensure doors and terminal enclosure covers are:
  - not unlocked until electrical supplies are isolated
  - locked before electrical supplies are restored for normal operation of equipment.

Maintenance and testing

The client must ensure that maintenance, set up and testing of the equipment is only carried out by authorised and competent persons.

The following rules must be adhered to:

- Before starting maintenance work, isolate the equipment completely where possible.
- Comply with safe working conditions.
- Do not work alone on the equipment when it is energised.
- Be aware of hazards which may arise when working on energised equipment, and take all necessary precautions.
- Familiarise all persons working on the equipment with the instructions and information provided in this manual.

5. Preservation and Storage Instructions

Where specified in the contract, the equipment is supplied by EXHEAT Industrial Ltd. suitably packed for storage.

Receipt of goods

Follow the guidelines below when goods are received:

- Use all design lifting points whenever moving the equipment from one area to another.

Lifting eyes fitted in the process connection of immersion heater bundles are designed for supporting only the bundle during removal and re-fitting, in conjunction with slings. They are not designed for the combined weight of the fitted heater in the vessel.

- Take care at all times to ensure that the equipment is moved safely and that no out of balance occurs during movement.
- On receipt of the equipment into the storage area:
  - Examine the equipment against the packing list to check that goods received match the packing list.
  - Check for any damage that may have occurred in transit. Any damage must be logged and reported to the site manager and EXHEAT Industrial Ltd. within seven (7) days of receipt of goods.
  - Unless otherwise agreed in writing, store the equipment in an inside location that is dry, clean and well ventilated. Please refer to Post Despatch & Storage.
  - Ensure that equipment is not stacked and observe any 'This Way Up' markings.

Preservation materials

Further preservation instructions can be found in Section 14.

Suitable preservation materials, such as silica gel bags, have been placed inside the packaging is only for transportation purpose.

It is the client's responsibility to ensure that, if the packaging is opened prior to installation, these bags are checked and replaced.

For heaters, the preservation materials have been placed inside the main heater terminal enclosure and the auxiliary instrument junction box, if fitted. It is the client's responsibility to ensure that, if the terminal enclosure is opened prior to installation, these bags are checked and replaced if necessary.

Post-Dispatch & Storage

Ensure the equipment is stored in a proper manner in order to minimise the risk of accidental damage.

The following preservation instructions must be adhered to. Failure to do so could result in the equipment warranty being invalidated:

- Store the equipment at between the temperatures as indicated on the nameplate.
- Ensure that the equipment is not subjected to direct sunlight at ambient temperatures above 30°C.
- Do not store the equipment for more than 3 months unless packed for long term storage.
- Protect the equipment against external sources of vibration and/or impact.
- Leave the equipment in its original sealed packaging until required for installation.
- Where the storage period has been stated to be more than three months from the date of despatch from EXHEAT Industrial Ltd, moisture indicators may have been fitted to the packaging. These indicators should be checked every three months, the preservation materials replaced if necessary, and the packaging resealed.
- Where provided, anti-condensation heaters should be temporarily energised during storage and prior to installation. The temporary supply must be disconnected following the equipment being put into full operation.
- Should it be necessary to open a packing/heater terminal enclosure, for example to cable in an anti-condensation heater:
    - check the preservation materials and replace them if necessary.
    - replace the terminal enclosure cover immediately after the work has been carried out.
    - reseal the packaging.
- The contractor must carry out periodic inspections of the equipment during storage in order to:
    - detect any signs of deterioration.
    - check on limitations of time in storage.
    - ensure maintenance of proper conditions.
    - determine the current state of materials.
- When the periodic inspections are complete, complete the Storage Preservation Check Record in Section 17.

Should it be necessary to open the main heater terminal enclosure, replace the preservation materials and update the preservation record (found in the main heater terminal enclosure) accordingly.

6. Pre-installation Instructions

Pre-Installation Inspection

Before carrying out the following inspections, take all electronic components in the product out of circuit. Do this by removing control fuses or by physically disconnecting the electronic components.

- Each immersion heater is manufactured to the highest standard with great care and quality materials. All the goods are thoroughly inspected and tested before leaving the manufacturing plant, and they must be handled with care during storage and installation. Before the installation starts it is advised that the immersion heater is checked to ensure the insulation resistance reading is above 2MΩ at no less than 500 volts dc.
- Should the immersion heater fail this test, isolate the power or control circuits (if installed), and follow the steps below:
  - Fill the terminal box with silica gel bags and replace the terminal box lid.
  - Leave for 24hrs to draw any moisture out of the elements.
  - If you have a heated blanket, place this over the heater elements to help with the drying. Heater blankets are available to purchase from www.exheat-industrial.com/contact/enquiry
  - If the insulation resistance has not been raised to a sufficient level after 24hrs, repeat the process above with replacement gel bags.
  - Should the above not raise the insulation resistance to the required level please contact the technical help as per section 1 or via our website:

    www.exheat-industrial.com/contact/support
- Before switching on the incoming power and thermostat control circuit supply to the unit, ensure that the supply conforms to the specified voltage on the product nameplate at a nominal variance of +/- 5% of the specified voltage (Note this variance is not for constant over voltage, but rather for spiking of power supply).

Compliance with these instructions is a warranty requirement. Documented evidence must be maintained in the form of a signed checklist. Copies of completed checklists and records will be required in the event of any warranty claim.

Insulation Resistance Tester

- An insulation resistance tester should be applied between the phase(s) and earth. A reading of greater than 2MΩ at no less than 500 volts dc should be recorded.
- Use the continuity (Ohms) setting on the elements and check the resistance of each element matches or is approximately equal to the results as per the electrical test certificate that would have been sent with the heater.

7. Installation Instructions

Overview

This section covers the installation requirements for most of the range of EXHEAT Industrial FP equipment.

This equipment includes:

- Flameproof Ex d electric heaters.
- Class I, Div. 1 electric heaters.

Refer to the relevant code of practice for the equipment:

- *IEC/EN 60079-14* for selection and installation
- *IEC/EN 60079-17* for inspection and maintenance of electric apparatus for use in potentially explosive atmospheres.

When installing these types of equipment, the installation contractor/operator shall be both familiar with and abide by the “Special conditions of use” as detailed within section 8.

Compliance with these instructions is a warranty requirement and documented evidence must be maintained in the form of signed checklist and records as contained in Section 17. Copies of completed checklists and records will be required in the event of a warranty claim.

