



HOWDEN

Electro Heating

OPERATING, INSTALLATION & MAINTENANCE INSTRUCTIONS

FE RANGE

THESE INSTRUCTIONS SHOULD BE READ AND FULLY UNDERSTOOD PRIOR TO INSTALLATION. THEY SHOULD BE KEPT IN A SAFE AND EASILY ACCESSIBLE PLACE NEAR THE UNIT.

THIS HEATER MUST BE INSTALLED BY A PERSON WITH THE RELEVANT ELECTRICAL QUALIFICATIONS AND EXPERIENCE IN ADDITION TO ANY OTHER APPROPRIATE QUALIFICATIONS AND EXPERIENCE. NO LIABILITY CAN BE ACCEPTED BY H.D. HOWDEN LTD FOR ANY INACCURACIES OR OMISSIONS IN THESE INSTRUCTIONS.

THIS HEATER SHOULD BE STORED IN A SAFE PLACE PRIOR TO INSTALLATION TO ENSURE THAT NO DAMAGE TO THE APPLIANCE OR ASSOCIATED COMPONENTS CAN OCCUR.

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APPLICATION

The 'FE' fixed element range of flange mounted immersion heaters are intended to heat water and are suitable for use in building services and industrial applications. The range features an industry standard flange and compact design for installation into cylinders, storage vessels, etc... It should be noted that it is necessary to drain the system down to inspect the elements and that the individual elements are not replaceable. If any elements fail during operation, a replacement heater must be ordered. Horizontal mounting is standard although vertical mounted heaters can be supplied. To avoid localised boiling or air locks, care should be taken to ensure that the cold zone extends beyond any neck piece.

CONSTRUCTION

The metal sheathed elements are brazed into the industry standard brass element plate. Support bands are fitted to the element 'bundle' to prevent the elements from bending outside the bore of the tank. Element terminals are interconnected to provide evenly balanced electrical circuits. The terminal enclosure comes complete with a removable gland plate for on-site cable entry drilling. Earth bonding connections are provided on the element plate, terminal enclosure and gland plate. The 'FE' range maximum operating temperature is 120°C and the maximum operating pressure is 5 bar. The heater generally conforms to B.S.7798.

Refer to Data Sheet in Appendix - for the detailed specification and construction of the heater.

INSTALLATION

MECHANICAL INSTALLATION INSTRUCTIONS

- The heater is supplied with a gasket, ready to be bolted to the appropriate flange on the vessel. It is not recommended that sealing compounds are used.
- Installation must be carried out with the thermostat (s) uppermost.
- Heaters with immersed lengths of 1200mm and longer should be provided with internal tank support.
- After fitting the heater into the vessel, the system should be filled with water and a check made for leaks around the joint. The Vessel should be filled according to your standard procedure ensuring that all air pockets are purged from the system. **It is important that the elements are immersed at all times during operation.**
- Control thermostats (if fitted) should be set to suit site requirements. Recommended settings are as follows :

Soft water areas or where efficient water softener is installed	Up to 82°C.
Medium hard water areas	Up to 71°C.
Hard water areas	Up to 65°C.

Note : Scald temperature of water is 66°C.

- The control thermostat is provided to regulate the temperature to the desired setting. When the set temperature is reached the heater circuit will switch off until the temperature falls below the differential of the thermostat. When this happens the heater circuit will energise and start the cycle again.
- The High limit manual reset cut-out thermostat should be set at approx. 15°C above that of the control thermostat setting. The high limit thermostat is incorporated as a safety device to prevent overheating. **It is highly recommended that a high limit thermostat is included in all installations for safety purposes.**
 - Thermal insulation should be applied to exposed surfaces where necessary for the protection of personnel.
 - **If any cleaning or sterilising solutions are to be 'flushed' through the system prior to commissioning, a check should be made to ensure that the solution will not damage the heater.**
 - **Warning: Do not cover the heater terminal enclosure.**

ELECTRICAL INSTALLATION INSTRUCTIONS

All electrical wiring must be carried out by a qualified person and must be comply with the current I.E.E Regulations to B.S.7671.