Over-temperature trip devices

It is a mandatory requirement that the over-temperature devices (excluding spares) are connected back to the dedicated trip system to shut down electrical power to the heater in the event of over-temperature, unless the over temperature devices are wired in series with the heater elements.

Be aware of the following important points:

Thermocouple

Note the polarity of the circuit for the sensor to operate correctly.

Ensure that the correct compensating cable is used for the type of thermocouple fitted, as detailed on the schedule drawings.

RTD

Note the correct connections to ensure that they operate as detailed on the schedule drawings.

Temperature transmitters

Note the polarity of each device to ensure that it functions correctly within the control loop, as detailed on the schedule drawings.

Thermostats

Note the connections shown in the drawing to ensure the correct operation.

- Where thermostats have been pre-set at EXHEAT Industrial Ltd. they require no further adjustment.
- Adjust thermostats that have been supplied un-set to meet process requirements.

If there is any uncertainty about these points, contact EXHEAT Industrial Ltd. for advice.

Failure to comply could result in the Hazardous Area Certificate being invalidated.

Scope

The extent of equipment to be installed is detailed in the drawings specific to the product purchased.

Responsibilities

This section outlines the installer's responsibility for the installation of the equipment supplied by EXHEAT Industrial Ltd:

- Install the equipment under the surveillance of the client's site engineers, in accordance with these instructions. In addition, where required, check Flow direction indication.
- Carry out the installation in complete accordance with this document, which shall be read as complimentary to all associated contract documents (such as site conditions, contract specifications and drawings) and national legislation/regulations.
- Ensure that all employees are fully trained and supervised in the appropriate site working procedures in order to ensure their safety. The site must be maintained in a safe condition at all times.
- Ensure that all site installation personnel are issued with copies of all relevant drawings, material schedules and specifications necessary to fulfil their obligations.

Pre-installation inspection

Before installation, inspect the equipment to ensure that all items are available and that all crates and/or packaging are in good condition and undamaged. Any damage must be reported to the site manager and to EXHEAT Industrial Ltd.

Moving the equipment into position

Follow the steps below to safely move the equipment into position:

Ensure that the equipment is moved and installed by technically qualified and competent persons experienced in the class of work involved.

- Carefully remove the packaging from each item and check for damage. Report any damage to the site construction manager immediately and to EXHEAT Industrial Ltd.
- If required, move the equipment by either crane or fork lift truck, using suitable lifting chains/slings to prevent damage to the heating elements. Observe the following safety points:
  - All lifting tackle/equipment must have a safe working load (SWL) capacity in excess of that of the equipment weight and include for snatch factors etc.

Certain equipment configurations may require a lifting beam to achieve a safe lift.

  - The slings or ropes must be long enough to keep the angle between the slings/ropes and the top of the equipment greater than 45°.

If the sling/rope is too short it will reduce this angle and lead to unacceptably high stresses on the eyebolts/lifting lugs.

  - Additional support should be provided when lifting, as necessary, to counteract any out of balance that may be present.
  - Use a suitable method to prevent or reduce the swing of the suspended load.

Lifting eyes fitted in the process connection of immersion heater bundles are designed for supporting only the bundle during removal and re-fitting, in conjunction with slings. They are not designed for the combined weight of the fitted heater in the vessel.

  - Only use a forklift truck to move equipment if absolutely necessary, particularly at the assembly site and on uneven ground. Use a crane whenever possible.
  - If a forklift must be used, space the arms as far apart as the equipment allows and ensure they are long enough to go completely under the equipment.
  - Ensure that the destination position is free from obstructions.
  - Move the equipment into position and set the load down carefully and without bumping.
  - Check the alignment prior to bolting it in position.

Installing the heater

Follow the steps below to install the heater:

- In the case of non-installed immersion heater bundles:
  - Inspect the gasket face prior to installation.
  - Inspect the immersed part of the heater bundle for any damage.
  - Check that the heating elements are not touching. This can lead to localised over-heating and premature element failure. Pay particular attention to the element ends furthest from the heater flange.
  - Report any damage or discrepancies to the site manager and EXHEAT Industrial Ltd.
- The equipment should be installed using industry recognised torqueing/ Tensioning Procedure.

- Check the insulation resistance of heater per stage. Use a 500VDC calibrated megohmmeter to take a reading between each phase terminal with reference to ground/earth. The reading should be taken for 60 seconds and to achieve greater than 2 megohm. If any of heater stages is lower than 2 megohm, contact EXHEAT Industrial Ltd. for advice.
- Ensure that the equipment is suitably supported, both internally and externally, and not subjected to undue stress or vibration.
- If a heater bundle is supplied without housing, the immersed part must be adequately supported within the respective vessel, tank or duct.
- Ensure that there is sufficient room around the heater to remove the heater bundle for maintenance.
- Each heater is fitted with safety devices as detailed on the drawings. These safety devices **must** be kept in good working order and connected into the dedicated trip system as stated on the drawings, unless the safety devices are wired in series with the heater elements.
- Safety interlocks must be installed to ensure that the heater may only be energised when the design flow rate through the heater is attained and that the heater is de-energised should this flow rate be reduced or stopped.
- Ensure that the supply cable is of the correct type and is sized for the current being carried. Consider:
  - maximum ambient temperatures.
  - cable routing method.
  - volt drops due to cable runs.
- Ensure that the supply cables are suitably supported to prevent undue force/stress on the terminal points.
- Check that the voltage on the heater nameplate is compatible with the mains supply being used.
- Under no circumstances interfere with any EXHEAT Industrial Ltd. internal cabling or connections. This includes re-routing and ‘bunching’ cables, which can have a serious adverse effect on the heat build-up generated within the terminal enclosure.

Terminal points

The terminal points for each heater are as follows:

- Power terminals and cable entries for heater power supply.
- Control terminals and cable entries for heater trip/alarms.
- Equipment earth terminals.

Earth-fault protection

For safety reasons, it is essential to limit the magnitude and duration of earth-fault currents. It is impractical to cover all possible systems, however note that, regardless of which system is used, the heater must be protected by a suitable device wired to shut down the heater in the event that a heater element fails to earth. Suitable devices include a residual current

device (RCD) – this is the preferred method and should be used whenever possible – or an insulation monitoring device.

- EXHEAT Industrial Ltd. recommended setting for RCDs: Instantaneous trip at 100mA. The maximum duration time setting of 10ms (ten milliseconds) ensures that any fault is detected within a single cycle of a thyristor system (where applicable).
- Maximum recommended setting for the insulation monitoring device: Insulation resistance is not greater than 50 ohms per volt of rated voltage.

Ensure that the equipment is earthed in accordance with the plant earthing philosophy.

If fitted, an anti-condensation heater must be protected by a 30mA earth leakage circuit breaker. Recommended systems are available from EXHEAT Industrial Ltd. upon request.

Before commissioning the equipment, the completed installation should be approved by an authorised and competent person to ensure that it has been carried out correctly and that the system is safe for commissioning.

Heaters must only be immersed in the fluid they are designed to heat. Introducing alternative fluids even in small concentrations for purposes such as sterilising may cause serious damage to the heater and will invalidate the warranty.

Before switching the heater on, check that the heater elements and process temperature sensors are fully immersed.

Ensure that the terminal enclosure is not subjected to direct sunlight at ambient temperatures above 30°C.

8. Special Conditions of Use

- Operating ambient temperature: - 60 ºC to + 60 ºC (Refer to Certificate for precise temperature)
- The terminal box cut-outs and flange temperature thermostat must be wired into a control circuit such that should any one operate, the electrical circuit supplying power to the heating elements is deenergized and cannot be re-energized without the operation of a key or special tool operated switch.
- The temperature classification is based on the flange temperature. The certificate does not cover the temperature of any part of the heating element inside the vessel or the heated vessel itself. Safety with regard to ignition risks due to hot surfaces inside and outside the vessel is a matter for the manufacturer, installer and/or user as appropriate.
- The anti-condensation heaters must be wired in accordance with the Wiring Diagrams sent with the product.
- The temperature classification may be invalidated unless the elements are completely immersed in the fluid. It is the responsibility of the manufacturer, installer and/or user, as appropriate, to ensure that an explosive atmosphere, as defined in EN 50014, (or relevant global equivalent), does not occur inside the vessel.
- The installer and user must ensure that the terminal enclosure and its associated stand-off are not lagged.
- Alternative arrangement, the terminal box can be equipped of a separated terminal box (minimum distance 75 mm) for the connection of thermocouple or RTD's. This box must be a certified type for considered using (flameproof enclosure "d", or increased safety "e" or intrinsically safe “i”)
- Overtemperature element shall be contained within the main certified flameproof terminal box only "d".

Supplementary special conditions for safe use for the FP…A

- the free ends of the temperature devices are to be suitably mechanically protected and terminated within a suitable terminal or junction facility.
- the RTD/thermocouple assembly of FP ... (A) must be wired into a control circuit such that, should any one operate, the electrical circuit supplying power to the heating elements is de-energized and cannot be re-energized without the operation of a key or special tool operated switch.

Supplementary special conditions for safe use for the FP (G) immersion heater

- the free ends of the temperature devices are to be suitably mechanically protected and terminated within a suitable terminal or junction facility.
- the RTD/thermocouple assembly of FP (G) must be wired into a suitable intrinsically safe circuit incorporated into the control circuit such that should any one operate, the electrical circuit supplying power to the heating elements is de-energized and cannot be reenergized without the operation of a key or special tool operated switch.

9. Pre-commissioning/Commissioning Instructions

Pre-commissioning

The following checks should be carried out prior to commissioning and the equipment should not be energised until all the checks have been completed.

Heaters

The pre-commissioning checks below should be carried out before installing heaters:

- Check the overall physical condition of the heater for any signs of damage.
- Ensure the layout of the installation is neat in appearance.
- Check for any loose components and tighten as required.
- Remove all debris from enclosures.
- Ensure that any preservation items, such as silica gel bags, are removed.
- Disconnect the main electrical supply cable and check the overall insulation resistance of the heater per stage. Use a 500VDC calibrated megohmeter to take a reading between each phase terminal with reference to ground/earth. The reading should be taken for 60 seconds and to achieve greater than 2 megohm. if any of the heater stages is lower than 2 Megohm, contact EXHEAT Industrial Ltd. for advice.
- Reconnect the cable ensuring terminations are secure.
- Ensure both the heater and instrument enclosure covers are closed and all fastenings are tight but not over-tight.
- Ensure all trip devices are functioning correctly (including over-temperature/low flow/no flow and over-pressure safety interlocks – where fitted).
- Check that labels and tags are secure and correct.

In addition to the steps above, Ex d flameproof or Class I, Div. 1 explosion-proof heaters must be inspected in accordance with the relevant codes of practice concerning the inspection and maintenance of electrical installations in hazardous areas.

Compliance with the points listed above is a warranty requirement. Documented evidence must be maintained in the form of signed checklist and records as contained in Section 17. Copies of completed checklists and records will be required in the event of a warranty claim.

Commissioning

The procedures in this section should be carried out after completion of all the pre-commissioning checks. All prevailing site safety regulations should be adhered to at all times.

Heater

These steps apply to:

- Heaters with thermocouples or RTDs.
- Heaters with adjustable control thermostats.

The steps are as follows:

- Before switching the heater on, check that the heater elements and process temperature devices are fully immersed.

Low flow and low level protection must be provided elsewhere in the system so as not to be solely reliant the over-temperature trips from the heater, which have not expressly been provided for low flow and low level protection.

- Set the control device to approximately the required temperature.
- Switch on the power supply to the heater.
- Ensure all temperature sensing instruments are monitored and show rising temperature.
- Allow the process temperature to stabilise.
- Check the temperature and adjust the control devices to the required temperature.

Temperature controller (if installed)

- Configure and tune the temperature controller, if fitted, in accordance to the component data sheet.

10. Operating Instructions

General

This section describes the operating procedures for equipment supplied by EXHEAT Industrial Ltd. Many of them contain information vital for ensuring the safe operation of the equipment and should be read by all operators/end users of the equipment.

Normal start-up

Before starting the equipment:

- Ensure process flow direction and conditions are correct.
- Provided that the controls are set correctly, the heating and temperature control is automatic.

Operation

Regardless of the heater type, it is vital to ensure correct operation, so you should also refer to the following:

- Drawings.
- Data sheets (If provided).

Heater types where the heating elements are in direct contact with the process fluid

When operated correctly, these types of heater are not considered overly susceptible to perforation failure where the process fluid is able to permeate through the heating element into the terminal enclosure. However, this type of failure can be caused by extreme conditions, such as overheating, excessive thermal cycling, or vibration, either flow-induced or externally by other means.

Temperature control – heaters with adjustable control thermostats

The control temperature set points can only be changed by adjusting the thermostat inside the heater terminal enclosure cover.

If an increase in the process operating temperature of more than 10°C is required, contact EXHEAT Industrial Ltd. to verify the resultant element surface temperature is acceptable.