- We recommend that the insulation of each circuit within the heater is checked prior to installation. The minimum insulation reading between live and earth should not fall below 1M Ω . Refer to the procedure in the Operational Faults section of this manual if the insulation is below 1M Ω .
- A terminal layout drawing is supplied inside the terminal enclosure to use as a guide when wiring the heater.
- The immersion heater **must** be connected to fixed wiring.
- The standard wiring is arranged for three phase supplies in either single circuit or multi-stage control. It is essential that the control equipment is compatible with the heater circuit configuration and all components are correctly rated. Control equipment can be supplied by H.D. Howden Ltd.
- Control equipment should consist of :
 - a readily accessible and clearly identified isolating switch.
 - fuse protection on the mains incoming supply, each heater circuit and the control circuit.
 - a contactor controlling each heater circuit. The contactor coil is to be controlled through a control thermostat.
- The enclosure is fitted with earth bonding studs which should be bonded to the various parts of the enclosure and element plate during installation.
- Ensure all wires are labelled with the phase colour and circuit number (important for future maintenance) and cable eye connectors should be used on terminal connections.
- The control thermostat is normally wired in series with the contactor coil of the contactor switch.
- The high limit thermostat should be wired in series with the control thermostat.
- All parts are bonded by a common earth link requiring the connection of one common earth terminal only.
- Check all electrical connections to ensure that they are tight.
- After all electrical connections have been made replace the heater terminal enclosure.
- Immersion heaters are designed to operate **ONLY** when the heating elements are totally immersed in water and **must not** be switched on when the heating elements are exposed to air.
- The vessel must be fully filled with water before operating the heater (See mechanical installation procedure).
- The heater will only heat the contents of the tank above the immersion heater.
- Should the vessel be drained at any time and the heater removed, this installation procedure must be repeated before proceeding to switch the heater circuits on.

WARNING : THIS APPLIANCE MUST BE EARTHED

MAINTENANCE

It is recommended that routine periodic checks are performed every 12 months or every 6 months where local water supply is particularly hard or contains a high proportion of solids. All precautions must be taken against electrical shock, in particular by switching off at the mains switch fuse between maintenance checks.

The recommended procedure is as follows :

WARNING : Always isolate electrical power at the mains switch before removing the terminal enclosure.

1. Isolate electrical power at the mains isolator and remove fuses.
2. Isolate mains cold water supply.
4. Visually check all water joints, ensuring no leaks are evident.
5. Remove heater terminal cover.
6. Disconnect incoming wiring (line connections) to busbars.
7. Carry out an insulation check on each circuit between live and earth. If readings are below 1M Ω refer to the insulation improvement procedure in the Operational Faults section of this manual.
8. Remove busbars and carry out resistance checks on all elements to verify element continuity.
9. Check operation of thermostat (s).
10. We only recommend removing the heater from the vessel if elements have failed or the water is particularly aggressive or contains a high concentration of dissolved solids.
11. Drain vessel and connecting pipes according to your standard procedure before removing the heater.

12. Unbolt the element plate and remove complete assembly from the vessel.
13. Visually inspect heating elements for scale formation or corrosion. In extreme cases heavy scaling will cause increased element running temperatures and eventual element failure.
14. If an element is heavily scaled or corroded and has failed, the entire heater must be replaced.
15. Replace any defective parts (Refer to the Spare Parts section of this manual for ordering information).
16. Fit a new flange gasket to the element plate.
17. Refer to the mechanical and electrical installation instructions section for re-fitting heater to vessel.

Note : If the system is to be 'flushed' through with solutions intended to sterilise or de-scale, a check should be made to ensure that the solution will not damage the heater.

OPERATIONAL FAULTS

Always isolate electrical power at the mains switch before removing the terminal enclosure.

• Lower Than Expected Heat Output

Check :

- a) If control thermostat has been incorrectly set.
- b) If there is an error in the initial sizing of the heater.
- c) If there is a fuse failure or fault in the control gear.
- d) If one or more of the heating elements has failed.