Check for hazardous gases and isolate the electrical supply before removing the terminal enclosure cover.

If adjusting the thermostat for Ex d/Class I, Div.1 heaters:

- Take extreme care when removing/re-fitting enclosure covers to maintain the integrity of the flame-paths.
- Clean the flame-paths thoroughly and re-coat with an approved Ex d corrosion inhibitor before refitting the cover.

Refer to the relevant code of practice for selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres.

Temperature control – panel (If installed)

The control temperature set points can only be changed by adjusting the temperature controller at the panel. This can be done while the system is in operation.

Over-temperature trip – control panel (If installed)

The following applies to both EXHEAT Industrial Ltd. and client-supplied control panels:

- A trip can only be reset at the control panel when the temperature at the sensor has fallen below the trip temperature set point.
- Investigate the reason for the trip before resetting the system.
- Only an authorised person is permitted to reset the trip using the key switch or special tool provided.

Over-temperature trip – heater

The following points apply to heater trips:

- The trip device will only operate if there is an over-temperature fault.
- Investigate the reason for the trip before resetting the system.

Test for hazardous gases and isolate the electrical supply before removing the terminal enclosure cover.

- A trip can only be reset at the heater. The trip device and reset button are inside the main heater terminal enclosure. It can only be reset when the temperature at the sensor has fallen below the trip temperature set point.

The above applies only to heaters where the latching trip (over-temperature or Hi-Hi thermostat) is located inside the heater terminal enclosure.

- For trips on Ex d/Class I, Div.1 heaters:
  - When removing/re-fitting enclosure covers, take extreme care to ensure that the integrity of the flame-paths is maintained.
  - Clean the flame-paths thoroughly and re-coat with an approved Ex d corrosion inhibitor before refitting the cover.
  - Refer to the relevant code of practice for selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres.

Normal shut down

To shut down the heater, press the Off button, either at the control panel (If installed) or locally where this facility is provided.

Emergency shut down

Where the control panel is supplied by EXHEAT Industrial Ltd. and/or an emergency shutdown facility is available, see the control panel operation information for the equipment for the emergency shut down operation.

11. Maintenance Instructions

For Ex d flameproof or Class I, Div.1 explosion-proof heaters, ensure that the flame path surfaces are in good condition. Report any damage to EXHEAT Industrial Ltd. as flame paths are not intended to be repaired.

General Safety Precautions

- All prevailing site safety regulations shall be adhered to at all times.
- Before removing the terminal enclosure, allow sufficient time for the internal components to cool down after electrical isolation.
- Check for hazardous gases before and during any maintenance activity.
- Fully isolate the equipment from the electrical supply before and whilst any work is being carried out.
- When the equipment is painted, there is the potential for electrostatic discharge and such painted surfaces should only be cleaned with wet cloth.

Heater

The following preventative maintenance should be carried out at the intervals shown below.

Any replacement parts, please contact EXHEAT Industrial Ltd.

Compliance with these maintenance instructions is a mandatory requirement. Documented evidence must be maintained in the form of a signed checklist and the records in Section 17. Copies of completed checklists and records will be required in the event of a warranty claim.

If heaters are not in used for a period of 3 months, they must be tested for insulation resistance before being energised.

Three-monthly maintenance inspections:

- Carry out a general inspection of the equipment to check for external damage. Notify EXHEAT Industrial Ltd. immediately of any defects and do not return the heater to service until authorised.
- Ensure that the heater terminal box is clear of obstruction and that good air flow remains unrestricted (more so on an stand-off type heater)
- Inspect the ACH (if fitted) to ensure it is working correctly.

Six-monthly maintenance inspections:

The following inspections should be carried every six months in addition to the three-monthly inspections:

- Isolate the electrical supply and remove the terminal enclosure cover, taking care not to damage the flame paths. Notify EXHEAT Industrial Ltd. immediately of any defects and do not return the heater to service until authorised.

Do not remove the terminal enclosure cover during wet or humid conditions as this will lead to a reduction in insulation resistance of the heater.

- Ensure that internals are clean, dry and free from debris.
- Ensure that electrical terminations are undamaged and secure.
- Measure the overall insulation resistance of the heater per stage. Use a 500VDC megohmeter to take a reading between per phase with reference to ground/earth. The reading should be taken for 60 seconds and to achieve greater than 2megohm. If it is not, contact EXHEAT Industrial Ltd.
- Ensure that the 'o'-ring, as applicable, is in good condition and carefully refit the cover.
- Ensure that earth conductors are correctly fitted between all earth points and main structure.
- Ensure all trip devices are working properly (including over-temperature/low flow/no flow and over-pressure safety interlocks). Notify EXHEAT Industrial Ltd. immediately of any defects and do not return the heater to service until authorised.

Annual maintenance inspections:

Ensure that the following is undertaken annually in addition to the 3&6 monthly inspections. This includes equipment that is in storage:

- Check for element failure by comparing phase resistance values. On a healthy three phase system these values should be equal. If there is an element failure or low insulation resistance, contact EXHEAT Industrial Ltd. for further advice.

Only EXHEAT Industrial Ltd. or EXHEAT Industrial Ltd. approved Services Representative are authorised to replace elements and/or heater related components. The hazardous area certification will be invalidated if this requirement is not strictly observed.

- Replace terminal enclosure cut-outs. These cut-outs are set and sealed by EXHEAT Industrial Ltd.
- Notify EXHEAT Industrial Ltd. immediately of any defects and do not return the heater to service until authorised.

Fitting any other device invalidates the hazardous area certification

- Where capillary thermostats require replacement, contact EXHEAT Industrial Ltd. for advice.

24-monthly Inspections:

If necessary, carry out the following every two years:

- For heaters immersed in an electrically non-conductive process, carry out a hydrostatic test of the vessel with the heater installed. Record the insulation resistance of each element, including any spares, before and after this test. Follow the instructions set out in Sections 15 & 17.
- Remove the heater bundle from immersion heaters and thoroughly inspect the condition of immersed parts, in particular the elements, for signs of abrasion or distortion. It is recommended that EXHEAT Industrial Ltd. is employed for this purpose.
- Notify EXHEAT Industrial Ltd. immediately of any defects, and do not return the heater to service until authorised.

If Section 15 specifies additional requirements for all or some of the heaters, both of the 24-monthly preventative maintenance checks included on the *Routine Maintenance Check Record* must be carried out.

12. Fault Finding, Correction and Spares

All Heaters

See Maintenance instructions for procedures relating to these faults.

Fault	Check	Resolution
Heater fails to achieve required design process temperature	• Isolated power supply • Supply fuses • Temperature control device set points correct • Is the ambient temperature of the product being heated greater than that required (thermostat has turned off)? • All elements still operative by taking load resistance reading. Resistance between phases should be equal	Contact EXHEAT Industrial Ltd. for advice.
Process temperature too high	• Temperature control device set points correct • Do the thermostats switch the heating equipment correctly? • Process flow within design limits	• Check with the installer. • Check the GA and wring diagrams • Contact EXHEAT Industrial Ltd. for advice
Heater trips	• Process flow not less than design rating and within design limits • Supply voltage correct • All trip devices functioning correctly, and sensors not failed • Ambient temperature is within design limits	• Check with the installer. • Check the GA and wring diagrams • Contact EXHEAT Industrial Ltd. for advice
Earth leakage trip	Limiting earth-fault currents (magnitude and/or duration) is essential for safety The earth-fault protection device is intended to provide critical safety protection if there is current leakage to earth. Fully investigate and rectify any trip condition and rectify prior to resetting the system and operating the heater again • Where the process is gas, de-pressurise the system during investigation	Where an earth leakage trip has occurred, isolate the heater and: • Check insulation resistance is according to Section 6 • Check settings of earth leakage protection device are according to Section 7 Where a heating element has failed, it will need removing and replacing before the heater is energised. If this is not possible it may be acceptable to disconnect the failed element and suitably isolate it, provided that: • EXHEAT Industrial Ltd. agrees to and approves proposed remedial action prior to the work commencing. • The failed element has been capped to an EXHEAT Industrial Ltd. approved procedure • Refer also to the additional requirements within section 15

Spares

The Spares available for this product are as follows:

Failure Type	Meantime Between Failures	Estimated Replacement Time	Spares Lead Time
Auto-Reset Thermostat	30,000 cycles	1 hour	2 weeks
Manual-Reset Thermostat	30,000 cycles	1 hour	2 weeks
Box Cut-Out Thermostat	30,000 cycles	1 hour	2 weeks
RTD or Thermocouple (inc compression fittings)	When Required	1 hour	2 weeks
Replacement Silica Gel bags	When Required	5 minutes	2 weeks
O-ring for lid seal	When Required	5 minutes	2 weeks
Compound for threaded entries	Consumable	Varies	2 weeks
Replacement Cores	100,000 Hrs	Varies	3 weeks
Replacement Cartridges	100,000 Hrs	Varies	7 weeks
Replacement Rod Type Elements	100,000 Hrs	Varies	6 weeks (Lower if stock coded)
Replacement Rod element compression fittings	When Required	Varies	2 weeks
Replacement cable entry bungs or glands	When Required	Varies	2 weeks (dependent upon type and size)

13. COSHH Statement

Health and Safety Information

There are no hazardous or toxic substances applied with this order as defined in COSHH (control of substances hazardous to health) regulations (2002).

14. Electrical Heater Insulation Resistance

Introduction

This procedure shall be read in conjunction with any procedures that have been supplied with the equipment. Any contradictions or conflicts must be brought to the attention of EXHEAT Industrial Ltd. for clarification.

Warranty

All EXHEAT Industrial Ltd. warranties are subject to EXHEAT Industrial Ltd. Guarantee Terms and Conditions, available upon request.

EXHEAT Industrial ltd. guarantees that the insulation resistance (IR) of the heater is at an acceptable level when the heater is dispatched from our factory. Evidence of this can be found on the test certificate provided with the equipment.

As EXHEAT Industrial Ltd. has no control over the storage or initial or ongoing preservation of the heater, EXHEAT Industrial Ltd. does not provide any warranty (inferred or otherwise) for minimum IR of the electrical heater.

Overview

The internal insulation of the element is constructed from compressed magnesium oxide powder (MgO). This powder is highly hygroscopic (it attracts moisture from the atmosphere).

Additionally, many heaters are shipped with a very high IR value which may reduce significantly over time. This time period is dependent on a number of factors but mainly on how stringently preservation procedures are followed during storage, installation, commissioning and ongoing maintenance/operation.

Heaters have many individual elements connected together in parallel. Whilst all the individual elements have an acceptable IR value, once they are connected in parallel this reduces significantly, ie $1/R_{total} = 1/R_1 + 1/R_2 + \ldots\ldots\ldots$etc

- Example 1 - 50 elements each with an individual IR value of 100 megohm will have a connected value of 2 megohm.
- Example 2 - 70 elements each with an individual IR value of 10 megohm will have a connected value of 0.143 megohm.
- Example 3 - 48 elements each with an individual IR Value of 100 megohm plus 2 individual elements with an IR value of 2 megohm will have a connected value of 0.676 megohm.
- Example 4 - 48 elements each with an individual IR Value of 100 megohm plus 2 individual elements with an IR value of 0.1 megohm will have a connected value of 0.0488 megohm.

Construction

During manufacture of the individual elements, each element is dried in a high-temperature oven and subsequently sealed using a very strict procedure. However, this is a manual procedure and the final results are dependent on a variety of factors and produce varying IR values. These factors include:

Drying oven

How long the heater elements were baked in the oven. EXHEAT Industrial Ltd. has no stipulated maximum time. This can mean that some elements are left in the oven much longer than others and will hence be dryer and have higher IR values than others.

Sealing of elements

The elements are sealed after they have been dried in the ovens. The length of time before the elements have their first seal applied determines how much atmospheric moisture they absorb. This varies depending on how many elements are in the ovens at any time, atmospheric humidity and so on. After sealing the elements are tested and, provided the IR is above the minimum acceptable value, they are passed regardless of the variations in the upper levels of IR. Electric elements only have to have a minimum IR value.

Terminal enclosure seal

EXHEAT Industrial Ltd. heaters have terminal enclosures that are completely sealed against ingress of moisture when dispatched from the factory. However, it is the client's responsibility to ensure that this seal is maintained once the equipment leaves our factory to ensure there is no ingress of moisture into the terminal enclosure which can be absorbed by the elements.

Poor preservation

Once the equipment is dispatched to site, EXHEAT Industrial Ltd. have no control on how it is preserved. Strict preservation procedures are issued to clients by EXHEAT Industrial Ltd. However, in our experience, clients/operators do not adhere to them e.g.:

- on many occasions the terminal enclosure covers are removed for long periods.
- silica gel is not replaced.
- terminal enclosure covers are removed for cabling and left off during periods of rain or high atmospheric humidity. All this will cause moisture to enter the terminal enclosure and ultimately degrade the IR levels.