• Heater Not Operating

Check :

- a) If High Limit Thermostat has operated. This may be re-set by depressing the button, only after locating and rectifying the cause of the excessive temperature. i.e. probably a failure of the control thermostat or control gear.
- b) Main Fuses.
- c) Main Electrical Supply.
- d) Control Thermostat for failure in 'open' position.
- e) Contactor operation and contactor coil fuse. Fault in contactor or control gear.
- f) Wiring to heater (No loose connections).
- g) Element continuity (resistance) - If faulty order a replacement heater (See spare parts section).

• Water Overheating

Check :

- a) Control Thermostat setting - may be too high.
- b) Control Thermostat for failure in 'closed' position.

• Constant Fuse Failure

When fuses constantly fail, it is recommended that the following be adopted :

- a) Ascertain which item (s) the fuse protects i.e. heater circuit etc..
- b) Once established, thoroughly check relevant circuit with test meter to determine if any elements have gone to earth.

• Faulty Elements

The following procedure should be carried out if the elements are suspect :

1. Check earth insulation from live to earth. This should be above 1 MegaOhm.
2. Check phase to neutral resistance (Star) or phase to phase resistance (Delta). These readings should correspond to those on the test certificate.

If these readings are found to be incorrect, remove busbars and repeat the above procedure for each individual element in order to identify the faulty element (s).

• Low Element Insulation

All elements are sealed prior to despatch to prevent any ingress of water, however storage conditions after despatch are not always ideal. In particular, if there is a long delay between purchase and commissioning there may be some degree of water ingress into the elements. Before connecting the immersion heater to the mains, an insulation test should be carried out across each element to earth using a megger. If the insulation resistance is less than 1 MegaOhm problems may be experienced with RCD's or other current controlling devices. The immersion heater will not be affected by the low insulation readings. However to allow any current control devices to operate it is suggested that the following procedures are carried out :

1. The terminals on the end of each element can be dried to remove any moisture. e.g. with a hairdryer or similar device.
2. When brought into operation, the elements will naturally improve in insulation. The stages within the heater can therefore be switched on one at a time to reduce the leakage current. i.e. one stage can be switched on and left overnight, then another stage can be switched on and left during the day. This is continued until all stages are operating. If the insulation readings are now checked they should be within normal operating levels.
3. If an RCD is being used this can be disconnected for a short time while the heater is switched on to allow the insulation readings to increase.
4. The element bundle can be placed in an oven at 200-250°C for a period of time to raise the insulation levels. If an oven is not available, the heater can be returned to H.D. Howden.
5. To maintain the insulation during periods of low use it is advisable to switch the heater on in the tank, in water, approximately once a month for 48 hours.

SPARE PARTS & REPLACEMENTS

To ensure the proper and safe operation of the heater it is important that all spares and replacement parts are to be ordered from H.D. Howden Ltd quoting the serial number of the heater. The serial number may be found on the nameplate which is on the terminal enclosure or stamped onto the side of the flange. It should be noted that it is necessary to drain the system down to inspect the elements and that the individual elements are not replaceable. If any elements fail during operation, a replacement heater must be ordered

SPARE PARTS LIST

- Flange Gasket
- Control thermostat
- High Limit Thermostat (if fitted)

GUARANTEE

The manufacturer will make good, by repair or at his option by the supply of a replacement, defects which, after proper installation, appear in the goods, within a period of twelve calendar months after the goods have been delivered and arise solely from faulty design, materials or workmanship. Provided always that defective parts are promptly returned by the user free to the manufacturer's works, unless otherwise arranged, the repaired or new parts will be repaired or new parts will be delivered by the manufacturer free of charge.

The policy of H.D. Howden Ltd is that of continuous improvement and development, the right is therefore reserved to change specifications without notice.

APPENDICES

KEEP THESE OPERATING INSTRUCTIONS IN A SAFE PLACE FOR FUTURE REFERENCE