IR level after use

Once the elements are switched on, any microscopic amounts of moisture inside the elements migrate along the hot portion of the element and accumulate at the hot/cold intersection of the element. This can cause a drop in overall IR value.

All elements are tested after sealing to ensure they meet our minimum criteria before assembly into the heater bundle.

Every heater that is shipped from EXHEAT Industrial Ltd. has a terminal enclosure that is sealed from moisture present in the atmosphere. However, every time the terminal enclosure is opened, moist and/or humid air enters the terminal enclosure. This then condenses on the terminals and/or internal wires or at worst can even be absorbed into the element insulation MgO.

Preservation

EXHEAT Industrial Ltd. recommends the following to ensure that there is no significant reduction in IR values that could prevent the heater from being operated satisfactorily:

Pre-installation /storage

When the heater is dispatched from our factory, the terminal enclosure has silica gel (or equivalent) inside. The terminal enclosure has also been sealed from atmospheric moisture and pressure tested to ensure it is pressure/air/moisture tight. Do not remove the terminal enclosure cover, gland plates or any other opening that may breach the integrity of the terminal enclosure until it is time to carry out the cabling and installation. This will allow moisture inside the terminal enclosure which will cause reduction of IR levels.

During cabling/installation

It is not necessary to remove the terminal enclosure cover to install the heater into the vessel/pipe work. Cable installation shall be done as quickly as possible and shall never be carried out during wet weather conditions. Under no circumstances shall water/moisture be allowed to enter the terminal enclosure. Keep the terminal enclosure gland plates and other openings sealed at all times unless it is critical to the installation that they are removed.

Once the cables have been installed and tested:

- check the terminal enclosure for any foreign objects, eg strands of amour cable, strands of copper cable/wire, tools or other objects that cause short circuits
- put fresh silica gel into the terminal enclosure and document the date of installation.
- replace the terminal enclosure cover
- tighten all terminal enclosure and gland plate bolts to ensure the weatherproof integrity of the terminal enclosure.

Post installation preservation

If the heater is not to be used for a significant period of time after installation, the following is recommended to ensure the inside of the terminal enclosure does not contain moisture that could reduce the IR value of the heating elements.

- Put fresh silica gel inside the terminal enclosure and write the date on the cover.
- Reduce or remove trapped moist air after refitting the terminal enclosure cover as follows:
    - Purge the terminal enclosure with clean, dry air after fitting/replacing and sealing the terminal enclosure cover, gland plates and any other openings.
    - Purge for approximately 10- 20 minutes by means of a temporary air hose connection. Please contact EXHEAT Industrial Ltd. for further instructions.
    - It is critical that the terminal enclosure is never pressurized: isolate the air supply first and close the vent 10/20 seconds later.
    - Disconnect the air hose and seal the connections.

On occasion, the heater is not to be used for a long period of time but regular IR values are required to ensure the integrity of the heater at start-up.

In this case, EXHEAT Industrial Ltd. recommends that a small core cable be attached to each phase bus-bar/main cable connection point and brought outside the terminal enclosure

so that IR values can be taken without opening the terminal enclosure cover and allowing moisture to enter the terminal enclosure.

This can be done with a small diameter multi-core instrument cable and brought out of the terminal enclosure via a weatherproof gland in the gland plate.

Mark the individual cables so that accurate records can be taken and maintained.

Remove this cable and plug the cable entry hole with a suitably certified blanking plug before any power is applied to the heater.

Recovering insulation resistance

Once the IR value has reduced, there are no procedures that can guarantee to bring it back up to the levels that were present before despatch from EXHEAT Industrial Ltd. However, following the steps in the post installation preservation procedure can prevent further reduction of IR values and may in many cases increase the IR value of the heater. Invariably, the final IR value, will dependant on whether the moisture is in the terminal enclosure or inside the heating elements.

Failure to increase IR values

If the IR value continues to reduce, or does not increase to an acceptable level, we recommend the following tests are carried out:

- Conduct a full inspection of the heater terminal enclosure to ensure that the terminal enclosure is now sealed from atmospheric humidity. If not, seal the enclosure and follow the steps in the post installation preservation procedure.
- If it is considered that the enclosure is sealed, measure the IR level of each element. If any are found to be excessively low these can be disconnected, spares fitted and, if they are at a higher level, connected into the circuit.

There is a ceramic insulator fitted to the end of each element. Take extreme care to ensure that it is not disturbed, cracked or broken during this process. When replacing wires or connections to the ends of elements, fully tighten the ceramic retaining nut to prevent localised heating. Do not over tighten the nut as this can overstress the ceramic and cause it to break or crack.

All the above procedures can be carried out by EXHEAT Industrial Ltd. site personnel if required. Relevant chargeable site rates prevail and can be provided upon request.

If the client elects to carry out the above procedures using other than EXHEAT Industrial Ltd. personnel, it is the client's responsibility and they shall ensure that all hazardous area certification, safety requirements and regulations are fully complied with.

15. Additional Requirements

'Dry' Process Fluids

The points contained in this section apply to heaters with 'dry' process fluids. They are important requirements that are additional to the other sections of this manual.

Some process fluids are considered 'dry', meaning that they are electrically inert and non-conductive. A dry fluid leaking through a perforation in the element sheath will not necessarily initiate an earth-fault trip, or show as low insulation resistance in the heating element.

For this reason, it is very important that you check the integrity of the element sheath as part of your routine maintenance checks. Refer to the maintenance instructions for more details.

Where possible, remove and replace a failed element before returning the heater to service. If this is not possible it may be acceptable to disconnect the failed element and suitably isolate it, provided that:

- EXHEAT Industrial Ltd. agrees to and approves the proposed remedial action **prior** to carrying out the work.

Where the process fluid is gas:

- Take routine samples to check for leakage inside the terminal enclosure
- Sample the gas using an appropriate Ex certified reducer and stop end fitted to the terminal enclosure to assist with access.
- Follow all approved site operating procedures during sampling.

Corrosive Environment

The environment can be both the external environment and/or the process.

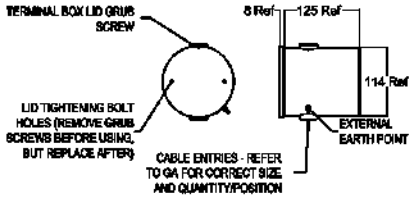
It is important any corrosive substance is removed from the heater when not in use.

High chromium steels, whilst having good corrosion resistance, require the surface to be free from contamination and washed with clean water in order to maintain the self-passivating chromium rich oxide layer.

16. General Arrangement/Wiring Drawings

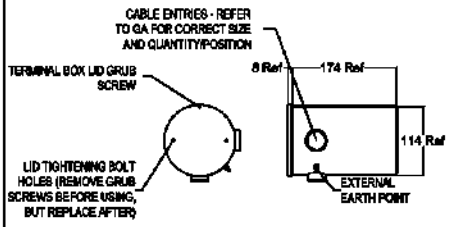
GENERIC TERMINAL BOX DETAILS

FP4H TYPE TERMINAL BOX



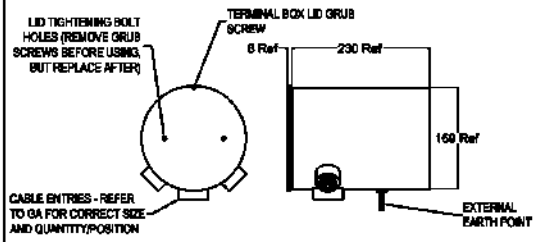
PLEASE REFER TO THE GENERAL ARRANGEMENT DRAWINGS SENT WITH THIS PRODUCT FOR SPECIFIC DETAILS ON ENTRIES, EARTH POST SIZES AND PROCESS FIXINGS

FP4 TYPE TERMINAL BOX



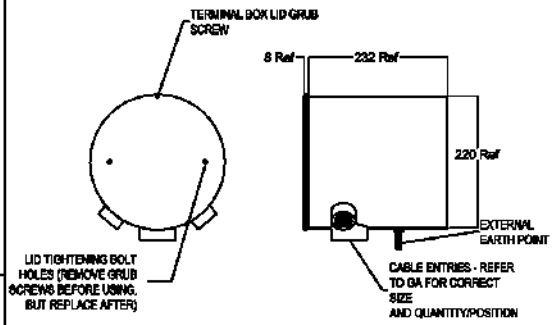
PLEASE REFER TO THE GENERAL ARRANGEMENT DRAWINGS SENT WITH THIS PRODUCT FOR SPECIFIC DETAILS ON ENTRIES, EARTH POST SIZES AND PROCESS FIXINGS

FP6 TYPE TERMINAL BOX



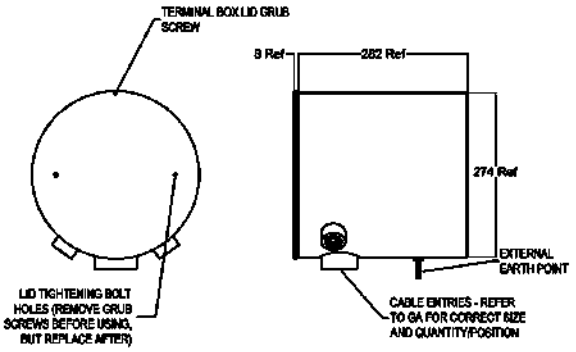
PLEASE REFER TO THE GENERAL ARRANGEMENT DRAWINGS SENT WITH THIS PRODUCT FOR SPECIFIC DETAILS ON ENTRIES, EARTH POST SIZES AND PROCESS FIXINGS

FP8 TYPE TERMINAL BOX



PLEASE REFER TO THE GENERAL ARRANGEMENT DRAWINGS SENT WITH THIS PRODUCT FOR SPECIFIC DETAILS ON ENTRIES, EARTH POST SIZES AND PROCESS FIXINGS

FP10 TYPE TERMINAL BOX



PLEASE REFER TO THE GENERAL ARRANGEMENT DRAWINGS SENT WITH THIS PRODUCT FOR SPECIFIC DETAILS ON ENTRIES, EARTH POST SIZES AND PROCESS FIXINGS

Wiring Diagrams

The wiring configurations can be single phase or three phase with thermostats RTD and Thermocouples wired in different configurations, please refer to the specific wiring diagrams that have been sent with the product to ascertain what configuration the product is and ensure wiring of the heater is installed to the wiring diagrams.

Please refer to the job specific drawings sent with the order for further details on specific heater dimensions and wiring configurations.

17. Warranty Forms

Instructions for completing and submitting check reports and certificates

Complete and sign off all *Pre-Commissioning Check Records* as pre-commissioning progresses; one check report must be completed for each piece of equipment supplied. When pre-commissioning is complete, submit all *Pre-Commissioning Check Records* to EXHEAT Industrial Ltd. for acceptance.

Check all load resistance, insulation resistance and trip settings at the commissioning stage. Record the results on the appropriate *Commissioning Check Record*. When commissioning is complete, submit all *Commissioning Check Records* to EXHEAT Industrial Ltd. for acceptance.

If the equipment is to be stored between completion of commissioning activities and start-up, refer to the appropriate preservation and requirements in this manual. Record all test results on the appropriate *Storage Preservation Check Record*.

If Section 15 specifies additional requirements for all or some of the heaters, carry out the additional preventative maintenance checks included on the Routine Maintenance Check Record.

Carry out all routine maintenance activities at the intervals determined by the *Routine Maintenance Check Record*. These records must be completed, signed off and submitted to EXHEAT Industrial Ltd. for acceptance if requested.

Check records/certificates can either be e-mailed to **commissioning@exheat-industrial.com** marked for the attention of the After Sales Department.

Forms shall be completed and registered with EXHEAT Industrial Ltd. to continue the equipment warranty and, the Hazardous Area Certification. Failure to do so may potentially result in warranty becoming void.

EXHEAT Industrial Ltd
Threxton House
Threxton Road Ind. Est.
Watton, Thetford, Norfolk
IP25 6NG, United Kingdom
Tel: +44 (0) 1953 886 269
Fax: +44 (0) 1953 883 853
www.exheat-industrial.com

ROUTINE MAINTENANCE INSPECTION RECORD

FP Type Immersion Heater

Serial Number	
Description	
PO No	
Reference No	

	Inspection Checklist	**Status Codes**	**Name**	**Date**	**Comment**
	3 Monthly Inspection				
a	Check equipment for external damage or signs of deterioration				
b	Check for dust build up or restricted air flow to the terminal box/stand-off section and clean				
c	Check that the ACH (if installed) is working correctly				
	6 Monthly Inspection (in addition to 3 Monthly Inspection)				
d	Check that there is no dirt, debris, loose items or moisture within the terminal enclosure				
e	Check that all electrical connections are undamaged and tight including any spare unused terminals.				
f	Check the heaters insulation resistance (refer to original docs sent)				
g	Check that enclosure O-rings (Gaskets if Ex e box is fitted) are undamaged and fitted correctly				
h	Check flamepaths are undamaged				
i	Check that earth conductors are correctly fitted and undamaged				
j	Check that the heater enclosure covers are closed and all fasteners are fitted, tight and of the correct type				
k	Check all trip devices are set and functioning correctly				
	12 Monthly Inspection (in addition to 3 & 6 Monthly Inspections)				
l	Check resistance values of heater				

Carry out the inspection in accordance with relevant standards concerning inspection and maintenance of electrical installations in non-hazardous or hazardous areas whichever is applicable.

Verified	**Installation**	**Energised**	**EXHEAT Industrial Ltd**
Name			
Signature			
Date			

Doc.No.IND.QC.001.R1

EXHEAT Industrial Ltd
Threxton House
Threxton Road Ind. Est.
Watton, Thetford, Norfolk
IP25 6NG, United Kingdom
Tel: +44 (0) 1953 886 269
Fax: +44 (0) 1953 883 853
www.exheat-industrial.com

PRE-COMMISSIONING RECORD

FP Type Immersion Heater

Serial Number	
Description	
PO No	
Reference No	

Inspection Checklist		**Status Codes**	**Name**	**Date**	**Comment**
01	Check overall physical condition of the heater for any signs of damage.				
02	Check that terminal enclosures are undamaged				
03	Check that the heater conforms to contract drawings (refer to the drawings provided)				
04	Check that all fasteners, glands and stoppers are complete and tight.				
05	Check that there is no dirt, debris, loose items or moisture within the terminal enclosure.				
06	Check that earthing is complete and satisfactory				
07	Check that enclosure gaskets are undamaged and fit correctly				
08	Check that all electrical connections are tight including any spare unused terminals				
09	Check that creepage and clearance distances are correct.				
10	Check that there is no obvious damage to internal wiring.				
11	Check that the apparatus is adequately protected against corrosion, the weather, vibration and any other adverse factors.				
12	Check that guards, where required, are present and correctly located.				
13	Check flame paths are undamaged.				
14	Check the heater insulation resistance and record readings on form IND.QC.003.				
15	Check all labels and tags are present, secure and correctly marked.				
16	Check heater and instrument enclosure covers are closed and all fasteners are fitted, tight and of the correct type.				
17	Check all trip devices are set and functioning correctly; (record set-points on form IND.QC.005)				
18	Earth leakage system in place and set points checked (record set-points on form IND.QC.005)				

Carry out the inspection in accordance with relevant standards concerning inspection and maintenance of electrical installations in non-hazardous or hazardous areas whichever is applicable.

Verified	**Installation**	**Energised**	**EXHEAT Industrial Ltd**
Name			
Signature			
Date			

Doc.No.IND.QC.002.R1

EXHEAT Industrial Ltd
Threxton House
Threxton Road Ind. Est.
Watton, Thetford, Norfolk
IP25 6NG, United Kingdom
Tel: +44 (0) 1953 886 269
Fax: +44 (0) 1953 883 853
www.exheat-industrial.com

CHECK RECORD
Insulation Resistance

Serial Number	
Description	
PO No	
Reference No	

	Insulation Resistance M.ohm											**Supplier**	**Fabrication**	**Energised**	**Megger Test Date**
	Stage to Stage								**Phase to Earth**						
Stage	1	2	3	4	5	6	7	8	L1	L2	L3				
1															
2															
3															
4															
5															
6															
7															
8															

Verified	**Installation**	**Energised**	**EXHEAT Industrial Ltd**
Name			
Signature			
Date			

Doc.No.IND.QC.003.R1

EXHEAT Industrial Ltd
Threxton House
Threxton Road Ind. Est.
Watton, Thetford, Norfolk
IP25 6NG, United Kingdom
Tel: +44 (0) 1953 886 269
Fax: +44 (0) 1953 883 853
www.exheat-industrial.com

CHECK RECORD
Load Resistance

Serial Number	
Description	
PO No	
Reference No	

	Load Resistance (ohm)						Supplier	Fabrication	Energised	Test Date
Stage	L1-L2	L1-L3	L2-L3	L1-N	L2-N	L3-N				
1										
2										
3										
4										
5										
6										
7										
8										

Verified	**Installation**	**Energised**	**EXHEAT Industrial Ltd**
Name			
Signature			
Date			

Doc.No.IND.QC.004.R1

EXHEAT Industrial Ltd
Threxton House
Threxton Road Ind. Est.
Watton, Thetford, Norfolk
IP25 6NG, United Kingdom
Tel: +44 (0) 1953 886 269
Fax: +44 (0) 1953 883 853
www.exheat-industrial.com

COMMISSIONING CHECK RECORD

Trip Settings

Serial Number	
Description	
PO No	
Reference No	

	Inspection Checklist (Blanks may be used for site specific requirements)	**Tag Number**	**Status / Verified Trip Setpoint**	**Name**	**Date**	**Comment**
01	Check all temperature sensors and transmitters are correctly located, undamaged and functioning correctly.					
02	Check temperature trip set points and record details below.					
03	Check earth leakage trip time and record details below:					
04						
05						
06						
07						
08						
09						
10						
11						

Carry out the inspection in accordance with relevant codes of practice concerning inspection and maintenance of electrical installations in non-hazardous or hazardous areas whichever is applicable.

Verified	**Installation**	**Energised**	**EXHEAT Industrial Ltd**
Name			
Signature			
Date			

Doc.No.IND.QC.005.R1

EXHEAT Industrial Ltd
Threxton House
Threxton Road Ind. Est.
Watton, Thetford, Norfolk
IP25 6NG, United Kingdom
Tel: +44 (0) 1953 886 269
Fax: +44 (0) 1953 883 853
www.exheat-industrial.com

GEL BAG REPLACEMENT RECORD

Serial Number	
Description	
PO No	
Reference No	

	Name of Engineer	Quantity Removed	Quantity Replaced	Initials of Engineer	Date	Comment
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						

Carry out the inspection in accordance with relevant codes of practice concerning inspection and maintenance of electrical installations in non-hazardous or hazardous areas whichever is applicable.

Verified	**Installation**	**Energised**	**EXHEAT Industrial Ltd**
Name			
Signature			
Date			

Doc.No.IND.QC.006.R1

18. Certification

THORNE & DERRICK INTERNATIONAL
Thorne & Derrick
+44 (0) 191 410 4292
www.heatingandprocess.com

1st Edition (July 2019)

Author: P. Bumstead

FP Type Immersion Heater - IOM_English

efer to EXHEAT Industrial Ltd website for latest edition.